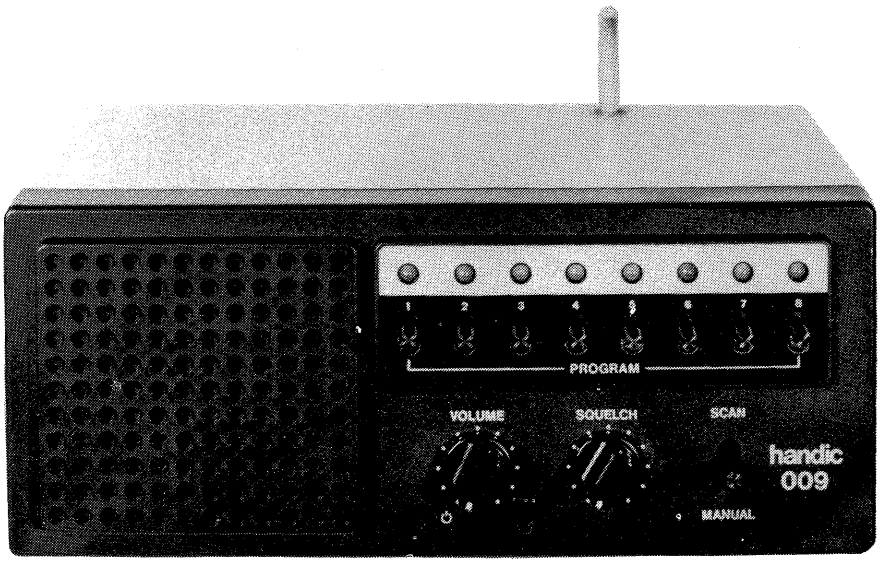
handic

SERVICE MANUAL
FOR
handic® 009
SCANNER RECEIVER



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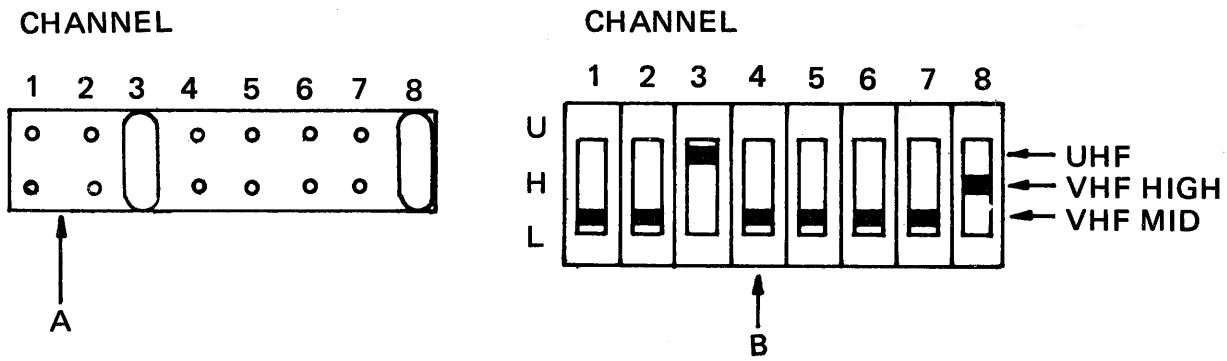
SPECIFICATIONS

GENERAL

Semiconductors	20 transistors, 4 integrated circuits, 14 diodes and 8 LEDs
Antenna Impedance	50 ohms, Motorola type receptacle
Speaker	Built-in, 66 mm dynamic type, 8 ohms
Audio Output	2 Watt
Power Requirement	AC 220 – 240 V, 50 Hz
Power Consumption	11 Watt maximum
Dimensions	240 W x 100 H x 160 D mm.
Accessory	Telescopic antenna
Receiving System	Crystal controlled double conversion superheterodyne
Frequency Coverage	VHF MID : 68 – 88 MHz VHF HIGH : 144 – 174 MHz UHF : 380 – 430 MHz
Intermediate Frequency	1st: 10.7 MHz, 2nd: 455 kHz
Selectivity	–6 dB ±9 kHz, –50 dB ±17 kHz
Filters	10.7 MHz Crystal Filter and 455 kHz Ceramic Filter
Sensitivity	VHF MID : 1.0 μV at 79 MHz VHF HIGH : 1.0 μV at 166 MHz UHF : 1.0 μV at 405 MHz
Signal to Noise Ratio	50 dB (100 μV, 5 kHz Dev. at 1 kHz)
Squelch Sensitivity	Less than 1 μV threshold
Crystal Type	HC-25/u
Scanning Channels	8 channels, with LED indicators
Scanning Rate	12 channels/second
Scan Delay Time	2 seconds



When a crystal has been installed in the crystal holder (A) the corresponding band selector (B) must be set to the frequency band for which the crystal is intended: VHF MID (68—88 MHz), VHF HIGH (148—174) or UHF (380—430). In the example shown in the figure, a UHF crystal is installed in channel 3 and a VHF HIGH crystal in channel 8.

