SERVICE MANUAL
FOR
handic 0050

Micro computerized AM/FM Scanner

handic ab
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CONTENTS

SPECIFICATIONS

Description	Nominal spec.	Limit spec.
Frequency Coverage		
VHF MID		68 ~ 88 MHz 5 kHz steps
AIRCRAFT		108 ~ 136 MHz 25 kHz steps
VHF HIGH		138 ~ 174 MHz 5 kHz steps
UHF		380 ~ 470 MHz 12.5 kHz steps
Sensitivity		
VHF MID FM	0.5 μV	2 μV
AIRCRAFT AM	1 μV	3 μV
VHF HIGH FM	0.5 μV	2 μV
UHF FM	1 μV	4 μV
	MOD.: 60% at 1 kHz (S + N)/N = 20 dB	
Selectivity – 6 dB	±9 kHz	±12 kHz
–50 dB	±15 kHz	±18 kHz
Spurious Rejection		
at 78 MHz	50 dB	40 dB
at 122 MHz	50 dB	40 dB
at 160 MHz	50 dB	40 dB
UHF		Not specified
(except primary image)		
IF Rejection 10.7 MHz	80 dB	40 dB
Modulation Acceptance (EIA RS-204-A)	±7 kHz	±5 kHz
Signal to Noise Ratio (AM: MOD. 60% at 1 kHz) (FM: DEV. 5 kHz at 1 kHz)		
VHF MID	45 dB	30 dB
AIRCRAFT	40 dB	25 dB
VHF HIGH	40 dB	25 dB
UHF	35 dB	25 dB
Residual Noise (Vol. Min)	3 mV	5 mV
Scanning Speed Fast	6 channels/sec.	4 ~ 8 channels/sec.
Slow	3 channels/sec.	2 ~ 4 channels/sec.
Search Rate Fast	8 steps/sec.	6 ~ 10 steps/sec.
Slow	3 steps/sec	2 ~ 5 steps/sec.
Priority Sampling	3 sec. 100 m sec.	2 ~ 4 sec. 80 ~ 120 m sec.
Scan Delay Time	3 sec.	2 ~ 4 sec.
Audio Output Power (T.H.D. 10 %)	1.5 W	1 W
Clock Accuracy		Not Specified

Channels of Operation	Any 50 channels in any band combination (10 channels x 5 Banks)
Channel, Frequency and Mode Display	Fluorescent multi display 13 letters
Receiving System	Direct Key entry Digital-Controlled Synthesizer, Superheterodyne 1st IF: 10.7MHz 2nd IF: 455 kHz
Power Requirements	AC-220 ~ 240 Volts 50 Hz 19 W DC-13.8 V 10 W
Accessory	Telescopic antenna and Car Mounting bracket with Screws.

NOTE: *Nominal Specs represent the design specs: all units should be able to approximate these – some will exceed and some may drop slightly below these specs. Limit Specs represent the absolute worst condition which still might be considered acceptable: in no case should a unit perform to less than within any Limit Spec.*

PRINCIPLES OF OPERATION

The handic 0050 is a PLL (Phase Locked Loop) Synthesized VHF/UHF AM – FM Receiver, controlled by a CPU (Central Processing Unit) via the Keyboard.

The VHF Mid Band (68 ~ 88 MHz) and High Band (138 ~ 174 MHz) are received in 5 kHz increments. Aircraft Band (108 ~ 136 MHz) is step up for 25 kHz increments, and the UHF Band (380 ~ 470 MHz) for 12.5 kHz increments.

Receiving frequency range, frequency determination, scanning speed, delay time, etc., are all functions controlled by the CPU. The CPU is able to do only the assigned functions, and no modification of the CPU is feasible.

The following paragraphs explain the operation of the circuit in terms of the functional blocks:

A varactor (variable capacitance diode) tuning ("Automatic Tuning System") is employed on all Bands.

Field-effect transistors (FET) are used in the RF/MIX circuits of Mid, High and Aircraft Bands, to achieve optimum mix-modulation and mutual-modulation characteristics. Q118 amplifiers 10.7 MHz IF. A 10.7 MHz monolithic Crystal Filter is incorporated for better selectivity.

