

GBPPR 'Zine



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"Not for the first time, the Vatican had been economical with the truth. [Mehmet Ali] Agca had confirmed what Luigi Poggi had been told by the Mossad. The plot to kill the pope had been nurtured in Tehran. The knowledge would color John Paul's attitude toward both Islam and Israel. Increasingly, he told his staff that the real coming conflict in the world was not going to be between the East and West, the United States and Russia, but between Islamic fundamentalism and Christianity. In public, he was careful to separate Islam, the faith, and Islamic fundamentalism."

--- Excerpt from *Gideon's Spies* by Gordon Thomas about the 1981 assassination attempt on Pope John Paul II.

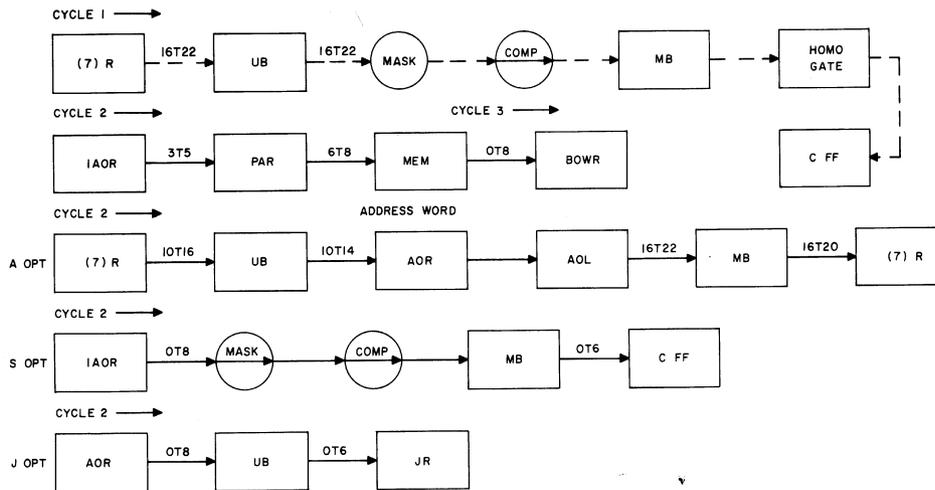
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8.61 TRP(00060), TRM(00065), TRAZ(00064 2), TRAU(00061 2), TRLZ(00064), TRLU(00061), TRLE(00065 2), TRGE(00060 2)—Transfer if Condition of One of Seven Registers is P, M, AZ, AU, LZ, LU, LE, or GE: The C control flip-flops are set to correspond to the contents, possibly PL masked, of the register specified in the R subfield. If the conditions indicated in the operation code are satisfied, program control is transferred to another instruction. In the case of a direct transfer, specified by an empty M subfield, the address of this instruction is the resultant DAR address. In the case of an indirect transfer, specified by an M in the M subfield, the address of the instruction is contained in a location specified by the resultant DAR address. Bits 0 through 19 of this location contain the address of the instruction to which control is transferred.



Options:

RM

LCJ

I(0V000;V=Index Reg No.)
 A(20000)
 S(20000 1)
 M(00002)

PL(00010)
 J(10000)

Note: If both the J option and the A option are specified, the return address placed in J is incremented by 1 if J is equal to I.

G. Combined Shift and Rotate Operations

8.62 The operation code of instructions in this category begins with either the letter H or Q. These letters mean that immediately after the indexing of the instruction, the contents of the KR will either be shifted (H) or rotated (Q) before performing the move, add, subtract, compare, or logical

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operation specified by the latter part of the operation code. There are two types of shift and rotate combinations: standard and special.

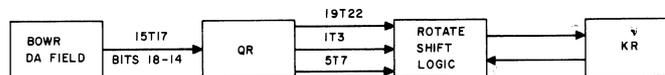
Standard Shift and Rotate Combinations

8.63 The variable field of these instructions consists of four subfields: HQ, A, R, and LCJ. The address of location M is determined according to the contents of the A field. After possible indexing, the contents of the KR are shifted or rotated according to the first letter (H or Q) of the instruction and the contents of the HQ subfield.

8.64 If the first letter of the operation code is H, the contents of the KR are shifted the number of places specified by the contents of the HQ subfield. A positive number specifies a shift to the left; a negative number specifies a shift to the right. Bits shifted past position 0 or 22 of the KR are lost. Positions made vacant are filled with zeros. If the first letter of the operation code is Q, the contents of the KR are rotated the number of places determined by the contents of HQ subfield. A positive number specifies a rotation to the left by the number of places given. A negative number specifies a rotation to the left by the number of places determined by the sum of 23 and the negative number. The result of the latter rotation is the same as if a negative number caused a rotation to the right by its absolute value. Bits rotated past position 22 of the KR enter the opposite end. Numbers whose absolute value is 23 through 31 must not be used.

8.65 The A subfield of the DA field can be blank or can specify an assigned number of the absolute value not greater than 16,383 (that is, a number of 15 bits including the sign in bit 20). This is the effective DA number which becomes the resultant DAR address after possible indexing.

8.66 The remainder of the instruction is executed according to the general purpose instruction specified by the letters following the H or Q of the operation code. The flow for the shift and rotate portion of the instructions is shown below. This diagram applies to all standard shift and rotate instructions. For the complete flow diagram, add the one below to the diagram for the instruction without shifting or rotating.



8.67 *HBM(20142 1), QBM(20142)*

Options: RM

I(0V000;V = Index Reg No.)

8.68 *HLM(20140 1), QLM(20140)*

Options: RM LCJ

I(0V000;V=Index Reg No.)

EL(00000 2)
C(10000)

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8.69 *HFM(20150 1), QFM(20150), HJM(20160 1), QJM(20160), HXM(20162 1), QXM(20162), HYM(20170 1), QYM(20170), HZM(20172 1), QZM(20172)*

Options:	RM	LCJ
	I(0V000;V = Index Reg No.)	EL(00000 2) PL(00004 2) C(10000)

8.70 *HMB(20602 1), QMB(20602), HMBCS(20630 1), QMBCS(20630)*

Options:	RM
	I(0V000;V = Index Reg No.)

8.71 *HMC(20610 1), QMC(20610)*

Options:	RM	LCJ
	I(0V000;V = Index Reg No.)	PL(00000 2) C(10000)

8.72 *HMCII(20612 1), QMCII(20612)*

Options:	RM	LCJ
	I(0V000;V = Index Reg No.)	PL(00000 2) C(10000)

Restrictions: Register B must not be used as an index register because it is destroyed on the first execution of either HMCII or QMCII.

8.73 *HML(20720 1), QML(20720)*

Options:	RM	LCJ
	I(0V000;V = Index Reg No.)	C(10000)

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8.74 *HMF(20622 1), QMF(20622), HHJ(20722 1), QMJ(20722), HMX(20710 1), QMX(20710), HMY(20700 1), QMY(20700), HMZ(20730 1), QMZ(20730)*

Options:	RM	LCJ
	I(0V000 ;V = Index Reg No.)	PL(00000 2) C(10000)

8.75 *HAMK(20752 1), QAMK(20752), HSMK(30752 1), QSMK(30752), HPMK(20642 1), QPMK(20642), HUMK(20670 1), QUMK(20670), HXMK(20650 1), QXMK(20650)*

Options:	RM	LCJ
	I(0V000 ;V = Index Reg No.)	PL(00000 2) *C(10000)

*For HSMK and QSMK, the C option has the octal representation of 00000.

Restrictions: The following instruction must not

- (1) Specify K in the R subfield
- (2) Be AKR or SKR.

8.76 *HCMK(20742 1), QCMK(20742), HCMKU(20740 1), QCMKU(20740)*

Options:	RM	LCJ
	I(0V000 ;V = Index Reg No.)	PL(00000 2) C(10000)

Restrictions: The following instruction must not be one of the early transfer instructions: TAULM, TAUMK, TUPMK, TCGMX, TCMMF.

8.77 *HPMX(20712 3), QPMX(20712 2), HMPY(20702 3), QPMY(20702 2), HPMZ(20732 3), QPMZ(20732 2), HUMX(20712 1), QUMX(20712), HUMY(20702 1), QUMY(20702), HUMZ(20732 1), QUMZ(20732)*

Options:	RM	LCJ
	I(0V000 ;V = Index Reg No.)	C(10000)

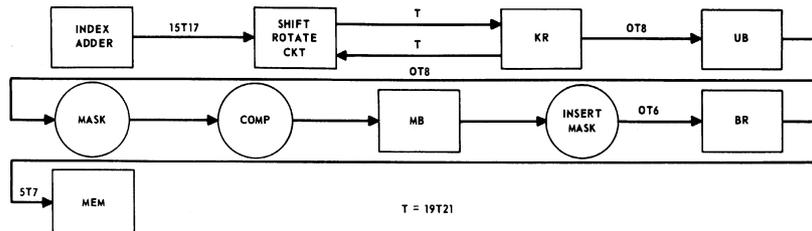
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Special Shift and Rotate Combinations

8.78 In these instructions only a rotation of one place to the left or a shift of one place to the left or right is allowed. No HQ subfield is needed for rotation and for shift instructions; the left or right choice is specified in the operation code. The A subfield is the same as in 8.65.

8.79 HOKM(20152 1): First the resultant DAR number determines the address of location M after which the contents of the KR are shifted to the left one place and bit position 0 is made 0. Then the new contents of the KR, after possible product masking and/or complementing, replace or are insertion masked into the contents of the BR, and the new contents of the BR replace the contents of location M.



Options:

RM

LCJ

I (0V000 ;V = Index Reg No.)

EL(00000 2)

PL(00004 2)

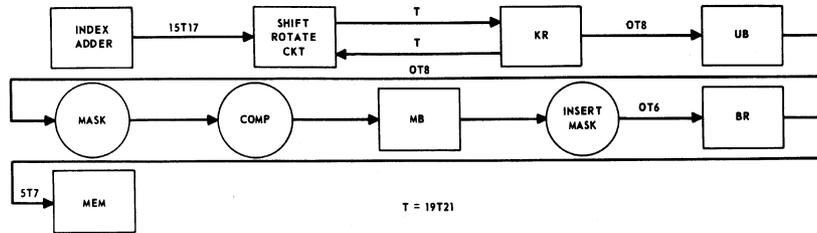
C(10000)

Note: Bit 14 is 1.

8.80 HCOKM(20152 1): First the resultant DAR number determines the address of location M after which the contents of the KR are shifted to the right one place and bit position 22 is made 0. Then the new contents of the KR, after possible product masking and/or complementing, replace or are insertion masked into the contents of the BR, and the new contents of the BR replace the contents of location M.

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Options: RM

I(0V000 ;V = Index Reg No.)

Note: Bits 19 and 14 are 1.

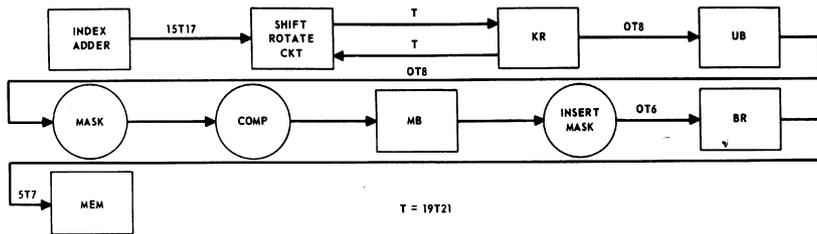
LCJ

EL(00000 2)

PL(00004 2)

C(10000)

8.81 QOKM(20152): First the resultant DAR number determines the address of location M after which the contents of the KR are rotated to the left one place. Then the new contents of the KR, after possible product masking and/or complementing, replace or are insertion masked into the contents of the BR, and the new contents of the BR replace the contents of location M.



Options: RM

I(0V000 ;V = Index Reg No.)

Note: Bits 19 and 14 are 1.

LCJ

EL(00000 2)

PL(00004 2)

C(10000)

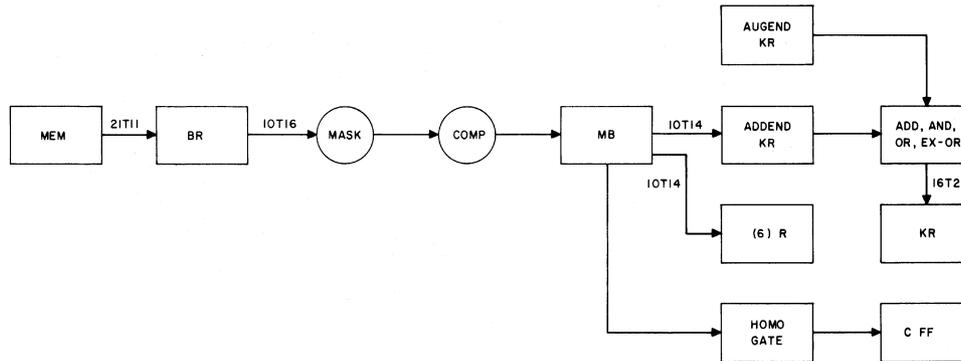
H. Double Destination Operations

8.82 MFMK(20622), MJMK(20722), MLMK(20720), MXMK(20710), MYMK(20700), MZMK(20730)—The contents of location M replace the contents of the B register and, after possible product masking and/or complementing, set the C control flip-flops and replace the contents of both the K register and register F, J, L, X, Y or Z, whichever is specified in the operation code. The effective DA number can

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be blank or can specify a signed number of absolute value not greater than octal 37777 (that is, a number of 15 bits including the sign bit).



Note: Bits 18 and 17 are 1.

Options: RM

I(0V000 ;V = Index Reg No.)

LCJ

*PL(00000 2)
C(10000)

*If the instruction is MLMK, the PL masking option is not available.

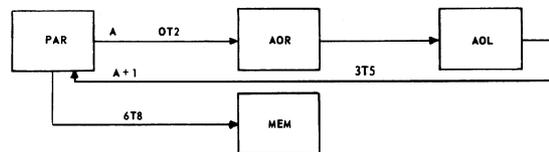
Note: Bits 18 and 17 are 1.

Restrictions: The following instruction must not

- (1) Be AKR or SKR
- (2) Specify K in the R subfield.

I. Miscellaneous Operations

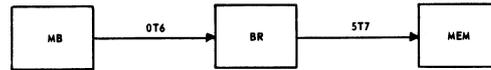
8.83 EE(00000)—NO-OP: This instruction is a blank instruction (all zeros) which consumes one cycle of time without doing anything.



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8.84 EZEM(00042)—Plus zero or if complementing is called for, minus zero replaces or is insertion masked into the contents of the B register. The new contents of B replace the contents of location M.



Options:

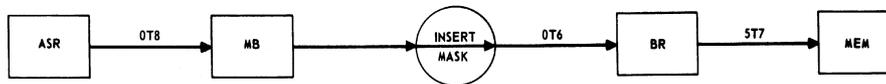
RM

I(0V000;V = Index Reg No.)
 A(20000)
 W(00000 1)
 S(20000 1)

LCJ

EL(00100 2)
 ES(00101)
 C(10000)

8.85 ENAM(00046)—*Next Address to Memory*: The address of the next instruction in sequence replaces the contents of the BR and location M.