CRYSTAL SPECIFICATION

	VHF MID	VHF HIGH	UHF
Frequency (MHz)	FR 10.7/2	FR –10.7/3	FR –10.7/9
Frequency tolerance %	0.002	0.001	0.001
Load capacitor (pf)	32	32	18
Mode	3 rd	3 rd	3 rd
Max imp. at series resonance	35	35	35
Max parallell capacity (pf)	6	6	6
Holder	HC-25/μ	HC-25/μ	HC-25/μ

Temp. tolerance 30 ppm (-10 –+60° C)

Drive level 2 mW

DISASSEMBLY DIAGRAM

Refer to Figure 1.
Remove four cabinet screws (A) and the Cabinet.

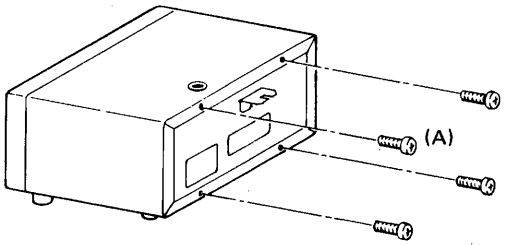


FIGURE 1. CHASSIS DISASSEMBLY

ALIGNMENT PREPARATION

Test equipment required
1. Oscilloscope
2. AC VTVM
3. DC VTVM
4. Frequency counter (60 MHz)
5. 8 ohm dummy load
6. Slow sweep generator with variable marker (10.7 MHz)
7. VHF sweep generator with variable marker (68-88, 144-174, 380-470 MHz)
8. Signal generator (68-88, 144-174, 380-470 MHz)

NOTES: *Use non-metallic tuning tools.*
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.
See PCB and Alignment Positions Illustrations for Test Points and Adjustable Components.

2nd LOCAL OSCILLATOR FREQUENCY CHECK (10.245 MHz)

Step 1: Connect Frequency Counter through a 10pF capacitor to IC-1, Pin 2. (See Figure 2)
Step 2: Read frequency on the Frequency Counter. Normal: 10.245 MHz ±1 kHz.

NOTE: *Frequency Counter coupling, capacitor should be as small a value as possible. Frequency Counter should be high impedance type.*

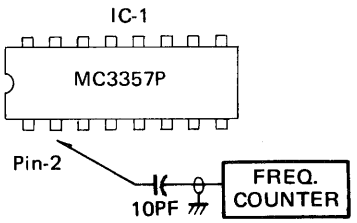


FIGURE 2.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown in Figure 3.
Step 2: Maintain Sweep Generator output at a low level to prevent overloading.
Step 3: Adjust T4, T5, T6, T7 of IF amplifier so that the 455 kHz marker is in the center of the discriminator curve and for best linearity as shown in Figure 4.

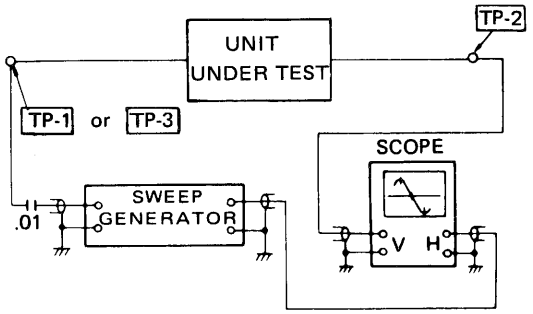


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

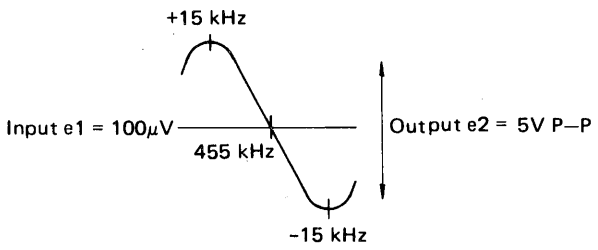


FIGURE 4. IF DISCRIMINATOR CURVE

FRONT-END ALIGNMENT

MID BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Adjust frequency of Sweep Generator to 79 MHz and connect Scope to TP-3.
Step 3: Use a channel with bandselector in mid position.
Step 4: Adjust T8, T9 and T10 of RF section for maximum output and best curve symmetry as shown in Figure 6.

HIGH BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5,
Step 2: Use a channel with bandselector in high position.
Step 3: Set Sweep Generator to a center frequency of 153 MHz.
Step 4: Adjust T1, T2 and T3 in RF section for maximum output and best curve Symmetry as shown in Figure 7.

