

THE WORLD SCANNER REPORT

A Journal of VHF-UHF Scanner Technology & Engineering

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SUMMER'S END - RADIO SEASON COMING

Just as Spring is drying in the dusty attic of memory, summer is now yielding to Autumn. Radio Season will be upon us once again. Before you know it, the weather will change and begin to influence a change of our habits. Picnicking, hiking, swimming, baseball, golf, softball, bicycle and motorcycle riding will give way to football, skiing and radioing! This is the time to look at your antenna & coax cable system and make any needed changes before the weather turns. You won't be inclined to replace your coax in the middle of January. Things to plan and consider NOW include: new or more antennas, coax cable changes & upgrades; boosting the height of your antenna another 10-ft or so; and an annual cleaning & weatherizing of the antenna & coax. Be sure to at least give your antennas a good steel-wooling to remove the season's accumulation of oxides and corrosion. While you're at it, inspect the connectors and the coax cable. Seal the connectors with a tight wrap of electrical tape or other moisture-proof covering. Get that outside work done before the weather turns. I remember a decade or so ago when I was in the Colorado High Country, how a part of my Avanti Moonraker 6 antenna worked loose and fell off in the middle of a January blizzard. Dedicated as we were, my sons and I lowered the tower and made repairs while contending with 4-ft snowdrifts and a chill factor below 0°F. It was a most un-fun experience and one that I would spare you from if possible. Anything that disrupts your radioing pleasure in the middle of Winter is a fate on a par with death and taxes, except that you can do something about it in advance to keep it from happening. The other two are etched into stone.

SPEAKING OF ANTENNAS.....

I've said it before and I'll periodically say it again: the antenna is the single most important aspect of your radio station. Depending on your interests in radio; CB, ham, shortwave, commercial/business or VHF-UHF scanning, different aspects of the antenna come first and others last. For instance, to CB'ers, Hams and commercial radio users, gain of the antenna is of paramount importance. SWLs and scannists are more concerned with the bandwidth of the antenna and less with gain.

One unique attribute of all antennas, however, belongs at the top of the list: HEIGHT! There is no substitute for height and that's all there is to it. Starting at HF freqs around 20 MHz or so all the way up through UHF and beyond, there can be an effective 3 dB to 6 dB of "gain" associated with every 10-ft height increment. Raise that antenna an additional 20' for a 6-12 dB improvement. In many cases, raising the antenna can be free or very low

cost. Consider that a low-noise, 12-dB preamp can cost \$100 or more, and will yield less of a performance boost than a 20' height increase! Here's the thing about antenna height & HF-VHF-UHF radio waves that you need to know. At about 20-25 MHz & up, radio waves travel pretty much in straight lines, line of sight, so to speak. A phenomena called "diffraction" causes all radio waves to bend slightly beyond the curve of the earth and also into shadow zones behind obstacles. The amount of bending varies with frequency, but is not a great amount at best. Therefore, let's take for granted the line of sight aspect of VHF-UHF radio waves. The distance, in miles, to the horizon from an observer's point of view over water or "flat" earth is given by:

$$D_{\text{miles}} = \sqrt{2H_{\text{FT}}}$$

where H_{FT} = height of view point in feet. As an example, a person 6' high at the eyes standing on the beach 2' above sea level will be able to see no farther than

$$\begin{aligned} D_{\text{miles}} &= \sqrt{2(6' + 2')} \\ &= \sqrt{2 \times 8'} \\ &= \sqrt{16} \\ &= 4 \text{ miles} \end{aligned}$$

Applying this to antennas, the maximum distance in miles between two antennas that can be in line of sight with each other is given by the equation:

$$D_{\text{miles}} = \sqrt{2HA_1\text{ft}} + \sqrt{2HA_2\text{ft}}$$

where A_1 is the height of the first antenna and A_2 is the height of the second antenna, each in feet. So using the above example, two antennas, each 8-ft above ground can't have a line of sight greater than 8 miles over water or flat earth. Here are some more solutions to check your math, or if you don't want to do the math:

- A1 = 50-ft; A2 = 50 ft, then line of sight = 20 mi
- A1 = 18-ft; A2 = 32-ft, then line of sight = 14 mi
- A1 = 200-ft; A2 = 450-ft, then line of sight = 50 mi
- A1 = 5-ft; A2 = 100-ft, then line of sight = 17.3 mi
- A1 = 15-ft; A2 = 100-ft, then line of sight = 19.6 mi

The last two examples above can serve as scenarios for the case of a handheld scanner sitting on a file cabinet and for another scanner connected to an outdoor antenna mounted just above the eaves of a house, each of which is tuned to a local police department's dispatch freq coming from an antenna 100-ft high. Note that if your location is about 17 miles from the tower, then the handheld scanner will just barely be within line of sight whereas the outdoor antenna will perform with margin to spare!

