NUTS & VOLTS
MAGAZINE

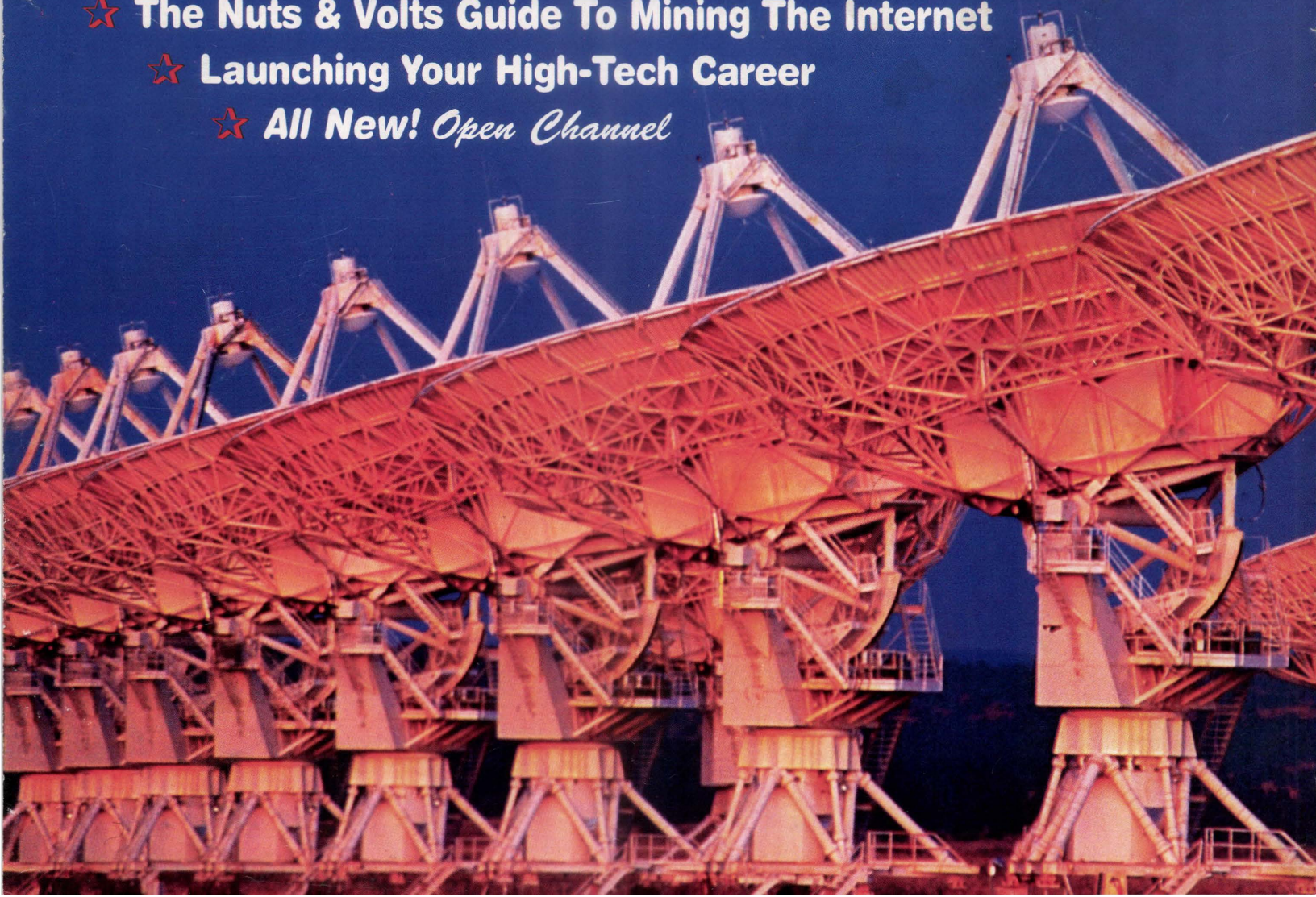
$3.50
VOL. 16 NO. 5
MAY 1995

OUR 16th YEAR

Exploring Electronics And Technology For The Hobbyist And Professional

DXing The Cosmos
Amateur Radio Astronomers Search Out Signals From Deep Space

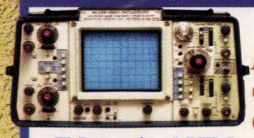
- ☆ Domino Effect Topples Complicated Controllers
- ☆ The Nuts & Volts Guide To Mining The Internet
- ☆ Launching Your High-Tech Career
- ☆ *All New! Open Channel*



Don't miss out on a great deal!

Call, write or fax for your FREE Tucker Catalog!

OPTOELECTRONICS · GoldStar · BK PRECISION · WAVETEK · LEADER · Protek · EXTECH INSTRUMENTS · HAMEG



Protective Front Covers Available... Only $25!

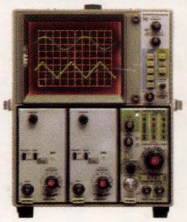
Tektronix 465M
100 MHz Portable Oscilloscope ... $695

- Dual Trace: 5 mV/div to 5 V/div
- DC to 100 MHz bandwidth
- Time Base A 0.5 sec/div to 0.05 µS/div into 22 steps; Time Base B 50 mS/div to 0.05 µS/div in 19 steps
- 8 x 10 cm display
- Portable —weighs 25.3 lbs
- Front cover not included.

Tucker Pre-Owned Quality

Unparalleled Value On This Full Performance Oscilloscope System
Thousands Off Original Tektronix Price

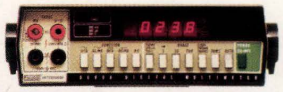
Tektronix 7603N System (7603N/7A15AN/7A15AN/7B53AN Option 11S)
Complete Oscilloscope System $495



Tucker Pre-Owned Quality

Recognize this? If you've worked in electronics then you know Tektronix Oscilloscopes. This system is one of Tektronix's best and TUCKER lets you have it for only $495. It views signals from 500 µV to 80 V. That's 5 mV to 10 V per division with a X 10 magnifier. Speed? You got it. It clocks in at 5 nS to 5 S/div. It shows you DC to 65 MHz with dead accuracy (2% of the input). The Mainframe can use many plug-ins. So your system grows with you. In fact, it also saves you money and space that way. It also has the DELAY function to focus in on a signal's particular component. Its bright CRT shows you a single sweep, a low repetition rate, or a very fast rise time sharply so you'll see what you want. You get two 7A15AN Vertical Plug-Ins to provide you with extra control and an ideal Multiple-Setting Comparator. You control the polarity and magnification any way you like. The quick 7B53AN Horizontal Plug-In gives you the variety of sweeps and triggering to get the job done. Tektronix Quality and Tucker Pricing are always a Winning Team!
Protective front covers are available for only $25 * 2 Universal P600S X1/X10 Switchable Probes ** For This Mainframe

AC or Battery Operation



Fluke 8600A/01
4½ digit Multimeter ... $350

Tucker Pre-Owned Quality

- Includes option 01 for AC or Battery operation!
- Measurement functions: AC & DC Volts, AC & DC current & resistance; 4½ digit display
- DC & AC voltage ranges are ±200 mV, 2 V, 20 V, 200 V & 1200 V
- DC & AC current ranges are 200 µA, 2 mA, 20 mA, 200 mA & 2000 mA
- Resistance ranges are 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2000 kΩ & 20 MΩ

*All Test Instruments Include Manuals and are Completely Operational Unless Otherwise Stated.

5 Channels, 12 Traces & FREE Probes! Protective Front Covers Available...Only $25!

Kikusui COS6100M ... 100 MHz Oscilloscope ... $695

Tucker Pre-Owned Quality

The COS6100M combines ease-of-use with powerful features that sets it apart from other scopes. Order yours today and we'll include 2 FREE TPI P1001S X1/X10 Switchable Probes! The COS6100M can be found in production, testing, R&D, and even home shops because of its wide capabilities and low cost. You'll appreciate the versatility of 5 channels and 12 traces, plus its portability and very bright, clear display. The front-panel is laid out in a fresh, user-friendly fashion so you don't have to learn a "new scope" all over. It will trigger four ways: off of channels 1, 2, 3, or "ALT." A patented "trigger lock" allows for stable, automatic triggering even on complex signals such as TV waveforms. Another unusual feature is its ability to display several patterns at once. For example, this Kikusui COS6100M can show you X-Y displays of channel 3 vs. channel 1, and vs. 2, 4, and 5. Bandwidth of 100 MHz, sensitivities are CH1 and CH2: 5 mV-5 V; CH3, CH4, CH5: 0.1 V and 1 V. The sweep speeds are 20 nS-0.5 S (A and B). This is a great deal on a powerful oscilloscope!

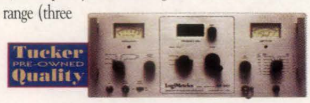
Fluke 893A
Differential Voltmeter

Tucker Pre-Owned Quality **$269**

- Can be used as a differential or conventional voltmeter
- Voltage range: 0 to ±1100 V (AC & DC)
- Resolution: 1 µV
- DC accuracy: ±0.01%
- AC accuracy: ±0.05%
- 50 Hz to 10 kHz
- Compact size

We Take Trade-Ins!

Logimetrics 920-S101
Signal Generator $295



Tucker Pre-Owned Quality

The 920-S101 is a solid-state instrument, used for generating accurate CW, amplitude modulated, or frequency modulated signals over the 11 MHz to 80 MHz frequency range (three over-lapping ranges). Easy-to-use, front-panel is logically designed so that quick setups are possible even with inexperienced users. Internal 1 kHz or external signal may be used for AM modulation. In the FM mode, signal may be modulated by an internal 1 kHz signal or by an external 50 Hz to 10 kHz signal. Calibrated output signal in 10 dB steps from -110 dBm to +10 dBm. Both Amplitude and Modulation are displayed using large, easy-to-read meters.

Great For Unattended Operation

Tucker Pre-Owned Quality

Hewlett Packard 7550A
RS-232C Plotter $795

Outstanding value on this high performance plotter offering both HP-IB and RS-232C interfaces. Great for many applications, accepts A3/B and A4/A size media, uses drafting media pens, and will rotate graphs 90° for a choice of either horizontal or vertical formats. Designed for easy operation, the 7550A has an automatic sheet feeder and utilizes a front panel display and function keys to guide through each plotter setup, report plotter status and give program messages. Acceleration: 6 g (80 cm/sec); 0.006 mm mechanical resolution; addressable step size down to 0.025 mm; repeatability of 0.1 mm.

The Original HP-IB

Hewlett Packard 10833A, B, C, D
HP-IB Interconnection Cables

Tucker Pre-Owned Quality

10833A 1 meter.....$35
10833B 2 meters.....$35
10833C 4 meters.....$30
10833D 0.5 meters.....$35

For the best data transfer and control...go with the original! Our price makes it easy to afford the best, the high quality HP cables. They have a connector block at both ends and each cable has a plug on one side and a matching receptacle on the other, allowing several cables to be connected in parallel. Don't settle for less, call Tucker!

Tucker Pre-Owned Quality

FREE HP-IB Cable

Hewlett Packard 2225A $149
HP-IB ThinkJet Printer ....

Order this popular HP ThinkJet Printer at a great price and we'll include a FREE HP-IB cable! This printer is a quiet, compact desktop printer that is very efficient (150 cps) while delivering crisp, easy-to-read text and graphics for letters, reports, and spreadsheets in either draft or quality mode. This printer is well known throughout the industry so software support is never a problem. Print cartridges are disposable and easily replaced. Due to its size, features, quality, and dependability, the HP 2225A is an excellent choice.

ALL ITEMS IN THIS AD
30 DAY MONEY BACK GUARANTEE

TUCKER ELECTRONICS

ALL ITEMS IN THIS AD
1 YEAR WARRANTY

VISA · MasterCard · American Express · Discover

•1717 Reserve Street, Garland, TX 75042
Local Call 214-348-8800

Call 800-527-4642

•P.O. Box 551419, Dallas, TX 75355-1419
24-Hour Fax 214-348-0367

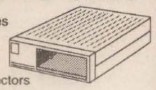
Write in 219 on Reader Service Card.

HSC Electronic Supply

Serving Silicon Valley since 1964!

...brings you a potpourri of high-tech goodies for the techno-tinkerer!
For thirty years we have been your source for Silicon Valley exotica!

SCSI Disk Drive Case



- Low-profile case for 5.25" drives
- Perfect for CD-ROM drives
- 9.5" x 2.5" x 10.5" overall size
- 50-pin SCSI daisy-chain connectors
- Uses IEC power cord (not included)
- Internal audio cable, RCA jacks on back
- Features 40W power supply, fan, SCSI ID switch

HSC# 15243 Low-Profile 5.25" Drive Case **$39.95**

Computer Parts Specials!

A. Teac half-height 5.25" 360K Floppy Drive
- Black Faceplate, Used, 30-day warranty

HSC# 14667 **$14.95**

B. Internal Fax/Modem Card, 2400data/9600fax
- New OEM (no box, software) with spec. sheet

HSC#15290 **$9.95**

C. 3.5" Floppy Drive Adapter Bracket for 5.25" bay
- Includes hardware, faceplate, connector adapters

HSC# 15124 **$1.95**

HP & Toshiba Cartridges

A. Hewlett Packard Deskjet & Deskjet Plus Font Cartridges
Order by HSC # plus letter: ❖ B, Prestige Elite ❖ ❖ C, Letter Gothic ❖ D, Times Roman 8 & 10 pt. ❖ ❖ E, Times Roman 12 pt. ❖ F, Times Roman 14pt. ❖ ❖ G, Helv. 8 & 10 pt. ❖ H, Helv. 12 pt. ❖ J, Helv. 14 pt. ❖ ❖ P, Times Roman ASCII ❖ Q, Helv. ASCII ❖

HSC# 97172 **$5.00**

B. Toshiba Laptop RAM Cartridges --1 Megabyte

HSC# 97171 **$5.00**

Handy Power Supplies

A) Switching power supply rated at 5VDC, 3A, Measures 2.75 x 3.25 x 5.25", IEC receptacle for universal (100 - 250VAC, 47 - 63 Hz) input, IEC cord not included, 6' Output cord with DIN plug
New in box. HSC#14996 **$5.95**

B) Linear supply rated at 12VDC @ 1200 mA. Input is strapped for 240 VAC input, use as is with 110VAC for lower voltage output, or re-strap it for 110VAC use at 12VDC. Measures 2.5 x 4 x 6.5", IEC cord not included.
HSC# 14980 **$5.95**

C) Standard 6' IEC power cord for use with above supplies, misc. colors & styles, used. HSC# 80119 **$.99**

D) Multi-output linear supply rated at 5VDC @ 600mA, +12VDC @ 250mA, -12VDC @ 250mA, 110VAC input, measures 2.5" x 3" x 4.75", generous 4' AC input cord, 5-pin DIN output cord, HSC# 15137 **$14.95**

E) Same as "D" above, only 5VDC @ 500mA, +12VDC @ 1A
HSC# 15139 **$9.95**

Multimedia Speakers

- Two styles to choose from, both new in OEM box
- White plastic enclosures, grey grilles
- MSS-1000 has Volume control, Bass boost switch, uses 3 C-cells per side, measures 3.5" x 3.5" x 5"
- MSS-2000 has Volume control, Bass & Treble boost switches, uses 2 C-cells / side, measures 3.75" x 4" x 6"

MSS-1000 HSC# 15127 Pair/ **$6.95**

MSS-2000 HSC# 15126 Pair/ **$8.95**

External Floppy Drive

- 5.25" half-height 360K floppy drive, beige face
- Sturdy beige enclosure with power supply
- IEC Power cord, 37-pin D cable included
- Case size 6" x 2.25" x 12.5" (great for mounting other external drives, i.e. CD-ROM, etc.)
- New in box, with manual
- 90-day warranty

HSC# 15138 **$24.95**

Arcade Game Controls

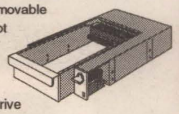
- Heavy-duty switch-type joysticks, made by Wico
- New in box, 10A Microswitch contacts
- Mounting flange 3" x 3.5", stick with knob is 3.25" high
- Choice of red or black teardrop or red ball knobs

HSC# 15227 Red Teardrop HSC# 15228 Black Teardrop
HSC# 15230 Red Ball Knob **Your choice $6.95**

- Heavy-duty "fire" buttons, made by Wico
- New, 10A Microswitch contacts
- Mounting flange 1.25" dia., mounts in 1.125" hole
- Nicely dished button, choose from several colors:

HSC# 15218 Yellow, HSC# 15219 White
HSC# 15221 Green, HSC# 15222 Red
Your Choice $1.95 ea.

IDE Docking Bay



- Makes 3.5" IDE Drives removable
- Fits in 5.25" half-height slot
- Plastic construction
- Remove drive for security
- New in box
- Power interlock protects drive
- Includes data & power connections

HSC# 15304 **$39.95**

Network Cable Special

- Dual Workstation Installation Kit
- Two high-quality 10' RG-58 coax BNC cables
- Two BNC tee's
- Two BNC 50Ω terminators
- One BNC coupler
- Enough to cable two Thin-net workstations to the wall-plate distribution point

HSC# 14967 **$9.95**

Transaction Terminal

- Used VeriFone Tranz 240 terminals
- Vacuum-fluorescent alphanumeric 16-character readout
- 12-key keypad ◆ Z-80 proc. ◆ CMOS program EPROM
- Mag-stripe read-head (may have been disconnected)
- Communicates over an RS-485 line
- Needs 8.5 VAC adaptor
- Quantity discounts available

HSC# 14848 **$19.95**

CD-ROM Drive Deals!

- Just in...too close to ad deadline to sort!
- We will have several brands, speeds and interfaces
- Single, double and triple speed drives
- From $49.95 to $139.95
- Used, tested, guaranteed good, 90-day warranty
- Proprietary and SCSI Interfaces

CALL FOR INFO.... **$ave $$$!**

New! QRP Kit Specials

- Popular QRP ham transceiver kits by Oak Hills Research
- 1.5 Watt (Sprint) & 3 Watt (Explorer) models
- 30, 40 Meter bands avail. for Sprint, 20, 30, 40 for Explorer
- 100% complete kits with chassis, knobs, etc.
- All coils prewound for assembly ease
- QRP Wattmeter kit WM-1 available for $79.95

Sprint Transceiver Kit $89.95
Explorer Transceiver Kit $129.95

Modem Madness...

- Hyundai external 2400 & 1200 bps modems
- New in box with telco cable, manual, power adaptor
- CCITT V.21(V.22/V.22bis for 2400), MNP-5 compatible
- 5" x 1.25" x 8.5" compact size, software included

HSC# 15179 2400 bps External Modem **$17.50**
HSC# 15238 1200 bps External Modem **$9.95**

- 1200 bps internal modem card, new with software

HSC# 15239 1200 bps Internal Modem **$4.95**

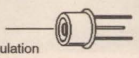
Multimedia Woofer!

- 60-watt air-suspension speaker with built-in crossover
- Mediavision Model 670-0020, used with CDPC system
- 6" speaker, 30 - 300 Hz freq. response, 40 Watts RMS
- Handsome black styling with removable black grille
- 9" x 7" x 17" cabinet, 1/4" phone plug input (cable incl.)
- New in box, 90-day warranty

HSC# 15178 **$27.50**

Laser Diode

- Toshiba TOLD-9200
- 3 to 4 mW at only 75 - 100mA of current!
- 670nm wavelength (visible red)



- Brand new prime
- Uncollimated, needs current regulation
- Application sheet with suggested circuit supplied

HSC# 15163 **$17.95**

Aerial Dogfight Game

- Lucasfilm's "Their Finest Hour -- The Battle of Britain"
- Historically accurate depiction of key WW II battle
- "Fly" a Spitfire, Stuka or one of six other fighter planes
- Realistic-looking cockpit instrument panel on screen
- Instruction book has 45 page history of the war with period photographs, campaign maps, profiles and quotes
- Turn on a "cockpit camera" to record your battle
- IBM/DOS,EGA/VGA, AdLib compatible.

HSC#14694 **$9.95**

HiFi Speaker Special!

- 40W Max, 20W RMS Woofer, 4Ω
- 5.5" dia. mounting, 1.7 lb. overall weight
- Black Injection-molded Graphite Cone
- Foam Suspension, Plastic Trim Ring
- Two-way Crossover Network with connection panel from same speaker system, freq. unknown

5.5" Woofer, new HSC# 15295 **$9.95**
Crossover, new HSC# 15296 **$3.95**

WORM-drive Project

- Maxoptix RXT800S internal full-height 5.25" drive
- 800 MB Write Once, Read Many (WORM) Optical Drive
- Customer returns, some work, some don't...
- As-is, no returns or exchanges...perfect for experimenter
- SCSI Interface, we have no other info.
- Driver software available in Corel SCSI! package
- Sorry, we don't have media yet, but we're looking!

HSC# 15209 **$19.00**

CD-ROM Starter Kit!

- Sony CDU-535 internal CD-ROM Drive (uses caddies)
- Working drive pulled from multimedia systems
- Single-speed half-height drive, Sony 40-pin interface
- Front earphone/speaker jack, rear audio connection
- New controller card, cable, drivers included (no caddy)
- 90-day warranty

HSC# 15191 **$49.95**

Remote Control for your Computer!

- Infrared Remote operates your computer from 50 feet
- Perfect for sales presentations, training, demonstrations
- Serial Interface (IBM version) or ADB (Mac version)
- Handheld remote is 7" x 2.5" x .5"
- Included software provides screen pointer for emphasis
- Keystroke mapping table can be customized, saved
- Roam the room, make eye contact with your audience
- Like using a TV set remote control (easy to set-up, use)

HSC# 15240 IBM Remote Keyboard **$29.95**
HSC# 15241 Mac Remote Keyboard **$39.95**

220V Printer Special!

- Citizen 120D+ 9-pin Dot-matrix printer, Parallel interface
- Narrow carriage, friction or tractor feed, tractor included
- 120 cps draft mode, 144 cps High-speed Elite
- Overall Size 3.5" x 14.5" x 9.5" (without tractor)
- 220VAC, British-style plug (big blades)
- Brand new in box, 90-day warranty
- Could be used with step-up transformer, inquire.

HSC# 15253 **$69.95**

Easy File Transfers!

- SmartSync Software by Nomadic Systems
- Provides easy way to keep multiple computers in synch
- Fast and efficient, transfers only the changes
- Works with modems, cables or diskettes
- Automatically updates multiple files, single and multi-user
- Prevents accidental overwrites, can remotely copy

HSC# 15305 **$19.95**

Back-up Tape Drive

- Summit Memory Systems "Express 120"
- 120 Megabyte internal tape-backup unit
- Bundled with Central Point Backup software
- Interfaces like a floppy drive (34-pin conn. on back)
- Brand new in box (includes AT mounting rails)
- DOS, Windows, Novell compatible
- 90-day warranty

HSC# 15246 **$59.95**

Halted specialties co. / HSC Electronic Supply

Toll Free (Orders Only) 1-800-4 HALTED (1-800-442-5833)
For Internet-return e-mail, post mail to: *HSC-Info@hsc.cue.com*
3500 Ryder St., Santa Clara, CA 95051 **(408) 732-1573** -or-
4837 Amber Ln., Sacramento, CA 95841 **(916) 338-2545** *FAX your orders to:*
6819 Redwood Dr., Cotati, CA 94931 **(707) 792-2277** *(408) 732-6428*

HSC now on Internet!

- Now you can request return e-mail from HSC!
- Simply send a posting to *HSC-Info@hsc.cue.com*
- Automatically receive an info package via return e-mail

To subscribe to our e-mail "Mailing list", send a posting to *HSC-server@hsc.cue.com* with the single line message:
SUBSCRIBE HSCmail <full name>
You will get future unsolicited mailings. You can "Unsubscribe" at any time in the same manner.

HSC-Info@hsc.cue.com

Terms: Some quantities limited; all items subject to prior sale. **Minimum order: $10.00 plus shipping.** Orders under $20.00 subject to $2.00 handling fee, in addition to shipping. All orders shipped FOB Santa Clara, CA (this means you pay freight!) by UPS Surface (no P.O. Boxes) unless otherwise specified, in which case prevailing carrier rate plus $5.00 handling fee applies. Prepaid orders that don't include shipping charges will be shipped freight COD. There is a $4.75 UPS charge added to shipping charges for COD shipments. If you have questions about your order, please call Customer Service at (408) 732-1854 M-F 9AM to 5PM PST.

Write in 63 on Reader Service Card.

WORLD CLASS

SENSITIVITY • SPEED • DISTANCE • POWER

Model 3300 $139.
1MHz-2.8GHz MiniCounter

- True pocket size
- 10 digit LCD display for best outdoors visibility and longer battery life
- Select six gate times
- Direct & pre-scaled ranges
- Hold switch locks display
- Low battery indicator

Model M1 $249.
10Hz-2.8GHz HandiCounter®

- High speed OE10
- Digital Filter greatly reduces random noise & oscillation
- Digital Auto Capture locks counter display on first reading to pass filter
- 5 Hour NiCad
- 10 Digit Backlit LCD display
- 16 segment RF bargraph
- Arm/Store button stores & recalls frequencies
- 250MHz direct count
- Digital Communications Port permits data logging with optional converter & software

Model 3000A $349.
10Hz-3GHz HandiCounter®

- High speed OE10
- Digital Filter greatly reduces random noise & oscillation
- Digital Auto Capture locks counter display on first reading to pass filter
- 6 Hour NiCad
- 10 Digit Backlit LCD display
- 16 segment RF bargraph
- Arm/Store button stores & recalls frequencies
- 250MHz direct count
- Digital Communications Port permits data logging with optional converter & software
- Multi-function: Frequency, Period, Ratio & Time Interval Measurement
- Dual High Impedance Inputs & Amplifiers
- Built In High Pass Filter

Model 8040 $679.
Bench Portable Counter

With all the features of the 3000A plus:

- Dual 50Ohm and 1Meg Ohm input amplifiers with AC/DC coupling, ± Polarity, Trigger Level adjust, Low Pass Filter & Attenuator
- Internal clock output/ external clock input
- RS-232 Serial computer interface
- Optional ± 0.1ppm TCXO or ± 0.05ppm KVG ovenized timebase

Products above shown with optional antennas.
When you order ask about our full line of Antennas and Filters to give you maximum pick-up distances & our Probes and Product Accessories.

Order Toll Free

1-800-327-5912

In FL: 305-771-2050 FAX: 305-771-2052

5821 NE 14th Ave, Ft. Lauderdale, FL 33334

OPTOELECTRONICS

5% Ship/Handling (Max $10) U.S. Canada. • 15% outside continental U.S. • Visa, Master Card, C.O.D., Cash or Money Order only.

Write in 52 on Reader Service Card.

NUTS & VOLTS MAGAZINE

Published Monthly By
T & L Publications, Inc.
430 Princeland Court
Corona, CA 91719
(909) 371-8497
FAX (909) 371-3052
CompuServe ID# 74262,3664

Subscription Order ONLY Line
1-800-783-4624

Publisher
Jack Lemieux
N6ZTD

—

Editor
Larry Lemieux
KD6UWV

—

Managing Editor
Robin Lukasik
KD6UWS

—

On-The-Road Exhibit Coordinator
Audrey Lemieux
N6VXW

—

Events Calendar
Shawn Vander Ploeg

—

Subscriptions
Natalie C. Sigafus

—

Classified Ads
Lisa Wharton

—

Copyright 1995
by T & L Publications, Inc.
All Rights Reserved

NOTICE TO ADVERTISERS

All advertising is subject to publisher's approval. We are not responsible for mistakes, misprints or typographical errors. Nuts & Volts Magazine assumes no responsibility for the availability or condition of advertised items or for the honesty of the advertiser. The publisher makes no claims for the legality of any item advertised in Nuts & Volts. This is the sole responsibility of the advertiser. Advertisers and their agencies agree to indemnify and protect the publisher from any and all claims, action or expense arising from advertising placed in Nuts & Volts.

Please send all subscription orders, correspondence, UPS, overnight mail and artwork to: 430 Princeland Court, Corona, CA 91719.

The closing date for each issue is the 10th of the prior month, e.g., the closing date for the June issue is May 10th. Ad copy to be typeset by Nuts & Volts should be received one week prior to the closing date.

Call or write for current advertising rates.

CONTENTS

VOLUME 16 NO. 5 MAY 1995

ARTICLES

DOMINO EFFECT TOPPLES COMPLICATED CONTROLLERS! *Scott Edwards* **17**
New microcontroller combines BASIC programming with industrial-strength hardware design.

UNDERSTANDING & USING MULTIPLEXED DISPLAYS *Thomas Henry* **31**
Discover a convenient method for interfacing a multi-digit LED display to a microprocessor circuit.

MAKING PRINTED CIRCUIT BOARDS (AN EASY WAY) *John Iovine* **51**
A quick refresher on making single sided PCBs.

THE COMMERCIAL RADIO LICENSE — DO IT BEFORE JULY! *Gordon West* **70**
Major changes in the commercial radio test pool will turn a relatively easy test into a major brain-thumper.

LAUNCHING YOUR HIGH-TECH CAREER: FINDING, GETTING, AND KEEPING YOUR FIRST POSITION AS AN ELECTRONICS TECHNICIAN *Ron Reis* **80**
To be successful as an electronics technician these days, you're going to have to go out and make it happen yourself — this article will show you how.

BUILDING THE SONIC ROVER KIT *Fred Blechman* **102**
Expand your understanding of audio amplifiers, switching, and time-constant circuitry with this robotic project.

THE NUTS & VOLTS GUIDE TO MINING THE INTERNET *Chris Sakkas* **122**
It's easier to "strike gold" when you know where to look for what you're searching for.

ELECTRIC CARS: LOW-CURRENT WIRING *Shari Prange* **130**
Although an electric car is powered by a high-voltage system, it still needs a separate low-voltage system for accessories and some control circuits.

COLUMNS

AMATEUR ROBOTICS *Karl Lunt* **59**
"Sensors for Mobile Robots" by H.R. Everett, and SBasic.

OPEN CHANNEL *Joseph Carr* **10**
NEW AUTHOR
Far-out DX is where you find it.

RESOURCE BIN *Don Lancaster* **84**
New opportunities in home automation.

SOFTWARE WIZARDRY *Harry Helms* **43**
NEW COLUMN
Exploring Visual Basic.

STAMP APPLICATIONS *Scott Edwards* **35**
NEW COLUMN
Adapt a keypad for pro-quality data entry; included software lets the Stamp "type" on your PC.

THE LASER EXPERIMENTER *Anthony Charlton* **112**
Laser surveillance.

THE SOLDERLESS BREADBOX *Don Wilcher* **90**
Experimenting with optical electronic integrated circuits.

DEPARTMENTS

ADVERTISER'S INDEX **139**
CLASSIFIED AD INFO **140**
DEALER DIRECTORY **128**
EVENTS CALENDAR **74**
MONTH AT A GLANCE **138**
NEW PRODUCT NEWS **64**
NV ADMART **118**
READER FEEDBACK **6**
TECH FORUM **24**

To Subscribe to NUTS & VOLTS

Send payment to the address below or call 1-800-783-4624 and use your Visa or MasterCard.

MAILED THIRD CLASS — USA ONLY
$19.00 — One Year **$35.00 — Two Years**

MAILED FIRST CLASS — ONE YEAR ONLY
$50.00 — USA **$50.00 — Canada/Mexico**
$100.00 — Foreign/Air Mail **$50.00 — Foreign/Surface**

Nuts & Volts Magazine
430 Princeland Court, Corona, CA 91719

EDITORIAL CONTRIBUTIONS

Nuts & Volts Magazine encourages article submissions and queries. Send a SASE for a copy of our writer's guidelines.

All submissions should be on 5-1/4 or 3-1/2 inch diskettes and include hard copy as well. If return of materials is requested, include a SASE with your submission.

Deadlines should be discussed in advance with the editor, but generally all material should be submitted by the 1st of the month for the next month's issue.

CHANGE OF ADDRESS

If you are moving, notify us AS SOON AS POSSIBLE so we can continue your subscription without interruption.

Your magazine WILL NOT automatically be forwarded to you by the post office, so it's important to submit your change of address directly to Nuts & Volts.

We will not be able to replace missed issues of the magazine due to unreported address changes.

When you send in your new address, include a current mailing label from the magazine with your account number on it. If you do not have a mailing label, be sure to include your old address and the name(s) under which the subscription was submitted.

INDEX TO CLASSIFIED ADS

10. Ham Gear for Sale 6
20. Ham Gear Wanted 9
30. CB — Scanners 12
50. Computer Hardware 14
60. Computer Software 29
70. Computer Equipment Wanted 39
80. Test Equipment 41
85. Security 76
90. Satellite Equipment 76
100. Audio — Video — Lasers 78
110. Cable TV 82
115. Telephone — Fax 92
120. Components 97
130. Antique Electronics 98
140. Publications 99
150. Plans — Kits — Schematics 101
155. Manuals — Schematics Wanted 107
160. Miscellaneous Electronics For Sale 108
170. Miscellaneous Electronics Wanted 115
180. Education 117
190. Business Opportunities 120
200. Repairs — Services 124

There is a new and up-coming electronics assembly company that you have got to know. It is called Tamsco, Inc.

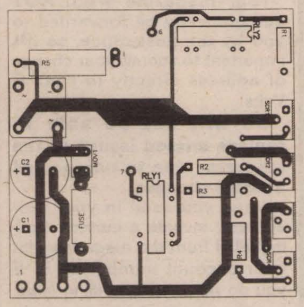
It is in a town just 50 miles west of Chicago, Illinois called Sugar Grove, just off of I-88, a nice little community.

They do all types of electronics design and assembly from printed circuit board layout to total turn-key operations and in any quantity you may need. They have years of experience in solid-state talking integrated circuits used for talking pop signs, kiddie rides, alarms, and almost anything you would like to make talk.

They are friendly folks that would like to help you and your business grow. Your success is our success; we will work with you to help you and your ideas succeed.

Just contact Owner Scott Gascoyne, Sales Manager John Middleton, or Sales Engineer Jim Payne to discuss your requirements.

Phone (708) 466-1260 Fax (708) 466-1263.



HAM GEAR FOR SALE

10

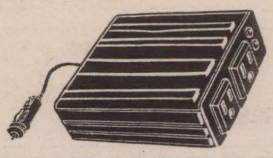
HOW TO conversion books land mobile to ham band, packet and repeater conversions. Contact for availability on make and model some converted units available. John Lansdell, 424 E. Shamrock, Rialto, CA 92376.

HV POWER Supply Plate Transformer, 3KV-1A, Hipersil, taps $179. Electrolytic capacitors, 2100MFD-400VDC, new $8. Filament transformer, 7.5V-75A, taps $109. Alan, K6GA, 714-964-3912.

COLLINS HF aircraft transceivers such as: ARC 58/R761 and similar units. buy/sell/trade. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

COLLINS RF Variable Inductor assembly, 41uH, 1KW+, motorized, 12-28 VDC $49. Collins Variable Vacuum Capacitor assembly, UCSL-1000-3KV, motorized, 12-28 VDC $69. Collins RF inductor, variable, 19uH, 1.5KW+, new $39. Alan, K6GA, 714-964-3912.

FREE ELECTRONICS CATALOG. Quality parts at surplus prices. All new, never used distributor and OEM overstocks. Call IME, 817-473-1730 or write PO Box 170415, Arlington, TX 76003.



TRUE-POWER©, 150 WATT DC TO AC POWER INVERTER. OPERATES 13" TV (or smaller) & VCR SAME TIME! China's NASA, space age quality & construction. INPUT 11.50-14.85VDC, OUPUT 115VAC 60Hz, (modified sine wave.) (FREQUENCY & VOLTAGE variation less than 1%, at full load). **$59.95 ea.** plus $3.50 S&H (to 5 lbs., Priority Mail). **CATALOG FREE** (Request inverter specification schematic flyer.) **CALL 702-642-0325, LESS BUSTER'S ELECTRONICS,** 2039 Civic Center Drive #176V, N. Las Vegas, NV 89030.

LOW PRICED quality two way gear, mot. Micor VHF 45W drawer only $10; Mitrec VHF 45W w/Mocom Acc $50. Ham cut Syntor 45w pl w/acc $100; Ham cut Mocom 70 30W w/acc $30; too much Motorola to list. Call for list, 909-873-1319 or FAX 909-820-1885. Write John Lansdell, 424 E. Shamrock, Rialto, CA 92376.

LOW PRICED quality two way gear. GE mstr2 40W VHF w/acc $35 50MHz mstr 2,100W $75; EX2 36MHz w/acc $40. For list call 909-873-1319 or FAX 909-820-1885. Write John Lansdell, 424 E. Shamrock, Rialto, CA 92376.

REPEATER OWNERS 5 volt talking clock module complete unit with LCD readout. Adding talking time was never easier. $19.95 shipped to your door. Larry's Electronics, 2442 Chestnut Grove Road, PO Box 656, Sharpsburg, MD 21782.

WANTED: ROCKWELL-Collins HF-8021 3KW Amp. Jim Stitzinger, 805-259-2011, fax 805-259-3830.

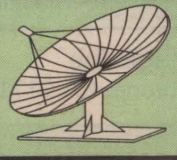
WHOLESALE CABLE

CONVERTERS AND DESCRAMBLERS

☑ Quality merchandise by brand name manufacturers
☑ Satisfaction guaranteed ☑ Free gift on first order
☑ Technical support ☑ 1 year warranty on new descramblers
☑ 2 year warranty on new converters
☑ COD shipping & overnight shipping by request
☑ Experience where it counts ☑ Volume pricing

Tell us the best price you were offered, where you got it from, and let us try to beat it.

ADD-ON DESCRAMBLERS: SB-3, TVT, FTB-3, STEALTH, SA-3, SA-3DF, M-80, PIO-GREEN, DMTBA, KN12, EAGLE PD-3, HAMLIN MLD-1200
COMBINATION DESCRAMBLER/CONVERTERS: PIONEER, SA, ZENITH, OAK, EAGLE, HAMLIN
PLAIN CONVERTERS: PANASONIC, SA, STARGATE, JERROLD
REMOTE CONTROLS: ALL MAJOR BRANDS, INCLUDING 2-4 FUNCTION UNIVERSAL REMOTES



WHOLESALE CABLE M-F 11am-6pm EST • (718) 262-0900 • FAX (718) 657-4015 • (718) 297-9221

No NY sales. Federal and local laws provide criminal and civil penalties for unauthorized use. Check with your cable providers for permission to use equipment. Must be paying for all services you receive. Order by model number only. Some equipment refurbished as new.

reader FeedBack

Dear Nuts & Volts:

I am a fairly new subscriber to *Nuts and Volts*, and The Laser Experimenter by, Anthony Charlton has already become a favorite of mine. The March '95 article on Phase Conjugated Light (PCL) is facinating. I have seen some information on PCL and PCMs in literature written by Tom Bearden, as well as in a few other articles scattered over the years.

When I reached the end of the article, I eagerly searched for some additional "reference" information, as I would like to read up in more detail on this incredible area of research, but unfortunately no references were cited.

Would it be possible to mail me a few good specific reference items that I may research in more detail? The University of California experiment using barium titanate crystals looks reproducible by a competent experimenter, if more specific information could be found.

The intriguing item in Figure 5 is the "wedge shaped mirror." If this were a front surface mirror, as is usually the case with mirrors used in laser and holography work, the shape and thickness of the glass behind the aluminized surface would be immaterial. Because the "wedge" shape is mentioned, one is then led to conclude that this mirror is a back surface mirror. The wedge shape of the glass would induce two reflections: one from the surface of the glass, and one from the aluminized back surface (indeed, I suspect the front surface may have been lightly silvered and the back surface highly silvered). The angle of the wedge would affect the physical separation of the two wavefronts returning to the crystal, and the thickness and refractive index of the wedge material would affect the separation in the time of arrival of the two wavefronts back to the crystal, yes? In fact, the wedge shape would cause the reflection to arrive at the crystal in such a manner that one side of the reflection(s) would arrive before the other side. Quite intriguing.

It is my guess that this diagram is deceptively simple. One might think that acquiring the barium titanate crystal would be the single most difficult key acquisition, but that wedge shaped mirror is critical!

As a side note, I am thinking of building a nitrogen laser in the near future. Much of my technical background has dealt with switching very high voltages at very high currents into a gaseous environment. After looking at some nitrogen laser plans, I believe I may have a way to replace the expensive thyratron switch with a vastly superior method of energizing the laser cavity. I believe it is possible to pump the cavity with at least one or two magnitudes of order more power, and at a fraction of the cost of an equivalent switching tube. There is really only one way to find out, I suppose.

Bert Pool
Fort Worth, TX

Dear Nuts & Volts:

I am writing to you in opposition to the pacifist sentiments which were expressed, without serious rebuttal, in your April '95 Reader Feedback column. Writer Darryl Phillips, in complaining about a military aircraft simulator review, implied the moral equivalence of our military ("fly-by shootings") and drug gangs ("drive-by shootings) killing off their competition.

Such muddled thinking about the difference between right and wrong is probably more responsible for the great increase in murders, robberies, thefts, and drug addiction over the last 30 years than any media or video game "violence."

Electronics plays an important role in our national defense, and the spill over of important technologies such as GPS from military use into our daily lives occurs all the time. I sincerely hope you don't modify your coverage in these areas on the basis of Mr. Phillips', or any one elses, "Political Correctness."

John P. Kontolefa
New York, NY

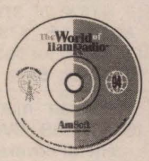
Dear Nuts & Volts:

In the March '95 Tech Forum, the answer to #2956 was not only rather disappointing, but flat WRONG on at least two counts. He is confusing technology with the little glass capsules being implanted into animals with the RF type anti-shoplifting tags. This is NOT how these things work. Also, if any stores automatically lock their doors upon activation of one of these readers, I'm sure the legal industry would like to know this. Violation of fire codes, etc.

Bomarc Services
Casper, WY

MILITARY RADIOS: Easily made battery adapters for military radios & other electronics. Get "Power Up," big new 96 page manual of instructions, diagrams. Use readily available commercial batteries in PRC-6, -8, -9, -10, -28, -25, -47, -74, -77, TRC-77, AN/PRR-9, AN/PRT-4, RT-77, URC-68, more, also mine detectors, night scopes, radiacs, field telephones, etc. Only $14.95, plus $5 S/H ($6 Canada). NYS residents add $1.70 tax. CRB Research, Box 56-NVV, Commack, NY 11725. Visa/MasterCard welcome. Phone: 516-543-9169.

HAM LICENSE PLATE KEY TAGS. Call sign engraved. All states available $4 each, includes S&H. Geniac Technologies, Inc., 8105 NW 33rd Street, Miami FL 33122. Attn: Key Tags. Phone; 305-599-7384.

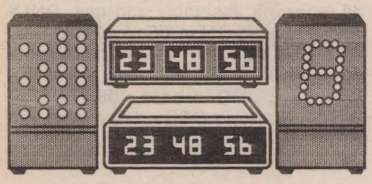


THE WORLD of Ham Radio CD-ROM May 1995 edition. The best choice in CD-ROM callbooks. The fastest retrieval callsign system in publication. The nicest ham software collection available. (Reviewed 11/94 N&V) $39 direct from AmSoft with Visa or MasterCard call: 717-938-8249 or FAX 717-938-6767.

PRINTED CIRCUIT baords for projects in N&V, QST, ARRL handbook, 73 Magazine. One off prototypes, no problem. USA orders deduct 20%. Orders over $15 postpaid, free list. B-C-D Electronics, PO Box 78033, Westcliffe Postal Outlet, Hamilton, Ontario Canada L9C 7N5.

FT901DM YAESU all mode HF transceiver also includes Yaesu FV901DM VFO, YO901P multiscope, SP901P speaker/phone patch, Yaesu base mic, all original instructional manuals and cables. Excellent condition asking $1,200. Call 616-861-5577, after 4pm.

HQ140XA HF receiver $75; EICO 720 HF CW transmitter, $75. Marti VHF FM transceiver $75; SWAN 350, HF CW/SSB transceiver, spare driver, final tubes, AC supply $150. W0PBV, 2001 Dunbar, Manhattan, KS 66502. 913-539-4448. Internet: mac@cis.ksu.edu.



TERRIFIC TIMEPIECES! Binary Clock, several LED clocks, "Time Beacon." KITS and assembled! FREE CATALOG! Whiterook Products, 309 South Brookshire, Ventura, CA 93003-4413. 805-339-0702.

HF-SSB SELECTIVE Call System, ack back and busy mode, works under severe noise and frequency shift conditions, microprocessor controlled. Compatible with all HF radios. $149 each. Communicate at long distance at any time! TRY-TOP 305-827-6880.

MDS DOWNCONVERTERS, COMMERCIAL BUILT, Factory new. May be altered to Upconverter-Xmitter, or retuned to Amateur 2300MHz? Or to GOES satellite or MMDS? Complete/power supply and schematic, $30 + $5 priority mail. Special: 30" dish and dipole (refurbished) $20 more. Money Orders/checks OK to Dave Porter, 145 N. 80th Pl, Mesa, AZ 85207. Quantity prices. 602-380-0064.

REPEATER CONTROLLERS complete wired, tested, $80. Crawford Amateur Radio Society, PO Box 653, Meadville, PA 16335.

PROGRAMMABLE COUNTER. Works with ANY VFO rig! Get a digital display for your rig, 100Hz resolution. You can read the tuned frequency directly, no need to calculate offsets. Counts to 40MHz, up **OR** down. Counter Kit $69.95. Kit w/case $99.95. Assembled w/case, $139.95 S&H $6 (Continental US). GUARANTEED TO WORK. For info send **SASE.** Call/write to order: S&S Engineering, 14102 Brown Road, Smithsburg, MD 21783. 301-416-0661.

HF MOBILE FIBERWHIPS™ Industrial grade, 75 thru 6 meter $18.75 each 8' assy. 250 watts $6, S&H US Horz/vert. HF dipole mnt. combo $48 each (ref. QST Feb 95') ASA 1-800-722-2681. Visa/MC/Dealers Welcome.

ATTN: LAW ENFORCEMENT, INVESTIGATORS, SECURITY, ATTORNEYS. Now you can turn your briefcase into a super sensitive microphone from the inside out with our latest high tech vacuum audio sensor S-2204B only $69.95. The most sensitive microphone in the world. Simply attach the S-2204B to the interior wall then plug into a tape recorder to record whispers, or broadcasts to your scanner up to 1/4 mile with the T-2501 crystal transmitter $89.95, to record sound through metal buildings, doors, walls, or to turn a desk, file cab. into a giant microphone. Order the S-2203G giant Ear Mike only $49. A-6P, a directional microphone with preamp, six-inch long with arm straps $49.95. Point then listen utilizing your tape recorder. Send check or MO to **ILIADIS,** add $5 for shipping, $1 for Micro-Ear catalog. **ILIADIS,** 1760 Dibble Circle West, Jacksonville, FL 32246. 904-641-9942.

Bargain Sale

35,000 sq. ft. of Bargains

• Test Equipment • Lab Equipment •
• Microwave Equipment • Connectors •
• Timers • Synchros • RF Cable •
• Misc. Computer Equipment • Modems •
• Muxes • Phone Equipment •
• And much more •

Check out these specials:

HP	432A	Power Meter	$295.00
HP	478A	Power Sensor	$295.00
HP	141T	Spectrum Analyzer Mainframe	$750.00
HP	8552A	IF Section Plug-in	$495.00
HP	8553A	RF Section Plug-in	$650.00
HP	8410A	Network Analyzer Mainframe	$525.00
HP	8411A	Frequency Converter	$995.00
HP	8412A	Display Plug-in	$595.00
TEK	7104	1GHZ Oscilloscope	$5,995.00
TEK	7A26	Dual Trace Plug-in	$175.00
Rockland	7530B	Spectrum Analyzer Plug-in	$395.00

Call, fax, or visit today!!!

Lectronic Research Labs 800-358-8378
665 Winks Ln., Cornwells Heights, PA 19020 Fax: 215-633-9309

Write in 61 on Reader Service Card.

CUNARD ASSOCIATES

R D 6 Box 104, BEDFORD, PA 15522
TEL / FAX 814 623 7000

THE POWER PRO

BATTERY PACKS

ALL MAKES & MODELS
FACTORY NEW

ALINCO DJ 580T / F1T

EBP20NX 7.2/1500	$ 42.95
EBP22S 12/800	$ 47.95
EBP16N 7.2/800	$ 37.95
EBP18N 12/600	$ 47.95

ICOM SAT / W2A

BP83 7.2/750	$ 29.95
BP8AC 9.6V/600 FOR 2AT	
WITH CHARGER	$ 34.95

KENWOOD TH27A / 47A

PB13 7.2/600	$ 42.95
PB14 12/800	$ 49.95

YAESU 23/26/411/470/416

FNB17 7.2V/600	$ 29.95
FNB12 12V/600	$ 39.95
FNB25 7.2/800	$ 34.95
FNB26 7.2/1000	$ 44.95
FNB27 12/600	$ 44.95
FNB2 11/800	$ 19.95

CELLULAR BATTERIES
ALL BRANDS - CALL

BATTERY REBUILD SERVICE

WE OFFER COMPLETE BATTERY PACK REBUILDING. OUR FULL SERVICE INCLUDES: MINOR REPAIRS REPLACEMENT OF ALL PROTECTION DEVICES SANYO CELLS OF EQUAL OR IMPROVED CAPACITY YOUR ORIGINAL PACK IS REBUILT AND RETURNED. 12 MO. WARRANTY / SATISFACTION GUARANTEED.

GENERAL ELECTRIC

MPD/PLS	
19A704850P(1200mAH)	$ 39.95
19A704860P(1800mAH)	$ 44.95
MPR/MPS/MPX/MARK V	
PL19D429763G1/3	$ 34.95
PL19D429777G1/3	$ 39.95

MOTOROLA

P200/HT600/MT1000	
NTN5521/4585	
4824/5414	$ 39.95

UNIDEN

APX650	$ 34.95
APX1200	$ 39.95

ICOM

BP2 / BP3 / 22	$ 18.95
BP5/CM6/BP8	$ 24.95
BP7 / CM7	$ 34.95

BENDIX KING

KR105/E	$ 34.95
LAA100	$ 34.95
LAA0125	$ 39.95

KENWOOD

PB2 / KNB3	$ 32.95
PB25/H/26	$ 22.95

YAESU

FNB3/4/4A/12	$ 32.95
FNB11/14/10S	$ 29.95
FNB17	$ 23.95

BATTERY INSERTS - BEST PRICES !

MANY OTHERS AVAILABLE WRITE OR CALL

12 MONTH WARRANTY ON ALL ITEMS

Master Card ***FREE CATALOG*** VISA

ADD $ 4.50 SHIPPING & HANDLING PER ORDER

Write in 60 on Reader Service Card.

New SuperBright

5mW pocket laser

"bright as a He-Ne"

Our new SuperBright laser includes all drive electronics, heatsink, & collimating optics. The laser will run over five hours on 4 AA alkaline batteries. Red laser beam 635nm is 10 times brighter than 670nm.

This laser blazes like a torch.

Price: $169.00

Please include $7.00 for shipping and handling. CA residents add 8.25% sales tax.

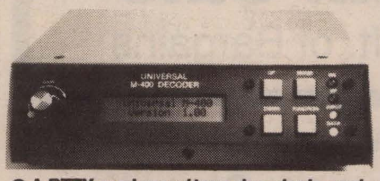
TO ORDER CALL
1 (800) 996-6873

HI-Q PRODUCTS, INC.
506 N. Garfield Ave., Suite 200, Alhambra, CA 91801
TEL: (818) 308-4400 FAX: (818) 308-4406

Write in 62 on Reader Service Card.

INTRODUCING THE UNIVERSAL M-400

A totally new concept in data / tone readers!



- Baudot
- Sitor A/B
- ASCII
- Swed-ARQ
- FEC-A
- FAX
- POCSAG
- GOLAY
- ACARS
- DTMF
- CTCSS (PL)
- DCS (DPL)

- **A RTTY-reader *and* tone-decoder in one!**
- **Easy to read two-line 40 character LCD.**
- **No computer or monitor required.**

Forget the limitations you have come to expect from most "readers". The self-contained Universal M-400 is a sophisticated decoder *and* tone reader offering an exceptional range of capabilities. The SWL will be able to decode Baudot, SITOR A & B, FEC-A, ASCII and SWED-ARQ. Weather FAX can also be decoded to the printer port. The VHF-UHF listener will be able to copy the ACARS VHF aviation teletype mode plus GOLAY and POCSAG digital pager modes. Off-the-air decoding of DTMF, CTCSS (PL) and DCS is also supported. The M-400 can even be programmed to pass only the audio you want to hear based on CTCSS, DCS or DTMF codes of your choosing. The M-400 runs from 12 VDC or with supplied adapter. The American-made Universal M-400 is *the* affordable accessory for every shortwave or scanner enthusiast.

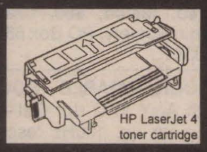
Only $399.95 (+$6 UPS).

Universal Radio
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Orders: 800 431-3939
◆ Info: 614 866-4267

FREE CATALOG
This huge 100 page catalog covers everything for the shortwave, amateur and scanner enthusiasts.

Toner Cartridge Recharge

& Laser Printer Supplies


HP LaserJet 4 toner cartridge

Start Your Own Recharge Business!

Recharge your customers' toner cartridges. Two profitable methods:

You Do It	We Do It For You
Learn how to recharge toner cartridges used in the most popular laser printers.	Send us your customer's toner cartridges and we will professionally recharge them for you.
Free Instructions Free Technical Support	**Prices as low as $19.95**
• *Supplies cost from $6.40 per recharge* • *Startrer Kit with supplies, tools & chemicals* • *Initial Investment approximately $630.00, including toner vacuum.* • *Dial Document# 2040*	We support all popular laser printers including all HP LaserJets (II, III, IIp, IIIsi, 4, 4si, 4L), IBM, NEC, Epson, Apple, QMS, Panasonic, etc. • *Just mail your cartridges to us and we will do the rest.* • *Dial Document# 3710*

For detailed information, Call us, or dial our
FAX-ON-DEMAND SYSTEM
Call from any Fax machine equipped with a touch-tone phone.
516-467-0772

CP CHENESKO PRODUCTS
Chenesko Products Inc.
2221 Fifth Avenue, #4, Ronkonkoma, NY 11779
Fax: 516-467-3223 Tech. Support: 516-467-3205
Orders: 800-221-3516

Write in 26 on Reader Service Card.

C and H sales co.

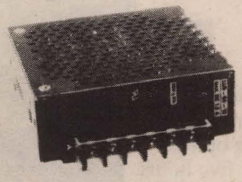
1-800-325-9465
FAX: 818-796-4875

2176 E. Colorado Blvd., Pasadena, CA 91107
Mailing Address: P.O. Box 5356, Pasadena, CA 91117-9988

BUY & SELL *Since 1947*

POWER SUPPLIES

DC POWER SUPPLY
SWITCHING SYSTEMS INTERNATIONAL #SQV402-1444-1. Four Output - 5 VDC @ 50 amps. Aux. 1 - 24 VDC @ 10 amps. Aux. 2 - 24 VDC @ 5 amps. Aux. 3 - 24 VDC @ 5 amps. Aux. 2 & 3 can be series to produce 48 VDC @ 5 amps.
Stock #PS9404 . . . . . **$99.50 each**
10 for $750.00



SWITCHING POWER SUPPLY
LAMBDA #LUS-8A-12. 12 VDC 1.3 amps.
Stock #PS93514 . . . . . **$20.00 each**
10 for $175.00

LINEAR POWER SUPPLY
POWER ONE #HB28-1-A. 28 VDC @ 1 amp.
Stock #PS9400 . . . . . **$20.00 each**
10 for $175.00

DC TO DC CONVERTER
INTRONICS #S1635-1. Input: 30 to 60 VDC. Output: 5 V @ 4 amps ± 15 V @ 150 mA.
Stock #PS9405 . . . . . **$20.00 each**
10 for $150.00

±15 VDC POWER SUPPLY
BECKMAN, #MPS-60. Input 120 VAC 60 Hz @ 1 amp. Dual adjustable outputs 0 to ±15 VDC @ 0-2 amps. Resolution 10 mV and 100 mA. Accuracy ±20 mV and 100 mA. Has digital display for voltage and current. Dim.: 12" wide x 4¼" high x 13¼" deep. Weight 16 lbs. New, with manual.
Stock #PS9410 . . . . . **$195.00**

TEST EQUIPMENT

HEWLETT PACKARD

#140T. Spectrum Analyzer. Mainframe	$500.00
#8555A. Spectrum Analyzer. RF Plug-in	$1,000.00
#204C. Oscillator	$125.00
#333A. Distortion Analyzer	$695.00
#432C. Power Meter	$250.00
#3330B. Automatic Synthesizer	$650.00
#8614B. Signal Generator. 0.8-2.4. GC	$695.00
#216A. Pulse Generator	$295.00
#8445B. Automatic Preselector	$495.00
#8057. Noise Generator	$295.00

See our catalog for more models in stock.

SOLID STATE SCOPE

HP OSCILLOSCOPE
#180A. 100 MHz bandwidth. Accepts standard 1800 series plug-ins.
Stock #OS8901 . . . . . **$395.00**

CALL OR WRITE FOR OUR FREE 128 PAGE CATALOG!

Write in 27 on Reader Service Card.

PACKET FOR Commodore 64 users. Digicom modem wired, tested. Software and documents. $49. Crawford Amateur Radio Society, PO Box 653, Meadville, PA 16335.

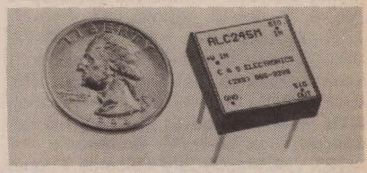
MICROWAVE X-BAND 10GHz Gunn xceivers, 2 for $25. Horn ant. kits, $15. For wide-band FM voice, video, or 2MB/sec data. SASE for info. Gary Krancher, WB1AUA, 1502 Old North Colony Road, Meriden, CT 06450. 203-634-3006.

YAESU/VERTEX commercial two-way portable, mobile radios. Discount prices! 4 channel mobile, VHF $390; 6 channel portable, VHF $292. Quantity discounts! 3 year radio warranty. 501-967-4070.

MICROWAVE COMPONENTS, surplus, misc. electronic and scientific equipment. For list contact T-Minus-7, 45845 Warm Springs Blvd., #F, Fremont, CA 94539. 510-651-9477 FAX 510-651-3657.

90 DEGREE SMA. STAINLESS MALE-FEMALE (PLUG-JACK). TOP QUALITY AMPHENOL 901-9219-ASF. $5 ea. postpaid. **TURCOTRONIX,** 1000 E. 14th, Suite 429A, Plano, TX 75074.

POLARAD TEST receiver ESH-2 $2,500, PRC-47 $175, Collins Antenna coupler HF8040 $550. Tel 714-441-1002, FAX 714-441-1214.



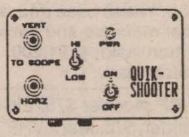
THE ALC245M AUTOMATIC VOLUME CONTROLLER will keep your transceiver or scanner volume constant from a whisper to a scream. $29.95. Other models are also available. FREE BROCHURE. C&S Electronics, PO Box 2142, Norwalk, CT 06852-2142. Phone/FAX 203-866-3208.

MOTOROLA HANDIE Talkies, all include chargers; UHF, HT220 2F, $75. MT500 3F, $125. VHF, MH70 1F, $75. Add UPS shipping. Large SASE for list. Bob Jarnutowski, 390 Glenoaks, Brea, CA 92621.

NEW NEW American made PC16000 transceiver 160-10, SSB, CW, RTTY, encode-decode, general coverage, DSP, IF-shift, AM, filters, more. All standard. Write, Peter Bergman, PATCOMM-NV, 3517 Estate Dr. SW, Brainerd, MN 56401.

COAX CABLE: 50 ohm, silver plated, double shielded, RG 214 at $1 ft., $85 per 100 ft. RG 223 at 35¢ ft., $30 per 100 ft. Plus shipping. Other numbers available, inquire. Apex JR, Steve Slater, 3045 Orange, La Crescenta, CA 91214. 818-248-0416.

GE 330 watt base station in 6 ft. cabinet, excellent condition, 33-42MHz, $1,500; Motorola Micors 100 Watt, 4 frequency with accessories, $100; all plus shipping. Harris Electronics, 105 14th St., PO Box 672, Fairbury, NE. 402-729-5029 or 402-729-5257.



THE QUICK-SHOOTER component tester can cut troubleshooting time by 50% and more. Use QUICK-SHOOTER to find bad components fast without removing them from the board. Easily used by non technical personnel. VHS VIDEO included, showing assembly and use. ONLY $59.95 plus $5 S/H in US. Available Only as a kit. LYNN JOHNSON ENTERPRISES, PO BOX 51268, San Jose, CA 95151-1268. VISA/MC orders 408-274-2534 ext444. Sorry no CODs. CA orders add 7.75%.

Prototype Plated Thru Circuit Boards

fast turnaround!

your order shipped in four business days if data is received by 7:00 am MST

example less than $90 U.S. for two 5"x6" boards-complete!

AP Circuits
#3-1112 40 AVE NE
Calgary, Alberta
Canada T2E 5T8
☎ (403) 250-3406

for complete information download newuser.exe from our 24 hr BBS (403) 291-9342 (8N1)

Write in 181 on Reader Service Card.

BUY MY Poor Man's spectrum analyzer kit, 80% finished! My station bought an analyzer, so I don't need it! VHF module, crystal filter, digital tuning readout, and tracking generator, 2-space enclosure. Worth over $450 unassembled, will take $325! 970-356-7599.

BANDHOPPER ALL band HF remote tuning mobile antennas. All commercial, Marine, Ham, Clandestine frequencies. Extensive info-pac $5 refundable on purchase. Avtech of Montana, Inc., Dept. NV, 201 Cherry St., Clancy, MT 59634-0138.

LIGHT UP that ham shack with a custom bright LED sign! Tailor made in your call ID letters, (specify five max). Fully assembled, tested using bright HP red LEDs. $22.50 total. Check/MO to: Digitronics, PO Box 933, Olalla, WA 98359.

MOTOROLA 800MHZ mobile. 6 channels, 15 watts. Accessories included. $275. Evenings, 319-257-6957.

TWO-WAY VHF: Icom U-16 w/desk charger SP/MIC spare batt $325; Yaesu FTH-2008 3 batt, wall chg, 2 SP/MIC & case $395; Midland 70-155B 80 ch w/MOB chgr $95; MX-350 6W, 4 ch, PL $85; MX-350 UHF 5W 6 ch PL $95; GE-MPX 5W 6 ch CG $95; MT-500 1 ch CS (MINT) $75; GE motorcycle radio 30W 6 ch CG $75; VHF 40W w/accy Syntor $95; Delta-S $95; Mitrek $75; Delta $65; Mocom-70 $45; Veetac $35; 100W Motrac $75; RCA 500, 700 & ML-1000 also available cheap! U-ship. Misc. mobile chargers, etc. Quantity prices. Call for list. Gene, 405-799-8787.

SPRAGUE RF Noise Filters, high performance, EMI/RFI transmitter, computer power line applications, 25A rating, new $25 delivered. Alan, K6GA, 714-964-3912.

FLEXIBLE PHOTOVOLTAICS Amorphous 12V 45mA $23. Other great prices. Dallas Solar, 1-800-345-4913.

GMRS-UHF COMMUNICATION to 50 watts with **no test** license. Great new way to keep in touch with non-ham family members. Send or call for free info. on the great new radios for **GMRS. Sports Communications,** Box 36, Scotts Mills, OR 97375. **1-800-573-2256.**

FREE HAM and IBM Shareware Catalog. Morse Code IBM Computer Interfaces use COM1 Serial Port $49.95. Add $3 shipping. IBM License Study Programs $10. Over 700 IBM Shareware Collections (No Adults) $2.95 each. Quantity discounts. No minimum order or shipping charges on shareware orders. Dynamic Electronics, Box 896, Hartselle, AL 35640, 205-773-2758, FAX 205-773-7295.

MAXON GMRS 2 to 5 watt 10 channel hand held. 50 CTCSS tones, programmable, scan modes, repeater capable. Many other features. We have this new model **210 + 3** in stock now! for info. and orders, write or call: **Sports-Comm** PO Box 36, Scotts Mills, OR 97375. **1-800-573-2256.**

COLLINS 312B4, round, manual copy - $150. Wade, 309-523-3262.

MANUALS FOR AMATEUR, AUDIO AND RADIO-RELATED EQUIPMENT. Lafayette, Heath, National, Hammarlund, Hallicrafters, Eico, etc. Quality is always our Number 1 customer priority. Catalog available. Send two $.32 stamps to: Pete Markavage, The Manual Man, 27 Walling St., Sayreville, NJ 08872-1818. 908-238-8964.

FUTURA COMPONENTS
1-800-640-9948
Converters Compatible To All Major Brands

BRX3 (DIC)	$ 59.95	BQN5	$ 47.00
BPV7 (DIC)	$235.00	BRX3	$ 35.00
BRZ3 (DIC)	$ 65.95	BRZ	$ 40.00
BPBB7	$300.00	10-Unit Price Specials	
BP5	$180.00	DQN7	$ 50.00
BPV5	$185.00	MICRO-550	$42.00

Call us for FTB3's/TVT and PTV's
4-Way Universal Remotes $11.50

5100D	$200.00	321	$ 99.95
6100D	$325.00	8535-420	$ 99.95
6300D	$350.00	SA 8590D-	$290.00
8500-311	$ 89.95	ST1600	$240.00
8500-310	$ 92.95	ST1086	$220.00

Call for (Stealth)
M80's/SA and SA-3,'s

We buy all types of converters. It's not the intent of Futura Components to defraud any cable company.

Write in 28 on Reader Service Card.

RCI-2950/2970 Modification Manual. Tune-up, audio, receiver, noise-blanker & clarifier modifications. Microphone wiring & more. $20 ppd w/money order, $25.50 COD. Scott, PO Box 510408, St. Louis, MO 63151-0408. 314-846-0252.

JVFAX HAMCOM Interface xmit and rec includes shareware software JVFAX 7.0 HAMCOM 3.0 Pakmon 1.0. WEFAX, COLOR HAM FAX, SSTV, CW, RTTY, AMTOR, (PACKET rec only). $24.95, $4.50 S&H in plastic case. Send #10 SASE for catalog. JHI, 741 E. Benton St., AURORA, IL 60505.

WANTED: GRM 10/ARC58. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

POWERTEC MODEL 2D15-6B Power Supply, 12 volts, 6.5A CCS, adjustable, New $35 delivered. Alan, K6GA, 714-964-3912.

HAM GEAR WANTED

COLLINS HF aircraft transceivers such as: ARC-58/R761 and similar units. Buy/sell/trade. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

I WANT it and I want it now. I want all of your SIMM memory. IBM, Mac, new, used, even defective. I want it all. Highest $ paid. Call 1-800-4-MEMORY now! Voice/FAX.

JAMES MILLEN equipment and parts wanted, especially VFO, HF/VHF/UHF transmitters and coils, modulator, scopes, power supplies, consider whatever else you have. Wade, 309-523-3262.

WANTED: GRM 21/ARC58. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

I NEED information/service manual on Racal 6217D/MA6314 Freq. synthesizer or MA 6355 xtal osc units. Also info. on RA 6338 convertor. Will sell 6217D mint. Please contact Frank KC4SRT, 912-857-4777, 1275 Union Ch Rd., Sylvania, GA 30467.

NEW HAM starting out, looking for equipment of any kind. Transceivers, receivers, antennas, base or mobile. Shoestring budget. Will take donated equipment. Mike, 315-732-4507.

WANTED: 6 METER antennas/plans. Especially interested in designs or antennas similar to "Saturn-6" by Hi-Par or Ebco "Skysweeper." Help me get on 6-meters! Bob, KB8UHU, 216-336-8940, 6-9 pm EST.

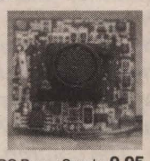
CHECK OUT OUR SPECIALS!

Freeze Protection PhoneAlarm AUTO-DIAL MONITORS
- Continuous Alarm Tone Dial-Out Every 16 min. when Temperature drops below 45°
- Remote Alarm, Status checks
- Additional input available for fuel tank level monitor and water detector
- Operates during power outage on rotary and/or touch tone lines
- 1 year factory warranty

#PA-2 ~~REG. PRICE 99.95~~ **$69.95**

Digital LCR
Hand Held Meter
Inductance .02mH - 200H
Capacitance .02 PF - 200µFd
Resistance .2Ω - 20MΩ
#LCR-680
~~REG. PRICE 129.95~~
NOW! $42.00

Pinhole Camera
Requires 1/16" opening size.
- 1-1/2"x1-1/2"x7/8"
- Power: 7.5-12VDC
- 3.8mm lens included
- High Resolution
- 380 lines res. • .8 lux



#CVC50PH
$139.95 ea. 12V DC Power Supply **9.95**

Metal Detector Wand by Garrett
#Super Scanner / Professional Grade
~~REG. PRICE 199.95~~
$169.95

NightVision Scope
See In The Dark
#NV-100
Call For Other Styles
~~REG. PRICE 550.00~~
NOW! $375.00

4.3X Magnification
Light Intensification

Call For FREE Catalog & Technical Assistance
Add $6.95 Shipping/Handling
NYS Add Tax
Visa/MC/Discover/Amex

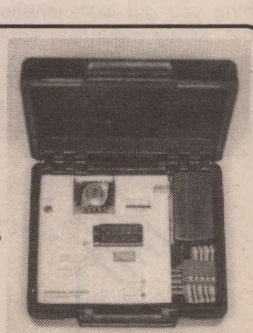
ALL PHASE
VIDEO-SECURITY INC.
WHOLESALE VIDEO WAREHOUSE

MAIL ORDERS TO :
70 CAIN DR.
BRENTWOOD, NY 11717

1-800-945-0909
FAX: 516-435-7494

Write in 187 on Reader Service Card.

EPROM+
PROGRAMMING SYSTEM
USES PARALLEL PORT



EPROMS (24,28,32 & 40*PIN PLUS 27CXXX AND 28F)
1702*,2708,TMS2716*,2716,32,32A,64,64A,128,128A,256,512,513,011,010,101
1001,1000,1024,210,020,2001,220,2048,4001,040,240,4096,2516,32,64,68764,66
EEPROMS AND NVRAMS (18, 24 & 28 PIN PLUS CXXX)
2210, 2212, 2804, 2816, 2816A, 2817, 2864, 2865, 28256, DS12XX
*SERIAL EEPROMS** (8 & 14 PIN PLUS CXX)
ER1400,M58657, 2401,02,04,16, 2444, 59C11, 8572,82,92, 9306,46,56,66
*BIPOLAR PROMS** (16 THROUGH 24 PIN) 74SXXX, 82SXXX FAMILY
*MICROCONTROLLERS**
8741,8742,8748,8749,8751,87C51,8752,87C52,87C5XXX,87C751,87C752
68705, 68HC705, TMS7742, PIC16C5X
*ADAPTER REQUIRED - DIAGRAMS INCLUDED IN MANUAL

- SOFTWARE - READ, VERIFY, PROGRAM, COPY, DISK FILE LOAD & SAVE, CHECKSUM, FULL SCREEN BUFFER EDITOR W/20 CMDS
- READS INTEL HEX, MOTOROLA S-RECORD AND BINARY FILES
- FAST-MOST DEVICES PROGRAM IN UNDER 60 SECONDS
- RUGGED (8"X7"X3") PORTABLE ENCLOSURE W/CARRY HANDLE
- MADE IN THE USA - 30 DAY MONEY BACK GUARANTEE
- SYSTEM INCLUDES: PROGRAMMING UNIT, PRINTED MANUAL PRINTER PORT CABLE, POWER PACK AND SOFTWARE

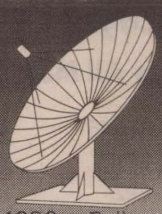
$289
ADD $5.00 SHIPPING
$5.00 COD
VISA / MASTERCARD

ANDROMEDA RESEARCH, P.O. BOX 222, MILFORD, OHIO 45150
(513) 831-9708 FAX (513) 831-7562

Far-Out DX Is Where You Find It

Open Channel

by Joseph J. Carr
K4IPV



This month is a change for the Open Channel column. Harry Helms is going to assume new chores in another Nuts & Volts column, so from now on I will be your monthly host. Who am I? I am Joe Carr K4IPV, and I've been writing books, columns, and articles on electronics and amateur radio for many years. If you wish to contact me with questions to be answered in this space, or suggestions for topics, then write to me at P.O. Box 1099, Falls Church, VA 22041.

The column will take on a somewhat different flavor than when Harry conducted it. Some of the same material will appear, but we'll also take a look at small construction projects, communications circuits discussions, amateur radio, CB, SWLing, monitoring/scanning, receivers, and a host of other topics that you should find interesting. This month, for example, we will take a look at DXing the cosmos ("DX" is radio shorthand, so "light years" surely qualifies as DX).

We may also dabble into other areas of science experimenting (with an electronics or communications flavor), if readers are interested. That material will probably include small construction projects, instruments, and so forth.

Amateur Radio Astronomers

Extraterrestrial radio signals are generated from sources as close as our own Sun, to pulsars and stars far enough into deep space that even Capt. Kirk and Scotty couldn't get there. In the early days of radio astronomy (late 1920s), many scientists scoffed at the idea of radio signals from outer space; astronomy was something you did with lenses and telescopes and cold, windy mountain tops. If you didn't freeze your fingers off on some dreary mountain top, then, to astronomers of that era you hadn't paid your dues . . . you hadn't "seen the elephant." But that changed.

In 1928, Bell Labs scientist Karl Jansky was tasked to study the level of background noise detected by maritime 15-meter band receivers. During his investigations, Jansky also studied noise picked up by undersea telegraph cables (undersea telephone cables didn't exist until the 1950s), and noise at wavelengths used for overseas shortwave radiotelephone service. Another scientist at Bell pointed out that the variation in noise strength could be explained by sources in the stars, rather than on earth. As a good scientist, Jansky published his work in a professional journal (*Proceedings of the Institute of Radio Engineers*, now IEEE). One observation pointed directly to the Milky Way as one source of radio noise. The result was a resounding silence as professional astronomers ignored Jansky's work.

One chap, however, didn't ignore Jansky. An amateur scientist named Grote Reber, from Wheaton, IL, was intrigued at the possibility of combining twin interests in radio and astronomy. In 1937, Reber patched together enough stuff to erect a 31-foot (9-meter) parabolic reflector in his backyard (it must be nice to have that much antenna space!). After initial failure, he changed his receiving equipment to listen to wavelengths of 33 cm (910 and 1.87 meters, 160.4 MHz). Hams and scanner operators who own VHF receivers can see solar noise increase dramatically as the sun comes up. Point a directional VHF antenna at the eastern horizon before sunup, and tune in on the "hiss." As the sun slips above the horizon, the hiss level forces the S-meter to take a dramatic leap to the right.

Radio astronomy got a further boost during World War II, when the consequences were a lot more profound. The British pioneered the use of radar detection of aircraft just in the nick of time for the Battle of Britain. Their initial Chain Home radar system operated in the HF shortwave bands, but was soon augmented by models working in the high UHF (900 MHz) band. These new "centimetric radars" (as they were called because of the 33 cm wavelength of the signals) were more advanced, but suffered an interesting peculiarity.

Radar operators noted a periodic dramatic increase in received noise level that decreased the distance at which they could detect German bombers. It was found that the noise occurred whenever the Milky Way was above the horizon. I bet that was top secret during the war!

Today, radio astronomy is alive and well, and is well regarded both as a professional activity for astronomers and a hobby activity for amateurs. The British operate a massive radio astronomy observatory at Jodrell Bank, in England.

In the USA, The National Science Foundation operates (through academic contractors) the National Radio Astronomy Laboratory **(NRAO, POB 2, Green Bank, WV 24944).** A good history of radio astronomy is available from them for a modest cost. Ask for *Proceedings NRAO Workshop Number 7, May 1983.*

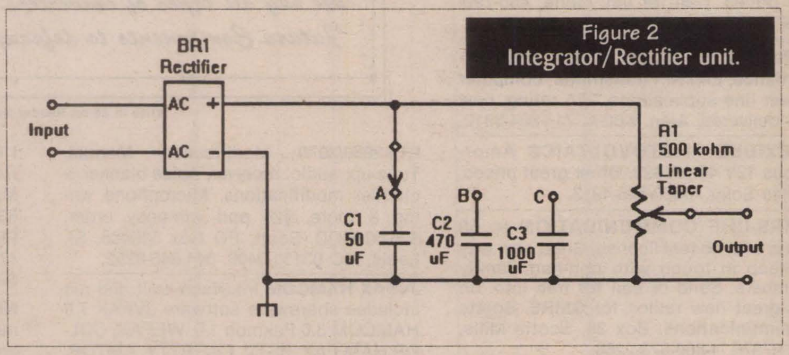


Figure 2
Integrator/Rectifier unit.

What You Can Do

Okay, so you don't have a 30 foot parabolic antenna, never mind a huge professional dish . . . are you cooked? No, just because your antenna isn't 100-tons of steel that walks across the sky under the control of a three-phase, 440-volt AC industrial power system doesn't mean that you are out of business.

Figure 1 shows the block diagram to an amateur radio astronomy system that is based on using an HF shortwave receiver as a "variable IF" system. This system is designed to receive galactic signals in the 435 MHz region. This frequency is close enough to an amateur radio band to permit use of ham components.

The antenna should be a high gain, directional type such as a VHF/UHF Yagi. A lot of amateur astronomers have used high-gain television antennas for this function. In general, the rule to follow is: the more elements, the higher the gain. One with at least eight elements (and the more the merrier). The antenna can be mounted horizontally, but that is limited. It would be better to aim the antenna at the portion of the sky you want to "DX," or provide az-el mounting to be able to point it anywhere you want.

The low-noise 435 MHz preamplifier is used to boost the antenna signal, and it should be located as close to the feedpoint of the antenna as possible. Some TV antennas have preamplifiers built-on, but be sure that it is described as a "low-noise" amplifier before buying it. Kit-

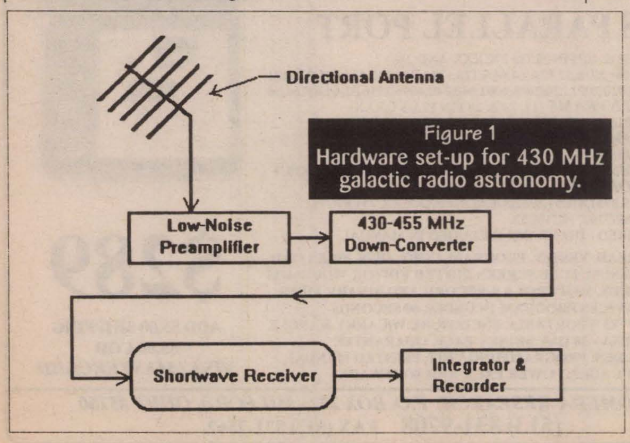


Figure 1
Hardware set-up for 430 MHz galactic radio astronomy.

form preamplifiers can be obtained from **Hamtronics, Inc., 65-D Moul Road, Hilton, NY 14468-9535.**

The output of the preamplifier is passed through coaxial cable to a 430 MHz down converter that translates the UHF input frequency to a shortwave frequency in the 28 MHz to 30 MHz region (depending on which converter you buy). Suitable converters include the **Advanced Receiver Research, (P.O. Box 1242, Burlington, CT 06013).** Model R432V and the build-it-yourself kit converters sold by Hamtronics, Inc.

The integrator/recorder section of the radio astronomy system of Figure 1 rectifies the output of the receiver, and then integrates it and displays it on a recorder or computer. Figure 2 shows an integrator circuit that can be connected to the headphones output of the shortwave receiver.

The circuit of Figure 2 consists of a rectifier, a switch to select the integrator time constant, and a potentiometer to set the output level. Rectifier BR1 is any bridge rectifier pack with ratings of 1 ampere forward current at a peak inverse voltage (PIV) rating of 100 volts, or more. The two "AC" terminals (sometimes marked with a little "~" symbol) are connected to a plug that will mate with the headphone jack on your receiver. The negative (-) output of the rectifier is grounded, while the positive (+) output is connected to the integrator circuit.

An "integrator" can be built with a capacitor. If you dig into any decent basic electronics text you will find that a resistor-capacitor (R-C) network provides mathematical integration with a time constant equal to the product of the resistance (in ohms) and the capacitance (in farads). Operating convenience requires three time constants, so C1, C2, and C3 are provided. All three capacitors should have a voltage rating of 35 WVDC or higher.

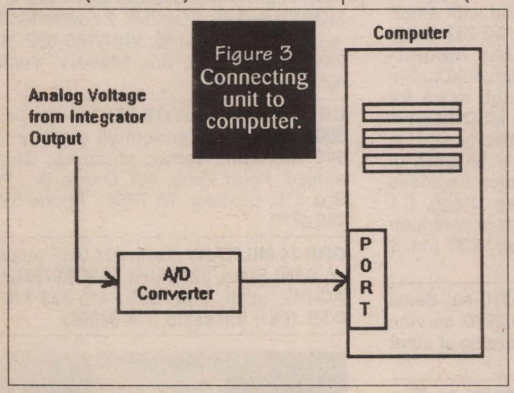


Figure 3 Connecting unit to computer.

The rectified signal, at the output of BR1, will charge the capacitors to a voltage proportional to signal strength. This voltage is applied to potentiometer R1, which is used to set the level provided through the output to the recorder.

The "recorder" is not shown here, but can be any of several instruments. If you want to spend a fair amount of money, then look for a 0-to-1 milliampere or 0-to-5 milliampere paper strip chart recorder. But that's no longer necessary because computers can be pressed into service.

A computer doesn't normally like to see analog signals, such as those produced at the output of the integrator (Figure 2). However, if the computer is provided with an analog-to-digital converter (A/D), then it will digest the data that you collect. Figure 3 shows the connection of the integrator to a computer where an outboard (add-on) A/D converter is used (some PCs have an internal A/D card).

The A/D converter can be almost any of the available models. I use a Pico Technologies, Ltd. model made in England. Others are easily available from USA manufacturers and importers. Two types seem to be generally available. One type connects to the serial communications port (COM1 through COM4 on PCs), while the other type connects to the parallel printer port. If the latter surprises you, then you know too much (the printer port is an *output*, after all). The standard PC parallel port can be used as a four-bit input port because of the four handshaking lines included on the standard Centronics interface used for the printer. It takes two "reads" to get an eight-bit word, but at the speeds these observations are made (one per second is overkill), that's not a problem.

An advantage of the computer is that it can store huge amounts of data in little space. For example, at one-byte per sample observation taken 24-hours a day, a standard 1.44 mbyte 3.5-inch floppy diskette will hold nearly two weeks worth of data. And that data can be plotted on a laser or dot matrix printer in most cases. If the A/D that you select lacks a graphing program, then the file can be plotted on a package like Microsoft's Excel.

Just a note. If you store the date and time along with each observation, then three columns are needed for Excel to make sense of it. Write a BASIC routine that reads the data and reformats to include a comma between entry in the sequential file. The CHR$(9) character will work nicely.

The system of Figures 1 through 3 are intended for use in the UHF band. Note that there are many different models of scanner and tunable receiver available that will tune the VHF/UHF range. Many such receivers operate in the 25 to 1,300 or 25 to 2,000 MHz range. Such receivers could easily be substituted for the system of Figure 1. The same integrator will work on those receivers as well.

A number of amateur radio astronomers use the microwave frequency 1,420 MHz (21 cm wavelength) for making observations. This frequency is the resonant frequency of hydrogen. Researchers interested in the Search for Extraterrestrial Intelligence (SETI) selected 1,420 MHz because it is theorized that intelligent, reasoning beings elsewhere in the universe would also know about the resonant frequency of the hydrogen atom. If they wanted to send messages to other civilizations, then they might think to transmit on or near this "universal calling frequency."

Television satellite dishes are sufficient for picking up 1,420 MHz signals (although a larger dish would be nice). The receivers used for TV reception, however, may be too noisy for radio astronomy. Two issues are seen on those receivers, and both involve the noise level. First, the receivers typically do not have very good low noise amplifiers at the antenna feedpoint (the "LNA" is not "low" enough). Second, the bandwidth is too wide (6 MHz), so way too much noise is admitted to the system. Note, however, that a number of amateur radio preamplifiers and downconverters intended for the ham microwave bands can be modified for use at 1,420 MHz.

Figure 4 shows the basic equipment set-up for 1,420 MHz operation. At the antenna site several items are needed. First, of course, is the dish antenna. A 7 to 9 foot diameter standard TVRO (satellite TV) parabolic antenna is sufficient, but if you can obtain or build a larger diameter dish, then all the better. Some people have also been successful by stacking standard and ring Yagi beam antennas to form an array. The 1,420 MHz signal must be downconverted to 30 MHz. The step in the process is to use a very low noise amplifier (NF as small as possible, within the budget), which is mounted right at the antenna feedpoint. The output of the preamplifier is fed to the RF port on a mixer, where it is combined with the signal from a 1,390 MHz local oscillator (LO). The difference frequency (1,420-1,390) that appears at the output of the mixer is 30 MHz.

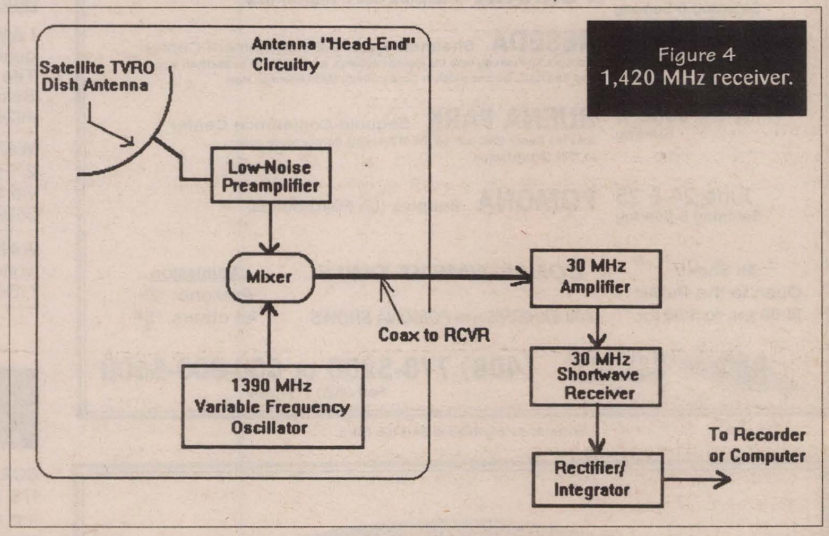


Figure 4 1,420 MHz receiver.

In order to provide some tuning around the operating frequency, it is common to use a voltage controlled oscillator (VCO) for the LO. Some designs use a varactor tuned crystal circuit, operating in the low-VHF region, which is then frequency multiplied up to 1,390 MHz. The output of the mixer is fed through coaxial cable to the receiver site. In some cases, a 30 MHz amplifier is used ahead of the receiver, although in some cases (especially where a good receiver is used), the signal is applied directly to the receiver.

Conclusion

Amateur radio astronomy can be a very rewarding hobby, and need not be too terribly expensive (especially for a do-it-yourselfer). If you are interested in chasing this topic further, then you might want to contact the **Society of Amateur Radio Astronomers (SARA), at 247 North Linden Street, Massapequa, NY 11758.** They publish *Radio Astronomy* monthly. **NV**

Computer MARKETPLACE

Computer Trade Show
With Wholesale Prices

There is no other place where you can find such a huge inventory of computer products all under one roof AND at low, wholesale prices! Hundreds of knowledgeable computer retailers and businesses each demonstrating their products and paying close attention to your needs.

May 6 Saturday	**SANTA BARBARA** Earl Warren Showgrounds	Take Highway 101 to the Las Positas Exit. Follow the signs to the fairgrounds.
May 13 & 14 Saturday & Sunday	**POMONA** Fairplex (LA Fairgrounds)	Exit Highway 10 at Fairplex Drive. Go north to McKinley Avenue, turn right. Turn left on White Avenue to Gate 14.
June 3 & 4 Saturday & Sunday	**POMONA** Fairplex (LA Fairgrounds)	
June 10 Saturday	**RESEDA** Sherman Square Entertainment Center	From the 101 Freeway take the Reseda offramp, turn left (east) to Sherman Way and turn right. Go one block to Canby Street. 18430 Sherman Way.
June 11 Sunday	**BUENA PARK** Sequoia Conference Center	Take the Beach Blvd. exit off the 91 Freeway. Go one block north to 7530 Orangethorpe.
June 24 & 25 Saturday & Sunday	**POMONA** Fairplex (LA Fairgrounds)	

All Shows Open to the Public 10:00 A.M. TO 5:00 P.M.

CONSIGNMENT TABLE
300 EXHIBITS at the POMONA SHOWS

Admission
Pomona: $7.00
All others: $5.00

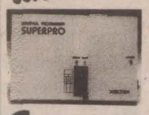
National Productions Inc.
(408) 778-5200 or 800-800-5600
Fax# (408) 779-1374

Write in 59 on Reader Service Card.

DEVICE PROGRAMMERS

NEEDHAMS EMP-20 UNIVERSAL $429 | EETOOLS ALLMAX UNIVERSAL $579 | NEEDHAMS PB-10 E(E)PROM $129 | HILO TUP-300 UNIVERSAL $449 | HILO TUP-400 UNIVERSAL $569

XELTEK REFURB SUPERPRO $249.



$ 49 SUNSHINE 1 GANG
$ 99 SUNSHINE 4 GANG
$169 SUNSHINE 8 GANG
$299 SUNSHINE 16 GANG
$199 SUNSHINE UNIVERSAL
$269 JDR MUP UNIVERSAL
$449 JDR EMUP UNIVERSAL
$569 JDR EMUPA UNIVERSAL

$569 LOGICAL CHIP3000
$569 ADVANTECH UPROG
$ 99 TTL/DRAM TESTER
$189 XELTEK ROMMASTER1
$269 XELTEK ROMMASTER4
$139 EETOOLS ROM MAX1
$199 EETOOLS ROM MAX4
CALL EETOOLS ALLMAX+

NEEDHAMS SA-20 STAND ALONE $699

General Device Instruments

GDI WILL BEAT ANY PRICE - NEVER UNDERSOLD

SALES 408-241-7376 FAX 241-6375 BBS 983-1234 Internet ICDEVICE@ix.netcom.com

Write in 58 on Reader Service Card.

#10 HAM GEAR FOR SALE *cont.*

I AM awaiting my Mars certif., but I need general coverage transmit mod. for Ten-Tec Paragon II now! WV1V, Vic, 15 Belmont St, Danbury, CT 06810 203-743-4928.

WANTED: INTERNAL TNC such as DRSI-2, PCPA-2 and DCD 3501. Must be in working condition. Write Jerry K7VKK at, 35200 The Glade, Nehalem, OR 97131.

WANTED: REGENCY 70 watt VHF not working, but must be complete. Cheap. 718-617-4332. Leave message.

CB & SCANNERS 30

SCANNING WITH THE PRO-2004/5/6 AT ITS FINEST, fully automated with amazing untamed power! The CE-232 Scanner/Computer Interface has AutoProgrammer; AutoLogger; Data LookUp; Birdie-Reject; Macros & much more for IBM/compatibles w/512k & MSDOS 3.1 & up! Kit, Program Disk (specify size) & detailed manual: **$194.95 + $5 S&H;** or SASE for info: COMMtronics Engineering, Box 262478-NVZ, San Diego, CA 92196-2478. FREE info from our computer BBS at 619-578-9247, after 5:30 pm & before 1:30 pm, PST.

SECRET CB Books 1-29, $10 ea; Sams Books $15 ea; RCI 2950-2970 service manual, $10. Call for free catalog of other goodies, 1-800-536-0109.

TOMCAT'S BIG CB Handbook, by Tom Kneitel! 221 pages, illustrated. Everything they never told you about AM, SSB, DX, Freeband, legal and otherwise. Only $15.95 (+ $5 postage, $6 to Canada). CRB Research, Box 56, Commack, NY 11725. (NYS residents add $1.78 tax). MC/Visa OK. Phone orders 516-543-9169.

BUILD THE ultimate 11 meter vertical antenna. It will provide: quieter receive, more receive gain, more transmit gain. It will reduce or totally eliminate bleed problems. Data sheets give detailed information on this antenna and information that can improve the performance of any vertical antenna. Send $15 to Terrapin Sales, PO Box 12426, La Crescenta, CA 91224-5426.

"BREAKER" SAVE big on Connex, Galaxy, Texas Star, Palamar and many more. Send to L & S Electronics, PO Box 655, Hazelton, PA 18201-0655. Enclose money order, payable to Lawrence Smith for S&H of catalog. Cost is $5.50 deductible from first order.

CB RADIO Hacker's Guide! New! Big 150 pages; pictorials, diagrams, text. Peaking, tweaking & modifying 200 AM & SSB CB radios. Improved performance, extra capabilities! Which screws to turn, which wires to cut, what components to add: Cobra, Courier, GE, Midland, Realistic, SBE, Sears, Uniden/President. $19.95 plus $5 shipping ($6 Canada). NY State residents add $2.12 tax. CRB Research, Box 56-NVV, Commack, NY 11725. Visa/MasterCard accepted. Phone order M-Tu-Th-F, 10-2 Eastern Time, 516-543-9169.

READOUT CHANNEL Kit for Cobra 148, $54.95; Modulation kits for RCI 2950, HR 2510, Galaxies, Cobras, Ranger 3300, plus more. Call 1-800-536-0109 for free catalog.

SCANNER HACKERS BIBLE 112 modifications. PO-2004/5/6, Yaesu, Kenwood, Bearcat, Icom. Frequency fixes, scan rates, interfaces, programmable channels, improving operation, antennas, and MORE!! $33.45. VOLUME 2 covers ICOM + KENWOOD $33.45. **VISA/MC** 602-782-2316. **TELECODE**, Box 6426-NV, Yuma, AZ 85366-6426.

CELLULAR RESTORATION on your 800MHz scanner performed expertly for $40 including return shipping. Guaranteed. Keith Perry, 607 Osage Dr., PO Box 816, Leander, TX 78641. Phone 512-259-4770.

GRR-24 MILITARY Radio AM-UHF receiver, Solid State, 225.0MHz to 399.975MHz, AC-DC, used, $95. Bob, 415-332-3905, POB 1081, Sausalito, CA 94966.

DON'T MISS ANY ACTION! The new Action Tape Controller plugs into your scanner and tape recorder, activating recorder only when scanner picks up something, and recording whatever it receives! Needs **NO BATTERIES** nor AC power $31.95 ppd. Worldcom, Box 3364, Ft. Pierce, FL 34948. 407-466-4640.

ANTENNAS! FILTERS! BOOSTERS! Many unique products including indoor amplified **loop antennas,** lightning and overload protectors, and modification enhancements that can add 10x **signal boosting,** extra-**narrow** AM/FM/SSB **filtering,** SCA decoding and more to your radio! For complete catalog, send two 32-cent stamps. Worldcom, Box 3364-P, Fort Pierce, FL 34948. 407-466-4640.

Forest Electronics Inc.

Are you overpaying . . .
. . . your cable company?

You are if . . .
. . . you are leasing their equipment.

- *Forest Electronics, Inc. offers a complete line of New Cable Decoders and Converters that are fully Compatible with your cable system.*
- *All systems come with: Remote Control, & Parental Guidance Feature. Volume Control is also available.*
- *All Equipment is fully guaranteed & comes with a 30 day money back option.*

For More Information Call Us 24 Hours a Day At:

800-332-1996

FAX: 708-860-9048

FEDERAL FREQUENCY Directory! Kneitel's "Top Secret" Registry of government Frequencies, New 8th Edition. 268 Pages! FBI, DEA, Customs, Secret Service, BATF, Immigration, Border Patrol, IRS, FCC, State Dept., Treasury, CIA, etc. & surveillance, bugs, bumper beepers, worldwide US military, 225 to 400 MHz UHF aero band, Canadian listings, & more. Ultimate "insider's" directory! Standard reference of law enforcement, news media, private security, communications industry & scanner owners. $22.95 + $5 shipping ($6 to Canada). NY State residents add $2.38 tax. CRB Research Books, Box 56-NVT, Commack, NY 11725. Visa/MC welcome. Phone orders 516-543-9169 weekdays (ex-Wed.) 10 to 2 Eastern.

SCANNER MODIFICATION HANDBOOK. Big! 160 pages! More than 20 performance enhancements for PRO-2004 and PRO-2005. Restore cellular, increase scanning speed, add 6,400 memory channels, etc. Step by step instructions, photos, diagrams. Only $18.95, +$5 shipping ($6 Canada). (NYS residents add $2.04 tax.) CRB Research, Box 56, Commack, NY 11725. Visa/MC welcome. Tel. 516-543-9169.

SALES, SERVICE: CB equipment, radios, modifications, power mics, echo-reverb boxes, kits, meters, filters, antennas, noise toys, mounts, hard to find items. Partial list $1, complete list $4. D&R Electronics, 10 Park St., Thomaston, CT 06787. 203-283-9492.

FREE CB EXPORT CATALOG 24 HOURS A DAY by our **INTERACTIVE VOICE MAIL SYSTEM, FAX ON-DEMAND. LISTEN** to or **FAX DOWN** the **ABSOLUTELY LOWEST PRICES** on CBs, Scanners, Modifications, Kits, Techinical Books, Accessories and more. **LORD/WYATT COMMUNICATIONS** 718-789-7329, press Ext. 1 for the CB department. No Fax machine. Please send $3 for catalog to **LWC,** PO Box 030128NVF, Brooklyn, NY 11203-0001.

VINTAGE TUBE CBs. LSASE list. RFD 1 Box 75, Fort Kent, ME 04743. 207-834-6273. Evenings/weekends only.

FINALLY READY, Bill Cheek's **The Ultimate Scanner** (Cheek 3) doesn't just build on his two earlier bestsellers. His new indispensable bench manual goes further and faster, explaining scanner modification technology proved by thousands of readers of The World Scanner Report. **The Ultimate Scanner** includes memory enhancements, up to 25,600 channels, cellular restoration, simple ways to automate arduous scanning tasks, signal discrimination, computer interfaces, optimum antennas, autologging "hits," power options, SCA decoders, auto-rejecting, hacking, and tons more. You get more of Cheek's laid-back down-and-dirty style, as he provès you may already own most of the "next generation" scanner. With a wealth of step-by-step procedures, photos, charts, diagrams, and schematics, Cheek gives us generic information for improving the performance of ANY scanner, plus detailed information on Radio Shack 2032/2036/2037/2026/2039/2030/2027/2022/2021/2003/2002/43A/46/51/62, Uniden 760/890/8500/5855/5800/590/2500/100, plus models from Shinwa, Icom and Regency. 260 pages, large format, $24.95 until 6/30/95, then $29.95 (plus $4 S&H; CA add 7.75% tax). Index Publishing Group, Inc., 3368 Governor Drive, Suite 273N, San Diego, CA 92122. Order line 1-800-546-6707.

WANT PRO2021 Mods for 800MHz. Joe Hilburn, 5013 Elkwood Ct., Raleigh, NC 27613.

MIDWEST ELECTRONICS

124 12th AVE. SOUTH, MPLS, MN 55415
Tel (612) 339-9533 · FAX (612) 338-3834

COMPUTERS

MINI TOWER 486DLC-40MHZ W/MATHCO, 4MB RAM, 200MB HD, 512K VGA CARD, 1.2 & 1.44 FD, KB (NEW) $819
PACKARD BELL 8086 XT 640K 30MB HD; 360K FD; KB, CGA $99
PACKARD BELL 286-12 5-1/4 FD, 1MB RAM, 40MB HD, 101 KB $149

MOTHERBOARDS

486DLC-40MHZ AMI BIOS..... $129
ZEOS 386SX-20 ..... $39

SPECIAL!!

14.4 F DRIVE..... $32
387DX-25-33 MATHCO..... $22
15PCS. COMPUTER TOOL SET $6.99
SCSI TERMINATOR..... $4

CONTROLLERS

AT MFM 16 Bit..... $35
AT RLL 16 BIT $25
XT MFM HD..... $39
XT FLOPPY..... $7
FLOPPY CONTROL XT..... $7
FLOPPY/IDE CONTROL 16 BIT..... $14
VGA 256K CARDS..... $27
VGA 512K CARD $35
MONO CARD..... $10
SERIAL OR PARALLEL..... $9
EGA VIDEO CARD $15

MISC. CARDS & CABLES

2400 INTERNAL MODEM $12
360K FLOPPY DRIVE..... $10
PRINTER CABLE..... $2.50
EXTERNAL SCSI CABLE $5
9 PIN MONITOR EXT. CABLE..... $3
Y POWER SPLITTER $3
IDE CABLE (USED)..... $2
40MB IDE HARD DRIVE..... $69
25 PIN M/F G. CHANGER..... $3
3 BUTTON MOUSE $9
15 PIN VGA EXT. CABLE..... $5
KEYBOARD EXT. CABLE..... $4

USED MISC.

MONO MONITORS STARTING..... $19
IDE/FLOPPY CONTROLLER..... $9
CGA MONITORS STARTING $49
I/O CARDS..... $9
MFM 20MB HARD $35
CGA CARD..... $9
RLL 30MB..... $40
SERIAL CARDS $5
ZEOS DESKTOP CASE W/200W PS $39
8 BIT ETHERNET CARD..... $19
MS-DOS VERSION 4.01 INCL GW-BASIC..... $9
MS-DOS VERSION 3.3 IN 3-1/2 DISKS $6

PLEASE CALL FOR QUANTITY DISCOUNT, SHIPPING CHARGES, & FOR MORE UNLISTED AT OR XT PARTS.

Write in 57 on Reader Service Card.

CB RADIO 6 months old for sale Cobra 2000 GTL with desktop power mic., and modified with xtra channels. Included is 100 feet of coax cable. Best base station CB sold today. Priced new $380. Asking $300. Call 516-564-1014.

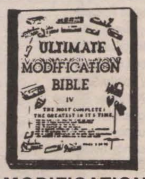
CB RADIO sales and service of export radios, amps, antennas, and more. Specializing in hard to get units. Send $1 for price list or call our BBS at 414-328-0190 2400-b. G.L. Electronics, PO Box 44201, West Allis, WI 53214. V-414-328-9899.

SCANNER MODIFICATIONS. Professional level mods at reasonable prices. S meters, extended memory, Linkall memory controller, computer interfaces, auto crystal switch, many more mods for all scanners. Recommended by Bill Cheek. Six month warranty all work. Mark Persson, 1369 Lombardy Blvd., Bay Shore, NY 11706. 516-665-6457.

CELLULAR HACKERS! Hot new software programs up to 39 different phones using your PC. All Motorola phones! Nokia, Oki, Novatel, etc. 8.6 Megabytes of info. covers ESN/NAM programming, test modes, everything! Manual and diagrams to make own cables included. Guaranteed! No need to spend $200 or more! Mention Nuts and Volts, get a disk of unbelievable underground stuff! Hot! Order now! $99.95 to; Bates, 426 West Belmont, Chicago, IL 60657. Phone, 312-213-7023.

WANTED: DEAD or alive: Radio Shack PRO 2005/6 Scanner. Please leave voice mail at 512-448-6664.

1995 EXPORT CB catalog, best prices on galaxy, TNT, and Texas Star. Send 2 stamps for catalog. J. Scott & PO Box 1896, Highland, IN 46322-0896.



ULTIMATE MODIFICATION BIBLE Vol. IV. Most complete, and greatest modification book in its time. 800 mike wirings CB and ham, 400 CB modulation boost, 200 CB PLL's, 175 ham radios, and 25 scanner modifications. Over 200 pages. KDC Sound, 17294 FM3083, Conroe, TX 77302. Send $29.95 or to order: 1-800-256-9895 COD ($4.50 extra for COD fee), Master Charge, Visa, or Discovery. Other calls: 409-231-3753.

"WORLD SCANNER REPORT," monthly scanner hacking guide by Bill Cheek, author of Scanner Modification handbooks! Scanner-computer interfaces; S-meters; CTCSS; DTMF; speedups; countermeasures; much more: $15/6-mo; $25/yr; SASE for info; PO Box 262478-NVZ; San Diego, CA 92196-2478.

CABLE EQUIPMENT!

- We Buy All Types U.S. Systems
- Offers of 200 Pieces Or More
- CALL TODAY!

1 402 392-2284

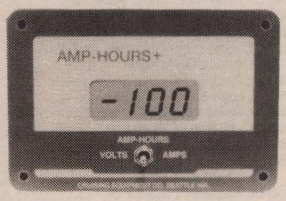
FAX: 1 402 392-0991

Ask For Purchasing... and Let's Deal!!

Write in 35 on Reader Service Card.

AMP-HOURS+™

World Leader in State of Charge Instrumentation



Battery status at a glance: Amp-hours consumed, plus Volts and Amps flowing in or out. Simple to use. Zero Ahrs are consumed from a full battery. **AMP-HOUR+** Meter counts down as Ahrs are used and back up during charging. Automatically learns, and compensates for, charging efficiency. Two channel model available.

NEW! MEMORY MODULE
Store up to 1 megabyte of RS-232 (9600, 8-N-1) data. Instrument remote sites -- retrieve data later for analysis and graphic display! Extremely versatile. Call or fax for complete details!

Dealer Inquires/Exporters Invited

CRUISING EQUIPMENT CO.
6315 Seaview Ave NW
Seattle, WA 98107 USA
(206) 782-8100
Fax (206) 782-4336

Write in 36 on Reader Service Card.

SURPLUS TEST EQUIPMENT

HEWLETT PACKARD

11664C, Detector $150
11713A, Attenuator Switch Driver $500
11720A, Pulse Modulator 118 GHz $1250
11975A, Amplifier, 2.0-8.0GHz $1500
11975A, Amplifier, 2.0-8.0GHz $2250
1630D, Logic Analyzer $800
1630G, Logic Analyzer, 65 Channel $900
1640B, Serial Data Analyzer $550
1725A, 275 MHz Oscilloscope $500
1740A, 100 MHz Oscilloscope $300
1741A, 100 MHz Storage Oscilloscope $450
182T/8755C, Swept Amplitude Analyzer $850
3310B, Function Generator, .0001Hz-5MHz $250
332A, Distortion Analyzer $150
3335A, Frequency Synthesizer, 200Hz-80MHz $2850
339A, Distortion Analyzer, 10Hz-110KHz $2250
3437A, High Speed Digital Voltmeter $250
3455A, Digital Voltmeter $500
3466A, 4.5 Digit Multimeter $350
3468B, 3.5 Digit Multimeter $250
3497A, Opt. 01, Data Acq. Unit/DVM $1000
355C, Variable Attenuator $125
3570A, Tracking Receiver $800
3575A, Phase Gain Meter 1Hz-13MHz $1200
3580A/ANALOG, Spectrum Analyzer, 5Hz-50KHz $1200
3580A/LED, Spectrum Analyzer, 5HZ-50KHz $2000
3581A, Wave Analyzer $750
3581C, Selective Voltmeter $950
3582A, Spectrum Analyzer, .02Hz-25.5KHz $3000
428B, DC Ammeter w/Probe $200
4342A, Q-Meter $1700
435A, Power Meter $250
461A, Amplifier $100
489A, Amplifier, 1.0-2.0 GHz $100
491C, TWT Amplifier, 2-4GHz, 1 Watt, 30dB $350
495A, Amplifier, 7.0-12.4 GHz $150
5005B, Signature Analyzer $700
5254A, Frequency Converter, .3-3.0 GHz $100
5255A, Frequency Converter, 3-12.4 GHz $100
5256A, Frequency Converter, 8-18 GHz $100
5314A, Frequency Counter, 10Hz-100MHz $250
5315B, Universal Counter, DC-100MHz $300
5316A, Universal Counter, DC-100MHz $600
5316B, 7 Digit Counter, DC-100MHz $750
5328A, Universal Counter, DC-100 MHz $225
5340A, Frequency Counter, 10Hz-18GHz $1000
5341A, Counter, 10Hz-4.5GHz $500
5342A, Frequency Counter, 0.5-18GHz $2750
5345A, Frequency Counter Mainframe $650
6002A Opt. 01, Power Supply, HP-IB, 0-50V/0-10A $800
6011A, Power Supply, 0-20V/0-120A $1000
6111A (HAR.), Power Supply, 0-20V/0-1A $75
6114A, Precision Power Supply, 0-20V/0-2A $550
6205B (HAR.), Dual Power Supply, 0-40V/0-0.3A $125
6227B, Dual Power Supply, 0-25V/0-2A $600
6260B, DC Power Supply, 0-10V, 0-100A $450
6284A (HAR.), Power Supply, 0-20V/0-3A $125
6483C, Power Supply, 440 Volts, 25 Amps $3250
7475A, 6 Pen Graphic Plotter $350
8160A, Precision Pulse Generator, 50MHz $3000
8170A, Logic Pattern Generator $750
8350A, Sweep Oscillator Mainframe $2500
83592A, RF Plug-in, .01-20 GHz $9750
8405A, Vector Voltmeter 1MHz-1GHz $250
8410B, Network Analyzer System w/8412A, 8743A & 8411A $800
8411A, Frequency Converter $250
8411A/018, Frequency Converter .11 to 18GHz $500
8443A, Tracking Generator/Counter $350
8445B, Automatic Preselector $600
8447A, Amplifier, 0.1-400MHz $300
8447B, Amplifier, 0.4-1.3GHz $350
8447C, Amplifier, 30-300MHz $300
8505A, Network Analyzer $2500
8552B, IF Section Plug-in $600
8552B & 8553B, Spectrum Analyzer w/141T Mainframe $1800
8552B & 8555A, Spectrum Analyzer w/141T Mainframe calibrated w/manuals $2250
8557A/182T, Spectrum Analyzer .01-350MHz $1850
8559A W/182T, Spectrum Analyzer, 0.01-21GHz $4000
8614A, Signal Generator, 0.8-2.4GHz $300
86290A, RF Plug-in, 2-18 GHz $1800
86290B, RF Plug-in, 2-18.6GHz $2000
8640B, Signal Generator, 0.5-512MHz $1500
8640B, Signal Generator, Opt. 002, .5-1024MHz $2500
8654A, Signal Generator, 10-520MHz $650
8656A, Signal generator, 0.1-990MHz $3000
86603A, RF Plug-in, 1-2600 MHz $1750
8660C Opt. 100, Signal Generator, 1-1300MHz w/86602B RF Plug-in & 86632A Mod. Plug-in $3000
8672A, Synth. Signal Generator, 2.18GHz $9000
8699B, RF Plug-in, 0.1-4GHz $300
8741A, Reflectometer Test Set $200
8743A, Reflection Test Unit, 2.0-12.4 GHz $100
8746B, S Parameter Test Set $600

HUNDREDS OF POWER SUPPLYS IN STOCK. CALL FOR SPECS.

TEKTRONIX

1410, NTSC Generator, w/SPG1, TSG1, TSP1, TSG3, TSG5, TSG6 ..... $3500
2215, Oscilloscope, 60MHz $600
2465A CT, 4 Channel Oscilloscope, 350MHz $3500
2465DMS, Four Channel Oscilloscope, 300MHz $3000
466, Storage Oscilloscope, 100MHz $800
466/DM44, Storage Oscilloscope, 100MHz $700
475, 200MHz Oscilloscope $650
475A, 250MHz Oscilloscope $800
492, Spectrum Analyzer Opt. 1, 2, 3 w/Mixers to 40GHz $8000
576, Curve Tracer $1750
577 D2, Curve Tracer w/177 Fixture $1700
5A48, Dual Trace Amplifier, 50MHz $200
7104, 1GHz Mainframe W/(2) 7A29, 7B10, 7B15 ..... $4850
7603, Oscilloscope Mainframe $175
7704A, Oscilloscope Mainframe, 150MHz $250
7854, Waveform Processing Oscilloscope $700
7904, Oscilloscope Mainframe, 500MHz $400
7904A, Oscilloscope Mainframe, 500MHz $600
7A13, Differential Amplifier $125
7A19, Dual Trace Amplifier, 600MHz $125
7A26, Dual Trace Amplifier, 200MHz $95
7B53, Dual Time Base $95
7B92A, Delaying Dual Time Base to 500MHz $250
7L12, Spectrum Analyzer, 0.1-1800MHz $1800
7L13, Spectrum Analyzer, 1KHz-1.8GHz $2250
7L14, Spectrum Analyzer, 10KHz-1.8GHz $3500
7L5, Spectrum Analyzer, 20Hz-5MHz, w/Opt. L3/025 ..... $2500
AM503, Current Amplifier $600
DC5010, 350MHz Programmable Counter/Timer $1000
FG504, Function Generator Plug-in, .001Hz-40MHz $850
OF150, Fiber Optic Cable Tester $3000
PG508, Pulse Generator Plug-in, 50MHz $600
R2445, Rackmount O-scope, 150MHz, 4 Channel $1750
R7613, Storage Oscilloscope Mainframe, 100MHz $300
R7704, Oscilloscope Mainframe, 150MHz $200
S-4, Sampling Head $250
S-52, Pulse Generator Head $550
S-6, Sampling Head $500
TM501, Single Slot Power Mainframe $100
TM503, Three Slot Power Mainframe $125
TM506, 6 Slot Power Module $100
TR503, Tracking Generator for 492/4/5/6 ..... $1200

MISCELLANEOUS

Boonton 41-4A, Power Sensor $100
Boonton 42B, RF Microwatt meter $350
Eaton 2052B, Amplifier, 100-512 MHz $1000
EIP 350D, Counter, 20Hz-12.4GHz $400
ESI 242B, Resistance Measuring System $2250
Fluke 335D, DC Voltage Standard $1500
Fluke 343A, DC Calibrator $1500
Fluke 382A, Current Calibrator $1000
Fluke 510A, AC Reference Standard, 400Hz $550
Fluke 5101B/03, Calibrator $10,000
Fluke 5200A, AC Voltage Calibrator $2250
Fluke 540B, Transfer Standard $1200
Fluke 6071A, Opt. 130, Signal Generator, 200KHz-1040MHz $3500
Fluke 732A, D.V. Reference Standard $2000
Fluke 8505A, 6.5 Digit Digital Multimeter $1000
Fluke 8506A, Digital Multimeter $2250
Fluke 8520A, Digital Multimeter $1000
Fluke 8600A, Digital Multimeter $75
Gen-Rad 1433P, Decade Resistor $300
Pac. Meas. 1038D11, Display Unit $450
Pac. Meas. 12464, Microwave Detector $150
PAR 5208, Two-Phase Lock-In Analyzer $2500
Power Designs 2005, Power Supply $75
Power Designs 2005A, Power Supply $100
Racal-Dana 5900, Digital Multimeter $100
Rockland 5100, Frequency Synthesizer $650
Rockland 5600, Frequency Synthesizer $800
Sorensen DCR 300-35A, DC Power Supply, 300V/35A $1500
Sorensen QRD20-4, Power Supply, 0-20V/0-4A $50
Sorensen QRD 60-1.5, 60V-1.5A, DC Power Supply $150
Wavetek 166, Pulse Function Generator $1200
Wavetek 186, Phase Lock Generator, 5MHz $400
Wavetek 3000, Signal Generator, 1-520MHz $900
Wavetek 3001, Signal Generator 1-520MHz $1100
Wavetek 3006, Signal Generator, 1KHz-520MHz $1200
Wavetek 801, Pulse Generator, 5Hz-50MHz $800
Wavetek 802, Pulse Generator, 5Hz-50MHz w/Delay $600
Wavetek 8501, Peak Pwr Meter 30MHz-40GHz $2500
Wavetek 859, Prog. Pulse Gen., 5Hz-50MHz $1500
Wiltron 560, Scalar Network Analyzer $650
Wiltron 6640, Sweep Generator, 26.5-40.0GHz $2500

MasterCard VISA

R & S Surplus
1050 E. CYPRESS STREET, COVINA, CA 91724

(818) 967-0846 · FAX (818) 967-1999

Check PC Monitors *Without a Computer!*

Monitor *Wizard*
Professional PC & Compatible Monitor Checker

Standard Sync Modes:
TTL : MGA, CGA, EGA
VGA : 640x350, 640x480, 800x600, 1024x768i

Optional Custom Sync Modes:
Any or all standard sync modes may be upgraded to any Custom Sync Mode. Call for details.

Order Today!

Easy to Use! No Technical Knowledge Required!
On Screen Display of Monitor Mode
Software Upgrades to ANY Sync Mode!
Tests the MOST POPULAR PC Monitors!
True *INTERLACED* scanning!
Portable! - Only 6.5"x5.5"x1.75"
Crisp & Stable Color Bars!
Correct 4x5 Aspect Ratio Cross Hatch!
30 to 50 Hours Battery Life! 110v a/c Adaptor too!!
Battery Low Light!
Overload & Short Circuit Protected!
Crystal Controlled - *No Internal Adjustments!*
9 pin to 15 pin VGA Adaptor Included!
Battery and A/C Adaptor Included!

Rugged all metal case!

Only.. **$299.95** Made in USA

One year limited warranty

816-836-1094
Independence Electronics Inc.
119 S Main, Independence Mo. 64050
25 years of Industrial & Consumer Electronics

MasterCard VISA

Write in 29 on Reader Service Card.

#30 CB – SCANNERS *cont.*

SCOPE BOOSTER. Increase the input frequency of your oscilloscope to 30MHz and beyond. Requires no internal connections. Great for checking transmitters on CB, ham, modulation, etc. Assembled: $49.95. Kit $29.95. S&H $3.50. Creative Technology, PO Box 1401, Torrington, CT 06790-1401.

BROWNING MARK IV eagles, very clean original. Not strapped manual and original mike $450. Good condition. You ship, COD as is. Jim Smith, 8990 South 52nd Ave., West Colfax, IA 50054. 515-674-3489.

COMPUTER HARDWARE 50

DEC EQUIPMENT WANTED! We are buying DEC systems, boards, terminals, drives and peripherals. Also Scientific Micro Systems (SMS), DSD, Datability, Dilog, other DEC compatibles, and Computer Output Microfilm (COM) units. Please call for a quote or fax us your equipment list. We buy, sell, and trade. **COMPUTER KEYWAYS,** 513-847-2300 or FAX: 513-847-2350.

UPS POWER 300VA to 1250VA, power supplies, tower cases, color monitors, network cards, network software. Call for catalog. GCS, 1-800-386-0577.

FACTORY FRESH not refurbs SVGA NI .28 $195. While supply lasts 90 day warranty. MSCRC Computers, 3243 South 13th Street, Lincoln, NE 68502. 1-800-401-3956.

FREE ADS, Buy, sell trade. Computer, Ham and video related equipment. SASE: Advertizer, 39652 West Idylwild, Bass Lake, CA 93604-9711.

MONITOR AND CPU schematics for Hyundai, Packard Bell, Compaq, Apple, Aamazing Adds, AT&T, IBM, DEC, CTX, Del, Gateway, HP, Epson, Loop, Mitsubishi, NEC, Samsung, Tatung, Wyse, Zenith and many more! $39.95 and up. Call 513-335-4560. Or FAX us at 513-339-6344. For a List.

MISC. COMPUTER inventory monitor. Printers, etc. for sale. 909-885-7785.

FOR SALE: Commodore C64 computers, disk drives, books and software. Send SASE for listing. To: Robert Ritchey, 619 58th, Vandalia, IL 62471-3003.

SIP TO SIMM 30-PIN MEMORY ADAPTER BOARD. Converts 256K/1MB/4MB SIP Memory Modules to 30-pin SIMM Socket for use with IBM/APPLE Computers. $10.95 each, plus $4 Shipping, per order. William DeCoster, 3801 9th Ave. N #27, St. Petersburg, FL 33713.

EXTERNAL TAPE backup Colorado tracker 120MB for notebook/desktops parallel port interface pass through printer port. Great price! $120. Servo-Track, 408-378-1374.

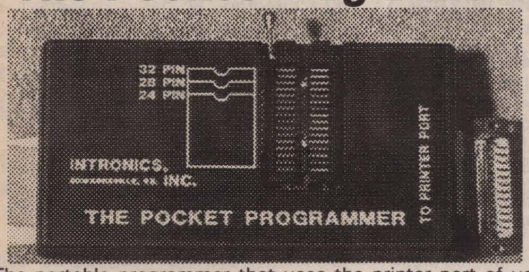
Cellular Extensions
from
"THE CELLULAR EXPERTS"
Motorola 3 Watt Bag Phone from $299.
Nec P120 12oz. Portable $399.
Motorola PT 550 10oz. "Flip" Phone $449.

Others available, buy new from us, or send us your phone.
Get a second or third phone with no additional monthly charges!
Motorola, NEC, Panasonic, Audiovox and many others.

Fax Back Hotline For 24hr info. call from your FAX
(714) 581-7460 or call (714) 581-2121 9 to 5 PST
CA Grapevine. World wide inquires welcome.

Write in 56 on Reader Service Card.

The Pocket Programmer



The portable programmer that uses the printer port of your PC instead of a internal card. The software has 24 functions and programs (E)Eprom, Flash & Ram 27/28(C)XXXX from 16K - 8 Megabit with a 32 pin socket. Adapters availble for 874X, 875X MCU's, Eprom Emulation to 32K X 8, 40-Pin & Serial Eproms. **Only $129.95**

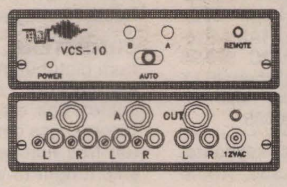
Mac EZ Programmer

The Only Eprom programmer made for Macintosh. The software has 15 functions including File Editing with a 32-Pin socket supports (E)Eprom, (27/28(C)XXX) and Dallas Ram from 16K - 4Megabit. **Only $299.95**

Intronics, Inc.
Box 13723
Edwardsville, KS 66113 Add $4.50 COD
Tel. (913) 422-2094 Add $4.00 Shipping
Fax (913) 441-1623 Visa / Master Charge

COMMUNICATIONS SYSTEMS LABORATORIES
1-800-529-9483

Multi-Media Control Systems For Home And Industry. Custom Design And Manufacturing.



VCS-10 A/B loss of video switch. Fully Automatic switch to A port if B loses video. Switches Stereo Audio in conjunction with Video. Will rack mount with available bracket (mounts 3 units) Signals fully buffered, may be manually or remotely switched. Introductory Price $225.00.

VCS-25 Commercial Insertion from Video Tape or Laser Disc. Fully automatic, responds to all valid network call tones, has event logging capability to support detailed customer billing. $ 1595.00.
VCS-75 Channel Controller. Integrate four VCRs, two Laser Discs, and two standby sources for fully automatic 24 hour unattended operation. Supports blackout programming requirements. $ 2995.00.
MMCS-10 Home entertainment 8x8 Video/Stereo Audio Cross Point Switch. Interconnect any of 8 inputs to any or all of 8 outputs. Ideal for interconnecting complex systems requiring periodic changes in signal routing. Re-program easily from front panel keypad. All inputs fully buffered, available in kit ($595.00) or fully assembled/tested ($695.00).
MMCS-11 Rack mountable commercial version of the MMCS-10, has additional feature of built in serial interface for external computer control. Assembled only $895.00.

To place an order or request detailed catalog of products and services call **TOLL FREE 1-800-529-9483.** MasterCard/VISA accepted.

Write in 31 on Reader Service Card.

CHEEK

The Ultimate Scanner!

There's only one BEST!

The King of Scanners takes this step-by-step, richly illustrated, bench manual beyond everything ever printed on scanner mods. Bill is a perfectionist who will help you convert your scanner into precisely what you've always wanted!

260 pages, large format (lay-flat binding), *FINALLY AVAILABLE!* $24.95 until 6/30/95, then $29.95.

***Cheek's* Scanner Modification Handbooks** Vol I: 160 pgs. Vol 2: 220 pgs, both large format c. $17.95. *Best Sellers for years!*

Monitor America *ESSENTIAL!* **Federal/state/local frequencies, with super detail. Everything you need! 800+ pages, $24.95**

Scanners & Secret Frequencies *Henry Eisenson's* best seller. Novice to pro, it's *MUST* reading,. Highly praised by the experts. 320 pages, $19.95

Emergency Radio! *Norm Schrein* Scanning news as it happens. *FUN!* 214 pag ., $14.95

Television Gray Market How they steal cable programming! *Eisenson*, 160 pages, $23.75

Index Publishing Group, Inc. 1st book: $4 s/h
3368 Governor Dr, Ste 273N Add'l: $2 ea
San Diego, CA 92122 CA: add 7.75% tax
1-800-546-6707 – credit cards

Write in 32 on Reader Service Card.

CONTROL DALLAS' CYBERCARD WITH IBM PC! PROVEN XT/AT-Bus I/O Card read/write Dallas' 6417X CyberCard FAST! TSR Driver, Software, Adaptor PCB, all just $99, socket add $20. UPS Ground. OEMs/info: 404-423-9862. BoMar, 821H Concord Rd #123, Smyrna, GA 30081.

HP PLOTTER Pens, felt tip, .3mm, for paper plots, blue only, in sealed blister packs, date expired but work fine, 100 pens/$20 + $3 shipping, send check to Mack Goodman, 2106 Hampshire Drive, Fallston, MD 21047 or call 410-893-0093.

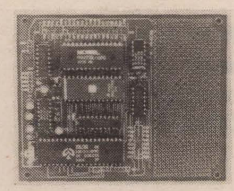
2 EXIDE (model S1103) 3000 Watt UPS units. 1 120 Volt, 1 220 Volt both need repair, $40 each. 13 Telex 289-C line printers and 1 Telex 274-C controller $100 OBO for all. Computer Data Tape (CDCC 6250) 1/2" tape on 10" reels, new unopened. $1 per reel. (200 reels available). Call Ed at, 912-439-1345.

NEW! LOW cost 68HCII Development Microcontroller System. Program your application in C or BASIC on PC or Mac or zap EEPROM right on board! No need to buy expensive EPROM programmer. 8 channel 8-bit A/D, Timers, Counters, 8-bit Shift Register, 32K ROM, 32K RAM, 32K EEPROM! RS-232, extra I/O on board, Prototyping Area, too much to list. Support code for LCD displays and sensors included. Kit and Assembled. For new product information and free catalog contact Black Feather Electronics. 1-800-526-3710.

DOCUMENTATION NEEDED for a Hewlett-Packard hard drive, HP Model C2285E, Part Number D1660-60001, D1660A, Option: STD. HP cannot find any info; I need to know jumper & DIP switch settings. This is a 330MB, 5-1/4" ESDI full height drive. C. Svetlik, 216-442-1006.

FREE CATALOG 9-pin printers $25 & up. Video cards: mono $5, mono/graphics $10, long CGA $10, short CGA $15, long EGA $20, short EGA $25. 1.2MB drives $25. 20MB MFM drive $20, 30MB RLL $30. New items: 540MB Quantum $185, 1.44MB Teac $35, 101 keyboard $15, mouse $10, ISA IDE/IO Card $12, VL IDE/IO Card $19, 1MB SIMMS $39, NEC multisync to VGA cables $4.30. Oasis Technologies, 9-5 Pacific Monday-Friday. 360-373-3818, BBS 360-613-1737. Box 267, Tracyton, WA 98393.

UPGRADE PARTS! 486DX2/66 VLB Motherboard & CPU New with 1 yr warranty, AMI BIOS and 256K Cache Memory $319. Mini Tower Case with 200 watt power supply $39. TEAC 3½" 1.44MB Floppy Drives $39. MB floppy drives $39. Plus lots, lots more. Call for other pricing. Stewart & Associates. 314-240-6500.



Z8 SINGLE BOARD COMPUTER. Fully assembled & tested 4x5" double-sided PCB. Plated through holes, silk screen, and solder mask. Socketed ICs. 560 hole prototype area. Zilog Z86C91 processor running at 12.288MHz. Low power CMOS design. 32K static RAM installed. Uses 8, 16, or 32K EPROMs. Eight pre-decoded I/O chip selects. 14 available I/O pins. Full 40 pin expansion bus. Built-in RS232 interface. Software: MSDOS Z8 cross assembler. Z8 C compiler with support for mixed C/assembly, direct coding of Z8 interrupts in C. Z8 debug/monitor supplied on EPROM. Load and test C and assembler programs in onboard RAM via RS232 port. Order# SBCZ8-01AC (all features including C compiler) $125 + $5 S&H. Check or MO to: VERSACOM, 145 S. Livernois #133, Rochester, MI 48307. 810-652-6266.

GUARANTEED PRICES FROM: $14.95 TO $59.95

SUPER CABLE TV TURN-ON MODULES

CUSTOM MANUFACTURED FOR EXCELLENCE!!

TEST YOUR CABLE BOX FOR OPTIMUM PERFORMANCE

Excellent Detailed Instructions • Complete With Illustrations

GUARANTEED PRICES FROM: $14.95 TO $59.95

JERROLD STARCOM *COMPATIBLE*
DP5 & DPV5
DPV7 & DPBB7 (Including R2 & V5 Models)
NEW *1 Wire Smart Board Available*
CFT-2000 Series
NEW *1 Wire Smart Board Available*

- EASY 5 MINUTE INSTALLATION
- FULLY ASSEMBLED & TESTED
- DISGUISED OPERATION
- TECHNICAL SUPPORT
- ONE YEAR REPLACEMENT WARRANTY

TOCOM *COMPATIBLE*
5503VIP & 5507

PIONEER *MODULES*
BA-5100 thru BA-6150
BA-6300 thru BA-6700

SCIENTIFIC ATLANTA *SMART BOARDS*

8500 Dual Module	8536 Dual Module	8580 Smart Board
8530 Dual Module	8550 Smart Board	8590 Smart Board
8535 Dual Module	8570 Smart Board	8600 Smart Board

ZENITH Z-TAC *MODULES*
ST-1000 thru ST-5612

MASTER COMPONENTS (800) 233-0570

Write in 33 on Reader Service Card.

Low cost Microcontroller Development System

80C552 (8051 core processor) 8 channel 10-bit A/D, PWM, 32K ROM, 64K RAM, RS-232, 24 more I/O, **$120** each SBC, optional 40x2 LCD $20. Complete development system (add **$70**) features assembler, real time execution and debugging, monitor program, examples, and more.

68HC11 8 channel 8-bit A/D, 32K ROM, 32K RAM, RS-232, 24 more I/O, **$120** each SBC. Development software $70 more.

Other CPU development systems and custom design are also available.

Universal Microprocessor Simulator/Debugger V2.1

Simulates popular 8-bit CPUs. Includes Assembler, Disassembler, Simulator/Debugger, and more functions, **$100** each CPU.

ROMY-16 EPROM EMULATOR

Emulates ROM or RAM in 8- and 16-bit systems. **$195** (2716-27256) or **$245** (2716-27010). Window/menu driven interface. 90 day warranty. 15 day money-back guarantee, Optional assembler, disassembler, ROM-debugger **$100** each CPU.

J&M Microtek, Inc.

83 Seaman Road, W Orange, NJ 07052
Tel: 201-325-1892 Fax: 201-736-4567

Write in 34 on Reader Service Card.

FOR SALE: Vic 20, recorder, software; Commodore 64, disk drive, software; Commodore printer; RS Color Computer 64, software, manuals and RS printer; magazines (Hot Coco, Rainbow). Extras! Best offer. Jim, 4330 Grace Ave., Bronx, NY 10466. 718-324-2153.

SBC-8K MICROCONTROLLER. Complete 68HC11 development package. 8704 bytes EEPROM. 272 bytes RAM. Programs via RS-232 port from PC. $79.95 plus $5.00 shipping. MC/Visa. Phone/FAX 410-586-2177. LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685.

APPLE IIGS, monitor, floppy, keyboard, mouse. $450. Apple Mise $30. Apple Keyboards $45. Apple Floppy drives $45. 909-885-7785. Smith Bro's Computers, 25586 E. Baseline. San Bernardino, CA 92410.

HARD DRIVES: 60MB RLL wth controller $65, ST-225 20MB $30, ST-251 40MB $50, AT HD/FD controller $15. **MONITORS:** IBM 5153 CGA $50, 9" CGA $35, 12" mono $20. **PRINTERS:** IBM Proprinter X24 $50, Epson FX-185 wide $50. **TURBO XT:** dual floppies, mono monitor $30. Add $5 S&H. Joe D'Airo, 424 Higbie Lane, West Islip, NY 11795.

MEMORY 72 pin $160 4Meg VGA Monitors $100 IDE 4X **CD-ROMs** $199. Many CD titles in Stock Catalog only $1. CPU 486 DX2-66 $150, 486 DX4-100 $195, NEW Hard Drives 720-$175 1.2 GIG $395. Call for current pricing, 717-387-6499. Order Only, 1-800-336-9065.

IRQ/DMA conflict eliminator: Easy to build board does what software can't. A must for troubleshooting PC's. Laser printed schematics, drawings and parts list, $15. Mark Lopez, 306 Roosevelt, Irvine, CA 92720.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmf/.

NEED MONITOR SCHEMATICS? 250 + name and tech service phone numbers for monitor, computer and parts supplier companies. Send $10 check or mone order to: Computer Care, 6905 Indian Bay Road, Montague, MI 49437.

COMPUTERS, ACCESSORIES, direct from distributers. Don't pay retail, buy at wholesale, complete step-by-step, guides, tips, etc. Over two hundred distributors cross country. Names, addresses, toll free numbers are furnished. They'll ship it right to your door. Send $14.95 to Nassirian, Box 382-V, Rio Linda, CA 95673.

386 COMPUTER with monitor, printer $400, VGA monitor $125, EGA monitor $75, VGA boards $25, 286 computer with monitor $150, Epson printer $50, CGA monitor $50, HP 7475A plotter $150, HP 7550A plotter $250, HP Vectora 286 computer $100, XT computer $45, HP85 computer $75, HP Think Jet printer $75, HP laser printer 2686A $125, Macintosh plus $150. Much more. 714-827-7345.

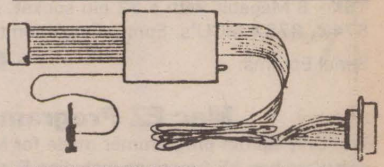
DEALERS, TECHNICIANS: Do you throw away bad power computer switching power supplies? I can show you how to fix 9 out of 10 in less than a half for under $10. I'm selling a schematic, extensive theory of operation, and a complete troubleshooting guide. The price? $40, the cost of one supply. It will pay for itself with the first repair. Jim, 520-623-8994. PO Box 5123, Tucson, AZ 85703.

WE BUY MEMORY SIMMS & DIPS. Dynamic & Static Memories. IBM Clone as well as Macintosh Memories. Call: **907-227-4637.**

WHOLESALE FLEAMARKET merchandise directory. 60 pages, hundreds of distributors listed that you may contact who supply fleamarket/swapmeet dealers. All kinds of items, incredible prices! Electronics too! Useful for business or personal use. $10. JACOMM-BV, Box 142, Wharton, NJ 07885-0142.

PHONEQUEST, phonecard for computer. 8-bit card, autodial, hands free use, $32. Also FM radio card, TV card. Call for catalog. GCS, 1-800-386-0577.

MOTHERBOARDS 80486SL-33 $99, 84086SL-50 $129, 80486DX2-50 $209. B&D Computers; 601-875-0596, FAX 601-872-2484.



EPROM EMULATOR. No unplugging or disconnecting during 11 second transfer thru parallel printer port. Includes cables, IBM disk. Supports Intel Hex, Motorola S and binary files. Multiple emulators support 16/32 bit/buss. 2764-27256 Emulator, $109. Upgradable anytime to 2764-27512 for additional $24. 100 ns access. 4.5 x 3.25 x 0.9" plastic case. $5 shipping. Texans add 7.75% tax. LOGICAL DESIGN TOOLS, INC., 5403 Everhart, Box 55, Corpus Christi, TX 512-888-4535.

RF VISION. Convert your IBM compatible into an RF Spectrum Analyzer/Monitor Receiver tuning 2 to 1700 MHz. Includes 3-D Surface Plot & Color Spectrogram Vs time. Basic kit & software $196. Send SASE to Science Workshop, Box 310PC, Bethpage, NY 11714.

N.E.W. National Electronic Wholesalers ★★★★

Your Wholesale Headquaters for "Test Fixtures" and Accessories!

Fix Compatible With Systems Using:

SCIENTIFIC ATLANTA

Quick Fix for Models: **8550, 8570, 8580, 8590, 8600**
(1-5) $22, (6-10) $20, (11-20) $19, (21-50) $17, (50+) $14.75
40-Pin *Micro Fix* for: **8570, 8580-7B, 8590, 8600**
(1-5) $21, (6-10) $20, (11-20) $19, (21-50) $15, (50+) $13

Fix Compatible With Systems Using:

JERROLD

Three - Wire Fix compatible with models **DP7, DPV7, DPBB7** - except R2, V5 & M1
(1-5) $13, (6-10) $10, (11-20) $9, (21-50) $8, (50+) $7
28 Pin *Micro Fix* compatible with models **DP5, DPV5**
(1-5) $10, (6-10) $9, (11-20) $8, (20+) $6

NEW PRODUCT!!!
One Wire *Super - Fix* compatible with **JERROLD CFT, R2 & V5** models, adjustable for **HRC, STD.**
(1-5) $35, (6-10) $31, (11-20) $28, (21-50) $25, (50+) $23

STEALTH DESCRAMBLER
Revolutionary New PAN replaces all JERROLD models except Base Band. Works Coast to Coast! Digital circuitry provides the sharpest picture with no Flashing!
(1-5) $55, (6-10) $50, (11-20) $45, (21-50) $42, (50+) $39

OTHER PRODUCTS.....

SSA - TV86 - One Piece descrambler
Compatible with all Scientific Atlanta, except Base Band.
(20+) $115ea, (50+) $105ea, (100+) $99 ea.

S.A. 8600.....$249ea. - 8590.....$239ea. - 8580.....$189ea.
PIONEER custom 6300 modules $59 ea. - 6100 modules $29ea.
ZENITH ZL-1 (1-10) $9, (11-20) $7, (20+) $4.60

SOFTWARE AVAILABLE FOR ALL FIXES!

Call us with your equipment needs! We have many products which are not listed. We also buy equipment for top $$$!

FREE CATALOG **1-800-618-7480** VISA MasterCard C.O.D. SORRY, NO CA SALES

Write in 183 on Reader Service Card.

DOMINO EFFECT TOPPLES COMPLICATED CONTROLLERS!

New Microcontroller Combines BASIC Programming with Industrial-Strength Hardware Design!

by Scott Edwards

Its line-numbered BASIC is as comfortable as an old pair of jeans. Its hardware is as new as this month's engineering journals. It's Domino-52, a tiny new microcontroller with a big list of features:

- Solid-epoxy package measuring 1.1" x 1.75" x 0.4".
- 11 MHz 80C52 processor with floating-point BASIC in ROM.
- Built-in development environment; no host program or extra development tools required, just a terminal program.
- Low current draw; typically 15 mA.
- 32KB each of RAM and EEPROM for large programs.
- 12 logic-compatible input/output lines.
- Built-in serial port with line drivers supporting standard RS-232, plus long-haul RS-422 and networkable RS-485.
- Hardware and firmware support for frequency measurement, precision timing, pulse and tone generation, and communication with serial expansion ICs via the inter-IC (I^2C) bus.
- Optional 12-bit, 2-channel analog-to-digital converter (ADC).
- Inexpensive, with prices starting at $79.00.

Domino-52 packs the equivalent of 8052, (E) EPROM and RAM chips – plus a 32-bit ADC and multistandard communication driver and receiver – into a rugged little block of epoxy.

I recently got my hands on one of the first production batch of Dominos, and this article summarizes what I found.

Hardware

Figure 1 is a block diagram of the Domino-52 hardware. Figure 2 is the pinout of its interface connector. The 80C52 processor is an Intel design, and a distant cousin of the Intel microprocessors that have been mainstays of PC-compatible computers since the beginning. Unlike the general-purpose micros found in PCs, this 80C52 is factory-programmed to run a control-oriented flavor of the BASIC programming language.

The 80C52 has 65,535 bytes (64 KB) of memory, divided into 32 KB each of RAM and EEPROM. You may recall that EEPROM retains data even with the power turned off, but may be erased under the control of the processor. As we'll see in the software discussion, this makes storing and revising BASIC programs very convenient.

The 80C52 has a built-in serial port, through which it receives BASIC instructions, and to which it sends data, prompts, and error messages. Domino couples this port to the outside world through a versatile line-driver/line-receiver arrangement that can be used for RS-232, -422, and -485 communication.Having these communication options built in is a subtly powerful feature, since it encourages you to choose the one that's right for your application. Table 1 summarizes the three standards.

With RS-422 and -485 capability built in, Domino is a natural for networking. Up to 32 Domino nodes (Dominodes?) could be distributed throughout a home, factory, or farm to monitor and control individual aspects of the operation. They'd report back to a central PC equipped with an RS-485 converter ($50.00 and up), which would act as the nerve center for the system. The nodes could even be reprogrammed from the

The Domino-52 Microcontroller at a Glance

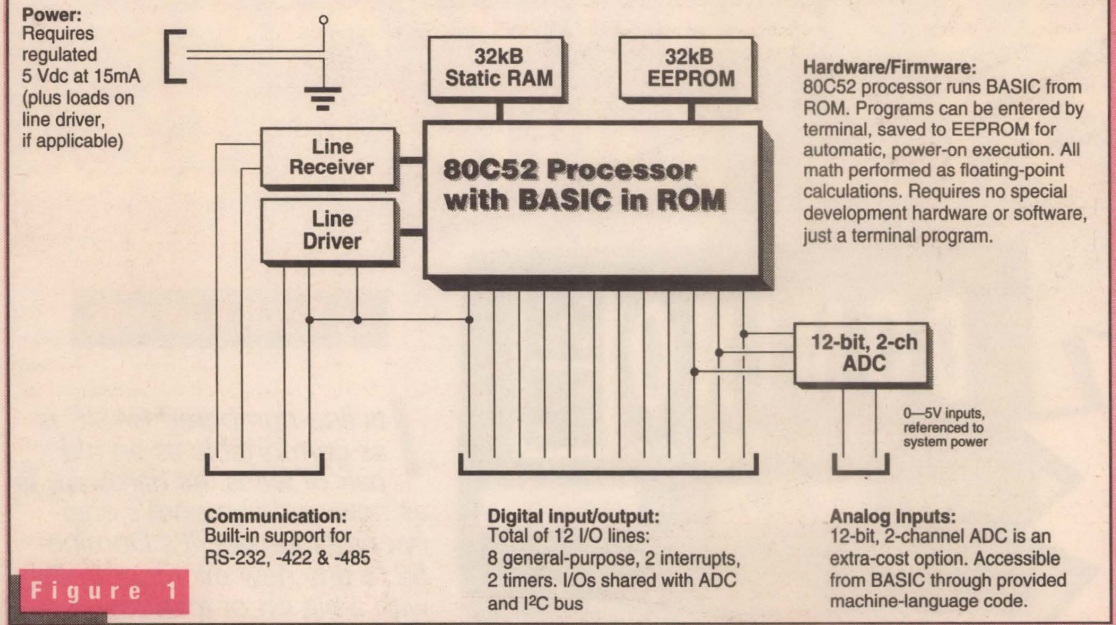


Figure 1

Bottom view of Domino-52 header connector

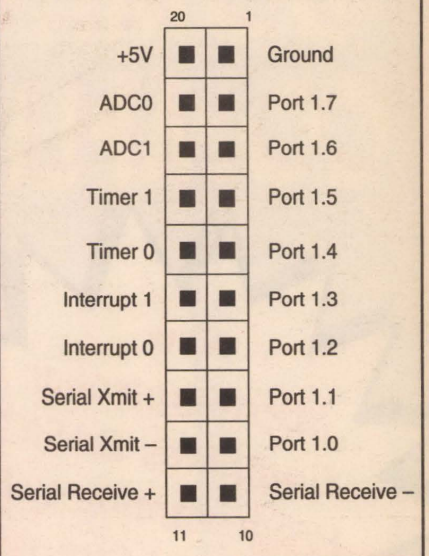


Figure 2

Domino uses standard 0.1" header stakes to connect to circuit boards, ribbon-cable connectors, or the optional development cradle.

host PC.

Domino has 12 digital input/output lines (I/Os), including a general-purpose, 8-bit port. this The 80C52 directly reads and writes port, which is compatible with standard TTL logic levels.

Those of you who have experience with PIC and BASIC Stamp microcontrollers will find the electrical specs of these I/O lines to be Domino's least desirable aspect. PIC I/O lines can source 20 mA and sink 25 mA. With more modest loads, they can be counted upon to be within a few millivolts of +5 volts or ground when outputting 1 or 0, respectively. In their input mode, PIC I/Os leak less than 1 microamp (uA) into or out of external circuitry.

By contrast, the I/O lines of the 80C52 processor used in Domino typically source just 400 uA and sink 1.6 mA. Output voltages are not ideal either, with 2.4 volts representing a 1 and 0.45 volts a 0 (at typical current ratings). The 80C52 has no input mode — you merely write 1s to the pins to be used as inputs, and the input voltage level overwhelms the 80C52's wimpy internal pull-up.

Although the 80C52's I/O characteristics are fully compatible with standard TTL logic, they aren't useful for lighting LEDs, or even driving some transistor switches. So interfacing Domino to many kinds of loads will require additional components such as buffers or latched high-current drivers. Fortunately, Domino's ability to communicate with peripheral chips serially through the inter-IC (I²C) bus makes interfacing such devices a snap. Table 2 lists a sampling of available peripherals.

Domino has four special-purpose I/O bits: two interrupts and two timers. Interrupts override the program in progress in order to take care of a high-priority task. Timers are hardware counters within the 80C52 that can be used to generate or measure time delays.

In Domino, these capabilities work together to provide two valuable capabilities: pulse-width modulation (PWM) and frequency measurement. PWM can be filtered to generate variable voltages, used to control the duty cycle (and therefore speed) of a motor, or amplified and sent to a speaker to generate tones and music. Domino's PWM operates continuously as a background task; just set it and forget it.

The frequency-measurement function can be used to interpret data from devices that produce variable-frequency output, such as tachometers, humidity sensors, and voltage-to-frequency converters.

The final hardware feature is an extra-cost option: an onboard LTC1298 analog-to-digital converter (ADC). The LTC1298 has 12 bits of resolution and two input channels. It is referenced to the controller's +5-volt supply. It can measure an input voltage to a precision of 5 volts/2^{12} = 5/4096 = 1.22 millivolts. ADCs are popular peripherals for microcontrollers, since they can measure any condition that can be converted to a voltage; light, temperature, position, battery condition, motor speed — you name it.

Table 1 **Selection Guide for Serial Standards**

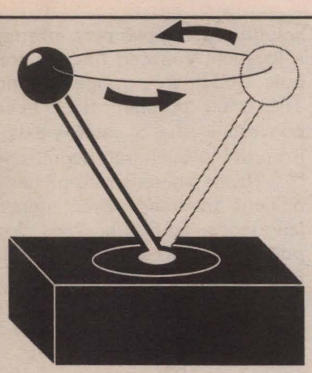
Type	Description	Max Wire Length	Pros	Cons
RS-232	Ground-referenced signal: +3V to +15V: 0 -3V to -15V: 1 Need 3 wires for simultaneous 2-way communication.	50 feet	Compatible with virtually any type of PC or terminal.	Limited cable length. Vulnerable to noise. Only 1 sender and receiver.
RS-422	Differential signal pair (Tx+ and TX-): Tx+ =0, Tx- =1: 0 Tx+ =1, Tx- =0: 1 Need 4 wires for simultaneous 2-way communication.	4000+ feet	Noise-resistant, long cables OK. Supports 1 sender and 10+ receivers.	Requires 4 wires. Not supported by all PCs.
RS-485	Same method as RS-422. Transmits and receives over 2 wires, but not simultaneously.	4000+ feet	Noise-resistant, long cables OK. Supports 32 senders and 32 receivers.	Requires software to tell senders when it's OK to talk.

Table 2 **A Sampling of I²C Bus Peripheral Chips**

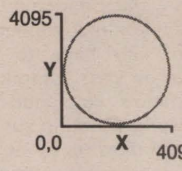
Domino has built-in support for I²C components, which can be daisy-chained onto a specialized two-wire serial port. I²C peripherals have factory-assigned ID codes, which can usually be changed by writing to one or more address pins, so the bus acts like a small, high-speed network. Here is a sampling of I²C chips offered by Phillips Semiconductors, I²C's originator and biggest booster.

Controllers and I/O Expanders	
P82B715	I²C bus extender
PCF8574	Remote 8-bit I/O expander, 8 slave addresses
PCF8584	Parallel bus to I²C converter
SAA1300	I²C to 5 high-current (85 mA) outputs
Computer Peripherals	
PCF8573/83/93	Clock/calendar chips; '83 has 256 bytes RAM
PCF2114x/6x	LCD drivers
PCF8577C	LCD direct/duplex driver
SAA1064	4-digit LED driver
PCF8591	8-bit ADC and DAC
Radio/Audio/Video	
PCD3311C/12C	DTMF/modem/tone generators
TEA6100	FM/IF system for microprocessor-controlled radio
TSA6057/60	Radio tuning phase-lock loop frequency synthesizer
TEA6320/22/23/30	Sound fader control
TEA6360	5-band equalizer
SAA9051	Multistandard TV decoder
TDA46xx series	Picture enhancement and video processing
SAA5243E	Teletext
Memory	
PCA858x series	EEPROMs with 128 to 1024 bytes of storage

(Other manufacturers offer I²C EEPROMs with up to 8KB of storage.)



Joysticks use a swiveling handle and two pots to track motions along two axes: left-right (X axis) and forward-back (Y axis). The joystick handle can move through a complete circle as shown at left. As the handle moves around the circular path, the resistances of the X- and Y-axis pots change. If the pots are wired as voltage dividers, a graph of voltage versus position would look like this:



Voltage range, seen by 12-bit ADC, is in units from 0 to 4095

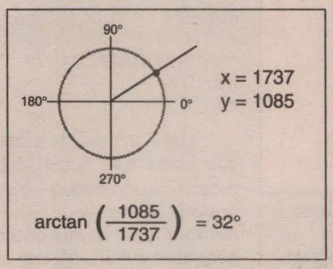
Figure 3

We can use the X-Y data provided by the pots to determine the joystick's angle on the circle. A little trigonometry will do the trick. First, we need to center the X-Y coordinate system on the circle by subtracting half the max value from each of the coordinates. Now we apply the formula:

$$\text{angle} = \arctan\left(\frac{y}{x}\right)$$

The result is the angle of the joystick.

EXAMPLE



Note: Two restrictions apply to this technique. (1) Programs that use it must catch cases in which x=0 to avoid a divide-by-0 error. If x is 0 and y is positive, then the angle is 90°; if x is 0 and y is negative, the angle is 270°. (2) Some calculators (and BASIC-52) work in radians, not degrees. Their results must be converted to degrees as shown in the program listing.

A joystick, plus a little trigonometry, solves the weathervane problem

Software

Although we discussed hardware first, it was only to set the stage for the software possibilities Domino-52 offers. And the neatest of those possibilities is rapid and painless application development through the use of Domino's built-in BASIC.

Domino runs BASIC-52, whose instruction set appears in Table 3. BASIC-52 is an interpreted language. If you're not familiar with the term "interpreter" and its counterpart, "compiler," let me illustrate. Suppose you're assigned to an embassy in a country whose language you don't speak. To communicate with the locals, you need someone to translate their strange gibberish.

When you go visiting, you take along an interpreter. He listens to a sentence of the foreign language, then interprets it for you in English. This is slower than normal conversation, but you can interact with the foreigners immediately.

For written communication, translators read your foreign-language letters and compile English versions for you. You can read these compilations rapidly, without any help. The downside is that you can't interact directly with the writers.

That's the difference between interpreted and compiled programming languages. Let's apply the analogy to the 80C52 processor:

The BASIC-52 interpreter lets you type BASIC commands at the keyboard of a terminal (or PC running communication software, such as Procomm). Each time you press Return, BASIC-52 stores the instructions you typed as abbreviated versions called "tokens." When you execute your program by typing RUN, BASIC-52 interprets the tokens and carries out the instructions they represent.

The advantage of interpreted BASIC-52 is that you can rapidly try ideas, see the results, and make changes. The disadvantage is that each line of BASIC code you write must be interpreted while the program is executing. This makes interpreted BASIC-52 programs much slower than machine-language equivalents.

There are also compiled versions of BASIC-52. You submit your complete program to the compiler software, and it translates the BASIC instructions into clumps of machine-language code. To test your program, you download the compiled code to an 8052 controller. To make changes, you edit the original program, recompile it, and download again.

The advantage of compiled code is that it's generally much faster than interpreted code. The disadvantage is that the more cumbersome compile-and-download cycle works against beginners, who really need to test every small change they make in a program.

There's a final option in our stranger-in-a-strange-land scenario.

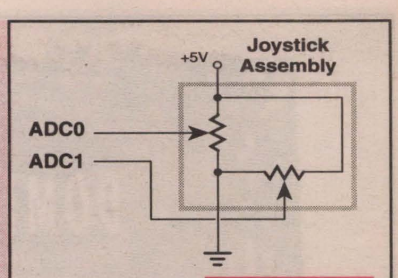


Figure 4

Hook up diagram for joystick/weathervane demo.

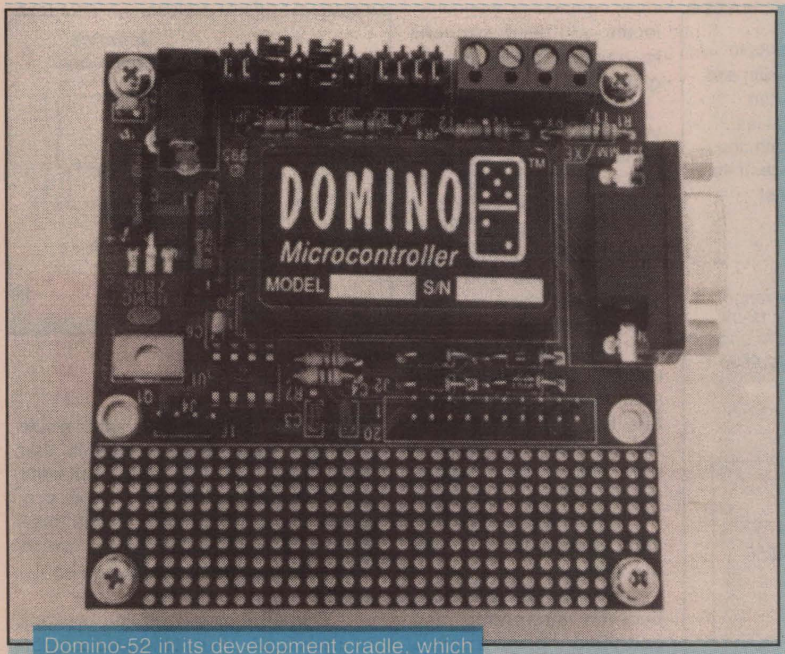
Table 3

BASIC-52 Commands, Operators, and Instructions

ABS	absolute value
AND	logical AND
ASC	ASCII character to number
ATN	arctangent
BAUD	set printer-port serial rate
CALL	use a machine-language subroutine
CBY	read a byte from code memory
CHR	number to ASCII character
CLEAR	initialize memory
CLEARI	clear interrupts
CLEARS	clear stacks
CLOCK0	disable real-time clock
CLOCK1	enable real-time clock
CONT	continue after STOP
COS	cosine function
CR	carriage return
DATA	establish data table
DBY	read a byte from data memory
DIM	dimension an array
DO-WHILE	loop while condition is true
DO-UNTIL	loop until condition is true
END	terminate program
EXP	raise number to power
FOR-TO-STEP-NEX	loop specified number of times
FREE	report available memory
GET	retrieve a character from serial port
GOSUB-RETURN	use a subroutine
GOTO	jump to a line number
IDLE	wait for an interrupt
IE	read/write interrupt enable
IF-THEN-ELSE	perform an action if condition is true
INPUT	retrieve variable data from serial port
INT	integer conversion
IP	read/write interrupt priority
LD@	load data from memory location
LEN	get length of current program
LET	assign value to variable
LIST(#,@)	list current program
LOG	natural log
MTOP	get maximum memory address
NEW	erase current program
NOT	logical inverse
NULL	pad serial output with null data
ON-GOSUB-RETURN	branch to one of several subroutines
ON-GOTO	branch to one of several addresses
ONERR	specify error-handling routine
ONEX1	specify interrupt-handling routine
ONTIME	specify timer-interrupt routine
OR	logical OR
PCON	serial data-rate register
PGM	program an EPROM (not used w/Domino)
PHO. AND PH1	(#,@) print data in hexadecimal format
PI	trig constant PI (3.14159...)
POP	take a value from stack and assign to variable
PORT1	retrieve or assign a value to the I/O port
PRINT	(#,@) print a value or string
PROG	xsave to EPROM (Domino uses calls for EEPROM)
PUSH	put a value onto the stack
PWM	output pulse-width modulation
RAM	store program in RAM
RCAP2	special-function register for timer
READ	retrieve value from DATA table
REM	begin a comment
RESTORE	move pointer to beginning of DATA table
RETI	return from interrupt handler
RND	compute random number
ROM	switch to program stored in EEPROM
RROM	run program from EEPROM
RUN	run current program
SGN	sign (positive/negative) of value
SIN	sine function
SPC	insert space characters to format serial output
SQR	square root
ST@	store data to location
STOP	temporarily halt program for debugging
STRING	allocate memory for string storage
T2CON	timer-control register
TAB	tab to next column to format serial output
TAN	tangent
TCON	timer-control register
TIME	store/retrieve time
TIMER0	store/retrieve timer 0
TIMER1	store/retrieve timer 1
TIMER2	store/retrieve timer 2
TMOD	timer-mode register
UI0	switch to normal console input routines
UI1	switch to custom console input routines
UOO	switch to normal console output routines
UO1	switch to custom console output routines
USING OR U.	set PRINT format
XBY	store/retrieve byte from external memory
XFER	move program from EEPROM to RAM
XOR	logical exclusive-OR
XTAL	set crystal frequency

Manufacturer-Provided Calls

ADC	read 0- to 5-volt input on ADC0 or ADC1
PWM	output one or two channels of continuous background PWM
FREQ	compute frequency of input signal
I²C	communicate with inter-IC (I²C) bus peripherals
PROG1-4	save auto-executable programs to EEPROM



Domino-52 in its development cradle, which includes a power supply, configuration and I/O headers, and serial connector.

You could learn the foreign language yourself. In terms of programming, that would mean learning 8052 assembly language. Although this is more difficult than BASIC, it can pay dividends even if you stick with a BASIC-52 controller like Domino. You can write the majority of your program in BASIC, then code the time-critical sections in assembly language. To execute an assembled routine from BASIC-52, you just supply the instruction CALL with the starting address of routine.

CALLs also let you use manufacturer-provided routines that access Domino's special features, like I²C, frequency measurement, ADC, and PWM. The manufacturer's routines are stored in Domino's 32K EEPROM, so they can be replaced or modified at any time. Your Domino can be updated for the latest firmware features by downloading new code from a disk.