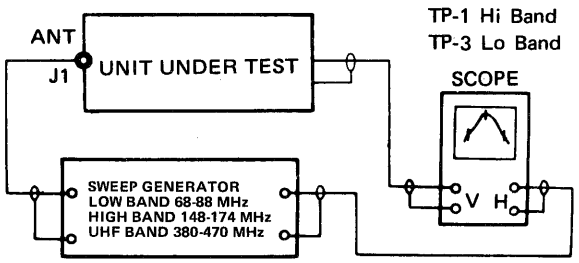


FIGURE 5. VHF LOW/HIGH AND UHF BAND RF TEST EQPT. HOOK UP

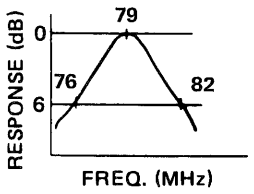


FIGURE 6. VHF Lo

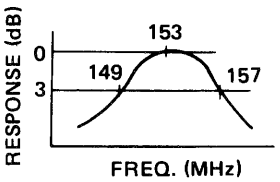


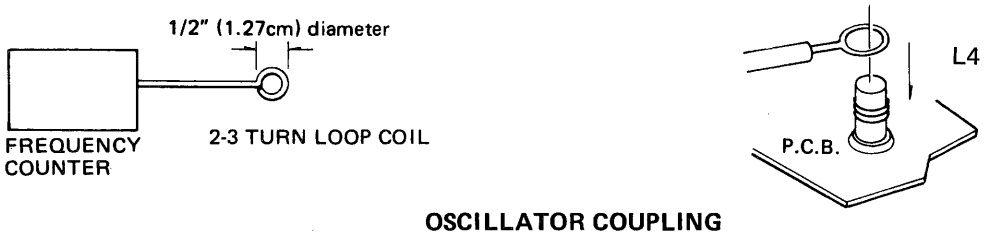
FIGURE 7. VHF Hi

UHF BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Use a channel with bandselector in UHF position.
Step 3: Set Sweep Generator to a center frequency of 405 MHz.
Step 4: Adjust TC-1, TC-2 and T11 in RF section for maximum output and best curve symetry.

VHF LOW/HIGH, LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Insert crystals in sockets.
Step 2: Couple the Frequency Counter thru a pickup coil to oscillator coil. Refer to Figure 9.



OSCILLATOR COUPLING

Step 3: Check the frequencies of the appropriate oscillators as shown in the following chart. Do not make adjustments until or unless you perform the "Overall Alignment and Sensitivity Measurement" procedures.

If necessary, adjust L4 as follaws:
As you adjust these coil, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

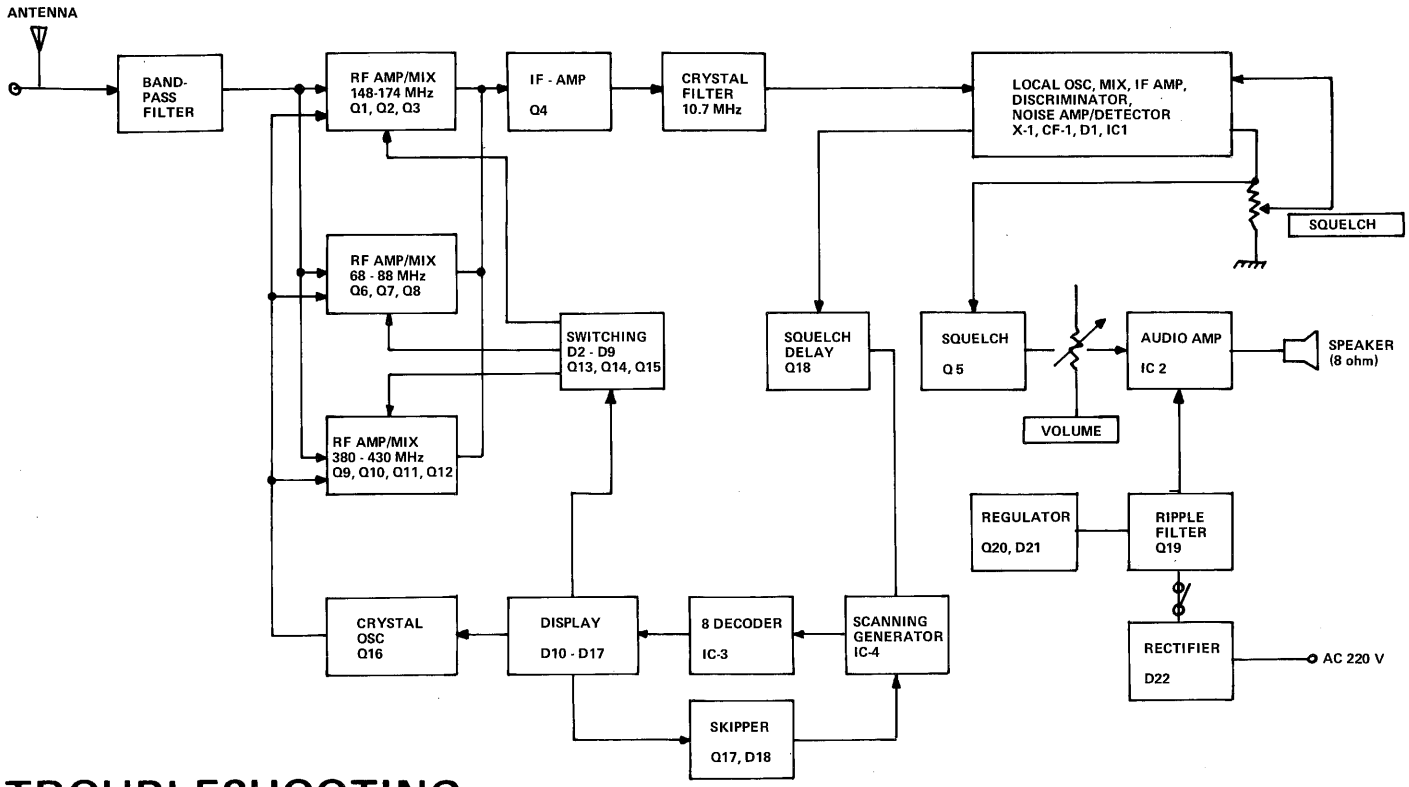
Fr		CRYSTAL POSITION	f osc	OSCILLATOR COIL
VHF MID	68 - 88 MHz	MID	(Fr +10.7 MHz)/2	L4
VHF HIGH	144 - 174 MHz	Hi	(Fr –10.7 MHz)/3	L4
UHF	380 - 470 MHz	UHF	(Fr –10.7 MHz)/9	