Not only does the earth's curve limit the range of radio signals because of "shadow effect", but so do hills, mountains, buildings, dense foliage and other obstacles. Raw distance between antennas is not nearly the limiting factor as is the shadow effect from the earth's curve and other obstacles. From the above equations, it can be seen where raising the height of either antenna extends the maximum line of sight between them. The increase in line of sight appears undramatic with minor boosts of antenna height, but something very dramatic happens to a signal in increments of every few feet due to another type of signal loss which we'll call "ground absorption". Signals in the proximity of the ground weaken at a much greater rate than the attenuating effect of distance alone. In fact, absorption is an attenuation factor on a par with shadow loss in severity. Absorption loss is greatest on signals closest to the earth but minimizes markedly with height above ground. Therefore, as an antenna goes higher, it penetrates into an ever stronger signal zone as it approaches the window of line of sight. When LOS is achieved with a distant antenna there is little else to be gained for THAT signal with further increases of height. But, the higher an antenna, the wider its view; therefore the greater its range. Now let's put this into perspective.

If you are a casual hobbyist using a rubber duck antenna or the whip antenna that came with the scanner, then chances are, depending on your terrain and geography, your effective range will be not more than 5 to 15 miles. But with an outdoor antenna a few feet above ground, your range of hearing can extend out to well beyond 20-miles, perhaps 30 or so. If you're a serious hobbyist with an antenna mounted at 50-ft above ground level, then your range can easily go to 40 miles and beyond. The thing is that except for over water or very flat land, earth's curve is not so apparent. In fact, certain terrain can propagate signals far beyond mortal limits. I once lived at the 6,000-ft level of the Colorado Rockies, and had line of sight for over 100 miles into portions of NE Colorado, SW Nebraska, and SW Wyoming. Some rules of thumb didn't apply to me, so to speak. But there is one rule of thumb that applies anywhere and everywhere: the higher your antenna above ground, the better.

Think of the first 20 to 50 ft above ground as containing an "RF noise blanket". The limit to ALL radio reception is NOISE. When a signal approaches the "noise floor" of a receiver or an area, that's about it. Hopefully, that noise floor will be in your receiver and NOT in the area around you. Unfortunately, most of us live in cities which are chock full of noise, mostly manmade, which is the bane of the dedicated SWL, but it's also serious to the scannist. Like a smog layer, most urban areas are smothered with a low level blanket of RF noise which can limit reception. Within this blanket, VHF & UHF signals can be fairly strong but difficult to receive because of competing noise fields. Again, a few extra feet of antenna height can boost reception by a great margin. Now just be careful of power lines and falling off the roof, either of which can kill or maim the unwary.

**A MODEST MEMORY UPGRADE FOR THE
PRO-2004/5/6, PRO-32/34; PRO-2021/2022;
BC-760/950XLT; BC-590/600XLT; R-1600**

All the above scanners use a 16k static random access memory (SRAM) chip which can be replaced with a 256k SRAM for a 16x boost in programmable memory. We can put 6,400 channels in the PRO-2004/5/6 using MOD-16 in my SCANNER MOD HANDBOOKS. With MODs-19 or 37, we can stick 3,200 channels into the PRO-32/34/2021/2022 and 1,600 channels in the BC-760/950XLT; BC-590/600XLT and the Regency R-1600. While hundreds, maybe thousands of these mods have been done, I continue to hear weird things like, "Who needs that many channels?", or "Those mods are too complicated for me!", or "Gee, I don't want THAT MANY channels; how about just a few more?" Bruce Heatley of Buffalo, NY, and I have an ongoing argument about the relative merits of thousands of channels versus a few hundred more than stock. Bruce thinks it's a lot easier to stick in just a few more channels than the full-blown methods given in my books. I don't agree, but since the controversy persists, despite my professional opinion, I can do no less than show you how to just double the number of channels if that's all you want and need. So, if you have one of the above scanners, here's how:

Each of these scanners use a 24-pin surface-mount 2k x 8 SRAM. The chip type number can be any of the following: TC-5517CF; uPD446G; LC-3517BM or MB-8416. No matter the number, because they're all the same. In theory, it's an easy matter to double the number of programmable channels by piggy-backing another chip atop the original one and paralleling all but one pin of each chip. The difficulty is soldering 24 hair-thin pins, spaced about a millimeter apart. To do that, you'll need a high power magnifier, preferably the kind worn on your head to leave hands free. You'll also need a good soldering pencil with a very thin tip. Two 100-k resistors, a SPDT switch of some sort and some fine hookup wire, preferably a bit of Radio Shack's #278-776, will be required, as well as the Service Manual for your scanner.

First locate the memory chip in your scanner, and de-solder Pin 18. When its solder has melted, gently pry Pin 18 up from the circuit board with a sewing needle so that it floats free and does not touch anything. Then position a new SRAM chip on top of the old one so that the pins all line up. You might have to bend the pins of the new chip down so they contact the pins of the stock chip. Tack solder Pin 12 of the new chip to Pin 12 of the old chip. Tack solder pin 24 of the new chip to pin 24 of the old chip. These two connections will hold the chip solidly in place so that you can then tack solder the remaining pins, pin for pin, except for Pin 18 of each chip. Do not allow anything to touch Pins 18. These pins must be isolated from each other and from everything else. Otherwise, the remaining 21 pins of the new chip should be soldered to the pins of the stock chip so they match up, pin for pin. By the way, Pin 18 of this SRAM chip is known as the Chip Select (CS) or Chip Enable (CE). The chip is selected for active status when Pin 18

is low or 0-volts, and it goes inactive at +5v. Our SPDT switching scheme will perform that necessary logic.