IC-101 contains Local Oscillator, Mixer, IF Amplifier, Quadrature FM Detector, Noise Amplifier and Detector. A Crystal Oscillator produces 10.245 MHz, which mixed with 10.7 MHz, resulting in 455 kHz IF. A 455 kHz Ceramic filter is provided to increase selectivity. The 455 kHz IF is amplified in the IF Amp stage, and a Quadrature FM Detector detects it to an audio signal. A portion of the 455 kHz Ceramic Filter output is picked up, amplified and detected by the AM IF Amp, which consists of Q120, 121 and D119, and then applied to the next stage via the ANL circuit.

Detected output of AM and FM is applied to IC-2. The IC-2 selects the AM or FM output, and also does Mute switching. The AM Pre-Amp consists of Q129 and Q130. IC-105 is an AF Power-Amp. Q127, 128 produce an approximately 2.5 kHz key peep tone with each valid key input.

Zeromatic circuit consists of IC-104 and Q126 and functions in search mode.

Noise Amp/Detector consists of Q119, IC-101 and D118, which converts the noise to proportional DC level to control audio mute and CPU via IC-103, D122, 123 circuit.

IC-1 is the CPU. The CPU does data processing, calculation, etc. Unstable supply voltage (V_{DD}) to the CPU can produce CPU malfunctions, such as wrong data processing, wrong data transfer, etc. To overcome this, C23 and D35 'initialize" the CPU. Initialization is done when AC or DC power is supplied to AC plug or DC connector. Figure 1 shows initializing waveform.

Figure 2 shows the Clock waveform. Data outputs from CPU are level shifted in IC-2 and applied to PLL circuit which consists of IC-12, 13. Also the data outputs are converted from 4 lines to 16 lines in IC-3, 4 and then written in IC-5, 6.

The memory data are picked up as needed, and applied to CPU via IC-7 and IC-11, for calculation.

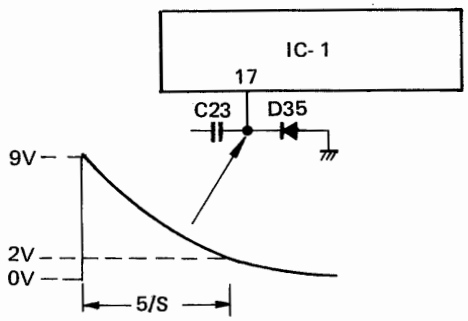


FIGURE 1

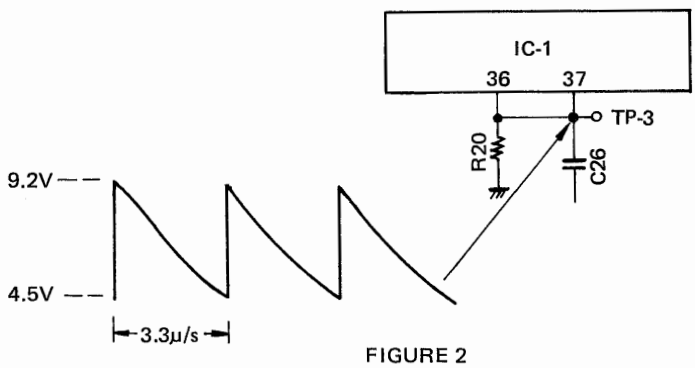


FIGURE 2

The CPU does the Clock count. IC-8, 9 pick up a 6.4 MHz Crystal oscillated frequency in the PLL, and produce 25 Hz to supply CPU with the 25 Hz. To protect Clock count from a momentary power failure, the Clock backup circuit consisting of Q135, 136, D137, 138 and a 9 volt Battery activates.

Output from PLL circuit controls the VCO via a Low-Pass Filter which consists of Q2, 3, 4 and D3, 4, 34.

All circuits except Audio Power Amp circuit are supplied with stabilized voltage. The CPU power supply is 9 volts from a DC – DC converter which works on well-regulated 5 volts. This is to prevent CPU malfunction due to low voltage, such as the sharp voltage drop when an engine starts when the unit used in a vehicle.