NOTE 1: Oscillating frequency, which is read on the frequency counter, should be 750 Hz of the calculated crystal frequency at MID and HIGH band.

VHF LOW/HIGH OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator to Antenna input and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receive band centers
Step 3: Adjust L4 for maximum sensitivity.
Step 4: Set the Signal Generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of –20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting.

NOTE 2: As supplied by the factory, this unit is set up to provide maximum sensitivity in ranges of 76 - 82 MHz for VHF MID, 149 - 157 MHz for VHF Hi and 405 - 415 MHz at UHF. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 68 MHz up to about 88 MHz for VHF MID, 148 MHz to 174 MHz for VHF Hi and 380 - 470 MHz at VHF. To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a band width "window" of about 6/8 MHz total—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). OF COURSE, BE SURE TO USE CORRECT CRYSTALS.



TROUBLESHOOTING

Symptom	Possible cause
1) Channel LED does not light and no sound. Power Switch : ON Channel Switch : ON Volume Control: MAX.	A) Faulty line power cord. B) Defective power switch C) Defective Q20, IC-3 and/or associated circuit component. D) Defective diode D22
2) Channel LED lights but no sound. Channel Switch : ON Volume Control: MAX. Squelch Control: MIN.	A) Defective speaker. B) Defective speaker jack. C) Faulty Q19, IC-2 and/or faulty associated circuit component. D) Faulty IF amplifier circuit component.
3) Sound but channel LED does not light. Channel Switch : ON Volume Control: MAX. Squelch Control: MIN.	A) Defective channel switch or defective diode D10 - D17 B) Defective R 93 C) Problem with integrated circuit IC-3 and/or IC-4
4) Does not scan and Squelch does not operate.	A) Defective Squelch control. B) Defective IF amplifier circuit, IC-1 and/or component parts. C) Defective integrated circuit IC-3 and/or IC-4 D) Defective Q5, Q 17 and/or Q18
5) Does not scan but Squelch operates.	A) Defective AUTO/MANUAL switch. B) Problem with integrated circuit IC-3 or IC-4 and/or transistor Q 18 and/or defective circuit component parts.
6) Manual selector does not operate.	A) Faulty manual selector switch, AUTO/MANUAL switch.

Symptom	Possible cause
7) Skipper does not operate.	A) Defective Q17 and/or defective circuit component parts.
8) Delay does not operate.	A) Defective Q18 and/or circuit component parts.
9) VHF (MID) band does not operate but VHF (Hi) and UHF band operates.	A) Defective crystal. B) Check setting of band selector (MID position) C) Weak crystal D) Defective RF amplifier Q6, Q7 or Q8 or defective circuit component parts.
10) VHF (Hi) band does not operate but (MID) band and UHF operates.	A) Defective crystal. B) Check setting of band selector (HIGH position). C) Defective RF Amplifier Q1, 2 or Mixer Q3 and/or defective associated part.
11) UHF band does not operate but MID and HIGH bands operates.	A) Defectiv crystal. B) Check setting of bandselector (UHF position). C) Defectiv RF amplifier Q9, mixer Q10, harmonic amplifier Q12 or IF amplifier Q11.
12) Neither band operate.	A) Defective OSC circuit. B) Defective IF amplifier circuit.
13) VHF and UHF, sound distorted.	A) Defective crystal. B) Defective amplifier circuit, IC-2 or circuit component parts.
14) VHF MID, Hi and UHF, low sensitivity.	A) Check alignment (frequency coverage). B) Defective RF AMP and IF AMP.
15) VHF MID, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
16) VHF High, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
17) UHF, low sensitivity.	A) Weak Crystal. B) Faulty adjustment at RF amplifier or faulty circuit component.