Refer to Figure 1, the Wiring Diagram, and install the SPDT switch in a location of choice, but preferably close to the Logic/CPU area of the scanner. Solder a thin hookup wire (A) to the now empty PCB pad where Pin 18 of the stock SRAM chip had been located. Solder the other end of Wire (A) to the center lug of the SPDT switch. Prepare two more hookup wires (B) & (C) of about the same length. Strip 1/4" from the end of each wire. Tightly wrap the stripped end of one wire (B) around one lead of a new 100-k resistor. Push the wrapped hookup wire tightly up to the body of the resistor and solder in place. Snip off all but 1/4" of that end of the resistor lead. Now prepare the remaining Wire (C) & 100-k resistor in an identical manner.

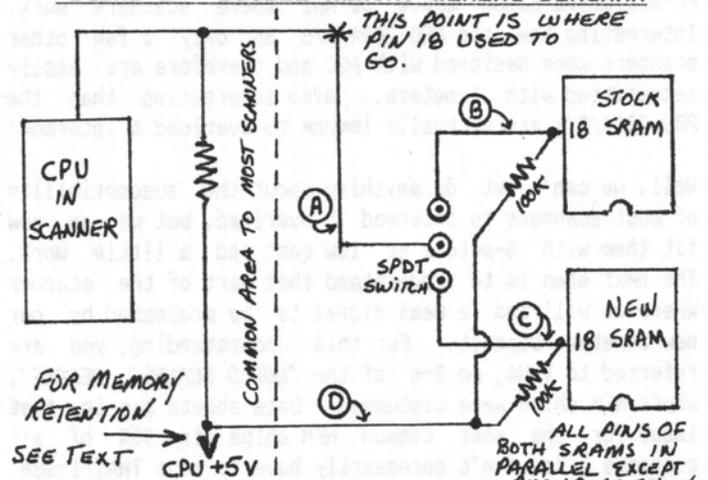
Twist together and solder the free ends of the two 100-k resistors and snip all but about 1/8" of that dual resistor lead. Solder a length of thin hookup Wire (D) to that dual resistor lead. Now solder the resistor end with wire (B) to the free floating Pin 18 of the stock SRAM chip. Solder the resistor end with Wire (C) to the free floating Pin 18 of the new SRAM chip. Solder the loose end of Wire (B) to one end lug of the SPDT switch. Solder the loose end of Wire (C) to the other end lug of the SPDT Switch. Now solder the free end of Wire (D) to a source of CPU/MEMORY +5v in the scanner. NOTE: This must be a +5v source that's never disrupted, regardless if the scanner is ON or OFF or even disconnected from power! This is identified for the following scanners:

PRO-2004:	CN-504, Pin 2
PRO-2005/6:	CN-3, Pin 10
PRO-32:	Cathode of D-27
PRO-34:	Cathode of D-3
PRO-2021:	Output of IC-10 at C-140
PRO-2022:	Cathode of D-35
BC-760/950XLT & R-1600:	Cathode of D-2 or D-3
BC-590/600XLT:	Unknown at this time

This method of memory expansion doubles the number of stock programmable memory channels. It's like having two identical scanners side by side except that only one at a time can be used. One position of the switch yields the stock Block of channels while the other position yields a second, different Block of the same number. You can flip between the two Blocks at whim and fancy, any time.

Liabilities are few. The biggest one is that you could have 8x that many channels for only a little more work and expense, but maybe this mod is a good one on which to sharpen your teeth. There could be problems with lengthy wires between the SRAM chips and the switch which can pick up noise & spikes, so keep those wires short. If peculiarities arise in operation, then solder a 0.01-uF disk cap from each Pin 18 to ground. Also solder a 0.01 cap to ground from the PCB solder pad where stock Pin 18 used to reside. *I can supply 2k x 8 SRAMS for US\$7.50 ppd, if you can't find one somewhere else. ED/WSR.*

FIGURE 1: DOUBLE MEMORY WIRING DIAGRAM



AT LAST! AN S-METER FOR MOST ALL SCANNERS

Something old; something new. S-meters are about as old as the hills. S-meters for scanners are fairly new, but S-meters for just any ol' scanner are brand new! Eureka! I made it happen and I'm quite proud of and pleased with myself (pat pat pat). Now to share the fruits of my labor FIRST WITH YOU as a way to THANK YOU for your support.

First, a little S-meter theory so you can grip what we're about to do. An S-meter provides a visual indication of the relative strength of incoming signals. An S-meter operates from a special signal that's derived from the incoming signals and which is processed to give about 0-volts on no signal to maybe 1-volt or more on extremely strong signals. I call it a relative indication, because looking at an S-meter is just like looking at a scale of miles on a map. The distance between two cities on a map might be a couple of inches, but the scale of miles puts things into perspective. An S-meter does exactly the same thing. So why don't all radios come with S-meters?

If it were easy to do, most mfgs probably would include an S-meter with their scanners, but the biggest reason they haven't is COST. Unlike ham, CB & SW receivers, scanners don't have some of the circuitry that makes it easy to tack on an S-meter. That special circuit is called AGC or Automatic Gain Control. Scanner's don't require AGC like other receivers because of the unique characteristics of FM. In the case of FM, there is a circuit to amplify all incoming signals to the utmost maximum such that the weakest signals and the strongest ones all are processed into audio at about the same strength. Just prior to audio processing, FM signals are amplified to the hilt and then passed through a "Limiter" to strip off noise and hash which is so characteristic of the CB, ham and SW bands. This is why FM signals are rarely, if ever, noisy. But it is also why S-meters can't work in most scanners. Down at the end of the receiver string where things count, all signals get amplified to the same level. The peculiar thing is that all receivers can benefit from AGC but most manufacturers don't design it into scanners. AGC reduces or minimizes intermod and overload, but it isn't as essential in the

FM-exclusive bands above 30 MHz where scanners work. Interesting how the PRO-2004/5/6 and only a few other scanners were designed with AGC and therefore are easily retrofitted with S-meters. Also interesting that the PRO-2004/5/6 are virtually immune to overload & intermod!