A quick summary: Domino has a built-in BASIC-52 interpreter, but it can also execute machine-language code generated by a compiler or assembler. Using machine-language routines from BASIC-52 is just a matter of inserting a CALL instruction.

Programming in BASIC-52 is a blast from the past. The language resembles those line-numbered dialects of BASIC that were built into the early "home computers" like the Commodores, Apple IIs, TI-99/4s, etc. Although BASIC-52 lacks some of the prettier features of newer BASICs like QBASIC, it has everything you need to write decently structured programs: DO-WHILE, DO-UNTIL, and FOR/NEXT loops; ON-GOTO and ON-GOSUB for faking a SELECT-CASE instruction; and a data stack for passing parameters between subroutines. In fact, for the relatively small programs used in control applications, the primary differences between BASIC-52 and more modern counterparts boil down to convenience and aesthetics.

To program in BASIC-52, you connect Domino to a PC or other computer running terminal software. I used several different machines to talk to Domino: a desktop PC running Procomm, an old Radio Shack Model 100 laptop with built-in "TELCOM" software, and desktop and laptop Macintoshes running Z-Term, the communication program shipped with many Mac modems.

When you first connect power to Domino, you have to press the spacebar on your computer in order for Domino's auto-baud-rate detection to work. (Domino supports standard serial rates up to 19,200 baud.) After a moment, this message appears on your screen:

```
*MCS-51 BASIC V1.1*
READY
>
```

The > symbol is a prompt, letting you know that BASIC-52 is ready to receive instructions. You have two options here: you can type a line number and begin entering instructions that BASIC-52 will remember as part of your program, or you can type an instruction without a line number. The un-numbered instruction will be executed immediately. For example, typing

```
PRINT PI
```

followed by the return key causes BASIC-52 to respond with:

```
3.14159
>
```

Since Domino has no screen of its own, it directs PRINT instructions to the current "console" device, which is whatever is connected to the serial port. You can redirect this I/O to other devices, like LCDs and keypads, with routines supplied by Domino's manufacturer.

Demo Application

Here's an application that demonstrates some of the strengths of Domino and BASIC-52. Suppose you want to precisely measure the pointing angle of a windvane as part of an electronic weather station. If you attach the vane to a potentiometer shaft, you're going to run into trouble. The pot rotates through about 270 degrees, then hits a mechanical stop. Even if you take the pot apart and remove the stops, the resistive element doesn't provide 360 degrees of travel.

Even if you used a 10-turn pot, you would eventually run into an end-of-travel problem. What to do? You could use a digital absolute-position encoder at a cost of $100.00+. Or you could cobble together some arrangement of mechanical or magnetic switches. Yuck!

Figures 3 and 4 show a solution. Using two pots arranged as a joystick, you can track a continuous, 360-degree range of motion. The main problem then becomes converting the x- and y-axis data from the joystick into degrees.

This is where BASIC-52 has a significant advantage over integer-only languages. BASIC-52 uses floating-point numbers, which are stored and processed internally in a scientific-notation format consisting of a signed number and a fraction multiplied by 10 raised to a power, e.g., -1.5793 x 103, meaning "-1579.3." BASIC-52 also includes the fundamental trig functions SIN, COS, TAN, and ATN (sine, cosine, tangent, and arctangent) in its instruction set. Although floating-point math isn't always essential in control applications, our demo would be nearly impossible without it.

Endless Possibilities

I've only scratched the surface with this introduction to Domino and BASIC-52. The demo application emphasizes the advantage of Domino's floating-point math capabilities, but its most exciting applications are likely to be those in which many Dominos use the built-in communication features to establish networks of intelligent sensors and controllers. NV

Program Listing: Converting Joystick Data into Pointing Angle

```
1     REM This program converts joystick data
2     REM into weathervane heading. Unlike
3     REM the example in Figure 3, 0 degrees
4     REM is due North (straight up)
5     REM Put ADC channels 0 & 1 onto stack
10    CALL 0F000H: CALL 0F008H
15    REM Move ADC data from stack into X, Y
20    POP X : POP Y
25    REM Center x/y coordinates on circle
30    LET X=X-2047 : LET Y=Y-2047
35    REM Prevent division by zero
40    IF X <> 0 THEN GOTO 70
45    REM X=0: if Y>0, A=180; if Y<0, A = 0
50    IF Y < 0 THEN A = 180 ELSE A = 0
55    REM Go directly to printing A
60    GOTO 110
65    REM Compute the angle
70    LET A=ATN(Y/X)
75    REM Convert from radians to degrees
80    LET A=A*(90/(PI/2))
85    REM Change +/- angle to 0-360 heading
90    IF X>0 THEN A = 90-A :
100   IF X<0 THEN A = 270-A
105   REM Print the results to nearest 0.1 degree
110   PRINT USING(###.#),A," degrees"
115   REM Slow things down with a do-nothing loop
120   FOR I=1 TO 100 : NEXT I
125   REM Do forever — or until cntl-C at terminal
130   GOTO 10
```

Sources

The Domino-52 controller evaluated for this article was the "A" model with built-in 12-bit analog-to-digital converter. It retails for $99.00. The basic model (no internal ADC) is $79.00. The development cradle is $49.00.

A reference book, *BASIC-52 Programming* by Systronix Inc., is $15.00. For more information on Domino-52, contact the manufacturer:

Micromint, Inc.
4 Park Street
Vernon, CT 06066
Phone (800) 635-3355

For additional insights into BASIC-52 applications, check out *The Microcontroller Idea Book* by Jan Axelson. This book contains circuits for homebrew 8052-BASIC controllers and peripheral circuits, as well as many programming examples. Available for $31.95 plus $3.00 shipping and handling from:

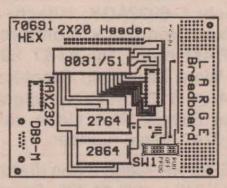
Lakeview Research
2209 Winnebago Street
Madison, WI 53704
Phone (608) 241-5824

For information on RS-422/485 conversion hardware suitable for use in PC-to-Domino networking applications, contact:

R.E. Smith
4311 Tylersville Road
Hamilton, OH 45011
Phone (513) 874-4796

#50 COMPUTER HARDWARE *cont.*

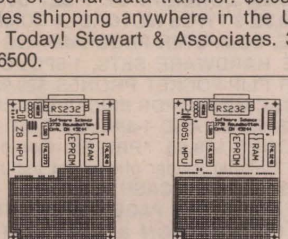
BUILD YOUR OWN IBM COMPATIBLE COMPUTER from parts for as little as $399 with the help of an easy to view 63 Minute Video Tape that shows you how. This easy to view award winning Tape will show you how to save money by assembling any compatible 286, 386, 486 or Pentium Computer in a step by step easy to follow procedure. It also shows the common pitfalls that you might run into if you try to assemble a computer by yourself and gives you secrets on how to overcome problems that might occur during assembly. When complete, you will have gained the confidence and experience to maintain your very own computer for years to come and even service it if necessary. Don't let this opportunity pass you by, order your Video Tape today while supplies last for only $29 (reg. $59.95) plus $2.95 P&H. Send check to: **EVP, PO Box 2201, Northlake, IL 60164-0201** or call: **1-800-754-5096** Now!



8051 SBCs wth Bootstrap Loader, Economical SBC with 128 byte memory, 24 I/O Ports. Contains preprogrammed Bootstrap software that allows loading of .OBJ files to EEPROM through Serial Port of PC. Run programs without burning EPROMs. IBM DOS compatible Utility Disk included (3.5 or 5.25 in). $59 plus S/H. Also; Learn Assembly code with the perfect 70691HEX companion; "Assembly Language BASICs". A 64pg booklet devoted to the programming of the 8031/51. Written with the novice programmer in mind. $15 plus S/H. Suncoast Technologies, Spring Hill, FL. 904-596-7599. V/MC Accepted.

DEC 486DX33 PC Pizza box workstation, DEC bare bones closeout special. Case, PS, 2 Meg VRAM-SVGA, 2S, 1P, & MP, IDE, H&F Cont, token ring, ext SCSI-2P. You supply: CPU 486SX to DX2-66, monitor mag 15" or equal, 1 or 4 Meg SIMMS Mem, 1.44M FD, Notebook HD, Keybd, mouse, for a $4,999.95 System. New Bulk -packed with manual. Cable & software. Size: 15" x 15" x 2.5" use as a portable or workstat. only $149. 19" SVGA monitors CAD CAM $349, many parts & CPUs available to complete these fantastic systems! WS & OEM accounts welcome. Since 1964. Send SASE or call for cat'l. BNF, 119 Foster St., Peabody, MA 01960, T508-532-2323, F508-532-1040.

LAPLINK CABLES plugs in your printer port to allow data transfer at 4 times the speed of serial data transfer. $9.95 includes shipping anywhere in the USA Call Today! Stewart & Associates. 314-240-6500.



PROTOQUICK Z8 AND 8051 Complete single board computer systems with large prototype area, serial port, operating system in EPROM, cross assembler, documentation and application notes, $99 ea. Call for technical flyer. Software Science, 3750 Roundbottom Rd., Cincinnati, OH 45244. 513-561-2060.

KEYBOARDS 101 New top of the line $16.50. E, 7019 Trent, Spokane WA 99212. 509-922-2179.

THE COMPLETE communicator, turn your computer into voice mail, fax center, windows or DOS $95. 2MB memory upgrade, Panasonic printer KXP4410/4430 $75. Commodore 1541 disk drive $25. Burroughs B26, CPU unit, $25. Burroughs TP119 Keyboard, $10. 708-740-0884.

SIMM MEMORY many types and configurations. All new, lifetime warr. We can save you $$! 1-800-275-SIMM.

I WANT it and I want it now. I want all of your SIMM memory. IBM, Mac, new, used, even defective. I want it all. Highest $ paid. Call 1-800-4-MEMORY now! Voice/FAX.

LAN-LINK DATA transfer kit includes software (works just like Lap-Link), parallel cable, and manuals. Limited offer for only $19.95. Stewart & Associates. 314-240-6500.

19" HITACHI HM3619AC-11-2 with video card, Wyse WY-600 with video card. Call Henry 908-689-0110.

TANDY/RADIO SHACK Model 1/3/4,1000 Support. Monthly magazine, software, parts, repair. Computer News, POB 680, Casper, WY 82602. 307-265-6483.

TRANSFER FILES between computers using RS-232 ports! Kit of cables and software diskettes fit most PC's. Send $25 to: Pioneer Enterprises, Box 429, Kittredge, CO 80457.

FAX MODEM cards 14.4/28.8, 14.4/14.4 int/ext. Voice/FAX for voice messaging, sound cards, motherboards, phone cards, radio cards. GCS, 1-800-386-0577.

Scanners/Weather Stations/CB

COMMUNICATIONS ELECTRONICS INC.

Emergency Operations Center

New Scanner Products Available

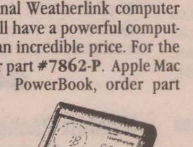
Now readers of *Nuts & Volts Magazine* may purchase communications and weather forecasting equipment directly from Communications Electronics Inc. Order today from CEI and save.

Bearcat Scanners

Bearcat 9000XLT-P base/mobile	$374.95
Bearcat 3000XLT-P handheld	$354.95
Bearcat 890XLT-P base/mobile/WX	$228.95
Bearcat 860XLT-P base	$159.95
Bearcat 760XLT-P base/mobile	$198.95
Bearcat 700A-P info mobile	$148.95
Bearcat 560XLA-P base/mobile	$83.95
Bearcat 220XLT-P handheld/SPECIAL	$208.95
Bearcat 178XLT-P base/WX alert	$128.95
Sportcat 150-P handheld w/800 MHz.	$159.95
Bearcat 148XLT-P base/WX alert	$83.95
Bearcat 120XLT-P handheld	$129.95
Bearcat 80XLT-P handheld	$159.95
Bearcat BCT7-P info mobile	$168.95

Weather Stations

Now you can be your own weather reporter with the Davis Weather Monitor II. Our top-of-the-line weather station combines the most advanced weather monitoring technologies available into one incredible package. Glance at the display, and see wind direction and wind speed on the compass rose. Check the barometric trend arrow to see if the pressure is rising or falling. Push a button, and read indoor and outdoor temperature, wind chill, humidity and barometric pressure. Our package deal includes the new ultra high resolution 1/100 inch rain collector part **#7852-P**, and the external temperature/humidity sensor, part **#7859-P**. The package deal is order **#DAV1-P** for $479.95 plus $15.00 shipping. If you have a personal computer, when you order the optional Weatherlink computer software for $139.95, you'll have a powerful computerized weather station at an incredible price. For the IBM PC or equivalent order part **#7862-P**. Apple Mac Plus or higher including PowerBook, order part number **7866-P.**



The Weather Monitor II (7440) comes complete with anemometer with 40 feet of cable, external temperature sensor with 25 feet of cable, junction box with 8 feet of cable, AC-power adapter, detailed instruction booklet and one year limited factory warranty.

Davis Weather Monitor II 7440-P	$334.95
Davis Weather Wizard III 7425-P	$154.95
Davis Remote Display Unit 7815-P	$84.95
Davis Rain Collector II 0.01" 7852-P	$59.95
Davis Rain Collector II 0.2 mm 7852METRIC-P	$59.95
External Temperature/Humidity Sensor 7859-P	$99.95
Davis Anemometer Mast Mount 7890-P	$15.95
Weatherlink Software for IBM PC-Version 3.0 7862-P	$139.95
Weatherlink Software for Apple-Version 3.0 7866-P	$139.95
4-Conductor 40' (12.2 m) extension cable 7876-P	$17.95
6-Conductor 40' (12.2 m) extension cable 7878-P	$21.95
8-Conductor 25' (7.6 m) junction box cable 7880-P	$14.95
8-Conductor 50' (15.2 m) junction box cable 7881-P	$24.95
8-Conductor 100' (30.5 m) junction box cable 7882-P	$44.95
Modem Adaptor 25-pin for communications port 7870-P	$9.95
Car/Boat/RV Lighter Cord 7873-P	$9.95
2400 baud modem for Weatherlink MEXT-P	$39.95
Talking weather card - Call 313-994-9000 for demo IT1-P	$474.95
Weatherlink language disks: Française, Deutsche, Italiana, Española 7863-P	$24.95
Barometer, Indoor Hygrometer & Thermometer, Clock/Calendar BA888-P	$59.95
Indoor-Outdoor Thermometer/Barometer & Hygrometer by OSI BA213-P	$79.95
Thermometer with transparent calender & clock display by OSI TC188-P	$19.95
Thermometer with AM/FM clock radio by Oregon Scientific CR388-P	$39.95
Indoor/Outdoor Thermometer with Jumbo Display by OSI JB880EX-P	$24.95

Bearcat® 9000XLT-P Radio Scanner

Mfg. suggested list price $769.95/**CE Special $374.95**

500 Channels · 20 banks · Alpha numeric display
Turbo Scan · VFO Control · 10 Priority channels
Auto Store · Auto Recording · Reception counter
Frequency step resolution 5, 12.5 & 25 KHz.
Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High

Frequency Coverage:
25.000-549.995 MHz., 760.000-823.995 MHz., 849.0125-868.995 MHz., 894.0125-1,300.000 MHz.

The new Bearcat 9000XLT gives you pure scanning satisfaction with amazing features like TurboSearch™ to search VHF channels at 300 steps per second.This base and mobile scanner is ideal for surveillance professionals because it has a selectable attenuator to help eliminate annoying intermodulation from adjacent frequencies in highly populated areas and selectable AM, Wide FM and Narrow FM modes that allow you to change the default receiving mode of the BC9000XLT. Other features include ***Auto Store*** - Automatically stores all active frequencies within the specified bank(s). ***Auto Recording*** - This feature lets you record channel activity from the scanner onto a tape recorder. **Hi-Cut filter** to help eliminate unwanted static noise. You can even get an optional ***CTCSS Tone Board*** (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **BC005** CTCSS Tone Board $54.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. The BC9000XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited warranty from Uniden.

CB/GMRS Radios

The new Maxon GMRS 210+3 transceiver is a PLL synthesized 10 channel radio on General Mobile Radio Service frequencies. Two repeater channels are programmable and one channel (462.675 MHz) is set aside for emergency and safety communications. The seven remaining interstitial frequencies 462.5625, 462.5875, 462.6125, 462.6375, 462.6625, 462.6875 & 462.7125 MHz are all-purpose GMRS radio channels. 2 watts of RF power for exceptional transmitting range. Up to 5 watts when used with the supplied 12 volt vehicular DC power cord. CTCSS built-in. Includes 450mAh Ni-cad rechargeable battery pack, AC/DC wall battery charger, owner's manual, FCC license application, belt clip, antenna. Order today.

Maxon GMRS210+3-P GMRS transceiver	$199.95
Cobra 148FGTL-P CB with freq. counter	$209.95
Cobra 29LTDWX-P CB/Weather Alert	$114.95
Cobra HH40-P CB 40 ch. Handheld	$99.95
Ranger RCI2950-P 25 watt 10 meter	$239.95
Uniden GMR100-P GMRS Handheld	$144.95
Uniden WASHINGTON-P SSB CB Base	$189.95
Uniden GRANTXL-P SSB CB Mobile	$139.95
Uniden PRO538W-P CB & Weather	$59.95

Digital Barometer

The Oregon Scientific BA888-P forecasting barometer displays rising, falling and constant barometric trends. Other features include 6-line advanced liquid crystal display, weather forecast shows sunny, cloudy, slightly cloudy or rainy, °C or °F selectable, indoor relative humidity, indoor temperature, barometric pressure bar graph shows trend for past 24 hours, clock/calendar/alarm.

Special $99.95

VHF Transceiver

RELM® WHS150-P Transceiver

Mfg. suggested list price $481.67/**CE price $339.95**

Severe weather spotters depend on the RELM WHS150 transceiver for direct two-way communications with their police or fire department, civil defense agency or ham radio repeater. The WHS150 is our most popular programmable five watt, 16 channel handheld transceiver that has built-in CTCSS, which may be programmed for any 39 standard EIA tones. Frequency range 148.000 to 174.000 MHz. Will also work 144.000-148.000 with slightly reduced performance. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features dealer programmable synthesized frequencies either simplex or half duplex in both 5.0 and 6.25 KHz. increments. Other features include scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the WHS150 from Communications Electronics Inc., you'll get a complete package deal including antenna, battery, belt clip and user operating instructions. Other accessories are available. A leather carrying case with swivel belt loop part **#LCWHS** is $49.95; rapid charge battery charger, part **#BCWHS** is $69.95; speaker/microphone, part **#SMWHS** is $54.95; extra ni-cad battery pack, part **#BP007** is $59.95. The radio technician maintaining your radio system must order programming instructions part **#PI150** for $18.00 to activate this radio. FCC license required for United States operation.

Other neat stuff

Soundtronic AC101-P digital portable shortwave receiver – 20 memory	$39.95
Grundig Yacht Boy 400-P digital portable shortwave receiver _ 40 memory presets	$179.95
Grundig Yacht Boy 230-P portable shortwave receiver	$109.95
Sangean ATS800-P portable shortwave receiver	$69.95
Sangean ATS803A-P portable shortwave w/AC adapter – 9 memory presets	$129.95
Sangean ATS808-P portable 45 memory shortwave receiver	$149.95
Sangean ATS818CS-P portable shortwave receiver with cassette recorder	$209.95
Uniden ED9200-P 900 MHz. 1 or 2 line cordless phone	$289.95
Bogen FX3110-P Digital FAX Friday Fax-on-Demand system & answering machine	$399.95
Bogen FX3020-P memory expansion module for Fax Friday/up to 36 minutes	$99.95
Bogen FR2000-P Digital two-line advanced voice mail system & answering machine	$279.95
Bogen FR0018-P memory expansion module, doubles recording time to 36 minutes	$79.95
FANS P161P-P 60 name/number caller ID, unwanted call blocker, automatic paging	$149.95
SNI ID200-P Bouncer name/number caller ID, call reject, forward to machine	$89.95
ICOM GP22-P handheld global positioning system (GPS)	$494.95
WX70-P weather radio with National Weather Service storm alert	$59.95
RELM WHS150-P VHF handheld 5 watt, 16 channel transceiver	$339.95
RELM RH256NB-P VHF 25 watt, 16 channel synthesized transceiver	$289.95
Ranger RCI2950-P 25 watt 10 meter ham radio transceiver	$239.95
Cobra RDL7125W-P Safety Alert receiver & Super Wideband laser/radar receiver	$159.95
Uniden LRD9900SW-P Super Wide band Laser/Radar Detector - VG2 undetectable	$139.95
MEZ-P Map Expert CD Rom for IBM PC by DeLorme Mapping	$299.95
ANTX-P VHF scanner/VHF transmitting antenna PL259 connector	$29.95
ANTMMBNC-P magnet mount scanner antenna w/ BNC connector	$29.95
ANTMMMOT-P magnet mount scan antenna w/Motorola plug	$29.95
ANTMMPL-P magnet mount scan antenna with PL259 connector	$29.95
ANTSGBNC-P glass mount scanner antenna with BNC connector	$29.95
ANTSGMOT-P glass mount scanner antenna with Motorola jack	$29.95

Buy with confidence

It's easy to order from us. **Mail orders to:** Communications Electronics Inc., Emergency Operations Center, P.O. Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $15.00 per radio or telephone product for U.P.S. ground shipping and handling in the continental U.S.A unless otherwise stated. Add $10.00 shipping for all accessories and publications. Add $10.00 shipping per antenna. For Canada, Puerto Rico, Hawaii, Alaska, P.O. Box, or APO/FPO delivery, shipping charges are two times continental U.S. rates. Michigan residents add state sales tax. No COD's. No returns or exchanges after 31 days. 10% surcharge for net 10 billing to qualified accounts. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. We welcome your Discover, Visa, American Express or MasterCard. Call 1-800-USA-SCAN to order toll-free. Call 313-996-8888 if outside the U.S.A. FAX anytime, dial 313-663-8888. **For technical assistance to solve your communications problem, call the Communications Electronics technical support hotline for $2.00 per minute at 1-900-555-SCAN.**

Scanner Distribution Center and CEI logos are trademarks of Communications Electronics Inc.
Sale dates 5/5/95 8/30/95 AD #041195GEN Copyright © 1995 Communications Electronics Inc.

For credit card orders call

1-800-USA-SCAN

Communications Electronics Inc.
Emergency Operations Center

P.O. Box 1045, Ann Arbor, Michigan 48106-1045 U.S.A.
For information call 313-996-8888 or FAX 313-663-8888

TEKTRONIX 4693D Color Image Printer 300 DPI, new $8,995, asking $995 with supplies. DEXIS, 612-944-7670.

SUREWRIT 9 PLUS DEVELOPMENT SYSTEM for Hackers only who like to study the VCII Plus and old VCII. Send SASE for flyer of SW9 + features. **TRIANGLE PRODUCT DISTRIBUTORS USA**, 5750 Lakeshore Dr., Holland, MI 49424. USA. 616-399-6390. M-F 9am to 2pm. EST.

WYSE GENICOM DEC Used Equipment (11) Wyse Model WY-75 Terminals, (3) Genicom Model 3310 Printers, DEC PDP11/10, PDP11/34, CPUs, LA120 printer, VT52 monitors, RL02 drives and disks, MDSI plotter, DSI tape reader, puncher, Teletype Model 43. 213-587-9125.

HEWLETT PACKARD Plotters. HP 7475A $199.95, HP 7550A $299.95. Both do up to 11x17 Drawings, and work with all popular CAD and graphics programs. Comes with pens too! Stewart & Associates. 314-240-6500.

CONT. CARDS ESDI DTC-6280-15 Tx $35. SCSI DTC-3280 16 Bit H/F w/software $55. SCSI Ultra 34F VLB $99. IDE card + cable 16 bit H/only $8. MFM EverexLark 16 bit H/F $25. Servo-Track, 408-378-1374.

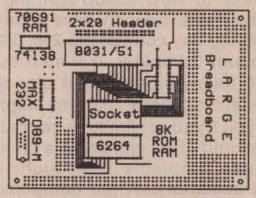
PCs CUSTOM designed and built, special features incorporated to your requirements. We can build them small, wall mount, anti-vibration, sealed, super cooled, or whatever your needs. Quantities as low as 10. Fax requirements to Fujimi Ltd., Hong Kong, +852 8340463.

WESTERN DIGITAL 1.2 Gig hard drive $380. 1.0 Gig hard drive $365. 850 Meg hard drive $271. 730 Meg hard drive $255. Three year warranty. MSCRC Computer, 3243 South 13th Street, Lincoln, NE 68502. 1-800-401-3956.

HP PLOTTERS. 7475A from $295 tested with 30 day warranty. **COMPUTER KEYWAYS,** 513-847-2300.

SONY MULTISCANS 0.26DP 15.7 thru 36KHz $175. Monitors SVGA 800x600 $145. Loop 286-12 PC's 1M, MFM EGA, I/O keyboard $145. Western Digital WD1003V FD/HD cont. $25. Hercules Monographic $15. CGA color $10 refurbished. Guaranteed. Rich, Pikul & Assoc., 101 Glenfield Dr., Festus, MO 63028. 314-937-0335.

HOME AUTOMATION & computer Control: Two-way IR, Two-way X10, & hardwire. Control Devices from serial computer link or stand-alone operation. CompCo, 615-436-5189 BBS 615-436-6333 evenings.

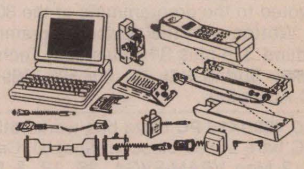


ECONOMICAL 8051 SBCs. The 70691RAM, a complete SBC with large breadboard area, serial port, 8K RAM/ROM and 40 pin Header for Easy interfacing. Also includes programming software (3.5 or 5.25in), documentation and sample .ASM codes. Assembled/Tested $50 plus S/H. Suncoast Technologies, Spring Hill, FL. 904-596-7599. V/MC Accepted.

URGENTLY WANTED! Video cards for: Mitsubishi C-6922AGK; Hitachi 4115-D-BA-0 fixed frequency monitors. Need toner, RAM chips for AT&T 595 laser printer. Want Microfield Graphics Video cards. Also 512K memory upgrade for: Paradise 8514/A Plus video card. Call 412-673-3742, leave number.

PLOTTERS: HP 7580B 8-pen drafting plotter (up to 24" x 48") $1,475. **ColorPro HP 7440A** (8-pen, 8½" x 11") $275. **HP 7475A** (6-pen, up to 11" x 17") $275. **HP 7550A** (8-pen, up to 11" X 17", with sheet feeder) $650. Excellent condition, with warranty. Pepper Systems, 214-353-0257.

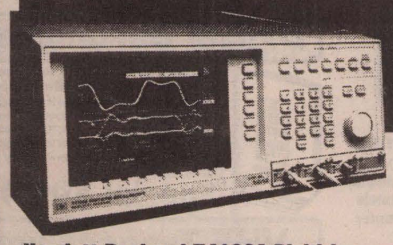
AVAILABLE NOW 3.5" floppy disk system that will hold 21MB of data and still read and write both 720K and 1.44MB disks. 1-800-827-8402.



UNION JACK'S©, MOTOROLA CELLULAR PHONE, AMPS/NAMPS RE-PROGRAMMING SYSTEM (FOR BRICK-UP, FLIP & BAG PHONES). UJMP-1 SOFTWARE SET, 4 3.5" 1.44MB DISKS, MFDP-1: Programs firmware below 9122s without a loader phone, **MFDP2:** Programs firmware 9122 to 9340 with a loader phone (FLIP-BRICK OR BAG, having a firmware below 9122) **FDP3 & 4** are a conglomeration of Cellular cloning etc., information. 60-page illustrated programming manual also included. **FREE technical backup & yearly updates.** 4-DISK SOFTWARE SET **UJMP-1 $199.95 COMBINATION OFFER (A), SAVE $50, COMPLETE RE-PROGRAMMING SYSTEM $419.95, CONSISTS OF 1 SET UJMP-1 $199.95, 3 TYPES MOTOROLA COMPATIBLE, COMPUTER PROGRAMMING CABLE HARDWARE SETS, 1-6PCs-CSFP** FOR FLIP-POCKET PHONES **$99.95, 1-3PCs-CS689/UC FOR BRICK/ULTA CLASSICS $99.95** AND **1-3PCs-BP** FOR BAG PHONES **$69.95. *PRICES:** Computer and Cellular loader phone not included. **S&H: UPS COD CASH ONLY, 2ND DAY AIR $12. FREE 2 PAGES OF ADDITIONAL INFORMATION & COMBINATION PRICES, AVAILABLE BY MAIL OR FAX. CALL LES, 702-642-0325,** 2039 CIVIC CENTER DRIVE #176, N. LAS VEGAS, NV 89030.

MONO CARD, $6. Modem 2400 BPS, card only $12. I/O card, $6. Floppy cont. card, $10. Microsoft mouse serial/PS-2 $15. Servo-Track, 408-378-1374.

Quality Reconditioned Test Equipment



Hewlett-Packard 54100A Digitizing Oscilloscope

1 GHz bw, 350 ps rise time, 100 ps/div time base, 40 ms/sec maximum digitizing rate, pre-trigger viewing, logic triggering, includes 3 HP 54002A 50Ω BNC input pods.

$6000.00

Hewlett-Packard 1725A Oscilloscope

275 MHz bw, 10 mV/div to 5 V/div vertical deflection factor, 10 nS max sweep rate, expandable to 1 nS/div. Special includes 2 new Probe Master probes.

$725.00

Hewlett-Packard 8569B Spectrum Analyzer

.01 to 22 GHz, can be extended to 115 GHz using external mixers (not supplied). Internal preselection, 1.7 to 22 GHz, wide resolution range 100 Hz to 3 MHz, simple three knob operation.

$9500.00

Wandel & Goltermann TSA-1 Transmission System Analyzer

Frequency range 100 Hz to 180 MHz, spectrum analysis, selective level, demodulation and phase jitter.

$2250.00

Above unit with Network Analyzer.

$2750.00

Fluke 5100B Calibrator

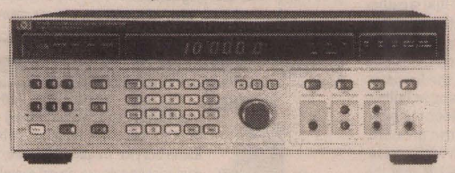
Multifunction calibrator for analog and digital multimeters to 4½ digits, direct or alternating voltage or current plus resistance. Has options 03, 05.

$8000.00

Hewlett-Packard 3336B Synthesizer/Level Generator

This level generator is an excellent precision source from 10 Hz to 20.9 MHz, frequency resolution of .001 Hz, level accuracy within .15 dB over full range, AM and phase modulation. Fully programmable over HP-IB, harmonics down more than 5 dB.

$650.00



Hewlett-Packard 3586B Selective Level Meter

Makes carrier measurements to 32.5 MHz, voice channel measurements from 50 Hz to 100 kHz, can use the 3336B Level Generator as an automatic tracking generator. Includes options 001, 003, & 004.

$850.00

Buy both together as a set for $1300.00

Tektronix 485 Oscilloscope

350 MHz bw, dual trace, 5 mV/div sensitivity, 1 nS/div sweep rate, 3.0 div/ ns writing speed, selectable input impedance. Includes 2 new Probe Master probes.

$1100.00

Wavetek 2001

Sweep Generator, 1 to 1400 MHz, RF output of +10 to -80 dBm in 1 dB steps.

$975.00

Wavetek 270 Function Generator

.01 to 12 MHz, programmable, GPIB, 200 stored settings. Option 002.

$950.00

Hewlett-Packard 8754A/ 8748A

Network Analyzer and S Parameter Test Set. 4 MHz to 1300 MHz, 80 dB dynamic range.

$4750.00

Tektronix 475A Oscilloscope

250 MHz bw, dual channel, 5 mV/ div sensitivity, 1 nS/ div sweep rate. Includes 2 probes.

$975.00

Hewlett-Packard 3582A Spectrum Analyzer

Frequency range, .02 Hz to 25.5 kHz, dual-channel, band selectable analysis for 0.02 Hz resolution, sensitivity -120 dBV, digital trace storage. Option 01.

$2850.00

Tektronix 492 Spectrum Analyzer

50 kHz to 21 GHz, 80 dB dynamic range, amplitude comparison in 0.25 dB steps. Options 01, 02, & 03.

$8850.00

General Radio 1423A Precision Decade Capacitor

100 pF to 1.111μF in steps of 100 pF. Value can be adjusted on the lower 4 decades and will be known to an accuracy of ±0.01% accuracy.

$400.00

Hewlett-Packard 8554B Spectrum Analyzer RF Plug-In

Frequency range is 10 MHz to 18 GHz, high sensitivity (-125 dBm), 100 Hz resolution.

$900.00 Special

Please call for our Free 1995 Catalog

14455 NORTH 79TH STREET, UNIT #C • SCOTTSDALE, ARIZONA 85260

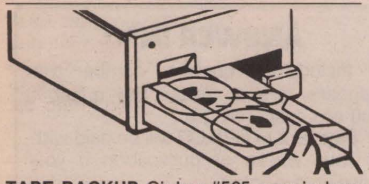
(602) 483-6202 • Fax (602) 483-6403

DANBAR SALES COMPANY

Write in 37 on Reader Service Card.

BUILD COMPUTERS! Handy book "How to Build an IBM Compatible and Save a Bundle!" 224 pgs.; 67 illustrations. Learn to build a powerful system using components available from stores, mail order vendors and swapmeets. ($23.95 shipped.) Prompt delivery. Jacomm Books, Dept-PK, Box 142, Wharton, NJ 07885-0142.

POWER BOOSTER kit delivers 60 Watts to a pair of 8 ohm speakers, from the earphone jack on your CD-ROM drive! 50-60 VDC power supply required. **Loud-Man™** is available now, only $37.95. **Visa/MC.** Decade, 2302N 5th NE, Salem, OR 97303, 503-363-5143, FAX: 503-399-9747, 73054.1755@compuserve.com.

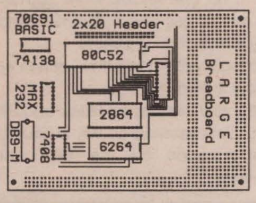


TAPE BACKUP Cipher #525 new in box, full height (internal) 50MB uses DC600 tapes. Buy one for $25, take all 250+ units. Please offer. For details call ATCO Corp. at 617-933-9909, FAX: 617-938-1299.

SIMM 1,2,4,16,32 Meg: Brand New 1 Meg 30pin 70ns/60ns $39/$41. 4 Meg 30 pin 70ns/60ns $125/$130. 4 Meg 72 pin 70ns/60ns $130/$140. 8 Meg 72 pin 70ns/60ns $265/$280. 16 Meg 72 pin 70ns/60ns $490/$520. 32 Meg 72 pin 70ns/60ns $950/$1,100. All SIMM modules available. 1 yr. warranty. Call Yub Sung, 603-893-5866. Salem. NH for current price/availability.

CLEARANCE SALE. We are clearing our excess inventory. PCs SVGA, Hard drives, RAM, CD-ROM, Fax Modem, etc. Wholesale prices, some are even below cost. For listing, FAX request to 818-855-1848 or send, SASE to OPTIMA, PO BOX 1366, COVINA, CA 91722.

EVERYTHING NEW with warranty! Motherboards 486, 256K Cache, Fastest 486DX4/100 $350. DX2/66 $250. DX33 $125. IBM 486SLC2/66 $165. SLC5/50 $110. 386SX40 $65 Memory $40/Meg. 1.2 and 1.44 Meg floppy drives $65/pair. DOS 5.0/6.1/6.2 $20/20/45. Windows $35. ACT For Windows $75, Paradox for DOS $75. FAX/modems 14,400 BPS $70. CD-ROMS, Microsoft ENCARTA $45, Cyberpack $29. Black 1.44 floppies $30. Monitors, Printers, IDE, SCSI hard drives 120 Meg 1.7 Gig. $95-750. Notebook hard drives 120-540 Meg available. 360K floppy drives $10. Call for items not listed. CCI, 714-778-0450. Orders only, 1-800-825-5042.



PROGRAM THE 8052 in BASIC with our inexpensive development SBC. Assembled/Tested board contains Intel's BASIC-52 Interpreter (80C52). Allows programming through serial port of PC. Also contains 8K RAM/ROM, Hi-Address Decoder, Large Breadboard Area, 40-pin Header and 2864 EEPROM that allows auto-startup of your saved programs. Programming software also included (3.5 or 5.25 in.) $70 plus S/H. Also learn how to program your purchase with the "BASIC-52 Users Manual." A 150 pg. book containing the proper usage of all commands/statements $20, plus S/H. Suncoast Technologies, Spring Hill, FL. 904-596-7599. V/MC Accepted.

HP COLOR CARTRIDGES. Refill kit for HP DeskJet 500C Color Cartridges, superior fade resistant ink requires easily modified cartridge. All instructions included and sufficient ink for 10 complete refills, applicator included, kit $44.95. LOALCO, PO Box 7117, Delray Beach, FL 33484. 407-241-9990.

ZENITH COMPUTERS. We have Zenith laptops and desktop computers in used working condition. Also, we have replacement boards, drives, power supplies, batteries, etc. for Zenith computers. Please call for quotes. Surplus Trading Corp., Benton Harbor, MI. 616-849-1800.

BEST US COMPUTER SYSTEM and parts prices. Hundreds of vendors and their prices. A thousand tips on configuring, building, repairing, upgrading and understanding your computer. On any size disks $3. Hard copy $20. SOC SUPPLY, Box 1349, Jacksonville, OR 97530.

MONITOR ADAPTERS. Convert O.E.M. (incl. PGA) 31.5KHz & above monitors with BNC connectors to PC use. Model VA10 VGA to RGB+ Sync $45. Model VA11 VGA to RG/Sync-B $55. VA12 VGA to PGA (DB9) $45. Rich, Pikul & Assoc., 101 Glenfield Dr., Festus, MO 63028. 314-937-0335.

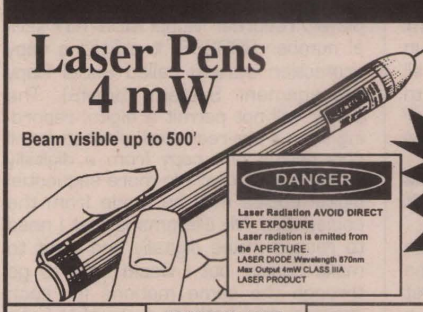
LAPTOP LOSING POWER? Have your power pack rebuilt with NEW cells at a 50% savings over the cost of a new pack! Increase your usage time with HIGH CAPACITY CELLS! Fully Guaranteed! The NiCad Lady, PO Box 654, Wildomar, CA 92595. 909-698-1901.

J.E.T. ENTERPRISES. Buy, sell, scrap electronics, obsolete computers, mainframes, phone systems, drives, circuit boards, memory, gold chips, etc. Expert repair on all Wyse terminals, including Logic, Monitor and power supply boards. Ask for Jim. Pick-up service. 909-982-8441, FAX: 909-982-5833.

RAINBOW KITS

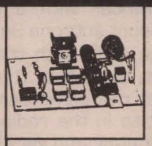
Laser Pens 4 mW

Beam visible up to 500'.



INCLUDES 2 AAA Batteries
Pen Size: 5 1/2" x 1/2"

SUPER NEW LOW PRICE $59.95



STROBE LIGHT

Do you need an attention getter, warning light,or flashing light for model airplanes? Then this kit is for you. Use it as an emergency light for your auto, radio tower, even use it on your bicycle. Has a variable flash rate. Size 3.5"x1.8" operates on 6 or 12v DC only.

ST-1 $9.95

The Exciting New TELEPHONE MONITOR

Monitors your phone system, See how accurate your phone company really is!

1. **RECORDS OUTGOING CALLS :**
   - Date & time of each call.
   - Length of the call.
   - What number was dialed.
   - If you use a credit card it records the card number.
2. **RECORDS INCOMING CALLS :**
   - Date & time of call.
   - How many times phone rings.
   - If answered the length of call.
3. **RECORDS ANY DTMF TONE :**
   - Detects any tone on line sent by phone company or any other source.

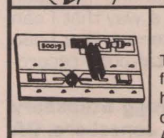
Records to Screen or Floppy Disk

EASY TO INSTALL
- Connects to parallel port
- Phone line in.
- Phone line out to telephone.

All software included!

TM-1 ONLY $99.95 KIT

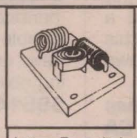
BUILT $169.95



WIDE BAND PREAMP

The ideal preamp for scanners, hand held radios, frequency counters. Amplifies low level (weak) signals. If the signal is extremely low 2 amps can be used in series. 1MHz to 2.5MHz @ 2.8dB nf 1dB compression = +0 dBm gain: 1MGHz-20dB to 2.5Hz-6dB Requires 12vDC @ 16Ma

WBA-6 $19.95



MICRO-MINIATURE PHONE TRANSMITTER

We haven't seen a smaller phone transmitter than the MMPT2 kit. Powered by the phone, it requires no battery. Transmits both sides of a phone conversation to an FM radio up to a 1/4 mile away.Tunable from 88 to 108MHz FM. Attach it to one phone or add it to the line to pick up all incoming calls. The MMPT2 is undetectable if properly installed. Unit has surface mounted parts, you install the leaded parts.Size .45"x.6"

MMPT2 $29.95

MICRO-MINIATURE WIRELESS MIKE

So small you could hide this one on some real bugs! It's the smallest we've ever seen. With it's super sensitive mike it transmits a whisper or a room of conversation to an FM radio, tunable from 88 to 108MHz FM. With a proper antenna & 9v it transmits about 1 mile. The kit is made with surface mounted parts, we have already mounted these parts. You install the leaded parts. Can operate on 6 to 12v DC. Size .35"x.9"

MMWM5 $34.95

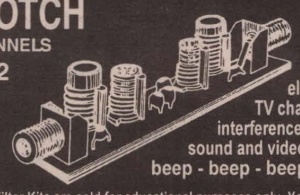
WIRELESS FM MICROPHONE

Small but mighty this little jewel will out perform most units many times its price. It really stomps out a signal. The WM-1 kit is a buffered wireless mike that operates from 80MHz to 120MHz FM , the frequency of any broadcast FM radio. Includes a mini-electret mike. SIZE: .8"x1" 6 to 12vDC

WM-2 $14.95

TV NOTCH FILTERS

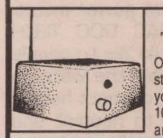
FOR CHANNELS 2 thru 22



Our TV filters eliminate unwanted TV channels or interference that alters both sound and video with a beep - beep - beep.

NOTE: All TV Filter Kits are sold for educational purposes only. You must obtain permission from your local cable company before using these filters on your cable system.

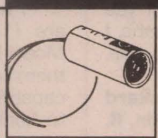
DF-222 Kit $14.95



FM STEREO TRANSMITTER

Own your own FM radio station. Any stereo signal you plug into the FMST-100 will be transmitted to any FM radio tuneable from 76 to 108MHz FM. Transmit a wireless link through an auditorium, from your car to your camper, listen to your cd's while mowing the lawn,Play music on one channel sing on the other. Clarity is excellent, aprox. 40dB stereo separation. Length of antenna determines the distance of transmission. Complete with stereo input level controls , & crystal for stereo separation. 9v battery operation

FMST-100 **$29.95** / FMSTC cabinet **$8.95**



5.0 mW Laser Diode

Great for making a gun sight, use as a transit, makes a super experimenters project. The beam is visible with a wavelength of 670 nm. Size of beam is 6mm at 5 meters. Operates on 3 volts DC at 85mA. Size: 10.5mm x 18.5mm with an adjustable collimating lens.

LDM-5 NEW LOW PRICE $59.95

PHONE TRANSMITTER

Small but mighty,it fits anywhere. Phone line powered, never needs batteries. Transmits both sides of a phone conversation loud and clear, wireless, to any FM radio at great distances. Variable tunes from 70MHz to 130MHz FM. You can also use it as a speaker phone. SIZE .5"x1"

TEL-B1 $12.95

BUILT $29.95

SUPER SNOOPER BIG EAR

Listen through walls, hear conversations across the room. Add a parabolic reflector and hear blocks away. The BIG EAR can be hidden about anywhere. Makes an ultra sensitive intercom. Can be used as a 1.5W AMP. We supply a mini-electret mike in the kit. SIZE: 1"x.75" 6 to 12vDC .

AA-1 $10.95

BUILT $29.95

This Manual contains all schematics, parts lists , P.C.B., layouts for most of the Rainbow Kits. Use your own parts to construct any of our kits.

KIT BOOK $14.95

$9.95 with the purchase of any kit.

4G

*Please add sufficient postage First lb **$5.00** Canada **$7.00** Additional LB. Add **$1.00** **US FUNDS ONLY***
We will accept telephone orders for Visa or Mastercard

MasterCard **To Order Call 317-291-7262** VISA

ELECTRONIC RAINBOW INC

6254 LaPas Trail • Indianapolis, IN 46268
FAX 317-291-7269

Questions & Answers
TECH FORUM

This is a READER TO READER Column. All questions AND answers will be provided by *Nuts & Volts readers* and are intended to promote the exchange of ideas and provide assistance for solving problems of a technical nature. All questions submitted are subject to editing and will be published on a space available basis if deemed suitable to the publisher. All answers are submitted by readers and *NO GUARANTEES WHATSOEVER* are made by the publisher. The implementation of any answer printed in this column may require varying degrees of technical experience and should only be attempted by qualified individuals. Always use common sense and good judgement!

QUESTIONS

I would like to know how I can obtain a hard drive defect Media table with diagnostic software when the original Media Track that comes with the hard drive is removed. I have several hard drives without the media track list. Please let me know.

5951 **Monroe D. Watkins**
Sacramento, CA

I have a 286 16MHz motherboard with a built-in IDE hard drive, floppy, printer, and serial controllers. It has two eight-switch DIPs, I have no documentation on how to set these switch's, any information on how to set these switch's and their functions would be very helpful.

5952 **Gregg Luther**
West Allis, WI

I'm looking for a simple circut to fire a flash assy randomly, to be used as a lightning simulator for a Halloween display or a circut that will take one side of a stereo to be used as a trigger. The other side would be a delay with thunder. This would be a nice addition to last Halloween's project which I am going to build this year.

5953 **Kevin Kosobucki**
Sayreville, NJ

Wanted: wiring diagram and parts list for a speed control, to replace the one on a trolling motor. It should be a foot control, either in the positive or negative lead. Capable of 20-25 amp.

5954 **Virgil Gochee**
Shaddona, IL

My Duofone TAD-220 telephone answering system (Radio Shack 43-318) cannot find messages it has logged. Radio Shack Repair Service says that they cannot make repairs because the required replacement component, IC 502 (TMS 1024), no longer exists. What do I do now?

5955 **R.J. Matusik**
Malden, MA

Re: switching power supplies as used in computers. Many are available in salvage, cheap. Output voltages are mostly incompatible with Radio amateur requirements. Surely the output circuitry could be modified to other voltages. I have been unable to find schematics. Perhaps someone knows where these can be found.

5956 **Elmo Black**
Oklahoma City, OK

Can anyone tell me how I can adapt my Corotor II Plus to receive the circular polorization or intelstat satellites, and where I can get a PAL to NTSC converter cheaply?

5957 **Gary Gretzinger**
Salem, OR

I am trying to use a RCI 2950 10m radio in my 1989 Lincoln Towncar with a Wilson 1000 trunk mount antenna Sur 1.1701. I must run the radio with the receiver turned all the way off to the left in order not to get the computerized dash computer noise in the radio. I don't have a long receiver and very low volume.

5958 **Earl Hawkins**
Oklahoma City, OK

I have a NEC PC 8023A-C 9-pin dot matrix printer that works just fine with Geoworks software and also most software written for DOS. I need a print driver or some way to make this printer work (print out) from Windows 3.1 software!

5959 **Alfred Gavenas**
San Jose, CA

I am interested in building an inverter for 12VDC to 120VAC. I have the schematics, but would like to use two large transformers, but have no way of knowing the internal wiring. They are: **(1)** ITT North 6124808; Burroughs 24712788. **(2)** ITT North 6124807; Burroughs 24718124.

59510 **Joe Dickerson**
Jasper, TX

I'd like to monitor a number of the functions of my car using my laptop computer. (I think that speed, tacho (RPM), oil press, coolant temp., volts & amps would do it.) Seems to me that I could access the car's computer too — for better control of service & maint. Which computer port & how? If you could give me the circuit/schematic, I can make it, dealer's don't have this, and they'd want thousands.

59511 **Chris Rickard**
Dixon, IL

A SW. REG. PS rated @ 5VDC, 8A & 12VDC, 4A requires a min load of 10%. When my computer sys is SW off temporarily (computer or disk drive reset) the load goes below 10% causing loss or regulated voltage. How can zener diodes be used to clamp this voltage at 5.6VDC and 13VDC? Is there a simpler way?

59512 **D.L. McCree**
Pasadena, MD

I own a pair of Motorola HT440s. These 5 watt handhelds utilize a 12.5 volt nicad battery pack. Motorola wants a small fortune for a cigarette lighter adapter that will run the radios from 13.8 volts. Can I simply connect 13.8 volts from the vehicle system to these radios without causing damage? (Charging voltage is 17-22 VDC for the battery packs.)

59513 **Steven Kaye**
San Diego, CA

I own a Sony minidisc player/recorder Model MDS-101 serial number 800868. It utilizes a copy protection system called Serial Copy Management System (SCMS). The player will not permit a digital recording from a pre-recorded minidisc. It will only permit one copy from a digitally written blank disc. No more sequential digital copies may be made from the copied disc. My dilemma is that I need to record mixes digitally and want to make copies, but I would have to go through the same motions for each identical disc. Is there a way that I can disable the SCMS system so that I can have unrestricted digital copy recording ability?

59514 **Gregg Stansbery**
Jonesboro, GA

I would like to know of any sources of information and parts, etc., for Heathkit robots and robots in general. One of my HEROs has a power supply problem and the other is missing the power supply and a few other boards.

59515 **Fred H. Ennenga**
Mankato, MN

I need an interface cable and software to test a TRC-6000 coin changer from Mars Electronics International, by using an IBM PC or cmpatible, and if possible to test all TRC-Series changer and bill acceptors.

59516 **Rene Rodriguez**
Orlando, FL

I have two identical power inverters (12VDC to 110AC DOC TECH Model DAC-201). I would like to couple them together for double the wattage capability. May I simply connect hotline to hotline and neutral to neutral, and wire an outlet to this configuration or is some kind of external circuit required?

59517 **Bill Green**
Albany, NY

Does anyone have any technical information on a Maxoplix WORM. Write once, read many, optical drive, Maxtor Model, RXT-8005.

59518 **Paul Garrett**
Detroit, MI

Is it possible to link together my car phone to a particular line in the telephone system at my office. If so, please give details and gear suppliers. I'm looking for an alternative to call-forwarding on that office line.

59519 **Gerry LaBorde**
Gretna, LA

ANSWER INFO

- Include the question number that appears directly below the question you are responding to.
- Payment of $25.00 will be paid within four weeks of publication if your answer is printed.
- Only one answer per question will be printed.
- If you do not want your name, address, or phone number available to the reader please so indicate or it will be assumed that you have no objection.
- In the event that more than one person submits the same solution, the choice will be made at the discretion of the publisher.
- Due to space limitations, we can not reprint the original questions with the answer. The question number and the issue it appeared in are printed above the answer.

QUESTION INFO
TO BE CONSIDERED FOR PUBLICATION

All questions should relate to one or more of the following:
1) Circuit Design 3) Problem Solving
2) Electronic Theory 4) Other Similar Topics

INFORMATION/RESTRICTIONS

- No questions will be accepted that offer equipment for sale or equipment wanted to buy.
- Selected questions will be printed one time on a space available basis.
- Questions may be subject to editing.

HELPFUL HINTS

- Be brief but include all pertinent information. If no one knows what you're asking, you won't get any response (and we probably won't print it either).
- Write legibly (or type). If we can't read it, we'll throw it away.
- Include your Name, Address and Phone Number. Only your name will be published with the question, but we may need to contact you.

1) I purchased a dozen UNISYS/SPERRY 286-8 computers, type 3137-00. These units have 2 DIP switches (an 8 and a 4 position) to provide set-up information to the motherboard similar to those used on XTs I would like to get a list of what each switch is for on these units.

2) I use Borland's "READ.COM" to display 132 column text files on my 386SX after setting the display to MODE 55 (my VGA Board has 512K RAM). On all of the 286 machines I have tried, the top 2/3 of the display changes color, but no text is displayed.

Is my problem being caused by the ROM Bios not supporting all VGA modes or should I look for another cause?

59520 **Bob Bayliss**
Viola, WI

I have a dead flyback transformer in the monitor of a Cordata Model CS-40 computer. It has a Serial Number 2GTAD09437, and was manufactured in Korea in Aug. '87. The information shown on the original flyback transformer is TMF-2500A; Totoku; TMF-2523; T-CF1319 (or) T-CFB19. The CRT is an Orion, R12DPGB-DH.

The flyback circuit has a very strong similarity to the 12 inch, Apple II Monitor, Model A2M2010. I have searched the usual sources such as SAMs Photofact, Philips ECG, NEC, etc., and have had no success. I did purchase a TMF-2500B, but it does not have the correct connections. Any assistance in locating a replacement flyback transformer would be greatly appreciated.

59521 **Ronald D. Cleven**
Huntertown, IN

I am building an electronic device which uses a Bar Code Laser scanner which reads a bar code and enters the value into my PC computer. I need a schematic for a "wedge-controller," which will decode the output of the laser scanner. Commercial wedges are available to do this, but I want to use a special bar code that would not be readable on a commercial wedge. I have not been able to see a circuit diagram for a wedge in any circuit books and would like to find such a circuit and theory of operation somewhere.

59522 **Roger A. Newlander**
Los Altos, CA

ANSWERS

ANSWER TO #49515 - APRIL 1995

Marianne Randak describes a fairly typical problem in attempting to upgrade her XT-clone computer by installing new high-density 3.5" and 5.25" floppy drives. She reports that her system is unable to properly access the drives and seeks a solution.

The solution is unfortunate because it does not make economic sense. The problem here is that Ms. Randak is hoping to get her 8088-based XT computer to recognize and communicate with hardware that had not even been invented when her computer was manufactured. She is correct in assuming that the problem lies within her machine's BIOS — a set of hard-coded instructions controlling the basic input/output functions of the system's motherboard. High-density floppy drives came along after the design of a 16-bit ISA bus.

With XT machines, the BIOS is simply incapable of instructing the high-density drives to function. The system designers never anticipated connection of any drive other than the standard 360K 5.25" floppy drive of the time.

There are several companies that sell replacement BIOS EPROM chips for older computers — such as American Megatrends, Inc. at 404-263-8181 — and I believe there is an "intelligent" floppy controller card that can support the current type of drive in an old machine, probably with some help from a software driver loaded during the boot process. I attempted to locate a source for such a controller in several catalogues, but without success. Perhaps there isn't such an animal. In any case, the real downside to these solutions is that they cost more than the computer itself is worth.

IBM XT computers are often for sale at hamfests and electronic swap meets. At the LARK-sponsored swap meets in Livermore, CA, an XT rarely fetches more than $75.00 and that includes a monitor. Although I advocate upgrading and reusing hardware to its fullest, in the case of XT systems, it does not make economic sense.

The two new drives Ms. Randak would like to add to her XT probably cost her about $80.00. That same $80.00 would have bought her a new motherboard with an 80386DX-40 CPU. With new motherboards and CPUs costing so little and offering such a drastic increase in compatibility and performance, it's almost masochistic to spend money upgrading an XT.

Since we've upgradced a number of 80386-based systems in our office, we'd be happy to give Ms. Randak one of the motherboards we've outgrown.

Damien Thorn
Stockton, CA

ANSWER TO #29512 - FEB. 1995

Use a high speed counter to reduce the frequency from 90 MHz to 30 MHz. Design a circuit to generate pulses at count zero, 10 Meg count, and 20 Meg count. This circuit must revert to count zero after counting 29,999,999. Design three phase locked generators. One synchronized to pulses generated at count zeros, one to pulses generated at count 10 Meg and one more for pulses generated at 20 Meg count.

Eiichi Takarada
Rockford, IL

ANSWER TO #4956 - APRIL 1995

You can use either RF or IR to control your stereo or other equipment. Holtek transmitter and receiver chips are popular in these applications, and are available from **DIGI-KEY (800) 344-4539.** They carry the chips and data book, and also Holtek's ready-made RF transmitter and receiver boards.

Circuit Cellar INK has had several articles on RF and IR control. The May '94 issue shows both RF and IR using the Holtek chips. The RF version uses a Ming transmitter and receiver which can be found in several *N&V* ads. An RF controller would have the advantage of working through walls!

The *Cellar's* June/July '91 issue describes an IR tranceiver with RS232 input/output for linking two computers or controllers together. This would have the advantage of allowing an unlimited number of control functions to be used VS the fixed number of codes with the Holtek chips, and could allow two-way communications between the remote and the stereo control.

The DEC '94 *Electronics Now* has a construction article on an IR receiver and "trainer" to teach a commercial LEARNING controller to talk to the receiver. Both the receiver and trainer boards use Holtek chips.

Electronics Now may be available at your library. ***Circuit Cellar*** carries back issues, and may be reached at **(203) 875-2751**. If you have problems locating the issue, drop me a line on C$ERVE, or regular mail.

Gary Drummond
71477,2037
2206 N 121st St.
Omaha, NE 68164

ANSWER TO #49511 - APRIL 1995

The problem Mr. Carter describes with his BOCA modem working fine under DOS and Windows NT, but not functioning under Microsoft's Windows 3.1 sounds like a fairly classic problem that arises with Windows.

Because of space limitations we'll avoid the technical discussion of exactly how serial communication devices exchange data with the PC's internal bus. It will suffice to say that each COM port has two characteristics that identify it to the system: a "base address" and an "IRQ" (interrupt request line).

The base address is the location in a standard "memory map" where data intended for the port can be sent, and data expected from the port can be received. The IRQ line is essentially used to "interrupt" the system's CPU and let it know that it needs attention. The PC continually scans the IRQ lines in order to determine what hardware device requires processor time.

In a standard AT-class computer, the standard base address (in hex) and IRQ line for the four serial ports are as follows:

Port	Base Address	IRQ
COM 1	03f8	4
COM 2	02f8	3
COM 3	03E8	4
COM 4	0238	3

The controller card within most PCs can be set to use any one of these base addresses, and often the IRQ can be set, as well. Internal modems have jumpers or DIP switches to allow one to set the base address and IRQ, thus causing it to show up as a particular COM port to the hardware and your communications program.

The frustrating thing about Windows 3.1 is that it will only recognize serial ports in sequence. This means that if COM 1 and COM 2 are present in your system, and you set your modem to COM 4, Windows will either report it as COM 3 or fail to see the device at all. Unfortunately, with many computers shipping with a COM 1 and a COM 2 port pre-configured, this means you would need to set your modem to COM 3 in order to have it recognized by Windows.

This would pose no problem except that mice are usually attached to COM 1. Because COM 1 and COM 3 share in IRQ line, the mouse and modem will interfere with each other. The PC is unable to tell which of the two devices is requesting an interrupt. Because of this contention, it makes perfect sense to configure the modem as COM 4 and let it share IRQ 3 with COM 2, making sure nothing is attached to COM 2. This works fine under DOS, but Windows becomes unhappy.

There are ways of fooling Windows 3.1 into believing that a COM port exists, even though there is no device physically present, but these types of software shims and .ini file tweaking do not always provide reliable results.

The best method of solving the problem is to identify the current COM ports in the system, and set the modem to the next available port address. When doing so, check the list above and make sure your mouse is not plugged into the port that shares in IRQ with the port you have just selected for the modem.

Resolving IRQ conflicts sounds complicated at first, but it's really fairly simple. Understanding the basics of port addresses and IRQs can be mandatory for anyone adding peripherals such as a sound card or CD-ROM drive. It's the odd software quirks that can get you, much like this oddity within Windows 3.1.

Damien Thorn
Stockton, CA

ANSWER TO #4954 - APRIL 1995

By far, the best way to get "on the air" is with the wireless transmitter kit (#K-488) available from **Antique Electronic Supply, 6221 S. Maple Ave., Tempe, AZ 85283, 1-800-706-6789.** The kit, which costs $19.95 is easy to build and is modeled after a 1939 Zenith "wireless record player."

The next best way would be to buy Radio Shacks' Engineers Mini-Notebook titled *Communications Projects*. On page 45 there is an excellent schematic of a transistor AM transmitter that uses common parts, and is simple to construct. The Radio Shack part number for the booklet is 276-5015A.

Finally, as you mentioned, radio servicemen had quite commonly used AM signal generators at their workbench. Most of these had an input for a high level audio source, such as a tape recorder line output. These signal generators are widely available at hamfests, and through the used test equipment classifieds in *Nuts & Volts*. The downside to using a test signal generator is that its output is tiny, and even with a good antenna, the signal would have trouble making it across a large room.

One of these suggestions should get you on the air in no time.

Robert P. Kramer
Aurora, IL

ANSWER TO #39510 - MARCH 1995

Compared to other two meter transceivers of its day, the TR-33C is easier to modify for frequency synthesizer operation, because only the receiver LO frequency must be generated.

I designed a synthesizer circuit for this transceiver that I use to this day. It fits into a 5-1/2 x 3 x 1-1/4 inch aluminum box and connects to the transceiver with a single coax cable that carries DC power in and local oscillator signal out.

Complete construction details for this project are in an article I wrote for the April 1978 issue of *73 Magazine*, page 72. It should be noted that the

Continued on page 125

WE HAVE WHAT YOU

Descramblers

Stealth 1000	$50
Stealth P-80	$65
TVT-3G	$42
Mini TVT-3G	$42
TNT	$59
M-80	$60
PIO+	$65
Refurbished SB-3	$15

Combination Converter/Descramblers

SSA-TV86	$159
ST-1600	$239
DPV-7XXX	$219
BA-6310	$319
BA-6150	$299
400-3 DIC	$69
450-3 DIC	$79
BOSS I (Replaces all SCIENTIFIC ATLANTA and PIONEER equipment)	$200
BOSS II (Replaces all TOCOM equipment, including wireless)	$210
MERLIN I (Replaces all JERROLD baseband equipment)	$220
MERLIN II (Replaces all ZENITH PZ/PM equipment)	$245

MasterCard VISA DISCOVER AMERICAN EXPRESS $$$$$$$$$ $$ COD $$ $$$$$$$$$

All prices are for 10 pieces, subject to change without notice. Some quantities may be limited. 30-Day Money Back Guarantee. One year parts and labor warranty.

HIGHLANDER

6325-9 Falls of the Neuse Road, Raleigh, NC 27615

WANT AND MORE !!!

Timeless Products $59

TPI-550 PC
Parental Lockout
STD/HRC Switchable
Channel 3 Output

Available with Built-in Stealth $125

Panasonic $75

TZ-PC 1453-G2
Parental Lockout
Channel 3 Output
STD/HRC Switchable
Sleep Timer

Novavision $199

The Novavision offers video pass-through technology and a host of advanced features including parental control, favorite channel memory, last channel recall, volume control, sleep timer, and channel ID, all controlled by a simple, user-friendly, menu-driven, on-screen display system. While others talk about the future, we deliver it...now! Only with Novavision!

NV 56 COMBO
Pioneer compatible.
Replaces all models 5000-6310.

NV 57 COMBO
Jerrold/GI compatible.
Replaces all models except baseband.

NV 58 COMBO
Scientific Atlanta compatible.
Replaces all models except baseband.

Millenium 3 $59

Parental Lockout
STD/HRC Switchable
Channel 3/4 Switchable Output

With Volume Control $89
With Any Built-in Descrambler $CALL

1-800-854-7119

Mon-Fri 10-7 EST; Sat 10-3 EST–FAX 1-800-854-7118

CRTs CHEAP. Buy direct from the manufacturer, save money. Mfg. all CRT types over 45 years. **3 Year Warranty.** 19 inch tubes $60, 25 inch $90. We specialize in **Hi Resolution** computer/video CRT's and complete repair of all monitors. T.M.C. 215-226-0749/223-0388 9:00am-10:00pm EST.

MOTHERBOARDS UPGRADE 286, 386 with ease, PCI, VL, AT BUS. IDE cards, I/O cards, SVGA cards, tower cases. Call for catalog. GCS, 1-800-386-0577.

CALLER ID in your PC! 8-bit card with software. Patented pass and block. Database included. Generates ASCII call record. Pager forwarding. More. Technical reference to write your own applications. Now only $109.95! Pewee Valley Innovations, Inc., 6601 Old Zaring Road, Crestwood, KY 40014. 502-241-4295.

COMPUTER REPAIRS for Atari, Commodore, Coleco, Sinclair/Timex, Osborne, TI, TRS-80 and IBM compatibles. Reasonable flat rate plus parts and shipping. Buy, sell, trade, upgrade. SASE appreciated. Computer Classics, RT-1, Box 117, Cabool, MO 65689. 417-469-4571.

E(E)PROM PROGRAMMER SYSTEM, $199. E(E)proms, 9346, Flash, Gals & Micros. Programmers, Erasers by AMS, Tribal and Xeltek. Send SASE for Catalog. Build-Ur-Own, 9346 Programmers too. **TRIANGLE PRODUCT DISTRIBUTORS USA,** 5750 Lakeshore Dr. Holland, MI 49424 USA. 616-399-6390. M-F, 9am to 2pm, EST.

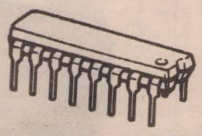
DISK DUPLICATOR for sale. Ventuno V5 Autoloader with duplication software included. Perfect condition. Makes copying large quantities of disks effortless. Was $2,800 new. Must sell. Will take best offer. Call 1-800-643-8950. Ask for Rich.

FLOPPY DRIVES 1.2/1.44 $25, h/drives, IBM 2.5 172MB IDE $125. IBM 2.5 258MB IDE $150. Call for price quote on other hard drives in stock. Servo-Track, 408-378-1374.

HARD DISK Technical reference on Disk. This disk is a complete technical reference for all major hard drives & controllers. Provides all the info and parameters you need to install, set up, and troubleshoot most mfg. hard drives and controllers. If you work on IBM compatible computers, this is a most have. To receive yours, send check or money order for $7.95 to: Stewart & Associates, 244 Mid Rivers Centre, St. Peters, MO 63376. 314-240-6500.

XT OWNERS, looking for those hard to find cards? Check this out! High Density floppy controller, $39.95, IDE hard drive controller $39.95, Multi I/O with Clock $19.95, Memory expansion cards $29.95, plus a large selection of used cards, hard drives, and other goodies in stock. All used parts are tested and carry a money back guarantee. Stewart & Associates, 244 Mid Rivers Centre, St. Peters, MO 63376. 314-240-6500.

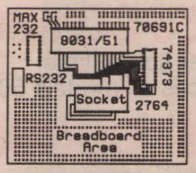
68HC11A1 MICROCONTROLLER. The SBC-2 lets you develop your own processor projects. Programs via RS-232 port from any PC. $59.95. $3.50 shipping. 410-586-2177. LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685.



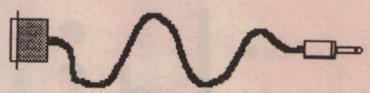
WANTED: EXCESS ELECTRONIC INVENTORIES. IC'S, MEMORY, EPROMS, PALs, LEDs, CIRCUIT BOARDS, DIODES AND TRANSISTORS. CALL ACTIVE MICRO, 310-494-4851 OR FAX 310-494-4913.

1-800-458-6778 FLOPPY DRIVE REPAIRS $1-$15. Consistently reliable since 1983. 2 day avg. turnaround, 6 mo. warranty. **ISR,** 2217 Downing Ln., Leander, TX 78641.

HISTORIC AND CLASSIC hardware support magazine. **The Computer Journal** provides how-to information on keeping S-100, Kaypro, Z80, 6809, CP/M, and PC/XT systems running. Over TEN years of hardware, software projects. 6 issues $24. Free sample. 1-800-424-8825. TCJ, PO Box 535, Lincoln, CA 95648.



INEXPENSIVE 8031/51 SBCs. The 70691C; Our most economical SBC is complete with a large breadboard area, serial port, 128 byte RAM. Also includes programming software (3.5 or 5.25in), documentation and sample .ASM codes. Assembled/Tested $38 plus S/H. Suncoast Technologies, Spring Hill, FL. 904-596-7599. V/MC Accepted.



DATA*LNK WORKS with Hamcomm, JVFAX, WEFAX, and others. Decode satellite photos, morse, teletype, weather charts, etc. Connect PC serial port to shortwave radio. 9 pin or 25 pin, $49ppd. Kit, only $24ppd. Information, SASE. Howard Olsen, 5411 Atlantic View, St. Augustine, Fl 32084.

SEC Sun Equipment Corporation

LODESTAR *Lodestar Electronics Corp. Since 1979*

3121-A Glen Royal Rd., Raleigh, NC 27612

1-800-870-1955/(919)870-1955 or 24-hr Fax:(919)870-5720

One Year Warranty. 15 Day Money Back Guarantee.
School purchase order accepted, net 30 days. Bids accepted.
3% discount for prepaid order, certified check or money order.
Quantity discount. FOB shipping point.
DISTRIBUTORS AND DEALERS WANTED.

MICROPROCESSOR/CONTROLLER TRAINING

Now, you can learn and apply Microprocessor control with our low-cost trainers and lead yourself to the advanced 80386, 80486, etc.. Our systems will help you learn BASIC, C, and ASSEMBLY languages programming and debugging, and Microprocessor/Microcontroller based system hardware design and troubleshooting.

Experiment guide and program examples are included in each trainer. Our trainers are widely adopted by technical colleges.

BGC-8088 only $699.00 8088µp Trainer &Tool.

Features: Assembly language coding, assembler, disassembler, single step and multi-breakpoint program debugger, display and rewrite registers, download/upload programs from/to external systems, I/O drivers, 56-key large size keyboard, LCD display, RS-232, UART, printer interface, two expansion slots, ±5V, ±12V switching power supply, user's guide and experiment guide, 20 I/O control applications available, such as servo and stepping motor, dot matrix display, D/A, A/D, sensors, ...

EDS-8811 $289.00 EP(P)ROM programmer for BGC-8088 or IBM PC/compatible. Burn your own EPROM and EEPROM in just a few minutes.

BGC-8052 $979.00 It helps you learn the most powerful and popular Intel 8051/8052 Embedded Microcontroller in today's appliance control. Learning guide and experiment examples included.

U-DBGR $1599.00 Universal Debugger/In-circuit Emulator for commonly used Microprocessors, such as 6502, Z80, MCS-48, MCS-51, 8088, .. etc.. Trace & debug program, EPROM programmer, DOS Shell. Can be operated with BGC-8088 or IBM PC/compatible. Speed up your development.

APEX-IE 8052 $699.00 In-Circuit Emulation Systems for 8051/8052. It helps you understand microprocessor based control circuit design, troubleshooting, assembly language programming and debugging. Can be operated on BGC-8088 or IBM PC/compatible. Speed up your product design.

CIC-100 $549.00 IBM PC/compatible I/O control applications, learn Assembly, C, and BASIC programming languages, 800-pin solderless breadboard for circuit design andtest, I/O drivers for controlling relay, step motor, LED, speaker, sensor, ..etc.. Experiment manual. Application control modules available, including step motor, matrix key-pad, traffic light, A/D, D/A, F/V, V/F converters, sensors, etc.

EDS-8809-1 $589.00 IBM PC/compatible(add an adapter $99.00) and BGC-8088 I/O control applications include 24 experiments, such as stepper motor control and simulation, digital clock, speaker control, dot matrix LED control , Matrix keyboard, sign lights, 8255 polling handshakes, electric piano, stop watch,.. more.

EDS-8804 $239.00 A/D and D/A converter applications for BGC-8088 or IBM PC/compatible.

EDS-8805 $479.00 Servo motor and stepper motor control for BGC-8088 or IBM PC/compatible.

MOST I/O APPLICATIONS FOR BGC-8088 CAN ALSO BE USED ON IBM PC/COMPATIBLE.

DC POWER SUPPLY

PS-303 $159.00
0-30VDC, 0-3A; 0.02%+2mV line regulation, 0.02%+3mV load regulation; 1mVrms noise & ripple; Short circuit overload protection, constant current constant voltage (CC & CV).
PS-303D $314.95 dual outputs.
PS-305 $219.95, 0-30VDC, 0-5A.
PS-305D $399.95, dual outputs.

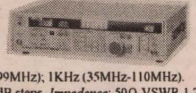
8110 $289.95 0-60VDC, 0-3A
8112 $399.95 0-60VDC, 0-5A
8108(8109) $549.95($699.95) 0-60VDC, 0-3A(5A), dual, independent tracking. Low ripple.
8102(8103) $399.95($489.95) dual 0-30VDC/0-3A(5A), fixed 5VDC/3A, indepedent tracking operation, constant voltage and constant current. Slave/Master, Serial/Parallel connection.
PS-1610S(8107) $289.00($399.95) 0-16VDC, 0-10A.
PS-2243(2245) $139.00($159.00) 0-12/0-24VDC,3A(5A).
8200(8201) $179.95($239.95) 0-30VDC(digital meter), 0-3A(5A).
8210(8211) $209.95($269.95) 0-30VDC, 3A/(5A). 2 digital meters.
8202(8203) $499.95($549.95) 3 outputs, digital display, dual 0-30VDC/0-3A(5A), a fixed 5VDC/3A, indepedent tracking operation, constant voltage and current.

AM/FM SWEEMAR SCOPE

SM-6225B/C $1999.95
Freq Range: (AM)490KHz, (FM) 10-11.4MHz; *Acuracy*: ± 0.1%
Marker: (AM)455KHz, ±5KHz, ±10KHz; (FM)10.7MHz, ±7.5KHz, ±150KHz.

STEREO SCOPE OS-7505B $369.00 trigger, 0-10MHz.
ALIGMENT SCOPE OS-7001A $369.00 0-200KHz.

AM/FM STD SIGNAL GEN.



SG-4110A $1799.00
Freq: 100KHz-110MHz
Display: 6-digit LED
Accuracy: <±(5x10-E5 ±1 count)
Resolution:100Hz (100-34.99MHz); 1KHz (35MHz-110MHz).
Output: -19dBu, -99dBu, 1dB steps. *Impedence*: 50Ω VSWR 1.2.

TV COLOR PATTERN GEN.

CPG-1366A $159.95
VHF NTSC;
Freq.: 45.75, 175.25, 187.25 MHz;
RF Output: 10mV.
Impedence: 75 Ohm;
Video Output: BNC, 1Vp-p

SWR/RF POWER METER

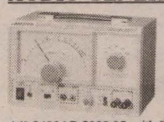
310 $89.95
Freq Range: 1.8-150MHz.
RF Power: 0-4W/20W/200W
SWR Measure.: 1.0 - ∞, 4W min. Accurcy: 5%-10%; SO-239 plugs.
Insertion Loss: O.3dB.
Input/Output Imp.: 50Ω.

320 $89.95, 130-520MHz.
330 $119.95, 1.8-520MHz.
SWR-3P $26.95 1.7-150MHz; *RF Power*: 0.5-10W, 0.5W-100W.
SWR-2P $22.95, 1.7-30MHz; *RF Power*: 0.5-10W.
PM-330 $136.00 1.8-500MHz; 0-5W/20W/120W.

RF SIGNAL GENERATOR

SG-4160B $119.00
100KHz-150MHz up to 450MHz on 3rd harmonics, 6 ranges; AM modu-lation.
RF Output: 100mVrms to 35MHz.
Modulation: Int. 1KHz AM, Ext. 50Hz-20KHz AM.
Audio Output: 1KHz, 1Vrms.
SG-4162AD $229.95, with Freq. Counter 1Hz-150MHz, 6 digits, for internal & external signals.

AUDIO GENERATOR



AG-2601A $119.00
10Hz-1MHz, 5 ranges;
Output Level: sinewave 0-8Vrms, square 10Vp-p.
Output Impedence: 600 Ohm.
Distortion: <0.05% 500Hz-50KHz; <0.5% 50KHz-500KHz.
AG-2603AD $229.95, with Freq. Counter 1Hz-150MHz, 6 digits, for internal & external signals.

FUNCTION GENERATOR

FG-2100A $169.95
0.2Hz-2MHz in 7 ranges; Sine, Square, Triangle, Pulse & Ramp
Output: 5mVp-p-20Vp-p, 1% distortion.
VCF: 0-10V control freq. to 1000:1.
FG-2102AD $229.95 generates signals same as FG-2100; 4-digit counter display, TTL & CMOS outputs, 30ppm ±1 count accuracy.
FG-2020B $159.00 0.5Hz-500KHz, Sine, Square, Triangle.
(FG)2103 $329.95, Digital sweep generator, 0.5Hz-5MHz in 7 ranges.
Operating Mode: sweep, AM, gated burst, VCG.
Freq. Counter: Int. 0.5Hz-5MHz; Ext. 5HZ-10MHz

FM STEREO MODULATOR

AG-2011A $549.00
RF SECTION:
Carrier: 98MHz ±2MHz;
Output: 10mV, 1mV & 0.1mV
COMPOSITE SIGNALS:
Pilot: 19KHz ±2Hz, 0.8Vrms
INT. MODULATION: 400KHz, 1KHz ±1%, 1Vrms, distortion < .5%;*L-R Seperation*: >50dB.
EXT. MODULATION: *Freq.*: 50Hz-15KHz
L-R Seperation: >45dB 100Hz-3KHz; >35dB 50Hz-15KHz.

AC MILLIVOLT METER

MV-3100A $159.95 wide band 5Hz~1MHz, 3 scales, mV, dB, &dBm; 300µV~100V in 12 ranges, 10µV resolution; -70~40dB in 12 ranges, 0dB=1Vrms, 0dBm=0.755V); ±3% accuracy; Input impedence 10MΩ; Noise <2%. **MV-3201B $309.95** dual channels, simultaneous measurement..

OSCILLOSCOPE

OS-7305B $249.00 DC~7MHz;
Vertical: 10mV/Div; *Horizontal*: 250mV/Div; 10Hz~100KHz in 4 ranges;
3" CRT;Internal and External Sync.; Input: 1MΩ/35pF. Probe included.
OS-7010A $369.00 DC~10MHz.
5" CRT, 10mV/Cm~10V/Cm, 1MΩ.
OS-622B $344.95 20MHz, dual trace.
OS-653 $699.95 50MHz, dual, delay sweep, ALT triggering, TV syn.
OS-6100B $1329.95 100MHz, 4ch. 8 traces, delayed sweep, **best buy**.

GRID DIP METER

DM-4061 $89.95 1.5-250MHz, 6 bands,6 plug-in coils, 2 transistor, and 1 diode.
Modulation: ≈ 2KHz Sinewave. *Crystal Oscillator*: 1-15MHz.
Wave absorption meter. Using 9VDCpower supply.

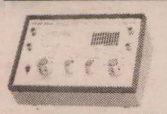
AUTO DISTORTION METER

DM-3104A $799.95
MEASUREMENT:
Range: 0.01%-30%, 0.1/0.3/1/3/10/30% full scale.
Freq.: 400Hz±10%, 1000Hz±10%(HPF).
Input: 3mV-100V, ratio measuring 20dB.
Auto. Switching Ranges: Fundamental Freq. = (fo)±10%;
Fund. Rejection: >-80dB at (fo)±5%; >-70dB at (fo)±10%.
Harmonic Accuracy: ±0.5dB, 1.8(fo)-20KHz.
DM-3204 $1,599.00 dual channels.

FREQUENCY COUNTER

FC-5250C $119.95
Freq. Range: 10Hz-220MHz (HF)10Hz-20MHz, (VHF)10MHz-200MHz.
Gate Time: 0.1 & 1sec.
Max. Input: 10Vp-p.
Input Sensitivity: 35mV 10Hz-200MHz.
Input Imped.: (HF) 1MOhm, (VHF) 50Ohm.
FC-5260A $146.00
10Hz-600MHz.
FC-5270A $149.95
10Hz-1300MHz.
FC-5600B $321.00
10Hz-600MHz.
(FC)5700B $329.95 10Hz ~ 1.3GHz.

SIGNAL TRACER/INJECTOR

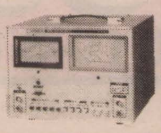


SE-6100 $134.95
TRACER: Gain Max. 60dB
Attenuation: 0/20/40/60dB
Input Imped.: 100KOhm
Output Imped.: 600Ohm;
Speaker: 8 Ohm.
INJECTOR: *Freq.*: 1KHz Squarewave, *Output Level*: Continuously variable 0 - 4.5Vp-p.

AUTO. CAPACITANCE METER

CM3300A $139.00 10 ranges, 99.9pF ~ 99.9mF, fully automatic.
Resolution: 0.1pF lowest, 0.1% full scale.
Accuracy:
0.5% of full scale±1digit to 99.9µF,
1% of full scale±1digit to 99.9µF.
Display: 3 digit LED.
Unit indicator: pF, nF, µF, mF. Overrange indicator.

WOW-FLUTTER METER



WF-3103 $699.95
Freq. Range: 3KHz±10% JIS/CCIR; 3.15KHz±10% DIN.
Range: 0.03/.1/.3/3% full scale.
Accuracy: ±5%.
WF-3105A $799.95, digital;
Function: LIN/WOW/Flutter/WTD.
Freq Cntr: 10Hz-9.99MHz.
Indication: CCIR/DIN/JIS.

Write in 40 on Reader Service Card.

HP PLOTTER, 7475A, 6 pen, A & B Size paper, with cables. Serial or HP-IB interface available, $395. DEXIS, 612-944-7670.

HP DESKJET CARTRIDGES, refill up to 10 times! Simple process, specially formulated ink, complete kit, $29.95. Loalco, Inc., PO Box 7117, Delray Beach, FL 33484. 407-241-9990.

START YOUR OWN TECHNICAL VENTURE! Don Lancaster's newly updated **INCREDIBLE SECRET MONEY MACHINE II** tells how. We now have autographed copies of the Guru's underground classic for $18.50. Synergetics Press, Box 809-K, Thatcher, AZ 85552. 520-428-4073. VISA/MC.

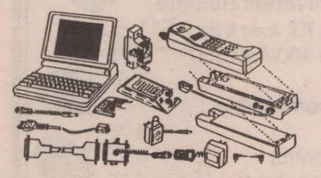
MACINTOSH/APPLE Repairs, Parts and Peripherals. Low prices on Macintosh, Apple II and peripheral repairs. Repairs of whole units or repair or exchange of parts. Sales of new third party peripherals. Used equipment available. Mac Shack 716-377-9230, FAX 716-377-9573.

WANTED: KAYPRO portable computer, does not have to work, need the case. 601-875-0596, FAX 601-872-2484.

NOTEBOOK/LAPTOP UPGRADE. Hard-Drives and Memory. Hard-drives 2.5" and 3.5" up to 9GB. For Price/listings call 818-855-1844. Installation available. We also carry PCMCIA products.

NOTEBOOKS 386/486 from $650. 386/486 desktop systems from $395. Gateway 2000 486DX2/50, 340 HD system $1095. Pentium 60/90MHz, 8 Meg RAM, 540 HD SVGA Card, $1,450/$1,650. 17/20 Inch Multiscan monitors $475/$995. Lazer printers, 8PPM 1.5 Meg RAM originally $850, now $425. New w/warranty. INFO, 714-778-0450. Orders, 1-800-825-5042.

COMPUTER SOFTWARE
60



UNION JACK'S©, MOTOROLA CELLULAR PHONE, AMPS/NAMPS RE-PROGRAMMING SYSTEM (FOR BRICK-UC, FLIP & BAG PHONES). UJMP-1 SOFTWARE SET, 4 3.5" 1.44MB DISKS, MFDP-1: Programs firmware below 9122s without a loader phone, **MFDP2:** Programs firmware 9122 to 9340 with a loader phone (FLIP-BRICK OR BAG, having a firmware below 9122) **FDP3 & 4** are a conglomeration of Cellular cloning etc., information. 60-page illustrated programming manual also included. **FREE technical backup & yearly updates.** 4-DISK SOFTWARE SET **UJMP-1 $199.95 COMBINATION OFFER (A), SAVE $50, COMPLETE RE-PROGRAMMING SYSTEM $419.95, CONSISTS OF 1 SET UJMP-1 $199.95, 3 TYPES MOTOROLA COMPATIBLE, COMPUTER PROGRAMMING CABLE HARDWARE SETS, 1-6PCs-CSFP** FOR FLIP-POCKET PHONES **$99.95, 1-3PCs-CS689/UC FOR BRICK/ULTA CLASSICS $99.95** AND **1-3PCs-BP** FOR BAG PHONES **$69.95. *PRICES:** Computer and Cellular loader phone not included. **S&H: UPS COD CASH ONLY, 2ND DAY AIR $12. FREE 2 PAGES OF ADDITIONAL INFORMATION & COMBINATION PRICES, AVAILABLE BY MAIL OR FAX. CALL LES, 702-642-0325,** 2039 CIVIC CENTER DRIVE #176, N. LAS VEGAS, NV 89030.

SEMICONDUCTOR CROSS-REFERENCE LIBRARY on disk, for IBM PC with 640 mem, EGA or better, 10 meg HD space. Over 234,000 devces (transistors, diodes, ICs, SCRs, ect.) Specification, lead and case configuation drawings for most. Send $49 to Custom Software Creators, PO Box 1092, St. Bethlehem, TN 37155. 615-647-6120.

CD-ROM BUYERS Club! Now in our second year. Don't pay retail! Save $$$ with group purchasing power. Send large SASE and 52 cent stamp for colorful catalog and membership details. Rascom, 20220 South Avalon Blvd., Suite 151, Carson, CA 90746.

CYCLE ANALYSIS finds patterns in scientific, financial data. Performs Fourier analysis plus data extrapolation, filtering, congruency, more. For IBM order Cycle Analyst $19.50, or Stock Cyclist $22.50 (does above plus strategy, pattern analysis). Rotch Design, POB 165, Washington, ME 04574.

CDs AND VIDEOS. Wholesale prices. **MAY Special:** "All Beauties," adult, 2500+ GIFs, only $12 postpaid (Must be over 21). Visa, M/C, Discover accepted. Categories from educational to adult. Free monthly flyer. Fast delivery. Message/Fax: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

IBM SOFTWARE. High quality without the price. Prescreened and tested, **No Junkware.** Printed installation instructions included. Free catalog, SASE appreciated. Professional retail packaging, retailer inquiries welcome. Roger DuHamel's Shareware, 1115 N Anza St., El Cajon, CA 92021.

FAMILY BBS Clean Family Oriented fun. These are only a few of the many comments about the Canaan Land BBS. The BBS offers multiplayer games, Internet, news groups, E-Mail, Christian library and thousands of programs ready for downloading. 2400 to 288K baud welcome No Charge, call 813-334-4259.

BLOWOUT! BLOWOUT!

TIMELINE INC.

Over 8 years and 23,000 customers and still growing.

BareBones 486 System $99.00

CPU not supplied. (Will support Intel or AMD cpu)

Includes slimline desktop case, (85 watt) power supply, all-in-one 486 motherboard. Motherboard designed for 486 SX or DX or DX2 at 25 or 33 Mhz. Tested at 40 Mhz. On board 256k super VGA, (Trident chip, Windows drivers supplied) upgradable to 512k or 1 MEG, IDE and floppy controllers, 2 serial ports (COM 1,2,3,4 disable), 1 parallel port (LPT 1,2 disable), game port (enable, disable). Case has room for one 5¼" floppy or CD ROM, one 3½" floppy and one internal 3½" hard drive. Three 16-bit ISA slots and two 8-bit ISA slots. External cache size is 0,32,128K, OK supplied. Uses 72-pin SIMM (2 slots), up to 32 MEG RAM. Phoenix Bios. Overall case dimensions: 15.3"W x 4.4"H x 15"D

LIQUID CRYSTAL DISPLAYS

160 x 128 dot LCD with built-in controller (T6963C)
20 character x 16 line $79.00 or 2 for $149.00

Mfr.: Toshiba TLX-1013-EO. *Unit is EL back-lit. Dim: 5 1/16" L x 4 1/16" H. The built-in controller allows you to do text and graphics*

Alphanumeric—parallel interface

16x1..... 3 for $25.00	32x4.....$15.00	16x4.....$15.00
20x2.....$12.00	40x4.....$25.00	24x2.....$12.00
20x4.....$25.00	16x2.....$8.00	40x2..... 2 for $25.00
		4x2.....$5.00

5V power required • Built-in C-MOS LCD driver & controller • Easy "Microprocessor" interface • 98 ASCII character generator • *Certain modules are backlit, call for more info.*

Graphics and alphanumeric—serial interface

size	mfr.	price	size	mfr.	price
640x480	Epson	$50.00	480x128	Hitachi	$15.00
640x400 (backlit)	Panasonic	$35.00	256x128	Epson	$20.00
640x200	Toshiba	$19.00	240x128 (backlit)	Optrex	$20.00
			160x128	Optrex	$15.00

LASER PRODUCTS

HeNe Laser Head (10Mw max. output) TEMOO, 15.5" long MFG:NEC **$99.00**
Laser Power Supply (for HeNe tube) **$100.00**

LASER SCANNER ASSEMBLY $29.00
Assembly intended for a laser printer. Includes laser diode, polygon motor (6 sided) and misc. optics and lenses.

LASER DIODE (5mW) with collimator **$20.00**

LASER DIODE: **Sharp part#: LT022MC**
5mW at 780 nm. single tranverse mode **$10.00**

NETWORK

IRMA BOARD 8 bit $99.00
Links 3270 mainframe systems to IBM PC

Proteon ProNet-4 Model p1347 Token Ring Board $79.00
16 bit • 4 Mbps • IEEE 802.2 and 802.5 compatible • twisted pair • interoperable with IBM Token Ring network

POS & BAR CODE

MAGNETIC CARD READER $25.00
Includes: • 20 character dot matrix display with full alpha-numeric capability • keypanel with full alpha-numeric entry • separate 7.5 VDC/0.5 Amp power supply • standard telephone interface extension cord • lithium battery and flat-cone speaker.

HP bar code wand (HBCS 2300).....$35.00

POWER SUPPLYS

73 WATT SWITCHING $15.00 or 2 @ $25.00, (2) 4 pin power connectors attached • 115/230 Volt, Dim: 8.5" L x 4.5" W x 2" H • Output: +5V @ 2-9.75 A, +12V @ 0-1.5 A, -5V @ 0-0.4 A, -12V @ 0-0.5 A

68 WATT SWITCHING $12.00 or 2 for $20.00, 115/230 Volt, Dim: 5.5" L x 3.2" W x 1.7" H • Output: 5V @ 4 A, 12V @ 4A

MISCELLANEOUS

ADAPTEC 4070A (RLL) OR 4000A (MFM) SCSI Controller, your choice $40.00

IBM 370 option XT and AT emulation boards $50.00

MONITORS

Non-Enclosed TTL

Comes with pinout. 12V at 1.4 Amp input.
Horizontal frequency 15Khz.
Ability to do 40 and 80 column.

5 inch Black & White	$35.00
7 inch Amber	$39.00
9 inch Amber	$29.95
12" Green or B/W	$19.95

Enclosed

9" Green BNC composite 115V/230V	$69.00
12" White BNC composite 24V	$79.00

Mfr.: Electrhome • For Very High Quality Medical & Industrial Applications

5" COLOR MONITOR $69.00
2 for $109.00

• Flat Faceplate • 320 x 200 Dot Resolution • CGA & Hercules Compatible • 12 VDC Operation • 15.75 KHz Horiz. Freq. • 60 Hz Vert. Sync. Freq. • Open Frame Construction • Standard Interface Connector • Degaussing Coil Included • *Mfg.: Samtron*

CHARGE COUPLED DEVICES

MATRIX TYPE

"The Spy In The Sky" $49.00

Sony CCD Imager - designed for black and white composite video cameras. Picture elements: 384 (H) x 491 (V)

Chip size 10.7 (H) x 9.3 (V) mm^2 • Unit cell size 23.0 (H) x 13.4 (V) um^2 • Ceramic 24 pin DIP package. • Mfr: Sony, Part# 016AL

LINEAR TYPE

4096 element CCD $29.00
2048 element CCD $15.00 • 1728 element CCD $15.00

HACKER CORNER

CELLSITE TRANSCEIVER $99.00

These transceivers were designed for operation in an AMPS (Advanced Mobile Phone Service) cell site. The 20 MHz bandwidth of the transceiver allows it to operate on all 666 channels allocated. The transmit channels are 870.030–889.980 MHz with the receive channels 45 MHz below those frequencies. A digital synthesizer is utilized to generate the selected frequency. Each unit contains two independent receivers to demodulate voice and data with a Receive Signal Strength Indicator (RSSI) circuit to select the one with the best signal strength. The transmitter provides a 1.5 watt modulated signal to drive an external power amplifier. Channel selection is accomplished with a 10 bit binary input via a connector on the back panel. Other interface requirements for operation are 26 VDC (unregulated) and an 18.990 MHz reference frequency for the digital synthesizer. The units contain independent boards for receivers, exciter, synthesizer, tunable front end, and interface assembly (which includes power supplies and voltage-controlled oscillator). Service manual, schematics and circuit descriptions are available.

Encased Black & White Composite CCD Camera with Adapter

IR viewing to 1000 nm1.7 W x 2.6 H x 4.5 L
Comes complete with CCD camera, mounting nut on bottom of casing, 12VDC power supply. Excellent low light capability, standard RCA NTSC video out. **$89.00**

Great for: entryway security/remote monitoring, video conferencing/desktop video conferencing **2 for $159.00**

This miniature camera is perfect for multimedia computer applications as well as security and surveillance. NTSC output allows use with all popular video digitizing boards for Apple Macintosh and Microsoft video for Windows. Connects directly to any composite monitor or VCR with "video" input. Its razor-sharp wide-angle lens focuses from two inches to infinity and its state-of-the-art CCD technology accurately captures 16 level grayscale images for Quick Time movies and still pictures. Records at 30 frames per second and 260 lines resolution with excellent low light capability. Uses 12 VDC (adapter supplied) and standard RCA cable.

Portable Micro Terminal

Flip up LCD display (9-16 VDC) • Can communicate with any computer having RS 232 port • Can communicate with another Microterminal • Use by itself as electronic notebook • Onboard microprocessor, data RAM (32K) and Video RAM (64K) • Complex built in diagnostics and set up capabilities. • Original intention for POS applications. • display size 40x16 (256 x 128 pixels.) Dimensions: 6.3" W, 11"L, 2"H. (With LCD up height is 7.1") **$99.00**

or 2 for $149.00

All in one 286 board $29.00

Includes: • 286-12Mhz CPU (1 wait state) • Built in IDE & floppy controller • 80287 math coprocessor socket • FAST! on board SVGA with 256K RAM • 2 serial ports, 1 printer port, mouse port • EMS-LIM ver 4.0 memory & shadow RAM support • Up to 8 mb memory (256K or 1 Mb SIMMS) • Comes with 0K on board • On board speaker • REAL TIME CLOCK • Phoenix BIOS • Note: There is one long non standard bus connector on board

23605 TELO Ave, Torrance, CA 90505
Order desk only: USA: (800) 872-8878 CA: (800) 223-9977
L.A. & Technical Info: (310) 784-5488 Fax: (310) 784-7590
OEM INQUIRIES WELCOME

Minimum Order: $20.00. Minimum shipping and handling charge $5.00. We accept cashiers checks, MC or VISA. No personal checks or COD's. CA residents add 8.25% sales tax. We are not responsible for typographical errors. All merchandise subject to prior sale. Phone orders welcome. Foreign orders require special handling. Prices subject to change without notice. 20% restocking fee for returned orders..

NOVAPLEX

The One-Stop Source for Cable Parts, Tools & Accessories

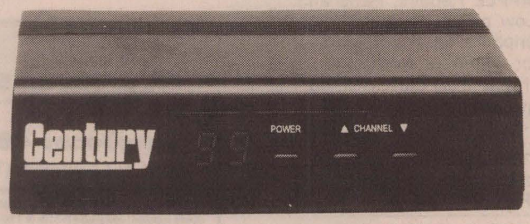
Announcing the Century—great performance at an incredible price!

Century

The New Century converter offers a number of powerful features:

- parental control
- switched AC outlet
- sleep timer
- remote control included
- auto/manual fine-tune
- favorite channel memory
- batteries included
- jumper cable included
- illustrated user manual
- LED display

please place your orders soon—demand for the Century is high!



Introductory Offer! For a limited time only, 10-lot price is only: **$65**

Panasonic & SA Converters

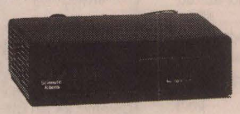
Panasonic TZPC 145 Converter
SA 8511-300 Converter

Units sold with wireless remote control & batteries
Features include: parental control (Panasonic only), last channel recall, favorite channel memory, sleep timer, channel 2 or 3 available.
In quantities of 10 or more, **$65**

Also: Panasonic TZ - PC 175 Series Converter w/volume. Topcases for Panasonic, SA and Jerrold (all models) also available. Call for pricing and availability.

Panasonic TZPC 145 $ 65
channel 2 or 3; 10-lot prices

SA 8511 channel 3 $ 65



Quality capacitors (1,000-lot price)

Capacitor	Cost	Capacitor	Cost
1uF - 50V	.06	3.3uF - 50	.06
100uF - 50V	.10	33uf - 35V	.06
100uF - 63V	.11	33uF 50V	.07
1000uF - 16V	.15	330uF - 50V	.14
1000uF - 50V	.30	330uF - 63V	.14
.22uF - 50V	.06	4.7uF - 50V	.07
22uF - 50 V	.06	47uF - 50V	.08
2200uF - 16V	.22	47uF - 63V	.08
600uF - 50V	.24	470uF - 50V	.19

Security Bits (10-lot)

Pioneer 6300 Oval Bit		$15.50
Jerrold-compatible bits		
1/4" Female Bit		$9.50
1/4" or 5/16" Bits		8.50
AVSAFE #4 round D series		14.50
TORX Bits		
Tocom	T - 7	$3.95
Zenith	T - 10, T - 15	3.95
Pioneer	T - 20	3.95
SA	T -20	3.95
Magnetic bit driver		4.75

Novaplex Converters (10-lot)

Novavision full-featured converter
Watch one channel and record another using inVIEW technology **$180**

Millennium multi-option converter
Configure the various optional packages to suit your specific needs **$62**

Remotes (10-lot)

Novaplex R1000 Universal Remote (lower prices)	
6-in-1 for TV, Cable, Satellite, VCR, Audio & More	$11.50
Jerrold-compatible 400/450/550	5.75
CFT 2000 (New item!)	7.50
Scientific Atlanta-compatible	
075 / 175	5.75
475 with volume control (lower prices)	6.25
8600 with on-screen display	6.25
Zenith-compatible (all Z-TACs)	6.00
Panasonic-compatibles	
120 /140 (lower prices)	7.75
170 with volume control	8.75
Pioneer-compatible for 81 / 82	7.00
Tocom-compatible (all models) (lower prices)	7.00

Dozens of other items in stock!

Panasonic-compatible topcases with lenses (lower price)	from	$7.25
SA-compatible cases	from	5.55
Toggle switches	from	.75
Batteries (9V, AA, AAA & more)	from	.15

Call for quantity discounts!

Kester Solder 44 Coresize	from	$8.45/roll
Jumper cables (1, 3 & 6 ft.)	from	.60
Jerrold-compatible bezels	from	.95
IC Socket/14 count (28-pin wire wrap)		1.19

Call for your free catalog! Call 1-800-644-NOVA today!

MasterCard VISA

Call Toll-Free 8am-6pm PST 800-644-6682

Novaplex, Inc. 8818 Bradley Ave, Sun Valley CA 91352
FAX: 818/504-6522 COD, MasterCard, Visa, Credit Terms

Panasonic™, Jerrold™, Zenith™, Tocom™, Pioneer™and Scientific Atlanta™ are trademarks of their respective corporations and are not affiliated with Novaplex, Inc.

Write in 200 on Reader Service Card.

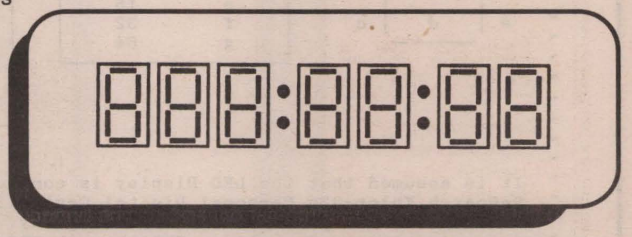
Understanding and Using Multiplexed LED Displays

by Thomas Henry

In order to provide information to the user, a digital or microprocessor-based circuit must employ an output device of some sort. This could be as simple as a single light bulb, or as complex as a color video monitor. Somewhere in between is the well-known seven-segment LED display. Such a device is excellent for representing numeric data. Of course, several of these can be grouped side-by-side to depict numbers composed of more than one digit. This article explains a convenient method for interfacing a multi-digit LED display to a microprocessor circuit.

Seven-segment LED displays come in two basic varieties: common-cathode and common-anode. In either case, seven bar shaped LEDs are distributed on a single block to form a universal pattern. By lighting various combinations of the LEDs, one can form the digits 0 through 9, as well as some upper- or lowercase letters of the alphabet (such as A, b, C, d, etc.). As the name suggests, with a common-cathode device, the cathodes of the seven LEDs are connected to a single pin, while each individual anode is brought out to its own private pin. This is reversed in the case of a common-anode unit. Since the working is similar in either instance, this article concentrates on the former arrangement.

So, each seven-segment display has a total of eight functional pins, one for the common cathode and the other seven for the anodes. Suppose we wish to design a display capable of representing a seven digit number. See Figure 1. Does this mean that we will have a total of seven times eight, or 56 wires emanating from the unit? Not necessarily! By utilizing a technique known as multiplexing, we can bring this unwieldy number of wires down to a much more manageable group of only 14.



▲ *Figure 1. Customized LED displays are easy to implement once you understand the concept of multiplexing. A seven-digit display like this could be used to show time, longitude, coordinates, etc. Even some limited alphabetic characters are possible since a microcontroller handles the segment decoding.*

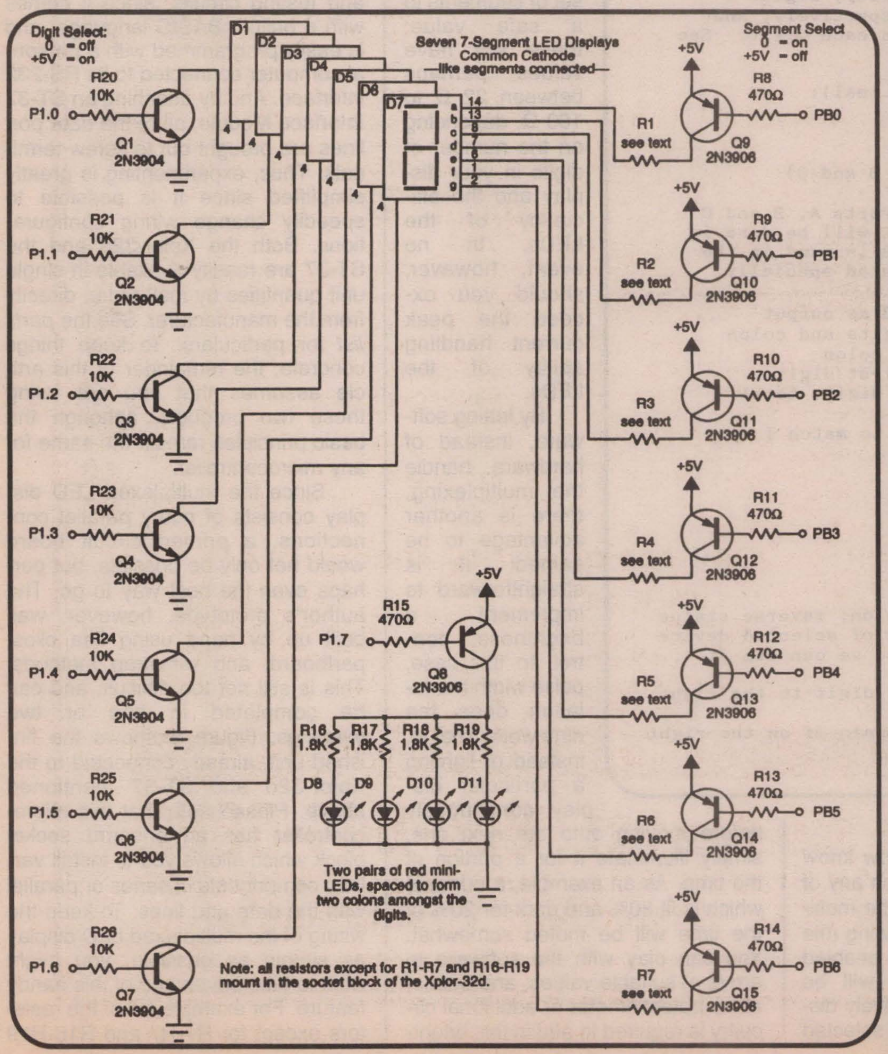
A Practical Example of Multiplexing

Refer to Figure 2. This schematic shows a complete circuit for displaying a seven-digit number, with optional colons as separators. Although the circuit looks complex, it really isn't, since many portions of it are merely repeated. Notice that there are two groups of seven control inputs; these are labeled P1.0 through P1.6, and PB0 through PB6. (These names correspond to the data ports on the microcontroller used by the author in his prototype.) Notice the 14 wires alluded to previously. If you wish, think of this arrangement as a matrix made up of columns and rows. The P1 lines each select a separate column (i.e., an individual seven-segment device), while the PB lines each select a row, that is, an individual segment LED within that device. By choosing a row and column, the LED at that intersection can be lit.

This circuit was designed to be driven by a microcontroller, and since most microcontrollers have limited output current capabilities, inputs P1.0 through P1.6 are buffered by transistors Q1 through Q7. Notice that applying +5V to any-one of the inputs turns on the associated transistor, which then grounds the cathode of its seven-segment display. In terms of logic, then, a 1 enables a display, while a 0 disables it.

For the same reason mentioned above, control inputs PB0 through PB6 are also buffered via transistors Q9 through Q15. In this case, grounding an input (a logical 0) causes current to flow through the transistor to the segment, while applying +5V (a logical 1) impedes the current flow.

It is a fairly standard convention to label the seven segments *a* through *g*, although the actual pinouts for the device may vary from



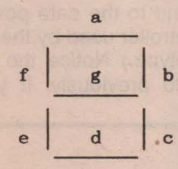
▲ *Figure 2. Schematic for a seven-digit LED display with a pair of colons.*

```
Test Program to Drive the
Seven-Digit LED Display with Colons
Author: Thomas Henry

Explanation: This program demonstrates the principle behind a
multiplexed display.  Performing at a slowed down rate, the
multiplexing action is clearly visible.  It simply lights the
seven 7-segment displays one at a time, while blinking the colons
on alternate counts. It can be used to confirm that all of the
segments and discrete LEDs are functional.  Later, you can strip
out parts of the code and modify them to perform practical tasks
in your own project, or use the BASIC program as an outline for
a fully functional assembler routine.

Once you start the program, which is a never-ending loop, type
CTRL-C to stop and exit to the command mode.

The 7-segment common cathode LED devices are labeled in the
following fashion.  The binary weight for each segment and the
decimal code required to show each of the ten digits are listed
in the accompanying tables.  (Note: A zero to each segment turns
it ON in this circuit).
```



Segment	Weight
a	1
b	2
c	4
d	8
e	16
f	32
g	64

Digit	Code
0	64
1	121
2	36
3	48
4	25
5	18
6	2
7	120
8	0
9	24

```
It is assumed that the LED Display is connected to a Blue Earth
Research Xplor-32d Personal Digital Controller.  The connections
are made to the ports in the following way.  Segments a through g
are connected to Port lines PB0 through PB6 respectively.
Counting from the leftmost digit of the LED display, digits 1
through 7 are connected to P1.0 through P1.6 respectively, and
the colons are connected to P1.7.  A one enables each digit.  See
the schematic for further details.

Required Port Addresses of the Xplor-32d (in decimal):

      Port 1          144   (digit select)
      Port B          8448  (segment select)
      Control Word    8960  (configures Ports A, B and C)

By writing the number 128 to the Control Word, Ports A, B and C
will all be configured as outputs.  This is what will be done in
the BASIC program below, even though only Port B is used in the
application.  Port 1 does not need to be configured specially.

10 XBY 8960 = 128              ~ configure Port B as output
20 DBY 144 = 128               ~ shut off all digits and colon
30 C=128                       ~ flag: status of colon
40 S=1                         ~ S now aims at first digit
50 FOR I=1 TO 7                ~ count through 7 digits total
~
60 GOTO 60+I                   ~ encode segments to match I
61 D=121:GOTO 70               ~ 1
62 D=36:GOTO 70                ~ 2
63 D=48:GOTO 70                ~ 3
64 D=25:GOTO 70                ~ 4
65 D=18:GOTO 70                ~ 5
66 D=2:GOTO 70                 ~ 6
67 D=120:GOTO 70               ~ 7
~
70 S=S OR C:C=C XOR 128        ~ factor in the colon; reverse status
80 XBY 8448=D:DBY144=S         ~ turn on segments of selected device
90 FOR J=1 TO 200              ~ kill some time so we can see it
100 NEXT J
110 S=2*S AND 127              ~ prepare for next digit to the right
120 NEXT I                     ~ do next one
130 GOTO 40                    ~ start all over again if on the right
~
999 END
```

manufacturer to manufacturer. In this circuit, all seven of the *a* segments are tied together; in a similar fashion all of the *b* segments are connected, and so on, up to the *g* segments. By choosing various combinations of segments to light at once, the numerals 0 through 9, as well as some letters and symbols, can be displayed.

So, at this point, we now know how to generate a pattern on any of the seven devices. To put the multiplexing into action, the following rule is obeyed: Only one unit is enabled at a time. The software will be designed so that it successively displays a segment pattern (as selected by PB0 through PB6) on D1, then a new pattern on D2, and so on up to D7. After this, the process starts all over again. If the rotational sequence is carried out fast enough, in the range of 400 Hz to 1000 Hz, then persistence of vision leads you to believe that all of the numeral displays are on at once! This is the secret of multiplexing.

Since each digit, in this case, is only lit for one-seventh of the time, its brightness must be increased to compensate. This implies that you will run the LEDs on a higher current than usual. Note that resistors R1 through R7 restrict the current flow through each set of segments to a safe value; these will have values perhaps between 22 Ω to 100 Ω, depending on the number of digits in your display and the efficiency of the LEDs. In no event, however, should you exceed the peak current handling ability of the LEDs.

By letting software, instead of hardware, handle the multiplexing, there is another advantage to be gained: it is straightforward to implement a brightness control. In this case, pulse width modulation does the dirty work. That is, instead of lighting a particular display continuously before moving onto the next one, simply illuminate it for a portion of the time. As an example, a numeral which is lit 80% and dark for 20% of the time will be muted somewhat. You can play with the software to arrive at suitable values, and best of all no potentiometer or additional circuitry is required to add in this brightness function.

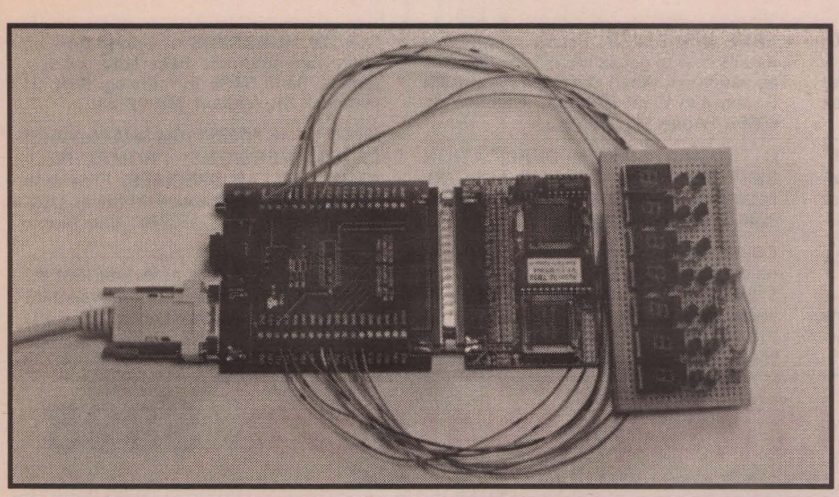
Before proceeding, refer to Figure 2 once more. For outputting time, longitude, latitude, and similar quantities, it is attractive to break up things with delimiting colons. These are easily implemented from scratch with pairs of mini-LEDs spaced appropriately. Control input P1.7 feeds R15, which switches Q8 on and off. A 0V input turns on the transistor, which then causes current to flow through LEDs D8-D11. Resistors R16-R19 keep the current at a reasonable level.

Building the Circuit

The first step in building the multiplexed LED display is to procure all of the parts. This should be quite simple, since only common, garden variety components are used. In fact, your junk box may provide a good proportion of them. Any remaining ones can be obtained at Radio Shack. See the *parts list* for complete details.

Of course, in order to test and use the circuit, you will need some sort of computer or microcontroller. The author's prototype was designed around the Xplor-32d Personal Digital Controller, manufactured by Blue Earth Research. This single board microcontroller is extremely convenient for designing and testing circuits, since it comes with a built-in BASIC language, and is easily programmed with a personal computer connected to its RS-232 interface. And by attaching an ST-37 Interface Module, all of the data port lines are brought out to screw terminals. Thus, experimenting is greatly simplified since it is possible to speedily change wiring configurations. Both the Xplor-32d and the ST-37 are readily available in single unit quantities by mail order, directly from the manufacturer. See the *parts list* for particulars. To keep things concrete, the remainder of this article assumes that you are using these two products, although the basic principles remain the same for any microcontroller.

Since the multiplexed LED display consists of many parallel connections, a printed circuit board would not only be possible, but perhaps even the best way to go. The author's prototype, however, was built up by hand using flea clips, perfboard, and wirewrap methods. This is still not too difficult, and can be completed in one or two evenings. Figure 3 shows the finished unit, already connected to the Xplor-32d and ST-37 mentioned above. Please note that this microcontroller has an onboard socket block which allows you to install various components in series or parallel with the data port lines. To keep the wiring of the multiplexed LED display as simple as possible, you might wish to take advantage of this handy feature. For example, all of the resistors except for R1-R7 and R16-R19



▲ *Figure 3. The seven-digit LED display has been attached to the Xplor-32d personal digital controller, by means of the ST-37 interface module. The white cable visible on the left connects the whole affair to a personal computer for programming and debugging.*

can be mounted on the socket block, greatly reducing the circuit board complexity.

Bring on the Controller and Software

As implied above, the multiplexed LED display is not an intelligent device; it depends upon a microprocessor and software to put it through its paces. Refer to the *program listing* now. This demonstration program has been written in the language TB52, a dialect of Tiny BASIC. Although the code was created especially to run on the Xplor-32d, it can probably be modified for other controllers and single board computers.

There are numerous program comments and explanations in the listing; these are indicated by the ~ (tilde). When typing in the program, you can ignore these comment lines, since the BASIC interpreter passes over them anyway. Thus, punching in the demonstration program should only consume several minutes. But do take the time to study the explanations. You will learn how the numeral codes are created, how data is written to the output ports, and how the different seven-segment displays are addressed. Remember, this is a demonstration program to be used for educational purposes or testing the unit. Any serious real-world application of a multiplexed display would have to be written in assembler, since the BASIC interpreter is far too slow. Recall that the modus operandi of this circuit is persistence of vision; if the scanning isn't fast enough, then the display will flicker, cause eye fatigue, or may simply be unreadable.

The manner in which you load the program depends upon what sort of microcontroller you are using. The Xplor-32d, exploited here, is easily programmed interactively by means of an RS-232 link to your personal computer. See the *Xplor Series User's Manual* (Mankato, MN, Blue Earth Research, 1994) for details, should you be duplicating the author's approach exactly.

Assuming that you entered the code as described above, and have finished up all of the electrical connections, you are ready to test the multiplexed LED display. Start the program running. What you will see is a greatly slowed down multiplexing process; each digit will light for about one second before moving on to the next. And the colons will blink on alternate seconds to confirm their operation. As mentioned above, to implement this as a practical circuit, you will want to recode the software in assembler. If this type of programming isn't up your alley, then help is at hand. As a service to readers, Blue Earth Research has agreed to post the assembler source and object code for a practical LED display driver on their BBS. The software is quite flexible, being usable with two to eight digits, and sports a dimming function as well. This service is available free of charge. See the *parts list* for details.

As we've seen, a multiplexed LED display has many advantages as an output device. It can be customized for specific applications, uses commonly available and inexpensive parts, requires very few connecting wires, and its operation can be readily modified through software. With all of these benefits at your disposal, why not try one in your next microcontroller project? **NV**

Parts List

Resistors

R1-R7	see text
R8-R15	470Ω
R16-R19	1.8K
R20-R26	10K

Semiconductors

µC — Xplor-32d Personal Digital Controller and power supply *(see source below)*

D1-D7 — seven-segment LED display, common cathode *Radio Shack 276-075*

D8-D11 — red mini-LED *Radio Shack 276-026*

Q1-Q7 — 2N3904 or equivalent, NPN transistor *Radio Shack 276-2016*

Q8-Q15 — 2N3906 or equivalent, PNP transistor *Radio Shack 276-2023*

Miscellaneous

ST-37 interface module for the Xplor-32d *(which allows breadboarding hook-ups and easy RS-232 connection to your personal computer; see source below)*, wirewrap, flea clips, solder, perfboard, etc.

Note: The following items are available from:

Blue Earth Research
165 West Lind Ct.
Mankato, MN 56001-0400
Credit card or C.O.D. order
(507) 387-4001, fax (507) 387-4008

Call for shipping charges and sales tax information.

- **Xplor-32d Personal Digital Controller** *(part number XP-01-D)* **$79.95**

- **ST-37 Interface Module for the Xplor-32d** *(part number XP-02-37)* **$29.95**

- **Xplor-32 Series Accessory Pack** *(part number XP-02)* **$49.95**

includes: standard personal computer interface cable (9-pin), 9 to 25 pin personal computer cable adapter, 9-volt DC power supply Xplor Series User's Manual and Binder, Xplor Series Applications Disk (3 1/2")

- **Xplor-32d Starter Package** includes all items above *(part number XP-03)* **$129.95**

As a service to readers, Blue Earth Research has posted the assembly language source and object code for a practical LED Driver on their BBS. It supports two to eight digits, and has a software intensity control. This service is available free of charge. Set your modem and software for No Parity, 8 Data Bits, 1 Stop Bit, 1200 to 14.4K bps and call **(507) 387-4007.**

From Auto-Routing to CNC Routing.....
Capital Electronics is Your Best Route For Printed Circuit Boards.

CAPITAL ELECTRONICS INC.

Design/Layout	*Printed Circuit Boards*	*Assembly Services*
• CAD Layout Services	• Single & Double Sided	• Fast Turn Board Stuffing
• Compatible With Almost All CAD Systems	• Multi-Layer & Flexible PCB's	• Wire Harnesses
• From Schematics or Sample PCB's	• From QUICK TURN PROTOTYPES to Scheduled Production Runs	• Wave Soldering
• Photoplotting Services	• Fine Lines, SMT	• Chassis Assembly
• 24 Hr On-Line Modem (Up to 19,200 Baude)	• Electrical Testing	• Acquisition of Parts
	• Precious Metal Plating	• Final Testing
		• Turnkey Services

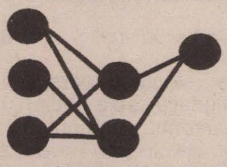
QUALITY IS OUR CAPITAL CONCERN

FOR QUICK & COMPETITIVE PRICING OR MORE INFORMATION, PLEASE CALL US TODAY!

852 Foster Avenue • Bensenville, Illinois 60106
(708) 350 - 9510 • Fax (708) 350 - 9760 • Modem (708) 350 - 9761

#60 COMPUTER SOFTWARE *cont.*

THE ULTIMATE LINUX DISTRIBUTION, SLACKWARE PROFESSIONAL LINUX 2.2. Linux a **UNIX** operating system, now available on this 3 CD-ROM set, includes GNU C/C++ compiler, X Window, TCP/IP, sound card support and much, much more. This release also includes Perfect Backup, a commercial backup program. Complete with 570+ page manual and 30 days of technical support. **Only $61.95.** ALSO available **LINUX STARTER BUNDLE** which includes Slackware Professional Linux 2.2, UNIX in a Nutshell handbook and the Essential System Administration handbook. **All for only $89.95.** To receive Slackware Professional or the Linux Starter Bundle, call and order with your charge card or send $61.95 plus $8 S/H for the Slackware Professional or $89.95 plus $11 S/H for the Linux Starter Bundle (CA residents add 7.5% tax) to: **JUST COMPUTERS!** PO Box 751414, Petaluma, CA 94975-1414. VISA/MC. Ph: 1-800-800-1648. FAX 707-586-5600.



NEURAL NETWORKS & Robotics. Neural Lab w/basic source code library $29.95. Learn to solve problems such as speech recognition, stock forecasting, pattern recognition and many more. Neural Lab "C" source code $29.95. Speech recognition, pattern recognition, financial market prediction, financial market prediction, and many more working examples included! Max Robot Base $129.95. Mobile base for home brew robotics. Postage included in prices, MO residence add 6% sales tax. Zagros Software, PO Box 460342, St. Louis, MO 63146-7342, 314-768-1328.

ENGINEERING PUBLIC DOMAIN SOFTWARE. For IBM PC's and clones. Printed circuit design, logic simulation, signal processing, pspice models, and autocad electronic symbols. Free catalog. Over 400 engineering programs. Sector Systems Company, Inc., 416 Ocean Ave., Marblehead, MA 01945. 617-639-2625.

COMPUTER PROGRAMS FOR Amway® PRODUCT DISTRIBUTORS

AMBIZ-PAK 3.1 IBM. Distributor Order, Distributor Bonus, Customer Invoice, 12-Column Ledger, Mailing List, PV Maximizer, Line Editor, Inventory Worksheet. Over 1500 sold. $39. Written by Emerald DD. Fred Blechman. VISA/MC. 818-346-7024 Pacific Time. (Amway Corporation does not endorse these programs.)

DISCOVER SOFTWARE vault! The world's finest collections of shareware on CD-ROM. Months of entertainment and thousands of programs on each low-priced disc. 12 available. Call 1-800-775-4232 or 918-742-2022 for free info!

SHAREREPAIR, E-MAIL tech support for TV-VCR technicians. For information, E-Mail: rhett@dump.com.

WHOLESALE: CLOSING out our CD-ROM inventory. Great bargains. For list call 716-392-5713 FAX/VOICE and mention CDs or write, Fabtronics, 5714 W. Wautoma Beach Rd., Hilton, NY 14468-9126.

SHAREWARE SALE. FREE CATALOG. Great Prices, bonus disks, CD-ROMS, + a free game on every disk catalog. Get your copy today! **DATA MATE**, PO Box 2811, Ronkonkoma, NY 11779.

FIX ANY PC Fast! Use DiagTech Software to test all major hardware components in your system. With DiagPost ROMs Fix Dead PCs. All tests are displayed on your video screen. BI-Tronix, 408-374-4518, POB 110233, Campbell, CA 95011-0233.

DATA CONVERSION 9-Track Reel to any format 1600/6250 BPI. $$ Best Price Anywhere! $$ 907-227-4637.

FREE DISKETTES! Brand new report details how to get as many free diskettes as you need! Wow! Order Now! Only $3! Bates, 426 West Belmont, Chicago, IL 60657. Phone 312-213-7023.

C THOMAS CD-ROM DUPLICATION SERVICES. Back up your Data to CD-ROM for $39. CALL FOR INFO, 310-925-8248. 9 to 5 only, please.

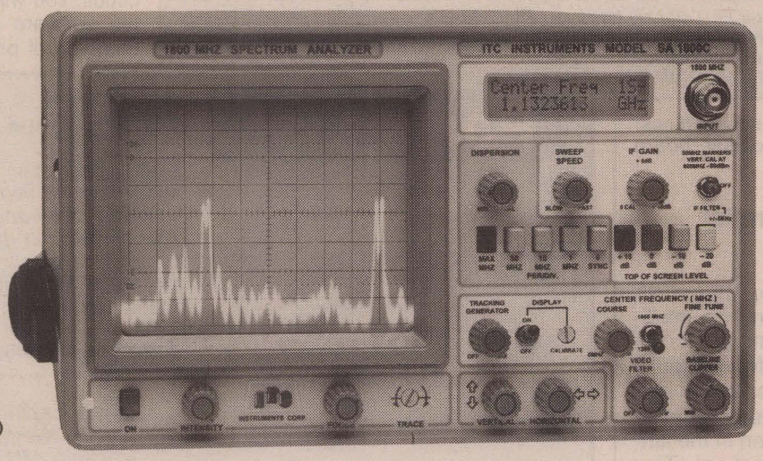
CD-ROM SOFTWARE. Discounted prices on our CDs. Many titles for $5, $7, $9 and $12 each. No up front fees. Call Andre for show locations we participate @ 619-720-1010 or write to: Amexpo Co., PO Box 2094, Carlsbad, CA 92018.

C64/128 HUNDREDS of public domain shareware programs, ham radio, utilities, games. Send SASE for catalog. RJR, 94 Hancock St., Malden, MA 02148.

SIMPLY THE FINEST IBM SHAREWARE! LATEST VERSIONS! PROMPT DELIVERY! DOLLAR SPECIALS! Free disk catalog! Specify disk size. Kathleen Lewis, c/o **PDUG,** Box 720396N, San Diego, CA 92172-0396.

ATARI 800/XL/XE Disk software! IBM PC software! Largest selections available! (209) 358-1160. Write to: Lots a Bytes, PO Box 1756, Winton, CA 95388. Catalogs Free!. Specify machine.

500 MHz SPECTRUM ANALYZER $895



6" x 12" x 16" (H x W x D) (only 16 LB)

SA1800C SHOWN $2295.00

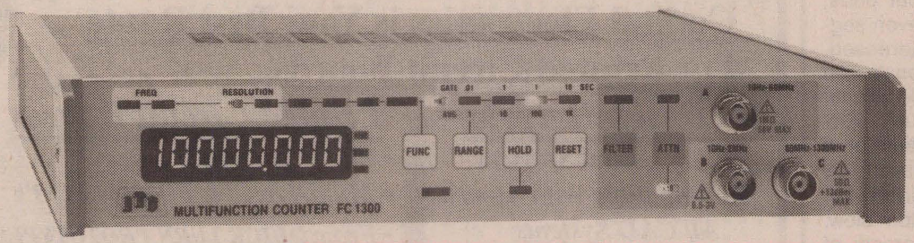
1-1300 MHz *In One Sweep* $1895 MADE IN THE USA

ALL NEW SPECTRUM DISPLAY MONITOR PLUS FULL FUNCTION SPECTRUM ANALYZER

LET THE SA500A SPOT THOSE HIDDEN SIGNALS The **SA500A** easily attaches to any receiver IF output jack. Providing a panoramic signal display of your 1-30 MHz and 30 to 2000 MHz scanner or communication receiver. The **SA500A** is a Professional Spectrum Surveillance Technology Monitor. A Full Function Spectrum Analyzer with +/- 5KHz Narrow Band Filter, Center Freq. Display, 50 MHz Marker Generator. Capable of Tuning Duplexes, Amps, Filters Receivers, Transmitters & Perform EMI, RFI, FCC, Testing. **SA500A** First affordable **Professional Spectrum Monitor/Analyzer** for all serious Ham Radio and Radio Monitoring Operators. just $895.00

.2-1.3GHz SA1300B THE ULTIMATE LOW COST ANALYZER **Quality & Performance** that's what **ITC Spectrum Analyzers** are known for. 80 dB on Screen, -110 dBm Sensitivity, Center Frequency Display, +/- 5KHz Narrow Band Filter (for 5KHz resolution band width) 50 MHz Marker. DISPERSION ZOOM, Baseline Clipper, Sweep Speed, Adjustable Video Filter, 40dB of Input Attenuation . Standard on all **ADVANTAGE** Spectrum Analyzer specials. The SA1300B and SA1800C provide Laboratory Performance at a fraction of the normal cost. The **SA1300B $1895.00 -SA1800C** .2-1.3GHz & .8-1.8GHz **$2295.00.** Add a 1.3GHz Tracking Generator to any unit

1.3GHz FREQUENCY COUNTER .001 ppm



$479.00

ISO9002 CERTIFIED
FIVE YEAR WARRANTEE
REG. PRICE $599.00
SAVE $120.00

Laboratory Performance PROCESSOR STABILIZED OVEN OSCILLATOR .001 ppm

ITC FC1300: ***the first truly*** **Accurate** ***low cost*** **Frequency Counter. Accuracy is the #1 Frequency Counter Requirement.** The $200 - $800 counters being advertised the past few years are but toys when it comes to accuracy. These **guess-so-matic** units are off 5 to 10 PPM over temperature & time (That's +/- 6,000 -13,000 Hz at 1.3 GHz) The **FC1300** is accurate to within **+/-13 Hz at 1.3 GHz 0-40 degrees C. Sensitivity is < 5mV 1Hz to 13 GHz,** 50 Ohm & 1 Meg Ohm inputs, LP filter, 1x -10x input Att. Frequency Measurement, Period Averaging, Time Interval, External Counter, Freq. Ratio, Hold & Reset Functions, 4 Gate times .01 to 10 Sec. Tired of **guess-so-matic** Counters: **Serious About Accuracy**: Ready to step up to **Laboratory Performance Accuracy**: Call Today & **Order**

Call 800-566-1818 To Order or Info. Free 1995 Catalog
ADVANTAGE
Carries a full line of Scopes - Analyzers Frequency Counters Generators LCR Bridges & DMM'S

ADVANTAGE INSTRUMENTS CORP. MASTER CARD -VISA - DISCOVER - AMX
3817 S. CARSON ST. # 818 CARSON CITY NV. 89701 Terms: COD - Check - Money Order
702-885-0234 FAX 702-885-7600 Call Toll Free 800-566-1818 - BBS 310-549-0321
PRICES & SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION. F.O.B. CARSON CITY NV. NV. RESIDENTS ADD SALES TAX.

Stamp Applications:

New Feature! Puts the Spotlight on BASIC Stamp Projects, Hints, and Tips

by Scott Edwards

This month's applications make an off-the-shelf numeric keypad for PCs do double duty; first as a serial data-entry terminal for the Stamp, then as a sneaky software method of getting Stamp data into your favorite PC applications, like spreadsheets and word processors.

Adapt a Keypad for Pro-Quality Data Entry; Included Software Lets the Stamp "Type" on Your PC

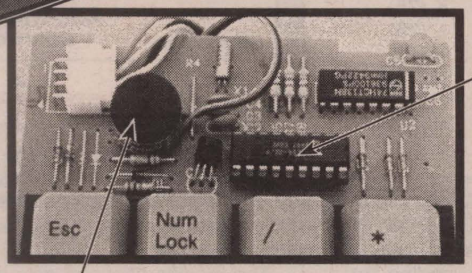
Hacking a Commercial Keypad

I've wanted to manufacture a Stamp-compatible keypad, but the cost of starting from scratch is daunting. A decent keypad requires good switches and a sturdy enclosure, both of which are very expensive in the small quantities that the Stamp aftermarket might use. There are occasional surplus bargains, but there's also the risk that the supply will dry up on the very day that Ultra-Mega Industries Inc. places a big order.

I recently found an accessory keypad for laptop computers — an ORTEK MCK-18S/N, made in Taiwan. It communicates with and is powered by a PC's serial port. Included software redirects data from the keypad to the keyboard buffer, so that it functions just like keys on the standard keyboard. The pad has 18 buttons, consisting of the numbers 0 through 9, decimal point, Escape, Num Lock, Enter, and the math operators (/, *, -, +). The keys are quality Alps switches with standard PC-style keycaps. The unit is enclosed in a nice flat-black case.

At $59.00 (see the source list), the keypad isn't cheap, but it's not unreasonably expensive either. So I bought one and proceeded to hack it. Here's what I found:

The heart of the keypad circuitry is a PIC microcontroller, just like the Stamp's own processor. This one runs at a leisurely 38.4 KHz; less than 1/100th the speed of a Stamp. This limits current draw to the 10s of microamps. It also helps the keypad meet FCC limits on radio interference.

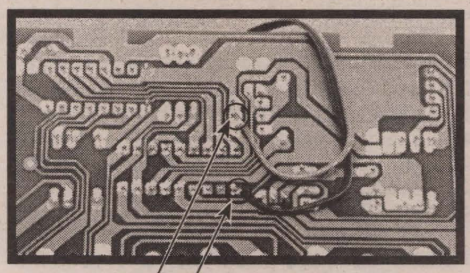


Carefully desolder and remove the original PIC from the board. Replace with the custom "Stamp Pad" PIC, using a socket if desired.

Figure 2

Install a piezo beeper (Radio Shack no. 273-074) for a "bink" response to each keypress. Attach hookup wire close to the body of the beeper, then trim excess lead length. Glue the beeper in place.

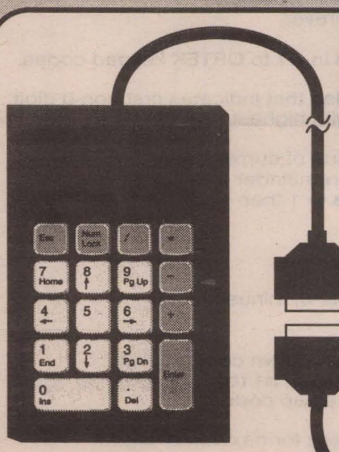
Details of the "Stamp Pad" modification.



Connect the beeper wires to pin 10 of the PIC (+) and circuit ground (–) as shown.

Beeper – lead.

Beeper + lead.



Connecting the serial keypad to a Stamp for data entry requires just one I/O pin, plus a few microamps from the Stamps power supply.

ORTEK Serial Keypad

Figure 1

When you press one of the pad's keys, its PIC sends a one-byte code (generally a lower-case letter) to the PC via an AT-style DB-9 serial connector. The serial data is sent at 1200 baud, with no parity, eight data bits, and one stop bit (N81). If you hold down a key, the PIC waits a moment, then transmits a string of the same one-byte key code in rapid-fire fashion to simulate the "typeamatic" response of the standard keyboard. When you release a key, the PIC sends a different one-byte code (generally the upper-case version of the key-down code). Table 1 summarizes the codes.

From an electrical standpoint, the keypad is wired to derive power from and send signals to the PC serial port. Its interface generates bipolarity RS-232 signals from the stolen port output voltages. However, the pad will work just fine with a single-ended five-volt supply, like that of the Stamp. See Table 2 for connections.

Armed with nothing more than the information above, you could make use of the ORTEK keypad for Stamp data entry. Figure 1 shows the hookup, while Listing 1 demonstrates how to make sense of the data. However, I couldn't leave well enough alone.

PC Keypad + Custom PIC Program = "Stamp Pad"

The SERIN command can convert strings of ASCII text like "123" into equivalent numbers without the additional programming effort of Listing 1. If only the keypad generated terminal-style output.

Instead of wishing, I picked up a soldering iron and removed the keypad's PIC controller. I probed the remaining keypad circuitry and determined the following:

> Like most keypads, this one is wired as a matrix of row and column connections. When a key is pressed, it shorts one row to one column. The processor looks up the row and column coordinates of the short in a table stored in ROM to translate it to a key code.

> The pad's column connections go to the four bits of PIC port RA, which are configured as

Table 1. Key Codes Used by Unmodified ORTEK Keypad

Key	Key-Down Code (ASCII value)	Key-Released Code (ASCII value)
1	' (96)	@ (64)
2	a (97)	A (65)
3	b (98)	B (66)
4	c (99)	C (67)
5	d (100)	D (68)
6	e (101)	E (69)
7	f (102)	F (70)
8	g (103)	G (71)
9	h (104)	H (72)
Esc	i (105)	I (73)
/	j (106)	J (74)
*	k (107)	K (75)
-	l (108)	L (76)
+	m (109)	M (77)
. (point)	n (110)	N (78)
0 (zero)	o (111)	O (79)
Enter	t (116)	T (84)
Num Lock	y (121)	Y (89)

Table 2. ORTEK Keypad Wiring

DB-9 Pin	Color Code	PC Function	Stamp Connection
2	orange	receive data	I/O pin (serial input)
3	yellow	transmit data	ground
6	white	handshake (DSR)	+5 volts
5	black	ground	ground

Table 3. Key Codes for Modified "Stamp Pad"

Key	Transmitted Text (ASCII value)
1	1 (49)
2	2 (50)
3	3 (51)
4	4 (52)
5	5 (53)
6	6 (54)
7	7 (55)
8	8 (56)
9	9 (57)
Esc	<ESC> (27)
/	/ (47)
*	* (42)
-	- (45)
+	+ (43)
. (point)	. (46)
0 (zero)	0 (48)
Enter	<RETURN> (13)
Num Lock	<SPACE> (32)

Table 4. Stamp-to-PC Connections for Listing 2

Stamp Pin	DB9-type Serial Connector	DB25-type Serial Connector
pin 0	2	3
GND	5	7

inputs. (On the Stamp, RA is used to communicate with the PC and manage the EEPROM. It isn't accessible to the user.) When no key is pressed, all bits of RA are pulled high (reading 1s) by four resistors.

> The pad addresses the row connections with the outputs of a 74HCT138 eight-channel multiplexer. This chip accepts a three-bit address from the lower bits of PIC port RB, and outputs a low on one of its eight outputs. Another bit of RB is used to activate and deactivate the '138. Bit RB.7 serves as the serial output. The remaining three bits of RB are unused.

Based on these observations, I coded a replacement PIC in assembly language. Thanks to the clever design of the hardware, this was extremely easy to do. Most of the effort went into preparing tables that unscrambled the row/column coordinate system of the pad, which was apparently designed to permit an inexpensive, one-sided circuit-board layout.

In addition to changing the data format with my new program, I added a hardware feature; a key-acknowledgment beeper. If an inexpensive piezo beeper is connected between pin RB.4 of the PIC and circuit ground, the beeper will make a short "bink" sound to acknowledge each key press. For applications that lack a display to confirm the numbers being entered, this is a tremendous help.

The modified keypad acts like a micro terminal that transmits one ASCII character per keypress (as shown in Table 3). The characters correspond to the Stamp's internal table of the ASCII character set. That is, the following line of Stamp code will respond to the code sent by pressing the "*" key:

```
IF theKey = "*" THEN Asterisk
```

My keypad PIC program has a strict debounce function that requires keys to be pressed and released in a deliberate manner. Speed isn't compromised, as long as users don't roll from one key to the other. The first key has to be released before the next will register.

You can make your own Stamp Pad. Figure 2 shows details of the modification. To use the modified pad, connect it to the Stamp as shown in Listing 1, then use Serin to collect the data. If, for in-stance, you want a 16-bit number to be stored to variable w1, use:

```
SERIN 0,N1200,#W1
```

The # symbol before the variable name tells the Stamp to interpret up to five keystrokes as a number ranging from 0 to 65,535 (the range of a 16-bit number). The user must press Enter or any

Listing 1: OR_KEYS.BAS (interpret ORTEK MCK-18S/N keypad codes)

```
' This program accepts serial data from the ORTEK MCK-18S/N numeric
' keypad and converts it into a 16-bit value in variable w1. Users
' must be careful not to hold keys down, or they will activate the
' pad's autorepeat function, causing entry errors.

' Main program loop.
Loop:
gosub GetKeys           ' Getkeys does all the work.
debug w1                ' Show the result on the PC screen.
goto Loop               ' Do it forever.

' Subroutine to receive the serial data, filter out extraneous key-up
' codes, and convert received data bytes to a 16-bit value. GetKeys
' will keep accepting and interpreting digits until the user presses
' a non-numeric key, like <Enter>. The routine takes advantage of the
' fact that the key codes for the numbers 1-9 are sequential;
' subtracting 95 from them leaves you with the number itself.
' Although0 (zero) is out of sequence, an additional IF/THEN
' statement recognizes its code ("o").
GetKeys:
let w1 = 0              ' Clear w1 to start.
Again:
 Serin 0,N1200,b0       ' Get code from the keypad.
 if bit5 = 0 then Again ' Bit5 is 0 in key-up codes; ignore em.
 if b0 <> "o" then skip ' Change 0 code from "o" (111) to 95.
 let b0 = 95
skip:
 if b0 > 104 then done  ' Non-numeric key pressed; we're done.
 let b0 = b0 - 95       ' Otherwise convert to 0-9, multiply
 let w1 = w1 * 10 + b0  ' old total by 10, add new value, and
goto Again              ' get the next digit.
done:
 return                 ' Done: return to main program.
```

Listing 2: FAKE_PAD.BAS (imitate the ORTEK keypad codes)

```
' This program mimics the codes produced by the ORTEK keypad,
' allowing a PC running the ORTEK software to receive Stamp data
' to its keyboard buffer. The Stamp "types" directly into programs
' that are incapable of normal serial input. To demonstrate this
' capability, the Stamp will count upward by 1 and type the result
' of each calculation to the PC. Remember that the keypad software
' must be installed on the PC for this to work. Before running
' this program, make sure that this program is saved, since the
' Stamp may begin typing numbers into it, if the keypad software
' is active.

SYMBOL nonZero = bit0       ' Leading-zero suppression flag.
SYMBOL code = b1            ' Key code to send.
SYMBOL decade = w2          ' Power-of-10 divisor for conversion.
SYMBOL count = w3           ' Counter for demo.

' Main program loop.
Loop:
 let w1 = count             ' Transfer value of copy to w1.
 gosub typeData             ' "Type" the data to PC.
 pause 100                  ' Wait briefly
 let count = count + 1      ' Increment counter.
goto Loop                   ' Do it forever.

' Subroutine to convert the value stored in w1 to ORTEK keypad codes.
typeData:
let nonZero = 0             ' Clear flag that indicates first non-0 digit.
let decade = 10000          ' Start with highest digit of w1.
nextDigit:
 let code = w1/decade       ' Get value of current digit.
 let w1 = w1//decade        ' Leave remainder in w1.
 if code=0 AND nonZero=0 AND decade <> 1 then skip3   No leading 0s.
 if code=0 then skip1
 let nonZero = 1
 goto skip2
skip1:
 let code = 16              ' Code for 0, minus 95.
skip2:
 let code = code + 95
 serout 0,N1200,(code)      ' Send key-down code of digit.
 let bit13 = 0              ' Clear bit5 of b1 (bit13) for key-up code.
 serout 0,N1200,(code)      ' Send key-up code.
skip3:
 let decade = decade/10     ' Get ready for next lower digit
 if decade > 0 then nextDigit
 serout 0,N1200,("tT")      ' Done. Send <Enter> key.
return
```

other non-numeric key to finish the entry. If you just want to know which key was pressed, use a byte variable without the #:

```
SERIN 0,N1200,B2
```

After the instruction executes, B2 will contain the ASCII value of the key pressed, as shown in Table 3. If you have used SERIN before to accept data from a PC or other computer, this stuff is old hat by now.

You can obtain the Stamp Pad PIC from me, either by buying it outright, or by obtaining the source code free with purchase of my *PIC Source Book*. This is a collection of assembly language routines for the PIC that mimic the functions of the BASIC Stamp, helping users to move their programs into faster, more efficient PIC hardware. See the source box elsewhere in this column.

But Wait, There's More!

Stamp Applications:

There's an expression about sausage makers using "every part of the pig except the squeal." In that spirit, I couldn't ignore the software that came with the keypad. It redirects codes from the serial port to the keypad buffer, allowing you to use numeric input from the pad in any DOS or Windows application.

It occurred to me that if the Stamp was programmed to mimic the key codes, and the keypad software was installed, then the Stamp could "type" data at the keyboard. Think about it — Stamp-collected data magically appears in your spreadsheet, database, or word processor document. No fumbling with terminal software or file transfers.

There are general-purpose software utilities and hardware devices sold for this very purpose, with prices from $100.00 to $500.00. They accept any kind of serial input, not just numbers. But if numbers are all you need, check out Listing 2. To use the program, install the keypad software according to the instructions that come with the pad. Temporarily disable the keypad driver by typing "KEYPAD OFF" at the DOS prompt. Connect a Stamp programmed with Listing 2 as shown in Table 4, but don't connect power to the Stamp yet. Next, turn on the keypad driver by typing "KEYPAD" at the DOS prompt.

You're ready to go. For a test drive, boot the BASIC Stamp host program STAMP.EXE, but don't load a program. Reconnect power to the Stamp. A column of numbers will be typed onto the screen. That's the Stamp, communicating with your keyboard buffer through the keypad software. Now you can write data-acquisition programs for the Stamp that can communicate directly with any piece of PC software you own!

By the way, the reason for the somewhat round-about set-up procedure above is to avoid trashing your work. When I wrote the program in Listing 2, I already had the keypad driver resident in my PC's memory, and the Stamp connected to the serial port. As soon as I ran the program, it began typing into my just-finished Stamp program listing. I had to quickly disconnect the Stamp, and erase all of the numbers it had added to the listing.

Conclusion

If you're interested in other keypad solutions for the Stamp, make sure to get Parallax application note no. 3, which shows how to connect a 74C922 16-key pad and an LCD to the Stamp. Looking for an interesting application for our serial keypad? Try Parallax application note no. 6, a stepper-motor driver that accepts serial inputs that can be entered directly from the Stamp Pad. To contact Parallax, see the listing in the Sources box. **NV**

Sources

The ORTEK keypad is available from Jameco (part no. 114841) for $59.95, plus applicable shipping and handling charges. To order or request a catalog:

Jameco Electronic Components
1355 Shoreway Drive
Belmont, CA 94002-4100
phone 1-800-831-4242 or 415-592-8097

For more information on the BASIC Stamp, contact:

Parallax Inc.
3805 Atherton Road #102
Rocklin, CA 95765
phone 916-624-8333; fax 916-624-8003
BBS 916-624-7101

The Stamp Pad PIC required to modify the keypad is $10.00 postpaid from Scott Edwards Electronics. Source code for the Stamp Pad PIC is free with purchase of *The PIC Source Book*, a cookbook of assembly language PIC routines based on the instruction set of the BASIC Stamp. Prototype your ideas with the Stamp, then convert them into fast, professional, one-chip solutions with the help of the cut-and-paste routines from the Source Book. Price is $39.00 postpaid. Order from:

Scott Edwards Electronics
964 Cactus Wren Lane
Sierra Vista, AZ 85635
phone 602-459-4802; fax 602-459-0623

Use Visa or MasterCard for phone/fax orders; checks, money orders, or POs from approved institutions also accepted. CODs and foreign orders incur additional charges.

Questions about this article? Suggestions for future topics? Contact the author at the business address above, or by E-Mail (CompuServe) at 72037,2612; Internet 72037.2612@compuserve.com.

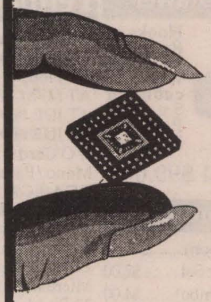
#60 COMPUTER SOFTWARE *cont.*

OPPORTUNITY KNOCKS If you own an IBM or compatible PC, this is the one you've been looking for. Use your PC for a local shopping guide. Advertise auctions, garage sales, grocery store specials and more. 8-10 easy Hrs a week nets potentially unlimited **$$$$.** For demo disk & business plan - send $5 check or money order to SRN, 2811 South St., Lincoln, NE 68502. Serious inquiries only.

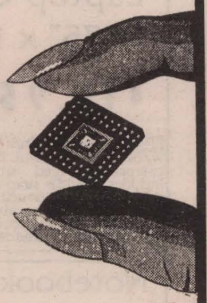
REPAIR SOLUTIONS - more than 15,000 VALUABLE, TIME SAVINGS, MONEY MAKING REPAIRS for servicing **TVs, VCRs CAMCORDERS** & other electronics, organized in an easy to use computer program - **The TIP REPAIR Program. PROFESSIONAL BOARD/COMPONENT LEVEL REPAIRS** with **Part numbers, component locations and values & test voltages** (when availble). **ADD** your own tips. **PRINT** tips. Works on **ANY** IBM compatible computer with a hard drive & 16 Megabytes free space. **NEW VERSION - works in DOS and WINDOWS.** Special introductory offer for **NUTS & VOLTS** readers. **Only $200! FREE Shipping** for prepaid orders. **FREE Demo! FREE Phone Call!** Have your own tips? Ask about our **TIP EXCHANGE** policy with **FREE Updates! 1-800-215-5081** (Mention **NUTS & VOLTS** when calling). **HIGHER INTELLIGENCE SOFTWARE, 60 Farmington Lane, Melville, NY 11747.**

WE BUY EXCESS ELECTRONIC INVENTORIES

Obsolete or Overstocked ICs, Damaged or Overstocked PC Boards, Hard Disk Drives, Anything Electronic . . .



WE PULL ICs FROM PRINTED CIRCUIT BOARDS



★ We have "IN HOUSE PULLING" facilities!
★ We BUY both socketed and soldered parts!
★ We BUY PC Boards for IC value!
★ WE BUY PC Boards for precious metal value!
★ WE OFFER "Certificate of Destruction."

Guaranteed quick response to all inquiries. . . If you have any surplus Electronic Inventory that you would like to

turn into call!

SPI *Worldwide distribution*

SEMICONDUCTOR
(818) 349-4495 • (818) 349-6562

Write in 102 on Reader Service Card.

COMPUTER PARTS - SCSI DRIVE ACCESSORIES - SURPLUS ELECTRONICS

QTY DISCOUNTS AVAILABLE* - GOVERNMENT/EDUCATIONAL PURCHASE ORDERS ACCEPTED - APPLE II / MAC & IBM

Tower & Desktop Cases

FullsizeDesktop Case..$49.00

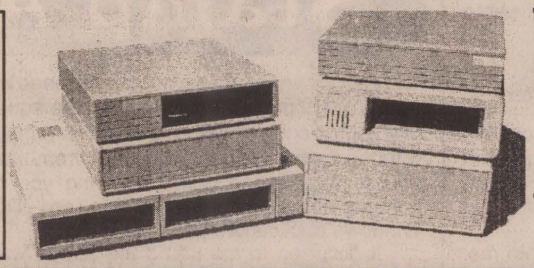
300W • 5 HH Bays • Built for Wang

Fullsize Tower Case

- 230W P/S
- 6 HH Bays
- LED's & Rst
- Fits Fullsize bd.

Great for servers & BBS's!

$49.00



External Floppy Drive Case

Made for PS/2 but modifiable for others. Power Supply & DB37 Cable included! Fits one HH 5.25" or 3.5" Drive

Made by IBM

$24.95

$19 - $65.00

Power Supplies

Mini Tower Power Supply. 145 Watts. Refurbished.....$20.00
New.....$29.00
XT Power Supply. 135W ...$25.00
IBM XT 65Watt P/S.....$5.00
300W. Tower or AT Type....$39.00
AT Power Supply. 200W Refurb.....$29.00
External 'Brick' type 5 Pin din +5 @ 1.3A, +12 & -12 @ .33A $9.95

FLOPPY & CD DRIVES

Used 360K 5.25" Drive.....$9.95
Used 1.2 Meg 5.25" HH $25.00
Used 720K 3.5" Drive.....$15.00
IBM PS/2 720K Drive OEM $29.00
5.25 --> 3.5 Floppy Adapter....$2.95

CD ROM Drives

Apple Ext. CD 150 SCSI 1x$149.00
Panasonic Int. CD SCSI 1X..$74.00
Panasonic Ext. CD SCSI 1X.$99.00

External Drive Enclosures • SCSI • CD ROM • Floppy • Computer Cases

External Floppy Drive Case 1 FH/2HH....$19.00
SCSI Case: Uses Apple 19 Pin floppy port for power. Quantum EPS type drive only!.....$19.00
Open Face HH SCSI Case. Use for a SyQuest, Bernouli, CD-ROM, etc $45.00
"Lunch Box" SCSI Case & P/S 3.5" Only..$35.00
Closed Face HH SCSI Case for 5.25/3.5" Drive. 30 Watt P/S.....$45.00
External MFM/RLL Case & P/S $19.95
FH Close Face SCSI Case & P/S for 1 Full Height 5.25" drive or two HH drives. $65.00
External CD ROM Drive case. 36 or 40 Pin. Specify CD Drive type. P/S and Fan $45.00
Desktop XT/AT Case & PS (150W). Reset & Turbo Switch, LED, 2 Exposed HH bays ..$29.00
Desktop PC Case (No P/S) $14.00
Side by Side open face SCSI Case. For two CD ROMs, or 1 CD & HD, or 2 3.5" HD..$59.00

Monitors

Open frame composite 9". B&W Monitor assembly. Build your own monitor.....19.00

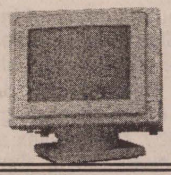
9" B&W Security Monitor. "Box" type with 75 Ω input.....$59.00

9" Composite "Box" type cabinet. Green screen. Good for security monitor. Input for 75Ω (standard) or High impedance.....$35.00

Color Composite Monitor. Not suitable for 80 column text but can be used for computer games, Nintendo, as a video monitor. Some have sound input also. Specify.....$69.00

Used/Refurbished Mono. DB9.....$29.00

Olivetti 9" Refurb. 9" MonoVGA with new tube installed. Mono VGA Monitor. Excellent for small places, where color is not needed. Makes a great POS terminal. Use for word processing, accounting and more! Standard VGA 640x480 resolution. Windows looks really good! Excellent Sharp Picture. Very Nice!.....$99.00



Monthly Specials

**** NEW ** 386DX/33 ** NEW ****

386DX/33 "Bare bones". Passive backplane type . Zero K. 8 SIMM sockets uses 1 or 4M simms. Built in IDE , Floppy, COM1/2, LPT1 Ports.
386 in Wang Full Size Desktop Case 300W P/S..$109.00
386 in Mini-Tower Case 230W P/S.....$109.00
386 in 6 Bay Full Size Tower Case 230W P/S.....$119.00
NEW VGA 256K.....$25.00 Upgraded to 512K ..$35.00
80387 -33 Math Coprocessor $25.00

Refurbished Systems

IBM XT Refurb., Mono., Kybd, 2 360K Drives ...$59.00
Tandem 286 Passive Backplane Type • Midsize Desktop Case • Mono Monitor • Kybd
8 Mhz • 1024K • 1.2M Drive $109.00

CHIPS & ROMs

80287-8.....$19.00
80387-33.....$25.00
V20-8.....$2.00 V20-10.....$6.00
16550 (Enh.serial port chip).....$13.00
82450.....$2.00 8250.....$1.00

RAM

4116, 4164 or short lead 41256 -12 or -15.....50¢
41024 (1 Meg x 1) .....$3.00 4 4256-80.....$4.00
256x8 -15 SIMM...$3.00 / -12.. .....$4.95
256x9 SIP -12. .....$5.95
256x9 SIMM -80.....$10.00

Batteries

1/2 AA size, 3.6V lithium.....$4.95
AT type "plug in" 3.6V or 6V $6.95

EPROMs & Microcontrollers

2716 or 2732 .....75¢
2764/27128/27256 .....$1.50
27512.....$2.00
271000 (32 Pin) $4.00
27010.....$6.00
8748.....$4.00
8749.....$6.00
8751.....$9.00

Alltech Electronics Co

2618 Temple Heights Oceanside, CA 92056
(Stores) 9-6 PM Mon.-Fri. - 9-5 PM Sat.

Phone Orders : VISA MasterCard

619/724-2404

Fax: 619/724-8808
School & Government POs Accepted!
Phone Order Hours 9AM - 5:30PM Mon- Fri

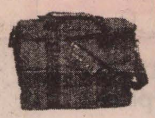
3 Southern California Locations!
Santa Ana - Lomita - Oceanside
1300 E. Edinger. Santa Ana - 714/543-5011
2018 W. Lomita BLVD. Lomita - 310/539-2260
1401 El Camino Real. Oceanside - 619/721-0093
We Buy Surplus and unwanted computer inentory.

Power Supplies
Monitors • Modems
Cables • Parts

Apple II
Service & Upgrades
Mac & IBM
****$10 Min. Order****

Laptop Carry Case 15.75" x 11.75" x 3"

$19.95



EPSON Carry case. Dark Blue w/black trim exterior. Non colapsable riged sides. Includes shoulder strap and separate 4" x 6" pouch for power supply or cables. Zippered external pocket. Extremly well built! Great deal!!

Laptop Carry Case 12" x 15" x 2.75"

$19.95

Zippered Exterior pocket 12" x 12" x 1". Carry handles & Shoulder Strap. Greyish color. Originally for Mitsubishi.

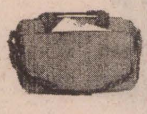
Notebook Carry Case 10.5" x 8.5" x 1.75"

$14.95

Exterior pocket 13" x 9" x 1.5" Simulated leather exterioror. Padded case. Black with lt. blue pinstripe, adjustable shoulder strap. Side flat pocket for papers, thin books. Originally for NCR

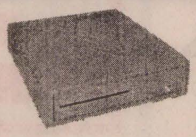
Combo Notebook Case 11.5" x 9.5" x 2.35"

$19.95



Combo! 2 Bag set. Other is 11.5"x9.5"x1.75" Two attach together with hooks and snaps. One side for computer, other holds papers, disks, etc. Adjustable Shoulder Strap

Fujitsu Cash Drawer



Hooks to Receipt printer w/RJ45 cable, or Serial Port Till included!

$75.00 / Serial $99.00

Cables & Connectors

IDE or Floppy (Flat ribbon).....$1. ea.
MFM/RLL/ESDI Cable Set $2.00
Int. Tapedrive cable (Jumbo).....$4.00
Power Y Cable. 4 Pin type.....$1.00
Power Extension 16". 4 Pin.....$1.00

Serial Link Cable

To link two computers for data transfer. Ends. Can be DB9 to DB9 or DB9 to DB25.....$9.95

SCSI Cables

3 Foot 25/50 SCSI Cable.....$9.95
50 Pin Pass-Through Terminator $5.95
50 Pin Single Ended Terminator..$3.95

Peripheral Cards / Accessories

101 Keyboard (NEW).....$29.00
5 Pin kybd to PS/2 adapter $2.95
AT Floppy, Serial & Par Controller $9.95
AT MFM HD & Floppy Controller.....$14.95
AT IDE HD Controller $4.95
AT IDE HD & Floppy Controller.....$7.00
I/O Card 2 Serial & 1 Parallel $4.95
Mono/Parallel Port.....$9.95
CGA/EGA Video Card.....$29.00
256K upgradable to 512K VGA Card $25.... w512K $35.00
8 or 16 Bit VGA Card (Specify) $19.00
Full Length CGA w/RCA out.....$14.95
16 Bit Backplane board.....$10.00
Microsoft InPort Mouse Card (only).....$9.00
32 Bit Mem Exp. (9 Meg/0K) SiliconValley $20.00
AT 2 Meg Mem. Exp Card w/2 Meg $35.00
101 XT/AT Keyboard.....$29.00
101 AT Keyboard.....$25.00
Keyboard Wrist Pad.....$1.95
Slot Expanders (3,4 & 5 Slot, vertical) $9.95
XT Multi I/O Card: Clock, Serial, Parallel, Game, Floppy.....$7.95
XT Motherboard w/640K $9.95
AT Motherboard $24.95
386 Passive backplane CPU board. 8 SIMM sockets. Uses 1 or 4 Meg SIMMS. 386DX/33. COM 1/2, LPT 1, IDE & Floppy. Auto HD Detecting BIOS $59.00

CA Residents please add 7.25% Sales tax. • Minimum shipping & handling charges $6.50. • Warranty: Used/Refurbished products have a 90 day warranty • ALL Returns must have an RMA #, call before shipping back to us. • No Returns without an invoice. Shipping & Handling charges are non-refundable • 20% Restocking charge, applies to products purchased in error & incompatibility problems. School & University Purchase Orders accepted, others on AOC only. • Prices and availability subject to change at anytime without any notification whatsoever..