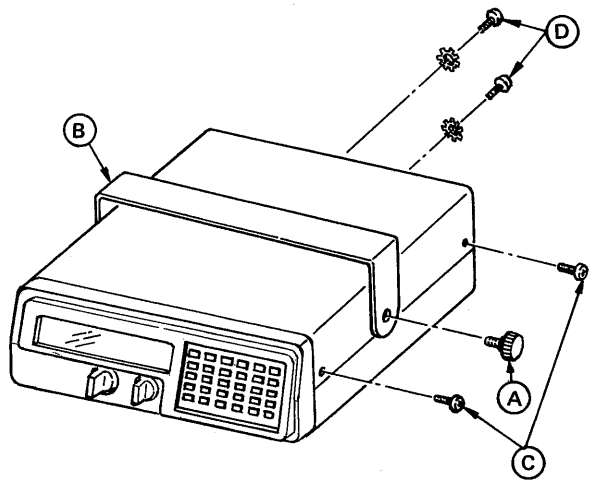
The handic 0050 draws approximately 220V – 60 mA AC, or 12V – 120 mA DC current to keep clock count even when the unit power switch is OFF.

Be sure to disconnect the AC plug (DC connector) when changing any component part for repair.

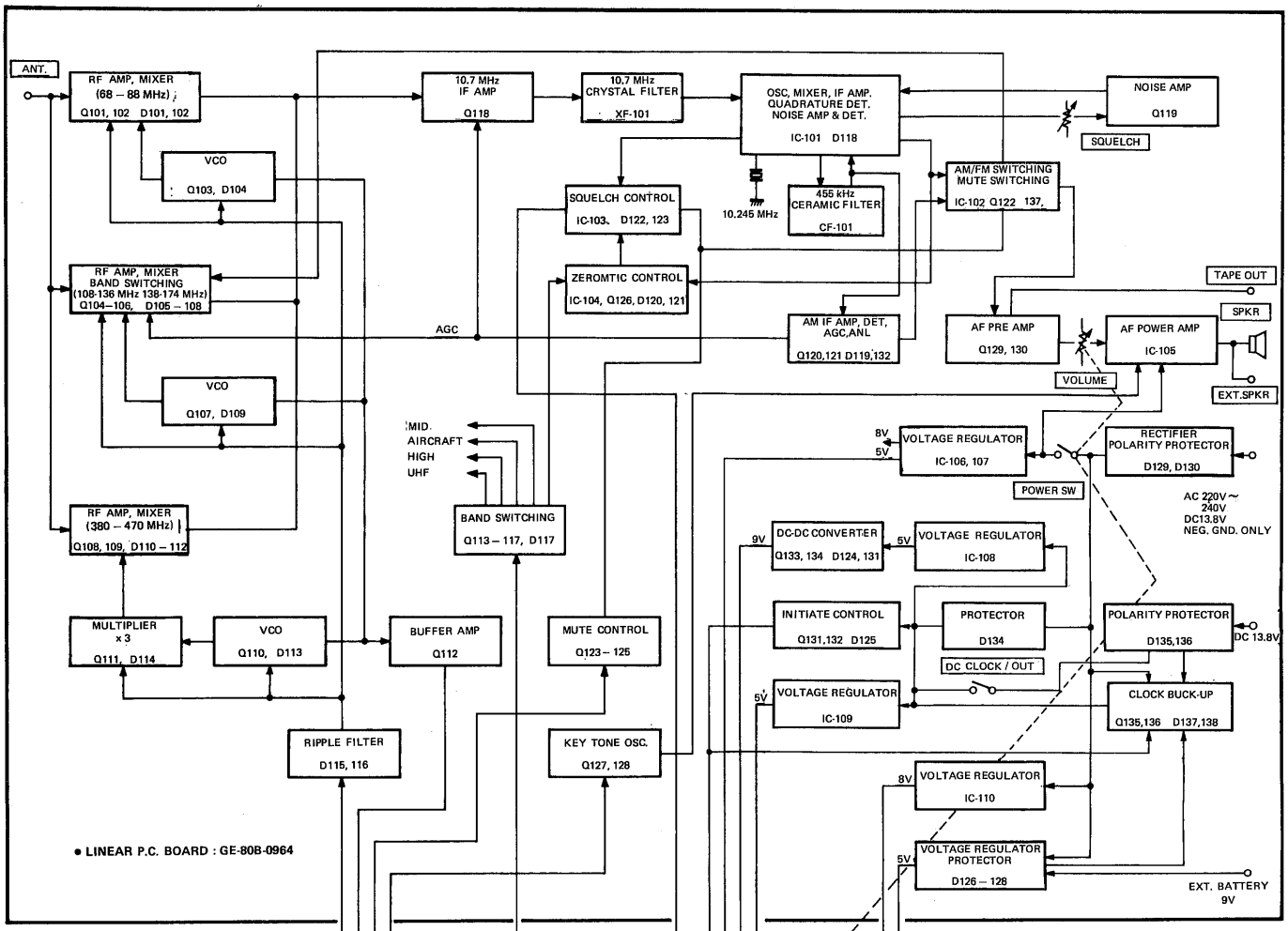
In the event of IC latch-up while checking the circuit, just disconnect the power source for about a minute.