Options:

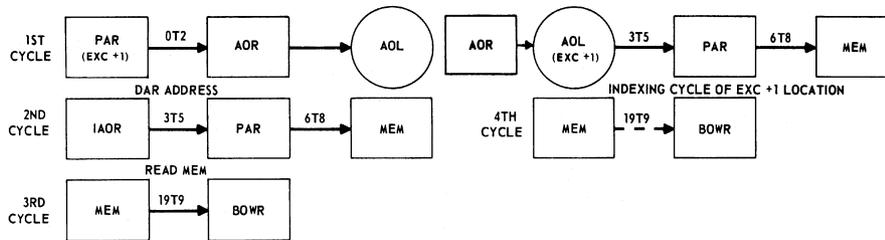
RM

I(0V000;V = Index Reg No.)
 A(20000)
 W(00000 1)
 S(20000 1)

8.86 EXC(00002)—*Execute*: This instruction calls for execution of the PS instruction specified by the resultant DAR address. During execution all interrupts are inhibited. If this execution does not result in a transfer, program control is returned to the instruction following EXC. If the instruction executed does result in a transfer, program control is transferred to the instruction to which the transfer is made. If the instruction executed is a transfer specifying the store return address option J and the transfer occurs, the JR will be set to the address of the instruction following EXC.

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Options: RM

I (0V000 ; V = Index Reg No.)
 A (20000)
 W (00000 1)
 S (20000 1)

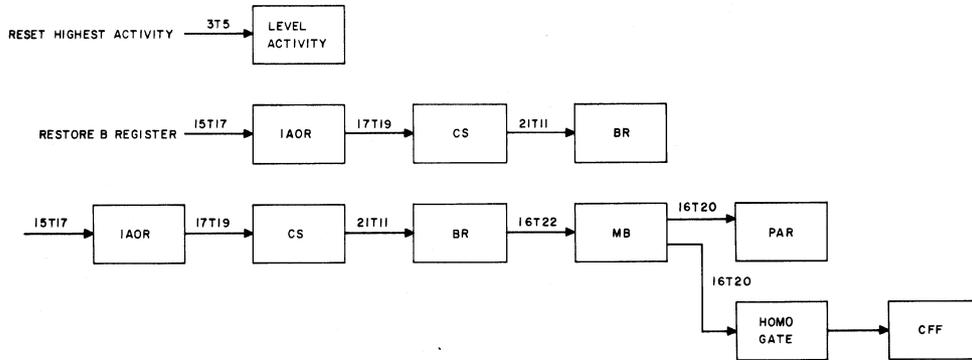
Restrictions: The executed instruction must not be

- (1) ENTJ
- (2) One that changes the register used for indexing the EXC instruction
- (3) MCII, MKII, HMCII, or QMCII
- (4) In the call store.

8.87 EGBN(00560)—Go Back to Normal: A flip-flop in the level activity register is set to 1 upon the occurrence of an interrupt level corresponding to that flip-flop. In addition, before transferring to the appropriate program, the interrupt circuitry stores the contents of the BR, the state of the C control flip-flops, and the interrupted program's return address. This information is stored in two adjacent CS locations. The addresses of these instructions are permanently associated with the particular interrupt level. When the instruction EGBN is executed, the highest level flip-flop that is set to 1 in the level activity register is reset to 0. The sequence circuitry restores the contents of the BR and the C control flip-flops and returns control to the interrupted program's return address.

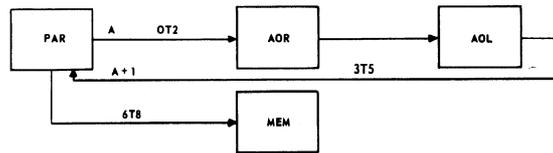
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Restrictions: The preceding instruction cannot be one that extracts information from the PS.

8.88 EEF(00004)—NO-OP: The EEF instruction causes a level A interrupt resulting in a transfer to the interrupt program address associated with level A. The interrupt can be inhibited by a manually operated console switch; in which case, each EEF instruction is executed as a NO-OP (EE). The contents of the DA field has no effect on the execution of the instruction but may be used for debugging purposes by programs which read it as 20-bit data.



INPUT-OUTPUT INSTRUCTIONS

8.89 This class of instructions consists of eight instructions. The first letter of the operation code is M or W. The second letter is A, S, or D and has the following significance:

- A:** Specifies peripheral unit address bus or central pulse distributor (CPD) address bus in certain operations that send information to a peripheral unit.
- S:** Specifies that an address be sent to the scanner via the peripheral unit address bus.
- D:** Specifies that the CPD be used in selecting and enabling peripheral equipment and for high-speed control of certain flip-flops.

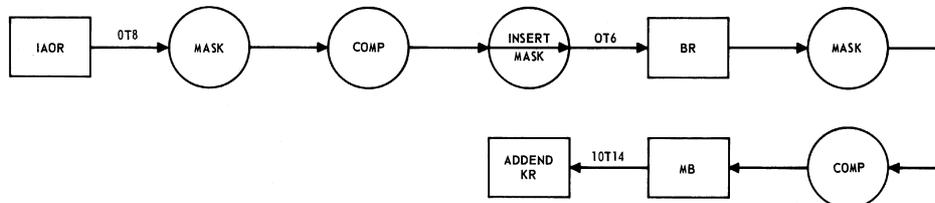
The letter S appearing as the third letter of the operation code means that a reading is expected on the scanner answer bus to the LR from a peripheral unit capable of sending data to the CC. The letter F appearing as the last letter of the operation code means that the enable address is set up in the F

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register and sent out to the CPD on the same instruction. This eliminates the necessity for presetting register F by a previous instruction as must be done on instructions MA, WA, MAS, and WAS.

8.90 WA(00760)—Word to Peripheral Unit Address Bus: The resultant DAR number W replaces the contents of the BR and then, after possible product masking and/or complementing, replaces the contents of the addend KR. Also according to the contents of bits 9, 8, and 7 of the FR, the resultant DAR number is sent either directly or through specified translation circuitry onto the peripheral unit address bus. If bits 9, 8, and 7 are 101, the resultant DAR number is sent directly onto the CPD address bus. Bit configurations are specified in 8.94. This instruction does not affect the C control flip-flops.



Restrictions: On instruction following WA:

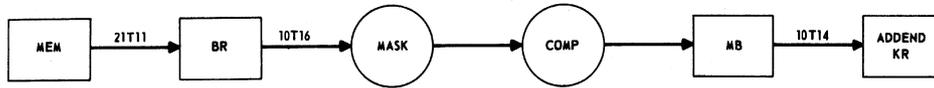
- (1) The following instruction must not be an input-output instruction.
- (2) Refer to K (accumulator) restrictions (8.99 and 8.100).
- (3) Refer to F register restrictions (8.101 and 8.102).
- (4) If bit 6 of F is a 1, refer to Y register restrictions (8.103 and 8.104).

8.91 MA(00360)—Memory to Peripheral Unit Address Bus: The contents of location M, after possible masking and/or complementing, replace the contents of the addend KR. Also according to the contents of bits 9, 8, and 7 of the FR, the same data is sent either directly or through specified translation circuitry onto the peripheral unit address bus. If these bits are 101, the same data is sent directly onto the CPD address bus. Bit configurations are specified in 8.94. This instruction does not affect the C control flip-flops.

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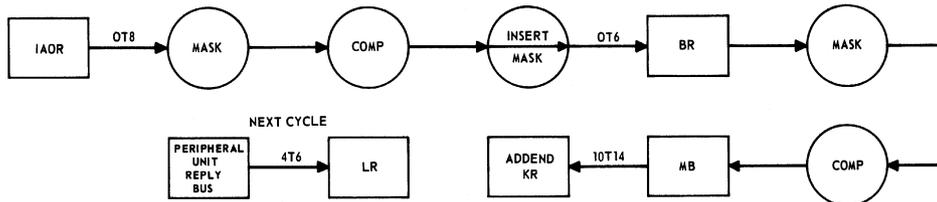
<p>Options: RM</p> <p>I(0V000 ;V = Index Reg No.) A(20000) W(00000 1) S(20000 1)</p>	<p>LCJ</p> <p>PL(00000 2) PS(00001) S(20401) C(10000)</p>
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Restrictions: On instructions following MA:

- (1) The following instruction must not be an input-output instruction.
- (2) Refer to K (accumulator) restrictions (8.99 and 8.100).
- (3) Refer to F register restrictions (8.101 and 8.102).
- (4) If bit 6 of F is a 1, refer to Y register restrictions (8.103 and 8.104).

8.92 WAS(00762)—Word to Peripheral Unit Address Bus and Response from Scanner Answer Bus:

The same CC actions occur in the execution of this instruction as in the execution of the instruction WA. In addition, the contents of the LR are cleared (made all zeros) after which (during a period of time extending beyond the cycle time of this instruction) bits 0 through 15 accept the information of the scanner answer bus from the peripheral unit. If a scanner all-seems-well failure occurs, bit 22 of the LR is set to a 1. The WAS instruction does not affect the C control flip-flops. The bit configurations for WAS are the same as those for WA covered in 8.94.



<p>Options: RM</p> <p>I(0V000 ;V = Index Reg No.)</p>	<p>LCJ</p> <p>PL(00004) PS(00005) C(10000)</p>
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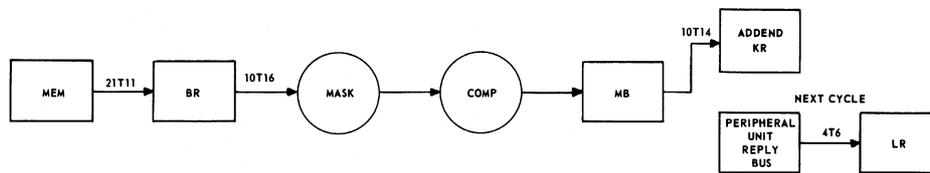
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Restrictions: On instructions following WAS:

- (1) The following instruction must not be an input-output instruction.
- (2) K (accumulator) restrictions (8.99 and 8.100).
- (3) F register restrictions (8.101 and 8.102).
- (4) If bit 6 of FR is a 1, Y restrictions (8.103 and 8.104).
- (5) LR restrictions (8.105 and 8.106).

8.93 MAS(00362)—Memory to Peripheral Unit Address Bus and Response from Scanner Answer

Bus: The same CC actions occur in the execution of this instruction as in the execution of the instruction MA. In addition, the contents of the LR are cleared (made all zeros) after which (during a period of time extending beyond the cycle time of this instruction) bits 0 through 15 accept the information of the scanner answer bus from the peripheral unit. If a scanner all-seems-well failure occurs, bit 22 of the LR is set. The MAS instruction does not affect the C control flip-flops. The bit configurations for MAS are the same as those for MA covered in 8.94.



Options:

RM

I (0V000 ;V = Index Reg No.)
 A (20000)
 W (00000 1)
 S (20000 1)

1CJ

PI (00000 2)
 PS (00001)
 C (10000)

Restrictions: On instructions following MAS:

- (1) The following instruction must not be an input-output instruction.
- (2) K (accumulator) restrictions (8.99 and 8.100).
- (3) F register restrictions (8.101 and 8.102).
- (4) If bit 6 of FR is a 1, Y restrictions (8.103 and 8.104).
- (5) LR restrictions (8.105 and 8.106).

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8.94 WA, MA, WAS, and MAS Bit Configurations: If bit positions 9, 8, and 7 of the FR specify any of the seven binary codes other than 101, then bits 10, 11, 12, and 13 of the FR control the execute translators in selecting the correct CPD. A particular point within a CPD is chosen by bits 14, 15, and 16 of the FR that made a vertical range selection and bits 17, 18, 19, and 20, 21, and 22 that make a horizontal range selection, thereby enabling the peripheral unit. A controller within the peripheral unit and a peripheral unit address bus are determined by using bits 10 and 14 of the FR as follows:

FR BIT 10	FR BIT 14	CONTROLLER	PERIPHERAL UNIT ADDRESS BUS
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	1

If bit position 6 of the FR contains a 1, the contents of the Y index register (YR) are cleared and the YR accepts an enable verify word. This word is a response via the CPD from the peripheral unit actually addressed. If the responding unit is not the unit addressed, an all-seems-well scanner check (wired) will cause a level F interrupt. If bit position 5 of the FR contains a 1, a wired check is made. If an all-seems-well signal is not received as the result of a wired check, an improper address or scanner malfunction is indicated and a level F interrupt occurs. Bits 0 through 4 of the FR are not used. The bit configurations are as follows:

- (a) **Short Binary (MA/WA and MAS/WAS):** If bits 9, 8, and 7 of the FR are 000, the contents of the addend KR (23 bits) plus an overall parity bit computed on the 23 bits of the BR are sent directly to the peripheral unit address bus.
- (b) **Long Binary (MA/WA and MAS/WAS):** If bits 9, 8, and 7 of the FR are 001, the contents of the addend KR (23 bits) plus the contents of bit positions 0 through 12 of the KR are sent directly to the peripheral unit address bus. Bits 13 through 22 of the KR are ignored. If the KR appears in the R subfield of the instruction and any register modification is specified, the KR will be modified before bits 0 through 12 are sent out on the peripheral unit address bus. The contents of the addend KR are unaffected by this register modification.
- (c) **Line Switching Frames/Circuits 4:1 (MA/WA and MAS/WAS):** If bits 9, 8, and 7 of the FR are 010, the contents of bits 0 through 9, 12 through 15, and 20 through 22 of the addend KR are sent through translation circuitry and activate 10 of the 36 leads of the peripheral unit address bus. Bits 10, 11, 16, 17, 18, and 19 of the addend KR are ignored. Bit position 5 of the FR must contain a 0 because the line switching frames/circuits do not contain the equipment necessary to make an all-seems-well scanner check.
- (d) **Line Switching Frames/Circuits 2:1 (MA/WA and MAS/WAS):** If bits 9, 8, and 7 of the FR are 011, the contents of bits 0 through 3, 5 through 9, 12 through 15, and 20 through 22 of the addend KR are sent through translation circuitry and activate 9 of the 36 leads of the peripheral unit address bus. Bits 4, 10, 11, 16, 17, 18, and 19 of the addend KR are ignored. Bit position 5 of the FR must contain a 0 because the line switching frames/circuit do not contain the equipment necessary to make an all-seems-well scanner check.
- (e) **Trunk or Junctor Switching Frames/Circuits (MA/WA and MAS/WAS):** If bits 9, 8, and 7 of the FR are 100, the contents of bits 0 through 13 and bits 20 through 22 of the addend KR are sent through translation circuitry and activate 13 of the 36 leads of the peripheral unit address

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bus. Bits 14 through 19 of the addend KR are ignored. Bit position 5 of the FR must contain a 0 because the trunk and junctor switching frames/circuit do not contain the equipment necessary to make an all-seems-well scanner check.