Write in 50 on Reader Service Card.

#60 COMPUTER SOFTWARE *cont.*

DOWNLOAD THOUSANDS of Shareware programs by modem. 615-837-0342.

SELECTED SHAREWARE (MSDOS): All good. No disappointments. Many unique & unusual programs. Lots of electronics stuff. $1 disk. **FREE CATALOG** on disk. Includes catalog of restricted books on electronic surveillance, locksmithing, weapons, cable phreaking, hacking and more: Mentor, Box 1549-N, Asbury Park, NJ 07712.

WIN VIDEO POKER. Booklet and Windows or DOS software. For More information, Call: 408-274-2534, ext888.

EMATH
PRO VERSION

EMATH PRO electronic calculator utility. Contains over 325 formulas for all fields of electronic engineering. Solves for all variables with unique solutions. Extensive on-line help for every formula, including text, data tables, diagrams, and references. Units conversion and hardcopy capability. IBM PC/XT/AT and hard disk with 1.3M free space required. $29 plus tax for CA residents. Specify disk size. Send check to **PROTOTECH,** 5074 Pine Tree Terrace, Campbell, CA 95008.

HACKING DISKETTES: magstripe card cloner plans $10; thirteen different tone box phreaking programs $15; eighteen different sequential modem "war" dialers $15; electronic germ warfare and virus source code creation equal to 1200+ pages of text $15; convert any XK radar detector to jammer $10; celtel phreaking and cloning software $25. Free catalogue. Peregrine Dynamics, 720 Portage Trail, Cuyahoga Falls, OH 44221.

HELP! HELP! Have 20 3½ discs with info stored by S/C WD. Processor. (Now deceased!) format not compatible with any IBM PC drive. How to access discs? Convert info to ASC-II DOS format? Lee Lipsky, 12700 Josephine #103, Garden Grove, CA 92641. Phone/FAX 714-537-0437.

COMMODORE 64 Ham Programs, 8 disk sides, over 200 Ham programs, $16.95. 32¢ stamp gets unusual software catalog of utilities, games and British disks. Home-Spun Software, Box 1064-H, Estero, FL 33928.

APPLE-II SOFTWARE! Large selection! $1 a disk. Free catalog! PMA-NV2, Box 2424, Scottsdale, AZ 85252.

OBSOLETE SOFTWARE: VIC-20, Atari 400/800, Adam Coleco, TRS-80 I & III, Apple II, II+, IIe, TI. Send large SASE for list. Nortech, 100 Highland Ave., Lisbon, NH 03585.

HUBBLE TELESCOPE Photographs (GIFS) challenge QUASAR Theory (Series $9.99)+ $2 shipping. Entire public Hubble Series available. SPACEPICS, PO Box 75711, Oklahoma City, OK 73147.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmf/.

SPEED TUNING TIPS 12 set up tips to increase computer performance by 5 to 20 percent. Send $6 to Computer Care, 6905 Indian Bay Rd., Montague, MI 49437.

OVERLABELED 720K DS/DD disks. 5 disks for $1. 10 disks for $1.90. 25 disks for $140. We pay the shipping, you pay the COD. MSCRC Computers, 3243 S. 13th St., Lincoln, NE 68502.

RAW DEALS

International Overseas Distributing, Inc. sells many makes and models of raw cable units. Our inventory changes daily. Quantity Discounts.

1-800-890-8755

IBM SHAREWARE! Huge selection! Over 10,000 programs! $1 a disk! Over 1,000 35¢ program specials. Established dealer. Excellent ham radio selection. Please specify disk size desired. Free catalog! PMA-NV, Box 2424, Scottsdale, AZ 85252. Phone 602-496-6547.

CPM DATA files converted to DOS. 173 CPM formats readable. Your originals returned unaltered. SASE for information. Arman Publishing, Box 785, Ormond Beach, Fl 32175. 904-673-5576, FAX: 904-673-6560.

ESTATE PLANNING Software, legal forms, power of attorney, etc. IBM PC compatible. Send $1 for catalog to GD Enterprises, PO Box 292705, Ft. Lauderdale, FL 33329-2705.

I WANT it and I want it now. I want all of your SIMM memory. IBM, Mac, new, used, even defective. I want it all. Highest $ paid. Call 1-800-4-MEMORY now! Voice/FAX.

SAVE ON Shareware. Call **1-800-848-6974** for free catalog.

PC-SIG library 14th Edition CD $35 incl. S&H. JCSD Shareware Library on CD $15 incl. S&H. Both PCSig14 & JCSD $43 incl. S&H. PC Game Disk or Archive Disk with catalog $3.50 incl. S&H. (Specify DOS or Windows and disk size.) Texas Residents incl. 8.25% sales tax. Halpenny Sales, PO Box 543, Aubrey, TX 76227-0543, 817-440-2995.

LATEST SHAREWARE Hard to find technical, and engineering: anti-virus, assemblers, astronomy, BBS, emulators, programming tools/tutorials; electronics, PCB design, HAM radio, more! DOS/Windows. Virus free, 89¢ each. Catalog $1, specify 1.44MB or 1.2MB disk. Charles Santos, PO Box 121191, Arlington, TX 76012-1191.

HOT DEAL! 2 CD-ROM disks loaded with Windows/DOS Retail Programs and Demos. 1.2GB+ $20 M/O to: ACN, PO Box 232673, Anchorage, AK 99523-2673.

FREE DISK CATALOG and discount coupon! Inexpensive, quality, **IBM** Shareware and **CD-ROMS. (ASP)** Vendor: **MOM "N" POP'S SOFTWARE,** PO Box 15003-N, Springhill, FL 34609-0111. 904-688-9108.

CLOSING DATE FOR NEXT ISSUE MAY 10TH

COMPUTER EQUIPMENT WANTED 70

WANTED: COMPUTERS, parts to build, and software. Excess, used or obsolete stock. Any quantity. Anything computer related. Laptops, lasers, memory, drives, monitors, faxes, etc. 914-738-6830.

WANTED: PRE1980 Microcomputers for museum collection. Microcomputer magazines and manuals also needed. 703-231-6478, 703-763-3311.

$100 GOLD! There is a circuit chip made by IBM that contains more than $100 each in scrap gold, and another worth $20. Almost nobody knows this. They are just starting to show up in resale outlets and junk yards. You can score big with this knowledge. Complete info with photo $35 to: Jim Sciuto, Box 128, Methuen, MA 01844.

WE BUY DEAD HARD DRIVES 100MB or greater. 907-227-4637 or 907-349-7116.

CRAZY BOB'S
Lowest Prices - Fastest Service

Only $19

Internet Access is the only Internet CD to include Tutorials, Tools, Information Files, & Navigational Aids.The 1995 version now includes Mosaic,Cello, and Winramp internet access programs and the 1995 Internet Guide

2 CD Set Only **$19**

Games To Treasure is the action packed, two CD set filled with arcade hits, flight simulators, board games, crosswords,cheats, card games and much more. Dare to take the challenge!

Only $15

Ham Radio + now includes the Amateur Radio Call Sign Directory, Mail List Down Loading, Packet Radio, Frequency Lists, Equipment Mods, FCC Regulations, Exam study, SSTV,FAX, CW Practice, Plus lots More! This is the most comprehensive Ham Radio resource ever published!

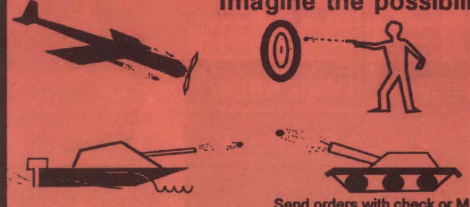
EnviroMedia Preformatted HD 3.5" Floppy Disks as low as$.24

Hundreds of CD Titles
Call Today for Free Catalog!
800-410-BOBS(2627)
email to nutvolt @ crazybob.com

50 New Salem St.
Wakefield, MA 01880
Tel 617-246-6767
Fax 617-246-6776

Add *FIREPOWER* to anything!

AMAZING NEW ELECTRONIC GUN
has only one moving part - *the projectile!*
Imagine the possibilities!



This simple, silent, and inexpensive project uses parts mostly available from Radio Shack and can be built in as little as 30 minutes. The same principles can be used to build a silent weapon with deadly force! Complete plans only $15.00 ($20.00 Canada and Mexico). Order #GGUN.

HoopsWare
P.O. Box 3079, Dept. NV
Sparks, NV 89432-3079
or Call (702) 322-6875

Send orders with check or M.O. to:
VISA & MC Accepted

Alarm Controller Chip

Amazing new part handles up to 4 zones plus 1 Panic/24hr input, Adjustable Entry, Exit, and Alarm Delays. Very low power operation and requires few external parts for a complete alarm system. Chip and application note only $15.00 ($20.00 Canada and Mexico). Order #ACPIC.

Home Automation and Security System

The inexpensive but powerful home automation system you can build yourself. Uses an inexpensive PC/AT compatible to SENSE events and then control lights, appliances, heating/AC, sprinklers and more! Interfaces to common X10 modules and has Relay closures too. Most parts available at Radio Shack. Plans and software only $20.00 ($25.00 Canada and Mexico). Order #INTROL1.

3-D Stereogram Generator for 3-D Mosaics

You've seen them in shopping malls and novelty stores, groups of people huddled around a picture which looks like a mosaic pattern of dots! Yet if you stare at these patterns in the right way, a dramatic 3-D picture comes to life. This amazing program lets you create and print these patterns yourself with your PC computer! The possibilities are endless and you could make some money too! Software only$20.00 ($25.00 Canada and Mexico) Order# HW3D

100% Satisfaction & Free Shipping

Resellers Dealers Welcome

Orders 24hrs Tel: 800-899-6430

Orders 24hrs Fax: 800-745-1670

ALL Motherboards w/CPU:

386 SX40 MHZ	$55
386 DX40 MHZ/128K	$89
486 SLC33 MHZ	$75
486SLC50 MHZ	$95
486 SLC40 MHZ VESA	$95
486 SLC 2-66 VESA IBM w/64K	$139
486 75 MHZ VESA IBM w/256K	$229
486 DX33 MHZ W 256K VLB	$199

PENTIUM READY T24

4 ISA & 3 VESA SLOTS

486 DX66 MHZ W/256 VLB	$259
486 DX2 80 MHZ W/256	$289
486 DX 2 100 MHZW/256K	$298

Floppy Drives:

1.44	MITSU	$29
1.2	MITSU	$39
1.44	TEAC	$31
1.2	TEAC	$42
1.2/1.44	COMBO	$84

Member of Better Business Bureau

Tapebackup Drives:

CORE 250MB	$119
COL(DJ 20) 250MB	$139

Math-Co $23

Monitors:

14" MONO.VGA	$84
14" SVGA 39 DP 1024x768	$185
14".28 1024x768 NI, LOW-R	*$205*
15".28 1024x768 NI, LOW-R	*$305*

HARD DRIVES SPECIAL

214MB $159	420MB $175
730MB $239	540MB $189
850MB $259	1GB $449

Keyboards:

101 KEYBOARD	$15
101 SPILL PROOF	$15
KEYTRONIC	$23
FOCUS 2000/2000+/8000	$CALL

VGA Cards:

VGA 256K	$27
TRIDENT SVGA 512K	$38
TRIDENT 1MB	$59
CIRRUS-LOGIC IMB WIN ACC	$59
VESA VGA 1MB EXP 2MB	$71
PCI VGA 2MB DRAM	$145
ANY OTHER VGA CARDS	PL CALL

Controller Cards:

IDE CARD (2FD/2HD)	$11
I/O (2S,1P & 1G)	$11
SUPER IDE-I/O (2S,1P & 1G)	$12
VESA IDE-I/O (ENHANCED)	$19

Modem/Fax Modem:

MX-96/96/24	$29
FAX/MOD. 14.4	$49
FAX/MOD. 28.8 V.34	$139
Voice M /Fax /Mod 14.4	$85
Voice M /Fax /Mod 28.8	$call

1 MB SIMM $35.95

Cases with P.SUPLIES

MINI TOWER CASE PREMIUM	$41
DESK TOP CASE PREMIUM	$45
MED TOWER CASE PREMIUM	$59
FULL TOWER CASE PREMIUM	$79

C.O.D Govt P.O. VISA MasterCard

Buy with Confidence Risk Free 30 days Money Back

WE DO CARRY COMPLETE SYSTEMS

Printer Memory.

ONE YEAR WARRANTY ON PARTS LIFE TIME Labor Warranty

AMERICAN EXPRESS

Terms: No minimum Charge No Hidden Charge Prices change w/o Notice 15% Restock fee for Non Defective Orders of $950 or more ground shipping free. Except Case,Monitor,Keybord & F. Drives

C.D. Rom QUAD Speed

Mitsumi/Sony	dbl sp	$115
Teac Quad sp (4x sp)	IDE	$219

All Kinds Drives , Sound Cards Speakers and CD Titles: Please Call

Mother Boards with CPU

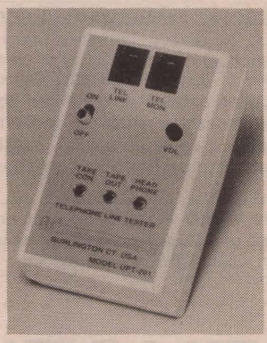
Pentium 66 MHz w/CPU	$469
Pentium 90 Mhz w/CPU	$749
Pentium100 Mhz w/CPU	$945
Pentium 120 Mhz w/CPU	$CALL

Bisme Computer, Inc 1298 Reamwood Ave Sunnyvale, CA 94089 Tel: 408 745-7203

Write in 44 on Reader Service Card.

UNDETECTABLE PHONE TAP

- SOPHISTICATED ULTRA HIGH IMPEDANCE CIRCUITRY AS USED BY CIA AND KGB
- NOT DETECTABLE BY EVEN THE MOST ADVANCED TAP SWEEPING EQUIPMENT
- MONITOR CONVERSATIONS, FAXES AND DATA WITHOUT FEAR OF DETECTION
- PLUG INTO ANY TELEPHONE LINE WITH NO CLICK, HUM, NOISE OR VOLTAGE CHANGE
- UNIVERSAL DESIGN ALLOWS MONITORING WITH HEADPHONES, TELEPHONE OR TAPE RECORDER
- VOICE ACTIVATED TAPE RECORDER CONTROL
- DISGUISED AS "TELEPHONE LINE TESTER"
- COMPACT SIZE - BATTERY POWERED



$109.95 VISA MC COD

Ar² Communications Products

Box 1242 Burlington CT 06013

VISA MasterCard

(203) 485-0310

Write in 103 on Reader Service Card.

WANTED: APPLE 1, Mark 8 and early microcomputers. Also journals for museum. PO Box 341, Floyd, VA 24091. 703-231-6478, 703-763-2321.

I WANT it and I want it now. I want all of your SIMM memory. IBM, Mac, new, used, even defective. I want it all. Highest $ paid. Call 1-800-4-MEMORY now! Voice/FAX.

PRINTHEADS WANTED. We buy all quantities of dot matrix printheads for hundreds of printer model types. Working or dead units acceptable. Call Mike Anderson @ 800-969-0009.

WANTED: TRACTOR feeds and sheet feeders for Tandy DWP-II and Alphapro 101. Richards, PSC81, Box 82, APO, AE 09724.

WANTED: TERMINALS + PRINTERS: DEC, Wyse, IBM, ADDS, Okidata, Data South, Epson, C.ITOH, etc. Call for quote on any surplus computer equipment. Call Jeremy, 603-673-8077.

DEC EQUIPMENT WANTED! We are buying DEC systems, boards, terminals, drives and peripherals. Also Scientific Micro Systems (SMS), DSD, Datability, Dilog, other DEC compatibles, and Computer Output Microfilm (COM) units. Please call for a quote or fax us your equipment list. We buy, sell, and trade. **COMPUTER KEYWAYS,** 513-847-2300 or FAX: 513-847-2350.

WANTED MFM Hard drives: Maxtor XT1085, XT1140, XT2190, Seagate ST 125, ST 138, ST 251, ST 1110, Toshiba MK134FA, NEC D3142. Call 714-542-1037 or FAX 714-835-1575.

WANTED TO get in touch with any user of the 6800 or 6809 S50 bus computer systems. Including hardware and software items. Special interest in SWTPC 6809/S09 system multi-user system. John J. Fiorino, Box 153, Brooklyn, NY 11209.

WANTED: DEFECTIVE COMPUTER MONITORS (50-300) VGA OR SVGA, ANY **RMAS,** ANY FREQ., ALL SIZES. 714-532-5660, FAX 714-532-3015.

WANTED: IBM PS/2 Model 25 starter diskette, technical and maintenance books or any other manuals for this computer. Send particulars and prices. Ronald Bauman, 711 Faulkner Street, New Smyrna Beach, FL 32168-6423.

HP-85, 86, 87, accessories needed. Assembler ROM with global files software. HP 82928A system monitor, BCD and GPIO modules and manuals. Arnold Allen, 423 South Highland, Ada, OK 74820. 405-332-8044.

HEATHKIT WEATHER STATION ID-4001 micro-processor IC, Heath PN 444-23 needed. Arnold Allen, 423 South Highland, Ada, OK 74820. 405-332-8044.

WANTED: ANY type of C or Basic compiler or assembler for the Intel 80860XR or 80860XP micro processor, also data books, in circuit emulators, 80860 chips, boards with 80860 chips. Dan Mathias, 106 Commerce Way, A8, Jupiter, FL 33458. 407-575-1487.

WANTED TO BUY: IBM and MacIntosh computers, printers, hard drives, peripherals, CPUs, notebooks, any quantity, in working condition. Call 714-778-0450.

WE BUY computers and computer parts. No order too small or too big. We pay the shipping. Call for a quote at 402-421-3956. Hours are 1PM to 10PM CST. Call MSCRC Computers, 3243 S. 13th St., Lincoln, NE 68502. We buy computer stuff.

BATTERIES

REPLACEMENT BATTERIES
(ALL NEW—MADE IN USA)

ICOM

7S 13.2v 1200 mah	$54.00
8S 9.6v 1200 mah	$52.00
BP7 13.2v 600 mah	$59.00

SA/SAT

BP82 7.2v@300 mah 1½"	$84.00
BP83A 7.2v 750 mah	CALL
BP84 7.2v 1000 mah 3"	$40.00
BP85B 12v 600 mah 3"	$69.00

KENWOOD

PB1 12v 1000 mah	$59.00
KNB4 7.2v 2200 mah	$59.00
PB6 7.2v @ 750 mah	$46.00
PB7 7.2v 1500 mah	$55.00
PB8 12v 800 mah	$49.00

NEW CHARGERS

FAST AND STANDARD DESK CHARGERS FOR YAESU, KENWOOD, ICOM, ALINCO AND MOTOROLA. THESE "SMART" CHARGERS WILL RAPID CHARGE 6 VOLT TO 12 VOLT BATTERIES IN 1/2 HOUR TO TWO HOURS (DEPENDING ON BATTERY CAPACITY).

MANY ADVANCED FEATURES NOT AVAILABLE ON ANY OTHER CHARGER.

SPECIAL INTRODUCTORY PRICES. MADE IN USA.

YAESU

FNB-2 @ 600 mah	$19.00
FNB-4 12v @750 mah (4")	$39.00
FNB-4A 12v 1000 mah	$55.00
FNB-17 7.2v 600 mah	$30.00
FNB-10S 7.2v 1000 mah	$42.00
FNB-12S 12v 600 mah	$45.00
290 charger (For FNB 17, 10S, 12S)	$65.00

NOW AVAILABLE

★ ALINCO 580 ★

EBP-20N 7.2v @ 800 mah
EBP-20NX 7.2v @ 1500 mah
EBP-22N 12v @ 800 mah

ALINCO EDC-34 Rapid Charger $84

INSERTS

CALL FOR LOWEST PRICES

ALINCO 10N, 12N
AZDEN 3000, 4000
ICOM BP-2, 3, 5, 7, 8, 7S, 8S
KENWOOD PB-21, 21H, 25, 26
REGENCY MT1000, HX1200
SANTEC 142, 144
STANDARD BP-1
TEMPO S-1, 2, 4, 5, BP-15, S-15
TEN TEC 2991, 2591
UNIDEN (BEARCAT)
YAESU 10S, 12S, 17

CAMCORDER

CANON	
8mm 2000 mah	$36.00*
Digital A 1	$45.00
JVC	
Type C	$36.00
PANASONIC	
PVBP80/88 12v 2.3 amps*	$36.00
RCA/HITACHI/MINOLTA	
Full size	$42.00
8mm @ 2000 mah	$36.00
SONY	
NP-22	$25.00
NP-77H @ 2400 mah	$42.00

ALL BRANDS AVAILABLE
*original Panasonic

*ALL BATTERY PACKS—GUARANTEED TO HAVE THE ADVERTISED CAPACITY

SEND FOR FREE CATALOG

DEALER INQUIRIES WELCOME

BATTERY-TECH, INC.

28-25 215 PLACE, BAYSIDE, N.Y. 11360 FAX 718-461-1978

800-442-4275 — N.Y.S. 718-631-4275

VISA MASTER CARD DISCOVER

Write in 45 on Reader Service Card.

LINUX Operating System On CD-ROM

A UNIX System with extra features for a lot less!!!

Slackware Professional Linux v2.1 **$57.95**
3 CDROM Set * 570 page Manual * Ready to run from CDROM * X Window C/C++ compiler * Emacs * Internet Tools * Complete Source Code

SWiM Motif v2.0 *NEW RELEASE* **$179.95**
A 100% OSF/Motif compatible graphical user interface X Window Manager for PC's running Linux.

The Linux Bible 2nd Edition **$34.95**
1100 pages of Linux documentation * Includes Installation and Getting Started guides.

A Wide Variety of Products Available from Yggdrasil, Walnut Creek, InfoMagic, O'Reilly & Associates, and others...

Just Computers! (800) 800-1648 Int'l (707) 769-1648 FAX (707) 765-2447
E-mail: sales@justcomp.com
P.O. Box 751414 Petaluma, CA 94975-1414 C.O.D. & Visa/MasterCard Gladly Accepted
For further info about products, send e-mail to: info@justcomp.com (include word "help" in message)

Please inquire about shipping and handling charges

Write in 46 on Reader Service Card.

WANTED: COPY II PC enhanced copy board for IBM. Working condition, with software. Already have option and regular versions. Board will have a button/switch in the rear. 414-458-2705.

WANTED: WORKING Texas Instruments Omni 800/model 830 printer. Also need chip pulls 8751H and 8749H. Call CJ Stafford at 301-419-3189 or FAX: 301-419-3661.

TEST EQUIPMENT 80

NEAR NEW Condition, HP 4800A/4801A Vector Impedance Meter $425 and HP4815A RF Impedance Meter $600 with probe, $450 without probe. **3455A** 6½ digits multimeter $485, fine condition. Psitech Plus, 707-745-4804, FAX 707-747-5277.

TEST CHAMBER 1.2 CUFT (-100°F to 350°F) **Thermotron S12** needs work. Call 215-332-0318. Frank. $750. **Benchtop**.

ENI AMPLIFIERS Buy-sell. Call, 908-280-0007, Tech-Systems.

IFR 500/500A WANTED. Must be in excellent physical and operating condition. Ask for Spence Porter, Communications Specialists, 1-800-854-0547.

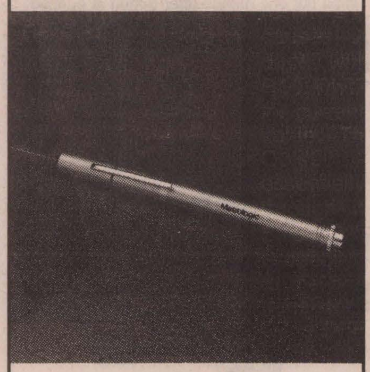
SWEEP SYSTEMS, Hewlett Packard **8620C**, $450; 8620A, $375. **86242D** 5.9-9.0GHz RF plug in $475. **86290B** 2-18.6GHz+10bBm leveled, $1,450. **WILTRON** 610C, 610D, $375; 6130 insert 12.4-18GHz $425, with 30 day guarantee manuals and scales, will be shipped from out East Coast facility. Hewlett Packard **8614A** signal generator .8-2.4 GHz, $500 **8616A** signal generator 1.8-4.5GHz $450; both for $825. New HP Coaxial switch 33311B $65 ea. Call for FAX list of surplus test equipment. Psitech Plus, 707-745-4804, FAX 707-747-5277.

WE NEED your surplus electronic test instruments!! 1-800-435-1516 or FAX 908-280-0111. To: Bill, Tech-Systems.

TEKTRONICS OSCILLOSCOPE 465M-100MHz. $425. TEKTRONICS SPECTRUM ANALYZER 491 10MHz to 40GHz $995. This equipment has been reconditioned and is in good working condition and is guaranteed for 90 days. ISA, PO Box 6955, Laguna Niguel, CA 92607. 714-495-5566 or FAX 714-495-4742.

HP 415E new in box, late model with option -001 (Battery Operation) $395, HP 11679A 25 ft. Extension cables for HP 8755, 8756 or 8757 Series, new in box, $50, List price $130. HP 7550A High speed plotter $395, Tek P6046 FET probe $595 complete w/all accessories. Weller TC202 Soldering stations $40 each. Call Test Equipment Sales, 603-434-2544.

Laser Pointer only $49.95



Metrologic's pen-sized laser pointer is the perfect tool for business presentations or educational experiments.
(AAA batteries included).
• Laser education kit for $20.00.

Call now to order!

Add $5.50 shipping plus state sales tax (NJ, CA, TX, GA, & IL)

1-800-ID-METRO
Metrologic Instruments, Inc.
Coles Rd. at Rte. 42, Blackwood, NJ 08012

Write in 47 on Reader Service Card.

PRINT T-SHIRTS FOR FUN OR PROFIT!

With your computer!

FAST, EASY with Heat Transfer Printer Ribbons!

1. Put Ribbon into your printer.
2. Print message or design onto regular paper but print it in a mirror image. (Print Shop and other programs have this capability.)
3. Place paper face down on T-shirt and iron the back of paper to transfer the image.

Available in red, green, blue, or black at **$10.95** each for the following printers *(specify make and colors wanted)*: Panasonic 1080/1180/1090/1190/1123/1124; IBM Proprinter; Epson MX/FX/RX 80/85/86e/LX800/LQ500/LQ510/LQ570/L1000; Star NX/NL/ NP10; Seikosha SP800/1000, Tandy DMP130; Apple Imagewriter, Citizen 120D/180D/GSX140; Okidata 182/192/320.

$11.95 each for Epson MX/FX-100/286e, LQ1000/1050, LQ2500/2550/EX800/1000/LQ860, AP3250/LQ100 Star NX1020/2400/2410/2415/2420, Panasonic KX-P 2180/2123/2124/1624/1524, Toshiba P321/351/1340. **$5.95** each for Okidata 82/92/83/93, Gemini 10X/15X.

Available in **BLACK** only at **$10.95** each for Star NX1000, NEC P2200, Commodore MPS-801.

Available in 4-Color Heat Transfer for Imagewriter II, **$12.95**; Star NX1000 **$14.95**; Star NX1020 **$23.95**; Star NX2420 **$23.95**; Star NX2450 **$23.95**; Citizen GSX-140 **$23.95**; Epson LQ2500/2550/EX800/1000 **$16.95**; Fujitsu DX2100/2200/2300/DL 3300/3400/3600 **$27.95**; Panasonic KX-P 2180/2123/2124 **$23.95**.

HEAT TRANSFER MARKING PENS

Add colors to the computerized design or use alone. Set/5 Colors (red, orange, yellow, green, blue) wide pens **$15.00**, narrow pens **$14.00**.

HARD-TO-GET PRINTER RIBBONS

Gorilla Banana, Commodore 1525 **$8.00**; Adam Coleco **$12.00**; TI-850/855 **$6.00**; Centronics 700 Zip Pack **$5.00**; C. Itoh Prowriter Jr., Riteman C+/F+ **$6.00**; Riteman Inforunner **$8.00**; Commodore MPS-801 **$5.00**; MPS 803 **$5.00**; Decwriter LA30/36 **$4.00**; Apple Scribe **$4.00**; Mannisman Tally Spirit 80, Commodore 1526 **$5.00**; Epson JX-80 4-Color **$14.00**. Printronix P-1013 **$11.00**.

Over 200 different ribbons in stock. All ribbons new, not re-inked. Fully guaranteed. Order directly or send SASE for complete list.

Add $2.00 per order shipping. California residents add 7.75% sales tax. On ribbon orders over $30.00 deduct 10% discount.

H.T. ORR Computer Supplies
249 Juanita Way, Placentia, CA 92670
714-528-9822
800-377-2023
FAX **714-993-6216**

Write in 48 on Reader Service Card.

SYNTAX-J *The State of the Art in Cable Solution*

100% DIGITAL TRI-MODE PANS

- ***Replaces TNT, TVT, STEALTH, etc.***
- ***No flash, flicker, waves or troubles***

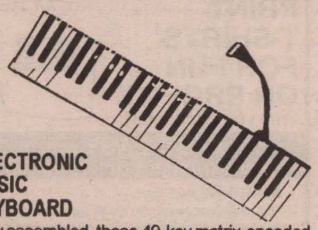
It's All We Carry – But They're THE BEST!!!

QTY.	PRICE
10	= $45 ea.
50	= $35 ea.
100	= $30 ea.
500	= Call

(Not sold in singles)

DEALERS CALL: **1-800-676-8131** (9 AM to 5 PM EST)

Write in 101 on Reader Service Card.



ELECTRONIC MUSIC KEYBOARD

Fully assembled, these 49-key matrix-encoded keyboards with full-sized keys are the real thing. If you've ever wanted to build a synthesizer, here is the main ingredient at a fraction of wholesale. Manufactured by Matsushita. All units are brand new. (92C035) **$24.95 each**

HELPING HANDS MAGNIFIER

Ball joints on all angles. Nickel-plated fittings. Heavy cast iron base. 2X 2.2" magnifying glass. Alligator spring clips. Locks at any angle. (93U002) **$5.95 each**

ALARM CONTROLLER

RF transmitter used on auto alarms. (95U007) **Three for $4.95**

AIRPAX STEPPER MOTOR

12 Volt, 15°/step, 2.125" diameter by 0.875" deep. (95M003) **$3.95 each**

14.5VAC 1A TRANSFORMER

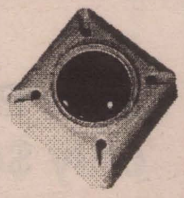
(95N002) **$3.95 each**

9VDC, 500 mA WALLWART

With coaxial connector, 2.5 x 5.5mm center (+). (95E016) **$4.95 each**

WALL WART ASSORTMENT

A random selection of assorted voltages and current ratings. (94E004) **10 for $14.95**

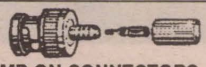


SCRABBLE TIMER

Times out one minute after button is pushed. Four LEDs and beeps of increasing frequency mark off 15-second intervals. Runs on 9V battery. (95U006) **$4.95 each**

VIDEO INTERCONNECT CABLE

Ten feet long with gold-plated push-on "F" connectors. Professional grade "Recoton Boa" cable. (95W008) **$4.95 each**



BNC CRIMP-ON CONNECTORS

- For Belden 9209 (foil shield RG59 Au). King #2025-38-9. (CB072)
- For Belden 8281 (low loss video cable 75 Ohms). King #2025-58-9. (CB105)

Your Choice $1.29 each
10 for $9.95

COLORED FILTERS

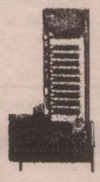
Set of four plastic colored filters: red, green, amber, frosted, 2.625" diameter. (95Z004) **$2.95 per set**

BAD MOTHERS!

PCXT-Type (92C033) **3 for $9.95**
PCAT-Type (92C034) **3 for $19.95**

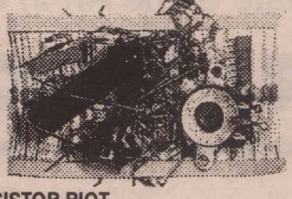
STK011 AUDIO POWER AMP IC

(94I018) **$8.99 each**



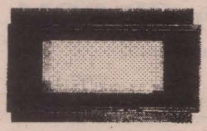
CAPACITOR

Hi Rel 4-24 pF machined air variable PC mount capacitor. (92P095) **$1.00 each**



RESISTOR RIOT

1/8, 1/4, 1/2 Watt, power, precision, fixed, adjustable, etc. Thousands of pieces. (92P023) **5 Lbs. for $4.95**

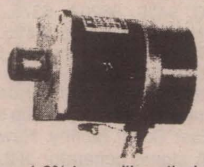


3½ DIGIT LCD PANEL METER

Single 9VDC operation. Set to 300 mV full scale range, but may be adjusted to three other full-scale ranges of 20 Volts, 200 Volts, or 500 Volts DC. Front panel bezel included. New, in box, with instructions. P/N PM-128. (95L003) **$19.95 each**

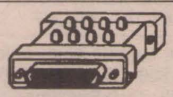
PHONE FM TRANSMITTER KIT

This small but powerful circuit attaches to a phone line and transmits the conversation into the FM band. It uses the phone line itself as an aerial. No battery is required since power is drawn from the phone line. Easily adjusted to transmit outside the commercial FM band for greater security. (Kit #16) **$12.99 each**



STEPPER MOTOR

1.7 Volts, 3.4 Amps, 1.8°/step, with optical encoder assembly attached to rear shaft. Japan Servo Co. #KP6M2-020 or equivalent. (95M004) **$14.95 each**



RS-232 MINI TESTER

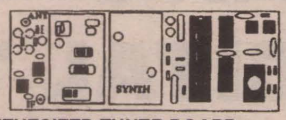
Latches LEDs to test for DTR, DTS, ID, etc. Self-contained line powered unit - a handy troubleshooting aid. (93C016) **$4.95 each**

RS232 NULL MODEM ADAPTER

DB25 female-female. P/N K-12NUM3. (94C010) **$2.90 each**

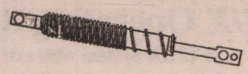
VARACTOR TUNER MODULE

Tuning range: 88.3 MHz to 108.1 MHz (FM broadcast band). Toko FTU310B. Basic schematic and pinout included. (95V005) **$9.95 each**



SYNTHESIZED TUNER BOARD

50-150 MHz approx. tuning range, 10.7 MHz IF. MC145155 synth IC and a Mitsumi 407-A26 tuner module. All controlled by a Z8 CPU and 2716. New. Comes with schematic and spec sheet for major components. (92A027) **$19.95 each**



ELECTRIC PISTON

The Electric Piston is an amazing, fully integrated shape memory alloy actuator. Power it up and this strong, compact device (about the size of a jumbo crayon) pulls with up to one pound of force and contracts by 20 mm (0.75 inch) - twenty percent of its length! No compressors or hydraulic fluids, just electricity.

Capable of lifting 45 times its own weight, the Electric Piston has an incredibly smooth and silent action. It has built-in protection from over strain, and mounting holes for easy installation in your devices. Typical activation requires just 1 volt at five amps for two seconds.

PHYSICAL

Length, relaxed: 100 mm
Length, contracted: 76 mm
Maximum diameter: 9 mm
Mass: 10 grams
Net stroke (no load): 23 mm
Net stroke (450 gram load): 19 mm

ELECTRICAL

Total electrical resistance: 0.2 ohm
Typical power: 5 Amps at 1 Volt
Typical contract time: 2 seconds
Typical relax time: 8 seconds
Typical cycle rate: 6 cycles per minute

THERMAL

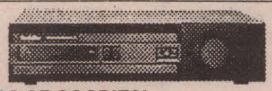
Contraction finish temperature (Af): 90° C
Relaxation finish temperature (Mf): 65° C
(3-137) **$7.95 each**

USED HARD DRIVES

Quantum Q540 - 36 Meg MFM 5¼" full-height. (94C025) **$29.95 each**

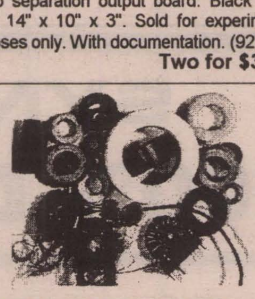
Seagate ST-225 Hard Drive (94C033) **$19.95 each**

Micropolis 1325 - 70 MB, MFM, 5¼" full height. (95C012) **$99.00 each**



GOBS OF GOODIES!
Studioline Stereotrack II
Cable TV Adapter

Separates stereo signals from the cable TV input, feeds TV signals to TV/VCR tuner and stereo signals to FM (either RF or fixed/variable level audio). Inside are hundreds of useful parts which may be removed for audio/RF projects. Controller board has CPU and socketed EPROM as well as Mitsumi varactor tuner, cable/FM separator board, regulated power supply subassembly, channel select board, and stereo separation output board. Black metal case, 14" x 10" x 3". Sold for experimental purposes only. With documentation. (92V020) **Two for $39.95**



TOROID CORE ASSORTMENT

WOW! May contain tape wound, powdered metal, ferrite material cores, different sizes. (92N016) **20 for $4.95**

ALLTRONICS

2300 Zanker Road - San Jose, CA 95131-1114
(408) 943-9773 - Fax (408) 943-9776
BBS (408) 943-0622 • 9600-N-8-1 • 24 Hrs. • Internet: alltronics.com

Visa, M/C, AmEx Accepted.
Minimum Order $15.00.
CA & OH Residents Add Sales Tax.
Shipping Additional on All Orders.
Store Hours:
10-6 M-F - 9-3 Sat.

010595

Write in 49 on Reader Service Card.

New Column!

SOFTWARE WIZARDRY

by Harry Helms

Exploring Visual Basic

If you're interested in getting involved with "visual" object-oriented programming (OOP), Microsoft's Visual Basic is the ideal place to start. In fact, I consider it to be the equivalent of a Swiss army knife for Windows programming — there are better tools for certain applications (like Asymetrix Multimedia ToolBook for multimedia development or Visual C++ for graphics programming), but Visual Basic can be used in a pinch for almost any Windows programming task. It's easy to learn, inexpensive, extensible through custom controls, and has powerful debugging and other development aids. Although I do most of my current programming using other tools (mainly Multimedia ToolBook), if I were stuck on a desert island and could only have one Windows programming tool, I would choose Visual Basic!

If you're familiar with a character-based BASIC for MS-DOS, like the GW-BASIC or QBasic supplied with different versions of MS-DOS, you might be surprised at how different Visual Basic is from them. Very little of your experience with MS-DOS versions of BASIC will be useful with Visual Basic. The truth is that Visual Basic is really an entirely new programming language that has little in common with MS-DOS versions of the language. The name "Visual Basic" is somewhat unfortunate, since it is a far more powerful and versatile programming tool than MS-DOS versions of BASIC.

The Heart of Visual Basic: Objects, Projects, and Controls

The key to understanding Visual Basic (or any other visual programming tool) is to understand the concept of *objects*. All of the items you see in a Windows application, such as buttons, scroll bars, labels, and graphics, are all objects. The objects you see are all independent bundles of data and programming code. A program in Visual Basic or other visual programming environment does not consist of hundreds or thousands of lines of sequential code, nor does such a program execute in a linear fashion from a "start" to a "finish." Instead, visual programs are *event driven*. This means nothing happens in a visual program until something is done, as when the user clicks a button or selects an item from a list. The event does not always have to be generated by the user; for example, the expiration of a specified period of time is also an event. When an event happens, it generates a *message* that the Visual Basic program or Windows will respond to.

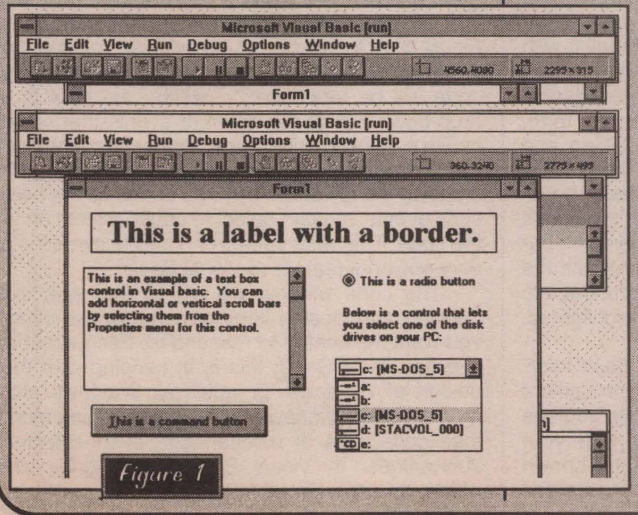


Figure 1

Figure 1 shows some of the objects available in Visual Basic. The window itself is an object called a *form*. All Visual Basic programs must have at least one form, and most have several. Other common objects include command buttons, "radio" buttons, list boxes, labels, text boxes, scroll bars, and graphics. All objects can be associated with Visual Basic code that determines how they respond to different events. Figure 1 shows how common Visual Basic objects look.

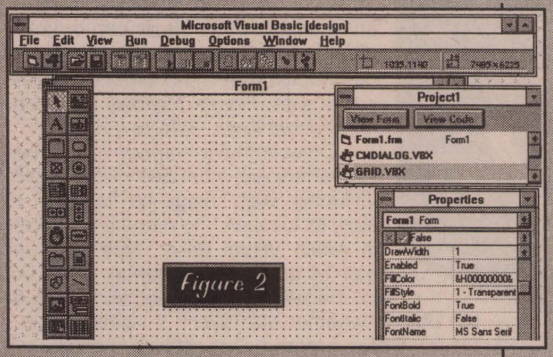
Objects have various properties. Properties are attributes of the object, including such things as its color, its size, its location, the name it is referred to within Visual Basic, type font, and color of any text appearing within the object, the text of any caption appearing on the object, whether the object is visible within a Visual Basic program, whether a border surrounds the object and the appearance of that border, and whether the object is functional, or *enabled*, on a form. The initial properties of an object are set by using menus while creating a Visual Basic program and can be altered during the program, if desired. For example, the color of an object and whether it is visible can be altered by events occurring during the program.

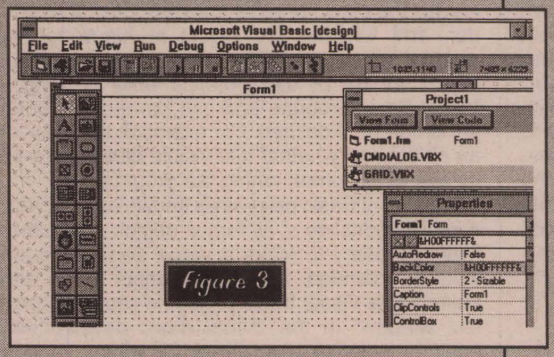
A Visual Basic program is known as a *project*. A project consists of all forms, objects, and other files necessary to make a Visual Basic program work as intended. As you add more forms and objects to a Visual Basic project, a separate "project window" in the Visual Basic development environment will keep track of those various forms and controls. When you've finished your programming, you can produce an executable file (one carrying an .EXE suffix) so your software can be used by those not having a copy of Visual Basic on their Windows PC.

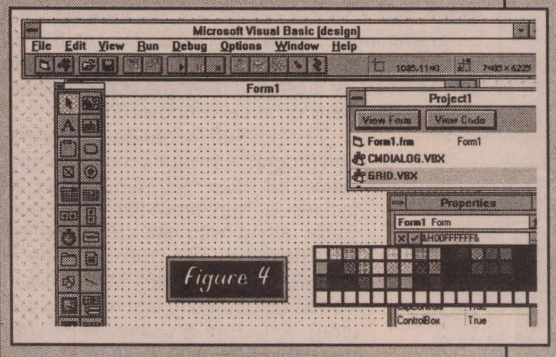
To distribute Visual Basic application programs to users without Visual Basic on their PC, you need to include a "run time" file for Visual Basic along with the .EXE file for your program. The "run time" file is actually a dynamic link library (DLL) file (as discussed in last month's column). A DLL is a collection of subroutines designed to let your applications program interface with Windows. The current "run time" file for Visual Basic is known as vbrun300.dll, with the ".dll" suffix indicating it is a dynamic link library. All this might seem complicated, but Visual Basic comes with a tool called "Set-Up Wizard." This tool prepares your application for distribution by converting all of your project's forms, objects, and files into a single .EXE file, adding the necessary "run time" file, and automatically including a simple installation program to let users painlessly install the application on their PC's hard drive.

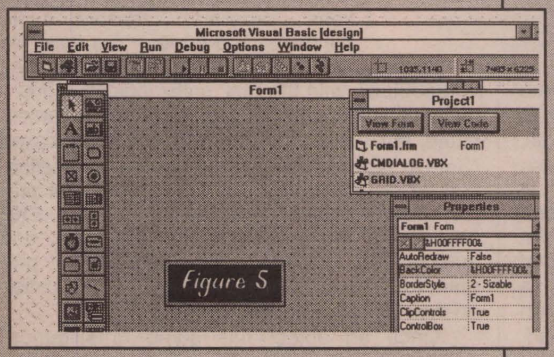
Once an object has some "intelligence" added to it through Visual Basic code, it becomes a *control*. A control is anything that can be placed on a form, even if it is not always visible to users (like a timer control). Controls are identified by file names ending with a .VBX suffix. Several controls are supplied with Visual Basic, and a cottage industry has sprung up around the creation of additional controls. Through these so-called "custom controls," Visual Basic's capabilities can be greatly extended. Among the custom controls currently available are complete spreadsheets, animation routines, text editors, data encryption and decryption tools, and a wide array of database access and manipulation controls. Custom controls are usually stored in a DLL and can be

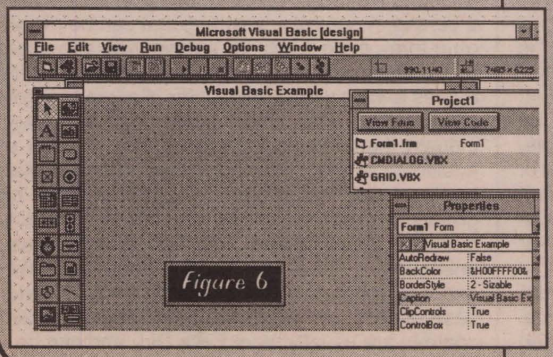
SOFTWARE WIZARDRY











used like any other Windows subroutine in a DLL.

(While we're on the subject of custom controls, custom controls are typically created using C or C++ and can also be used by other visual programming tools like Microsoft's Visual C++ or Borland's Delphi. We'll discuss the entire subject of custom controls in greater detail in a future column.)

Figure 1 shows some of the controls that come supplied with Visual Basic. As you can see, a rich variety of controls are already available. All of these controls have properties that you can define and the behavior of all controls can be determined through Visual Basic code you can write and "attach" to each control.

Visual Basic in Action

Since Visual Basic is "visual," the best way to understand and appreciate its advantages is by looking at how we can develop a real application in Visual Basic.

When you launch Visual Basic from Windows, you'll see a screen display similar to that shown in Figure 2. This is the "development environment" in which you create Visual Basic applications. You start with a window, which is called a form in Visual Basic. Notice that the form has a caption, "Form1." At the top of the form is a *tool bar* providing drop-down menus used to save, run, and debug Visual Basic programs. To the left of the form is a vertical *tool box* consisting of two columns of tool icons. By pointing to one of the tool icons and double-clicking, you can place a command button, list box, text box, radio buttons, a label, etc., on the form. You can also draw simple graphics using the appropriate tool icons or draw a container to hold graphics prepared using other software. To the upper right of the form is a *project window*. The project window keeps track of all the forms and custom controls used in your project; you can see many of them or their code by double-clicking on the desired form or control. (Note that a couple of controls, CMDIALOG.VBX and GRID.VBX, are automatically part of any Visual Basic project.) Finally, there is a properties window to the lower right of the form. Since the only thing you see at the moment is Form1, the properties listed are those belonging to it. By clicking and dragging with your mouse, you can re-arrange the tool bar, tool box, and various windows as you desire.

Note there is a grid pattern on the form. This is supplied to aid you in placing and aligning various controls on the form for a pleasing appearance. The default background color of a form is white. Let's suppose you want to change this. Using the scroll bar at the right of the properties window, find the "BackColor" (background color) item. Point to it and click once; the item will be highlighted, as shown in Figure 3.

When you double-click on the "BackColor" item, you will see a palette of different colors appear, as shown in Figure 4. When you see the color you want, point to it with your mouse and double-click. The result is shown in Figure 5; the background color is changed to the one you selected from the palette. Take a look at the alphanumeric code opposite the "BackColor" item in the properties window of Figure 3 and 5. These codes represent the different background colors seen in Figures 3 and 5. You can change the background color of a form while a program is executing by writing Visual Basic code to change the alphanumeric code.

One of the properties of a form is the caption that appears on it. So far, it's been simply "Form1," as shown in previous illustrations like Figure 5. It's simple to change the caption on our form using the properties window. Figure 6 shows how this is done. You can scroll the properties window until you reach the "Caption" item. When you double-click it, you will see the default caption ("Form1") displayed on the line at the top of the properties window. You can edit this line like any other text, including cutting and pasting text. In this example, let's cut "Form1" from the line and type in "Visual Basic Example" in its place. When we do so, the new caption appears at the top of the form, as shown in Figure 6.

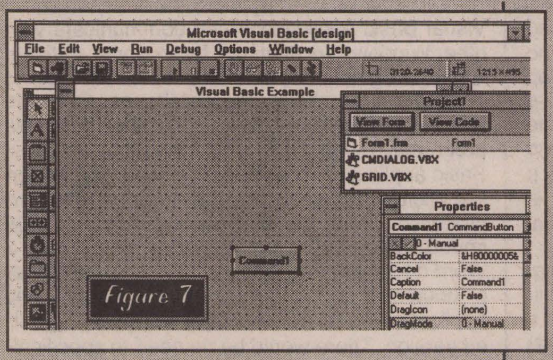
Writing Actual Code

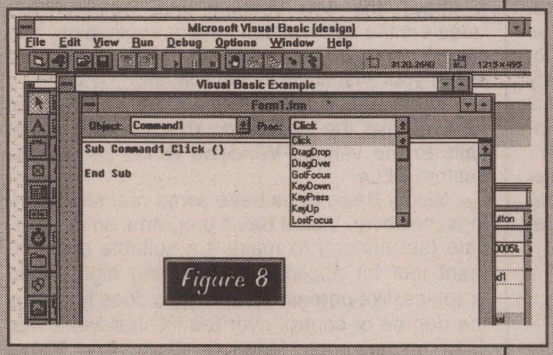
So far, we've seen how easy it is to get a Visual Basic application to "look" the way we want it to. But how do we actually program in Visual Basic?

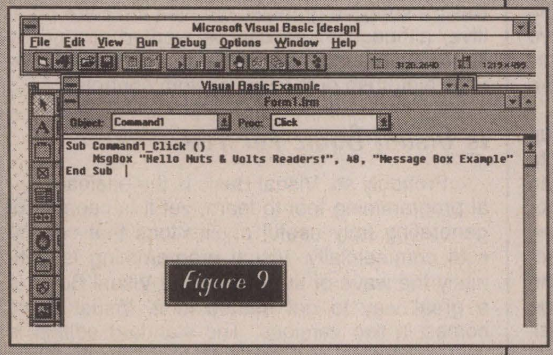
Perhaps the most commonly-used control in Visual Basic (other than a form, of course!) is the *command button*. A command button is an area, looking like a pushbutton, that will cause some action to take place when it is clicked or otherwise activated. It's easy to place a command button on a form. All you have to do is point to the command button icon in the tool box, double-click, and a command button appears on the form. Figure 7 shows this process. The command button icon is the third one from the top in the right column of the tool box; note that it is highlighted to indicate it has just been clicked. The command button will appear in the middle of the form. Note that the properties window has now changed; it is a properties window for the command button. You can switch back to the properties window for the form by clicking once on the form. To switch back to the properties window for the command button, click the command button once.

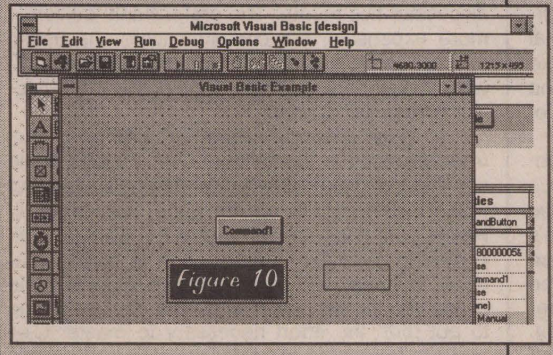
A command button needs some Visual Basic code before it can do anything useful. To "program" the command button, double-click it. When you do, you'll see a *code window,* like the one in Figure 8. At the top left of the window, you see the name of the object ("Command1" in this case) the code will be "attached" to. At the top right is a drop-down box of the different events that could cause execution of the code. For a command button, the default event is a click. However, Figure 8 shows the full drop-down menu and all the possible events you can select to cause execution of the code. This wide variety of possible events is a very powerful feature of Visual Basic.

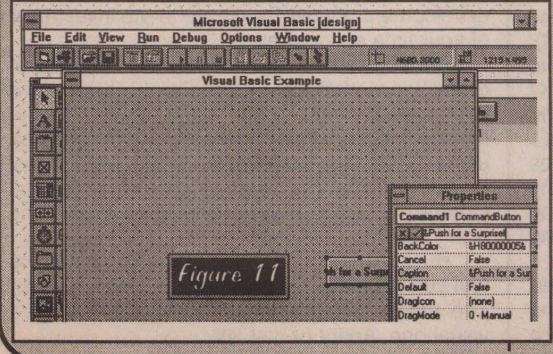
The code window will supply you with the opening and closing lines of code for the event you want the control to respond to. Each event is a subroutine ("Sub"); this is in keeping with the design of Windows, in which all Windows programs — like Windows itself — are nothing more than collections of independent, event-selected subroutines. In Visual Basic, subroutines are known as *procedures.* In this case, the opening











line "Sub Command1_Click ( )" indicates the code that follows is a procedure executed when command button "Command1" is clicked. The "End Sub" line simply marks the end of the subroutine. Visual Basic procedures (subroutines) are not called from a main program, as in GW-BASIC or other character-oriented languages; there is no "main program" in Visual Basic. Perhaps the best way to think of a Visual Basic program is a large collection of small, independent programs that can work together and communicate with each other.

For our example, let's program Command1 to display a message box with a desired message and caption. Message boxes are a familiar part of any Windows application; they display information and require the user to click an "OK" button before execution of the application can resume. Message boxes are one of the controls supplied with Windows and available to all Windows applications (like Visual Basic). We don't have to program the look and functionality of a message box in Visual Basic. Instead, all we need to do is specify what we want a message box to display and pass that information along to Windows from Visual Basic. Windows will then return a message box with that information to our Visual Basic application.

Figure 9 shows a line of Visual Basic code we could enter to display a message box. "MsgBox" tells Windows to return a message box when this procedure is executed. The first line of text in double quotes following MsgBox is the information we want displayed in the message box. The number 48 following the first set of quotes is a code that tells Windows what symbol or icon (if any) we want displayed in the message box. In this case, the "48" code will cause an exclamation point to be included. The second line of text in double quotes is the caption we want the message box to have. We close the code window after entering this line of code.

Suppose we want the command button to be in a different location on the form. We can move any object on the form by pointing to it and holding the mouse button down as we move it around. Figure 10 shows the original position of the command button and a rectangle representing the command button. The rectangle represents the new position of the command button. When the command button is in the desired location on the form, release the mouse button and the command button will now be located at the new position.

The default caption for the command button is "Command1," which is not very informative for users. To change it, we click the button to show its properties window and select the "Caption" item. We can then enter the new caption in the space provided at the top of the properties window, as shown in Figure 11. Notice that we place an "&" symbol at the start of the caption. The "&" symbol means the user can press the "Alt" key plus the first letter of the caption ("P" in this case) and accomplish the same result as clicking the button with a mouse. Letting users access a button from the keyboard is a good feature to include in case the user doesn't have access to a mouse, which is often true for notebook computer users.

Our new caption is too long to fit within the current size of the button. However, it's easy to re-size the button. Note in Figure 12 that the button has "dots" on its vertical and horizontal borders. The dots are sizing "handles." To change the size of a button (and many other objects in Visual Basic), point to one of the sizing handles, click, and hold the mouse button down as you "drag" the vertical or horizontal border to re-size the button. When you've moved either border to the desired position, release the button. A re-sized command button that "fits" the caption is shown in Figure 12.

Now it's time to see our application in action. To run the program, we go to the "Run" menu in the tool bar at the top of display and select the "Run" item from the drop-down menu. The result will be the display shown in Figure 13. The application is "running," even though nothing seems to be happening; it is awaiting an event it can respond to. By the way, the elements of the development environment (like the partially visible project and properties windows at right) would not be visible in any final version of an application you would distribute to others.

Figure 14 shows what happens when the user clicks the button or presses the "Alt" and "P" keys together. The message box with our desired information and caption is displayed; the exclamation point is also included. When this message box is displayed, execution of the program is halted until the user clicks the "OK" button on the message box. When that happens, the display again looks like that shown in Figure 13. Message boxes are often used to alert users to certain information or to caution them before taking certain actions. For example, message boxes can be used to alert users that certain actions cannot be reversed (like deleting a file) or that some desired action is not possible.

Let's suppose that you don't like the exclamation point and want something more emphatic, like a stop sign. Figure 15 shows how this could be done. All that's necessary is to change the number code to 15. When you do this, the result is shown in Figure 16.

Something Incredible

At this point, we should stop and reflect on something incredible.

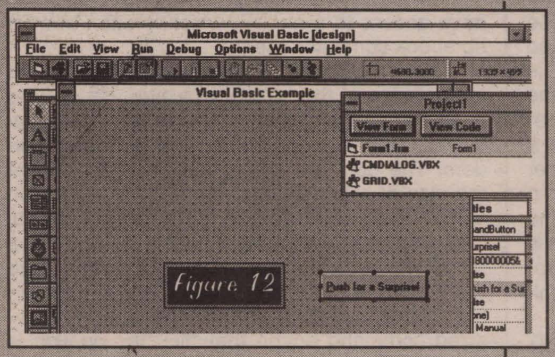
Here's what we did in our example: we put a window on screen, changed its background color, gave it a caption, put a command button on the window that can be accessed by the mouse or keyboard, gave the button a caption, moved the button to a desired location, created a procedure where a message box can be called from Windows, and that message box had the message, caption, and symbol we desired.

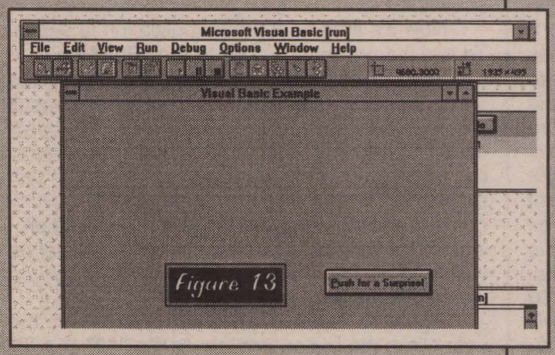
We did all of that, and we had to write just ONE LINE of Visual Basic code to do so.

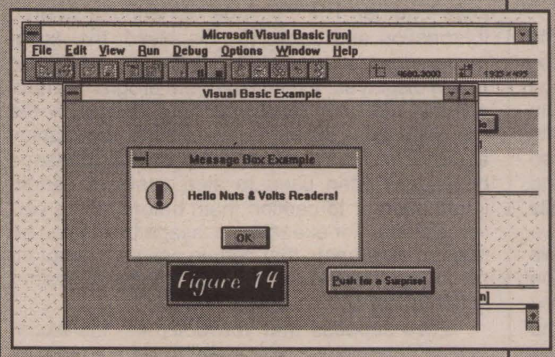
One line of code. That's all. To do an equivalent Windows program in a character-based version of C or Pascal would take hundreds of lines of code and at least a couple of days of serious effort. And those hundreds of lines of code would be tough to write and debug, a contrast to the trivial single line used in this example.

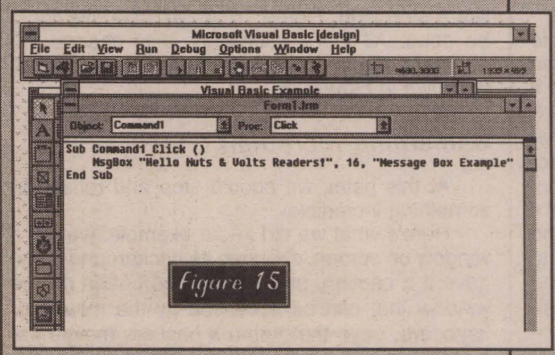
This is what the software revolution I discussed in last month's column is all about. If

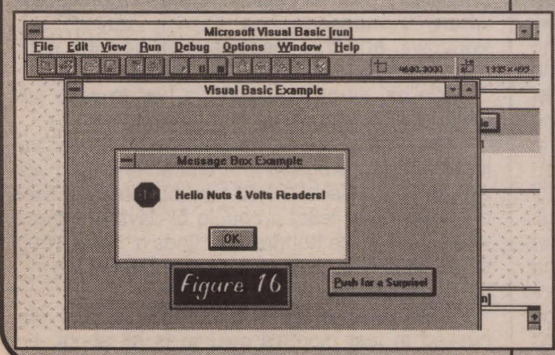
SOFTWARE WIZARDRY











you're trying to develop with character-based programming tools, you're dead. There's no way you can be as productive or develop applications as rapidly as someone using a visual programming tool. Back in 1992, the ability to write C code that drew windows and called message boxes from Windows was a hot, in-demand skill. Today, that "ability" is nothing special; it's built into tools like Visual Basic!

This progression really isn't that surprising. In the early days of microcomputers, the ability to program in the assembly language of a specific microprocessor (like Apple II's 6502) was all-important in developing applications. When the first compilers (like Borland's Turbo C and Turbo Pascal) became available, assembly language programming gradually became a niche specialty. Now the process is repeating itself as character-based programming languages give way to visual ones.

If you're not spending a big chunk of your programming time these days pointing, clicking, and dragging instead of writing code, you're probably doing something wrong.

"Specifications" of Visual Basic

While Visual Basic does a lot of the "dirty work" of programming for you, it is still a full-featured programming language. You'll have to put some time and effort into mastering all of its features and learning how to apply them to programming tasks.

Variable names in Visual Basic can be up to 40 characters long. Variables don't have to be declared before use (although they can be, and good programming practice calls for doing so). Variables can be local (recognized only within a single subroutine) or global (recognized by and available to any subroutine on any form). Data types for variables include integer, long integer, single precision real, double precision real, and string. Two special data types unique to Visual Basic include currency (8-byte numbers with a fixed decimal point) and variant, which can hold double precision and string values. You can define your own data types as needed. Arrays of variables can be declared.

Visual Basic includes several control structures, including *If. . . Then* statements, *If. . . Then. . . Else* statements, *Select Case* Statements, and *Do* and *For* loops. There's even a *Go To* statement that you can use within a procedure. Control structures can be nested and procedures can contain other subroutines that can be called as necessary. Visual Basic has a full set of arithmetic and logical operators along with mathematical functions such as *Sqr* (returns square root), *Rnd* (generates random numbers), *Atn* (returns arctangent), *Cos* (returns cosine of an angle), *Sin* (returns sine of an angle), and *Tan* (returns tangent of an angle). There's also several string manipulation functions allowing string comparison, formatting, taking or adding characters to strings, converting from upper case letters to lower case and vice-versa, and comparing two strings.

Visual Basic supports dynamic data exchange (DDE) and objecting linking and embedding (OLE). DDE is a method by which Visual Basic applications can communicate with other Windows applications; for example, a Visual Basic program could share data with other Windows applications, like databases. OLE lets you set up interactive links with other Windows programs. Using OLE, you could link a Visual Basic application to another Windows application like Microsoft's Excel spreadsheet or Word's word processor. Your Visual Basic application could import part of an Excel spreadsheet or text from a Word document and display it. If the spreadsheet or document is changed, then your Visual Basic application would automatically display the updated version. There would be no need to specifically import the new version; OLE automatically transfers the new version to your application. You can also manipulate such imported versions from within your Visual Basic application.

Visual Basic gives you access to Windows features like the clipboard. You can also make calls to the various Windows DLLs, as well as custom DLLs.

Visual Basic does have some real shortcomings, however. Visual Basic programs do not execute fast enough to make it a suitable development tool for applications involving high speed graphics, like games. Visual Basic does not allow the degree of control over the PC hardware that C or an assembly language does. And Visual Basic's supplied graphics creation tools are primitive, although these can be worked around by importing graphics created with applications like PC Paintbrush or through custom controls.

Is Visual Basic For You?

Probably so. Visual Basic is the easiest visual programming tool to learn, yet it is capable of generating truly useful applications that can be sold commercially. Visual programming is definitely the wave of the future, and Visual Basic is a great way to get started in it. Visual Basic comes in two versions. The standard edition is less expensive and contains all of the features discussed this month. The professional edition is more expensive, but contains numerous useful custom controls and tools for professional software developers. Both versions come with effective interactive tutorials.

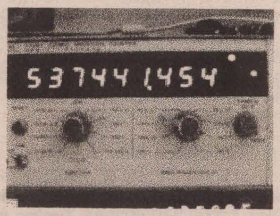
A more powerful visual programming tool from Microsoft is their Visual C++. I wish I could say this tool makes C++ programming simple, but that's not true; it makes C++ less painful. However, it does relieve you of the drudge work of writing repetitive lines of code to create windows, buttons, and other common objects while giving you the full power of C++. If you are willing to put forth the effort necessary to master C++ and are interested in professional-level software development, Visual C++ is worth the investment of your time and money.

Borland has finally entered the visual programming market with Delphi. Delphi should have been called "Visual Turbo Pascal," as that is what it essentially is! While I haven't used this product, users of Borland's character-based versions of Turbo Pascal tell me it's great, so you should look carefully at Delphi if you have some experience with Pascal.

But regardless of which visual programming tool you decide to go with, the message is clear: The programming world of the future will be a visual one. Adapt or die! **NV**

TEST EQUIPMENT Sale: HP 141T, 8552B, $1,600; HP 141T, 8552B, 8555A, $2,200; Tektronix 7603, 7B53A, 7A26 X2 $650; HP 8690B, $250; 8694B, $200; 8695A $200; 8693A $200; 8692A $200; Frequency counters HP 5340A $900; Systron Donner, 6245A $1,500; HP 5326A $200; HP 5327B 50MHz counter, timer DVM, $250; HP 5328A op 10,30Hi stab osc, 520MHz $400; HP 5328A opt 31,40; 1.2GHz counter $500; HP 5303B, 5300A 500MHz counter $200; HP 5257A xfer osc 50MHz-18GHz, $300; HP 8410B, $300; HP 8411A opt 018, $500; Gould 260, 6 channel Chart Recorder $600, Gould 220 2 channel chart recorder $250, Shibasoku, AS953B, MPX TV sound Multiplexer $400; Weather Measure 40010 Solar radiation recorder 7 day, $200, Marconi TF2300B, AM-FM modulation meter, 4-120MHz, $250, A-Comm Electronics, 303-290-8012. FAX 303-290-8133.

TEKTRONIX 1240A logic analyzer $1,500, 9129 DAS logic analyzers $1,000 ea., HP 1980 scope $1,500, Rockland 500kc spectrum analyzer $500. 818-352-6619.



HIGHEST ACCURACY of any counter/timer known. This HP 5328A with high-stability oven oscillator gives you .000,000,03% stability; that's only .15Hz at 500MHz! The 500MHz option has a 15 millivolt sensitivity and is usable up to 999MHz at higher levels. Excellent condition. There is nothing better than this for only $495! They are going fast. Gary, N6ZD, 408-385-0301, FAX 408-385-0261.

TEKTRONIX PLUG-INS 7B53 100MHz hor. $100, **7B92A** 500MHz hor. $295, 7A16 150MHz sgle vert. $95, 7A18 75MHz dual vert $85, 7A24 400MHz dual vert. $395, 7A26 200MHz dual vert $195, 7A19 600MHz sgle vert $250, 7D15 Univ Ctr 225MHz $425. TG501 Time Mark Generator $575. DC503 100MHz Univ Counter $225, SC501 5MHz Oscilloscope $95. **Lehman Scientific**, 717-252-4211, 717-244-7540.

TEK 501A Function generator, like new $300; Scope probes TEK P6122 two in sealed package, both for $60. 415-244-9254.

LAFAYETTE MOD. 76106 six channel datagraph chart recorder with manual, $295. GBC Electronics, Blountville, TN. Ph 615-323-2976.

SELECTIVE VOLTMETER, HP 3581C clean, guaranteed $495. Gould Brush 220 2 ch oscillograph with alum. case and acc. $475. **Technologies West**. 503-267-6064.

TEKTRONICS OSCILLOSCOPE 465M-100MHz. $425. TEKTRONICS SPECTRUM ANALYZER 491 10MHz to 40GHz $995. This equipment has been reconditioned and is in good working condition and is guaranteed for 90 days. ISA, PO Box 6955, Laguna Niguel, CA 92607. 714-495-5566 or FAX 714-495-4742.

SIEMENS LEVEL oscillator W2008 200Hz-18.6MHz $365. Dexis, 612-944-7670.

HP 5328A $200, HP 5328A + oven oscillator + 500 MHz direct count + HPIB $500, with DVM add $50. Gary, 408-385-0301.

Serving the public since 1981

XANDI ELECTRONICS

1270 E Broadway # 113, Tempe AZ 85282

Electronic KITS!

BUY WITH CONFIDENCE
· 30-DAY REFUND POLICY
· TECH SUPPORT NUMBER
(602-894-0992)

- Miniature photo battery mounts right on circuit board. (Included with kit)
- Tunes 88-108 MHz.
- Up to 1/2 mile range.
- Sensitive 2 stage audio amplifier, picks up sounds at the level of a whisper..

MICRO-MINIATURE FM TRANSMITTER
Including the battery, this is the Worlds smallest FM transmitter. Use with any FM broadcast receiver. Easy to assemble, uses pre-assembled circuit board.
XWB1000 E-Z KIT $49.95

- Transmits at 143 MHz.
- Up to 1 mile range.
- Miniature photo battery mounts right on circuit board. (Included with kit)
- Amazing audio sensitivity, picks up sounds at the level of a whisper.

CRYSTAL CONTROLLED TRANSMITTER
This is the Worlds smallest crystal controlled FM transmitter. Transmits to any scanner type receiver. Easy to assemble, uses pre-assembled circuit board.
XTL1000 E-Z KIT $69.95

- Uses sensitive microwave transistor amplifier.
- Covers 1 to 2,000 MHz.
- Compact hand held unit.
- Includes miniature loud speaker for audio indication of detected signals.

SUPER SENSITIVE BUG DETECTOR
When the XBD200 intercepts a signal in the 1 to 2,000 MHz range, it emits a growl that increases to a high pitched squeal as the signal strength increases.
XBD200 (C) Kit $49.95

- Smallest FM transmitter anywhere!
- Tunes 88-108 MHz.
- Powerful 2 stage audio amplifier.
- Sensitive, picks up sounds at the level of a whisper.
- Up to 1 mile range.

SUPER-MINIATURE FM TRANSMITTER
Worlds smallest FM transmitter. Use with any FM broadcast receiver. Easy to assemble, all chip components are pre-assembled to the circuit board.
XST500 (E-Z) Kit $44.95

- Smallest Phone transmitter anywhere!
- Tunes 88-108 MHz.
- No batteries required, powered by phone line.
- Up to 1/4 mile range.
- Attach to phone line anywhere in house, even inside phone.

SUPER-MINIATURE PHONE TRANSMITTER
Worlds smallest FM phone transmitter. Use with any FM broadcast receiver. Easy to assemble, all chip components are pre-assembled to the circuit board.
XSP250 (E-Z) Kit $34.95

- Powerful 2 stage audio amplifier.
- Up to 1 mile range
- Use with any FM broadcast receiver.
- Hear every sound in an entire house!

MINIATURE FM TRANSMITTER
The XFM100 has a super sensitive microphone and is capable of picking up sounds at the level of a whisper and transmitting them to any FM broadcast receiver.
XFM100 (C) Kit $32.95

- Digital voice changing: male to female, female to male, adult to child, child to adult.
- 16 levels of voice masking.
- Button for normal operation.
- Complete anonymity on all calls.
- Not a kit, fully assembled.

VOICE CHANGING TELEPHONE
STOP THOSE ANNOYING TELEPHONE CALLS! Sound older and tougher when you want to. Not a kit. Fully assembled. Single phone operation only.
TRANSITION 2000 ..... $89.95

- Digital voice changing: male to female, female to male, adult to child, child to adult.
- Use with any modular phone.
- 16 levels of voice masking.
- Connects between handset and phone.
- Not a kit, fully assembled.

VOICE CHANGING ACCESSORY
STOP THOSE ANNOYING TELEPHONE CALLS! Sound older and tougher when you want to. Not a kit. Fully assembled. Use with single or multi-line phones.
TRANSITION 2001 ..... $59.95

- Transmits a continuous beeping tone.
- Adjustable from 88 to 108 MHz.
- Up to 1 mile range.
- Works with any FM broadcast receiver.
- Operates from battery voltages of 3 to 18 Volts.

TRACKING TRANSMITTER
Measuring 0.7 by 2.4 inches, the XTR100 is ideal for use in locating lost model rockets, bicycles, automobiles, games of hide and seek, and contests.
XTR100 (C) Kit $33.95

- Uninterrupted coverage of 800 to 950 MHz.
- Works with any scanner that can receive 400 to 550 MHz.

800-950 MHz SCANNER CONVERTER
If your scanner can receive 400-550 MHz, just add the XLC900 for uninterrupted 800-950 MHz coverage. It converts all 800-950 MHz signals down to 400-550 MHz so your scanner can receive them! Add our custom case and knob kit for that "Professional" look.
XLC900 KIT $49.95
XLC-MATCHING CASE SET $13.95

- Transmit high quality stereo to any FM stereo receiver.
- Built in output level monitor for quick and easy tuning.
- Ideal for use with personal CD player.

FM STEREO TRANSMITTER
Transmit full bodied Hi Fi stereo to any FM stereo receiver. Separate left and right inputs and gain controls. Includes an output booster stage for greater range.
XFS108 KIT $41.95
XFS-MATCHING CASE SET $13.95

- Dial your phone from anywhere and listen to the sounds inside your home.
- Two digit Touch Tone code for secure operation.

TELEPHONE SNOOP
The latest in home or office security. Dial home from any other telephone, enter a two digit security code, and listen to all the sounds in your home . Automatically turns on without ringing the bell, waits for code, then remains activated for one and a half minutes.
XPS1000 KIT $49.95
XPS-MATCHING CASE SET $13.95

WE ACCEPT VISA, MC, MO, COD
MasterCard VISA

TOLL FREE ORDER LINE
1-800-336-7389
ASK FOR FREE CATALOG OF OUR PRODUCTS

SEND MAIL ORDERS TO:
XANDI ELECTRONICS
BOX 25647
TEMPE, AZ 85285-5647

Write in 113 on Reader Service Card.

HEWLETT PACKARD MD 8673D synthesized signal generator $26,500. HP 11713A, 8497K. 8494H. 355C. 355D. G382A. X382A. HP 86632B AM-FM modulator section. Hughes 1277H TWTA. EIP.575. Austron 2100F. Krohn-Hite DCA-10 amplifier. Call for complete list. 517-876-6666, FAX: 517-876-6363.

TEKTRONIX TDR S. Completely reconditioned, calibrated with manual 30 day warranty. Model 1503 complete $2,350 3 available. Psitech Plus, 707-745-4804, FAX 707-747-5277.

HP 8640B $1,900 512MHz signal generator, HP8640B Opt. 02 1024MHz version = $2,900. Tech-Systems 1-800-435-1516.

THIS LOW circuit loading SCOPE PROBE produces a 60dB **SPECTRUM ANALYZER** display on **your** inexpensive scope. Excellent EMI/compliance tool. Request Technical Tips for line conduction, field strength, and current probe. 255 Spectrum Probe 30KHz to 2.5MHz $279. 107 Probe 1 to 100 MHz $249 ($279 extra shielding). Accessory Current Adapters: IA5 $19, IA7 $29. **SMITH DESIGN**, 215-661-9107, 207 E. Prospect Ave., N. Wales, PA 19454.

TEKTRONIX EQUIPMENT Sale: Tektronix 109, pulse gen $100; 1410R NTSC gen with SPG2, PSG1, TSG2, TSG3, $900; 147 NTSC gen $600; 310A DC-4MHz scope $90; Tek 422 15MHz scope $200; Tektronix 465 100MHz dual chan $450; Tek 603 XY storage, $250; Tek 603A XY storage $250; Tek 634, video monitor, $250; Tek 7403N 60MHz 3 slot frame, $200; Tek 7603 100MHz 3 slot frame, $250; Tek 7633R 100MHz multimode storage, $450; Tek 7704A 250MHz four slot frame, $300; Tek 7834 400MHz storage, $900; Tek 7904 500MHz storage, $500, Tek 7A11 250MHz with probe $500; Tek 7A13, $300; Tek 7A19 600MHz $300; Tek 7A22, 1MHz, CMMR Amp $300; Tek 7A24, $400; MHz dual trace $300, Tek 7A26, $200. Tek 7A29, $600; Tek 4 ch 350MHz amp. 7A42 $600; Tek 7B10 $300; 7B15 $250; 7B50 $150; 7B50A $150; Tek 7B53A $150; 7B70 $150; 7B71 $200; 7B80 $200; 7B85 $250; 7B87 $350; Tek 7B92A, $350. A-Comm Electronics, 303-290-8012. FAX 303-290-8133.

WE TAKE TRADES ON NEW EQUIPMENT PURCHASES. FOR SALE: Hewlett Packard 86222A plug-ins, new in sealed HP box with dial scale and manual. $950 each. Cushman CE-50A units taken in on trade, some with tracking. $800 each. **WANTED:** IFR 500A, RYCOM 6040, 6041. Cushman CE-24A **WE BUY:** HP, IFR, TEK, EIP, MOT. Phone, 601-863-1430, FAX 601-868-0133.

Debco Electronics
4025 Edwards Road, Cincinnati OH 45209
Toll Free Order Hot Line 1 (800) 423-4499
Information - (513) 531-4499

Millions of Chips, Transistors and Electronic Components in Stock!

74LSxx

74LS00	.35	74LS368	.45
74LS01	.45	74LS373	.75
74LS02	.35	74LS374	.75
74LS03	.35	74LS375	.99
74LS04	.35	74LS377	.75
74LS05	.35	74LS378	.89
74LS06	.55	74LS379	.89
74LS07	.55	74LS386	.35
74LS08	.40	74LS390	.89
74LS09	.35	74LS393	.79
74LS10	.35	74LS395	.79
74LS11	.35	74LS396	.89
74LS12	.35	74LS447	1.19
74LS13	.40	74LS465	1.09
74LS14	.45	74LS490	1.09
74LS15	.40	74LS534	1.29
74LS20	.35	74LS540	.99
74LS21	.35	74LS541	.89
74LS22	.34	74LS573	2.09
74LS26	.34	74LS574	2.09
74LS27	.34	74LS590	4.25
74LS28	.45	74LS612	1.99
74LS30	.35	74LS623	1.49
74LS31	.35	74LS624	2.19
74LS32	.40	74LS629	2.19
74LS33	.40	74LS640	.99
74LS37	.40	74LS641	1.50
74LS38	.40	74LS643	1.29
74LS40	.40	74LS645	4.25
74LS42	.45	74LS646	2.39
74LS47	.89	74LS669	.99
74LS48	.89	74LS670	.79
74LS49	2.69	74LS674	14.95
74LS51	.35	74LS682	2.19
74LS54	.34	74LS683	2.19
74LS55	.34	74LS684	1.59
74LS63	.89	74LS685	8.00
74LS73	.45	74LS688	1.99
74LS74	.40	74LS783	25.00
74LS75	.45		
74LS76	.65		
74LS78	.65		
74LS83	.59		
74LS85	.59		
74LS86	.55		
74LS90	.55		
74LS91	.69		
74LS92	.65		
74LS93	.49		
74LS95	.59		
74LS96	.75		
74LS107	.45		
74LS109	.49		
74LS112	.45		
74LS113	.99		
74LS114	.45		
74LS122	.57		
74LS123	.59		
74LS125	.45		
74LS126	.45		
74LS132	.55		
74LS133	.59		
74LS136	.49		
74LS137	.75		
74LS138	.49		
74LS139	.49		
74LS145	.69		
74LS147	1.59		
74LS148	.89		
74LS151	.49		
74LS153	.49		
74LS154	1.49		
74LS155	.59		
74LS156	.59		
74LS157	.59		
74LS158	.40		
74LS160	.40		
74LS161	.79		
74LS162	.89		
74LS163	.55		
74LS164	.79		
74LS165	.89		
74LS166	.89		
74LS168	.99		
74LS169	.99		
74LS170	.69		
74LS173	.45		
74LS174	.49		
74LS175	.45		
74LS181	1.69		
74LS189	3.95		
74LS190	.79		
74LS191	.79		
74LS192	.79		
74LS193	.69		
74LS194	.69		
74LS195	.69		
74LS196	.59		
74LS197	.79		
74LS221	.69		
74LS224	12.95		
74LS240	.59		
74LS241	.69		
74LS242	.69		
74LS243	.69		
74LS244	.59		
74LS245	.75		
74LS247	.79		
74LS248	.99		
74LS249	1.29		
74LS251	.59		
74LS253	.59		
74LS256	1.09		
74LS257	.45		
74LS258	.55		
74LS259	.89		
74LS260	.59		
74LS261	4.95		
74LS266	.45		
74LS273	.79		
74LS279	.45		
74LS280	.69		
74LS283	.85		
74LS290	.79		
74LS293	.65		
74LS295	1.09		
74LS298	.99		
74LS299	1.59		
74LS323	1.59		
74LS348	1.09		
74LS352	.65		
74LS353	.65		
74LS365	.45		
74LS366	.79		
74LS367	.45		

74HCTxx

74HCT00	.35	74HCT368	.69
74HCT02	.35	74HCT373	.79
74HCT04	.35	74HCT374	.79
74HCT08	.35	74HCT377	.89
74HCT10	.35	74HCT393	.89
74HCT20	.35	74HCT541	.69
74HCT27	.45	74HCT573	.89
74HCT30	.49	74HCT574	.89
74HCT32	.35	74HCT640	.99
74HCT74	.45	74HCT670	1.09
74HCT75	.40	74HCT4020	.79
74HCT85	.89	74HCT4040	.79
74HCT86	.49	74HCT4060	.89
74HCT93	1.39	Also extensive listings for these other types...	
74HCT109	.49	74xx	
74HCT123	.70	74Sxx	
74HCT125	.65	74Fxx	
74HCT132	.59	74Cxx	
74HCT138	.59	74HCxx	
74HCT139	.59	74HCTxx	
74HCT151	.69	74ALSxx	
74HCT154	1.79	74ACTxx	
74HCT157	.59		
74HCT158	.59		
74HCT161	.99		
74HCT163	.59		
74HCT164	.79		
74HCT165	.79		
74HCT166	.79		
74HCT174	.69		
74HCT175	.79		
74HCT191	.69		
74HCT193	.79		
74HCT194	.79		
74HCT195	.79		
74HCT237	.89		
74HCT240	.79		
74HCT241	.79		
74HCT243	.79		
74HCT244	.79		
74HCT245	.79		
74HCT251	.69		
74HCT257	.69		
74HCT259	.79		
74HCT273	.79		
74HCT299	1.69		
74HCT367	.79		
74HCT368	.69		
74HCT373	.79		
74HCT374	.79		
74HCT377	.89		
74HCT393	.89		

LINEAR

LM35CH	14.00
TL061	1.19
TL062	1.19
TL064	.99
TL071	.75
TL072	.89
TL074	.99
TL081	.79
TL082	.79
TL083	.99
TL084	.99
LM10K	4.95
LM207	.69
LM208	.50
MAX231	2.69
MAX232	2.19
MAX233	5.95
MAX238	4.95
LM301	.55
LM301H	.89
LM307	.69
LM308	.89
LM309H	4.25
LM309K	2.39
LM310	1.89
LM311	.55
LM311H	1.89
LM312H	4.95
LM316	4.00
LM317K	2.29
LM317	.79
TL317(TO92)	.79
LM316	1.29
LM319	1.19
LM322	11.95
LM323K	3.39
LM323T	2.95
LM324	.50
LM329	.85
LM331	4.79
MAX333	5.95
LM334	1.29
LM335	1.59
LM336	1.19
LM337K	3.29
LM337T	1.09
LM338K	5.95
LM338T	2.69
LM339	.55
LM347	1.09
LM348	.89
LM350K	4.49
LM350T	2.99
LF351	.79
LF353	.79
LF355	1.09
LF356	1.09
LF357	1.09
LM358	.59
LM380	1.29
LM380N-8	1.19
LM381	3.95
LM383T	3.29
LM384	2.39
LM385Z 1.2	1.95
LM386N-1	.79
LM386N-3	.99
LM386N-4	1.29
LM387	1.89
LM390	1.79
LM391	3.95
LM392	1.59
LM393	.45
LM395K	9.95
LF398	1.99
LM399H	6.00
LF411	1.09
LF412	1.19
ZN414Z	2.49
LF441	1.09
LF442	1.19
LF444	1.89
TL489	1.59
TL494	1.89
TL497	2.09
NE531T	1.99
LM555	.45
LM556C	.89
XRL555	.90
LM556	.59
LM566C	.89
NE558	.79
NE564	1.79
LM565	1.69
NE566	1.29
LM567	.79
NE571	2.09
NE592	.45
ICL8032AN	3.19
MAX663	3.39
MAX666	3.19
MAX690	4.49
MAX690	4.95
MAX691	5.49
MAX692	5.95
MAX694	5.69
MAX695	5.95
LM709	.85
TS451	.90
LM711	.89
LM723	.59
MC239	1.29
MAX732	4.69
LM733	.99
LM741	.45
LM741HC	.99
LM747	.79
LM748	.69
SAA1027	6.99
MAX1232	2.69
LM1310	1.39
MC1596G	2.59
MC1723CL	1.29
MC1733CL	1.29
MC1350	.99
MC1358	.69
MC1374	2.00
MC1404	1.99
MC1406-8	1.89
MC1408-8	1.69
MC1411	1.99
LM1414	1.89
MC1456	1.50
MC1458	.55
MC1496	.50
DS14C88	1.19
LM1489	.50
DS14C89	1.19
MC1496	1.29
TCM1520	1.39
MC1558	2.59
MC1596G	2.59
MC1723CL	1.29
MC1733CL	1.29
MC1350	.99
LM1871	5.95
LM1872	5.95
LM1877	3.95
LM1881	4.95
LM1889	3.95
ULN2001	.79
ULN2003	.79
ULN2004	.79
XR2206	3.99
XR2207	2.99
XR2209	1.89
XR2211	2.39
XR2240	1.49
ULN2803	1.19
LM2877	3.39
LM2878	5.95
LM2901	.89
LM2903	.49
LM2907	1.69
LM2917	2.19
LM2917-14	1.59
CA3046	.89
CA3059	1.49
CA3060	2.95
CA3080	.90
CA3081	1.09
CA3082	.89
CA3083	.79
CA3086	.79
CA3089	1.59
CA3096	1.69
TCM3105	6.95
CA3126	1.45
CA3140	.79
CA3146	.99
CA3160	1.09
CA3161	1.99
CA3162	6.00
CA3183	1.39
MC3302	.75
MC3340	1.29
CA3401	1.99
MC3373	1.09
MC3401	.90
MC3403	.70
MC3470	1.29
MC3479	4.69
MC3486	.99
MC3487	.99
SG3524	1.09
LM3900	.69
LM3905	1.09
LM3909	1.49
LM3911	1.89
LM3914	2.39
MC3915	2.69
LM3916	2.69
MC4001	4.00
MC4024	2.29
MC4044	4.99
MC4136	1.19
NC4136	1.09
RC4151	1.29
RC4558	.79
MC4151	12.95
MC4155	2.95
NE5205	2.19
NE5532	1.19
NE5534	.99
NE5539	2.49
ICL7106	3.69
ICL7107	3.69
ICL7109	7.95
ICM7216	25.00
ICM7231	9.49
ICM7555	.69
ICM7556	1.19
ICL7660	1.69
ICL7663	2.49
ICL7665	3.19
ICL8038	3.79
ICL8211	1.59
LF13741	.99
LM13700	1.29
75107	.79
75108	.89
75110	.79
75136	.89
75150	1.29
75154	1.29
75160A	3.19
75174	1.99
75175	1.99
75182	2.09
75182	1.29
75183	1.29
75189	.50
75189	.50
75T202	4.95
75365	.89
75451	.49
75452	.59
75453	.59
75454	.59
75477	.99
75491	1.19
75492	1.49
MC145026	1.79
MC145027	1.49
MC145028	1.49
MC145151	12.95
MC145406	2.09
MC146818	3.69
MC145155	2.95

REGULATORS

Adjustable

LM150K	4.95
LM117K	2.29
LM117T	.79
TL317(TO92)	.79
LM337K	3.29
LM337T	1.09
LM338K	5.95
LM338T	2.69
LM723	.59
LM350K	4.49
LM350T	2.99

Positive Output

78L05	.50
78L62	.45
78L15	.45
78L12	.45
7805T	.59
78M05	.59
7810T	.59
7812T	.59
7815T	.59
7824T	.59
7805K	1.79
7812K	1.79
7815K	1.79
7824K	1.79
78M05	.59

plus many more...

In addition to these catagories, we have millions more components, chips, CPUs, RAMs, EPROMs, PALs, diodes, bridges, MOVs, resistors, chokes, toroids, LEDs, displays, cables, switches, tools, instruments and other new and surplus equipment in stock. **Call or write for a complete listing**

Gigantic Surplus Buy-Out, PRICE BLOW-OUT!

Vinyl Notebook Bag
black with inside pockets
9x12x2 inches **$9.99**

Large Laptop Bag
black nylon with 2 zippered inside pockets
12x14x6 inches **$7.95**

Terms and conditions of sale: (NO MINIMUM ORDER!) - Mail all orders to: Debco Electronics, Inc. 4025 Edwards Road, Cincinnati, Ohio 45209 or call, toll-free - 1 (800) 423-4499 or (513) 531-4499 - We accept cash, checks, money orders (U.S. funds only), VISA, DISCOVER and Mastercard - UPS ground shipping- $5.00 1st. lb. - .50 each additional lb. - 2nd Day Air- $8.50 1st. lb. + 1.50 each add. - Next Day Air- $17.00 1st. lb. + 2.50 each add. - Most orders shipped within 24 hours. (COD add $5.00) *(COD'S SHIPPED CASH ONLY) - Open accounts to qualified customers. Ohio residents add 5.5% Ohio Sales Tax or submit cert. of exemption.*
All prices and availability are subject to change without notice

Debco Electronics, 4025 Edwards Road, Cincinnati, OH 45209
Orders, 1 (800) 423-4499 - Info, 1 (513) 531 4499 - FAX (513) 531-4455 ad #9449a

Write in 64 on Reader Service Card.

CABLE TV DESCRAMBLERS

Best Wholesale Prices in the U.S.A.!

	1-4	5-9	10-19	20-49	50+
For Jerrold Systems					
TNT+	69	62	55	45	40
Stealth+	55	49	44	39	34
FTB3	49	39	35	32	30
For Scientific Atlanta Systems					
M80	69	62	55	45	40
SA3	55	45	40	36	33
For Pioneer Systems					
Super-PIO+	69	62	55	45	40
Panasonic Converter					
TZPC1003	75	67	62	59	57

If you see a lower price in the Nuts & Volts, please give us a call, we will beat anyone's price!

Fast Shipping
Best Service

1-800-818-9688

U.S. Cable TV Inc. M-F: 9-6 EST

4100 N.Powerline Rd., Bldg.F4 Pompano Beach, FL 33073

U.S. Cable will only sell the cable equipment to authorized cable subscribers. It is illegal to operate this equipment without paying for the basic and the premium services. U.S. Cable will not sell to anyone who will not comply with Federal and State laws.

No Florida Sales.

Write in 51 on Reader Service Card.

GET YOUR CATALOG OF HUNDREDS OF

LASERS

LASERS CAN BE USED FOR:

Communications — *Laser Light-Shows*
Alarm Systems — *Weapon-sights, etc.*
Experiments — *Machining & Cutting*
Holography — *Optics & Night-Vision*

We are always looking for surplus lasers, laser related and optical equipment. If you have equipment/components lying around, gathering dust & taking up valuable warehouse space, call us for an offer today !

MWK INDUSTRIES
1269 W. Pomona, Corona, California 91720
(909) 278-0563 FAX (909) 278-4887
FAX-ON-DEMAND SYSTEM (909) 278-1225

CALL FOR YOUR FREE CATALOG

** QUALITY COMPUTER COMPONENTS **

MOTHER BOARDS
386SX- 40 W/CPU ..... $ 85.00
386DX-40 W/CPU & 128K ..... $ 125.00
486DX VESA L/B W/256K ..... $ 128.00

VIDEO & IDE CONTROLLERS
IDE & I/O W/CABLES ..... $ 14.00
VESA L/B IDE & I/O ..... $ 36.00
1 MB OAK ISA VIDEO..... $ 48.00
1 MB VESA VIDEO ..... $ 96.00

ADD ON CARDS & MISC
2400 DATA MODEM ..... $ 28.00
96/24 FAX/MODEM ..... $ 38.00
101 DELUXE KEYBOARD.... $ 19.00
MINI TOWER W/PS & LED. $ 52.00
MITSUMI CD-ROM ..... $ 180.00
14.4 FAX/MODEM ..... $ 148.00

FLOPPY DRIVES $85.00 *PER SET!!*

HARD DRIVES
130 MB SEAGATE **$ 168.**
250 MB SAMSUNG **$ 235.**

•••• SPECIALS ••••
486 VESA LOCAL BUS MAINBOARD W/ 256K CACHE
— PLUS —
1 MB 32 BIT VESA VIDEO & 32 BIT VESA IDE I/O CARD
COMPLETE WITH CABLES & SOFTWARE
ONLY .... $ 249.00

250 MB SAMSUNG HARD DRIVE
— & —
250 MB CONNOR TAPE DRIVE
ONLY .... $ 389.00

ALL PRODUCTS ARE 1ST QUALITY FACTORY NEW & FULLY WARRANTIED. WE DO NOT CARRY ANY REFURB OR USED GOODS. CALL FOR OUR COMPLETE PRODUCT LIST. DEALERS WELCOME - TERMS AVAILABLE.

WE STOCK IT ALL .... CPUs, MEMORY, COMPLETE & BAREBONE SYSTEMS

B W C COMPANY, INC.

PHONE : (803) 764-0474 FAX : (803) 824-0278

DEALERS WELCOME ... TERMS AVAILABLE ... CALL FOR FREE PRICE LIST

Write in 65 on Reader Service Card.

TEKTRONIX NTSC Vectorscope 520A, $995/offer. Dexis, 612-944-7670.

SELL: HONEYWELL 1858 Visicorder $900; GR1987 sound level calibrator $90; Winslow ZM21B meggar $125; Systron Donner 6153 3GHz counter $300; National HRO-500 HF receiver $500; HP 740B $300; HP 740A $250; HP 141T $500; HP 8553B $500; HP 8552B $650. Send for test equipment sales list. A-Comm Electronics, 7198 S. Quince St., Englewood, CO 80112. 303-290-8012. FAX 303-290-8133.

NEW REPLACEMENT RF PROBES FOR BOONTON 91/92 RFVMs, $65 ea. HP 86114s and 8616s, excellent condition, $500 ea. BWO for HP 8551, 2 to 4 GHz, $75. Many RF transistors and modular amplifiers, new, to 15W/1GHz, $2 to $10 ea. Bob Dixon 719-548-1200 X205.

TEKTRONIX OSCILLOCOPE type 564B storage, engine, 4 channel w/test leads, case, camera, case, $500 or will trade for used 386 color laptop or notebook. No manual. William C. Hickerson, 10419 Glenkirk, Houston, TX 77089. 713-484-1405.

FLUKE TEST equipment; Fluke 80K, High voltage probe $80; 893A, Diff AC DC VM $150; 8010M, $100; 8010A $150, 731B Transfer std, $300; Fluke 382A Voltage current std, $300; 1920A 520MHz counter, $250. A-Comm Electronics. 303-290-8012.

TEKTRONIX 453 Scope 50 MHZ, solid state $295. Gary, 408-385-0301.

SELL: HUGHES 1406 5 watt solid amp 500-1000MHz, $400; HP X375A, $150; H375A $100; Kikusui COS6100M, 100MHz dual channel scope $450, Knopp P-S000 Precision standard transformer, $400, MECA 700-M031 dual directional couplers, $50 ea, MB M6 vibration meter and probes, $100, HP 8620C, 8624A, 2-8GHz sweeper, $1,400; HP 3586B 50Hz-32MHz Frequency selective vm, $1000; HP 3746A, $2000; HP 805C slotted line .5-4GHz, $200; A-Comm Electronics, 7198 S. Quince St., Englewood, CO 80112. 303-290-8012.

BUY AND SELL late model test equipment: HP, Fluke, Genrad, Tek and Wavetek. Call Dennis at **G P T E Surplus, 408-749-9805, FAX 408-749-9806.**

FEITEK PROVIDES repair, calibration and certification on many makes of test equipment. We also have a large selection of used equipment. Send large SASE envelope for list. VISA and MasterCard accepted. Feitek Inc., 2752 Walton Road, St. Louis, MO 63114, 314-423-1770.

HP 334A $595. Gary, 408-385-0301.

TEK M577D2 CURVE TRACER with 177 Test Fixture, 10 adapters and manuals. Mint, $875; **EIP M331 18GHz FREQUENCY COUNTER** with 1MHz resolution $345; **HP 8557A SPECTRUM ANALYZER** plug in, $285; **HP 432A POWER METER** cable and 478A Thermister Mount, $285. Call: "Charlie" 407-254-6775.

SELL: FAIRCHILD TRF-14, Tunable rejection filter $500; HP 3403C, $300; Scientific Atlanta 410-428 Telemetry receiver 1.6-1.7GHz, $2000, HP 59308A Timing generator, $200 HP 8742A 2-12.4GHz Reflection Test Unit, $400; HP 3550B Transmission Test Set, $400 Send or call for test equipment sales listing. A-Comm Electronics, 7198 S. Quince St., Englewood, CO 80112. 303-290-8012, FAX 303-290-8133.

HP 1725A $695. Gary, 408-385-0301.

POWERTRONICS Multi Channel Disturbance Analyzers, compare to BMI & Dranetz, all types of different models to fit your application. Call **TEST EQUIPMENT SALES,** 603-434-2544, for information, your authorized POWERTRONICS Distributor.

TEKTRONIX OSCILLOSCOPE sale 4-OS/245 (7603N) 100MHz with 2 AM6565 (7A15) vertical amplifiers and 1 TD1085 (7B53) time base $165 ea. 464 storage oscilloscope 100MHz $525, R7704 mainframe 175MHz $125, 10 1106 battery packs $25 ea. after 5:00pm EDST, BOB 717-429-1971.

WANTED: TEST equipment One General Radio Co., "Vacuum-Tube" bridge type 561-A, B, C, or D with adaptors and manual. These bridges were mostly produced in the 1940's. Call collect Charlie Lauter, 305-252-0163.

TEK 455 with battery pack $395. Gary, 408-385-0301.

TEK 485 oscilloscope 350MHz $875. Dexis, 612-944-7670.

TEK SALE: Tek 2336 100MHz scope $750; Tek 466DV44 100MHz storage $850; Tek AM 503 current probe amp $550; Tek TM501 mainframe $200; Wav 166 pulse/function gen. $900. Call Dennis at GPTE Surplus, 408-749-9805, FAX 408-749-9806.

WANTED: HP Part number 5081-3024 vertical output chip. For 172? 275MHz series. Scopes new, used tested good. 504-446-9564, evenings.

SPECTRUM ANALYZERS, Tek 7L12 0.1-1800MHz $1,150, Tek 1401/324 1-500MHz w/access $700, Jeff 503-690-8904.

HP 5381A $85. Gary, 408-385-0301.

Write in 53 on Reader Service Card.

24 HOUR SHIPPING

ELENCO • HITACHI • B&K PRODUCTS
GUARANTEED LOWEST PRICES

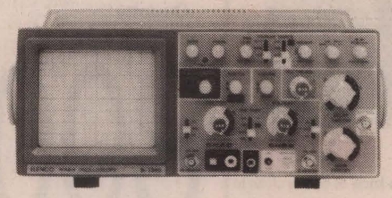
TO ORDER
CALL TOLL FREE
1-800-292-7711
1-800-445-3201 (Can.)

AFFORDABLE - HIGH QUALITY
2 YEAR WARRANTY

STANDARD SERIES
S-1325 25MHz $339
S-1340 40MHz $489
S-1365 60MHz $795

Features:
- High Luminance 6" CRT
- 1mV Sensitivity
- X-Y Operation
- TV Sync
- 2 - x1, x10 Probes
- Complete Schematic
- Voltage, Time, + Frequency differences displayed on CRT thru the use of cursors (S-1365 only)
- Plus much, much more

ELENCO OSCILLOSCOPES



DELUXE SERIES
S-1330 25MHz $439
S-1345 40MHz $569
S-1360 60MHz $759

Features:
- Delayed Sweep
- Automatic Beam Finder
- Z Axis Modulation
- Built-in Component Test
- Plus all the features of the "affordable" series
- Dual time base
- Illuminated internal gradicule

Hitachi Compact Series Scopes

V-212 - 20MHz Dual Trace	$425
V-525 - 50MHz, Cursors	$1,069
V-523 - 50MHz, Delayed Sweep	$995
V-522 - 50MHz, DC Offset	$975
V-422 - 40MHz, DC Offset	$849
V-222 - 20MHz, DC Offset	$695
V-660 - 60MHz, Dual Trace	$1,375
V-665A - 60MHz,DT, w/cursor	$1,449
V-1060 - 100MHz, Dual Trace	$1,549
V-1065A - 100MHz, DT, w/cursor	$1,695
V-1085 - 100MHz, QT, w/cursor	$2,125

B&K OSCILLOSCOPES

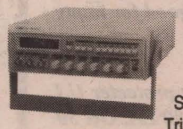
2120 - 20MHz Dual Trace	$389
2125 - 20MHz Delayed Sweep	$539
1541B - 40MHz Dual Trace	$749
2160 - 60MHz Dual Trace, Delayed Sweep, Dual Time Base	$949
2190 - 100MHz Three Trace Dual Time Base, Delayed Sweep	$1,379
2522A - 20MHz / 20MS/s Storage	$869

Digital Multimeter
EDM-83B
$175.00
Almost every feature available Bargain of the decade

Elenco LCR + DMM
LCM-1950
$79
12 Functions
Freq to 4MHz
Inductance
Capacitance

Digital Capacitance Meter
CM-1555
$49.95
- Measures capacitors from .1pf to 20,000µf
- 3-1/2 Digit LCD readout with unit indicator

Digital LCR Meter
LCR-680
$79.95
- 3-1/2 Digit LCD Display
- Inductance 1µH to 200H
- Resistance .1Ω to 20MΩ
- Capacitance .1pf to 200µF

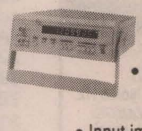


Function Generator
GF-8026
$225
Int/Ext Operation
Sine, Square, Triangle, Pulse
Ramp, .2 to 2MHz, Freq. Ctr.

3-3/4 Digit Multimeter
BK-390
$139.00
- 0.1% DCV accy
- Analog bar graph
- Auto/manual ranging
- 4,000 count LCD display
- Capacitance meas.
- Temperature probe

Digital Multimeter Kit
with Training Course
By Elenco
M-2665K
$49.95
- Full function 34 Ranges
- Extra large display • Ideal school project

M-2661 (Assembled) $55.00



Frequency Counter
F-1225
$225.00
- 8 Digit LED display
- Wide measuring range
- High sensitivity
- Data hold function
- Input impedance 1MΩ or 50Ω
- 10:1 Input attenuation function

FLUKE MULTIMETERS
(All Models Available Call)

Scopemeters		70 Series	
Model 93	$1,225.00	Model 70II	$69.95
Model 95	$1,549.00	Model 77II	$149.00
Model 97	$1,795.00	Model 79II	$175.00
10 Series		**80 Series**	
Model 10	$62.95	Model 87	$289.00
Model 12	$84.95		

Triple Power Supply
XP-620
By Elenco
$75.00
3 fully regulated supplies; 1.5-15V @ 1A, -1.5 to -15V @ 1A or (3-30V @ 1A) and 5V @ 3A **Kit XP-620K $49.95**

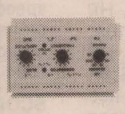
Quad Power Supply
XP-581
By Elenco
$79.95
Four supplies in one unit; 2-20V @2.5A, 5V @ 3A, -5V @ .5A and 12V @ 1A. All regulated and short protected

High Current DC Power Supply
BK-1686
$169.95
- 3 to 14 VDC Output
- 12A @ 13.8V (less current at lower voltages
- For servicing high power car stereos, camcorders, ham radios, etc.
- Connect 2 or more in parallel or series

Wide Band Signal Generators
SG-9000
$119.95
RF Frequency 100K-450MHz AM modulation of 1KHz Variable RF output
SG-9500 150MHz built-in counter **$235**

Telephone Kit
PT-223K
$14.95
Available Assembled PT-223 $15.95

Function Generator Blox
#9600
By Elenco
$29.95
Kit $26.95
Sine, Triangle, Square wave



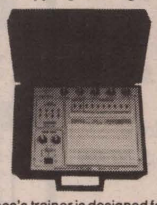
Learn to Build and Program Computers with this Kit

MM-8000
By Elenco
$129.00
From scratch you build a complete system. Our Micro-Master trainer teaches you to write into RAMs, ROMs and run a 8085 microprocessor, which uses similar machine language as IBM PC.

Electronic Tool Kit
TK-1000
$39.95

A professional organizer tool kit at affordable prices. Includes 25 high quality tools in a high impact carrying case which includes a pocket for meter.

Digital/Analog Trainer
Complete Mini-Lab For Building, Testing, Prototyping Analog and Digital Circuits



XK-525
$159.95
Kit XK-525K
$129.95

Elenco's trainer is designed for school projects, with 5 built-in power supplies. Includes a function generator with continuously variable, sine, triangular, square wave forms. All power supplies are regulated and protected against shorts.

The case can include a full line of tools and meter of your choice.

Transistor Radio Kits
with Training Course

AM/FM Radio
Model AM/FM-108 $29.95
AM Radio Kit
Model AM-550 $19.95

Telephone Line Analyzer

Kit TT-400K $19.95
Assembled TT-400 $26.95

WE WILL NOT BE UNDERSOLD
UPS SHIPPING: 48 STATES 5% OTHERS CALL
IL RES add 7.75% TAX
PROBES INCL ALL SCOPES & METERS

C&S SALES INC.
1245 ROSEWOOD, DEERFIELD, IL 60015
FAX: 708-520-0085 • (708) 541-0710

VISA MasterCard

15 DAY MONEY BACK GUARANTEE
FULL FACTORY WARRANTY
WRITE FOR FREE CATALOG

MOORES COMPUTER
816 PATTERSON
MONROE MI 48161

External Nec 25 1x scsi cdrom. Works with IBM, MAC, AMEGA. Can daisy chain up to 7 drives off one card GOOD 4 BBS $65.00 Card for above drive ONLY $29.00

Paralel to SCSI adaptor, hook-up hard drives, etc to any IBM paralel port. Use your printer simultaneously. Great for lap tops, or when you want a portable scsi device $79.00

120 MEG TAPE BACKUP Q/40 USE 2000 SERIES TAPES NEW IN BOX $62.00

36"blow guns with darts not a toy nice unit $18.00

PRE LABELED 1.44 DISKS TOP GRADE MONEY BACK GUARANTEE $18.00 per 100

12 volt nicad rechargable battery for NEC 36 cdrom good for many things only $10.00

Single plug in surge protecter U.L. listed retale box $2.00 EA. OR 50 FOR $50.00

MAGNETIC PADLOCK
I use them my self
Hardened shackle no key hole use a magnetic strip to open it $5.00

Future Domain 8 bit scsi card and all doc,s $19.95

Mac software $10.00 and up

6'printer cabel only $2.00

True IBM disk drive box with p/s many applications nice box $21.00

C.D. plastic cases 25 for $12.00

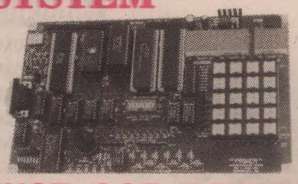
MECC AWARD WINNING Oregon trail software $10.00

16 bit sound card with mic and speakers 3cd interfaces $68.00

Wangtech 120 meg tape drive pc36 format new no card $20.00

MOORES COMPUTERS WHERE YOU GET MORE FOR LESS
We buy non working cdroms in bulk
MON-FRI 10:00-5:00
1-313-243-1117

THE BEST 8085 MICRO-PROCESSOR TRAINING SYSTEM



JUST GOT BETTER!

No other training system we know of comes close to matching the PRIMER's features at this low price. The PRIMER teaches more and is easier to use than other comparably priced trainers. The over 100 page Self Instruction manual takes you from binary number systems, to processing interrupts. At the end of the manual are working examples of using a photocell, a temperature sensor, making a wave form generator, a timer with alarm, and a motor speed controller using back EMF. The PRIMER comes with everything you need to start programming the 8085 in machine language. Continue on to program in Assembler, Forth, and BASIC with optional upgrade and software. Upgrade includes: RS232 serial port, cable, and 32K of battery backed RAM. Picture shown with upgrade option and optional heavy-duty keypad installed. The PRIMER is $119.95 in kit form. The PRIMER assembled & tested by EMAC is $169.95. Order now and receive one free power supply. Please add $5.00 for shipping in USA.

EMAC, inc.
618-529-4525 FAX: 618-457-0110
BBS:529-5708 ~ P.O.BOX 2042
CARBONDALE, IL 62902

Write in 68 on Reader Service Card.

SMART AC or SOLAR BATTERY CONTROLLERS

FOR GEL-CELLS OR LEAD-ACID BATTERIES

IMPROVED!

6 TO 28V. 110/220 VAC, 50/60 HZ. *WILL NOT OVERCHARGE!* USES UC3906 I.C. SWITCHABLE CURRENT, REVERSE BATTERY PROTECTION, TRICKLE START-UP, DBLE SIDED PCB, QUICK CONNECT TERMINALS, SELF RESETTING FUSE PROGRAMMABLE VOLT OR CURRENT, MANUAL.

BASIC KIT: 6 TO 14V; 1A MAX ..... $ 54.95
24/28V; 1/2A ..... $ 64.95
OPTIONS: TRANSFORMER ..... $ 18.95
AUTO LOW VOLT DISCONNECT WITH ALARM OUTPUT ..... $ 18.00
ALL METAL ENCLOSURE ..... $ CALL
ENCLOSURE WITH CUSTOM METER ..... $ CALL

"SMART" SOLAR CONTROLLER IMPROVED! SENSES IF LIGHT SOURCE IS ADEQUATE. CONFIGURE AS DUAL LEVEL FLOAT OR DUAL STEP CURRENT CHARGER ..... $ 54.95

BC-04, 5 AMPS (OR LESS) CHARGING RATE, 12 OR 14 V., AMMETER, HEAVY DUTY XFMR, 3.5 X 8.5 X 10. METAL ENCLOSURE, FOR DEEP CYCLE HIGH POWER USAGE. 110 VAC 60 HZ. ... $ 199.95

CURTIS KEYER KIT

INCLUDES AUDIO AMPLIFIER, IAMBIC KEYING, ADJUSTABLE SPEED- ..... $ 39.95
POS/NEG KEY, WEIGHT/TONE CONTROL ... $ 10.00
SPEED METER OPTION ..... $ 14.95

COMPONENTS

UC3906 BATTERY CHARGER CHIP ($7.00); LM350K ($7.50); 8044ABM CURTIS KEYER CHIP ($19.95); LM338K ($10.50); MC3423P1 ($3.00); NE604AN ($5.00), NE602AN ($2 EA. 6/$10.00); & MORE

ANTENNAS: TWIN-LEAD LADDER-LINE

MARCONI: 80 M - .. $37.95; 160 M - ..... $ 44.95
J-POLES: (2M, 6M, 220, 440 MHZ) $8.95 – $ 42.95
"WINDOM" W/ 1:4 BALUN+ 50' FEED LINE $ 89.95
G5RV MULTIBAND (80 THRU 10M) ..... $ 44.95

TO ORDER CALL 1-800 JADE PRO (523-3776)
VISA, MASTERCARD, CHECK OR MO ACCEPTED
USA SHIP COST: $8.00 1ST $100 + $1.00 /EA. ADD'L $100.

JADE PRODUCTS, INC.
PUTTING THE AMATEUR BACK IN RADIO

P.O. Box 368
E. HAMPSTEAD, NH 03826
PHONE: 603-329-6995
FAX: 603-329-4499
PRICES AND SPEC SUBJECT TO CHANGE

TAZ HAZ

THE BEST PRODUCT, PRICES, AND SERVICE

QUANTITY	1	5	10	20
B P V 7 ----/----	$235.00	$225.00	$215.00	$205.00

800-800-9521

orders shipped within 24 hours Via UPS C.O.D.

Write in 69 on Reader Service Card.

#80 TEST EQUIPMENT *cont.*

TEST EQUIPMENT for sale. All major brands including HP, TEK, FLUKE, Keithley and others. Savings up to 90% off list price. We also buy test equipment. Call ValueTronics, John, at 1-800-552-8258 for free catalog, or with your "For Sale" list.

TEST EQUIPMENT: We buy and sell late model HP, TEK, Fluke, Wavetek, GR, etc. All equipment we sell is calibrated and guaranteed to meet manufacturers specifications. **KANDEL ELECTRONICS,** Inc., PO Box 204, Oreland, PA 19075. **Toll Free 1-800-582-TEST (8378), 215-233-6100, FAX 215-886-7017.**

TEKTRONIX FRAMES, 7904 TESTED WORKING AND GUARANTEED $325. 7S12, $195 with manual: **S-1** $80, **S-2** $120 ea., 2 available; **S-3** with complete accessory kit & manual $350. **TEK 475** portable scope $465. TEK Plugs, 7A13 (LED) $285. 7A18, 7A18A, $45 & $50, 7A26 $65, 7B15 $200, 7B50 $50, 7B71 $70, 7B80 $80, 7B85 $90, 134 current probe amplifier $105. **7D20** $385. **TEKTRONIX DC-501A** OPT1 $150. DC-505A, $195; DM-502A, $150; DD-501 $90; PG-501 $150. **HEWLETT PACKARD 141T** spectrum analyzer frames, $280, new color. **Tektronix** 491 Spectrum Analyzer $550. Call for FAX list of surplus test equipment. Psitech Plus, 707-745-4804, FAX 707-747-5277.

HP 8660A, 86602B, 86632B, 11661B 1300MHz, synthesized signal generator system 1.0 - 1300MHz, $1,900! includes 30 day guarantee and manuals. Tech-Systems, 1-800-435-1516.

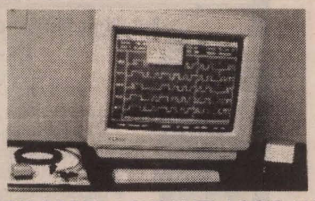
CUSHMAN CE-5 w/scope, pad & manual $675, OBO; Alexander TA1500 II batt analyzer $195. Gene 405-799-8787.

HP 5180A Waveform recorder $750, HP 400EL AC voltmeter $125, HP 1610A, 1610B logic state analyzer $150, HP 6940B multiprogrammer $200, HP 5359A Time synthesizer $1,100, HP 8410A network analyzer $250, HP 8412B phase-mag display $250, TEK 7844 400MHz oscilloscope $300, HP3500 Attenuator set $125, HP222A pulse generator $100, HP 34702A multimeter $125, Fluke 1953AE Counter Timer $200, Fluke 8000 digital multimeter $60, TEK 7B71 $100, TEK P6451 DATA acquisition $45, Preston GMAD-1A analog to digital conversion system $100, H-H Scott random noise generator $50, Tek P6105, P6106 PROBE $45, HP 85 $50, KIKUSUI electronics power supply PBA 32-2 $150, Gould K450L Logic Analyzer $150, TEK 4957 digitizer $100, LAMDA LP-521-FM V = 20V, I = 3.3A, LP-520-FM V = 10V, I = 5.0 $100. 714-827-7345.

HP 8673D $34,500, 11792A, 11713A, 8497K, 8494H, 355C, 355D, G382A, X382A, 86632B, Fluke 1722A Instrument Controller 752A, EIP 575 Austrom 2100F Hughs TWTA. Also, have Wiltron, Weinschel, Tektronix, Astromed, Instruments and connectors. Call for complete list, 517-876-6666. Michigan.

TEST, MISC. electronics. Send SASE for huge listing. Ellicot Electronics, R3, Calhan, CO 80808.

TEK 1410/SPG3/TSG2/TSG3 NTSC TV signal generator, like new $950. Tek 146 NTSC signal generator $500. Wavetek 1062 RF signal generator, new, $475. HP 355D/01 attenuator, new, $75. Wavetek 1084 microwave signal generator $400. Marconi TF2300A modulation meter $250. Naptech, 707-928-1961.



LOGIC PROBE 5 CHANNEL LOGIC ANALYZER OPERATES THROUGH PRINTER PORT. Features include: 30 day money back guarantee (Less $15 S&H). 30% trade-in for future instrument upgrades. Windows like pull down menus. 3 different trigger modes. Self calibrating. 98% accuracy or ±1 sample. Marker and Cursors displayed in Eng units. Schmitt Trigger inputs accept > ±50 VDC. All surface mount electronics in conn housing. Save, load, and print logic displays. On line help. Convenient "Hot Keys" for fast response. Note: Maximum Sample rate depends on computer. Typical speed = 1.6 Us for 486. Software, cable/probes, and electronics $69.55. American MicroTech, Inc., 219-482-3896, PO Box 8304, Ft. Wayne, IN 46825-8304.

SCOPE BOOSTER. Increase the input frequency of your oscilloscope to 30MHz and beyond. Requires no internal connections. Great for checking transmitters on CB, ham, modulation, etc. Assembled: $49.95. Kit $29.95. S&H $3.50. Creative Technology, PO Box 1401, Torrington, CT 06790-1401.

AT&T MICROHMETER NDT TEST SYSTEM, model M-100, 12ft spring cord, Bi-position handle, Battery Charger, Calibration plate, 0.100 & 0.250 in Probe cartridges, complete documentation; Carrying case w/molded insert; Working, as new condition $450 or best offer. Psitech Plus, 707-745-4804, FAX 707-747-5277.

 Write in 67 on Reader Service Card.

Making Printed Circuit Boards (An Easy Way)

by John Iovine

A few months ago, we described how to interface a scientific instrument (Geiger counter) to the IBM printer port. We created a simple interfacing circuit consisting of a single CMOS op-amp and a few resistors. This month, we will use that interfacing circuit to illustrate making a basic single sided printed circuit board (PCB).

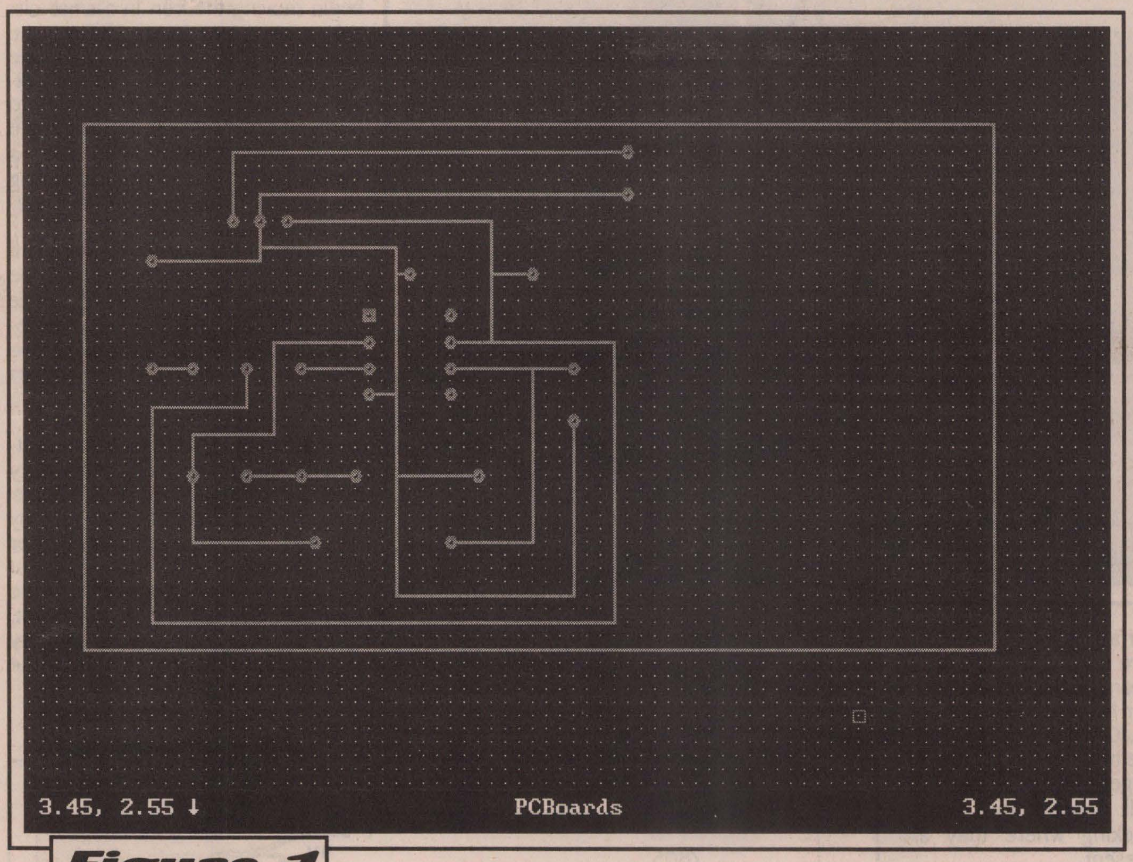


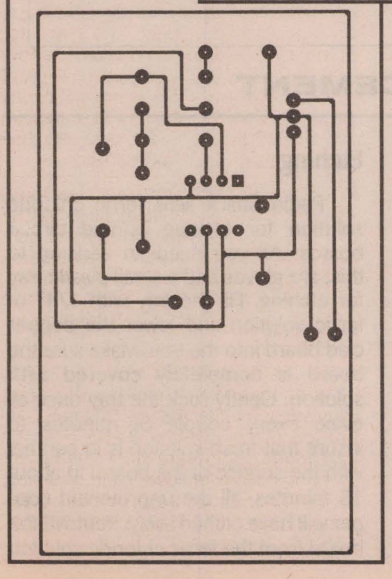
Figure 1

A PCB will give your homemade electronic projects a professional look. In addition, wiring errors and subsequent trouble shooting headaches are sharply curtailed.

Printed circuit boards are easier to make today than a few years ago. New materials are available from DynaArt Designs (see parts list) that reduce the amount of work and skill required. Just about anyone can successfully make high quality PCBs.

DynaArt supplies specially coated paper sheets. PCB patterns are copied onto the paper using a plain paper photocopy machine or a laser printer. If you are using a PCB pattern from a book or magazine, you are restricted to using the photocopy machine. If you don't own a plain paper photocopy machine, use a local photocopy service that can photocopy the pattern onto your paper for a nominal charge.

Figure 2



The specialty paper allows one to transfer the etch-resist patterns directly from the paper onto copper clad boards.

The PCB etch-resist pattern is transferred from the paper onto a copper clad board using a household iron. The paper is placed onto the copper board and pressed with an iron. The iron is set to about 300 degrees, typically a "cotton" fabric setting.

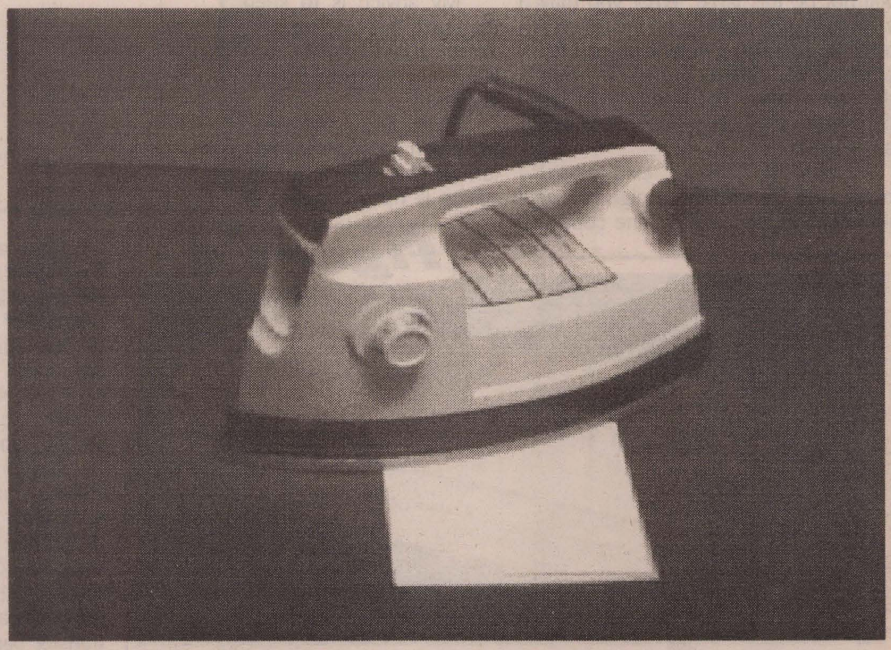
The toner used in photocopiers and laser printers is heat sensitive. The heating iron fuses the toner onto the copper board. The fused toner makes an excellent etch-resist that protects the copper laying underneath it. This allows one to etch an accurate board design on a copper clad board. Once the design is transferred onto the board using the household iron, the board is placed into a dish of warm water.*

The water causes the paper to separate from the copper clad board, leaving behind the PCB pattern. The board is removed from the water and allowed to dry completely before etching.

Next, the copper clad board is etched then drilled. The toner photoresist can then be removed using a steel wool pad and soap.

If you have a PCB design program see (Figure 1) like PC Boards or Pro-Board and a laser printer, you can print the design directly onto the specialty paper. This eliminates the photocopying step. For our project, however, I'll assume you will be using a PCB pattern published in a magazine, such as the PCB pattern accompanying this article and using a plain paper photocopier.

Figure 3



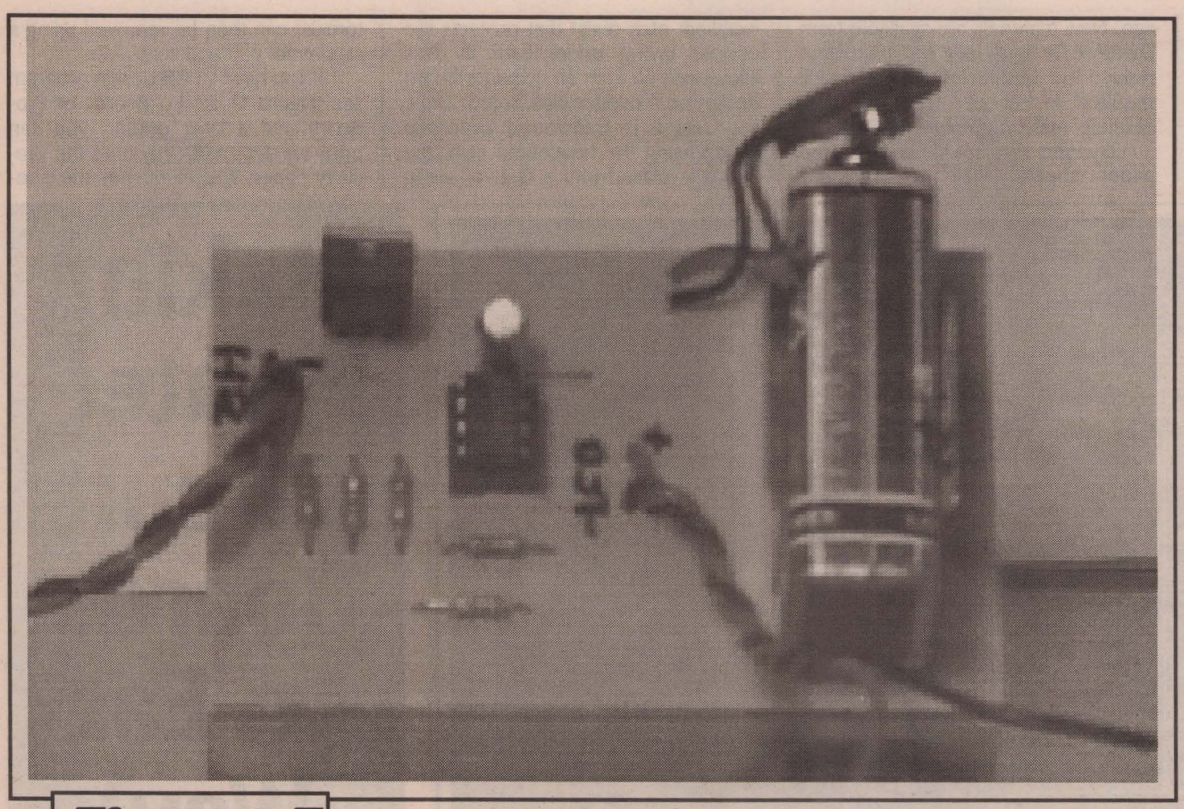


Figure 5

Interface Adaptor

To get our feet wet using this new technique we will make a simple, but practical project. Figure 2 is a PC foil pattern for the interface circuit.

First Step

The first step is to copy the PCB design onto the transfer paper using a photocopier. As stated previously, many local printers and photocopying services will photocopy the design onto the specialty paper for a nominal fee. The specialty paper comes in a standard 8.5" x 11" paper size. Chances are that your PC foil patterns will not be this large. What you may want to do is double up on the foil pattern. Or you may combine several PC patterns for different projects onto the same paper. The idea is to utilize the sheet of specialty paper as much as possible.

Clean the copper clad board before you transfer the design to it. If there is any dirt or oil on the copper surface, it may prevent the toner pattern from adhering to it. To clean the board, use a fine wet and dry sandpaper to remove every trace of dirt and oil. Once the surface is clean, handle the board by its edges only, fingerprints are "oily" and will prevent the pattern sticking where they are present.

Transferring the Image

Preheat a clothes iron to its "cotton" setting (approximately 300 degrees). While the iron is heating, we have three factors to consider: heat, pressure, and time.

My advice is to keep the iron's heat setting consistent at the "cotton" setting every time you use this process.

Regarding pressure, too much pressure will flatten out the trace lines. My advice is not to apply any pressure when transferring the design. Just allow the weight of the iron itself to press down on the pattern.

Well, so far we eliminated two of the three variables, this leaves "time." For a small pattern such as the one we are using in this article, 1.25 to 1.5 minutes of heating with the iron is all that is required. This is assuming you are using an equally small copper board. A large board will require additional time due to its greater heat-sinking capacity.

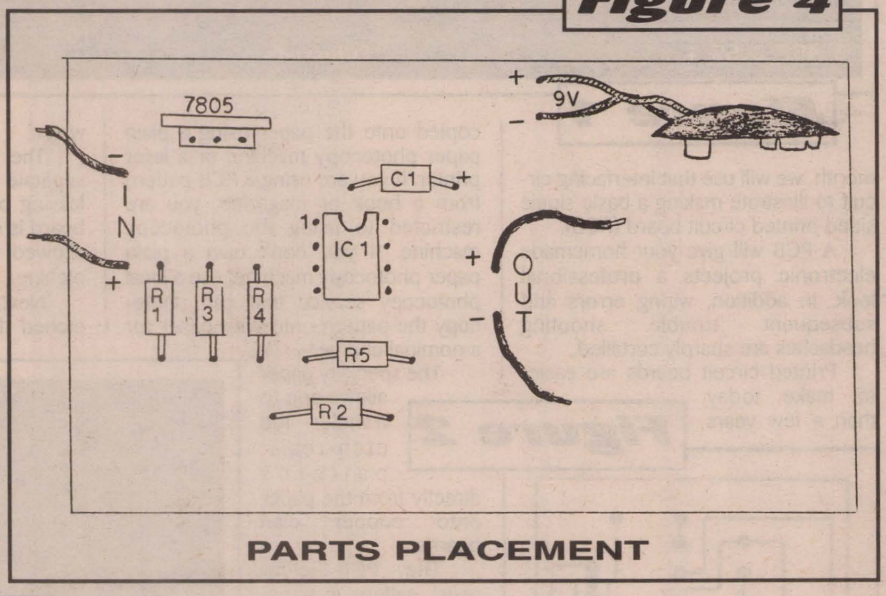
Find a flat surface to work on. Place a small cloth towel on the work surface to protect it from the iron's heat. Place the copper board onto the work surface. Next, place the specialty paper, toner side down onto the copper board. Included with this kit of transfer paper is a protective translucent sheet. Place the translucent sheet over the transfer paper. This sheet protects the transfer sheet's backing from becoming chaffed and provides a good sliding surface for the iron. Start timing and bring the iron straight down on the pattern and begin moving the iron in a small circular motion (see Figure 3). Keep the iron moving at all times. When the time is up, remove the iron immediately. Carefully pick up the board (remember it's still very hot) and slip it into a dish of water. After about a minute, the paper will slide off leaving the pattern (fused toner) on the copper board.

Remove the board and inspect it (do not touch the toner pattern). If the pattern is not good, try to determine what is the cause. Some typical problems are the pattern adheres in one area and not others, flattened lines and pads that may be caused by too much pressure or over-heating.

Minor imperfections in the pattern can be repaired using a specialty marker from Radio Shack. The black marker's ink is an etch resist and may be used to add or repair the toner PCB pattern.

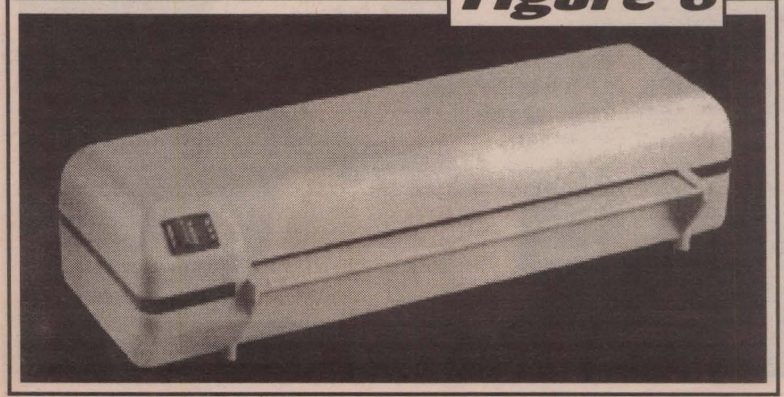
If the pattern is okay, move to the next step: etching the board. If not, clean the board with fine wet and dry sandpaper to remove all traces of the pattern and start over.

Figure 4



PARTS PLACEMENT

Figure 6



Etching

Radio Shack sells ferric chloride solution for etching printed circuit boards. All you need, in addition to this, are gloves and a small plastic tray for etching. Fill the tray with 1/4" of ferric solution and lower the copper clad board into the tray. Make sure the board is completely covered with solution. Gently rock the tray once or twice every couple of minutes to insure that fresh solution is in contact with the surface of the board. In about 15 minutes, all the unprotected copper will have etched away. Remove the board from the ferric chloride solution

and rinse under running water for five minutes. Discard the spent solution left in the tray.

Alternate

Radio Shack also sells small etching kits that contain the ferric chloride solution, a few single sided copper clad boards, and a plastic tray for etching. Buying this kit will simplify your material purchases (see parts list).

Clean & Drill

After you have rinsed the board in running water, remove the toner/resist using steel wool. You should now be looking at a bright copper pattern. The next step is to drill all the holes you need. Radio Shack sells an inexpensive plastic hand drill made just for drilling printed circuit boards.

The drill bit supplied with the drill is a little too large for our design (and most other designs found in magazines and books). This drill bit is made for drilling chunky pads and patterns, the type that are laid out in resist tape by hand (lots of work using tape). I advise to purchase a .015 inch diameter drill bit from a local hardware store and use it for all your PCB drilling.

Stuffing

After you've finished drilling the board, it's time to add your components (called stuffing). This PCB project requires just a handful of components, (see parts list). Figures 4 and 5 illustrate the parts placement on the PCB.

Going Further

As you can see, making a quality PCB is no longer the onerous task that it used to be. You can use PCBs whenever you have the chance now, instead of hand wiring.

DynaArt also sells more advanced equipment for producing PC boards. The DynaArt Fuser is a heat laminator that automatically fuses the paper to the copper clad board (see Figure 6). This eliminates using the household iron. The Fuser allows one to produce high-quality foil patterns on copper clad boards consistently.

Beyond this, DynaArt sells equipment for producing double sided PC boards.

Decals

There is one last facet to the DynaArt system I would like to mention. The same materials can be used to make high quality black and white or color decals for project face plates. The instructions to make decals are included with the package from DynaArt Designs. NV

Parts List

Toner Transfer System
$28.95

Package Includes:
10 Sheets 8.5" x 11"
Protector Sheet
Full Instructions

DynaArt Designs
3535 Stillmeadow Lane
Lancaster, CA 93536-6624
(805) 943-4746

Shipping for one transfer package $4.00
Shipping for each additional package $1.50
CA residents add appropriate sales tax

PC Board Kit
$10.95

Kit Includes:
Two 4.5" x 3" copper clad board
Resist ink pen
Etchant
Tank
Layout strips & pads
1/16 drill bit
Instructions

Available from:
Local Radio Shack

IC1 CMOS OP-AMP	$5.00
IC2 7805 Voltage Regulator	$2.00
R1-R5 1000 ohm 1/4 watt resistor	.10 ea.
C1 100 uF 10-volt capacitor	$1.50
9-Volt Battery Cap	$1.00
9-Volt Battery Holder	$1.00
PC Board	$10.00

Available from:
Images Company
P.O. Box 140742
Staten Island, NY 10314
(718) 698-8305

❖ ATTENTION CABLE VIEWERS ❖

CABLE VIEWERS . . . get back to your BASIC Cable Needs

Call 1-800-577-8775
For information regarding all of your **BASIC** cable needs.

5 GOOD REASONS TO BUY OUR FAR SUPERIOR PRODUCT
- ❖ PRICE
- ❖ EFFICIENT SALES AND SERVICE
- ❖ WE SPECIALIZE IN 5, 10 LOT PRICING
- ❖ ALL FUNCTIONS (COMPATIBLE WITH ALL MAJOR BRANDS)
- ❖ **ANY SIZE** ORDER FILLED WITH SAME DAY SHIPPING

We handle NEW equipment ONLY - Don't trust last years OBSOLETE and UNSOLD stock!
COMPETITIVE PRICING — DEALERS WELCOME

BASIC ELECTRICAL SUPPLY & WAREHOUSING CORPORATION

It is not the intent of B.E.S.W. to defraud any pay television operator and we will not assist any company or individual in doing the same.
*Refer to sales personnel for specifications.

P.O. Box 8180 • Bartlett, IL 60103-8180 • 708-582-2099

WESTERN TEST SYSTEMS

WE BUY AND SELL

Inquiries **303-438-9662** • Fax **303-438-9685**

Orders only **800-538-1493**

530 Compton St., Unit #C, Broomfield, Colorado 80020

OSCILLOSCOPES & ACCESSORIES

TO 100 MHz

TEK 465B 100 MHz Dual Trace Oscilloscope $650.00
TEK 5440 50 MHz 4-Trace Oscilloscope System, w/(2)5A48, 5B42 ..... $650.00
TEK 5A13N Differential Comparator $300.00
TEK 5A18N 2 MHz Dual Trace Amplifier $125.00
TEK 5A19N 2 MHz Differential Amplifier $175.00
TEK 5B10N 2 MHz Time Base / Amplifier $100.00
TEK 7A13 100 MHz Differential Comparator Amp., LED display $400.00
TEK 7A18 75 MHz Dual Trace Amplifier $100.00
TEK 7A22 1 MHz High CMRR Differential Amplifier $400.00
TEK 7B53A 100 MHz Dual Time Base $200.00
TEK R7704 100 MHz Quad Trace Rack O'scope System, w/(2)7A26,7B53A $600.00

ABOVE 100 MHz

TEK 475 200 MHz Dual Trace Oscilloscope $850.00
TEK 475A 250 MHz Dual Trace Oscilloscope $950.00
TEK 485 350 MHz Dual Channel Oscilloscope $1,100.00
TEK 7844 400 MHz Dual Beam Oscilloscope frame $750.00
TEK 7904 500 MHz 4-slot frame $500.00
TEK 7904 500 MHz System, with 7A24, 7A26, 7B92A $1,100.00
TEK 7904 500 MHz System, with 7A24, 7A26, 7B80, 7B85 ..... $1,100.00
TEK 7904A 500 MHz Oscilloscope Frame $700.00
TEK 7A16A 225 MHz Single Trace Amplifier $150.00
TEK 7A24 400 MHz Dual Trace Amplifier $450.00
TEK 7A26 200 MHz Dual Trace Amplifier $250.00
TEK 7A29 1 GHz Single Channel Amplifier $850.00
TEK 7B10 1 GHz Time Base $500.00
TEK 7B15 1 GHz Delaying Time Base $600.00
TEK 7B80 400 MHz Delayed Time Base $200.00
TEK 7B85 400 MHz Delta Delaying Time Base $250.00
TEK 7B92A 500 MHz Dual Time Base $450.00

STORAGE

TEK 5441 50 MHz 4-Trace Storage System, w/(2)5A48, 5B42 ..... $850.00
TEK 7633 100 MHz 4-Trace Storage System, w/(2)7A26, 7B53A $1,000.00
TEK SC503 10 MHz Dual Trace Storage Oscilloscope, TM500 series $700.00

DIGITAL

TEK 2201 20 MHz Analog & Digital Oscilloscope, 20 MS/s $1,300.00
TEK 468 100 MHz Analog / 10 MS/s Digital Oscilloscope $1,500.00
TEK 7D20/R7603 Programmable Digitizer w/frame, 10 MHz 1-shot/70 MHz rep $1,300.00

SAMPLING

TEK 7854 400 MHz Waveform Processing frame, GPIB $1,500.00
TEK 7S11 Sampling Unit $450.00
TEK 7S14 1 GHz Dual Channel Sampling Unit $700.00
TEK 7T11 Sampling Sweep Unit $950.00
TEK R7603 1 GHz Dual Trace Sampling system, w/7S14 ..... $750.00

PROBES

TEK 1101 Accessory Power Supply, for FET probes $250.00
TEK P6201 900 MHz 1X/10X/100X FET Probe $500.00

CALIBRATION

TEK CG551AP/TM506A Oscilloscope Calibrator, with pulse head & power module $3,500.00

WAVEFORM & GENERATORS

FUNCTION

HP3310A 5 MHz Function Generator $325.00
HP3310B 5 MHz Function Generator, monocycle & burst operation $425.00
HP3312A 13 MHz Function Generator, sweep, AM, FM $850.00
SYNTEST SI-102 TTL Clock Synthesizer, 0.1 Hz-16 MHz, 6 decade resol. $150.00
TEK DD501 Digital Delay & Burst Gen., for function & pulse gen's $375.00
TEK FG502 11 MHz Function Generator, TM500 series $325.00
TEK FG504 40 MHz Function Generator, TM500 series $875.00
TEK RG501 Ramp Generator, TM500 series $225.00
WAVETEK 132 2 MHz VCG / Noise Generator $600.00
WAVETEK 135 2 MHz Lin/Log Sweep/Function Generator, tone burst $275.00
WAVETEK 142 10 MHz Function Generator $275.00
WAVETEK 148 20 MHz Function Generator, AM/FM/PM modulation $700.00
WAVETEK 166 50 MHz Pulse/Function Generator $1,250.00
WAVETEK 188 4 MHz Sweep/Function Generator, 20 Vp-p $275.00

PULSE

HP214B 10 MHz Pulse Generator, 50 V/50 Ohms, auto duty cycle $2,250.00
HP8004A 10 MHz Pulse Generator, double pulse & offset $250.00
HP8007B 100 MHz Pulse Generator $650.00
HP8080A/81A/82A/83A 300 MHz Word Generator $900.00
HP8080A/91A/92A/2x93A 1 GHz Dual Channel Pulse Generator $1,650.00
HP8080A/91A/92A/93A 1 GHz Single Channel Pulse Generator $1,400.00
HP8080A/91A/93A 1 GHz Clock Generator $900.00
HP8082A 250 MHz Dual Output Pulse Generator $1,400.00
PHILIPS PM5785B 125 MHz Dual Output Pulse Gen., burst mode, 1 nS Tr $1,100.00
TEK 284 Pulse Gen., 70 pS Tr, +200 mV/50 ohms, trigger output $500.00
TEK PG501 50 MHz Pulse Generator, TM500 series $300.00
TEK PG502 250 MHz Pulse Generator, Tr<1nS, TM500 series $700.00
TEK PG505 100 kHz Pulse Generator, 80V, TM500 series $275.00
WAVETEK 801 50 MHz Pulse Generator $550.00

PROGRAMMABLE

HP3325A Synthesizer / Function Generator, 1 uHz-21 MHz $2,500.00
HP8165A Programmable Signal Source, 1 mHz-50 MHz $2,600.00
TEK AWG5102 Arb.Waveform Gen.,20 MS/s,12 bits, 50ppm synthesis <1MHz $1,800.00
TEK AWG5105 Arbitrary Waveform Generator, 50 MS/s, 12 bits $2,200.00
TEK AWG5105-opt.02 Arbitrary Waveform Generator, dual channel option $3,000.00
TEK PFG5505 Programmable 12 MHz Pulse/Function Generator $1,275.00
WAVETEK 278-opt.02 12 MHz Programmable Synthesized Function Gen., GPIB $1,500.00

VOLTAGE & CURRENT

VOLTMETERS

HP3456A 6-1/2 digit Voltmeter $850.00
HP3457A 7-1/2 digit Voltmeter $2,000.00
HP3468A-001 5-1/2 digit Multimeter, battery power option $375.00
KEITHLEY 181 6-1/2 digit Nanovoltmeter, 10 nV sensitivity, GPIB $1,500.00
SOLARTRON 7150 5-1/2 / 6-1/2 digit Multimeter, GPIB $550.00
TEK DM511-opt.02 4-1/2 Digit DMM, w/P6602 Temp. BOXED) Probe; TM500 (NEW/ $395.00

CALIBRATION

FLUKE 332B/AF DC Voltage Calibrator, 0-1111 V, 0-50 mA, 7 decades $675.00
FLUKE 343A DC Voltage Calibrator, 0-1100 V, 7 decades, 20 ppm acc. $1,375.00
FLUKE 510A AC Reference Standard, 10 VRMS, 19.2 kHz, <0.1% acc. $450.00
FLUKE 752A DC Reference Divider $2,500.00
VALHALLA 2500-E AC/DC Current Calibrator, DC-5 kHz, 100 uA-10 A f.s $1,250.00
VALHALLA 2703 AC Voltage Calibrator, 0-1200 VRMS, 10 Hz-100 kHz $2,200.00

VOLTAGE SOURCES

HP6114A Precision Dual Range Power Supply, 20 V 2 A / 40 V 1 A $875.00
HP6115A Precision Dual Range Power Supply, 50V 0.8A / 100V 0.4A $875.00

CURRENT METERS & SOURCES

DRANETZ 656A /(3)TR2019A Current Demand Analyzer, w/(3) current probes 300A max. $5,000.00
HP6177C DC Current Source, to 50V, 500mA $600.00
HP6181C DC Current Source, to 100 V, 250 mA $675.00
HP6186C DC Current Source, to 300V, 100mA $750.00
KEITHLEY 225 Current Source, 1 nA-99.9 mA, 10-100 V compliance $450.00
KEITHLEY 642 Electrometer $3,900.00
LEEDS & NORTHRUP 4360 Precision Current Shunts, 15-500 Amp $650.00
TEK CT-5 High Current Transformer for P6021/A6302, to 1000A $650.00

IMPEDANCE & COMPONENT TEST

L.C.R.

BALLANTINE 3205A 4 digit Micro-Ohmmeter $875.00
BOONTON 62AD 1 MHz Inductance Meter, 2-2000 uH $700.00
BOONTON 72BD 1 MHz Digital Capacitance Meter, 2-2000 pF $700.00
E.S.I. 296V 4-1/2 Digit LCR Bridge, 120 Hz & 1 kHz $850.00
HP4275A Multi-Frequency LCR Meter, 10 kHz-10 MHz $6,250.00
HP4328A-001 Milliohmeter, 0.001-100 ohms f.s., battery option $1,350.00
HP4329A High Resistance Meter, 500K ohm- 2x10E16 ohm, 10-1000V $1,350.00
HP4342A Q Meter, 22 kHz-70 MHz, Q=5-1000 ..... $2,250.00
MEGURO MQ-171 VHF Q Meter, 20-230 MHz, Q=10-500, freq. readout 100 Hz $1,100.00

STANDARDS

E.S.I. RS-925 9-Decade Resistor, 0.01 ohm-1.2 Megohm $2,000.00
E.S.I. SR1010 Resistance Transfer Standards, 1 ohm-100 K/step $800.00
FLUKE 5450A Programmable Resistance Standard, 2 & 4 wire $2,750.00
GR 1409-SERIES Standard Mica Capacitors, 0.05% accuracy $150.00
GR 1432-N 5-Decade Resistor, to 11,111 ohms, 0.1 ohm res. $275.00
GR 1432-U 4-Decade Resistor, 0-111.10 ohms, 0.01 ohm resolution $175.00
GR 1433-X 6-Decade Resistor, to 111,111.0 ohms, 0.1 ohm res. $550.00
GR 1434-G 7-Decade Resistor, 0-1,111,111.0 ohms, 0.1 ohm res. $500.00

CURVE TRACERS

TEK 577D1/177 Storage Curve Tracer, with standard test fixture $2,250.00
TEK 577D2/177 Curve Tracer, with standard test fixture $1,950.00
TEK 7CT1N Curve Tracer, to 0.5W, 7000 series $500.00

T.D.R.

TEK 1502-opt.04 Time Domain Reflectometer, 0-2,000 feet, chart recorder $2,250.00
TEK 1503-opt.04 Time Domain Reflectometer, 0-50,000 feet,chart recorder $2,000.00

POWER SUPPLIES

SINGLE OUTPUT

GLASSMAN PS/EG-05R06 5kV CV/CL Power Supply, to 6mA $500.00
HP6002A-001 Programmable Power Supply, 0-50 V / 0-10 A / 200 Watts $875.00
HP6023A Autoranging Power Supply, to 20 V / 30 A / 240 Watts $1,000.00
HP6207B 160 V at 200 mA CV/CC Power Supply $300.00
HP6260B-027 10V at 100A CV/CC Power Supply $675.00
HP6261B-027 20 V at 50 A CV/CC Power Supply $675.00
HP6263B 20 V at 10 A CV/CC Power Supply $400.00
HP6267B 40 V at 10 A CV/CC Power Supply $550.00
HP6268B 40 V at 30 A CV/CC Power Supply $850.00
HP6299A 100 V at 750 mA CV/CC Power Supply $250.00
HP6384A 4.0-5.5 V at 8 A CV/CL Power Supply $175.00
HP6434B 40 V at 25 A CV/CC Power Supply $800.00
HP6438B 60V at 5A CV/CC Power Supply $375.00
SORENSON DCR 110-45T 110 V at 45 A CV/CC Power Supply $2,200.00

MULTIPLE OUTPUT

HP6227B Dual 25 V at 2 A CV/CC Power Supply $650.00
HP6253A Dual Output 20 V 3 A CV/CC Power Supply $500.00
HP6255A Dual Output 40 V 1.5 A CV/CC Power Supply $500.00

MISCELLANEOUS

ACME PS2L-1000 Programmable Load, 0-75 V / 0-150 A / 1000 Watts max. $450.00
HP59501A HPIB Isolated DAC/Power Supply Programmer $175.00
HP6824A Bipolar Power Supply/Amplifier, to 50 V, 1 A $400.00
HP6827A Bipolar Power Supply/Amplifier, to 100 V, 500 mA $800.00
KEPCO BOP-100-4M 100 V, 4 A Four Quadrant Bipolar Supply / Amplifier $1,000.00
KEPCO BOP-15-20M Bipolar Amplifier / Power Supply, to 15 V, 20 A $875.00
KEPCO BOP-36-5M Bipolar Op Amp/Power Supply, to 36 V, 5 A $550.00

TIME & FREQUENCY

UNIVERSAL COUNTERS

HP5314A 100 MHz/100 nS Universal Counter $225.00
HP5315A 100 MHz/100 nS Reciprocal Counter, high res. audio $550.00
HP5315A-001 100 MHz/100 nS Universal Counter, TCXO reference $650.00
HP5316A 100 MHz/100 nS Universal Counter, HPIB $750.00
HP5316A-003 100 MHz/100 nS Universal Counter, HPIB, 1.0 GHz C-chan. $1,000.00
HP5370B-001 100 MHz Univ. Time Int. Counter, 20 pS single shot,OCXO $2,250.00
HPE1420A-010,030 VXI card 200 MHz/ 2 nS Univ. Counter, TCXO& 2.5 GHz C-ch $1,500.00
PHILIPS PM6654/056 120 MHz/ 2 nS Programmable High Res. Counter, OCXO,GPIB $950.00
TEK 7D15 225 MHz Universal Counter/Timer, 7000 series $275.00
TEK DC5004 Programmable 100 MHz/100nS Counter/Timer, TM5000 series $475.00
TEK DC5009-opt.01 Programmable 1 35 MHz Univ. Counter/Timer, TCXO, TM5000 ..... $750.00
TEK DC5010 350 MHz/3.125 nS Univ. Counter, TM5000 series $1,200.00
TEK DC503A 125 MHz Universal Counter/Timer, TM500 series $500.00
TEK DC509 135 MHz High Resolution Universal Counter/Timer, TM500 ..... $700.00
TEK DC510 350 MHz/3.125 nS Universal Counter, TM500 series $900.00

FREQUENCY COUNTERS

EIP 545-opt.05,08 18 GHz Frequency Counter, OCXO and GPIB $1,875.00
FLUKE 7220A-opt.111 1.3 GHz Communications Counter, TCXO option $650.00
HP5305B/5300B-001 1.3 GHz Counter Package w/TCXO ref., high res. audio $450.00
HP5340A-001,011 18 GHz Frequency Counter, OCXO reference, HPIB $1,900.00
HP5342A-01,04,05,11 24 GHz Frequency Counter, B OCXO, DAC, and HPI $3,900.00
HP5345/5355/5356A-006 Pulsed/CW Frequency Counter, 0.4-18.0 GHz, 75 nS pulse $3,500.00
HP5361A-006 20 GHz Pulsed/CW Frequency Counter, 10 Watt protection $6,750.00
SYSTRON-DONNER 6054B 24 GHz Frequency Counter $1,875.00
SYSTRON-DONNER 6054B-opt.05,26 26.5 GHz Frequency Counter, GPIB $2,400.00
TEK 7D14 525 MHz Frequency Counter, 7000 series $175.00
TEK DC502 550 MHz Frequency Counter, TM500 series $400.00
TEK DC504 80 MHz Frequency Counter $125.00
TEK DP501 1.3 GHz Digital Prescaler, for DC503A,DC509,DC5010,etc. $500.00

STANDARDS

AUSTRON 1250A Crystal Frequency Standard, 0.1/ 1.0/ 5.0 MHz, AC/batt. $900.00
HP5087A-031 Distribution Amp., 0.1/1.0/5.0 MHz x 4 channels each $1,800.00

Write in 214 on Reader Service Card.