CAPACITORS

C1	8pF	ceramic	C36	0.001 µF	Mylar	C71	100 µF 16WV	Electrolyt
C2	0.5 pF	Ceramic	C37	22 pF	Ceramic	C72	1 µF 50WV	Electrolyt
C3	8 pF	Ceramic	C38	2 pF	Ceramic	C73	0.022 µF	Mylar
C4	33 pF	Ceramic	C39	15 pF	Ceramic	C74	47 µF 16WV	Electrolyt
C5	0.001 µF	Ceramic	C40	47 pF	Ceramic	C75	47 µF 16WV	Electrolyt
C6	0.001 µF	Ceramic	C41	0.001 µF	Ceramic	C76	100 pF	Ceramic
C7			C42	0.001 µF	Ceramic	C77	100 pF	Ceramic
C8	100 pF	Ceramic	C43	10 pF	Ceramic	C78	1 µF 50WV	Electrolyt
C9	0.001 µF	Ceramic	C44	33 pF	Ceramic	C79	47 µF .16WV	Electrolyt
C10	2 pF	Ceramic	C45	0.001 µF	Ceramic	C80	0.68 µF	Tantal
C11	0.001 µF	Ceramic	C46	3 pF	Ceramic	C81	0.001 µF	Ceramic
C12	0.01 µF	Ceramic	C47	0.001 µF	Ceramic	C82	0.001 µF	Ceramic
C13	0.001 µF	Ceramic	C48	10 pF	Ceramic	C83	0.001 µF	Ceramic
C14	0.01 µF	Ceramic	C49	33 pF	Ceramic	C84	0.001 µF	Ceramic
C15	0.01 µF	Ceramic	C50	12 pF	Ceramic	C85	0.001 µF	Ceramic
C16	0.001 µF	Ceramic	C51	0.0047 µF	Ceramic	C86	0.001 µF	Ceramic
C17	0.01	Mylar	C52	10 pF	Ceramic	C87	0.001 µF	Ceramic
C18	220 µF	Electrolyt	C53	3 pF	Ceramic	C88	0.001 µF	Ceramic
C19	1 µF	Tantal	C54	0.001 µF	Ceramic	C89	0.47 µF	Tantal
C20	150 pF	Ceramic	C55	0.001 µF	Ceramic	C90	0.002 µF	Mylar
C21	120 pF	Ceramic	C56	0.001 µF	Ceramic	C91	100 µF 10WV	Electrolyt
C22	0.01 µF	Mylar	C57	0.001 µF	Ceramic	C92	0.01 µF	Mylar
C23	0.01 µF	Mylar	C58	20 pF	Ceramic	C93	220 µF 10WV	Electrolyt
C24	3 pF	Ceramic	C59	0.001 µF	Ceramic	C94	100 µF 16WV	Electrolyt
C25	470 pF	Ceramic	C60	0.0022 µF	Ceramic	C95	0.04 µF	Ceramic
C26	0.1 µF	Mylar	C61	12 pF	Ceramic	C96	100 µF 16WV	Electrolyt
C27	0.047 µF	Mylar	C62	0.001 µF	Ceramic	C97	100 µF 16WV	Electrolyt
C28	150 pF	Ceramic	C63	56 pF	Ceramic	C98	0.04 µF	Ceramic
C29	10 pF	Ceramic	C64	2 pF	Ceramic	C99	100 µF 16WV	Electrolyt
C30	27 pF	Ceramic	C65	0.0022 µF	Ceramic	C100	1000 µF 25WV	Electrolyt
C31	150 pF	Ceramic	C66	100 pF	Ceramic	C101	Not used	
C32	0.01 µF	Mylar	C67	6 pF	Ceramic	C102	2 pF	Ceramic
C33	0.01 µF	Mylar	C68	39 pF	Ceramic	C103	4 pF	Ceramic
C34	0.01 µF	Mylar	C69	0.0047 µF	Ceramic	C104	5 pF	Ceramic
C35	0.022 µF	Mylar	C70	0.01 µF	Ceramic			