(f) **Signal Distributor (MA/WA):** If bits 9, 8, and 7 of the FR are 110, the contents of bits 0 through 10 of the addend KR are sent through translation circuitry and activate 7 of the 36 leads of the peripheral unit address bus. Bits 11 through 22 of the addend KR are ignored.

(g) **Normal Scanner (MA/WA and MAS/WAS):** If bits 9, 8, and 7 of the FR are 111, the contents of bits 4 through 9 of the addend KR are sent through translation circuitry and activate 2 of the 36 leads of the peripheral unit address bus. Bits 0 through 3 and bits 10 through 22 of the addend KR are ignored.

(h) **Skew Scanner (MAS/WAS):** If bits 9, 8, and 7 of the FR are 110, the contents of bits 16 through 21 of the addend KR are sent through translation circuitry and activate 2 of the 36 leads of the peripheral unit address bus. Bits 0 through 15 and bit 22 of the addend KR are ignored.

(i) **Long Binary CPD Address Bus:** If bit positions 9, 8, and 7 of the FR are 101, then bits 10, 11, 12, and 13 of the FR control the execute translators in selecting the correct CPD. The contents of bits 0 through 15 of the addend KR and the contents of bits 0 through 15 of the KR are sent directly onto the CPD address bus. The CPD address bus leads, thus activated by this binary code, enable the CPD output. If bit position 16 of the KR contains a 1, a test lead pulse is also sent out on the CPD address bus. If bit position 17 of the KR contains a 1, reset lead pulse is also sent out on the CPD address bus. Bits 16 through 22 of the addend KR and bits 18 through 22 of the KR are ignored. If bit position 6 of the FR contains a 1, the contents of the YR are cleared (made all zeros) and YR accepts an enable verify word. This word is a response via the CPD from the peripheral unit actually addressed. If it is not the unit intended, a wired-check will cause a level F interrupt. Bit position 5 of the FR must contain a 0 since an all-seems-well scanner check, which depends on information from the peripheral unit address bus, cannot be made. The remaining bits (0 through 4 and 14 through 22) of the FR are ignored. If the KR appears in the R subfield of the instruction and any register modification is specified, the KR will be modified before any of its contents are sent out on the CPD bus. The contents of the addend KR are unaffected by this register modification.

8.95 WSF(00660)—Word to Scanner and Set FR: The resultant DAR number W, after possible product masking and/or complementing, replaces the contents of the BR, FR, and addend KR. The contents of bits 10, 11, 12, and 13 of the FR control the execute translators in selecting the CPD. A particular point within the CPD is chosen by bits 14, 15, and 16 of the FR that make a vertical range selection and bits 17, 18, 19, 20, 21, and 22 that make a horizontal range selection, thereby enabling the scanner. A controller within a peripheral unit and a peripheral unit address bus are determined by using bits 10 and 14 of the FR as follows:

FR BIT 10	FR BIT 14	CONTROLLER	PERIPHERAL UNIT ADDRESS BUS
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	1

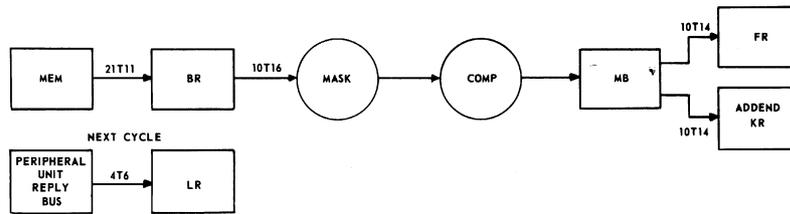
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selection, thereby enabling the scanner. A controller and a peripheral unit address bus are determined by using bits 10 and 14 of the FR as follows:

FR BIT 10	FR BIT 14	CONTROLLER	PERIPHERAL UNIT ADDRESS BUS
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	1

- (a) The contents of bits 4 through 9 of the addend KR are sent through translation circuitry and activate 2 of the 36 leads on the peripheral unit address bus to select the scanner row address.
- (b) The contents of the LR are cleared. Then, during a period of time extending beyond the cycle time of this instruction, bit positions 0 through 15 receive the answer from the scanner.
- (c) The contents of the YR are cleared and the YR accepts an enable verify word. This verify word is a response via the CPD from the peripheral unit actually addressed. If the responding unit is not the unit addressed, an all-seems-well scanner check (wired) will cause a level F interrupt. If an all-seems-well signal is not received as the result of a wired-check, an improper address or scanner malfunction is indicated and a level F interrupt occurs.
- (d) The MSF instruction does not affect the C control flip-flops.



Options:

RM

LCJ

I(0V000;V = Index Reg No.)
 A(20000)
 W(00000 1)
 S(20000 1)

PL(00000 2)
 PS(00001)
 C(10000)

Restrictions: On instructions following MSF:

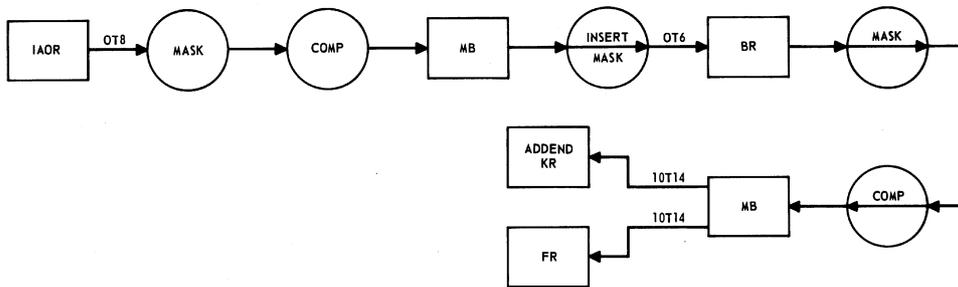
- (1) The following instruction must not be an input-output instruction.
- (2) K (accumulator) restrictions (8.99 and 8.100).

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- (3) F register restrictions (8.101 and 8.102).
- (4) Y register restrictions (8.103 and 8.104).
- (5) L register restrictions (8.105 and 8.106).

8.97 WD(00662)—Word to CPD: The resultant DAR number W, after possible product masking and/or complementing, replaces the contents of the BR, the contents of the FR, and the contents of the addend KR. Bits 10, 11, 12, and 13 of the FR control the execute translators in selecting the CPD. A particular point within a CPD is chosen by bits 9, 14, 15, and 16 of the FR that make a vertical range selection and bits 17, 18, 19, 20, 21, and 22 that make a horizontal range selection, thereby setting or resetting a particular flip-flop, relay, etc. If bit position 8 of the FR contains a 1, a confirming pulse will be sent. Bits 0 through 7 of the FR are ignored. The WD instruction does not affect the C control flip-flops.



Options: **RM**
 I (OV000 ; V = Index Reg No.)

LCJ
 PL (00004)
 PS (00005)
 S (00001)
 C (10000)

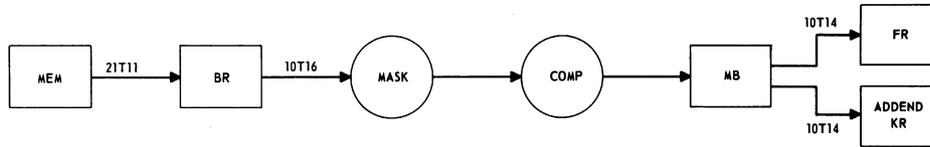
Restrictions:

- (1) The following instruction must not change register F.
- (2) If the following instruction consumes only one cycle of time in its execution, the next instruction, unless it is another input-output instruction, must not change register F.

8.98 MD(00262)—Memory to CPD: The contents of location M replace the contents of the BR and, after possible product masking and/or complementing, replace the contents of the FR and the addend KR. Bits 10, 11, 12, and 13 of the FR control the execute translators in selecting the correct CPD. A particular point within a CPD is chosen by bits 9, 14, 15, and 16 of FR that make a vertical range selection and bits 17, 18, 19, 20, 21, and 22 of the FR that make a horizontal range selection, thereby setting or resetting a particular flip-flop, relay, etc. If bit position 8 of the FR contains a 1, a confirming pulse will be sent. Bits 0 through 7 of the FR are ignored. The MD instruction does not affect the C control flip-flops.

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Options:

RM

I(0V000 ;V = Index Reg No.)
 A(20000)
 W(00000 1)
 S(20000 1)

LCJ

PL(00000 2)
 PS(00001)
 S(20401)
 C(10000)

Restrictions:

- (1) The following instruction must not change register F.
- (2) If the following instruction consumes only one cycle of time in its execution, the instruction after that, unless it is another input-output instruction, must not change register F.

RESTRICTIONS ON INPUT-OUTPUT INSTRUCTIONS MA, WA, MAS, WAS, MSF, AND WSF

A. K (Accumulator) Restrictions

8.99 The following instruction may use K (accumulator) in only these specific ways:

- (1) As an index register (but register modifications are not permitted)
- (2) In the instruction KM
- (3) TK...
- (4) Shift (H, HC), rotate (Q, QC, QS, QSC)
- (5) AKR, or SKR (but R may not be identified by K)
- (6) CWR or TR... with K in the R subfield (but register modification is not permitted).

8.100 If the following instruction consumes only one cycle of time in its execution, in the next instruction, K (accumulator) can only be used in one of the following ways:

- (1) An input-output instruction
- (2) As an index register (but register modifications are not permitted)
- (3) In the instruction KM
- (4) TK...
- (5) AKR or SKR (but R may not be identified by K)

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- (6) AKR or SKR (but R may not be identified by K)
- (7) CWR or TR... with K in the R subfield (but register modification is not permitted).

B. F Register Restrictions

8.101 The following instruction must not change register F. (This, of course, rules out such instructions as TZRFU, TZRFZ, some input-output instructions, some of the combined instructions, instructions which change F by register modifications, etc.)

8.102 If the following instructions consume only one cycle of time in its execution, the next instruction, unless it is MF, TCMMF, HMF, QMF or another input-output instruction, must not change register F.

C. Y Register Restrictions

8.103 The following instruction must not use register Y.

8.104 If the following instruction consumes only one cycle of time in its execution, in the next instruction, Y can only be used in an input-output instruction.

D. L Register Restrictions

8.105 The following instructions must not use register L. (This, of course, rules out such instructions as PWX/Y/Z, PMX/Y/Z, UWX/Y/Z, UMX/Y/Z instructions specifying masking options, etc.)

8.106 If the following instruction consumes only one cycle of time in its execution, in the next instruction, register L can only be used in one of the following ways:

- (1) By an input-output instruction
- (2) The instruction ML
- (3) PL masking on an instruction having a memory location as its origin
- (4) In one of the following combined instructions: UNKMJ, KMKUS, KMKXS.

COMBINED INSTRUCTIONS

8.107 A combined instruction calls for two or more operations that generally require separate instructions. There are 11 combined instructions with each instruction designed to save time in frequently executed programs such as scans for input data. Some of the operations are conditional and can involve transfers. When no transfers are involved, a combined instruction is executed in a single machine cycle. The following definitions of the instructions do not specify or assume any particular use, but are grouped according to primary functions.

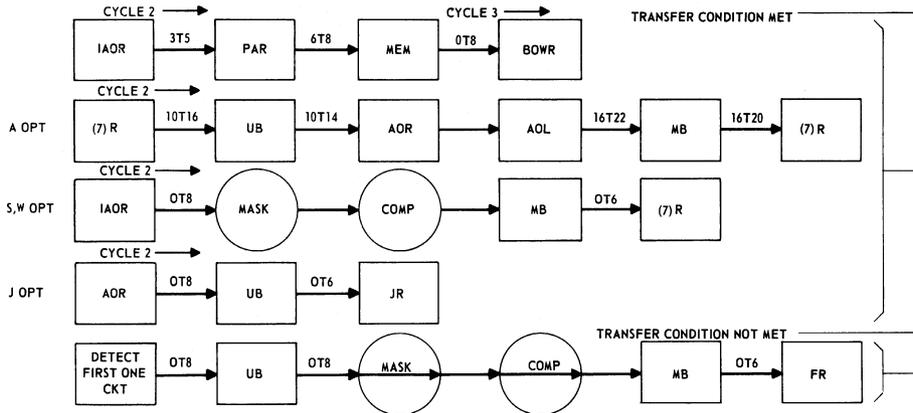
A. General Purpose Combined Instructions

8.108 *TZRFU(00014)—Transfer if Accumulator is 0 or Find Right-Most 1:* If the contents of the KR are logical 0 (all zeros), program control is transferred to another instruction. In the case of a direct transfer specified by an empty M subfield, the address of this instruction is the resultant DAR address. In the case of an indirect transfer specified by an M in the subfield, the address of the instruction is contained in a location specified by the resultant DAR address. The contents of bits 0 through 19 of this location contain the address of the instruction to which control is transferred. If the

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content of the KR is not logical 0, the bit address of the right-most 1 of the KR is placed in the FR. This number will be between 0 and 22, inclusive. Options occur only if transfer is executed.



Options:

RM

ICJ

I (0V000 ;V = Index Reg No.)
 A (20000)
 W (00000 1)
 S (20000 1)
 M (00002)

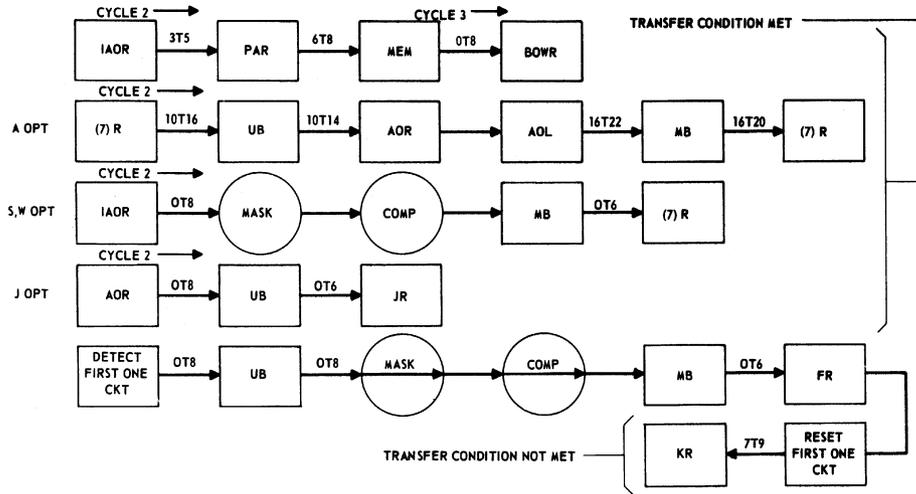
J (10000)

Note: If both the J option and the A option are specified, the return address placed in J is incremented by one if J is equal to I.