90 DAY WARRANTY PARTS AND LABOR • 10 DAY INSPECTION

TEST EQUIPMENT WANTED CALL OR FAX LIST • OPEN ACCOUNTS

AUDIO & BASEBAND

SPECTRUM ANALYZERS

HP3580A-002 Spectrum Analyzer, 5 Hz-50 kHz, 1 Hz res., bal. input — $1,850.00
HP3581A Wave Analyzer, 15 Hz-50 kHz — $900.00
HP3582A FFT Spectrum An., 25.6 kHz max., dual channels, HPIB — $2,500.00
HP3585A Spectrum Analyzer, 20 Hz-40 MHz, 3 Hz res., HPIB — $6,000.00
HP3586C Selective Level Meter, 50 Hz-32.5 MHz, 50 & 75 ohms — $1,750.00
HP8556A LF Section, 20 Hz-300 kHz — $500.00
TEK 7L5-opt.25/7603 Spectrum Analyzer, 20 Hz-5 MHz, w/tracking gen.,display — $2,250.00

DISTORTION ANALYZERS

HP334A Distortion Analyzer, 5 Hz-600 kHz, -60 dB, auto nulling — $550.00
HP339A Distortion Analyzer, built-in low distortion osc. — $2,400.00
TEK DA4084 Programmable Distortion Analyzer, 0.0025% THD, w/frame — $1,500.00

RMS VOLTMETERS

FLUKE 8920A True RMS Voltmeter, 180 uV-700 V, 10 Hz-20 MHz — $700.00
HP3400A RMS Voltmeter, 10 Hz-10 MHz — $250.00
HP400FL AC Voltmeter, 100 uV-300 V f.s., 20 Hz-4 MHz — $200.00

OSCILLATORS

FLUKE 6011A Synthesized Signal Gen., 10 Hz-11 MHz, 10 Hz res. — $1,200.00
HP204C Oscillator, 5 Hz-1.2 MHz, 5 VRMS — $150.00
HP204D Oscillator, 5 Hz-1.2 MHz, 5 VRMS, 80 dB step attenuator — $200.00
HP209A Sine/Square Wave Generator, 4 Hz-2 MHz, 5 VRMS max. — $225.00
HP4204A Synthesizer, 10 Hz-1 MHz, 1 mV-30 V / 600 Ohms — $350.00
HP652A Test Oscillator, 10 Hz-10 MHz — $300.00
ROCKLAND 5100 Synthesizer, 1 mHz-1.999999999 MHz — $400.00

FILTERS, MISCELLANEOUS

KROHN-HITE 3202 Dual High-Pass/Low-Pass Filter, 20 Hz-2 MHz, 24 dB/oct — $600.00
KROHN-HITE 3342 Dual HP/LP Filter, 0.001 Hz-99.9 kHz, 48 dB/octave — $1,100.00
KROHN-HITE 3343 Dual HP/LP Filter, 0.01 Hz-99.9 kHz, 48 dB/octave — $950.00
P.A.R. 189 Filter/Amplifier, 0.1 Hz-110 kHz, variable Q & gain — $400.00
TEK AM502 Differential Amplifier, 0.1 Hz-1 MHz, TM500 series — $575.00

RF & MICROWAVE

SPECTRUM ANALYZERS

HP11970A WR28 Harmonic Mixer, 26.5-40 GHz — $1,100.00
HP11970U WR19 Harmonic Mixer, 40-60 GHz — $1,400.00
HP5371A Modulation Domain Analyzer, 125 mHz-500 MHz — $5,900.00
HP8406A Comb Generator, 1/10/100 MHz increments, to 5 GHz — $450.00
HP8443A Tracking Generator, 0.1-110 MHz, LED display — $700.00
HP8444A Tracking Generator, 0.1-1300 MHz, for 8554B — $800.00
HP8444A-059 Tracking Generator, 0.5-1500 MHz, for 8554,8568,etc. — $1,500.00
HP8445B Preselector, 1.8-18.0 GHz, for HP 8555A — $800.00
HP8552B IF Section — $750.00
HP8553B RF Section, 1 kHz-110 MHz — $500.00
HP8554B RF Section, 0.1-1250 MHz — $800.00
HP8554B/8552B/141T Spectrum Analyzer, 100 kHz-1250 MHz, 100 Hz resolution — $2,000.00
HP8555A RF Section, 0.01-18 GHz — $950.00
HP8555A/8552B/141T Spectrum Analyzer System, 10 MHz-18 GHz, 100 Hz res. — $2,250.00
HP8558B/181TR Spectrum Analyzer, 0.1-1500 MHz, 1 kHz res., w/display — $2,250.00
HP8559A/181TR Spectrum Analyzer, 0.01-21 GHz, 1 kHz res., w/display — $4,500.00
TEK 494P Spectrum Analyzer, 1 kHz res., w/display — $13,000.00
TEK 496P Spectrum Analyzer, 1 kHz-1.8 GHz, 30 Hz res., GPIB — $5,500.00
TEK 7L14/7603 Spectrum Analyzer, 10 kHz-1.8 GHz, 30 Hz res.,w/display — $3,200.00
TEK 7L18/7603 Spectrum Analyzer, 1.5-18.0 GHz, 30 Hz res., w/display — $3,400.00
TEK TR503 Tracking Generator, 0.1-1800 MHz, for 492/4/5/6 — $1,750.00

NETWORK ANALYZERS

HP 11665B Modulator, 0.15-18.0 GHz, for use with 8755/6/7 — $375.00
HP8405A Vector Voltmeter, 1-1000 MHz — $700.00
HP8407A/8412A/8601A Network Analyzer, 100 kHz-110 MHz, with sweep generator — $1,250.00
HP85020A Directional Bridge, 0.01-4.3 GHz, N(f), for 8755/6/7 — $750.00
HP85021A Directional Bridge, 0.01-18.0 GHz, APC7, for 8755/6/7 — $1,200.00
HP85050D APC7 Calibration Kit, for 8510 series — $1,100.00
HP8755C/11666A-02/181T Scalar Network An. w/dir. bridge, 10 MHz-18 GHz & frame — $1,750.00
HP8756A Scalar Network Analyzer — $3,000.00
NARDA 7000A/7202/7206 Microwave Multimeter System: scalar analysis 0.1-18 GHz — $1,950.00
WILTRON 560/ 3x-7S50 Scalar Network Analyzer, w/3 detectors, 0.01-18.5 GHz — $2,000.00
WILTRON 560/ 560-98K50 Scalar Network Analyzer, w/VSWR Autotester 0.01-40 GHz — $2,950.00
WILTRON 640/G50/E(2)/7B50(2) Network An., w/1-1500 MHz source, (2) log amp, (2) det. — $1,675.00

SIGNAL GENERATORS

BOONTON 1020 Synthesized Signal Gen., 0.15-540 MHz, GPIB — $1,850.00
BOONTON 102C Signal Generator, 0.45-520 MHz, AM, FM — $850.00
COMSTRON FS-2000-4 Synthesizer, 10 MHz-4 GHz, 1 uS speed, -140 dBc noise — $15,000.00
FLUKE 6060A-488 Synth. Signal Gen., 100 kHz-1040 MHz, 100 Hz res., GPIB — $3,500.00
FLUKE 6060A/AN Synthesized Signal Gen., 10 kHz-520 MHz, 10 Hz res,GPIB — $2,000.00
GIGATRONICS 875/86 Levelled Multiplier, 26.5-40.0 & 50.0-75.0 GHz outputs — $8,000.00
HP85100V Frequency Mult., 10-15 GHz in / 50-75 GHz out >0 dBm — $4,250.00
HP8656A Synthesized Signal Gen., 0.1-990 MHz, 100 Hz res., HPIB — $3,250.00
HP86601A RF Plug-in, 10 kHz-110 MHz, for 8660 series — $650.00
HP8660C/86602B/86633B Synthesized Signal Generator, 1-1300 MHz, AM, FM, HPIB — $2,750.00
HP8660C/86603A-002/34A Synthesized Sig. Gen., 1-2600 MHz, phase mod. to 10 MHz — $4,500.00
HP8683B Signal Generator, 2.3-6.5 GHz, AM, WBFM, Pulse — $5,000.00
HP8684B Signal Generator, 5.4-12.5 GHz, AM, WBFM, Pulse — $5,000.00
ROHDE & SCHWARTZ SMK Signal Gen., 10 Hz-140 MHz, -130 dBc/20 kHz phase noise — $1,750.00
WILTRON 6742A Synthesizer/Sweep Generator, 18.0-26.5 & 26.5-40.0 GHz — $9,000.00

SWEEP GENERATORS

EIP 928-opt.9201 Sweep Gen.,1.0-18.6 GHz, step atten.,power sweep, GPIB — $4,000.00
HP8350A/86290B-H08 Programmable Sweep System, 2.0-22.0 GHz, +4 dBm lvl'd — $5,500.00
HP8601A Generator/Sweeper, 0.1-110 MHz, +20 dBm levelled — $500.00
HP8620C Sweep Oscillator Frame — $550.00
HP8620C-011 Sweep Oscillator Frame, HPIB programmable — $675.00
HP86210A RF Plug-In, 3-350 MHz, +13 dBm levelled — $450.00
HP86222A-002 RF Plug-in, 10-2400 MHz, 70 dB step attenuator — $1,750.00
HP86222B-002 RF Plug-In, 10-2400 MHz, crystal markers, 0-70 dB atten — $1,950.00
HP86240B RF Plug-in, 2.0-8.4 GHz, +13 dBm levelled — $1,000.00
HP86240C RF Plug-in, 3.6-8.6 GHz, +16 dBm levelled — $1,200.00
HP86241A-001 RF Plug-in, 3.2-6.5 GHz, +8 dBm levelled — $500.00
HP86242D-004,008 RF Plug-In, 5.9-9.0 GHz, +10 dBm levelled — $500.00
HP86260A RF Plug-in, 12.0-18.0 GHz, +10 dBm unlevelled — $1,000.00
HP86290A RF Plug-in, 2.0-18.0 GHz, +7 dBm levelled — $1,750.00
HP86290B RF Plug-In, 2.0-18.6 GHz, +10 dBm levelled — $2,000.00
WAVETEK 1067 Sweep Generator, 1-400 MHz, +10 dBm, 75 ohms — $500.00
WAVETEK 2001 Sweep Gen., 1-1400 MHz in 3 bands, +10 dBm levelled — $850.00
WAVETEK 2002 Sweep Gen., 1-2500 MHz in 4 bands, +10 dBm levelled — $1,500.00
WAVETEK 964 Signal/Sweep Generator, 3.7-7.6 GHz, +7 dBm unlevelled — $2,000.00
WAVETEK 962 Sweep Generator, 1.0-4.0 GHz, markers, +12 dBm unlvld — $2,500.00
WAVETEK/MARCONI 8910 Programmable Sweep Generator, 2-20 GHz, +10 dBm, GPIB — $5,500.00

POWER METERS

BOONTON 42B/41-4E Analog Power Meter, with 1 MHz-18 GHz sensor — $650.00
BOONTON 42B/42A-S3 Analog Power Meter, with 1 MHz-8.4 GHz N(f) sensor — $375.00
GENERAL MICROWAVE 476/4240A Power Meter & Sensor, 0.01-18 GHz, -35 to +10 dBm — $375.00
HP11683A Range Calibrator, for HP 435/6/7/8 — $750.00
HP432A/478A Power Meter, 0.01-10 GHz, -20 dBm to +10 dBm f.s. — $375.00
HP432A/8478B Power Meter, 0.01-18 GHz, -20 to +10 dBm f.s. — $500.00
HP432C Autoranging Digital Power Meter, 10 uW-10 mW f.s. — $425.00
HP435A/8481A Power Meter, 10 MHz-18 GHz, -30 to +20 dBm — $1,000.00
HP435A/8482A Power Meter, 0.1-4200 MHz, -30 to +20 dBm — $1,000.00
HP435A/8482H Power Meter, 0.1-4200 MHz, -15 to +34 dBm — $1,150.00
HP435A/8484A Power Meter, 10 MHz-18 GHz, -70 to -20 dBm — $1,000.00
HPK486A WR42 Thermistor Mount, 18.0-26.5 GHz, for 432 series — $400.00
HPQ8486A Power Sensor, 33.0-50.0 GHz, WR22 waveguide — $1,500.00
HPR486A WR28 Thermistor Mount, 26.5-40.0 GHz, for 432 series — $400.00
WAVETEK 1034A Portable Analog Power Meter, 1 MHz-18 GHz — $375.00

RF MILLIVOLTMETERS

MILLIVAC MV-723BBRS RF Millivoltmeter, 10 kHz-1.2 GHz, 1 mV-30 V — $375.00
RACAL 9303 TRMS Level Meter, 10 kHz-2 GHz, -77 to +23 dBm, GPIB — $875.00

AMPLIFIERS, MISCELLANEOUS

AILTECH 7616 Noise Source, 1.0-12.4 GHz, N(m), 15 dB ENR — $375.00
AILTECH 7618E Noise Source, 10 MHz-18 GHz, SMA(m), 15 dB ENR — $675.00
BOONTON 82AD FM/AM Modulation Meter, 10-1300 MHz — $1,000.00
ENI 240L Amplifier, 50 dB, 20 kHz-10 MHz, 40 Watts — $1,250.00
ENI 600L Amplifier, 24 dB, 0.8-1020 MHz, 150 mW — $450.00
ENI A150 Amplifier, 55 dB, 0.3-35.0 MHz, 150 Watts — $2,000.00
ENI A300 Amplifier, 55 dB, 0.3-35.0 MHz, 300 Watts — $3,500.00
HP346B Noise Source, 0.01-18.0 GHz, 15 dB ENR, APC3.5(m) — $950.00
HP8447F-H64 Dual Amp., 9 kHz-50 MHz/ 28 dBG & 0.1-1300 MHz/ 25 dBG — $1,100.00
LOGIMETRICS A300/L TWT Amplifier, 20 Watts, 1.0-2.0 GHz, gain >30 dB — $2,200.00
M.P.D. LAB2-1020-2A Amplifier, 34 dB, 1.0-2.0 GHz, 2 Watts — $1,000.00
M.P.D. LAB2-110-1E Amplifier, 30 dB, 100-1000 MHz, 1 Watt — $700.00
M.P.D. LAB2-714-3A Amplifier, 34 dB, 0.7-1.4 GHz, 3 Watts — $1,000.00
MICROWAVE SEMI.CORP. MC5112Noise Source, 25.5 dB ENR, 1.0-12.4 GHz, N(m), +28 VDC — $325.00

COAXIAL & WAVEGUIDE

ANZAC MDC-171 Mixer, RF/LO=4-18 GHz, LO +7 dBm, IF=DC-4 GHz, SMA — $135.00
GR 874-LTL Constant Impedance Trombone Line, 0-44 cm, DC-2 GHz — $450.00
GR 900-LB Precision Slotted Line, 0.3-8.5 GHz, 50 Ohms 0.1% tol. — $450.00
GR 900-Q GR900 14mm Interseries Adapters — $125.00
HP 11590A-001 Bias Network, 1-18 GHz, APC7 — $400.00
HP 11691D Directional Coupler, 22 dB, 2-18 GHz — $500.00
HP 11692D Dual Directional Coupler, 22 dB, 2-18 GHz — $900.00
HP33330D Detector, 0.01-33.0 GHz, APC3.5(m)/SMC(f) — $275.00
HP764D Dual Directional Coupler, 20 dB, 215-450 MHz — $150.00
HP767D Dual Directional Coupler, 20 dB, 1.9-4.1 GHz — $150.00
HP778D-011 Dual Directional Coupler, 20 dB, 100-2000 MHz — $400.00
HP779D Directional Coupler, 20 dB, 1.7-12.4 GHz — $375.00
HP8472A Crystal Detector, 10 MHz-18 GHz, neg. pol., SMA(m) — $150.00
HP8495B-001 Step Attenuator, 0-70 dB, DC-18.0 GHz, N(f/f) — $400.00
HP8497K-004 Programmable Attenuator, 0-90 dB, DC-26.5 GHz, APC3.5 — $600.00
HP911C Coaxial Sliding Load, 2.0-26.5 GHz, APC3.5 — $450.00
HPK532A WR42 Frequency Meter, 18.0-26.5 GHz — $500.00
HPK752A WR42 Directional Coupler, 3 dB, 18.0-26.5 GHz — $425.00
HPK752C WR42 Directional Coupler, 10 dB, 18.0-26.5 GHz — $425.00
HPK752D WR42 Directional Coupler, 20 dB, 18.0-26.5 GHz — $425.00
HPQ532A WR22 Frequency Meter, 33.0-50.0 GHz — $1,500.00
HPR532A WR28 Frequency Meter, 26.5-40.0 GHz — $500.00
KRYTAR 202020016 Directional Det., 2-20 GHz, SMA(f/m)/SMC(f), 10 uV/uW — $200.00
MITEQ AMP-1269 Amplifier, 30 dB gain, 700-1200 MHz, 1 Watt, 24V 500mA — $175.00
NARDA 26298 20 dB Attenuator, 150 Watts, DC-1 GHz, N(f/f) — $200.00
NARDA 3000-SERIES Directional Couplers — $150.00
NARDA 3090-SERIES Precision High Directivity Couplers — $225.00
NARDA 3752 Direct Reading Phase Shifter, 1-5 GHz, 180 deg./GHz — $1,250.00
NARDA 4000-SERIES SMA Miniature Directional Couplers — $75.00
NARDA 4203-6 Directional Coupler, 6 dB, 2-18 GHz, SMA(f/f/f) — $225.00
NARDA 5070-SERIES Precision Reflectometer Couplers — $300.00
NARDA 765-20 20 dB Attenuator, 50 Watts, DC-5 GHz, N(m/f) — $125.00
NARDA 792FF Variable Attenuator, 0-20 dB, 2.0-12.4 GHz — $375.00
PASSIVE MW. RHG-1003 WR28 Isolator, 20 dB, 26.5-40.0 GHz, loss <1 dB — $250.00
RLC AV-70124-R Level Set Attenuator, 0-20 dB, 7.0-12.4 GHz, SMA(f/f) — $75.00
TRANSCO 9D31800 Cavity Backed Spiral Antenna, 0.5-18.0 GHz, SMA(f) — $150.00
TRG B510 WR22 Precision Rotary Vane Atten., 0-50 dB, 50-75 GHz — $1,000.00
TRG B551 WR22 Frequency Meter, 33.0-50.0 GHz — $550.00
TRGV510 WR15 Precision Rotary Vane Atten., 0-50 dB, 50-75 GHz — $1,000.00
TRGV551 WR15 Frequency Meter, 50.0-75.0 GHz — $600.00
WEINSCHEL 1515 Power Divider, DC-18 GHz, SMA(f/f/f) — $125.00
WEINSCHEL 1579 Power Divider, DC-26.5 GHz, APC3.5(f/f/f) *NEW* — $275.00
WEINSCHEL 3200-1 Programmable Step Atten., 0-127 dB, DC-2 GHz, SMA *NEW* — $200.00
WILTRON 87A50 VSWR Bridge, 2-18 GHz, 35 dB dir., APC7 test port — $950.00
WILTRON 97SF50-1 Directional Bridge, 10 MHz-18 GHz, SMA(f), 38 dB dir. — $1,500.00

LOGIC

HP5004A Signature Analyzer — $150.00
HP5005A Signature Multimeter — $350.00
HP5005B Signature Multimeter, TTL/CMOS/ECL, HPIB — $750.00
HP8170A-002 Logic Pattern Generator, 2 MB/s, address driver option — $1,400.00
TEK 1240/(2x)D2 Logic Analyzer, w/(36) 50 MHz channels — $1,500.00

COMMUNICATIONS

HP28687A LAN Wire Test Instrument, for 25 pair cable — $750.00
HP3551A Transmission Test Set — $750.00
HP4935A Transmission Test Set, 20 Hz-110 kHz — $1,675.00
HP59401A HPIB Bus Analyzer — $700.00
TEK 1410R-opt.04 NTSC Test Signal Gen. w/ SPG2,TSG1,TSP1,TSG3,TSG5,TSG6 — $2,750.00
TEK 1411R-opt.04 PAL Test Gen. w/SPG12,TSG11,TSP11,TSG13,TSG15,TSG16 — $2,750.00
TEK 144 NTSC Test Signal Generator — $675.00
TEK 147A NTSC Test Signal Generator, with noise test signal — $950.00
TEK 1485R Dual Standard Waveform Monitor, NTSC & PAL — $1,850.00
TEK 521A PAL Vectorscope — $1,500.00

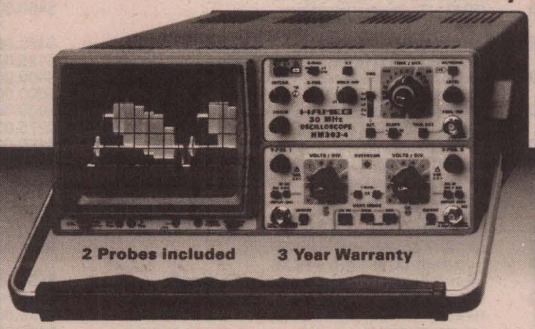
MISCELLANEOUS

FLUKE 2190A/2300A/1120A 10-Chan. Scanning Thermometer, types J,K,T,R,C, GPIB — $875.00
FLUKE 2190A/Y2003/Y2001 Temperature Calibration System — $950.00
HP59307A HPIB VHF Switch — $200.00
HP7090A Measurement System Plotter ** NEW / UNUSED ** — $3,000.00
P.A.R. 5205-94,95,96,98 Lock-In Amp, 20 Hz-20 kHz, int. osc., lin/log, GPIB — $2,750.00
P.A.R. 5206 Two-Phase Lock-In Amplifier, 2 Hz-200 kHz — $3,000.00
TEK TM5006 5000-series 6-slot Programmable Power Module — $600.00
TEK TM503 500-series 3-slot Power Module — $175.00
TEK TM504 500-series 4-slot Power Module — $175.00
TEK TM506 500-series 6-slot Power Module — $250.00
TEK TM515 500-series 5-slot Traveller Power Module — $275.00

HAMEG®
Instruments

New 30MHz Scopes for low budgets

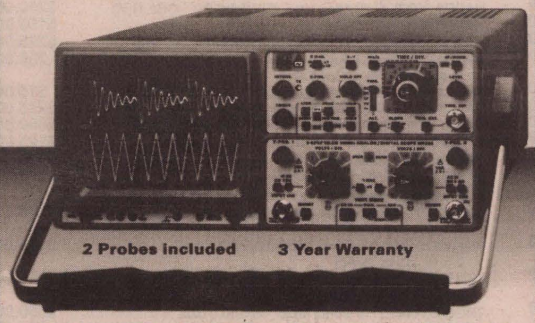
Made in Germany



2 Probes included 3 Year Warranty

Analog Oscilloscope HM303

**2 Channel DC-30MHz, sensitivity 1mV - 20V/div.
Timebase 0.2s-10ns/div., triggering 0-100MHz
Component Tester, Probe calibrator 1kHz/1MHz
Overscan indicator, switch. power supply 90-260V**



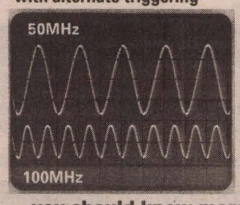
2 Probes included 3 Year Warranty

Analog/Digital-Oscilloscope HM305

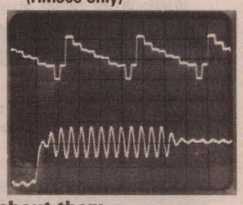
**2 Channel DC-30MHz, sensitivity 1mV - 20V/div.
Timebase 0.2s-10ns/div., triggering 0-100MHz
Component Tester, Probe-Calibrator 1kHz/1MHz**

**Sampling rate 2x40MS/s, Memory 2x2048x8bit
Refresh, single and roll mode, Pre-Trigger 50%**

50 and 100MHz sine wave with alternate triggering



Stored Video Signals (HM305 only)



...you should know more about them.

call toll-free at: 800.247.1241

HAMEG Inc.

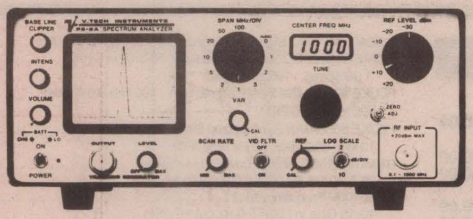
1939 Plaza Real
Oceanside, CA 92056
(619) 630-4080
(619) 630-6507

266 East Meadow Ave.
East Meadow, NY11554
(516) 794-4080
(516) 794-1855

Write in 78 on Reader Service Card.

PS-2A SERIES
PORTABLE SPECTRUM ANALYZERS

HIGH PERFORMANCE AND EASY OPERATION



GREAT FEATURES : PRICE AT $1895

- 0.1 - 1000MHz range in one scan,(0 - 100MHz in 11 selectable span widths)
- Measurable Range -108 dBm to +20 dBm
  -118 dBm to +20 dBm (optional PS-2A Special)
- 5 resolution bandwidths (10 KHz - 1 MHz)
- 50dB input attenuator in 10dB steps
- 2 / 10 dB LOG scale display with base line clipper
- 10 Turns tuning
- Built - in AM / FM demodulation with speaker
- Digital controlled center frequency display
- Tracking generator (optional PS-2A TG-01)
- 3 way power sources (optional + 12 VDC battery)
- Compact size (10.3"W x 4.0"H x 12.3"D), light weight (approx. 10 lbs)

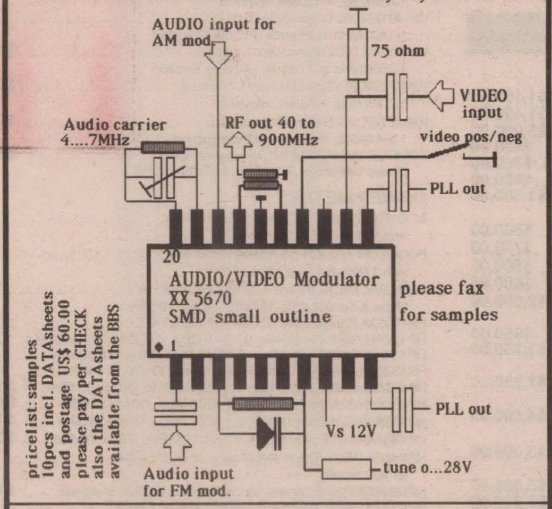
For spec sheet contact :

V. TECH Instruments, Inc. 171 Burns Ave.Lodi, NJ 07644
Tel 201 - 516 - 7635 Fax 201 - 516 - 7651

Write in 71 on Reader Service Card.

VIDEO-AUDIO Modulator for switchable FM/AM Audio

Application for:
CATV-Modulator,Computer,TV-Transmitter,
Video- Generator, Video security systems etc.



pricelist: samples 10pcs incl. DATAsheets and postage US$ 60.00 please pay per CHECK also the DATAsheets available from the BBS

PICOTRONIC communication
Zollamtstr.48 ,
67663 Kaiserslautern
GERMANY

FAX ++ 49 631 29579
BBS ++ 49 631 21048
Tel ++ 49 631 29187

SALE/HEWLETT PACKARD HP 5300/5306A Multimeter counter $125. **3406A** Broad Band voltmeter $250. 8080A **Pulse** Generator System, includes following inserts: 8091A, 8092A, 3 ea 8093A to 1GHz $375/bo. **331A**, $95, **332A** $185. **334A** $400. Freq. synthesizer 3320B opt 002, 007, $350/bo. Psitech Plus, 707-745-4804, FAX 707-747-5277.

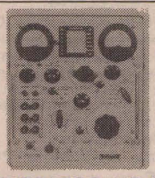
NI-CD BATTERY analyzers: charge, discharge, cycle and test. PC controlled using serial port and DOS software. $289. PO Box 672, London, ON N6A 4Y4. Lamantia Products, 519-472-5566, FAX 519-472-1702.

BIOMEDICAL TEST EQUIPMENT, new and used. Test defibs, centrifuges, esu, IV-pumps and many others. Great deals in all units. Thousands of medical electronic and mechanical parts also available. Call or fax requests today: JM Baragano Biomedical 809-722-4007, FAX 809-722-4491.

LIEBERT PORTABLE power line disturbance monitor, Model 3600A, 1 or 3 phase with built in printer, & RS232 fully programmable compact, 12" x 18" x 7" $650. HP 5411OD 1GHz, color digital scope, bright CRT, only $3,200. Call Harry, 516-385-9452, FAX 516-424-6575.

POWER SUPPLIES Hewlett Packard DC Metered Lab supply 6101A, 6203A, $100 ea. Dual Range 6206B $175 ea w/manual. 6289A $185. **POWER DESIGN** 2005A Precision Power Source 0-20V, 500mA. CV/CC $200., Mod. 2015 0-20V 1.5A. $300. Mod. TW 4005 40V, 500 mADual CV/CC $250. Volume discounts. Psitech Plus, 707-745-4804, FAX 707-747-5277.

HP 54110D digitizing 1GHz logic triggering oscilloscope, $20,000 new, $7,500 w/probes + 90 day guarantee. 1-800-435-1516. Tech-Systems.



SIGNAL GENERATOR, HP 608 equivalent, (TS 510 A/U), 10-420 MHz, with transit case, operating manual, sold "as-is," tested for output only, $85 ea. FOB. Kemner Enterprises, 17 Lightcap Rd., Pottstown, PA 19464. 610-495-5367 lv. messages. Looking for other good deals? Get on mailing list, $2, cash OK, deduct 1st order. SASE.

WAVETEK 288 20MHz Synthesized funtion generator $1,500 and **HP 3320A** 13MHz Synthesizer $350. Call, 215-332-0318. After 7pm, Frank.

HP 54111D 500MHz logic triggering oscilloscope/gigosample/second digitizing scope system w/probes $27,000 new. $8,500. 1-800-435-1516, Tech-Systems.

WANTED: LATE model test equipment & manuals. Naptech buys & sells test equipment by HP, Tektronix, etc. Wanted: Tek 2200 and 2400 series, HP 8560 & 8590 series, Fluke 87, 77, 97, 8050A, etc. Wanted: HP, Tektronix, Fluke, etc. catalogs & manuals. Wanted: Source for HP, Tektronix, etc. parts. Call Naptech, 707-928-1961.

HP SALE: HP 1741A storage scope $350; HP 9826A Technical computer $400; HP 983GA Technical computer $500; HP 8620C Sweep oscillator $350; HP 86290A RF 2-18GHz $1,250. Call Dennis at GPTE Surplus, 408-749-9805, FAX 408-749-9806.

SWEEP GENERATOR Krohn-Hite-2000, $270. Dexis, 612-944-7670.

#80 TEST EQUIPMENT *cont.*

TEKTRONIX PLUG-INS: FG 501A audio to 1MHz function generator $265. **AA501** DISTORTION ANALYZER $1,250. **DA 4084** distortion analyzer (like AA 5001) $1,250. **AM 503 & A6302** current probe & amplifier (to 5A/div; DC to 50MHz) $890. **DM 502A** auto-ranging multimeter $215. **PG 508** 50MHz pulse generator (variable rise, fall times) $325. **PS 503A** power supply $250. **TR 503** .1-1800MHz tracking generator $1,400. **5D10** Waveform digitizer with readout, for 5000-series $475. Excellent condition! With warranty. Many others available; mainframes available. Pepper Systems, 214-353-0257.

PORTABLE SCOPE Tek 465B/DM44 (100MHz) $635. **Tek 475** (200MHz) $595. **Tek 475** (200MHz) $595. **Tek 475/DM44** (200MHz) $660. **Tek 475A** (250MHz) $695. **Tek475A/DM44** (250MHz) $760. **Tek 485** (350MHz) $790. **HP 1727A** (275MHz storage) $925. **Tek 466** (100MHz storage) $850. **Tek 2230** (100MHz digital storage); **Tek 2465 & 2465DVS** (300MHz) call. All with Bright CRT's excellent condition, warranty. Pepper Systems, 214-353-0257.

FEITEK HAS the test equipment you want at reasonable prices. We buy, sell, and trade HP, Tek, G.R., etc. Call or Fax Monday thru Friday 9 to 5, 314-423-1770, or write us at Box 3423, St. Louis, MO 63143.

TEK 1410/SPG3/TSG2/TSG3 NTSC TV signal generator, like new $950. Tek 146 NTSC signal generator $500. Wavetek 1062 RF signal generator, new, $475. HP 355D/01 attenuator, new, $75. Wavetek 1084 microwave signal generator $400. Marconi TF2300A modulation meter $250. Naptech, 707-928-1961.

POOR MAN'S Spectrum Analyzer/Monitor Receiver Kit. 2 to 1,700 MHz. Basic kit only $78. Now available with switched resolution filters, tracking generator and direct digital frequency readout. Works with ANY scope or IBM compatible computer. Send stamped envelope for details. Science Workshop, Box 310B, Bethpage, NY 11714.

New and Pre-Owned Test Equipment

Substantial **SAVINGS** on New & Pre-Owned Fluke, Hewlett Packard, Goldstar, Leader, Tektronix, and more ...

SUPER SALE! $499.00

TEKTRONIX 465 100 MHz Oscilloscope

- Professionally Refurbished to Original Manufacturer's Specifications.
- Dual Channel, Calibrated Delayed Sweep.
- 90 Day Warranty.

Full line of Oscilloscopes, Video & Audio Test Equipment, Power Supplies, Meters, Probes and Accessories.

FOTRONIC CORPORATION
P.O. BOX 708
Medford, MA 02155
FAX (617) 665-0780

VISA AMEX C.O.D. **TOLL FREE 1-800-99-METER**

Write in 79 on Reader Service Card.

CABLE T.V. EQUIPMENT

Friendly, Knowledgeable Service

ORDERS CALL:
1-800-361-4586

- All Equipment New
- Converters & Descramblers
- 30 Day Money Back Guarantee
- 6 Month Warranty
- Visa, MC, C.O.D. Welcome

KDE ELECTRONICS, INC.

P.O. Box 1494
Addison, IL 60101
Info. **708-889-0281**
Fax **708-889-0283**

FLUKE: 720A Voltage Divider Standard, 332B DC Calibrator, 382A Current/Volt Source, C41 Shunt Standards Kit (12 $1,000 shunts, 10Ma-20Amp), A55-3V Thermal Converter, 1780A InfoTouch Intelligent Screen with Digitek 6610P Printer. HP 745A/746A AC Standard, 59501 Isolated D/A PwrSup Programmer. 2801 Digital Thermometer w/4 quartz probes. Holt 250 HiAmp AC Calibrator, Julie Research DCS105C Current Source 1.2MA-12Amp full scale with 7 digit resolution. ESI 1010-10K resistance transfer standard. Keithley 242A 300-3000VDC source. GR 1238 Detector. And more DC to GHz. 817-370-2575, after 6 and weekends.

TEST EQUIPMENT sale: Quantech 304TDL Wave ana $300, Quantech 2415 VF Transponder, $200, Tektronix DC501, $200; DC502, $300; DC503 $300; DM502 $150; FG501 $350, FG502 $300, Ct-5 High Current Transformer $300; Tek T912 10MHz Dual Channel Storage $250; Tek TM506 $250, Triplett 60na VM $60; Wavetek 2001A sweep gen 1-1400MHz $950; Boonton 72bd LED capacitance meter 0-2000pF. $300. A-Comm Electronics, 7198 S. Quince St., Englewood, CO 80112. 303-290-8012. FAX 303-290-8133.

CESIUM & Rubidium Standards available. Calibrated and guaranteed. Competitive prices, please inquire. Repairs also performed. Corby Dawson 805-736-0288.

HP 415E NEW IN BOX, late model with option -001 (BATTERY OPERATION) $395, HP 11679A 25 FT. Extension Cables for HP 8755, 8756 or 8757 Series, NEW IN BOX, $50, List Price $130. HP 7550A High Speed Plotter $395, Tek P6046 FET Probe $595 Complete w/all accessories. Weller TC202 Soldering Stations $40 each. LOOK FOR OUR DISPLAY AD IN THIS ISSUE. Call **TEST EQUIPMENT SALES** 603-434-2544.

SALE! TEST equipment. HP 1740A, $500; HP 3466A, $350; HP 3311A, $225; TEK R7063, $250; 6 month warranty. Call Richard at **Metric** 1-800-432-3424.

BUY, SELL, late model test equipment, all makes. Buy parts for HP, Tek and Fluke. Jim, JCS, Ph: 800-44-TESLA, FAX: 510-475-0442.

141T SPECTRUM analyzer plug-ins: HP 8553B 110MHz R/F $250; HP 8552B I/F $395; HP8406A Comb Generator for calibrating 141T system, brand new $350; 141T cable clones: tracking generator, preselector $95; HP8505/8754, etc. network analyzer cables $135. Others. Call Wade, 309-523-3262.

WANTED RUBIDIUM and Cesium standards "dead or alive." Some modules and subassemblies also wanted. Corby Dawson 805-736-0288.

FLUKE 1/2 PRICE SALE. New Counters; 1900A $217, 1910A $305, 1910A-01 $334, 1911A $362. Used DMMs 8050A-01 $175, 8800AF $332. Old chart recorders cheap. 509-878-1292 5-11pm pacific.

HP 5383A $250. Gary, 408-385-0301.

TEK 222 portable oscilloscope 10MHz $875. Dexis, 612-944-7670.

HP 141T W/8552B, 8553A $950; 8554B $750; 8555A $950; TEK 2225 new in box $725; TEK 485 $650, TEK7000 series packages starting at $350 $200; HP 334A $375, Motorola 1201A 1GHz sig gen $950, HP 8654B $600, HP 8754A network analyzer $3,500. All types of other gear call or fax us with your needs. **BARTEK ELECTRONICS, CHARLOTTE, NC. 1-800-960-8378, 704-588-5991 FAX 24HR. NOW ACCEPTING VISA AND MASTERCARD.**

Starlite Electronics

Highest Quality Test Devices
Lowest Possible Prices

FULLY ILLUSTRATED INSTRUCTION

FULL TECH SUPPORT

ZENITH COMPATABLE ST MODELS ONLY

MODEL	1'S	10'S
Z-TAC ZF-1	$15.95	11.95
NEW! Z-TAC III	$19.95	15.95

PIONEER COMPATABLE

MODEL	1'S	10'S
51XX-61XX	$49.95	25.95
63XX-67XX	$49.95	26.96
ALL NEW! RUNNER	$59.95	55.95

TOCOM COMPATABLE V.I.P. ONLY

MODEL	1'S	10'S
5503 V.I.P.	$17.95	13.95
5507 V.I.P.	$17.95	15.95

MISCELLANEOUS

MODEL	1'S	5+
FM-TRAP	$19.95	CALL!
T-7 TORX	$6.95	CALL!
T-15 TORX	$8.95	CALL!
T-20 TORX	$10.95	CALL!
#3 BIT FOR JERROLD	$19.95	CALL!

CALL FOR BULK PRICES. 10+

** NOTE **
It is not the intent of STARLITE ELECTRONICS to defraud any pay TV operation and we will not assist any company or individual in doing the same.

JERROLD COMPATABLE

MODEL	1'S	10'S
DP/DPV/DPBB 5	$24.95	15.95
DP/DPV/DPBB 7	$29.95	19.95
MP-1 SD	$34.95	29.95
NEW! FOR DPBB /R2/V5 ect.	$59.95	55.95

FSK DEVICES

PIONEER	$149.00	5+ CALL!
STAR 6/7	$149.00	5+ CALL!

SCIENTIFIC ATLANTA COMPATABLE

MODEL	1'S	10'S
8580 NEW VER 8 WIRE	$39.95	29.95
8570/80/90 8600 40 PIN	$49.95	45.95
8500/50	$28.95	20.95

Orders 718-843-7671

ALL TEST DEVICES COME FULLY ASSEMBLED & WIRED

Fax 718-843-7627

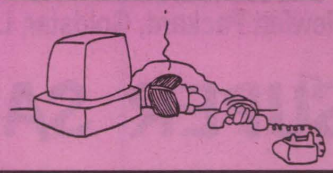
Write in 72 on Reader Service Card.

SAY

HEY!! .... CALL US HERE AT ACME BARGAIN TEST BOARD COMPANY, WE'LL BE HERE JUST LONG ENOUGH TO TAKE YOUR MONEY.... AND WHEN YOU NEED TECH. SUPPORT OR SOFTWARE UPGRADES.... WELL WE'LL SEE WHAT WE CAN DO FOR YA'!! ... AFTER ALL WE DO HAVE THE ABSOLUTE LOWEST PRICES.... JUST THINK HOW MUCH YOU'LL..... SAVE??

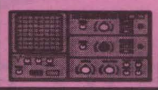
TO OUR COMPETITION

ACME SERVICE DEPARTMENT



A CLAIM TO GIVE THE LOWEST PRICE CAN BE A VERY DECEIVING STATEMENT, AND WHEN UNWELCOME CHANGES TAKE PLACE..... COUNT ON *VISUAL COMMUNICATIONS* FOR THE SOLUTION.

NEW PRICE POLICY
BUY FIVE MODULES
AND GET ONE FREE!!



AND GREAT TECH. SUPPORT

SO REMEMBER

DON'T GAMBLE YOUR BUCKS!!

OR YOU'LL END UP BEHIND THE

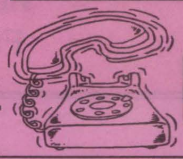
CABLE CONVERTER DIAGNOSTIC TEST MODULES

ANYONE IMPLYING THEFT OF SERVICE IN ANY WAY SHAPE OR FORM, DO US AND YOURSELF A FAVOR DON'T BOTHER CALLING US. "AND YES WE DO MEAN YOU" *THESE PRODUCTS ARE FOR QUALIFIED BENCH TECHNICIANS. FOR DIAGNOSTIC PURPOSES ONLY PERIOD !!! NO N.Y. SALES.*

JERROLD COMPATIBLE*	1 PC - 10 PC
DPV-5XXX	19.95 - 16.95
NEW STAR 7 QUICK KIT	34.95 - 29.95
STAR 7 R/2V/5/CFT 1WIRE	
MULTI MODE QUICK KIT	39.95 - 34.95
STAR 7 R/2V/5 CFT 3 WIRE	29.95 - 24.95
GENESIS STANDARD	154.95 -144.95
GENESIS *"RE-SPAWN"*	199.95 -189.95

PIONEER COMPATIBLE*	1 PC -10 PC
BA-51XX - BA-61XX	34.95 - 29.95
BA-63XX - BA-67XX	34.95 - 29.95
NEW NEVER RESET E- 4	39.95 - 34.95
GENESIS STANDARD TRANSMIT	154.95 -144.95
GENESIS MORPHING MODE 6300	199.95 -189.95
NEW MULTI-MODE BOARD	39.95 - 34.95
NEW *6300 PIO WRITER*	
CLEARS E-2 THRU E-8	*59.95 - 54.95*
ZENITH 1000 TO 2660	16.95 - 12.95
TOCOM 5507& 5503 COMPATIBLE*	19.95 -16.95

SCIENTIFIC ATLANTA COMPATIBLE*	1 PC - 10 PC
S/A 8600 QUICK BOARD	34.95 - 29.95
S/A 8590 QUICK BOARD	34.95 - 29.95
S/A 8580 QUICK BOARD	34.95 - 29.95
S/A 8570 QUICK BOARD	34.95 - 29.95
S/A 8580 40 PIN PLUS +	34.95 - 29.95
S/A 8570 /90 /8600 40PIN	34.95 - 29.95
S/A 8550 14 PIN EAROM	34.95 - 29.95
S/A 8550 QUICK BOARD	34.95 - 29.95
S/A 8536 AUTO BOARD	34.95 - 29.95
S/A 8535 AUTO BOARD	34.95 - 29.95



INTRODUCING GENESIS

NEW FEATURES
"RE-SPAWN MODE"
"MORPHING MODE"
MULTI-FREQUENCY
PROGRAMMABLE ID
BATTERY OPERATION

GENESIS: IS THE LATEST JERROLD AND PIONEER COMPATIBLE DIAGNOSTIC TRANSMITTERS. NEW STATE OF THE ART DESIGN. ALLOWS FULL DIAGNOSTIC TEST MODE OF RAW CONVERTERS.

NEW

JUST ARRIVED & LONG AWAITED, *THE PIONEER 6300 WRITER* !! CLEAR UP YOUR E-2 BLUES. PIO WRITER CLEARS E-2 THRU E-8.

NEW

NOTE: THE ABOVE MENTIONED NAMES ARE ALL REGISTERED TRADEMARKS. ALL REFERENCES TO THE ABOVE MENTIONED EQUIPMENT IS FOR IDENTIFICATION PURPOSES ONLY. WE ARE IN NO WAY IMPLYING THAT ANY OF THE PRODUCTS IN THIS AD ARE ORIGINAL EQUIPMENT. VISUAL COMMUNICATIONS IS IN NO WAY AFFILIATED WITH THE ABOVE MENTIONED COMPANIES OR CORPORATIONS!!

WE STOCK A COMPLETE LINE OF SECURITY SCREW TOOLS
TOCOM-S/A-JERROLD-ZENITH-PIONEER

VISUAL COMMUNICATIONS INC.
800-GO-CABLE *FOR ORDERS ONLY*
718-229-2358 FOR CATALOG & TECH. SUPPORT
ESTABLISHED 1975

Write in 73 on Reader Service Card.

O'SCOPE SALE: Tek 465M 100MHz, excellent condition, only $300. Call Baker Tech. Services, 305-923-0338, ask for Jon.

METERS: HP 3455A 6-1/2 digit multimeter $550. **Tek DM 501A** 4-1/2 digit multimeter $250. **Tek DM 502A** auto-ranging multimeter $215. Pepper Systems, 214-353-0257.

WANTED: TWO Simpson 260-7pm new or used VOMs. Must be -7 series having both the relay overload protection and the mirrored scale options. D. Niemi, NMU Jacobetti Center, Marquette, MI 49855. 906-227-1520.

TEST EQUIPMENT sale, Tek 465B-DM44 $575, **Tek 475-DM43** $600, Philips PM3234 10MHz storage scope $99.95. Systron Donner 6250 timer/counter $45. **Berkely Telonics** marker generator, 7 markers 1-500MHz new w/manual $300. **HP 5335A** universal counter with DVM and 1.3GHz opt. $650. **HP 805A** slotted line w/2 carriages $100, **Keithley 155** null detector-microvoltmeter 1uv-1KV $100. Hickok DP150A counter-digital mainframe $35. **Wanted: Tek-Sony 305 for parts.** EFXX Products Co. 818-709-5415 FAX 818-341-0520. Visa-M/C-Disc-Amex. Prices plus UPS.

WANTED: TO buy: Standard capacitors and standard decades above 10 UF; Standard decades above 100 Megohm. Jeff, VCE. 209-268-3311 FAX 209-233-3414.

GHz STUFF: HP P370C, P375A(2), G424A, H424A, P486A(6), M486A, X486A, 520, 934A, X910A(3), X910B, X912A, P532A, J532A, P810B(3), X910B, X912A, P532A, J532A, P810B(3), X810B, 537A, 335, 393A, 766A, 777D, 798C, 805A, 805C, 905A, 907A, 5254A, 5254B, 8694B, 8733B, 11507A, 11521A. Hadron 108. Narda Microline 3073, 5074. Narda 779, 3093, 3094. Waveline/HP 606-20/X370D, 702-20/P372D, 702-10/P372C(2), 770-20, 602-?/X372C. New Coleman Microwave Two-channel Tunable Filter modules 201600, 201575(2), 501800(2). Logimetrics A100/X 1 watt 7-12.4GHz, A300/U/opt6.7 10?watt 12.6-18GHz. Military SP-2 1-3.2GHz Transceiver. Empire Devices AC-105 Antenna Kit. Much more DC to GHz, such as Behlman 3 phase digital variable voltage and frequency 150-2000Hz 1030VA Power Supply. SASE for list & send yours. Art Klinger, 4601 Yellowleaf Dr., Fort Worth, TX 76133. 817-370-2575 after 6PM CST and weekends.

TEST EQUIPMENT Manuals, mostly **Hewlett Packard** and **Tektronix.** Buy, sell, trade. Send us your want list. **Ed Matsuda,** PO Box 390613, San Diego, CA 92149. Phone: 619-479-0225, FAX: 619-479-1670.

AFFORDABLE HP power sensor repair! For example most HP 8481As repaired for $195. Call or write for information and pricing. Willamette RF, Inc, PO Box 1599, Corvallis, OR 97339. Phone 503-754-7226, FAX 503-753-4629.

TEST EQUIPMENT, ETC: HP 214B high-power pulse generator $1,650. **HP 436A/022** power meter (HP-IB), cable 8481A sensor $1,450. **HP 7580B** 8-pen drafting plotter, sizes A-D $1,475. **Fluke 540B** thermal transfer standard $1,500. **Tek 1105** portable battery-operated inverter, for 465, 475 etc. scopes, and TM 500 series mainframes $195. **Tek 390AD** dual-channel waveform digitizer $600. **HP 6002A** autoranging 200 watt power supply $750. **HP 6227B** 0-25V 0-2.0A dual tracking lab power supply $475. **HP 6443B** 0-120V 0-2.5a power supply $450. **Kikusui PLZ 300W** electronic load $600. **HP 8405A** vector voltmeter $395. **HP 8015A** 50MHz pulse generator $425. **HP 8016A** 50MHz 9-channel ECL/TTL word generator $400. **GR 1689** LCR meter $2,400. **HP 59401A** bus system analyzer for GPIB $675. **BMI 4800** and **Dranetz 626** printing power line disturbance monitors - call. Excellent condition! All with warranty. Pepper Systems, 214-353-0257.

FREE LIST of Calibration and test equipment. 10-day trial; 90 day Warranty. Hamilton Instruments: 619-439-1345.

HEWLETT PACKARD 5245L counter, DC to 50MHz, $100. **5253B** plug-in 50 to 500MHz, $45. **10544** oscillator assembly, 10MHz, $100. **1MHz** oscillator assembly, $35. **Readout cards** with nixies, $15. Misc. parts, covers. **Ed Matsuda,** PO Box 390613 San Diego, CA 92149. 619-479-0225.

OLDIES/GOODIES, HICKCOCK 1605M all probes & HF probe $85, **DANA** lab digital multimeters, 3800B & 3860A $85 ea. or $150 both. **HEWLETT PACKARD** 310A, Waver Analyzer $25. **FLUKE 893A** Differential Voltmeter $75, Mil by **FLUKE** ME 202D/U $25 **ME 26D/U** Multimeter with probes $20. **GR 1390B** noise generator $65. **DATAPULSE** 101 Pulse Generator $175. Offers accepted, quantity discounts. Psitech Plus, 531 Gordon Ct., Room A, Benicia, CA 94510. 707-745-4804, FAX 707-747-5277.

SCOPES, METERS, etc. Tek 432, 453, R5103/D12 with (2) 5A15N & (1) 5B10N, Telequipment D75, HP 130C, 209A, 3734A, 332A, 446A, Krohn-Hite 4200, 3302 Wavetek 30, Gen-Rad 1680A, 1672A, 1673A, 1680-P1, Yew 2041, Fluke 8000A, Ballantine 300E, Intel MDS240M. Call Henry, 908-689-0110.

SPECTRUM ANALYZERS FOR AUDIO, BROADCAST, VIDEO: Tek 7L5/L3 spectrum analyzer, 20Hz-5MHz, digital storage $1,500; with tracking generator $2,000. **HP 3580A** spectrum analyzer, 5Hz through 50KHz, 1Hz resolution bandwidth, digital storage, adaptive sweep, tracking generator $1,195 to $1,695. **Anritsu MS420B** powerful spectrum/network analyzer, 10Hz through 30MHz, 3Hz resolution bandwidth, digital storage, tracking generator $2,700. All in excellent condition. All with warranty. Pepper Systems, 214-353-0257.

AMATEUR ROBOTICS

by Karl Lunt

A. K. Peters, Ltd., publishers of *Mobile Robots*, by Joe Jones and Anita Flynn, are scheduled to release another new robotics book at the end of June 1995. If the pre-publication review copy I looked at recently is any indication, I think Klaus and his staff have another winner on their hands.

The book, entitled *Sensors for Mobile Robots*, was written by H.R. (Bart) Everett, a retired Commander in the United States Navy and a former director of the Office of Robotics and Autonomous Systems at the Naval Sea Systems Command in Washington, DC.

Sensors deals almost exclusively with the theory and application of sensor systems. It covers a bewildering variety of sensors, describing the effect sensed, how to install and effectively use the sensor, weaknesses and strengths of the sensor and the returned data, and how to factor the returned data into developing a more accurate picture of the robot's world.

Often, the sensor discussed is available in one or more commercial configurations. In these cases, Bart usually includes a discussion of the more popular units, and sometimes provides pictures or graphics of existing robot systems built with the commercial sensor units. This helps you gauge how easily such a system might fit into your plans.

I knew I was going to like this book before I even finished the forward, written by Dr. Rodney A. Brooks of the MIT AI Lab. Rod Brooks makes a strong case for non-visual robotics sensors, arguing that some robot builders tend to focus on those sensors most like the system we find the most vivid: our eyesight.

Nature, however, has devoted millenia to developing non-visual sensors that are remarkably effective. Rod mentions the cockroach, specifically.

Any of you who have lived in the Arizona desert and tried to demonstrate your evolutionary superiority over a cockroach probably found it a maddening experience. Simply trying to stomp a cockroach usually makes you look like a fool.

You can try the quick stomp, but the roach usually skitters away long before your foot gets there. You can try the sneaky method, where you slowly lower your foot until it's so close to the bug you couldn't miss if you tried, but you usually miss.

And I won't even try to describe trying to hit a moving cockroach with anything slower than a 9 mm slug. (No, don't ask!)

According to Rod, it isn't the bug's eyes that make it so hard to hit; it's the 30,000 wind-sensitive hairs attached to the roach's legs. These hairs detect minute changes in wind currents, and the bug can respond in only 10 milliseconds. The roach can detect your approaching foot, then change speed and direction far faster than you can react.

And we think our vision sensors make us such hot stuff!

Back to the book

Chapter 1 consists of an introduction describing some of Bart's earliest robots. WALTER, a science fair project from the mid-1960s, stood five feet tall and used an AC power cord for its current source. Bart scrounged actuators for sewing machines, a movie projector, a kitchen mixer, and bicycles.

WALTER used vacuum tubes for its electronics, had two microphones for ears, and a capacitive sensor on one of the two grippers. Bart writes that this sensor was specifically added to discourage pulling and prodding from curious onlookers.

". . . any stray finger that poked its way into the open claw would be met by a startling and decidedly effective warning snip. The resounding thump of the actuating solenoid only served to accentuate the message."

I'll leave the story of WALTER's demise undiscussed, other than to say it contains warnings all of us would do well to heed.

Bart went on to create CRAWLER I in the late 1960s, this time for a junior-year science fair. CRAWLER I was battery operated, fully autonomous, with tank-like treads for locomotion, a rotating photocell scanner for tracking a homing beacon, and tactile sensors made of guitar strings.

Lacking BOT-Boards in those days, Bart "programmed" his robot using an ingenious system built on a circular punched-paper disc. This program disc measured about 12 inches in diameter, and con-

```
*
*  SBasic compiler (Beta 0.3) for the 68HC11
*
varbeg      equ   $00c0
codebeg     equ   $b600
stkbeg      equ   $00ff

      org   varbeg        start of variables
      rmb   52            room for 26 16-bit vars


      org   codebeg       start of code
start
      lds   #stkbeg       top of stack


* foo.bas(1):  '
* foo.bas(2):  '  prog3.bas       test program to
* foo.bas(3):  '                   68hc11 SBasic
* foo.bas(4):  '
* foo.bas(5):
* foo.bas(6):  '
* foo.bas(7):  '  Declare some constants
* foo.bas(8):  '
* foo.bas(9):
* foo.bas(10):  const  portb = $1004
* foo.bas(11):  const  baud  = $102b
* foo.bas(12):  const  sccr2 = $102d
* foo.bas(13):  const  scsr  = $102e
* foo.bas(14):  const  scdr  = $102f
* foo.bas(15):
* foo.bas(16):  const  MAXN = 10000
* foo.bas(17):  const  MINN = 1000
* foo.bas(18):
* foo.bas(19):
* foo.bas(20):
* foo.bas(21):  '
* foo.bas(22):  '  Initialize the target
* foo.bas(23):  '  default maximum.  Initialize
* foo.bas(24):  '
* foo.bas(25):
* foo.bas(26):  x = MAXN
      ldd   #10000
      std   varbeg+46

* foo.bas(27):  pokeb  baud, $30
      ldd   #48
      stab  4139

* foo.bas(28):  pokeb  sccr2, $0c
* foo.bas(29):
      ldd   #12
      stab  4141

* foo.bas(30):  '
* foo.bas(31):  '  Do forever...
* foo.bas(32):  '
* foo.bas(33):
* foo.bas(34):  while  1 = 1
* foo.bas(35):
whl000
      ldd   #1
      cpd   #1
      beq   *+5
      jmp   whl001

* foo.bas(36):  '
* foo.bas(37):  '  Initialize a counter, turn
* foo.bas(38):  '  count up until the counter
* foo.bas(39):  '
* foo.bas(40):
* foo.bas(41):     pokeb  portb, $ff
      ldd   #255
      stab  4100

* foo.bas(42):     for n=0 to x
      ldd   #0
      std   varbeg+26
for000
      ldd   varbeg+26
      cpd   varbeg+46
      ble   *+5
      jmp   for001

* foo.bas(43):     next
      ldd   #1
      addd  varbeg+26
      std   varbeg+26
      jmp   for000
for001

* foo.bas(44):
* foo.bas(45):  '
* foo.bas(46):  '  Initialize a counter, turn
* foo.bas(47):  '  count up until the counter
* foo.bas(48):  '
* foo.bas(49):
* foo.bas(50):     pokeb  portb, 0
      ldd   #0
      stab  4100

* foo.bas(51):     for n=0 to x
      ldd   #0
      std   varbeg+26
for002
      ldd   varbeg+26
      cpd   varbeg+46
      ble   *+5
      jmp   for003

* foo.bas(52):     next
      ldd   #1
      addd  varbeg+26
      std   varbeg+26
      jmp   for002
for003

* foo.bas(53):
* foo.bas(54):  '
* foo.bas(55):  '  Test for a character from the
* foo.bas(56):  '  and echo anything received.
* foo.bas(57):  '
* foo.bas(58):
* foo.bas(59):     if  $20 and peekb(scsr) = $20
      clra
      ldab  4142
      anda  #0
      andb  #32
      cpd   #32
      beq   *+5
      jmp   if000

* foo.bas(60):           c = peekb(scdr)
      clra
      ldab  4143
      std   varbeg+4

* foo.bas(61):           pokeb  scdr, c
      ldd   varbeg+4
      stab  4143

* foo.bas(62):     endif
if000

* foo.bas(63):  wend
      jmp   whl000
whl001

* foo.bas(64):
* foo.bas(65):  end
      bra   *

* foo.bas(66):
* foo.bas(67):
      org   $fffe         reset vector
      fdb   start

      end
```

Output from the SBasic compiler

tained groups of punched holes. The hole patterns encoded each of the 16 possible input sensor arrangements, and each of the corresponding actuator responses.

By altering the holes controlling the actuator patterns, Bart could precode his machine's responses to each possible input combination.

CRAWLER I simply spun the disc until its scanning photocells saw a group of sensor holes matching the current configuration. It then stopped the disc and read the actuator response for this pattern from the output section of the disc, and changed its actuators as needed.

This technique, updated to today's technology, could serve as a good stepping stone toward fully microcontroller-driven robots.

Start by replacing the paper disc with a 27c64 or other cheap EPROM. Tie all of the robot's sensor signals to selected address lines on the EPROM. Wire some or all of the EPROM's data lines to your actuators. Then burn the proper responses to each possible input combination into the EPROM.

Viola! A one-chip robot controller, suitable for science fair projects and class demonstrations. And, incidentally, capable of quite sophisticated behaviors, given proper programming. For example, you could hook one of the EPROM's data lines back to an address line, creating a feedback loop. Or, you could add a slow 555 timer as an input sensor, which would give your robot a "heartbeat" or a timing reference.

(Actually, I like this idea a lot. You might see more on this concept in a later column.)

Bart followed CRAWLER I with CRAWLER II, a tethered, 117 VAC robot that was apparently built in his early years at Georgia Tech.

ROBART I was built during Bart's thesis work at the Naval Postgraduate School, in 1982. ROBART I contained a huge assortment of sensors, as well as a SYM-1 6502-based microcontroller board. Designed as a security and patrol machine, ROBART I could detect and respond to fire, smoke, flooding, earthquake, and toxic gas. It could detect intruders using optical or ultrasonic motion detection.

Bart's robots became increasingly sophisticated, with larger numbers of sensors and actuators over the years. No doubt it helped that he didn't have to pick up the tab for all of his machines' additions; he was able to evaluate sensor systems beyond the budget of many robot hobbyists.

You have to see the pictures of ROBART III, a security robot that sports a six-barreled Gatling-style tranquilizer dart gun. The text contains quite a bit of detail on the gun's construction and operation. Very scary!

Chapter 1 concludes, as do all of the other chapters, with a multi-page list of references for relevant papers and publications. For all the information contained in this book — and it contains a lot — the extensive and up-to-date citation list may be the book's greatest asset.

Bart has compiled over 500 references for this book, many of them as recent as 1995. Since the references are broken down on a per-chapter basis, you can skip to a desired chapter, read Bart's information, then find additional information by skimming the chapter's reference list.

The power of this technique becomes immediately apparent when you start on Chapter 2, dealing with dead-reckoning navigation. Bart describes several types of odometry sensors, such as potentiometers, synchros and resolvers, various kinds of optical encoders, and Doppler and inertial navigation systems.

He then writes about mobility configurations. This refers to the arrangement of steering and driving wheels; assuming, of course, that your 'bot has wheels or treads. Different configurations accumulate dead-reckoning errors differently, and you can improve your robot's ability to correct for these errors if you understand the weaknesses of your chosen system.

The chapter concludes with over 40 references on steering mechanisms and dead-reckoning navigation. If you want to know a LOT more about, say, Ackerman steering, read Bart's write-up, then head for the library or Internet and check out his references.

By the way, many of these citations actually refer to parts of a larger, more diverse reference. For example, Bart cites papers in Chapter 2 that describe robotic wheelchairs, autonomous robotic cars, mining robots, and tele-operation of off-road vehicles.

Following chapters go into similar detail on various sensor systems, and on using data collected from those systems. Chapter 3 discusses tactile and proximity sensors, Chapter 4 goes into triangulation ranging, Chapter 5 covers time-of-flight (TOF) ranging, Chapter 6 deals with various ranging systems built on phase-shift measurement and frequency modulation, and Chapter 7 covers several other ranging techniques.

Each of these chapters covers a variety of methods for acquiring data. This usually includes both active and passive systems. It also includes, where appropriate, sensors that respond to a wide range of energies, such as infrared (IR), acoustic (sonar), radio-frequency (RF), laser, and microwave.

Chapter 8 goes into great detail on sonar systems, while Chapter 9 handles electromagnetic energy systems, including optical and radar systems.

Starting with Chapter 10, on collision avoidance, Bart begins looking at sensor systems designed to fulfill specific tasks. For example, he discusses navigation control strategies, or general techniques your robot can use to avoid collisions with local obstacles. Each discussion is accompanied by suitable equations and charts to simplify and explain the concepts. Where necessary, Bart recommends sensor systems that fit well with each strategy.

```
'
'  prog3.bas .      test program to demonstrate
'                   68hc11 SBasic
'

'
'  Declare some constants
'

const  portb = $1004
const  baud  = $102b
const  sccr2 = $102d
const  scsr  = $102e
const  scdr  = $102f

const  MAXN = 10000
const  MINN = 1000


'
'  Initialize the target variable (x) to the
'  default maximum.  Initialize the serial port.
'

x = MAXN
pokeb  baud, $30
pokeb  sccr2, $0c

'
'  Do forever...
'

while  1 = 1

'
'  Initialize a counter, turn the LED on, then
'  count up until the counter hits the target.
'

      pokeb  portb, $ff
      for n=0 to x
      next

'
'  Initialize a counter, turn the LED off, then
'  count up until the counter hits the target.
'

      pokeb  portb, 0
      for n=0 to x
      next

'
'  Test for a character from the serial port,
'  and echo anything received.
'

      if  $20 and peekb(scsr) = $20
            c = peekb(scdr)
            pokeb  scdr, c
      endif
wend

end
```

Sample SBasic source file

Chapter 11 covers guide path following, where the robot senses and tracks some type of course-defining agent or material. Here, the sensors must accurately locate the agent, then maintain "lock" as the robot performs its tasks.

Chapter 12 deals with magnetic compasses. This type of sensor has a large number of commercial designs available, and his comments on the different systems make interesting reading. This chapter covers a lot of ground, and I strongly recommend you check Bart's material on compasses before trying to add one to your own machine.

Chapter 13 discusses issues related to gyroscopes. While this is not usually a sensor one associates with a hobby machine, there has been considerable traffic in comp.robotics lately on using gyros, and this material could answer a lot of questions.

Chapter 14 handles position locating systems built around RF components. Such systems could be as simple as a couple of home-built RF beacons, or as technologically advanced as the global positioning system (GPS) satellites. Bart discusses the workings of several commercial systems, including Loran and Navstar.

Chapter 15 provides similar treatment of various optical and sonar position locating systems. In some cases, these designs are commercially available, either as components or as total robotic systems. For example, IS Robotics' Genghis walking robots use a pair of sonar pingers, located at two points on the floor or wall, to locate themselves within their world.

Chapter 16 covers world referencing using fixed landmarks, such as walls, doorways, and ceilings. This type of referencing is usually used to cancel out any accumulated dead-reckoning errors, since the robot has reached a known landmark. Bart describes how ROBART II used elements of this system to locate and confirm its recharging station, and also zero out its navigation errors.

The final chapter deals with a variety of application-specific sensors.

This covers the strange sensors that you might have to add to, say, a security robot that would not be needed in your general-purpose mobile robot.

Here Bart limits his discussion to two applications with which he is most familiar: physical security and automated inventory assessment. Some of the more colorful applications, such as hazardous material handling, are not explored. Still, he provides good coverage of a variety of passive IR (PIR), acoustical, vibration, pyroelectric, and other sensors.

The book concludes with a listing of cited sources, so you know who to call to order copies of any of the cited literature.

I didn't see much missing from this book, certainly not in the area of sensor coverage. Anything you would normally need in a robot confined to a human-benign environment is discussed.

I did notice that the book lacks an index. This could have been simply because my copy is not a publication draft; I certainly hope that is the reason. Failing to provide an index to a book like this would

be a serious, though certainly not fatal, omission.

Another item curiously missing was any means of checking on-board power levels. Given the wide variety of batteries available, and the number of different power-control and charging systems in use, I would have liked some discussion on how a robot can determine that it is hungry. Perhaps the large number of possibilities to cover precluded any such discussion.

You might have noticed that I did not mention vision systems. *Sensors* focuses (interesting . . .) on non-vision sensors, leaving discussion of vision-based systems to other writers. Bart does, from time to time, make minor references to aspects of robot vision, but it is cursory only; certainly not in the depth he devotes to, for example, sonar.

And you will be disappointed if you go into *Sensors for Mobile Robots* expecting to find implementation-specific software. This bookcovers sensors only (well, and some actuators); you get to supply the software for your system.

But this book more than makes amends for these minor faults. This is, simply, an astounding work, in both the range and depth of its coverage.

From the most mundane to some fairly bizarre sensors, Bart Everett provides both immediately useful information on theory and application, and (perhaps more valuable) citations to definitive references. These references are often papers developed by the sensor's designer, or in-depth reports of real-world robots that used the sensor in part of its suite.

Get a copy of this book, and keep it on the shelf next to your copy of *Mobile Robots*. I guarantee you'll go back to both works often.

68hc11 SBasic

For years, I waited for someone to develop a Basic compiler for the 68hc11, but no one ever did. At least, I haven't run across it yet in all my years of scrounging.

There's something about Basic that is, well, basic. As in simple, easy-to-write software. Face it, almost anyone with a PC has access to some form of Basic, and most such robotic experimenters have tried their hand at writing Basic programs.

Now, you can find a 68hc11 Basic interpreter on the Motorola FREEWARE BBS. In fact, those of you interested in staging the Basic language on your 68hc11 robot should take the time to download this program and play with it.

But I wanted a compiler, not an interpreter. I'm perfectly willing to trade a little extra code size for a lot more speed.

Well, no one ever got around to writing the compiler I wanted, so I am writing my own.

I call it SBasic, for Simple Basic. I started with the source code for a simple Basic interpeter that I copied from an excellent book by Herbert Schildt, entitled *The Art of C*.

Anyone interested in the nuts and bolts of simple, functional C programs should pick up a copy of *The Art of C* and spend some time looking through it. Herbert provides full source listings and files (on supplied disc) for fairly hefty PC projects. You get a very simple serial-based LAN, some simple video and graphics programs, a mouse program, and a simple Basic interpreter.

Starting with Herbert's SBasic interpreter, I started adding and changing, redesigning the code as I needed it. The program, vastly changed, no longer executes a Basic source file, but instead turns the file into 68hc11 assembly language source.

Note that this is a modest start at a compiler, hardly a commercialgrade product. Think of it more as tiny4th for the Basic language.

In its current form, SBasic supports the following operators:

```
+ - * / Math functions
mod Modulus
and Boolean AND
or Boolean OR
xor Boolean XOR
= Assignment, test equals
<> >< Test not equals
< Test less than
Test greater than
<* Unsigned test less than
>* Unsigned test greater than
peek() Fetch 16-bit value
peekb() Fetch 8-bit value
poke Store 16-bit value
pokeb Store 8-bit value
if-else-endif Structured if
while-wend Structured while
interrupt Interrupt service routine (ISR)
return Return from ISR or subroutine
const Declare a 16-bit constant
```

This list is very preliminary, and only describes SBasic as of this writing (end of March, 1995). The features will grow and mutate as time permits.

SBasic currently supports only 26 variables, each 16 bits wide. This will change in the future; I intend to support named variables and arrays, but this small, fixed variable set is a good starting point.

I also have the first cut at for-step-next loops installed. As of now, SBasic doesn't handle down-counting (negative step values), but that should change before long.

I also intend to add do-loop structures, along with while-and-until-modifiers.

And I want to add a whole slew of goodies to make SBasic more suitable for embedded control and robotics. Some of these features already exist in the list above, and deserve a little discussion.

I have added the <* and >* test operators, to allow unsigned comparisons of 16-bit numbers. Without them, $8000 is less than $7fff; with them, the comparison works the way you expect for a 65K number range.

I also added the interrupt command, used to mark the beginning of a 68hc11 interrupt service routine (ISR) written in SBasic. Since SBasic compiles down to fairly tight assembly language, it is perfectly reasonable to write your ISRs in SBasic.

I will, however, add the ability to include segments of 68hc11 assembly source, for those instances when you absolutely have to write in assembly language.

So how good is the compiler's output? I have included a very simple test case to show what kind of output you can expect. Note that the compiler does no optimization. It rearranges SBasic operands, where possible, to take advantage of register usage, but it does not optimize from one SBasic source line to the next.

The sample SBasic source file contains a small program that alternates the output lines of port B between 0 and $ff. After each change, the code sits in a tight for-next loop, running a counter from 0 to 10,000.

My test system is a BOT-Board with an LED hooked to one of the port B lines. This gives me a visual indication of the port's state.

After writing a 0 to port B, the code also glances at the SCI status register, in case the host computer sent a character. If so, this code echoes the character back to the host. Note that two lines of code at the top of the source file initialize the SCI for 9600 baud, assuming a crystal of 8 MHz.

The SBasic compiler translates this file, prog3.bas, into a corresponding assembler source file named prog3.asc. The prog3.asc file is properly formatted to assemble with the Motorola FREEWARE asmhc11 assembler.

Take a few minutes to examine the accompanying listing of the output from the SBasic compiler.

All lines that do not begin with an asterisk in column one will be treated by the assembler as either source code or assembler directives.

Most of the comment lines (those with an asterisk in column one) are the original SBasic source lines, copied into the output file by the SBasic compiler. This helps you follow the transformation between SBasic source and 68hc11 assembler source.

SBasic automatically reserves 52 bytes of RAM space for its 26 variables, each of which gets 2 bytes. Any reference to a variable, such as X in source line 26, is converted into an offset added to the address VARBEG.

VARBEG is assigned at the top of the output file, and is currently hard-coded to $00c0. Later versions of SBasic will allow full control over the placement of VARBEG, CODEBEG, and STKBEG. The latter two values set the start of the code and stack, respectively.

Check the code generated by source lines 42 and 43, an empty for-next loop. This represents the minimum amount of code that a for-next loop will create, and indicates the top speed you can reach in a simple counting loop.

This empty loop consumes 28 cycles for each iteration, or 14 usecs using an 8 MHz crystal. Since the example loops count to 10,000 on each pass, the LED will stay on (or off) for 10,000 times 14 usecs, or .14 seconds.

Looking at this from another angle, your software could count through this empty for-next loop more than 71,000 times per second. Obviously you will have to replace a large portion of those empty loops with meaningful code. Still, the code generated by the SBasic compiler is far faster than tiny4th's interpreted code, and plenty fast enough to do useful robot tasks.

SBasic is one of those evolving software projects; they always seem to take longer than I expected when I started them. But I will continue to refine SBasic, and hope to have a strong version, ready for release, by the time you read this.

I want to make SBasic so simple to use that even total 68hc11 novices can sit down at a PC, write a few lines in a language they already understand, and watch their robots move. Initial feedback from those SRS members who have been kind enough to beta-test my early SBasic executables is encouraging.

Incidentally, I have designed SBasic so that all code generation is confined to a single, well-defined module. I already have plans to make a second code generator, to create SBasic output for the 68302.

This will give me the tools I need to develop serious robot code for my hacked Practical Peripheral's ProClass external modem; see the previous two columns for details. **NV**

As always, you can reach me at:

Karl Lunt
2133 186th Pl., S.E.
Bothell, WA 98012
E-Mail: karl@mav.com

A.K. Peters, Ltd.
289 Linden Street
Wellesley, MA 02181
(617) 235-2210
E-Mail: kpeters@math.harvard.edu

BRIGAR

ELECTRONICS INC.

7-9 ALICE ST.
BINGHAMTON, NY 13904

TO ORDER:
PHONE: (607) 723-3111
MONDAY-FRIDAY 7:30AM TO 4:30PM
SATURDAY 7:30 TO 12:00 NOON

FAX: (607) 723-5202
24 HOURS A DAY, 7DAYS A WEEK

QUANTITY DISCOUNTS AVAILABLE

IMMEDIATE SHIPMENT FROM STOCK
PHONE,MAIL OR FAX IN YOUR ORDER TODAY

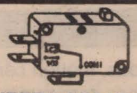
VISA AND MASTERCARD ACCEPTED

FREE CATALOG

LET ONE DOLLAR DO THE WORK OF TEN!

SERVING: INDUSTRY - SCHOOLS - HOBBYISTS - EXPERIMENTORS CONSUMERS

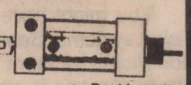
SUPER BARGAINS



CROUZET # F83161.6
12AMP 250VAC
.187" QUICK CONN. TERM
PHENOLIC PLUNGER ACTUATOR. SPDT
SALE PRICE ... 90¢

AIR CYLINDER

1-1/8" BORE
1" STROKE



Sheffer
Ports 1/8 NPT
Retracted length 7-5/8"
Rod 5/16", 5/16-24 thread, with clevis
Force exerted approx 1.15 of air pressure
Nose end bore block mount
Back end has shock absorber 5/16-18 stud
• Double acting
• Wt. 2 lb

.....$6.95
10 for $60.00

DECORATOR AUTOMATIC WALL SWITCH

LITRONIC US - ULTRALIGHT

ULTRASONIC LIGHT SWITCH

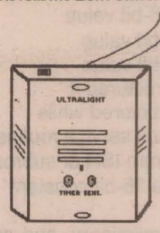
THIS DECORATOR STYLE AUTOMATIC WALL SWITCH, IS AN ATTRACTIVE LIGHT SWITCH REPLACEMENT THAT INSTALLS IN PLACE OF EXISTING WALL SWITCH TO TURN LIGHTING ON WHEN A PERSON ENTERS A ROOM OR OFFICE AND OFF WHEN THE SPACE IS VACATED.

VOLTAGE: 120 OR 277VAC 50/60HZ
MIN. LOAD: 80WATT 120V, 160WATT 277V
MAX. LOAD: 1000W 120V, 1500W 277V
SENSOR TYPE: low power ultrasonic 25khz crystal
SENSOR COVERAGE: 250 sq. Ft. With 180° detection field
ADJUSTMENTS: sensitivity and time out (5 to 25 minutes)
MIN.-MAX. red led lights when movement is sensed.
SWITCHING CAPACITY: 800 watts, ballast loads, single or double switches.
OFF/AUTO SWITCH: turns lights off manually when necessary, or leaves lights in automatic control mode

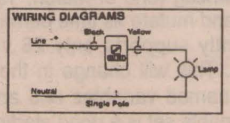
COLOR: WHITE
SIZE 5"SQ X 1 3/8" THICK

LIST PRICE $99.95

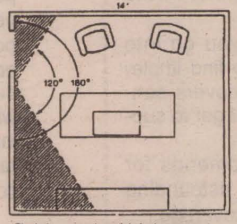
AUTOMATIC LIGHT SWITCH



TURNS LIGHTS ON & OFF AUTOMATICALLY



Typical Application 196 sq. ft.



Shaded area requires slight body movement; unshaded area requires only hand or arm movement.

DOCUMENTATION & SCHEMATIC INCLUDED

THIS UNIT CAN ALSO BE USED TO MAKE A BURGLAR ALARM SYSTEM. KIT INCLUDES: 1 SENSOR UNIT,1 POWER CORD AND 4 ALARM BUZZERS. (MIN. OF 75 WATT LIGHT BULB NEEDED-NOT SUPPLIED)
KIT #HG700 ..... $18.95 EA.

ENERGY SAVINGS FROM 30 TO 60% SINCE LIGHTING WILL NO LONGER REMAIN ON ONCE ROOM IS VACANT.

BRIGAR SALE PRICE ..... $12.95 EA.
..... 5 FOR $60.00

STEPPING MOTORS

AIRPAX 100 STEPS/REVOLUTION
STEPPING BI POLAR WOUND FACE MOUNTED. BI-DIRECTIONAL, CONT. DUTY. VOLTS: 3.2VDC 6.8 AMPS 2 PHASE , 3.6 STEP ANGLE, TORQUE 75 oz./in . FOUR 24AWG COLOR CODED WIRE LEADS. SHAFT: 7/16"LONG X 3/16" DIA. BODY SIZE: 1.5"SQ. X 1 3/8"H MOUNTING PLATE 3" LONG WITH PRE DRILLED HOLES 2 5/8" ON CENTER
SPECIAL SALE PRICE ... $1.95

ANSWERING MACHINE CODE-A-PHONE 1750

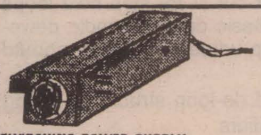
FEATURES:
*ONE TOUCH PLAYBACK
*AUTO OUT GOING MESSAGE CHECK
*BUILT IN CASSETTE
*VOICE-ACTIVATED RECORDING
*FAST FORWARD,PAUSE,&REWIND
*RING DELAY (1,2,3,4)
*LED MESSAGE DISPLAY
*VARIABLE OUT GOING MESSAGE
*NO CALL DISCONNECT
R/E MINT COND COMMERCIAL QUALITY
ORIGINAL COST $179.00

BRIGAR SALE PRICE $7.95

ANALOG METER MOVEMENT
50 MICRO AMP D.C. FULL SCALE
LARGE 4.5" DIAMETER - MIL. SPEC.
PANEL METER 3.5" DIA. VIEWING AREA.
ZERO ADJUSTMENT KNOB. WHITE FACE.
SCALES: IN GREEN,BLACK, AND BLUE LETTERS. THREE AC AND THREE DC VOLT SCALES. 0 - 2.5, 5 AND 10. ONE RESISTANCE SCALE FROM 0 TO INFINITY.
INCLUDES RUBBER GASKET, MOUNTING HARDWARE. 1 1/4" BEHIND PANEL DEPTH
BRAND NEW FACTORY BOXED.

ANALOG PANEL METERS MULTIMETERS
PHASTRON # 40-013857

PRICE
..... $4.95 EA.



SWITCHING POWER SUPPLY

Fully Enclosed-Fan cooled-Mulitple Output
Part # 130568SXD INPUT 115Vac
Output 1: +5 Vdc 10Amp
Output 2: +12Vdc 1 Amp
Output 3: -5 Vdc 0.1Amp
Output 4: logical signal +3.25Vdc
Common: 2.5 volt with 1000 ohm
Fan Cooled, EMI Filtered & on-off switch
Size: 12"L x 3 1/2"W x 2" deep - 3 1/4 LB
BRAND NEW FACTORY BOXED.
SALE PRICE $9.95

WABER #WH7NSA

MULTI-PURPOSE ELECTRONICS PROTECTOR WITH SURGE ALERT.
*7 OUTLET STRIP WITH 4'CORD
*AUDIBLE ALARM - SOUND IF SURGE PROTECTION IS NOT FUNCTIONING
*MASTER POWER SWITCH
*PUSH TO TESET 15AMP BREAKER
*HIGH IMPACT THERMOPLASTIC CASE
*UL APPROVED LIST PRICE $29.95
SALE PRICE
BRIGAR SALE PRICE $7.95

TRANSISTORS

GENERAL PURPOSE-AMPLIFIER
PART# PN2222A MFG. Rohm

VBR	FT	IC	hFE @ IC	
CEO	MHZ	MA	MIN	MA
MIN	MIN	MAX	100	150
40	300	800		

PRICE...
100 PCS. FOR $7.00
500 PCS. FOR $30.00
1500 PCS. FOR $60.00

TO-92 (Plastic)

ROHM

The general-purpose transistors are designed for small-signal amplification from dc to low radio frequencies. They are also useful as oscillators and general-purpose switches. P_D @ T_A = 25°C = 625mW

DISKETTE FILES
FELLOWS 5.25" DISKETTE FILING TRAY. CONVENIENT DESKTOP STORAGE FOR UP TO 60 DISKETTES. INCLUDES PROTECTIVE FEET, SNAP CLOSURE LID, FRONT HANDLE AND ADJUSTABLE DIVIDERS. LIST PRICE $9.00

PRICE ..... $1.19 EA.
10 FOR $10.00 100 FOR $80.00

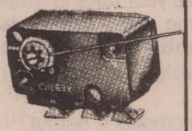
TELEDYNE

SOLID STATE RELAYS
PART# 615-8500
Control Volts: 3-32vdc
Rated: 10A @ 250VAC
50/60Hz - Opto isolated
Connection: screw or quick connects. (Removed from unused equipment)
SALE PRICE $8.95

CHERRY SWITCH #E51

5A,125/250VAC
1.25"LONG PHENOLIC LEVER ARM
ROTATION:CCW

..... $2.00



Irradiated Polyolefin Shrinkable Tubing

SHRINKAGE RATIO 2:1 (50% Shrinkage)

100' SHRINK TUBING ASSORTMENT
KIT TG80 100 ft. of 4 foot sticks, most popular assortment. **Retail price $75.00 - BRIGAR PRICE ONLY $18.00**

HEWLETT PACKARD

NEW

GREEN RECTANGULAR LED
PART# HLMP-S500 DIFFUSED
SIZE: 5MM X 2MM 200,000 PCS. IN STOCK
SALE PRICE 100 @ .10EA. 1000 @ .05 EA.

Superior Electric

SLO-SYN® MICRO SERIES MOTION CONTROLS
MODULAR TRANSLATOR DRIVES

The 230-t electronically convert input pulses into drive signals of the proper swquence and power required to operate a stepping motor: one input pulse being "translated" into one motor step.

To drive the motor, a technique called "chopping" is used. The voltage applied to the motor windings is turned on and off very rapidly, or chopped. The voltage level and chopping freq. are precisely controlled so that the desired current is produced. The instantaneous current in the drive circuit is sensed and is used to control the current to the motor.

The translator circuitry accepts a single pulse at a time as an input and determines which windings of the motor must be turned on and off in order to advance the motor shaft one step. the translator circuit is fully self contained and is not accessible through any of the function pins.

SUPPLY VOLTAGE NEEDED: 28VDC, NOMINAL 24 MIN TO 36 MAX INCLUDING RIPPLE.
SUPPLY CURRENT: 2.5AMPERES
FILTER CAPACITOR REQUIREMENT:
MINIMUM OF 250MFD. 50VDC NEEDED ACCROSS VM-VOM AT DRIVE TERMINALS
CONTROL INTERFACE REQUIREMENTS:
MIN PULSE WIDTH LOW: 15 MICROSECONDS
MIN PULSE WIDTH HIGH: 50 MICROSECONDS
RISE AND FALL TIME: LESS THAN 2 MICROSECONDS

TYPE 230-T

SLO-SYN MICRO SERIES
TYPE 230-T 2A 36V
DESCRIPTION:
BI POLAR, 2 PHASE STEPPING MOTOR DRIVE WITH TRANSLATOR
POWER SEMICONDUCTOR TYPE: H-BRIDGE
POWER IC TRANSLATOR: INTERNAL IC

PERFORMANCE:
RESOLUTION: HALF-STEP OR FULL STEP
STEP RATE: 0 TO 10,000 FULL STEPS/SEC
0 TO 10,000 HALF STEPS/SEC
CHOPPING FREQ: 20 kHz NOMINAL
SPEED/TORQUE: ALL SPECS USE TYPICAL DATA
DIRECTION: CW/CCW
MOTOR COMPATIBILITY: M061-M092
NO OF LEADS: 4,6,8
SIZE: 3.15"L X 2.70"W X 1.31"H
WEIGHT: 1 LB
BRAND NEW - INDIVIDUALLY FACTORY PACKED. COMPLETE WITH INSTRUCTION MANUAL AND SPEC SHEETS
BRIGAR SPECIAL PRICE **$79.95**

Gas Spring

GAS SPRING CO. #19537B1
NORMALLY EXTENDED - 13" OVER ALL EXTENDED LENGTH 4"COMPRESSED STROKE. (9" OVERALL LENGTH IN RETRACTED POSITION). 5/16" ROD - 3/4" CYLINDER O.D. PRESSURE TO COMPRESS:85-115 LBS. MOUNTING SCREW AT 90° TO SHAFT **PRICE ... $2.00/PAIR**

COMPUTER PRODUCTS

POWER CONVERSION

5-9W DC/DC Converters
LOW-COST UNREGULATED
PC-Mountable Excellent Isolation
PI Input Filter High Efficiency

NEW

COMPUTER PRODUCTS
MODEL # EM9S1S
5-9W DC/DC CONVERTERS
- PI INPUT FILTER
- 500V ISOLATION
- SHORT CIRCUIT PROTECTED
- HIGH EFFICIENCY - 75%
- NON-CONDUCTIVE PLASTIC ENCLOSURE

2" X 2" X 0.4" PACKAGE
OUTPUT VOLTAGE ±12V/ ±375MA
INPUT VOLTAGE: 5VDC
REGULATION LINE: 1.2% LOAD 8%
REFLECTED RIPPLE: 75mA P-P
5 PIN PC MOUNTABLE
BRAND NEW FACTORY BOXED.

$ 8.25

Write in 74 on Reader Service Card.

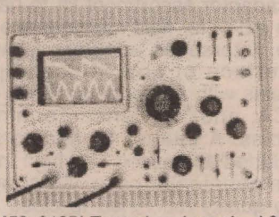
#80 TEST EQUIPMENT *cont.*

RF EQUIPMENT: HP 5342A/1 18GHz microwave counter (oven time base) $2,220. **Tek 492/1,2,3** spectrum analyzer, 50KHz through 21GHz, 100Hz resolution bandwidth, digital storage, internal preselector, CRT readout, calibrated $8,000. **Tek TR 503** .1 to 1800MHz tracking generator, calibrated $1,400. **HP 3403C/3,6** true RMS digital voltmeter (DC-100MHz, autoranging, remote control, dB display) $375. **HP 8660C/005, 100** synthesized signal generator mainframe $1,700. **HP 86222B** .01 to 2.4GHz sweep oscillator plug-in $1,600. **HP 8505A** RF network analyzer .5 to 1300MHz, 100dB dynamic range, with phase-lock option 005 and HP 8501A storage normalizer. Bright CRT. $3,700. **Tek P6201** 900MHz active probe $350. Excellent condition, with warranty. Pepper System, 214-353-0257.

TEKTRONIX 7L12 spectrum analyzer for 7613/23 oscilloscope, 0.1-1800MHz, 300Hz RBW. Service manual, application notes. $1,400. John, PO Box 95, Los Alamos, NM 87544. 505-455-2565.

TEKTRONIX TEST EQUIPMENT FOR AUDIO, BROADCAST, VIDEO: AM 503 & A6302 current probe & amplifier (to 5 A/div; DC to 50MHz) $890. **AM 503 & A6303** (to 50 A/div; DC to 15MHz) $1,440. **FG 501A** audio to 1MHz function generator $265. **FG 502** audio to 11MHz funtion generator $275. **FG 504** audio to 40MHz function generator, lin/log sweep $750. **PG 508** 50MHz pulse generator (variable rise, fall times) $325. **DM 502A** autoranging multimeter $215. **AA 501** distortion analyzer $1,250. **DA 4084** distortion analyzer (like AA 5001) $1,250. **466** 100MHz portable storage oscilloscope $845. **485** 350MHz portable oscilloscope $795. **7633** 100MHz storage mainframe $475. **7A22** high-sensitivity differential vertical amplifier $375. **AM 502** high-sensitivity differential amplifier $375. **7854** 400MHz oscilloscope mainframe: digital storage, waveform processing, GPIB $975. **7D20** digital storage plug-in: cursor measurements, min/max enveloping, signal averaging $825. **149A** NTSC generator $775. Excellent condition, with warranty. Pepper Systems, 214-353-0257.

TEST EQUIPMENT surplus for sale, MA4001, GI412R satellite receiver, HP 8020B sweep mainframe and HP 8621A RF section, Oak Mark II and III scrambler. Best offer. Call 619-569-8089.



TEK 453, $185! Tested and repaired $245. Very good condition $295. Calibrated, manual, accessories, 1 year warrantee $395. Gary, N6ZD. 408-385-0301; FAX 408-385-0261.

HP SWEEP generator 86290C $1,500; 86342C, 86350C, $750; Wavetek 1001 $150; ETN System noise monitor $250; Electro Metrics interference analyzer EMC-50 $1,500; Polarad test receiver $2,500 (ESH-2). Tel 714-441-1002, FAX 714-441-1214.

LOGIC ANALYZERS: HP1630D logic analyzer (100MHz timing, 25MHz state) $995. **Pods** for HP 1600A $39 each. **Tek 7DO1/DF1** logic analyzer plug-in (to 100MHz) $225. **Tek DAS 9129** color systems, up to 660MHz - low prices. Analyzers sold with pods, warranty. Pepper Systems, 214-353-0257.

HP 7351A DC transfer standard $500; HP 3400A RMS voltmeter $150; Tek 7CT1N curve tracer $300; AO microscopes, model 40 stereo 20X & 40X with light $300, model 60 biological 40X, 100X, 430X with substage light $200. Call 412-833-0874.

WANTED: LATE MODEL TEST EQUIPMENT (Tektronix, HP, Fluke). Especially: Tek SG 505/2, Tek S-6, Tek 2465A/B. Also, we buy test equipment **service manuals** and **catalogs.** Pepper Systems: 214-353-0257; 214-902-9511 FAX.

WANTED DOLCH model **ALP44** active logic probes (and possibly other 4850A compatible accessories) 708-358-3275.

GENRAD 2220 Bug Hound $265. Dexis, 612-944-7670.

UNITEK WELDERS wanted for cash. Parallel heads and power supplies. Call 608-643-5434, FAX: 608-643-4439.

WANTED: TWT Amps bad/good, new/used, and TWT tubes. We buy all types of test equipment. Call/Fax Richard at: MHz Electronics, 602-265-0731. FAX: 602-285-9066.

WANTED: TEST equipment in working condition. TEK, HP, FLUKE and others! DEXIS. Fax list to 612-942-9712 or voice at 612-944-7670.

WANTED! TEST equipment. We pay top dollar for used, scopes, generators, analyzers from HP, Tektronix and others. Call Charles at **Metric** for immediate quotation. 1-800-432-3424.

TEK 78440 oscilloscope dual beam 400MHz $700. Dexis, 612-944-7670.

FLUKE 2240C Data logger $1,200. Dexis, 612-944-7670.

WANTED: SERVICE monitors dead or alive. Motorola, IFR, Cushman, Wavetek. Fax your list. Call me last for best cash price. 408-929-2244 pager 510-498-6875.

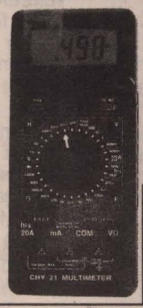
TEST EQUIPMENT sale: GR916AL, RF bridge $350; Environmental Instruments RDM101 Respirable Dust Monitor, $300; Druck DP1600 Dig pressure indicator $200, GR 874-D50 50cm adjustable stub, $50, GR1650A RCL Bridge, $250, GR1568A Wave ana, $200; GR1521B Graphic level Recorder $300, GR1432J, $100. A-Comm Electronics 303-290-8012.

ALFA ELECTRONICS

HIGH QUALITY TEST EQUIPMENT BEST PRICE

DMM 89 $199.95
Most Advanced DMM
All Purpose & Communication
-80.7 to 81.4 dBm with 4Ω–1200Ω 20 reference impedances
True RMS
Frequency counter: 0.01Hz-10MHz
Capacitance: 1pF-50,000µF
Measure AC volt to 20kHz
5000 counts, 0.1% accuracy
Auto/manual range, fast bar graph
Min/Max/Ave/DH/Relative/Zoom
Auto power off
Input warning
Splash proof
Volt, amp, ohm, logic, diode, continuity
Ruggerdized case
Rubber holster included

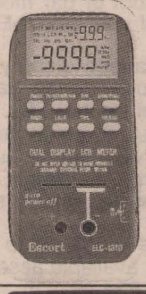
DMM 2360 $119.95
DMM+LCR Meter
Very Versatile DMM
Inductance: 1µH-40H
Capacitance: 1pF-40µF
Frequency: 1Hz - 4MHz
Temperature: -40-302 °F
TTL Logic Test: 20MHz
Diode, Continuity
Volt, Amp, Ohm
3999 count display
Peak Hold
Auto power off
Ruggerdized case.
Rubber Holster $8.00
Temperature probe $7.00



DMM 21 $74.95
Inductance: 1µH-40H
Capacitance: 1pF-200µF
Frequency: 1Hz-1MHz
Volt, amp, ohm, diode, continuity
3999 count display
TTL logic, HFE
Peak hold
Ruggerdized case
Rubber holster $8.00

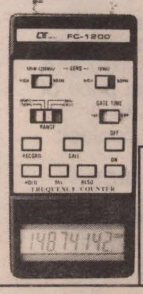
Full line of DMMs, economy, compact, ruggerdized, solar cell, automotive, heavy duty, industrial, starts from $15.95

Fluke Multimeter	
Fluke 12	$84.95
Holster C-10	$10
Fluke 70 II	$67.5
Fluke 73 II	$94
Fluke 75 II	$129
Holster C-70	$16
Fluke 77 II	$149
Fluke 79 II	$169
Fluke 29 II	$169
Fluke 83	$225
Fluke 85	$259
Fluke 87	$287
Fluke 97 Scope Meter	$1785



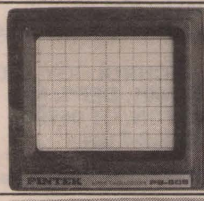
LCR Meter 131D $229.95
Most Advanced LCR
Dual display:L/Q or C/D
Inductance: 0.1µH-1000H
Capacitance:0.1pF-10,000µF
Impedance:1mΩ-10MΩ
0.7% basic accuracy
Dissipation factor & Q factor
Serial & parallel mode
Relative mode for comparison and to remove parasitics
Statistics, tolerance,
Best for design, incoming testing & production
SMD and chip component test probe $25.00

LCR Meter 814 $189.95
Best Resolution LCR
Inductance: 0.1µH-200H
Capacitance: 0.1pF-20,000µF
Resistance: 1mΩ-20MΩ
1% basic accuracy
Dissipation factor indicates leakage in capacitor and Q factor in inductor
Zero adjustment to reduce parasitics from test fixture
Best for high frequency RF and surface mount components.
SMD and chip component test probe $25.00, Deluxe carrying case $5.00



Frequency Counter FC-1200 $129.95
Frequency:0.1Hz-1.25GHz
Display: 8 digit LCD
Period: 0.1µs-0.1s
Records Max/Min/Average
Data hold, relative mode
Telescoping antenna $8.00
Deluxe case $5.00

Also Available:
AC/DC clamp meter,Light meter, Thermometer, pH meter, High voltage probe, Digital caliper, Anemometer, Electronic scale, Force gauge,Tachometer, Stroboscope, Humidity & EMF adapter, Sound level meter, Frequency counter, SWR/field strength/power meter, Dip meter



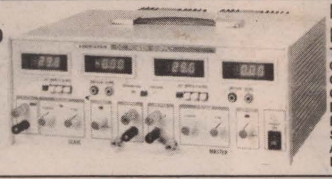
20 MHz Oscilloscope with Delay Sweep PS-205 $429.95
Dual Trace, Component test, 6" CRT, X-Y Operation, TV Sync, Z-Modulation, CH2 Output, Graticule Illum, 2 probes each has x1,x10 switch. Best price with delay sweep.

PS-200 20 MHz DUAL TRACE	$339.95
PS-400 40 MHz DUAL TRACE	$494.95
PS-405 40 MHz DELAY SWEEP	$569.95
PS-605 60 MHz DELAY SWEEP	$769.95

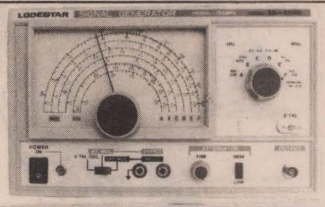
Scope Probe: 60MHz x1, x10 $13, 100MHz x1, x10 $22

20 MHz Digital Storage Oscilloscope DS-203 $729.95
Switchable between digital and analog modes
2 K word per channel storage
Sampling rate: 10 M sample /sec
8 bit vertical resolution (25 Lerel/div)
Expanded Timebase 10ms/div - 0.5 s/div
Refresh, Roll, Save all , Save CH2, Pre-Trig
Plotter Control
250MHz x1, x10 $29, 250MHz x100 $39

DC Power Supply PS-303 $159.00
0-30 VDC , 0-3A output
Constant voltage & constant current mode
0.02% + 2mV line regulation
0.02% + 3mV load regulation
1 mVrms noise and ripple
Short circuit and overload protected
PS-8200 with digital voltmeter $179.00
Also available: 30V/5A, 60V/3A, 60V/5A 16V/10A, 30V/10A



DC Power Supply Triple Output PS-8202 $499.95
Two 0-30 VDC , 0-3A outputs
One fixed 5VDC, 3A output
Capable of independent or tracking operation
Constant voltage and constant current mode
Four digital meters for volt and current display
Excellent regulation and low ripple
Short circuit and overload protected
Also available: 30V/5A triple output $549.95
Dual tracking 30V/3A, 30V/5A, 60V/3A, 60V/5A



RF SIGNAL GENERATOR SG-4160B $119.00
100 kHz-150MHz sinewave in 6 ranges
RF Output 100mVrms to 35 MHz
Internal 1kHz, External 50Hz-20kHz AM modulation
Audio output 1 kHz, 1 Vrms

AUDIO GENERATOR AG-2601A $119.00
10Hz - 1MHz in 5 ranges
Output: 0-8Vrms sinewave
0-10Vp-p squarewave
Synchronization: ±3% of oscillation frequency per Vrms
Output distortion:
0.05% 500Hz - 50kHz
0.5 % 50Hz - 500kHz
Output impedance: 600 ohm

FUNCTION GENERATOR FG-2100A $169.95
0.2 Hz -2 MHz in 7 ranges
Sine, square, triangle, pulse and ramp
Output: 5mV-20Vp-p
1% distortion, DC offset ± 10V
VCF: 0-10V control frequency to 1000:1

FUNCTION GEN/COUNTER FG-2102AD $229.95
Generates signal same as FG-2100A
Frequency counter 4 digits
Feature TTL and CMOS output

RF SIGNAL GEN./COUNTER SG-4162 AD $229.95
Generates RF signal same as SG-4160B
Frequency counter 1Hz - 150 MHz for internal and external source
Sensitivity <50mV

AUDIO GEN./COUNTER AG-2603AD $229.95
Generates audio signal same as AG-2601A
Frequency counter 1Hz-150MHz for internal and external sources
Sensitivity <50mV

SWEEP FUNCTION GEN./COUNTER $329.95
0.5Hz to 5 MHz in 7 ranges
Sweep: Linear 10:1/Log 10:1 20ms to 2s
AM Modulation
Gated Burst, Voltage Control Generator
Generator Control Voltage & 6 digit counter
1Hz-10MHz for internal & external sources

ALFA ELECTRONICS
741 Alexander Rd., Princeton, NJ 08540
(800) 526-2532/(609) 520-2002
FAX:(609) 520-2007
15 DAY MONEY BACK GUARANTEE. 1 YEAR WARRANTY
CALL OR WRITE FOR FREE CATALOG AND BEST OFFER.
Visa, Master Card, American Express, COD, Purchase Order Welcome

New Product News

Our readers are always looking for new and interesting electronic items. Showcase your NEW PRODUCTS here to help stimulate your product's success. Submit all news releases, product information, and/or photos to:

NUTS & VOLTS MAGAZINE
NEW PRODUCT EDITOR,
430 PRINCELAND CT., CORONA, CA 91719

TF-144 2M INTERMODULATION FILTER

Tucker Electronics and Computers announces the Tucker TF-144 2M intermodulation filter.

The TF-144 utilizes a three-pole filter that provides 40 dB or more of attenuation to frequencies outside of the two-meter amateur band.

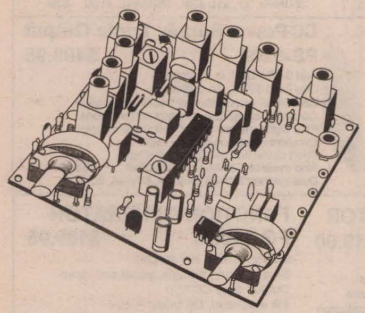
The TF-144 installs between the antenna and the transceiver with two female SO-239 connectors. The filter automatically switches on during receive and off during transmit. It can also be manually switched in and out of the circuit. It can be used on both handheld and mobile transceivers.

The TF-144 measures only 2.5" x 1.75" x 1.75" and is powered by 12 VDC at less than 100 mA (power cord included). List price of the Tucker TF-144 is $79.95.

For more information, contact:

TUCKER ELECTRONICS & COMPUTERS
1717 RESERVE ST., DEPT. NV
GARLAND, TX 75042-7621
1-800-527-4642
214-348-8800
FAX: 214-348-0367

HAMTRONICS® VHF FM RECEIVERS



Hamtronics®, Inc. announces new low-cost monitor receiver kits for the 28, 50, 73, 144, 152, and 220 MHz bands. The R100 Receiver was designed to replace both the R144/R220 and R76 series receivers which have long been popular for demanding applications, such as repeaters, audio and data links, packet radio, and remote control. The R100 not only provides a replacement for the older R76 series used for the lower VHF bands, but it also allows easier coverage of the various segments of the 150-175 MHz high band and 200-240 MHz ranges which are popular with commercial customers. In addition, the R100 was designed to have a new positive-acting, wide-range squelch circuit, and additional output terminals for repeater audio and discriminator audio. And it is now easier to assemble and align.

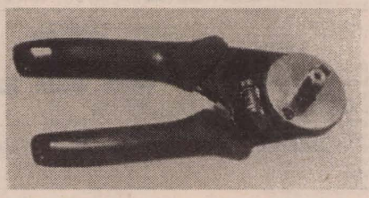
It uses triple-tuned circuits in the front end and excellent crystal and ceramic filters in the IF with steep skirts for close channel spacing or repeater operation. The IF selectivity, for instance, is over 100dB at ± 12KHz away from the carrier. Low noise FETs in the front end provide good overload resistance and 0.15///V sensitivity.

The price of the R100 is considerably less than the R144/R220 series. Kits for any of the bands are only $129.00. Wired and tested units are only $189.00, a $30.00 savings. Channel crystals for any desired frequency within these bands are only $12.00. Proportionally-controlled crystal ovens are available for operation over wide temperature ranges.

For more details, contact:

HAMTRONICS, INC.
65-F MOUL RD., DEPT. NV
HILTON, NY 14468-9535
716-392-9430 FAX: 716-392-9420

MINIATURE PIN CRIMPING TOOL



RF Industries introduces a new miniature pin crimping tool for coax and D-subminiature crimp pins.

This new tool will crimp pins with an OD from as large as AWG 20 to as small as AWG 26. The crimping action is quite different from the normal hex die set and allows one tool to crimp many different sized pins with one movable die. This four-way die action will provide unique and positive crimping action.

Many of the new subminiature cable connectors are using center conductor pins smaller than .052" and, therefore, outside the range of most crimping die sets. The RFA-4089 miniature pin crimping tool will crimp such pins.

For additional information, contact:

RF INDUSTRIES, LTD.
7620 MIRAMAR RD., DEPT. NV
SAN DIEGO, CA 92126
619-549-6340 FAX: 619-549-6345
1-800-233-1728

DUAL COLOR BARGRAPH

The new D101 from Creative Technology, Inc. is usable in low light or total darkness. Full scale is always lit green, signal voltage is red, enabling you to see the signal and full scale together. The unit can be used in either dot or bar mode, any combination of dual color LEDs may be used.

Over range causes display to flash red/green, over range flash can be set to any of the 10 LEDs.

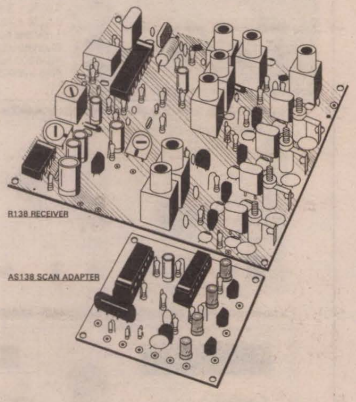
Kit includes built-in audio beep for over range. Device can be used as a voltmeter in your home, or automotive applications, or use two for the stereo.

The unit has a kit price of $26.00 and is also available assembled and tested for $34.95.

For further details, call or write:

CREATIVE TECHNOLOGY, INC.
P.O. BOX 1401, DEPT. NV
TORRINGTON, CT 06790
203-482-7124

SCAN ADAPTER



The new Hamtronics® R138 Receiver now has a companion accessory, the AS138 Scan Adapter Module.

The R138 Receiver is crystal controlled; and it has four-channel oscillators, which allows you to select a particular satellite simply by grounding the desired control line with an external switch. Crystals are available for all the common satellites, and they install simply by plugging into sockets on the board. This scheme is very practical and saves about 50% of the cost of having a synthesized receiver, even more if you built it as a kit.

The new AS138 Scan Adapter allows you to be away from the shack and still monitor the various weather satellites. It consists of a small PC board which continually monitors the receiver, scanning the four channels, looking for an active satellite overhead. If it hears one, the scanner stops on that channel and turns on a relay. The relay can be used to activate a tape recorder, allowing you to play back the tape into your demodulator unit whenever you have time to reproduce the satellite images on your computer.

The R138 Receiver's kit price is $129.00. It is also available wired & tested for $189.00. The AS138 Scan Adapter Module is $39.00 in kit form, or $69.00 wired & tested. Channel crystals are only $12.00 each.

For more details, write to:

HAMTRONICS, INC.
65-F MOUL RD., DEPT. NV
HILTON, NY 14468-9535
716-392-9430 FAX: 716-392-9420

INTERSERIES ADAPTORS

L-com has announced a handy RF adaptor assortment kit to have in the lab or for field maintenance people. Interseries adaptors allow the interface of any BNC equipped cables with any popular SMA, UHF, RCA, and "F" Series Terminated cables. A total of 11 adaptors are included all housed in a high impact compartmental case. All adaptors are quality machined to close tolerances. The adaptors have nickel plated housings and gold plated contacts.

The Model BA1800K Interseries assortment is moderately priced at only $39.95.

For more information, contact:

L-COM, INC.
1755 OSGOOD ST., DEPT. NV
NORTH ANDOVER, MA 01845
800-343-1455, 508-682-6936
FAX: 508-689-9484

THREE CHANNEL 5 AMP SUPPLY

Diamond Mountain Engineering announces the release of a new

three channel programmable power supply designed for four-corner product testing. The Model 553 has a fixed 5 volt, a programmable 5 volt, and a programmable 12-volt channel. Voltage range is ± 750mV in 1.5mV steps (5 volt) and ± 2 volts in 4mV increments on the 12-volt output. Accuracy of both programmable channels is 0.1%. The 5-volt channel is also configurable to 3 volts. The unit is easily programmed with high or low level software through the PC parallel port. Sample software written in QuickBasic is included.

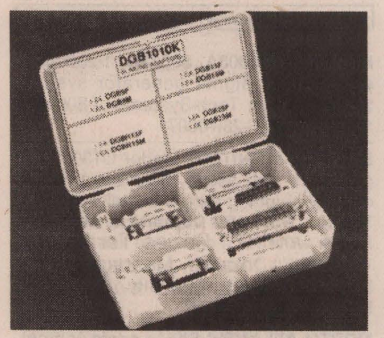
Other features include a manual or automatic programming switch, remote sensing capabilities, output sequencing, and two 10-turn potentiometers for voltage adjustment in the manual mode.

Applications include testing of electro-mechanical devices such as hard disk drives, floppies and tape units, integrated circuit parametric testing, motherboard burn-in, and any other application where stable and accurate voltages at currents up to 5 amps are required. Unit is available as a board level product, with a bulk power supply, or as an enclosed stand-alone bench top unit with two 3-1/2 digit voltmeters.

For more information, contact:

DIAMOND MOUNTAIN ENGINEERING, INC.
3213 WHIPPLE RD., DEPT. NV
UNION CITY, CA 94587
510-487-9530 FAX: 510-487-9531

GENDER CHANGER ASSORTMENT



The slimline gender changer assortment kit contains a total of eight adaptors usable on just about every D-Sub equipped cable. Includes DB9, DB15, DB25, and DB37 types, each in male-male or female-female versions.

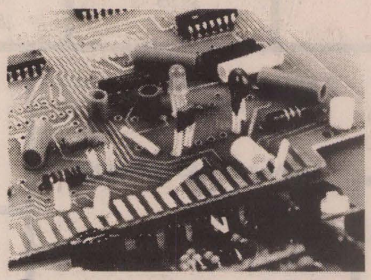
Slimline gender changers are manufactured to tight tolerances and with high quality materials. Extremely low profile of only 3/16" between connectors contributes to less strain for overstressed interface ports. Fully shielded, gold plated contacts, and UL Listed. Provided with applicable fastening hardware which may be removed if not needed.

The Model DGB1010 kit is packaged in a high-impact carry container. Single lot price is only $49.95, priced much lower than when the eight gender changers are purchased separately.

For detailed information, contact:

L-COM, INC.
1755 OSGOOD ST., DEPT. NV
NORTH ANDOVER, MA 01845
800-343-1455, 508-682-6936
FAX: 508-689-9484

TEFLON® STANDOFFS



Standard and thin wall Teflon® tubing that can be cut to length in precise sizes for raising components on PC boards to improve solder flow and prevent electrical discontinuities is available from M.M. Newman Corporation.

M.M. Newman Teflon Standoffs can be fabricated from 56 standard sizes of tubing ranging from AWG 30 to AWG 0 in standard and thin wall types. Used to raise capacitors and other components on plated thru hole PC boards, they draw solder into the holes by capillary action and help to prevent electrical discontinuities.

Cut to length from 1/16" with ± .032" accuracy, M.M. Newman Teflon Standoffs are available clear or in colors for coding by length. Featuring a 2.1 1400 v/mil dielectric strength, the tubing is chemically inert, nonflammable, operates from -450°F to +500°F, conforms to MIL-I-22129, ASTM-D-3295, AMS-3653/3655, and is UL listed.

For more information, contact:

M.M. NEWMAN CORPORATION
24 TIOGA WAY
P.O. BOX 615, DEPT. NV
MARBLEHEAD, MA 01945
617-631-7100 FAX: 617-631-8887

HEADSTARTCARD™ PCMCIA PROTOTYPING KIT

Accurite Technologies, Inc. announces the latest addition to its family of PCMCIA products with its HeadstartCard™ PCMCIA prototyping kit.

Release 2.10 compatible, the HeadstartCard kit streamlines the design cycle for PCMCIA products providing a completed PCMCIA interface design ready for tailoring to a custom application and already packaged in a type II form factor.

The HeadstartCard development and prototyping kit includes a type II physical format PCB with PCMCIA interface logic based on the Zilog Z86M17ASC adapter chip. The custom application area of the PCB supports surface mount ICs including 32 or 64 pin QFPs, 44 or 100 pin QFPs, and 150 and 300 mil SOICs.

The ample documentation supplied includes schematics for the prototype board together with data books and specifications for key chips included on the board, as well as for popluar controller chips being used in PCMCIA card readers.

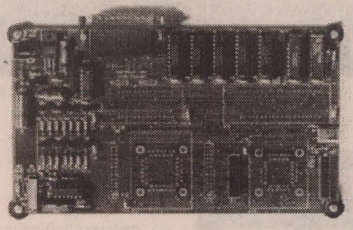
PCMCIA general design reference material is also provided together with assorted utility software useful in debugging and completing the design.

The HeadstartCard prototyping kit is economically priced at $399.00.

For more information, contact:

ACCURITE TECHNOLOGIES, INC.
231 CHARCOT AVE., DEPT. NV
SAN JOSE, CA 95131-1107
408-433-1980 FAX: 408-433-1716

PB-51/11 PROGRAMMING BOARD



Allen Systems announces the PB-51/11 programming board. The PB-51/11 is a cost-effective EPROM and EEPROM programmer for the popular 8051 and 68HC11 microcontroller families. It connects to a PC parallel printer port (either LPT1 or LPT2) and includes the necessary cable and driver software (MS-DOS, 5-1/4 inch disk). Also included is an AC adapter which supplies the 9 VDC power to the board.

The programming board accommodates a number of zero insertion force (ZIF) socket types: a 28 pin DIP ZIF for programming the 27C256 (32K EPROM); both a 40 pin DIP ZIF and 44 pin PLCC ZIF for programming the 89C51 (4K EEPROM), and 87C51 family devices (4K, 8K, 16K, 32K EPROM); and a 52 pin PLCC ZIF for 68HC711E9 devices (12K EPROM).

To minimize cost, the board is offered in a number of configurations. ZIF sockets can be very expensive, expecially for 44 and 52 pin PLCC types. Hence, the board can be purchased with only the required ZIF socket(s) installed. It can even be purchased without any ZIF sockets.

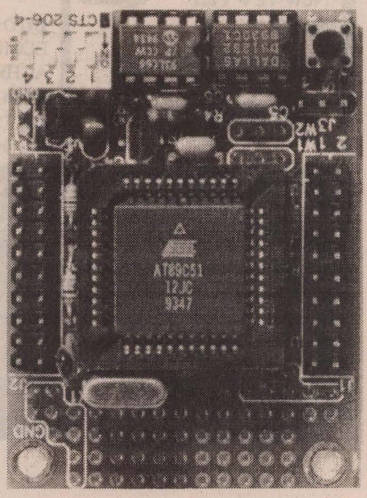
Each PB-51/11 configuration supports a single target device type and package style. If desired, the user can reconfigure the PB-51/11 for other devices and/or packages.

An assortment of software drivers for the host PC is supplied with the PB-51/11. Currently, four drivers are included: 89C51 Driver, 87C51 Family Driver, 68HC711E9 Driver, and 27C256 Driver.

For more information, contact:

ALLEN SYSTEMS
2346 BRANDON RD., DEPT. NV
COLUMBUS, OH 43221
614-488-7122

MINIATURE 8051 BASED SINGLE BOARD COMPUTER



The LITTLE BYTE-51 is a miniature single board computer based upon the popular 8051 family of microcontrollers. The family device installed on the board is the 89C51. It is a fully static CPU with clock speeds of up to 20MHz.

A main advantage of the 89C51 is its 4K byte EEPROM for program storage. Because the EEPROM is electrically erasable, application software can be installed or updated while the 89C51 remains on the board. This "in-system programming" is performed using Allen Systems' PB-51/11 programming board.

A major design feature of the LITTLE BYTE-51 is its small footprint. The board measures only 1.625 by 2.25 inches. Other board features include the DS1232 MicroMonitor chip, the 93LC66 serial EEPROM, and a prototyping area. The DS1232 generates the reset signal on power-up, and provides an optional watchdog timer. The 93LC66 is a serial EEPROM with 512 bytes of storage.

Designing with the LITTLE BYTE-51 is relatively straightforward because of the connectors on the board. Two 20 pin headers provide access to all CPU lines. These can

Continued on page 133

CONDOR D.C. POWER SUPPLY
PN# YCA426 115VAC INPUT
+5V, 4.0A / +12V, 3.0A
-12V, 0.8A / -5V, 0.2A
$9.95

Joystick Assembly
5 microswitches, cord, handle assembly $3.99ea.
GREAT PARTS BUY !

MINDSCAPE POWER PLAYER JOYSTICK
FOR COMMODORE 64, AMIGA, ATARI
$4.99

ACER
101 KEY KEYBOARDS NEW - AT ONLY
$29.95

COMPUTER "STUFF"

COREL DRAW ver. 3.0
CD & 3.5 DISKS - $59.95
CD ONLY - $49.95

DOS 5.0, 360K DISKS
$19.95

DOS 4.01 - $12.95

MINITOWER CASE
NEW - 200 WATT P.S.
$59.95

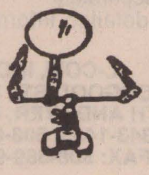
MASTERING DOS
TUTORIAL AND USERS GUIDE
COVERS UP TO VER. 3.3
BUT GREAT BASIC REFERENCE
575 PAGES $2.99

LED SPECIAL !
Assortment of shapes, colors, and sizes.
100 pcs. - $19.99

• • • • • • • • • •
WE SPECIALIZE IN HARD TO FIND COMPUTER AND ELECTRONIC ITEMS. CALL FOR STOCK AND PRICES.
• • • • • • • • • •

SHAREWARE ASSORTMENT
OUR CHOICE
10 5.25" DISKS - $10.00
10 3.5" DISKS - $15.00

POCKET PC REFERENCE
370 PAGES OF HARD TO FIND INFORMATION FOR IBM PC'S AND COMPATIBLES.
EXCELLENT BOOK
$14.95



HELPING HANDS
DUAL CLAMP
WITH LENS
$9.95

ASSORTED HEATSINKS
10 pcs. - $9.99
All different sizes, shapes.
Managers Choice.

MUFFIN FANS
3 1/8 x 3 1/8 x 1"
New 12V Fan
$8.95

FAN CORDS - $1.25

FAN GUARD - $1.00

HEMOSTATS-3.5" to 8"
GREAT FOR HOLDING PARTS
$2.95 to $5.95

NEEDLE FILE SET
COARSE CUT - 10 pcs.
$2.99

LOOP
EDMUND SCIENTIFIC
ACHROMATIC
12X COATED
FOLDING - W/CASE
$14.99

WIRE TIES
PKG. OF 100
4" WHITE - $2.50
5" BLACK - $3.40

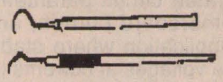
CD ROM DRIVE
W/CARD, CABLE.
SINGLE SPEED
MITSUMI, USED.
90 DAY WARR.
$49.95

VARIABLE SPEED CONTROL
FOR CEILING FANS - $2.50

TRIM POT ASSORTMENT
25 pcs - $10.95
50 pcs. - $20.00

I.C.'S GALORE !!!
CALL FOR UPDATED LIST
OF CURRENT STOCK OR FOR
PRICE AND AVAILABILITY

ANTI-STATIC BAGS
Used once, Good Shape
Assorted Sizes, great for protecting spare P.C. boards.
100 pcs. - $11.99



PIK ASSORTMENT
5 pcs. $10.00

WE BUY SURPLUS! - FAX US YOUR LIST FOR IMMEDIATE OFFERS

ELECTRONIC MATERIALS RECOVERY, INC.

3102 W. THOMAS #902, PHOENIX, AZ. 85017

PHONE (602) 272-3200 FAX (602) 269-3265 E.M.R. B.B.S. (602) 272-5300

MINIMUM ORDER $15.00 - VISA/M.C ACCEPTED - NO C.O.D.'S - UPS SHIPPING ADDED TO ALL ORDERS
QUANTITIES LIMITED - CALL FOR OTHER PRODUCTS AND SPECIALS - CALL FOR CATALOG

NV4 95

Write in 76 on Reader Service Card.

NOW! A QUALITY SATELLITE
SCPC AUDIO RECEIVER

AT AN AFFORDABLE PRICE

UNIVERSAL SCPC-100 AUDIO RECEIVER

SERVICES ON SCPC RADIO

ALL SPORTS - NEWS NETWORKS - AP - UPI - RADIO NETS - HOMETOWN SPORTS - TALK SHOWS - MUSIC (CLASSICAL, JAZZ, ROCK) - MAJOR RADIO STATIONS - FINANCIAL NEWS - NEW, QUICK LOCATOR CHANNEL GUIDE FURNISHED - OVER 430 CHANNELS AND GROWING!

FEATURES OF THE SCPC-100

MICROPROCESSOR TUNING, EASY TO TUNE - 50 CHANNEL MEMORY RECALL - WORKS WITH 950-1450 SYSTEMS - 3-MINUTE HOOKUP - 1/2" DISPLAY - C AND Ku BAND SCPC - DOES NOT DISABLE VIDEO IN USE - USE WITH HI-FI SYSTEM - RECEIVES ALL SCPC CHANNELS - SIMPLE TO USE - TUNE ALL "HIDDEN" CHANNELS.

INTRODUCTORY PRICE $439 + S&H

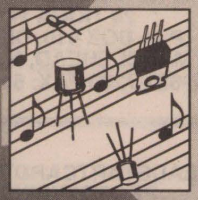
UNIVERSAL ELECTRONICS, INC.
4555 GROVES RD., SUITE 12, COLUMBUS, OH 43232
(614) 866-4605 FAX (614) 866-1201

Write in 77 on Reader Service Card.

Don't Count Inventory...
Count Cash!

Turn your surplus inventory into surplus cash. Phone or fax us about your excess inventory and we'll make you an offer on the spot.

Our purchasing power, personal service and integrity in the marketplace is unmatched. For over 35 years we've staked our reputation on it.



If cash for surplus is music to your ears, listen to a...

SYMPHONY
Electronics Corporation

WEST COAST: 10127 JEFFERSON BLVD. • CULVER CITY, CA 90230
PH (800) 347-0743 • FAX (310) 837-6159

EAST COAST: 2239 15TH STREET • UNIT B • SARASOTA, FL 34237
PH (813) 955-9666 • FAX (813) 955-5958

#80 TEST EQUIPMENT *cont.*

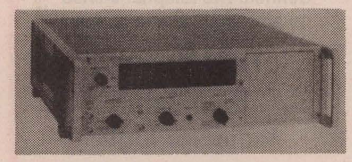
HP 8660C, 86603A, 86633B, 1-2600MHz synthesised signal generator system, $4,500. Bill at Tech-Systems, 1-800-435-1516, FAX 908-280-0007.

SERVICE MONITOR. Model CT3000S. 1 gigahertz with scope. New condition in original shipping carton and all manuals. $3,200. Other test equipment available. Fax or write for a complete list. No junk! Visa, M/C, Discover, Message or Fax: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

NORTH ATLANTIC Phase angle voltmeter, VM-204, 200BR $100 ea; 321A, $150. Krohn-Hite amplifier DCA-50 $100, 330M band pass filter $100 ea. Gertsch decade resolver bridge and resolver standard, SB-4C-4/2 (mounted on common rack and panel) $700. ESI Synchro test bridge X-628, 2 sec acc. $150. Gertsch complex ratio bridge CRB-4RS $150. Otto wolf secondary resistance standard MW31 $250. Phone 818-761-8594.

DEC EQUIPMENT WANTED! We are buying DEC systems, boards, terminals, drives and peripherals. Also Scientific Micro Systems (SMS), DSD, Datability, Dilog, other DEC compatibles, and Computer Output Microfilm (COM) units. Please call for a quote or fax us your equipment list. We buy, sell, and trade. **COMPUTER KEYWAYS,** 513-847-2300 or FAX: 513-847-2350.

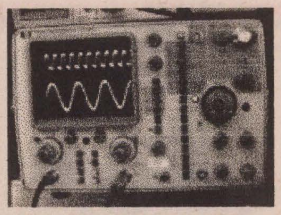
ELECTRONIC EQUIPMENT, surplus, misc. electronic and scientific equipment. For list contact T-Minus-7, 45845 Warm Springs Blvd. #F, Fremont, CA 94539. 510-651-9477, FAX 510-651-3657.



HEWLETT PACKARD 5245L counters are all gone, but **PRETESTED REPAIR PARTS ARE STILL AVAILABLE:** Readout with Nixie, $14.95. A17 card, $14.95. Other cards, $9.95. Nixies, $7.50. Xtal oven assy, $39. Add $5 shipping. Send stamped addressed envelope for quote on any other part. Check/MO plus part number/description to: **TURCOTRONIX,** 1000 E. 14th, Suite 429A, Plano, TX 75074.

MORE! TEST Equipment: AIL 521, $200; HP 1715A, $750; HP 3400A, $300; HP 8620C, $450; TEK 7A26, $150; Call Dale at **Metric** 1-800-432-3424.

HP8175A DIGITAL signal gen. w/15464A TTL pod. $5k OBO. 408-662-0194.



HP 1725A, 275MHZ. ±.5% time base phase delay measurements. $495! Gary, N6ZD, 408-385-0301, FAX 408-385-0261.

HP 8015A 50MHz Pulse Generator. Option 02 adds counted burst, option 07 adds level tracking, $695; **HP 203A Variable Phase Function Generator** 0.005Hz to 60KHz simultaneous sine and square wave outputs, continuously variable phase on channel two. $250. **Marconi TF2300B FM/AM Modulation Meter,** 4MHz to 1.2GHz, excellent condition, $350, **General Radio 1531 Xenon Strobotachometer,** 110 RPM to 25,000 RPM direct measure, $250. **HP 5255A Frequency Converter** 3.0-12.4GHz fits 5245 counters, $125, **Gelman HV Power Supply,** 0-500 VDC, 125mA, dual meters $100. **Lehman Scientific,** 717-252-4211, 717-244-7540.

FOR SALE: Dolch Logic analyzer model PALAS 40C50 with 6 Logic probes. Paid $12,000, will sacrifice for $5,000 or best offer. Call Nova, 516-582-2250 or FAX 516-582-2267.

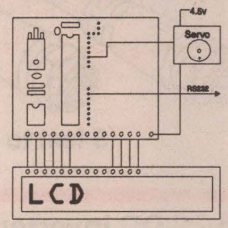
DIGITAL C,L METERS. 4 and 4½ digits, several models to choose from, 30 day money back/3 year repair warranty. Large LED display, small, rugged aluminum box. Test frequency 10MHz/1MHz down to 1KHz. Accuracy: ±0.2%. Resolution: 0.0001pF/0.001pF & 0.0001μH/0.001μH. Test signal: sinewave 0.1V/1V analog output, many more features. Best performance/price ratio, available today with prices starting at $360. **DIGITAL PHASE METERS.** 3Hz to 30MHz, 0.01° accuracy, 4½ LED display. Features: auto gain/attenuation, no adjustments, accept any wave forms, same mechanical features and warranty terms. Price $670. All equipment is manufactured in the USA by TBE ELECTRONICS, PO Box 42, Candor, NY 13743. Ph: 607-659-3030.

GEIGER COUNTER. Beta and Gamma sensitive. LCD display. Pocket sized. Batteries included. $49.95 + $3 S&H. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

NEW FBASIC TICkit™

- **FAMILIAR TECHNOLOGY:** Based on the popular PIC16C57® micro controller.
- **LOTS OF MEMORY:** 48 bytes internal RAM and 2k or 8k byte eeprom for program storage.
- **EASY TO PROGRAM:** Uses FBASIC, a structured Basic dialect that does compile time error checking.
- **EASY TO DEBUG:** Source level Debugger single steps through program. Memory variable peeking and poking.
- **EASY TO INTERFACE:** Library routines for external 8bit and 4bit busses. Pulse routines, RC measurement, RS232, 16 I/O lines, Square wave generator, etc.
- **EASY TO AFFORD:** TICkits from $49 each. Development systems are only $45. IBM compatible with a serial port works as compiler and downloader.

CALL FOR INFORMATION, TICkits ARE AVAILABLE NOW!



VersaTech Electronics™
P.O. Box 18476
Boulder, CO 80308-1476
(800) 940-5590
(303) 440-5590

PIC is registered trademark of Microchip Technologies, Inc.

CABLE TV DESCRAMBLERS NOBODY BEATS OUR PRICE!

SAVE MONEY-DON'T RENT

COMPATIBLE SYSTEMS FOR:
OAK • SCIENTIFIC ATLANTA • HAMLIN
JERROLD • PIONEER • ZENITH

QUANTITY DISCOUNTS! 24 HOUR SHIPPING

CALL VIDEO CONNECTION, INC.

1-800-677-0321

Anyone implying theft of service will be denied assistance.
NO FLORIDA SALES

Write in 80 on Reader Service Card.

TERTRONIX 491 Spectrum analyzer, 10MHz-12.4GHz. $600. HP 5340A microwave counter, 10HZ-18GHz $1,000. Fluke 8502A, 6.5 digit multimeter, opt. 1, 2, 3, 4, 5, $600. HP 8553B spectrum analyzer plug-in, $250. HP 1741A, 100MHz, dual trace storage scope, $350. Call for list of others. Don Phelps, WA6IPQ. 909-279-7347.

TEST EQUIPMENT: HP3585A spectrum analyzer, $4,800; Fluke 8920A RMS voltmeter, $425; HP3400A RMS voltmeter, $175; HP334A distortion analyzer, $315; Tek T932A oscilloscope, $250; HP1200A oscilloscope, $150; caller ID unit, $20. Call evenings 301-977-7408.

TIRED OF paying high prices to get Tektronix, Hewlett Packard, Wavetek, IFR, etc. repaired, calibrated, certified? Give us a call. Free estimates, fast service. We also sell and rent test equipment. For information: Feitek 2752 Walton, St. Louis, MO 63114. 314-423-1770.

WANTED: LATE model test equipment & manuals. Naptech buys & sells test equipment by HP, Tektronix, etc. Wanted: Tek 2200 and 2400 series, HP 8560 & 8590 series, Fluke 87, 77, 97, 8050A, etc. Wanted: HP, Tektronix, Fluke, etc. catalogs & manuals. Wanted: Source for HP, Tektronix, etc. parts. Call Naptech, 707-928-1961.

TEST EQUIPMENT FOR SALE/WANTED: RF, Microwave, Video and Fiber Optic. Cable TV, Broadcast TV, Satellite and related industries. Wavetek, Tektronix, Hewlett Packard and other manufacturers. Spectrum Analyzers, Signal Level Meters, Sweep Systems, TDRs, OTDRs, and much more. PTL Cable Service. Phone 407-747-3647, FAX 407-575-4635.

WANTED: HP4284A or 4192A Z meter, HP239A oscillator, HP1120A or 1121A probe, HP1122A supply, HP11654A probes. SELL: HP4276A. Phone/fax, John at 505-982-1894.

TEKTRONIX 650HR 12" broadcast. Color monitors w/602 vector. $1,100 ea. 818-352-6619.

Robot Kits

✓ *Academic-Level Books*
✓ *Build it Yourself*
✓ *Action Packed*

EASY TO BUILD You do ALL electronic & mechanical assembly using 2-color Instruction Books with step-by-step, well-illustrated directions for assembly, experiments and testing. Each Robot Kit applies different electronic & robotic principles. Learn how Robots work and have fun at the same time!

606A *"Scrambler"* **All Terrain Robot** This 6-legged Robot walks over rough terrain. Uses high-tech infrared beam to sense and avoid avoid objects in its path. 32 page Book. **$37.95**

603A *"Copycat"* **Programmable Robot** Program direction, light and sound using detachable keypad (included) or optional PC. Learn digital logic basics. 44 page Book. **$57.35**

602A *"Blinky"* **Pathfinder Robot** Follows path made with a marker pen or tape. Red/green LEDs react to steering changes, adding fun and interest. 28 page Book. Infrared emitter/detectors. **$36.95**

601A *"Scooter"* **Sound Controlled Robot** Backs up, changes direction, goes forward when it hears loud noise or hits an object. Florescent red. 24 page Book. Fast-paced excitement! **$18.95**

DEPENDABLE PRODUCTS Since 1963, Graymark's ONLY business has been producing educational electronic kits. We do one thing and we do it right. That's why Graymark has the largest selection of electronic kits. And, our ***"It works or we fix it"*** policy guarantees success for YOU!

ORDER TODAY! *Phone: VISA/MasterCard/Discover/AMEX*
Mail: Check/Money Order, Credit Cards
Add: $4.00 Shipping

CALL FOR *FREE* 40 PAGE CATALOG

Graymark P.O. Box 2015, Tustin, CA 92681 **800-854-7393**

Write in 81 on Reader Service Card.

Roger's Systems Specialist

21021-504 Soledad Canyon Road
Santa Clarita, California 91351

"We Have Great Connections"

Computer • Communications
Network • Audio • Video

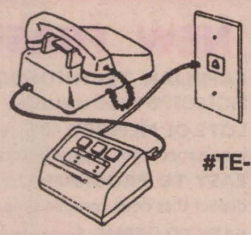
™ © 1993

Cables ★ Connectors ★ Accessories

Free catalog with any order!

800-366-0579 805-288-2288

DISCOVER AMERICAN EXPRESS Card **Fax 805-288-2293** VISA MasterCard



Two Line Telephone Switch

#TE-SW4

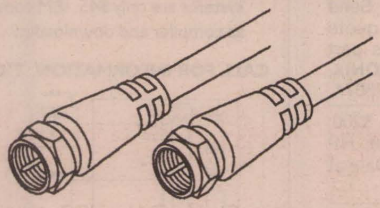
Connect two telephone lines to any single line telephone

Hold Button
Ring Light
Indicator Light

$6.00 each 4 for $20.00

Television Cable

50 feet "F" to "F" Cable

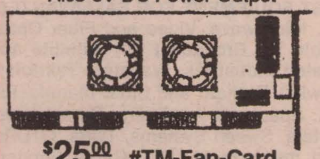


$5.00 each
#VC-50F

3 feet to 25 feet also available

Dual Fan Card

Internal Fan Card w/2 fans
Also 6V DC Power Output



$25.00 #TM-Fan-Card
$35.00 #TM-Fan-Combo
Combo I/O Controller

Stereo Headphones

For Sound Cards or Compact Disc Stereo
10 Ft. Cord Super-Dynamic

$10.00 #TM-170

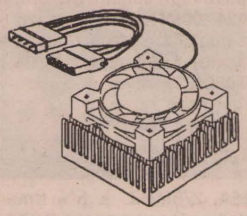
Pear Shape High Quality
$3.00 #TM-171

Digital Stereo Headphone and Mono Microphone!
$18.00 #TM-169

AC / DC Inverter

"AC Power from you car Cigarette Lighter"
100 Watt 12v DC to 120v AC
Low Battery Shutdown
Electronic Circuit
Protections

$34.95 #TM-140-SP



Heat Sink with Fan

Easy power hook-up!
Clips to Chip

486/AT CPU
$7.00 #TM-FAN-2

586/AT CPU
$10.00 #TM-FAN-66

586/AT CPU
$10.00 #TM-FAN-90

Computer Speaker

For IBM Clones
2" Internal Replacement Speaker

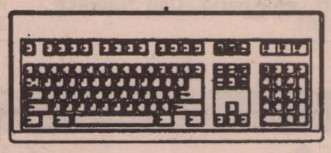
with bracket
Easy to install

#TM-123

$1.00 6 for $5.00

101 Keyboard

Brand New Top Quality Major Brand Name
1 Year Warranty "Soft" or "Click" touch



#TM-KB1

$22.00 5 up $20.00

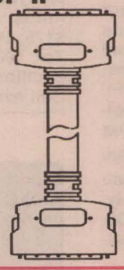
SCSI I and SCSI II

3' SCSI I to SCSI II
$20.00 #CC-679

6' SCSI I to SCSI II
$26.00 #CC-686

3' SCSI II to SCSI II
$24.00 #CC-678

SCSI III also available



CMOS Battery Holder with Lead

#TM-124
Holds 4 "AA" batteries

L.E.D. Speed Display for Case

#TM-SPD
Call for your other case goodies such as screws and hardware

Your Choice!
$1.00 20 up .83¢

Power Supply Fan

For Mid-Tower or Auxiliary fan, 7 blades
12 volts 3 1/8" x 3 1/8" x 1"

$5.00 20 up $4.50 #TM-FAN

Motherboard Standoffs

#CN-475 Nylon

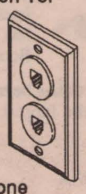
#CN-474 Brass without nut

#CN-475-U Nylon

$1.00 10 piece bag

Duplex Wall Plate

6c (RJ-14)
Top Quality
Beige Color
MFG By Allen Tel
U.L. & CSA Approved



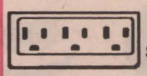
#TE-WPD-6

Other phone accessories available

$1.00 20 up .80¢

Surge Suppressors

3 Outlet Wall Mount
UL Listed



#TM-198
$2.00 each

Single Outlet
Wall Mount Adaptor
3-Wire Grounded
UL Listed

#TM-202
$1.00 6 for $5.00

AC to DC Converter

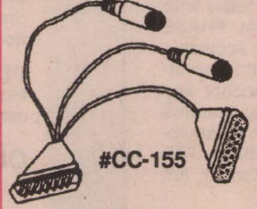
Universal
Multi-voltage 1.5v - 12v DC
6 Different Connectors
Polarity Switch

#TM-307 $3.00
500ma

#TM-310 $5.00
1000ma

Game Port to MIDI Keyboard Cable

6' DB15 male-female
2 - 5 pin DIN male
Soundblaster Compatible



#CC-155

$17.00

Microphones

General purpose
Large Dynamic Mic
1/4" to 1/8" Adaptor Included

$5.00 #TM-MIC

Condenser
Clip-on Mic
1/8" Plug

$3.00 #TM-MIC2

Only $10.00 minimum order • Add $4.50 for pre-paid orders • California residents add 8.25% tax • No out of state checks accepted
Most orders shipped same day

Write in 83 on Reader Service Card.

TEKTRONIX 7000 SERIES: 7854 400MHz oscilloscope mainframe with GPIB, digital storage, waveform measurement capability $975. **7633** 100MHz storage mainframe $475. **7904** or **R7903** 500MHz mainframe $435. **7B53A** 100MHz dual time base $190. **7B85, 7B80** delaying, delayed 400MHz time bases $225, $175. **7B92A** 500MHz dual time base $325. **7B15, 7B10** delaying, delayed 1000MHz time bases $550, $475. **7CT1N** curve tracer $475. **7D15** 225MHz counter/timer $275. **7D20** digital storage plug-in featuring cursor measurements, min/max enveloping, signal averaging $825. **7L5/L3** spectrum analyzer, 20Hz-5MHz, digital storage $1,500; with tracking generator $2,000. **7S12** time domain reflectometer with S-6, S-52 - can measure cable length to resolution of .1" (20 psec) per division $1,600. **7S14** 1GHz dual trace delayed sweep sampler $675. Excellent condition! Other plug-ins, mainframes, package discounts available. All with warranty. Pepper Systems, 214-353-0257.

TEKTRONIX 7000 SERIES VERTICAL AMPLIFIERS: 7A13 105MHz differential comparator (LED) $375. **7A18** 75MHz dual-trace $65; **7A18A** (newer version) $90; **7A18A/6** (with variable offset) $120. **7A22** 1MHz high-sensitivity, differential $375. **7A24** 400MHz dual-trace $250. **7A26** 200MHz dual-trace $135. **7A29** 1000MHz single-trace $750. **7A42** 350MHz 4-channel $595. Excellent condition! Other plug-ins, mainframes, package discounts. Pepper Systems, 214-353-0257.

FOR SALE: Digilog 800 Protocol Analyzer with V.35 and X.21 options. Great unit for spare or parts. Call John at Computer Locaters South with offer. 910-760-3705.

TEKTRONIX: 7223A oscilloscope with two -7A26, -7B53A plug-ins $600. Tektronix: 7633 oscilloscope with two -7A26, -7B53A plug-ins $600, Tektronix: 485 oscilloscope $750, Fluke: 8520A digital multimeter $200, HP: 8616A signal generator $100. Ty Miller, South Coast Surplus, 714-830-9170, FAX 714-454-9841.

SPECTRUM ANALYZERS, HP 141T systems. Mainframes, plug-ins, tracking generators, preselectors, and hook-up cables. 909-279-7347.

TEST EQUIPMENT: PRD/HP USM-37A X,H Slotted line vswr kit, $400; GR1567 Sound level calibrator, $80; GR1921 Real time ana $900, GR1925, multichannel filter $600; Gr1826C, $400 megohmmeter, GR1926 multichannel KMS detector, $600; GR1216A IF unit, $75, A-Comm Electronics, 303-290-8012.

TEK 465M $495. Gary, 408-385-0301.

TEAM AMERICA'S "PERIPHERAL BARGAINS"

Team America

CONTROLLER CARDS:

- SCSI 8bit TM850 FUTURE D **$30**
- SCSI 8bit T100/w/CD ROM sw **$20**
- SCSI 16bit ADAPTEC 1542B **$130**
- SCSI 16 bit FUTURE HD only **$85**
- SCSI MC 1640 Adaptec **$95**
- IDE I/O s/p- game 16 or 32 bit VLB **$15**
- IDE 16 bit DT3767A 16bit HD only **$4**
- RLL 16bit Seagate ST22R HD/FD **$20**
- RLL 16bit Adaptec 2372C HD/FD **$20**
- RLL 16 bit WD 1003-SR1 HD only **$15**
- MFM 8bit SMS 5510 to 20MB **$20**
- MFM 16bit SMS OMTI 8240 HD/FD **$20**
- MFM 16bit DTC 7180 HD **$20**
- MFM 16bit Everex EV349 HD/FD **$35**
- ESDI Ultra Store 12F 16bit HD/FD **$65**
- ESDI 16 bit DTC6180 HD only **$35**
- ESDI 16 bit DTC 6280 HD & FD **$45**
- 4 Floppy 8 bit 360k -2.88 w/CBL **$15**

CARDS:

- MEMORY CARD16 bit 2MB EXP **$50.**
- MEMORY CARD 16 bit 8 simm slots **$20**
- AT/XT I/O 2S/1P w/cables **$15**
- AT Multi I/O Holds 4 MB w/0MB **$20**
- VGA 8 bit 256 K **$25**
- CGA 8 bit **$10**
- Motherboard 386DX33 w/cpu ide,fd **$80**
- Motherboard 486 128K ca/ no CPU **$80**
- MODEM 2400 INT or EXT **$10**
- SOUND CARD Microsoft 16 bit **$55** stereo, speakers, HP, mic.

NETWORK CARDS

- ETHERNET 8 & 16 bit **$15/ $25**
- ETHERNET NW1000TP 8 bit **$20**
- ETHERNET 3C503 8bit **$20**

FLOPPY DRIVES:

- 360K 5.25" FDD blk/bge HH **$12**
- 720K SMD FDD BLK **$25**
- 1.44 FDD BEIGE **$31**
- 1.2 FDD beige **$35**

HARD DRIVES:

- 20 MB SEAG ST225 MFM 5 1/4 " **$59**
- 40MB IDE CONNER CP3044 **$75**
- 90MB ST 2106E ESDI 5 1/4 **$75**
- 170 MB IBM IDE 3.5 **$125.**
- 210 MB CONNER CFS210A IDE **$185**
- 540 MB MAXTOR 7540 IDE 3.5 **$235**
- 670 MB MICRP. 1558-15 SCSI **$275**
- C D ROM DRIVE 2X w/controller **$120**
- CD ROM DRIVE 2X SCSI **$125**
- CD ROM DRIVE 1X SCSI EXT **$75**

MORE TERRIFIC VALUES

- Minitower Case BEIGE W/230W PS **$45**
- XT/AT Case w/oPS **$10**
- Cable Sets, HD, MFM, RLL or ESDI **$3**
- Adapter Kits 3-1/2 to 5-1/4HD or FD **$5**
- 101 Key Board AT/ XTSwitchable **$19**
- MOUSE 3 button beige or black **$7**
- LARGE ASSORTMENT OF SOFTWARE

MasterCard VISA

90 DAY WARRANTY - ALL PRODUCTS
FOR A COPY OF OUR LATEST INVENTORY
USE "FAX ON DEMAND" DIAL 818-787-2139
CALL FROM YOUR FAX MACHINE 24HRS

Call: 818 787-1920 Fax: 818-787-9118 16104 Covello Street Van Nuys, CA 91406

Write in 84 on Reader Service Card.

OSCILLOSCOPES! TEKTRONIX 7704A w/7B80, 7B85, 7A26, 200MHz oscilloscope system, $795. **Tektronix 2335** 100MHz dual trace, delayed sweep, ultra-portable $795. **HP 1740A** 100MHz dual trace, delayed sweep $395 w/o probes, $450 w/2 new non-HP probes. **Kikusui COS6100** 100MHz five trace! Delayed sweep $495/$550. **Tektronix 453** 50MHz dual trace, delayed sweep $195/$235. **Tektronix 2215,** 60MHz dual trace, delayed sweep $475/$515. **Tektronix 2213,** 60MHz dual trace, delayed sweep $395/ $425. **Tektronix 454A,** 150MHz dual trace, delayed sweep $395/$450. **Lehman Scientific,** 717-252-4211, 717-244-7540.

141T COMPUTER INTERFACE All cables, Windows software included, just connect to PC parallel port and modernize your old 141T spectrum analyzer. Multiple traces, digital average, max hold, normalize, markers, graph, numeric listing, etc. Print and plot to any Windows printer or plotter. Save traces and setup to disk. Click and drag to alter the screen layout. Export graph to word processors, and more $169, requires Windows 3.1. Innovation First, PO Box 221, Mason, OH 45040, 513-459-7070.

POTASSIUM PERMANGANATE Controls concentration of chemical or color in a flowing stream of water. Concentration to below .25PPM. Cratar Instruments, 2304 West Broadway, Sedalia, MO 65301.

Get the Best Meter .....for your Dollar

An Engineering Workhorse for...$29.95

Dealer List

Sunex Electronic Supply
4 Locations in FL
(813) 885-4074

Lynntronics
Phoenix, AZ
(602) 841-3900

Minute Man Electronics
Fremont, CA
(510) 791-5036

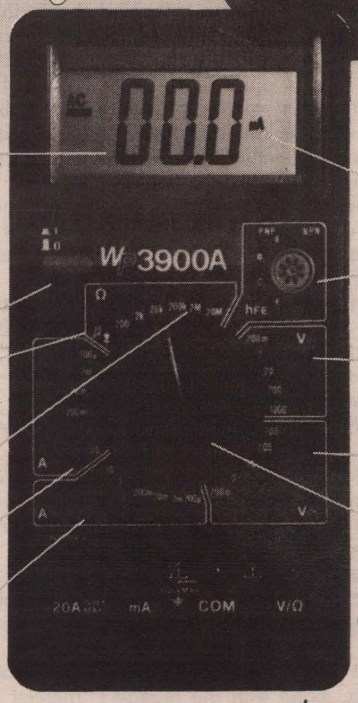
Gateway Electronics
3 Locations
(314) 427-6116

ACE Electronics
San Jose, CA
(408) 297-1383

Alltronics
San Jose, CA
(408) 943-9773

Weirdstuff
Sunnyvale, CA
(408) 746-1100

Additional Dealers Welcome



See Your Local Dealer or Call

9am to 5pm Pacific Std. Time

800-470-WIND *(9463)*

Fax: 408-987-7735

Item# X3900 **$29.95**

Item# X3910 with Capacitance..... **$39.95**

Item# X3920 with Capacitance & Temp. **$44.95**

Note: Add $4.00 for Shipping and Handling

Windward Products

We Stand Behind our Products..Satisfaction Guaranteed

P.O. Box 378 , Moffett Field, CA. 94035

Write in 87 on Reader Service Card.

DESCRAMBLERS

NEED Only 1,2/More Descrambler Combos?

We **GUARANTEE** to beat anyone's similar "All In One Special" pricing on orders of 1, 2, 3...25+.(Basebands or used equipment not included)

ALL IN ONE SPECIALS: Converter/Descrambler "One Piece" unit means no more messy wires or power supply cables required. Brand new.

	Quantity 1-5	5-20
ViperII...Replace TNT, TVT, Merlin, FTB systems	$125	CALL
Viper80 NEW...Replace Scientific Atlanta 8600 & lower	$145	CALL
SSA-80...Replace SA8600, 8590,80,70,55, & lower	$140	CALL
Novavision Replace SA,TNT,TVT,Merlin,FTB,Pioneer	$LOWEST	

PANS

TVT-3G.....$32
STEALTH....$39
M80.....$49

CABLES

PIONEER..$55
FTB.....$32
N12(OAK).$40

Coax(6ft)...$2.50
Coax(3ft)...$2.00
Coax(1ft)...$1.50

CONVERTERS (1..25+)
Millennium3....Best Price Guarantee

RX11 Video Stabilizer NEW...$20 remove all copyguard, jitter color fade from your home VHS tapes.

PM ELECTRONICS

IF YOU DONT CALL WE BOTH LOSE

OUR PRICES SPEAK FOR THEMSELVES

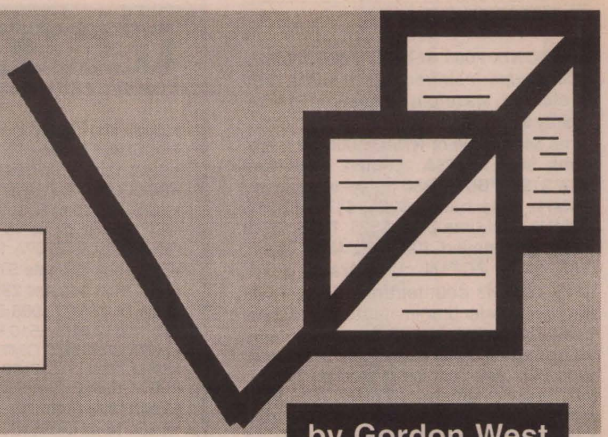
602-910-5341

MONEY BACK GUARANTEE

Write in 86 on Reader Service Card.

THE COMMERCIAL RADIO LICENSE –

DO IT BEFORE JULY!



by Gordon West

If you have been planning to study for the commercial radio operator licenses, better hit the books before this coming July. Major changes in the commercial radio test question pool will turn a relatively easy test into a major brain-thumper. Worse yet, there won't be any study materials for the new test until the end of the year.

The commercial general radio operator's license is the FCC ticket necessary for performing maintenance on marine and aviation two-way radios, as well as the radar endorsement exam necessary for maintaining land and marine radar systems, plus the rules exam for talking over certain ship and aircraft radio systems where passengers are carried for hire.

The commercial radio operator license was originally called radiotelephone-first class license, radiotelephone-second class license, and radiotelephone-third class permit. Back in the old days, the third class ticket allowed you to speak over certain broadcast stations and aboard boat stations. The second class license was necessary to work on boat radios and aircraft equipment, and in the old days the first class ticket was necessary for the adjustment of AM and FM/TV broadcast stations.

In 1984, that all changed — the FCC dropped the requirements for any commercial license to work on land mobile radio equipment, like business band radio, police radio, CB radio, and radio control. They also rolled up the first and second class radiotelephone licenses into a new lifetime general radiotelephone operator license. The third class radiotelephone permit, along with the broadcast station endorsement, was also canned. However, the commercial general radiotelephone operator license (old first or second class ticket) was still required to work on aircraft radios, marine radios, and powerful shortwave broadcast radios. Also, the marine radio operator permit (old third class) was still required by operators aboard boats carrying passengers for hire, and certain aviation and marine shore-side radio stations.

Even though the FCC "delicensed" the need for the commercial radio operator's permit for domestic radios, they were still overwhelmed by the number of applicants wanting to take the exams, plus the fact that the exams were terribly out of date, and major cutbacks in their budget loomed ahead. The FCC needed out, and looked at how well the amateur radio volunteer examination system was handling the requirement for obtaining the amateur radio ticket.

Just one year ago, the FCC turned over the general radiotelephone and radiotelegraph testing business over to "colems" — commercial operator license examination manager organizations. Nine colems (see list) would manage the test question pools and begin giving the commercial FCC tests for the following FCC commercial licenses:

- Marine radio operator permit, written Element 1
- General radiotelephone operator license, Element 1 and 3
- First class telegraph license, CW Elements 3 and 4, written Elements 1, 5, and 6
- Second class radiotelegraph license, CW Elements 1 and 2, written Elements 1, 5, and 6
- Third class radiotelegraph license, CW Elements 1 and 2, written Elements 1 and 5
- Global marine distress safety system operator, written Element 1 and 7
- Global marine distress safety system radio maintainer, written Element 1, 3, and 9
- Ship radar endorsement, written Element 8

It's been over a year since the colems have assisted with coming up with the original test questions for each of these license grades, and a year since the colems have been actively administrating the exams. The program has worked SUPERBLY with volunteer examiners giving the commercial exams almost everywhere in the country on an almost every-week basis.

The most popular examinations were the general radio operator license with ship radar endorsement. Only one test preparation book was available for the first year that covered every question, every answer, and a description of how the correct answer was arrived at — and I am happy to say that I am the author of that book available through all Radio Shack stores. The book is now in its second printing and still continues to be the ONLY source of all of the questions, answers, AND a description of how the right answer is calculated.

The radiotelegraph questions were not a big hit because most U.S. ships have dropped radiotelegraph equipment in favor of the new global marine distress safety system satellite gear. So radiotelegraph didn't get much play last year, even though a six-tape code course specifically for radiotelegraph Elements 1-4 is available from this author (Gordon West, 714-549-5000).

The global marine distress safety system exams were few and far between because there was absolutely no study material available for the tests, and only a few ships in the United States were looking for GMDSS accredited radio operators.

Without question, the most exams given were for the general radio operator license Elements 1 and 3 along with Element 8 for ship radar endorsement.

The technical question pool for GROL was hastily pulled together due to an extremely short period for colems to develop the initial question

These happy GROL test passing applicants and examiners were the first in the country under the new rules in 1993 to offer exams outside of an FCC office.

DO IT BEFORE JULY!

pool. The big contributor was W5YI VEC, one of the country's biggest amateur radio test-givers who is also accredited as a commercial COLEM. Over 80 percent of the Element 3 test questions came out of the amateur radio Advanced and Extra class question pools. This gave hams who were Advanced and Extra class operators an easy go at re-studying those ham questions, and passing rules and regs Element 1 and the technical Element 3. Almost all used the Gordon West Radio Shack book.

The radar Element 8 was another matter — the test questions came from all over the place, and some of the test questions were as old as the operator submitting them dealing with ancient radar where images were seen as a horizontal line on an old phosphorous oscilloscope. There were copious mentions of Loran A, and the Loran A navigation system that has little to do with radar was turned off over 20 years ago! And some of the other radar questions were so complex that even your scientific calculator would at times hiccup. Nonetheless, the Gordon West explanations on the radar question pool were developed and are now available from the author (714-549-5000) as the only explanations out there specifically addressed to the present Element 8 radar question pool.

BIG CHANGE THIS JULY

Despite the FCC getting out of the commercial licensing business, they were still responsible for seeing that the question pools were indeed valid and best reflect the subject material, and the FCC was also the only agency issuing the actual license once the test results were turned into them in Gettysburg, PA. They received so many comments from marine radio and aviation radio technical experts that the Element 3 was nothing more than a re-warmed ham test, they decided to let colems and all interested parties review ALL of the test question pools; send in their comments, complaints, and suggestions for better questions; and CHANGE all of the question pools this coming July, 1995.

This July, all of the written commercial question pools will reflect new updated questions. Most of the Element 3 amateur radio questions will be thrown out, and new brain-busters introduced. Element 1 rules won't change much because rules are rules. The Element 8 radar questions will be completely revised, and their complexity will probably remain the same if not slightly reduced in necessary calculations.

Radiotelegraph written exams and GMDSS written examinations will change slightly, but nothing will change as much as Element 3. And Element 3 is the big one that is required for most of the other licenses, and Element 3 is the main question pool for the general radio operator's license.

The new question pool won't be released to the public until a few weeks before the new questions go into effect. When the new pool is released, it will take book publishers, including yours truly as an author, time to review the questions, come up with an explanation of the correct answer, and publish the book by December of this year. There won't be many folks passing the GROL from July to December without proper study materials, and it takes at least six months for study materials to get into stores throughout the country.

BEST ADVICE — TEST NOW

The question pools won't rotate until July of this year. If ever you wanted to test for the written based on amateur radio-type questions, now's the time to do it. In one month, a licensed ham could get up to speed on passing the test. In about 60 days, the radio enthusiast could get through the books and prepare for the test without much problem.

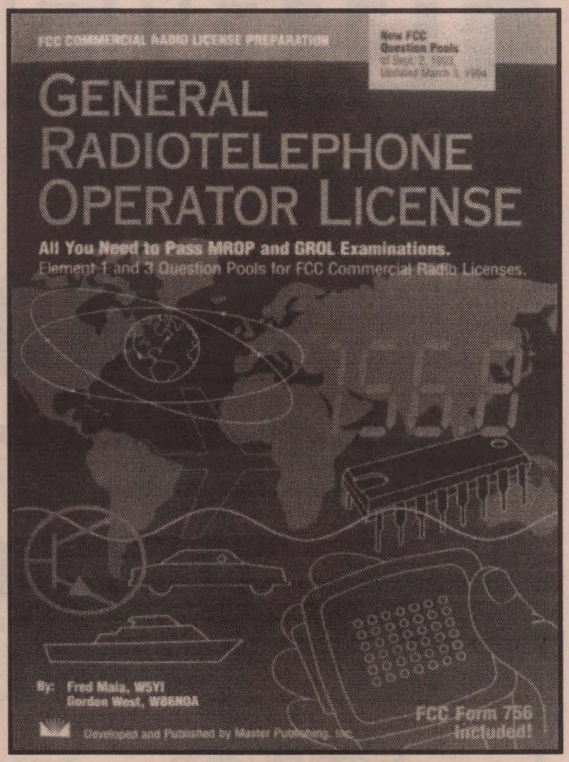
Radio Shack anticipates a sell-out of their remaining stock of current GROL test preparation books written by yours truly, along with Fred Maia W5YI.

They believe, as Fred and I do, that there will be a literal run for the books as being the only ones in the country that reflect the present test question pool, and folks throughout the country will want to take the test before the exam gets infinitely more complex.

So if ever you wanted the commercial general radio operator's license, Elements 1, 3, and 8 should be taken before July with the study materials along with a description of how the correct answers were arrived at in a Q & A and description format.

If you can't locate the study materials near you, contact Gordon West Radio School, (714) 549-5000, Monday through Friday, 10:00 a.m. to 4:00 p.m.

Speak directly with me so we can get you up to speed and through the tests before the major summertime change. **NV**



Commercial GROL books will only be valid until July! Pass the tests now (while the test questions are easy)!

Commercial Radio Licenses — Examination Requirements

License Class	Test Element	Type of Examination	Pass[3]
Marine Radio Operator Permit (MROP)	Written Element 1	24-question written examination	18
General Radiotelephone Operator License (GROL)	Written Element 1	24-question written examination	18
	Written Element 3	76-question written examination	57
T-1 – First Class Radiotelegraph Operator Certificate - 1st R/T (Must be 21 years old and have 1 year of experience)	Telegraphy Element 3[2]	20 code groups (CG) per minute	
	Telegraphy Element 4[2]	25 plain language (PL) words per minute	
	Written Element 1	24-question written examination	18
	Written Element 5	50-question written examination	38
	Written Element 6	100-question written examination	75
T-2 – Second Class Radiotelegraph Operator Certificate - 2nd R/T	Telegraphy Element 1[2]	16 code groups (CG) per minute[4]	
	Telegraphy Element 2[2]	20 plain language (PL) words per minute[4]	
	Written Element 1	24-question written examination	18
	Written Element 5	50-question written examination	38
	Written Element 6	100-question written examination	75
T-3 – Third Class Radiotelegraph Operator Certificate - 3rd R/T	Telegraphy Element 1[2]	16 code groups (CG) per minute[4]	
	Telegraphy Element 2[2]	20 plain language (PL) words per minute[4]	
	Written Element 1	24-question written examination	18
	Written Element 5	50-question written examination	38
GMDSS Radio Operator[1] (GMDSS/O)	Written Element 1	24-question written examination	18
	Written Element 7	76-question written examination	57
GMDSS Radio Maintainer[1] (GMDSS/M)	Written Element 1	24-question written examination	18
	Written Element 3	76-question written examination	57
	Written Element 9	50-question written examination	38
Ship Radar Endorsement (RADAR)	Written Element 8	50-question written examination	38
Six Months Endorsement (Must hold First or Second Class Radiotelegraph Operator's Certificate)	No examination requirement, but requires a minimum of six months service as a radio operator aboard a U.S. ship.		
Restricted Radiotelephone Operator Permit	No examination requirement, but holder must be eligible for employment in the U.S., be familiar with radio law, be able to keep a log and be able to speak and understand English.		

Notes:
1. The Global Maritime Distress and Safety System (GMDSS) is an automated ship-to-shore distress alerting system using satellite and advanced terrestrial communications systems. GMDSS basically replaces Morse code communications which is being phased out as a maritime distress communications medium.
2. Passing telegraphy examination requires copying CW (Morse code) for one minute without error.
3. Number of correct answers to pass examination.
4. Amateur Extra Class operators automatically receive credit for this element examination without testing.