Well, we can't yet do anything about the susceptibility of most scanners to intermod & overload, but we can now fit them with S-meters at low cost and a little work. The next step is to understand that part of the scanner where we will tap a weak signal to be processed by our new S-meter circuit. For this understanding, you are referred to V1N4, pp 3-6 of the "WORLD SCANNER REPORT", where NFM chips were discussed. Data sheets are in that issue for the most common NFM chips in 95% of all scanners. You don't necessarily have to have THAT issue, but it will help you locate and understand your NFM chip now. We have to avoid needless repetition.

It's that NFM chip which does so much, working for and against us. For example, it's what super-amplifies signals to maximum gain and makes it tough to put in an S-Meter. Fortunately, that chip has a pin where we can access signals before they're amplified and fed to the Limiter. NFM chips can include any of the below, although they're all pretty much the same except for pin count:

TK-10420 TK-10421M-2 MC3357 MC3359 MC3361

By now, you should be finding the NFM chip in your scanner. It will be characterized by the presence of a 455 KHz IF filter at or near Pins 3 & 5. In fact, the chip's output to the 455 KHz IF filter will pretty much always be Pin 3 and the filter will feed the signal back into Pin 5. There may be exceptions to this, (See Note B in Figure 4). Now, locate the output of the 455 KHz IF filter and trace it back to the NFM chip, probably Pin 5. That's where we'll tap the scanner's weak IF signal and process it with our add-on circuit for S-Metering. At this point, the signal has been filtered and cleaned of adjacent signals and wide band noise, and except for lack of strength it's eminently suited for S-metering. The circuit in Figure 4 does the necessary amplification to drive either an analog S-Meter or an LED S-Meter, your choice. For the inside scoop on these two types of S-Meters, please see MOD-25 and MOD-26 in Vol-2 of my SCANNER MOD HANDBOOK.

Now examine your scanner for how to do the job. Decide whether to have an analog S-meter or an LED version; decide on whether to mount it inside or outside the scanner. If your scanner is a handheld, relax: you can put this new mod to work, too. It's just that everything will probably have to be put into a metal box external to the unit. That's how I developed this mod for my PRO-34, in which case, nothing had to be done to the scanner other than to install a 1/8" stereo phone jack and wire one lug to Pin 5 of the NFM chip; another lug to DC POWER at the VOL control, and the ground lug of the jack to scanner ground. Except for the 3 connections, this S-Meter mod is self-contained and independent of the

scanner. The scanner won't need a radical modification. So find a source of +8 to +13 volts in your scanner, usually on the switch part of the Volume Control; find Pin 5 of the NFM chip, or the pin that gets the signal from the 455 KHz IF filter; and find scanner ground! Everything else is independent of the scanner, even if you choose internal installation.

BUILD THE CIRCUIT on perfboard according to Figures 2, 3 & 4. Layout is not overly critical, but don't stray too far from that shown. Make the board as small as possible and unless yours is a handheld scanner, the board should be installed in the scanner as close to the NFM chip's Pin 5 as possible, even if your actual S-Meter is going to be outside the scanner. The reason for this is that the weak 455 KHz IF signal that has to be tapped for the board can be a source for noise pickup and needless radiation to interfere with other things. If a handheld scanner, well, mount the jack as close to the NFM chip as possible and use a very short hookup wire from Pin 5 to a lug of a stereo jack. From the jack on out to the board and meter, you should use a short length of mini-coax cable such as RG-177 to carry the 455 KHz signal to the board. The shield of the coax will be the ground conductor and a third unshielded wire can be ran along with the coax for DC power to the board. For base scanners and external meters, the board should still be installed inside the scanner as close to the NFM chip as possible and only two wires need exit the scanner: ground and S-meter signal. Coax not necessary.

EXPLANATION & ADJUSTMENT OF THE S-METER CIRCUIT

C-1 taps a sample of the low-level 455-KHz IF signal into U-1, a high gain block amplifier. VR-1 sets the desired gain of U-1. The highly amplified signal goes out of U-1 Pin 8 and is fed to Q-1 to amplify the signal a little more and to isolate the S-meter circuit from U-1. D-1, D-2, R-6 & C-7 rectify the amplified 455 KHz AC into a DC signal of proportional strength. That DC signal is then fed to an analog S-meter for relative indications of incoming RF signals, or it can be fed to an LED S-meter for the same results. Depending on the Block gain set by VR-1, the DC output from D-2 will be about 0-volts when no signals come in and can be as high as 4 volts+ when exceptionally strong signals are received. VR-1 should be set so that the DC output from D-2 with no RF signals coming in is less than 0.2 volts, or so that the S-Meter reads nearly zero. Then, the scanner should be set to receive a very strong signal; nearby handtalkies or even cordless phones can be used for this purpose. VR-2 is then adjusted so that the S-meter reads at its maximum point. If an LED S-Meter is used, follow the adjustment instructions given for MOD-26 in my SMH, Vol-2.