8.109 TZRFZ(00015)—Transfer if Accumulator is 0 or Find and Zero Right-Most 1: If the contents of the KR are logical 0 (all zeros), program control is transferred to another instruction. In the case of a direct transfer specified by an empty M subfield, the address of this instruction is the resultant DAR address. In the case of an indirect transfer specified by an M in the M subfield, the address of the instruction is contained in a location specified by the resultant DAR address. The contents of bits 0 through 19 of this location contain the address of the instruction to which control is transferred. If all KR bits are not 0, the right-most 1 is made 0 and its bit address is placed in the FR. The number placed in the FR will be between 0 and 22, inclusive. Options occur only if transfer is executed.

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Options:

RM

LCJ

I (0V000 ; Index Reg No.)
 A (20000)
 W (00000 1)
 S (20000 1)
 M (00002)

J (10000)

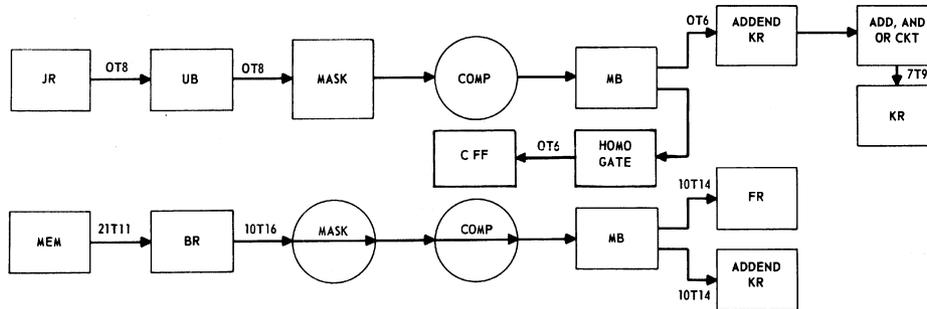
Note: If both the J option and the A option are specified, the return address placed in J is incremented by 1 if J is equal to I.

B. Dial Pulse Scan Combined Instructions

8.110 JKMSF(00264): The contents of the JR, after possible product masking and/or complementing, replace the contents of the KR and set the C control flip-flops. This instruction is then completed by the execution of the instruction MSF (memory to scanner and set the FR as covered in 8.96, which is unaffected by the options specified in the LCJ subfield).

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Options:

RM

LCJ

PL(00000 2)
PS(00001)
C(10000)

For MSF

I(0V000;V = Index Reg No.)
A(20000)
W(00000 1)
S(20000 1)

Restrictions:

- (1) The following instruction must not be an input-output instruction.
- (2) KR restrictions (8.99 and 8.100).
- (3) FR restrictions (8.101 and 8.102).
- (4) YR restrictions (8.103 and 8.104).
- (5) LR restrictions (8.105 and 8.106).
- (6) Location M cannot be the PS.

8.111 TAUMK(00244): If the C control flip-flops do not indicate arithmetic 0, a transfer is made to the address in bits 0 through 19 of the ZR, and the return address is placed in the JR. If the C control flip-flops indicate arithmetic 0, the transfer is not executed and the contents of location M replace the contents of the BR and, after possible product masking and/or complementing, replace the contents of the KR. Options occur only if transfer is not executed.



An Overview of Microwave Sensor Technology

By Jiri Polivka
Spacek Labs, Inc.

Here is a comprehensive review of the current types of microwave sensors, used in a wide variety of detection and measurement applications

This article presents the technical background and function descriptions for many kinds of sensors that utilize microwave technology. Applications of microwave sensors cover industry, medicine, environment and other fields, and a good knowledge of their function, principles and limitations is essential before selection and deployment.

Introduction

There are many types of microwave sensors that have been developed, and more are being developed. Many of their principles are generally known while some are new and surprising.

Microwave sensors utilize electromagnetic fields and devices internally operating at frequencies starting from ~300 MHz up to the terahertz range. Such devices can be found in the following classes:

- Pulsed radar type,
- Doppler-effect radars,
- FM-CW (frequency-modulated, continuous-wave) radars,
- UWB (ultra-wideband) systems
- Transmitter-receiver systems,
- Passive detectors (radiometers)
- Resonator sensors
- Impedance meters,
- Noise-using devices,
- Modulated targets.

The majority of the above sensor types (except radiometers) utilize a signal generator

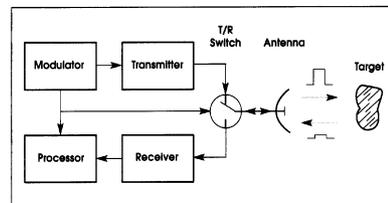


Figure 1 · Monostatic pulsed radar.

(transmitter), and a detector (receiver). The differences between them consists in the type of signal modulation and system design.

Some microwave sensors can operate at a distance from an object of interest, while other types can be mechanically joined with it.

Pulsed Radars

Sensors of this kind can be arranged in two basic modes. The “monostatic” arrangement utilizes one common antenna to transmit and receive, as shown in Figure 1. The transmitted signal pulse arrives at the object of interest, located in the field created by the antenna, and is reflected back to the antenna, and received with a time delay:

$$T = 2 r/c \quad (1)$$

In which r is the distance between the antenna and object (meters) and c is the speed of light (3×10^8 meters/sec).

Such a system can measure the distance between the antenna and a selected object by the delay T in (1), and the position of that object is determined by antenna pointing. Because the antenna must be switched from

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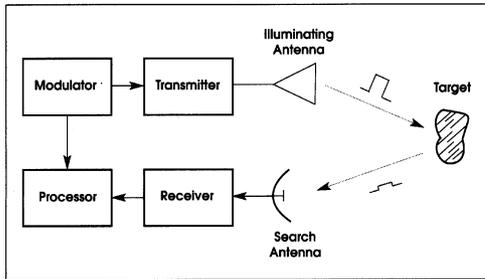


Figure 2 · Bistatic (pulsed) radar.

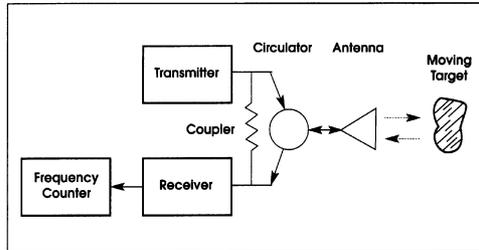


Figure 3 · Doppler Effect sensor.

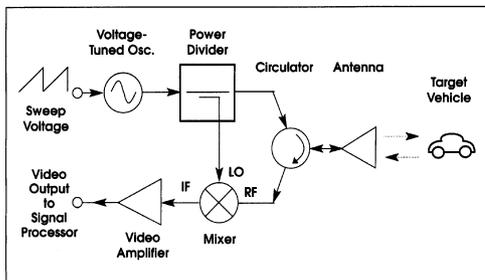


Figure 4 · Anti-collision radar mm-wave module configuration.



Figure 5 · Spacek Labs prototype of the mm-wave module in Fig. 4.

the transmitter to the receiver, and very fast, it is difficult to detect objects (“targets”) which are located close to the antenna. For such cases, the probing pulse must be much shorter than T , as well as the switch response. Details are numerous and can be found e.g. in Skolnik [1].

The “bistatic” arrangement shown in Figure 2 has two separate antennas, one connected to the transmitter, the other to the receiver. The transmitted signal illuminates the volume of interest, and the receiver (or more receivers) detect the existence, distance and position of a target (or, multiple targets). Antennas are often arranged as a matrix for a better pointing, also the mechanical antenna movement for pointing can be replaced by electrical scanning. [2]

Doppler-Effect Radars

To detect a moving object, an unmodulated (CW) signal can be used. As shown in Figure 3, the receiver in this type of sensor processes (in principle, multiplies) the transmitted signal with the received signal reflected from a target. Due to the Doppler effect, the mutual speed of an object related to the antenna causes a frequency shift that is determined by:

$$F = d\phi/dt \cdot 1/2\pi = 2flc \cdot dr/dt \cdot 1/c = 2vflc \quad (2)$$

Where v is the velocity (mutual speed) in meters per second, f is the signal frequency, Hz, and c is again the speed of light.

Recently, anti-collision radars are being developed to be deployed in automobiles. The operation frequency is ~77 GHz, but for illustration we can more easily estimate the Doppler frequency for a probing signal at 10 GHz, and car speed of 100 km/h:

$$F = 2 \cdot 100/3600 \cdot 10E10 / (3 \cdot 10E8) = 1851 \text{ Hz}$$

It can be simply estimated that the Doppler frequency (which is the beat frequency obtained in receiver) is the number of the half-waves of the signal frequency passed by the target per second. A higher speed will produce a higher Doppler frequency.

Such a system, with a provision for detecting signal phase, can also indicate the sense of target movement: escaping objects generate a lower frequency than the one of the probing signal, approaching objects generate a higher frequency.

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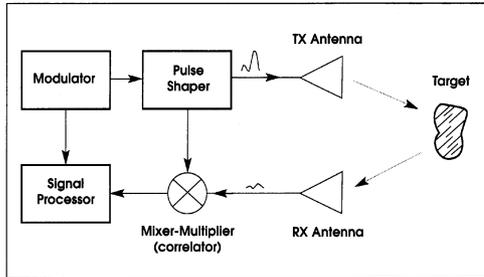


Figure 6 · Ultra wideband (UWB) sensor with correlator. TX and RX antennas can be combined.

Such Doppler systems are a heart of well-known police speed radars: a typical range is up to 100 meters using a typical transmitter power of 10-100 mW.

Doppler radars also can be used to measure the speed of poured construction materials, of very-high speed objects, and objects located in very dense environment like mining or iron/steel mills. Doppler systems are usually low-cost, and when installed in triangle, one can measure a target's vector speed. Devices operating at millimeter waves may one day assist blind persons in their daily navigation.

Figure 4 presents an anti-collision radar module utilizing millimeter waves. Figure 5 shows an example of an automotive radar mm-wave block developed by Spacek Labs.

Ultra Wideband Systems

Ultra-wideband (UWB) systems represent an old and new technology. The signal structure used in UWB systems is reminiscent of spark telegraphy, in that it uses very short "monocycle" bursts or pulses with a very wide spectrum. By doing this, and by correlating the transmitted and/or reflected signals with the original, amplitude over frequency features allow us to determine objects' presence and shape in lossy media (e.g., ground-penetrating radar, GPD), or to transmit high-data rate information (just now in development). A typical UWB sensor schematic is shown in Figure 6.

GPD usually operates over the frequency band of 200-2000 MHz and radiates its pulsed power of ~10W into the soil to detect mines, pipes, and the like. The higher frequency band was recently allocated by FCC, covering ~3 to 10 GHz, with only very low power allowed to prevent interference to existing communication systems.

The UWB transmitter typically generates only one wave, and the response is correlated to obtain the time delay, pulse power and phase. There are many problems to resolve before a good sensor is presented. One of the

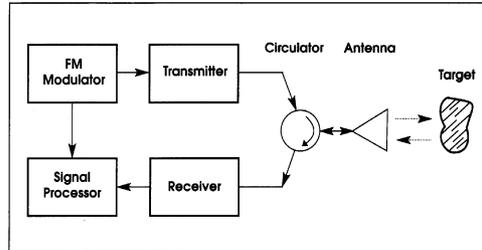


Figure 7 · FM-CW radar sensor. For short distances, the circulator can be replaced with a less-costly power divider/coupler.

problems is antenna design: many well-known antennas do not have flat response over frequency, and affect the pulse shape and phase. The "reverse" thinking of designers should be readjusted for this and other new challenges of UWB [3].

FM-CW Radars

Radars using frequency-modulated continuous-wave signals can combine the Doppler-radar's capability to measure target speed with the added ability to measure target distance. Unlike pulsed-radar systems, distance can be measured essentially from zero. The system schematic of FM-CW radar is shown in Figure 7.

FM-CW systems usually sweep the signal frequency over a band Δf , with a time period T . By multiplying the transmitted and received signals, a new beat frequency F is generated:

$$F = 4 \Delta f r / (cT) \quad (3)$$

Where r is again the target distance, meters, c the speed of light, and T the sweep period, seconds.

When the target is moving, in addition to the frequency F in (3), the Doppler frequency as in (2) will be generated. This makes possible to detect the movement sense only by evaluating the output signal spectrum.

A typical application is in airplane radio altimeters which indicate the actual airplane height over terrain.

This system has an inherent error in determining the target distance, which only depends upon the sweep bandwidth:

$$\Delta r = c / (4\Delta f) \quad (4)$$

For instance, old altimeters used a bandwidth of ~50 MHz, with which the distance error was ~1.5 meters, negligible for airplanes flying up to 10,000 meters above terrain. But for industrial applications where ranging over

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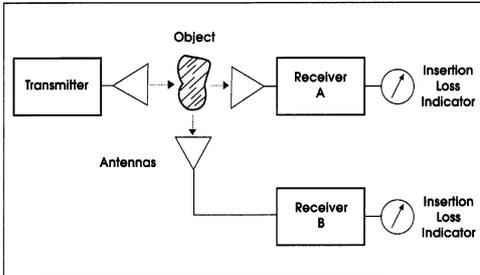


Figure 8 · Transmitter-receiver sensor. Insertion loss and reflection loss are often angle-dependent.

short distances is important, Δf should be adjusted to make Δr acceptable. As shown in [5], by using two-frequency modulation, distance was measured over a range 0 to 200 mm with an error of <2 mm.

FM-CW sensors are simple and low-cost, and could find industrial applications where IR or optical sensors fail due to the presence of dust, smoke or vibrations.

Recently, FM-CW microwave sensors with dielectric-rod or horn antennas have been widely marketed for liquid-level indication in tanks [6].

Transmitter-Receiver Systems

The transmitter-receiver systems are presented separately as they offer other features than the above, which also use transmitters and receivers.

As shown in Figure 7, those systems are close to their optical equivalents in that the purpose of the arrangement is mainly to measure insertion loss or reflectivity of tested objects, not distance or movement.

During the measurement, for insertion loss, the “standard” power level is measured without a lossy object, then with it. For reflectivity, the “standard” power level is taken with a good reflector, e.g. an aluminum plate mirror adjusted to 45 degrees.

Comparing insertion loss and reflectivity of similar objects is often useful to evaluate object form, material composition uniformity or contamination.

For special purposes in science, polarization of waves is also studied, using polarimetric analyzers. They allow a tensor characterization of objects or media.

Finally, the tested object must be fixed between the antennas as shown in Figure 8 for good results. If moving objects are to be tested, skip to the section “Noise Utilizing Devices.”

Radiometers

Passive detectors, “radiometers,” are essentially sensitive microwave receivers capable to detect mainly thermal

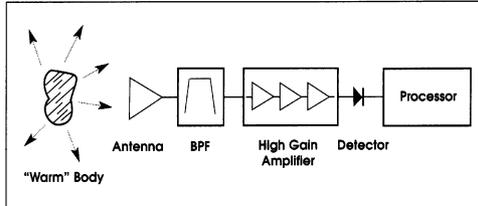


Figure 9 · Microwave radiometer functional diagram.