TONY TALLI'S ORIGINAL *SINCE* 1984

TELEVIEW DISTRIBUTORS

NOT AFFILIATED WITH NCCA

WHERE OUR VALUED CUSTOMERS' BUSINESS IS HONESTLY APPRECIATED

1 • 800 • 847 • 3773

VEGA ONE ORDERS ALSO ACCEPTED

Good guys wear white hats. Free golf hat with $150 purchase.

1 • 800 • 525 • 0428 P.M. SALES

90 DAY + GUARANTEE

NO PERSONAL CHECKS
U.P.S. INSURED

PRICES EFFECTIVE MAY 1993

NO NEVADA SALES
HOURS: M-F 9-4 PST

	PAN	COMBO
NEW SB3	$50.00	$110.00
TRI BI	$65.00	$125.00
FAST TRI BI	$90.00	$150.00
HAMLIN		
MLD	$50.00	$110.00
OAK		
N12VS	$50.00	$110.00
PIONEER		
BA5135	$75.00	$135.00
BA1200	$75.00	$135.00
BA6110	$130.00	$190.00
BA6150		$175.00

	PAN	COMBO
SCI.ATL.		
8500 to 8569	$55.00	$120.00
8570 to 8580		$175.00

NO ZENITH
NO BASEBAND BB

ORDERS CALLED IN BY 1:00
SHIPPED SAME DAY
$15.00 Shipping

FREE 1 YEAR SUBSCRIPTION TO NUTS & VOLTS WITH $500.00 MIN. ORDER

VISA MasterCard

Nuts & Volts May Special
SA86 $160.00

GIVE TELEVIEW TONY A CALL TODAY

1-702-253-1852 • FAX 1-702-253-1854 • P.O. BOX 71465 • LAS VEGAS, NV 89170-1465

Tony Talli's Original Teleview is not affiliated with Teleview, Inc. NV Corp. or Teleview Distributors, Inc. of Illinois.

WAIVER

☐ Yes, I am paying for full service, this unit is only to be used as an extra unit.

1. **WARNING:** The ownership of a cable decoder DOES NOT give the owners of the decoder the right to decode or view premium cable channels without AUTHORIZATION from their cable company.

2. **AUTHORIZATION:** In general terms, proof of payment to a cable company for viewing their premium channels is **AUTHORIZATION**. I, the undersigned, understand paragraphs 1 and 2 above and agree that: **AS A USER:** I will not use any cable products purchased from Teleview Distributors by myself or my company, for the purpose of decoding or viewing unauthorized premium cable channels or avoiding rightful payment to any cable company. **AS A SELLER:** I will not sell, trade, give or dispose of any goods I have purchased from Teleview Distributors to any third party or customer to whom I know, believe or suspect of using said goods for the purpose of decoding unauthorized premium cable channels or avoiding rightful payment to any cable company. **AS AN ADVERTISER:** I agree I will not advertise, tell or communicate to anyone in any manner, that products I have purchased from Teleview Distributors can be, should be or are intended to be used for the purpose of decoding unauthorized premium cable channels or avoiding rightful payment to any cable company.

Signature _____ **Date** _____

Greenleaf ELECTRONICS

PLEASE FOR ORDERS ONLY

1-800-742-2567

P.O. BOX 538
BENSENVILLE, IL 60106

Call 708 • 616-8050 OR Fax 708 • 616-8094

* SSA-86-1 pc. (Scientific Atlanta, Pioneer) **$160.00**

Starbase SB3	$50.00	85 Ch. Converter w/Remote & Volume	$ 85.00
ED+ (TVT-3G)	65.00	SB3 Combo	110.00
Scientific Atlanta SA-3B	55.00	ED+ Combo	125.00
SA-4 (8580)	100.00	SA-3B Combo	120.00
Pioneer SMod (6100)	120.00	SA-4 Combo (8580)	165.00
Pioneer+	75.00	* FTB 312 Combo	150.00
Oak N12	50.00	Pioneer SMod Combo (6100)	180.00
Hamlin MLD 1200	50.00	Pioneer Combo	135.00
* FTB 312 (DPV 7212)	90.00	Oak N12 Combo	110.00
85 Ch. Converter w/Remote	65.00	Hamlin MLD 1200 Combo	110.00

✸ASK ABOUT THE NEW MILLENNIUM 3✸

For Orders ONLY: • 1-800-742-2567

Hours: Mon.-Fri. 8-6 CST Sat. 10-2 CST

✸SIX-MONTH GUARANTEE (30-DAY MONEY BACK)✸

QTY.	ITEM	OUTPUT CHANNEL	PRICE EACH	TOTAL PRICE

SUBTOTAL	
HANDLING ADD 5%	
SHIPPING ADD $7.00 PER UNIT	
TOTAL	

SHIPPING + HANDLING CHARGES NON-REFUNDABLE
NO PERSONAL CHECKS — NO ILLINOIS SALES
Cashier's Check • Money Order • COD • VISA • MC
SPECIAL SHIPPING RATE ON 5 & 10 LOT ORDERS
VISA ☐ MASTERCARD ☐

PLEASE PRINT **CARD #** **EXP. DATE**

Name _____

Address _____

City _____ **State** _____

Zip _____ **Phone No. (** **)** _____

It is not the intent of Greenleaf Electronics to defraud any pay television operator and we will not assist any company or individual in doing the same.

THIS FORM MUST BE SIGNED AND SENT BACK TO INSURE GUARANTEE

WAIVER

☐ Yes, I am paying for full service, this unit is only to be used as an extra unit.

1. **WARNING:** The ownership of a cable decoder DOES NOT give the owners of the decoder the right to decode or view premium cable channels without AUTHORIZATION from their cable company.

2. **AUTHORIZATION:** In general terms, proof of payment to a cable company for viewing their premium channels is AUTHORIZATION.

I, the undersigned, understand paragraphs 1 and 2 above and agree that:

AS A USER: I will not use any cable products purchased from Greenleaf by myself or my company, for the purpose of decoding or viewing unauthorized premium cable channels or avoiding rightful payment to any cable company.

AS A SELLER: I will not sell, trade, give or dispose of any goods I have purchased from Greenleaf to any third party or customer to whom I know, believe or suspect of using said goods for the purpose of decoding unauthorized premium cable channels or avoiding rightful payment to any cable company.

AS AN ADVERTISER: I agree I will not advertise, tell or communicate to anyone in any manner, that products I have purchased from Greenleaf can be, should be or are intended to be used for the purpose of decoding unauthorized premium cable channels or avoiding rightful payment to any cable company.

Signature: _____ Date: _____

Events CALENDAR

The Events Calendar is a free service limited to electronic events such as computer shows, hamfests, flea markets, etc. If your organization is sponsoring an event and would like a free listing, contact us at least 60 days prior to the event. Include your flyer, estimated attendance, name of person to contact and phone number.

Complimentary issues are available upon request for distribution to your attendees. A street address for UPS shipment is required.

While we strive for accuracy in our calendar, we cannot be responsible for errors or cancellations. The information contained in this column is for the use of the readers of Nuts & Volts and may not be republished in any form without the written permission of T & L Publications, Inc.

All listing information should be sent to:

Nuts & Volts Magazine
EVENTS CALENDAR
430 Princeland Court
Corona, CA 91719
Phone 909-371-8497
FAX 909-371-3052

WESTERN REGION

MAY 6

CA - SANTA BARBARA — Computer Marketplace. **SPONSOR:** National Productions. **LOCATION:** Earl Warren Showgrounds. **ADMISSION:** $5. **CONTACT:** National Productions, 408-778-5200.

CA - SANTEE — Ham Radio, Computer & Electronics Swap Meet. **SPONSOR:** ARC of El Cajon. **LOCATION:** Santee Drive-In, 10990 N. Woodside. **HOURS:** 6:30am-? **ADMISSION:** 50¢. **TALK-IN:** 146.520. **FEATURES:** C - E - F - F/R - H. **DEALER INFO:** $6/vehicle. **CONTACT:** Pat, WA6MHZ, ARCEC, Box 50, El Cajon CA 92020. 619-561-0052.

MAY 7

CA - LIVERMORE — East Bay Area Amateur Radio/Electronics/Computer Swap Meet **SPONSOR:** Livermore Amateur Radio Klub (LARK). **LOCATION:** Las Positas College, N of I-580 at Airway Blvd. exit. **HOURS:** 7am-12noon, rain or shine. **ADMISSION:** Free. **TALK-IN:** 147.045+ (PL 94.8) from west, 145.350- (PL 100) from east. **FEATURES:** E - H - FP - F/R. **DEALER INFO:** Setup after 7am only. $10 space fee. Covered spaces avail. if rain. **CONTACT:** Noel Anklam KC6QZK, 510-447-3857 eves or 510-783-2803 message days.

CA - SANTA ROSA — MarketPro Computer Show & Sale. **LOCATION:** Sonoma Co. Fairgrounds. **HOURS:** 10am-5pm. **ADMISSION:** $6, free w/membership. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

MAY 13

CA - FONTANA — Amateur Radio & Electronic Equipment Swap Meet. **SPONSOR:** Inland Empire ARC & A.B. Miller High School ARC. **LOCATION:** A.B. Miller High School, 6821 Oleander Ave. **HOURS:** 7am-?. **ADMISSION:** Free. **FEATURES:** E - EX - FP - F/R - H. **DEALER INFO:** Set-up 6am. **CONTACT:** Bill Gruber 909-822-4138 eves.

MAY 13-14

CA - POMONA — Computer Marketplace. **SPONSOR:** National Productions. **LOCATION:** Fairplex Expo Center. **ADMISSION:** $7. **CONTACT:** National Productions, 408-778-5200.

CA - SACRAMENTO — MarketPro Computer Show & Sale. **LOCATION:** Cal Expo. **HOURS:** 10am-5pm. **ADMISSION:** $6, free w/membership. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

MAY 14

CA - SAN DIEGO — MarketPro Computer Show & Sale. **LOCATION:** Scottish Rite Center. **HOURS:** 10am-5pm. **ADMISSION:** $6, free w/membership. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

MAY 20

CA - FRESNO — MarketPro Computer Show & Sale. **LOCATION:** Fresno Fairgrounds. **HOURS:** 10am-5pm. **ADMISSION:** $6, free w/membership. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - POMONA — Radio & Electronics Swap Meet. **SPONSOR:** Calif. Microwave Relay Assn. **LOCATION:** DeVry Institute of Technology Parking Lot. **HOURS:** 7am-11am. **ADMISSION:** Free for buyers. **TALK-IN:** 146.175+, 445.925- PL100. **DEALER INFO:** Tailgate space, $5. **CONTACT:** Mike Wulfestieg, N6RHZ, 714-537-4230.

CA - SANTEE — Ham Radio, Computer & Electronics Swap Meet. **SPONSOR:** ARC of El Cajon. **LOCATION:** Santee Drive-In, 10990 N. Woodside. **HOURS:** 6:30am-? **ADMISSION:** 50¢. **TALK-IN:** 146.520. **FEATURES:** C - E - F - F/R - H. **DEALER INFO:** $6/vehicle. **CONTACT:** Pat, WA6MHZ, ARCEC, Box 50, El Cajon CA 92020. 619-561-0052.

MAY 20-21

WA - YAKIMA — ARRL Hamfest. **SPONSOR:** Yakima ARC. **CONTACT:** Mark Tharp, KB7HDX, POB 2222, Yakima WA 98907. 509-965-3379.

MAY 21

AZ - PHOENIX — Computer & Electronic Swap Meet. **SPONSOR:** Electronic Materials & Computers. **HOURS:** 8am-3pm. **ADMISSION:** Free. **FEATURES:** FP. **DEALER INFO:** Vendor spaces $15. **CONTACT:** 3102 W. Thomas Rd. #902, Phoenix AZ 85017. 602-272-3200.

CA - SAN RAFAEL — MarketPro Computer Show & Sale. **LOCATION:** Embassy Suites. **HOURS:** 10am-5pm. **ADMISSION:** $6, free w/membership. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - STOCKTON — MarketPro Computer Show & Sale. **LOCATION:** Civic Auditorium. **HOURS:** 10am-5pm. **ADMISSION:** $6, free w/membership. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

JUNE 2-3-4

OR - SEASIDE — SEAPAC Ham Convention. **SPONSOR:** Oregon Tualatin Valley ARC. **LOCATION:** Seaside Convention Center. **HOURS:** Fri. 12pm-6pm; Sat. 8am-5pm; Sun. 8:30am-2pm. **ADMISSION:** $6 adv., $8 door. **TALK-IN:** 146.660. **FEATURES:** AC - B - CB - DP - E - EX - F - FM - FP - F/R - H - RV-S - S. **DEALER INFO:** Al Berg, 503-640-5456. **CONTACT:** Randy Stimson, 503-297-1175. * VE Testing - Registration Deadline May 1, 1995.

JUNE 3

CA - SANTEE — Ham Radio, Computer & Electronics Swap Meet. **SPONSOR:** ARC of El Cajon. **LOCATION:** Santee Drive-In, 10990 N. Woodside. **HOURS:** 6:30am-?. **ADMISSION:** 50¢. **TALK-IN:** 146.520. **FEATURES:** C - E - F - F/R - H. **DEALER INFO:** $6 vehicle. **CONTACT:** Pat, WA6MHZ, ARCEC, Box 50, El Cajon CA 92020. 619-561-0052.

JUNE 3-4

CA - Pomona — Computer Marketplace. **SPONSOR:** National Productions. **LOCATION:** Fairplex Expo Center. **ADMISSION:** $7. **CONTACT:** National Productions, 408-778-5200.

JUNE 4

CA - LIVERMORE — East Bay Area Amateur Radio/Electronics/Computer Swap Meet **SPONSOR:** Livermore Amateur Radio Klub (LARK). **LOCATION:** Los Positas College, N of I-580 at Airway Blvd. exit. **HOURS:** 7am-12noon, rain or shine. **ADMISSION:** Free. **TALK-IN:** 147.045+ (PL 94.8) from west, 145.350- (PL 100) from east. **FEATURES:** E - H - FP - F/R. **DEALER INFO:** Setup after 7am only. $10 space fee. Covered spaces avail. if rain. **CONTACT:** Noel Anklam, KC6QZK, 510-447-3857 eves or 510-783-2803 message days.

JUNE 10

CA - FONTANA — Amateur Radio & Electronic Equipment Swap Meet. **SPONSOR:** Inland Empire ARC & A.B. Miller High School ARC. **LOCATION:** A.B. Miller High School, 6821 Oleander Ave. **HOURS:** 7am-?. **ADMISSION:** Free. **FEATURES:** E - EX - FP - F/R - H. **DEALER INFO:** Set-up 6am. **CONTACT:** Bill Gruber 909-822-4138 eves.

JUNE 17

CA - SANTEE — Ham Radio, Computer & Electronics Swap Meet. **SPONSOR:** ARC of El Cajon. **LOCATION:** Santee Drive-In, 10990 N. Woodside. **HOURS:** 6:30am-?. **ADMISSION:** 50¢. **TALK-IN:** 146.520. **FEATURES:** C - E - F - F/R - H. **DEALER INFO:** $6 vehicle. **CONTACT:** Pat, WA6MHZ, ARCEC, Box 50, El Cajon CA 92020. 619-561-0052.

JULY 1

CA - SANTEE — Ham Radio, Computer & Electronics Swap Meet. **SPONSOR:** ARC of El Cajon. **LOCATION:** Santee Drive-In, 10990 N. Woodside. **HOURS:** 6:30am-?. **ADMISSION:** 50¢. **TALK-IN:** 146.520. **FEATURES:** C - E - F - F/R - H. **DEALER INFO:** $6 vehicle. **CONTACT:** Pat, WA6MHZ, ARCEC, Box 50, El Cajon CA 92020. 619-561-0052.

JULY 2

CA - LIVERMORE — East Bay Area Amateur Radio/Electronics/Computer Swap Meet **SPONSOR:** Livermore Amateur Radio Klub (LARK). **LOCATION:** Los Positas College, N of I-580 at Airway Blvd. exit. **HOURS:** 7am-12noon, rain or shine. **ADMISSION:** Free. **TALK-IN:** 147.045+ (PL 94.8) fr west, 145.350- (PL 100) fr east. **FEATURES:** E - H - FP - F/R. **DEALER INFO:** Setup after 7am only. $10 space fee. Covered spaces avail. if rain. **CONTACT:** Noel Anklam KC6QZK, 510-447-3857 eves or 510-783-2803 message days.

JULY 8

CA - FONTANA — Amateur Radio & Electronic Equipment Swap Meet. **SPONSOR:** Inland Empire ARC & A.B. Miller High School ARC. **LOCATION:** A.B. Miller High School, 6821 Oleander Ave. **HOURS:** 7am-?. **ADMISSION:** Free. **FEATURES:** E - EX - FP - F/R - H. **DEALER INFO:** Set-up 6am. **CONTACT:** Bill Gruber 909-822-4138 eves.

JULY 14-15-16

ID - BOISE — Convention 1995. **SPONSOR:** International Radio Club of America. **LOCATION:** Owyhee Plaza Hotel. **FEATURES:** DP - F. **CONTACT:** 208-377-5346.

JULY 15

CA - SANTEE — Ham Radio, Computer & Electronics Swap Meet. **SPONSOR:** ARC of El Cajon. **LOCATION:** Santee Drive-In, 10990 N. Woodside. **HOURS:** 6:30am-?. **ADMISSION:** 50¢. **TALK-IN:** 146.520. **FEATURES:** C - E - F - F/R - H. **DEALER INFO:** $6 vehicle. **CONTACT:** Pat, WA6MHZ, ARCEC, Box 50, El Cajon CA 92020. 619-561-0052.

JULY 16

AZ - PHOENIX — Computer & Electronic Swap Meet. **SPONSOR:** Electronic Materials & Computers. **LOCATION:** Electronic Materials & Computers parking lot, 3102 W. Thomas Rd. #902. **HOURS:** 8am-3pm. **ADMISSION:** Free. **FEATURES:** FP. **DEALER INFO:** Vendor spaces $15. **CONTACT:** 3102 W Thomas Rd. #902, Phoenix AZ 85017. 602-272-3200.

CENTRAL REGION

MAY 6

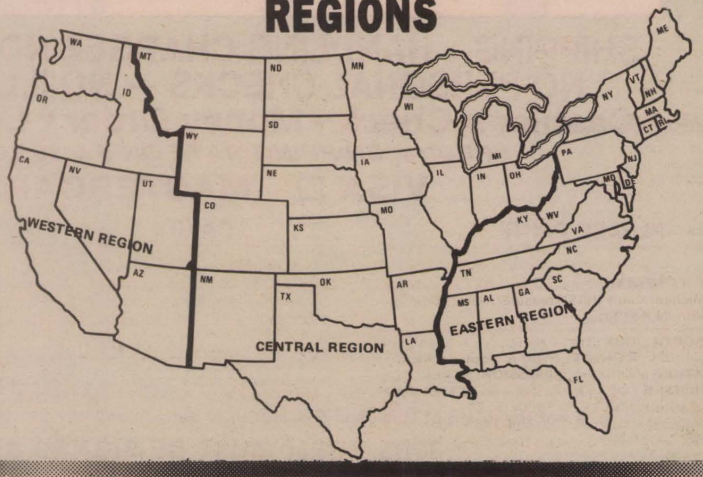
AR - RUSSELLVILLE — ARRL Hamfest. **SPONSOR:** Arkansas River Valley AR Foundation. **CONTACT:** Jerry Wilkinson, WB4ICV, 544 Richland Circle, Russellville AR 72801. 501-968-7257.

IN - INDIANAPOLIS — Indianapolis Computer Fair. **LOCATION:** Knights of Columbus Auditorium, 2100 E. 72st St., just W of Keystone Ave. **HOURS:** 10am-3pm. **ADMISSION:** $4, under 12 free. **FEATURES:** C - DP. **CONTACT:** Ben Yanto, AGI Computer Fairs.*

MI - TAYLOR — Computer Trade Show. **LOCATION:** Democratic Club of Taylor, 23400 Wick Rd., 4 blocks E of Telegraph. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

OH - AKRON — Electronics Fair. **SPONSOR:** National Expos, Inc. **LOCATION:** Emidio & Sons Center, 48 E. Bath Rd. & old Rt. 8. **HOURS:** 9am-3pm.

REGIONS



FEATURES KEY

AC	— Air-conditioned
B	— Banquet
C	— Computers
CB	— Commercial Booths
DP	— Door Prizes
E	— Electronics
EX	— FCC exams
F	— Forums
FM	— Flea Market
FP	— Free Parking
F/R	— Food & Refreshments
H	— Amateur Radio
RV-H	— RV Parking w/hookups
RV-S	— RV Parking Self-contained
S	— Seminars
T	— Tailgating

COMPUTER SHOW PROMOTER INFO

AGI Computer Fair - 317-299-8827

CMA Computer Shows - 804-272-1570

KGP Computer Shows - 908-297-2526

MarketPro Computer Shows:
West (CA) - 415-388-8893
East (MD, OH, PA, VA) - 301-365-9696
N.E. (CT, MA, NJ, NY, RI) - 201-265-1075

NARISAAM Computer Shows - 800-436-6707

Northern Computer Shows - 508-744-8440

ADMISSION: $5. **FEATURES:** C - DP - E - FM - F/R - H. **DEALER INFO:** 6' indoor table $10, 8' premium location tables $25. After 4/25/95 add $5. **CONTACT:** Joe Bowen Pres., Voice or FAX 216-442-1776. Ron Nelson Voice President, Voice 216-292-7744 or fax 216-292-7746, and mail to: National Expos, Inc., 30799 Pinetree Rd., #230, Cleveland OH 44124.

TX - AMARILLO — ARRL Hamfest. **SPONSOR:** Panhandle ARC. **CONTACT:** Guy Pigg, WZ5C, POB 3842, Amarillo TX 79116-3842. 806-372-8462.

MAY 6-7

TX - ABILENE — ARRL West Texas Section Convention & Hamfest. **SPONSOR:** Key City ARC. **LOCATION:** Abilene Civic Center. **HOURS:** Sat: 8am-5pm; Sun: 9am-2pm. **ADMISSION:** $7 adv., $8 door. **TALK-IN:** 146.160/760. **FEATURES:** EX - FP. **DEALER INFO:** Tables $5; set-up, Fri. 4pm-9pm, Sat. 6am. **CONTACT:** Peg Richard, KA4UPA, 1442 Lakeside Dr., Abilene TX 79602, 915-672-8889.

MAY 7

IN - SOUTH BEND — Camera/Computer Swap Meet. **LOCATION:** Century Center, Downtown South Bend. **HOURS:** 10am-3pm. **ADMISSION:** $5, under 12 free. **DEALER INFO:** 8' tables $50. **CONTACT:** Roger L. Smith, 8863 E. Black Point Rd., Syracuse IN 46567. 219-856-3863, voice/FAX.

MI - LANSING — Computer Trade Show. **LOCATION:** Holiday Inn South Convention Center, 6820 South Cedar St., Exit #104 off of I-96. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

MN - BEMIDJI — Hamfest. **SPONSOR:** Paul Bunyon ARC. **LOCATION:** Bemidji Eagles Club. **HOURS:** 8:00am-3:30pm. **TALK-IN:** 146.13/73. **FEATURES:** CB - DP - EX - FM. **CONTACT:** Dave Peterson N0QHL, 218-751-2314. George Welte, N0WBU, 218-751-2931. To register for testing, Gurnee Bridgeman W9NT.

OH - CLEVELAND — Compvter Manial **SPONSOR:** National Computer Exposition. **LOCATION:** Brenan's Party Center, 13000 Trisket Rd. at I-90 Exit 166, 1/4 mile S to Trisket, 1/2 mile W on Trisket. **HOURS:** 10am-3:30pm. **ADMISSION:** $1 off w/ad, under 12 free. **FEATURES:** FP. **DEALER INFO:** Setup 8am-9:30am. Sellouts are common, early booking advised. **CONTACT:** Joe Bowen, 216-442-1776 or Ronald Nelson, FAX: 216-292-7746. National Expo's,Inc., 30799 Pinetree Rd. #230, Cleveland OH 44124.

OH - LISBON — 1995 Columbiana County Hamfest. **SPONSOR:** Triangle ARC. **LOCATION:** Columbiana County Fairgrounds. **HOURS:** 8am-? **ADMISSION:** $4, under 12 free. **TALK-IN:** 146.70 - 224.66 - 146.805. **FEATURES:** DP - RV-S. **DEALER INFO:** Indoor Tables $6 each, Flea Market Space $1 each. Set-up 6:30. **CONTACT:** K8JKB, Dick 216-385-1245.

MAY 12-13

IN - KOKOMO — 24th Regional Radio Festival. **SPONSOR:** Indiana Historical Radio Society. **LOCATION:** Ramada Inn. **HOURS:** Fri: 8am-5pm; Sat: 8am-6pm. **ADMISSION:** $8 adv., $8/family (same address); $10 door/family (same address). **FEATURES:** B - FM - F/R - S. **DEALER INFO:** Outside flea market space; $5/1 space, $15/2 spaces, $35/3 spaces. Indoor flea table, Friday only, limit 1 $5/6' table. **CONTACT:** Herman Gross, 317-459-8308. Dr. Michael Clark IHRS Treasurer, RR 2, Box 90, Franklin IN 46131.

NE - SOUTH SIOUX CITY — Hamboree & Iowa State Convention. **SPONSOR:** 3900 & Sooland ARA. **LOCATION:** Marina Inn. **ADMISSION:** $6 both days. **FEATURES:** B - DP - EX - F - F/R - H. **DEALER INFO:** Flea Market tables $5, Al Smith, 3529 Douglas St., Sioux City, IA 51104, 712-259-7475. **CONTACT:** Dick Pitner, 2931 Pierce St., Sioux City IA 51104, 712-258-1520.

MAY 13

LA - SPRINGHILL — North LA/South AR Hamfest. **SPONSOR:** Springhill ARC, Inc. & Arkla ARC, Inc. **LOCATION:** Civic Center, North Main Street. **HOURS:** 8am-2pm. **ADMISSION:** $3. **TALK-IN:** 147.165 & 146.730. **FEATURES:** CB - DP - EX - FP. **DEALER INFO:** Tables, $10. Set-up 7:00am. **CONTACT:** N5NSX, 605 5th NE, Springhill LA 71075, 318-539-4167.

OH - TOLEDO — Compvter Manial **SPONSOR:** National Computer Exposition. **LOCATION:** Ramada Inn/Southwyck, 2340 S. Reynolds Rd., Ohio Tpk. 80/90 Exit 4, 1/4 Mile North on Rt. 20. **HOURS:** 10am-3pm. **ADMISSION:** $1 off w/ad, under 12 free. **FEATURES:** AC - C - DP - FP - F/R. **DEALER INFO:** Setup 8am-9:30am. Sellouts are common, early booking advised. **CONTACT:** Joe Bowen, 216-442-1776 or Ronald Nelson, FAX: 216-292-7746. National Expo's, Inc., 30799 Pinetree Rd. #230, Cleveland OH 44124.

WI - MANITOWOC — Lakeshore Hamfest, Electronics & Computer Swapfest. **SPONSOR:** Mancord Radio Club. **LOCATION:** Manitowoc County Expo. **HOURS:** 8am-? **ADMISSION:** $2 adv., $3 door. **TALK-IN:** 146.61- or 147.03 +. **FEATURES:** DP - EX - F/R. **DEALER INFO:** Tables, $4 ea., electric outlets, $5 ea., set up Fri. night until 10pm or early Sat. morning. **CONTACT:** Glen 414-684-7096 or Red 414-684-9097.

MAY 14

IA - MARSHALLTOWN — Hamfest '95. **SPONSOR:** CIRAS. **LOCATION:** Marshalltown Community College. **HOURS:** 8am-4pm. **ADMISSION:** $4 adv., $5 door. **FEATURES:** DP - EX - H - T. **DEALER INFO:** 8' tables, $8 pre-paid. **CONTACT:** CIRAS, POB 184, Laurel IA 50141.

MI - DEARBORN — 3rd Annual Mothers Day Computer Trade Show. **LOCATION:** Dearborn Civic Center, 15801 Michigan Ave., corner of Greenfield. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult, all females free. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

OH - ATHENS — 16th Annual Hamfest. **SPONSOR:** Athens County ARA. **LOCATION:** City Recreation Center. Take the E Street exit on either US Rt. 33 or US Rt. 50 and look for signs to the hamfest. **ADMISSION:** $4, YLs and female spouses of hams are free. **TALK-IN:** 145.15MHz (-600 offset). **FEATURES:** DP - FM - F/R - H - T. **DEALER INFO:** Indoor space is only available by advanced registration. If interested contact John Biddle, WD8JLM, 80 Wonder Hills Dr., Athens OH 45701. Phone 614-594-8901, after 6:00pm. **CONTACT:** Carl J. Denbow, KA8JXG, 63 Morris Ave., Athens OH 45701-1939. Internet: denbow@mail.oucom.ohiou.edu; or packet: KA8JXG@KA8DRR.OH.US.NA.

OH - MEDINA — Medina County Hamfest '95. **SPONSOR:** Medina 2 Meter Group, Inc. **LOCATION:** Medina County Community Center, 735 Lafayette Rd. **HOURS:** 8am-1pm. **ADMISSION:** $3 adv., $4 door. **TALK-IN:** 147.63/03. **FEATURES:** C - DP - E - FM - FP - F/R - H. **DEALER INFO:** Tables $6, flea market, 10', space $4, set-up 6:00am. **CONTACT:** Medina Hamfest Committee, POB 452, Medina OH 44258, 216-725-4492, 10am-5pm.

MAY 19-20-21

SD - HOT SPRINGS — 1995 Dakota Division Ham Radio Convention. **SPONSOR:** Hot Springs ARC. **LOCATION:** Mueller Civic Center. **HOURS:** 8am-? **ADMISSION:** $8 adv., $10 door. **TALK-IN:** 146.850(-). **FEATURES:** B - C - CB - DP - F - FM - F/R - H. **DEALER INFO:** Flea Market tables $10. **CONTACT:** Tim Anderson, K0OR, 440 N 20th, Hot Springs SD 57747, 605-745-6323.

MAY 20

CO - COLORADO SPRINGS — Swapfest. **SPONSOR:** Pikes Peak ARA. **LOCATION:** Liberty High School, 8720 Scarborough Dr. **HOURS:** 8am-3pm. **ADMISSION:** $3. **TALK-IN:** 146.97, 146.52. **FEATURES:** C - DP - E - EX - F/R - H. **DEALER INFO:** Tables $10, 2 or more $8. Set-up 6am. **CONTACT:** Harv Hunter, WA3EIB, 1437 Chelton Rd., Colorado Springs CO 80909. 719-597-8964.

IN - INDIANAPOLIS — Indianapolis Computer Fair. **LOCATION:** Quality Inn East, 35th & Shadeland Ave. **CONTACT:** Ben Yanto, AGI Computer Fairs.*

MI - WESTLAND — Great Lakes Computer Expo & Sale. **SPONSOR:** Progressive Computer Productions. **LOCATION:** Wayne-Ford Civic League, 1645 Wayne Rd., 1 blk. S of Ford Rd. **HOURS:** 10am-4pm. **ADMISSION:** Adults $4, Seniors/Students $3, under 12 free w/adult. **FEATURES:** C - DP - FP - F/R - S. **DEALER INFO:** 8' $35 ea. 12' $40 ea. **CONTACT:** Progressive Computer Productions, 23814 Michigan Ave., Ste. 237, Dearborn MI 48124. 313-425-9276.

MO - FESTUS — Cave Fest '95. **SPONSOR:** Jefferson County ARC. **LOCATION:** 20 miles south of St. Louis, I-55 South to exit 178, Herculancum, East to HWY 61/67. South on HWY 61/67 2 miles to CAVE entrance. **HOURS:** 7am-? **ADMISSION:** $3, under 12 free. **TALK-IN:** 147.075/224.04/442.500. **FEATURES:** C - CB - DP - E - EX - F - FP - F/R - H - S - T. **DEALER INFO:** Tables $15/commercial, $10/amateur, $7/electric hookups, $10/tailgaters. Set-up Fri. noon-11pm, Sat. 4am-7am. **CONTACT:** Herb Metts, POB 232, House Springs MO 63051, 314-671-0667.

MO - KANSAS CITY — Missouri State Convention. **SPONSOR:** Missouri State Convention. **CONTACT:** Chuck Miller, WA0KUH, 7000 NE 120th St., Kansas City MO 64166. 816-781-7313.

TX - ARLINGTON — Calculator & Antique Instrument Collector Convention. **SPONSOR:** International Assoc. of Calculator Collectors. **LOCATION:** Arlington Convention Center, 10 minutes from Dallas/Ft. Worth Airport. **HOURS:** 10am-4pm. **ADMISSION:** Free. **DEALER INFO:** 8' tables $20. **CONTACT:** Skip Solberg, 817-467-0368, 717 Salsbury, Arlington TX 76014.

MAY 20-21

NM - RUIDOSO — ARRL Hamfest. **SPONSOR:** Sierra Blanca ARC. **CONTACT:** Gunnar Carlson, AE4W, POB 4067, Ruidoso NM 88345. 505-525-2159.

OH - CINCINNATI — Cincinnati Computer Fair. **LOCATION:** Cincinnati Gardens. **HOURS:** Sat. 10am-5pm, Sun. 10am-3pm. **ADMISSION:** $5. Good both days. **DEALER INFO:** 10 x 10 professional space w/backdrop & electricity 2 8' draped tables w/chair $200. 8 x 6 Flea market space w/8' table $30, Elec. $5. **CONTACT:** 513-263-3378

MAY 21

IA - BURLINGTON — Valley Emergency Communications Assn. **CONTACT:** Chuck Gysi, N2DUP, POB 911, Burlington IA 52601-0911. 319-752-3000.

IL - GLEN ELLYN — Computer Central. **LOCATION:** College of DuPage, Park Blvd. & College Rd. **HOURS:** 9:30am-3pm. **ADMISSION:** Adults $6, 8-12 $2, under 8 free. $1 off reg. adult admission w/this ad. **FEATURES:** AC - C - FP. **CONTACT:** Computer Central, Jay B. Robinson, 708-940-7547.

IL - PEOTONE — ARRL Hamfest. **SPONSOR:** Kankakee Area Radio Society. **CONTACT:** Willis Bowser, K9IFO, 1210 N. Riverside Dr., Momence IL 60954-3452. 815-472-2079.

IN - WABASH — 27th Annual WCARC Hamfest. **SPONSOR:** Wabash County ARC. **LOCATION:** Wabash County 4-H Fairgrounds. **HOURS:** 7am-5pm. **ADMISSION:** $6 adv., $5 door. **TALK-IN:** 147.63/03 442.325/447.325. **FEATURES:** C - CB - DP - E - FM - FP - F/R - H - RV-S - T. **DEALER INFO:** Indoor tables, $10. Set-up: Sat. 1pm-9pm, Sun. 6am-7am. **CONTACT:** Don Spangler, 235 Southwood Dr., Wabash IN 46992, 219-563-5564.

MI - MADISON HEIGHTS — Computer Trade Show. **LOCATION:** UF & CW Hall, 876 Horace Brown Dr., 1 block East of I-75, 3 blocks S of 13 Mile Road. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4; Seniors & students w/ID $3; under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

MAY 26-27-28

OK - TULSA — Green Country Hamfest & Oklahoma State Convention. **LOCATION:** Maxwell Convention Center, Exhibit Hall A, W 7th St. between Denver Ave. & Houston Ave. **HOURS:** Sat, 8am-5pm. Sun, 9am-12 noon. (Hamfest Hours Only.) **ADMISSION:** $8 adv., $10 door. **TALK-IN:** 146.88, 145.27. **TALK-IN:** B - CB - DP - EX - F - FM - RV-H. **DEALER INFO:** Flea market tables, $6 adv., $8 door. Dealer booths start @ $45. Set-up Fri. afternoon. Charlie 918-241-4214. **CONTACT:** Call 918-272-3081, leave message.

MAY 27

MI - TROY — Computer Trade Show. **LOCATION:** American Polish Cultural Center, 2975 E. Maple Road (15 Mile), corner of Dequindre. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

MAY 27-28

WY - CASPER — ARRL Hamfest. **SPONSOR:** Casper ARC. **CONTACT:** Steve Speir, N7JUO, 3511 Swanton Ave., Casper WY 82609. 307-265-5675.

MAY 28

IL - CHICAGO — Hamfest. **SPONSOR:** Chicago ARC. **LOCATION:** DeVry Institute of Tech, 3300 N. Campbell. **HOURS:** 8am-3pm. **ADMISSION:** $4 adv., $5 door. **TALK-IN:** 147.255 +, 444.825 +. **FEATURES:** FP. **DEALER INFO:** Indoor tables $1 a foot. Outdoor Swapfest free. Set-up 6am. **CONTACT:** CARC, 5631 W. Irving Pk. Rd., Chicago IL 60634, 312-545-4740.

IL - ORLAND PARK — The Orland Park Computer Show. **LOCATION:** Orland Park Civic Center, 147th St & LaGrange Rd. (Rt. 45). **HOURS:** 9:30am-3pm. **ADMISSION:** Adults $5 - $1 off with copy of this ad, 8-12 yrs $2, under 8 free. **FEATURES:** A - C - CB - DP - FP - F/R - All indoors. **CONTACT:** 24-hour Hotline 708-974-3123.

OH - YOUNGSTOWN — 10th Annual Hamfest & Computer Show. **SPONSOR:** Twenty Over Nine Radio Club. **LOCATION:** Canfield Fairgrounds, Rt. 46. **HOURS:** 8am-3pm. **ADMISSION:** $3 adv., $4 door. Under 12 free w/paid admission. **TALK-IN:** 147.315 +, 443.225 +. **FEATURES:** C - FM - FP - F/R - H. **DEALER INFO:** Inside tables. Outdoor flea market free with admission. Set-up 6:30am. **CONTACT:** Don Stoddard, N8LNE, 42 S. Whitney Ave., Youngstown OH 44509, 216-793-7072. Or Dave Mellott, KE8KT, 2895 Penny Ln., Austintown OH 44515, 216-793-0816.

JUNE 3

CO - LOVELAND — Superfest Swapmeet. **SPONSOR:** Northern Colorado ARC. **LOCATION:** Larimer County Fairgrounds, 700 S. Railroad. **HOURS:** 8am-3pm. **ADMISSION:** $3. **FEATURES:** C - CB - DP - E - EX - FP - F/R - H. **DEALER INFO:** Tables $8, Jeanene Gage, N0YHY @ 303-351-7327. **CONTACT:** Gen. info. Randy Long, WB6AVV, 303-226-1529, Musser Moore, AA0PB, 303-221-3698.

MI - GRAND RAPIDS — 15th Annual Hamfestival. **SPONSOR:** Independent Repeater Assn. **LOCATION:** Hudsonville Fairgrounds, 5 miles W of Grand Rapids, off I-196, X-way. **HOURS:** 8am-3pm. **ADMISSION:** $4 adv., $5 door, under 12 free. **TALK-IN:** 147.160 Link Repeater System. **FEATURES:** C - CB - DP - EX - F/R - H. **DEALER INFO:** Tables $8, 10' trunk spaces $5. Set-up 6am. **CONTACT:** Tom or Kathy Werkema, KA8YSM/KB8KZH, 562 92nd St. SE, Byron Center MI 49315. 616-698-6627.

JUNE 4

IL - PRINCETON — Princeton Hamfest & Computer Show. **SPONSOR:** The Starved Rock Radio Club. **LOCATION:** Bureau County Fairgrounds. **HOURS:** 8am-? **ADMISSION:** Flea Market: Free. Show: $5 adv. double stub, $5 door single sub. **TALK-IN:** 146.355/955. **FEATURES:** C - CB - DP - FM - FP - F/R - H - RV-S. **DEALER INFO:** Tables $10, bring your own dropcards. Set-up: Sat. 12pm-6pm, Sun. 6am. **CONTACT:** Bruce Burton, KU9A/Debbie Burton, N9DRV, 1153 Union St., Marseilles IL 61341-1710. 815-795-2201.

IN - EVANSVILLE — Hamfest, Computers & Electronics Show. **SPONSOR:** Tri-State ARS. **LOCATION:** Vanderburgh County 4-H Fairgrounds, Hwy 41 & Boonville - New Harmony Rd. **HOURS:** 8am-?. **ADMISSION:** $4. **TALK-IN:** 147.15MHz (transmit + 600KHz). **FEATURES:** C - CB - DP - E - EX - F/R. **DEALER INFO:** Indoor tables free, commercial vendor set-up 6am, Flea market set-up 7am. **CONTACT:** TARS, PO Box 4521, Evansville IN 47724.

KS - SALINA — Hamfest. **SPONSOR:** Central Kansas ARC. **LOCATION:** Bicentennial Center Heritage Hall. **HOURS:** 9am-3pm. **ADMISSION:** $6. **TALK-IN:** 147.03 (+). **FEATURES:** AC - C - CB - DP - E - FM - F/R - H. **DEALER INFO:** Commercial tables $10. Flea market tables $5. **CONTACT:** Dan Cook, AA0TT, % CKARC, POB 2493, Salina KS 67401-2493. 913-263-8540.

MI - CHELSEA — 18TH Annual Chelsea Swap "N" Shop. **SPONSOR:** Chelsea ARC. **LOCATION:** Chelsea Fairgrounds. **HOURS:** 8am. **ADMISSION:** $3, YLs, XYLs, under 12 all free. **TALK-IN:** 146.980. **FEATURES:** FM - F/R. **DEALER INFO:** 8' tables $10, Trunk space $3. Set-up 6am. **CONTACT:** PO Box 325, Manchester MI 48158, or Gary R. Widmayer, 313-428-9398.

OH - DAYTON — PC Buyers Mart. **SPONSOR:** 5 O'Clock Computers. **LOCATION:** Nutter Center. **HOURS:** 10am-4pm. **ADMISSION:** $4 Seniors, $2 students. **FEATURES:** C. **DEALER INFO:** 6' tables $30, $5 electric hook-ups. **CONTACT:** 5 O'Clock Computers, 513-426-0350 or 1-800-363-5200.

JUNE 10

IN - INDIANAPOLIS — Indianapolis Computer Fair. **LOCATION:** Knights of Columbus auditorium, 2100 E. 71st St., W. of Keystone Ave. **HOURS:** 10am-3pm. **ADMISSION:** $4, under 12 free. **FEATURES:** C - DP. **CONTACT:** Ben Yanto, AGI Computer Fairs.*

JUNE 11

IL - ORLAND PARK — The Orland Park Computer Show. **LOCATION:** Orland Park Civic Center, 147th St. & LaGrange Rd. (Rt. 45). **HOURS:** 9:30am-3pm. **ADMISSION:** Adults $5 - $1 off with copy of this ad, 8-12 yrs $2, under 8 free. **FEATURES:** A - C - CB - DP - FP - F/R - All indoors. **CONTACT:** 24-hour Hotline 708-974-3123.

IL - WILLOW SPRINGS — 18th Annual Hamfest. **SPONSOR:** Six Meter Club of Chicago. **LOCATION:** Santa Fe Park, 91st & Wolf Rd. **ADMISSION:** $4 adv., $5 gate. **TALK-IN:** 146.52, 146.37/97 (107.2Hz). **FEATURES:** C - CB - E - FM - FP - F/R - H. **DEALER INFO:** Joseph Gutwein, WA9RIJ, 7109 Blackburn Ave., Downers Grove IL 60516. 708-963-4922. **CONTACT:** Adv. tickets: Mike Corbett, K9ENZ, 606 S. Fenton Ave., Romeoville IL 60441.

MI - DEARBORN — Computer Trade Show. **LOCATION:** Adray Sports Arena, 14900 Ford Road (M-153), 1 block E of Greenfield. **HOURS:** 10am-4pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

JUNE 16-17

MN - MAPLEWOOD — Electronics Fair '95. **SPONSOR:** North Area Repeater Assn. **LOCATION:** Aldrich Arena, 1850 White Bear Ave. **HOURS:** Fri.: Outside flea market 6pm-9:30pm, Commercial Exhibits 6pm-10pm. Sat.: Outside flea market 6am to 3:30pm, Commercial Exhibits 8am-3:30pm,

Continued on page 136

#80 TEST EQUIPMENT *cont.*

EQUIPMENT MANUALS we have 1000's of service and operators manuals for all types of test and measurement equipment from 1950 to present. All test equipment manufacturers are represented. Call, write, or fax your want list. Please include mfg.'s manual P/N unit serial no's if known. **Manuals Plus,** Box 937, Spanaway, WA 98387. 206-531-8031 or FAX 206-536-1121.

SOR-POWER supply 0-10 volt, 0-40 amp, DCR 10-40B $140. Dexis, 612-944-7670.

CLOSING DATE FOR NEXT ISSUE MAY 10TH

SECURITY 85

ALARM CONTROL panels, power supplies, contacts, motion detectors, sirens, strobes, metal enclosures, timers, water, gas and temperature sensors. Call 908-840-5959 for catalog or write: H.E.S. Electronics, PO Box 183, Brick, NJ 08723. Also: CATV, CCTV, antennas, video distribution, X10, and phone products and installation tools.

SECURITY TECHNICAL help online 24 hours a day on the HES BBS via modem: 908-840-6921.

SPY EMPORIUM privacy security. Professional recorders, parabolic mic., Wireless covert video, bugging/phone tap detectors, scramblers, locksmith tools, etc. FOR CATALOG, SEND $5 to Security Trade, 6065 Hillcroft, Suite 413, Houston, TX 77081. 713-774-1000, FAX 713-270-4708.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmff/.

PROTECT YOURSELF with a 90,000 volt stungun! Small, compact, and effective. $34.95 + $1.95 for shipping. Send payment to JDS, 749 Ridge Crest St., Monterey Park, CA 91754.

SECURITY/SURVEILLANCE: Video, Audio, Publications-Best Selection. Call our information retrieval system from your Fax handset, 24 hours: 215-953-1316.

CALLER ID in your PC! 8-bit card with software. Patented pass and block. Database included. Generates ASCII call record. Pager forwarding. More. Technical reference to write your own applications. Now only $109.95! Pewee Valley Innovations, Inc., 6601 Old Zaring Road, Crestwood, KY 40014. 502-241-4295.

SECURITY CAMERA equipment and related products. 1000s of pieces of equipment, from cameras, lenses, cable, video recorders, switchers, mounting brackets. All equipment is new with manufacturer's warranty. WEI Systems and Equipment. 1-800-348-4448.

SURVEILLANCE: ALL ELECTRONICS SECURITY DEVICES AND ALL YOU NEED FOR PRIVACY AND SECURITY, BUGGING/PHONE TAPPING DETECTORS, TELEPHONE RECORDING, TELEPHONE/FAX SCRAMBLERS, VEHICLE TRACKING SYSTEM, COVERT VIDEO CAMERA, TRANSMITTER KITS, AND MORE. FULL CATALOG AVAILABLE. **A.B. ELECTRONICS, NY, 1-800-U-ANTIBUG, 718-253-3637.**

ICOM R100 receivers, not blocked, 50 avail. NIB $600 @ ppd. U16, U28, U18, U400 used, call. ICOM commercial bought, sold, mended, warranty. No amateur F30/40LT in stock, 99 channel, 8 digit alpha, keyboard programmable. SWS Security, 410-879-4035.

SATELLITE EQUIPMENT 90

RCA DSS 18" Dish Systems, single and dual systems available. Call for price info. quantities available. 201-728-3217. 10am-6pm EST.

1.2 MEGABYTES of satellite tracking programs, lists every satellite visible in US, co-ordinates, channel frequencies, audio carriers, scrambling methods. Computes solar outages, telemetric data sources for low orbiting satellites. $8. Cabletronics, Box 30502N, Bethesda, MD 20824.

SATELLITE EQUIPMENT: Fully programmable stereo C/KU receivers with remote control, 25 degree C-Band LNBs 36VDC motors, RF modulators, and complete satellite systems. Call 714-548-5521.

AMPLIC 950-1459 Satellite Block Receivers. Excellent for KU and multiple receiver system. $74, two or more $65, limited supply. 0.6 BLUE THUNDER KU-LNB $85. Voice orders and information 918-479-6451. Sync-A-Link Communications, PO Box 4, Locust Grove, OK 74352.

VIDEOCYPHER II descrambling manual Schematics, video and audio. Explains DES, EPROM, CloneMaster, Pay-per-view (HBO, Cinemax, Showtime, Adult, etc.) $16.95, $2 postage. Schematics for Videocypher Plus, $20. Schematics for Videocypher 032, $15. Collection of Software to copy and alter EPROM codes, $25. VCII Plus EPROM, binary and source code, $30. Cabletronics, Box 30502N, Bethesda, MD 20824.

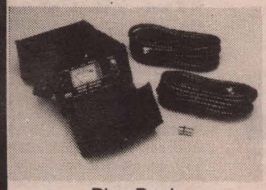
SKYVISION INC.®

ORBITRON

Known the world over for their superior reception and picture quality, the Orbitron satellite dish features an exclusive Spinclination mount, which allows declination to be set by rotating the antenna to correct the latitude setting on the scale. Their compact shipping cartons allow these antennas to be shipped very economically to any point in the world. Let Orbitron help you expand your viewing choices.

1514001	6.7'	SX-7	Polar/Spin	$45 (S&H)	$259
1514002	8.3'	SX-8.5	Polar/Spin	49 (S&H)	319
1514004	10.0'	SX-10	Polar/Spin	63 (S&H)	449
1514005	11.7'	SX-12	Polar/Spin	84 (S&H)	649

and many more...



Pico Peaker

You can now accurately aim your satellite dish to receive ***all*** the satellites using a tool the experts use. Whether installing a new system, moving your dish, or realigning your dish due to wind or frost, the Pico Peaker will save you both time and money. This unit can be used on any receiver system with block down-converted frequencies between 400 and 1450 MHz. It will also eliminate the need for those expensive service calls. The unit includes everything you need—even the cables. A *"must"* for every satellite enthusiast.

900038 Pico Peaker S&H $5 $89.95

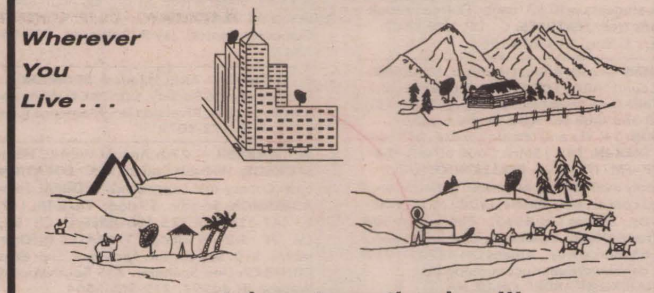
Superjack Actuators

Is your actuator no longer doing its job because of wear and tear? As the hardest working part of your satellite system, the actuator must move your dish from east to west across the entire satellite belt. Each time you change satellites, your actuator sends pulses to the receiver telling the receiver when to stop moving the dish. Most older actuators sent only 10-16 pulses for each inch of travel, which may not be enough to stop the dish at the maximum signal strength. Today's new heavy duty actuators with high resolution reed sensors send 48 pulses per inch of arm travel.So if your old actuator is getting tired, let a new SuperJack insure the finest picture possible.

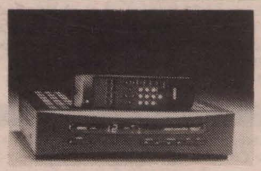
18" arm	1019018	S&H $15	$ 89
24" arm	1019026	S&H $16	139

Satellite Television

Wherever You Live . . .



. . . at down to earth prices!!!



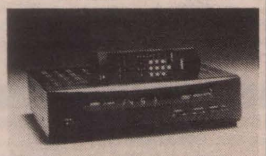
Ultra

The Ultra is Uniden's newest, smallest fully-integrated C/KU receiver ever. This unit includes the ability to control dish movement and is ready for an optional internal program decoder. The Ultra comes preprogrammed for 49 satellite positions and allows you to add satellites as they are launched. Move directly to the satellite by entering the abbreviation from the included infrared remote control. Forty programmable favorite channels can be accessed immediately from your easy chair. Run across something you don't want your kids to see? Just touch a button and eliminate that channel from their access. A complete variety of color menus allow you to control everything from your remote control. The Uniden Ultra is an ideal receiver to get you started in Direct-To-Home Satellite TV.

4527008 Ultra S&H $22 $379.00

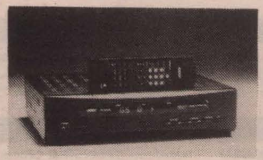
uniden®

The UST 4600 sets a standard in value and performance for home satellite receivers. This unit features automatic satellite programming, 160 favorite channels can be instantly recalled for easy access. All 160 can be changed or updated at any time. This IRD features a stereo processor, enabling you to tune both left and right channels for a full stereo effect from over 100 radio stations found in satellite. The QuikTune feature quickly optimizes the satellite picture for the sharpest image. The 4600 offers other features including IR/UHF remote, 55 satellite position memory and direct satellite access. The versatility makes this an excellent choice.



UST 4600

4527009 UST4600 S&H $22 $499.00



UST 4900

The Uniden UST 4900 is one of the most sophisticated satellite television receiver systems available today. This receiver will open your home to the universe of satellite viewing and is designed to be one of the most user-friendly IRDs available anywhere. Sophisticated microcomputer technology brings in crystal clear audio and video broadcasts with a minimum of user effort. The UST 4900 front display features easy-to-read icons that show you vital information including satellite, channel, polarity, timer status, antenna position and much more. This receiver is capable of storing the positions of the satellites, as well as the tuning details for each channel. The picture-in-picture feature allows you to view two video sources at the same time. You can have it all, including advanced technology and lasting quality, with the UST 4900.

4527010 UST4900 S&H $22 $689.00

All Major Credit Cards Accepted

Skyvision Inc.®

1016 Frontier Drive, Fergus Falls, MN 56537 – Toll Free 800-334-6455

Mail in coupon or call today for the SKYVISION Satellite TV Product Catalog/Buyers Guide Delivered free to your mail box in U.S. and its possessions.

☐ Send Free Domestic Satellite TV Products Catalog

☐ Send International Satellite Catalog (For Int'l Catalog add $8.00 for S&H)

Name _____ Phone ( ) _____

Address _____

City _____ State _____ Zip _____

Install A System, Upgrade & Repair Yourself And Save $$$$

Call Toll Free 800-334-6455 • International 1-218-739-5231 • Fax 218-739-4879

Write in 88 on Reader Service Card.

SYNC-A-LINK UNIVERSAL VIDEO SYNC GENERATOR is an educational and troubleshooting tool for those persons seeking technical support for evaluating different types of video difficulties. It will restore all horizontal & vertical sync lines from standard or distorted analogue video-type formats. It requires pretuned baseband video, and comes complete with operations manual & 90-day warranty. Total package case with power pack completely assembled, aligned, tested. $150. Voice orders and information 918-479-6451 or write to Sync-A-Link Communications, PO Box 4, Locust Grove, OK 74352.

25K LNB $59.95, 20K LNB $89.95, complete systems, C/KU, RCA, DSS 18", Orbitron, Ajak, Drake, Chaparral, Echostar, HTS, Accessories expert advice. Free catalog. Satellite Warehouse. 1-800-851-6534.

IRDs - UNIDEN ULTRA $249, UST 4600 $399, UST 4900 $529, Toshiba TRX $529, TRX2220 $879, 30 DEG LNB $41, RCA DSS 18" Dish Basic $659, Deluxe $779. Killon Electronics, ph 703-236-8918, 6pm-10pm EST.

SATELLITE RADIO BOOK AND GUIDE. New book covers all Audio Services, SCPC, Subcarriers, FM Squared, Facsimile, Press Services, Weather Services. Simple how-to-receive instructions. $16.95 plus $3 Priority Mail. UNIVERSAL ELECTRONICS, 4555 GROVES ROAD, #12, COLUMBUS, OH 43232. 614-866-4605.

NEW 18 inch satellite system with one month free HBO. Call 317-385-2305.

BUYING TOCOM, SCIENTIFIC ATLANTA 8536s, 8550s, 8580s, 8590s, and 8600s. **JERROLD** DPV and DPBB. **PIONEERS**, all, and Zeniths, all. Any quantity. Top $$$ paid. Contact National Cable Brokers, Plymouth, IN. Phone 219-935-4128.

SUBSCRIBE TO the North Star Gazer, your nucleus to Satellite Piracy News & other satellite-related information. Published monthly. Send check or money order today for $48 US, $58 Canada, $83 Overseas to: North Star, PO Box 1023, Lapeer, MI 48446. PH: 810-664-4022, FAX: 810-664-0351.

HEAR NON-COMMERCIAL satellite radio programs right in your area without the use of a dish or any other expensive receiving equipment. Thousands of these programs are operating today across America. Programs may include talk shows, weather, sport events, news feeds, financial reports, music programs, and data ports. This technology is received through a high tech SCSRT1 card. Find out today what you have been missing! 800-944-0630. Credit card orders accepted.

LULY 10' portable satellite antenna, umbrella type, rear feed, H-D Tripod $400/Best Offer. EDM. 517-456-6108.

WANTED COMPLETE dish antenna assembly for the RCA 18 inch DSS system. Phone 415-665-5606, Fax 415-665-0616.

FOR SALE: Warehouse full of used/reconditioned C-band Satellite Receivers, LNAs, LNBs and modulators (commercial, just removed from service). All guaranteed & great for experimenting of for small cable TV companies. Call today for price/availability: 503-549-1450.

COLLINS TXRX 11GHz microwave television transmitter, receiver, no antenna, $3,750. 818-352-6619.

STEREO FOR B-MAC & OAK DECODERS, $99. Dynamic Stereo for live programming or VCR Recording of Movies, Sports & more. Add depth to any mono system. **TRIANGLE PRODUCTS DISTRIBUTORS USA**, 5750 Lakeshore Dr., Holland, MI 49424 USA. 616-399-6390, M-F 9am to 2pm, EST.

B-MAC HI-NET programming, cinemas, racing, boxing, wrestling & soccer. The only reliable source for quality units, programs & service. No expensive unreliable modem necessary. We auto update. Don't be fooled by Canadian salesman selling unecessary products. Call 201-728-3217 10am-6pm EST.

OAK SATELLITE DECODER MODULE, $299. Watch Disney, Discovery, ABC, BBC, CBN, CBS, NBC, PPV, Sports, Weather, Cooking, Home Improvements & Soaps. Send SASE. **Stand-Alone B-MAC's, & Oak Decoders Available. TRIANGLE PRODUCT DISTRIBUTORS USA, 5750 Lakeshore Dr., Holland, MI 49424. USA. 616-399-6390 M-F 9am to 2pm, EST.**

WANTED: LARGE SATELLITE ANTENNAS, 7-20 meter, commercial grade only. Also transmitters for uplink, HPAs, exciters, etc. Prefer Scientific Atlanta, Andrews, Vertex, RSI, etc. Will remove. PTL Cable Service, Inc. Phone 407-747-3647, FAX 407-575-4635.

DISH ANTENNA 24" diameter with feedhorn for direct TV or KU band $80. 415-244-9254.

SATELLITE HACKERS BIBLE. Covering: satellite data communication, RTTY, SCPC, WEFAX, frequencies, schematics, BMAC, stock market quote receivers. Includes: 200+ IBM-PC software files. $56.95 **VISA/MC** 602-782-2316. **TELECODE**, Box 6426-NV, Yuma, AZ 85366-6426.

REPAIRS, SOFTWARE, etc. for satellite equipment. No TX sales. Buying 010, 018, 019 VCII's. K. Perry, PO Box 816, Leander, TX 78646-0816. Phone: 512-259-4770.

VIDEOCIPHER II, modules, products and repairs. Auto update software, codes and components. For repairs call 201-728-3217, 10am-6pm EST. S & J Electronics, 1614-0 Union Valley Rd., W. Milford, NJ 07480. Also Buying VC IIs, BMAC decoders and cable converters.

IT'S LEGAL!
Cable TV Converters & Remotes

TAKE CONTROL OF YOUR TV!

- Full Service
- Highest Quality
- Original Equipment

BOSS DISTRIBUTORS

P.O. Box 1282 • Beloit, WI 53511

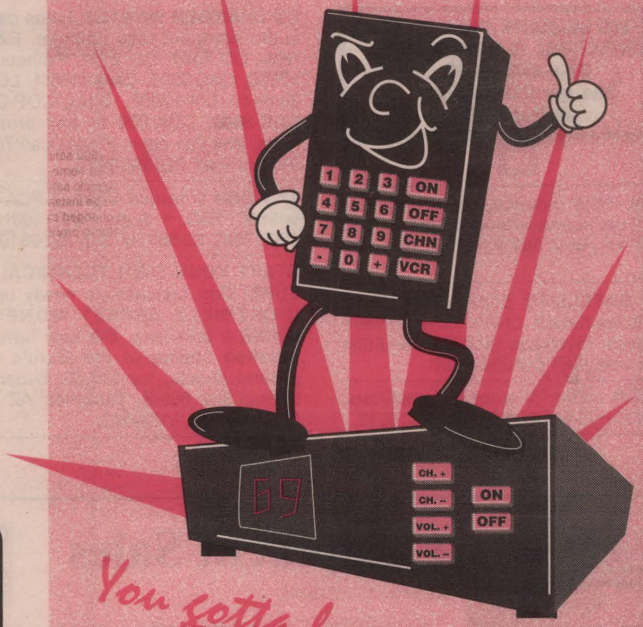
CALL TODAY!!!
1-800-228-2677

Mon. thru Fri. / 8 am – 8 pm
Saturday / 9 am – 2 pm

VISA MasterCard

Tired of Paying Rent To Your Cable Company?

WHY RENT WHEN YOU CAN OWN?



You gotta luv it!!!

- Over 5 Yrs. Experience
- Excellent Customer Service
- Prompt Delivery Anywhere
- Tell Your Friends About Us
- Call Today For Our LATEST SPECIALS!

NCCA
MEMBER OF NATIONAL CABLE CONSUMER ASSOCIATION

Write in 100 on Reader Service Card.

MOTOROLA MINITOR PAGERS

DELIVERED ON YOUR FREQUENCY AND CODE*

Monitor your frequency or respond to your individual call. Excellent for Volunteer Fire, Rescue Squads, Auxiliary Police, Civil Defense, C.A.P., or Amateur. Frequency ranges 148-160, 33-37,45-50, 450-470, or 500-512 Mhz., single code. Dual code option available at extra cost. Limited supplies, excellent condition. Supplied ready for service with batteries and charger. Amp/charger available at $35.00. Warranty 90 days parts 30 days labor. **Fax orders to 708.848.0230**

$149

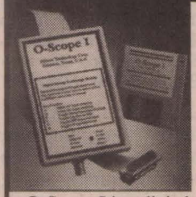
*Motorola and Minitor are trademarks of Motorola Inc.

(708) 848-4210 VISA

MDM Radio, Ltd.
7112 W Roosevelt Rd.
Oak Park, Il. 60304

Write in 89 on Reader Service Card.

Digital Storage Oscilloscope For $169.95 ???



Portable
Low Cost
Easy to Use

Includes Cable, AC Adaptor, and Software
Assembled & Tested $169.95
Kit(without case)..... $119.95
Shipping ..$7.50 (air $11.50)

Specifications
- Size: 5.75" x 3.5" x 1.2", 8 oz.
- Input: 10V to 50mV/Div. DC - 22kHz (-3dB)
- Sweep: 10sec to 500 usec/Div. (plus expansions)*
- Sample rate: 100,000 Samples/sec*
- Accuracy: 3% typical
- Power: 12VDC < 100 ma.
- Uses standard x1, x10 scope probe
- Works with EGA, VGA, MGA displays

Advanced Features
- 128 point frequency spectrum mode DC-50kHz*
- Print Screen and data logging to disk
- Calculates waveform frequency and period
- Voltage displays - Min, Max, Ave, and RMS

*On most AT compatible computers

O-Scope I is a digital storage oscilloscope module that connects via the printer port and turns a PC AT compatible computer into a smart digital storage oscilloscope, spectrum analyzer, frequency counter, and volt meter.

Uses include
- Automotive Diagnostics
- Power Supplies
- Production Testing
- Technical Sales
- Education & Training
- Audio/Stereo Equipment
- Industrial Instrumentation
- Field Service
- Sound System Setup
- Analytical Instrumentation

Allison Technology Corporation
8343 Carvel Houston, TX 77036
Orders & Inquiries: 1-800-980-9806 or FAX
Technical: 1-713-777-0401, FAX/BBS 1-713-777-4746

Write in 90 on Reader Service Card.

TOP OF THE LINE SATELLITE EQUIPMENT AT DISCOUNT PRICES. Complete Houston Tracker Systems with (module, IRD, dish and electronics) $1059 and up. Electronics pkg. $169, 10' Pareclipse dish (UPS) $499. Shipping additional. Many top brand IRD's and Satellite Equipment available. Computers 486 systems complete starting at $879. **EVCO** can now offer long distance calling for 14 cents a minute anytime, anyday. 800 numbers $10 a month. Call or send SASE for catalog. 410-335-7511. **EVCO**, 3316 Choptank Ave., Baltimore, MD 21220-4328.

SCPC-100 SATELLITE AUDIO RECEIVER
UNIVERSAL ELECTRONICS
614-866-4605
See our DISPLAY AD on Page 66.

LEARN HOW videocypher II and plus owners get sound without codes. $19.95. Nassirian. Box 382-V, Rio Linda, CA 95673.

USED SATELLITE EQUIPMENT. You name it, we have it. LNA's, downconverters, drives, receivers. Working condition guaranteed. Call 317-385-2305.

15 CCOR cable TV trunking amplifiers, w/fail safe, new, $200 ea. 818-352-6619.

SATELLITE EQUIPMENT RCA DSS 18" Basic $599 Deluxe $699 C-band Uniden Ultra $235, Ust 4600 $375, TRX 2220 $799, 25 Deg. LNB $42, VCRS modules $369. Killon Electronics, 703-236-8918. 6pm-10pm EST.

AUDIO — VIDEO — LASERS
100

CD CHANGER WANTED: Large capacity audio compact disc changer. Example NSM CD 3101, CD 2101, Pioneer CAC-V3000, CAC-3200, CAC-V180M. LC-V200, Dennon DN-1200F, Sony CDP-CX100, CDK-3600, CDK-006 or any broadcast units. Will pay cash. Please call 705-292-5509 or FAX 705-292-7970.

1" VIDEO C format VTRs, 2 RCA TR800 w/8000 TBC, 1 Sony BVH1100 w/BVT 1000 TBC, $3,500 ea. 818-352-6619.

START YOUR OWN TECHNICAL VENTURE! Don Lancaster's newly updated **INCREDIBLE SECRET MONEY MACHINE II** tells how. We now have autographed copies of the Guru's underground classic for $18.50. Synergetics Press, Box 809-K, Thatcher, AZ 85552. 520-428-4073. VISA/MC.

SCIENTIFIC EQUIPMENT, surplus, misc. electronic and microwave equipment. For list contact T-Minus-7, 45845 Warm Springs Blvd. #F, Fremont, CA 94539. 510-651-9477, FAX 510-651-3657.

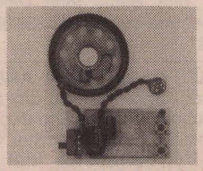
WANTED: SVHS VCR Mitsubishi, preferred but not required. Fred, 619-434-9701, FAX 619-434-9702.

NIGHT VISION KITS, and brand name US and Foreign units. **Complete** kits include all neccessary components to build your own night vision scope. **SAVE $. US Military Intensifiers, IR, Foreign and more. Call or write: NENVIS, INC.,** 320 Main St., Box 1088 Sturbridge, MA 01566 or 508-347-7238, 10-4pm EST.

MINI VIDEO Spy Camera (1½ x 2½ x 4½) B/W Only. Sold $299. Sell $149 OBO "New" Excellent Picture Quality. 619-241-6356 Anytime.

DIGITAL VIDEO STABILIZER. Restores & stabilizes the source video signal to its original strength. Removes automatically viewing problems from movies. **ON/OFF (B/A) switch, GOLD plated connectors, free power adapter. VHS $49.95, SVHS $79.95, S&H $8.** MC, Visa accepted, CODs **$4.50**. Video Equipment, Inc., 1-800-831-2050.

VHS-VCR Repair Solutions Sets I through IX. Each contains 150 symptoms and cures, free assistance, $19.95 each, all nine $39.95 plus $3.00 shipping. Visa/MC. FAX 219-272-6612. Eagle Electronics, Box C, 52053 Locks Lane, Granger, IN 46530.



ETVM-2000 20 SECOND RECORD AND PLAY NATURAL SOUND SYSTEM. The ETVM-2000 offers and easy, simple and low cost solution for natural voice record and playback on a miniature 1.0" x 2.4" PC board. Using state of the art **CHIP-ON-BOARD** technology (which provides unbeatable sound quality), the ETVM-2000 is ready to integrate into custom prototypes or production runs of thousands. The module has 20 seconds of record time, a superb **microphone,** high quality **speaker,** 4 AA **battery case** and an LED **recording indicator.** Extra through holes for push to record, play, LED indicator locations and a motion sensor are available. **PRICE:** $25 (Quantities of 2-25), $15 (Quantities of 1000) Visa or MasterCard accepted, Ohio orders add 6.25%. EDTM Inc. Ask for Jeff or Mark. 419-389-0354. **DISTRIBUTORS WELCOME.**

Test Equipment Sales

HP 3335A/01	$ 2695	Tek 7A18N	$ 69
HP 1630G	$ 1095	Tek 7A26	$ 125
Tek 2230	$ 2495	Tek 7B53AN	$ 99
Tek SG503	$ 695	Tek 7A24	$ 250
Tek TG501	$ 595	Tek 7B85	$ 150
Datron 1065	$ 995	Tek 7B92A	$ 250
Tek 465	$ 449	Tek FG503	$ 225
Tek 475	$ 625	Tek FG504	$ 695

Customer Satisfaction is our #1 Priority.

All Equipment Warranted

Phone (603)434-2544
Fax (603)425-2945

We buy surplus equipment

ELECTROLAB

19925 Stevens Creek Blvd.
Cupertino, CA. 95014

TEL: (408) 245-3565
FAX: (408) 739-3495

We Buy, Sell, & Lease

Quality Refurbished
Test & Measurement Equipment

Manufactured by: Hewlett-Packard
Tektronix
Fluke
Wavetek
& many other Well-Known Brands

Write in 91 on Reader Service Card.

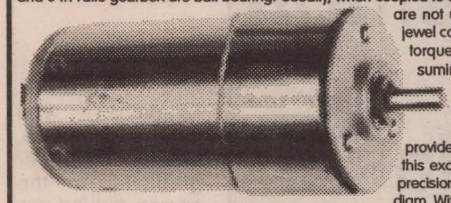
Write in 92 on Reader Service Card.

LOOKING for SOMETHING?

The QUALITY you DESERVE, PRICES you can AFFORD.

INCREDIBLE PORTESCAP SWISS GEARMOTOR

They told us this was to be part of a medical device used for drilling the skull! Are they kidding? You be the judge.Their superior construction is something else. **Brand new.** Both the motor and 64:1 ratio gearbox are ball bearing. Usually, when coupled to a gearbox, ball bearings are not used in the motor. This jewel can deliver over 14oz/in of torque @ 112RPM, while consuming only 6VDC @100mA! Can be operated from 1.5VDC to 12VDC. A polished stainless steel case provides a suitable enclosure for this excellent example of Swiss precision. Size: 58mmL x 23.8mm diam. With 3mm diam. shaft. Use as a state of the art drive for robotics. If you need one,don't wait. They will sell out.



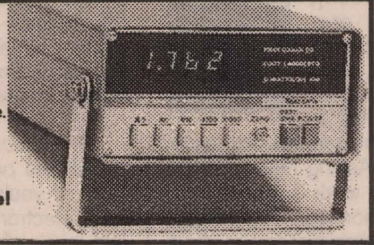
Portescap price, over $200ea.! But don't despair, Our Price....$29.95ea.

EG&G FLASHLAMPS, TYPE FX227-C4

BRAND NEW! QUARTZ FLASHLAMPS, Boxed, Overall length 7" with a 4" arc length. Perfect for flashlamp pumped lasers. Can be used in conjuction with our "BIG-A" caps at right. **EG&G price $180 ea.!**

Our Price..... $29.95ea. or 2 for..... $49.95

TEKTRONIX J16 PHOTOMETER



Digital LED readout.
Accurate spectral responce.
Eight different probes available.
Probe not included.
Excellent condition.

TEK PRICE $1595 less probe!
OUR PRICE: $249

LAB STYLE DIODE LASERS

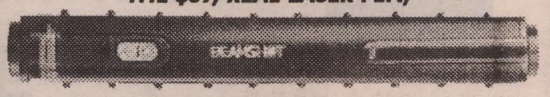
635nm, 650nm, 670nm

5mW, diode laser, Fully self-contained with internal alkaline cell (included) and, po./po. switch. Black anodized alum. housing. Internal X-Y adjustment screws. Superior quality. Can be used as a super laser pointer. VERY rugged. SIZE: .75" diam.x2.85"L

670nm,.....$89
650nm, 5X BRIGHTER $119
635nm, 10X BRIGHTER $149

SHOWN ACTUAL SIZE!

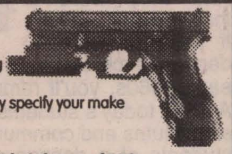
THE $39, REAL LASER PEN,



Well we went and did it! We broke the rules and tossed out the mold. We have always stressed the quality of our laser products with our "you get what you pay for" attitude. Well how about this model for quality and price? The body is machined from a super tough aluminum extrusion. Brass inserts for battery cap and grippers on the side. You could stand on it! Black anodized body has a substantial feel. Looks very HI-TECH. Yet weighs only 2 ounces. A real on/off switch at the beam end makes for steady operation. Two AAA cells that don't rattle, provide power. Batteries, and 1 year Mfr.'s Warranty. You will be amazed!

LASERSIGHTS,

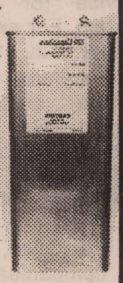
Rugged & Dependable.



Windage and Elevation are easily adjustable using internal adjustment screws. Custom mount, alkaline battery and remote switch included. Simply specify your make and model for the appropriate mount.

LASER SIGHT, 670nm.....$99
650nm, 5X brighter .....$129, 635nm, 10X brighter.....$159

NEW! BIG "A" CAPS

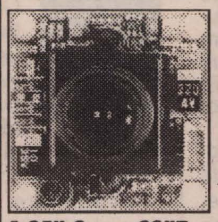


50uf @ 2500VDC $39ea.

10uf @ 1500VDC $20ea

10uf @ 3000VDC $29ea.

ACTUAL SIZE



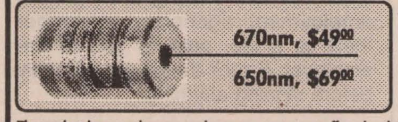
1.25" Sq. x .99"D

CCD MICRO CAMERA,

Chinon model 060. Black and White, 1/3" CCD, with a full 250,000 PIXELS!, 380 Lines Resolution. Sens. 0.3 LUX. AGC and Electronic Shutter. Low Power 9VDC @90mA operation. Adjustable focus 4mm, f1.8 lens. (provides 78 degree FOV, 10mm to infinity) A real lens! (When you take family photos do you use a "pinhole camera?" You get what you pay for. A little more, for a lot more quality. Standard video out. (PAL avail.) Weighs only 1/2 once! IR SENSITIVE! A quality, brand name camera. Mating Connector w/ cable included. **PRICE.....$149ea.**

Mini Camera Housing, Black,textured ABS. 1"x1.5"x2".....$15.95

Easy to use, WIDE Input 5mW, LASER with 3V to 6VDC power!



670nm, $49.00

650nm, $69.00

SPECIFICATIONS: DC Power, 3 - 6Vdc, @65mA Power out, 5mw max. Range, 100-300 Meters Glass Collimator (fixed @ inf.) Size, 0.41"diam. x 0.7"L

Through a large volume purchase we can now offer absolutely the best value and best quality available on our commercially made, 670nm and 650nm, subminiature, laser diode modules. A glass collimating lens provides adjustment free <1.5mRad performance. (comparable to HeNe lasers.) NEW wide input range, internal surface mount power supply operates from 3 to 6 Volts DC. The package is machined brass for excellent thermal characteristics. These are THE quality laser modules.

12V @5AH GATES, GEL CELL PACK,

BRAND NEW! with 15" LEADS.
SIZE: 3.5"Wx 3"Hx5.5"L
$12.50ea. or 3 for $35

GATES, GEL CELL PACK,

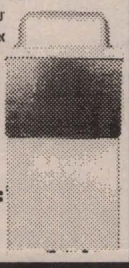
BRAND NEW! Arrainged as a 1X6 cell pack. SIZE: 2"Wx4"Hx11"L
$15.00ea.
Metal box of 4 packs...$39

EG&G DT110 Large Area PHOTODIODE

Planar diffused, guard ring construction. Wide spectral range: 400nm to 1150nm. 10nS rRT into 50 ohms. Dark current <400nA. Linearity, <1%. Bandwidth: 45MHz. Active Area: 100 Sq. mm
EG&G PRICE $95

OUR PRICE.....$19.95

STEP DOWN XFMR 220 to 120VAC



1.5 KVA Heavy Du
Brand New, Boxe
Size:
11"Lx7W"x6"D
Weight: 41lbs.
NEMA 3 BOX.
Single Phase
List $185
OUR PRICE: $39ea.

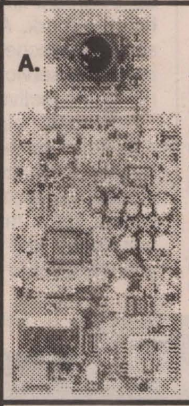
±15VDC POWER MODULE

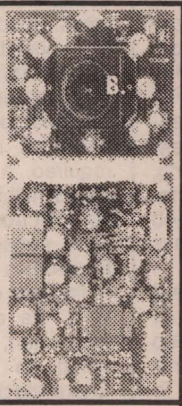
Wall Industries type, W15D50MK, 110V AC input with 50mA DC each side. High quality, encapsulated.

Limited Quantity.

OUR PRICE: $9.95ea

COLOR or IR SUPER SENSITIVE





A. COLOR CAMERA, remote head, only 0.3 lux. 330 lines, 1/3" CCD, 3mm, f1.8, 110° FOV lens, 12VDC @150mA, auto shutter and AGC, Size: Head, 1.37" x 1.57", Proc., 2.5" x 3.9", weight, 2.3 oz.

EXCELLENT PRICE.....$289ea.

B. IR SENSITIVE CAMERA see in total darkness! on board IR LED's. Remote head, 0.3 lux. 350 lines, 1/3" CCD, 4mm, f2.8, 74° FOV lens, 12VDC @150mA, auto shutter and AGC, Size: Head, 2"W x 1.57"H, Proc., 2"W x 2.36"H", weight, 2.1 oz.

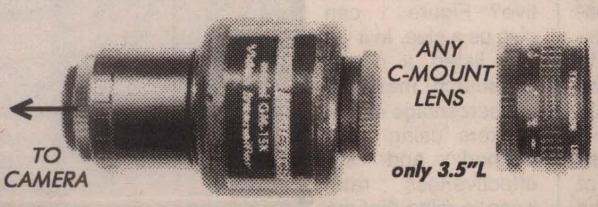
PRICE.....$119ea.

C-MOUNT IMAGE INTENSIFIER

NOW DOUBLES AS A MINI SIZED HAND HELD VIEWER.

Our EXCLUSIVE GM-15K, U.S. made 2nd GEN. I² system provides 15,000X gain. Providing true night vision and super IR capability to any quality CCD camera. Simply install between camera and your C-mount lens! Now use your GM-15K as a hand held viewer with our new eyepiece option, Clip on battery and 10X eyepiece let your intensifier due double duty. Provides you with one of the tiniest viewers available!

GM-15K INTENSIFIER for CCD CAMERA , $599 EYEPIECE assembly and Battery holder....$149



TO CAMERA

ANY C-MOUNT LENS

only 3.5"L

SUPER SENSITIVE, C-MOUNT MINI CCD CAMERA.

Perfect for scientific applications. GM-410, B&W camera, 38mm SQ. x40mmD, 1/3" CCD, over 270,000 Pixels, 410 Lines Res., Sens. 0.05 LUX., AGC and Electronic Shutter. 12VDC @100mA power. Three lens options fully exploit its superior performance. Composite out. IR SENSITIVE, RCA video connector and jack for DC power. When you need performance not hype, there is no substitute for a good lens! This camera will out-perform any camera in this magazine guaranteed!

BRAND NEW!, without lens...$189ea.
with 16mm, f1.6, (15deg. FOV) $219ea.
with 8mm, f1.3, (30deg. FOV) $239ea.
with 4mm, f1.4, (56deg. FOV) $239ea.

350MHz,TEK 485,

A Superior performing, Dual Trace, Delayed sweep 1 nS/div Sweep rate, 5mV Vert. Sens. Switchable Imped., 50 ohm /1meg. Package includes 2 NEW probes, cover and manual.

ORIG., $9100 NOW, $1095

RESOURCES UN-LTD.

VISA, MASTERCARD, AMERICAN EXPRESS, DISCOVER, COD.
TOLL FREE ORDERLINE: 800-810-4070, TECH INFO 603-668-2499 FAX ORDER LINE: 644-7825
8030 SOUTH WILLOW ST. BLDG. 2, MANCHESTER, NH 03103
WE ARE ALWAYS LOOKING FOR UNUSUAL SURPLUS, FAX US YOUR LIST.

Launching Your High-Tech Career:

Finding, Getting, and Keeping Your First Position as an Electronics Technician

by Ronald Reis

Ah, the good old days.

And they weren't that long ago, either. If you were a student at a technical school back in the early 1980s, you'll remember them. As with today's students at vocational institutes and community colleges, students of a decade or more ago often had trouble finishing their certificate or degree programs in electronics technology. But it wasn't so much because, as with today's students, they were burdened with family obligations, dead-end work responsibilities, or difficult academic challenges, though they faced all of those obstacles, too.

No, many of yesterday's electronics students failed to complete their course of study because, believe it or not, they were often yanked out of a program, midway through, by predatory, application-waving corporate recruiters from firms such as Hughes Aircraft, IBM, and Litton Industries, enticed by promises of high salaries, good benefits, and job security. Unfortunately, with today's corporate downsizing, world-wide competition, an automation onslaught, and changing job descriptions, those good old days are gone for good.

Be that as it may, there are still electronics technician jobs to be had, good ones. But to find, get, and keep one, you better not be waiting for a recruiter to jerk you out of class. To be successful now, you're going to have to go out and make it happen yourself. In this article, we'll show you how.

Finding Your First Position: The Job Search

Your first step in launching an electronics career is to find companies that employ electronics technicians. In doing so, you'll need to know what kind of companies hire technicians and what job-search methods are most effective.

What type of companies use electronics technicians? First, of course, there are the electronics companies that produce or repair the products and services of the electronics age. Trimble Navigation, of Sunnyvale, CA is typical. They sell, install, and repair portable Global Positioning Systems (GPSs). They obviously need electronics technicians. Also in this category are the giant service (or repair) centers. For example, Circuit City Stores, Inc., operates a huge service center in Walnut, CA where over 30 electronics technicians repair everything from washing machines to VCRs.

There are, in addition, many *non-electronics* companies that demand electronics technicians of all types. Hospitals are a good example. Most hospitals of any size have medical electronics technicians on duty to deal with emergency equipment failure and routine preventive maintenance. If more extensive work is required, a distributor or vendor is called in. It is important to keep these non-electronics companies in mind while engaging in your job search. Electronics is so pervasive, it's hard to find any enterprise that is immune to it. As an electronics technician, you're going to wind up where electronics are — and that's everywhere.

Let's turn now to specific job-search procedures. Just what are the methods used to find technician positions and which ones are most effective? Figure 1 can give us a clue. In it we see listed a dozen job-search methods, the percentage of job-seekers using each method, and the effectiveness rate. Keep in mind that the information covers all job categories, not just that of electronics technicians.

According to the data, 66.0 percent of all job-seekers apply directly to an employer, and when they do, nearly half — 47.7 percent — find employment. Clearly, direct employer contact is effective. So too is answering local newspaper ads: 23.9 percent, or close to one out of four job seekers, find a job in this manner. Asking friends about jobs where they work is also a successful, time-honored approach, 22.1 percent finding that this method hits the mark. At the other extreme, asking a teacher or professor, or taking a civil service test are, in general, rather ineffective.

Though helpful, the list in Figure 1 is not complete. A number of job-search approaches for the would-be electronics technician are not mentioned. Here, then, are an additional half-dozen key job-search methods you will want to seriously consider:

1. *Networking with friends and relatives.* Everyone you meet, be it relative, friend, former graduate, or the person behind the counter at the local electronics store, needs to know that you are looking for a position as an electronics technician.

2. *Networking on the Net.* While parents and friends will remain the main networking tool for a long time to come, many job searchers are now "surfing the nets" for job information. Check with the *National Business Employment Weekly* for more information.

3. *School placement offices and public and private employment services.* If you're still in school, check your electronics department's files and those of the general placement office. When dealing with private employment agencies, remember there is a fee, paid by you or the employer. Check things out carefully before signing anything.

4. *Job fairs.* Wherever you find job fairs, be they at schools, conventions, or large companies, approach individuals with an "I know what I am looking for" attitude. Follow up any good lead with a phone call or letter of inquiry.

FIGURE 1

Commonly Used Job Search Methods

Percent of Total Job Seekers Using the Method	Method	Effectiveness Rate*
66.0%	Applied directly to employer.	47.7%
50.8%	Asked friends about jobs where they work.	22.1%
41.8%	Asked friends about jobs elsewhere.	11.9%
28.4%	Asked relatives about jobs where they work.	19.3%
27.3%	Asked relatives about jobs elsewhere.	7.4%
45.9%	Answered local newspaper ads.	23.9%
21.0%	Private employment agency.	24.2%
12.5%	School placement office.	21.4%
15.3%	Civil Service test.	12.5%
10.4%	Asked teacher or professor.	12.1%
1.6%	Placed ad in local newspaper.	12.9%
6.0%	Union hiring hall.	22.2%

*A percentage obtained by dividing the number of job-seekers who actually found work using the method, by the total number of job-seekers who tried to use that method, whether successfully or not.

Source: *Tips for Finding the Right Job.* U.S. Department of Labor, Employment and Training Administration, 1991.

Five Critical Interview Tips

FIGURE 2

1. Show interest and enthusiasm. Try to relate your interests to the organization's.

2. Make points politely. Stress your best qualities and experience; note what you could bring to the position. Focus on the employer's needs, not your own.

3. Be honest. Admit when you don't know something. Remember, you're not expected to be an expert on the company's products and services, just a quick learner.

4. Be positive about former employers. Never complain about previous employers or their practices.

5. Ask for the job at the close of the interview. Of course, don't expect an affirmative response on the spot. Ask when you can expect to hear from the company.

5. *Professional clubs or organizations.* To get a list of organizations, consult the *Encyclopedia of Associations* found in most libraries.

6. *Cold calls and walk-ins.* A cold call takes guts, but it can be extremely effective. Remember, your main objective is to get an application on file. Most companies will let you do at least that.

How many of these half-dozen job-search methods should you use? You may need all of them and then some. As has been said, finding a job is practically a full-time job in itself.

Getting Your First Position: Being the Chosen One

Until now, we have dealt only with the first step toward full-time employment as an electronics technician — the job search. Once you have identified an attractive company that you hope is hiring, it is time to move onto the second, most critical step — that of actually getting, or securing the job. Here you must do everything possible to become the chosen one from what will surely be a deluge of candidates. To do so, you will have to (1) write a flawless resume and cover letter; (2) "ace" any employee test that is given; and (3) not only survive, but exploit, the job interview.

Dozens of books, and many more articles, have been written on how to write resumes and cover letters. We won't take up valuable space here restating what they cover quite adequately. Visit you local library or book store to get the guidance you need.

Nonetheless, with regard to resumes and cover letters, there is one important point that can't be overstated. Remember, your resume reveals two things about you: (1) your qualifications for a position, and, (2) how well you express and present yourself. No matter how good you look on paper with regard to the former, if the resume (and cover letter) isn't perfect, meaning absent of all flaws, it doesn't matter. Type and retype a resume and cover letter until it is flawless.

Some employers will require you to take a company test. There are two types, formal and informal. If a test is given at all, you will certainly be given the former. You may not, however, even know you're getting the latter.

The written test, most likely multiple choice, tends to be heavy on basic electronics, contains some math, and requires a knowledge of Ohm's law, Kirchhoff's laws, etc. If you have been out of school for a while, secure a basic electronics text book and spend a few hours brushing up on the material. That should do it.

The informal test, when given, is often in the form of a tour of the facilities, with questions to follow. Do not make the mistake of thinking that such a tour is just a chance for the employer to show off the company. There is often more to it than that, with the tour guide later asking you questions on what you saw and what was said. It's a chance for the employer to see how fast you pick things up — how much of a "quick study" you are. As Keith Bilby of Anheuser-Busch Brewery in Van Nuys, CA said: "I take a prospective employee on a standard one-hour tour of the plant, the entire beer-brewing operation. Later on, during the interview, I refer back to the tour to see how much the applicant picked up and retained. It gives me another input on his or her capabilities."

Having a well-prepared resume is important and passing the company test, if given, is a must, but the job interview, especially today, is vital — it, more than anything else, gets you the job. Why is this so? It is during the interview that the employer sizes you up, probes in questionable areas, and gets to see what you are really like. Resumes are often inflated, but the interview, as much as anything, tends to "tell it like it is." While the resume will get you in the door, it is the job interview that will determine whether or not you stay there.

There are a number of things that should be done before the interview takes place.

First, you should investigate the company and the industry in general. Find out all you can about the company's products and services. Talk with people who work there, if possible. Also, research the industry in a generic sense. If you have an interview at a brewery, for example, 15 to 30 minutes with an encyclopedia, pouring over the beer-brewing process, will be time well spent.

Second, gather up any pertinent materials you want to bring — extra copies of your resume, work samples, list of references, etc. Never walk into an interview empty-handed.

Third, organize your thoughts. Plan answers to possible questions. Find a good list of typical job — interview questions and go over it carefully.

Fourth, dress appropriately. The rule is simple, when choosing an outfit, dress to be included.

Fifth, be on time, although 10 to 15 minutes early is even better.

When you're ready for the actual interview, follow the five critical interview tips shown in Figure 2.

Keeping Your First Position: The Critical Early Weeks

You got the job, you're ready to start work. Congratulations — your "honeymoon period" is about to begin.

The honeymoon is a time, from a few weeks to a couple of months, when you can be a "freshman" again. It's a vague period in which "dumb questions" from you are not only tolerated, but expected. Take advantage of this opportunity to ask questions that you will be too embarrassed to put forth later on when you're expected to know the answers.

The first few weeks on the new job are also a time to develop a reputation, a period when your co-workers and supervisors find out who you are and what you're all about. It's a time to identify with the 20 percent of the work force that is doing 80 percent of the work. You will want to hang around with them, be seen with them, work with them, and become one of them. They are the winners — the group you want to be a part of.

Throughout this period, never lose sight of what you are there for — to earn a profit for the company. While at first your productivity will be low, eventually it must become high enough to justify your presence in the organization.

Keep in mind the "no-no's," the things most likely to upset an employer. In Figure 3, we list the top 10, according to a national survey.

On the positive side, be realistic, be patient, be alert, show initiative, be cooperative, be conscientious, be mature, and be inquisitive. (Sounds like the Boy Scout Oath, doesn't it?) And above all, keep on learning — on the job, in school, or on your own.

You are entering a field that is changing so drastically that what you know today will be obsolete tomorrow. Yet, electronics is filled with so much excitement, wonder, and promise that a long and rewarding career is ahead for you.

Make the most of it. **NV**

Further Reading:

**For a more in-depth discussion of what it means to be and what it takes to become an electronics technician, you might want to pick up a copy of the author's book *Becoming an Electronics Technician: Securing Your High-Tech Future*
Prentice Hall Publishing, Inc.
445 Hutchinson Ave.
Columbus, OH 43235.**

FIGURE 3

Ten "No-No's" to Avoid in the First Critical Weeks

1. Dishonesty and lying.
2. Irresponsibility, goofing off, and attending to personal business on company time.
3. Arrogance, egotism, and excessive aggressiveness.
4. Absenteeism and tardiness.
5. Not following instructions.
6. Ignoring company policies.
7. A whining or complaining attitude toward the company or job.
8. Absence of commitment, concern, or dedication.
9. Laziness and lack of motivation or enthusiasm.
10. Taking credit for work done by others.

ELECTROHOME VIDEO DATA/GRAPHICS TELEVISION PROJECTORS WANTED: will take projectors in any condition, not concerned about status of CRTs or lens. Looking for "ECP" Models: 2100, 3100, 3101, 4100, 4101, 8000, 9000, 4000, 3000. Will pay cash. Please call 705-292-5509 or FAX 705-292-7970.

BEAM SPLITTERS Brand new, precision grade, prism type, cube beam splitters, 29 x 34 cm, mounted in a panel mounting ring. Highest quality, mil-spec, $20 ea. or 3 for $50. Wade, 309-523-3262.

JVC BR6400TR Pal VHS VCRs $250 ea. NTSC $200 ea. 818-352-6619.

BUYING TOCOM, SCIENTIFIC ATLANTA 8536s, 8550s, 8580s, 8590s, and 8600s. **JERROLD** DPV and DPBB. **PIONEERS**, all, and Zeniths, all. Any quantity. Top $$$ paid. Contact National Cable Brokers, Plymouth, IN. Phone 219-935-4128.

VIDEO TAPES for sale: 3/4" broadcast 10 to 60 min. Sony etc. $1 each, factory prerecorded movies VHS or BETA $1 each needs fix or splice. Video storage boxes & sleeves 25¢ VHS, Beta Hi8. Quantity available. Blank tapes $1, 16mm-35mm film $5-$75. Ask Jim, 310-815-9090.

ALTEC SHURE sound equipment all types. SARA-COMM, 25 Gladwish Rd., Delmar, NY 12054. 518-439-9531.

BEAMSCAN BY RED LINE self-contained microprocessor controlled laser scanning systems, $595 complete. Red Line Laser Products, 1935 Fernwood Trail Dr., St. Louis, MO 63031. Tel: 314-831-3014, FAX: 314-831-3927.

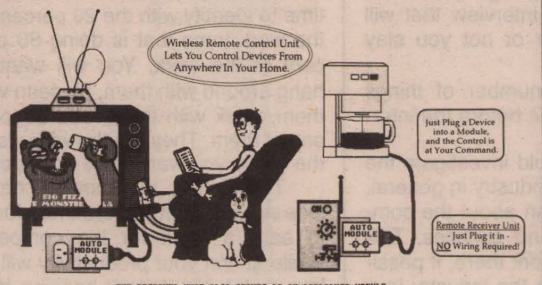
LASER RANGEFINDER measures distances up to 1800 meter: 10cm accuracy @ 1Hz update rate, 5mW laser diode, battery operated w/microcontroller. $2,000. Plans $20. 20MHz preamplifier/detector $160. Send $1 ea. for data sheets. Laser Sensor Technology, 3873 Easy Circle, Marietta, GA 30066. 404-928-2867.

SIMPLEX 35MM XL Telecine projector w/telemation camera PAL NTSC $4,000. 818-352-6619.

CUTTING EDGE AUTOMATION

"The Computerized Automation People" Specializing In User-Friendly Computer Control Systems

WIRELESS AUTOMATION SYSTEMS



THE RECEIVER UNIT ALSO SERVES AS AN APPLIANCE MODULE.

System No. WIR2 - Includes 16 Device Remote, Receiver, 1 Lamp Module, 1 Appliance Module.....$60.75
System No. WIR3 - Includes 16 Device Remote, Receiver, 1 Lamp Mod., 1 App. Mod., 1 Universal Mod.....$79.75
System No. WIR4 - Inc 16 D. R., Key Chain Rem, Rec., 1 Lamp & 2 App Mods, 1 Univ Mod, 1 Thermostat.....$110.15

Compatible with all other X-10 Controllers including the Computer & Timer Control Systems.

COMPUTER AUTOMATION SYSTEMS

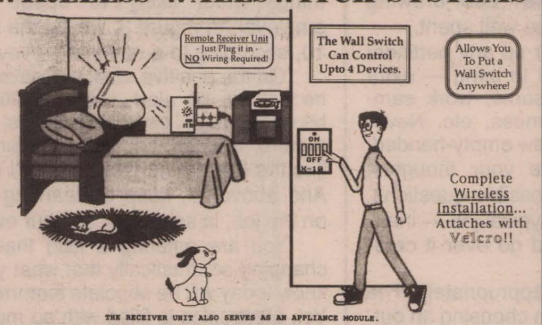
Connect the Control Unit to Your Computer, Program it in Windows, DOS, or with a Mac, and it's Ready to Go. Controls up to 128 Devices Per the Program, or with the Push of a Button.

DOS & Windows or Macintosh Systems

New & Improved Software

System No. PC5290 - Includes IBM or Macintosh Compatible Software, Computer Control Unit, 1 Lamp Module, 1 Appliance Module, 1 Universal Module.....$99.95
System No. PC4290 - Includes IBM or Macintosh Compatible Software, Computer Control Unit, 1 Lamp Module, 1 Appliance Module.....$85.95
Please Specify Either IBM or Macintosh Software When Ordering.
Fully Compatible With All X-10 Control Units, Including the Wireless Systems.

WIRELESS WALLSWITCH SYSTEMS

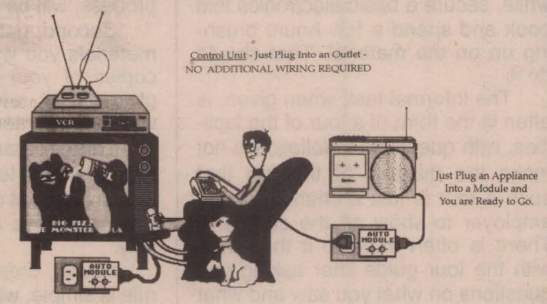


THE RECEIVER UNIT ALSO SERVES AS AN APPLIANCE MODULE.

System No. RW684 - Includes 2 Unit Wireless Wall Switch and Receiver.....$27.79
System No. RW6842 - Includes the RW684, & 1 Lamp Module Or 1 Appliance Module.....$38.95
System No. RW694 - Includes 4 Unit Wireless Wall Switch & Receiver.....$28.79
System No. RW6944 - Includes the RW694, 1 Appliance Modules and 2 Lamp Modules.....$60.95

Comparable with all X-10 Controllers, Including Telephone & Computer Systems.

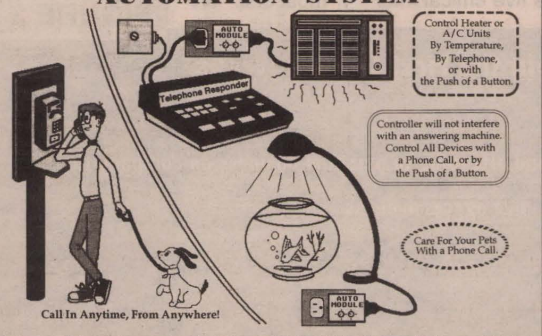
BASIC AUTOMATION SYSTEMS



System No. BAS2 - Includes Mini Controller, 1 Lamp Module, 1 Appliance Module.....$33.20
System No. BAS4 - Includes Maxi Controller, 2 Lamp Mods, 2 Appliance Mods., 1 Thermostat Controller.....$80.70
System No. BASTIME4 - Incl. Timer Controller, 2 Lamp Mods., 2 App. Modules, 1 Thermostat Controller.....$84.50

Compatible with all X-10 Controllers, Including Telephone & Computer Systems.

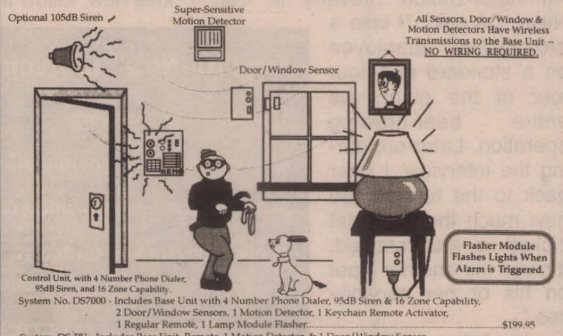
TELEPHONE RESPONDER AUTOMATION SYSTEM



System No. TR5510 - Inc. Responder Control Unit, 1 Lamp Mod, 2 Appl. Mods., 1 Thermostat Ctrl.....$119.70

Compatible with all other X-10 Controllers including the Computer & Timer Control Systems.

WIRELESS SECURITY SYSTEMS



System No. DS7000 - Includes Base Unit with 4 Number Phone Dialer, 95dB Siren & 16 Zone Capability, 2 Door/Window Sensors, 1 Motion Detector, 1 Keychain Remote Activator, 1 Regular Remote, 1 Lamp Module Flasher.....$199.95
System DS-RV - Includes Base Unit, Remote, 1 Motion Detector, & 1 Door/Window Sensor with a 4 number Phone Dialer, 95dB Siren & 16 Zone Capability & Flasher.....$164.95
SP554A - Additional Motion Detectors.....$ 52.99
DW534 - Additional Door/Window Sensors.....$ 14.99

Separate Automation Controllers
Part No. MC460 - Mini Controller - 8 unit Controller.....$12.38
Part No. SC503 - Maxi Controller - 16 unit Controller.....$23.85
Part No. RC5000- Wireless Remote Rec. & Trans. - 16 unit.....$39.99
Part No. RW724 - 3 unit Wireless Wall Switch - use with any X-10 RF Rec. NO Wiring Needed "Place a 3 Function Wall Switch Anywhere".....$15.59

Automation Modules
Part No. LM465 - Lamp Module.....$12.39
Part No. AM486 - Appliance Module 2-Pin Polarized.....$12.39
Part No. AM466 - Appliance Module 3-Pin Grounded.....$13.29
Part No. WS467 - Wall Switch Module.....$12.39
Part No. WS4777 - 3-Way Wall Switch Module.....$15.13
Part No. SR227 - Wall Receptacle Module with Custom Wall Plate.....$15.13
Part No. HD243 - Heavy Duty 220V 15A Appliance Module.....$23.85
Part No. HD245 - Heavy Duty 220V 15A Appliance Module.....$23.85

For Information Or To Place An Order, Please Call Us Today!

(708) 350 - 2555 • Fax (708) 350 - 9760

CUTTING EDGE AUTOMATION

AN AUTHORIZED X-10 DISTRIBUTOR

852 Foster Avenue
Bensenville, Illinois 60106 USING X-10 TECHNOLOGY

Cutting Edge Automation Stocks A Full Line Of Small Control & Security Systems, Including Stand Alone, Wireless, Computer Based And Telephone Controlled Units.

We Accept Visa/Mastercard/Discover/American Express

FIBER OPTIC Video transmission system. Transmits RS-170 video over multimode fiber (ST connectors). Range up to 5km. Equipped with AGC, color compatible. Surplus, unused units (Terrahertz Technologies, Inc. V-250) consist of transmitter, receiver, and associated wall mount supplies. $295. Send SASE for specs. EO Techniques, 16 Slusser Ave., New Hartford, NY 1313-2117, phone 315-736-3642.

DIGITAL VIDEO STABILIZER. Restorers & stabilizes the source video signal to it's original strength. Removes automatically viewing problems from movies. **ON/OFF (B/A) switch, GOLD plated connectors, free power adapter. VHS $49.95, SVHS $79.95, S&H $8.** MC, Visa accepted, CODs **$4.50**. Video Equipment, Inc., 1-800-831-2050.

MICROWAVE ASSOCIATES 10GHz equipment. 2 transceivers, full duplex video, 2 audio subcarrier modulators/demodulators. Very high grade equipment. Evenings, 319-257-6957.

LASER ILLUSIONS laser light controller $239.95. Display commercial clipart with your IBM. Requirements: A 386 or better and a closed loop scanner system. Free demo disk. Laser Illusions. 406-563-7506.

THE ALC245M AUTOMATIC VOLUME CONTROLLER will keep your transceiver or scanner volume constant from a whisper to a scream. $29.95. Other models are also available. FREE BROCHURE. C&S Electronics, PO Box 2142, Norwalk, CT 06852-2142. Phone/FAX 203-866-3208.

SHAREREPAIR, E-MAIL tech support for TV-VCR technicians. For information, E-Mail: rhett@dump.com.

CABLE TV 110

SCIENTIFIC ATLANTA, PIONEER AND JERROLD COMPATIBLE DESCRAMBLERS. 1-PIECE, NON-BASEBAND. FREQUENT BUYER AND VOLUME DISCOUNTS. NO CA ORDERS. ACME CABLE PRODUCTS. 1-800-866-ACME.

R2/V5/CFT 1 wire HRC/STD. CH #3/4 fast version. Limited time offer. **$14 min. 10 pcs. Call 1-800-831-2050.**

SA8500-310's. FULLY TESTED but not turned on. $60 each. You can find them a little cheaper but not refurbished and tested at this price! Banck Cards Accepted. Message/FAX: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

CABLE HACKERS! Blow out sale! Cable hacker's Handbook $15.95! Also, build a universal descrambler for under $50! Works on any system! Guaranteed! Easy to build! Plans only $7.50! Also, mention N&V and get a special bonus report, "What the cable companies don't want you to know!" Free! Wow! Send to: Bates, 5541 West Quincy, Chicago, IL 60644.

Write In 93 on Reader Service Card.

MEMORY DEVICES PROGRAMMED. 11 years experience. Deal with confidence. We will duplicate your ICs for $2 each. EEPROMS, MICROs, etc. We carry a complete inventory of hard-to-find ICs. Satisfaction guaranteed. Custom programming services available. M/C, Visa, Discover. Message/FAX: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

CBTV DESCRAMBLERS, Make your own! For under $10. 7 easy steps, Instructions show you how! All parts are available at Radio Shack. Plans including S&H. Only $7. Send to: Information Wholesale, PO Box 9359, Toledo, OH 43697.

PIONEERS! E2s, MISSING BAR CODE from BA6300 etc.? Write in your very own bar code with the WRITER-1. TIRED OF ALL THOSE CUSTOM MODULES? Use WRITER-1 to make all of yours 63s, work with your existing test cube or modules, with or without barcodes. Innovative design requires NO SOLDERING. K-2 tester will clear E-2 code, works only in conjunction with WRITER-1. WRITER-1 $125 + S&H; K-2 $75 + S&H; Call SA RESEARCH 718-358-0033. **NOTE:** Test cubes or test modules are not sold. For troubleshooting and diagnostic purpose only. NO NY SALE.

CABLE HACKERS BIBLES VOLUME 1. 275 pages covering all aspects of most cable systems. Schematics, fixes, theory and more. VOLUME 2. All new information including software. $44.45 each. Catalog $3. **VISA/MC** 602-782-2316/fax 602-343-2141. **TELECODE**, Box 6426-NV, Yuma, AZ 85366-6426.

WIRELESS CABLE dipole/feedhorn w/ built in cable ready downconverter and power supply $125. About half price. 36 channels. 30dB gain "stinger" type. 512-259-4770. 10AM-6PM CST.

MASTER COMPONENTS
CABLE TV TEST MODULES
EXPERT DESIGNS. 1-800-233-0570
See our DISPLAY AD
on Page 15.

DESCRAMBLING, NEW secret manual. Build your own Descramblers for Cable and Subscription TV. Instructions, schematics for SSAVI, Gated Sync, Sinewave, (HBO, Cinemax, Showtime, UHF, Adult) $12.95, $2 postage. Cabletronics, Box 30502N, Bethesda, MD 20824.

PIONEER 63XX/67XX MASTER PROGRAMMING FILES $500 Pioneer 63XX units $200 w/remote. Also available: MASTER files for ALL other TEST MODULES except DPBB/R2/V5/CFT $200. 1-800-MODULE-O.

FSK DEVICE compatible with R2s and more. New design, auto frequency, no switches, never needs filters, does not cause interferance like the RFT-1 $135. Sloppy Joe's, 707-778-7488.

INVENTORY BLOWOUT, Test kits: Quickboards SA8550 thru 8600 $25; DPV7, DPBB-R1 $10; DPV5, 5503, 5507, **ZENITH Z-TEST-3 $5;** Stackable 28-pin sockets for Star6 and Impulse7 kits $1.75. Complete units: 8600 $225; 8580 $190; 8550 $150; DPV7 $190; DPV5 $150; Pioneer 5xxx $190. **Blank Microchip PIC16C56 only $3.90.** Limited quantity. COD Only! 1-800-574-2116 or 818-578-8449.

R2/V5/CFT 1 wire HRC/STD.CH $3/4 fast version. Limited time offer. **$14 min. 10 pcs. Call 1-800-831-2050.**

TEST KITS AT A DISCOUNT. CLEARANCE SALE. **ZENITH** ZL1, ZF1, ZZ Chip, your choice $6 each. **PIONEER** 5XXX and 61XX, E2, E3, E4 and E5 error code clear and test $15 each. All kits are strictly for testing purposes only. No Florida sales. 24 hour voice order line 407-952-5064.

PIONEERING IN STATE OF THE ART REPAIRS? LET US HELP WITH NO E4 PROGRAMS, E2 WRITERS, BAR CODE AND SERIAL NUMBER WRITERS. MULTI-MODE, NO MAP AND MAPPING ALL IN ONE KIT! PARTS AND REMOTES. CALL 407-676-2530.

CABLE CONVERTERS: 550MHz **PANASONIC, REGAL, VIEWSTAR.** Brand new. Converters feature: IR, remote, parental guidance, favorite channel programming, mfg. warranties, available in Ch-3 or Ch-2. **SPECIAL 10 LOT PRICING.** WHOLESALE ACCOUNTS WELCOME. **FOR PRICING AND AVAILABILITY CALL 1-800-757-8186.**

RAW PULLS DRZ-3 10/$250, JSX-3-DIC, 50/$250, 10/$80, also. Expert repair service on car audio amps/decks. UPS shipping. Call Bob 10am EST 914-351-2742.

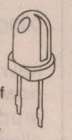
PIONEER UNITS 5XXX-63XX boxes, call for prices, E2-E5 clear modules for 5XXX-61XX $30 ea, 63XX-67XX modules with # $35 each. All modules are no. E4. I can help you with E2 on 63-67XX boxes. RF transmitter $150. Box repairs. Compatible Starcom 6 and Tocom compatible test kits $20 each. Call, 216-428-6910.

UNIVERSAL BASEBAND Impulse 7000 DPBB-7XXX channel 3 (compatible all BB mode). Have make & model number ready. $250 each, minimum 10 units. (Guarantee work in critical area.) 212-978-3535. No NY sales.

ALL ELECTRONICS CORP.

QUALITY PARTS • DISCOUNT PRICES • FAST SERVICE • HUGE SELECTION

JUMBO LEDs



Liton # LTL 327C - 8MM
Ideal for eye-catching indicators and displays. A recent quantity purchase of these BIG, 8mm diameter, red diffused LEDs enables us to provide some very special pricing. The leads on these devices are 0.325" long with plenty of room for soldering.

5 for $1.00 CAT# LED-23
100 for $ 15.00
1000 for $ 120.00

GREAT DEAL! SURFACE MOUNT SPEAKERS

These surface mount speakers were designed for use with car stereo, but they will work as well, or better as intercom or communications speakers in your home or workshop.

4", 4 ohm, speakers mounted in an unbreakable black plastic, slant-faced enclosure. They are rated 5 watts. Enclosure measures 4.82" X 4.5" X 2.45"h. Each pair is boxed and includes two short pieces of hook-up wire.

$3.75 per pair
CAT# SK-411

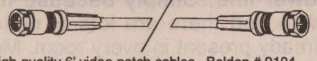
"HI-8" VIDEO CASSETTE (USED)

8 mm Video Camcorder Users!.

SONY Hi-8
Top quality, metal particle 120 minute video cassettes. Used for a short time, then bulk-erased. Each cassette has its own plastic storage box. Satisfaction Guaranteed.

$3.00 each
CAT # VCU-8
10 for $28.00 • 100 for $250.00

6 FOOT VIDEO HOOK-UP CABLE



High quality 6' video patch cables. Belden # 9104 "Duobond" dual shielded RG-59 cable with heavy-duty F connectors hex-crimped onto each end. Large quantity available. CAT# VHU-6S

$1.00 each
10 for $7.50
100 for $60.00

OPTO SENSOR

SHARP # GP1I52
0.12" gap. CAT# OSU-23

2 FOR $1.00

SMALL ELECTRET MIKE

0.31" diameter X 0.325". 0.7" long leads terminated with a two pin connector (0.1" centers).

$1.75 each
CAT # MIKE-18

MINIATURE SWITCHES

D.P.D.T. (ON-ON)
ALCOSWITCH # MTM206NPC
Short bat handle,,0.25" long.
PC terminals
CAT # MTS-82PC **$1.25 each**
25 for $25.00 • 100 for $90.00

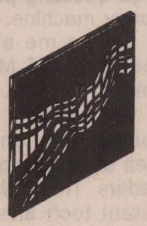
REDUCED PRICE!

MINIATURE D.P.D.T. PUSH/ON PUSH/OFF

Augat/Alcoswitch # MPE206N
Miniature DPDT, push/on push/off switch. Splashproof: O-ring on shoulder and inside movable shaft provides moisture seal. Rated 6 amps @ 125 Vac. RED 0.4" dia. cap. 0.25" diameter threaded bushing. 0.8" behind panel depth. Solder lug terminals. UL and CSA listed.

$1.75 each CAT# MPB-20
25 for $37.50

9 VOLT 60 MA SOLAR PANEL



These 6" X 6" glass enclosed photovoltaic panels produce 9 Vdc at 60 ma. Ideal for charging batteries and powering small devices. Put two or more together for more current and voltage. Includes hook-up instructions.

CAT # SPL-960

$5.25 each

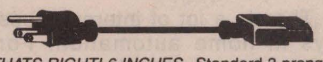
7 Vdc MOTOR

Matsushita
MMX- 7AC O 8A
1.25" diameter x 1.25" high motor. Prepped with 1.61" diameter flywheel, pulley and fiberglass mounting board.

CAT# DCM-54
$1.00 each
10 for $9.00
100 for $80.00

A.C. LINE CORDS

6 INCH IEC POWER CORD



THATS RIGHT! 6 INCHES...Standard 3 prong grounded male one end and 3 prong IEC receptacle on other end. CSA listed. Large quantity available.

2 for $1.00 CAT # LCAC-36
10 for $4.50
100 for $35.00

ROUND 4' BLACK 16/3 CORD

0.32" od, SJT insulation. Standard 3 prong grounded plug one end, moulded strain relief on other end. Pigtail leads. CSA listed. Large quantity available

CAT # LCAC-35 **$1.75 each**
100 for $150.00

MANUFACTURERS - We Purchase EXCESS INVENTORIES... Call, Write or Fax YOUR LIST.

CALL, WRITE or FAX For A Free 64 Page CATALOG.
Outside the U.S.A. send $2.00 postage.

ORDER TOLL FREE **1-800-826-5432**

MAIL ORDERS TO:
ALL ELECTRONICS CORP.
P.O. BOX 567
VAN NUYS, CA 91408-0567

FAX (818) 781-2653
INFO (818) 904-0524

VISA MasterCard DISCOVER

NO MINIMUM ORDER • All Orders Can Be Charged to Visa, Mastercard or Discover • Checks and Money Orders Accepted by Mail • Orders Delivered in the State of California must include California State Sales Tax • NO C.O.D • Shipping and Handling $5.00 for the 48 Continental United States - ALL OTHERS including Alaska, Hawaii, P.R. and Canada Must Pay Full Shipping • Quantities Limited • Prices Subject to change without notice.

Don Lancaster's

RESOURCE BIN

number forty

New opportunities in home automation

Our usual reminder here that the *Resource Bin* is now a two-way column. You can get tech help, consultant referrals, and off-the-wall networking on nearly any electronic, *tinaja questing* personal publishing, money machine, or computer topic by calling me at (520) 428-4073 weekdays 8-5 Mountain Standard Time.

A portion of my PSRT RoundTable on *GEnie* has also been set aside for you *Nuts & Volts* readers. This is the place you go for instant tech answers. Among the many files in our library, you will find complete reprints for all the *Resource Bin* columns.

I did manage to wrangle one super special sign-up deal for you *Resource Bin* readers. Ten free hours.

GEnie now offers far lower daytime rates, a direct Internet access, and a Windows graphics interface, so it's an even better deal than ever.

See the trailer blurb for details.

Home Automation

There's a lot of interest these days in home automation. For increased comfort, reduced power bills, lower environmental impact, and improved security. While home automation has been around for 20 years now, this field is about to explode. Thanks to some rather interesting and brand new developments.

I guess I'd define home automation as any set-up that lets computers and microcontrollers intelligently interact with a traditional home environment. In climate, cooking, lighting, security, and entertainment systems.

As I see it, there's three key issues today in home automation: **(1)** How is reliable and interference free *two-way* comm going to take place? **(2)** What standards (if any) should get used in the way of formats, protocols, and such? And **(3)** Where do we get a low-cost, legal, and electrician-free remote current transducer?

Let's look at these issues in more depth. We'll pick up a few of the key players as we go along . . .

Power Line Comm

The "obvious" way to send control signals and status messages around a house is to use your AC power line. Simply because it is there and there are lots of outlets already present in every room. Most of what you need to control is already "on line."

The only problem is that power line comm does not work very well.

One of the first real jobs I ever had was designing carrier current comm devices for railroads and coal mines. In those days, you simply shoved 30 watts or so of FM modulated voice or control signals on back into the tracks. Useful frequency channels went from 30 KHz to 200 KHz.

NEXT MONTH:
Don looks at resources for security and alarm industry products.

Receivers were remarkably similar to what we could call a TV sound chip today. A limiter, discriminator, and an audio amp. Sensitivity was in the two millivolt range.

Sadly, the power lines have gotten real ugly since then. More and more things that plug into the power line generate badly interfering harmonics. Two of the worst offenders are power supplies and dimmers.

Capacitor input DC power supplies often draw their current out as a short impulse current slug. Those dimmers have a sharp switching risetime in the middle of each AC half cycle. Both of these generate bad interference to any ultrasonic VLF carrier comm.

A second problem is that more and more things that plug into the power line now use superb noise filters.

A carrier system's information gets seen as noise by a filter. As an ancient example, that input filter on a *Diablo* 630 Daisywheel flat out blocks out *all* BSR control commands for a dozen or more feet in any direction. The typical computer lashup now has at least six filters that are as bad or worse.

These days, your home power line looks more or less like a dead short at carrier comm frequencies.

A third problem is that the signals may travel too far. Or not far enough. Controlling your neighbor's hot tub is obviously a big no-no.

Especially for its *piranha* mode.

Most home power systems consist of one center-tapped single phase 220 volt system that delivers two separate 110 volt *legs*. It is very hard for carrier signals to hop between legs. A large coupling capacitor might sometimes help. At other times a special linking circuit could get used.

Yet other times, a reliable coupling flat out ain't gonna happen.

Finally, the regulators have newly fouled things up. There are new and horrible restrictions on how much AM radio interference gets allowed. These new restrictions can *severely* limit the amount of transmitted carrier power permitted. At the least, an expensive filter may be needed.

There is a brand new solution that's called *spread spectrum communications*. Using spread spectrum comm, pretty near the *entire* frequency range from 20 to 400 KHz is used by *every* channel. *Spreading codes* give outstanding noise immunity. And allows many sources to simultaneously communicate.

Interference free.

But spread spectrum carrier comm is so new that you have to work at the chip level or else go to costly systems. Two sources are *Signetics/Philips* and *SGS*. Another is the *Echelon* PLT-20.

One newsletter is Randy Robert's *Spread Spectrum Scene*.

The rule seems to be that anything less than full spread spectrum power line carrier comm appears doomed to failure. Thus, there is no point of even thinking about trying to do your own single channel FM or PWM lashup.

Power line carrier comm setups are routinely used by the electric utilities. More details on how the big boys do it by way of EPRI, that *Electric Power Research Institute*. They also publish a few home automation titles.

One chip source is *National*. They have teamed up with *Cyplex and Itron* to build new *IC/SS* products.

The most obvious source of power line comm products, of course, is . . .

BSR and X-10

The ancient home controller system that everybody loves to hate is made by *BSR*. And is called the

new from
DON LANCASTER

ACTIVE FILTER COOKBOOK
The sixteenth (!) printing of Don's bible on analog op-amp lowpass, bandpass, and highpass active filters. De-mystified instant designs. **$24.50**

CMOS AND TTL COOKBOOKS
Millions of copies in print worldwide. **THE** two books for digital integrated circuit fundamentals. About as hands-on as you can get. **$24.50** each.

INCREDIBLE SECRET MONEY MACHINE II
Updated 2nd edition of Don's classic on setting up your own technical or craft venture. **$18.50**

LANCASTER CLASSICS LIBRARY
Don's best early stuff at a bargain price. Includes the CMOS Cookbook, The TTL Cookbook, Active Filter Cookbook, PostScript video, Case Against Patents, Incredible Secret Money Machine II, and Hardware Hacker II reprints. **$119.50**

LOTS OF OTHER GOODIES

Ask the Guru I or II or III	$24.50
Hardware Hacker II, III or IV	$24.50
Micro Cookbook I	$19.50
PostScript Beginner Stuff	$29.50
PostScript Show and Tell	$29.50
Intro to PostScript Video	$29.50
PostScript Reference II	$32.50
PostScript Tutorial/Cookbook	$19.50
PostScript by Example	$31.50
Understanding PS Programming	$29.50
PostScript: A Visual Approach	$22.50
PostScript Program Design	$24.50
Thinking in PostScript	$22.50
LaserWriter Reference	$19.50
Type 1 Font Format	$15.50
Acrobat Reference	$24.50
Whole works (all PostScript)	$380.00
PostScript Insider Secrets	FREE
Hacking Insider Secrets	FREE

POSTSCRIPT SECRETS
A Book/Disk combination crammed full of free fonts, insider resources, utilities, publications, workarounds, fontgrabbing, more. For most any PostScript printer. Mac or PC format. **$29.50**

BOOK-ON-DEMAND PUB KIT
Ongoing details on Book-on-demand publishing, a new method of producing books only when and as ordered. Reprints, sources, samples. **$39.50**

THE CASE AGAINST PATENTS
For most individuals, patents are virtually certain to result in a net loss of sanity, energy, time, and money. This two volume set shows you tested and proven real-world alternatives. **28.50**

BLATANT OPPORTUNIST I
The reprints from all Don's Midnight Engineering columns. Includes a broad range of real world, proven coverage on small scale technical startup ventures. Stuff you can use right now. **$24.50**

RESOURCE BIN I
A complete collection of all Don's Nuts & Volts columns to date, including a new index and his master names and numbers list. **$24.50**

FREE SAMPLES
Well, nearly free anyway. Almost. Do join us on GEnie PSRT to sample all of the Guru's goodies. The downloading cost on a typical Guru file is **21 cents**. Modem access: Dial (800) 638-8369. On prompt, JOINGENIE, then DMD524 on key.

FREE VOICE HELPLINE VISA/MC

SYNERGETICS
Box 809-NV
Thatcher, AZ 85552
(520) 428-4073

Write in 181 on Reader Service Card.

RESOURCE BIN

HOME AUTOMATION RESOURCES

Ademco
165 Eileen Way
Syosset NY 11791
(800) 645-7492

Arcatron
3641 W Phelps Road
Phoenix AZ 85023
(602) 843-2589

Black Range Films
Route 2, Box 119
Kingston NM 88042
(505) 895-5652

BSR
Route 303
Blauvelt NY 10913
(914) 358-6060

Circuit Cellar Ink
4 Park St #20
Vernon CT 06066
(203) 875-2751

Command Control
8800 Roswell Rd Ste 130
Atlanta GA 30350
(404) 992-8430

CompCo Enginering
611 Parkway Ste D4
Gatlinburg TN 37764
(615) 436-5189

Custom Command
115 Paint Branch Dr #3181
College Park MD 20742
(301) 314-7767

Cyberlynx Gateway
3066 Sixth Street
Boulder CO 80304
(303) 444-7733

Cyplex
472 Amherst Street
Nashua NH 03063
(603) 882-8104

Echelon
4015 Miranda Avenue
Palo Alto CA 94304
(800) 258-4566

Scott Edwards Electronics
964 Cactus Wren Lane
Sierra Vista AZ 85635
(602) 459-4802

Electronic House
56790 Magnetic Drive
Mishawaka IN 46545
(219) 256-2060

Electronic Industries Assn
2001 Pennsylvania Ave NW
Washington DC 20006
(202) 457-4900

Enerlogic Systems
2 Townsend Way Ste 6
Nashua NH 03063
(603) 880-4066

EPRI Journal
PO Box 10412
Palo Alto CA 94303
(415) 855-2000

GEnie
401 N Washington St
Rockville MD 20850
(800) 638-9636

Global Eng Documents
15 Inverness Way East
Englewood CO 80112
(800) 854-7179

Habitech95
5310 Harvest Hill Rd #235
Dallas TX 75230
(800) PARKS11

Hewlett-Packard
PO Box 10301
Palo Alto CA 94303
(415) 857-1501

Holt Integrated Circuits
9351 Jronimo Road
Irvine CA 92718
(714) 859-8800

Home Automation
2709 Ridgelake Drive
Matairie LA 70002
(504) 833-7256

Home Automation Assn
808 17th Street #200
Washington DC 20006
(202) 223-9669

Home Automations Labs
5500 Highlands Pkwy #450
Smyrna GA 30082
(800) HOME-LAB

Home Automation Systems
151 Kalmus Dr Ste M6
Costa Mesa CA 92626
(714) 708-0610

Home Automator
2258 Sandy Lane
Mebane NC 27302
(910) 578-9519

Home Control Concepts
9520-108 Padgett Street
San Diego CA 92126
(800) CONTROL

Home Power
PO Box 520
Ashland OR 97520
(916) 475-3179

Home Systems
PO Box 6236
Oklahoma City OK 73123
(405) 840-4751

Home Systems Network
Box 3006
Edmond, OK 73083
(800) 808-0718

Honeywell
1985 Douglas Drive
Golden Valley MN 55422
(800) 345-6770

Infrared Data Assn
PO Box 3883
Walnut Creek CA 94598
(510) 943-6546

Information Store
500 Sansom St Ste 400
San Francisco CA 94111
(415) 433-5500

Intelligent Systems
175 New Britain Avenue
Plainville CT 06062
(203) 793-9951

Intellihome
8350 N Central Exp M1100
Dallas TX 75206
(214) 361-4044

Intellon
5100 W Silver Springs Blvd
Ocala FL 34482
(904) 237-7416

Itron
E 15616 Euclid Avenue
Spokane WA 99216
(800) 635-5461

JaMar Distributing
1292 Montclair Drive
Pasadena MD 21122
(410) 437-4181

JDS Technologies
16750 W Bernardo Drive
San Diego CA 92127
(619) 487-8787

Leviton
59-25 Little Neck Pkwy
Little Neck NY 11362
(800) 824-3005

Linear Technology
1630 McCarthy Blvd
Milpitas CA 95035
(408) 432-1900

Lone Wolf Corp
2030 First Avenue
Seattle WA 98121
(206) 728-9600

Makita
14930 Northam Street
LaMiranda CA 90638
(800) 4-MAKITA

Marvin
2020 Silver Bell Road
St Paul MN 55122
(800) 328-0268

Mastervoice
10523 Humbolt Street
Los Alamitos CA 90720
(213) 594-6581

Media Magic
PO Box 507
Nicassio CA 94946
(415) 662-2426

Menage Automation
120F W Campbell Avenue
Campbell CA 95008
(408) 378-9451

MicroMint
4 Park St Ste 20
Vernon CT 06066
(203) 875-2751

Microchip Technology
2355 W Chandler Blvd
Chandler AZ 85224
(602) 963-7373

Motorola
5005 E McDowell Rd
Phoenix AZ 85008
(800) 521-6274

National Semiconductor
2900 Semiconductor Rd
Santa Clara CA 95052
(800) 272-9959

NEC Electronics
PO Box 7241
Mountain View CA 94039
(800) 632-3531

Omnipotence
2236 Cambridge Drive
Sarasota FL 34232
(813) 371-5085

Plessey
PO Box 660017
Scotts Valley CA 95067
(800) 927-2772

Powerline Control
9031 Rathburn Avenue
Northridge CA 91325
(818) 701-9831

Raindrip
21305 Itasca Street
Chatsworth CA 91313
(818) 718-8004

Remote Measurement
2633 Eastlake Ave #200
Seattle WA 98102
(206) 328-2255

Security Etc
19 Alamo Square
Alamo CA 94507
(510) 838-9160

SM Automatic
10301 Jefferson Blvd
Culver City CA 90232
(310) 559-6405

Solartronics
76 Benbro Drive
Buffalo NY 14225
(716) 681-6686

Spread Spectrum Scene
PO Box 2199
El Granada CA 94018
(800) 524-9285

Synergetics
Box 809
Thatcher AZ 85552
(602) 428-4073

Unity Systems
2606 Spring Street
Redwood City CA 94063
(415) 369-3233

Kenneth Wacks
9 Pinewood Road
Stoneham MA 02180
(617) 662-6211

Wireless Design & Dev
301 Gibraltar Dr
Morris Plains NJ 07950
(201) 292-5100

Zomeworks
PO Box 25805
Albuquerque NM 87125
(505) 242-5354

X-10 system. With off-the-shelf modules offered by *Radio Shack, Heath*, and others.

Transmitters, lamp and appliance modules, computer interfaces, and the handheld remotes are offered. At $12.00 for a receiver module.

The appliance modules are for high-current on-off control only. But lamp modules can be remotely dimmed or brightened. You must *never* connect an induction motor or any fluorescent light to their lamp modules.

The BSR transmitter has 512 codes grouped into a *home code* and a *unit code*. A code gets sent, followed by its complement, giving a limited amount of noise immunity.

Comm is one-way only. There is no way to verify whether your command actually took place. Unless you see or hear the result yourself.

The modules are cheap and sort of work. Some of the time.

Their major faults include one-way comm, slow speeds, few commands, no collision detection, the ease with which signals can get stomped on by noise filters, and the major difficulty of hopping phase legs.

Insider technical details on the BSR system are in a Steve Ciarcia story in the Sept. 1980 *Radio Electronics*.

Individual chips are also available. The basic control chips from BSR. And advanced computer interfacing chips from *MicroMint*.

Sources of BSR application products now include *Enerlogic, Jance Associates, Powerline Control, Creative Processing, Home Automation, JDS, Omnipotence, Remote Measurement,* and *Menange*.

Leviton is a second source for home controller modules. They also do get into occupancy detectors and similar stuff. Leviton has a *DEC Tech Manual*, the *DEC Troubleshooting Guide*, and a Home *Automation Network Guide*.

Infrared Comm

At one time, most TV remotes used ultrasonics in the 40 KHz range. But it turns out that nearly anything you could do with ultrasonics, you can do with near infrared. And usually do so far cheaper using much less power in a smaller package.

Thus, ultrasonics are no more.

A standard TV remote control uses a near IR light emitting diode to send out signals in much the same format as the ultrasonic originals.

Two good sources for details: the *Cable, TV, and Audio Handbook* from *Plessey*. Or the *IR Remote Control Data Pack* from *NEC*.

Two other sources for encoder and decoder chips are *Motorola* and *Holtek*. Holtek is stocked by *Digi-Key*.

But there's a brand new game in town that gives you ultra high speed infrared comm. This one is the *IrDA* standard from a group that calls itself the *Infrared Data Association*. The baud rates go from 115 Kilobaud to several Megabaud and higher.

There's a good IrDA review in the March 30, 1995 issue of *EDN*. One leading proponent is *Hewlett Packard*. Who now does offer free two-way *IrDA Evaluation Modules*. Another source is *Linear Technology* with their LT1319 IR receiver integrated circuit.

Infrared and power line comm are likely to remain your two biggies for home automation. Other candidates now include twisted pair phone lines, optical fibers, or the elegantly simple micropower comm used by aerobic pulse monitors. See HACK68.PDF for the astounding secret insider details on the latter.

There's also UHF wireless comm. Try *Wireless Design & Development* and similar trade journals for your latest and best in this area. I've uploaded an extensive listing of wireless resources to GEnie\ PSRT as NUTS38.PDF.

Which Standards?

Ideally, every home controller must be able to simultaneously talk to each other on an interference free basis. By using some sort of a unified and *fully open* public standard.

At the least, such a standard *must* offer full duplex two-way, multi host comm having a full collision detection and excellent noise immunity. It must be medium independent, and perform equally well with powerline, infrared, wireless, or most "none of the above" signalling schemes.

And, of course, the standard *must not* be at all proprietary or favor any particular manufacturer in *any way*. The standard *must* be fully open with *all* documentation accessible.

Computer LAN networks certainly could be used for home control. Such as AppleTalk or Ethernet.

The only little problems have been their cost and complexity. Today, an Ethernet interface would double the price of, say, a bread machine. But prices are dropping rapidly. Time will tell whether these might eventually eliminate any need for any separate home automation bus standard.

Surely some musician somewhere is now running his kitchen toaster off MIDI. Giving a whole new meaning to having jam sessions.

The BSR code is a standard of sorts. This is well documented and more or less open. But, as we have seen, this code is pitifully slow, one-way only and has serious noise immunity and collision problems. I guess we could say this code is about the same as an 1890 aviation standard.

I know about three emerging home automation standards. One is the old *LonWorks* system from *Echelon*. To me, this is a grossly overblown example of megacorporations run amuck.

They started with the wrong micro family and applied it to proprietary bloated nonsolutions to nonproblems.

Did they do this on purpose?

A maverick home standard from out in left field is being honchoed by *Lone Wolf Technologies*. This one is clean, lean, and mean. But it may lack enough momentum to ever make it into the mainstream. This one sure is cute, though.

But the home automation standard that looks like it is going to run away with all of the marbles is called the *CE Bus*, short for *Consumer Electronics*. It's now *Open Standard IS-60*. Copies of which are gotten from the *Electronics Industries Association, The Information Store,* or *Global Engineering Documents*.

This bus is called a packet oriented, peer-to-peer network. It now supports powerline comm, infrared, wireless, twisted pair, coax, and fiber optics. A good summary story is *CEBus for the Masses*, in the

RESOURCE BIN

April 1995 *Circuit Cellar Ink* on pages 61-68.

Sources for CE Bus info, software, and end products now include *Intellon, Arcatron, Micromint, Command Control,* and *Cyberlynx.*

The CE bus is probably the one to bet on. At least for now.

Current Sensing

I'm utterly amazed that nobody has yet picked up on the key part needed for home energy management. This is a low-cost remote current sensor that installs without using an electrician and without rewiring.

I first described these as an *Isopod* on back in HACK47.PDF. This was a tennis ball shaped device which you glomped onto your home power drop at the weatherhead. When prompted, it sends a digital word proportional to present current use.

Similar modules could also plug-in at any outlet. The receiver would pick up a reference voltage. Extracting real and reactive power.

Obvious uses are to dramatically reduce your power bill by finding out where and when most of your usage takes place. Or doing load shedding for better utility rates. Or for such odd things as servicing air conditioning intermittent problems.

Current sensors, of course, must sense current. While those *Hall Effect* devices might work, an old fashioned *current transformer* is probably all you need to do the job. Done properly, the current transformer should also be able to pirate enough energy to run a transmitter as well.

Amecon is one mid-range source for snap-on current transformers. But I sure have been intrigued by the new #273-104 snap-on chokes from *Radio Shack.* Around $3.50 each. With some care, you should be able to hack these into useful sensors.

Uh, I have not run those 60 Hertz permeability and saturation tests on their core material just yet. But, if it is manufactured from anything this side of ground up stove parts, they should work out just fine.

When you experiment with these, remember that a current transformer has to accept *one, but not both* of the load wires. And you must *never* open circuit a current transformer.

This is an exciting new opportunity with a virtually unlimited market.

Magazines and Such

So far, I've found three good mags on home automation. The one I like the best is *Circuit Cellar Ink.* Their April 1995 has lots of useful info in it. They tend to have special quarterly home automation supplements.

Electronic House is a bimonthly pub that has been publishing since 1986. Targeting on advanced housing and home automation topics.

There is also a new *Home Automator* labor-of-love newsletter.

If your primary focus is alternate off-grid energy, *Home Power Magazine* does a really great job here.

And, speaking of alternatives, one outstanding series of videos on straw bale home construction is offered by *Black Range Films.* They also host a superb wilderness bed and breakfast. And networking that you simply will not be able to believe.

From *Alpha Centari,* even.

Another useful video is *Living With an Intelligent Home.* It is produced by *Home Systems Network.*

Which Microcontroller?

While a few older designers haven't gotten the message yet, there is one and *only* one chip to *ever* consider for home automation use. This, of course, is the PIC. Which completely, totally, and utterly blows the others away.

Start with the *Microcontroller Data Book* and *PIC Applications Manual* by *Microchip Technology.* Then go to the *BASIC Stamp* made by *Parallax.* And finally those superb *PIC Design Tools* from *Scott Edwards Electronics.*

By special arrangement with Lance Wally of Parallax, I've just uploaded the entire BASIC Stamp manual to my *GEnie* PSRT. It is yours free for the downloading. See BASTAMP1.PDF as an intro, BASTAMP2.PDF for stamp commands, and BASTAMP3.PDF for detailed applications info.

Acrobat readers are also available free for the downloading if you do not already have one. In PSRT library #10. These let you view camera ready documents directly on your computer screen. Much more on Acrobat in my MUSE89.PDF.

A complete listing of PIC resources is in HACK87.PDF. The instruction set is in MUSE88.PDF. And, of course, all the previous Resource Bin columns are also in the library.

Other Suppliers

MicroMint is one leading source of home automation electronics. Check out their *HCS II* and *SpectraSense 1000* product lines. They have got a brand new *Xpress Reference Manual.* Plus free BBS and catalogs.

Besides the previously mentioned books, *Home Automation Systems* also offers an *X-10 Applications Manual* and a unique *Building Interiors, Plants, and Automation* text for plant watering.

One useful source for the watering parts and systems is *RainDrip.*

Another automation distributor is *Home Control Concepts.* Who are also big on X-10 stuff, motion detectors, and intelligent remotes.

Other resources are *Home Systems, CompCo, Ademco,* and *Ja Mar.*

Drapery and window controls are offered by *Bautex, Cardiff, Solartronics, Makita, Marvin,* and *SM Automatic.*

Solar control products are available through *Zomeworks.*

High end consultants for architects and such include *Intellihome, Custom Command, Honeywell, Secant, Unity Systems, Home Automation Laboratories, Intelligent Systems, Mastervoice, Media Magic, Security,* or *Ken Wacks.*

A *Habitech95* home systems trade and training show is scheduled for May 17-20 in the Atlanta Apparel Mart and the Westin Peachtree Plaza.

There's also a new *Home Automation Association* trade group reachable at 75250.1274@COMPUSERVE.COM or by way of (202) 223-9669 voice.

This Month's Contest

I feel I might have missed a home automation supplier or two. For this month's contest, just tell me about any unmentioned resource.

Or, alternately, experiment with the #273-104 and show me what you can come up with in the way of a cheap, convenient, and electrician-free home automation current sensor.

There will be a largish pile of my new *Incredible Secret Money Machine II* books going to the dozen or so better entries, plus an all expense paid (FOB Thatcher, AZ) *tinaja quest* for two that will go to the very best of all.

Let's hear from you. **NV**

Microcomputer pioneer and guru Don Lancaster is the author of 32 books and countless tech articles. Don maintains his no-charge tech helpline found at (520) 428-4073, besides offering all of his own books, reprints, and all of his consulting services. He also has a free catalog full of his resource secrets waiting for you. Your best calling times are 8-5 on weekdays, Mountain Standard Time.

Don is now the sysop of GEnie PSRT, where a special Resource Bin topic has been reserved for Nuts & Volts readers. For modem access: (800) 638-8369. When prompted, enter JOINGENIE. When asked for an offer code, enter DMD524.

You can also reach Don at Synergetics, Box 809, Thatcher, AZ 85552. Or send any messages to his Internet address of SYNERGETICS@GENIE.GEIS.COM

#110 CABLE TV *cont.*

DEALERS NEEDED: one piece descramblers, 5 or more pieces. Zenith ST $229, DPV 7 $239, DPVBB $289, SA 8580 $239, SA 8590 $269, Pioneer combos $289. Call Gene or Jim, Mega Electronics, 1-800-676-6342.

DESCRAMBLE CABLE with simple circuit added to Radio Shack RF Modulator part # 15-1273 and using cable ready VCR as tuner instructions, $10. Telcom, Box 832-V, Brusly, LA 70719.

CABLE CONVERTER diagnostic and test modules for sale. Internal and external. Call John, 1-800-879-9657.

FREE PAY TV, NEED MONEY? Learn how to make money descrambling pay TV like the pros. You can make up to $20,000 a month. Anyone can do it almost anywhere in the U.S. No electronics background needed. Order the **NEW BOOK**, Pay TV-The Inside Scoop. Send $9.95 to A/V Publishers, 16281 S.F. Mission Blvd. #407-N, Granada Hills, CA 91344.

CABLE PHREAKERS! Program your own test chips! Complete set of master files for Scientific Atlanta, Tocom, Pioneer, etc. Wow! Sold for educational purposes only! Only $50! Specify disk size! Bates, 5541 W. Quincy, Chicago, IL 60644. 312-914-2763. No Illinois Sales!

TEST KIT BLOW OUT. New factory fresh kits that must be eliminated. **SA 40-pin Processor** kits 70/80/90/8600 $20 each. **SA Quick Board** 70/80/90/8600 $18 each. **Pioneer Compatible Test Kit** super small removes E5, E4, E3, E2 $15 each. **Zenith ZL1** wire kit for all models but PM/PZ $6 each. This sale is valid until stock is depleted. Minimum purchase $50 (US dollars), mix or match. Shipping and COD costs not included in test kit price. No Florida Sales. 407-676-2530. **ELECTRONIC SURPLUS ELIMINATORS.**

SSA-TV86 works on all 8500-8580, $135/1, $125/5, $115/10, SA8600 "NEW" $275 ea. Others avail. including test kits. 203-283-9492.

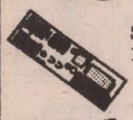
E(E)PROM PROGRAMMER SYSTEM, $199. E(E)proms, 9346, Flash, Gals & Micros. Programmers, Erasers by AMS, Tribal and Xeltek. Send SASE for Catalog. Build-Ur-Own, 9346 Programmers too. **TRIANGLE PRODUCT DISTRIBUTORS USA**, 5750 Lakeshore Dr. Holland, MI 49424 USA. 616-399-6390. M-F, 9am to 2pm, EST.

BUYING SCIENTIFIC Atlanta 8600, 8580, 8550, 8500. Software available. SA, Pioneer. Will program your 8550, 8500 earoms for $7.50. Cable security key gets past collars $25. Add $5 shipping. No TX sales. Send postal money order to: K. Perry, PO Box 816, Leander, TX 78646-0816. Phone: 512-259-4770.

Miniature Transmitters and Receivers

Small, Attractive, High End Quality, 2 Channel Transmitter
59,049 Settable Codes, 150'–300' Range, 1–1/4"x2"x7/16", Assembled

		Qty 1	5	10
RF300T	150' Transmitter	24.95	19.95	15.95
RF300XT	300' Range Transmitter	29.95	24.95	19.95



Small, High End Quality, Receiver for the RF300 Transmitters
1–1/4"x3–3/4"x9/16", 8–24 vdc CMOS Input / Outputs, PCB

RF300R	Receiver, assembled	24.95	20.95	16.95
RF300RK	Receiver, Parts Kit	19.95	15.95	12.95

Small, Economical, Transmitter and Receiver Set
Set Code, 60' Range, 1–7/8"x2–3/8"x7/16" (T), 2"x2–3/4"x9/16" (R)

RF60	Transmitter and Receiver	24.95	19.95	14.95

Add $ 4 shipping for first item + $ 1 for each additional item. Ca. residents add 8.25% tax
Visa, Mastercard, Money Orders, Personal Checks and Cash C.O.D.s

Visitect Inc. (510) 651–1425 Fax (510) 651–8454
P.O. Box 14156 Fremont, CA. 94539

Write in 95 on Reader Service Card.

Electronics made Easy with UCANDO

UCANDO'S unique computer animation makes learning electronics fast and easy. These videos will...teach you more in less time...allow you to learn at your own pace... help you remember more of what you learn...give you years of quality use...become a valuable source of reference material...make your understanding of electronics complete and help you build your future today. **Call today** and see how UCANDO is...

"Changing The Way The World Learns Electronics"

VT102 Intro to VCR Repair	$44.95	VT303 Digital 3	$44.95
VT103 VCR Maint. & Repair	$29.95	VT304 Digital 4	$44.95
VT201 Direct Current	$44.95	VT305 Digital 5	$44.95
VT202 Alternating Current	$44.95	VT306 Digital 6	$44.95
VT203 Semiconductors	$44.95	VT401 AM Radio	$44.95
VT204 Power Supplies	$44.95	VT402 FM Radio Part 1	$44.95
VT205 Amplifiers	$44.95	VT403 FM Radio Part 2	$44.95
VT206 Oscillators	$44.95	VT404 TV Part 1 "Intro to TV"	$44.95
VT301 Digital 1	$44.95	VT501 Fiber Optics	$44.95
VT302 Digital 2	$44.95	**NEW .. VT405 TV Part 2 "The Front End"**	**$44.95**

SAVE!!! Buy any 6 videos for only $240 .. OR .. Buy any 12 videos for only $450

MONEY BACK GUARANTEE! Call for details.

VISA **Call Toll Free 1-800-678-6113**

or mail check or money order to:
MasterCard UCANDO Videos, P.O. Box 928, Greenville, OH 45331

FREE Shipping...FREE Catalog

Write in 96 on Reader Service Card.

MASTER PROGRAMMING FILES. Memory devices programmed. Reverse engineering. Circuit boards made and much more. 407-676-2530.

SCIENTIFIC ATLANTA 40 pin replacement processors for the 8580 7-button, 8590 11-button and 8600 boxes, $22. Will install for free. Master program files available for $60 each. Blanks $17. 714-744-2786.

CONNECTOR SALE New 50 ohm GR874-CL58 locking cable, GR874-PFL. Panel feedthru, GR874-Elbow & GR to BNC connectors for cable type RG29/U, 58/U, 141/AU, 159/U & 223/U. SASE for complete sale list of other connectors. Send SASE; EO Techniques, 16 Slusser Ave., New Hartford, NY 13413-2117. Phone 315-733-4852.

INTELLIGENT PIONEER test device the WATCH-DOG, is state of the art true guardian of your Pioneer unit. AUTO TIME SET, AUTO LOCAL MAP, NO E2 through E5, NO MANUAL FLIP SWITCHES AND NEVER E4 are only a few qualities to mention, has numerous SECURITY features. Aren't you tired of buying DUMB test modules. Try WATCH-DOG you'll be glad you did. Only $49.99 for generic, or $59.99 with your bar-code. Innovative devices only from; SA RESEARCH, 718-358-0033. FOR TESTING AND DIAGNOSTIC PURPOSE ONLY. NO NY SALES.

CABLE TV Converters for sale in package deal. (20-DP7-R2-V5, 20-BBRI-R2-V5-20-8600) all units in full test mode. No remotes first $9,000 takes all 60. No individual sales and no other units available. If interested call, 818-683-1429.

CABLE TELEVISION descramblers. Stop over paying for your equipment. Catalog of over 50 companies that sell descramblers & accessories at below wholesale prices. Send $10. Money order or certified check only, to: Garvey, Dept. C, PO Box 364, Quincy, MA 02269.

BUYING: JERROLD 450 Trimode test kits. All models. Wanted Jerrold 550, Trimode test kits. Call 301-986-2436. Leave message.

BUYING JERROLD DPV and DPBB, SA 8550, 8580, 8590, 8600 and Zenith 1600's. Any quantities. Call 201-728-3217. 10am-6pm EST.

"DESCRAMBLER SCHEMATICS REVEALED." A powerful guide to descrambling schemes. $10. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

R2/V5/CFT Test-Kit. Now $15 each, minimum 10. 718-349-6506. No NY sales.

FREQUENCY AGILE diagnostics transmitter, automatic operation. Works with DPxxxxx, R2, V5, CFT, RF and more. $140 in single lot. 707-763-7939.

STAR 7 Baseband DPBB-7212 $250, DPV-7212 $225, Star 6 Baseband DPBB-212 $225. Min. 10. Call, 212-978-3535. NO NEW YORK SALES.

"TVT" COMBO $150. Test mode devices for BA-51XX, BA-61XX $40 ea., BA-63XX $45 ea. Call Ben at 1-800-484-7250 then dial 7525.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmf/.

FULL SERVICE BOXES: ZENITH ST1612 with anti-flashing circuit and remote, $149 5-lot, $169 2-lot, $189 single **SCIENTIFIC ATLANTA 8600** (2 versions, 8600STNN, 8600SZNN) with remote $249 UPS/COD. Dirk Braem, 4928 Aquatic Rd., Nashville, TN 37211. 615-331-9637 voice/fax. No TN sales/ Canadian order.

AVAILABLE NOW: Test aids for the discerning customer at a fair price. Quickboard 8570, 8580, 8590 10 and 11, 8600 New 22V5 chip, Star6, Star7, ZL1, DPBB212/R2, Notch filters 2-23. No FL SALES. 407-337-2649.

SCIENTIFIC ATLANTA, PIONEER AND JERROLD COMPATIBLE DESCRAMBLERS. 1-PIECE, NON-BASEBAND. FREQUENT BUYER AND VOLUME DISCOUNTS. NO CA ORDERS. ACME CABLE PRODUCTS. 1-800-866-ACME.

BUYING TOCOM, SCIENTIFIC ATLANTA 8536s, 8550s, 8580s, 8590s, and 8600s. **JERROLD** DPV and DPBB. **PIONEERS,** all, and Zeniths, all. Any quantity. Top $$$ paid. Contact National Cable Brokers, Plymouth, IN. Phone 219-935-4128.

CABLE EQUIPMENT FOR ALL YOUR TV NEEDS. ALL BRANDS AVAILABLE. DISCOUNT ON QUANTITIES. WE BEAT EVERYBODY'S PRICES. CALL 713-444-2477. NO TEXAS SALES. VISA, MASTERCARD, DISCOVER.

TEST KITS. Star6 DPV $5, Star6 DPBB $15, Star6 DPBB M1 $25, Star7 DPV $15, Pioneer all $25, S/A 8570, 80, 90 $25, Tocom all $5. Call 718-349-6506, Min. 10, NO NY SALES!

WHOLESALE CABLE TV DESCRAMBLERS. Get the names & address' and phone # of company that will sell to you wholesale & retail. Converters add on. Buy direct and save, get a complete list just $19.95. **SEND CERTIFIED CHECK OR MONEY ORDER TO; JF, BOX 244, SELDEN, NY 11784.**

DIAGNOSTIC TV NOTCH FILTERS

COMPARE OUR QUALITY STANDARDS

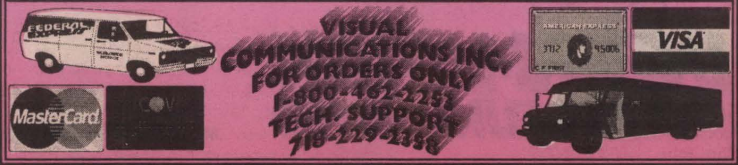
PROFESSIONAL CYLINDRICAL CASE DESIGN, HERMETICALLY SEALED.
EXCLUSIVE EIGHT STAGE FILTER DESIGN, NO CORNER CUTTING!!
YIELDS RAZOR SHARP SELECTIVITY , DEEP CARRIER SUPPRESSION.
OUR FILTERS PRODUCE A 75DB EXTRA DEEP NOTCH!!
EVERY FILTER IS INDIVIDUALLY INSPECTED & PROOF TESTED ON A SPECTRUM ANALYZER, OUR QUAL. CONTROL IS SECOND TO NONE!!
PERFECT FOR MAINTAINING DIAGNOSTIC TEST MODE WHILE YOU ARE REPAIRING OR TESTING CABLE CONVERTERS, OR SUPPRESSION OF STRONG INTERFERING FM CARRIERS. . SUCH AS HERRINGBONE.

THESE FILTERS ARE CUSTOM MADE EXCLUSIVELY FOR US BY THE LEADING FILTER MANUFACTURER IN TAIWAN AND EXCEED INDUSTRY SPECIFICATIONS.

NOTICE: WE DO NOT SELL POSITIVE TRAPS OF ANY KIND!!

THE SALE OF THIS PRODUCT IS LIMITED TO QUALIFIED BENCH TECHNICIANS,MSO'S & CABLE COMPANY REPAIR DEPARTMENTS. THESE PRODUCTS ARE DESIGNED FOR THE EXPRESS PURPOSE OF TESTING AND REPAIRING CABLE CONVERTERS,MAINTAINING CABLE CONVERTERS IN DIAGNOSTIC TEST MODE,AND SUPPRESSION OF FM CARRIER INTERFERENCE.... SUCH AS IN HERRINGBONE PATTERNS!!

ANYONE IMPLYING THEFT OF SERVICE IN ANY WAY SHAPE OR FORM,WILL BE DENIED SALE... SORRY NO NY SALES!! .. WE SHIP UPS AND FEDERAL EXPRESS PRIORITY!!



Write in 97 on Reader Service Card.

AMAZING Electronic and Scientific Products

Long Range 3 Mile Voice Transmitter

- Super Sensitive Mike
- Crystal Clear
- Tunable 80 to 120 MHz • Miniature Design

XFM1KN $39.50

Blitzer Stun Guns

Life is Precious! Protect It!

- Hard Hitting • Reliabile

READY TO USE

STUN1X - 80,000 Volts.....$29.95
STUN2X, 100,000 Volts....$39.95
STUN4X, 200,000 Volts....$69.95

Check Local & State Laws Before Ordering

Electric Charge Gun

Stuns Attacker Up to 15' Range

- Legal In Most States
- More Knock Down Power Than Most Handguns
- No Permanent Injury - Ready to Use with Identifying Code

Special Introductory Offer Includes our 80KV Stun Gun

ECG10N .....$249.50 Data Pack, creditable toward purchase ...$10.00

TV Joker

Shirt pocket device allows you to totally control and remotely disrupt TV or radio reception. Great gag to play on family or friends. Discretion required.

EJK1KM Easy to Assemble Kit .$24.50

ALL NEW! Powerful Home Security Telecom - Infinity Transmitter

Access on premises, ongoing phone calls, phone break-in capabiltiy, control of electrical functions such as lights, alarms etc. *Caution - Check Legality in Your State!*

TELECOM2KN Kit, w/PC board ..... $149.50 TELECOM20N Ready to Use $199.50

FM Telephone 3 Mi Transmitter

Listen to calls over any FM radio

- Tunable 70 - 130 MHz
- Undetectable
- Only transmits during phone use

XFT300KN.....$29.50

Wireless Wizard Transmitter

Rebroadcast VCR, Tape Recorders, Stereo to any TV or FM Radio

- Eliminates Wires & Cables
- Wide Band Operation • 70-130 MHz

RWM3KN.....$24.50

Tracking / Beeper Transmitter

For Homing & Tracking up to 3 Mi

- Works with any FM radio • 70 - 130 Mhz
- Use for Hunt Games, Vehicles, Animals, etc. **HOD1KN**.....$24.50

High Voltage 50,000 VDC Lab Supply

- Sub Mini Design
- Universal Battery/12VDC/115VAC oper.
- Many HV applications and experiments

HV50N Ready to Use $149.50

Build a Handheld Ultrasonic Blaster for Self Defense

Phasor Pain Field for Property Protection or High Powered Animal Control System. Many uses. Inlcudes high efficiency transducer. **ULDR1KN** $39.95

Laser Window Bounce Listener

Aim at room window and listen to sounds from within using reflected light. *Caution - Not for Illegal Use!* Includes ready-to-use 5mw laser gun sight and long range laser receiver kit. **# LWB3KN**.....$149.50

Ion Ray Gun

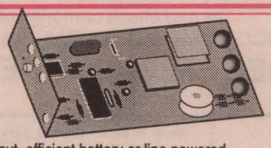
Projects charged ions that induce shocks in people and objects without any connection! Great science project as well as a high tech party prank!

IOG30N Ready to Use $99.50

Higher Powered Lab Version:

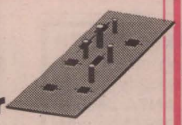
IOG7KN Kit $99.50
IOG70N Ready to Use $149.50

Universal High Voltage Power Supply Module



Self adjusting, current limited, switching, high output, efficient battery or line powered, Intended for capacitor charging when used with pulsed lasers, magnetic guns, plasma pyrotehcnics, etc. Includes triggered spark gap switch for high energy pulse applications. Many lab and R&D uses. Easy to assemble kit. **HVPS1KN** $99.50

Super Sensitive Amplifier



- Hear an insect walk! • Hear through walls!
- Build a Long Range Parabolic Mike or Super Directional Shotgun Mike!

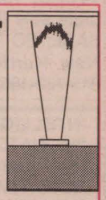
AG7KM Kit $29.95

World's Smallest Tesla Coil

Neat little device will light a 40W fluorescent lamp without contact, yet is smaller than a pack of cigarettes. Many interesting applications. 12VDC or 115VAC.

BTC2N Kit $29.95

Jacob's Ladder



Visual display of plasma pyrotechnics. 3" arc travels 30° from top to bottom. Unique solid state 12KV transformer, safety shutdown. Req's wood enclosure and readily availble hardware.

JKC1KN 12KV Transformer $74.50

Build a Stun Gun, Flame Thrower...

....Pulsed Shocker, ignitor, etc. Electronic Module Kit. **PSHK1KN Kit** **$29.50**

Shocker Force Field/ Vehicle Electrifier

Neat device - Make hand and shock balls, shock wands, electrify objects, charge capacitors. Great payback for those wise guys! **SHK1KN EZ Assembly Kit $24.50**

Electronic Hypnosis

Puts subjects under control using highly effective electronic stimuli. Intended for entertainment- Must be used with caution. Includes valuable text book reference and plans. **EH2N Plans and Text Book.. .$19.50**

Tesla Coil

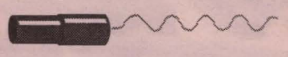
10 to 14" Streamers!

- Wireless Energy
- Plasma Pyrotechnics
- Corona / St Elmo's Fire
- Lightning

Torioid Terminal Optional

BTC3KN Kit.....$299.50

Body Heat Telescope



Detects the presence of living bodies, warm and hot spots, insulation leaks, etc. Use for security, law enforcement, R&D, etc. Dual mode operation.

BHTIKN Kit $99.50

Ultrasonic Cleaner Kit

Cleans PC boards, jewelry, coins, small parts,. Large capacity hopper, operates at 30KHz from 115VAC. **ULCL1KN**..... $79.50

1000 Ft++ Spud Cannon

NOT A TOY. Uses electronic or piezo ignition. CAUTION REQUIRED!

POT1 Plans.(Dangerous Product) $10.00

FireBall Gun

Shoots flaming ball - two shot capacity. Great for special effects and remote fire starting. CAUTION REQUIRED!