NOTES FOR LED S-METERS: It might not be possible to get a pure zero S-reading with this circuit. It's not a big deal for analog S-meters which won't exaggerate slightly above zero levels. In the case of my LED S-Meter MOD-26, the first LED might remain ON all the time, even with the antenna disconnected. There is a solution: modify the

LED S-Meter to add a ZERO ADJUST. See VR-3 in the diagram of MOD-26b on page 119 of my SMH, Vol-2. Add a 10-k trim pot to MOD-26a with one end lug to ground, the other end lug to +5v and the middle lug to Pin 4 of the LM-3914 chip. (Don't ground Pin 4 as shown in the diagram on pg-109!) Adjust the new trimmer so that the first LED just goes off with no RF signals coming in. Then simulate a strong signal with a nearby handtalkie or cordless phone and adjust the Hi-Cal trimmer so that the 10th LED lites.

NOTE FOR ALL S-METERS, LED OR ANALOG: VR-1 of the Generic S-Meter Circuit might be very touchy to get set exactly right, depending on whether the S-meter is analog or an LED type. Some experimenting may be needed to get it right. Basically, you want U-1 to have plenty of gain but not so much that the S-Meter can't read nearly zero with no signals coming in. Think of VR-1 as a ZERO ADJUST instead of a gain adjust. VR-2 on either the analog S-meter or the LED S-Meter board serves as a full-scale adjustment. So the general idea is to make adjustments for BOTH zero and maximum signals. In that manner, your new S-Meter will be calibrated for the extremes of signals and all others will fall in between.

TABLE 1: GENERIC S-METER PARTS LIST

Sym	Description	RADIO SHK #
C1-6	Capacitor, 0.1-uF	272-109
C7	Capacitor, 0.01-uF	272-1065
C8	Capacitor, 22-uF/16v	272-1437
R1	Resistor, 4.7-k @ .25-watt	271-1330
R2a 1	Resistor, 1-k @ .25-watt	271-1321
R2b 1	Resistor, 330-ohm @ .25-watt	271-1315
R3	Resistor, 1-Meg @ .25-watt	271-1356
R4	Resistor, 1-k @ .25-watt	271-1321
R5	Resistor, 2.2-k @ .25-watt	271-1325
R6a 2	Resistor, 47-k @ .25-watt	271-1342
R6b 2	Resistor, 10-k @ .25-watt	271-1335
R7	Resistor, 2.2-k @ .25-watt	271-1325
D1,2	Diode, germanium; 1N34A	276-1123
VR1	Variable resistor, trimmer, 10-k	272-282
U1 3	IC; MC-1350P or ECG/NTE-746	non-Radio Shack
Q1	JFET, N-channel, MPF-102	276-2062
Misc	Hookup wire, solder, mounting hdwe	Various

Optional, depending on need

VR-2	Variable resistor, trimmer, 10-k	272-282
M1a	Analog S-meter; salvaged from old CB radio or purchased from repair parts department of various radio mfgs. See MOD-25 in SMH, Vol-1	
M1d	LED S-meter; see MOD-26, SMH, Vol-2	
Misc	Jacks or connectors to connect external S-meter to scanner; stereo phone jack required for handheld scanners.	Various

NOTES:

- 1 R-2 should be 1.3-k, but R/S doesn't carry it.
- 2 R-6 should be 56-k, but R/S doesn't carry it.
- 3 U-1 can also be an MC-1590G, but the pinout differs from the MC-1350. See Figure 4.

FIGURE 2: GENERIC S-METER BOARD PARTS LAYOUT

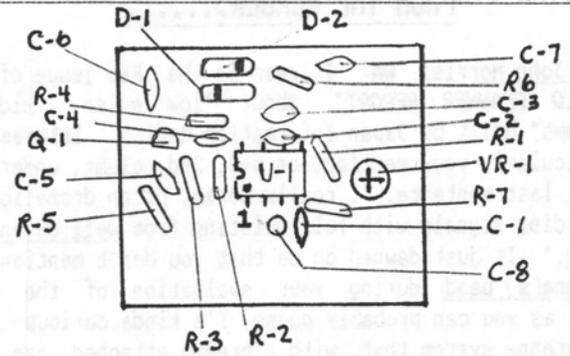
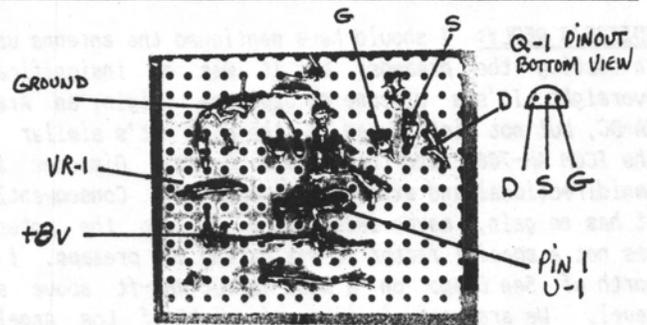


FIGURE 3: GENERIC S-METER BOARD WIRING SIDE



GENERIC S-METER CONCLUSION & SUMMARY: This S-meter is not limited to scanners! It is adaptable to any kind of radio: CB, ham, shortwave, AM/FM, 49 MHz handheld, land-mobile, satellite, etc. The MC-1350P chip is good for RF up to 50-90 MHz, so there could be other uses for this circuit besides S-metering! The chip is versatile and so is the circuit. Use your imagination!