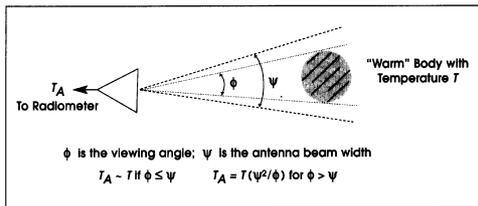


Figure 10 · Illustration of the microwave radiometry principle.

mal radiation of objects. [8]. Figure 9 presents the basic diagram of a microwave radiometer.

Two principal features of radiometers are:

- 1) Temperature resolution in Kelvins, achieved by using low-noise receivers, and by smoothing the output voltage; sometimes also by interrupting the input noise:

$$-1/2 dT = T_s (Bt) \quad (5)$$

Where dT is the smallest temperature variation distinguished (K), T_s is the system noise temperature (K), B is the system RF bandwidth (Hz) and t is the time constant of system integrator, s.

- 2) Spatial resolution, determined by antenna parameters, in steradians. This resolution allows to separate two objects before the antenna. See Figure 10 for an illustration of the microwave radiometry principle.

In addition to detecting object temperature over a distance, radiometers can measure spectral characteristics of ionized gas or plasma, etc. In short, it can be said that a radiometric system (radiometer plus antenna) is a temperature-measuring device operating over a distance. Astronomers use such devices with radio telescopes to precisely measure surface temperature of distant planets. [9].

Designing microwave radiometers remains an art but

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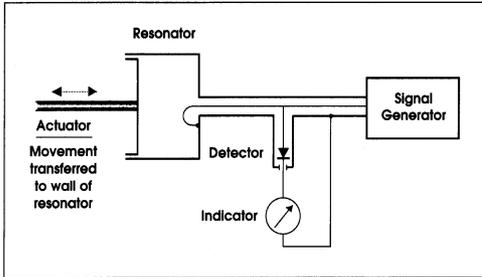


Figure 11 · Microwave resonator movement sensor using a moving or deformable wall.

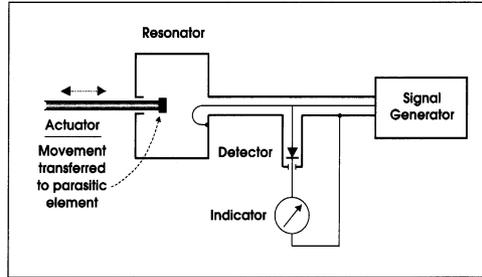


Figure 12 · Microwave resonator movement detector using a moving parasitic element.

as microwave and mm-wave components become available in good quality and low cost, their deployment will be soon common in industry as well as in scientific applications.

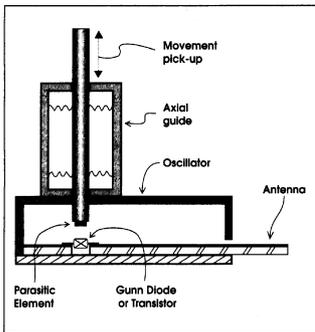


Figure 13 · A prototype of the sensor of Fig. 12.

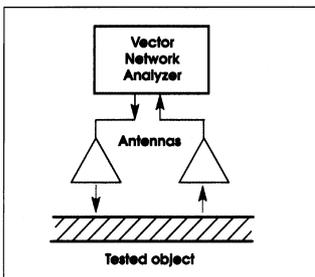


Figure 14 · Impedance-measuring sensor.

Selecting the operating frequency for a radiometric sensor is important. It is essential to avoid interference by other radar and communication systems, while there are natural phenomena to know:

For radiometer antennas pointed to the sky, precipitations emit microwave noise above 8-10 GHz,

with clouds also contributing [8].

At 23.4 GHz, water-vapor resonance in the atmosphere offers a means to evaluate its density and height distribution, usually with comparison to a 31 GHz reference frequency.

At 50-60 GHz, oxygen emission/absorption lines can be used for

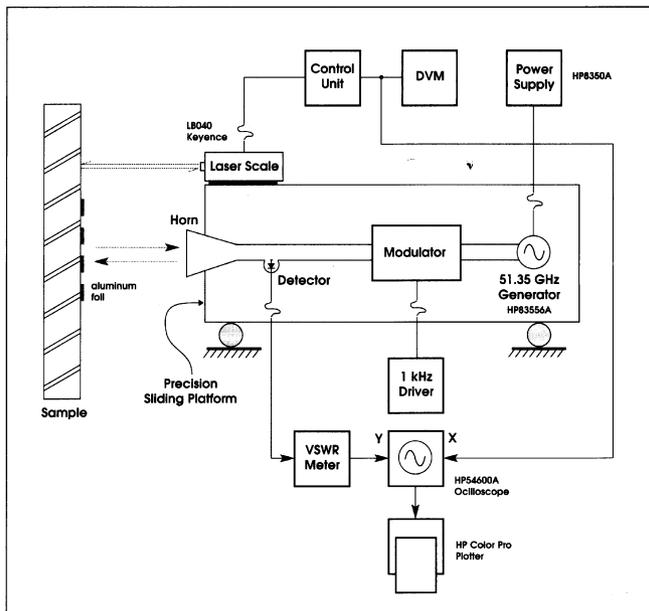


Figure 15 · Experimental setup for measuring dielectric permittivity of concrete at 50 GHz.

An Overview of Microwave Sensor Technology

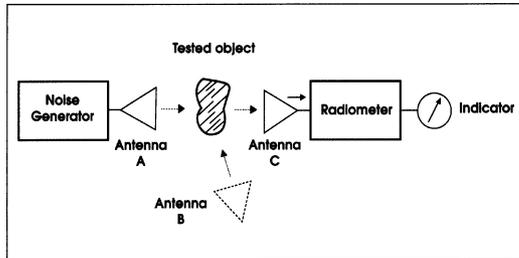


Figure 16 · Microwave noise sensor indicating insertion loss. It can indicate reflectivity is noise is radiated from location B.

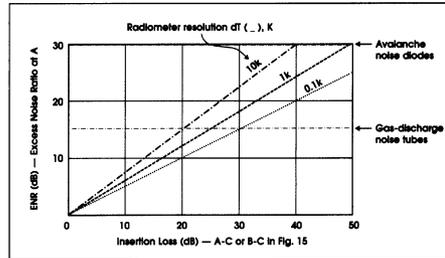


Figure 17 · Estimation of noise sensor sensitivity by noise ENR at position A and radiometer resolution dT at position C in Fig. 16.

study of higher atmosphere. Above 120 GHz, there are multiple resonances of atmospheric gases, again useful for studying the atmosphere.

Resonator Sensors

To measure movement and vibration of objects, there are many other sensors as well, utilizing electrical capacitance, induction, infrared and optical methods.

Using a microwave resonator is possible, and in certain situations, this technology can be preferred. Usually, microwave sensors are sensitive, able to survive overdrives and their signal can be directly transmitted over a distance to be evaluated at a safe location.

There are many principles of resonator sensors, usually deforming their conductive walls, as shown in Figure 11. [10]. Long ago, the author needed a sensor with a low inertial mass to measure low-frequency vibration in seismography, so he developed and patented [11] a sensor with a parasitic element in a microwave resonator (Figure 12). The sensor was used in one version to calibrate seismometers (resolution $<10 \mu\text{m}$, frequency 0-20 Hz). Another version was a small microwave transmitter with its frequency varied by a spring-mounted parasitic element, as in Figure 13. This version transmitted the P-wave pulse above an underground explosion, by a ~ 10 GHz sig-

nal, to a remote receiver located at a safe place. Both sensors could be overdriven heavily while maintaining their sensitivity. [12].

Impedance Meters

Impedance-measuring sensors are close to the Transmitter-Receiver systems described earlier. They differ in that, instead of antennas, "applicators" are used to transmit the generated microwave field into and out of the tested sample or object. One or two applicators can be used, as e.g. in Figure 14.

The microwave test instrumentation is often a Vector Network Analyzer allowing to measure insertion loss, reflectivity and time delay over a chosen frequency band.

Instead of such complex and expensive instrumentation, simpler

structures using a bridge or a reflectometer are designed for particular applications [13].

The author designed a simple reflectometer operating at ~ 50 GHz to measure the permittivity of a concrete plate, see Figure 15 [14]. The results were comparable and even more accurate than those obtained by a special polarimetric radar while the sensor and its operation were quite simple.

Noise Utilizing Sensors

Whenever microwave sensors as outlined above are used, interference fields appearing close to antennas can be important obstacle in a real installation. Components of microwave sensors, mainly antennas, cause signal reflections as well as surrounding objects. Often it is diffi-

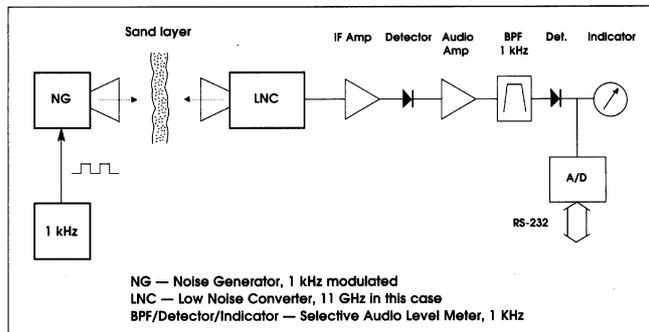


Figure 18 · System to measure moving object loss using noise.

An Overview of Microwave Sensor Technology



MICROWAVE SENSORS

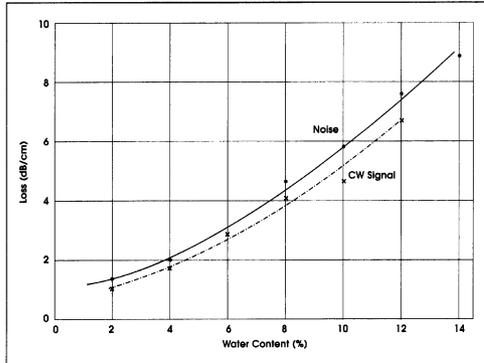


Figure 19 · Measured loss of sand layer at 2.5 cm wavelength.

cult to separate such interference from the useful signal. Utilizing microwave noise as a probing signal was pioneered by the author in a number of instruments and sensor designs [15]. The principles of Transmitter-Receiver or Radiometer systems remain, but a noise radiator is used as the probing signal source, and a radiometer as a typical receiver. Creating a noise field in and outside of an antenna brings an important advantage: the interference field is random in time, and its effects are removed by output smoothing. It was observed that the tested objects could be moderately moved during sensor operation without affecting the measurement. Figure 16 presents a diagram of the noise system, Figure 17 shows the coverable loss by different source ENR and radiometer resolution.

As one typical example, a sand-moisture measuring system was designed and tested in a concrete-mixing factory. [16]. The moisture of the sand moving on a conveyor or pouring chute could be determined over 0-14% with ~1% accuracy. Figure 18 presents the schematic diagram of the developed sand-moisture measuring system. Figure 19 shows the calibration response of the described sand-moisture meter using noise.

Another noise test system was used to measure reflectivity of hot-aluminum-metallized plastic boards. It was detected that aluminum particles baked into the plastic support created a partially-conducting layer which did not reflect correctly back under the angle of incidence.

Recently, the author has experimented with Microwave Coherence Tomography [17] which was confirmed capable of expanding on the success generated in the field of the Optical Coherence Tomography during the last decade [20]. More development is needed, but the MCT sensor could be utilized in medicine to detect tissue

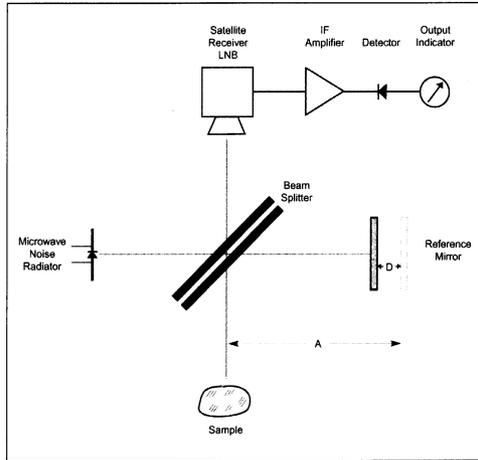


Figure 20 · Michelson Interferometer setup for use in Microwave Coherence Tomography.

profiles in depth, with a reasonable resolution. Figure 20 shows the MCT test system.

Modulated Targets

Modulated targets, or, often called modulated scatterers, offer to all above sensing methods several useful advantages:

- 1) The loss or reflectivity can be periodically keyed by the modulating square-wave signal, and the response can be retrieved by synchronous detector, improving the signal-to-noise ratio of the system

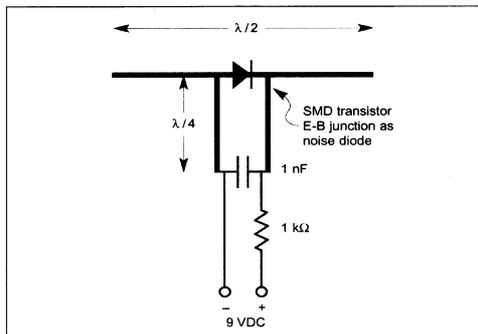


Figure 21 · The partially-coherent source is provided by a noise diode (E-B junction of a transistor) connected directly to an antenna.

An Overview of Microwave Sensor Technology

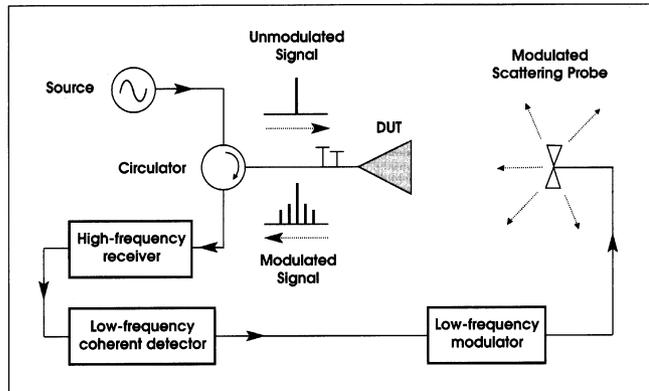


Figure 22 · Electrical modulation setup in a monostatic configuration, also showing the frequency spectrum of the incoming signal (CW) and of the reflected signal (modulated).

2) It is possible to use more modulated targets (scatterers) with different modulating signals, to simultaneously obtain data from more locations.

3) The sensor operation can be easily automated and/or digitized.

Figure 21 presents a schematic of one particular modulated-target system. There are many other variations on the system design, described in [19].

Conclusion

In the above, the author presented only some examples of a wide selection of sensors utilizing microwave technology; other types have been or are being developed.

The size of microwave wavelengths compares well with the human body size and with objects we encounter in daily life. While sensors using other methods, also optical and IR, can offer a high accuracy and other advantages, microwave and millimeter-wave sensors are gradually coming into light as the cost of devices is decreasing.

Given recent interest in sensor technologies, we will certainly see

more microwave, millimeter and terahertz-wave sensors in near future.

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GBPPR Video Camera Sync Detector

Introduction

It's starting already.