FIREBALL Plans (Dangerous Product) $10.00

NEON License Frames

Easy to install, high brightness units. Available in purple, green, or pink. Specify color when ordering. *While They Last!*

LICN (specify color) $19.50

See in Total Darkness

- Includes laser illuminator kit
- Light amplification • With camera adapter
- Hi quality optics • Viewer Ready to Use!

NVW10N with Laser Kit..... $395.00

Mystery Levitating Device!

Remember War of the World? Objects float in air and move to the touch. Defies gravity, amazing gift, conversation piece, magic trick or great science project.

ANT1KN Easy to Assemble Kit $19.50

Extended Play Tel. Taping System

Automatically records both sides of a call. CAUTION: check local laws for alerting beeper requirements. Ready to use with X4 recorder. **TAP40XN** $84.50

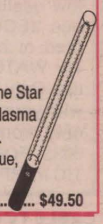
Mind Machine

Create Spectacular Hallucinations!

- New Technology Utilizes *Electro-Brainwave Coherence!*
- Uses No Drugs! • Must be over 18

MIND1N Plans $10.00

Plasma Neon Fire Saber



Active energy field produces the Star Wars effect, visible length of plasma field controlled by grip contact. Choose your color: Photon Blue, Neon Red, Phasor Green or StarFire Purple. **FS2KN** $49.50

Plasma Pen

Etch and write with the burning fire of electronic plasma! For FUN and PROFIT!

- Pen Sized - Easy to Use
- Baggage and Identification
- Create Spectacular Designs

writes!

PLPEN10N $29.50

SUPER VALUE! 3 for 1 HIGH PERFORMANCE Home Surveillance Kits -

You Get ALL 3 for only $29.95!!!

Telephone Tape Recorder Switch
+ Long Range 2 mi+ Telephone Transmitter
+ Long Range 2 mi+ Voice Transmitter
= A GREAT DEAL! Order # COMBON ALL 3 UNITS $29.95

WOW!

INFORMATION UNLIMITED

Dept NV2, Box 716, Amherst, NH 03031
Phone: 603-673-4730 FAX 603-672-5406
MC, VISA, COD, Checks accepted Please add $5.00 Shipping & Handling

CATALOG! With many more items! FREE with Order or send $1 P&H

Order by Mail or by 24 Hour Orders-Only Phone
800-221-1705

Write in 107 on Reader Service Card.

PRIME ELECTRONIC COMPONENTS, INC.

150 West Industry Court, Deer Park, NY 11729

(ABSOLUTELY NO WALK-IN SALES)

516-254-0101 • FAX 516-242-8995

EPROM & CPU/MPUs SOCKET PULLS

2516	$0.65 Ea.	27C512	$2.65 Ea.
2532	$0.75 Ea.	27C64	$1.25 Ea.
27128	$1.45 Ea.	8087-1	$19.95 Ea.
27128A	$1.45 Ea.	8087-2	$14.95 Ea.
2716	$0.65 Ea.	8087-3	$12.95 Ea.
27256	$1.90 Ea.	8088-2	$3.95 Ea.
2732	$0.75 Ea.	8741	$3.95 Ea.
2732A	$0.75 Ea.	8742	$4.95 Ea.
27512	$2.40 Ea.	8748	$4.95 Ea.
2764	$0.95 Ea.	8748H	$5.50 Ea.
2764A	$0.95 Ea.	8749	$5.95 Ea.
27C010	$3.95 Ea.	8749H	$6.50 Ea.
27C020	$4.95 Ea.	8751	$8.95 Ea.
27C100	$3.95 Ea.	8751H	$9.95 Ea.
27C1001	$3.95 Ea.	8752	$13.95 Ea.
27C101	$3.95 Ea.	8755	$6.95 Ea.
27C1024	$2.95 Ea.	All parts and socket pulls must be cleaned and erased. Note: Speed selection available at additional charge and subject to availability.	
27C210	$4.95 Ea.		
27C256	$2.25 Ea.		

All DRAMS are clean socket pulls and have full leads.

4164-15	$0.18 Ea.	41256-15	$1.00 Ea.
4164-12	$0.25 Ea.	41256-12	$1.25 Ea.
		41256-10	$1.35 Ea.

NEW 14" SUPER VGA PAPER WHITE MONOCHROME DISPLAY

Made by Tatung. 640x350 to 1024x768 Interlaced VLMF Rated/Model #MM14SAE. Excellent Low-Cost Mono Monitor.

MM14SAE 14 Mono ..... $59.95 Ea.

NEW PCMCIA 2.5 MEG FLASH MEMORY CARD

SOLD OUT

Made for IBM b... with any laptop with PCMCIA AT... face & software drivers. (**Software ... not included**)

TPF-2.5MB REV (2 for $99.95) ..... $59.95 Ea.

NEW MITSUMI 1.2 MEG 5-1/4" FLOPPY DRIVE

5-1/4" half height Mitsumi
Model #D509V2 White face plate only.

Mitsumi 1.2M FDrive ..... PRICE REDUCED $28.95 Ea.

NEW IBM ENHANCED 101 KEYBOARDS

IBM Enhanced 101 Keyboards with PS/2 Style Cable (6 pin Mini-Din). Great IBM Click. IBM P/N 59G7980. Limited quantity available.

Model #59G7980 ..... $49.95 Ea.

NEW VICTOR/HONEYWELL ENHANCED 101 KEYBOARD

4 ft. coil cord with PS/2 type 6 PIN MINI DIN connector. AT and XT DIP switch selectable

Model #101WN ..... $24.95 Ea.

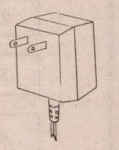
OEM VERSION QAplus DIAGNOSTIC SOFTWARE

Great for analyzing system problems & performance. Version DEC4.63 for 286 thru 486 systems

OEM QAPLUS ..... $14.95 Ea.

WALL PLUG WALL ADAPTERS

Input: 117 Vac 50/60 Hz. Outputs Available.



Quantity Pricing Available

6Vdc 400Ma	$2.00 Ea.
9Vdc 200Ma	$1.50 Ea.
9Vdc 300Ma	$2.50 Ea.
9Vdc 450Ma	$3.50 Ea.
9Vac 500Ma	$2.95 Ea.
9.5Vac 750Ma	$3.50 Ea.
12Vdc 100Ma	$1.25 Ea.
12Vdc 200Ma	$1.50 Ea.
12Vdc 500Ma	$2.95 Ea.
12Vdc 600Ma	$3.95 Ea.
12Vdc 800Ma	$6.95 Ea.
12Vac 830Ma	$4.95 Ea.
14Vdc 500Ma	$3.50 Ea.
14Vdc 700Ma	$5.95 Ea.
16Vdc 1.2Amp	$6.95 Ea.

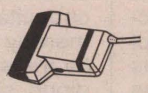
NEW 80486SX-25 BABY MOTHERBOARDS

Supports up to 32MB of RAM on-board. 256KX9/1Megx9/4Megx9/(80NS) 30 Pin type SIMM Five 16 Bit Slots and One 8 Bit Slot, AMI BIOS/Supports loadable hard drive parameters 720K/1.2Meg/1.44Meg/2.88Meg (with proper controller) 8K Internal cache only. 486SX-25 Baby Motherboard (CPU included)

(0-K RAM) ..... PRICE REDUCED $89.95 Ea.

NEW NISCAN/GS PLUS OCR/256 GRAY SCALE SCANNER

Brand New True 256 Gray Scale Hand Scanner. Resolution: 25-400 DPI.
Scan Width: 4.2 In. Scan Length: 11 In.
Interface: 16 Bit high speed (ISA) card, 64K SRAM.
System Requirements: 286/386/486 PC Compatible (16MHz), Available 16-Bit Interface slot, Windows 3.1, 4 Meg RAM, 10 Meg of Available HD space (Min.), Mouse or Other pointing device.



Software Included: Picture Publisher LE 3.1, (Imaging Software), Perceive Personal 2.1, (OCR Software)

Niscan/GS Plus ..... $69.95 Ea.

USED 150MEG SCSI TAPE BACK-UP DRIVE

Pulled from working equipment 150Meg SCSI Cipher P/N ST150-II. 30-Day Guarantee. 5-1/4" Half Height, off-white color faceplate. Interface: SCSI/1, 50 Pin.

Cipher ST150S-2 ..... $49.95 Ea.

NEW 160 MEG 2.5" AT HARD DISK DRIVE

Great for Laptop replacement. Logical format 966 Cyl, 10 Heads, 34 Sect. Check your BIOS. 17ms/+5VDC 1 Amp Max. 90-Day Guarantee. 2 1/2" x 3/4" Height (44 Pin Connector).

Quantum GRS160 HD ..... $109.95 Ea.

USED 1.44 MEG FLOPPY DISK DRIVE

Pulled from working equipment 1.44 Meg 3.5" in 5-1/4" mounting bracket. 30-day guarantee. 5-1/4" Half Height, off-white color face plate. Interface: 34 pin & 4 pin power.

Sony MP-F17W-70D ..... $19.95 Ea.

USED 80 MEG 3.5" SCSI HARD DISK DRIVE

Pulled from working equipment. 80 Meg SCSI Quantum P/N ProDrive 80S. 30-day guarantee. 3-1/2", 1/3 Height (1-5/8"). Interface: SCSI/2, 50 pin.

Quantum 80S SCSI ..... $49.95 Ea.

NEW SQUARE EQUIPMENT FANS

115 Vac 3.1" or 4.7"	$7.95 Ea.
12 Vdc 3.1" or 4.7"	$6.00 Ea.
12 Vdc 2-3/8"	$4.95 Ea.
12 Vdc 2-5/8"	$6.00 Ea.

NEW PANASONIC 360K 5-1/4" FLOPPY DRIVE

5-1/4" half height Panasonic M# JU-455
Black face plates only.
P/N: JU-455 ..... $9.95 Ea.

NEW 112W BABY SWITCHING POWER SUPPLY

Input: 120-220V, 50Hz/60Hz, UL & CSA
Output: +12Vdc @ 4 Amp., -12Vdc @ 0.3 Amp. + 5Vdc @ 12.5 Amp., -5Vdc @ 0.3 Amp.
Model #PS2682L Nichimen ..... $14.95 Ea.

NEW 200W BABY SWITCHING POWER SUPPLY

Input: 120V-220V, 50Hz/60Hz, UL & CSA
Output: +12 Vdc @ 8 Amp, +5 Vdc @ 22 Amp -5 Vdc @ 0.5 Amp, -12 Vdc @ 0.5 Amp
Model #SA201-3440 Astec ..... $24.95 Ea.

NEW AA HIGH CAPACITY NI-CAD BATTERY

1.2Vdc 800Ma/Hr. Charge Rate 15 Hours @ 80Ma. Manufacturer Kenwood/Batteries have nippled end.

Kenwood NB-88 (KR-AA)	$1.75 Ea.
Kenwood NB-88 (KR-AA) 4 or more	$1.50 Ea.

NEW PS/2 NOTE (N51) LAPTOP NI-CAD BATTERY

10.8VDC 1.2A/Hr. IBM P/N 07G1753

N51 Battery ..... $34.95 Ea.

USED ADAPTEC 1540A ISA SCSI-2 CARDS

Pulled from working equipment. The Adaptec's first generation 1540A SCSI-2 ISA BUS card. Includes 2 Device 50 Pin SCSI cable. (NO Software) (No Floppy support) 30-Day Guarantee.

ADPTEK 1540A ..... $34.95 Ea.

USED 150 MEG SCSI TAPE BACK-UP DRIVE

Pulled from working equipment 150 Meg SCSI Wangtek P/N 5150 ES. 30-Day Guarantee 5-1/4" Half Height, Off-white color face plate. Interface: SCSI/1 50 Pin.

WANGTEK 5150ES ..... $74.95 Ea.

NI-CAD BATTERY

Varta Cordless phone Ni-Cad battery 3.6V 280Ma/H Charge Rate: 14 Hours @ 28Ma

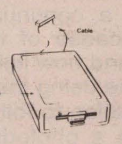
Model #3/V280R ..... $2.75 Ea.

PADDED LAPTOP NYLON CARRYING CASE

Features two zippered sections. First for laptop and second for charger and/or accessories. Includes detachable shoulder strap. Holds most laptop computers. Exterior (Fully packed) 12"H x 12.5"W x 5"D.

Laptop Case ..... PRICE REDUCED $19.95 Ea.

NEW EXTERNAL 3-1/2" 720K FLOPPY DISK DRIVE



Made by Tandy for Tandy 1000EX Computer. Unit enclosed with cable for hook-up. Drive inside is a Teac Corp. Model #FD-35 FN-10-U. Color: White

Tandy Model #25-1061 ..... $24.95 Ea.

WIRE TIES

4" Black Plastic, Packs of 100 ..... $1.00

NEW SYTOS PLUS (TAPE BACK-UP SOFTWARE)

Works with WangDAT DAT/130/320 or Wangtek 150/525/1GB in a MS-DOS environment supporting Adaptec Host Adapters. 5.25 & 3.5 disks supplied. (Will work with other tape back-up if you get configuration file from Sytron.) (Sytron BBS 508-898-2608 Conf. Files.)

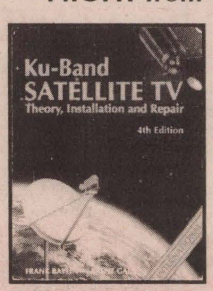
Sytos Plus Ver. 1.32 ..... $17.95 Ea.

We buy all defective Memory Boards/Modules from IBM, as well as computer scrap. Please contact Mr. Wiley Burke.

SATELLITE TV from 18 INCH DISHES?

PROFIT from the small dish revolution now upon us!

Ku-band Satellite TV "Bible"



- Operation, installation and troubleshooting of Ku-band satellite systems
- Footprint maps and video standards
- and much more

TO ORDER – Send $30 plus $4s/h to Baylin Publications 1905 Mariposa, Boulder, CO 80302

–CREDIT CARD orders accepted– TEL:303-449-4551 FAX:303-939-8720

432 pages, 8.5 x 11"

CALL 800-483-2423

FREE CATALOG of books, videos and software on *Satellite Television, MMDS & SMATV*

REMOTE VIDEO SYSTEMS

NEW CAMERAS
Series 65 B/W, Reduced $ 125.00
PINHOLE-Special at only $ 145.00
Color cameras, 2 to choose from: Low LUX (2L) low power @ $325 or Small size (20lux) higher power @ $275.
MEMBER R.C.T.V. ASSOC.

UNDERWATER
SVS Series Dn. to 100 ft. 1.8"dia. x 2.4"(L) cbl xtra
SVS 60: $ 489.00
SVS 1: $ 459.00
25' std, 50-100 add $

TRANSMIT VIDEO TO ANY TV

Our MiniLink II™ 2.4GHz transmitter and receiver are all you need to *legally* transmit audio-video (B/W or color) to any TV set. FCC approved Range: 500' up to 1* mile. Trans: $640; Receiver: $770.w/std ant. *With optional add on antenna. Patch Ant. $139, Dish $156.

CALL TODAY FOR FREE CATALOGUE

MICRO VIDEO PRODUCTS

Orders: (800) 473-0538 FAX (714) 847-4486 Tech. info: 714 842-4648
16201 Osborne St. Westminster, Ca. 92683 *Satisfaction Guaranteed*

Write in 98 on Reader Service Card.

THE SOLDERLESS BREADBOX

by Donald Wilcher

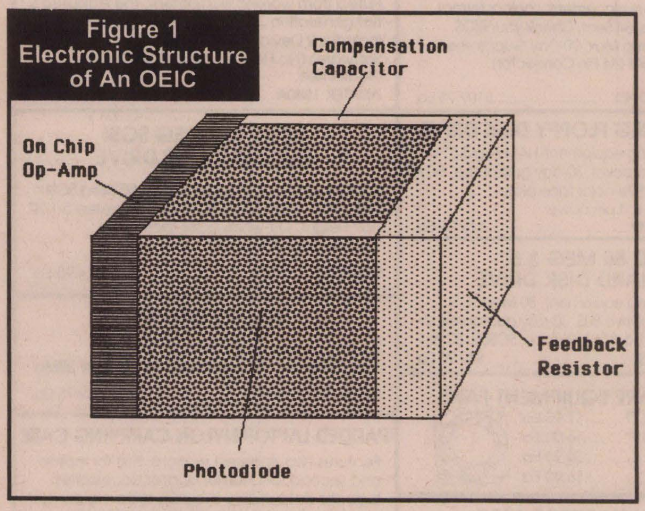


Figure 1
Electronic Structure of An OEIC

Experimenting With Optical Electronic Integrated Circuits

This column is a continuation of last month's subject because of the topics of light, photodiodes, and how light measuring devices can be made using those two components. The discussion to follow will focus on how to combine a photodiode with an operational amplifier to create an optical electronic integrated circuit (OEIC). This integration of a light detector on an op-amp is quite unique because the only external part count required for the IC is a voltage bypass capacitor. With this feature, small light detecting devices and sensors can be created for all kinds of hacker inventions. Several applications that come to mind for this chip are proximity sensing, light curtains, wireless burglar alarms, photometers, an optical counter, and an optoisolator. In the paragraphs to follow, we will explore the inner workings of OEICs in terms of its electronic structure and the physics behind its light sensing operation. And, as usual there will be plenty of hacker circuits to construct and experiment with. So, without further delay, let's take a look at an OEIC's electronic structure.

An OEIC's Electronic Structure

An OEIC is made up of a photodiode and an op-amp sandwiched into one small package. The fabrication of an ordinary photodiode is made by a bipolar semiconductor process. However, for an OEIC's photodiode, it is fabricated in a dielectric process in which all active circuit components are separated by a wall of silicon dioxide that is 1000 um (micrometers) thick. This fabrication process makes combining a PN photodiode and a FET op-amp on the same chip possible. Both the 1Meg feedback resistor and the quiescent current values are laser trimmed to maintain the IC's circuit accuracy. Figure 1 shows the structure for an OEIC. Another unique feature of this chip is the size of the photodiode, plus the speed of the op-amp determines the speed of the chip's optical system. The photodiode is large enough to just maximize the signal-to-noise ratio (SNR). If the OEIC is uniformally illuminated, the signal increases in proportion to the area of the photodiode's die. The addition of noise is caused by the

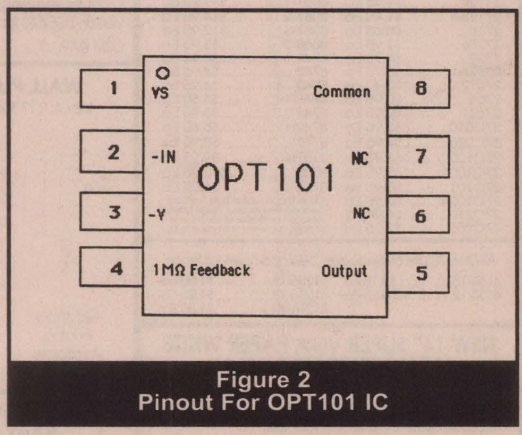


Figure 2
Pinout For OPT101 IC

increase in the photodiode's size and is a direct relation to the function of the square root of its capacitance. However, the noise of the amplifier is independent of the photodiode's size. The noise contributed by the feedback resistor will decrease for lower gain, because it can decrease proportionately to the photodiode's size. Also, a large photodiode area makes it possible to keep the optical beam as wide as possible. The wide beam reduces the required accuracy of the optical system making the overall cost of the system less. The disadvantage of increasing the photodiode size is that its capacitance increases linearly with size, thereby reducing the speed of the system by the square root of the increase in photodiode size. A typical package size for an OEIC's photodiode is 2.29 mm by 2.29 mm, the largest that will fit with an op-amp and

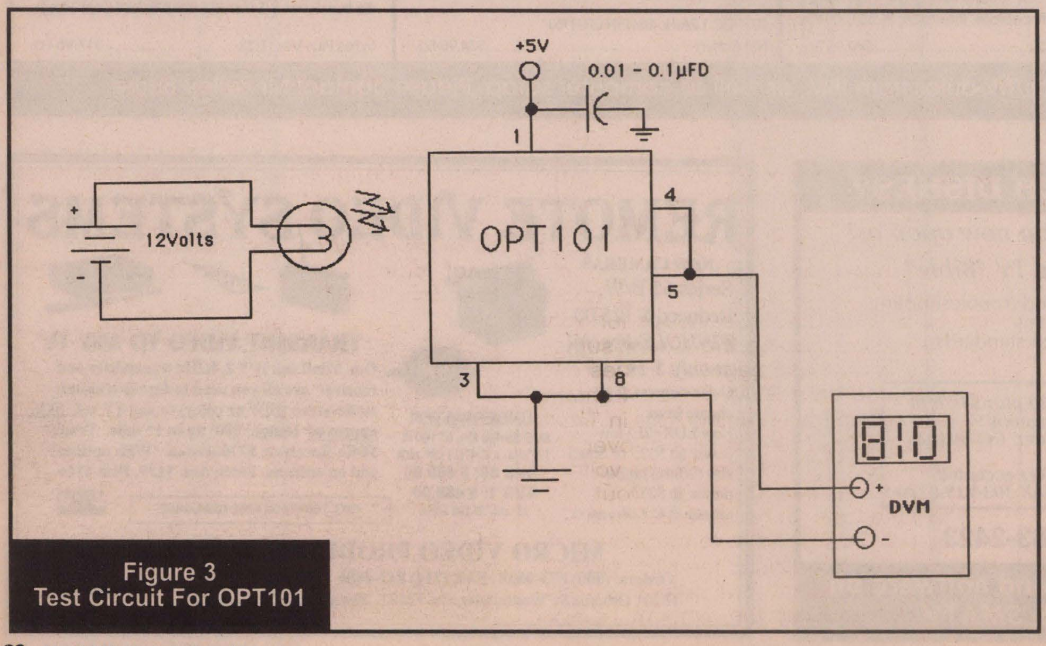


Figure 3
Test Circuit For OPT101

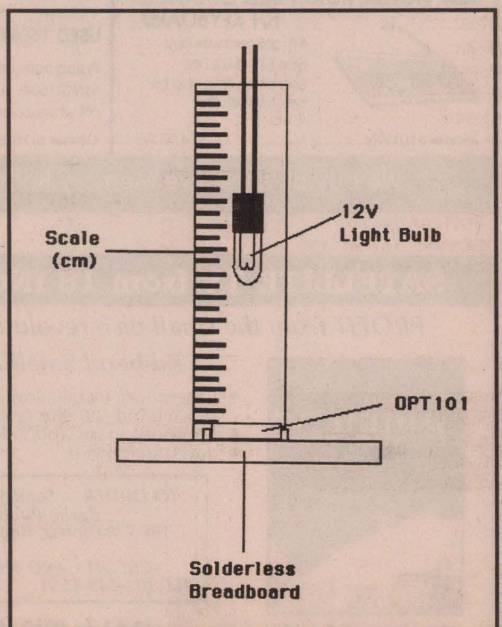


Figure 4
Test Setup For Obtaining Data In Table 1

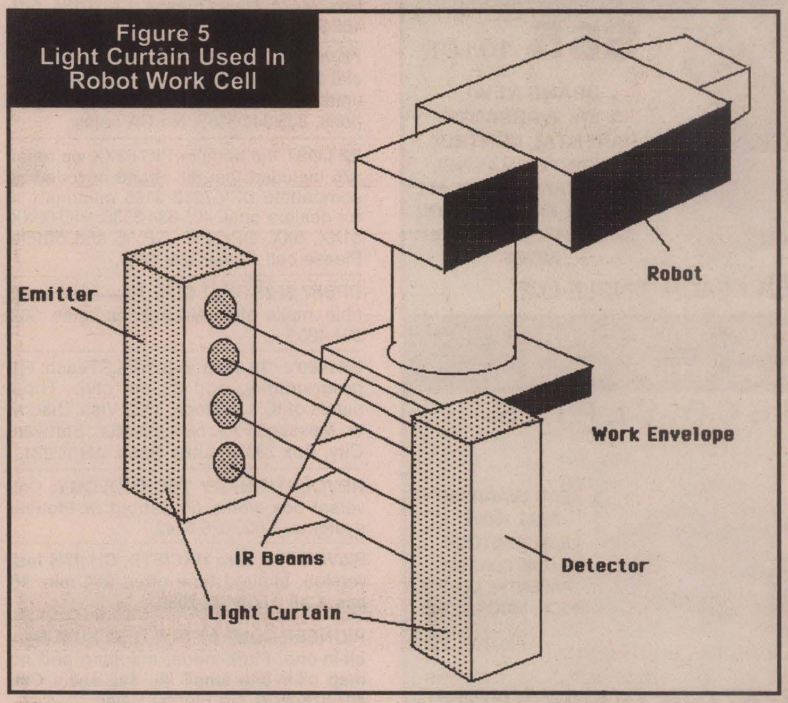


Figure 5
Light Curtain Used In Robot Work Cell

cm	Vout (mv)
0	-297
2	-114
4	-64
6	-36
8	-23
10	-17
12	-13.5
14	-11.0
16	-9.3
18	-8.0
20	-7.0

Table 1
Data Obtained From OPT101 Test Circuit In Figure 3

resistor in a standard 8 pin DIP package. One thing to keep in mind when designing OEICs is noise equivalent power (NEP). NEP is the amount of light that must fall on the photodiode to generate equivalent electrical noise at the output. NEP is a combination of the dark current of the photodiode amplifier noise, resistor-generated noise, and input capacitor noise peaking. Now that OEIC's electronic structure has been explained, let's take a look at an actual device. We will begin the discussion by describing an OEIC that is manufactured by BURR-BROWN. This talk will then lead into some hacker experiments to perform.

BURR-BROWN's OPT101 OEIC

BURR-BROWN's OPT101 OEIC is a photodiode and op-amp chipsandwich. The photodiode is monolithic and the op-amp is transimpedance. The amplifier is designed for single or dual power supply operation, making it ideal for battery operated equipment. The combining of the photodiode and transimpedance amplifier on a single chip eliminates the problems commonly found with discrete designs such as leakage current errors, noise pick-up, and gain peaking due to stray capacitance. The 0.09 x 0.09" photodiode is operated in the photoconductive mode for excellent linearity and low dark current. The OPT101 operates over a wide supply range (+2.7V to +36V) and supply current is only 120uA (microamperes). It is packaged in a transparent plastic 8 pin DIP or 5 pin SIP (single in-line package). The temperature range for the IC is 0 degrees to 70 degrees Celsius. Figure 2 shows the pin out for the 8 pin package.

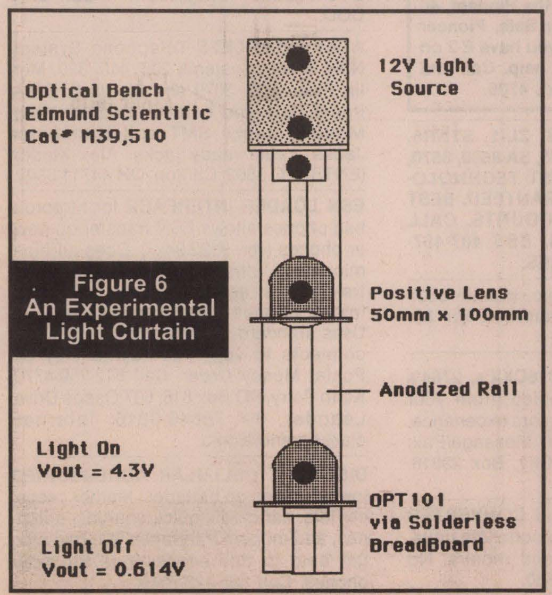


Figure 6
An Experimental Light Curtain

OPT101 Experiments

We have now reached the point where to truly appreciate the OPT101's capability, some experiments must be tried. So, we will start off our investigation by measuring the output voltages relative to the amount of light shining on the IC. Figure 3 shows a test circuit for the OPT101. As mentioned in the introduction, the external capacitor is the only component that is wired to the IC. By tying pin 4 to 5, this connection establishes the gain/sensitivity to the circuit. Pins 8 and 3 are for the grounding circuit of the chip. Table 1 shows output voltages measured with varying light bulb distances. The interesting thing about this data is the negative values for voltage. By disconnecting the power supply from the chip, these negative values can be measured on a DVM. Figure 4 shows the test set-up for obtaining data in Table 1. If a cardboard tube is placed over the powered up OPT101, the output voltage measured on the DVM is about 0V. Without the tube, the chip registers a -2.7 mV value. This positive to negative voltage value demonstrates the NEP characteristic of the chip. The effect is minimized by reducing the amount of light falling on the chip. I used a lens assembly made from the POLY-OPTICON kit instead of tubing, but the results should be the same.

Experimenting with a Light Curtain

Using the OPT101 circuit already constructed, an experimental light curtain can be built. A light curtain is an optical switch used to provide safety for operators working around industrial machinery. If the invisible beam of light (Infrared) is broken, the machine stops dead in its tracks. The switching device consists of an emitter/detector pair arranged where the two components are mounted outside of the work envelope of the machine. The emitter transmits an IR beam to the detector, thereby allowing the machine to run continuously. The light curtain controls the machine's operation by use of a relay. Light curtains come in varying lengths and use several emitter/detector pairs which create a "curtain" of IR beams. Figure 5 shows a typical light curtain device and how it is mounted in a machine's work envelope. The diagram in Figure 6 shows the set-up for an experimental light curtain. An optical bench is used to mount the light source (emitter), the lens, and the OPT101 IC (detector). With the light beam hitting the photodiode die of the OPT101, the measured output is approximately 4.3V. By placing a hand between the lens and the IC, the output signal drops to approximately 0.614V. This digital output signal can then be tied to a relay for controlling other electromechanical loads.

Further Thoughts and Experimentation

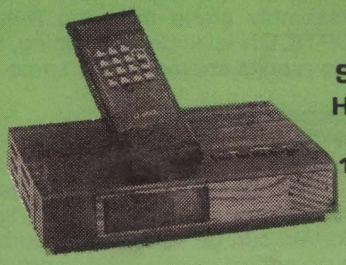
The light curtain project just discussed can be used as an electronic sensor for an optical counter. The digital output signal would be connected to a DCU (Digital Counting Unit) without the use of a signal conditioning circuit. Also, an optoisolator circuit can be constructed by using a switch tied into the light bulb circuit thereby separating or "isolating" 12V from 5V. Note: This arrangement is necessary where protection from high input voltage is not allowed when designing TTL circuits. Experiment with the circuits described and see if you can create other applications for this unique device. Enuf said, see ya next month in the breadbox !! **NV**

Resources

To order the OPT101 from BURR-BROWN, call them at (602) 746-1111. The Optical Bench used in the light curtain project can be purchased from Edmund Scientific Company. They can be reached at (609) 573-6250.

YOU HAVE SHOPPED THE REST NOW BUY FROM THE BEST!

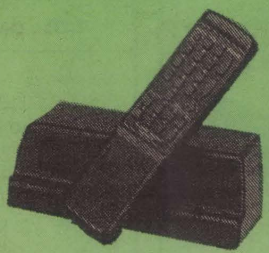
JERROLD 400 DRX-105



$35 50+

SINGLE $49.95
HAND CONTROL
INCLUDED
1 YEAR WARRANTY

REGAL 550 MHZ



$65 10 LOT

BRAND NEW!
5 YR. WARRANTY
PARENTAL CONTROL
FAVORITE CHANNEL
LAST CHANNEL RECALL
WE WILL PROGRAM HRC, 99 CH, WHATEVER YOU NEED!

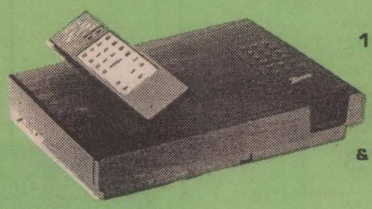
$75.00 EACH SINGLE LOT

CALL NOW FOR THE INFO ON THE LATEST TECHNOLOGIES FOR:
BASEBAND. PIONEER. ZENITH. IMPULSE. ETC.

REGAL CR83

$59
EACH SINGLE LOT
83 Channels
Last Channel Recall
PARENTAL CONTROL, ETC.
DUAL A/B INPUT AVALABLE

ST 1600 SERIES



1 YEAR WARRANTY
CALL NOW
LIMITED STOCK
VOLUME CONTROL
PARENTAL L/O
& MUCH, MUCH MORE!

BEST WARRANTY IN THE BUSINESS!

COMBO PACKAGES

ALL EQUIPMENT "BULLET PROOF"
DRX-3-105 w/PIO. VER 4.0.....$149
DRX-3-105 w/TV GOLD.....$109
DRX-3-105 w/SA-3.....$119
DRX-3-105 w/M-80.....$149

BOSS II, PIONEER, ZENITH, BASEBAND, S.A., AND MORE!

!!5 LOT DEALS!!
DRX-3-105.....$45
SA-3.....$45
STEALTH.....$49
TVT-GOLD.....$42
M-80.....$75
PIONEER ver. 4.0.....$69
MIX OR MATCH MUST BUY CONVERTERS TO QUALIFY.

J.E.S. INC.
1-800-676-7966
ORDER NOW TOLL FREE!
VISA MasterCard

It is not the intent of J.E.S. Inc. to defraud cable systems. Users are advised to check local and Federal Laws.

!!GET YOUR BEST PRICE AND THEN CALL US!!

NCCA
Member of the National Consumer Cable Association

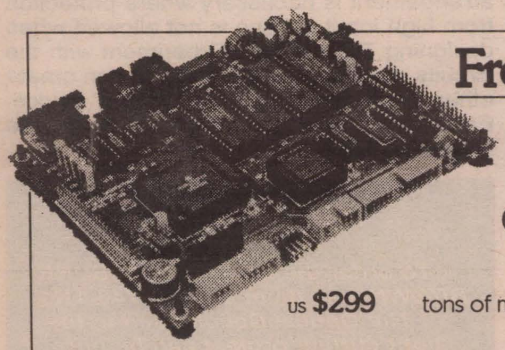
Write in 99 on Reader Service Card.

#110 CABLE TV *cont.*

SCIENTIFIC ATLANTA 8580, $160; Quick board for 8600, 8580, 70, 50, $35; 8500, $10. 313-482-6958.

UNIVERSAL DESCRAMBLER. Unscramble signals using your VCR as the tuner. Works with virtually any system, this is the only one you need. Declare cable box independence! $129.95 + $5 S&H. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

TECHNICAL DATA SHEETS on Baseband converter units starting with the DPBB210 Japanese version and ending with the CFT 2000 series. Covered also are the 3 versions of the V5 unit. Information consists of **Adjustment** data, **Channel 2** to channel 3 conversion, **Audio** problem units, **Audio** add on circuit data and **Schematic,** what units will work in **HAWAII** with slight modification, etc. **SCAN LINE ELECTRONICS,** 1101 Main St., Shenandoah, PA 17976. 717-462-2010. 10am to 6pm est.



Freedom 16

16 Bit Data Acquisition & Control System

Easy to use, fast, tons of memory, I/O & features

us $299

16.8MHz 68HC16 DSP capabilities
RS-232 & RS-485

34 digital I/Os (7 IRQ)
+ LCD/Keypad port
+ 8 ch 10b A/D

Affordable "C" compiler/library
RT clock available
Up to 256K ea. SRAM Flash EPROM

INTEC INOVENTURES INC. Phone: (604) 721-5150
2751 Arbutus Rd., Victoria, B.C. Canada V8N 5X7 FAX: (604) 721-4191

Write in 104 on Reader Service Card.

CONVERTER SA 8500-311, 320, 321, $65 E., 8530-330 & 320 $75, 8535-330 $80, 8550-331 & 321 $80, 8580-338 $100, 8590s $140, DP5 $85, DPV7 $120. All in stock + Panasonic, Zenith + + we do repair. 305-220-9384, FAX 305-220-9396.

YOUR WAY Electronics, Pioneer BA-51xx $200; Pioneer BA-63xx $250; We also sell test parts for the Pioneer, 40 pin $25, 8 pin $20. For Sale, Pioneer ESN Program $350. If you have E-2 on your BA-63xx, we can help. Call and save. 1-800-484-1780 ext. 4705.

CABLE TV TEST KITS. ZL-1, STAR6, STAR7, DPBB, DP5, DPV5, SA 8550, 8570, 8580, 8590, 8600. LATEST TECHNOLOGY, TESTED AND GUARANTEED. BEST PRICES, VOLUME DISCOUNTS. CALL TODAY 1-800-581-7974, BBS 407-467-9779. NO FLORIDA SALES.

DRX, DRZ-DIC, Panasonic, Hamlin $825 EPROM can be programmed for $5. Voice/FAX 405-691-0647.

ER1400's, 74S287's, PIC16CXX's, 2764's and hundreds more copied (from your original) for $2 each. 11 years experience. Money back guarantee. Message/Fax: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

REMOTE CONTROL and **CONVERTER ELIMINATION.** Parts and complete units. Sold as-is, and may need repairs. No Florida Sales. **407-676-2530.**

CABLE UNSCRAMBLED. Everything you want to know about Cable, but are afraid to ask. $10. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

PIONEER 6310 boxes. This month's special $250. Also low prices on other cable units and test aids. Magic Communications, 805-944-6865. No CA sales.

E2 LOST the number PIO-63XX we repair $75 included test kit. Brand new Jerrold compatible DPV-7212 $195 minimum 10 for dealers only. 405-634-3338. PIO-63XX, 61XX, 5XX, DP-5-310, DPV-5 and others. Please call. 1-year warranty.

DPBB7 $225 DPV7 $195. Raw units available, make offer. No Arizona sales. 602-254-4931.

ER1400's - $5 each. 74S287's $3 each. For programming add $2 per chip. Thousands of IC's in stock. M/C, Visa, Discover, Message/FAX: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

REVOLUTIONARY TECHNOLOGY: Universal box works on Jerrold or Pioneer systems. 1-800-676-6342.

R2/V5/CFT 1 wire HRC/STD. CH #3/4 fast version. Limited time offer. **$14 min. 10 pcs. Call 1-800-831-2050.**

PIONEER COMPATIBLE TEST KITS. New all-in-one. Multi-mode, mapping and no map all-in-one small kit. $25 each. Call 407-676-2530. No Florida Sales.

R2, V5 CTF test kit, now $30 each. Star7, DPBB, DPV, $15. Call 1-800-787-5001. Min. 5 per order.

TELEPHONE — FAX 115

A TO Z OF CELLULAR PROGRAMMING. Programming instructions on over 300 phones in a software database. Also back door and test mode across instructions for all the popular models; manufacturers contacts, system select, lock/unlock info. N&V special just $59.95. Call: 714-581-2121.

CELLULAR GOODIES includes literature, diagrams and secret codes for programming new and old Motorola phones, also many other brands. Complete package $24.95. ESS, PO Box 10986, Fort Wayne, IN 46855-0986 or E-Mail: BYDN38C@Prodigy.com. I can ship COD.

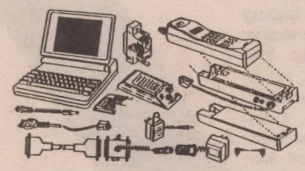
AT&T COMPLETE Telephone System. New. Merlin Systems 206, 410, 820. Merlin Plug 1030, 3070 and Merlin II. Other items new and current modular plug. Modular Jacks SMT and Harmonica Jacks, cable ready jacks. Alex Mastin (ENTS), PO 8802, Canton, OH 44711-8802.

ESN LOADER INTERFACE for Motorola bag phones allows ESN transfer on newer phones (ver. 9122-94xx). Does all flips, micro-tacs, ultra-lites, pocket phones, ultra-classics, series three and four bag, install phones $200, $200 amps also! Uses standard programming cables and connects to your PC. Payment by US Postal Money Order. Call 512-259-4770. Keith Perry, PO Box 816, 607 Osage Drive, Leander, TX 78646-0816. Internet: cia@paranoia.com.

DISCOUNT CELLULAR ACCESSORIES lowest prices on batteries, leather cases, car kits, car cords, quick charges, antennas, and modem interfaces. We can also get hard to find accessories for older phones. Call 305-428-7045.

OKI 900/AT&T 3730 and MITSUBISHI 800, 1500, 3000 ESN/NAM KEYPAD PROGRAMMABLE modifications. Enter ESNs ALL on KEYPAD and **CHANGEABLE** at **ANYTIME,** only $250. **SPECIAL** MOTOROLA ESN INTERFACE kit, w/G2 software or MPC software and custom firmware, $300. We also carry stand alone programmers, COPYCAT, MOTOROLA programming cables, ESN readers, sales, modifications and repairs. Call for new and refurbished cell phones and accessories. OKIROM chips (discontinued by factory), BLANK $25. Call, LVCC NATIONWIDE @ **702-894-3617**, CA sales **909-388-FLIP,** or FAX 702-242-4863. We ship same day UPS/FEDEX COD. Or mail order to 240 N. Jones Blvd. #122, Las Vegas, NV 89107.

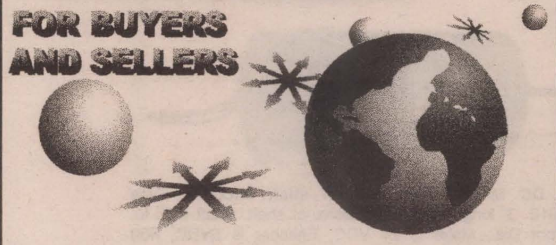
FAX SWITCH fully automatic. Connects your fax, phone, and answering machine onto a single line. $39.95 plus $5 UPS. Phil Spargo, 130 Dellbrook Ave., San Francisco, CA 94131 or call 415-641-9346 between 6:00-8:00 pm PST.



UNION JACK'S©, MOTOROLA CELLULAR PHONE, AMPS/NAMPS REPROGRAMMING SYSTEM (FOR BRICK-UC, FLIP & BAG PHONES). UJMP-1 SOFTWARE SET, 4 3.5" 1.44MB DISKS, MFDP-1: Programs firmware below 9122s without a loader phone, **MFDP2:** Programs firmware 9122 to 9340 with a loader phone (FLIP-BRICK OR BAG, having a firmware below 9122) **FDP3 & 4** are a conglomeration of Cellular cloning etc., information. 60-page illustrated programming manual also included. **FREE technical backup & yearly updates.** 4-DISK SOFTWARE SET **UJMP-1 $199.95 COMBINATION OFFER (A), SAVE $50, COMPLETE RE-PROGRAMMING SYSTEM $419.95, CONSISTS OF 1 SET UJMP-1 $199.95, 3 TYPES MOTOROLA COMPATIBLE, COMPUTER PROGRAMMING CABLE HARDWARE SETS, 1-6PCs-CSFP** FOR FLIP-POCKET PHONES **$99.95, 1-3PCs-CS689/UC FOR BRICK/ULTA CLASSICS $99.95** AND **1-3PCs-BP** FOR BAG PHONES **$69.95. *PRICES:** Computer and Cellular loader phone not included. **S&H: UPS COD CASH ONLY, 2ND DAY AIR $12. FREE 2 PAGES OF ADDITIONAL INFORMATION & COMBINATION PRICES, AVAILABLE BY MAIL OR FAX. CALL LES, 702-642-0325,** 2039 CIVIC CENTER DRIVE #176, N. LAS VEGAS, NV 89030.

CELLULAR HACKERS BIBLE VOLUME 2 Completely new material on cellular hacking! Covers: NAM format maps/reverse voice channel hacking/RVC & FOCC message/unit ID code hacking/SID/control channel frequencies/reverse scanning/Mitsubishi M800 modifications/data stream encoding/control channel signaling/qualification codes/central office codes/40-50 MHz television tuner hack/ESN codes/ESN/MIN scanning hack. PLUS!!! software to program Motorola, Nokia, NEC, Radio-Shack, Panasonic, and Mitsubishi phones! WOW! All this and much more. $79.95 PPD. Specify 1.2/1.44Mb. CELLULAR PROGRAMMERS BIBLE 250+ programming instructions, $54.45. **BAGPHONE VIDEO BIBLE,** New video shows and tells ALL about Radio-Shack bagphones. Covers: ESN/cloning/resurrecting "dead phones"/Checksums/security/covers R-S and Nokia phones, $39.95. **VISA/MC**, 602-782-2316 or **FAX** 602-343-2141. **TELECODE**, PO Box 6426-NV, Yuma, AZ 85366-6426.

THE GLOBAL DATABASE FOR BUYERS AND SELLERS



The World's Classified Ads For Used Hi-tech Equipment And Components

BUY, SELL, RENT, TRADE, WANTED

Updates Daily - Easy to Use - Fast - Convenient

All Types Of Used Equipment "FOR SALE" By :

Dealers Universities
Corporations Individuals

TECNET

You Can Reach Us On The INTERNET :
Telnet to TECNET.COM
Email to POSTMASTER@TECNET.COM
LOGIN FOR FREE DEMO 800.297.2483 / 407.876.4092
VOICE 800.774.0996 / 407.876.6226 FAX 407.876.6339
TECNET P.O. Box 1509 Windermere Florida 34786 USA

Write in 105 on Reader Service Card.

When Visiting Disney World And Sea World.
Come To The World Of Electronic Surplus!

SKYCRAFT
PARTS & SURPLUS, INC.
ORLANDO, FLORIDA

Located At The Intersection Of I-4 And Fairbanks Avenue.

A Self-Service Retail Outlet Featuring Commercial And Government Electronic Surplus Including:

- ★ WIRE
- ★ SWITCHES
- ★ RESISTORS
- ★ TRANSISTORS
- ★ TRANSFORMERS
- ★ TEST EQUIPMENT
- ★ NI-CAD BATTERIES
- ★ COAX
- ★ RELAYS
- ★ HARDWARE
- ★ CAPACITORS
- ★ PANEL METERS
- ★ CIRCUIT BOARDS
- ★ INTEGRATED CIRCUITS

★ ★ ★ ★ ★ ★ ★ ★ ★

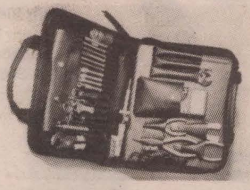
We Buy Surplus Electronic Parts — *FAX your list.*

HOURS:
Monday - Friday 8:30-6:00
Saturday 8:30-5:00

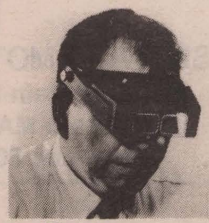
FAX 407/647-4831
PH 407/628-5634
P.O. BOX 536186
ORLANDO, FLA. 32853-6186

FOR THE BEST PRICES ON PROFESSIONAL TOOLS, CALL ELECTRO-TOOL

platt – Case – Deluxe Polypropylene. Chemical Resistant. Tools by CooperTools and others. 800T Case, complete with tools . . . **$389.99**
800T Case Only. . . **$114.80**

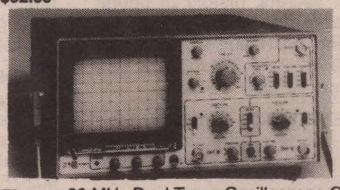


platt – Case – Cordura Exterior. Two exterior pockets & one literature pocket. 660ZT Case, complete with tools . . . **$208.00**
660ZT Case Only. . . **$57.40**
Optional Sperry meter #DM6510 as shown . . . **$63.95**



Weller WCC100- Electronically controlled station, temperature adjustable from 350°F-850°F, Zero voltage circuit-safe for sensitive components, 40 Watt pencil . . . **$92.00**

OptiVISOR – Superior magnification, Optical Glass Prismatic lenses, (not plastic) Select any one of (6) magnifications . . . **$22.50**



GoldStar – 20 MHz Dual Trace Oscilloscope OS-9020A-Large 6" rectangular, high sensitivity: 1mV/div, high accuracy: ±3%, stable, low-drift design, 8 divisions of displayed dynamic range and accurate, distortion-free waveform measurements . . . **$370.80**

Electro Tool, Inc.
9103 Gillman, Livonia, MI 48150
Customer Service: (313) 422-1221
ORDERS ONLY: 1 (800) 772-3455
"Tools American Made."

Write in 127 on Reader Service Card.

LOWEST PRICES ON CELLULAR TELEPHONES PROGRAMMING EQUIPMENT. **Motorola** ESN also kit to install in series III & IV phone transfer it to loader $250. Kit for modifing OKI-900 5NAM/ESN $250. Interface cables and software for different type telephone. Please call, "GL Communicaiton" 718-339-8029.

STAND ALONE cellular phone emulator for Novatel Capehart, Traveler Bag and similar phones. No PC needed. Copies ESN-MIN in 5 seconds. Includes all necessary hardware and literature. Easy to use. $200. INFO SASE (send 3 stamps) required before ordering. EDM, PO Box 156, Clinton, MI 49236. 517-456-6108.

LOWEST PRICES on Underground Information and Products including **Hacking, Phreaking, Cellular, Electronics, Viruses, Anarchy, Scanners, Cable-TV, Encryption, Wardialers, Internet,** and many other items. **Disks as low as $3.** Send $1 or SASE for current catalog. **Byte Bandits,** PO Box 861, North Branford, CT 06471.

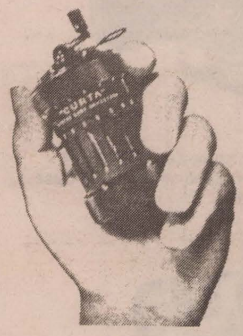
CELLULAR PROGRAMMING: Motorola cables, flip $75, bag loaner $50, loaner phone with power supply $150, Amps G2 software with instructions, diagrams $150. Other software available. ESS, PO Box 10986, Fort Wayne, IN 46855-0986 or E-Mail BYDN38c@prodigy.com. I can ship COD.

CELLULAR COMPUTER INTERFACE CABLES: Factory made, high quality, professionally assembled and guaranteed. Price includes regulated power supply: Motorola flip series $125, 8000/brick series $150, NEW ELITE CABLE $165. Flip/brick combo cable $250, mobile/bag: $100. NEC P200/P300 $150, Panasonic and Mitsubishi cable $100. Other accessories also available. Call: 714-581-2121.

FOR SALE: Reconditioned telephone transmission equipment and reconditioned telecommunications equipment repair or replacement also parts. Send for mfg. list. Alex Mastin, PO Box 8802, Canton, OH 44711-8802.

A casual mention of collecting and antique instruments last month brought an unexpectedly large response. I am an avid collector, and listed below are instruments I am looking for. I will pay cash or trade for any of these items.

However, at the selling end of things, I feel my mission is to bring you **State of the Art Vision and Motion Instruments and Components at a savings of at least 75%.** Those of you interested in antiques should write my good friend **David Garcelon, 10 Hastings Ave, Millbury MA 01527,** and ask for a sample listing of antique instruments, slide rules etc.

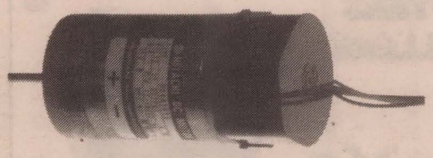


WANTED
Curta Calculator (illustrated)
Norden Bombsight
M209 Cryptographic machine
Anything Apollo
Early missile guidance
Surveying and
Nautical Instruments
Unusual Slide Rules, etc.

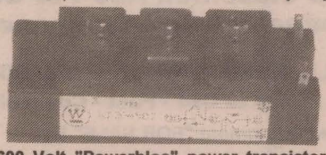
Frank Fink emerging from the Surplus Mine with an archeological find, a 1948 Press Wireless Voltage Divider.

VISION AND MOTION SURPLUS

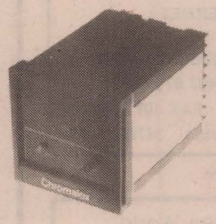
241 East Main Street, Unit A
Westboro MA 01581-1745
Telephone 508-366-8370

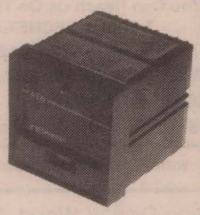


Hitachi DC Motor with built-in shaft encoder. Type DO4A191E. 3" long 1.5" Dia. exclusive of shaft. Shaft 0.75 in. long, 4mm Dia., Motor is 24 VDC, Encoder is 5VDC, 400 counts per turn. Output 5Watt av, 50 Watt peak. You couldn't buy the encoder at this price.;.....**$28.00 postpaid**

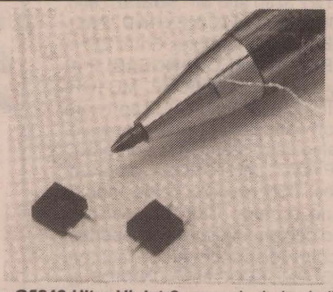


100 Ampere 600 Volt "Powerbloc" power transistor pair. Includes catch diodes. Two transistors in series in usual "half bridge" configuration. Darlington boosted for high beta. Type KD224505, Westinghouse or PRX manufacture.....**$8.00 Postpaid**
Similiar 200 Amperes.....**$15.00 Postpaid**





Chromalox humidity controller. LED readout. Manufacturers list is $465.00 Our price.....**$135.00 Postpaid**
Omega temperature controller. Model 4201A-PC2. LED Readout. List $320.00.....**$99.00 Postpaid**



Hamamatsu G5842 Ultra Violet Sensor. Includes built-in filter to block visible and infra-red. Response 260 to 400 nm. Can be used for flame detection, detection of power line corona, identification of (visibly) clear liquids, and astronomy experiments. Its most important application is the detection of **solar or UV lamp UV-B radiation which is harmful to the human body.** Simple circuits are provided for building a radiometer and a dosimeter. The subminiature package contains a GaAsP photodiode chip and UV pass filter.....**$18.00 postpaid**

Saft 23 ampere-hour aircraft type Nickel-Cadmium battery cell. For those experimenting with electric vehicles etc., this is one of the best cells, but is not widely used because of its expense. Long life, ability to withstand overcharge, high surge capacity, and good low temperature operation. Cells are used, but fully tested for 100% capacity. .....**$5.00 Postpaid**

Thanks for reading my ad. All equipment is new or removed from new equipment unless specified otherwise. Everything is guaranteed to be as represented, or your money back. We are not accepting credit cards at this time, but will gladly ship COD or we will ship immediately on receipt of your personal or business check.

Thanks, Franklin G. Fink CEO, CC&BW Frank

Write in 108 on Reader Service Card.

PHONE PHREAKER'S BIBLE. NEW!!! Covers: boxes, ISDN, MCI services, ANI, direct and international dialing, electronics, payphones, glossary of terms, how its done, box secrets, history of phone phreaking, operator etiquette, phone tapping, tracing, ISDN, and More! $33.45. **VISA/MC** 602-782-2316 **TELECODE** Box 6426-NV, Yuma, AZ 85366-6426.

CELLULAR EXTENSION SPECIAL. Motorola "bag" phone programmed as an extension to your existing line just $299. Call: 714-581-2121.

UNIDEN CELLULAR phone programming, all models, except handhelds. Motorola Brick phones programmed. Digitals & Micro Tac Elites programmed. Call CellTech at 617-764-5000.

$40 DTMF DECODER. Decodes Touch-Tones from your scanner, ham radio or phone. Kit (no case) $40. Assembled (includes case) $50. Requires PC compatible or laptop PC. As seen in January Midnight Engineering. Gary Bach, Box 751454, Dayton, OH 45475.

PHONE BOX BIBLE. NEW!!! 35 plus plans and articles on phone boxes. Blue, red, beige, and 22 other boxes. Includes the new "QUARTER" box plans. For educational use only!!! $43.45. **VISA/MC** 602-782-2316 **TELECODE** Box 6426-NV, Yuma, AZ 85366-6426.

PULSE TO DTMF CONVERTERS. Add pulse capability to your voice mail or IVR application. Fax for price sheet. Telexperts, Inc., 408-865-0497.

CELLULAR TELEPHONE. Reprogram from your computer, Motorola bag changed in minutes. Compare, ours is at a much lower cost. Software & manual $199. Voice or FAX 903-389-8352. Call now. MC/VISA, COD. Bag phones 9122 and above also.

CELLULAR EXTENSIONS, SEND US YOUR PHONE. Or buy a new or used phone from us! Proof of line ownership required. Call for a list of available models, we program many different brands including all Motorola, NEC, Audiovox. Same day service. Call: 714-581-2121.

TELECODE™

CELLULAR PROGRAMMERS PACKAGE OFFER!!! Volumes 1 and 2 of the Cellular Hackers Bibles, Cellular Programmers Bible, Bagphone Video Bible and Cloning Cellular Telephones Video. INCLUDES software to program Motorola (9122 & lower), NEC, Panasonic and Nokia $179. **VISA/MC**, 602-782-2316 or **FAX:** 602-343-2141. **TELECODE** PO Box 6426-NV, Yuma AZ 85366-6426.

MULTIPLE CELLULAR PHONES, ONE NUMBER! Enjoy convenience of 2 or more cellular phones all using same phone #3 and one monthly bill. Consumer brochure, $5; Dealer, $10. Become a CelluSoft agent, no investment cost. SASE to **Cellusoft™ Technologies USA,** 5750 Lakeshore Dr., Holland, MI 49424. 616-399-6390, M-F 9am to 2pm, EST.

MINIATURE JACKFIELDS. Telephone industry type 19" rack mount jackfields with bantam jacks. Several styles available. Connectorized. $40/unit. More info? Phone 415-665-5606 or FAX: 415-665-0616.

FOR SALE: B+K telephone analyzer Model 1050. Tests telephones; regular and cordless and answering machines. With book and scams, $1,000 or best offer. Cliff, 810-771-2254.

INTERNATIONAL TELEPHONE call back equipment from 4 ports and up. Dealers inquiries: WTSI, FAX 305-592-3828.

CALL BACK units. No more calling cards. Reverse billing. %40-60 savings on long distance calls. Single analog units, full remote functions, loaded with useful features. Install anywhere in the US and Canada. Call Int'l Connection Services, Inc. 201-523-5546.

CELLULAR PROGRAMMING SOFTWARE Motorola software (Pre v9122) $69.95 includes manual and diagrams for building programming cables. Motorola (EMPS or MPC) late and new software (up to v9340) $129, (cables not included). All prices include shipping anywhere in the US (COD add $15). **All Major credit cards accepted.** Call 508-977-0665 or send order to, CCS, PO Box 3315, Peabody, MA 01961-3315.

CELL PHONE cloning for the guy who has (two of) everything. Must have current service contract. Motorola, Tandy. For more info, call Keith 512-259-4770.

TURN ON YOUR CELLULAR PHONE through key-pad programming. Manual $22. Cabletronics, Box 30502N, Bethesda, MD 20824.

CELLULAR BATTERY SALE: Motorola flip Thick: $25. Slim: $43. Car charger: $25. NAPA leather cover: $18. Add $3.50 S&H. Send check or money order to: JVM ENTERPRISES, PO BOX 79, Broomall, PA 19008. Many other accessories available at discount prices. Call: 610-356-1524.

FLUKE. TEST EQUIPMENT 1-800-90METER

> FLUKE 21-2	MULTIMETER - YELLOW W/ 10A & 300MA	$121.00
> FLUKE 23-2	MULTIMETER - YELLOW W/ HOLSTER	$141.00
> FLUKE 25	MULTIMETER - YELLOW or GRAY	$197.00
> FLUKE 27	MULTIMETER - YELLOW or GRAY	$251.00
> FLUKE 33	CURRENT CLAMP - W/ MIN-MAX	$250.00
> FLUKE 37	MULTIMETER - BENCH / PORTABLE	$270.00
> FLUKE 45	MULTIMETER - DUAL DISPLAY	$625.00
> FLUKE 51	K/J THERMOMETER	$125.00
> FLUKE 52	K/J THERMOMETER - DUAL INPUT	$167.00
> FLUKE 73-2	MULTIMETER - GRAY W/ 10A	$88.00
> FLUKE 77-2	MULTIMETER - GRAY W/ HOLSTER	$142.00
> FLUKE 78	MULTIMETER - AUTOMOTIVE W/ TEMP/RPM	$195.00
> FLUKE 79-2	MULTIMETER - W/ FREQ / CAP / LO OHMS	$175.00
> FLUKE 83	MULTIMETER	$214.00
> FLUKE 85	MULTIMETER	$267.00
> FLUKE 87	MULTIMETER - W/ TRUE RMS	$273.00
> FLUKE 88	MULTIMETER - AUTOMOTIVE	$335.00
> FLUKE 80T-IR	INFRARED TEMPERATURE PROBE	$167.00
> FLUKE 80i-410	A/C - D/C CURRENT CLAMP - 400A	$151.00
> FLUKE 80i-1010	A/C - D/C CURRENT CLAMP - 1000A	$250.00
> FLUKE 80TK	DMM THERMOCOUPLE MODULE	$58.00
> FLUKE T88	AUTOMOTIVE DMM TRAINING PACKAGE	$110.00
> FLUKE 860	GRAPHICAL MULTIMETER SERIES	$CALL
> FLUKE 97/808	SCOPEMETER - AUTOMOTIVE	$1800.00
> FLUKE 99	SCOPEMETER**	$2195.00
> FLUKE 96	SCOPEMETER**	$1895.00
> FLUKE 92	SCOPEMETER**	$1595.00

** FREE FLUKEVIEW SOFTWARE WITH SCOPEMETER PURCHASE

VISA & MC ACCEPTED ***AUTHORIZED DISTRIBUTOR***

WE STOCK
√ CARRYING CASES
√ FLUKE LITERATURE
√ TEST LEADS & CLIPS
√ REPLACEMENT FUSES
√ SCOPEMETER ACCESS.
√ TEMPERATURE PROBES

WE WELCOME
√ SCHOOLS
√ GOVERNMENT
√ CORPORATE POs
√ DEALER INQUIRIES

FREE UPS SHIPPING+
+ SOME RESTRICTIONS MAY APPLY

GMP Parts Company
8765 Cooperston Way
Elk Grove, CA 95624
(916) 685-1055
FAX (916) 685-3139

Write in 110 on Reader Service Card.

Javanco

40,000 FT² OF REAL BARGAINS:

- computer parts & software
- terminals
- TV/VCR service parts
- ICs
- sockets
- transistors
- diodes
- LEDs
- phone stuff
- resistors
- capacitors
- switches & relays
- connectors
- tie-wraps
- batteries
- fuses
- crystals
- oscillators
- fans, meters
- speakers
- wire
- "old junk"
- equipment racks
- knobs & hardware
- circuit boards
- subassemblies

We've *slashed* the price on an old favorite: used tested Televideo 925 terminals, excellent for use with serial packet radio TNCs. Our stock no. CPS-2188, $19.95 each.

Call or write for a catalog

Orders Only: **1-800-528-2626**
615 244-4444
BBS 244-4445 FAX 244-4446

501 12th Ave S Nashville TN 37203 VISA/MasterCard/Discover

New Hours: 8:30a-5:30p M-F, 9a-1p Sat

Write in 109 on Reader Service Card.

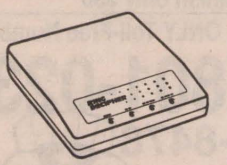
UNLIMITED LONG-DISTANCE from 7am to 7pm on the MCI network for $299 per month. Call from any phone, no busy signals. You can resell this service for a large residual income. Call Synthesis, 818-504-1788.

CALLER ID in your PC! 8-bit card with software. Patented pass and block. Database included. Generates ASCII call record. Pager forwarding. More. Technical reference to write your own applications. Now only $109.95! Pewee Valley Innovations, Inc., 6601 Old Zaring Road, Crestwood, KY 40014. 502-241-4295.

LIQUIDATE CELLULAR phone sale! Shintom reconditioned complete set handphone, bat, chger, ant all $79, mobile $49, transportable $59. 30-day warrant or as-is condition from $29. Some accessories available. 310-809-0531, phone/fax. Thrifty Electronics.

PHONE SYSTEMS WANTED!!! We buy AT&T MERLIN, SYSTEMS 25/75/85 and other AT&T phone systems. Please call for a quote or fax us your equipment list. **COMPUTER KEYWAYS**, 513-847-2300 or FAX 513-847-2350.

MULTIPLE CELLULAR PHONES, ONE NUMBER! Enjoy convenience of 2 or more cellular phones all using same phone #3 and one monthly bill. Consumer brochure, $5; Dealer, $10. Become a CelluSoft agent, no investment cost. SASE to **Cellusoft™ Technologies USA**, 5750 Lakeshore Dr., Holland, MI 49424. 616-399-6390, M-F 9am to 2pm, EST.



RING DECODER. Decodes up to 4 unique rings purchased from your local phone company. Not available in all areas. Have up to four phone numbers on one line. FCC 68 cert. Save big monthly bills. $79.95. $5 UPS. Accept VISA. Call for COD. LOGICAL DESIGN TOOLS, INC., 5403 Everhart, Box 55, Corpus Christi, TX 78411. Phone 512-888-4535.

CALL WAITING messing up your FAX, or your home computer when you are downloading a file with your modem? Send $1 to: Gene, PO Box 594, Newbury, OH 44065, for the cure!

DIGI-CALL Kit. Protect against telephone abuse. Microprocessor controlled call logger automatically records data on 1500 phone calls with telephone number, time and date stamp, call duration and more! Supports Caller-ID too! Easy to use DOS software lets you retrieve, sort, print, and save the phone data. Complete kit, includes all electronic components, circuit board, software, manual. $169.95, plus $6 for USA Shipping. CA residents include local tax. MasterCard, Visa, Discover. Digital Products Company, 134 Windstar Circle, Folsom, CA 95630. 24Hr Voice/FAX 916-985-7219.

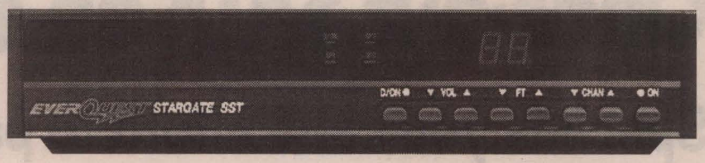
LOOKING FOR A LINEMAN'S HANDSET? We have rotary for $65 and 12-key TouchTone for $175. Send your order to DURHAM TECHNICAL PRODUCTS, PO Box 237, Arlington, TX 76004. We also carry crystals (6.5MHz, $4) and DTMF ICs. Cash, money order, or check accepted. Checks must clear before product ships. Send mail or E-Mail (bkd@sdf.lonestar.org) for parts flyer.

INTRODUCING

STARGATE SST

BBASNED

CABLE CONVERTER BOX



Replaces ***JERROLD*** and ***SCIENTIFIC ATLANTA*** Products

Features:

- Built-in Descrambler
- Infrared Wireless Remote Control
- Non-Volatile Memory
- Programmable Parental Lockout
- Switched Electrical Outlet
- Audio-Video Ports
- Sleep Timer
- Auto Fine Tuning
- Volume Control

NCCA

Member of National Consumer Cable Association

ONLY $319

VISA MasterCard DISCOVER

MD Electronics

875 S. 72 Street • Omaha, NE 68114

CALL NOW 1-800-624-1150 FOR YOUR FREE CATALOG!

Write in 140 on Reader Service Card.

DON'T REPLACE YOUR CAR–*RECYCLE IT!*
CONVERT FROM GAS TO ELECTRICITY
ELECTRO AUTOMOTIVE

SHOWS YOU HOW:

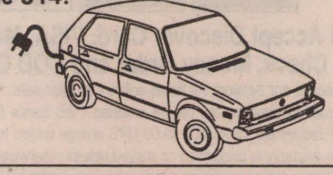
BOOKS: Including the new third edition of the definitive how-to manual, ***Convert It.*** Greatly expanded & updated, with improved printing quality. Now $24.95, + $3.50 postage. (In California, add sales tax.)

VIDEOS: From introductory information to technical instruction, including: ***EVs–Fact, Fiction, & Fantasy; The EV Components Primer; Women in EVs; The Voltsrabbit™ Components Packaging Tour;*** and many more! Coming soon–***Convert It–The Video.***

GIVES YOU THE MEANS:

COMPONENTS: Complete line of components for gas-to-electric conversions. All are in current production–no used or obsolete parts. Full tech support & warranty.

KITS: The easy, economical way to a reliable and safe conversion. ***Deluxe Kit*** fits any compact car or light truck (manual transmission). ***Voltsrabbit™ Kit*** is a bolt-in kit for a VW Rabbit–no design, fabrication, or welding needed. Coming soon–the ***Voltsporsche™ Kit,*** a complete bolt-in kit for a Porsche 914.



Conversion Components Since 1979
For Catalog, Send $5.00 To:
ELECTRO AUTOMOTIVE
POB 1113-NV
FELTON, CA 95018

Write in 111 on Reader Service Card.

SALE

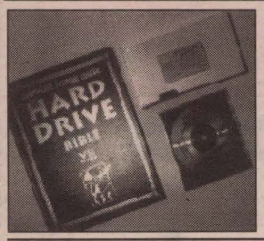
Clear-out SALE on everything!

Check out our NEW BBS!
•Find new items before they appear in our ads
•Get more detailed information on our products •Download drivers and manuals
•Place orders online
(408) 748-8478
Up to 14,400 bps N-8-1

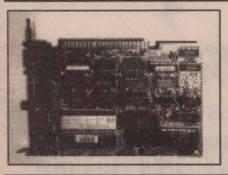
Specials you can't afford to pass up . . .

Computer Stuff at Great Low Prices

CorelSCSI! Version 1.2
ONLY $20
The best way to connect PC peripherals. Compatible with any ASPI supported SCSI Host Adapter. On 3.5" high density disks. Plus all these programs and utilities:
- CorelDRIVER Software supports 100's of devices
- CorelSCSI Utilities
- Corel Tape Backup
- CorelSCSI for Jukeboxes
- SitBack Software
- Corel CD-AUDIO for Windows
- SCSI Tools for WIndows



Hard Drive Bible
Only $30
NEW, Still in the box. This is the definitive reference source for hard drives. It includes CD-ROM and video tape. It will look great on your bookshelf.

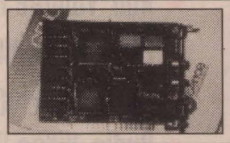


Sperry 8-Bit CGA Card
Only $10 each
or $7.50 for 20+
- New, in the box F4764 short-port color interface card

MacVision Only $10
European PAL version 3.0
- Capture images from video camera, VCR's and other video sources easily
- Integrate images into databases and personal files • Desktop publishing (Not for NTSC systems)

High-Grade Shielded Cables
- Heavy duty 6 ft parallel printer cable. 45° angle DB25, ground wire on centronics connector. $7.50 ea. 10 or more $5 ea.
- 25 ft DB25F to DB25M with 25 pins connected straight through. $15 ea. 10 or more $10 ea.
- 100 in. DB25F to DB25M with all 25 pins connected straight through.$25 ea. 10 or more $20 ea.

Labtec CS-150 Stereo Computer Speaker System . . . ONLY $10
A nice little addition to any computer system. These are new, still in the box ready to use.



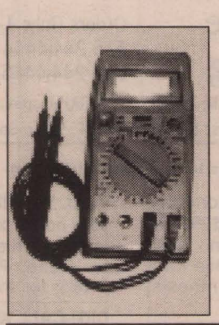
Genoa Super EGA HiRes+ Adapter . . . ONLY $20
New, in the box with manual and software. Up to 800 x 600 on multisync monitors.

GREAT Software Bundle... ONLY $30
This package includes DOS 5.0, Windows 3.1 and Dashboard — "the fastest way to work in windows." Manual for Dashboard only. Comes on 3-1/2" HD disks.

Panasonic JU-475
1.2Mb Floppy Drives — Great Price ONLY $20
These were made for HP, and are used but have all tested good and come with a beige face plate.

DTC CONTROLLER CARDS
NEW - In Box - 30-day Warranty!

Description	Interface	Description	Price
3190	SCSI	32-bit EISA HD Only 1 MB Cache	$45
3180AS	SCSI	16-bit Hard Drive Only	$40
3250AS	SCSI	8-bit Hard/Floppy	$30
510DB	MFM	MFM to SCSI Interface	$15
5150XL	MFM	8-bit Hard Drive Only	$20
5160X	RLL	8-bit Hard Drive Only	$10
5187	RLL	16-bit 2:1 Hard Drive Only	$10
5280	MFM	16-bit 2:1 Hard Drive/Floppy	$15
5287	RLL	16-bit 2:1 Hard Drive/Floppy	$15
6180	ESDI	16-bit Hard Drive Only	$20
6280	ESDI	16-bit Hard/Floppy	$25
7180	MFM	16-bit 1:1 Hard Drive Only	$15
7187	RLL	16-bit 1:1 Hard Drive Only	$10
7287	RLL	16-bit 1:1 Hard Drive/Floppy	$15
DT3767	IDE	16-bit Hard Drive Only (Not DTC)	$5
CCI	SCSI	8-bit Hard Drive Only (Not DTC)	$20



Digitek DT-3800 Full Range DMM — ONLY $25
- 5DCV ranges ± 0.5 %
- 5 ACV ranges ±0.8%
- 7 DCA ranges ±0.5%
- 7 ACA ranges ±1%
- 6 Ohms ranges ±0.8%
- Diode & Transistor Tester
- Continuity Buzzer
- Leads, manual and battery

Military Style Tripods
$15 each (Volume discounts given)
This military surplus tripod is new, still in the box. It's ideal for surveyors and general contractors. If you want rugged, this is the one for you. It has a built-in level, and is ready to ship. At this price you should buy several.

Zircon Electra Level
ONLY $10
This is a new electronic water level that you can use for any project you have that you need to make sure it's level — even around corners. Ideal for business or at home

Block and Tackle $15
This is a new item with maximum capacity of 750 lbs. These are priced to move quickly.

Gates Battery Pack
ONLY $5 each or 10 for $40
Great buy on a battery pack.
8 volts, 2,5 AH

MS-DOS 6.0 **ONLY $20**
For new computer systems, comes on 3.5" 1.44 MB disks. Also available in French.
DOS 6.2 in Spanish only $20
Windows 3.1 in Spanish only $30

Special ORDER ONLY Toll-Free Number
1-800-801-0230
BBS 408-748-8478

DISCOVER NOVUS VISA MasterCard

We Accept Discover Card, VISA, Mastercard, Check, Money Order and COD Orders.

This Advertisement is our catalog. All items subject to prior sale. Minimum order $10.00 plus shipping and handling charges. All orders shipped FOB Santa Clara, CA via UPS ground unless otherwise requested. There is a $5.00 UPS charge added to COD orders. All items are sold as-is, and no warranty is expressed or implied unless otherwise noted.

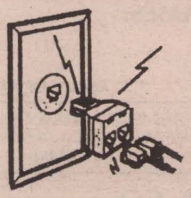
We buy and sell surplus & excess inventories

RA ENTERPRISES
2260 De La Cruz Blvd.
Santa Clara, CA 95050
Tel: 408-986-8286
Fax: 408-986-1009

Write in 112 on Reader Service Card.

#115 TELEPHONE – FAX *cont.*

WHOLESALE: RING decoders, caller ID, phone accessories, also long distance service, 800#s and calling card alternatives at reduced rates. Agents needed, great commissions. Fabtronics, 5714 W. Wautoma Beach, Hilton, NY 14468. 1-800-294-3228 FAX/VOICE.



TELEPHONE (BUG) TRANSMITTER KIT hidden inside a dual modular adaptor. Transmits both sides of phone conversation to any FM radio up to 1/4 mile. Crystal clear reception. No soldering necessary. Simply snap kit together & plug into modular outlet. Uses existing phone line for operating power and antenna. $49.95. 404-393-3311. Electronic Specialties, PO Box 467068, Atlanta, GA 31146.

CALL PROCESSING system, Telephonic Equipment Corp. model CPS-1 up to 50 menus, Submenus, announcements. Excellent cond. $3,995. **Technologies West.** 503-267-6064.

PANASONIC, SOUTHWESTERN Bell Telephones and Systems, jacks, plugs, wire, test equipment and installation tools. Call 908-840-5959 or write: H.E.S. Electronics, PO Box 183, Brick, NJ 08723.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmf/.

COMPONENTS 120

RARE CERAMIC SWITCH, 2 Pole 6 Position Centralab PA-2003, non shorting. Great for RF projects. $8 ea. 10 for $7 ea. 100 for $6 ea. Call Roger @ GS&E, 716-338-4001. VISA/MC.

FREE ELECTRONICS CATALOG. Low, low prices for high quality overstocked parts. Call 817-473-1730. IME, PO Box 170415, Arlington, TX 76003.

$100 GOLD! There is a circuit chip made by IBM that contains more than $100 each in scrap gold, and another worth $20. Almost nobody knows this. They are just starting to show up in resale outlets and junk yards. You can score big with this knowledge. Complete info with photo $35 to: Jim Sciuto, Box 128, Methuen, MA 01844.

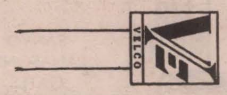
I WANT it and I want it now. I want all of your SIMM memory. IBM, Mac, new, used, even defective. I want it all. Highest $ paid. Call 1-800-4-MEMORY now! Voice/FAX.

CRTs CHEAP. Buy direct from the manufacturer, save money. Mfg. all CRT types over 45 years. **3 Year Warranty.** 19 inch tubes $60, 25 inch $90. We specialize in **Hi Resolution** computer/video CRT's and complete repair of all monitors. T.M.C. 215-226-0749/223-0388 9:00am-10:00pm EST.

SCHOTTKY RECTIFIERS: MOTOROLA MBR1645 or MBR1080 (16A@45V or 10A@80V). **TOUGH** and usually **EXPENSIVE.** Our price: 20 for $10 postpaid. TURCOTRONIX, 1000 E. 14th, Suite 429A, Plano, TX 75074.

SURPLUS ELECTRONIC PARTS For list, send SASE to: A&A Engineering, 2521 W. LaPalma #K, Anaheim, CA 92801.

NEWPORT MOTORIZED ROTARY STAGE, Model 495-A, New! .001# Res. Accuracy .05#, bi-directional repeatability .003# type load cap. 25Kg $600. Call Roger @ GS&E, 716-338-7001. VISA/MC.

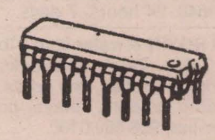


CRYSTALS: RADIO and microprocessor, low price, fast delivery, all brands, prototype, production runs. Velco Electronics, 716-924-2073, FAX: 716-924-2136.

RF TRANSISTORS, Japanese transistors and tubes need dealers, repair shops, kit makers, etc. for 2SC1969, 2SC2312, MB8719, MRF455, MRF454, 2SC2879 and more. WESTGATE, 1-800-213-4563.

NEW! RESISTORS and caps! 8000 available! Send $1 for list. Box 19130, Indianapolis, IN 46219.

ELECTRONIC BARGAINS: Dual .5" C.C. 7-seg. red LED readouts: 3 for $1. Jumbo LEDs. Red: 20 for $1, Yel. or Gr: 12 for $1. 16 pin WW sockets: 6 for $1. 470uF or 220uF caps, 5 for $1. 5x7 dot matrix display: $2 ea. 723 V.-Reg.: 5 for $1. HP 80MHz freq. C7: $75 no min. add $3 S&H. Send to Omega-tronics, PO Box 911, Bloomingdale, IL 60108-1944.



WANTED: EXCESS ELECTRONIC INVENTORIES. IC'S, MEMORY, EPROMS, PALs, LEDs, CIRCUIT BOARDS, DIODES AND TRANSISTORS. CALL ACTIVE MICRO, 310-494-4851 OR FAX 310-494-4913.

TEST & MEASUREMENT INSTRUMENTS

Refurbished Scopes, Analyzers, Generators, Counters from HP, TEKTRONIX, FLUKE, ANRITSU and *many more!*

* SELL, RENT & LEASE
* OVER 7,000 MODELS
* *6-MONTH* WARRANTY
* BIG SAVINGS

Yes, we will buy your quality surplus equipment!

Metric Equipment Sales, Inc.

tel: 800-432-3424 fax: 415-341-8874

351A Foster City Blvd. Foster City, CA 94401

Write in 82 on Reader Service Card.

WE BUY gold plated parts, transistors, hybrids, ICs, diodes, circuit boards, patch panels, military pins, tantalum capacitors, relays, old test equipment and all types of electronic material. **GOLD'N WEST SURPLUS** in Corona. Ph: 909-340-1501, FAX: 909-340-1504. ASK FOR MARK.

EPROM ERASER: 10 EPROMS erase in 15 min. ~~$45, $60~~ with timer. 40 EPROM industrial model 5"x12" drawer + timer $225. Made in USA & full 1 yr. guarantee. 714-777-7738, FAX: 714-777-3382.

Z80 DART IC (120) $3 ea., 87C51CCN40 (20) $2 ea. HCF4538BE (50) $.50 ea., TIP31 Trans (50) $.75 ea., 2N5875 Trans (100) $2.50 ea. Min. order $10, 1N5362, 1N5384B, 1N5373, 1N5370, 5 watt zener diodes, 16-160 volts $.10 ea. Bills Electronics, 519-367-2771.

SOLID STATE RELAYS. Gordos OAC15; 9-18VDC input, 120VAC output @ 3A. Never used, most in original packaging $2.75 @ qty 1-10, $2.25 @ qty 11-50, $1.95 @ qty 51-up. PowerOne 15V supplies HD15-6-A factory box $25. ISI, 3901 Norris Dr., Millbrook, AL 36054. 205-285-4222.

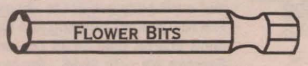
VACUUM VARIABLE capacitors and vacuum relays bought and sold. Send your list, with condition and price. Your SASE gets mine. Also buying turns counters, Bird slugs/equipment, and RF connectors. Bond, 221 Greencrest Ct., Marietta, GA 30068.

PC BOARD manufacturers/users: rolling storage/transport rack holds up to 700 loaded boards. Board size infinitely adjustable; 5 sizes at one time. 5x6x2 feet. $250/offer. PO Box 3042, San Ramon, CA 94583. 510-735-2727.

Viewstar

85 CHANNEL CONVERTER *w/REMOTE*
includes these great features and many more
Last Channel Recall — Parental Control
Favorite Channel Scan — Sleep Timer
1 5
64.95 62.95 **54.95** 10+

new **Jerrold HEX Drive**



¼" x 2"	1-9	12.50
¼" x 4"	1-9	14.50

These security bits are compatible with the following companies:

Jerrold Star Bit	9.50
Jerrold/Pioneer oval Bit	14.95
Pioneer Oval Bit (Original!!)	16.95
NEW Jerrold Flower-head Security Screwdriver–7"	16.50
NEW Hex-drive Hand Ratchet Fits all our TORX and Hex bits	9.95

Steel-shank magnetic screwdriver for Hex-insert bits 5.35

REMOTE CONTROLS

Remotes compatible with these companies:

	1-9	10-25
Jerrold		
400/450/550	7.65	6.40
CFT-2000	8.75	7.65
Scientific Atlanta		
075/175	7.65	6.40
475 Remote works w/DMX w/Vol Control	8.10	6.90
8600 On-screen Display	8.10	6.90
Zenith 1000 Series		
RD3Z	8.35	7.15
Prices for all of the following:	8.75	7.65

Panasonic
PA 120
PA 140
Hamlin
RCPX, CRP-5
CRP-6, CRP-7
Oak
Sigma Series
Pioneer
BR-82
Tocom
All Models

KIT
Includes Screwdriver and any four 1" TORX bits *only*
19.95

VISION DISTRIBUTORS

CUSTOMER SERVICE
(909) 483-3848
ORDERS ONLY
(800) 233-8431
pacific time
Rancho Cucamonga, CA

We don't Sell Descramblers
Many Other Items
VOLUME PRICING
COD (ADD TO ORDER)
California Sales Tax 7¾%
Prices Subject to Change

TORX BITS *New Sizes*

	1"	2"	3" x-long
Tocom T-7	3.95	4.95	na
Zenith T10	3.95	4.95	na
Zenith T15	3.95	4.95	5.95
Scientific Atlanta T20	3.95	4.95	5.95

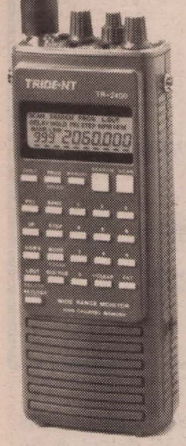
Write in 178 on Reader Service Card.

What's the easiest way to get Radio Active?

Dial 1 800 445 7717

TRIDENT

TR2400 $449
100KHz to 2.06 GHz

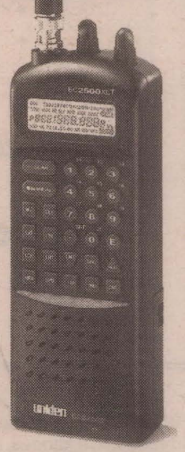


TR980 $259
5MHz to 1 GHz

Bearcat

BC220 $219
Turbo Scan
with 800MHz

BC2500 $319
25MHz to 1.3 GHz



GRUNDIG

YB400 $199
Top Rated Compact
Shortwave Receiver

Trident TR4500 with optional
Spectrum Analyzer 1-1300MHz
$469.00

These are a few of our products and price values for more information dial toll free to talk, fax or get instant specs & info. from our fax back service.

Toll Free, 24 Hours! For orders, tech support, inbound fax and Fax Facts instant catalog sheet service. Computer BBS Modem & Fax/Modem,317-579-2045. International Fax: en Espanol, en Francais, und auf Deutsch, or just in plain English to:317-849-8794. Instant info toll free via Fax, Dial 1 800 445 7717 from your fax.

ACE COMMUNICATIONS
10707 E. 106th St.
Fishers, IN 46038

Service & Support hours: Mon.-Fri. 9AM to 6PM, Sat. 10-4 EST. Mastercard, Visa, Checks, Approved P.O.'s & COD (add $5.50) & AMEX, Discover. Prices, specs and availability subject to change. Flat rate ground shipping and handling charge only $6.95 per unit. Express Air only $9.95 , for most units, to most locations.

Write in 115 on Reader Service Card.

BATTERIES — BATTERIES — BATTERIES

FOR HANDHELD RADIOS:

ICOM YAESU MOTOROLA
KENWOOD ALINCO G.E.
AND MANY OTHER RADIOS

BRAND NAMES:

SANYO VARTA SAFT
PANASONIC DURACELL AND
GATES YUASA MANY MORE!

BATTERIES FOR ALL YOUR POWER REQUIREMENTS!!! PLEASE CALL OR FAX FOR FAST SERVICE. WE STOCK THE MOST COMPLETE INDUSTRIAL & CONSUMER BATTERY SELECTION IN THE INDUSTRY!!

E.H. YOST & CO.

2211-D PARVIEW RD., MIDDLETON, WI 53562 • PHONE: 608-831-3443 • FAX 608-831-1082

POLYPROPYLENE CAPACITORS, 0.0075 mfd 1200 volt, 30 for $15. Surface Mount Capacitors, 10 each of 20 values, $15. Mica Dip Capacitors, 10 each of 25 values, $15. 1N4002A Diodes, 200 for $8. Shipping included. USA only. Credit Cards. Phone/FAX 702-795-7151. Star-Tronics, PO Box 98102, Las Vegas, NV 89193.

ELECTRONICS EXCHANGE ST. LOUIS the only surplus electronics store in the St. Louis area. We buy anything in electronics that's a bargain. Call or FAX, 314-426-4848. 24 hours, 7 days.

SOLDER ROSIN & water core 1 lb spools, Wire & Cable, Terminal Blocks, fuses, connectors, switches, line cords, display tubes, lamp holders, relays, pots. Call Henry for list, 908-689-0100.

RESISTORS $1 a dozen. Catalog $1, foreign add $1. ZIPFAST, Box 12238, Lexington, KY 40581-2238.

68HC11AO $2 each. Add $3 shipping and handeling. Used processors that may have open analog input pins. Call after 5:30pm EST, 216-974-8091.

WANT TO Buy: ICs, military & aircraft relays, diodes, transistors, electronic test equipment & most components. Hoffy Electronic Ent., 818-718-1165, FAX 818-341-5506.

FLEXIBLE WAVEGUIDE Brand new, silver plated, rubber coated, six-inch length of WR90 in sealed foil pouch. 4 pieces for $25. Wade, 309-523-3262.

BBS COMPONENT Catalog. All types of ICs, transistors, capacitors, resistors, computer parts, software, Radio Shack parts and more! Free access to BBS. Home Net BBS 612-755-9661.

ELECTRONIC COMPONENTS BOUGHT: all transistors, diodes, resistors, capacitors, ICS, milspec, commercial. FAX LABB Associates, 215-364-5415.

ANTIQUE ELECTRONICS 130

WANTED: APPLE 1, Mark 8 and early microcomputers. Also journals for museum. PO Box 341, Floyd, VA 24091. 703-231-6478, 703-763-2321.

CRYSTAL SETS. Parts, plans, books, kits. Largest source in the world. Catalog $2. MIDCO, PO Box 2288, Hollywood, FL 33022.

RADIO, TV, Industrial tubes for sale. Thousands in stock. DH Distributors, PO Box 48623, Wichita, KS 67201. 316-684-0050 voice/fax.

RADIO, TV, transmitting, receiving and CRT tubes. Sam's Photofacts and more. PEM Tubes, 7392 French Rd., Sacramento, CA 95828. 916-383-9107.

ANTIQUE RADIO CLASSIFIED. Free sample copy! Antique radio's largest-circulation monthly magazine. Old radios, TVs, ham equip., 40s & 50s radios, telegraph, books & more. Ads & articles. Free 20-word ad monthly. Subscribe today. Six-month trial: $17.95. Yearly rates: $34.95 ($51.95 by 1st class). Foreign write: ARC, PO Box 802-G15, Carlisle, MA 01741. 508-371-0512.

ANTIQUE TUBES Early balloon and collectable types. Free price list. Antique Triode, Box A2, Farnham, NY 14061.

TUBES, NEW, most types 20,000 in stock, $3 up. Sams Photofacts, $2 up. Send for quotes & availability. $2 for name on mailing list, deduct 1st order, cash OK, SASE. Kemner Enterprises, 17 Lightcap Rd., Pottstown, PA 19464. 610-495-5367 lv. message.

1950s & 1960s electronic organ service manuals, some parts for Wurlitzer & Conn; audio transformers & other misc. Send LSASE for complete list. C.F. Hooper, 1629 Keystone, Ct., Clearwater, FL 34616.

CABLE TV

UNIVERSAL Descrambler

NEW PRODUCT

MasterCard VISA DISCOVER

MODEL 5000 Fully Assembled $199.95

Our fully assembled product is factory tested and *GUARANTEED* to work on your system. We will also include an AC power adaptor and complete hookup instructions. This unique product will be available for a limited time only!

MODEL 4000 KIT $79.95

The 4000 KIT comes with all the electronic components and our Cad designed PC board. We provide a schematic, parts list, wiring diagram, tutorial and FREE in-house support.

4000 And 5000 Features

- The latest in Video Amplification Technology.
- New clocking circuits to stabilize color and the picture performance.
- The most advanced picture locking circuitry.
- Inverted Video Option is available.
- Connects easily to the VCR.
- NO CONVERTER BOX is necessary.

MODEL 4000A Enc. $44.95

The 4000A Enclosure Package will provide the hobbyist, who has our 4000 Kit, a custom enclosure, AC adaptor and finish accessories to professionally enclose their kit.

CALL THE HALCYON GROUP 1-800-664-6999

NO Florida Sales! Anyone implying theft of cable service will be denied assistance.

Write in 116 on Reader Service Card.

SOLAR ELECTRICITY
LOWEST PRICES UNDER THE SUN !

TOLL FREE **1-800-842-5678** (24 HRS)

CALL COLLECT (619) 581-0051 FAX (619) 581-6440 E-MAIL SOLAR@CTS.COM

SOLAR ELECTRIC INC.
AT THE ROSE CANYON BUSINESS PARK
4901 MORENA BLVD. #305
SAN DIEGO, CA 92117 U.S.A.

MEMBER CALSEIA

WE FEATURE **SIEMENS** TRACE ENGINEERING AND OTHER FINE PRODUCTS

Write in 117 on Reader Service Card.

RADIO AND TV tubes from 1927 to 1977. $1 for list to: Preller TV, 208 South 2nd St., Augusta, AR 72006. 501-347-2281.

WANTED: TELEGRAPH instruments, any kind, keys, sounders, books, signs. Also Western Union Postal Telegraph items. Goodman, 636 Grant, Charleston, IL 61920. 217-345-6771.

TUBE TYPE Test Equip Scopes, Tube Testers, OSC, Eput, Grid. DIP, etc. 904-383-8344.

REMEMBER WHEN they cost $400 for four funtions? Collect inexpensive (for now) pocket electronic calculators. Join the only organization of its kind. $12/yr with quarterly newsletter. International Association of Calculator Collectors, PO Box 345, Tustin, CA 92681.

MCINTOSH MODEL MI-200AB 200 watt power amp, Optimation model PA1002 power amp. Call Henry, 908-689-0110.

VINTAGE MANUALS for all your radio-related equipment. Catalog available. We buy, swap, and sell. Pete Markavage, 27 Walling St., Sayreville, NJ 08872-1818. 908-238-8964.

WANTED, ELECTRON Tubes for auto radios. Fred Cranshaw, 1624 Bitter Ck, Garland, TX 75040. 214-494-4917.

WANTED: WWII German electronics. Any Western Electric audio equipment and other power amplifiers. Also wanted: Vintage speakers and microphones. Call Steve after 11 am Central, 608-251-6121.

TUBES, NEW, up to 90% off, SASE, Kirby, 298 W. Carmel Dr., Carmel, IN 46032.

PUBLICATIONS
140

EARTHQUAKE ELECTRIC SIGNALS, experiments newsletter. Sample issue, $1. Geo-Monitor, 65 Washington Street, #400-V, Santa Clara, CA 95050.

COPIER DOCTOR: Introductory text teaches troubleshooting and basic copier repair. Plus: access to toner, parts, developer, supplies. $12.95 plus $2.50. S&H. Coastal Technical Products, 317 Leeds Gate Rd., Savannah, GA 31406.

START YOUR OWN TECHNICAL VENTURE! Don Lancaster's newly updated **INCREDIBLE SECRET MONEY MACHINE II** tells how. We now have autographed copies of the Guru's underground classic for $18.50. Synergetics Press, Box 809-K, Thatcher, AZ 85552. 520-428-4073. VISA/MC.

"FORBIDDEN SECRETS Of The Legion of Doom Hackers." Big 224-page handbook. Condemned programs & techniques from the infamous LOD's shut down BBS. Hacking, phreaking, & more! Limited edition. $20.95 plus $5 S/H ($6 Canada). NYS add $2.21 tax. VISA/MC OK. CRB Research, Box 56-NNV, Commack, NY 11725. Phone orders: 1-800-656-0056.

FALKNER ENTERPRISES OF AMERICA, INC.

New Gel cells: 12v 7AH 15.00; 6v 10AH 10.00
12v 33AH 30.00; 6v 3.2AH 4.00; 12v 2.2AH 8.00
Gates 2v 2.5AH D-cells and 5AH X-cells 2.00 each
X-10 controllers and programmable timers 10.00 ea
YOUR SOURCE FOR PORTABLE POWER
Call or write for FREE catalog

Phone 515-683-7621 | 206 South Jefferson Street Ottumwa, IA 52501 | FAX 515-683-7631

Write in 118 on Reader Service Card.

TOP SECRET

CONSUMERTRONICS
2011 Crescent, P.O. Drawer 537
Alamogordo, NM 88310

Voice: (505) 439-1776, 439-8551; 8AM-8PM MST, Mon-Sat

Fax: (505) 434-0234, 434-1778 (orders only; if you get voice, enter "#11 #11" any time); 24-hr

Free Tech Support (relates directly to your order or prospective order): **Tues.** and **Thurs.** only.

10% Off on orders $100+
15% Off on orders $200+

Add $5 total S/H (US, Canada). All items in stock. **VISA, MCard** OK. No CODs or "bill me"s. **New Catalog** (200+ offers) $2 w/order, $5 w/o (check or MO) - NO free catalog. NO dealers. Since 1971.

As seen on **CBS "60 Minutes," Forbes,** etc. By **John Williams** - former Lockheed Senior Engineer, NMSU Computer Science Professor, NIH Health Physicist.

Wanted: 9 MAC IIci, PC386, portable or better; software; modem electronic test equipment; small parts. Buy or trade.

***All software supports all IBM-PC compatible x86 systems (8086 - Pentium)**

Off-the-Shelf Hardware
Van Eck Systems, ATM2, Data Card Reader/Writers, RF/EM/Radar/Ultrasonic/IR Jammers/Detectors/Receivers/Xmitters, Security/Surveillance Devices, EM Lab/Weaponry/Countermeasures, Neurophone/Hieronymus/Rife Resonant Crystal Radionics, Lineman's Handsets, Voice Disguisers, Phone Color Boxes, DTMF Decoder, Bug & Tap Detector/Blaster, Carjack/Kidnap Foiler, Hearing Assistor, Shriek Module, TENS, 6th Sense Communicator, Subliminal Mixer/Amp, Levitator, Vortex Generator, Noise Cancelling System, Unknown Presence Detector, Electronic Dowser, Bacteria Detection Kit - many more. See our **New Catalog.**

SPECIAL PROJECTS
We design/build/obtain/repair/modify/maintain/consult on any device/system/project/process - electrical/electronic/phone/computer/mechanical/optical/automotive for business/personal/invention prototyping need. Confidentiality guaranteed. Describe and include **$30** pre-engineering fee (does not obligate you). Time and cost estimates in 7-10 days.

TECHNICAL RESEARCH SERVICES
Unique 58+K electronic and computer design article database accessed by title and subject: Digital, µP, µC, analog, hybrid, nomograph, software. Many hacker, in-house, non-published articles. Provide us up to 25 keys (OK to combine topics), we return list, you select articles. $25 search fee + $1/selection + .25/page + $5 S/H.

AUTOMATIC TELLER MACHINES
ATM crimes, abuses, vulnerabilities and defeats exposed! 100+ methods detailed, include: Physical, Reg. E, cipher, PIN compromise, card counterfeiting, magnetic stripe, false front, TEMPEST, Van Eck, tapping, spoofing, inside job, super-cool, vibration, pulse, high voltage - others. Case histories, law, countermeasures, detailed security checklist, labeled internal photos, figures. ATMs contain up to $250,000 in cash! Recent $350,000 ATM crime spree still unsolved! **$39.**

CREDIT CARD SCAMS
Cardholders, merchants, banks suffer $ Billions in losses annually because of credit card fraud. Describes every known means of credit card fraud and scams. **Protect yourself! $29.**

CONS, SCAMS & RELATED SWINDLES
Cons, scams and related swindles fleece Americans of $100+ Billion per year! The most comprehensive survival manual on cons & scams of all kinds - from the classic to hi-tech. Details 100s, their many variations, and countermeasures. **Protect yourself! $39.**

Beyond VAN ECK PHREAKING
Eavesdropping on TV and computer video signals using an ordinary TV described in detail. Includes security industry reports. Range up to 1 KM. Plans include both the **Consumertronics** and the original **Top Secret Van Eck designs! $29.**

VORTEX GENERATOR
Heat and cool with amazing, simple 3-port device. Uses no moving parts, electricity, fossil fuel, liquid or freon. Guaranteed scientifically sound! Plans. **$9.**

CELLULAR/CORDLESS PHREAKING
How cellphones operate and are modified. Vulnerabilities to hack attack and countermeasures. Comprehensive info on reprogramming NAMs, ESNs, etc (cloning), control data formats, computing encoded MINs, ESNs, SIDHs, operating systems, PROMs and their programming, forcing ACK, test mode and resets, scanning, tracking, scanner restorations, freq and channel allocations, roaming. ESN and SIDH tables, parts/equipment sources, attendant stations, non-USA bands, health concerns, and the ECPA and critique. Step-by-step descriptions to keypad-reprogram 100+ popular cellphones. Plus complete section on phreaking cordless phones! Much more. Comprehensive, invaluable - 10 times more info than our competitor's $79 manuall **$69.** (Do **Special Projects** (above) for up-to-date hardware/software).

PBX HACKING
1000s of PBXs are hacked to the tune of about $8 Billion/yr! While our **"VOICE MAIL HACKING"** (below) details how VMSs are hacked for "phun" and profit - including VMS methods for hacking PBXs themselves - **"PBX HACKING"** addresses all other issues relating to PBX hacking, including countermeasures. Can your business or agency afford a $90,000 phone fraud loss (average loss due to hacked PBXs)? As described in **Forbes Magazine** article. **$29.**

VOICE MAIL HACKING
How **Voice Mail Box** systems are used and the specific ways they are hacked. Includes **ASPEN, MESSAGE CENTER, BIX, GENESIS, RSVP, SYDNEY, PHONE MAIL, AUDIX, CINDY, CENTAGRAM, SPERRY LINK, EZ,** etc. Absolutely required for all users, sysops and security personnel! **$29.**

PHREAKING CALLER ID & ANI
Details on how they work and dozens of effective ways of defeating Caller ID, ANI, *69, *57, Call Blocking and *67. Also describes Caller ID, Orange, Beige, Cheese and CF Boxes, ESS, SS7, E-911, various CLASS services, CNA, NON PUB DA, CAMA, DNR, 800-ECR, Diverters, LD Extenders, Centrex - more. $29.

Beyond PHONE COLOR BOXES
Dozen phone color boxes described - many circuits. Plus **Call Forwarding, Conferencing, Phreak History, Glossary, Diverters, Extenders, Loops, REMOBS, Bridging Heads & Cans, Optocom, 3rd Party** and many other non-box methods - more. **$39.**

ROBOFONE AUTODIALER
Powerful, versatile, menu-driven **"Wargames"** autodialer lets you dial any quantity (up to 10K) or mix of local/long distance phone #'s in any order, over any length of time, whether busy or answered (your choice) and log the times/commands/results to monitor/disk/printer. Quick-dial directory of up to 600 numbers. BUSY redial options. Direct modem command and control. All Result Codes, including VOICE and RINGING. Optional shell to terminal program upon CONNECT. Exit to menu or DOS (for batching). **Manual + Disk* $29.**

COMPUTER PHREAKING
Describes in detail how computers penetrate each other, and how **VIRUSES, TROJAN HORSES, WORMS,** etc are implemented. Dozens of computer crime and abuse methods and countermeasures. Includes disk filled with hacker text files and utilities, and the legendary **FLUSHOT+** protection system **(Ed. Choice, PC Magazine).** BBS advice, password defeats, glossary - much more! **Manual + Disks* $39.**

The HACKER FILES
Compilation of 100s of the best articles written (in ASCII) by top hackers & phreakers. Covers every major topic in hackerdom! **3 HD Disks* $59.**

CRYPTANALYSIS TECHNIQUES
Five powerful menu-driven crypto programs (in .COM and .BAS source codes) to analyze, decrypt "secure" ciphertexts. Worked-out examples. Recommended by prestigious **"Computers & Security". Manual + Disk* $29.**

By an ORDER of the MAGNITUDE
The most comprehensive, hard-hitting, hi-tech survival book ever written! Topics include electronic, computer, commo, chemistry, energy, weaponry, cryptography, concealment, revenge, alarm, disguise & ID change, etc designs, tactics and strategies to survive an increasingly dangerous world. We all face increasingly physically and financially brutal times! Field-expedient use of technology in various threat and conflict environments and scenarios. Comprehensive. **$49.**

ROCKET'S RED GLARE
Design and construction of solid-propellant amateur and survival rockets. Emphasis on formulation, manufacture, installation of propellants, motors, igniters, etc. Includes list of commonly available materials, and the design of launch pads and test beds (with schematics). **$29. FIREWORKS:** How firecrackers (M-80s, blockbusters, cherry bombs), small rockets, volcanos, fountains, sparklers and safety fuses are made and colored. Simple, cheap, common ingredients. **$9.** Both **$36.**

STOPPING POWER METERS
As reported on "60 MINUTES": How certain devices can slow down (even stop) watthour meters - while loads draw full power! Device plugs into one outlet and normal loads into other outlets. Also describes meter creep, overload droop, etc. Plans **$29. THE I.Q. MANUAL:** External magnetic ways (applied to meter itself) to slow down and stop watthour meters while drawing full loads. Plans. **$19. KW-HR METERS:** How watthour meters work, calibration, error modes (many), ANSI Standards, etc. Demand and **Polyphase Meters.** Other experimental results to slow and stop meters by others. **$19.** Any 2, **$38.** All 3, **$59.**

HIGH VOLTAGE DEVICES
HV device plans: **Stun Gun, Taser, Prod, Cane, Flasher, Blaster, Zapper, Audio/RF/Radar Jammer, Jacob's Ladder, Plasma & Van de Graaf Gens., Fence Charger, Geiger Counter, Ozone Gen., Fish Stunner, Plant Stim., Kirlian,** more! All plans for only **$29.**

UNDER ATTACK!
Electromagnetic Interference and **Electronic Weapon Attacks** cause: Cancer, birth defects, and profound psychological, neurological, cardiovascular and immune system disorders! Destructive to people, animals, plants, equipment! Includes **ACTUAL CASES OF EM ATTACKS** (we investigated)! Includes how to verify and pinpoint EMI and electronic attack sources, and specific countermeasures. **$29. EM BRAINBLASTER:** Tutorial and plans for powerful **ELECTROMAGNETIC WEAPONS** and **LAB DEVICES.** Optimum circuits, freqs, waveforms, duty cycles, intensities. Thorough, **$29.** Both **$49.**

RADIONICS MANUAL
Exciting electrical, electronic and electromagnetic therapeutic, diagnostic and preventive devices (mostly experimental). History, descriptions, plans (dozens), availabilities of **Radionics Devices** from early to modern. While drugs cost $ Hundreds, electricity costs pennies! **$29. HEAL THYSELF:** Plans for 3 major electronic therapeutic devices of types approved by **FDA. $24. EMF & LIGHT THERAPIES:** Systematic study of the germicidal properties of EMFs and lights *in vitro* and *in vivo.* Bands include µwaves, 4 IR, 6 visible and 3 UV, using continuous, single-pulse, strobe, random pulse rate and width exposures. **$29.** Any 2, **$48.** All 3, **$69.**

STEALTH TECHNOLOGY
Police radar is fascinating! It also has error rates of 10-20%! Every known error mode - stealth method and material used to minimize radar reflections - tactic and strategy to fight unjust radar tickets (that cost you $100s in insurance and risk cancellation) - methods to detect and jam signals - fully described! **$29.**

SECRET & SURVIVAL RADIO
Optimum survival and security radio equipment, methods, freq allocations and voice/data scrambling/encoding. Includes small receivers/transmitters, telemetry, antenna optimizations, remote monitoring and control, security, surveillance, and ultrasonic, fiber-optic and infrared commo. 70+ circuit plans, tables. **$29.**

HARD DRIVE MANUAL
Covers all hard drive and controller implementations (emphasis on PCs). How to select, interface, initialize, set up, use, maintain, troubleshoot and repair them. How to protect them from mistakes, sabotage, prying eyes and sticky fingers. How to recover damaged and lost files. How to prevent crashes. Includes software reviews. Loaded with info, advice, tips. **$39. DISK SERVICE MANUAL:** Maintain, adjust, align, troubleshoot, repair floppies without special equipment or software. **3.5"/5.25"/8", PCx86, MAC, Apple, Atari, Commodore,** etc systems. All floppies need some upkeep. **$29. DISK DRIVE TUTORIAL:** Theory, practical facts on floppy drives, disks, including many tips, recommendations, formatting, interfacing, FDC, etc. **$25.** Any 2, **$54.** All 3, **$74.**

NATURAL BEAUTY SECRETS
Legendary beauties Cleopatra, Helen of Troy, Brunhild, others augmented beauty with natural preparations. Describes in detail how many personal care products (ex: skin care, hair care, makeup, soaps, grooming preparations and fragrances) are made from safe, natural, inexpensive substances. For all skin colors, shades. Also includes theatrical, ceremonial, warpaint makeup. **$29.**

ULTIMATE SUCCESS MANUAL
Underpaid, overworked, harassed or **abused?** Victim of office politics? Stuck in a dead-end job? Can't find a good job? Expect to be laid off, fired or transferred soon? The ultimate no-holds-barred, looking-after-#1 Machiavellian techniques to find, obtain, optimize and keep top jobs, pay and benefits. **THE RULES OF THE GAME FOR A GAME WITHOUT RULES!** From resume to CEO. **$29.**

Sold for Educational Purposes Only

CABLE TV BLOW-OUT

MicroCom Industries Inc.

800-665-2002

Call for FREE Brochure

- Quantity Orders Only
- All Other Models Available
- Call for Pricing of Smaller Quantities

Best Dealer Prices Available Anywhere

MasterCard • VISA • AMX • COD

Jerrold, Scientific Atlanta, Pioneer are registered trademarks and all references are for identification purposes only.

"The Originals"

MicroCom still offers these add-on descramblers and the *BEST* dealer prices available anywhere!

JERROLD® REPLACEMENTS:

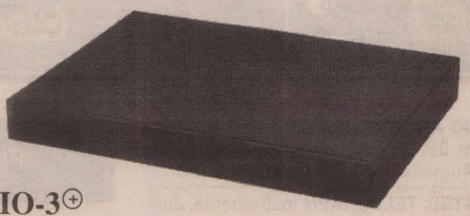
TvT - 3G

TnT - "DIGITAL DYNAMITE"

Activates all Jerrold except Baseband.

SCIENTIFIC ATLANTA® M80

Activates all Jerrold except Baseband.



NEW IMPROVED!!!

PIONEER® PIO-3⊕

This is NOT the Pioneer Green! This PIO-3⊕ always works, even when the "Green" doesn't!!

550 MZ BASIC CONVERTERS:

Comes with wireless remote control. Options include: parental control (except 8511), last channel recall, favorite channel memory, sleep timer, and many more. Channel 2 or 3 available also.

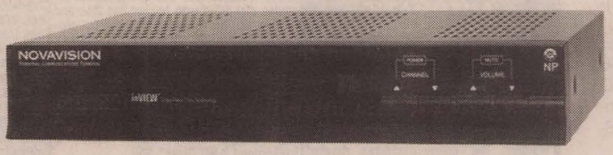
- MILLENNIUM³
- PANASONIC TZPC 145 CONVERTER
- SA 8511-300 CONVERTER
- VISION³ CONVERTER

All other models available. Call about our specials on the Zenith ST1600.

NEW!!!

NOVAVISION

Revolutionary new universal one-piece converter and descrambler. Fully activates all Jerrold, Scientific Atlanta, and Pioneer systems except Baseband. Options include:



- Picture in Picture
- Simaltaneous watch/record
- Clock/sleep timer
- Volume/Mute
- Parental control
- On-screen display
- Stereo
- Last channel recall
- Favorite channel memory
- Ch 3/4 switch

Call for Pricing on Novavision and Millennium³⊕

NEW!!!

MILLENNIUM³⊕

The Millennium³ with built-in TvT, TnT, M80, or PIO III for a complete one-piece converter and descrambler. Fully activates all Jerrold, Scientific Atlanta, and Pioneer systems except Baseband. Options include:

- Picture in Picture
- Simultaneous watch/record
- Std/HRC switch
- Parental control
- Remote A/B switch
- Last channel recall
- Favorite channel memory
- Ch 3/4 switch

Write in 133 on Reader Service Card.

COMPONENTS

Franchised Philips ECG Distributor*

"The Master of Japanese ICs"

WE BUY ELECTRONIC PARTS

Stocking Distributor
Japanese and American Semis, Transistors, and Passives

1N & 2N DIODES AND TRANSISTORS
2SA - 2SK
AN, BA, BX, CX, DM, FT, GL, HA, IRF, IX, KA, LA, LM, M5, MA, MB, MC, MJ, NJM, ON, PA, PC, PS, RB, RD, RU, SI, STA, STK, TA, TC, TDA, UPC

LJ ENTERPRISES
An Elec-Cetera, Inc. Company
68 Railroad Avenue
Valley Stream, NY 11580

(302) 378-3334
FAX (302) 378-3558
TOLL FREE: (800) 627-8755

Write in 119 on Reader Service Card.

The Filter Company, Inc.

1-800-235-8080

Large STOCK on all channels for fast delivery. Available Ch. # 2 thru 24. Order by single channels. NOBODY BEATS OUR PRICE'S.
Monday - Friday (8am to 8pm Central Time)

All Filters are 75 db deep and carry our exclusive 2-year Warranty
Professional Non-Tunable Metal Cylinders. Excellent Fast Service

We Specialize in Large Quantities and Dealer Pricing!!!!!!

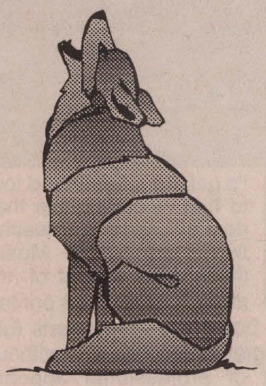
PRICES AS LOW AS $6.00ea

Standard Positive Filter's
1pc @ 16.00 5pcs @ 14.00ea
10pcs or more call.

NEW G & S Series Positive Filter's
1pc @ 30.00 5pcs @ 28.00ea
10pcs or more call.

NEW HIGH CHANNELS
0,1,60,61,98 And 99

Anyone implying theft of service will be denied assistance.
We Do Not Sell Data Blockers!!



Give our 800 line a HOWL for the best Positive Filters and SERVICE.....

#140 PUBLICATIONS *cont.*

WORLD'S MOST UNUSUAL Communications Books! Large selection covering Scanners, "confidential" frequency (HF/VHF) registries, wireless history, bugging, wiretaping, electronic surveillance, monitoring, etc. Big free catalog! CRB Research, Box 56-NV, Commack, NY 11725.

LASER PRINTER REPAIR MANUAL. Don Thompson's Laser Service Seminars offers the only book available on general laser printer repair. Over 380 pages of vital information on all Canon based engines, HPs and Apple Laserwriters. $350 + S/H. 1-800-457-5776. 714-855-3838.

57 ELECTRONIC Journals, How to get **free** subscriptions. $5. Cabletronics, Box 30502N, Bethesda, MD 20824.

PINBALL MACHINES. Books, magazines, manuals, diagrams, supplies. Send $2 for catalog now to: Marco Specialties, Inc., 5290 Platt Springs Rd., Lexington, SC 29073-9252. 803-957-5500. FAX: 803-957-6974.

MILITARY MONITORING GUIDE. New book covers all phases of Military Monitoring. Military Frequencies All Services, US Military Bases, Military Black Projects. Major Air Force Installations, Monitoring Equipment and Systems, Navy/Coast Guard and more. $19.95 plus $4 Priority Mail. UNIVERSAL ELECTRONICS, 4555 GROVES ROAD, #12, COLUMBUS, OH 43232. 614-866-4605.

"POWER UP!" How to make commercial-battery adapters for: military radios, mine detectors, night scopes, field telephones, etc. Instructions/diagrams. $14.95, plus $5 S/H ($6 Canada). NYS res. add $1.70 tax. CRB Research, Box 56-NAV, Commack, NY 11725. Phone: 516-543-9169.

POETRONICS: POETRY of Computers by Human. 70+ Poems. $88. John Bajak, PO Box 8324, White Plains, NY 10605-8324.

USED TECHNICAL books: Radio, Electronics, Math, Military Manuals, Magazines, Catalogs, Data Manuals, Physics, Chemistry, Computing, etc. List $1 (stamps OK), Vacuum tube list, SASE. (Buying similar materials; send your lists with prices.) Softwave, Dept. NV, 1515 Sashabaw, Ortonville, MI 48462.

JOB HUNTING? Federal job vacancies nationwide on IBM diskette. All areas, all categories. Sample disk, $2. POB 1022, Laurel, MD 20725-1022.

SUBSCRIBE TO NUTS & VOLTS TODAY.

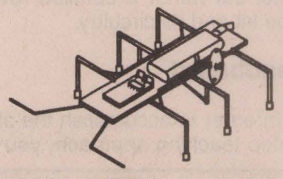
PLANS - KITS - SCHEMATICS 150

FM STEREO TRANSMITTER kit. Transmitter broadcasts any audio signal from a CD player, VCR, or cassette player to FM stereo radios throughout your home and yard. Uses the unique BA1404 IC. Tunable across the FM band, runs on 1.5 to 12 volts DC. PC board/components $24. Visa/MC. **TENTRONIX**, Dept. NV595, 3605 Broken Arrow, Coeur d'Alene, ID 83814. 208-664-2312.

BIG-SCREEN oscilloscope. Convert any television to sensitive big-screen oscilloscope. Only minor changes required. Illustrated plans, $10. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

TOCOM COMPATIBLE schematics, 5507 $15; 5503VIP $10; 5504A $10; 5504A full service testing modifications $20; 5503VIP two different full service testing modifications $20; program codes 5507, 5503VIP, or 5504A $50 for each code; money orders or cash COD, 719-661-1659.

MAGNETIC AMPLIFIER. Solid state amplifier without semiconductors or vacuum. Amplifies through the use of magnetic fields. Plans, $10, Kit (plans + one amplifier), $20. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

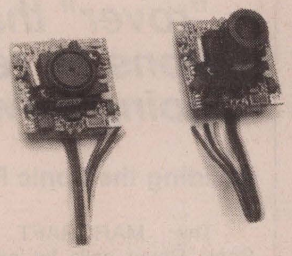


WALKING ROBOT. HexWalker six legged robot kit. Basic stamp controlled, servo driven. $125 + $5 S&H North America, $15 all others. Manual only, $10 + $1 S&H (applicable to kit purchase). CA folks add 7.75%. M&T Systems, PO Box 7816, Huntington Beach, CA 92615. Tel. 714-969-3166, Fax 714-969-3167, E-Mail Mandtsys@ix.netcom.com.

HOBBY CATALOG: Broadcasting, Ham, CB, Cable TV, Hobby and Computer stuff. Transmitters, amplifiers, bugging devices, science projects, TV add-ons, descramblers, books (start your own radio station!), software and more. **PANCOM International,** Box 130-V5, Paradise, CA 95967.

LASER LIGHT show plans. New, inexpensive, non-computerized. Exotic patterns from music! $8.95. TJ Tek, 9318 S. Steele St., Suite 222, Tacoma, WA 98444.

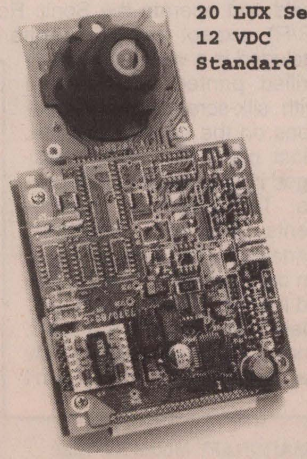
MINIATURE BLACK & WHITE CAMERA MODULES



ASC-307SM $ 125
(Standard Lens)
ASC-307SMP $ 145
(Pinhole Lens)
ASC-307SMC $ 165
("C" Mount Lens)

SPECIFICATIONS
1-1/4" SQUARE
.4 LUX Sensitivity
8 - 12 VDC
Standard NTSC

PAN-1C COLOR CAMERA $ 275
2-1/2" Square
20 LUX Sens.
12 VDC
Standard NTSC



COMPLETE
5 Channel - 2.4 Ghz Video/Audio Transmitter/Receiver System

500' Range with Rubber Ducky Antennas

3000' Range with High Gain Receive Antenna

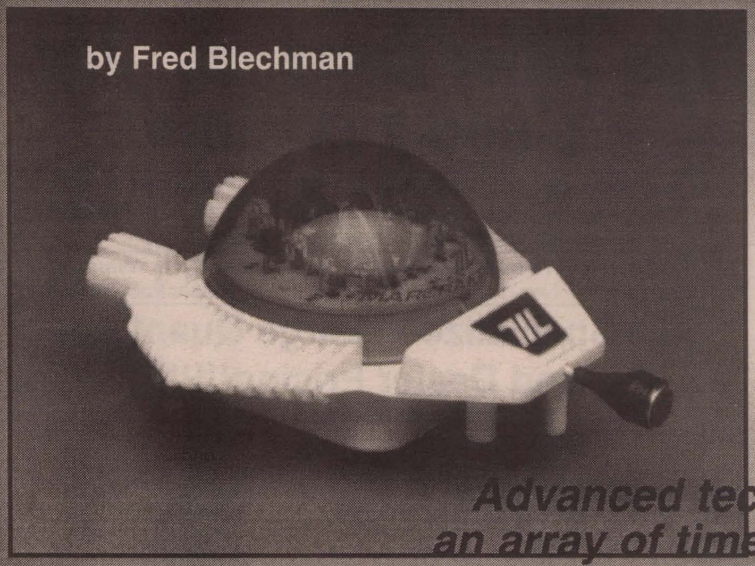
Call or Write For Details
System Price
$ 1,295.00

CME, Inc.

P.O. Box 4477, Englewood, Colorado 80155
PHONES: (800) 771-1295 - (303) 771-1288 - FAX: (303) 771-1136
CALL - WRITE OR FAX FOR FREE CATALOG

Write in 120 on Reader Service Card.

by Fred Blechman



Building the Sonic Rover Kit

Advanced technology has provided us with an array of time-saving, entertaining, and useful products. These new products, however, require more and more technical information and skills to design, manufacture, and service.

The purpose of building the MARCRAFT SE-1029 Sonic Rover is to expand an electronic student's understanding of audio amplifier, switching, and time-constant circuitry combined into a basic robotic device — and have fun with the results!

This article reviews the construction and circuit design of a nine-transistor, three-wheeled "rover" that responds to sound and obstructions by reversing direction, turning, and then going forward again.

It's getting tougher and tougher to find electronic kits that still deal in basics and teach anything significant. Most kits these days consist of nothing more than a small printed circuit board with a few parts (usually integrated circuits), and without any sort of professional appearance when completed. The instructions can be a single sheet of paper, with little in the way of circuit explanation. They may be easy to build, and work properly, but little is learned in the process.

Exactly the opposite approach is taken by MARCRAFT International Corporation (P.O. Box 2694, Tri-Cities, WA 99302. Phone: 800-441-6006). It provides several kits with highly-detailed, two-color, heavily-illustrated manuals designed to teach rather than just assemble. The free catalog (a large wall-size two-sided color poster) shows pictures of various kits, from a power supply to analog (swinging needle readout) and digital (number readout) multimeters.

Intended for use in schools, the kits are available in quantity discounts, and the finished products are completely professional in appearance and operation. They appear to be products that you would normally buy pre-assembled, but instead are packaged in kit form.

With each kit you receive a very comprehensive two-color *Knowledge Transfer Project* manual. The staple-bound, 64-page 8.5-inch by 11-inch manual for the SE-1029 Sonic Rover, for example, contains many photos, two-color line drawings, schematics, and detailed step-by-step assembly and test instructions. The intention here is to teach by doing and testing.

Building the Sonic Rover

The MARCRAFT SE-1029 Sonic Rover sells for only $13.95 plus shipping; call the 800 number listed previously to order. The kit consists of everything you need to build and operate the Sonic Rover (S/R) except two AA batteries. Included is a very high-quality drilled printed circuit board with silk-screened part locations on the component side. Most parts are neatly packaged in several plastic pouches. The electronic components (resistors, capacitors, transistors, etc.) are mounted on cardboard strips with printed identification for each part. Many special parts are used, such as molded plastic body parts and gears, so you can't really build the S/R "from scratch." That's why this is not a construction article, but rather a detailed review of the kit and its circuitry.

Breadboard

In order to accomplish the step-by-step teaching approach, you are supplied with an "experimental breadboard." This uses a special self-stick schematic (Figure 1), a polyurethane panel, 53 brass pins, some bare wire, and some colored insulated wire. You stick the schematic on the panel and then follow illustrated manual instructions to insert the pins and bus wires. Each

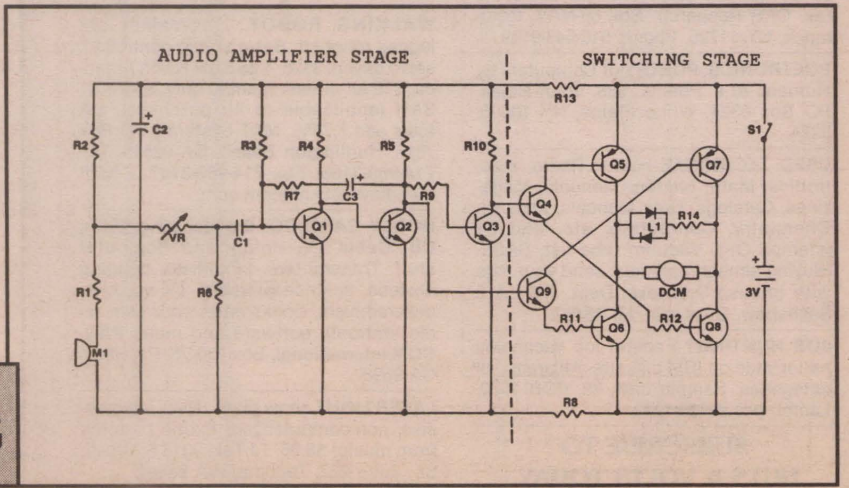
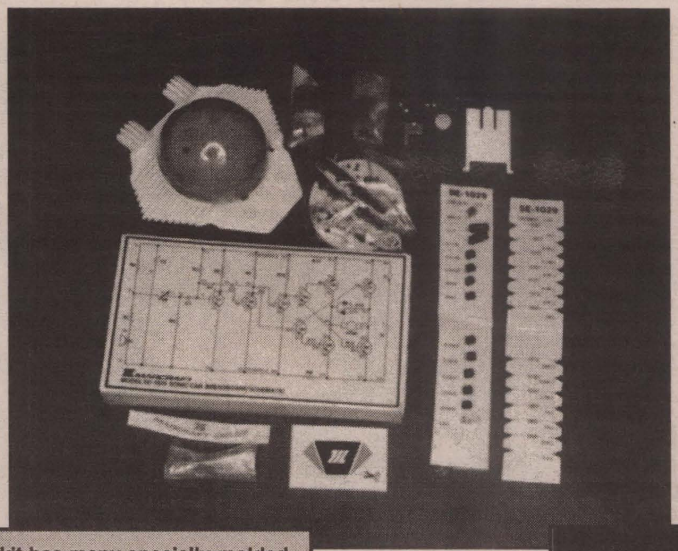


FIGURE 1. Breadboard schematic for the MARCRAFT Model SE-1029 Sonic Rover. The number designations show the locations of solder pins inserted into a polyurethane block. All parts are then mounted for testing and experimentation before building the actual Sonic Rover.

pin has a reference location of a number followed by an "x" as seen in Figure 1.

Next, following detailed instructions, you solder components (resistors, capacitors, transistors, etc.) to the pins as you breadboard and test each part of the circuitry. Once you've completed the breadboard assembly and testing, you unsolder the components and build the actual device.

Before each breadboard construction section of the manual is a discussion that fully explains – with illustrations – the function of that section. After construction of each section, you perform various tests, some requiring a multimeter, oscilloscope, or audio frequency signal generator.



The kit has many specially-molded plastic parts, and includes custom decals.

Fast forward?

If you choose, of course, you can bypass the breadboarding and testing and fast-forward through the manual to the actual construction of the circuit on a printed circuit board, following the step-by-step assembly instructions. Here again, the manual excels in its detail, even including four trouble-shooting flow diagrams for the chassis assembly, audio amplifier stage, switching stage, and time-delay circuit. Various charts show specifications for the motor, two-color LED (light-emitting diode), gear ratios, and even the proper voltages at the terminals of each transistor. This is definitely not intended to be just a put-together-and-run kit!

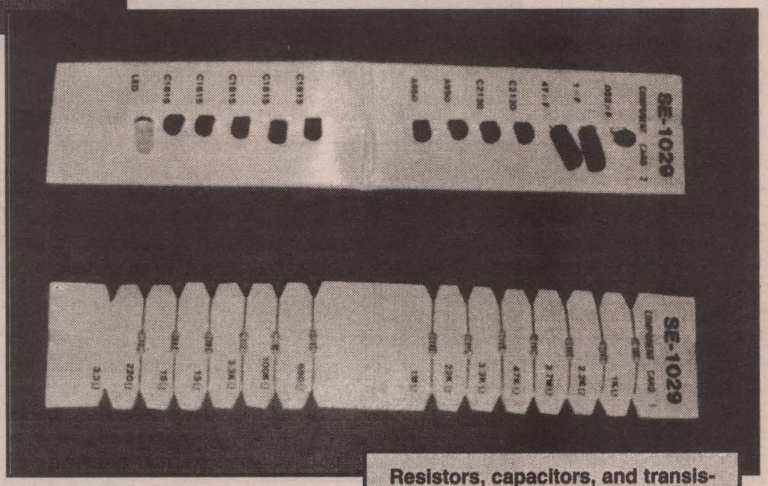
Putting It Together

Following the step-by-step instructions in the manual, I only had a couple of difficulties in the actual assembly of the Sonic Rover. I found several parts missing from the kit: one gear, two gear shafts, and a 3.3-ohm resistor. These were quickly provided by MARCRAFT when I reported the shortage. As a matter of convenience, the kit includes a Replacement Parts Order Form to report damaged, missing, or defective parts. Furthermore, the manual shows a MARCRAFT part number and photo for every part, making identification easy.

The mechanical assembly consists of several plastic parts — some pre-assembled — to which you add a motor, gear train, battery contacts, and a slide switch. The printed circuit (PC) board assembly contains all the other electronic parts. The assembly is greatly simplified by many color-coded illustrations and the fact that the top of the PC board has silk-screened designations for all parts. Also, having most parts mounted on labelled card strips makes it easy to find the proper resistor, capacitor, and transistor.

I did have a problem with the dual-color LED installation. The manual tells you to insert the longer lead into the hole marked "-" but that results in "backwards" operation. The LED is supposed to light GREEN when the S/R is moving forward, and RED when it is moving backward. It was doing the opposite. The easy "fix" was to just reverse the leads from the manual's description by putting the longer lead in the "+" hole.

Once completely assembled, but before installing the transparent plastic dome, I adjusted the variable resistor so that ambient noise did not trigger motor reversal, and then watched the S/R go through its antics.



Resistors, capacitors, and transistors come mounted on specially-marked cardboard strips.

Circuit Description

While building the S/R provides some construction and soldering experience, a description of how the circuit actually works is important to those intending to further their electronic education. The following description is not intended as an "in-depth" theoretical explanation, but rather as a brief non-mathematical "how-it-works" description that presumes only modest previous electronic knowledge.

For further details, I suggest you refer to *Basic Electronics Theory — With Projects and Experiments* by Delton T. Horn (TAB Books, Blue Ridge Summit, PA 17294-0850. ISBN 0-8306-4200-5. $24.95), one of the best elementary texts I've found, and now in its 4th edition.

Figure 2 shows the complete circuit, but WITHOUT the breadboard pin locations. Notice that basically there are two sections to this design — the audio amplifier stage and the switching stage.

You may wonder why none of the parts values or transistor designations are shown. All nine transistors supplied with the kit are foreign-made, and with designations that might be hard to locate in this country. Since the specific characteristics of each transistor (three types are used) would dictate the proper associated component values, no values are given. Circuit operation will be discussed in sufficient detail, however, to allow you to use parts you may have on hand if you choose to build similar circuits, and if you are willing to experiment with different resistor values.

The object of this circuit is to detect a sound above the ambient level — such as the clapping of hands, a loud shout, or the bumping of the Sonic Rover into an obstruction — and reverse the motor for a short period, then continue forward motion. The front wheel of the three-wheel chassis is so designed that when the motor reverses, the S/R turns while moving backwards. When the motor resumes forward motion after a short time delay, the S/R travels straight ahead in the new direction.

Audio Amplifier Stage

Looking at Figure 2, we'll start with the audio amplifier stage. The microphone, M1, is mounted at the very front of the S/R where it will be the first thing to bump against anything in its path. It is an electret type microphone that contains its own preamplifier, but needs voltage from the circuit.

When switch S1 is closed, positive battery voltage is applied to M1 through resistors R1 and R2. Any sound detected and amplified by M1 changes the voltage at the intersection of R1 and R2. This varies the voltage at the voltage divider network consisting of variable resistor VR, and resistor R6. Since VR is variable, it can be used to adjust the microphone output, and therefore control the microphone sensitivity to prevent the S/R from shifting into

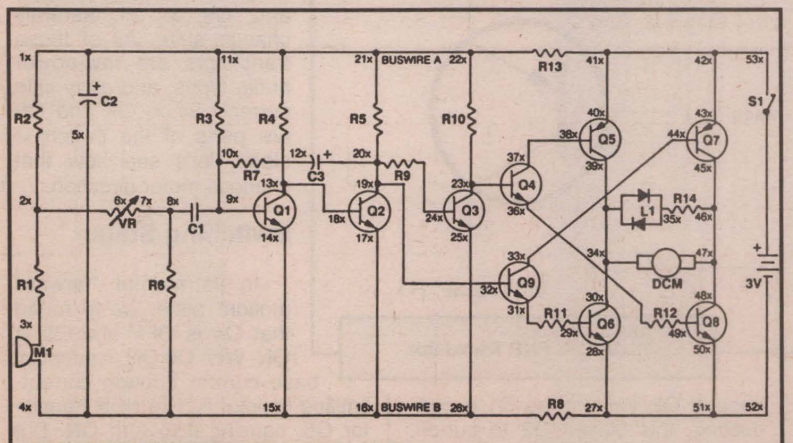


FIGURE 2. Sonic Rover Schematic.

reverse from normal noise levels produced by the motor and gear train.

Sounds received at the microphone produce an alternating voltage at the intersection of VR and R6, and are coupled through capacitor C1 to the first transistor. At this point, let's depart from the circuit explanation to describe briefly how transistors work.

There are many types of transistors: low power, medium power, high power, audio frequency, radio frequency, bipolar, unijunction, field effect, etc. — and all sorts of combinations of each type. The transistors used in this circuit are bipolar audio low and medium power types. There are two types of bipolar transistors: NPN and PNP.

Figure 3 shows the symbol for an NPN transistor, with the three terminals identified: collector, base, and emitter. Notice that the arrowhead on the emitter points AWAY from the base. Figure 4 shows the symbol for a PNP transistor, where the emitter arrowhead points TOWARD the base. Be aware that the emitter, collector, and base leads may be drawn in any of the three positions on some schematics to reduce the crossing of circuit diagram lines, but the emitter is the lead with the arrowhead!

In the explanations that follow, I will use the simple "CURRENT flow" explanation rather than the scholarly "ELECTRON flow" explanation. The difference is this: Current flows from a higher positive voltage to a lower voltage, looking for "ground" or the negative power terminal; electron flow is from negative to positive. IMPORTANT: The arrowheads on most symbols for transistors, diodes, and many other electronic components, show the direction of CURRENT flow from positive to negative.

Now, back to the transistors, and how they work. Look at Figure 3 again. NPN transistors have the lowest voltage on the emitter, a small positive "bias" voltage on the base, and a larger positive voltage on the collector. Without getting into complex theory, NPN transistors turn ON when the bias voltage at the base reaches a point where current flows from base to emitter. This, in effect, opens a gate that allows a larger current flow from the collector through the emitter. The more base-emitter current, the greater the collector-emitter current, up to "saturation" where the collector-emitter current no longer increases. In other words, for an NPN transistor, positive base bias voltage controls collector-emitter current flow.

Figure 4 shows a PNP transistor, which has everything just the reverse of an NPN transistor. The PNP requires positive voltage on the emitter, a small negative "bias" voltage on the base, and a larger negative voltage on the collector. PNP transistors turn ON when the negative bias voltage at the base reaches a point where current flows from emitter to base. This, in effect, opens a gate that allows a larger current flow from the emitter through the collector. The more emitter-base current, the greater the emitter-collector current, up to "saturation" where the emitter-collector current no longer increases. In other words, for an PNP transistor, negative base bias voltage controls emitter-collector current flow.

It is important to note that when the bias voltage at the base of a transistor drops below a required value for that transistor type, the transistor is OFF, with essentially no current flowing. As the bias increases and current flows through the emitter and collector, it becomes as if the collector and emitter were almost connected together, with a very small voltage between them.

With all this understood (you DO understand, don't you?), now we can go back to Figure 2. NPN transistor Q1 has positive voltage on the collector through resistor R4, the emitter is essentially "grounded" through resistor R8 back to the negative side of the battery, and a small positive bias voltage on the base through resistor R3 allows a small current to flow through Q1. With Q1 conducting, the collector voltage drops close to the emitter voltage, which is essentially grounded. The collector of Q1 is connected directly to the base of Q2. As long as Q1 is conducting, this biases Q2 to cut-off, and Q2 is not conducting.

Now look at NPN transistor Q3. Since Q2 is not conducting, positive bias voltage through resistors R5 and R9 causes Q3 to conduct, with resistor R10 limiting collector current to a safe value. This places Q3's collector essentially at ground through its emitter. Since Q3's collector is directly connected to the base of NPN transistor Q4, then Q4 is OFF.

So, at this point, with no triggering sound coming into the microphone, Q1 is ON, Q2 is OFF, Q3 is ON, and Q4 is OFF. But notice something else: The collector of Q2, which is almost at maximum voltage since Q2 is OFF, is connected directly to the base of NPN transistor Q9, keeping Q9 ON.

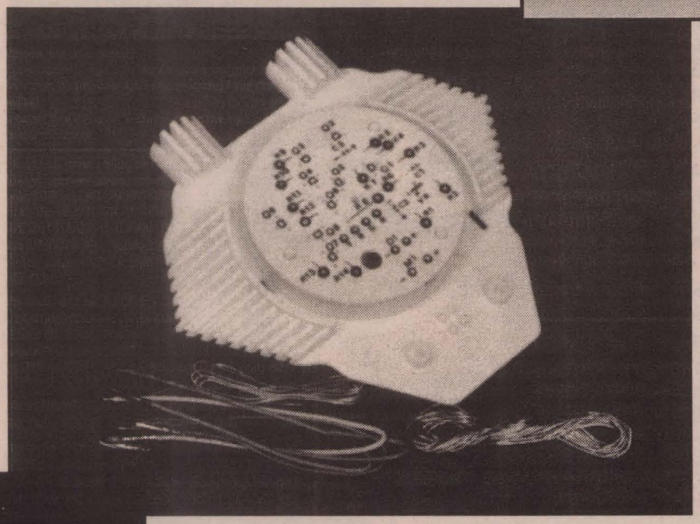
When a sound of sufficient magnitude is received by the microphone, an alternating voltage signal fed to the base of Q1 through coupling capacitor C1 both adds and subtracts from the bias voltage. The component values are such that a NEGATIVE voltage swing of the input signal reduces the base bias on Q1 below the voltage needed for Q1 to conduct, and Q1 is suddenly turned OFF!

The instant Q1 is turned OFF, its collector goes positive (no longer held low by the collector-emitter connection), which, in turn, positively biases Q2's base, and Q2 turns ON. This cuts OFF Q3 and Q9. Since Q3 is now OFF, Q4 has positive voltage bias on its base and Q4 turns ON.

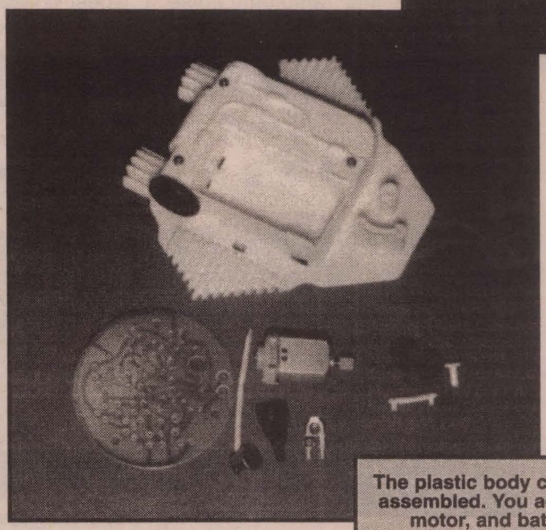
This is how a loud sound — or the microphone bumping into something — causes transistors Q1, Q2, Q3, Q4, and Q9 to all instantly change state. All of these transistors are low-power audio types, and carry little current. Since Q4 and Q9 are parts of the switching stage, let's see how that changes motor direction.

Switching Stage

In its normal "forward motion" state, we've found that Q4 is OFF and Q9 is ON. With Q9 ON, it supplies base current through current-limiting resistor R11 to NPN transistor Q6, causing it to turn ON. But notice that the collector of Q9 is directly connected to the base of PNP transistor Q7. The emitter of



The silk-screened printed circuit board (shown here without components installed) fits into the plastic body.



The plastic body comes mostly pre-assembled. You add the gear train, motor, and battery contacts.

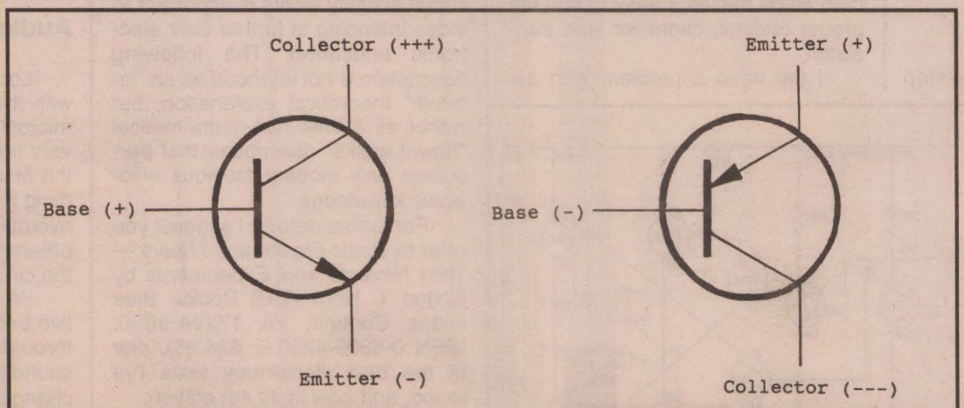


FIGURE 3. NPN Transistor.

FIGURE 4. PNP Transistor.

Q7 is directly connected to positive voltage when S1 is closed, and with both Q9 and Q6 conducting, Q7's base is pulled toward ground, turning Q7 ON.

While a small base current flows through Q7, a larger emitter-collector current through Q7 flows through limiting resistor R14 and the two-color LED, L1 through Q6 (which is ON), and then to the negative side of the battery. The LED lights GREEN. At the same time, emitter-collector current through Q7 follows a parallel path through the motor (DCM) and Q6. This turns on the motor and the S/R moves forward.

But when the loud sound changes the state of the amplifier transistors, and Q9 is turned OFF, Q4 is turned ON, as previously described. With Q9 OFF, Q6 and Q7 are turned OFF. With Q4 ON, Q5 and Q8 conduct. Current flows through L1, R14, and DCM in the OPPOSITE direction. The LED lights RED, the motor reverses, and the S/R runs backwards. The swiveling front wheel causes the S/R to turn as it moves backwards.

Transistors Q5 and Q7 are PNP medium-power transistors (since they must carry the relatively high motor current), and Q6 and Q8 are NPN medium-power transistors for the same reason.

Time Delay Circuit

However, looking again at Q1, it was only the negative halfwave of the loud triggering signal that turned it off. As long as the sound endures, Q1 will be off and the S/R will be running backwards. But what if the sound stops? What will keep the S/R running backwards long enough for it to be aiming in a new direction when it goes forward again?

The "secret" to maintaining backward motion for a defined period of time is a resistance/capacitance (R/C) time delay circuit. In this design, the time delay is provided by resistor R7 and capacitor C3 is series. Both ends of this series combination are tied to positive voltage through resistors R3 and R5 — but R3 is a very high value compared to R5, so current will flow into the positive (+) end of C3 and through R7, charging C3.

The longer it takes for C3 to charge up to a certain voltage value through R7, the longer the S/R continues to move in reverse. Increasing the value of either R7 or C3 (or both) increases the time delay.

Actually, when you first turn the S/R ON by closing switch S1, it will run in reverse a short time. Why? The values used for biasing transistors Q1, Q2, and Q3 cause Q2 to come ON first, making the switching stage run the motor in reverse. But as C3 charges up, delayed by R7, the positive bias fed back to the base of Q1 allows Q1 to turn ON and "normal" forward motion resumes.

With C3 charged up, when a loud noise triggers Q1 OFF and Q2 ON, C3 discharges quickly through the collector-emitter path of Q2 to ground, but then starts charging again through R7 until Q1 turns ON again, Q2 turns OFF, and forward motion resumes.

More Detail?

The 64-page *MARCRAFT Knowledge Transfer Project Manual* goes into considerably more detail than the space allowed here, with lots of electron flow diagrams and tests you can perform to clarify my abbreviated explanation.

Although this project appears fairly simple — a little car that goes forward, turns in reverse, and goes forward again — there's a lot going on "under the hood." The modest $13.95 price of the kit, for all the parts and the excellent manual, would be a wise purchase for anyone that would like some basic groundwork in analog electronics and simple robotics. **NV**

Since 1961, Fred Blechman has written over 700 magazine articles and five books about electronics, microcomputers, and flying.

#150 PLANS – KITS – SCHEMATICS *cont.*

OAK SIGMA I/II/3D/PH2 schematic for building Prom Programmer, instructions, Prom Codes, to turn units into full service mode for Testing purposes, $20. Postpaid, money order please. Surplus Electronics, POB 10009, Colorado Springs, CO 80932.

ELECTRONIC KITS: Caller ID w/battery backup, 150 call memory and an RS232 interface, Multistation Thermometer w/4 separate temperature stations and an RS232 Interface, Telephone Dialer, 240 number storage and an LCD display. Call Genoa Group, 1-800-772-3945.

CNC LOW COST 3 AXIS CONTROLLER KIT. CIMPLE COMPUTER NUMERICAL CONTROL (CCNC) IS HERE! THIS 3 axis motion controller receives step and direction pulses from parallel port. Will drive 3 unipolar stepper motors at 1.25A per phase with 2 phase on. XYZ home switch and overtravel protection inputs. Expandable to drive solid state relays. Works with CNC shareware. Kit includes PC board and all parts for controller board and demo software. Uses a computer power supply or 12V battery. Use to CNC control PC board drill machines, bandsaws, drill presses, wire measuring and cutting machines. Kit is $95 plus $5 S/H. Assembled and tested $145. Send US check/MO to CAMTRONICS INC., 18230 130th PL NE, Bothell, WA 98011-3118. Tel: 206-487-0013.

OAK SIGMA I converter descrambler schematic $15; Oak Sigma STV I/II schematic $15; Jerrold Starcom-5 compatible XT5-211 baseband schematic $10; Starcom-7 compatible DPV7212 schematic $10; Starcom-7 compatible DPBB/M1 baseband schematic $20; Money order please. Surplus Electronics, POB 10009, Colorado Springs, CO 80932-1009.

NI-CAD ZAPPER can rejuvenate those unrechargeable NI-CAD batteries. Instructions, schematic and parts list to construct NI-CAD ZAPPER: $5. **TENTRONIX**, 3605 Broken Arrow, Coeur d'Alene, ID 83814.

SERVICE MANUALS/Schematics for many brands of VCRs, camcorders, color + B/W TVs and audio. Have original and SAMs literature from $2-$20, plus postage. Call after 6pm EST 617-871-9068, with make and model numbers.

FISH ZAPPER Proven solid state design stuns fish and they float to the surface! Complete detailed information on the theory of operation and how to build your own from readily available. Sold for educational purposes only. Only $20 (postpaid) Visa, M/C, Discover. Message or Fax: 501-223-9406. Software, Inc., Box. 23016, Little Rock, AR 72221.

NEW BOOK "BUILD-UR-OWN SPECTRUM ANALYZER." Based on the popular Poor Man's Spectrum analyzer/monitor receiver. Complete instructions, photos, layout drawings, parts lists, theory of operation, user modifications, applications, magazine article reprints, etc. $24.95 + $4 S/H. Science Workshop, Box 310NV, Bethpage, NY 11714.

IRQ/DMA conflict eliminator: Easy to build board does what software can't. A must for troubleshooting PC's. Laser printed schematics, drawings and parts list, $15. Mark Lopez, 306 Roosevelt, Irvine, CA 92720.

DUAL COLOR bargraph uses LM3914 plus. Full scale always lit green. Signal voltage is red dot or bar. Full scale reading makes display flash red/green. Great visual effect, use for volt meters etc. Kit $26, assembled $34, S&H $3.50, Creative Technology, PO Box 1401, Torrington, CT 06790-1401.

DIGITAL KLOCK kit plays one of twelve melodies on the quarter hour. Six displays, 12/24 hour mode, date, alarm and accessory outlet. Send $2 for complete assembly plans and pricing to Kerber Klock Kompany, 36117 Hillcrest Dr., Eastlake, OH 44095.

CABLE TV
Descrambler Kits

"NEW & IMPROVED UNIVERSAL KIT"

Universal Kit 1995 . . . . . $79.95
Includes all the original parts plus the improvements and a silk-screened PC Board. New Product.

Enclosure Package $44.95
Includes all the switches, hardware, AC Adaptor, and a black silk-screened box for above Universal kit.

Tri-Mode Kit $59.95
Includes all the parts (with a SAW filter), a silk-screened PC Board, and AC Adaptor. Not included is the enclosure.

SB-3 Kit $44.95
Includes all the parts, a silk-screened PC Board, and AC Adaptor. Not included is the enclosure.

Kill Caller ID $69.00
Protect your privacy, automatically.

Notch Filters $39.00
Tunable.

CALL TOLL FREE 1-800-886-8699

Visa, MasterCard, or COD
Add $7.50 Shipping and Handling.

Northeast Electronics, Inc.
PO Box 3310-N, North Attleboro, MA 02761

Write in 137 on Reader Service Card.

WE BUY MEMORY NEW AND USED

SIMMS, SIPPS, CREDIT CARD, SOJ, ZIPP, DIP, CPU'S
AST-COMPAQ-DELL-HP-IBM-NEC-
PACKARD BELL-TI-TOSHIBA-ZENITH & MORE!

WE PAY HIGHEST PRICE!

NO QUANTITY TOO SMALL OR TOO LARGE

PH: 1-800-252-5959 FAX: 702-895-9007

MEMORY EXPERTS

Write in 121 on Reader Service Card.

PHONELINE SIMULATOR Kit. As featured in Jan. '95 Popular Electronics Magazine. Microprocessor controlled system is used to demonstrate/test telephones, modems, fax machines, voice mail, etc. Authentic dial tone, busy signals, and ringing. LED display shows dialed touchtone digits too! Kit includes printed ciruit board, all electronic parts, technical manual. $145 plus $6.50 for USA shipping. CA residents include local tax. MasterCard, Visa, Discover. Digital Products Company, 134 Windstar Circle, Folsom, CA 95630. 24 hr. voice 916-985-7219, Fax 916-985-8460.

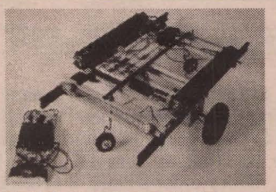
VCR BELT KITS! Save big bucks by changing broken or worn belts. Send make, model & $15 to Minute Man Electronics, 37111 Post St. #1, Fremont, CA 94536. Visa or MC. 510-791-5036.

CRYSTAL RADIO Kits; comes complete for an old style radio. $22.50. Carl & Grace Ent., 5636 Romeyn, Detroit, MI 48209.

CONVERT ANY cassette recorder to 10+ hour R/PB schematic PCART detailed inst. $10. EAH, 23352 West Spring Harbor, Siloam Springs, AR 72761.

MINIATURE TRANSMITTERS! All types! Send $2 for information, refundable on first order. **Parsec Electronics,** PO Box 34594, Phoenix, AZ 85067-4594.

TV TRANSMITTER plans, 34 pages including schematics, parts list, tuning, kit information. Capable of transmitting 2 watt of audio and video exceeding several miles range. $10 cash or money order to: Borderline Electronics, PO Box 1831, Riverhead, NY 11901.



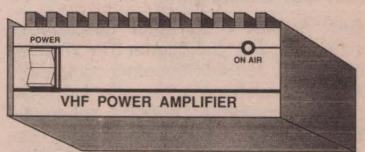
OPIE THE MOBILE ROBOT provides a complete course in robotics. OPIE comes with a 13 chapter manual covering transducers, digital and analog circuits, microcontrollers and more. Used in University, College and High School. Buy as little or as much as needed. MasterCard accepted. Precision MicroDynamics. Tel. 604-472-7249, FAX 604-472-1830.

FREE PHONE calls through your CB radio. Project plans $5. DB International, PO Box 1933, Lynnwood, WA 98046.

REMOTE CONTROL miniature encoded transmitters and receivers infrared and RF kits and assembled boards. Free catalog. Inventive Solutions, Inc., PO Box 8, Stratford, NY 13470.

HYDROGEN FUEL cell educational kit PEM fuel cell, solar panel, electrolyzer and more, $149. GreenLux, 415-753-0251.

VIDEO GAME cartridge design plans and memory maps for the 8 and 16 bit systems. Explore game design using a C64 or IBM computer. For more information send a SASE. Andrew S. Pakerski, PO Box 86, Thorndale, PA 19372.



BROADCAST FARTHER! 75-110 MHz amplifier connects to stereo transmitters. Produces 15-20 watt signal. Requires 50-150MW drive. Complete plans with part source information and antenna designs, only $16. Visa, MC accepted. **PROGRESSIVE CONCEPTS,** 1434 North Mills Ave. Claremont, CA 91711, 909-626-4969.

Designers
Programmers
Engineers
Technicians
and/or
Hackers

Are you an expert in any of these areas?
• IR Control • PCB Design • C++ • Machine Code • Windows Development Code • Lasers • Spread Spectrum • ISO 9000 • FCC Certification Part B • Networks • X-10 • PIC16C55 • Fiber Optics • Plastic Molding • Tool & Die • CAD/CAM • Electronics.

We are a multi-million dollar electronics corporation looking for a few good independent subcontractors who can work at home or in an office to help us design new products on a fast track.

If you have special skills in any of these areas, we would like to hear from you. Please send your complete technical qualifications, and/or a list of your abilities and achievements to:

CORBY Access Control Systems
Department 111
1501 East Pennsylvania St.
Allentown, PA 18103

LA PAZ
Electronics International

COMPUTER PARTS

MEMORY

1Mx9-70 (3-chip) SIMM	$38
1Mx9-70 SIMM	$38
4Mx9-70 SIMM	$125
1Mx36-70 72-pin SIMM (4MB)	$157
1Mx1-70 DRAM	$4.90
256Kx4-70 DRAM	$5.25
1Mx4-70 ZIP DRAM	$22

NEW ITEM

256Kx16 ZIP (CAS/WE) FOR VIDEO UPGRADE (Packard Bell, Genoa, ATI, and others)	$39

PROCESSORS & MATH-CO

386DX-16 INTEL	$19.50
486DX-33/DX2-66 INTEL	$119/$185
486DX2 OVERDRIVE INTEL	$195
80387SX-25/SX-33	$45
80387DX-33/DX-40	$49

UPGRADES

HP II/III 2 MEG RAM CARD	$79/$95
PANASONIC 4410/4420 2 MEG CARD	$95/$99
PANASONIC/CITIZEN 32K BUFFER	$10.50/$19.50
14.4 FAX MODEM	$98
PB-10 EPROM PROGRAMMER	$135
SERIAL CARD W/16550 UART	$27.50
I/O CARD W/16550 UART	$34
SUPER IDE I/O W/16550	$59
CPU COOLING FAN	$9.50

OTHER CHIPS

16550AFN UART W/FIFO	$12
32Kx8-20ns CACHE SRAM	$5.25
27128A-2 EPROM	$3.50
27C256-150 EPROM	$3.95
27C512-150 EPROM	$4.95

• OTHER PARTS AVAILABLE, CALL FOR QUOTE • VOLUME DISCOUNTS OFFERED • PRICES SUBJECT TO CHANGE WITHOUT NOTICE • TERMS: COD (CASH), VISA/MC • MINIMUM ORDER: $20 • FREIGHT: $5.00 MIN.

LA PAZ ELECTRONICS INT'L
P.O. Box 261095, San Diego, CA 92196
TEL (800) 586-4199 FAX (619) 586-1482

Write in 122 on Reader Service Card.

EZ-EP DEVICE PROGRAMMER - $149.95

INEXPENSIVE - Best programmer under $200.
PORTABLE - Attaches to PC parallel port.
FAST - Programs 27C010 in 23 seconds.

VERSATILE - Supports devices 2716 thru 27080 plus EE and Flash to 32 pins. Reads and writes binary, ASCII hex, Intel Hex, and Motorola S formats.

SERVICE - Information and software updates via BBS or voice. 30 day money back guarantee.

ADAPTERS for additional devices are available.

EP-51 (8751,C51)	$39.95	EP-PIC (16C5x,71,84)	$49.95
EP-SOIC28	$49.95	EP-SEE (24xx,93xx Serial EE)	$34.95
EP-11 (68HC11)	$59.95	EP-16 (16bit EPROMs)	$49.95
EP-55 (8755)	$39.95	EP-49 (8741,42,48,49)	$49.95
EP-PLCC32	$49.95	EP-PEEL(18v8,20g10,22v10)	$59.95

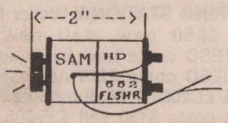
M²L ELECTRONICS **310/837-7818**
3526 Jasmine; Suite #4 **Voice**: 9AM - 1PM M-S
Los Angeles, CA 90034 **BBS/FAX:** other hours
CA orders add 8.25% sales tax. Ground Shipping - $5.00 3 Day - $7.00
2nd Day Air- $10.00 Overnight - $15.00 COD $4.50

Write In 123 on Reader Service Card.

NIGHT VISION KITS, and brand name US and Foreign units. **Complete** kits include all neccessary components to build your own night vision scope. **SAVE $. US Military Intensifiers, IR, Foreign and more. Call or write: NENVIS, INC.,** 320 Main St., Box 1088 Sturbridge, MA 01566 or 508-347-7238, 10-4pm EST.

ROBOT STARTER kits. Robot control board, the Bot-Board $5.95 or 3 for $15. Robot base kit, the B-Bot $29.95. Armbot, robot arm kit, $12.95. Add $3 shipping. Check or MO to Marvin Green, 821 SW 14th Street, Troutdale, OR 97060.

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. Phone: 616-925-5899, 8-4 ET.



YOU WON'T be caught flashing with SILENT SAM's patented Vehicle Turn Signal Reminder. Its brief, timely signal alerts you to cancel. Kit w/case $15. Also, prewired $20 and $25 hi output model. Plus $2.50 S&H. Visa/MC. Money back guarantee. To order call toll free 1-800-398-5605, Free Flyer. Silent Sam, 1627 Basil Dr., Columbus, OH 43227.

NON-MAINSTREAM technical topics on diskette for the computer enthusiast. Free catalog. Peregrine Dynamics, 720 Portage Trail, Cuyahoga Falls, OH 44221.

TIRED OF IRONING? Prototype service for hobbyists & engineers. Single/small quantity ss PCBs. No setup fee. $10 minimum, most boards $25. We scan magazine artwork **free** so get out your back issues! For details write or call **FIRST PROTO** 1355 W. Palmetto Park Rd., #158, Boca Raton, FL 33486 407-392-8677.

VOICE CHANGER board! Fully assembled and tested! Not a kit! 16 levels of change, many applications! $39.95 + $4 (S&H) US funds! **PARSEC Electronics,** PO Box 34594, Phoenix, AZ 85067.

MANUALS - SCHEMATICS WANTED

155

WANTED: SCHEMATICS for all types of Hi-pot testing equipment, service manuals also wanted. Youngson's Inc., 6701 Melrose Ave., Louisville, KY 40216.