YOU readers of the "WSR" are the first to learn of this important new modification. The Generic S-Meter is in its first stage of design and prototype evaluation. While I didn't run into any bugs or unusual difficulties developing it on a PRO-34, certain peculiarities could arise in other radios. I want your feedback and notes of problems & improvements. My guess is that this circuit can be improved, but as given here, it works great.

It's impossible for me to give out specific installation instructions for specific scanners and other radios. But if you run into trouble with this project, AND if you have the Service Manual for the radio, I am available to render written assistance to steer you back on the narrow and righteous path to success. All I ask is that you include with your request a SASE, one loose extra stamp and a copy of the Service Manual, if I don't have one.

PRO-2004/5/6 OWNERS, PLEASE NOTE that this circuit is not for your scanner! Aw, it would work ok, but why do it when my MODs 25 & 26 are tried, proven and easier? In other words, there's not much sense in doing this S-meter on the PRO-2004/5/6 because I've already developed great S-meters for them. The Generic S-Meter is for all other scanners & radios for which an S-Meter circuit has not been concocted. But if you feel like playing, the circuit given here will work for the PRO-2004/5/6, too.

FROM THE READERS.....

From John Morris; WA: I read in the Feb issue of the "WORLD SCANNER REPORT" about "low noise, wideband preamps" built by Japan Information Medium. Interesting. Particularly your mention, on p-3, 2nd column, under JIM M-75, last sentence, "...really works, often dramatically, providing signals with full quieting from well beyond 100 miles." It just dawned on me that you don't mention the antenna(s) used during your evaluation of the M-75. Well, as you can probably guess, I'm kinda curious about an antenna system that, with a preamp attached, can pick up signals well beyond 100 miles. What is it? /JM

EDITOR'S REPLY: I should have mentioned the antenna used in testing the preamps, but it was an insignificant oversight. It's a discone of Japanese origin, an Araki YA-DC, but not distributed in the USA. It's similar to the ICOM AH-7000 and the Diamond D-130J. Discones are omnidirectional and extremely widebanded. Consequently, it has no gain, maybe less than 0 dB. So, the antenna was not a special factor in evaluating the preamps. I am north of San Diego on a mesa about 480-ft above sea level. We are not in line of sight of Los Angeles (140-mi), but the land path is maybe 15-mi before encountering sea path the rest of the way. I routinely pick up LA's VHF/UHF public service repeaters. The preamps dig in and catch some of the ground units and lots of cell sites, trunk sites and even low powered mobiles. My location may be a special factor but even so, the preamp still digs things out of the noise with full quieting that can't be heard at all without it. I also pick up nice clean 1296 MHz signals with the preamps that can't be detected even with the squelch turned down! Another special factor is that I use high quality, low loss coaxial cable. This alone can make a difference! Nice to hear from you, John! 73/BC

From Larry McDermott, CA: I understand that ACE Communications is dropping their AR-2500 and coming out with a new model very soon called the AR-2800. It is supposed to be free of the many bugs in the 2500. It is to have much better side band reception. I hear they are dropping the built-in RS-232 port to keep the price down. Maybe you can find out more about this new unit and report on it in one of your articles. My AR-950s work fine. Maybe it is just as well that I waited a while before buying an AR-2500. Thank you/LM

EDITOR'S REPLY: I haven't heard about an AR-2800. ACE ignores me like the plague, it seems. I have sent them numerous inquiries, requests for information, etc, but rarely a reply and never a personal one. I wonder if it's because I tend to tell it like it is and maybe they are afraid of what I might have to tell? I dunno.... I have heard something about a new ACE GaAsFET, low-noise wideband preamp that will actually work! I'd say their scanners have room for improvement and if that's what they're doing, more power to them! I'm with you that some things are worth the wait. 73/BC

TERRY HARN ON THE ICOM R-1

I'd like to share with your readers the discovery I made recently about a hot new scanner, the ICOM R-1. Imagine if you will, a receiver that covers 100 KHz - 1300 MHz with no gaps. There are 10 Search Banks and 100 Memory Channels. The R-1 SEARCHes in steps of .5,5,8,10,12.5, 15,20,25,30 & 50 KHz. At the press of a button it can also jump in steps of .1, 1, 10 or 100 MHz. Yes, MHz!

The R-1 covers AM, NFM and WFM modes, selectable at the touch of a button. There is a manual tuning knob used in SEARCH and SCAN and in selecting its many features:

- + LCD signal strength meter.
- + RX light; can be de-activated if desired.
- + Volume controlled confirmation beeps; de-selectable.
- + Monitor button to momentarily remove the squelch.
- + LCD Display Contrast control for better angle viewing.
- + 24-hour clock w/sleep timers in 20, 40 or 60 min
- + Wake Up Alarm; 5 beeps, then plays last active freq
- + Back lit display; on-off button, or auto off after 5-sec from last keyboard entry.
- + Speeds of 10 or 20 channels per second.
- + 2 Freq Lockouts; skip or mask; mask hides the memory freq from all scanning methods, skip is not so harsh.
- + 3 Scans: Select Scan scans high/low limits except "skips"; Program Scan scans all freqs in memory; Mode Scan scans by mode (AM, FM or WFM).
- + Scan Limit; selectable for High / Low limits.
- + Search & Store memory feature.
- + Search Freq Skip; no lock up on known birdies, etc.