Apparently, *\$2600 Magazine's* Horny Old Pedophiles Everywhere (HOPE) conference might not take place in 2008 due to the possibility of Hotel Pennsylvania being demolished. Now, for those who don't know, New York City is very small and only has one hotel. Instead of holding it at another possible location, which might effect Manny Golddigger's huge annual income, they are trying to whip up one of those "end-of-the-world" frenzies so their little sheep following will send them even more money.

This got me thinking. Why does Manny Golddigger want to keep those HOPE conferences at Hotel Pennsylvania so badly?

Then it hit me.

I should have known! How could I be so stupid?

It's because those sickos at *\$2600 Magazine* have hidden video cameras planted in the hotel rooms!

Everyone knows (and I do mean *everyone*) that *\$2600 Magazine* is run by a bunch of fruit loops. No matter how hard they try to hide it, or how much they edit their letters section (heh!), the "truth is out there." It wouldn't be such a problem (except for that whole "child rape" thing), but when *\$2600 Magazine* tries to come off as the "hacker" community's leader, it's just a little bit hypocritical. Of course, so is selling other people's old BBS files and stealing a dead baby's personal identification, but they don't seem to mind that either.

It's amusing when *\$2600 Magazine* tries to go after others for mistakes they've made in the past, while they gloss over the massive amount of factual and technical errors in their *own* little magazine. Here is a good example from the most recent issue:

"The effects are said to feel like being dipped in molten lava. This is incredibly scary stuff."

--- Excerpt from *\$2600 Magazine* Volume 23, Number 4 discussing the U.S. military's Active Denial System (ADS).

Oh great! Molten lava? Just how stupid are you people? Too busy counting the money you made by stealing... err... "publishing" other people's work? *Hint:* At 95 GHz the wavelength is only 3 mm and the penetration depth is only about 1/10 of that due to dielectric absorption by the skin. Also, when it hits your eyes, it causes you to blink, and the "pain ray" is absorbed by your eyelids. A consumer microwave oven that doesn't shut off when the door is opened is actually *more dangerous*, as they operate with a high duty cycle at 2.45 GHz. This frequency has a longer wavelength, which results in much deeper penetration. Ever wonder why you can't microwave a whole turkey? Ever notice the cooking depth is a function of the 2.45 GHz wavelength? Do you think the hippies will ban microwave ovens now? Are there any *real* hackers left?

Of course, a two-second Yahoo search would have confirmed all that, along with finding this nice website on the dielectric properties of body tissues:
<http://niremf.ifac.cnr.it/tissprop/htmlclie/htmlclie.htm>.

But now, for the next 50 years, we'll have to listen to every two-bit leftist thug rant about the evil "molten lava" weapon just so these jerks could sell a few issues of their little pseudo-hacker magazine.

And that's just one example, from one article, in one issue of *\$2600 Magazine* (don't even get me started about Digg). Where are the protests? The outrage? Bumper stickers? T-shirts? Defaced websites? Only silence and manufactured fear to scare teenaged boys into sending them money. Trust me, there's a lot worse stuff, but this article isn't about technically clueless pedophiles. It's about preventing them from spying on you.

Project Overview

This project consists of a tuned ferrite rod antenna system coupled to a high-gain, low-noise NE5532 dual op-amp, which feeds a LM567 tone decoder and piezo buzzer. The ferrite rod antenna is tuned to resonant at around 15.75 kHz, which is the horizontal synchronization frequency for a standard NTSC video signal. The idea is to simply receive, amplify, and recognize this specific synchronization frequency. Any device which is generating or carrying a video signal should be detectable, depending on the amount of shielding and local RF interference. Being able to detect any video device is both good and bad. It's good, in that every television set generates a nice, strong 15.75 kHz signal for testing. It's bad, in that every television set in the immediate area will give you a false "hidden camera" reading. You'll need to take this into account when you are performing your video countermeasures sweep. Physically unplug any TV you find from the AC outlet, as they are never really "turned off." You may have to flip a few circuit breakers to do this properly. You'll also want to pick up a TV-B-Gone or two. Heh...

The heart of this project is the ferrite rod antenna. Thankfully, these are now easy to find due to the abundance of "self-setting" clocks. These clocks have an internal radio receiver which is tuned to the WWVB atomic clock broadcast at 60 kHz. You can salvage a useable ferrite rod antenna from an old clock. You can also order a C-MAX CMA-60-100 ferrite rod antenna from Digi-Key, part number 561-1001-ND for only \$1.53. The C-MAX ferrite antenna from Digi-Key will be used for this particular project. This ferrite antenna will need to be slightly modified to receive the 15.75 kHz signal. The stock antenna comes with a 4,700 pF capacitor in parallel with the antenna's main winding, which equal approximately 1.5 mH. This results in a tank circuit which resonates at around 60 kHz. You'll have to replace the 4,700 pF capacitor with a 0.068 μ F capacitor instead. A high-quality, 5% tolerance polystyrene capacitor is recommended. One little quirk, though. The winding on my C-MAX ferrite antenna measured around 1.74 mH. This required a 0.056 μ F capacitor to lower the resonant frequency to 15.75 kHz. You may wish to double check the value of the ferrite antenna's winding before you begin this project, especially if you are using a salvaged ferrite rod antenna.

A option to this design will be a buffered output of the op-amp's output signal. This could be useful for adding a small audio amplifier to drive a pair a headphones so you can listen to the received signal. An even better idea would be connecting it to a computer soundcard for further, and much more powerful, signal processing, filtering, decoding, etc.

Another possible use for this device is to locate the video cameras which are often used by terrorists to record their attacks for later broadcast. It's no secret the war profiteers in the liberal media need to extend wartime efforts in a desperate move to gain more advertising dollars. Networks like Al-Jazeera and CNN are a perfect example of this. CNN is an "international" news network which, of course, is liberal-speak for "our shareholders are from shady Arab countries." An example of this:

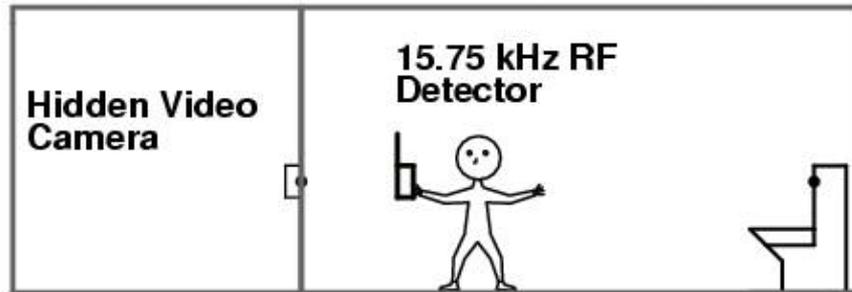
"Given the current rise in enemy sniper ops, especially since CNN aired the footage of Jaysh al Islami (Islamic Army) killing American soldiers in Baghdad, proper employment is paramount."

--- Excerpt from *Soldier of Fortune*, February 2007 discussing sniper operational deployments.

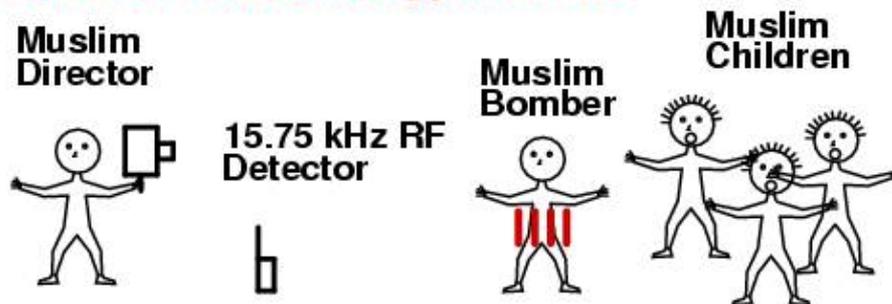
If you detect a strong video synchronization signal coming from a group of ragheads, shoot the fuckers.

Block Diagram

Emmanuel Goldstein Is Watching You Poop!



Counter-Terrorism Applications

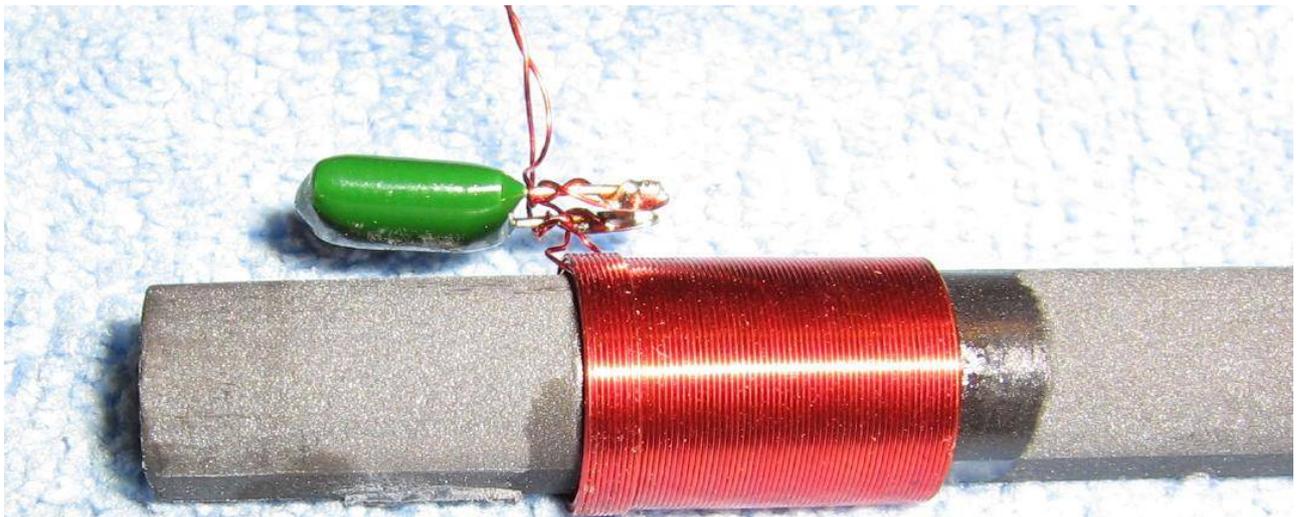


Construction Notes & Pictures



Parts overview. The ferrite rod antenna will be mounted inside a five inch piece of 1/2" diameter PVC pipe. The detector PC board will be mounted inside a five inch piece of 1.5" diameter metal pipe. The PVC and metal pipe sections are connected together via a threaded reducing coupler. A metal pipe end cap will be used to mount the gain control potentiometer / power switch.

The ferrite rod antenna will be supported inside the PVC pipe with a series of O-rings and plumbing washers. Get an assortment pack of plumber's washers at the hardware store and dig through it to find the best ones.



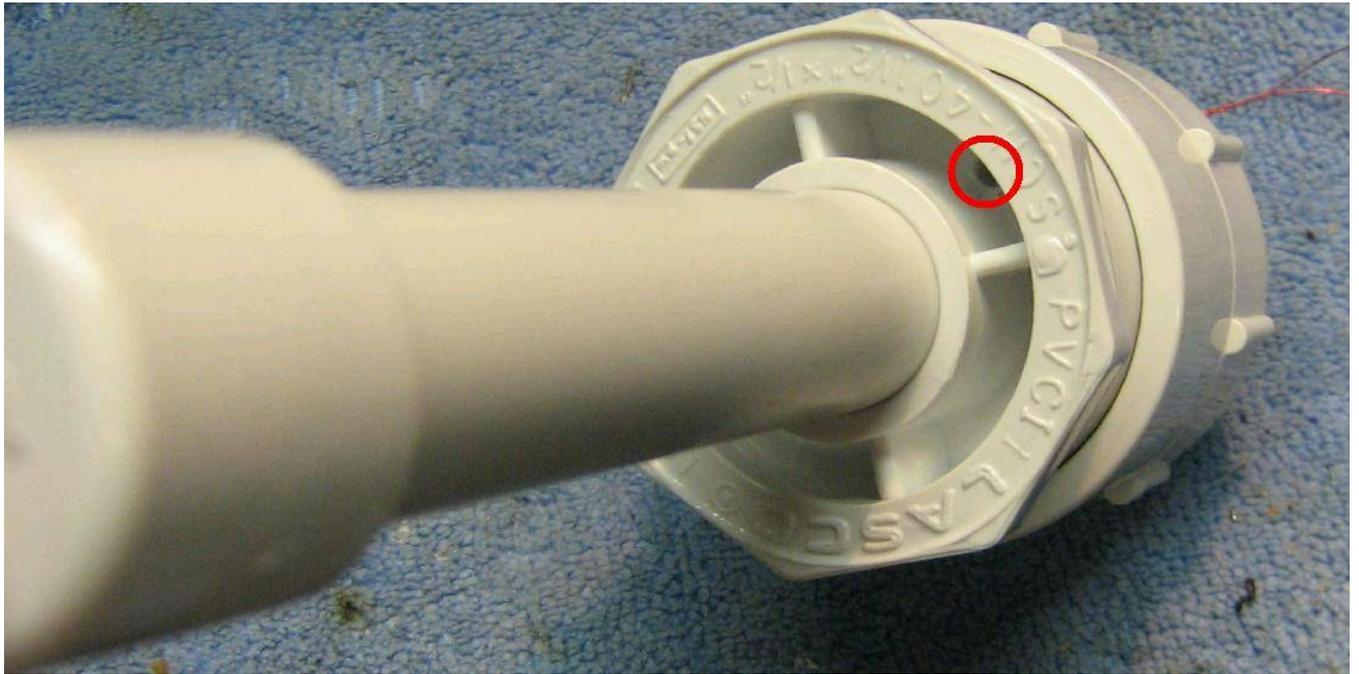
Close up picture of the stock C-MAX CMA-60-100 ferrite rod antenna. This is Digi-Key part number 561-1001-ND. The antenna's winding is in parallel with a 4,700 pF capacitor.