RESISTORS

R1	56K	1/4W Carbon film	R35	1K	1/4W Carbon film	R69	22K	1/4W Carbon film
R2	330	1/4W Carbon film	R36	10K	1/4W Carbon film	R70	120K	1/4W Carbon film
R3	10K	1/4W Carbon film	R37	10K	1/4W Carbon film	R71	680	1/4W Carbon film
R4	220	1/4W Carbon film	R38	3.3K	1/4W Carbon film	R72	100	1/4W Carbon film
R5	10K	1/4W Carbon film	R39	330	1/4W Carbon film	R73	75	1/4W Carbon film
R6	10K	1/4W Carbon film	R40	470	1/4W Carbon film	R74	Not used	
R7	3.3K	1/4W Carbon film	R41	4.7K	1/4W Carbon film	R75	Not used	
R8	100	1/4W Carbon film	R42	10K	1/4W Carbon film	R76	1K	1/4W Carbon film
R9	100	1/4W Carbon film	R43	100	1/4W Carbon film	R77	1K	1/4W Carbon film
R10	470K	1/4W Carbon film	R44	3.3K	1/4W Carbon film	R78	1K	1/4W Carbon film
R11	100	1/4W Carbon film	R45	330K	1/4W Carbon film	R79	1K	1/4W Carbon film
R12	100	1/4W Crabon film	R46	1M	1/4W Carbon film	R80	1K	1/4W Carbon film
R13	1K	1/4W Carbon film	R47	47	1/4W Carbon film	R81	1K	1/4W Carbon film
R14	1K	1/4W Carbon film	R48	100	1/4W Carbon film	R82	1K	1/4W Carbon film
R15	270K	1/4W Carbon film	R49	10K	1/4W Carbon film	R83	1K	1/4W Carbon film
R16	2.2K	1/4W Carbon film	R50	3.3K	1/4W Carbon film	R84	10K	1/4W Carbon film
R17	10K	1/4W Carbon film	R51	100	1/4W Carbon film	R85	100K	1/4W Carbon film
R18	100K	1/4W Carbon film	R52	330	1/4W Carbon film	R86	10K	1/4W Carbon film
R19	2.2K	1/4W Carbon film	R53	22K	1/4W Carbon film	R87	10K	1/4W Carbon film
R20	330	1/4W Carbon film	R54	10K	1/4W Carbon film	R88	47K	1/4W Carbon film
R21	1M	1/4W Carbon film	R55	2.2K	1/4W Carbon film	R89	100K	1/4W Carbon film
R22	2.2K	1/4W Carbon film	R56	47	1/4W Carbon film	R90	100K	1/4W Carbon film
R23	22K	1/4W Carbon film	R57	2.2K	1/4W Carbon film	R91	27K	1/4W Carbon film
R24	1.8K	1/4W Carbon film	R58	47	1/4W Carbon film	R92	2.2K	1/4W Carbon film
R25	47K	1/4W Carbon film	R59	2.2K	1/4W Carbon film	R93	100	1W Carbon film
R26	22K	1/4W Carbon film	R60	47	1/4W Carbon film	R94	150	1/4W Carbon film
R27	15K	1/4W Carbon film	R61	47	1/4W Carbon film	R95	1	1W Carbon film
R28	1K	1/4W Carbon film	R62	100	1/4W Carbon film	R96	390	1/4W Carbon film
R29	10K	1/4W Carbon film	R63	2.2K	1/4W Carbon film	R97	1	1W Carbon film
R30	22K	1/4W Carbon film	R64	2.2K	1/4W Carbon film	R98	1K	1/4W Carbon film
R31	56K	1/4W Carbon film	R65	2.2K	1/4W Carbon film	R99	330	1/4W Carbon film
R32	330	1/4W Carbon film	R66	39K	1/4W Carbon film	R100	4.7K	1/4W Carbon film
R33	10K	1/4W Carbon film	R67	4.7K	1/4W Carbon film			
R34	220	1/4W Carbon film	R68	470K	1/4W Carbon film			

COILS TRANSFORMERS/FILTERS

T1	RF coil	113SN–5066X
T2	RF coil	113SN–5067X
T3	RF coil	113SN–5067X
T4	IF coil	L470033N
T5	IF coil	L470033N
T6	IF coil	M452503N
T7	IF coil	M452503N
T8	RF coil	755R–094
T9	RF coil	755R–094
T10	RF coil	755R–094
T11	IF coil	L470033N
T12	Power transformer	K6421
L1	Tank coil	8LNR–093
L2	Tank coil	8LNR–093
L3	Choke coil	6.8 uH
L4	Osc coil	SNO–087
L5	Choke coil	1.8 uH
XF-1	Crystal filter	10M15A
CF-1	Ceramic filter	LF–B20
X1	Crystal 10.245 MHz	

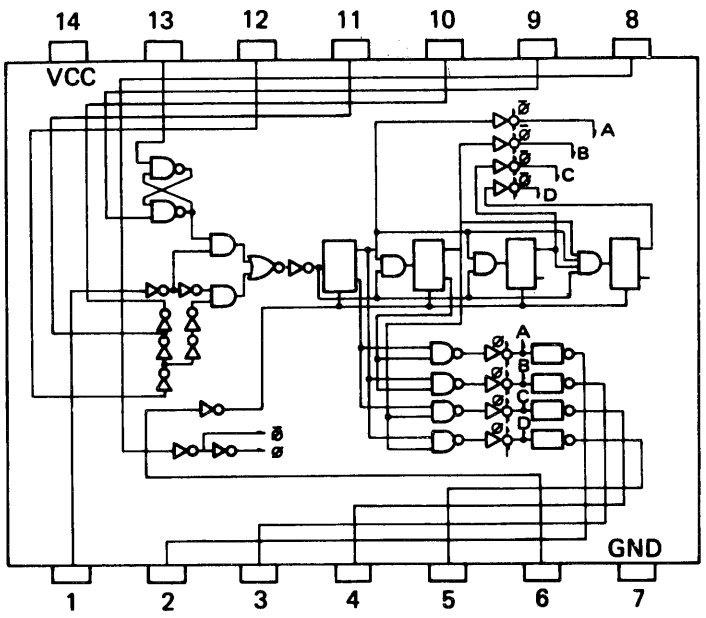
SEMICONDUCTORS

Q1	2SC535 (B)	IC1 MC3357
Q2	2SC535 (B)	IC2 SN76007
Q3	2SK19 (Y)	IC3 SN74145
Q4	2SC1815 (O)	IC4 T3375
Q5	2SC1815 (GR)	
Q6	2SC535 (B)	
Q7	2SC535 (B)	
Q8	2SK19 (Y)	
Q9	2SC1117	
Q10	2SC1117	
Q11	2SC19 (Y)	
Q12	2SC387 (A)	
Q13	2SA1015 (O) or 2SA495 (O)	
Q14	2SA1015 (O) or 2SA495 (O)	
Q15	2SA1015 (O) or 2SA495 (O)	
Q16	2SC394 (Y)	
Q17	2SC1815 (GR)	
Q18	2SC1815 (GR)	
Q19	2SC1173 (O)	
Q20	2SD526 (O)	
D1	HU80	
D2-9	HU80	
D10-17	TRL106	
D18	HU80	
D19	HU80	
D20	HU80	
D21	05210A	Zener
D22	1B4B	