WANTED: COLLINS Radio Company literature. Jim Stitzinger, 805-259-2011, FAX 805-259-3830.

AN/TRC97A MANUALS wanted. Wade, 309-523-3262.

WANTED INFORMATION and schematics on **ELECTRONIC SPEEDOMETERS** for American and Foreign automobiles. Top dollar paid for information about Lincoln Town-car 1990-1995. Please call 718-463-8746 or beep 917-249-3338.

HELP! I need a schematic for a Truetone shortwave/broadcast band receiver, Model #D1104. R. A. Hudson, Rt 2, Box 205A, Herman, MO 65041.

ELGAR 1000 watts UPS model 1PS1100. Mark, 801-394-4907.

NEED INFO for Televideo 924 Terminal and GE Intersil IPO/80 "shoebox" computer. Dan, KA6UQT, 2761 Skyline Dr., Eureka, CA 95503. 707-443-2450.

WANTED: VIDEO arcade game parts and test equipment. Especially want any Cinematronics test equipment and Atari CAT box. Also looking for Atari "Quantum" and Cinematronics "Sundance". Interested in other X-Y parts. Dave Hanes, 912 Deercreek Lane, Ft. Collins, CO 80526, 303-223-2069.

WANTED: MANUALS for Amtron color monitors CD 1903CD and CD 1923-41C. reply: Carver 690 Mahard Drive, Twin Falls, ID 83301. 208-734-3568.

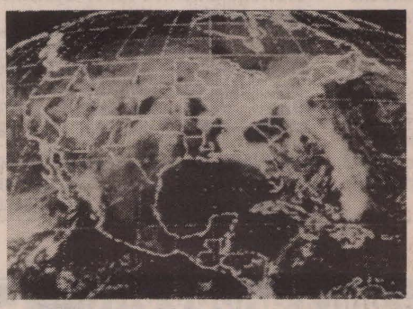
WANTED: SCHEMATIC for Power Designs, Inc. Model 5015A power supply. Will copy and return if you wish. Don Oldfield, 4715 Lofty Pines Circle E., Jacksonville, FL 32210. 904-777-2974. FAX 904-354-2811.

WANTED: MANUAL for Hickok 123A tube tester that explains how to put coding information onto tube test code cards. Also, instructions wanted for Hickok CAS Universal tube tester adapter. Lawrence Greenberg, 34 Brixton Road South, West Hempstead, NY 11552. 516-481-6943.

NEED COPY of tube chart for Heathkit Model TC-2 tube checker early types such as 2A3, 42, 75, 6A6, 4, 5, 6, pin tubes etc. Also manual on Fluke counter 1952A, Beckman, DVM 3020. J. Critchfield, 1579 Sean Dr., Placerville, CA 95667.

WANTED: MANUALS, operators and service schematics for Communications Receivers: Realistic DX-160 catalog 20-152. Lafayette model KT-340, National H/F receiver type, NC-120. Will pay copy costs, etc. Have Collins remote type. COL-23270 for a TCS-9, possible trade? Call collect: 407-247-2117. 8-6 M-F EST.

Get A New Image

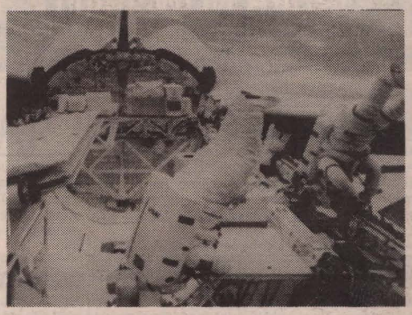


PC HF Facsimile $99

PC HF Facsimile is a simple, yet comprehensive short-wave fax system for the IBM PC and compatibles. It includes an FSK demodulator, advanced signal processing software, tutorial audio cassette, and complete reference manual. Just plug the demodulator into a serial port, install the software and getting FAX is a snap.

PC SSTV $149.95

PC Slow Scan Television is a complete system for sending and receiving full color amateur SSTV. The package includes an SSTV FSK modem, SSTV software, image capture utilities and reference manual. All popular formats are supported including Robot, Scottie, Martin and AVT. The system requires a 286, 386 or faster PC with VGA or super VGA display.



Have It All For Only $199.95

For a limited time we are offering both software packages with a single FSK modem for under $200. This combination offer will let you send and receive all the popular HF image transmission modes.

Call or write for our free catalog. Visa and Mastercard welcomed.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
[illegible] Fax (714) 498-0568

Anyone
We

WANTED: SERVICE manual, or schematic for Trac 201L IBM-286 laptop computer made by SamSung. Contact: Mike Crawley, 4806 Adams Ridge Drive, Greensboro, NC 27407. 910-299-2272. FAX 910-299-5568.

WANTED: SERVICE manual for Burroughs Dex 3500 Fax machine. Schematics for Fisher FVH 8300, FVH 725 and Panasonic PV-1000A plus Shimtom XR1000 VCRs. Contact Paul Garrett, 3823 Thirty First Street, Detroit, MI 48210-3117. 12-5pm. 313-894-0947.

WANTED: TEST EQUIPMENT SERVICE MANUALS! For late model Hewlett-Packard, Tektronix, Fluke, Wavetek, ESI test equipment. Pepper Systems: 214-353-0257; 214-902-9511 FAX.

WANTED: SPECS on house no's GD/E666094-547; -554 and GD/E-R666094-017. Also, (UTC) D1212. All audio/line transformers. Vern Fabishak, W9HDH, PO Box 20972, Greenfield, WI 53220.

DOCUMENTATION WANTED: Starcom 6 & 7 service lit. (Thru V5 & V5b series.) Please fax price info to 202-722-4509.

MISCELLANEOUS ELECTRONICS FOR SALE 160

WIRE RECORDER wire on original spools $5 ea. Large inventory pipe/electronic organ parts. Captures, keying, contactless keying, gold contact wire, speakers, etc. Complete altos business computer with two work stations etc. Complete Apple IIE computer system. Make offer. 206-863-2331.

MANUFACTURING PLANT closed: Dover wave solder machine model #515530, 220VAC, adjustable track, good condition, $5600. Shuttleworth, Inc. cool down conveyor 100VAC, fan bank and all controls, $1700, and more. Call for complete list, ISE, ph: 210-350-5555.

SOLAR KING'S many million dollars of solar panels in stock. Solar panels: 12" x 24", 15V, 6.5W, .5A, $170/10, $800/50, $1,550/100; 12" x 12" 15V. 3W, .25A, $17.95, $150/10, $700/58, $1,350/100, 6" x 12" 15V, @ .125A, 1.5W, $13.95, $120/10, $1,100/100, $1,000/100, 6" x 6" 7.2V, @ .065A, .75W, $4.95, $39/10, $350/100, $2,980/1000. Wholesale/retail/mail order. Material running low. New solar material coming in all the time. Since 1964. Send SASE for Cat'l. BNF, 119 Foster St., Peabody, MA 01960, T508-532-2323, F508-532-1040.

ORDER NOW 1-800 4 HOBBY KITS

AIRCRAFT RECEIVER

Hear exciting air-craft communications—pick up planes up to 100 miles away! Receives 110-136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit.....**$29.95** Matching case set, CAR ...**$14.95**

FM RECEIVERS & TRANSMITTER

Keep an ear on the local repeater, police, weather or just tune around. These sensitive superhet receivers are fun to build and use. Tunes any 5 MHz portion of the band and have smooth varactor tuning with AFC, dual conversion, ceramic filtering, squelch and plenty of speaker volume. Complete manual details how the rigs work and applications. 2M FM transmitter has 5W RF out, crystal control (146.52 included), pro-specs and data/mike inputs. Add our case sets for a nice finish.
FM Receiver kit Specify band: FR-146 (2M), FR-6 (6M), FR-10 (10M), FR-220 (220MHz) **$34.95**
CFR Matching case set **$14.95**
FT-146 Two Meter FM transmitter kit **$99.95**

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur cube - including battery and mike. Two

SYNTHESIZED AUDIO GENERATOR

DDS (Direct Digital Synthesis) technology brings you a terrific audio generator at a fantastic price! Generates from 0. 01 Hz to 50 KHz with five digit LED display of frequency. Sine and square wave output adjustable 0-5 volt p-p. Frequency selected by direct keyboard entry and with handy continuous tune tuning knob. Crystal controlled accuracy of 10 ppm and two memories for rapid frequency changes. Retire that jury-rigged old generator and treat yourself to the pleasure of using a new state-of-the-art SG-550!
SG-550 Kit ..**$199.95** SG-550WT assembled **$269.95**

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning. AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SR1.....**$29.95**
Shortwave converter kit, SC1 .....**$27.95**
Matching case set for SR1, CSR **$14.95**
Matching case set for SCI, CSC **$14.95**

AM TRANSMITTER

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna
FM-10A Stereo transmitter kit **$34.95**
CFM Case,whip ant set **$14.95**

DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.
DN-1 Dr. Ni-Cad conditioner/fast charger kit.....**$49.95**
CDN Matching case set.....**$14.95**
DN-1WT Fully assembled Dr. Ni-Cad with case **$89.95**

SPEED RADAR

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.
SG-7 Complete kit.....**$99.95**

STEREO PEAK HOLD BARGRAPH

) bar graph with a peak hold display! Bar graph displays are neat and eye speed is their downfall - they just can't capture the peaks. Our kit is like fast display to show the signal and a long persistance display to capture go for hundreds of bucks! We offer 3 models: Linear for general use, U meters, and Log for power displays. Dual - for stereo! - 10 segment display for snazzy, eye grabbing display and easily set ranges for from voltmeters to audio VU meters to audio power amps to SWR uctions for easy hook-up to most any device. Add our matching case unit.
graph kit.....**$39.95** PH-15 Dual Log bargraph kit ..**$39.95**
Bargraph kit.....**$39.95** CPH Matching case set **$14.95**

RAMBLER

ble systems heard or set up your own n system over the rd generation IC is quality - equivalent nd mixers! Crystal ar sound with a built- direct radio hook-up. ach user has a unit gon. Communicate in Add our case set for n.
scramblerkit **$39.95**
ase set.....**$14.95**
led
e set **$79.95**

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!
CS-1 Crystal set kit **$19.95**

TOUCH-TONE DECODER

numbers right off the air, phone or tape. A simple hook-up to any radio line is all that is required to instantly decipher touch-tone phone . A 256 digit memory stores decoded numbers and keeps its memory of power loss. An 8 digit LED display allows you to scroll through the amine numbers. To make it easy to pick out number groups or codes, d between sets of digits that were decoded more than 2 seconds apart. quality crystal controlled decoder is used allowing rapid and reliable rs at up to 20 digits per second! For a professionally finished look, case set. Start cracking those secret codes tomorrow with the Tone
abber kit.....**$99.95** CTG Matching case set **$14.95**
assembled TG-1 and case.....**$149.95**

DIGITAL VOICE RECORDER

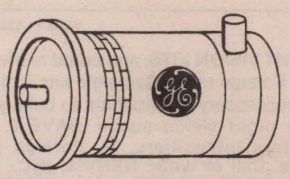
ox digital voice storage unit will record your message of up to 20 seconds. split up into four 5 second blocks which can be played separately or for longer messages. An LED display shows message location and de for easy operation. Nifty built-in interfaces allow simple connection to s for automatic keying when the PTT is initially closed or after it is ou can even loop your rig's mike through the Chatterbox. For contest or , the CB-1 can drive an external speaker. Includes a built-in electret mike. nat finishing touch, add our matching case set.
-1 Voice recorder kit.....**$59.95** CCB Matching case set **$14.95**

S CALL 1-800-4 HOBBY KITS (446-2295) ORDERS ONLY
TECH/ORDER/INFO (716)924-4560 FAX (716)924-4555

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. Add $4.95 for shipping, handling and insurance. For foreign orders add 20% for surface mail. COD (U.S. only) add $5.00. Orders under $20 add $3.00 NY residents add 7% sales tax. 90-day parts warranty on kit parts. 1-year parts & labor warranty on wired units.

Y ELECTRONICS, INC 793 CANNING PARKWAY VICTOR NY 14564

Write In 125 on Reader Service Card.



ELECTRIC CAR Motors. Genuine GE motors and controllers specifically designed for EVs. Series and Shunt motor systems complete with controller, accelerator switch, and digital display. Discount prices. Specification and price sheets available. Specify Series or Shunt System and send $3 ea. or $5 for both to: DM3 Electrics, POB 14574, Scottsdale, AZ 85267-4574.

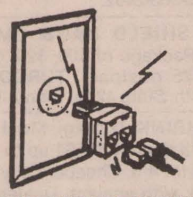
TUBES, NEW, up to 90% off, SASE, Kirby, 298 W. Carmel Dr., Carmel, IN 46032.

SOLDERING STATIONS: Weller MC5000 costs $550 new, sell new $250. EC2001ESD costs new $329, sell $150. EC2000ESD costs $279 new, sell $100/$50/$25. EC2001 $100, turquoise WTCPN, WTCPL costs $130 sell $35-$65. HEXACON adj. temp. solder station costs $239, sell $45. DESOLDERING STATIONS: (vacuum pump built in) UNGAR 4624 solder/desolder $400 new, Ungar 4024 $275 new, Ungar 4000 $200 Supertech 999SD-A solder desolder $250, PACE desolder center $250, $300, Ungar 2000 $175. Chip pullers pak extractor $100, Raychem hot air pencil $350, Princess heat gun $75, hot tweezers $75. Raychem IR500 costs new $865, sell $150. Ungar SMR1000 costs new $10K, sell $4K. Pace desolder pencil $65. Weller DS217 desolder head new cost $107, sell new $50. Weller TC201 pencils $30. Lindstrom cutters $10, thermal strippers $25, $30, $300. Restance soldering for $100, $239 UNGAR soldering stations for $100, $129 UNGAR solder station for $50. Also tip, wick solder. Ask Jim, 310-815-9090.

ANAHEIM WIRE PRODUCTS. DISTRIBUTOR OF ELECTRICAL WIRE AND CABLE since 1973. Items available from our stock: Hook up wire, Automotive primary wire, GXL, SXL, Plenum cable, Teflon wire, Multi-conductor cable, Irradiated PVC, SO-CORD, Mil-Spec wire, Building wire, Welding cable, Battery cable, Telephone wire, Shrink tubing, Cable ties, Connectors. If interested, please call **1-800-626-7540**, FAX: 714-771-5043. Visa/MC.

QUICK-LITE™. ATTENTION AUTOMOTIVE INSTALLERS/SERVICEMEN. Finest handheld automotive test light available! Checks for voltage, continuity and polarity (12 to 24 volts neg. ground). Features fully automatic operation, self-test ground lead, high reliability, pro-quality, replaceable parts, guaranteed product! $29.95 postpaid, ME residents add 6% sales tax. Send LSASE for free brochure. MORIN PRODUCTS, 118 Market St., Ft. Kent, ME 04743. 207-834-5961.

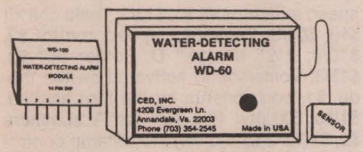
FOR SALE: Hammond organ parts, tubes keys, ICs, printed circuit boards, service manuals. Retiring my 45 year service collection. SASE for quotation and availability of your needs. Dick Stein, 249 Spring Creek Road, Northfield, OH 44067. 216-467-6704.



TELEPHONE (BUG) TRANSMITTER KIT hidden inside a dual modular adaptor. Transmits both sides of phone conversation to any FM radio up to 1/4 mile. Crystal clear reception. No soldering necessary. Simply snap kit together & plug into modular outlet. Uses existing phone line for operating power and antenna. $49.95. 404-393-3311. Electronic Specialties, PO Box 467068, Atlanta, GA 31146.

40 CHANNEL triggerable logic monitor switchable resistance/capacity box variac 500VA 0-130V 50/60Hz, DP1 digital pulser 50MHz, LP1 logic probe 50MHz, LM1 logic monitor 50MHz, $300. Plus shipping. Digital Matrix, 6335 Garland Court, New Port Richey, FL. 34652-2042. 813-848-1938.

WEST AMP-SERVO MOTOR CONTROLLER Model A6511-10ES. 10 available @ $50 ea. Call Roger @ GS&E, 716-338-7001. VISA/MC.



WATER-DETECTING Alarm. If you have a basement, you need at least one water detector to warn you of sewer backup, sump pump malfunction, burst washing machine hose, etc. CED offers the WD-60, an assembled water detecting alarm, which will produce a loud beeping sound whenever it detects the smallest amount of water. A 9-volt battery (not included) will last two years or longer. If you want to make your own alarm, CED also offers the WD-100 module and the WD-77 beeper to which you only need to add a 9-volt battery and a piece of speaker wire. A pictorial assembly is provided with the module. The price of the WD-60 (assembled unit) is $21.95 plus $3 S/H and in Virginia 4.5% tax. The price of the WD-100 (module) is $12.95 and the WD-77 (beeper) $6.95 plus $2 S/H and in Virginia 4.5% tax. Satisfaction guaranteed or your money back. Send check or money order to CED, 4209 Evergreen Lane, Annandale, VA 22003. Phone 703-354-2545.

MICRO IMAGER Bell & Howell ABR-120, includes ABR-100A recorder and ABR-100 imprinter. Slight cosmetic damage, no manuals. Best offer/or trade. Ken Alspaugh, 625 Stemen Rd. NW, Baltimore, OH 43105. 614-862-6053.

MDS DOWNCONVERTERS, COMMERCIAL BUILT, Factory new. May be altered to Upconverter-Xmitter, or retuned to Amateur 2300MHz? Or to GOES satellite or MMDS? Complete/power supply and schematic, $30 + $5 priority mail. Special: 30" dish and dipole (refurbished) $20 more. Money Orders/checks OK to Dave Porter, 145 N. 80th Pl, Mesa, AZ 85207. Quantity prices. 602-380-0064.

CNC BUILDERS: Stepper motors, machines, linear rails, several sizes of stepper motors, some servo motors and misc. drivers. Industrial equipment removals. Price list. Jim DuBois, 330 State Road 101, Amherst, NH 03031. 603-673-3645.

AT&T MICROHMETER NDT TEST SYSTEM, model M-100, 12ft spring cord, Bi-position handle, Battery Charger, Calibration plate, 0.100 & 0.250 in Probe cartridges, complete documentation; Carrying case w/molded insert; Working, as new condition $450 or best offer. Psitech Plus, 707-745-4804, FAX 707-747-5277.

MINIATURE TOGGLE switches SPDT O-OFF-O $1, BNC-T adaptor $2, dual shielded RCA 6 ft. $1.75. BNC panel mount $1.25 ea. Call us about the parts you need, access to hundreds of items. Quantity prices available. Black Feather Electronics. 1-800-526-3710.

$1,000,000 DISTRIBUTOR Inventory! 28 pin IC socket .09 ea.; 4" cable ties .50 per 100; 34 cond flat cable $19.95/100'; Buss fuse 1½ amp Slo Blo .25 ea.; 4PDT Ctr off switch $2.90 ea.; 14 Ga 3 cond SJT cable .44' assortment of 200 AMP terminals $3.95; Receiving tubes, semiconductors, connectors & much more. C&H Distributing, 215 S. George St., York, PA 17403. Phone 717-843-7881, FAX 717-843-3875.

X-BAND WAVEGUIDE, 10.525 Gz, Copper, for sale, random lengths, with or without flanges. Antique portable tube tester superior. Instrumnet Co. model 85, for sale. Please call Joe D. @ 510-651-2288, Fremont, CA.

CALL TOLL FREE
1-800-292-7711
1-800-445-3201 (Can)

C&S SALES
EXCELLENCE IN SERVICE

CALL FOR A FREE CATALOG

Educational Kits at Low Prices

Space War Gun $8.95 — Rapid fire or single shot sound with 2 flashing LEDs. Speaker incl. K-10

0-15V Power Supply — A low-cost way to supply voltage to electronic games, etc. $14.95 K-11

Strobe Light — Produces a bright flash via xenon flash tube. The flashing rate is adjustable. $8.95 K-1

Automatic Siren — Can be used with a burglar alarm or as an attention getter. Speaker incl. $8.95 K-13

Christmas Tree — Produces a dazzling effect. Use as an ornament. $11.95 K-14

Fish Caller — Makes a sound that should attract hungry fish. K-15 $7.95

Hidden Tormentor — Your friends will go crazy trying to find it. K-16 $7.95

LED Robot Blinker — You'll have fun displaying the PC board robot. Learn about free running oscillators. $6.50 K-17

Telephone Hold Button — Put all incoming and outgoing calls on hold at the press of a button. $6.50 K-18

Digital Bird — You probably have never heard a bird sing like this before. $8.95 K-19 Speaker incl.

Nerve Tester — Test your ability to remain calm. Indicates failure by lit LED or mild shock. K-20 $8.95

Signal Injector/Tracer — Both signal generator & receiver. $19.95 K-21A

Yap Box — Makes six exciting sounds; Laser gun, Siren, Puppy, Diesel horn, Wolf whistle, Machine Gun. Case Incl. Available assembled YAP-10 K-22A $8.95

Burglar Alarm — Alarm for your car, house, room or closet. Buzzer incl. K-23 $6.95

Whooper Alarm — Can be used as a sounder or siren. $7.95 Speaker incl. K-24

Digital Roulette — Sure winner with your friends. 32 LEDs are arranged in a 5" circle. $19.98 K-25

Metal Detector — Find new money and old treasure. Get started in this fascinating hobby. $7.95 K-26

Logic Probe — A must to check out logic circuits. $14.95 K-27

Pocket Dice — To be used with any game of chance. $13.95 K-28

TV/FM Oscillator — Learn about oscillators and FM tranmitters. Use as FM transmitter. $5.95 K-29

FM Mic — Transmit your voice on any FM radio. Range up to 1000ft. Case incl. $8.95 K-30

Digital Lock — Program your combination from thousands of different choices. K-31 $19.95

Decision Maker — Let this kit make decisions for you. 6 LEDs & speaker create mystic mood. K-32 $9.50

Solder Practice — Learn soldering techniques and build a flashing European type siren. $7.25 K-33 Speaker incl.

One Button Bandit — Press the button and away she goes, if 3 LEDs light, you win.. Our version of Vegas one arm bandit. $15.95 K-34

Telephone Bug — Size of a dime, yet transmits both sides of a phone conversation to any FM radio. No battery needed. $8.95 K-35

Sound Activated Switch — Clap and the light comes on, clap again and off it goes. $8.95 K-36

Resistor Substitution Box — Contains 24 different value resistors from 10 ohms to 1 meg. K-37 $12.95

Capacitor Substitution Box — Contains 12 different value capacitors from 100pfd to 1MFD. K-38 $12.95

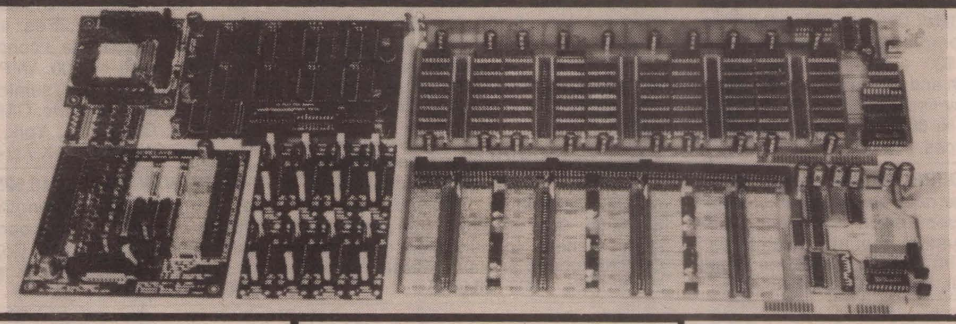
Love Tester — Test your sex appeal with this exciting kit. $10.95 K-39

WE WILL NOT BE UNDERSOLD
UPS SHIPPING: 48 STATES 5%
IL RES 6.5% TAX ($5.00 min.)
OTHERS CALL

C&S SALES INC.
1245 ROSEWOOD, DEERFIELD, IL 60015
FAX: 708-520-0085 (708) 541-0710

15 DAY MONEY BACK GUARANTEE
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

VISA **SUPERCHARGED I/O 1-800-546-2529** MASTERCARD



SCPIO16
128 Channel I/O Board

- FREE I/O Tester board when you buy SCPIO16
- Directly drive many popular Solid State Relays.
- Directly drive sensitive mechanical relays.
- Control many different types of devices.
- Monitor wide range of sensors & events.
- Interface to TTL, LS, HCT, ALS, AS, FCT, etc...
- Blows away performance of 8255 I/O boards.
- Outputs source & sink more current than 8255s.
- Powerful yet very inexpensive. With software.
- 16 Byte wide ports. 8 In + 8 Out. 1/2 card size.
- Sustained I/O > 500 K Bytes / Second.
- High noise immunity low load CMOS inputs.
- With power, ground, read & write strobes.
- Cards can share same space via extended I/O.
- Machine pin sockets make field repairs a snap.
- Silk screened, solder masked, & gold plated.
- See SCREWTERM, TERMRACK, SCRELAY8

SCRELAY64
64 Channel Relay Board

- 64 SPST 10VA 100 VDC 70 VAC 0.5 AMP relays.
- Use to drive solenoids, valves, relays, contactors.
- 16 Relays per 64 line gold plated header.
- 2 pins per relay line reduces resistance
- Independent A & B lines on all relays
- High density board reduces computer slots used.
- Sensitive relays minimize power consumption.
- Only 1.0 milliseconds to turn on/off relays.
- Long life relays (10,000,000 operations).
- Cards can share same space via extended I/O.
- Power on reset leaves relays open on power up.
- Uses 16 Byte wide ports. 8 Input + 8 Output.
- Full length PC AT form factor card for 8 bit slot.
- Input ports can read back state of any relay.
- Gold plated 64 line headers support 16 relays ea.
- Silk screened, solder masked, & gold plated.
- Includes manual and software.

SCPROBE
240 Channel Stimulus/Response

- Ideal to test cables, wire harnesess', PCBs
- Use for ATE, testing switch matrices & boxes.
- 240 Output paired with 240 Input channels.
- Use to stimulate any line
- Then monitoring all other lines for responses.
- Set port 0 to stimulate any 1 of 240 channels
- Set port 1 to monitor selected channel.
- Read port 0 to determine resopnse.
- Then scan 1 to 240 channels for response.
- Multiple boards may be used in system.
- Open collector outputs with 5.1K pullups.
- Every output paired with an input channel
- Uses only 4 ports in PC I/O space.
- Full size fuse protected PC/AT form factor card.
- Gold plated 50 line headers. 48 signal+pwr/gnd.
- Machine pin sockets make field repairs a snap.
- Silk screened, solder masked, & gold plated.

SCREWTERM
16 Channel Screw Terminal Board

- Directly interfaces to any port on SCPIO16.
- Supports 8 Input + 8 Output channels.
- LED Bargraph Displays monitor inputs & outputs.
- Screw terminals for all I/O, control & power lines.
- Termination resistors increase noise immunity.
- Fuse protected power lines.
- Screw terminal blocks socketed for quick release.
- Minimize your setup time.
- Reduce maintenance and repair costs.
- Saves many hours of building & wire wrapping.
- Shrouded Gold plated header with ejectors.
- Boards are Solder Masked & Silk Screened.
- I/O, Pwr, Gnd, Cntrl identified with legends.
- 3"x3" board with mounting holes & hardware.

TERMRACK
128 Channel Termination Board

- Directly interfaces to SCPIO16
- Supports full set of 8 SCPIO16 cables.
- Supports 128 channels. 64 Input / 64 Output.
- 2 solder pads for ea. signal, control, & power line
- Provides simple interface to Solid State Relays.
- Easy interface to many other devices.
- Simple interface to wide range of sensors.
- Saves many hours of building & wire wrapping.
- Shrouded Gold plated headers with ejectors.
- Boards are Solder Masked & Silk Screened.
- I/O, Pwr, Gnd, Cntrl identified with legends.
- Large solder pads with plated through holes.
- Wide dual signal traces increase reliability.
- Plenty of well spaced mounting holes.

Order 7 Days A Week 24 Hours A Day

SCPIO16	Sink/Source	Price
Standard	7.50 / 7.50 ma	168.00
Commercial	24.0 / 24.0 ma	189.00
Industrial	48.0 / 48.0 ma	229.00
SCPIO16 Accessories		
Cable set	Eight 4' cables	32.00
SCRELAY8	8 optos + 8 rlys	129.00
TERMRACK	8 hdrs / 128 chnls	35.00
SCREWTERM	1 hdr / 16 chnls	29.00
SCRELAY64	64 Relays	495.00
	32 Relays	295.00
	16 Relays	195.00
Cable set	Four 4' cables	59.00
SCPROBE	240 Channels	489.00
	192 Channels	429.00
	144 Channels	369.00
	96 Channels	299.00
	48 Channels	199.00
Cable set	Five 4' cables	59.00
SCMIDI16	128 Channels	295.00
Cable set	Eight 4' cables	32.00
IOTESTER	Leds&Switches	29.95
Shipping & Handling		10.00

Quantity Discounts Available

- We send FAX data sheets & love FAX orders.

SCRELAY8
8 Optoisolators + 8 Relays

- Drive solenoids, valves, relays, & contactors.
- Monitor external events & power sources.
- Directly interface to any port on SCPIO16 board.
- 1500 V optically isoated inputs.
- SPST 10VA 100VDC 70VAC 0.5Amp relays.
- Sensitive relays minimize power consumption.
- LED Bargraphs display input & output status.
- Opto inputs monitor AC/DC 0..32 volt lines.
- Independent A & B lines on all relays
- Power on reset leaves relays open on power up.
- Fuse protected power lines.
- Supports use of optional external power supply.
- I/O, Pwr, Gnd, Cntrl identified with legends.
- 5"x5" board with mounting holes & hardware.

MIDI **SCMIDI16** **MIDI**

128 Line MIDI Digital I/O Board

- Control real world devices from MIDI systems.
- Turn 64 digital devices on/off as music plays.
- Accept commands from up to 64 digital inputs.
- FREE I/O Tester board when you buy SCMIDIO
- Accepts MIDI commands from MIDI controllers
- Programable MIDI Channel number 1 .. 16
- On board computer converts notes to Outputs
- On board computer converts inputs to Notes
- MIDI IN/OUT/THRU on 5 pin DIN connectors.
- Will drive any SCPIO16 accessory
- Uses same cables as SCPIO16
- Drives SCREWTERM, TERMACK, SCRELAY8
- Will drive upcomming light dimmer board.

SC Engineering 1961 E. Whittier Blvd La Habra, CA 90631-4131 (714) 870-4237 (Voice & FAX!)

Write in 126 on Reader Service Card.

WIRELESS DOORBELLS: Two for $21. Attractive wireless lights, $8. **SOFTWARE:** SATELLITE TRACKING SOFTWARE, SIX DISK SETS, ELECTRONICS TEACHER, and SPEAKER software for IBM/MAC. Choose. $42 each. Ham radio software, TEN DISK SET. IBM/MAC $50. Choose 3.5" or 5.25" format. Send check or money order payable to: **Money Savers**, PO Box 31340, CAPITOL HEIGHTS, MD 20731.

BAUSCH & LOMB Bench metallograph 50, 100, 200 & 500 pwr. $395. Hermes Mod. ITF-V engravograph with manual engrave call letters $650. Aluminum and stainless steel aircraft grade, blind rivets, assorted sizes, 225lbs $850. GBC Electronics, Blountville, TN. Ph 615-323-2976.

COLOR MONITOR Controls concentration of chemical or color in a flowing stream of water. Concentration as low as .25PPM. Cratar Instruments, 2304 West Broadway, Sedalia, MO 65201.

FOR SALE: Limited supply of black-and-white picture tubes. Most are new in the box. Some round. Free list. SASE. Mike Wesolowski, 117 High St., Herminie, PA 15637.

UNIQUE SOLAR power plug and play new packaged items, for ATVs, RTVs, campers, cars, boats, car phones etc. Car phones, solar powered w/NI-CAD battery, etc. Runs anything powered by a car cigar lighter $49. Boom box radio solar battery, solar panel in frame with hardware & parts powers today's popular radio, CD player, or recorder playback units, up to 6-cell battery powered, 9V, 4 watts, $39.95; Marine solar battery charger, keep your boat battery always charged. Plug and play 12V, 4 watts, $49; Solar battery charger clam shell design, 12V, 6 watts, only $79. Dealers welcome, retail-wholesale. BNF, 119 Foster St., Peabody, MA 01960. Since 1964. Send SASE for cat'l, T508-532-2323. F508-532-1040.

POWER SUPPLIES Hewlett Packard DC Metered Lab supply 6101A, 6203A, $100ea. Dual Range 6206B $175 ea w/ manual. 6289A $185. **POWER DESIGN** 2005A Precision Power Source 0-20V, 500mA. CV/CC $200., Mod. 2015 0-20V 1.5A. $300. Mod. TW 4005 40V, 500 mA-Dual CV/CC $250. Volume discounts. Psitech Plus, 707-745-4804, FAX 707-747-5277.

FOR SALE: IC's MC68HC705C8P $10, MC68HC711D3CFN2 $15, MC68B02P $3.50, MAC15A6TRIAC $0.75, MOC3010 $0.40, 12V 13A switching power supply $24.95, BCD thumbwheel switch $2.50. We also buy your excess electronic material. Intertex, 210-820-3830, FAX 210-820-3344.

SELLING NUTONE: Hoods, fans, heaters below wholesale. Interested call, 909-788-6224, Tri-County. Also available in stock, Nutone Intercones, Ironing centers, food centers, central vacuum fittings, parts and access. All parts & service available on old Nutone Products.

CABLE TESTER This instrument checks for open or shorts on cables with 1/4" jacks or XLR connections. Rugged metal chassis and inexpensive. Send cashier's check or money order for $29.95, plus $3 shipping to: IC Electronics, 11 Windsong Way, Nitro, WV, 25143.

ELECTRONIC PARTS, equipment and miscellaneous electronics for sale. **B-E 41st YEAR.** Send $2 for limited edition catalog or stamp for regular flyer. USA only. Bigelow Electronics, PO Box 125, Bluffton, OH 45817.

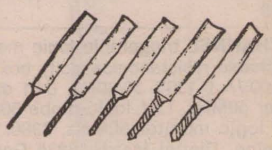
HIGH QUALITY TOOLS AND STAINLESS STEEL HARDWARE. European and American, electronic soldering stations, screwdrivers, nutdrivers, pliers, hex keys, balldrivers, and more! Free catalog. Robert Mink Import-Export, Box 6437V, Fair Haven, NJ 07704. Telephone or FAX 908-758-8388.

NIM, CAMAC, PMTs, Optics, Neutron Detectors, High Vacuum, High Voltage, W/t Pressure Gauges, Nuclear Components and Equipment, Scintillation Plastic, NaI(T1) Crystals, and much more are available from OE Technologies. We supply components and equipment for your College, University or R&D Organization. We guarantee high quality at reasonable costs. For current inventory, contact OE Technologies, Box 703, La Madera, NM 87539, 505-583-2482.

STATIC SHIELD BAGS. 3M #2100. 10"x12". Package of 100, $20. Carton of 1,000, $175 postpaid. **TURCOTRONIX,** 1000 E. 14th, Suite 429A, Plano, TX 75074.

HEAT SHRINK Tubing. Most sizes & colors. Will cut: 4ft. for $1 up to 1/2", 1/2" and up $2 for 4 ft. Cheaper "buy" the roll. Also avail. with sealant. Dealers invited. Call for avail. & quote. $1 for list, SASE. Kemner Enterprises, 17 Lightcap Rd., Pottstown, PA 19464. 610-495-5367.

ELECTRONIC EQUIPMENT, surplus, misc. electronic and scientific equipment. For list contact T-Minus-7, 45845 Warm Springs Blvd. #F, Fremont, CA 94539. 510-651-9477, FAX 510-651-3657.



CARBIDE DRILL 50 piece assortment. Sizes from .20 to .135. Also 25 piece router assortment. Special $19.95 each assortment plus $4.50 S/H. Send check, money order to ITEC, Box 464, Beaver, PA 15009.

CLOSEOUT ITEMS from BNF: Wind speed indicator kit $5, $13/3; Tesla coil kit $19, $55/3; Fan/motor speed control $3, $10/4; 2½" ID 1½" D. Solder pot $3, $13/3; Voice/sound activated switch modu. $1, components by the foot asst'ed. $1/10, 500 pts: 4" x 10" Car/TV speakers $2, $10/6: 2 speed sw. Motor/lamp control $1/2, 12/$5; Mallory sonalert SC628 $3.50, $16/5, security keylock switch, w/2 keys $3/2: Cable Box's oak L30 or Oak G26 $4, $10/3; mix or match, all working units, 2 to 1 cable splitters $1; 4' Sony video cable M-M w/push-on connectors $1, $5/6; Sony push-on mat'g Xformer 75-300 $1/2, $5/12; right angle F connector M to F screw on $1/2, $5/12: 14550 UART $2. Since 1964. Send SASE/Flyer. BNF, 119 Foster St., Peabody, MA 01960. See our 5 ads in N&V, T508-532-2323, F508-532-1040.

SOLAR-POWERED FAN HAT. Baseball type hat with solar powered fan. Great for sports fans, golfers, etc. Available in red or blue. $19 plus $2.00 shipping. CA residents add 7.75% sales tax. Visa/MC/Disc/Amex OK. H.T. Orr Computer Supplies, 249 Juanita Way, Placentia, CA 92670. 714-528-9822, 1-800-377-2023, FAX 714-993-6216.

CABLE TV EQUIPMENT

We carry a complete line of all major brands and accessories

BELOW WHOLESALE PRICES • QUANTITY DISCOUNTS
30 DAY MONEYBACK GUARANTEE • 1 YR. WARRANTY
YEARS OF CUSTOMER SATISFACTION

C & C ELECTRONICS

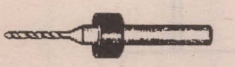
CALL NOW 1-800-995-1749

Immed. Delivery from Giant Stock! Sorry No FL Sales.

Write in 30 on Reader Service Card.

ELECTRONIC ASSEMBLY MACHINERY. We buy and sell assembly machinery including solder machines and board cleaners, insertion machines and lead formers. Petlock Inc., Rialto, CA. 909-877-8900, FAX 909-877-8902.

24V @ 25A SWITCHING POWER SUPPLY, fan cooled, full cover, small size 2.50x5.00x12.00, RFE. Model ES-101 by Unipower @ $40 ea or 10 for $35 ea. Call Roger @ GSE, 716-338-7001. Visa, MC, or COD.



CARBIDE DRILLS! 10 of one size: $4, 50 of one size: $15, add $3.25 S&H. Check/MO only. Sizes avail: .033, .035, .036, .037, .041, .042, .043, .045, .046, .047, .049 dia. Also electronic components. Send for flyer. Hoffman Industries, 853 Dundee Avenue, Elgin, IL 60120. 708-622-8201.

CHILLER-RECIRCULATING LOOP, made by Filtrine. New! 3,500 BTU/hr, ambient temp 90°F, discharge temp 68°F. $400. Truck shipment. Call Roger @ General Science & Engineering, 716-338-7001. Visa or MC.

COMPUTER CONTROLLED WOOD CARVER $4,500 (Due to typographical error, price was previously advertised as $500.) 3HP Router, very sturdy. Draw in like CorelDraw (*.plt), carve on machine. Ray, 503-543-6670.

MINIATURE TRANSCEIVER: 300MHz for home, security, hobbies, automotive alarm and many other remote controlled projects. Also transmit and receive 1200 baud data. TRX-300 one channel $29.95, two channel $32.95, and four channel $36.95 for transmitter and receiver pair. Send check or money order + $5.00 S/H to: DB Electronics, 3811 South "F" Street, Oxnard, CA 93033. For more information, send a SASE or call 805-483-3767.

HOME AUTOMATION & computer Control: Two-way IR, Two-way X10, & hardwire. Control Devices from serial computer link or stand-alone operation. CompCo, 615-436-5189 BBS 615-436-6333 evenings.

RADAR GUNS: MPH Industries, model K-55 displays your speed & target speed. Comes w/case & instructions. Only $250, 1-800-539-2859.

TUBES $2.49, 1000 types. Also surplus components. SASE brings list. DNF, 6690 7 Mile Rd., South Lyon, MI 48178.

FOR SALE: Poor mans spectrum analyzer all assembled. Works great! $290 UHF regency repeaters $200. 913-625-7141.

ASSEMBLY EQUIPMENT for sale. Amistar CI-1000 CNC IC Insertion machine, Metron model 16 circuit board comparator. Burgmaster Model OB Turret Drilling & tapping, Benchmaster 4 ton punch press. Call Henry, 908-689-0110.

DRILL MACHINE. Computer controlled X-Y-Z table for printed circuit board drilling. Affordable and not a kit. Also electronic project kits. Call 203-653-4278 or write for catalog. CBBI, PO Box 222, North Granby, CT 06060.

BUYING TOCOM, SCIENTIFIC ATLANTA 8536s, 8550s, 8580s, 8590s, and 8600s. **JERROLD** DPV and DPBB. **PIONEERS,** all, and Zeniths, all. Any quantity. Top $$$ paid. Contact National Cable Brokers, Plymouth, IN. Phone 219-935-4128.

RUBIDIUM OSCILLATORS. Ball/Efratom M-100, (10MHz). Excellent frequency standard. $500 each plus shipping. Call 317-864-0478 or 317-864-0634.

COLLINS HF aircraft transceivers such as: ARC-58/R761 and similar units. Buy/sell/trade. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

Your choice has got to be...

M.F.M. COMMUNICATIONS.

for...

CELLULAR PROGRAMMING KITS

All Kits are Supplied with Cables and Software, unless indicated.

!!! NEW PRODUCTS ADDED !!!

(Look for the "" to find them.)*

"Guaranteed Lowest Prices" or we beat by $10!

We want you to have the best deal and at MFM we are sure that we are offering you unbeatable prices. To back this up; if you have seen any of our products at lower prices, then we will beat them by a further $10.

NEC. P200, 201, 300, 301. **$149.**

NEC. P400, 600, 601, 100, 120, TT180, 181. **$399.**

*NEC. *P7. **$499.**

*MITSUBISHI DIAMONDTEL. 20x, 22x, *99x. **$499.**

PANASONIC. HH 700, 900, EBH40. **$249.**

PANASONIC. HH 600, HP600. **$149.**

MOTOROLA (software). 9122 & above (AMPS G2). **$149.**

MOTOROLA (software). 9122 & above (MPC). **$49.**

CHECKSUM Calculator. *suitable for Panasonic, Tandy, RadioShack, Mitsubishi and Nokia Models.* only **$99.**

Call Us Now on... **011-44-1-88-333-0060**

M.F.M. COMMUNICATIONS.
57 Addison Road, Caterham. CR3-5LU. UK.

Prices do not include shipping.
"For Information Purposes Only"

Write in 143 on Reader Service Card.

ACP's 67th GIANT COMPUTER SWAP★MEET

Orange County's Original!

Be a Seller! ...for space call Mary...

Sunday, 8am-2pm
May 21st

FREE Admission & Parking
Shop 100's of Sellers

in ACP's Giant Parking Lot

Advanced Computer Products, Inc.

ACP SUPER★STORE
Since 1976

1310 E.Edinger
Santa Ana, CA
714-558-8813

IC MASTER

THE WORLD FAMOUS HEARST PUBLICATION

WOW $85!

~~$190.00~~ EVERYWHERE ELSE

Liquidating Way Below Distributor Cost

The Most Comprehensive IC Reference ever Published 100,000 IC's of EVERY Kind from Every Manufacturer Specifications, Datasheets, Cross References and Alternate Sources. This 9 Pound 3 Volume Set is **HUGE** It's Like a Thomas Register for IC's. Perfect for Service, Designers, Distributors & Experimenters. Finally.... It's affordable! **DON'T MISS IT!** Also ask about CD's & EEM's, CALL NOW 8am to 10pm 7 Days!

516 826 1808 ext 6300

Write in 128 on Reader Service Card.

THE LASER EXPERIMENTER

Conducted by
Anthony Charlton

Welcome! This issue we take a look at laser surveillence and how this is accomplished. We've been getting some inquiries in this area, and thought it would be a good idea to outlay the principles involved. Although we won't be building a working circuit because of the possible legal and certainly moral issues involved, we'll give you enough information so that you can proceed with the project if you like on your own.

Hi-tech surveillence can involve several methods. You can hide an RF transmitter in the telephone which may parasite off its current source, or "bug" a room with a discrete transmitter containing its own battery supply. However, both of these methods can be detected by a "bug sniffer" — a device that will indicate that an RF transmission is taking place when the bug operates.

Modern electronics can also indicate the frequency band the transmission is taking place on, the intensity of the signal (which would give away the maximum radius of whoever's listening), and the type of modulation being used (which would indicate the sophistication of the listener's equipment and hence give a clue as to his level of professionality). A simple RF field strength meter can be used with a directional antenna to locate the bug. And then the game's all over for the eavesdropper.

When you get REALLY hi-tech like say, governments spying on each other, then the laser is the way to go. Although it can be detected — the one described here is based on a He-Ne laser and would stick out like a fire siren — there are laser frequencies that aren't so easy to detect like infrared, which can be seen only with a CCD camera or image intensifier (nightvision).

For experimental purposes, you can use a hidden transmitter such as the Lazerwave system described in LEdec93, along with a sensitive mike pick-up & amp described in LEfeb94. But one of the most interesting methods to do surveillence is by bouncing the laser beam off the window glass from the area in question, and be able to decode the voice data from the glass and listen to it. Amazing!

Properties of Glass

This method of surveillence isn't new; the Oct. '87 issue of *Radio-Electronics* (renamed *Electronics Now* several years back), described a working circuit to experiment with the technique. The way laser surveillence works is basically this: Glass isn't a totally solid material. It can be considered a flowing solid, if you think of it in a long enough time frame. I have read somewhere that glass used in ancient cathedrals is actually measureably thicker at the bottom due to the force of gravity acting upon it over time. The consensus is that it's not a result of the fabrication technique of the day either. There is little doubt that glass is semi-flexible when you consider the nature of glass wool insulation, or the way glass can be bent, even at room temperature, when it is drawn out by a glassblower to a fine diameter.

The slightly flexible nature of glass (and certainly plastic, as well) window panes, plus the short wavelength and highly bright concentration of the laser enables one to use an amplitude modulation technique to gather vocal information from persons within a building whose windows are constructed from glass or plastic.

Note Figure 1 The incoming sound wave on the right hand of the sketch shows the sound in a room. Of course, it will consist of many different frequencies and amplitudes simultaneously; the clean, single-frequency, single-amplitude wave is shown just for clarity of illustration of the concept. As the wave passes to the glass, it will vibrate it slightly, but certainly at a lesser displacement than it will air.

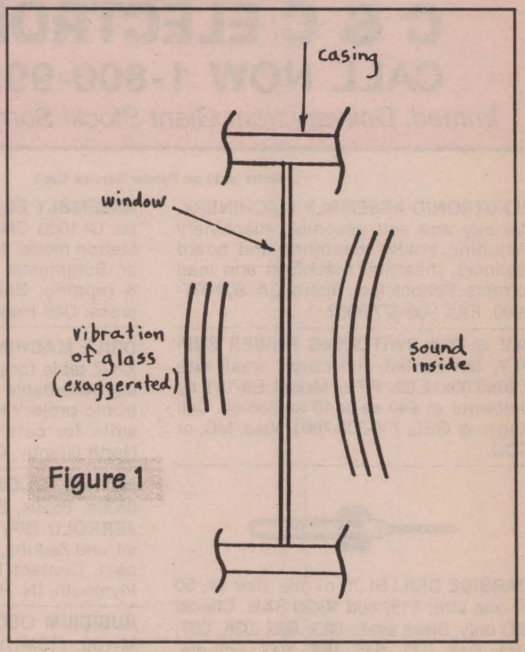


Figure 1

This is analogous to how the hearing sense works. In life-forms that can hear, stimulation occurs within the organ that is called an "ear," although different life-forms can have rather exotic ears; a primary example I can think of is the lateral line that runs down the length of a fish's body, and enables it to respond to hydraulic variations in water pressure.

In the case of humans, the mechanism which responds to the variations in air pressure are tiny nerve fibers deep within the recesses of the inner ear, the ear itself being a sort of concentration device shaped in such a way so that sound waves are funneled to these sensitive nerves whereupon, the sound is transmitted along nerve fibers, and your brain decodes the sound into whatever pattern it has been trained to recognize and interpret. For instance, the snap of a twig to an ancient culture may predict the attack of an animal; the sputtering of an engine in our culture may preclude the failure of an automotive ignition system just as we are trying to pass a tandam-truck on a superhighway; the tone of voice of our spouse or boss may signal an impending disagreement.

Lasers are a fine way to recover information from glass or plastic windows, because they operate at so much higher frequencies than the vibrations the human ear can DIRECTLY perceive. The recovery process is INDIRECT, that is, you can't "hear" what the beam will say directly by your senses without the intermediate step of electronic demodulation and amplification circuits. But the laser beam, being of very short wavelength, can use the aforementioned AM technique to recover the information.

Why? Because the vibration of the window (or as a matter of fact, even a mirror or picture inside the area under surveillence) will vibrate the glass object a millionth of an inch (or more) and in doing so, the beam will be displaced by a small

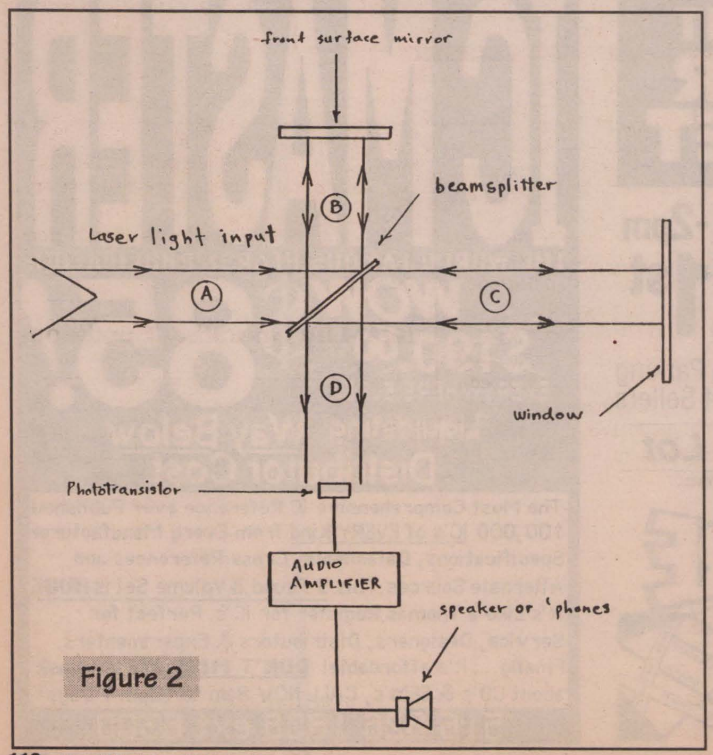
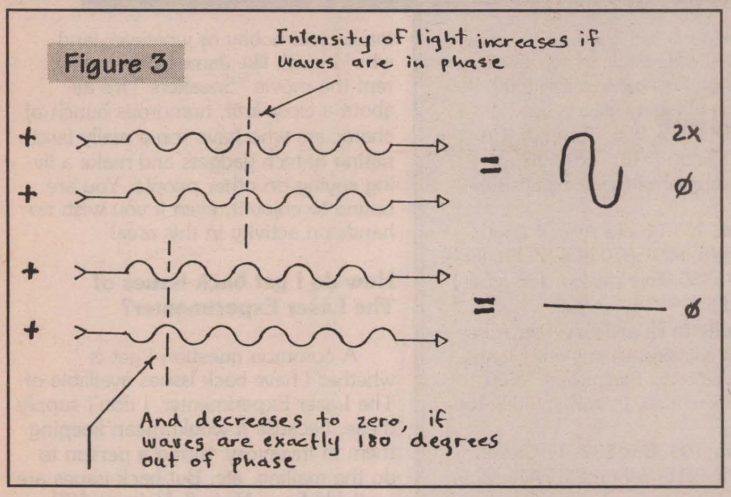


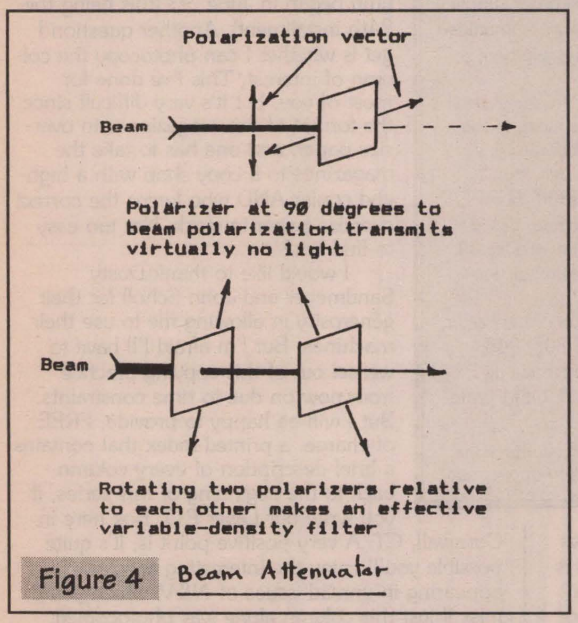
Figure 2

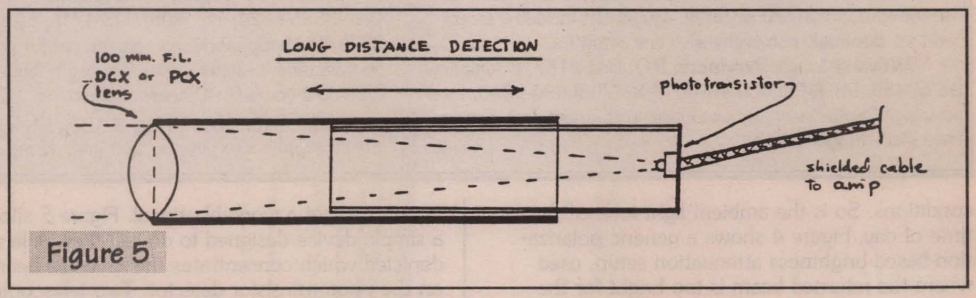


amount, which results in an AM modulation of the beam, or a variation of intensity, that may be decoded into audio. Although, in most cases it isn't practical to do so, the most sensitive type of light surveillence occurs if you are using an INTERFEROMETRIC technique, where a reference beam is mixed with a reflected beam via the use of a BEAMSPLITTER, and the two beams are thus re-combined as shown in Figure 2 The laser beam enters at A), and is split into two parts. One goes to B), the front (or first, as it's also called) surface mirror. The other portion goes to C), the window we want to listen to. The return bounce from the mirror and the window are combined by the beamsplitter, producing interference and proceeds to D) a phototransistor/amplifier combination which ultimately results in the sound we wish to hear at the speaker or headphones. Note the light will travel in both directions from the beamsplitter to the mirror to the glass pane, and may be reflected several times on its way to the phototransistor.

The physical displacement of the glass as it vibrates will shift the lightwave according to the distance of displacement. Let's figure it out. One nanometer is 3.937 {-8} inches, and the 632.8 nM wavelength of a helium-neon laser means one wavelength is 632.8 * 3.937 {-8} or 2.4913 {-5} or roughly 25 millionths of an inch. One does not need to get a full wavelength of displacement to extract a useful signal; just a fraction of a wavelength that is enough to produce a variable brightness at the receiver is adequate to extract useful information.

Figure 3 shows the interferometric effect of two laser beams being combined. If they are in prefect co-incidence, as shown in the top diagram, the amplitude of the emergent beam is re-inforced. If they are out-of-phase by perfect opposition of wave polarity, the emergent beam is negated to the point of non-existence. One might correctly imagine that the original beams would have to be aligned perfectly in order to produce either extreme effect.





Laser Helpline
A Reader-To-Reader Interactive Forum

This is a free service to the readers of The Laser Experimenter who wish to get in touch with one another by whichever medium they mutually prefer. To place your "free ad" (no commercial products, please), send your abstract and communication protocol to: The Laser Experimenter, Laser Helpline, P.O. Box 74, Cornwall Bridge, CT 06754.

Byron Goldburg is seeking an inexpensive laser-operated method to measure the presence of flaws as they may develop in plastic and aluminum-sheet home-made high-voltage, variable capacitors. The object is to identify arc tracking across the plates, which predicates failure, and such failures occur after a certain time due to the stress of high voltage and the ozone generated by same on the plastic. Oil immersion techniques evidently won't work due to the 40 or so KVAC involved, plus the need for electrical isolation from the operator and the complex seals that would be required. Anyone with ideas in this area are invited to contact Byron at the Laser Experimenter's P.O. Box, for mutual exchanges of knowledge and information.

LASER NEWS AND DEVELOPMENTS
Laser Hardens Teeth Against Cavities

Destructive bacteria in the mouth are responsible for the nemesis of all teeth — cavities. The mechanism whereby they do their damage is by secreting acids during the digestion process of converting sugar to energy for bacterial sustainment and replication. The teeth are composed largely of calcium, which dissolves under the prolonged effect of the acids, and thus leads to cavities. That's why dentists warn us incessantly to avoid sugary snacks between meals and to brush after meals, to remove the "fertilizer" — sugar — that results in the growth of these destructive bacteria.

Lasers promise a way in our future to harden teeth against bacterial attack by fusing the enamel at high temperatures and very short pulse durations to form a much stronger defense against bacterial acids. The technique would not damage the interior of the tooth, where its pulp and nerves are located. Conventional hygiene and repair methods are quite effective against cavities, in concert with regular fluoride treatments. But wouldn't it be nice to semi-permanently bid farewell to the dentist?

The University of Rochester and Eastman Dental Center have tested a technique on extracted teeth that involves fusing the enamel using a carbon dioxide (CO_2) infrared pulsed laser operating at 9.3 or 9.6 micrometers (one micrometer = 1,000 nanometers) that is absorbed by the tooth's enamel. Most CO_2 lasers operate at 10.6 micrometers, so this one had to be tuned to a higher frequency to be effective. Roughly 25 pulses, that are each 100 microseconds long, are used in the tests to heat the tooth's enamel up to 1,000 degrees in a split second. That burst of energy is absorbed by the surface of the enamel coating, the treated layer amounting to about a thickness equal to 1/5 of the width of a human hair. Despite this brief treatment, it is reported that the enamel is 70 to 85 percent more resistant to acids.

The two scientists leading this project are John Featherstone, chair of the Department of Oral Sciences at Eastman. He is a chemist and expert on tooth decay. The other scientist is Wolf Seka, who is a laser expert at the University of Rochester's Laboratory for Laser Optics and Associate Professor at the Institute of Optics. Both believe that the heat-treating effect will last for many years, but we will have to wait until more studies are completed before this technique is available at the dentist's office.

Source: *Lasers and Optronics*

Real-Life Operating Conditions

The condition of the window's casement, the size of the window, whether the glass is not annealed or annealed (called "break-resistant"), the thickness of the glass, and whether the glass is the "Thermopane™" type — a glass made of two panes cemented together with an air-space in between to lower transmission of temperature differentials — will all affect the performance of the system. The stability of your mounting of both the laser and the receiver is important, especially if you are trying the experiment with the interferometric technique.

Beam enhancement and attenuation needs are both the likely result of real-life

THE LASER EXPERIMENTER

SOURCES

Society for Amateur Scientists, 4951 D. Clairemont Square, Suite 179, San Diego, CA 91777; ph/FAX: (619) 239-8807. Internet: scarlson@sas.org

Anderson Lasers, Inc., 2883 West Royalton Road, Broadview Heights, OH 44147. New and surplus industrial and scientific lasers & equipment. Carries high-power commercial grade equipment, not a hobbyist supplier. Professional inquiries contact: Richard Anderson, Ph: (216) 237-6629, or FAX: (216) 237-0656.

Small Parts, Inc., 13980 N.W. 58th Court, P.O. Box 4650, Miami, FL 33014-0650. Free catalog. Catalog requests: (305) 558-1255. LNS Technologies, 20993 Foothill Blvd, Suite 307, Hayward, CA 94541. Inquiries: (510) 886-9296, orders: (800) 886-7150. Visible laser diodes and a driver kit, also carries a line of high-technology electronic kits. Accepts major credit cards. Catalog $1.00.

MWK Industries, 1269 West Pomona, Unit 112, Corona, CA 91720; Ph: (909) 278-0563, FAX: (909) 278-4887. Hours: 8-5 PST weekdays, 10-3 Saturdays. Free catalog. Source for new and used laser equipment, supplies and optics. Carries a wide variety of He-Ne and other lasers suitable for the experimenter & hobbyist.

Images Company, P.O. Box 140742, Dept. N, Staten Island, NY 10314; Ph: (718) 698-8305. Carries Holography supplies, optical components, components for laser power supplies, stepper motors.

Geo-Monitor, 65 Washington Street #400, Santa Clara, CA 95050; Ph: (408) 749-6770, FAX: (408) 249-3780. Publishes a technical newsletter about earth science, and may be useful to those interested in using lasers to record seismic activity.

Edmund Scientific Company, 101 East Gloucester Pike, Barrington, NJ 00807-1380; Ph: (609) 573-6250, FAX: (609) 573-6295. Free catalog. Supplier of a wide variety of educational and scientific equipment including lasers and an extremely comprehensive line of optics.

Midwest Laser Products, P.O. Box 2187, Bridgeview, IL 60455; Ph: (708) 460-9595, FAX: (708) 430-9280. Free catalog. Carries new and used laser equipment and inexpensive start-up systems.

Mouser Electronics. Mouser is a first class hobbyist and industry supplier of a very wide range of new electronic parts, equipment, and supplies. Free catalog. Call (800) 346-6873 for catalog and location of facility nearest you.

Amidon Associates, P.O. Box 956, Torrance, CA 90508. Ph: (310) 763-5770; FAX: (310) 763-2250. Hobbyist and experimenter supplier of ferrite materials in many shapes and sizes.

Digi-Key Corporation, 701 Brooks Avenue South, P.O. Box 677, Thief River Falls, MN 56701-0677; Ph: (800) 344-4539, FAX: (218) 681-3380. Free catalog. Top quality new electronic parts supplier.

Imaging Concepts Bulletin Board Service, A free Scientific Bulletin Board that contains, among other topics, laser information. Georgia area code. Parameters: 9600 baud, N81. Accessable 24 hours a day by calling (404) 466-3932.

Herbach & Rademann, P.O. Box 122, 17 Canal Street, Bristol, PA 19007; Ph: (215) 788-5583, FAX: (215) 788-9577. Free catalog. An excellent experimenter source for quality mechanical, optical, electronic, and electromechanical surplus.

Allegro Electronic Systems, 3 Mine Mountain Road, Drawer NV, Cornwall Bridge, CT 06754. Mail order supplier of He-Ne laser systems, experimenter-level laser communication & data acquisition kits; plans, specialized equipment & hard-to-find electronic parts. Catalog $1.00.

Viking Office Products, Quality office products of all kinds at a discount. Listed here because of the value to the experimenter wanting to organize his or her laboratory. Viking features free catalogs and unsurpassed delivery promptness. Call (800) 421-1222 or FAX to (800) SNAPFAX [(800) 762-7329] for free catalog. Accepts prepaid, net 30 and credit card orders. Free delivery of orders over $25.00 and free UPS pick-up of items that have problems or you aren't satisfied with.

DynaArt Designs, 3535 Stillmeadow Lane, Lancaster, CA 93536-6624; Ph: (805) 943-4746, FAX: (805) 943-3776. Desk-top fabrication equipment for printed circuit boards; toner-transfer paper for easy hobbyist & OEM prototype do-it-yourself PC board making.

Be sure and mention Nuts & Volts when you contact the above suppliers so your request goes to the right department.

conditions. So is the ambient light level of the time of day. Figure 4 shows a generic polarization-based brightness attenuation setup, used where the returned beam is too bright for the detector to handle, resulting in a condition called "Swamping." By rotating the polarizers relative to each other and to the polarization vector of the beam, you have control of the beam intensity ranging from the level emerging from the polarizers after absorption when they are exactly aligned, to an almost 100% attenuation when the polarizers are rotated 90 degrees relative to each other.

At the opposite end of the scale, it may be necessary to enhance the brightness of the beam in order to get a workable signal. Figure 5 shows a simple device designed to do just that. A lens is depicted which concentrates the reflected beam on the phototransistor detector. Two telescoping sections of tubing are used in order to enable focusing of the signal. This allows one to quickly assess audio quality, and adjust it to the needs of the amplifier, by varying the pickup lens-to-detector distance of this simple adjustable optical system.

The Laser Experimenter is a reader-interactive column. We like to hear from the reader, and in many cases, the best projects have come directly from your suggestions. If there is some particular facet of laser science that interests you, we would welcome hearing from you at: The Laser Experimenter, P.O. Box 74, Cornwall Bridge, CT 06754. Questions, comments, suggestions, and material relating to lasers are all welcome. We would like to publish letters in Reader Feedback occasionally. Indicate whether using your name and address is okay. We can now respond to your letters personally on an "as time permits" basis. Your FAX number, which will be kept confidential, will speed replies.

A Substitute for Eavesdropping

One method that is excellent for demonstrating AM modulation of a laser beam is to obtain a lightweight mirror and glue it on a ceramic piezoelectric transducer. Sound is then fed into the transducer from a suitable source such as a tape player or radio with an external headphone jack. The modulations are impressed upon the beam, and will appear in a suitable receiver. Such a receiver could be the LAD optical amplifier presented in LEsep93. The combination works quite well. If you are in need of the LAD schematic and a PC board pattern, I'll be happy to provide them free of charge if you write me at The Laser Experimenter's P.O. Box listed elsewhere in this column.

By the way, if you are into espionage as a intellectual hobby or whatever (and who doesn't like James Bond, eh?), rent the movie "Sneakers." It's all about a close-knit, humorous bunch of characters who have some really fascinating hi-tech gadgets and make a living spying on other people. You are bound to enjoy it, even if you wish no hands-on activity in this area!

How do I get back issues of The Laser Experimenter?

A common question I get is whether I have back issues available of The Laser Experimenter. I don't supply these, because it would mean keeping them in inventory, hiring a person to do the mailing, etc. But back issues are available from *Nuts & Volts* at 430 Princeland Court, Corona, CA 91719 for $5.00 each postpaid. You can get issues back to Dec. '91, and this column began in June '93 (this being the 24th installment). Another question I get is whether I can photocopy the column of interest. This I've done for most of you, but it's very difficult since the format of this magazine is in oversize paper, and one has to take the magazines to a copy shop with a high-end copier AND who keeps the correct oversize paper in stock. Not too easy to find one!

I would like to thank Dusty Sandmeyer and John Scholl for their generosity in allowing me to use their machines. But I'm afraid I'll have to weasel out of this copying practice from now on due to time constraints. But I will be happy to provide, FREE of charge, a printed Index that contains a brief description of every column back to the beginning of this series, if you write our Laser P.O. Box here in Cornwall, CT. A very positive point is, it's quite possible you'll enjoy the interesting articles appearing in unread issues of *N&V*, which you'd miss if just this column alone was photocopied.

And, as usual, sometimes I can locate and provide or lend material from the reference library for your favorite area of interest as long as lent material is returned, and you pay the postage charges!

Until the next installment of The Laser Experimenter . . . **NV**

CLOSING QUOTE:

Closing Quote: "Science is a first-rate piece of furniture for a person's upper chamber if he has common sense on the ground floor."
— Alfred Lord Tennyson (1809-1892)

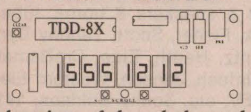
Anthony Charlton is an active electronics and science "do-it-yourself" project designer, does custom R & D, and writes technical articles. Previous work experiences include design of hardware & software for microprocessor-based process control systems and electronic design. His hobbies include lasers, gardening, target shooting, and model rocketry.

Motron Electronics 310 Garfield St Suite 4 PO Box 2748 Eugene, Oregon 97402

New Low Price!

$59.00

DTMF Decoder



The TDD-8X features a large 8-digit LED display and decodes all 16 DTMF digits. The 104 character memory is viewed, without loss of data, by scrolling either left or right. Although a computer is not required, the serial ASCII output allows for automatic logging of decoded number groups. ToneLog™, our IBM/Compatible logging software, is included with each TDD-8X at no additional charge.

TDD-8X Assembled & Tested PCB $ 59.00 **PMK-1** Plastic Mounting Kit $15.00
CAB-1 Audio & Computer Cables 20.00 **PS-12** 12VDC AC Power Adaptor 10.00

Now, catalogs are also available via the Internet. Write to motron.info@emerald.com
Visa, MasterCard, American Express, Discover and Government Purchase Orders accepted.
COD on Cash or Money Order basis only.
Minimum Government Purchase Order: $99.
S/H: $6 USA/Canada; $15 Foreign COD: $5.

Info: (503) 687-2118 **Orders: (800) 338-9058** Fax: (503) 687-2492

#160 MISC. ELECTRONICS FOR SALE *cont.*

SERVO AMP made by EG&G. 5A ±50VDC output, new @ $150 ea. 6 available. Call Roger @ GS&E, 716-338-7001. Visa, MC, COD.

UNIQUE RS-232 products. Free information. Robotic Electronics, Inc., 4387 Swamp Rd. Suite 263, Doylestown, PA 18901. 215-230-8599.

TUBES, NEW, unused. Send self-addressed, stamped envelope for list. Fala Electronics, Box 1376-3, Milwaukee, WI 53201.

PROGRAMMABLE SUPPLIES. Low cost three channel PC programmable power supplies for product testing. Models available for 5V/12V @ 5A. Programmable from 4.25-5.75 and 10.00-14.00 volts. Available board level or enclosed with meters. Custom voltages available. Call Diamond Mountain Engineering, 510-487-9530.

VHF PORTABLES; GE/MPI 2-watt, 1-advanced Videotech 5-watt w/accys, 3-GE/PE-PY 5-watt w/accys, 1-Wilson 5-watt w/accys & xtra charger, others. Call Mike, 802-748-2612.

FLEXIBLE BREADBOARD JUMPERS Use our **GOLD** machined crimp pins with your #22 stranded wire and make jumpers that surpass solid wire jumpers. Pins: 10/$1, 50/$4.50, 100/$8, 1000/$60. SASE Sample and Instr. EAH, 23352 W. Spring Harbor Rd., Siloam Springs, AR 72761.

VISIT THE surplus store by the Jersey Shore. Tech Systems, 1309 Hwy 71, Belmar, NJ 07719. 908-280-0007.

ULTRA ISOLATOR TRANSFORMER, 2.5 KW, Xentek, New! 120/240 output, 100/120/200/220/240 input. 3 pcs. available. Roger @ General Science & Engineering, 716-338-7001. Visa or MC.

WANT TO Buy: ICs, military & aircraft relays, diodes, transistors, electronic test equipment & most components. Hoffy Electronic Ent., 818-718-1165, FAX 818-341-5506.

IRFD9120 DIP HexFET -100V/IA D-Channel $1.50, MJE8501 NPN Power 800V/2.5A $2.50, Valor DC-DC 5V to 12V PM 9006 $10. GreenLux, 415-753-0251.

PC FABRICATION Equipment for sale. Colight DMVL exposure unit 1000 watt, Execellon UniDrill#1230, Quad drilling unit, Air routers, Air beveler. Call Henry, 908-689-0110.

87C51 $9, Max630 $1, Inductor for Max630 $1, IRF640 200V/18A N-FET $2, 21MB floptical disks $5, 2V/2.5SAH gel battery $2, AA Nicad $1.25. GreenLux, 415-753-0251.

WANTED: GRM 21/ARC58. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

ELECTRONICS, MISC. and test. Send SASE for listing. Ellicott Electronics, 1155 Ellicott Hwy, Calhan, CO 80808.

MISCELLANEOUS ELECTRONICS WANTED 170

KINGSLEY WIRE stamp machines, digital pressure, gauges, Setra 370 IFR 401L, 402AP, 600A, RD300, 120043, etc. Auto pilot test equip. Jet, JT-1, FC110, Buy, sell, trade. 813-575-0138 P/F.

WANTED: GRM 21/ARC58. Russell Ott, 9050 Briarclift Rd., Indianapolis, IN 46256-2206. 317-849-5866.

WANTED: BUY & SELL all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Rd., Hugo, MN 55038. 1-800-421-9397 or 612-429-9397. FAX: 612-429-0292.

SS WHITE AIRABRASIVE wanted, Model K, H, or similar. Call or fax Jack, 513-777-0800, 513-779-3931 (voice).

UNITEK WELDERS wanted for cash. Parallel heads and power supplies. Call 608-643-5434, FAX: 608-643-4439.

EXCESS INVENTORY WANTED: Transistors, semiconductors, capacitors, PC boards, & diodes. We buy it all!! Contact: **SEMITECH, INC.,** 334 Cooper Road Bldg. A, Berlin, NJ 08009. Phone 609-768-0030, FAX 609-768-5690.

DO YOU have aluminum anodizing knowledge, experience, or equipment? Will trade your small set-up or info for my cash or toolmakers services. Call Philip, 408-244-0728.

AVIONICS MAINT. manuals. Collins, King, Narco, Cessna, RCA, etc. Collins Proline Red Band, any condition, any type, control heads, King, Collins, Gables, Sperry, Radar, any. 813-575-0138 P/F.

WANTED: APPLE 1, Mark 8 and early microcomputers. Also journals for museum. PO Box 341, Floyd, VA 24091. 703-231-6478, 703-763-2321.

WANTED: AVIONICS test equipment. IFR 1200Y3, 401L, 750B, 600A. Also Collins, King, Microline, Proline, Silver, Gold Crown Ground Power Units, Fox Carts. Avionics Plus, 28000 Airport Rd., Box A17, Hanger 97, Punta Gorda, FL 33982. 813-575-0138 P/F.

Get the latest technology in cable converters and descramblers

- Best prices
- Save on equipment rental fees
- Quality merchandise by brand-name manufacturers
- Friendly personal service
- Thirty-day money back guarantee
- All orders delivered fast and conveniently via FedEx Economy Two-Day℠ service

You'll appreciate the premium view when you order from us!

1-800-841-7835 Call for free catalog

CABLE BOX WHOLESALERS, INC.

460 W. ROGER RD. #106, TUCSON, AZ 85705

Write in 129 on Reader Service Card.

Lowest Prices on Laser Memory!!!

The Key to Added Profits are Printer Trays

For All Popular HP & Canon Printers*

- SX Envelope $19
- SX Legal, Letter, A-4...$39
- LX Lower Cassette (IIP, IIIP, etc.) $99
- 3si/4si Legal $69
- HP 4 Legal $49

Add-On America Corporation

CALL NOW!!

800-576-2349

Fax (410) 987-3258

Elite Products

Write in 130 on Reader Service Card.

ELECTRONICS EXCHANGE ST. LOUIS the only surplus electronics store in the St. Louis area. We buy anything in electronics that's a bargain. Call or FAX, 314-426-4848. 24 hours, 7 days.

WANTED IN2169,A IN2170,A and/or IN2171,A Zeners. State quantity and price to: S. Johnsen Ents., RR 1 Box 295B, Reelsville, IN 46171 or call, 317-672-8483.

WANTED DOLCH madel **ALP44** active logic probes (and possibly other 4850A compatible accessories) 708-358-3275.

ROBOTS WANTED: Dead or Alive, Whole or Parts, Heathkit, Androbot, RB5X, Artec, Omnibots, Rhino, Hero 2000, Etc. Will pay cash. Please call 810-777-5900 or write to, Robert Doerr, 22407 Bayview Drive, St. Clair Shores, MI 48081.

WANTED: OLD, new, used, Western Electric, RCA, Telefunken, GE, Jan, McIntosh, Marantz, Dyna, Fisher, JBL, EV, Tannoy, Jensen, EMT, Thorens, Fairchild, Altec, Westrex: **TUBES,** speakers, amps, etc. Maury Corb, 713-728-4343, FAX 713-723-1301.

PINBALL MACHINES wanted. Broken, parts, assemblies, PCBs, in any condition. Leave message with callback number. 818-513-0546.

WANTED: EARLY Audio equipment, amplifiers, pre-amps, tuners, audio tubes, ect. George Schwarz, 18504 Arrowhead, Cleveland, OH 44119, 216-486-6489.

TUBES WANTED Cash for new. 6L6GC, 5881, 6V6, 7027, 6550, 6CA7, EL-34, 7591. Alex, 610-767-9097.

WANTED: ELECTRON TUBES, ICS, SEMICONDUCTORS. ASTRAL, PO BOX 707NV, LINDEN, NJ 07036. CALL 800-666-8467.

CASH WAITING for your consumer ICs and transistors. We want your semiconductors, fuses, electrolytic capacitors, flybacks and other electronic parts. Call LJ Enterprises, 302-378-3334, FAX 302-378-3558, 1-800-627-8755.

COLLINS HF aircraft transceivers such as: ARC-58/R761 and similar units. Buy/sell/trade. Russell Ott, 9050 Briarcliff Rd., Indianapolis, IN 46256-2206. 317-849-5866.

JENSEN SPEAKERS WANTED 10" or 12", blown or ripped cones OK. Alex, 610-767-9097.

I WANT it and I want it now. I want all of your SIMM memory. IBM, Mac, new, used, even defective. I want it all. Highest $ paid. Call 1-800-4-MEMORY now! Voice/FAX.

WANTED: TUBE Hi-Fi & Commercial equipment & speakers & horns, tubes. Altec, RCA, Fisher, Scott, Tannoy Dyna Co., Marantz, Heath, Eico, Craftsman, Brook, McIntosh, Jensen, Western Electric, JBL, EV, etc. Sonny Goldson, 1413 Magnolia Ln., Midwest City, OK 73110. 405-737-3312.

BUYING TOCOM, SCIENTIFIC ATLANTA 8536s, 8550s, 8580s, 8590s, and 8600s. **JERROLD** DPV and DPBB. **PIONEERS,** all, and Zeniths, all. Any quantity. Top $$$ paid. Contact National Cable Brokers, Plymouth, IN. Phone 219-935-4128.

WANTED: TUBES. I pay cash or trade for all types of transmitting or special purpose tubes. Mike Forman, 1472 MacArthur Blvd., Oakland, CA 94602. 510-530-8840.

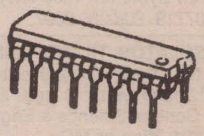
WANT USED or surplus DC motor controls or adjustable frequency AC drives, 1/2 HP and up. DC motors fractional to 3 HP. C. Woodruff, 5507 55th Ave. So., Seattle, WA 98118. Voice/Fax 206-723-8487.

DEC EQUIPMENT WANTED! We are buying DEC systems, boards, terminals, drives and peripherals. Also Scientific Micro Systems (SMS), DSD, Datability, Dilog, other DEC compatibles, and Computer Output Microfilm (COM) units. Please call for a quote or fax us your equipment list. We buy, sell, and trade. **COMPUTER KEYWAYS,** 513-847-2300 or FAX: 513-847-2350.

WANTED MFM Hard drives: Maxtor XT1085, XT1140, XT2190, Seagate ST 125, ST 138, ST 251, ST 1110, Toshiba MK134FA, NEC D3142. Call 714-542-1037 or FAX 714-835-1575.

WANTED: LATE MODEL TEST EQUIPMENT (Tektronix, HP, Fluke). Especially: Tek SG 505/2, Tek S-6, Tek 2465A/B. Also, we buy test equipment **service manuals** and **catalogs.** Pepper Systems: 214-353-0257; 214-902-9511 FAX.

WANTED R1913 PMT tubes new or surplus from Hamamatsu. Wanted Hamamatsu photomultipliers and microchannel plate tubes. Wanted design engineer familiar with FIFO IDT72245 to upgrade to IDT72265. Fax info to 408-384-2704 or call 408-384-6780.



WANTED: EXCESS ELECTRONIC INVENTORIES. IC'S, MEMORY, EPROMS, PALs, LEDs, CIRCUIT BOARDS, DIODES AND TRANSISTORS. CALL ACTIVE MICRO, 310-494-4851 OR FAX 310-494-4913.

HP 85 series computer info., parts, ROMs, service ROM, drawers, also print heads, needed by apprentice program free school. 929 Marion Highland Park, IL 60035. Robert Oakes Jordan, 708-432-7999. FAX 708-432-8999.

WANTED: UNIDEN & Johnson radios. 800Mg only. 1-800-779-1905.

WANTED: LOOKING for new/used TV "tuner subber." Fax or voice message, 904-673-0286.

WANTED: IC chip, 30-pin, LA-7231 Sanyo, VCR-Model VHR-1900, Garrick-5000 Bernard N., Crystal, MN 55429 or Tel: 612-535-1909, leave message on machine.

ASSET SALES, INC.

Used Technology Clearance Center

101 S.W. 41st Street • Renton, WA 98055

(206) 251-6653 • Fax (206) 251-6960

"Just Because It's High-Tech Doesn't Have To Mean It's High Priced."

NOW OPEN

of our

Sunnyvale, California Retail Store

Located at

1190 Kern Avenue (in the WeirdStuff Electronics Center)

COMPUTERS

Power Supplies: Power Designs

TW5000 Dual 0-50Vdc, 0-.5A **$149.**

PD4050 0-40Vdc, 0-.5A **$99.**

RF Directional Wattmeters

"As-New"

Struthers Model 1219-D

50Ω, Frequency Range: 2MHz to 1GHz, Uses plug-in elements (3 included) 2-30MHz in ranges 0-50W, 0-100W, 0-500W, 0-1KW; 25-250MHz in ranges 0-10W, 0-50W, 0-100W, 0-500W; 200MHz-1GHz in ranges 0-10W, 0-50W, 0-100W, 0-500W; VSWR ≤ 1.08:1; Transit Case; Type N Connectors **$199.**

Tektronix

485 Oscilloscope 350MHz w/2 P6131 Probes **$895.**

Hewlett-Packard

7550B Graphics Plotter Serial/Parallel Interfaces **$299.**

7475A Color Plotter Serial Interface **$149.**

7550A Graphics Plotter GPIB/RS-232 Interfaces **$199.**

Looking for Test Equipment Manuals?

Call: **Manuals Plus**

Tel: 206-531-8031

Fax: 206-536-1121

Fluke

73 -II Digital Mulitmeter 10A Range w/Test Leads **$65.**

75 Digtial Mulitmeter 300ma & 10A w/Test Leads **$79.**

TEK "AS-NEW" ITEMS

214 Oscilloscope Battery Operated•Storage **$695.**

314 Oscilloscope Battery Operated•Storage **$695.**

CDM250 Digital Multimeter 4.5 Digits **$225.**

CMC250 Frequency Counter 1.3GHz 10ppm **$350.**

CMC251 Frequency Counter 1.3GHz 1ppm **$400.**

TEST EQUIPMENT

We Buy and Sell Late Model Test Equipment

Retail Store Hours:
Mon.-Sat.
9:30A.M.-6P.M.
Order Desk Hours:
Mon.-Fri.
8:30 A.M.-5P.M.

Visa • MasterCard

(206)251-6653

Limited quantities available. All items subject to stock on hand. Ask about warranty details. Shipping and Handling will be added to all orders. CA, WA, OH Residents add Sales Tax.

Check Out Our Prices!

Write in 131 on Reader Service Card.

NEED FOR Geiger counter 1-1B86 G-M tube (vic + green) and 5799 diode. Please call/write: Steve Gillilano, 4581 Fairground Rd., Selina, OH 45822.

LOOKING FOR 3:1 interstage audio transformers (5-15 watt), GL-211 tubes (VT-4C), 211 sockets and 811 tubes (new) w/sockets. Send prices, name, address & day phone to Fred Fabishak, 226 Addison Ave., Elmhurst, IL 60126.

WANTED: HP printers & plotters, all Mfg's coaxial & waveguide hardware, AC & DC variable power supplies, standards, high voltage meters/dividers, Hypot testers, DSOs, large screen display. Call 908-681-6500 of FAX 908-681-9309. Atlantic Coast Instruments, PO Box 1747, Wall, NJ 07719.

WANTED: ELECTRONICS book or books explaining what commonly available test instruments to use and how they are used (including scopes) for troubleshooting basic electronic circuits. M. Fisher, 310 N. Mine, Lebanon, PA 17042.

USED ELECTRONICS wanted; TVs, stereo equipment, CD players, speakers, VCRs, tape decks, amplifiers, converter boxes, decoders. Prefer working, take non if real cheap. Buy quantity at right price. Von Neubauer, 1121 W. Sandusky, Bellefontaine, OH 43311-1029. 513-599-2997.

TEKTRONIX 570 curve tracers and manuals. Prefer operating units, but will consider non-operational "parts cars." Contact: Pearl, 2528 19th. SW, Calgary, Alberta, Canada T2T 4X3. Ph 403-244-4434, FAX 403-244-9026.

WANTED: SONY EV-C8U 8mm video cassette recorder. Must be in excellent condition. Prefer unit with all accessories. Les Adams, 312-648-3662 days, or 708-364-1482 evenings.

EDUCATION 180

LASER PRINTER REPAIR TRAINING. From the laser printer training specialists. Our detailed hands-on seminars show you how to repair the most popular laser printers out today, HPs and Apple Laserwriters, etc. We also provide a 400 page up to the minute manual and free tech. support for 1 year! Don Thompson's Laser Service Seminars, 1-800-457-5776, 714-855-3838.

AMERICAN INSTITUTE FOR COMPUTER SCIENCES helps you increase your earning and career potential by earning a college degree through home study. Accedited B.S. and M.S. degrees in Computer Science, plus ADA, C++, Windows, and CareerPath training in computer programming. Employer reimbursement, military and work tuition reductions may apply. **1-800-767-AICS or 205-323-6191 for a free catalog.**

HUBBLE TELESCOPE Photographs (GIFS) with accompanying NASA Texts. GALAXIES in the YOUNG UNIVERSE Series, $9.99 + $2 shipping. Entire public Hubble Series available. SPACEPICS, POB 75711, Oklahoma City, OK 73147.

NEW VIDEO. A Technician's Guide to: Printer Maintenance Cleaning and Troubleshooting Tips for Canon based machines: Covers SX, LX, EX and NX engines. Videos sold separately at $39 each or in a set with all 4 tapes at $145. To order call Diversified TechniGraphics, Inc., 1-800-457-5776 or 714-855-3838, FAX: 714-855-3959.

LEARN MICROWAVE OVEN REPAIR! Plus: **VCR KNOW-HOW** State-of-the-art videotapes by internationally published electronics expert J. Carlton Gallawa. Complete course. Guaranteed logical, practical, realistic, specific. **FREE** brochure. Call MICROTECH, **1-800-700-UFIX.**

FCC LICENSED TECHNICIANS earn more $$$$$. Electronics home study. Fast, Inexpensive. Free details. COMMAND, D-225, Box 2824, San Francisco, CA 94126-2824.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmf/.

ESP, BIOELECTRICITY, microwave hearing introduction comprehensive booklist $1. Research Associates, PO Box 3583, Boynton Beach, FL 33424-3583.

COLLEGE LECTURES on VCR tapes. Topics include electronics, computers and communications. Send for course list. OCS, PO Box 292, Fort Mill, SC 29715-1832.

FCC COMMERCIAL License RadioTelephone RadioTelegraph. Fastest easy homestudy manuals. Audio, Video, PC disks, Q&A pool. "Career Guide." Guaranteed to pass. Free details, WPT Publications, 800-800-7588.

125 WAYS to multiply and divide numbers. Make electronic calculations readily. Solving electrical problems becomes quicker and more interesting a must. "Practamatics & Arithmagic" $12.50 PP. Mazal Electronics, 81 Market Sq., Newington, CT 06111.

ELECTRONIC ENGINEERING. 8 volumes complete. $109.95. No prior knowledge required. Free brochure. **Banner Technical Books,** D-2 1203 Grant Ave., Rockford, IL 61103.

LEARN PC Assembly Language. Disk $5, Book $15. ZIPFAST, Box 12238, Lexington, KY 40581-2238.

30 pc. TAMPER-PROOF SECURITY BIT SET $16.95

Drive bits with hollowed tips designed for those security screws often found in computers and other modern equipment. This set includes 9 different sizes of Torx bits (TT-7 thru TT-40), 4 sizes of square drive bits (S0 thru S3), 7 different sizes of hex bits (from 5/64 to 1/4), as well as flat and phillips bits, a socket holder, a 1/4" adapter, and a magnetic tipped handle to accomodate all the bits in the set. Handle also has a storage compartment for pocket use, and the complete set comes in a sturdy plastic storage case. Ideal for the bench or toolbox.

gateway
ELECTRONICS, INC
8123 PAGE BLVD * ST. LOUIS, MO 63130
(314)427-6116
9222 CHESAPEAKE DR. * SAN DIEGO, CA 92123
(619)279-6802
2525 FEDERAL BLVD. * DENVER, CO 80211
(303)458-5444
MAIL ORDERS CALL TOLL-FREE
1-800-669-5810
FAX ORDERS (314)427-3147
ELECTRONICALLY SPEAKING, GATEWAY'S GOT IT!

BIG BROTHER IS WATCHING

You've probably wished for a closed circuit camera/monitor system for your home or business, but those cost big bucks! Well, once again, Gateway comes to the rescue! We've got a 9" solid state video monitor with black and white camera and 10' interconnecting cable. Runs on 115 VAC. There is a microphone in the camera for one-way audio monitoring, and you can make cable runs up to 300 ft with twisted 3-pair wire. Requires 6 conductor round telephone cable and RJ-12 modular plugs. Why so cheap? The surplus market is an amazing place! We hook 'em up, make sure they get a picture from the camera to the monitor,(that's quality controll) and sell them to you at such-a-deal prices. Great for ATVers, business monitoring, and I-spy surveillence.
approx. dimensions : camera 2-1/2" x 4-1/4" x 8"
monitor 8-1/2" x 8-1/2" x 9-3/8"
(*mailorder customers please include $15.00 per system or extra camera or monitor for shipping & handling)

VIDEO SYSTEM* $125.00
includes camera, lens, 9" video monitor, 10' cable, 1-way paging. System operates on 115 VAC. Includes a 2-way switching option so you can add an extra camera.

VIDEO SYSTEM IV* $150.00
(same as above, but monitor features a 4-way switching option so you can add upto 3 additional cameras)

ADDITIONAL CAMERA* $100.00
ADDITIONAL MONITOR* $75.00
(for use with above systems)

The CCD Camera Cookbook $29.95

With the help of this informative book by Richard Berry, John Munger and Veikko Kanto, you can build a powerful CCD camera at home with a minimum of special equipment & skills! The authors take you on a detailed journey through the innerworkings of low light CCD imaging. Chapters include Introduction to CCD Cameras, How a CCD Camera Works (in all its gory detail!), Building the Camera Interface, Building the Camera Head, Building the Coolant System (they even talk about our beloved peltier junctions !) The book includes a diskette and has a sizable chapter on Using the Camera Software. The book ultimately turns you on to using CCDs in amateur astronomy, photographing images in space! A fascinating book to read and a challenging group of projects to build!

THE FINE PRINT : PRICES SUBJECT TO CHANGE WITHOUT NOTICE * GATEWAY IS NOT RESPONSIBLE FOR PRINTING ERRORS * MASTERCARD, VISA AND DISCOVER ACCEPTED * YES, WE'LL TAKE YOUR CHECK -- SORRY, NO C.O.D.s * $10 MERCHANDISE MINIMUM ON MAIL ORDERS * SUPPLY OF SOME ITEMS IS LIMITED * PRICES DO NOT INCLUDE SHIPPING * UPS GROUND SHIPPING/HANDLING WITHIN THE CONTINENTAL U.S. (ITEMS REQUIRING ADDITIONAL AMOUNTS ARE NOTED)...$4.25 FOR THE FIRST ITEM, $0.50 FOR EACH ADDITIONAL ITEM. RESTOCKING CHARGE MAY BE ASSESSED ON RETURNED ITEMS. The people who say words can't hurt them never got hit in the head with a dictionary!

NOT-SO-BIG SOLAR PANEL II $14.95

A smaller version of the popular Big Solar Panel, this 12" X 6" X 3/16" thin film glass solar panel is ideal for experimenters, small applications, and conservative budgets! 21 V no load, 12V 125mA with load.

BIG SOLAR PANEL* $36.50

A whopping 1' X 3' X 3/16", this thin film glass solar panel puts out a hefty 12-14 volts @ 700-750 mA (3/4A). Imagine this as a power supply for your handheld or other project requiring 12 VDC.

*big solar panel mailorder customers please include $15.00 to cover shipping/handling on this item.

ultra low-profile camera with pinhole lens! $175.00

PINHOLE - that means you can conceal this camera behind almost anything and you only need a hole the size of a pin for it to "see" through! For the super-spy in all of us, here's the latest in little CCD cameras. It is about 1/2" thick and about one square inch (like those little crackers that are good for you!) It can be housed in almost anything due to it's small size. Requires 12 VDC and a little imagination. This camera is a tiny 1.3"x1.3"x 0.6", features a pinhole lense, a 0.4 lux 1/3 CCD sensor, 380 lines of resolution, and electronic shutter time of 1/100,000 sec. Whether you're spying on your mother-in-law or navigating your RC car, this is the ultimate in miniature surveillance.

127 THERMOCOUPLES PELTIER JUNCTIONS

The peltier junction is a solid-state thermovoltaic device. Current applied to the device will produce heat on one side of the device and a cold surface on the other side. Water placed on the surface will freeze or boil depending on polarity of applied voltage. Ideal for applications from 3-12 VDC -- grab a battery and let your imagination run wild! DOCUMENTATION INCLUDED!!!

Small Peltier Junction $20.00 (approximately 1.17"x1.17"x.12")
Large Peltier Junction $29.50 (approximately 1.56"x1.56"x.15")

Sliver-of-light Miniature Miniature Bulbs
10 for $7.50
A tiny sliver of bright light, ideal for model train builders, doll house enthusiasts, RC plane hobbyists, etc. Originally designed to backlight wrist watches. Features wire leads, no socket needed. Requires 1.5 VDC. Approximate bulb size: 0.053" diameter; 0.143"high.

Passive Infra-red Talking Motion Detector !!! $27.50

"Stay out of that refrigerator !", "Watch your step!" ... The possibilities are mind-boggling with this talking motion detector. You speak into it to record your message (upto 12 seconds long), turn the unit on, and instantly your voice (or your mother-in-laws) reminds anyone in the vicinity that you were expecting them. Message can be changed with the flip of a switch. Uses 4 AA batteries (not included), or an external power source (built-in jack). May be used independently (80 db output) or with an amplified speaker to blast your message throughout the house. Approx 4"x 3-1/2"x 1-1/2".

5 mW LASER

5 MW LASER MODULE $55.00

Mini 5 mW visible laser module wavelength 630 - 680 nm.
3/4" x 1/2" complete unit has a built-in power supply and an adjustable culminating lens.
Operates on 3 volts DC (a pair of AA or AAA batteries work great)
WARNING: AVOID DIRECT EYE CONTACT

controlling the world with your PC...

Here's a useful book that tells you how to connect your personal computer to the real world and make it do useful work like controlling stepping motors, monitoring fluid levels, or switching appliances on and off. No PC modification necessary for these projects either -- every circuit in this book connects directly to the parallel printer port of your PC! Also included are a circuit diagram and listings for control software written in Pascal, C, and BASIC. AND (this is the good part) the accompanying disk contains full source code in all languages plus compiled (.EXE) files -- (that means no typing ... yeah!) Whether you want to generate audio tones and speech, drive high power loads and DC relays, or convert DTMF tones to binary values, this books is a great source for information, projects, and ideas. There are also 9 appendices (that's plural for appendix - that hunk of helpful info that didn't fit into any one chapter of the book!) They cover such topics as expanding the parallel port for 24 bit I/O, bidirectional printer port use, and using your PC's game port for input. Controlling The World with Your PC is $29.95

NEW PRODUCTS WANTED

Established manufacturing company is looking for new inventions and ideas in the electronic surveillance, counter-measures, cellular monitoring, and FAX interception field.

We can develop, produce, and market on a partnership, profit sharing, or on an outright purchase basis.

Tech Support Systems
1040 Hamilton Court
Menlo Park, CA 94025
415-325-6691 • FAX 415-325-6693

SURPLUS SALE

200,000 WALL TRANSFORMERS

3.6 VDC	900 MA	2.25
12 VDC	100 MA	1.10
12 VDC	500 MA	1.75
12 VDC	800 MA	2.10
14 VAC	500 MA	1.75
16 VAC	1.25 A	2.95

Min 1000/type - - Call for other types

SURPLUS TRADERS
PO Box 276,
Alburg, Vt. 05440
Tel: 514-739-9328
Fax: 514-345-8303
FREE CATALOG!

WANTED

SIMMS

256x9 1x9 1x36
512x36 4x9 2x36

DRAM

1x1 256x4

BEST PRICES PAID
CALL OR FAX NOW!

ADD-ON America Corp.
(800) 576-2349
FAX (410)-987-3258

BCD electro

MJE16106 ..... .75
MTH35N15, TO218 ..... 2.25
(Replaced by MTW35N15, TO247)

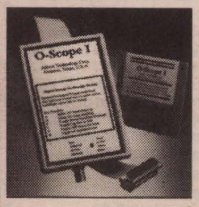
MC68705U3CS rfb.	MMBF170LT1A
4049BF (Tosh smd)	SG1526J/883
UC7905ACT	N82077A
2 1/4" sq., 12 vdc fan	MC74F240PC
2SD1978 ammo	DM74ALS245AN
AT28C256-20DI	SN74F20DWR
AT28C256-25LM/883	74HC4066D
D8751H rfb.	COP8782CMC
KCO12S, 65mHZ osc.	MC6845L
MC68HC11A1FN rfb.	MC1463R
SN75174DWR	P6KE12CA
UA78L05ACDR	40 mHZ Oscillator

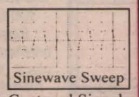
This is only a Smattering, fax your needs
We Buy Manufacturers Excess Electronics
Hours 8:00AM through 6:00PM M-F CST
Phone (214) 343-2170, FAX 1854

Digital Storage Oscilloscope For $169.95 ???

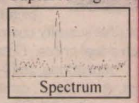
And much, much more!

O-Scope I turns PC-ATs into DSO, spectrum analyzer, frequency counter, DVM. DC-50KHz




Sinewave Sweep

Captured Signals


Spectrum

For Orders and Inquiries Call: 1-800-980-9806
For Technical Assistance: 1-713-777-0401

Allison Technology Corporation
8343 Carvel, Houston, TX 77036
FAX and BBS 1-713-777-4746

COIN PHONES

G-TEL
713-550-5592
FAX 713-550-1028

DEVICE PROGRAMMERS

ROMMASTER/1
32 PIN UNIVERSAL PROGRAMMER FOR GALS, FLASH, E(E)EPROMS, PSD3XXX* MICROCONTROLLERS*
$189

ROMMASTER/4
4 SOCKET 32 PIN PROGRAMMER E(EPROMS
$269

SUPERPRO REFURB
40 PIN UNIVERSAL PROGRAMMER FOR GALS, FLASH, E(E)EPROMS, PEELS MICRO-CONTROLLERS, FPL, EPLD AND MANY OTHER DEVICES **$249.**

SEE OUR OTHER ADD IN NUTS AND VOLTS

General Device Instruments
408-241-7376 SALES
408-241-6375 FAX
408-983-1234 BBS

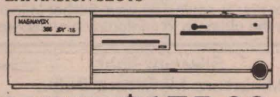
GDI WILL BEAT ANY PRICE - NEVER UNDERSOLD
WE ALSO BUY AND SELL USED PROGRAMMERS

FOSS WAREHOUSE DIS CENTER
289 Schenck St., North Tonawanda, NY 14120
1-800-473-0506 716-694-6400 1-800-488-0525 FAX

MAGNAVOX COMPUTER

Used – from bankruptcy stock

- 386 SX-16 INTEL
- 42 MEG HDD
- 3.5" FLOPPY DRIVE H/D
- 5.25" FLOPPY DRIVE H/D
- IDE CONTROLLER ON BOARD
- VGA CONTROLLER ON BOARD
- RAM 1 MEG ON BOARD
- EXPANDED MEMORY SLOT 1 "72 PIN SIMMS-NP"
- MODEM 2400 BAUD HAYES COMPATIBLE INSTALLED
- 3 EXPANSION SLOTS



SPECIAL PRICE $175.00
Call for special memory prices.

"NOW BUYING"

$$ BEST PRICES AVAILABLE $$

SCIENTIFIC ATLANTA	**TOCOM**	**JERROLD**
8536 THRU 8600	5503A, VIP THRU 5507	DPV5, DPBB212 THRU DPV7, DPBB7
ZENITH	**PIONEER**	
1086 THRU 1612	5135 THRU 6300	

Midwest's Largest Cable Brokers
(We buy quantities of one to one thousand units)
NATIONAL CABLE BROKERS
(219) 935-4128

SPY ON THE EARTH

See *live* on your PC what satellites in orbit see

Capture *live* breathtaking images of the Earth for fun or profit. Zoom in up to 20X. Send $39 check or M.O. ($45 air, $50 overseas) for our *fantastic* SpySat, 8 diskette set of copyrighted programs (IBM type) that does satellite tracking, image acquisition, image processing, 3-D projections and more. Direct reception from the satellites guaranteed worldwide without a satellite dish. Schematics included for interface. For FREE information and demo programs log-on to our bulletin board anytime at: (718) 740-3911.

VANGUARD Electronic Labs
Dept. N, 196-23 Jamaica Ave.
Hollis, NY 11423 Tel.718-468-2720

WANT TO BUY *Memory*

★Circuit Boards
★Memory New & Used
★EProm New & Used

SINACO ELECTRONIC
Call Frank:
Tel. 818-705-1880
Fax: 818-705-1881

Robot Explorer™

The *Robot Explorer*™ newsletter is your guide to the world of intelligent mobile robots. Each of the 8 yearly issues is packed with robot explorations: from Antarctica, to the depths of volcanoes, to desktop mechanical creatures.

Build the newest robot kits, review the latest books, and receive expert guidance from master robot crafters.

Whether you're a professional robot designer, researcher, educator, hobbyist, or simply love to read about robots, *Robot Explorer* contains the in-depth articles you need to keep up to date with the quickly evolving world of intelligent machines. Eight issues for $14.95.

Call Now!
MC/Visa **1 (800)GO-ROBOT** *1(800)467-6268*
POB 458, Peterborough NH 03458 603.924.6079
$14.95 North America $29.95 World-Wide

NEW BOARDMAKER SCHEMATIC and PCB CAD

For IBM PC and compatibles

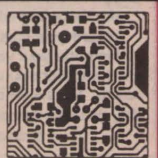
BOARDMAKER
Entry Level — Only **$95**
Easy to use
Dot matrix, laser, plotter
Gerber & NC drill output

Advanced — **$395**
Accepts netlists
Design rule checking

Board Capture — **$395**
Full feature schematic capture

Board Router — **$200**
Gridless autorouter

Free Demo



OHIO AUTOMATION INC
7840 ANGEL RIDGE ROAD
ATHENS, OHIO 45701
(614) 592-1810

Visa & MasterCard Accepted

TRUST THE EXPERTS...
50 YEARS SERVING THE LAMP INDUSTRY

- HARD TO FIND LAMPS
- FREE LAMP ID SERVICE
- $25 MINIMUM ORDER
- WE PURCHASE EXCESS INVENTORY

USA: 800-8 LIGHTS • Local: 714-452-0900
FAX (24 Hours): 800-255-3141

SUNRAY LIGHTING INC
1 Whatney, Irvine, CA 92718-2806
P.O. Box 50370, Irvine, CA 92619-0370

PCB's in Minutes From LaserPrint!*

8 1/2" x 11" Sheets

* Or Photocopier Use household iron to apply.

Press-n-Peel

PnP BLUE or **PnP WET**

PnP BLUE	PnP WET
For High Precision Professional PCB Layouts	Easy Hobby Quality PCB's
1. LaserPrint 2. Iron-On 3. Peel-Off 4. Etch	1. LaserPrint 2. Iron-On 3. Soak-Off w/ Water 4. Etch
Adds an Extra Layer of Resist for Super Fine Lines on Std Clad Bds	Transfers Laser Printer or Copier Toner as Resist to Std Clad Bds

20Sh$30/40Sh$50/100Sh$100 Blue/Wet (No Mix)
Sample Pack 5 Shts Blue + 5 Shts Wet $20
VISA/MC/PO/CK/MO $4 S&H -- 2nd Day Mail
Techniks Inc. P.O. Box 463 Ringoes NJ 08551
(908)788-8249
100% Money Back Guaranteed-Dealer Inquiries Invited

CCTV SPECIALS

Panasonic WV-BP114 • 1/3"CCD Camera — $179
• 0.1 lux • CS mount • 380 lines• ELC • Lenses $39 & up • 24vac xfmr $10

CHINON CX-060 • 1/3"PC Board Camera — $159
• 0.3 lux • 380 lines • ELC • 1.26" Sq • 120 or 86 degree Field of View

Panasonic WV-CP214 • 1/3"Color Camera — NEW! — $449
• 1.5 lux • CS mount • 380 lines• ELC • Lenses $39 & up • 24vac xfmr $10

Panasonic TR-930B 9" B/W MONITOR — $149
• 700 line resolution

DETECTION DYNAMICS

• ALSO AVAILABLE– Pinhole Board Cameras from $229 • Video Motion Detectors & Switchers

4700 Loyola Lane, Suite 119 Austin, Texas78723
(512) 345-8401 • FAX 926-0940
CCTV CATALOG $5.00 - REFUND W/PURCHASE

PROFESSIONAL 10 HOUR RECORDER
Built like a BATTLESHIP

- Special Nuts & Volts price **$149**
- BUILT-IN voice activation add **$25**
- Specifically engineered for long play recording
- 12, 14, and 16 hour versions available

CODs OK. California residents add tax.
Sorry, no credit cards
(All they "do" is increase the prices . . .)

FREE 32 page special equipment catalog!

VIKING INTERNATIONAL
SINCE 1971
150 Executive Park Blvd. #4600-N
San Francisco, CA 94134
Phone: (415) 468-2066
Fax: (415) 468-2067

TRUE TAMPER-PROOF
SECURITY SCREW REMOVAL BITS

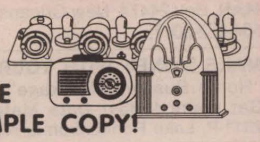
The SUPER TORX Kit Includes:

T-10, T-15, T-20 & T-25
COMPLETE SET FOR ▶▶ $19.60

TOCOM 5503 Bit	$ 8.95
TOCOM 5507 Bit	$19.95
ZENITH PM/PZ-1 Bit	$10.95
JERROLD Starcom Bit	$19.95
PIONEER (Oval) Bit	$23.95
OAK Sigma (Oval) Bit	$23.95

*** Security Screws Available ***

TAMPER-BIT SUPPLY CO.
(310) 866-7125



FREE SAMPLE COPY!

ANTIQUE RADIO CLASSIFIED
Antique Radio's Leading Monthly Magazine

Articles – Classifieds – Ads for Parts & Services. Also: Ham Equip. – Books – Telegraph – 40's, 50's & 60's Radios – Early TV – Auction Reports & more...
1-Year: $34.95 ($51.95 by 1st Class)
6-Month Trial - $17.95. Foreign - Write.
A.R.C., P.O. Box 802-G16 Carlisle, MA 01741
Call: 508-371-0512 Fax: 508-371-7129

PAGERS PROGRAMMED!

We can offer you 1 or 51 to work on your existing number.

Write, fax, or call us for free flyer. We offer fast, friendly service and the most affordable prices in the industry.

We also buy and sell pagers of all types.

SOFTWARE CITY
9501 N. Rodney Parham Suite 120
Little Rock, AR 72207
Fax/Msg (501) 223-9406

VISA • M/C • DISCOVER

Computer Maniac

We will custom build complete PC systems with color monitor, from $549 all the way to high end Quad Pentium CPU graphics workstations and file servers.

E-Mail us for our over 500 component catalog at: maniac@hooked.net or check out our home page: http://www.hooked.net/users/maniac

230 Skyline Plaza, Daly City, CA 94015
(415) 992-4855 voice; (415)992-6443 fax

DON'T LOOK

ONLY $95 INCLUDING SHIPPING

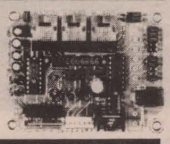
20 HOURS ON A SINGLE C-120 CASSETTE

FULLY AUTOMATIC PANASONIC TELE-RECORDER COMPLETE, READY TO USE.
DEALERS WELCOMED.

SEND CHEQUE OR MONEY ORDER TO:
VAKIS EFTECHIOU
1402 PINE AVE. #400
NIAGARA FALLS, NY 14301

Convert RS-232 to RS-485 or TTL/CMOS for Only $49.00

Communicate up to 4,000 feet, at up to 1 MEGA–BPS, full or half duplex, up to 32 units on one serial link, with 31 jumper options for flexible configuration. LED indicators.



COMMUNICATIONS CONVERTER

- FULL SCHEMATIC AND DOCUMENTATION
- FULL FAMILY OF MODULAR DESIGNS
- RS-485/RS-422 REMOTE I/O MODULE KITS
- NETWORK SOFTWARE AND SOURCE CODE
- AUTOMATIC OR RTS UNITS AVAILABLE
- RJ-11/12 CONNECTORS OR TERMINAL STRIP
- TURN YOUR PC INTO A DISTRIBUTED DATA ACQUISITION AND CONTROL SYSTEM

R.E. SMITH
(513) 874-4796
4311 TYLERSVILLE RD. ■ HAMILTON, OHIO 45011
FAX (513) 874-1236

Plug in HERE ⇨ to Maximize the Value of Your Oscilloscope!

EXT. TRIGGER

NEW SuperProbe™
Oscilloscope Triggering Devices

- Complex triggering for digital circuits
- Easy to use
- Simplifies circuit debugging
- Works with any oscilloscope
- Models start at only $125

PROGRAMMABLE DESIGNS INC. (pdi)

41 Enterprise Drive ■ Ann Arbor, MI 48103
Phone: (313) 769-7540 ■ Fax: (313) 769-7242

EPS

EPROMS AS LOW AS 50¢

27C256	8748	27C010
27C512	8749	27C020
2732A	8741	27C040
27128	8742	27C1024
2764	8744	**STATIC RAM**
2716	8751	6264 2016
27C512-90	8759	62256 6116

Flash EPROMS, CPUs, UARTs, PROMs & much more...

MEMORY
FOR ALL PCs & LASER PRINTERS

SIMM & SIP MODULE, D-RAMS

1MEGX9	1X36 & 32	44256
4MEGX9	2X36 & 32	1MEGX1
256X9	4X36 & 32	41256

TEL: (818) 774-9444 · FAX: (818) 774-0822
WE BUY EXCESS INVENTORY

FREE 24 HOUR FAX BACK CATALOG

MISCELLANEOUS EQUIPMENT

• Lasers	EXT 340
• Tools, Hand & Power	EXT 341
• Manufacturing & Shop Equipment	EXT 343
• Construction & Trade Tools	EXT 344

LAB & TEST EQUIPMENT

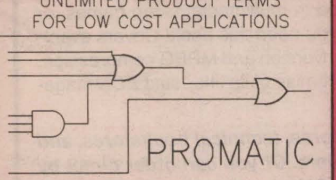
• TEK Scopes	EXT 330
• HP Test Equipment	EXT 331
• Other Test Equipment	EXT 332
• Inspection Equipment	EXT 333
• Lab Equipment	EXT 335
COBWEB CORNER	EXT 380
SPECIALS	EXT 305
ELECTRONIC COMPONENTS	EXT 381

Receive Information via FAX return: A) Have your fax number ready, B) Dial 1-800-547-4636, C) Request Extension # from above.

COMPLETE INDEX EXTENSION 300

DEXIS Corporation
(612) 944-7670 FAX (612) 942-9712
9749 Hamilton Road
Eden Prairie, MN 55344

UNLIMITED PRODUCT TERMS FOR LOW COST APPLICATIONS



PROMATIC
OR ALMOST

PROM devices are the natural solution for low cost logic applications requiring lots of product terms.

PROMATIC is an HDL compiler for PROM devices which uses a familiar logic description syntax. Output options include popular binary and HEX formats.

ONLY $39

SPECIAL ECONOMIES
3 MARGIT STREET
WILMINGTON, DE 19810
Orders by mail or BBS at (302) 475-5095

TOGGLE SWITCHES AT WHOLESALE PRICES
NEW SWITCHES –125V OR 1/2 RATING AT 250V

FULL SIZE TOGGLE SW. 1/2" Dia.

Type	Mod#	Cont. Rat.	Lead	Price 100	1000
SPST	S125	6A/125V	6" Wire	.77	.67
SPST	S128	4A/125V	Solder	.57	.47
DPDT	S126	5A/125V	Solder	.77	.67
DPDT/ ON-OFF-ON	S127	10A/125V 5A/250V	Solder/ Screw	1.17	1.06

MINIATURE TOGGLE SW. 1/4" Dia.

SPST	S131	6A/125V	Solder	.57	.47
SPDT	S132	6A/125V	Solder	.61	.51
SPDT/ MOM-OFF-MOM	S129	6A/125V 3A/250V	Solder Solder	.77	.67
SPDT/ ON-OFF-ON	S134	6A/125V 3A/250V	Solder Solder	.77	.67
DPDT	S133	6A/125V	Solder	.77	.67
DPDT/ ON-OFF-ON	S135	6A/125V 3A/250V	Solder Solder	.91	.82
DPDT/ MOM-OFF-MOM	S130	6A/125V 3A/250V	Solder Solder	.91	.82

Black Plastic Boots For Above Switches 200/$1.00

SUB-MINIATURE TOGGLE SWITCHES 1/8" Dia.

SPDT	S136	3A/125V	Solder	.82	.73
DPDT	S137	3A/125V	Solder	.92	.83

MOMENTARY PUSHBUTTON SWITCHES 1/4" Dia.

SP-NOR OPEN	MS-1	3A/125V	Solder	.26	.22
SP-NOR CLOSED	MS-2	3A/125V	Solder	.27	.23

ANY ORDERS LESS THAN 100 ADD 12¢ EA.

FERTIK'S ELECTRONICS
5400 Ella St., Phila., PA 19120 • PH/FX 215-455-2121

BREADBOARDS

Set of three sizes, 8x11, 3320 points - 6x8, 1660 points - 3x8, 830 points. Solid-steel back plate. Lots of binder posts. Assembled. $59.95 each set. For each order placed, we will include FREE, one 3.5", 12 VDC cooling fan. Add $4.50 S&H. Illinois residents add 8.25% tax.

Check, Money Order, Visa/Mastercard. No CODs.

1-800-321-5274
M.O.O. Corporation
809 West Estes Ave.
Schaumburg, IL 60193

DATA CARTRIDGES
Formatted QIC 80 2120/250

- Universal Brand
- The Best Cartridge for Tape Backup
- U.S. Made Quality

In lots of 10 **$8.70** ea.

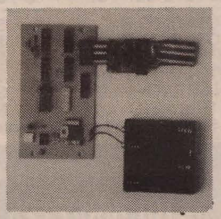
1-800-603-1008
UNIVERSAL DATA CORP

As Seen On "Good Morning America"

EASILY DISARM MOST AUTO ALARMS

in less than 10 minutes with the

Alarm Dominator Jr!



- ▶ Portable, remote device needs no access to auto.
- ▶ Easy to use, just flip a switch and wait for the "Chirp, Chirp."
- ▶ Perfect for locksmiths, law enforcement, alarm installers, repo pros, tow truck operators, etc...
- ▶ Battery operated PC board measures just 2 1/2" X 4 1/2" and comes complete with easy to use instructions.

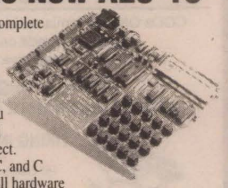
Sales to qualified buyers ONLY. Prepaid orders, C.O.D.s, and the American Express Card are gladly accepted.

Easy to Build Kit : $69.95
Assembled & Tested: $99.95
Enclosure: $10.00
Standard Shipping: $5.00

Dominator Technologies, Inc.
12062 SW 117 Ct., Suite 132
Miami, Fl 33186
(305) 271-2737

Write in 134 on Reader Service Card.

Learn MICROCONTROLLERS EMBEDDED SYSTEMS and PROGRAMMING with the New AES-10



The AES-10... a complete learning system, a complete embedded control system. Extensive manuals guide you through your 8051 development project. Assembly, BASIC, and C programmable. All hardware details, complete schematics. Learn to program the LCD, keypad, digital and analog I/Os. The entire board is software reconfigurable for your applications. Everything you need, nothing extra required.

80C32 Computer/Microcontroller board with:

• 32K Byte ROM, 32K Byte RAM • 2 by 16 Liquid Crystal Display • 4 by 5 Keypad • Two serial ports • 5 interrupt sources • 3 timers • A/D, D/A, PWM and digital I/O • Built in Logic Probe • Power supply (can also be battery operated) • Extended Intel BASIC and AES Monitor in ROM • RS-232 cable to connect to PC for programming • 8051/52 DOS Cross Assembler • Program disks with well documented examples • User's Manual, Language Manual, and Text (over 400 pages).

AES-10 $285
Money Back Guarantee
CALL 1-800-730-3232

Free Info Pack
M/C Visa
714 - 550-8094
Fax 714 - 550-9941

AES Advanced Educational Systems

970 West 17th Street, Santa Ana, California 92706, USA

#180 EDUCATION *cont.*

START YOUR OWN TECHNICAL VENTURE! Don Lancaster's newly updated **INCREDIBLE SECRET MONEY MACHINE II** tells how. We now have autographed copies of the Guru's underground classic for $18.50. Synergetics Press, Box 809-K, Thatcher, AZ 85552. 520-428-4073. VISA/MC.

BUSINESS OPPORTUNITIES 190

DRIVE A NEW MOTOR HOME FREE, ANYWHERE IN THE US! For information just ask us. 1-800-294-3228 FAX/VOICE and mention "HOW TO".

START YOUR OWN TECHNICAL VENTURE! Don Lancaster's newly updated **INCREDIBLE SECRET MONEY MACHINE II** tells how. We now have autographed copies of the Guru's underground classic for $18.50. Synergetics Press, Box 809-K, Thatcher, AZ 85552. 520-428-4073. VISA/MC.

$100 GOLD! There is a circuit chip made by IBM that contains more than $100 each in scrap gold, and another worth $20. Almost nobody knows this. They are just starting to show up in resale outlets and junk yards. You can score big with this knowledge. Complete info with photo $35 to: Jim Sciuto, Box 128, Methuen, MA 01844.

PC OWNERS! New disk-based book profiles over 100 computer related businesses. $29.95 postpaid. SASE for details. Enclose disk size. MATCO, POB 509A1, Roseville, MI 48066-0509A1.

MAKE $250 DAILY CHROME PLATING AUTO PARTS AND MOTORCYCLE PARTS STARTING WITH NOTHING. Send 2 stamps for free information to: Communications Engineering, 76 Boulevard L, Hudson Falls, NY 12839.

NATIVE UKRAINIAN wants to be your Tech Rep in Ukraine or Eastern Europe. Fluent in four languages, BSE degree, highly skilled in IBM/DOS hardware, software, networking, LF to UHF communications, antenna and transceiver design. Training or temporary work in USA to learn your products ok. KC1VF/US5WE, 703-231-6478, PO Box 2490, Christainsburg, VA 24068.

WANTED: AGENTS who want to make money brokering long distance service at GREAT COMMISSIONS. Call 1-800-294-3228 FAX/VOICE and mention "AGENT."

50 REASONS NOT TO PATENT. Make money instead. $10. VISA/MC. **ELECTROMAN,** Box 24474, New Orleans, LA 70184. 504-482-3017.

MAKE MONEY WITH YOUR PC. Free "Home Business Package" tells how. Get yours today! Data Mate PC, Box 2811-P, Lake Ronkonkoma, NY 11779.

TRADE: CARIBBEAN vacations or real estate, or 1/2 acre in San Jacinto County Texas for photo voltaic or alternative energy system, computer equipment, soil test equipment, or consumer electronic equipment. 310-473-6896 ask for John.

I AM making over $600 per week selling a simple one-page information report on gold value in circuit chips for $35 each. Cost only 5¢ to print. Want to do the same? Call 24 hr. message, 603-645-4767.

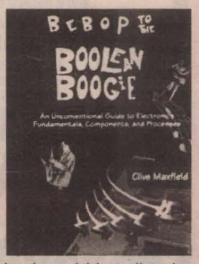
MAKE MONEY WITH YOUR PC. Free "Home Business Package" tells how. Get yours today! Data Mate PC, Box 2811-P, Lake Ronkonkoma, NY 11779.

When Was The Last Time You Bebopped To The Boolean Boogie???

A long time, we bet. But HighText has the remedy!

Bebop to the Boolean Boogie

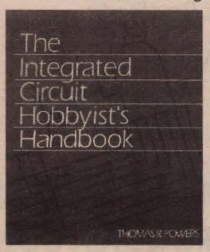
An Unconventional Guide to Electronics Fundamentals, Components, and Processes
by Clive (Max) Maxfield



This is the damnedest book on electronics you've ever seen! It's a thorough A to Z guide to contemporary electronics laced with the author's sometimes bizarre sense of humor. You'll find useful, real-world information about finite state machines, multichip modules, circuit board design, integrated circuit fabrication, and logic family interfacing techniques along with a recipe for terrific seafood gumbo and tips on the best times of day to eat smoked fish. Pete Waddell of *Printed Circuit Design* magazine says, "This is a dangerous book. . . . not only do you stand a chance of learning something from it, but ten years from now you will still remember it." Replace those boring old handbooks on your shelf with this hip, heavily-illustrated, 500+ page wonder! A steal at $35.00.

The Integrated Circuit Hobbyist's Handbook

by Thomas R. Powers



Like to build stuff using ICs or design your own circuits on a breadboard? If so, you need this book! It discusses the major types of ICs—op amps, linear, TTL, and CMOS—and how to breadboard circuits using them. There are also details on interfacing different device families, power supplies, and "deglitching" techniques. There's in-depth treatment of the most popular ICs, complete with pin numbering diagrams, internal circuit diagrams, logic tables, specifications, and a ton of applications information. Includes hundreds of applications circuits on its 8.5x11" pages. Don't buy another IC without buying this book first! Only $19.95.

AND DON'T FORGET THESE OTHER GREAT BOOKS. . . .

CONTROLLING THE WORLD WITH YOUR PC by Paul Bergsman shows how to control stepper and servo motors, monitor fluid levels, switch appliances on and off, and do other neat things using circuits connected to the parallel port of IBM-compatible PCs. Includes schematics, operational theory, construction hints, and control software source code in BASIC, Pascal, and C for each circuit. Accompanying HD disk includes all source code plus compiled .EXE files. A lot of cool stuff for just $29.95!

THE FORREST MIMS ENGINEER'S NOTEBOOK by Forrest Mims (who else?) is the latest edition of his classic guide to IC applications. Includes pin-outs, logic tables, specs, and plenty of applications circuits. What?!?! You don't have a copy yet??? Grossly underpriced at $14.95.

VIDEO DEMYSTIFIED by Keith Jack. Interested in multimedia, video games, or other applications using video on a PC? If so, you need this book! Covers everything from the basics of NTSC to color space conversion and MPEG compression. "This 435 page book more than lives up to the promise of its title," said *EDN* magazine. Essential information for only $29.95.

HighText titles are available at larger bookstores, technical bookstores, and leading electronic parts and equipment dealers. Or you can order direct by including $3 shipping per book ($4 Canada, $10 elsewhere). California residents must add sales tax. U.S. funds only, please. Or call our order number and charge it!

Call **1-800-247-6553** to order!

HighText publications inc.

P.O. Box 1489, Solana Beach, CA 92075

Write in 135 on Reader Service Card.

THE CASE AGAINST PATENTS. Thoroughly tested and proven alternatives that work in the real world, $28.50. **SYNERGETICS PRESS,** Box 809-N, Thatcher, AZ 85552. 520-428-4073. Visa/MC.

3 PROFITABLE and growing businesses for sale from $32,000. Computer training center and others. Beautiful, green, quiet SW Oregon. The future is here in Oregon. Salmon fishing, elk hunting, lots more. Call agent Paul Erickson, 1-800-848-9202.

MAKE $100 per hour with your computer and our books and software. Call 602-782-2316 for details or write to: **TELECODE,** Box 6426-NV, Yuma, AZ 85366-6426.

WOULD SOFTWARE training be a useful adjunct to your business? Complete materials available under license. One student payback/course. Windows, WordPerfect, Office. Craigo Technical Services, Inc., 6s235 Steeple Run Dr. Ste. 12G, Naperville, IL 60540. 708-961-0290.

TAIWAN ADDRESSES. Deal directly and save. 486-66-DX with CPU motherboards $130, Memory 1x3:60 $4, 3.5 or 5¼ DRs $13, over 290 addresses $20. No minimum and much more. G.R. Stringer, PO Box 30563, Houston, TX 77249-0563.

WANTED: COMPANIES or individuals who don't believe there are cheaper long distance rates and alternative services. Let us surprize you. Free details 1-800-294-3228 FAX/VOICE. Mention LD service. Agents also needed. Great commissions.

100 BILLION dollar long-distance telecommunications industry. Build your own profitable business. Excellent income potential. No capital required. no experience necessary. Free information. 1-800-397-5202, PIN# 5949, ext. 10.

EXPERIENCED ELECTRONIC consulting group looking for projects/business opportunities: Edge Electronics, PO Box 1364, State College, PA 16803. 814-238-8119. We have tons of expertise and experience. We will save you time and money!!!

OPPORTUNITY KNOCKS If you own an IBM or compatible PC, this is the one you've been looking for. Use your PC for a local shopping guide. Advertise auctions, garage sales, grocery store specials and more. 8-10 easy Hrs a week nets potentially unlimited **$$$$.** For demo disk & business plan - send $5 check or money order to SRN, 2811 South St., Lincoln, NE 68502. Serious inquiries only.

WATER TREATMENT Dealer wanted to handle sales and distribution of instrument that controls the concentration of Potassium Permanganate in a flowing stream of water. Concentration to below .25PPM. Cratar instruments, 2304 West Broadway, Sedalia, MO 65301.

10KT. OR 14kt. solid gold, assorted electronic charm pendants. Over 1,200 items, everything imaginable, manufacturer direct, save 80% big color catalog $5. Shipped 2-day priority, $10 refundable w/1st order. Satisfaction guaranteed! Gold N' Treasures, Suite 24, 6 School Street, Jackson, GA 30233.

WE WANT TO TELL YOU! (COME AND SEE US (FREE) ON THE INTERNET) http://www.epinet.com/kmf/.

SUBSCRIBE TO NUTS & VOLTS. CALL 1-800-783-4624 AND USE YOUR VISA/MC.

EPROMS

27C64 . . . . . $2.50
27C128 . . . . . $3.00
27C256 . . . . . $3.50
27C512 . . . . . $4.50
OTHERS . . . . . CALL

TUBES ONLY

PROGRAMMERS
by EE TOOLS

4-GANG $195.00
PRO-MAX . . $425.00

1-800-677-3773

H.E.A.R.T. & Associates
14121 W. CANTRELL
L.R., AR 72212

VISA MasterCard

The RF Connection
213 North Frederick Ave.
Suite 11NV
Gaithersburg, MD USA
20877

Complete Selection of MIL-Spec Coax, RF Connectors and Relays

UG-21B/U N Male for RG-213/214 ..... $5.00
UG-21D/U N Male for RG-213/214 ..... $3.25

N Connectors for 9913/Flexi4XL/9096

UG-21B/9913.....$5.75 **Pins Only**..... $1.50
UG-21D/9913.....$4.00 **Extra Gasket**.... .50

Amphenol 83-1SP-1050 PL-259 ..... $0.90
UG-176/U Reducer RG-59/8X... .25 or 5/$1.00
UG-175/U Reducer RG-58/58A. .25 or 5/$1.00
J&I Silver Teflon PL-259 MIL-Spec.....
.....$1.25 or 10/$10.00

MIL-Spec Coax Available (Teflon, PVC 11A) Certified CQ Flexi 4XL811A (Flexible 9913)

New Product: International's 9096-2A Low Loss RG-8 Size, Stranded Center Conductor Same Specs As 9913..... .70/ft or $59.00/100ft

Also New: RG-8X Clear w/UV Jacket 98% Cu
Intro Price.....$14.00/100ft

Call for Specials of the Month

Full Line of Audio Connectors for Icom, Kenwood, and Yaesu

8 Pin Mike Female..... $2.00
8 Pin Mike Male Panel $2.50
13 Pin DIN for Kenwood..... $2.75
8 Pin DIN for Icom..... $1.00
8 Pin DIN for Kenwood $1.50

Prices Do Not Include Shipping

Orders	**800/783-2666**
Info	**301/840-5477**
FAX	**301/869-3680**

Write in 41 on Reader Service Card.

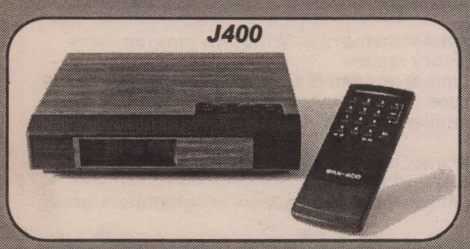
MEMBER OF NCCA

KD VIDEO

CALL
1-800-327-3407
FOR ALL YOUR CABLE TV NEEDS

A CONVERTER FROM K.D. VIDEO IS *CHANNEL SURFING* AT ITS FINEST

J400



* 61 CHANNELS
* FINE TUNING
* COMPATIBLE TO JERROLD DRX AND DRX-3DIC SYSTEM

STEALTH ADD ON

* DIGITAL TUNING
* EXCELLENT PICTURE QUALITY
* COMPATIBLE TO ALL JERROLD SYSTEMS EXCEPT BASEBAND (DPBB)

STAR 7

* 86 CHANNELS
* LOADED WITH FEATURES
* COMPATIBLE TO ALL JERROLD SYSTEMS

SCIENTIFIC ATLANTA 8580

* 99 CHANNELS
* UNSURPASSED PICTURE QUALITY
* COMPATIBLE TO S.A. 8500 THRU 8580 SYSTEMS EXCEPT 8570

ZENITH ST1XXX

* VOLUME CONTROL
* ANTI FLASH TECHNOLOGY
* COMPATIBLE TO ALL ZENITH ST-XXXX SYSTEMS

NOTCH FILTERS FOR CHANNELS 2, 3 AND 14 THRU 23

EXTRA REMOTE CONTROLS FOR JERROLD, SCIENTIFIC ATLANTA, ZENITH, PIONEER, TOCOM

JERROLD & SCIENTIFIC ATLANTA TYPE SECURITY SCREW REMOVAL BITS

IF YOU DO NOT SEE THE EQUIPMENT YOU NEED LISTED, PLEASE CALL US. WE HAVE OTHER MODELS AVAILABLE.

*** PLEASE HAVE THE MAKE AND MODEL NUMBER OF THE UNIT USED IN YOUR AREA WHEN CALLING FOR INFORMATION**

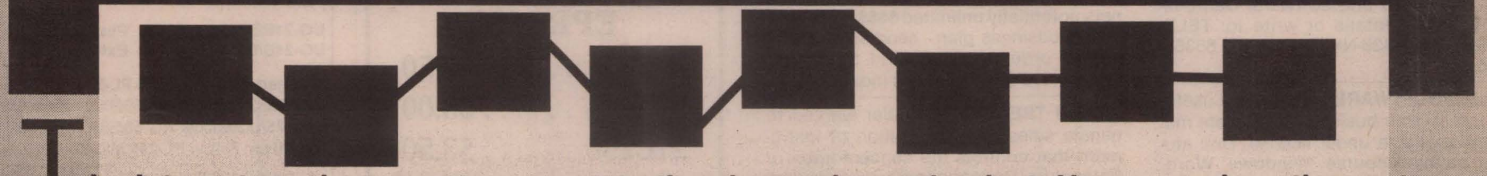
1-800-327-3407

*** WE SPECIALIZE IN DEALER PRICING! 10 AND 20 LOT!**
* FOR A FREE CATALOG WRITE TO:
P.O. BOX 29538 • MPLS., MN 55429

Write in 138 on Reader Service Card.

The Nuts and Volts Guide to Mining the Internet

by Chris Sakkas



The Internet can be a great resource to the electronics enthusiast. However, given the vast size of this cyberworld, it can be very difficult to find the helpful information that you may need. While many on-line services are now providing electronic mail, Usenet newsgroups, FTP ability, and World Wide Web support, very few tools are provided to help in the search for information. To make the most of your on-line time, this guide points you in the right direction to begin mining the Internet for electronics-related information.

This guide is divided into four sections. The first section covers Usenet newsgroups. These newsgroups furnish a place to discuss topics of special interest. The next section covers the World Wide Web. The Web is a hypertext based system of informational multimedia pages set up by users of the Internet. The third section covers E-Mail newsletters. These newsletters cover special interest discussions that do not have their own newsgroup. Finally, the FTP section covers Internet sites providing downloadable files of interest to the electronics enthusiast.

I hope that this guide saves you time and introduces you to new areas of the Internet. When searching for information on the Internet, knowing where to mine greatly increases your chance of striking gold!

USENET NEWSGROUPS

Electronics related groups

sci.electronics — General discussion of electronics, much technical information
sci.electronics.repair — Discussion on repairing electronics
sci.electronics.cad — CAD discussions for electronics (PCB and schematic capture mainly)
comp.dsp — Digital Signal Processing discussion group
comp.home.automation — Home automation discussion group
comp.robotics — Amateur robotics discussion group
alt.comp.hardware.homebuilt — Homebrew computer hardware builders discussion group
rec.radio.amateur.homebrew — Homebrew amateur radio builders discussion group
comp.sys.intel — Discussion of Intel-based computers
comp.realtime — Realtime computing issues discussion group
alt.hackers — Hackers group
alt.2600 — 2600 hackers group
sci.virtual-worlds — Virtual Reality discussion group
sci.virtual-worlds.apps — Applications of Virtual Reality discussion group
sci.engr.advanced-tv — HDTV discussion group
comp.dcom.telecom — Telecommunications discussion group

Radio related groups

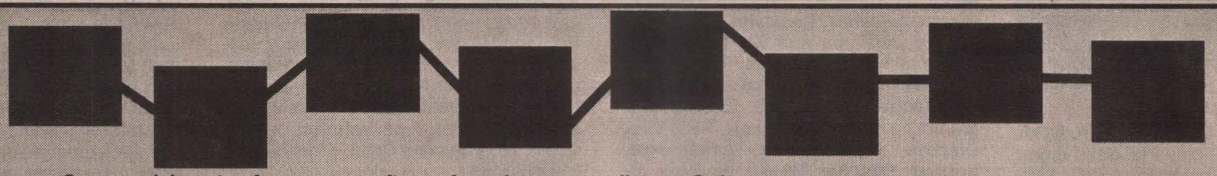
rec.radio.info — Information about rec.radio groups
rec.radio.amateur.digital.misc — Amateur radio digital communications group
rec.radio.scanner — Scanner listeners group
rec.radio.amateur.antenna — Amateur radio antenna discussion group
rec.radio.amateur.equipment — Amateur radio equipment discussion group
rec.radio.amateur.homebrew — Amateur radio homebrew builders group
rec.radio.amateur.space — Amateur radio satellites and other space related discussion
rec.radio.amateur.misc — Miscellaneous discussion of amateur radio
rec.radio.amateur.policy — Laws and policies related to amateur radio
rec.radio.cb — CB radio discussion group
rec.radio.noncomm — Noncommercial broadcasters discussion group
rec.radio.shortwave — Shortwave radio listeners discussion group
rec.radio.swap — Buying and selling radio related gear
alt.radio.digital — Digital radio discussion group
alt.radio.pirate — Pirate radio discussion group

Programming related groups

comp.os.msdos.prgrammer — MSDOS programmers discussion
alt.msdos.programmer — More MSDOS programmers discussion
comp.os.ms-windows.programmer.graphics — Windows programmers group for graphics
comp.os.ms-windows.programmer.controls — Windows programmers group for controls
comp.os.ms-windows.programmer.winhelp — Windows programmers group for developing help files
comp.os.ms-windows.programmer.drivers — Windows programmers group for writing drivers
comp.os.ms-windows.programmer.memory — Windows programmers group for discussing memory issues
comp.os.ms-windows.programmer.multimedia — Windows programmers group for multimedia issues
comp.os.ms-windows.programmer.ole — Windows programmers group for OLE discussion
comp.os.ms-windows.programmer.networks — Windows programmers group for discussion of networks
comp.os.ms-windows.programmer.tools — Windows programmers group for development tools
comp.os.ms-windows.programmer.misc — Windows programmers group for miscellaneous items
comp.lang.basic.visual — Discussion of Microsoft's Visual Basic
comp.lang.basic.misc — Discussion of Basic language, miscellaneous items
alt.lang.basic — Basic language programmers group
comp.lang.ada — Ada language programmers group
comp.lang.c — C language programmers group
comp.lang.c++ — C++ language programmers group
comp.lang.forth — Forth language programmers group
comp.lang.lisp — Lisp language programmers group
comp.lang.modula2 — Modula2 language programmers group
comp.lang.postscript — Postscript language programmers group
comp.lang.prolog — Prolog language programmers group
comp.lang.pascal — Pascal language programmers group
rec.games.programmer — Video game programmers group, good technical info
comp.sys.ibm.pc.soundcard.tech — Technical info on programming soundcards
comp.sys.ibm.pc.programmer — General IBM PC programmers group

Computer and Electronics Business related groups

biz.comp.hardware — Commercial posts of computer hardware for sale
biz.comp.services — Commercial posts of computer related services



biz.comp.software — Commercial posts of computer software for sale
biz.general — General commercial posts and business discussion
biz.misc— Miscellaneous commercial posts
misc.entrepreneurs — Entrepreneurial issues discussion
biz.jobs.offered — Postings of jobs offered
misc.jobs.contract — Discussion and posting of contract jobs (mostly software)
misc.jobs.misc — Miscellaneous jobs discussion
misc.jobs.offered — Postings of jobs offered (mostly software)
misc.jobs.resumes — Postings of resumes
alt.computer.consultants — Computer consultants discussion group

Technical Books related groups

biz.books.technical — Commercial postings of technical books offered
alt.books.technical — Discussion of technical books
misc.books.technical — Discussion of technical books

Satellite and Cable related groups

rec.video.satellite.misc — Miscellaneous satellite topics
rec.video.satellite.dbs — DBS satellite discussion
rec.video.satellite.tvro — TVRO satellite discussion
rec.video.cable-tv — Cable TV discussion

WORLD WIDE WEB PAGES

General

http://www.cis.ohio-state.edu/hypertext/faq/usenet/top.html
List of all available Internet FAQs
http://alpha.med.pitt.edu:9001/
sci.electronics FAQ in hypertext form
http://alfredi.u.washington.edu:8080/~pfloyd/ee/index.html
circuits archive
http://www.panix.com/stimpson/index.html
8031 and related microcontroller info
http://rel.semi.harris.com/docs/datasheets/
Harris Semiconductor datasheets
http://epims1.gsfc.nasa.gov/engineering/ee.html
The World-Wide Web Virtual Library: Electrical Engineering
http://engr-www.unl.edu/ee/eeshop/eeshop.html
Engineering Electronics Shop Page
http://motserv.indirect.com/
Motorola Semiconductor Products datasheets
http://piglet.cs.umass.edu:4321/robotics.html
Robotics Internet Resources Page
http://www.spie.org/
SPIE (The International Society for Optical Engineering) home page
http://infopad.eecs.berkeley.edu/~burd/gpp/cpu.html
CPU Info Center
http://web.cs.ualberta.ca/~wade/HyperHome/
Home Automation Page

Amateur Radio

http://www.ee.umanitoba.ca/~tessier/umarsindex.html
Amateur radio related material
http://www.acs.oakland.edu/barc.html
Boston Amateur Radio Club Home Page
http://w6yx.stanford.edu/w6yx.html
Stanford Amateur Radio Club
http://www.acs.ncsu.edu:80/HamRadio/
Amateur Radio Web Server
http://www.amsat.org/amsat/AmsatHome.html
AMSAT Home Page
http://www.acs.oakland.edu/barc/arrl.html
The American Radio Relay League
http://bb.iu.net/infomotion/pkthome.html
The Packet Radio Home Page
http://bb.iu.net/infomotion/taprhome.html
Tucson Amateur Packet Radio (TAPR) Home Page

E-MAIL NEWSLETTERS

info@arrl.org
Amateur radio relay league *information. Send body of message with the word help.*
pic-request@figment.mit.edu
*Mailing list for PIC processors. This address is for requesting addition to the list.**
mc68hc11-request@hipp.etsu.edu
Mailing list for MC68hc11 processors. This address is for requesting addition to the list.
listserv@oberon.com
Send with subject "subscribe robot-board <real name>" to add to list. Covers 68HC11 based mini-board used in robotics
info@circellar.com
Send E-Mail to get information file on services available
All Circuit Cellar INK and BYTE related files available

FTP SITES

General

ftp.netcom.com pub/rander-*electronics related material*
bode.ece.ualberta.ca pub/cookbook-*electronics cookbook*
pub/electrical-*electronics related material*
csus.edu *vectrex hacking info*
tybalt.cco.caltech.edu pub/Heathh/sb-*Soundblaster related files*
Princeton.edu pub/Graphics/GraphiGems/Gems/SRC-*Graphic Gems source code*
evans.ee.adfa.oz.au /mirrors/tibbs-*DSP related stuff*
ti.com *Texas Intstruments FTP site*
oak.oakland.edu /pub/msdos/S*imtel mirror, includes dirs for electric, engineer, x-10, and much more*
nic.funet.fi /pub/cae *Computer aided engineering tools (spice, VHDL, etc)*
rtfm.mit.edu /pub/usenet-by-group/. *Archive of FAQs and others files related to newsgroups*
garbo.uwasa.fi */pc-general pc software*
teeri.oulu.fi /pub/msdos/programming-*DOS game developers material, much technical*
wuarchive.wustl.edu *Large site containing PC software and much more*

68HC11

bode.ee.ualberta.ca /pub/motorola
/pub/motorola/68hc11
/pub/motorola/mcu11
hipp.etsu.edu /pub/hc11
sugrfx.acs.syr.edu /pub/vr/powerglove/hc11
hpcsos.col.hp.com /misc/motorola/68hc11
cherupakha.media.mit.edu /pub/miniboard-*robotics related code*
/pub/6811
ftp.funet.fi /pub/microprocs/6811
ernie.uvic.ca/pub/mcu11
ftp.netcom.com/pub/imagecft *C compiler*
asterix.inescn.pt/pub/forth/68hc11

8051

ftp.pppl.gov /pub/8051
/pub/incoming
ftp.funet.fi /pub/compilers/8051
/pub/microprocs/MCS-51 *other subdirectories in /pub/microprocs include: 1802, 6805, 6811, 8048, 8096 and many other microprocessors*
ftp.intel.com /pubs/mcs51
/pub/mcs51/tools-*contains various development tools*
ftp.mcc.ac.uk *more 8051 material*
ftp.luth.se /pub/languages/assembler
asterix.inescn.pt/pub/forth/8051-*FORTH archive*
hpcsos.col.hp.com /mirrors/.hpib0/forth/8051
/misc/ns32k/beowulf/a-8051
/mirrors/.hpib0/forth/eForth
130.123.96.9/giovanni/51forth.zip
ftp.kulnet.kuleuven.ac.be /pub/MCS-51/keil-demo

PIC

nic.funet.fi /pub/microprocs/pic
ftp.sics.se /pub/mchipsoft
ftp.parallaxinc.com *Parallax Inc. ftp site with much info on PICs and Stamps*
wpi.wpi.edu /stamp *Parallax Basic Stamp material*

Home Automation

oak.oakland.edu /pub/msdos/x_10

Amateur Radio

garbo.uwasa.fi /pc/ham *amateur radio related material*
plan9.njit.edu /pub/hamradio
oak.oakland.edu /pub/hamradio
ftp.cs.buffalo.edu *Ham radio related files*
nic.funet.fi /pub/ham

REPAIRS - SERVICES 200

REBUILD YOUR OKIData 400/800, GCC, PLP11, BLP, Elite, BLP11, Imagining drum assembly only, $99. Toner re-fill kit for above printers, only $12. Send drum, check or money order to: APLC, 1316 North Cedar Lake Road, Roundlake, IL 60073. 708-740-0884.

CUSTOM COMPUTER & microprocessor software & hardware. Program in C, Basic, Forth, Fortran, etc. Design interfaces to telephones, lights, alarms, relays, motors, etc. 212-479-7805.

MEMORY DEVICES PROGRAMMED. 11 years experience. Deal with confidence. We will duplicate your ICs for $2 each. EEPROMS, MICROs, etc. We carry a complete inventory of hard-to-find ICs. Satisfaction guaranteed. Custom programming services available. M/C, Visa, Discover. Message/FAX: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

QUALITY ELECTRONICS Engineering firm specializing in home automation & large run circuit board design seeks contracts. Able to engineer your ideas for electronic devices from conception thru manufacture. Call or fax to 615-436-5189.

PROTOTYPE DESIGN and development, embedded micro-controllers including PIC, multi-layer PCBs, assembly language programming, device replication, packaging, from concept to completion, high quality, great rates. Your "one-stop-shopping" prototype solution. MicroCosm, 2855 Masters Court, Pinckney, MI 313-878-3355.

GENERAL ASSEMBLY Corporation is an electronic contract manufacturer that builds surface mount and through hole printed circuit boards. We will build prototypes or thousands of assemblies. Give us a call 910-246-5143 or FAX us your RFQ 910-246-6030.

GORDON WEST

Ham/Commercial Code Course

10 wpm through 30 wpm, 6 long-play stereo code cassettes

☑ Prepare for amateur radio Extra 20 wpm code test.

☑ Pass commercial 16 wpm, 20 wpm, and 25 wpm code tests.

☑ Earn both licenses with one code course from "Gordo."

This Gordon West Commercial/Extra code course actually OVER-QUALIFIES you for passing the amateur Extra class code test. Amateur Extra class operators automatically receive code credit for second class and third class radiotelegraph operator telegraph Elements 1 and 2.

Go on to pass telegraph Element 3, 20 wpm code groups, and telegraph Element 4, 25 plain language words for commercial first class radiotelegraph operator certificate.

$29.95
PLUS $4 P&H
Checks only to:
Radio School, Inc. in California

All instructions spoken on tape on how to prepare for both commercial and amateur radio "top gun" exams. Many ham radio QSO-type tests and many commercial code groups (CG) and plain language (PL) examinations, ALL with narrated answers.

AVAILABLE DIRECT FROM

GORDON WEST RADIO SCHOOL

2414 College Drive, Costa Mesa, CA 92626

GAL/MICROCONTROLLER DATA RECOVERY. We can extract the ***EXACT*** GAL fuse map or microcontroller contents from your ***SECURED*** device. This service is available for all GALS (GAL6001 extraction will be offered starting in May), all Motorola 28 and 40 pin microcontrollers (including pin-damaged and original OEM masked devices), and most Zilog and Intel microcontrollers. Please call for information on support for other devices. **OVERNIGHT SERVICE.** Saur Electronics, 1992 Commerce Street #221, Yorktown Heights, NY 10598. 500-288-2888.

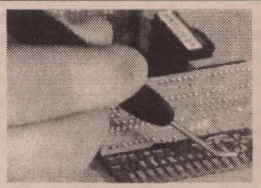
CPM DATA files converted to DOS. 173 CPM formats reaable. Your originals returned unaltered. SASE for information. Arman Publishing, Box 785, Ormond Beach, Fl 32175. 904-673-5576, FAX: 904-673-6560.

APPLE REPAIRS! Depot service on power supplies, CPUs, drives, monitors, keyboards, etc. Flat rate for IIe or IIc $49. IIgs $75 (includes return COD shipping). Call for RMA. 215-443-5700, 9-5 daily (Eastern).

AFFORDABLE HP power sensor repair! For example most HP8481As repaired for $195. Call or write for information and pricing. Willamette RF, Inc, PO Box 1599, Corvallis, OR 97339. Phone 503-754-7226, FAX 503-753-4629.

PRODUCT/CIRCUIT development available. Specializing in RF and analog design of satellite communications equipment. Have complete microwave and digital development lab for RF, analog, digital and PCB design, Tom Hajjar, 543 W. Amherst, Satellite Beach, FL 32937. 407-773-5633.

PCB SERVICE. Very reasonable rates. See our tired of ironing ad under Plans-Kits-Schematics. **FIRST PROTO,** 407-392-8677.



GOLD-N-PEN 24K gold plating with new compact pen plater. Gold plate any small metal object in seconds. Repair worn or damaged PC boards and electrical connectors. Touch-up jewelry, watches, customize models, make your own awards and gifts, and 100s of other uses. Includes 1.0 oz. of 24K gold plating gel. Simple to use. $79.95 plus $5 shipping and handling. MASTERCARD and VISA accepted. 1-800-373-3321.

REPAIR SOLUTIONS - more than 15,000 VALUABLE, TIME SAVINGS, MONEY MAKING REPAIRS for servicing **TVs, VCRs CAMCORDERS** & other electronics, organized in an easy to use computer program - **The TIP REPAIR Program. PROFESSIONAL BOARD/COMPONENT LEVEL REPAIRS** with **Part numbers, component locations and values & test voltages** (when availble). **ADD** your own tips. **PRINT** tips. Works on **ANY** IBM compatible computer with a hard drive & 16 Megabytes free space. **NEW VERSION - works in DOS and WINDOWS.** Special introductory offer for **NUTS & VOLTS** readers. **Only $200! FREE Shipping** for prepaid orders. **FREE Demo! FREE Phone Call!** Have your own tips? Ask about our **TIP EXCHANGE** policy with **FREE Updates! 1-800-215-5081** (Mention **NUTS & VOLTS** when calling). **HIGHER INTELLIGENCE SOFTWARE, 60 Farmington Lane, Melville, NY 11747.**

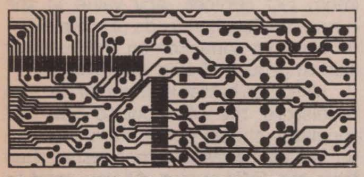
SHAREREPAIR, E-MAIL tech support for TV-VCR technicians. For information, E-Mail: rhett@dump.com.

Write in 139 on Reader Service Card.

PINBALL MACHINES! Books, magazines, manuals, diagrams, supplies, parts. Send $2 for catalog Now to: Marco Specialties, Inc., 5290 Platt Springs Rd., Lexington, SC 29073-9252. Call 803-957-5500, FAX: 803-957-6974.

(E)EPROM PROGRAMMING done quickly and economically. One day turn around typical. Simple copy $2.50 per device. Also prototyping, design, and consulting services available. Call or send SASE to **Luzer Electronics, 4023 North Bayberry, Wichita, KS 67226. 316-687-4759, FAX 316-687-3103.**

PROTOTYPING SPECIALISTS providing quick turnaround on analog and digital designs. Wirewrap and printed circuit boards thru hole and surface mount available. Competitive pricing from concept to completion with on time delivery. **Contact** NU-AGE Products, 2271-F Palmdale Blvd., STE B-38, Palmdale, CA 93550. 805-285-6000, FAX 805-285-6904.



PCB FABRICATION, PROTOTYPE and **PRODUCTION,** 1 or 2 sided, Multilayer, SMT. **CAD LAYOUT** from Schematic or Sample PCB. CAD Generated Schematics, pen plotting to D Size. **LASER PHOTOPLOTTING** CAT, 501-967-4070.

ER1400's - $5 each. 74S287's $3 each. For programming add $2 per chip. Thousands of IC's in stock. M/C, Visa, Discover, Message/FAX: 501-223-9406. Software City, Box 23016, Little Rock, AR 72221.

PCB DRAFTING and Schematic capture. single and double sided. Through hole preferred. Circuit prototyping. Applications design for 8051 and derivitives also. For more information, send your requirements to: EBS, R1 Box 122B, Arlington, NE 68002. Call, 402-639-7802 or FAX to 402-478-4440.

ENGINEERING CONSULTING. Experienced engineering for your ideas. Product development from conceptual to manufacturing stages. Digital, analog, sensor, and RF expertise. Precision audio designs. Microcontroller designs for HCO5xx, HC11xx, PIC16C5x. Software design for IBM PC. ASIC design using XILINX. Enclosure and packaging design. In house schematic capture and PWB layout. Reasonable Rates. Contact Steve Hicks, Diasystems Electronics, 7508 E. Granada Rd, Scottsdale, AZ 85257. 602-970-3162.

FRONTIER ELECTRONICS Rebuilds capacitorss, Twist-locs, Tubulars, any canned capacitor, Flyer available free. PO Box 218, LEHR, ND 58460. 701-378-2341.

ELECTRONICS EXPERTISE available. Call Les Orloff PhD (EE) for Design and Development. Capabilities include Solid State Circuitry, Embedded Systems, ASIC design, Controls, RF Communications, DSP, Telecom and Computer Programming. Active Systems Development Lab, PO Box 1626, Huntington, NY 11743. 516-692-6329.

MAGICIAN IS available to solve your RF problem. Have Laboratory & Instrumentation up to 10GHz. Prototyping, Consultation, Tutoring. MINARET RADIO, John Horvath, 2023 Gates Ave., Redondo Beach, CA 90278. Ph: 310-318-3156.

TECH FORUM

Continued from page 25

receiver and transmitter RF stages of the TR-33C were designed for the 146-148 MHz range, which was the FM/repeater band segment at the time of TR-33C manufacture. The synthesizer covers the full 144-148 MHz range, but the transceiver will require realignment for full transmit power and full receiver sensitivity below 146 MHz.

Joe Moell
Fullerton, CA

ANSWER TO #29520 - FEB. 1995

To receive 800 MHz and above frequencies on TV-UHF tuners and variable tuners is easily accomplished. What you need is a circuit which comes pre-built (kits are available) and in essence, chops the real frequency (i.e., 800 MHz) in half. 880 MHz would be received on only 440 MHz. This circuit simply plugs into your antenna port, and your original antenna plugs into the other end of this box. That's it! This frequency converter box is sold by **CRB Research Books (1-800-656-0056)**, for $94.95/built.

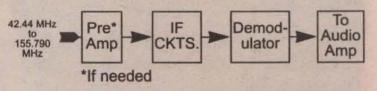
Tony Padgett
Ellaville, GA

ANSWER TO #39511 - MARCH 1995

There is no easy device you can install in a scanner to replace crystals. One solution I came up with is to convert the received frequency to an intermediate frequency (IF) like an FM radio would. This is illustrated in the block diagram below.

This is one possible solution out of many possible solutions. The criteria for determining the best solution is: **1)** How well the circuit performs, **2)** Cost, **3)** Space limitation **4)** Complexity, and **5)** Parts availability.

Also, if you have not looked inside the scanner, take it apart and see how many crystals the scanner needs. Many modern scanners need only one crystal because phase locked loop (PPL) chips are used in scanners. The single crystal would be used for frequency reference purposes by the PLL.



Dennis Gifford
Henagar, AZ

ANSWER TO #49513 - APRIL 1995

Fifteen years is a very long time for a small company to stay in the electronic business in today's climate. The UA78HGKC that you are looking for is a hybrid high-current adjustable regulator. This regulator was made by Fairchild which has also been out of business a long time. Because of its unique 4 pin TO-3 case it was one of a kind. Soon after, these devices were obsolete when the standard 3 pin adjustable regulators came out. As a result you will have a very hard time finding a new replacement.

Your alternative is to replace it with an up-to-date three terminal

BUY 5 GET 5 FREE

TEST MODULES

* WHOLESALE PRICES AVAILABLE *

	1 Pc
STAR 6 - DPV-5XXX (Compatible)	19.95
STAR 7 - DPV-7XXX (Compatible)	29.95
STAR 7 - DPBB-7XXX (Compatible)	29.95
SA 8550 (Compatible)	29.95
SA 8570 (Compatible)	39.95
SA 8580 (Compatible)	39.95
SA 8590-11 (Compatible)	39.95
ZENITH - ZF 1	19.95
ZENITH - ZF 2	19.95
5503 VIP (Compatible)	19.95
5507 (Compatible)	19.95
5507 MAP (Compatible)	39.95
PIO 5000 & 6000 Series	49.95

BUY 5 GET 5 FREE

	1 Pc
STAR 7 - DPV-7XXX	269.95
STAR 7 - DPBB-7XXX	269.95
SA 8570 (Compatible)	259.95
SA 8580 (Compatible)	269.95
SA 8590 (Compatible)	289.95
5503-5507 (Compatible)	259.95
PIO 51XX	259.95
PIO 61XX	289.95
PIO 63XX	299.95
PIO 67XX	329.95
ZENITH - ST-2601	**159.95**

1 Year Guarantee with this AD signed and returned.

☐ YES, I AGREE ALL UNITS ARE TO BE USED OR RESOLD IN COMPLIANCE WITH FEDERAL AND STATE LAWS.

Signature X_____

1-800-841-0244

PRICES SUBJECT TO CHANGE WITHOUT NOTICE
* BAY 5 GET 5 FREE APPLIES TO TEST MODULES ONLY *

ULTIMATE GAME POWER

The best Video Game Saver (Never Die) with unlimited fun and no code needed, Start at anywhere and middle of your games with instant save.

Games Partners expands your SNES into a computer system.

Feature: 16 Megabit RAM, 24M and 32M (expandable to 128 Megabit), 256K SRAM, 3.5" high density disk drive and built-in utility including DOS for reading and writing games, data and programs, MEMORY MANAGER for multi-games-in-one, up to 16 games to play.

BACKUP for loading cartridges into internal memory and saving onto diskettes.

Enhancement: 4 times Inter-active slow-motion.

Instant Save Screen ISS and Restore; virtually, you never "die". Start or Practice at your desired screen.

File Handling: Game data, ISS data, creation from Modify Game and records can be saved on 3.5" diskette. Game cartridges can be backup to protect your investment. Format is compatible with PC and Mac.

Money back guarantee.

To order or information:

212 · 219 · 8999

GAMES PARTNERS, INC.

Dealer welcome.

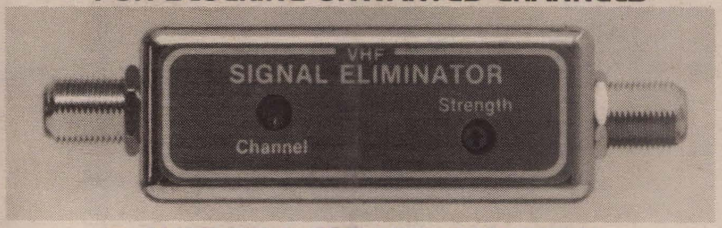
VISA MasterCard COD welcome.

Enhancement is our business. All features compatible with SNES and SNES games. SNES is a trademark of Nintendo of America, Inc.

Write in 146 on Reader Service Card.

CABLE - TV NOTCH FILTERS

- FOR ELIMINATING RF INTERFERENCE
- FOR BLOCKING UNWANTED CHANNELS



- AVAILABLE FOR VHF CHANNELS Ø THRU 36 AND 95 THRU 99
- PRICING AS LOW AS $12 EACH

Call or write for a FREE brochure today!