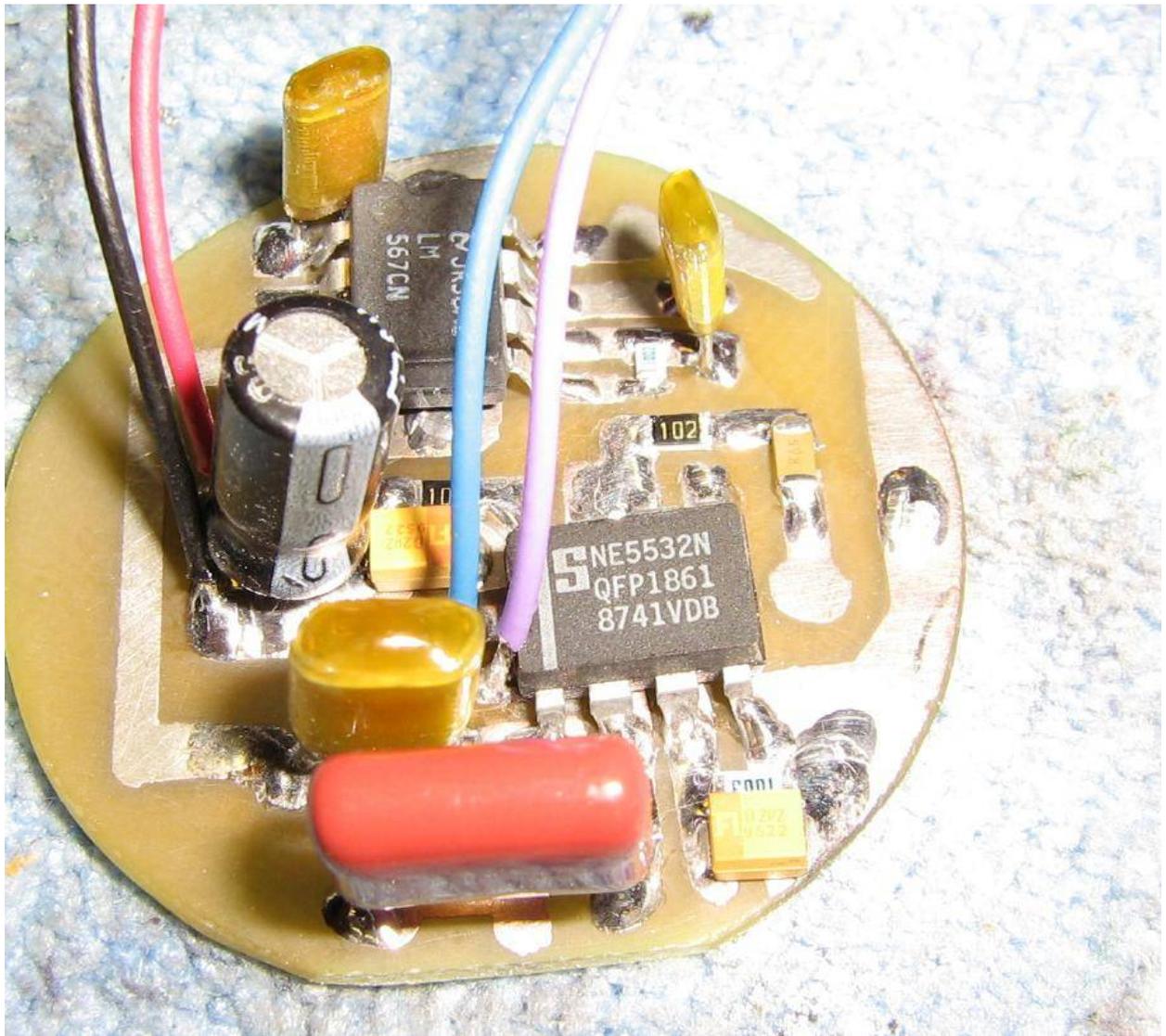
Replace the 4,700 pF capacitor with a 0.068 μF or 0.056 μF capacitor. This lowers the ferrite rod's resonant frequency to around 16 kHz. Note the O-ring to secure the fine wires.



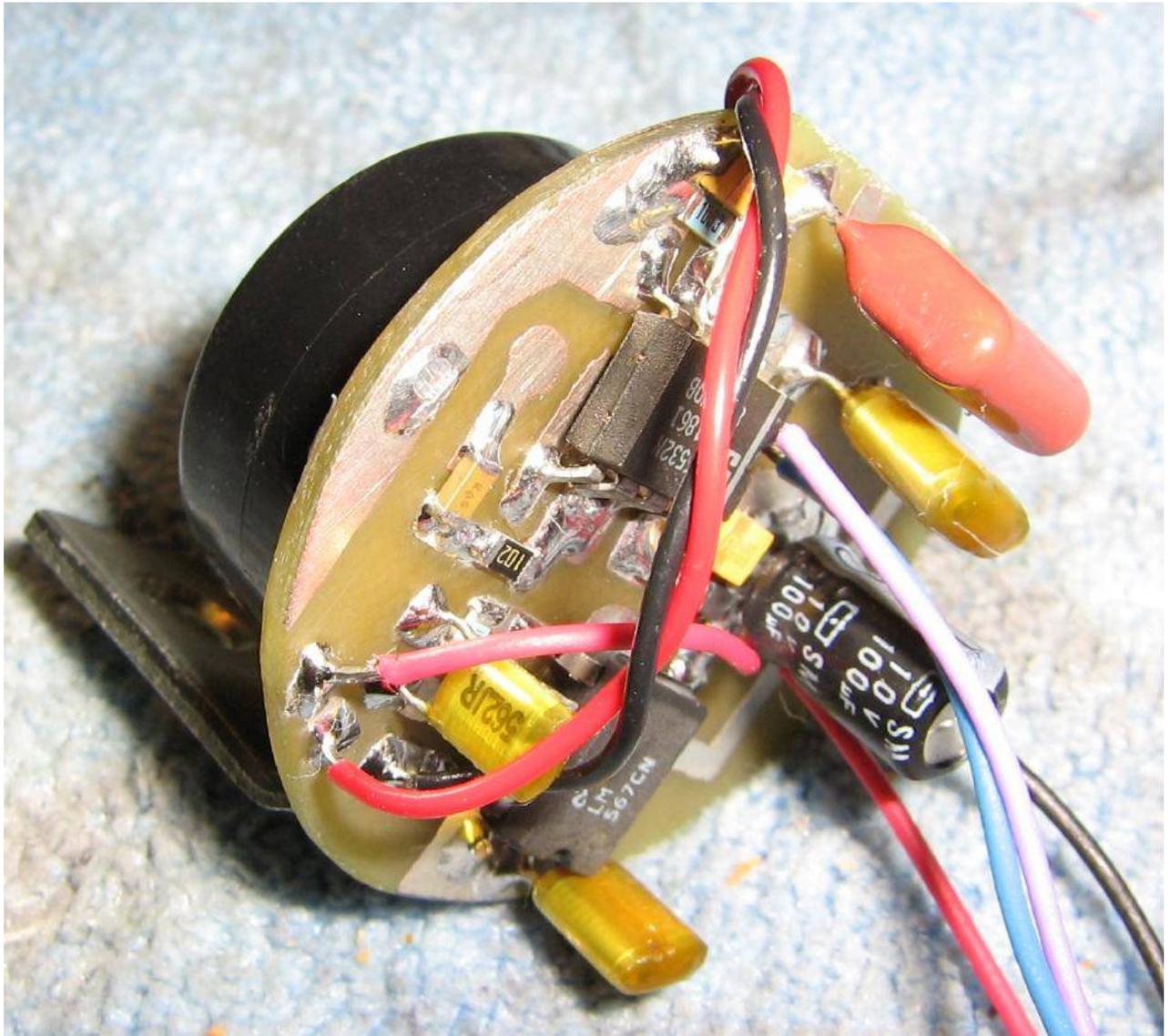
Place the ferrite rod antenna inside the piece of 1/2" diameter PVC pipe and secure the open end using rope caulk. Be sure the brittle ferrite antenna is set on a "cushion" of rubber washers or O-rings.



Connect the PVC pieces together like so. Note the small hole in the reducing coupler. This will be for an electrostatic shield around the ferrite antenna.



Make the circuit up like so. A circular PCB layout was used so it can easily mount inside the metal pipe. The schematic and the components shown in the photo differ due to experimentation. Use the components as shown in the schematic.



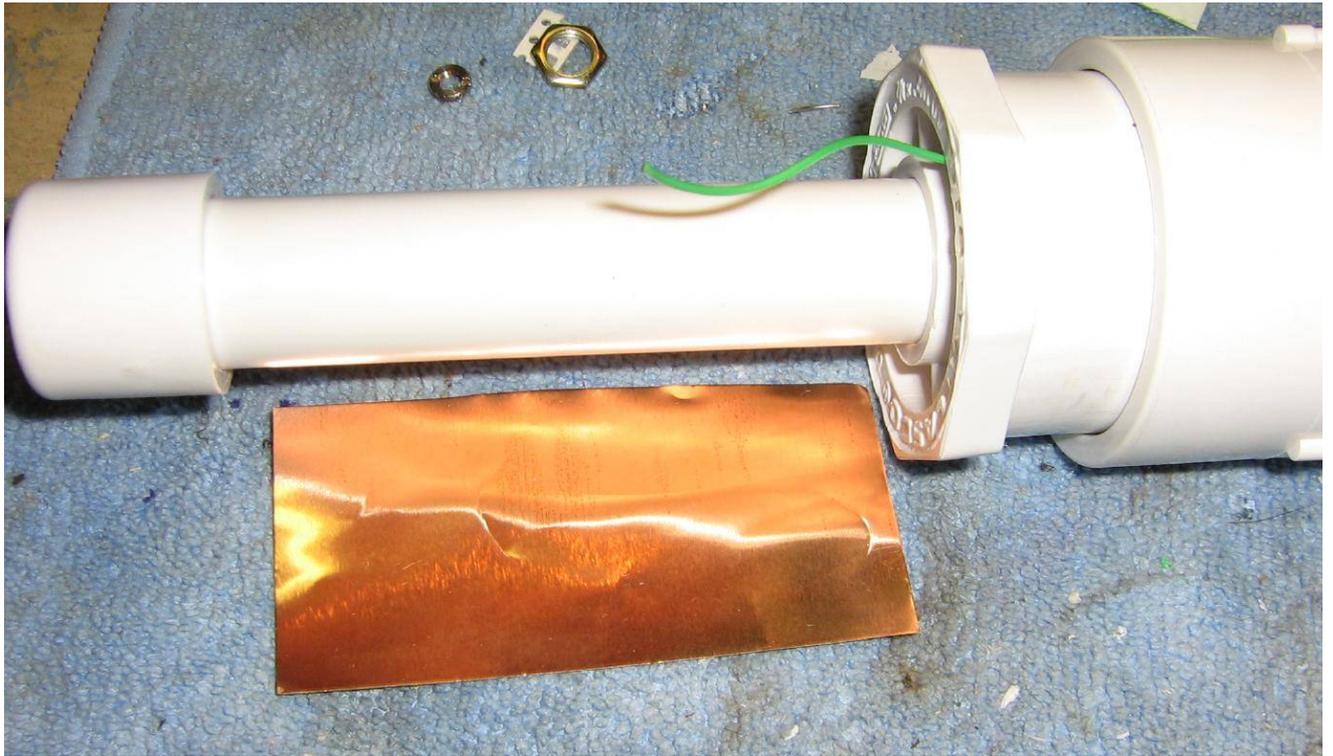
Mount the circuit board on a little L-bracket using some epoxy putty. You may also attach the piezo buzzer to the back of the circuit at this time. Be sure you use a real piezo buzzer and not a speaker. A piezo buzzer contains all the necessary tone-driver hardware. In addition to the piezo buzzer, a LED or small vibrating motor could also be added.



The metal end cap will be used to hold the gain control potentiometer / power switch. It will also hold a 3/32" jack for the buffered output signal. Since the end cap has a slight curve to it, it will look kind of funny when drilled. Use a large-diameter drill bit to countersink the holes so you can access the mounting hardware.

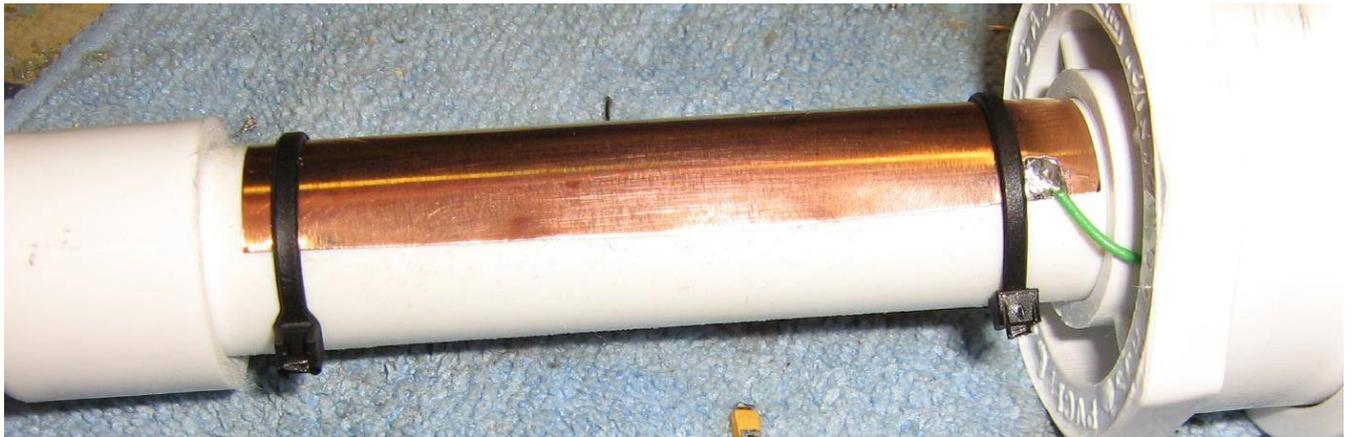


Mount the detector circuit board inside the metal pipe by using epoxy putty pressed over the L-bracket.

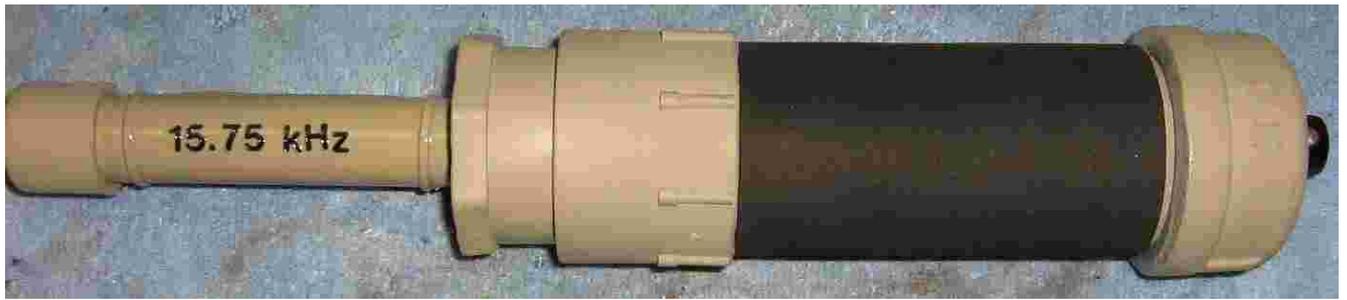


Next, is the electrostatic shield. This will consist of a piece of copper foil which will partially surround the ferrite rod antenna. This shield is to prevent the antenna from becoming unbalanced by forcing the capacitance along the length of the ferrite rod to be at an equal "ground" potential.

It's made from a 3.5" by 2.5" piece of #44 gauge copper foil glued around the ferrite antenna PVC pipe section. Ideally, the shield should extend over the length of the ferrite rod by an inch or so. You may wish to experiment with this setup.



The foil is attached and a ground wire is soldered to it. A few zip-ties help to secure the copper foil in place.