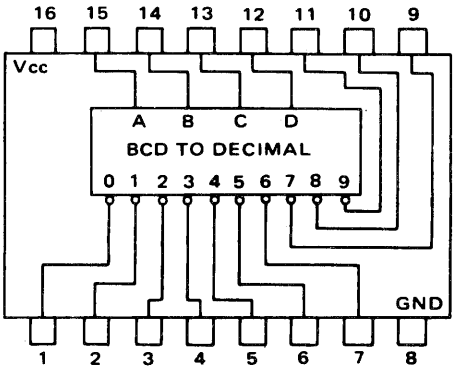
MISCELLANEOUS

	Crystal socket	SF-101B-00
	Band switch	S-113146
	Skip switch	SSFMB-12-16K
	Scan/manual switch	MLS-G-2
	Volume control	50 K A
	Squelch control	50 K B
	Phone jack	JA-C-011
	Motorola jack	JA-C-020
	Fuse holder	HN 1150-2
	Fuse 50mAT/250V	SEMCO
	Speaker	N1312
	Power cord	BLK2M
	Front escutcheon	GE-23B-7568
	Bonnet	GE-22B-6383
	VR knob	GE-20D-5514
	Antenna guide	GE-22D-6428
	Cord stoppen	5120
	Telescopic antenna	F2007-113
	Model label	GE-23D-7520
	Crystal label	GE-22D-6409

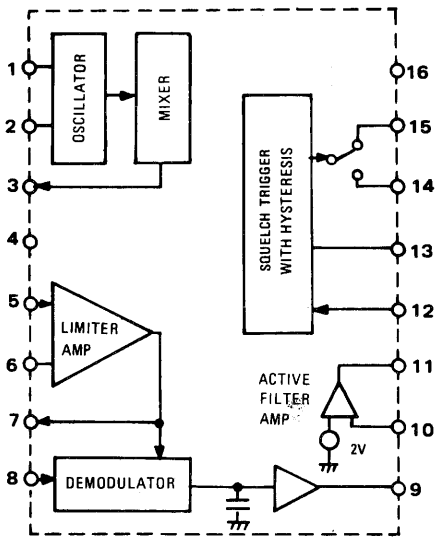
IC PIN CONFIGURATIONS



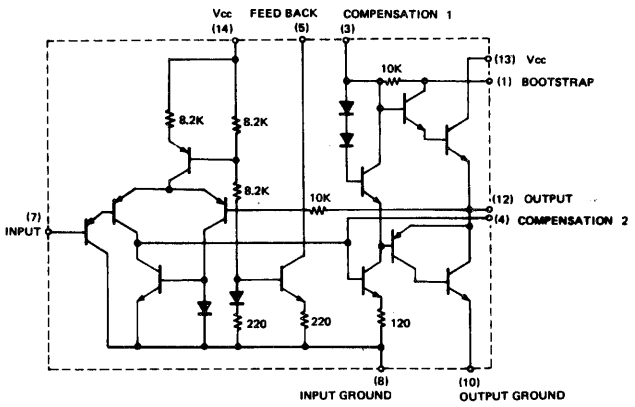
MOS IC T3375



SN74145N



MC3357P

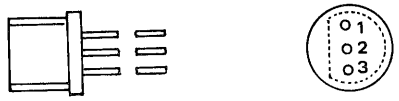


SN76007N

SEMICONDUCTOR LEAD IDENTIFICATION

(A) : 2SA495(O), 2SC373, 2SC387A, 2SC394(Y)
(B) : 2SK19(Y)
(C) : 2SD526, 2SC1173
(D) : 2SC535(B)
(E) : 2SC1117
(F) : 2SC1815(O), 2SC1815(GR)
(G) : SN76007, T3375
(H) : MC3357P, SN74145N

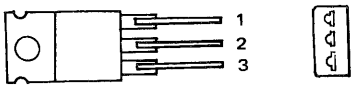
(A)
(B)



(A)
1. Base
2. Collector
3. Emitter

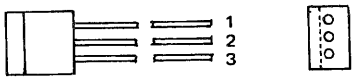
(B)
1. Gate
2. Source
3. Drain

(C)



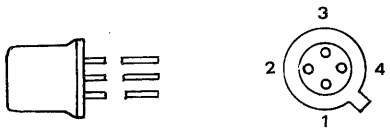
(C)
1. Emitter
2. Collector (Heat sink)
3. Base

(D)



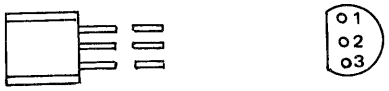
(D)
1. Base
2. Collector
3. Emitter

(E)