STAR CIRCUITS

P.O. BOX 94917
LAS VEGAS, NV 89193

1-800-535-STAR

TECH FORUM

adjustable regulator such as the LM 338 which is a 5A version of the popular LM317 regulator. This regulator is available by mail order from Digi-Key Corp. The new regulator will require some minor changes to your original circuit. The basic difference between the two regulators is that the new one has only 3 pins and the internal reference is 1.2V and instead of 5V. One of the advantages of this new regulator is that the output could be adjustable from 1.2V up to 30V output. Of course the max. output voltage depends on your power supply. The basic circuit for the LM338 is identical to the LM317 which was published several times in previous issues of *Nuts & Volts* and other magazines.

Haim Sandel
Flanders, NJ

ANSWER TO #4957 - APRIL 1995

Your question did not mention what kind of computer you have. However, if you have an IBM-PC, the original SoundBlaster card has software which does a respectable job of reading ASCII text files to you.

Here is a batch file which will read any text you have prepared:

```
REM    First load the driver
SBTALKER /dBLASTER
REM    Then have the text file
       spoken out the speaker
SAY %1
REM    Then remove the driver
       to free memory
REMOVE
```

If you name this batch file README.BAT, you can use it by entering "README whatever.txt" and the file "whatever.txt" will be read to you.

Ken Clark
Garden Grove, CA

ANSWER TO #3952 - MARCH 1995

There are several companies that specialize in the business of word processor disk conversions. Here are three major firms:

Pivar Computing Services, Inc., 165 Arlington Heights Road, Buffalo Grove, IL 60089, 1-800-CONVERT, 708-459-6010.

Shaffstall Corporation, 1-800-357-6250, 317-842-2077, FAX 317-842-8294.

Graphics Unlimited, Inc., 3000 Second Street, North Minneapolis, MN 55411. 1-800-745-7571, 612-588-7571, FAX 612-588-8783.

J.Q. LaVielle

ANSWER TO #4955 - APRIL 1995

From your problem description it is a little difficult to figure out whether the IF Amp oscillates because of an oscillation in your power supply or because of a cross coupling between the two DC outputs or possibly because of some ground loop between the two outputs.

To isolate the problem you should get a hold of an oscilloscope and make sure that the DC outputs are clean of any high-frequency oscillation or noise. Most of the three terminal regulators will oscillate at high frequency if the inputs and outputs are not well bypassed. You are showing on your schematic, capacitors on each input and output of the regulators. You have to make sure that these capacitors are of good quality and effective at high frequencies such as Tantalum capacitors. If the oscillation still exists try to add in parallel to each capacitor you have, a ceramic capacitor of 0.1 uF. These capacitors must be directly across the regulators terminal and each regulator with its own separate ground wire back to the bulk filter capacitors (2200 uF).

To solve any problem with cross coupling between the two DC outputs, each output must have a separate ground return and wired directly to the ground pin of each regulator. If the problem still exists you may have to decouple each DC output with an LC filter. The inductor value is not very critical, it only has to be rated for the maximum DC current. Any value in the range of a few hundreds uH with a 0.1 uF ceramic capacitor on the receiver side to ground should work well.

Also, for better isolation of the two regulators, the DC input to the 12V regulator should come from the center tap of the transformer rather than from the 24V output. All you need to do is to connect one of the 2200uF from the center tap of the transformer to ground and connect that line to the input of the 12V regulator. This way the 12V and the 24V regulators don't have to dissipate so much power. Each regulator supplies only the current that the output draws and totally eliminates any current loops.

Another possible problem may be that the DC input to the 24V regulator in your configuration is too low. You do not specify the output current on each output. If it is close to 1 amp then the DC output voltage with a 25 VAC transformer may be too low to obtain at least 27VDC (not including the output ripple voltage). The idea in any trouble shooting is to understand and isolate the problem, and then to attack it. There is no reason why this power supply should not work for you.

Haim Sandel
Flanders, NJ

ANSWER TO #49520 - APRIL 1995

The HP Vectra 286 requires a separate set-up program to set-up the BIOS parameters such as hard drive type, floppy drive type, etc. You may contact me directly and I will mail you a copy of set-up program or you can download it directly from HP's Bulletin Board. HP's BBS number is 408-553-3500.

Michael E. Young
Newville, Alabama

ANSWER TO #4952 - APRIL 1995

Drivers for the five-year-old HP PaintJet printer Mr. Urbanowicz received for Christmas are indeed hard to find, but he should be aware of several facts regarding printer drivers. The first is that there is usually not any type of generic DOS driver software. The special features of various printers are normally supported by drivers that are included with the particular DOS application. For example, Novell's WordPerfect for DOS includes a ton of printer drivers to allow the program to take advantage of color, fonts, and formatting features specific to a given printer.

Continued on page 129

MPI

Descramblers

For Jerrold/GI Systems:

TVT-3G	$39
TVT-Mini	$37
Stealth 1000	$45
TNT	$41

For Scientific Atlanta Systems:

M-80	$61
Stealth-80	$61

For Pioneer Systems:

PIO-6300	$65
PIO+	$65

20 Piece Pricing

New Converters

Panasonic TZ-PC 1453G2	$65
Millenium 3	$55
Timeless Products w/PC	$55

20 Piece Pricing

Brand New Combo Units Replacements for:

SA-8580/8590	$219
All Pioneer Models	$219
All Tocom Models (including wireless)	$229

BOSS

20 Piece Pricing

1-800-778-7966

6 Month Warranty
Satisfaction Guaranteed

DEALER DIRECTORY

The dealers listed below carry the latest issue of Nuts & Volts, for your convenience.

ALABAMA

Alabama Radio
8907 Alabama Highway 9
Anniston 36201

Little Professor Book Center
2717 18th Street
Birmingham 35209

RT Systems Amateur Radio Supply
8207 Stephanie Drive
Huntsville 35802

ARIZONA

Electronic Materials & Computers — Phoenix
3102 W. Thomas Rd. #902
Phoenix 85017

Lynntronics
3415 W. Glendale Ave. #4
Phoenix 85051

MJ Sales, Inc.
1842 West Grant Road
Tucson 85745

TRI-TEK
9014 N. 23rd Ave. #11
Phoenix 85021

Wholesale Satellite
706 E. Fort Lowell Road
Tucson 85719

CALIFORNIA

A & A Engineering
2521 W. La Palma #K
Anaheim 92801

ABC Electronics
1210 S. Garey Avenue
Pomona 91766

Ablетronics
9155 Archibald Ave Unit E
Cucamonga 91730

All Electronics
905 S. Vermont Avenue
Los Angeles 90006

All Electronics
14928 Oxnard Street
Van Nuys 91411

Alltronics
2300-D Zanker Road
San Jose 95131

California Compu-Books
3805 Ocean View Boulevard
Montrose 91020

Collins Computer Innovations
6274 Adobe Road
Twenty-Nine Palms 92277

Communications Specialists
426 W. Taft Avenue
Orange 92667

Computer Disk Service
3537 Old Conejo Road #115
Newbury Park 91320

Computing Technology
251 Balsam Street
Ridgecrest 93555

Darcell
4910 Santa Anita
El Monte 91732

Electronic Material Industries
10153½ Riverside Drive #194
Toluca Lake 91602

Ford Electronics
8431 Commonwealth Avenue
Buena Park 90621

Harding Way News
113 W. Harding Way
Stockton 95204

Henry Radio, Inc.
2050 S. Bundy Drive
Los Angeles 90025

Hi-Fi Doctor
1814 E. Ball Road
Anaheim 92805

HSC Electronic Supply of Sacramento
4837 Amber Lane
Sacramento 95841

HSC Electronic Supply of Santa Clara
3500 Ryder Street
Santa Clara 95051

HSC Electronic Supply of Santa Rosa
6819 Redwood Drive
Cotati 94931

Murphy's Electronic & Industrial Surplus Warehouse
401 N. Johnson Avenue
El Cajon 92020

Opamp Technical Books
1033 N. Sycamore Avenue
Los Angeles 90038

Orvac Electronics
1645 E. Orangethorpe Avenue
Fullerton 92631

Pace Electronics
4680-J Los Angeles Avenue
Simi Valley 93063

Panaxis Productions
3460 Skycrest
Oroville 95965

Pioneer TV
8895 Laurel Canyon Boulevard
Sun Valley 91352

R&D Electronic Supply
100 E. Orangethorpe Avenue
Anaheim 92801

Roger's System Specialist
21021-504 Soledad Canyon Road
Santa Clarita 91351

Sav-On Electronics
13225 Harbor Boulevard
Garden Grove 92643

Servo Track
535 Salmar Avenue Suite D
Campbell 95008

Survival Books & Equipment
11106 Magnolia Boulevard
North Hollywood 91601

Tex-Comp
11550 Zelzah Avenue
Granada Hills 91344

The Radio Place
5675-A Power Inn Road
Sacramento 95824

Video Electronics
3829 University Avenue
San Diego 92105

Wheeler's CB
40095 Forest Road
Big Bear Lake 92315

CANADA

Com-West Radio Systems Ltd.
8179 Main Street
Vancouver, BC V5X 3L2

RP Electronic Components
2113 W. 4th Avenue
Vancouver, BC V6K 1N7

COLORADO

Fistell's Micro Electronics
7023 E. Colfax
Denver 80220

International Tesla Society
2220 E. Bijou Street
Colorado Springs 80909

Western Test Systems
530 Compton #C
Broomfield 80020

CONNECTICUT

Archway News
64 Bank Street
New Milford 06776

Derric Electronics
1660 Whitney Avenue
Hamden 06517

Salcon
33 Brook Road
Enfield 06082

FLORIDA

Alfa Electronics Supplies
1502 S. State Road 7
Hollywood 33023

ANI Specialties
1581 Gretchen Avenue
Lehigh Acres 33971

Clarks Out of Town News
303 S. Andrews Avenue
Fort Lauderdale 33301

International Radio & Computers, Inc.
3804 South U.S. 1
Fort Pierce 34982

J.T. Communication
579 NE 44th Avenue
Ocala 32671

Mike's Electronic Distributing Co.
1001 NW 52 Street
Fort Lauderdale 33309

Pavilion Bookstore
857 Vanderbilt Beach Road
Naples 33963

Skycraft Parts & Surplus, Inc.
2245 W. Fairbanks
Winter Park 32789

Sunnys At Sunset
8260 Sunset Strip
Sunrise 33322

GEORGIA

Omar Electronics
2130 Highway 81 SW
Loganville 30249

IDAHO

Electrocom
846 6th Avenue South, Suite D
Payette 83661

RJM Electronics, Inc.
7544 Lemhi Street #2
Boise 83709

The Current Source
5159 Glenwood
Boise 83714

ILLINOIS

NUTRON Computers & Electronics, Inc.
821 E. Rosevelt
Lombard 60148

Pick's Electronics
Lewis Park Mall
Carbondale 62901

INDIANA

Harbourtown Sales
108 Park 32 West Drive
Nobleville 46060

New Horizons
Corner of SR 26 & SR 55
Pine Village 47975

SHF Microwave Parts
7102 West 500 South
La Porte 46350

KANSAS

Lloyd's Radio & Electronic, Inc.
220 W. Harry Street
Wichita 67213

Pioneer Technologies
1644 Elgin Drive
Salina 67401

Revcom Electronics
1104 S. Main
Scott City 67871

KENTUCKY

Security World Plus
212 Pike Street
Covington 41011

MARYLAND

Maryland Radio Center
8576 Laureldale Drive
Laurel 20707

Silicon Valley Electronics
2014-A Industrial Drive
Annapolis 21401

MASSACHUSETTS

Eastbridge Electronics
49 Cedar Street
East Bridgewater 02333

Lux Et Veritas
224 Main Street
Rowley 01969

MICHIGAN

Family Electronics
111 East Superior Street
Alma 48801

Hal-Tronix, Inc.
12671 Dix-Toledo Highway
Southgate 48195

Little Professors Book Center
22174 Michigan Avenue
Dearborn 48124

Purchase Radio Supply, Inc.
327 East Hoover Avenue
Ann Arbor 48104

MINNESOTA

Satellite City
2663 County Road I
Moundsview 55112

MISSISSIPPI

Bay Area News Services
603 Highway 90 #11
Bay St. Louis 39520

MISSOURI

Accurate Instruments
3123 Weatherford Road
Independence 64055

Electronics Exchange
8644 St. Charles Rock Road
St. Louis 63114

Independence Electronics
119 S. Main
Independence 64050

Missouri Radio Center
630 NW Englewood
Kansas City 64118

Stewart & Associates
204 Sonderen Street
O'Fallon 63366

NEBRASKA

Ladd Electronics Co.
111 N. 41st Street
Omaha 68131

NEVADA

Amateur Electronic Supply
1072 North Rancho Drive
Las Vegas 89106

Radio World
1656 Nevada Highway
Boulder City 89005

NEW HAMPSHIRE

Cahill Electronics
160 Main Street
Kingston Plaza
Kingston 03848

NEW JERSEY

JR Tech Systems
1309 Route 71
Belmar 07719

NEW MEXICO

Consumertronics
2011 Crescent Drive
Alamogordo 88310

Vonns Electronics Co.
1306 East Madrid
Las Cruces 88001

NEW YORK

All Phase Video Security, Inc.
70 Cain Drive
Brentwood 11717

Audio-Video Exchange MS Associates
402 Craig Street
North Syracuse 13208

GS & E
182 Avenue D
Rochester 14621

Hirsch Sales Co.
219 California Drive
Amherst 14221

Tony's Equipment
10065 Morley Road
North Collins 14111

NORTH CAROLINA

North State Tech Services
4608-M Industry Lane
Durham 27713

OHIO

Bigelow Electronics
186 E. Jefferson Street
Bluffton 45817

Compustuff
2751 Medina Road
Medina 44258

Computer Keyways
611 S. Main Street
Miamisburg 45342

Digital One
7601 Mentor Avenue
Mentor 44060

Footsteps
4925 Jackman Road Store #58
Toledo 43613

Hosfelt Electronics, Inc.
2700 Sunset Boulevard
Steubenville 43952

Leo's Book Shop
330 North Superior Street
Toledo 43604

Mendelson Electronics
340 E. 1st Street
Dayton 45402

Mike's Surplus Stuff
132½ E. 3rd Street
Dayton 45402

North Olmsted Amateur Radio Depot
29462 Lorain Road
North Olmsted 44070

Powermaxx, Inc.
1587 U.S. Route 68 North
Xenia 45385

The Electronics Exchange, Inc.
547 McKinley
Akron 44311

OREGON

News & Smokes
2295 W. Main Street
Medford 97501

News & Smokes #8
259-C Barnett Road
Medford 97501

Norvac Electronics
7940 SW Nimbus Ave. Bldg. 8
Beaverton 97005

Portland Radio Supply
234 SE Grand Avenue
Portland 97214

Powell's Technical Bookstore
33 NW Park
Portland 97209

PENNSYLVANIA

Asher Technology Services
69 Gingerbread Lane
East Stroudsburg 18301

Business & Computer Bookstores, Inc.
213 N. Easton Road
Willow Grove 19090

Lee Frank Electronics
6337 Evelyn Street
Harrisburg 17111

Lehman Scientific
2997-F Cape Horn Road
Red Lion 17356

Shop N Drive
3050 Canby Street
Harrisburg 17103

Surplus Al
RD 1 Box 337
Hunlock Creek 18621

The Insideoutlet
415 Arch Street
Norristown 19401

PUERTO RICO

Marval Security Equipment
Calle 6 #13, Ext. San Agustin
Rio Piedras 00926

SOUTH CAROLINA

555 Electronics
5646 Farrow Road
Columbia 29203

Discount Software
Route 1 Box 195 Highway 6
Cross 29461

R&D Associates
514½ West Avenue
North Augusta 29841

TENNESSEE

GBC Electronics
125 Birch Street
Blountville 37617

TEXAS

Tanner Electronics
1301 W. Beltline #105
Carrollton 75006

Tucker Surplus Store
1805 Reserve Street
Garland 75042

UTAH

Omega Electronics
1500 North 150 West
Provo 84604

VIRGINIA

Electronic Equipment Bank
516 Mill Street
Vienna 22180

Riley's Distributing
1045 Edom Road
Harrisonburg 22801

Satellite Headquarters
9310 Timberlake Road
Lynchburg 24502

WASHINGTON

A-B-C Communications, Inc.
17550 15th Avenue NE
Seattle 98155

Amateur Radio Supply Co.
5963 Corson Avenue S. #140
Seattle 98108

Supertronix
18650 68th Avenue South
Kent 98032

WEST VIRGINIA

IBIM-Colorsat
Route 1 Box 113
Morgantown 26505

WISCONSIN

Amateur Electronic Supply, Inc.
5710 W. Good Hope Road
Milwaukee 53223

Cudahy News & Hobby Center, Inc.
4758 Packard Avenue
Cudahy 53110

E.H. Yost & Co.
2211-D Parview Road
Middleton 53562

Rich's Surplus
Route 2 Highway H North
Stanley 54768-9418

Continued from page 126

Microsoft solved this type of problem nicely with the introduction of Windows. Once you've installed the proper driver to interface between Windows and a given printer, all Windows applications talk to the Windows printer driver to generate output. Unlike the individual drivers required for each DOS application, Windows software can take advantage of a single driver.

Hewlett-Packard has not abandoned their customers, and the limited number of drivers available for the PaintJet line of printers can be obtained free of charge via modem from the HP Download Service. Anyone requiring drivers for an older printer, or the latest version of a driver for a current printer can use any standard communication program to call 208-344-1691. Several driver archives are online for use with the PaintJet series printer.

Damien Thorn
Stockton,CA

ANSWER TO #39516 - MARCH 1995

The congress uses a distributed system for the Senate and House chambers. This system uses speakers mounted in each desk and a computerized control system that adjusts speaker volume according to the microphones being used. When someone is speaking, his loudspeaker is turned off and those that are near him are reduced in volume.

Committee rooms and gallery areas use a distributed speaker system to reduce feedback and the effects of room reverberation.

Dennis Daugherty
Russellville, KY

ANS. TO #49516, PART 1 - APRIL 1995

It isn't clear that you've strung any wire yet. If not, I'd recommend running at least three wires and using a standard current-loop set-up. However, to answer the question you asked requires a different approach.

Probably the best answer to Part 1 of your question is to use regular old external modems at each end of the wire and supply your own CO (central office) voltage just like the telephone company does. This satisfies your two-wire requirement, and gives you your bi-directional communications at whatever baud rate your modems will allow. Trying to use earth ground as one of the wires is asking for reliability problems. I'll leave the problems of stringing a two-mile twisted pair into the "Great Abyss" to you.

For around-the-lab use, a regulated 12-volt supply works fine as a CO eliminator if you place a big inductor in series with it. Without the inductor, supply regulation greatly attenuates the audio signals. The secondary or primary of a standard 24-volt filament transformer will work fine for this. (**DON'T** plug it in, just use it as a choke.) Try each side of the transformer to see which winding does a better job, since transformer windings vary.

For a two-mile length of wire, you may need a higher voltage, or a constant-current supply. Try testing with two cheap electronic telephones first. They'll be useful anyway, as explained later. If you're using something higher than 12 or 13 volts, leave the two phones connected for a day or so to make sure some parts do not overheat. (No sense burning out a modem or two.) The phones, modems, and the CO supply should all be connected in parallel. Make sure to use phone surge suppressors and lightning arrestors at both ends of the long wire to avoid some nasty surprises during thunderstorms.

When your "really private" phone line is working, you and your friend can use it to talk over the coordination of the next steps. Once you're both ready to try the modems, you'll need to force one of the modems to "answer the phone." For this, you can supply your own ringing voltage. For safety's sake, this can be approximated by stacking about eight or nine 9V batteries in series to get 70+ volts, and then rapidly switching the polarity. (Using transformer-isolated 120 volt AC bursts works also, but with a two mile wire, who knows who is connecting what to points somewhere in between. Be safe, use 9V batteries. They'll last years.)

Cross-connect the DPDT switch so each of the extreme positions presents a different battery polarity to the modem. Rapidly flipping a center-off DPDT switch back and forth usually works. (The reason for the center-off position is so you can stop the voltage supply when the modem answers.) With a bat-handled switch and a fast hand, you should obtain a 140 P-P "squarewave" at about 8 Hz. Connect this ringing circuit in parallel to the other equipment.

Tell your friend to command his modem to dial you. He can do this by sending it an "ATDT9876543210" string through the RS-232 port, or using his software to dial as if he were hooking to a BBS. After you hear his first few touch tones in your ear, disconnect from the long wire joining you, hang up your phone, and toggle the "ringing" switch madly for about 2 seconds. Then center the switch for about 4 seconds. Repeat as necessary. Your phonce will ring (haltingly, no doubt), but this will usually get the modem to pick up the line and begin protocol negotiations. (That is, if you've remembered to set your modem into "answer mode" first.) You'll hear the modem's relay click when it answers if you listen for it. You'll also hear the answer tone in your ear if you pick up your phone for a moment during the 4 second rest periods.

When your modem picks up the phone, re-connect your set-up to the long wire going to your friend and make sure to center the DPDT "ringer" switch. If both your modem speakers are configured for this, you will both hear the answer tones and negotiations until they are complete. If either has remained off-hook to listen in,

Continued on page 132

N.E.W. National Electronic Wholesalers ★★★★

Your Wholesale Headquaters for "Test Fixtures" and Accessories!

Fix Compatible With Systems Using:

SCIENTIFIC ATLANTA

Quick Fix for Models: **8550, 8570, 8580, 8590, 8600**
(1-5) $22, (6-10) $20, (11-20) $19, (21-50) $17, (50+) $14.75
40-Pin *Micro Fix* for: **8570, 8580-7B, 8590, 8600**
(1-5) $21, (6-10) $20, (11-20) $19, (21-50) $15, (50+) $13

Fix Compatible With Systems Using:

JERROLD

Three - Wire Fix compatible with models **DP7, DPV7, DPBB7** - except R2, V5 & M1
(1-5) $13, (6-10) $10, (11-20) $9, (21-50) $8, (50+) $7
28 Pin *Micro Fix* compatible with models **DP5, DPV5**
(1-5) $10, (6-10) $9, (11-20) $8, (20+) $6

NEW PRODUCT!!!
One Wire *Super - Fix* compatible with **JERROLD CFT, R2 & V5** models, adjustable for **HRC, STD.**
(1-5) $35, (6-10) $31, (11-20) $28, (21-50) $25, (50+) $23

STEALTH DESCRAMBLER
Revolutionary New PAN replaces all JERROLD models except Base Band. Works Coast to Coast! Digital circuitry provides the sharpest picture with no Flashing!
(1-5) $55, (6-10) $50, (11-20) $45, (21-50) $42, (50+) $39

OTHER PRODUCTS.....

SSA - TV86 - One Piece descrambler
Compatible with all Scientific Atlanta, except Base Band.
(20+) $115ea, (50+) $105ea, (100+) $99 ea.

S.A. 8600.....$249ea. - 8590.....$239ea. - 8580.....$189ea.
PIONEER custom 6300 modules $59 ea. - 6100 modules $29ea.
ZENITH ZL-1 (1-10) $9, (11-20) $7, (20+) $4.60

SOFTWARE AVAILABLE FOR ALL FIXES!

Call us with your equipment needs! We have many products which are not listed. We also buy equipment for top $$$!

FREE CATALOG **1-800-618-7480** VISA MasterCard C.O.D. SORRY, NO CA SALES

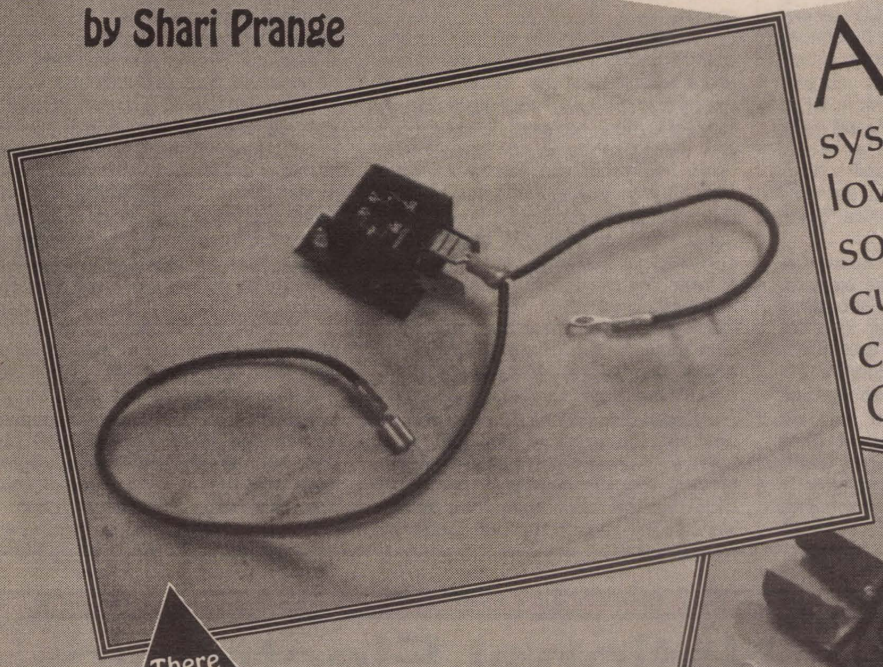
Electric Car Conversion

Part 14

Low-Current Wiring

by Shari Prange

Although an electric car is powered by a high-voltage system, it still needs a separate low-voltage system for accessories and some control circuits. Part of this circuit is the car's original 12-volt system. Other parts are added or modified by the person doing the conversion.



There are several uses for small relays in an electric car's low current system.

A good quality crimping tool and good quality connectors are essential.

Technique

The procedures used on the low-current wiring system should follow standard automotive wiring practices. These practices include specifications for the size of the wire used, types of connectors, and how the wires are routed and secured.

An automobile is a harsh environment for wiring. It is subject to temperature extremes, moisture, dust, and road vibrations. A low-current wiring failure can stop the car, or start a fire, just as quickly as a failure in the high-current system.

Wire Gauge

The proper gauge of wire for a specific application is determined by two factors. The first is the amount of electricity it will be carrying. This is usually displayed on a chart showing various amperages at one fixed voltage. It is not enough to check the current level on the chart. The voltage must also match. For example, 25 amps on a 12-volt system requires a different wire gauge than 25 amps on a 6-volt system.

The other factor is the length of the wire. The longer the wire, the more resistance it has, and the more heat it will throw off. For the same voltage and amperage, a longer run may require a heavier gauge of wire.

Although very fine wires are sometimes adequate, they can be difficult to work with and secure in automotive connectors. For most automotive 12-volt applications drawing less than 12 amps, 16 gauge wire is used. For higher current draws, 10 gauge may be substituted.

Connections

Good connections are essential. This means automotive quality connectors properly crimped on with a good quality tool. It also means using the right size connector for the job. Crimp-on connectors are color-coded for the wire size they will accept: red for 22-18 gauge wire, blue for 16-14 gauge, and yellow for 12-10 gauge.

Sometimes a siamese connection will be made, with two 16 gauge wires stripped, twisted together, and crimped into the same connector. In this case, use the next size larger connector.

Measuring

It is common to need to run wires from one end of the car to the other. When this occurs, a good rule of thumb is to cut 1 1/2 times the length of the car in wire. This will give you enough to cover all the twists and turns the wire takes along its path. You will need to trim a little to fit the far end, but you won't come up short.

Electric Car Conversion

Color Codes & Documentation

Wires are color-coded for identification. Try to follow the wiring protocols for your model of car. For example, if the manual tells you that brown wires are always ground, use brown wires for any grounds you add. If you need to use one of the car's original wires and splice an extension on it, try to match the original wire color with the extension.

Many wires may have a base color and a contrasting stripe or dots. You can simulate this by matching the base color with your new wire, and marking bands or dots of contrasting color using model or touch-up paint.

Document thoroughly any wires you add or change. Draw color wiring diagrams. If you ever need to troubleshoot or modify your wiring, documentation will be critical.

Looms

For both aesthetic and safety reasons, wires should be gathered into looms and routed along the periphery of the car to their destinations. You may be able to secure your loom to the car's original loom in many places. The "explosion in a spaghetti factory" style of wiring is the hallmark of an automotive amateur.

For running wires the length of the car, four-in-one trailer wire makes a neat instant loom. This is a ribbon of four 16 gauge wires lightly bonded together. They come in a variety of color combinations. As each wire needs to exit from the loom, it can be peeled apart from the others.

Whenever you are running a loom fore-and-aft, it's a good idea to include two to four extra 16 gauge wires. Someday you might want to add something to the car, and it will be handy to have wires already in place. Be sure to document these spares in your wiring diagram.

Wire Protection

Wires need to be protected from cuts and abrasions. For this reason, they should never be stretched tight, especially around corners — even rounded corners. Under the constant motion of a car, a hard round surface will still rub away the insulation on a wire.

On the other hand, they should not have so much slack that there are hanging loops of wire waiting to catch on something. A wire should be like a leash on a well-trained dog: not tight enough to choke the dog, and not loose enough to drag on the ground.

Once you have gathered the wires into a loom, you can give them extra protection with some kind of sheath. For short runs, you can use heatshrink tube.

However, heatshrink tubes, like diamonds, are forever. Once in place, the only way to change your mind is to cut them open, at the risk of slicing wire insulation. It is also difficult to peel out one wire mid-point on a loom encased in heatshrink.

Other options include spiral wrap and Flex Guard. Spiral wrap is just what it sounds like: a spiral of protective material that can be wrapped around the loom. It can be unwrapped easily if you need to make changes, and individual wires can be brought out of the loom between loops of the spiral.

Flex Guard is a ribbed flexible plastic tube with a slit down its length. You feed the loom in — and extract any individual wires you need — through the slit, and secure the tube at intervals with tie wraps. The end result is very clean and professional looking.

You can wrap wires in electrical tape. However, if you remove it later, it leaves the wires sticky. Also, unless it is done with a careful hand, it looks ugly and kludgy.

Any time wire must pass through a hole in the sheet metal, the hole should be grommeted. If you cannot find a grommet of the proper size, you can make one. Use a piece of automotive fuel line with a braided cloth exterior, such as VW uses.

Slice one side of it lengthwise. Curl it with the slice outside, and fit it into the hole, with the metal edge safely tucked inside the slice. Secure it with body trim cement.

Fuse Blocks & Terminal Blocks

You will be adding several components to the 12-volt system. It's a good idea to fuse each one separately. The cleanest way to do this is to run one keyed ignition 12-volt wire into a fuse block, and feed all the components from there.

Similarly, if you have several components that need to be grounded, you can ground them all at one terminal block.

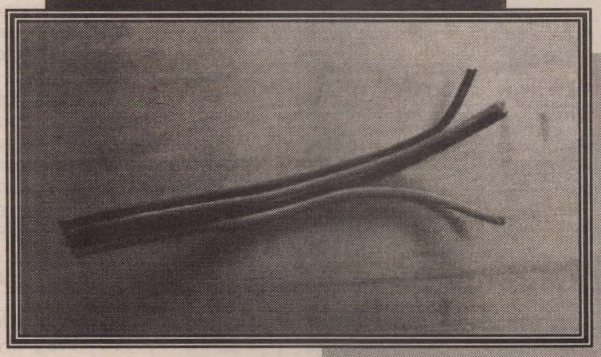
Grounds

It used to be simple to ground a wire in a car. You simply punched a hole in some convenient sheet metal and screwed it down. Today's paint systems, however, won't allow that anymore.

Most modern cars have several designated ground points, which are indicated in the wiring diagram. Use these whenever possible.

If you must make your own ground, sand the area down thoroughly to bare metal. After your ground is made, protect any exposed metal with touch-up paint or some other rustproof coating.

Four-in-one trailer lead makes a neat and convenient instant loom.



Dash Indicator Lights

Some of the dash indicator lights may have new uses in your electric car. For example, the alternator light can be grounded so that it will stay on whenever the key is on. Since an electric car makes no noise sitting still, it can be handy to have some feedback to indicate that the car is turned on.

Another light, such as the oil pressure light, can be wired to a temperature sensor in the motor. (The Advanced D.C. motors come with this sensor built in, and wire leads attached.)

This light will serve as a motor overheat warning light. You will never see it in normal use, so if it ever does come on, it indicates a serious problem needing immediate attention.

Relays

There are several places in an electric car where relays are useful. These are applications in which you want one function to automatically start (or prohibit) another function.

An example is the charger interlock relay. This relay automatically cuts power to the main contactor whenever the charger is engaged. It prevents you from driving away while still plugged in.

Relays can also be used to bypass power cutoffs in some circumstances. For example, the Curtis/PMC controller has a microswitch on the throttle potbox. This microswitch cuts off all battery pack power to the main contactor and controller whenever the throttle is released. This is a "deadman switch" safety feature.

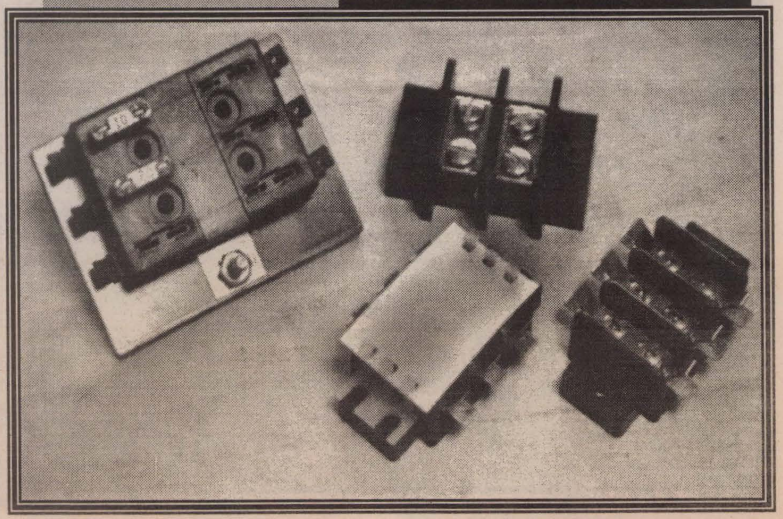
Relays can be used to continue to feed battery pack power to the voltmeter and the DC/DC converter (which charges the 12-volt auxiliary battery). In this way, these functions are not interrupted every time the throttle is released, but the safety feature is maintained.

A third application is a load-carrying device. You may want to re-use an original car wire for a heavier application. Instead of replacing the wire with a heavier gauge, you can use the wire to trigger a relay, which then remotely switches another, higher current circuit of larger gauge wire. The original wire simply carries a signal, and the larger wire does the actual work.

Attention to Detail

One of the most common problems in gas cars is a failure in the electrical system. The electric conversion relies on a similar low-current control and accessory system. It is essential to design this system with care and automotive quality standards to insure reliability of operation. **NV**

A fuse block (left) and terminal blocks (right) are easy ways to connect many wires to the same power source or ground.



WHOLESALE ONLY!
MINIMUM ORDER $250
DEALERS
MIX OR MATCH QUANTITIES TO BEST SUIT YOUR NEEDS!

$59 20 LOT
REGAL 550 MHZ
BRAND NEW!
5 YR. WARRANTY
PARENTAL CONTROL
FAVORITE CHANNEL
LAST CHANNEL RECALL

ALSO:
FACTORY REFURBISHED
$49 20 LOT
REGAL
83 CHANNEL P/C
F.C. MEMORY
2 YR. WARRANTY

$35 20 LOT
DRX-3-105 • FULLY REFURBISHED • 1 YEAR WARRANTY
WITH REMOTE

ALL ONE YEAR WARRANTY • PANS • ALL FACTORY NEW

	5+	10+	20+
DIGITAL TRI-BI GOLD	$50	$42	$39
STEALTH	$55	$49	$45
SA-3	$49	$45	$39
8580 COMPATIBLE	$75	$69	$65
PIONEER FULLY AUTOMATIC (Latest Version)	$85	$69	$65

CALL NOW
1-800-322-9690
8:30 AM - 6:00PM EST

MIXING OF MODELS FOR BEST PRICING ENCOURAGED

Jaguar Electronics

At Jaguar, we believe your customers deserve top quality for their dollar.
All of our products are to be used in compliance with Federal and State laws. We will not assist any company or individual not complying with applicable laws!

NCCA
Member of National Consumer Cable Association

TECH FORUM

Continued from page 129

make sure you and your friend hang up both phones ASAP. ("Listening in" will attenuate the signals and introduce stray noises, both unwanted effects.) Left to themselves the modems should then figure out what speed thay can achieve through their automatic negotiations.

At this point, if you're both using external modems, you can simply hook serial cables to the modems and your have your RS-232 connection.

In case one modem or the other gets reset, or the CO supply power cord gets kicked out of the wall, you'll have to go through the ringing steps again to re-initiate the connection.

Ken Clark
Garden Grove, CA

ANSWER TO #4953 - APRIL 1995

From reader Eschbaugh's question I assume his dot matrix printer is a Commodore compatible, one that uses the proprietary Commodore serial interface (plugs into the disk drive connector).

Cardco and Micrografix are among the many vendors who manufactured Commodore-to-Centronics-parallel interfaces that are compatible with the C64 and VIC20, as well as Mr. Eschbaugh's C128. All will work with some degree of success with the "newer IBM compatible printers" Mr. Eschbaugh wants to use. These interfaces are more complex than a simple cable. They require enough intelligence to be able to recognize the printer's device number in the serial data stream, convert the Commodore-unique printer codes to conventional codes (Commodore CHR$(15) codes are changed to CHR$(20), for example). Commodore used a secondary address scheme to trigger special functions on its printers and a good interface will capture that output and convert it, as well.

Printer interfaces should be available on the used and surplus market, as well as from the few remaining dealers who sell new Commodore compatible hardware. Readers who buy used interfaces should be sure to get documentation with them. Finding the right combination of DIP switch settings or special CHR$() codes without good docs will be a challenge.

The now out-of-print *More on the Sixtyfour* by H.C. Wagner (Hofaker) describes a simple 11 wire User Port to Centronics cable that allows a C64/C128 to send signals to a Centronics printer. While the cable is simple, a machine language driver (listing is in the book) is needed to trap the Commodore printer data stream and redirect it to the User Port. This system will work for any user written code or most BASIC programs. Commercial programs such as word processors will probably ignore or overwrite Wagner's driver making it impractical for serious printer work.

Noel Nyman
Seattle, WA

ANSWER TO 49522 - APRIL 1995

CLASS stands for Custom Local Area Signaling Service and is a set of features presented by Regional Bell Operating Companies (RBOCs) and independent telephone companies. CLASS includes call-forwarding, voice mail, and Calling Number Delivery (CND). CND messages come in two types, the "single format" message, which contains only time and calling number and the "multiple format" message which contains additional data such as the calling party's name. It's possible your telephone company is delivering one of these messages and the box you purchased is expecting the other. It should be possible to switch your caller-ID service to send the right format, but that's something you'll have to take up with your service provider. A call to the ID box manufacturer may be helpful.

More data on CLASS services is available from the technical arm of Bell, BELLCORE. They can be reached at 800-521-2673. The CLASS document number is: TR-TSY-000030 "SPCS Customer Premises Equipment Data Interface."

George Scott
Alexandria, VA

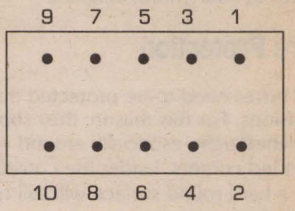
ANSWER TO #39515 - MARCH 1955

The Tandy CM-8 Color monitor (26-3215) is a 640 x 192 - 80 column RGB monitor for use on the Radio Shack Color Computer 3. I have enclosed a pinout from the Color Computer Manual 81101790A. You may be able to adapt a VGA to RGB cable to the monitor or build your own cable. Hope this will help.

RGB Monitor Jack Pin Location

Looking at the outside of the RGB OUT jack on the bottom of the computer:

1. Ground	6. Polarity (No Pin)
2. Ground	7. Sound
3. Red	8. Hsync
4. Green	9. Vsync
5. Blue	10. No Connection



Pete Bumgardner
Decatur, TN

ANSWER TO 4959 - APRIL 1995

Relative position encoding is not an expensive undertaking, thanks to the large variety of encoders designed to support the robust printer market. The Hewlett-Packard HEDS 5500 series encoders are typical of this type and feature an operating temperature range of -40 to 100 degrees C. It is accurate to 10 minutes of arc and requires only a single 5V supply. These encoders are about one cubic inch in size.

The encoder supplies two TTL outputs, in phase quadrature with each other. By monitoring these outputs, you can determine when and in which direction the shaft endcoder has moved.

Further data can be obtained from your local HP sales outlet or:

Hewlett Packard, P.O. Box 10301, Palo Alto, CA 94303.

George Scott
Alexandria, VA

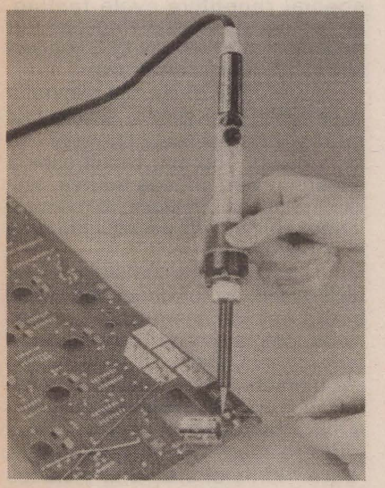
Write in 142 on Reader Service Card.

be tied to user circuitry or to the PB-51/11 during programming. A three pin header on the board provides communication with a PC's printer port. If desired. RS-232 buffering can be added to the 89C51's UART in the prototyping area. This can be linked to the serial port on a host PC. Finally, an on-board regulator allows the LITTLE BYTE-51 to be used with an unregulated supply source of 9 VDC.

For more information, contact:

ALLEN SYSTEMS
2346 BRANDON RD., DEPT. NV
COLUMBUS, OH 43221
614-488-7122

SUPER SENSOR 100 SOLDERING IRON



A new soldering iron that features sensor controlled automatic temperature adjustability for use at low temperature ranges to solder and desolder sensitive electronic components is being introduced by Bonkote America.

The Bonkote Super Sensor 100 Soldering Iron #SS1005B features a ceramic tip with a built-in sensor for maintaining variable temperatures from 220°C to 450°C with ± 4% accuracy. Providing a dial control in the handle to select the temperature and a flashing neon lamp for verification, this iron is ready to solder within 40 seconds.

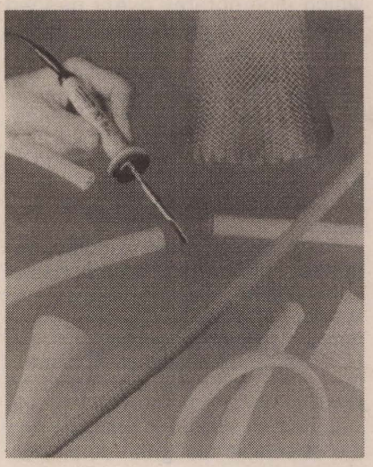
Available with interchangeable ceramic solder tips, the Bonkote Super Sensor 100 Soldering Iron incorporates zero-switching to minimize the affect of noise. The heater rating is 120V @ 40W with 18W actual power consumption and the insulation resistance is at least 50 megohms @ 400°C after 1500 hours of constant use.

The Bonkote Super Sensor 100 Soldering Iron is priced at $125.00 (list).

For more information, contact:

BONKOTE AMERICA
P.O. BOX 278, DEPT. NV
THREE RIVERS, MA 01080
413-289-1343 FAX: 413-289-1754

LIGHTWEIGHT HOT KNIFE



A lightweight, easy to handle hot knife that quickly cuts, melts, and seals woven plastic sleeving to prevent fraying is available from Hot Tools.

The Hot Tool WB-1 Hot Knife concentrates 850°F heat in the tip to simultaneously cut and melt woven plastic sleeving and create a beaded edge that won't unravel. Featuring a wooden handle that stays cool because the heating element is directly under the tip, this tool weighs less than one ounce and is only 6-3/4" long.

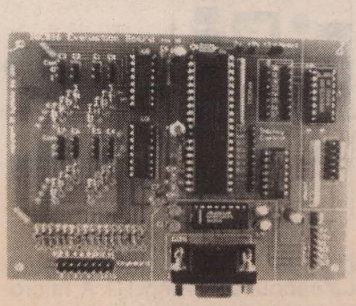
Ergonomically tapered to comfortably fit into the hand, the lightweight Hot Tool WB-1 Hot Knife heats up fully in less than a minute and is suitable for high volume use. This hot knife is ideal for cutting and sealing sail cloth and other synthetics including Nylon®, Dacron®, Pellon®, and Mylar®.

The Hot Tool WB-1 Hot Knife is priced at $24.95 (list), complete with a tip. Replacement tips are $3.95 ea. and slide-on without screws or threads.

For more information, contact:

HOT TOOLS
DIVISION OF M.M. NEWMAN CORPORATION
24 TIOGA WAY
P.O. BOX 615, DEPT. NV
MARBLEHEAD, MA 01945
617-639-1000 FAX 617-631-8887

IQC 816 INTERFACE



IQ Systems, Inc. announces the IQC 816, the first in a series of chips to greatly simplify the incorporation of encoders, displays, keyboards, switches, sound, and speech in electronic products. The product family is founded on a new command set that provides for a standardized software interface to man/machine I/O, regardless of the host processor type.

The IQC 816 is the first chip in this family and can support or drive the following:

1) 32 digits of LED display, addressed as 4 displays of 8 digits. Displays can be concatenated for more than 8 digits or reduced in width for increased brightness. The 816 provides numerous display smarts including, left/right formatting, flashing and bright up cursors, alpha decode, programmable display width, etc. A high scan rate ensures no display flicker.

2) 32 segments of LCD display, plus support of 4 x 40 lines of LCD alpha numeric smart display. The LCD displays have identical software control format and capabilities to the LED displays.

3) 16 non-multiplexed outputs to drive actuators, relays, or incandescent bulbs.

4) 8 rotary encoders with full quadrature decoding. Each encoder is supported by an 8 bit up/down counter.

5) 48 standard switches, or 176 with shift, control, and alternate key modifiers. Switches are debounced and can either have 2 key lock out, auto repeat, and control modifiers or have N key roll over and entries in the output buffer for both depression and release. These switch types can be mixed.

6) The output buffer is 8 bytes deep and records both switch scan codes and the address of any encoders that have changed state.

7) Sound generator with programmable frequency and duration.

8) UART with speeds of up to 19.2K baud. The IQC 816 performs orror checking on the UART (RS232) link, this can be optionally turned off. The 816 also parses incoming messages to ensure they are syntactically correct. If errors are detected, then the message is discarded and an error code is returned to the host.

The software interface is flexible and yet easy to use. Commands are in ASCII and framed between braces ('{' and '}'). The goal is to standardize the command set to the man machine interface in much the same way as the interface to modems was standardized with the Hayes 'AT' command set. Such a standardization will allow companies to rapidly prototype this critical part of product design and refine it, without jeopardizing time to market or product cost.

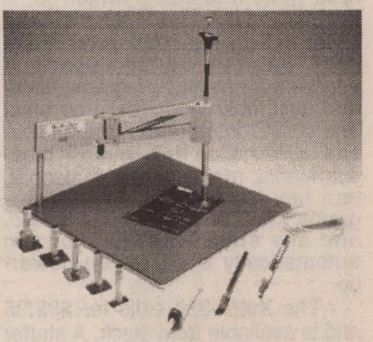
The IQC 816 is available now in 40 pin DIP packaging for $9.95 in 1000s, and $19.95 in single quantities. The chip is also available in 44 pin PLCC and PQFP packages, and both 5V and 3V technology.

An evaluation kit is available for $95.00. This kit enables a designer to plug on displays, encoders, speaker etc., and then couple to any host with a UART. The kit contains 'C' drivers for the IBM PC and numerous application examples.

For more information, contact:

IQ SYSTEMS, INC.
20 CHURCH HILL RD., DEPT. NV
NEWTOWN, CT 06470
203-270-8667

REWORK MINI-STENCIL SYSTEM



TopLine's latest innovative offering is the MSP-100 mini-stencil system. It is an all-new way to simply and accurately apply clean solder paste to rework surface mount components.

The MSP-100 comes complete with six popular stencils. The QFP 100 and 208; PLCC 68; BQFP 132; TSOP 32; and BGA 225. Also included are the base plate, a metal squeegee, and the placement mechanisms itself.

Additional stencils, including specially-built custom designs, can be obtained to add to the MSP-100 system. Any size BGA stencil (side mounts) can also be obtained.

For further information and pricing, please contact:

TOPLINE
310-433-7000 FAX: 310-498-0490.

NEW XPLOR-32c PERSONAL

DIGITAL CONTROLLER

Blue Earth Research introduces the new Xplor-32c, the latest model in the Xplor Series of personal digital controllers (PDCs). The Xplor Series PDCs are designed for embedded control, limits monitoring, and data logging applications. The Xplor-32c supports all the standard features of the Xplor Series including an Intel 80C32 CPU, Xicor 8K

New Product News

byte EEPROM, serial port, and + 5V regulator. It also includes screw terminals for all I/O connections, a power input jack, and a serial port connector, all mounted inside a 2 1/2" x 5" x 1" protective enclosure.

Each of the Xplor-32c's 12 digital I/O lines include a socket block that provides solderless connections for interface components such as resistors, capacitors, or transistors.

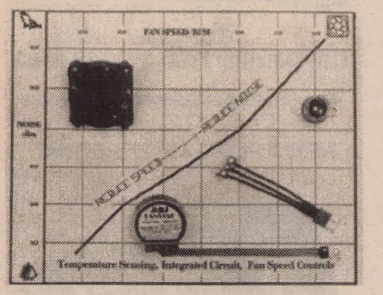
The Xplor-32c's EEPROM features concurrent read write technology, which allows the device to be read while it is being written to. A BASIC interpreter occupies the lower half of the block-protectable EEPROM, leaving the upper half available for BASIC programs, data, and assembly language programs. The BASIC interpreter includes several utilities such as frequency measurements, real time clock/calendar, and hex file loading. BASIC programs may be interactively edited, and any stored BASIC program automatically executes on power-up.

The Xplor-32c sells for $89.95 and is available from stock. A starter package sells for $129.95 and includes the Xplor-32c, user's manual, PC serial interface cable, 9V power supply, and application disk. The disk includes an 8052 assembler and a customized terminal program with a BASIC line editor. BASIC and assembly language software examples are also included.

For more information, contact:

BLUE EARTH RESEARCH
165 WEST LIND CT., DEPT. NV
MANKATO, MN 56001
507-387-4001 FAX: 507-387-4008
E-Mail:tom.bachmann@industry.net

IC FAN SPEED CONTROLLER



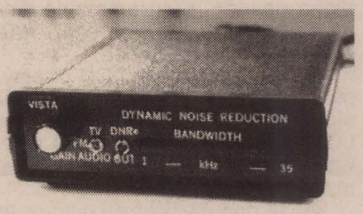
MDJ, Inc. introduces a complete line of integrated circuit temperature sensing, fan speed controllers. This controller series is named "THERMOCHIP" and is now available. Fan speed reduction yields lower noise and extended fan and filter life.

THERMOCHIP supplies voltages from 5 to 15 VDC. It has outputs for AC & DC fans to 300 watts, local or remote temperature sensing. Potentiometric, resistor or factory setpoints are available. Fan failure alarm output is available. Power supply current is less than 200 micro amps. Proportional temperature indication output is available. Single & dual setpoints -- single setpoint with alarm is standard. Available in TO-220 and Hardened industrial, potted units. Accuracy to .5% some models, 1% is standard. Temperature sending range from -50C to +130C.

For more information, contact:

MDJ, INC.
P.O. BOX 1019, DEPT. NV
GLEN ALPINE, NC 28628
704-584-4007 FAX: 704-584-7000

UNIVERSAL STEREO DYNAMIC NOISE REDUCTION COMPONENT



Vista's universal stereo Dynamic Noise Reduction (DNR) component does not require encoded material to achieve 10 dB on noise reduction from virtually any line level source material-disc, FM or TV broadcast, and tape. The DNR employs National Semiconductors patented psychoacoustical noise masking and adaptive filter.

The device should be installed after any signal preamplifiers and before any volume controls or tone control circuits. Because the DNR can handle line-level signals from 300 mV to 3V RMS, a good location is at the tape monitor I/O or alternately in a signal processing loop. It can also be installed at the line output of a stereo TV to hi-fi amplifier to improve the quality of the audio.

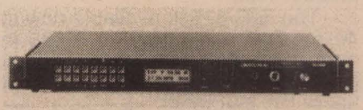
Once installed, only one adjustment is required. An LED bargraph display shows the instantaneous bandwidth from 1-35 KHz. A front panel switch allows A/B comparison of the DNR's effectiveness to be made by forcing the bandwidth open to 50 KHz.

The Dynamic Noise Reduction kit is $95.00 + S&H. It is also available wired and tested for $139.00 + S&H.

For more information, contact:

VISTA
P.O. BOX 1425, DEPT. NV
BOLINGBROOK, IL 60440
708-378-5534

UNIVERSAL SCPC XE-1000



The new Universal SCPC XE-1000 Audio Receiver is the latest state-of-the-art microprocessor-controlled audio broadcast receiver which incorporates every needed feature for broadcast-quality reception of all SCPC audio networks. Full flexibility contained in one receiver allows the reception of all SCPC channels on any satellite. There are no costly frequency boards as the SCPC XE-1000 is fully frequency agile and fully transponder agile with a push of a button.

Full readout of transponder, frequency, bandwidth, de-emphasis, companding, channel name, and memory channel in use are prominently displayed on an easy-to-read LCD display of 2 lines at 20 characters per line. All companding boards, 1:1, 2:1, 3:1 are built in and included as standard features and are selectable alongwith de-emphasis selection.

The SCPC XE-1000 has 50 channel non-volatile memories, which are recalled with the touch of a single button to select any SCPC channel that you place in memory, along with the parameters that are used for the channel. Frequencies, transponders, and all parameters are entered by front key pad. Two high-quality phase locked loop synthesized frequency converters are used to achieve stable reception in the receiver.

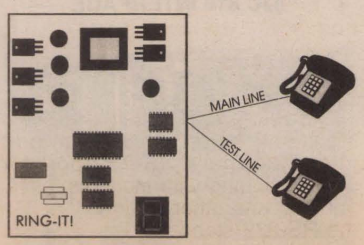
A totally new audio section produces high-quality, low distortion broadcast-quality to two 600 ohm line outputs, plus 4 ohm speaker output, and front panel headphone monitoring jack. The input frequency of the XE-1000 receiver is 950 to 1450 MHz from a stable phase lock loop LNB at dish. A quality 75 ohm RG-6 coax line is used from antenna to receiver. All C-Band and Ku-Band channels are compatible with the XE-1000.

Standard rack mounting of 19" wide, 10" deep, 1.75" high, with 115 VAC, 60 cycle power requirements.

For further details, contact:

UNIVERSAL ELECTRONICS, INC.
4555 GROVES RD., STE. 13,
DEPT. NV
COLUMBUS, OH 43232
614-866-4605 FAX: 614-866-1201

PHONE LINE SIMULATOR KIT



Digital Products Company announces Ring-IT! A microprocessor controlled telephone line simulator. With it you can easily evaluate all types of standard telephone equipment. And because it is offered only as a kit, you can own one for a fraction of the cost of commercial systems by building it yourself.

It can be used to test or demonstrate any standard telephone, answering machine, fax unit, voice mail system, or modem. In fact, almost anything that you can connect to a phone line can be tested or demonstrated using Ring-It.

Telephone equipment that is plugged into this handy test system will behave just as if it was connected to a real telephone line.

An LED type digital readout is used to display the DTMF digits that are dialed, so you can even verify operation of TouchTone type push-button phones.

You can choose between five different test modes that allow standard telephone line emulation or special repetitive cycle testing, including automatic ring-up. For extra convenience, the LED readout shows the test mode in-use.

An internal 20 Hz ring generator uses digital precision to ensure that most any type of telephone gear can be rung-up. The ring circuit uses a superimposed voltage source, just like the phone company, to maintain compatibility with all popular telephone products.

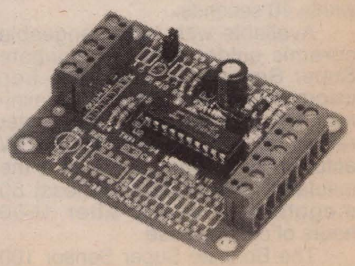
The kit comes complete with a high-quality two piece printed circuit board set, all electronic components, programmed microprocessor, transformers, and a 25 page technical manual. All you need to finish the kit is a good soldering iron, and a small enclosure of your choice. If you are more adventuresome, a "basic" kit is offered that includes just the circuit board, programmed microprocessor, and technical manual.

The kit's price is only $145.00. The "basic" kit is $53.95 & S&H.

For more details, contact:

DIGITAL PRODUCTS COMPANY
134 WINDSTAR CIR., DEPT. NV
FOLSOM, CA 95630
24Hr Voice/FAX 916-985-7219.

16-BIT A/D CONVERTER MODULE



Blue Earth Research introduces the SI-01 Sensor Interface Module for converting the output of various analog sensors to a digital format. The SI-01 was designed to be used with high-precision sensors, especially those having a millivolt level output signal. The digital out-

put can be read by many popular microcontrollers, including all of the single board controllers manufactured by Blue Earth Research.

The SI-01 is based on a single channel 16-bit delta-sigma type analog-to-digital converter with a two-wire digital output. The ADC can operate in bipolar mode for ± 2.5V differential inputs or unipolar mode for 0-2.5V differential or single-ended inputs. The common mode range for differential inputs is 0-5 volts. Up to 20 conversions per second can be performed.

An external 9-16V power supply can be used to power the SI-01, which includes an on-board 5-volt regulator. Series resistors are present on all signal lines for transient and out-of-range voltage protection. Screw terminals are provided for all I/O connections.

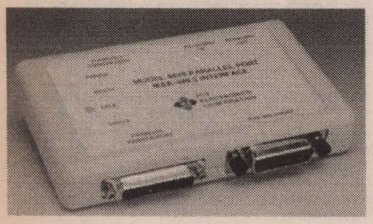
Several options are available, including temperature compensated sensor excitation, and an oscillator circuit for measuring the output of capacitive type (e.g., humidity) sensors. A protective plastic enclosure is also available.

The standard SI-01 is priced at $59.95 and is available from stock. It includes complete documentation along with BASIC and 8051 Assembly Language software examples.

For more information, contact:

BLUE EARTH RESEARCH
165 WEST LIND CT., DEPT. NV
MANKATO, MN 56001
507-387-4001 FAX: 507-387-4008
E-Mail: tom.bachmann@industry.net

IEEE-488.2/GPIB CONTROLLER FOR PORTABLE COMPUTERS



ICS Electronics Corporation announces a new IEEE-488.2 controller module that lets any IBM compatible desktop or portable computer control GPIB bus devices from its parallel port. Model 4818, GPIB controller is an external module that works with standard and enhanced parallel printer ports to convert the computer into an IEEE-488.2 bus controller. The 4818 does not interfere with the operation of existing printers, security keys, or other devices that use the computer's parallel port.

The 4818 is a small 6.3"x 3.75" module that connects between the computer's parallel port and printer. The 4818 monitors the output from the computer's parallel port and automatically routes all GPIB commands out its IEEE-488 connector to the GPIB bus. Responses from the GPIB device are sent back through the printer port to the computer. The 4818 passes all non-GPIB commands and data to the printer output connector. The 4818 is powered from the computer's auxiliary keyboard connector and it does not require an external power supply. LEDs on the 4818 provide the user with a visual indication of its status.

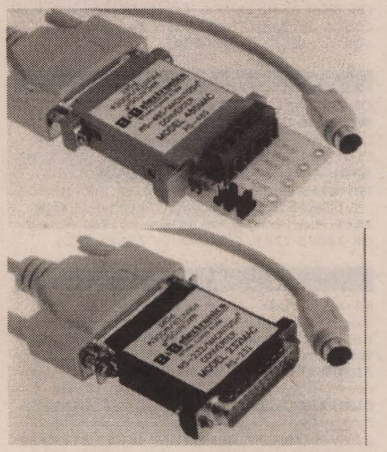
The 4818's software includes ICS's 488 driver libraries, program example, and an Interactive Command Line program that lets a user control GPIB devices from the keyboard without having to write a program. The 488 Driver Libraries support Quick Basic, Visual Basic, C and C++ programs, and include all of the required IEEE 488.2 controller protocols. The 4818 can execute programs written for ICS's 488-PC2 GPIB controller card by relinking the existing programs with the new 488 Driver Library.

The Model 4818 GPIB Controller includes the computer connection cables, adapters, 488 driver software, and instruction manual. Price is $395.00 each.

For more information, contact:

ICS ELECTRONICS CORP.
473 LOS COCHES ST., DEPT. NV
MILPITAS, CA 95035-5422
408-263-5500

TWO NEW MACINTOSH SERIAL CONVERTERS



The 232MAC and 485MAC Serial converters are now available from B&B Electronics Manufacturing Company. Both new Macintosh based products are priced at $74.95.

The 232MAC converts a Macintosh printer or modem port into a standard RS-232 port for communicating with modems, serial printers, and other devices that use the RS-232 standard. The 232MAC not only adapts the Macintosh mini-din connector to the DB25 connector, but also is an active device that uses RS-232 driver/receiver ICs to comply fully with the RS-232 standard. The 232MAC has a DB25 male connector for the RS-232 connection and supports transmit & receive data, request to send, clear to send, and carrier detect.

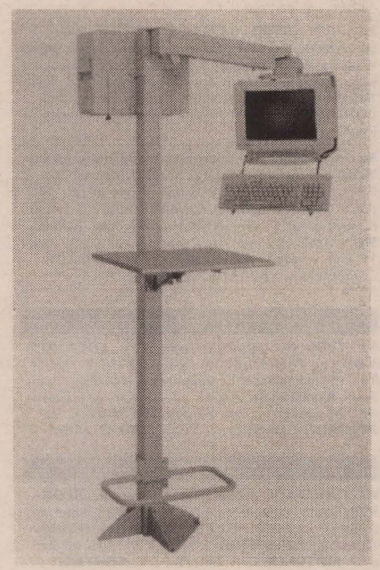
The 485MAC allows your Macintosh printer or modem port to connect directly to RS-422 equipment, or to a multidrop RS-485 system transmit & receive data are converted from the Mac serial port to a balanced differential signal that fully complies with the RS-485 standard. The RS-485 side of the converter brings out the transmit lines and receive lines on screw down terminal blocks for easy connection to RS-422/485 two-wire or four-wire systems. Jumpers are provided for automatic send data control or hardware handshake control of the RS-485 driver and receiver.

Both the 232MAC and 485MAC converters require 12 VDC at about 100mA and include a six foot cable for connection to a Macintosh. A power supply is available for use with both converters (Models 232PS and 485PS, $14.95 each).

For more information contact:

B&B ELECTRONICS MFG. CO.
707 DAYTON ROAD
P.O. BOX 1040, DEPT. NV
OTTAWA, IL 61350
815-434-0846
24-HR FAX: 815-434-7094
24-HR BBS 815-434-2927

THE COMMAND POST



Ergotron, Inc. announces the availability of another in its line of Ergonomic Computer WorkCenters. The Command Post is a computer/video display mounting column that can be used in manufacturing plants, assembly lines, commercial kitchens, and restaurant video display locations. It saves floor space in areas where floor space is at a premium by providing computer/video access without using worksurface space.

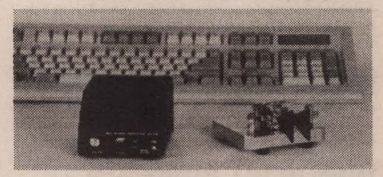
Mounted to the floor, The Command Post uses less than two square feet of floor space and when mounted overhead uses no floor space at all. Workers can access computerized records, recipes, or procedures that might otherwise have not been immediately available. In addition, the monitor can be positioned and repositioned to the correct height, distance, and angle for operators of any size.

The Command Post features Ergotron's patented ergonomic monitor suspension technology, a rugged mounting column, steel components, and several installation options. Optional accessories include a foot rest, collapsible worksurface, and keyboard holders. The Command Post is priced starting at $750.00.

For more information, contact:

ERGOTRON, INC.
3450 YANKEE DR., STE. 100
DEPT. NV
ST. PAUL, MN 55121-1627
612-452-8135, 1-800-888-8458
FAX: 612-454-8346

SUPER CW KEYBOARD



MFJ Enterprises, Inc. announces the MFJ-452 Super CW Keyboard with Perpetual memory, only $129.95.

The MFJ-452 CW Keyboard has a two-line LCD display and includes an RFI suppressed keyboard.

The MFJ-452 features eight 250 character nonvolatile message memories, a 150 character type-ahead buffer, an iambic keyer, and a powerful "Morse Code Trainer."

When you purchase the MFJ-452, you will be sending effortless CW as soon as you turn it on. There is no computer to boot up, no program to load, you just start typing.

The MFJ-452 includes Perpetual Memory which means you can save your messages and settings up to 20 years without power or batteries.

MFJ gives you an easy-to-read LCD display that simultaneously shows you what you're sending out on another. You can review stored messages, keyboard settings, and spot typing errors that can be quickly corrected by backspacing. The LCD display will also eliminate those painful "neck-typing" strains. The LCD is displayed on a sloped front panel and has a contrast control that can be seen by even the "red-eyed" HAM.

The CW keyboard (included) has RFI suppression, it won't lock up or send characters you don't want because of the RF and you won't hear any digital hash in your receiver. There aren't any complex

New Product News

strokes here either.

MFJ offers the SingleTouch function keys which make it simple to store and recall messages, set speed, weight and tone, set up serial numbering, turn on and off the transmitter tune, and it also features a keying and handkey mode.

With the MFJ-452, commonly used prosigns are assigned keys for easy use. You can also create any prosign by pressing Alt and any characters. The 452 also features an iambic keyer for fast break-in; plug in an iambic paddle and you can even use it as a full featured keyer. Pause your playing buffer or message or insert your comments with your paddle and then resume playing.

The MFJ-452 also features a powerful and educational "Morse Code Trainer." You can practice or teach Morse code in Farnsworth or normal code. You can select letters, numbers, punctuations, or prosigns in any combination to practice and use standard 5, random 1 to 8 character groups, or select specific six character sets.

The MFJ-452 also includes extra side effects, like the speaker, sidetone, volume control, and jack for external speaker or earphones.

The MFJ-452's AT101 compatible keyboard plugs into compact 3-1/2 x 2-1/2 x 3-1/2 inch interface. Use a 12 VDC or 110 VAC with MFJ-1312B, $12.95.

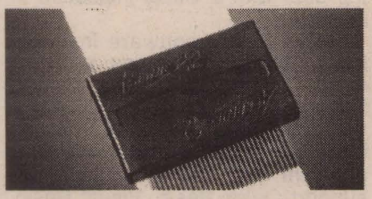
MFJ-452X is the exact same model as MFJ-452, but comes without the keyboard, at only $99.95.

Both models come with MFJ's now famous "No Matter What" one year unconditional guarantee.

For more information, contact:

MFJ ENTERPRISES, INC.
P.O. BOX 494, DEPT. NV
MISSISSIPPI STATE, MS 39762
601-323-5869 FAX: 601-323-6551
1-800-647-1800

RIBBON CABLE TERMINATOR



Aeronics, Inc. announces the availability of its newest SCSI terminator connectivity solution, the 68 Position IDC 0.025 Pitch Ribbon Cable terminator.

The 68 Position IDC ribbon cable terminator provides a simple and inexpensive method of increasing SCSI bus performance.

The terminator easily clamps onto an existing SCSI ribbon cable and eliminates the standard passive terminators usually found on OEM peripherals.

The 68 Position IDC ribbon cable terminator is available in seven electrical configurations, including active, high current active, forced perfect, differential, and passive terminators.

For more details, contact:

AERONICS, INC.
12741 RESEARCH BLVD., STE. 500
DEPT. NV
AUSTIN, TX 78759
512-258-2303 FAX: 512-258-4392

Events CALENDAR

Continued from page 75

Grand Prize drawing 2:30pm. **ADMISSION:** $7, under 6 free. **FEATURES:** C - DP - E - EX - FM - FP - F/R - H. **DEALER INFO:** Outdoor flea market $4 per vehicle + admission. Electricity not available. For information including commercial booth and club exhibit information contact Electronics Fair at PO Box 26331, St. Paul MN 55126 or by calling, 612-653-9999.

JUNE 17

OH - MILFORD — Hamfest. **SPONSOR:** Milford ARC. **LOCATION:** Live Oaks Career Development Center, 5956 Buckwheat Rd. **HOURS:** 8am-2pm. **ADMISSION:** $4 adv., $5 door, under 12 free. **TALK-IN:** 147.345+. **FEATURES:** CB - EX - F/R. **CONTACT:** Gerry, 513-677-9255.

MI - MIDLAND — 20th Annual Hamfest. **SPONSOR:** Midland ARC. **LOCATION:** Midland National Guard Armory. **HOURS:** 8am-1pm. **ADMISSION:** $4. **TALK-IN:** 147.00+. **FEATURES:** DP - E - EX - F/R. **DEALER INFO:** 8' tables $10 adv., $15 door. Set-up 6:30am. **CONTACT:** MARC Hamfest, PO Box 1049, Midland MI 48641. 517-832-3053 eves.

JUNE 18

IN - CROWN POINT — Dad's Day Hamfest. **SPONSOR:** Lake County ARC. **LOCATION:** Lake County Fairgrounds. **CONTACT:** John Gianotti, KF9GW, 1513 Camellia Dr., Munster IN 46321. 219-922-1065.

MI - MADISON HEIGHTS — Computer Trade Show. **LOCATION:** UF & CW Hall, 876 Horace Brown Dr., 1 block E of I-75, 3 blocks S of 13 Mile Road. **HOURS:** 10am-4pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

MI - MONROE — Hamfest. **SPONSOR:** Midland ARC. **LOCATION:** Monroe County Fairgrounds M-50 at Rasinville Road. **HOURS:** 8am-2pm. **ADMISSION:** $3 adv., $4 door. **FEATURES:** EX - FM - H. **DEALER INFO:** 8' indoor tables $10, 8' outdoor space $3. Dealer info. Judy Kraatz, 2275 Nadeau Rd., Monroe MI 48161. 313-289-2638. **CONTACT:** Fred Lux, WD8ITZ, PO Box 982, Monroe MI 48161. 313-243-1053.

OH - MACEDONIA — Hamfest & Computer Show. **SPONSOR:** Cuyahoga ARS. **LOCATION:** Nordonia High School. **HOURS:** 8am-1pm. **ADMISSION:** $3 adv., $4 door. **TALK-IN:** 146.82(-). **FEATURES:** C - DP - H. **DEALER INFO:** Indoor spaces $11 (includes table & 1 admission), outdoor spaces $4. **CONTACT:** Rich James or Cars 1995 Hamfest, 7620 Crestwood Lane, Northfield OH 44067. 216-468-2035.

JUNE 24

MI - LIVONIA — Computer Trade Show. **LOCATION:** Livonia Elks Lodge Hall, 31117 Plymouth Rd., 1 block E of Merriman. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

MI - WESTLAND — Great Lakes Computer Expo & Sale. **SPONSOR:** Progressive Computer Productions. **LOCATION:** Wayne-Ford Civic League, 1645 Wayne Rd, 1 blk S of Ford Rd. **HOURS:** 10am-4pm. **ADMISSION:** Adults $4, seniors/students $3, under 12 free w/adult. **FEATURES:** C - DP - FP - F/R - S. **DEALER INFO:** Covered 8' table $35 ea. **CONTACT:** Progressive Computer Productions, 23814 Michigan Ave., Ste. 237, Dearborn MI 48124. 313-425-9276.

JUNE 25

IL - GLEN ELLYN — Computer Central. **LOCATION:** College of DuPage, Park Blvd. & College Rd. **HOURS:** 9:30am-3pm. **ADMISSION:** Adults $6, 8-12 $2, under 8 free. $1 off reg. adult admission w/this ad. **FEATURES:** AC - C - FP. **CONTACT:** Computer Central, Jay B. Robinson, 708-940-7547.

MI - ANN ARBOR — Colossal Computer Sale. **LOCATION:** Jewish Community Center. **LOCATION:** Washtenaw Community College's Morris Lawrence Bldg. **HOURS:** 9:30am-4pm. **ADMISSION:** $4. **FEATURES:** C - S. **DEALER INFO:** Vendor tables $40. **CONTACT:** 313-971-0990 - Jewish Community Center.

MI - WATERFORD — Computer Trade Show. **LOCATION:** NOCC CAI Building, 5640 Williams Lake Rd., between Airport Rd. & R/R tracks; at Exit 89 off I-75 go W 3.5 miles to Walton Blvd., turn right & go approx. 1 mile. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4, seniors & students w/ID $3, under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

JULY 1

MI - TROY — Computer Trade Show. **LOCATION:** American Polish Cultural Center, 2975 E. Maple Rd. (15 Mile) corner of DeQuindre. **HOURS:** 10am-3pm. **ADMISSION:** Adults $4; Seniors & students w/ID $3; under 12 free w/adult. **FEATURES:** C - DP. **CONTACT:** Computers & You, 313-283-1754.

JULY 8

WI - OAK CREEK — 26th Annual Swapfest. **SPONSOR:** South Milwaukee ARC. **LOCATION:** American Legion Post #434, 9327 S. Shepard Ave. **HOURS:** 7am-2pm. **ADMISSION:** $4. **TALK-IN:** 146.52 Simplex. **FEATURES:** DP - EX - FP - F/R. **CONTACT:** 414-762-3235.

JULY 14-16

MT - EAST GLACIER — Montana State Convention/ Hamfest. **SPONSOR:** Montana State Convention & Glacier/Waterton Int'l Hamfest. **CONTACT:** Darrell Thomas, N7KOR, 743 33rd Ave. NE, Great Falls MT 59404. 406-453-8574.

JULY 15

IN - INDIANAPOLIS — Indianapolis Computer Fair. **LOCATION:** Quality Inn East, 3525 N. Shadeland Ave., near Pendleton Pike. **HOURS:** 10am-3pm. **ADMISSION:** $4, under 12 free. **FEATURES:** C - DP. **CONTACT:** Ben Yanto, AGI Computer Fairs.*

JULY 16

IL - ORLAND PARK — The Orland Park Computer Show. **LOCATION:** Orland Park Civic Center, 147th St. & LaGrange Rd (Rt. 45). **HOURS:** 9:30am - 3pm. **ADMISSION:** Adults $5 - $1 off with copy of this ad, 8-12 yrs $2, under 8 free. **FEATURES:** AC - C - CB - DP - FP - F/R - All indoors. **CONTACT:** 24-hour Hotline 708-974-3123.

OH - VAN WERT — Hamfest '95. **SPONSOR:** Van Wert ARC. **LOCATION:** Van Wert County Fairgrounds, Commercial Bldg. US 127 South. **HOURS:** 8am-3pm. **ADMISSION:** $4. **TALK-IN:** 146.850. **FEATURES:** C - CB - DP - E - EX - FP - F/R - H - T. **DEALER INFO:** 8' tables $10 + admission, space only $6 + admission, trunk sales $6 + admission. **CONTACT:** Bob High 419-795-5763 before 5pm; Bob WD8LPY 419-238-1877 after 5pm.

JULY 23

IL - SUGAR GROVE — ARRL Hamfest. **SPONSOR:** Fox River Radio League. **CONTACT:** James E. Von Olnhausen, N9UZC, 405 Davis Rd., Batavia IL 60510-1306. 708-879-3042.

JULY 28-29

OK - OKLAHOMA CITY — Ham Holidays '95. **SPONSOR:** Central Oklahoma Radio Amateurs. **LOCATION:** Oklahoma State Fair Park, Arts & Crafts Bldg. **HOURS:** Fri. 5pm-8pm; Sat. 8am-5pm. **ADMISSION:** $6 adv., $8 door. **TALK-IN:** 146.67. **FEATURES:** C - CB - DP - EX - F - FM - FP - F/R - H - RV-S - S. **DEALER INFO:** Flea Market $10/table. **CONTACT:** Ham Holidays '95, PO Box 851281, Yukon OK 73085-1281. CompuServe 75672,3475.

JULY 29

MI - WESTLAND — Great Lakes Computer Expo & Sale. **SPONSOR:** Progressive Computer Productions. **LOCATION:** Wayne-Ford Civic League, 1645 Wayne Rd, 1 blk S of Ford Rd. **HOURS:** 10am-4pm. **ADMISSION:** Adults $4, Seniors/Students $3, under 12 free w/adult. **FEATURES:** C - DP - FP - F/R - S. **DEALER INFO:** Covered 8' table $35 ea. **CONTACT:** Progressive Computer Productions, 23814 Michigan Ave., Ste 237, Dearborn MI 48124. 313-425-9276.

OH - XENIA — Hamfest & Computer Expo. **LOCATION:** Heartland Flea Market & Bingo Hall, Corner of Allison. **HOURS:** 8am-3pm. **ADMISSION:** Free. **FEATURES:** FP - T. **DEALER INFO:** Inside space, $15 per table, $25 per table w/electric, tailgate spaces $10. **CONTACT:** High Noon Trading Co., 4230 Dayton-Xenia Rd, Ste 500, Beavercreek OH 45432, 513-429-5403.

TX - TEXAS CITY — ARRL Hamfest. **SPONSOR:** Tidelands ARS. **CONTACT:** Bill Steele, WA5WVP, PO Box 892, Texas City TX 77590. 409-948-0308.

JULY 30

IL - GLEN ELLYN — Computer Central. **LOCATION:** College of DuPage, Park Blvd. & College Rd. **HOURS:** 9:30am-3pm. **ADMISSION:** Adults $6, 8-12 $2, under 8 free. $1 off reg. adult admission w/this ad. **FEATURES:** AC - C - FP. **CONTACT:** Computer Central, Jay B. Robinson, 708-940-7547.

IL - STICKNEY — ARRL Hamfest. **SPONSOR:** DuPage ARC. **CONTACT:** Edwin Weinstein, WD9AYR, 7511 Walnut Ave., Woodridge IL 60517. 708-985-0527.

MI - PORT HURON — ARRL Hamfest. **SPONSOR:** Eastern Michigan ARC. **CONTACT:** Henry Kohl, K8DD, 1640 Henry St., Port Huron, MI 48060. 810-982-7088.

EASTERN REGION

MAY 6

MD - STEVENSVILLE — Hamfest & Computer Flea Market. **SPONSOR:** Kent Island ARC. **LOCATION:** Grasonville VFW, located behind Sleep Inn. **HOURS:** 8am-2pm. **ADMISSION:** $4 donation, tailgate free. **TALK-IN:** 146.94/146.34. **FEATURES:** C - DP - FM - F/R - H - T. **DEALER INFO:** Tables & tailgating spaces are free w/admission. **CONTACT:** Glen, WN3G, @ 410-643-1125; Jim, K3UBC, @ 410-643-3338.

NJ - WAYNE — Computer Show. **LOCATION:** William Paterson College, Recreation Center, near I-80, Rt. 23 & Rt. 46. **HOURS:** 9:30am-4:30pm. **FEATURES:** C. **DEALER INFO:** 500+ tables. **CONTACT:** KGP Computer Show.*

NY - OWEGO — Southern Tier Hamfest. **SPONSOR:** Southern Tier ARC. **LOCATION:** Marvin Park Fairgrounds, Rt. 17C & Exit 64. **HOURS:** 8am-4pm. **ADMISSION:** $3 adv., $4 door, tailgate $2 extra. **TALK-IN:** 146.16/76 & 146.52/52. **FEATURES:** B - CB - EX - F - FM - F/R - H - T. **DEALER INFO:** Tables $15. **CONTACT:** STARC, POB 7082, Endicott NY 13761-7082.

PA - ELIZABETHTOWN — Computer Show/Hamfest. **SPONSOR:** Susquehanna Valley Repeater Assn. **LOCATION:** Elizabethtown Area High School. **HOURS:** 8am-?. **ADMISSION:** $5 - under 12 free. **TALK-IN:** 147.105 449.525. **FEATURES:** C - EX - F/R - H - T. **DEALER INFO:** Indoor tables $10, Tailgating - admission + $3. Set-up 6am. **CONTACT:** Richard Clark, KC3DR, 485 Maytown Rd., Elizabethtown, PA 17022. 717-361-8202.

SC - GREENVILLE — Hamfest. **SPONSOR:** Blue Ridge ARS. **LOCATION:** Anderson County Fairgrounds. **HOURS:** 8am-5pm. **ADMISSION:** $4 adv., $5 door, under 12 free. **TALK-IN:** 146.01/146.61, 146.22/146.82. **FEATURES:** DP - EX - F/R - RV-H - T. **DEALER INFO:** Indoor flea market tables $11, outdoor tailgating - 110' space free w/paid admission, add 1 space $5 each. Set-up: Fri. 6pm-9pm, Sat. 6am-8am. **CONTACT:** Jeff, WA4EFT, or Kay, KE4NHX, Borke, 403 Aster Dr., Simpsonville SC 29681. 803-967-3284, or E-Mail borke@aol.com.

VA - MANASSAS — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Prince William County Fairgrounds (Manassas Fairgrounds). **HOURS:** 9:30am-4:30pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

MAY 6-7

AL - BESSEMER — Birmingham Area Computer

Show. **LOCATION:** Bessemer Civic Center, 1130 9th Ave, Exit 108 at I-20/I-59. **HOURS:** Sat: 9am-5pm, Sun: 10am-4pm. **ADMISSION:** $5 both days, $4 Sun. only. **FEATURES:** AC - C - DP - FP - F/R. **DEALER INFO:** 8' tables $35. **CONTACT:** Computer Show, POB 295, Riverdale GA 30274. 404-907-6225.

PA - ALLENTOWN — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Allentown Fairgrounds. **HOURS:** 9:30am-4:30pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

PA - NORTH WALES — PC Dealer Showcase. **SPONSOR:** StarWare. **LOCATION:** Montgomery Mall, Rt. 309 & 202. **HOURS:** Sat: 10am-9:30pm, Sun: Noon-5pm. **ADMISSION:** Free. **FEATURES:** AC - C - FP. **DEALER INFO:** Tables $95 ea. per day. **CONTACT:** StarWare, 610-584-8770.

MAY 7

MA - TAUNTON — Computer Shows & Sales. **SPONSOR:** Northern Computer Shows. **LOCATION:** Taunton Holiday Inn, Exit 9 off I-495, between Rt. 24 & I-95. **HOURS:** 10am-3:30pm. **ADMISSION:** $7, under 14 free w/adult. **FEATURES:** C. **DEALER INFO:** Setup 8am. **CONTACT:** Northern Computer Shows.*

NY - SELDEN — Amateur Radio Auction. **SPONSOR:** Radio Central ARC. **LOCATION:** Suffolk Community College. **HOURS:** 8:30am-? **ADMISSION:** $3. **TALK-IN:** 145.15/42, 449.525/2A. **FEATURES:** FP - F/R. **DEALER INFO:** Tables - free. Set-up 7am. **CONTACT:** Emil Tillona, KD1F, 516-696-0610; John Mark, KB2QQ, 516-689-6343.

NY - YONKERS — Giant Electronic Fleamarket. **SPONSOR:** Metro 70cm Network. **LOCATION:** Lincoln High School, Kneeland Ave. **HOURS:** 9am-3pm rain or shine . **ADMISSION:** $5, under 12 free. **TALK-IN:** 440.425MHz PL 156.7, 223.760MHz PL 67.0, 146.910Hz, 443.350MHz PL 156.7. **FEATURES:** DP - EX - FP - F/R. **DEALER INFO:** Setup 7am. $19 1st table, $15 ea. All tables 30''x5', or bring your own at $14 per 6' space. Tables $25 ea. at door, $20 per 6' space. Full payment due w/registration. **CONTACT:** Otto Supliski, WB2SLQ, 914-969-1053.

PA - WRIGHTSTOWN — Hamfest '95. **SPONSOR:** Warminster ARC. **LOCATION:** Middletown Grange Fairgrounds, Penn's Park Rd. **HOURS:** 7am-2pm. **ADMISSION:** $6 XYL & kids free. **TALK-IN:** 147.09 rptr 146.52 Simplex. **FEATURES:** EX - F/R - T. **DEALER INFO:** Indoor space $12, Outdoor space $9, Vendor info. Woody Woodside, N6XES, 215-672-8482. **CONTACT:** George Brechman, N3HBT, 215-443-5656.

VA - ANNANDALE — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Northern Virginia Community College (NOVA). **HOURS:** 9:30am-4:30pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

MAY 13

MD - BOWIE — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Bowie State College. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

NH - PORTSMOUTH — Computer Shows & Sales. **SPONSOR:** Northern Computer Shows. **LOCATION:** Rockingham Park, Exit 5 off I-95 to Rt. 1 Bypass South. **HOURS:** 10am-3:30pm. **ADMISSION:** $7, under 14 free w/adult. **FEATURES:** C. **DEALER INFO:** Setup 8am. **CONTACT:** Northern Computer Shows.*

OH - TOLEDO — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Seagate Convention Center. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

MAY 13-14

PA - PLYMOUTH MEETING — PC Dealer Showcase. **SPONSOR:** StarWare. **LOCATION:** Plymouth Meeting Mall, PA Tpke. Exit 25. **HOURS:** Sat: 10am-9:30pm, Sun: Noon-5pm. **ADMISSION:** Free. **FEATURES:** AC - C - FP. **DEALER INFO:** Tables $95 ea. per day. **CONTACT:** StarWare, 610-584-8770.

MAY 14

MD - HAGERSTOWN — Great Hagerstown Hamfest & Computer Show. **SPONSOR:** Antietam Radio Assoc. W3CWC. **LOCATION:** Hagerstown Jr. College, Athletic & Recreation Center. **HOURS:** 8:30am-3pm. **ADMISSION:** $5, under 12 free. **FEATURES:** C - DP - EX - H - T. **DEALER INFO:** Tailgate spaces $5 - first come, first serve. Indoor tables - $15 adv., $20 door. Set up 6:30pm-9:30pm, Sat. **CONTACT:** Fred Bailey, N3HTN, 301-416-8079, 301-714-0688.

WV - WHEELING — 18th Annual Wheeling Hamfest/Computer Show. **SPONSOR:** Triple States Radio Amateur Club. **LOCATION:** Wheeling Park, off I-70. **HOURS:** 8am-3pm. **ADMISSION:** $2 adv., $3 door. Women & 17 or younger, free. **TALK-IN:** 146.910 & 146.715. **FEATURES:** B - C - CB - DP - EX - FM - FP - F/R - H - RV-S - S - T. **DEALER INFO:** Flea market free w/admission. Set up 6am. Tables sliding scale amount. **CONTACT:** TSRAC, Box 240, RR#1, Adena OH 43901. Ph/FAX 614-546-3930.

MAY 19-20

VA - EMPORIA — Vintage Radio Trade/Show. **SPONSOR:** Vintage Radio Unique Society. **LOCATION:** Holiday Inn & WEVA. Corner of I-95 & Hwy 58 (east side). **HOURS:** Fri, 12pm-4pm; Sat, 8am-4pm. **ADMISSION:** $3 both days, over 59 $1. **TALK-IN:** CB. **CONTACT:** Jerry Sears, WB4JGZ, 312 Auburndale St., Winston-Salem NC 27104. 910-765-4302.

MAY 19-20-21

NY - ROCHESTER — 61st Annual Hamfest & Computer Show. Combined with the Atlantic Division/New York State ARRL Convention. **LOCATION:** Monroe County Fairgrounds, Rt. 15A & Calkins Rd. **ADMISSION:** $6, adv., $8 door. **FEATURES:** B - C - CB - FM - H. **DEALER INFO:** Flea market - 10 x 20 tailgate space $10.. **CONTACT:** Rochester Hamfest, 716-424-7184.

MAY 20

KY - PADUCAH — Dukefest ARRL Hamfest. **SPONSOR:** Paducah ARA. **LOCATION:** Cherry Convention Center. **HOURS:** 8am-? **ADMISSION:** $5. **TALK-IN:** 147.060. **FEATURES:** EX - F - FM - F/R. **DEALER INFO:** 8' tables, $5. **CONTACT:** David Fraser, KQ4IU, 5715 Blandville Rd., Paducah KY 42001. 502-554-7999.

NJ - BELVIDERE — ARRL Hamfest. **SPONSOR:** Cherryville Repeater Assn. **CONTACT:** Marty Grozinski, NS2K, 6 Kirkbridge Rd., Flemington NJ 08822. 908-806-6944.

NJ - PHILLIPSBURG — Hamfest. **SPONSOR:** Cherryville Repeater Assn. **LOCATION:** Warren County Farmers Fairgrounds. **HOURS:** 8am-2pm. **ADMISSION:** $6, under 12 free. **TALK-IN:** 147.375 + 600 @ 6am. **FEATURES:** C - CB - DP - E - EX - F - FM - FP - H - T. **DEALER INFO:** Indoor tables $15, electric $5 extra, tailgate spaces $10. Set-up 6am. **CONTACT:** Keith Burt, KF5FK, 908-788-4080, before 10pm, 908-526-4958/FAX.

NJ - WILMINGTON — Computer Show. **LOCATION:** Shriner's, N of Boston at I-93 Exit #39, right at bottom of ramp, follow signs. **HOURS:** 9:30am-4:30pm. **FEATURES:** C. **DEALER INFO:** 500+ tables. **CONTACT:** KGP Computer Show.*

PA - EPHRATA — Lancaster County Hamfest & Computer. **SPONSOR:** Ephrata Area Repeater Society. **LOCATION:** Ephrata Senior High School. 803 Oak Blvd. **HOURS:** 8am-?. **ADMISSION:** $4, children free. **TALK-IN:** 145.450 444.650. **FEATURES:** EX - F/R. **DEALER INFO:** Inside 8' table $6 + admission, tailgating (2 spaces) $3 + admission, Electricity $1 extra. **CONTACT:** EARS, 906 Clearview Ave., Ephrata PA 17522.

PA - LEBANON — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Lebanon Valley Expo Center. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

RI - FORESTDALE — Flea Market & Auction. **SPONSOR:** Rhode Island FM Repe. **LOCATION:** VFW Hall, Rt. 146. **HOURS:** 8am-?. **CONTACT:** Rick, K1KYI, 401-725-7595.

VA - ROANOKE — Mayfest '95. **SPONSOR:** Roanoke Valley ARC. **LOCATION:** Roanoke Civic Center. **HOURS:** 9am-4pm. **ADMISSION:** $5 adv., $6 door. **TALK-IN:** 146.985 (-600) 442.50+. **FEATURES:** EX - F. **DEALER INFO:** Commercial, 8' table $20; Inside flea market 8' table $10 + admission; Tailgate space $5 + admission//Electric hookup $15. Set-up 6am. Doug Moore, K4WVS, 703-343-6794(h), 703-342-8513(w), 703-342-1250(f). **CONTACT:** RVARC, PO Box 2002, Roanoke, VA 24009.

MAY 20-21

AL - BIRMINGHAM — ARRL Hamfest. **SPONSOR:** Birmingham ARC. **CONTACT:** Bill Levey, WA4FAT, 2953 Donita Dr., Birmingham AL 35243. 205-967-6122.

NJ - PHILLIPSBURG — PC Dealer Showcase. **SPONSOR:** StarWare. **LOCATION:** Phillipsburg Mall, Rt. 22. **HOURS:** Sat: 10am-9:30pm, Sun: 11am-5pm. **ADMISSION:** Free. **FEATURES:** AC - C - FP. **DEALER INFO:** Tables $95 ea. per day. **CONTACT:** StarWare, 610-584-8770.

MAY 21

MA - CAMBRIDGE — Tailgate Electronics, Computer & Amateur Radio Flea Market. **SPONSOR:** MIT Radio Society and Harvard Wireless Club. **LOCATION:** Albany & Main Sts. **HOURS:** 9am-2pm rain or shine. **ADMISSION:** $2. **TALK-IN:** 146.52, 449.725/444.725 - pl 2A - W1XM/R. **FEATURES:** C - FP - H - T. **DEALER INFO:** Tailgate room for 600 sellers. $10 per space at gate, $8 adv. includes 1 admission. Setup 7am. For info call 617-253-3776. Mail advance reservations before the 5th. **CONTACT:** W1GSL, POB 397082 MIT BR., Cambridge MA 02139.

NH - PORTSMOUTH — Computer Shows & Sales. **SPONSOR:** Northern Computer Shows. **LOCATION:** Frank Jones Center, Exit 5 off I-95 to Rt. 1 Bypass South. **HOURS:** 10am-3:30pm. **ADMISSION:** $7, under 14 free w/adult. **FEATURES:** C. **DEALER INFO:** Setup 8am. **CONTACT:** Northern Computer Shows.*

NY - WOODBURY — Hamfair. **SPONSOR:** Long Island Mobile ARC. **LOCATION:** Briarcliffe College, 250 Crossways Park Dr. **HOURS:** 9am-3pm. **ADMISSION:** $6, YL's & children free. **TALK-IN:** 146.25. **FEATURES:** C - CB - DP - EX - FP - F/R - H. **DEALER INFO:** Space $15 @ door, no advance. **CONTACT:** Neil Hartman, WE2V, 516-462-5549. Mark Nadel, NK2T, 516-796-2366.

MAY 26-27

MS - PASCOGOULA — Hamfest '95. **SPONSOR:** Jackson County ARC. **LOCATION:** Jackson County Fairgrounds. **HOURS:** Fri. 6-9, Sat. 8-3. **ADMISSION:** $2, under 12 free. **TALK-IN:** 144.51/145.11. **FEATURES:** DP - EX - F/R - H RV-S T. **DEALER INFO:** Winston Dunn KI5ZH, 601-762-8070. **CONTACT:** Charles "Kim" Kimmerly, N5XGI, 601-826-5811.

MAY 27

CT - VERNON — Harford Hamfest. **SPONSOR:** Natchaug ARC. **LOCATION:** Tolland Agricutural Center. **CONTACT:** Wayne, 203-487-1921.

FL - FORT LAUDERDALE — Narisaam Computer Show. **SPONSOR:** Narisaam, Inc. **LOCATION:** Holiday Inn West, 5100 N State Rd. 7. **HOURS:** 9:30am-3:30pm. **ADMISSION:** $5, $4 w/ad, under 12 free. **FEATURES:** AC - C - FP. **CONTACT:** Narisaam.*

NC - DURHAM — 21st Annual DUR-Ham-Fest. **SPONSOR:** Durham FM Assn. **LOCATION:** South Square Mall; at the front of the mall on Business 15/501. **HOURS:** 8am-3pm. **ADMISSION:** $4 adv., $5 door. **TALK-IN:** 147.225(up), Hillsborough, 145.45(dn), Durham. **DEALER INFO:** Tables, adv. $10, door $12. Tailgaters $5 + admission. **CONTACT:** Rodney Draughon, KD4KMI, Rt.4 Box 205, Rougemont, NC 27572, 910-364-7420.

MAY 27-28

MD - GAITHERSBURG — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Montgomery County Fairgrounds. **HOURS:** 9:30am-4:30pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

PA - KING OF PRUSSIA — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Valley Forge Convention Center. **HOURS:** 9:30am-4:30pm. **ADMISSION:** $6.50. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

MAY 28

FL - WEST PALM BEACH — Narisaam Computer Show. **SPONSOR:** Narisaam, Inc. **LOCATION:** Palm Beach Airport Hilton, 150 Australian Ave. **HOURS:** 10am-4pm. **ADMISSION:** $5, $4 w/ad, under 12 free. **FEATURES:** AC - C - FP. **CONTACT:** Narisaam.*

MD - WEST FRIENDSHIP — Hamfest. **SPONSOR:** Maryland FM Assoc. **LOCATION:** Howard County Fairgrounds, Rt. 144. **HOURS:** 8am-3pm. **ADMISSION:** $5 donation. **TALK-IN:** 146.16/.76, 223.16/.76 & 449.00/4.00. **FEATURES:** CB - FM - FP - F/R. **DEALER INFO:** Tables: $15 adv., $20 door. **CONTACT:** Melvin Seyle WA3KZR, 15809 Pointer Ridge Dr., Bowie MD 20716. 301-249-6147.

NY - POUGHKEEPSIE — Mt. Beacon Hamfest. **LOCATION:** Arlington Senior High School, North Campus. **HOURS:** 8am-1pm. **ADMISSION:** $5, spouses & kids. **TALK-IN:** 146.97MHz(-). **FEATURES:** C - E - EX - FM - FP - H - T. **DEALER INFO:** Tailgating or OWN indoor table, $6 (includes 1 free admission). Tables, adv. $8, Door $10 (1 free admission, 1 table). **CONTACT:** Ken Akasofu, KL7JC0, 316 Titusville Rd. #4, Poughkeepsie, NY 12603-2944. 914-485-9617.

JUNE 3

MD - HAVRE DE GRACE — Computer Show & Sale. **SPONSOR:** GOOD Shows. **LOCATION:** Havre de Grace Community Center. **HOURS:** 9am-4pm. **ADMISSION:** $4, under 12 free w/adult. **FEATURES:** C - DP - E. **CONTACT:** GOOD Shows, 2106 Hampshire Dr. ½, Fallston MD 21047. 410-893-0093.

NC - WILMINGTON — 3rd Annual 1995 Seafest. **SPONSOR:** Azalea Coast ARC. **LOCATION:** Trask Coliseum at UNCW. **HOURS:** 9am-3pm. **ADMISSION:** $5 adv., $6 door. **TALK-IN:** 147.180. **FEATURES:** AC - CB - DP - EX - FM - FP - F/R. **DEALER INFO:** Tables $10 + admission, electric hook-ups $5. **CONTACT:** ACARC, PO Box 4044, Wilmington NC 28406. 910-686-4325, nights.

NH - MANCHESTER — Computer Shows & Sales. **SPONSOR:** Northern Computer Shows. **LOCATION:** Expo Complex at Holiday Inn, Center of NH, I-293 Exit 5 or 6. **HOURS:** 10am-3:30pm. **ADMISSION:** $7, under 14 free w/adult. **FEATURES:** C. **DEALER INFO:** Setup 8am. **CONTACT:** Northern Computer Shows.*

NY - ROME — ARRL Hamfest. **SPONSOR:** Rome Radio Club. **CONTACT:** Russell Schorer, KB2MAS, POB 327, Clark Mills NY 13321. 315-853-8739.

OH - DAYTON — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Montgomery County Fairgrounds. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

PA - FORT WASHINGTON — Computer Show. **LOCATION:** Expo Center, near Philadelphia, PA Turnpike Exit #26, 1/2 mi. to light, turn right & follow signs. **HOURS:** 10am-3pm. **FEATURES:** C. **DEALER INFO:** 500+ tables. **CONTACT:** KGP Computer Show.*

VA - ANNANDALE — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Northern Virginia Community College. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

JUNE 4

CT - NEWINGTON — Amateur Radio & Electronics Flea Market. **SPONSOR:** Newington ARL. **LOCATION:** Newington High School, Willard Ave, Rt. 173. **HOURS:** 9am-1pm. **ADMISSION:** $4. **TALK-IN:** 145.45, 146.52 Simplex. **FEATURES:** CB - E - EX - H - T. **DEALER INFO:** Tables- $15, adv., $20 door. **CONTACT:** Fred Jarvis, N1KWJ c/o NARL, 34 Meadow St., Newington CT 06111.

MD - BOWIE — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Bowie State College. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

NH - CONTOOCOOK — Hamfest. **SPONSOR:** Contoocook Valley ARC. **ADMISSION:** $2. **DEALER INFO:** Sellers $6. **CONTACT:** John, N1FOJ, 603-746-4817.

OH - COLUMBUS — Computer Show & Sale. **SPONSOR:** MarketPro. **LOCATION:** Ohio State Fairgrounds, Expositions Center. **HOURS:** 10am-4pm. **ADMISSION:** $6. **FEATURES:** C - FP. **CONTACT:** MarketPro, POB 41044, Bethesda MD 20814. 301-530-2355.

PA - BUTLER — 41st Breezeshooters' Hamfest. **LOCATION:** Butler Farm Showgrounds. **HOURS:** 8am-4pm. **ADMISSION:** $1, under 12 free. **TALK-IN:** 147.96/.36. **FEATURES:** CB - FP - F/R - H - T. **DEALER INFO:** Tailgating space $1. Dealer tables $15. **CONTACT:** Breezeshooters' Hotline, 412-828-3694.

PA - TAMAQUA — ARRL Hamfest. **SPONSOR:** Tamaqua Area Side Band ARA & Anthracite Rptr. Assoc. **CONTACT:** Allen R. Breiner, W3TI, 212 Race St., Tamaqua PA 18252. 717-668-3098.

VA - MANASSAS — Hamfest & Computer Show. **SPONSOR:** Ole Virginia Hams. **LOCATION:** Prince William County Fairgrounds, I66 West to Rt. 234, South on Rt., 234. **HOURS:** 8am-4pm. **ADMISSION:** $5. **TALK-IN:** 146.37/146.97 223.06/224.66. **FEATURES:** C - CB - DP - E - FM - FP - F/R - H - RV-S - T. **DEALER INFO:** Contact Joe, K4FPT, 703-257-9719. **CONTACT:** Mary Lou, KB4EFP, 703-369-2877.

JUNE 10

CT - GOSHEN — ARRL Hamfest. **SPONSOR:** Southern Berkshire ARC. **CONTACT:** Sid Shore, K1SS, 205 Sharon Valley Rd., Sharon CT 06069. 203-364-0480.

NC - WINSTON-SALEM — Hamfest & Computer Fair. **SPONSOR:** Forsyth ARC. **LOCATION:** Dixie Classic Fairgrounds. **HOURS:** 8am-3pm. **ADMISSION:** $6 adv., $7 door. **TALK-IN:** 146.04/64. **FEATURES:** AC - C - CB - DP - E - EX - FM - FP - F/R - H - RV-H - S - T. **DEALER INFO:** Tailgate space $3. Covered outdoor space, call. Indoor table w/chair $10. **CONTACT:** Bill Patterson, KD4RGB, POB 11361, Winston-Salem NC 27116. 910-723-7788.

NJ - EDISON — Computer Show. **LOCATION:** Raritan Center Exposition Hall, NJ Tpke. Exit #10, right at toll, follow signs; near SI & NYC. **HOURS:** 9:30am-4:30pm. **FEATURES:** C. **DEALER INFO:** 1,000+ tables. **CONTACT:** KGP Computer Show.*

JUNE 11

KY - COVINGTON — Ham-O-Rama '95. **SPONSOR:** Northern Kentucky ARC. **LOCATION:** Erlanger Lions' Park. **HOURS:** 8am-? **ADMISSION:** $4 adv., $5 door, under 13 free. **TALK-IN:** 147.255+, 147.375+. **FEATURES:** DP - F - F/R - H. **DEALER INFO:** Indoor table $15, Flea market space $2 (no table). Set-up 6am. **CONTACT:** KC4FET % NKARC, PO Box 1062, Covington KY 41012. 606-341-

1213, FAX 606-384-4002.

NY - LANCASTER — 7th Annual Hamfest. **SPONSOR:** Lancaster ARC. **LOCATION:** Darien Center Firehall. **HOURS:** 6am-3pm. **ADMISSION:** $4 adv., $5 door. **TALK-IN:** 147.255 +600, 443.850 +5MHz. **FEATURES:** DP - FM - F/R. **DEALER INFO:** Indoor tables $10 first, $5 addt'l. **CONTACT:** Luke Callianno, N2GDU, 1105 Ransom Rd., Lancaster NY 14086. 716-683-8880.

NY - QUEENS — Hamfest. **SPONSOR:** Hall of Science ARC. **LOCATION:** New York Hall of Science, parking lot. Flushing Meadows Park, 47-01 111th St., Queens. **HOURS:** 9am-3pm. **ADMISSION:** $5, under 12 free. **TALK-IN:** 444.200, WB2ZZO Repeat, 146.52 Simplex. **FEATURES:** C - CB - DP - FP - F/R - H. **DEALER INFO:** Space $10, includes one admission. Set-up 7:30am. **CONTACT:** For further information call at night only: Charles Becker, WA2JUJ, 516-694-3955. Arnie Schiffman, WB2YXB, 718-343-0172.

PA - HANOVER — Pleasant Hill Computer & Hamfest. **SPONSOR:** Hanover Area Hamming Assn. **LOCATION:** Pleasant Hill Fire Co. Fairgrounds, 5 miles south of Hanover on Rt. 94. **HOURS:** 8am-? **ADMISSION:** $5, under 12 free. **TALK-IN:** 146.895. **FEATURES:** C - EX - F/R - H - T. **DEALER INFO:** Indoor Tables $10 ea, Tailgating admission + $3 per space. Set-up 6am. **CONTACT:** Roger Gibson, N3ICJ, POB 820, Hanover PA 17331. 410-239-8451.

PA - WINFIELD — Central Pennsylvania Ham & Computer Fest. **SPONSOR:** Susquehanna Valley ARC & Milton ARC. **LOCATION:** Union Township Fire Co. Carnival Grounds. US Rt. 15, 5 mi South of Lewisburg. **HOURS:** 8am-?. **ADMISSION:** $4 door only, under 12 free. **TALK-IN:** 146.37/146.97, 147.78/147.18. 146.52. **TALK-IN:** C - DP - E - F/R - H - T. **DEALER INFO:** Tailgating $1 space. **CONTACT:** David Welker, AA3BO, 717-286-0787. SVARC, PO Box 73, Hummels Wharf PA 17831-0073.

JUNE 16-17

GA - ALBANY — ARRL Hamfest. **SPONSOR:** Albany GA ARC. **CONTACT:** John Crosby, K4XA, 308 Residence Ave., Albany GA 31701. 912-883-7373.

JUNE 17

MA - MARLBOROUGH — Computer Show. **LOCATION:** Royal Plaza Trade Center, near Boston Mass Pike to I-495 N, Exit #24-B, 1/2 mile on right on Rt. 20. **HOURS:** 10am-3pm. **FEATURES:** C. **DEALER INFO:** 500+ tables. **CONTACT:** KGP Computer Show.*

ME - HERMON — ARRL Hamfest. **SPONSOR:** Pine State ARC. **CONTACT:** Roger Dole, KA1KS, RR 2, Box 730, Bangor ME 04401. 207-848-3846.

NJ - DUNELLEN — Hamfest. **SPONSOR:** Raritan Valley Radio Club, Inc. **LOCATION:** Columbia Park, near intersection of Rt. 529 & 28. **HOURS:** 8am-2pm. **ADMISSION:** $5. **TALK-IN:** 146.025/625, 146.520 Simplex. **FEATURES:** F/R. **DEALER INFO:** Spaces $5 + admission. **CONTACT:** John Manna, WA2F, 908-722-9045. Bob Pearson WB2CVL, 908-846-2056 before 8pm.

NY - CORTLAND — 13th Annual Cortland Hamfest. **SPONSOR:** Skyline ARC. **LOCATION:** Cortland County Fairgrounds, Exit 12 from Interstate 81, then South on 281 to Fisher Ave. **HOURS:** 7am-3pm. **ADMISSION:** $4 adv., $5 door, under 14 free. **TALK-IN:** 147.180 (+600). **FEATURES:** CB - DP - EX - FM - F/R - H. **DEALER INFO:** Tables $10/ea, Flea Market tailgaters $2/space + admission. **CONTACT:** SARC/Hamfest, PO Box 5241, Cortland NY 13045. 607-756-6550 eves.

PA - LANCASTER — Computer & Electronics Show & Hamfest. **SPONSOR:** Red Rose Repeater Assn. **LOCATION:** Centerville Junior High School, 865 Centerville Rd. **HOURS:** 9am-2pm. **ADMISSION:** $5 under 14 free. **TALK-IN:** 147.015+ 449.575-. **FEATURES:** C - DP - E - FP - T. **DEALER INFO:** Indoor table, admission + $10 ea; tailgate space, admission + $5 ea. **CONTACT:** RRRA, PO Box 8316, Lancaster PA 17604. Mark Walton, 717-560-2321. 717-560-2920 FAX.

TN - NASHVILLE — Hamfest Nashville. **SPONSOR:** Nashville ARC. **LOCATION:** Tennessee State Fairgrounds, Agriculture Bldg. **HOURS:** 8am-5pm. **ADMISSION:** $5. **TALK-IN:** 145.47. **FEATURES:** AC - DP - H. **DEALER INFO:** Tables $10 (vendor admission free). **CONTACT:** Murray Jones, K4ANH, 615-824-7216.

VT - RUTLAND — Vermont State Convention. **CONTACT:** Justin Barton, WA1ITZ, 3 Crab Apple Ridge, Randolph VT 05060-9709.

JUNE 17-18

PA - LANGHORNE — PC Dealer Showcase. **SPONSOR:** StarWare. **LOCATION:** Oxford Valley Mall, Rt. 1. **HOURS:** Sat: 10am-9:30pm, Sun: Noon-5pm. **ADMISSION:** Free. **FEATURES:** AC - C - FP. **DEALER INFO:** Tables $95 ea. per day. **CONTACT:** StarWare, 610-584-8770.

JUNE 18

MA - CAMBRIDGE — Tailgate Electronics, Computer & Amateur Radio Flea Market. **SPONSOR:** MIT Radio Society and Harvard Wireless Club. **LOCATION:** Albany & Main Sts. **HOURS:** 9am-2pm rain or shine. **ADMISSION:** $2. **TALK-IN:** 146.52, 449.725/444.725 - pl 2A - W1XM/R. **FEATURES:** C - FP - H - T. **DEALER INFO:** Tailgate room for 600 sellers. $10 per space at gate, $8 adv. includes 1 admission. Setup 7am. For info call 617-253-3776. Mail advance reservations before the 5th. **CONTACT:** W1GSL, POB 397082 MIT BR., Cambridge MA 02139.

MA - TAUNTON — Computer Shows & Sales. **SPONSOR:** Northern Computer Shows. **LOCATION:** Taunton Holiday Inn, Exit 9 off I-495, between Rt. 24 & I-95. **HOURS:** 10am-3:30pm. **ADMISSION:** $7, under 14 free w/adult. **FEATURES:** C. **DEALER INFO:** Setup 8am. **CONTACT:** Northern Computer Shows.*

MD - WALKERSVILLE — Annual Fathers Day Hamfest. **SPONSOR:** Frederick ARC. **LOCATION:** Volunteer Fire Company Carnival Grounds, 4 miles north of Frederick, off Rt. 194. **HOURS:** 8am-3pm. **ADMISSION:** $5. **TALK-IN:** 146.52 Simplex, 147.06(+) repeater, 448.425(-) repeater. **FEATURES:** C - CB - E - FM - F/R - H - T. **DEALER INFO:** Tailgating, $5 per space. **CONTACT:** FARC, POB 1260, Frederick MD 21702. 301-695-2633 6393.

NC - RALEIGH — Computer Fair & Sale. **SPONSOR:** Tri-State Fairs. **LOCATION:** North Raleigh Hilton - 3415 Wake Forest Rd. Across the street from Raleigh Community Hospital. **HOURS:** 10am-3:30pm. **ADMISSION:** $5, $4 after 1pm, under 10 free. **FEATURES:** C - FP. **CONTACT:** Tri-State Fairs, 919-571-7764.

JUNE 21-22-23

MA - BOSTON — Electronic Trade Show. **LOCATION:** Hynes Civic Center. **CONTACT:** 1-800-223-7126.

JUNE 24

NC - SPRUCE PINE — Hamfest. **SPONSOR:** Maryland ARC. **LOCATION:** Maryland Community College Campus, US 19E North of Spruce Pine. **HOURS:** 8am-? **TALK-IN:** 147.375+, 145.310-. **FEATURES:** DP - EX - F/R - T. **DEALER INFO:** 12' tables $10. **CONTACT:** Frank Stone, WA3KSN, 704-675-9083. David Biddix, KD4PXS, 704-765-7351/days, 704-765-4223/evenings.

JUNE 24-25

PA - HARRISBURG — PC Dealer Showcase. **SPONSOR:** StarWare. **LOCATION:** Harrisburg East Mall, I-83 & Paxton St. **HOURS:** Sat: 10am-9:30pm, Sun: Noon-5pm. **ADMISSION:** Free. **FEATURES:** AC - C - FP. **DEALER INFO:** Tables $95 ea. per day. **CONTACT:** StarWare, 610-584-8770.

JUNE 25

ME - PORTLAND — Computer Shows & Sales. **SPONSOR:** Northern Computer Shows. **LOCATION:** Verrillo's Conv. Ctr. at Howard Johnson Motor Lodge, I-95 (Maine Tpke.) Exit 8. **HOURS:** 10am-3:30pm. **ADMISSION:** $7, under 14 free w/adult. **FEATURES:** C. **DEALER INFO:** Setup 8am. **CONTACT:** Northern Computer Shows.*

JULY 1

NC - MOORE COUNTY — Mid-Atlantic Star Party & Swap Meet. **LOCATION:** Boy Scout Camp Reeves, S of Robbins. **HOURS:** 8am-5pm. **ADMISSION:** $10. **FEATURES:** C - CB - DP - E - FM - FP - F/R - RV-S - S. **DEALER INFO:** One space free w/paid admission. **CONTACT:** E-Mail: starman@email.unc.edu. Voice Mail: 919-362-5194 or send SASE to: MASP, Occoneechee Council BSA, POB 41229, Raleigh NC 27629.

JULY 2

PA - LEHMAN — 16th Annual Wilkes-Barre Hamfest & Computer Fest. **SPONSOR:** Murgas ARC. **LOCATION:** Luzerne County Fairgrounds, Rt. 118. **HOURS:** 8am-?. **ADMISSION:** $3 adv., $4 door, XYL & under 16 free. **TALK-IN:** 146.52 146.61. **FEATURES:** C - CB - DP - E - EX - FM - F/R - H. **DEALER INFO:** Inside table $12, 8' outside space, 1 free with admission, addt'l space $5. **CONTACT:** KA3A: 717-824-5724, days; 717-825-3940, eves.

JULY 4

PA - HARRISBURG — 23rd Annual Firecracker Hamfest & Computer Show. **SPONSOR:** Harrisburg ARC. **LOCATION:** Bressler Picnic Ground. **HOURS:** 8am-?. **ADMISSION:** $4 XYL, YL & Kids free. **TALK-IN:** 146.16/76MHz 146.52/MHz Simplex. **FEATURES:** DP - F/R. **DEALER INFO:** Tables w/electricity, Adv. $12, Door $15, Tailgate Space $5. Set-up 6am. **CONTACT:** 717-232-6087.

JULY 8

NC - SALISBURY — The Firecracker Hamfest. **SPONSOR:** North Carolina Alligators Group. **LOCATION:** Civic Center. **LOCATION:** Civic Center. **HOURS:** 8am-?. **ADMISSION:** $3 adv., $4 door, XYL's free. **TALK-IN:** 146.625. **FEATURES:** AC - EX - FM - FP - F/R - H. **DEALER INFO:** Inside flea market tables $5 + admission, set-up 9pm Fri. 7/7, or 7am Sat. 7/8. **CONTACT:** Walter "Alligator" Bastow, 3045 High Rock Rd., Gold Hill NC 28071.

JULY 8-9

IN - INDIANAPOLIS — Convention. **SPONSOR:** Central Division Convention. **CONTACT:** Jim Rinehart, WB9CEP, 1455 N Shannon Ave., Indianapolis IN 46201. 317-356-1908.

JULY 9

MD - BALTIMORE — Hamfest & Computer Fest. **SPONSOR:** Baltimore Radio Amateur Television Society. **LOCATION:** Timonium Fairgrounds, York Rd off I-695, I-83. **ADMISSION:** Under 12 free. **TALK-IN:** 147.03/+ 224.96/-. **FEATURES:** AC - C - DP - EX - FM - F/R - T. **CONTACT:** BRATS, PO Box 5915, Baltimore MD 21208. 410-467-4634.

NY - ALEXANDER — Batavia Hamfest. **SPONSOR:** Genesee Radio Amateurs. **LOCATION:** Alexander Fireman's Grounds, 8mi south of Village of Alexander on Rt. 98. **ADMISSION:** $3 adv., $5 door, under 12 free. **FEATURES:** FM - F/R. **DEALER INFO:** 8' table $15, flea market space $1, $2 under cover. Dealer contact; Deb Johnson 716-757-9213. **CONTACT:** Knute Carlson, 26 Burke Dr., Batavia NY 14020. 716-343-5580.

JULY 15

ME - CLINTON — ARRL Hamfest. **SPONSOR:** Maine Council of AR Clubs. **CONTACT:** Robin Walls, N1NFK, 34 Tufton St., Brunswick ME 04011. 207-442-9405.

NC - CARY — 23rd Annual Mid-Summer Swapfest. **SPONSOR:** Cary ARC. **LOCATION:** Cary Community Center. **HOURS:** 8am-?. **ADMISSION:** $4 adv., $5 door. **TALK-IN:** 147.75/15. **FEATURES:** DP. **DEALER INFO:** 6' tables, $10 each. **CONTACT:** CARC, PO Box 53, Cary NC 27512.

JULY 15-16

GA - ATLANTA — 1995 Atlanta Hamfestival. **LOCATION:** Cobb Galleria Center, US Hwy 41. **HOURS:** Sat. 9-4, Sun. 9-3. **ADMISSION:** $6 adv., $8 door. **TALK-IN:** 2 meters at 146.82. **FEATURES:** C - CB - DP - E - EX - F - FM - H - T. **DEALER INFO:** 8' Flea Market table $25, Tailgate spot $10. **CONTACT:** Atlanta Hamfestival, PO Box 80947, Atlanta, GA 30366.

GA - PERRY — Southeast Computer & Camera Fair. **LOCATION:** Georgia National Fairgrounds, Heritage Hall, 401 Larry Walker Pkwy, I-75 Exit 42. **HOURS:** 10am-4pm. **ADMISSION:** Adults $3, Seniors $2.50, Age 6-12 $1, under 6 free. Immediate family $7. **FEATURES:** AC - C - CB - FM - FP - F/R - RV-S. **DEALER INFO:** 8' table $40. **CONTACT:** Southeast Model Train & Toy Shows, PO Box 360033, Decatur GA 30036. 404-987-2773.

JULY 16

MA - CAMBRIDGE — Tailgate Electronics, Computer & Amateur Radio Flea Market. **SPONSOR:** MIT Radio Society and Harvard Wireless Club. **LOCATION:** Albany & Main St. **HOURS:** 9am-2pm rain or shine. **ADMISSION:** $2. **TALK-IN:** 146.52, 449.725/444.725 - pl 2A - W1XM/R. **FEATURES:** C - FP - H - T. **DEALER INFO:** Tailgate room for 600 sellers. $10 per space at gate, $8 adv. includes 1 admission. Setup 7am. For info call 617-253-3776. Mail advance reservations before the 5th. **CONTACT:** W1GSL, POB 397082 MIT BR., Cambridge MA 02139.

JULY 22

NH - NASHAU — Flea Market. **SPONSOR:** New England Antique Radio Club Resurrection Center Church. **ADMISSION:** $5 at 8am; $1 at 9am. **CONTACT:** 617-923-2665.

JULY 23

MD - BRUNSWICK — Sweatfest '95. **SPONSOR:** Mid Atlantic DX & Repeater Assn. **LOCATION:** Brunswick Train Museum. The MARC Train Station. **ADMISSION:** $5. **TALK-IN:** 147.060 448.125MHz repeaters. **FEATURES:** CB - EX - FM - F/R - S. **DEALER INFO:** Indoor Space $20, Covered Flea Market $10, Flea market $5. **CONTACT:** MADRA Sweatfest '95, 230 N. Potomac St. #2B, Hagerstown MD 21740. Voice BBS 301-416-8447 Box 109.

PA - INDIANA — 3rd Annual Hamfest & Computer Fair. **SPONSOR:** Indiana County ARC. **LOCATION:** Red Barn Sportman Club. **HOURS:** 8am-?. **ADMISSION:** $2, under 12 free. **TALK-IN:** 146.91. **FEATURES:** C - DP - H - T. **DEALER INFO:** Inside tables $15, 2 for $25, 5 for $50: Outdoor tables $10, 3 for $25 under a pavilion: Tailgate $5/space. **CONTACT:** Tim Ringler, WA3W, 412-349-8847. Gary Robinson, K3SJX, 412-459-8941.

JULY 29

FL - TAMPA — 4th Annual "Last Minute" Hamfest. **SPONSOR:** Univ. of South Florida Radio & Electronics Club. **LOCATION:** University of South Florida on Fletcher Ave between I-75 & I-275. **HOURS:** 9am-3pm. **ADMISSION:** $3.75. **TALK-IN:** 147.240. **FEATURES:** AC - EX. **DEALER INFO:** Swap Tables $10 + admission. Set-up, Fri. 6pm-9pm, Sat. at 8am. **CONTACT:** USF-REC Hamfest, CTR 2416, Tampa FL 33620.

NC - HAYWOOD COUNTY — 20th Annual Western Carolina Hamfest. **SPONSOR:** Western Carolina ARS. **LOCATION:** Haywood County Fairgrounds. **HOURS:** 8am-4pm. **ADMISSION:** $4 adv., $5 door. **TALK-IN:** 146.76 146.91. **FEATURES:** EX - F - H. **DEALER INFO:** 8' x 8' covered tailgate space $5 + admission, tables $8 per, uncovered tailgate space admission only. **CONTACT:** Tom Queen, 704-258-2639.

NJ - PENNSAUKEN — Computer Show. **LOCATION:** South Jersey Expo Center, off NJ Tpke. Exit #4 on Rt. 73. **HOURS:** 10am-3pm. **FEATURES:** C. **DEALER INFO:** 500+ tables. **CONTACT:** KGP Computer Show.*

PA - BERWICK — Hamfest-Computerfest. **SPONSOR:** Columbia Montour ARC. **LOCATION:** Nescopeck Township Firehall Grounds. 5.2 mi South of Berwick on Rt. 93. **HOURS:** 8am-?. **ADMISSION:** $3 XYL & under 12 free. **TALK-IN:** 147.225 (+600), 146.52 Simplex. **FEATURES:** EX - F/R. **DEALER INFO:** Indoor table $10 + admission, tailgating space $1 + admission. Set-up 6am. **CONTACT:** Dave, WC3A, 717-752-6851.

JULY 29-30

NH - MANCHESTER — Convention. **SPONSOR:** New England Division Convention. **CONTACT:** Alan Shuman, N1FIK, 297 Weare Rd., New Boston NH 03070. 603-487-3333.

EVENTS CALENDAR Month at a Glance

MAY 1995

MAY 6

AL - Bessemer - Birmingham Area Computer Show
AR - Russellville - ARRL Hamfest
CA - Santa Barbara - Computer Marketplace
CA - Santee - Ham Radio/Computer/Electronics Swapmeet
IN - Indianapolis - AGI Computer Fair*
MD - Stevensville - Hamfest & Computer Flea Market
MI - Taylor - Computers & You Computer Show
NJ - Wayne - KGP Computer Show*
NY - Owego - Southern Tier Hamfest
OH - Akron - Electronics Fair
PA - Elizabethtown - Computer Show/Hamfest
SC - Greenville - Hamfest & Computer Flea Market
TX - Amarillo - ARRL Hamfest
VA - Manassas - MarketPro Computer Show*

MAY 6-7

PA - Allentown - MarketPro Computer Show*
PA - North Wales - PC Dealer Showcase
TX - Abilene - ARRL West Texas Convention & Hamfest

MAY 7

CA - Livermore - Swapmeet
CA - Santa Rosa - MarketPro Computer Show*
IN - South Bend - Camera/Computer Swap Meet
MA - Tauton - Northern Computer Show*
MI - Lansing - Computers & You Computer Show
MN - Bemidji - Hamfest
NY - Selden - Amateur Radio Auction
NY - Yonkers - Giant Electronic Fleamarket
OH - Cleveland - Compvter Mania
OH - Columbus - Computer Festival
OH - Lisbon - 1995 Columbiana County Hamfest
PA - Wrightstown - 21st Annual Hamfest '95
VA - Annandale - MarketPro Computer Show*

MAY 12-13

IN - Kokomo - 24th Regional Radio Festival
NE - South Sioux City - Iowa State Convention & Hamboree

MAY 13

CA - Fontana - Amateur Radio & Electronic Swapmeet
LA - Springhill - North LA/South AR Hamfest
MD - Bowie - MarketPro Computer Show*
NH - Portsmouth - Northern Computer Show*
OH - Toledo - Compvter Mania
OH - Toledo - MarketPro Computer Show*
WI - Manitowoc - Lakeshore Hamfest & Swapfest

MAY 13-14

CA - Pomona - Computer Marketplace
CA - Sacramento - MarketPro Computer Show*
PA - Plymouth Meeting - PC Dealer Showcase

MAY 14

CA - San Diego - MarketPro Computer Show*
IA - Marshalltown - Hamfest '95
MD - Hagerstown - Hamfest/Computer Show
MI - Dearborn - Computers & You Computer Show
OH - Athens - 16th Annual Hamfest
OH - Medina - Medina County Hamfest '95
WV - Wheeling - 18th Annual Hamfest/Computer Show

Events CALENDAR

MAY 19-20
VA - Emporia - Vintage Radio Trade/Show

MAY 19-20-21
NY - Rochester - Hamfest/Computer Show/State Conv.
SD - Hot Springs - Dakota Division Ham Radio Convention

MAY 20
CA - Fresno - MarketPro Computer Show*
CA - Pomona - Radio & Electronics Swapmeet
CA - Santee - Ham Radio,Computer & Electronic Swapmeet
CO - Colorado Springs - Swapfest
IN - Indianapolis - AGI Computer Fair*
KY - Paducah - Dukefest
MA - Wilmington - KGP Computer Show*
MI - Westland - Great Lakes Computer Expo & Sale
MO - Festus - Cave Fest '95
MO - Kansas City - Missouri State Convention
MS - Pascagoula - Ham Fest '95
NJ - Belvidere - ARRL Hamfest
NJ - Phillipsburg - Hamfest
PA - Ephrata - Lancaster County Hamfest & Computers
PA - Lebanon - MarketPro Computer Show*
RI - Forestdale - Flea Market & Auction
TX - Arlington - Calculator/Antique Instrument Convention
VA - Roanoke - Mayfest '95

May 20-21
AL - Birmingham - ARRL Hamfest
NJ - Phillipsburg - PC Dealer Showcase
NM - Ruidoso - ARRL Hamfest
OH - Cincinnati - Computer Fair
WA - Yakima - ARRL Hamfest

MAY 21
AZ - Phoenix - Computer & Electronics Swapmeet
CA - San Rafael - MarketPro Computer Show*
CA - Stockton - MarketPro Computer Show*
IA - Burlington - ARRL Hamfest
IL - Glen Ellyn - Computer Central Computer Show
IL - Peotone - ARRL Hamfest
IN - Wabash - 27th Annual WCARC Hamfest
MA - Cambridge - MIT Fleamarket
MI - Madison Heights - Computers & You Computer Show
NH - Portsmouth - Northern Computer Show*
NY - Woodbury - Long Island Hamfair
OH - Findlay - Computer Festival

MAY 26-27
MS - Pascogoula - Ham Fest '95

MAY 26-27-28
OK - Tulsa - Green Country Hamfest/Oklahoma State Conv.

MAY 27
CT - Vernon - Hartford Hamfest
FL - Ft. Lauderdale - Narisaam Computer Show*
MI - Troy - Computers & You Computer Show
NC - Durham - 21st Annual DUR-HAM-FEST

MAY 27-28
MD - Gaithersburg - MarketPro Computer Show*
PA - King of Prussia - MarketPro Computer Show*
WY - Casper - ARRL Hamfest

MAY 28
FL - West Palm Beach - Narisaam Computer Show*
IL - Chicago - Hamfest
IL - Orland Park - Orland Park Computer Show
MD - West Friendship - Memorial Day Hamfest
NY - Poughkeepsie - Mt. Beacon Hamfest
OH - Youngstown - 10th Annual Hamfest & Computer Show

JUNE 1995

JUNE 2-3-4
OR - Seaside - SEAPAC Ham Convention

JUNE 3
CA - Santee - Ham Radio,Computer & Electronic Swapmeet
CO - Loveland - Superfest Swapmeet
MD - Havre de Grace - Computer Show & Sale
MI - Grand Rapids - 15th Annual Hamfestival
NC - Wilmington - 3rd Annual 1995 Seafest
NH - Manchester - Northern Computer Show*
NY - Rome - ARRL Hamfest
OH - Dayton - MarketPro Computer Show
PA - Ft. Washington - KGP Computer Show*
VA - Annandale - MarketPro Computer Show*

JUNE 3-4
CA - Pomona - Computer Marketplace

JUNE 4
CA - Livermore - Swapmeet
CT - Newington - Amateur Radio & Electronics Flea Market
IL - Princeton - Hamfest & Computer Show
IN - Evansville - Hamfest, Computer & Electronics Show
KS - Salina - Hamfest
MD - Bowie - MarketPro Computer Show*
MI - Chelsea - 18th Annual Swap & Shop
NH - Contoocook - Hamfest
OH - Columbus - MarketPro Computer Show*
OH - Dayton - PC Buyers Mart
PA - Butler - 41st Breezeshooters' Hamfest
PA - Tamaqua - ARRL Hamfest
VA - Manassas - Hamfest & Computer Show

JUNE 9-10-11
TX - Arlington - '95 West Gulf Div ARRL Convention

JUNE 10
CA - Fontana - Amateur Radio & Electronic Swapmeet
CT - Goshen - ARRL Hamfest
IN - Indianapolis - AGI Computer Fair*
NC - Winston-Salem - Hamfest, Computer & Electronics Fair
NJ - Edison - KGP Computer Show*

JUNE 11
IL - Orland Park - Orland Park Computer Show
IL - Willow Springs - 18th Annual Hamfest
KY - Covington - Ham-O-Rama '95
MI - Dearborn - Computers & You Computer Show
NY - Lancaster - 7th Annual Hamfest
NY - Queens - Hamfest
PA - Hanover - Pleasant Hill Computer Show & Hamfest
PA - Winfield - Central Pennsylvania Ham & Computerfest

JUNE 16-17
GA - Albany - Non-ARRL Hamfest
MN - Maplewood - Electronics Fair '95

JUNE 17
CA - Santee - Ham Radio,Computer & Electronic Swapmeet
MA - Marlborough - KGP Computer Show*
ME - Hermon - ARRL Hamfest
MI - Midland - 20th Annual Hamfest
NJ - Dunellen - Hamfest
NY - Cortland - 13th Annual Hamfest
OH - Milford - Fifth Annual MARC Hamfest
PA - Lancaster - Computer/Electronics Show & Hamfest
TN - Nashville - Hamfest Nashville
VT - Rutland - Vermont State Convention

JUNE 17-18
PA - Langhorne - PC Dealer Showcase

JUNE 18
IN - Crown Point - Dad's Day Hamfest
MA - Cambridge - MIT Flea Market
MA - Taunton - Northern Computer Show*
MD - Walkersville - Annual Father's Day Hamfest
MI - Madison Heights - Computers & You Computer Show
MI - Monroe - Hamfest
NC - Raleigh - Computer Fair & Sale
OH - Macedonia - Hamfest & Computer Show

JUNE 21-22-23
MA - Boston - Electronic Trade Show

JUNE 24
MI - Livonia - Computers & You Computer Show
MI - Westland - Great Lakes Computer Expo & Sale
NC - Spruce Pine - Hamfest

JUNE 24-25
PA - Harrisburg - PC Dealer Showcase

JUNE 25
IL - Glen Ellyn - Computer Central
ME - Portland - Northern Computer Show*
MI - Ann Arbor - Colossal Computer Sale
MI - Waterford - Computers & You Computer Show

JULY 1995

JULY 1
CA - Santee - Ham Radio,Computer & Electronic Swapmeet
MI - Troy - Computers & You Computer Show
NC - Moore County - Mid-Atlantic Star Party & Swap Meet

JULY 2
CA - Livermore - Swapmeet
PA - Lehman - 16th Annual Hamfest & Computerfest

JULY 4
PA - Harrisburg - Fire Cracker Hamfest/Computer Show

JULY 8
CA - Fontana - Amateur Radio & Electronic Swapmeet
NC - Salisbury - The Firecracker Hamfest
WI - Oak Creek - 26th Annual Swapfest

JULY 8-9
IN - Indianapolis - Central Division Convention

JULY 9
MD - Baltimore - Hamfest & Computer Fest
NY - Alexander - 1995 Batavia Hamfest

JULY 14-15-16
ID - Boise - Convention 1995
MT - East Glacier - Montana State Convention & Hamfest

JULY 15
CA - Santee - Ham Radio,Computer & Electronic Swapmeet
IN - Indianapolis - AGI Computer Fair*
ME - Clinton - ARRL Hamfest
NC - Cary - 23rd Annual Mid-Summer Swapfest

JULY 15-16
GA - Atlanta - 1995 Atlanta Hamfestival
GA - Perry - Southwest Computer & Camera Fair

JULY 16
AZ - Phoenix - Computer & Electronic Swapmeet
IL - Orland Park - Orland Park Computer Show
MA - Cambridge - MIT Fleamarket
OH - Van Wert - Hamfest '95

JULY 22
NH - Nashau - Flea Market

JULY 23
IL - Sugar Grove - ARRL Hamfest
MD - Brunswick - Sweatfest '95
PA - Indiana - 3rd Annual Hamfest & Computer Fair

JULY 28-29
OK - Oklahoma City - Ham Holidays '95

JULY 29
FL - Tampa - 4th Annual "Last Minute" Hamfest
MI - Westland - Great Lakes Computer Expo & Sale
NC - Haywood County - 20th Western Carolina Hamfest
NJ - Pennsauken - KGP Computer Show*
OH - Xenia - Hamfest & Computer Expo
PA - Berwick - Hamfest - Computerfest
TX - Texas City - ARRL Hamfest

JULY 29-30
NH - Manchester - New England Division Convention

JULY 30
IL - Glen Ellyn - Computer Central
IL - Stickney - ARRL Hamfest
MI - Port Huron - ARRL Hamfest

ADVERTISER'S INDEX

Ace Communications....98
ACP Super Store....111
Add-On America Corp.....115
Advantage Instruments Corp. 34
AES....120
Alfa Electronics....63
All Electronics Corp. 83
All Phase Video Security, Inc. 9
Allison Technology Corp. 78
Alltech Electronics Co. 38
Alltronics....42
Andromeda Research....9
AP Circuits....8
Ar² Communications Products 40
Asset Sales, Inc. 116
Basic Electrical Supply & Warehousing Corp. 53
Battery-Tech, Inc. 40
Baylin Publications 89
Bisme Computer, Inc. 40
Boss Distributors 77
Brigar Electronics, Inc. 62
BWC Company, Inc.....48
C & C Electronics 111
C & H Sales Co. 8
C & S Sales, Inc. 49, 109
Cable Box Wholesalers, Inc. 115
Capital Electronics, Inc.....33
CA Grapevine 14
Chenesko Products 8
CME, Inc. 101
Communications Electronics, Inc. 21
Communications Systems Laboratories....15
Comtrad Industries 141
Consumertronics 99
Corby Access Control Systems....106
Crazy Bob's 39
Cruising Equipment Co. 13
Cunard Associates 7
Cutting Edge Automation....82
Danbar Sales Co. 22
Debco Electronics....47
Dominator Technologies, Inc. 120
E.H. Yost and Company....98
Electro Automotive 95
Electrolab 78
Electro Tool, Inc. 93
Electronic Materials Recovery, Inc. 66
Electronic Rainbow, Inc. 23
EMAC, Inc. 50
Falkner Enterprises of America 99
Forest Electronics, Inc. 12
Fotronic Corp....57
Futura Components....9
Games Partners, Inc. 126
Gateway Electronics, Inc.....117
General Device Instruments 12
GMP Parts Company....94
Graymark....67
Greenleaf Electronics 73
Halted Specialties Co. 3
Hameg, Inc. 56
H.E.A.R.T. & Associates 121
Highlander....26-27
HighText Publications, Inc. 120
Hi-Q Products, Inc. 7
HoopsWare....39
H.T. Orr Computer Supplies....41
Independence Electronics, Inc. 14
Index Publishing Group, Inc. 15
Information Unlimited....88
Intec Inoventures, Inc. 92
International Overseas Dist. Inc. 39
Intronics, Inc. 15
J & M Microtek, Inc.....16
Jade Products, Inc. 50
Jaguar Electronics....132
Javanco 95
J.E.S., Inc. 92
Just Computers 41
KD Video 121
KDE Electronics, Inc. 57
La Paz Electronics Int'l. 106
Lectronic Research Labs....7
LJ Enterprises....101
M²L Electronics....107
Master Components 15
MD Electronics 95
MDM Radio, Ltd. 78
Memory Experts 106
Metric Equipment Sales, Inc. 97
Metrologic Instruments, Inc. 41
MFM Communications....111
MicroCom Industries....100
Micro Video Products 89
Midwest Electronics....13
Moore's Computers 50
Motron Electronics....115
MPI 127
MWK Industries 48
National Electronic Wholesalers....16, 129
National Productions, Inc. 12
Northeast Electronics, Inc. 106
Novaplex....30
Optoelectronics....4, 143
Parallax, Inc. ....Back Cover
Picotronic Communications 56
PM Electronics....69
Polaris Industries....105
Prime Electronic Components, Inc. 89
R & S Surplus....14
Radio School 124
RA Enterprises 96
Ramsey Electronics, Inc. 108
Resources Un-Ltd. 79
Roger's Systems Specialist....68
SC Engineering 110
Skycraft Parts & Surplus, Inc. 93
Skyvision, Inc. 76
Software Systems Consulting 107
Solar Electric, Inc. 99
SPI Semiconductor....37
Star Circuits....126
Starlite Electronics....57
Sun Equipment Corp. 28
Symphony Electronics Corp. 66
Synergetics....84
Tamsco, Inc. 6
Taz Electronics....50
Team America....69
Tecnet....93
Teleview Distributors 72
Test Equipment Sales 78
The Filter Company, Inc. 101, 107
The Halcyon Group 98
The RF Connection 121
Timeline, Inc. 29
Tucker Electronics & Computers....2
UCANDO Videos....87
Universal Electronics, Inc. 66
Universal Radio 8
U.S. Cable TV, Inc. 48
VersaTech Electronics....67
Video Communication Systems, Inc. 142
Video Connection, Inc. 67
Vision & Motion Surplus 94
Vision Distributors....97
Visitect, Inc. 87
Visual Communications, Inc. 58, 87
V. TECH Instruments, Inc. 56
Western Test Systems 54-55
Wholesale Cable 6
Windward Products 69
Xandi Electronics....47

►►►► USE THE CLASSIFIEDS ! ! ◄◄◄◄

READ BY 80,000 QUALIFIED ELECTRONIC BUYERS, SELLERS AND TRADERS EVERY MONTH!

HOW TO USE THE CLASSIFIEDS

TYPE or PRINT your "electronically related" ad copy **CLEARLY (not all caps)** on the form provided or on a separate piece of paper. Calculate the number of words and multiply it by the appropriate rate (see DETERMINING YOUR RATE PER WORD section). Include any charges for **Bold** and/or CAPPED words, any photo costs that would be applicable and/or costs for boxing your ad (explained below). Choose the appropriate classification for your ad(s) to appear in (see right). Enclose your name, address and account number (if available) for identification purposes. Include full payment — **CLASSIFIEDS ARE RUN ON A PRE-PAID BASIS ONLY** — and mail your completed order to:

NUTS & VOLTS MAGAZINE
430 Princeland Court
Corona, CA 91719

DETERMINING YOUR RATE PER WORD

The ad rate for **current PAID subscribers** is **30¢** per word. **All others** pay **60¢** per word. These rates apply to the first 150 words of your ad. From 151-200 words, the rate per word doubles to 60¢ and $1.20 respectively. We do not accept ads over 200 words. There is a $4.50 minimum charge per ad per insertion.

ADDING PHOTOS, DRAWINGS OR BOXES

A photo or drawing may be run at the top of your classified ad for an additional **$10.00 (one inch max.)** for camera ready art. No wording is allowed in this area. Add a one-time charge of **$5.00** to enlarge or reduce line art or **$8.00** for halftone of photographs. To **BOX** your ad, include an *additional* **$25** for copy-only ads **OR $50** for ads with artwork or photos.

USING BOLD AND/OR CAPS IN YOUR AD

Words to be set in **bold** or CAPS are each **10¢** extra PER WORD. **BOLD CAPS** are **20¢** extra per word. Indicate bold words by Underlining. Words normally written in caps (e.g., IBM) and accepted abbreviations such as VAC or MHz are NOT charged as all cap words. Use a 2-letter abbreviation for states (e.g., Ohio = OH). A phone number is one word. It will be most helpful if you would spell out words when submitting handwritten copy.

WHEN YOUR AD WILL BE PRINTED

Ads received BY our closing date (the 10th of the month) will run the following month. EX: Ads received by May 10th will run in June. Ads postmarked through May 10th but received after the closing date will be placed in the next available issue. No cancellations or changes after the 10th.

SOME THINGS YOU SHOULD KNOW BEFORE SUBMITTING A CLASSIFIED AD

The **first two words** of your ad will be set in **BOLD CAPS** at **no charge**. Running copy only. No special positioning, centering, dot leaders, extra space, etc. is allowed. All advertising in Nuts & Volts is limited to electronically related items ONLY. All ads are subject to approval by the publisher. We reserve the right to reject or edit any ad submitted. We do not take ad copy or changes over the phone. The magazine is mailed on or before the 1st of the month. We do not bill for classified ads. Repeat ads or ads run in multiple classifications within the same issue are allowed. Paid subscribers may run ads at the 30¢ rate only through their subscription expiration date.

FAXING IN AD COPY

You may fax in ad copy or changes to Nuts & Volts before the closing date (the 10th) at 909-371-3052 using a MasterCard or Visa. Be sure to include the credit card expiration date, the name that appears on the card and a daytime phone number. Ads faxed in without credit card information will not be printed until payment is received in full. For verification of faxed-in ads, call 909-371-8497.

CHOOSING A CLASSIFICATION

Select the appropriate classification for your ad(s) to appear in and mark it in the space provided below. If no classification is indicated, the ad(s) will be placed in the Miscellaneous Section or wherever we deem most suitable. Available classifications to choose from are:

10. Ham Gear For Sale
20. Ham Gear Wanted
30. CB - Scanners
40. Music & Accessories
50. Computer Hardware
60. Computer Software
70. Computer Equipment Wanted
80. Test Equipment
85. Security
90. Satellite Equipment
100. Audio - Video - Lasers
110. Cable TV
115. Telephone - Fax
120. Components
130. Antique Electronics
140. Publications
150. Plans - Kits - Schematics
155. Manuals - Schematics Wanted
160. Miscellaneous Electronics For Sale
170. Miscellaneous Electronics Wanted
180. Education
190. Business Opportunities
200. Repairs - Services

PLEASE TYPE or PRINT CLEARLY — ONE WORD PER SPACE—

AD #1 — CLASSIFICATION # _____

_____ x _____ = _____ + _____ + _____ = _____ x _____ = _____

Total Words	☐ 30¢ Paid Sub or ☐ 60¢ Non Sub	Subtotal	☐ Bold/☐ Caps and/or ☐ Art/Photo	BOX IT! ☐ $25 copy only ☐ $50 copy/art	Subtotal	No. of Issues	Total

AD #2 — CLASSIFICATION # _____

_____ x _____ = _____ + _____ + _____ = _____ x _____ = _____

Total Words	☐ 30¢ Paid Sub or ☐ 60¢ Non Sub	Subtotal	☐ Bold/☐ Caps and/or ☐ Art/Photo	BOX IT! ☐ $25 copy only ☐ $50 copy/art	Subtotal	No. of Issues	Total

Account Number _____ Total Enclosed _____

REMEMBER: All Ads Must Be PREPAID. $4.50 min. per ad per insertion. Classified ads will not be processed until payment is complete. No refunds. Credit only.

500 miles from nowhere, it'll give you a cold drink or a warm burger...

This NASA-inspired portable fridge outperforms conventional fridges, replaces the ice chest, and alternates as a food warmer!

by Brad P. Richardson

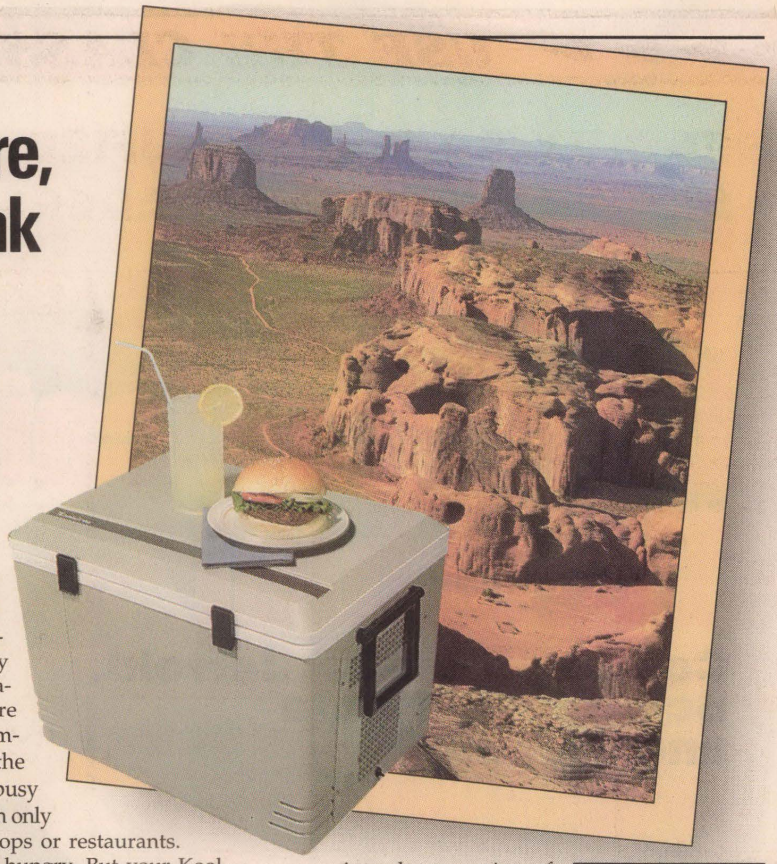
Recognize the ice cooler in this picture? Surprisingly enough, there isn't one. What you see is a Koolatron, an invention that replaces the traditional ice cooler, and its many limitations, with a technology even more sophisticated than your home fridge and far better suited to travel. What's more, Koolatron is not just a refrigerator—it's also a food warmer!

NASA-inspired portable refrigerator. Because of the tough demands of space travel, scientists had to find something more dependable and less bulky than traditional refrigeration coils and compressors. Finally, research led them to discover a miraculous solid-state component—the thermoelectric module.

Besides a small fan, Koolatron has no moving parts to wear out or break down. And it's not affected by tilting, jarring or vibration, which often cause home fridges to fail. The governing module, no bigger than a matchbook, delivers the cooling power of a full 10-pound block of ice.

From satellites to station wagons. Thermoelectric temperature control has been proven with over 25 years of use in the most rigorous space and laboratory applications. Koolatron is the first manufacturer to make this technology available to families, fishermen, boaters, campers and hunters—to anyone on the move.

Home refrigeration has come a long way since the ice box and blocks of ice. But when we travel, we go back to messy ice coolers and soggy, even spoiled food. Now for the price of a good cooler and one or two seasons of buying ice, (about five family restaurant meals) all the advantages of home cooling are available for travel—electronically!



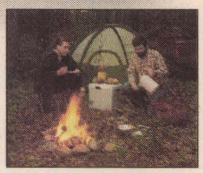
Consider your last trip. You finally got away on your vacation, and are cruising comfortably in the car along a busy interstate with only a few rest stops or restaurants. The kids are hungry. But your Koolatron is stocked with fruit, sandwiches, drinks and fried chicken—all fresh and cold. Everybody helps themselves. You have saved valuable vacation time and avoided another expensive restaurant bill.

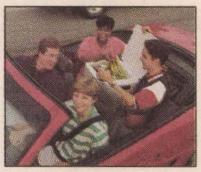
Hot or cold. With the switch of a plug, Koolatron becomes a food warmer for casseroles, burgers—even a baby's bottle. It heats up to 125 degrees. And because there are no temperamental compressors or gases, it works perfectly under all circumstances—even when upside down. Empty, the large model weighs only 12 pounds. And the smaller one weighs just seven. Full, the large model holds up to 40 12-ounce cans, and the smaller one holds six.

Just load it up and plug it in. On motor trips, plug Koolatron into your car's cigarette lighter. It uses less power than a tail-light. If you decide to carry it to a picnic spot or a fishing hole, the Koolatron will hold its cooling capacity for up to 24 hours. If you leave it plugged into your battery with the engine off, it will consume only three amps of power.

Factory-direct offer. Because Comtrad is bringing this offer to you directly, you can save the cost of middlemen and retail markups. For a limited time only, you can get Koolatron's advanced technology at the special introductory price of just $99. Call today and take advantage of this promotional pricing!

Try it risk free. As with all of our products, Koolatron is backed by Comtrad's exclusive 30-day risk-free home trial. Try it! And if you're not completely satisfied, return Koolatron within 30 days for a full refund—"No Questions Asked." It is also backed by a full one-year manufacturer's limited warranty. Most orders are processed within 72 hours and shipped UPS.





Koolatron is compact enough to take to your campsite, on a picnic or on the road in your car.

Koolatron comes in two convenient sizes; one holds 30 quarts. The other holds seven quarts.

30-quart Koolatron (P 24A) . . . . . **$99** $16 S&H
7-quart Koolatron (P 9) . . . . . **$79** $8 S&H
Optional AC Adapter (AC 10) . . . . . **$49** $6 S&H

Please mention promotional code **734-NV5813.**

For fastest service, call toll-free 24 hours a day

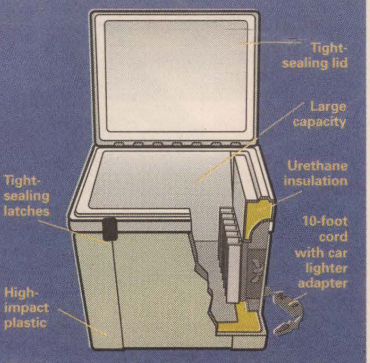
800-704-1210

AMERICAN EXPRESS VISA DISCOVER MasterCard

To order by mail, send check or money order for the total amount including S&H (VA residents add 4.5% sales tax). Or charge it to your credit card by enclosing your account number and expiration date.

COMTRAD INDUSTRIES
2820 Waterford Lake Drive, Suite 106
Midlothian, Virginia 23113

The refrigerator from outer space



The secret of the Koolatron cooler/warmer is a mini thermoelectric module that effectively replaces the bulky piping coils, loud motors and temperamental compressors used in conventional refrigeration. In the cool mode, the Koolatron reduces the outside temperature by 40° F. With the switch of a plug, it becomes a food warmer, going up to 125°.

Introducing the Video Communication Terminal

PRICES AS LOW AS $199.95

Compatible with Jerrold, Scientific Atlanta and Pioneer

Latest high-tech features...

- 750 MHz
- Infra-Red Wireless Remote Control
- Integrated Volume and Mute Control
- On Screen Menu Displays For All User Functions
- Clock
- Favorite Channel Memory Bank
- Programmable Parental Lockout
- Channel 3/4 Switchable
- Last Channel Recall
- Sequential or Direct Channel Access
- HRC / STD / IRC Programmable
- Auto Frequency Control Tuning
- Sleep Timer
- Audio and Video Ports
- Switched Electrical Outlet
- Inview Video Pass-Thru Technology

Add on Descrambler for Jerrold Systems

	1-9	10-19	20+
TVT GOLD (orig)	$59	$47	$42
PURPLE or PINK	$59	$49	$45
TVT (4X4)	$49	$42	$39
STELTH+ (new)	$59	$52	$45
TNT (orig)	$75	$65	$59

Add on Descrambler for Scientific Atlanta

	1-9	10-19	20+
SADF	$69	$65	$59
SA - 3	$59	$55	$49
M80 (orig)	$75	$65	$59

Add on Descrambler for Pioneer Systems

	1-9	10-19	20+
PIO - GRN	$79	$69	$59
PIO - GRN+ (new)	$99	$89	$79
PIO - TNT (new)	$95	$85	$79

CONVERTERS

Wave Master 5500-3

- Parental Control
- Favorite Channel Memory
- Sleep Timer
- Wireless Remote Control
- Last Channel Recall
- HRC / STD Switchable
- 99 Channel

1-9	10-19	20+
$75.00	$69.00	$63.00

Millenium M-3

- Parental Control
- Favorite Channel Memory
- Wireless Remote Control
- Last Channel Recall
- HRC / STD Switchable
- 99 Channel
- Available With Built In Descrambler
- Available With A/B

1-9	10-19	20+
$69.00	$65.00	$55.00

VCS...

VIDEO COMMUNICATION SYSTEMS INC.

ask about our complete line of products

1-800-872-6585

Write in 171 on Reader Service Card.

SCANBLASTER™

BLAST your way through the Frequency Spectrum

Featuring the SCOUT and the OPTOSCAN456

(SCANNER NOT INCLUDED)

Each **SCANBLASTER™** series includes in the accessory set:

• **CX12A**	Computer Interface
• **N100**	FM Notch Filter
• **BLP-70**	Low Pass Filter
• **BHP-800**	High Pass Filter
• **DB32**	UHF/VHF Mini Antenna
• **RD27**	27 MHZ Antenna
• **RD440**	440 MHZ Antenna
• **RD800**	800 MHZ Antenna
• **Spectrum**	CD-ROM FCC Database
• **Utility Disk**	SCOUT Download Program
• **AC100**	Rapid Charge Adaptor
• **Cable/Adaptor**	SCOUT Reaction Tune Pat. Pend.
• **CC30**	Carry Case for SCOUT

3 YEAR EXTENDED WARRANTY

SCANBLASTER™ I

Includes:
SCOUT Pat. Pend.
OPTOSCAN456
Accessory Set

$999 (Save $328)

SCANBLASTER™ II

Includes:
SCOUT Pat. Pend.
Accessory Set

$849 (Save $179)

SCANBLASTER™ III

Includes:
OPTOSCAN456
Accessory Set

$699 (Save $179)

SCANBLASTER™ UPGRADE

Accessory Set Only

$459 (Save $120)

OPTOELECTRONICS®

ORDER LINE
800•327•5912
TEL: 305-771-2050
FAX: 305-771-2052

5821 NE 14th Avenue • Ft. Lauderdale, FL 33334 • Contact Factory for shipping prices. Visa, Master Card, & C.O.D. (cash or money order only)

• OPTOSCAN456 software featured, SCANSTAR COMM'L.™ Software also available from: PROBE,© SCANCAT, SCANNERWEAR,™ and RADIO MGR.

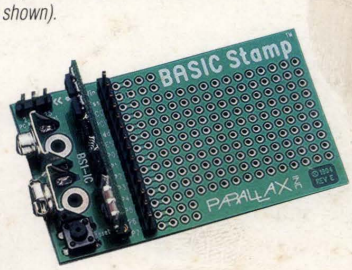
All prices and specifications are subject to change without notice or obligation.

Write in 218 on Reader Service Card.

BASIC STAMP MODULES!®

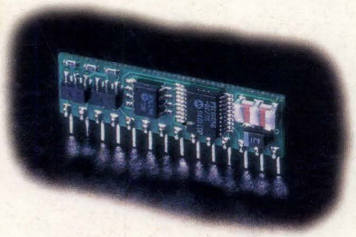
Stamp-Sized Modules Run BASIC Programs

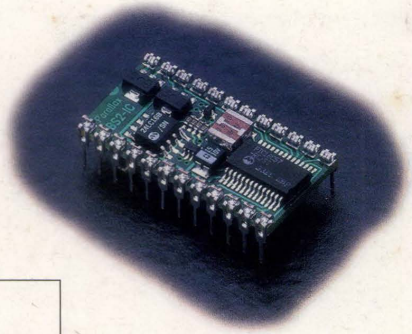
** Carrier boards provide battery clips, prototyping area, programming connector, and reset button (BS1-IC carrier shown).*



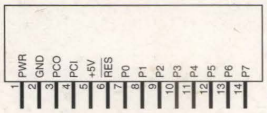
BASIC Stamp I Module (BS1-IC)

8 general-purpose I/O lines
256-byte program space (100 instructions)
4-MHz clock (2400 baud serial, etc.)
$34, $54 with carrier board*

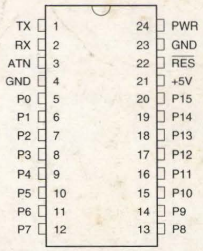




BS1-IC



BS2-IC



These new BASIC Stamp modules are the latest in BASIC Stamp computers. They're perfect for numerous applications, from controlling model trains to monitoring factory sensors. They have 8 or 16 I/O lines, which can be used for a variety of digital and analog purposes. And like the original BASIC Stamp, these modules are programmed in BASIC. Our special "PBASIC" language includes familiar instructions, such as GOTO, FOR...NEXT, and IF...THEN, as well as SBC instructions for serial I/O, pulse measurement, and button debounce.

The BASIC Stamp Programming Package contains everything you need to program Stamps using your PC. The package includes our editor software, programming cables, manuals, application notes, and free technical support. The package is available for $99; Stamps must be purchased separately.

The BASIC Stamp I will always be the smallest and least expensive Stamp. For many applications, it's the most prudent solution. However, a growing number of customers need the additional features of the Stamp II. We hope you'll find both Stamps useful and fun.

BASIC Stamp II Module (BS2-IC)

16 general-purpose I/O lines
2048-byte program space (600 instructions)
20-MHz clock (9600 baud serial, etc.)
$49, $69 with carrier board*

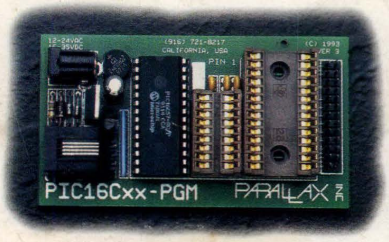
NETSURF OVER TO PARALLAX

We're now available on Internet, so you can contact us more easily than before!

Send email to info@parallaxinc.com
Ftp to ftp.parallaxinc.com
Browse at http://www.parallaxinc.com

PIC®16/17Cxx DEVELOPMENT TOOLS

New prices make PIC development more affordable



You've probably seen the articles about PIC microcontrollers. They're popular because they're cheap and efficient. Which is why we chose PICs for our BASIC Stamps. A typical PIC has 18 or 28 pins, 1K of program space, and 32 bytes of RAM, all for around $5. If you'd like to program PICs in assembly language or C, we offer the hardware and software tools to get you going.

PIC16Cxx Programmer

Programmer for PIC16C5x/64/71/74/84/...
Printed manuals; cables; power supply • **$199**
Docs on disk; user-supplied cables* • **$99**

®PARALLAX

3805 Atherton Road, #102 • Rocklin, CA 95765 • USA
(916) 624-8333 • Fax: 624-8003 • BBS: 624-7101 • Internet: parallaxinc.com

0395NV

BASIC Stamp and the Parallax logo are registered trademarks of Parallax, Inc. • PIC is a registered trademark of Microchip Technology, Inc. • Features and prices subject to change without notice. • Prices are U.S. prices only.
* Programmer "Hobbyist Pack" requires MS Windows for printing documentation.

NUTS & VOLTS MAGAZINE
430 PRINCELAND COURT
CORONA, CA 91719

FWD & ADDRESS CORRECTION REQUESTED