Finished overview. Fill the metal pipe with pieces from a cut up sponge and squeeze the 9 volt battery in. Apply a good coat of camel-humper beige spray paint and some art foam around the handle to make it look all pretty.

How does it work? It does detect cameras and TVs quite well, but the range isn't too great, well under a foot. Possible improvements include adding much more gain in the op-amp section and switching to an op-amp with good ultrasonic capabilities. A Maxim MAX437 would be a good choice for this application.

DMS-100 Remote Office Test Line Call-Back Table (ROTLCB)

Table Name

Remote Office Test Line Call-Back Table

Functional Description of Table ROTLCB

Table ROTLCB and table ROTLSCSD (Remote Office Test Line Scan & Signal Distributor) drive the Remote Office Test Line (ROTL) facilities.

Tables ROTLCB and ROTLSCSD enable the incorporation of ROTL facilities into the DMS-100 family of switching systems. The remote office test line function allows a centralized automatic trunk test system, such as Centralized Automatic Reporting On Trunks (CAROT) or Remote Automatic Measurement of Performance And Reporting on Trunks (RAMPART), to automatically test outgoing and two-way trunks in a DMS-100.

The ROTL unit is connected to the DMS-100 by access lines and test ports. The two access lines are accessible from the Direct Distance Dialing (DDD) network as subscriber lines. The CAROT or RAMPART system (referred to as CONTROL throughout this section) can access the ROTL unit through one of the two access ports, which must be connected as ground start lines. The two access lines behave as a two-line hunt group. In a DMS-100 office they are connected through card NT2X18AD (line circuit card type-B) or equivalent line cards installed in the line module. Access lines for a DMS-200 switch are connected to a local class-5 switch.

Two ROTL unit test ports are used to originate tests. The ROTL test ports interface with the DMS switch through a trunk group with a pseudo-Common Language Location Identifier (CLLI) of ROTLTP assigned in table CLLI. The two members of the trunk group consist of trunk circuits NT3X91AA (remote office test line circuit card).

These trunks must be assigned to tables TRKGRP, TRKSGRP, and TRKMEM with a trunk group type "ROTL."

Each test port has four sense (scan) and four control (signal distributor) points associated with it. Table ROTLSCSD must be datafilled to identify the location of the scan cards and signal distributor cards that contain the scan and signal distributor points.

Circuits must not have been previously assigned to tables ALMSC (Alarm Scan), NWMSC (Network Management Scan Group), and SCGRP (Scan Group) before scan groups are assigned to table ROTLSCSD.

A maximum of six 105-type test lines are used to terminate 105 test line calls in the near-end office. The 105 test lines interface with the DMS through NT3X91AA trunk circuits. These trunks are contained in a trunk group with a pseudo-CLLI of TERM105 assigned in table CLLI and must be assigned to tables TRKGRP, TRKSGRP, and TRKMEM with a trunk class code of "TERM105." Code 105 in the code table and its associated route must be datafilled to allow a call to the 105 test line to route to the trunks.

One alarm scan (sense) point is used for reporting major alarms such as power failure to the DMS office. This requires that tables ALMSC and ALMSCGRP be datafilled with function equal to ROTLALM.

Datafill Sequence & Table Size

The following tables must be datafilled before table ROTLCB.

- TRKMEM (Trunk Member)
- ALMSCGRP (Alarm Scan Group)

Table size is 0 to 11 tuples.

Datafill

The following table describes datafill for table ROTLCB:

Table ROTLCB Field Descriptions

Field	Subfield	Entry	Explanation and Action
INDEX		See subfield	<i>Index</i> This field consists of subfield K.
	K	1 to 10	<i>Call-Back Index</i> Enter the call-back index that is specified in the priming digits of a call-back request. A security call-back is made to the directory number for this index and the specified authorization level is granted if the 1004-Hz unlocking signal is received.
AUTHORIZ		AUTO or MANUAL	<i>Authorization</i> Enter "AUTO" if a make busy request is allowed if the number of trunks out of service does not exceed the out-of-service limit. Enter "MANUAL" if a make busy request is allowed even if the number of trunks out of service exceeds the out-of-service limit. The out-of-service limit is defined by office parameter ROTL_OUT_OF_SERVICE_LEVEL in table OFCENG.
DR		Alphanumeric (up to 18 digits)	<i>Digit Register</i> Enter the directory number (security call-back number) for the call-back index entered in subfield K.

-End-

Datafill Example

The following example MAP display shows sample datafill for table ROTLCB:

For index **1**, the authorization is **AUTO** and the call-back directory number is **6211234**.

For index **2**, the authorization is **MANUAL** and the call-back directory number is **6221235**.

INDEX	AUTHORIZ	DR
1	AUTO	6211234
2	MANUAL	6221235

Bonus



End of Issue #37



Any Questions?

Editorial and Rants

You won't be hearing about this...

Why Asian Oil Firms are Likely to be First at Iraq's Oil

April 5, 2007 – From: money.cnn.com

by Steve Hargreaves

NEW YORK (CNMoney.com) — Despite claims by some critics that the Bush administration invaded Iraq to take control of its oil, the first contracts with major oil firms from Iraq's new government are likely to go not to U.S. companies, but rather to companies from China, India, Vietnam, and Indonesia.

While Iraqi lawmakers struggle to pass an agreement on exactly who will award the contracts and how the revenue will be shared, experts say a draft version that passed the cabinet earlier this year will likely uphold agreements previously signed by those countries under Saddam Hussein's government.

"The Chinese could announce something within the next few months" if all goes well with the oil law, said James Placke, a senior associate at Cambridge Energy Research Associates who specializes in the Middle East.

The Asian firms are at an advantage for several reasons.

First, less constrained by Western sanctions during the Hussein regime, they've been operating in Iraq and know the country's oilfields, said Falah Aljibury, an energy analyst who has advised several Iraqi oil ministers as well as other OPEC nations.

Aljibury said the first contracts likely awarded will be to the Chinese in the south central part of Iraq, the Vietnamese in the south, the Indians along the Kuwaiti border, and the Indonesians in the western desert.

The contracts under consideration are small.

Aljibury said the Chinese agreement is to produce about 70,000 barrels of oil a day, while the Vietnamese one is for about 60,000.

It's hard to put a dollar amount on what those contracts might be worth, as security costs, drilling conditions and the exact terms to be offered by Baghdad are unknown, said Christopher Ruppel, a senior geopolitical analyst with the consulting firm John S. Herold.

But the barrel amount is tiny even by Iraq's depressed post-war production of around 2 million barrels a day.

And the country is thought to be able to ramp up production to over 3 million barrels a day with fairly little effort, providing the security situation improves. Rosy estimates even have Iraq producing 6 million barrels a day in the long term, which would make it the world's No. 4 producer behind Russia, Saudi Arabia and the United States.

But the Asian firms are also well positioned to grab further contracts.

Having avoided military entanglements in the region, they may curry more favor with the Iraqi people.

"They have no involvement with the secular or ethnic people," said Aljibury. "The conditions favor them."

Given its rapidly growing thirst for oil, combined with its feeling of isolation from world oil markets, China is sometimes viewed as more cavalier than Western oil firms when it comes to putting capital and people at risk. That could lead them to sign contracts in violent Iraq sooner than Western firms.

"The Chinese seem to be willing to go places where other companies can't find workers to go," said Adam Sieminski, chief energy economist at Deutsche Bank.

But none of this suggests Western firms like ExxonMobil, Chevron, BP, and Royal Dutch Shell will be completely cut out of the action.

First, their technical prowess is world renowned.

"I have not heard anything from any Iraqi ministers against U.S. oil companies," said Aljibury. "In fact, I have heard the opposite. They are the best in field exploration and development. They want them."

Second, Iraq's oil contract game has just begun.

According to a letter supplied by John S. Herold's Ruppel, memorandums of understanding have been signed with all the oil majors for several years. And Iraqi Oil Minister Hussein al-Shahristani has said the country plans to tender for major oil projects in the second half of 2007.

Steve Kretzmann, executive director of Oil Change International, an industry watchdog group, criticized the draft oil law for allowing long-term oil contracts to be awarded to foreign oil firms, a practice he said was unique in the Middle East.

"Giving out a few crumbs to the Chinese and Indians is one thing," said Kretzmann, who noted the draft law was seen by both the Bush administration and the International Monetary Fund before it was given to Iraq's parliament. "But the real prize are the contracts that award long-term rights. I think the [Western oil companies] are biding their time."

Free Mumia! No more prisons!

Wait... That white man said a bad word... Jail him!

9-Month Sentence for Making Racial Slurs Against Seattle Clerk

May 24, 2007 – From: seattlepi.nwsource.com

SEATTLE -- A man who made racial slurs against a store clerk who refused to sell him alcohol has been sentenced in Seattle to nine months in jail.

Thirty-five-year-old Brian Lappin of Seattle apologized today in King County Superior Court for his behavior. Judge Michael Hayden told him that being drunk was no excuse and gave him the maximum nine-month sentence.

Lappin had pleaded guilty to malicious harassment, a hate crime, for the incident in February at Saleh's Delicatessen in the Ballard neighborhood.

When the owner, Steven Saleh, who is from Yemen refused to sell him alcohol Lappin tried to grab him and called him names.

Police say a Shoreline woman with Lappin, Nichol Kirk, also called Saleh names. Her trial is set for June eleventh.

The incident was captured on store video and Saleh and his nephew, who was in the store, were called un-American Arab terrorists.

Here's a real shocker! I wonder what shady Arabs the Eurosavages have been hanging around?

Raid on Spy's Home Reveals Details of Chirac's Secret £30m Bank Account

May 24, 2007 – From: news.scotsman.com

By Susan Bell

LONG-STANDING rumours that the former French president Jacques Chirac holds a secret multi-million-euro bank account in Japan appear to have been confirmed by files seized from the home of a senior spy.

Papers seized by two investigating magistrates from General Philippe Rondot, a former head of the DGSE, France's intelligence service, show Mr Chirac opened an account in the mid-1990s at Tokyo Sowa Bank, credited with the equivalent of £30 million. It is not known where the money came from, nor whether it is connected to various kick-back scandals to which Mr Chirac's name has been linked over the past decade.

Last year, Mr Chirac "categorically denied" having a bank account in Japan.

The seized documents have been described by the magistrates as "explosive" and are believed to contain copies of the former president's bank statements.

A magistrate close to the investigation told the satirical magazine *Le Canard Enchaîné*: "Subject to verification of the documents, there is enough material to open a new judicial investigation for breach of trust or for possession of money received from corruption. Moreover, the investigating judges have everything necessary to trace the network back to its ringleaders."

Mr Chirac, who was succeeded by Nicolas Sarkozy last week after 12 years as president, looks certain to be questioned about the account – as well as several other alleged corruption scandals dating from his time as mayor of Paris – when his presidential immunity runs out on 16 June.

The alleged evidence was discovered by judges Jean-Marie d'Huy and Henri Pons after they seized 112 bound files and numerous other documents from the home of Gen Rondot in connection with their inquiry into an alleged smear campaign. Dubbed "The French Watergate", it centred on whether Dominique de Villepin, the then prime minister, had asked Gen Rondot to dig up dirt on Mr Sarkozy, then interior minister, who had been wrongly accused of receiving kickbacks from the £1.4 billion sale of French frigates to Taiwan in 1991.

Claims of Mr Chirac's secret nest egg first came to the attention of the French authorities in 1996 when his friend Shoichi Osada, a Japanese banker, decided to invest £500 million in France, so triggering a routine investigation by the DGSE, which is said to have stumbled upon the then president's Japanese account.

Thrown into a panic, Mr Chirac is said to have summoned Gen Rondot in 2001 and ordered him to destroy all DGSE evidence of the account. Unfortunately for the president, the spy simply removed the notes and memos about the affair to his home, where they were seized in March last year by Mr d'Huy and Mr Pons. Since then, the judges have been discreetly pursuing an investigation, interviewing 20 intelligence officers about the affair.

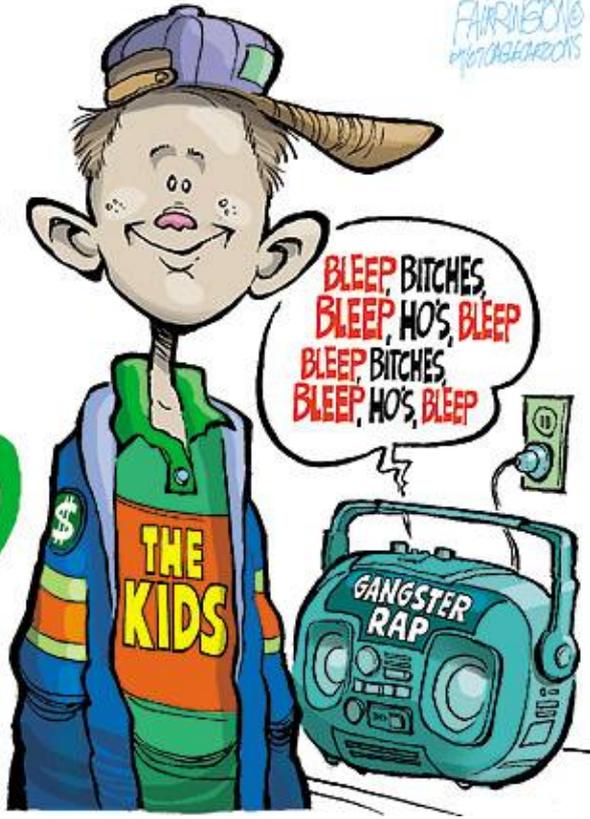
Mr Chirac is reported to have struck a deal with Mr Sarkozy, whereby the latter will push through judicial reforms ensuring the ex-president escapes prosecution. However, the magistrates are expected to move before the reforms are passed this summer.



"Cultured" Eurosavages in action.

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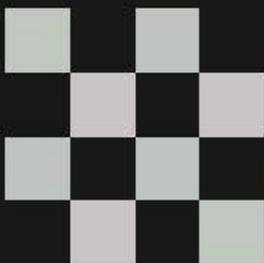
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War declared on China and Iraq

contributed by Legion of the Underground

In a very heated and emotional discussion Legion of the Underground declared cyber-war on the information infrastructure of China and Iraq last night. They cited severe civil rights abuses by the governments of both countries as well as the recent sentencing to death of two bank robbers in China and the production of weapons of mass destruction by Iraq as the reasons for their outrage.

Quoting from the Declaration of Independence about the right of the people to govern themselves and stating that the US government will probably stand idly by while these atrocities happen in other countries the Legion of the Underground called for the complete destruction of all computer systems in China and Iraq.

"The Government controls what goes into our mouths lets not let them do the same with what comes out!" said one LoU member during a press conference held on IRC Monday night.

LoU mentioned that they may seek out assistance in their war from the Hong Kong Blondes. The HKBs are a well known group attempting to cause mayhem on China's internetworks from within the Iron Curtain. The HKBs where trained and assisted, until recently, by the infamous [Cult of the Dead Cow](#) hacking group.

Legion of Underground gained previous notoriety

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