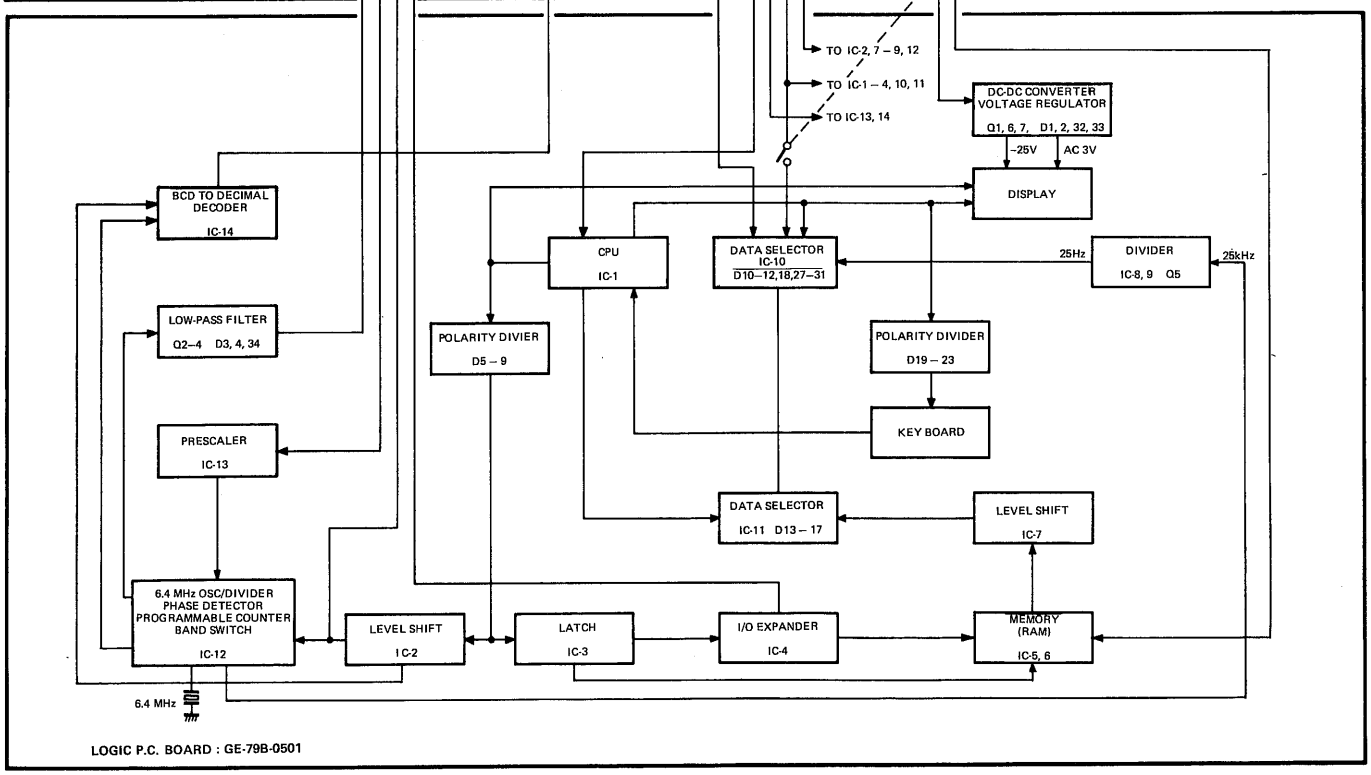
DISASSEMBLY DIAGRAM

Step 1: Remove two bracket screws (A) and the bracket (B).
Step 2: Remove four screws (C) two from each side of the Cabinet.
Step 3: Remove two screws (D) back side of the cabinet.
Step 4: Open the cabinet. Use care not to damage leads of speaker installed on the cabinet.