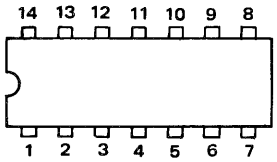
(E)
1. Emitter
2. Base
3. Collector
4. Case

(F)

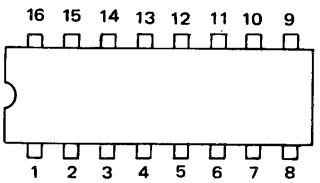


(F)
1. Base
2. Collector
3. Emitter

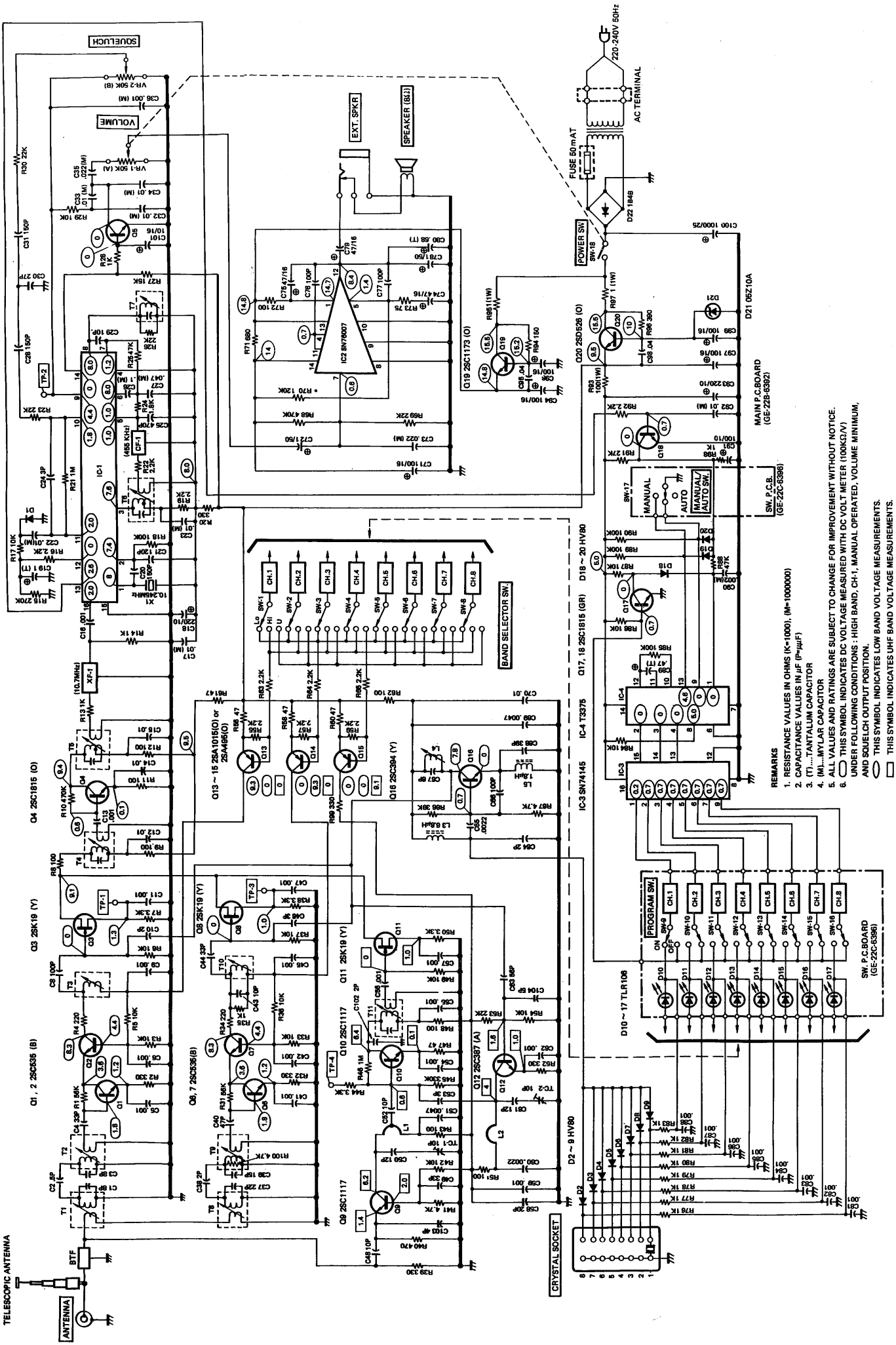
(G)



(H)



SCHEMATIC DIAGRAM



REMARKS

1. RESISTANCE VALUES IN OHMS (K=1000), (M=1000000)
2. CAPACITANCE VALUES IN μF (P=μμF)
3. (T)...TANTALUM CAPACITOR
4. (M)...MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.
6. ○ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH DC VOLT METER (100KΩ/V) UNDER FOLLOWING CONDITIONS : HIGH BAND, CH-1, MANUAL OPERATED, VOLUME MINIMUM, AND SQUELCH OUTPUT POSITION.
   ⬭ THIS SYMBOL INDICATES LOW BAND VOLTAGE MEASUREMENTS.
   □ THIS SYMBOL INDICATES UHF BAND VOLTAGE MEASUREMENTS.