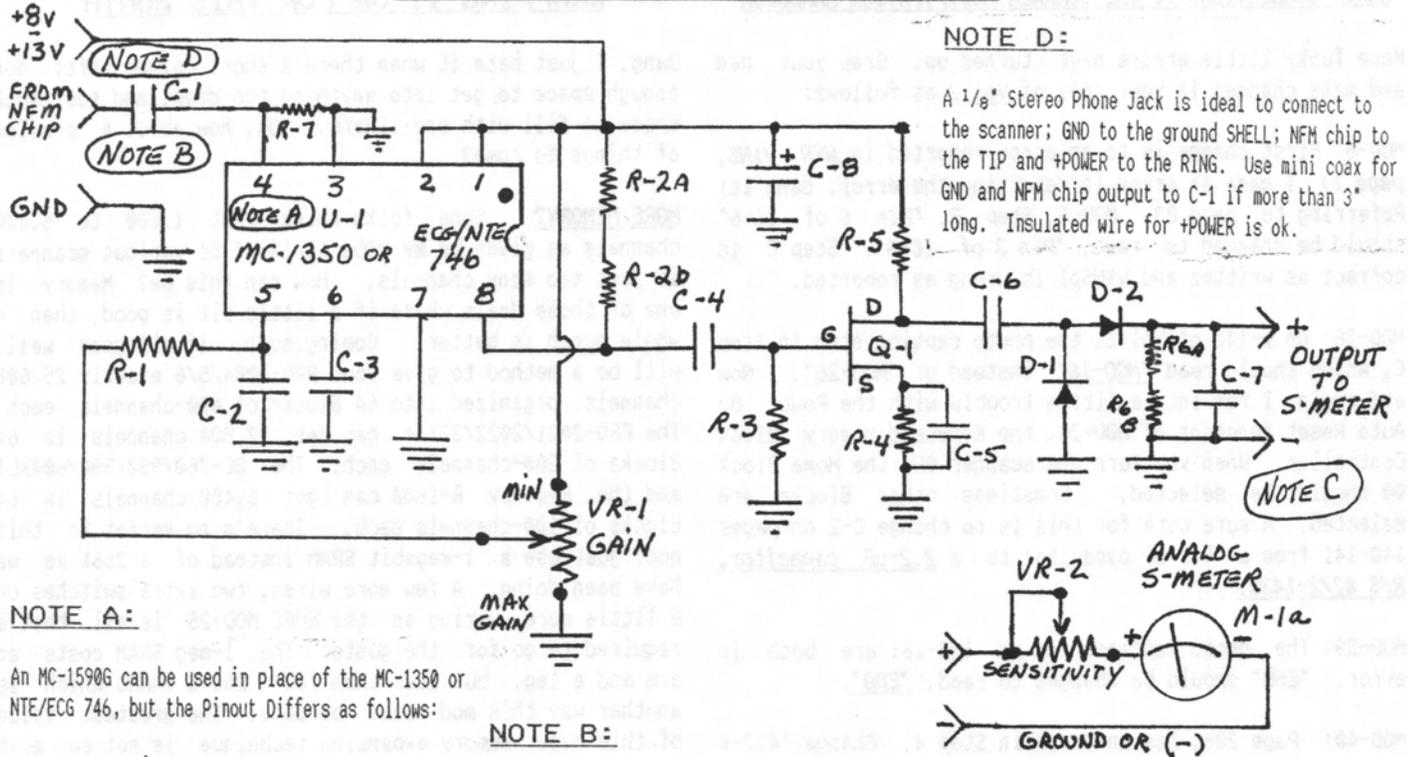
The ICOM R-1 fits in a shirt pocket, and weighs 9.9 oz including the built in rechargeable batteries. Input voltage is very flexible, accepting from 6 to 16 volts DC with 13.8v required for recharge. External batteries that clip on other ICOM handhelds just snap on the R-1, too.

Sensitivity is good, although LF & MF can be tough to get especially 560 - 1600 KHz, but a different antenna than the one supplied from the factory helps a lot. I use a telescoping whip from Radio Shack. The R-1 has a BNC connector, so changing antennas is a snap, literally.

Audio is excellent considering size. In fact all of the R-1 is surprising for the size. Imagine going from a talk show on 710 AM to Radio Havana to police, fire and ambulance to music FM to TV Ch-4 News to cordless and cellular phones to boats to taxi cabs to military traffic in minutes with one radio that can be hidden under your hat. Imagine the applications for "Surviva-Comm"; its flexible power requirements making it ideal. Too bad you can't buy the ICOM R-1 in the United States. /Terry Harn

EDITOR'S REPLY: At first, I wasn't going to run your review because the R-1 isn't available in the USA. But then I got to thinking...why not? None of us know why the R-1 isn't available, and apparently ICOM won't say. Perhaps ICOM will say something in the media if enough readers and Hobbyists ask about the R-1. 73/bc

FIGURE 4: GENERIC S-METER SCHEMATIC/WIRING DIAGRAM



NOTE D:

A 1/8" Stereo Phone Jack is ideal to connect to the scanner; GND to the ground SHELL; NFM chip to the TIP and +POWER to the RING. Use mini coax for GND and NFM chip output to C-1 if more than 3' long. Insulated wire for +POWER is ok.

NOTE A:

An MC-1590G can be used in place of the MC-1350 or NTE/ECG 746, but the Pinout Differs as follows:

ECG/NTE-746 MC-1350 Pin #	MC-1350G Pin #
1	6
2	7
3	4 & 8
4	3
5	2
6	1
7	4 & 8
8	5

NOTE B:

Take an I.F. filtered signal from the NFM chip in any scanner. The proper pins are given as a guide below for various types of NFM Chips:

NFM Chip Type	Tap this pin
TK-10420	5
MC-3359P	5
MC-3357P	5
MC-3361P	5
TK-10421-M	6
NJM-3359D	5

NOTE C:

An LED S-Meter can also be used. See MOD-26a in Vol-2 of my SCANNER MODIFICATION HANDBOOK, except remove the ground from Pin 4 of the LM-3914 chip and connect a "Zero Adjust" trim pot as follows: one end of the 10-k pot to +5v; other end of the trim pot to ground; middle lug of trim pot to Pin 4. See MOD-26b for reference.

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			hobby info & personal reply! Business inquiries exempt.	

More funky little errors have turned up. Grab your pen and make changes in your copy of Vol-2 as follows:

MOD-5: First change is to an error reported in WSR V1N5, page 1: I made an error in reporting the error, dang it! Referring to page 83, MOD-5, Step B, "Pin 6 of IC-6" should be changed to read, "Pin 3 of IC-6". Step C is correct as written and V1N5p1 is wrong as reported.

MOD-28: On p-142 of Vol-2, the photo caption errs in item C, which should read "MOD-16" instead of "MOD-26". Now and again, I run into a little trouble with the Power On Auto Reset function of MOD-28, the KeyBoard Memory Block Controller. When you turn the scanner ON, the Home Block 00 should be selected. Sometimes other Blocks are selected. A sure cure for this is to change C-2 on pages 140-141 from a 0.1-uF capacitor to a 2.2-uF capacitor, R/S #272-1435.

MOD-29: The photo captions on pp 160-161 are both in error. "EMB" should be changed to read, "EDB".

MOD-40: Page 206, has an error in Step 4. Change "4.7-k resistor" to read "10-k resistor". While you're at it, add "R-215" by where it says, "leadless resistor". Then, add to the end of the sentence in Step 3, "where R-215 connects to Pin 40 of the CPU". Then, back to Step 4, add just after "K-1013", (IC-206, Pin 8).

MOD-43: Next, turn to page 79 of Vol-2 and see the photo, Label C, reported as MOD-43. You won't find MOD-43 in the book because the Publisher wouldn't print it, but the photo correctly shows the position of the SCA Board, MOD-43. Some people hunted through the book, inside and out looking for MOD-43. It ain't there, but see V1N1 of the WSR for all pertinent details.

Apologies for any inconvenience caused by these goofs.

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Dang, I just hate it when there a short column left; not enough space to get into anything too deep, and too much space to fill with one-liners. Ok, how about a preview of things to come?

MORE MEMORY? Some folks think that 1,600 to 6,400 channels as given by my MODs 16/19/37 to various scanners is just too many channels. How can this be? Memory is one of those deals where if a little bit is good, then a whole bunch is better. Coming soon, if all goes well, will be a method to give your PRO-2004/5/6 exactly 25,600 channels, organized into 64 Blocks of 400-channels each. The PRO-2021/2022/32/34 can get 12,800 channels in 64 Blocks of 200-channels each. The BC-760/950/590/600XLT and the Regency R-1600 can get 6,400 channels in 64 Blocks of 100-channels each. There's no secret to this mod; just use a 1-megabit SRAM instead of a 256k as we have been doing. A few more wires, two extra switches or a little more wiring on the KMBC MOD-28 is all that's required to go for the gusto! The 1-meg SRAM costs an arm and a leg, but less than four 256-k SRAMS which is another way this mod could be done. The greatest value of this huge memory expansion technique is not so much the number of channels; rather, the number of Blocks, which permit different configurations & scanning programs so that you can have more choices of what to scan and search for on any occasion.

COMPUTER INTERFACING? Imagine punching in a few thousand freqs by hand! I've done it, but it ain't much fun. We're still working on an RS-232 interface that can be used by most any computer with a serial port. Lots of problems yet to overcome, but we're making progress. The problems have more to do with making one universal design for ASCII transfers than making a given computer program the scanner. We've done that much, but an Apple-specific circuit won't help most of you. Sure could use some hardware design help if anyone's capable. 73/bc

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THE LATEST GOSSIP IS.....

.....that the replacement for the PRO-34 will be the PRO-37. Some say it is already being sold in Canada, and it is said to be identical to the PRO-34 except for slightly faster SCAN & SEARCH speeds. Supposedly, it looks like the PRO-34, feels like the PRO-34, acts like the PRO-34, but is a PRO-37 with a price considerably less than the PRO-34. The PRO-34 have been on sale several times this last year so apparently we've seen the last of it. Radio Shack's new 1992 Catalog will tell all, and will be available sometime this month.

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