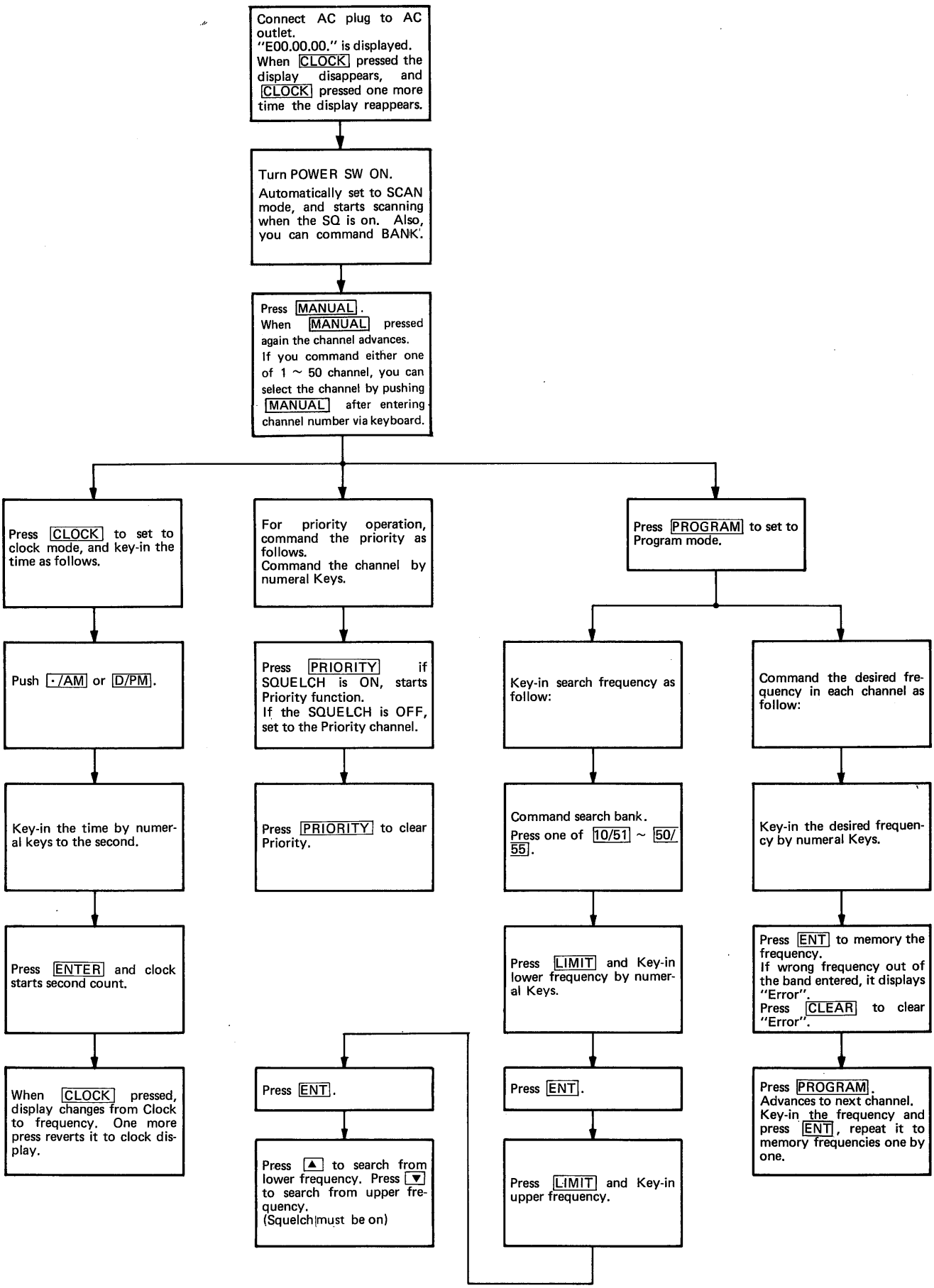


BLOCK DIAGRAM

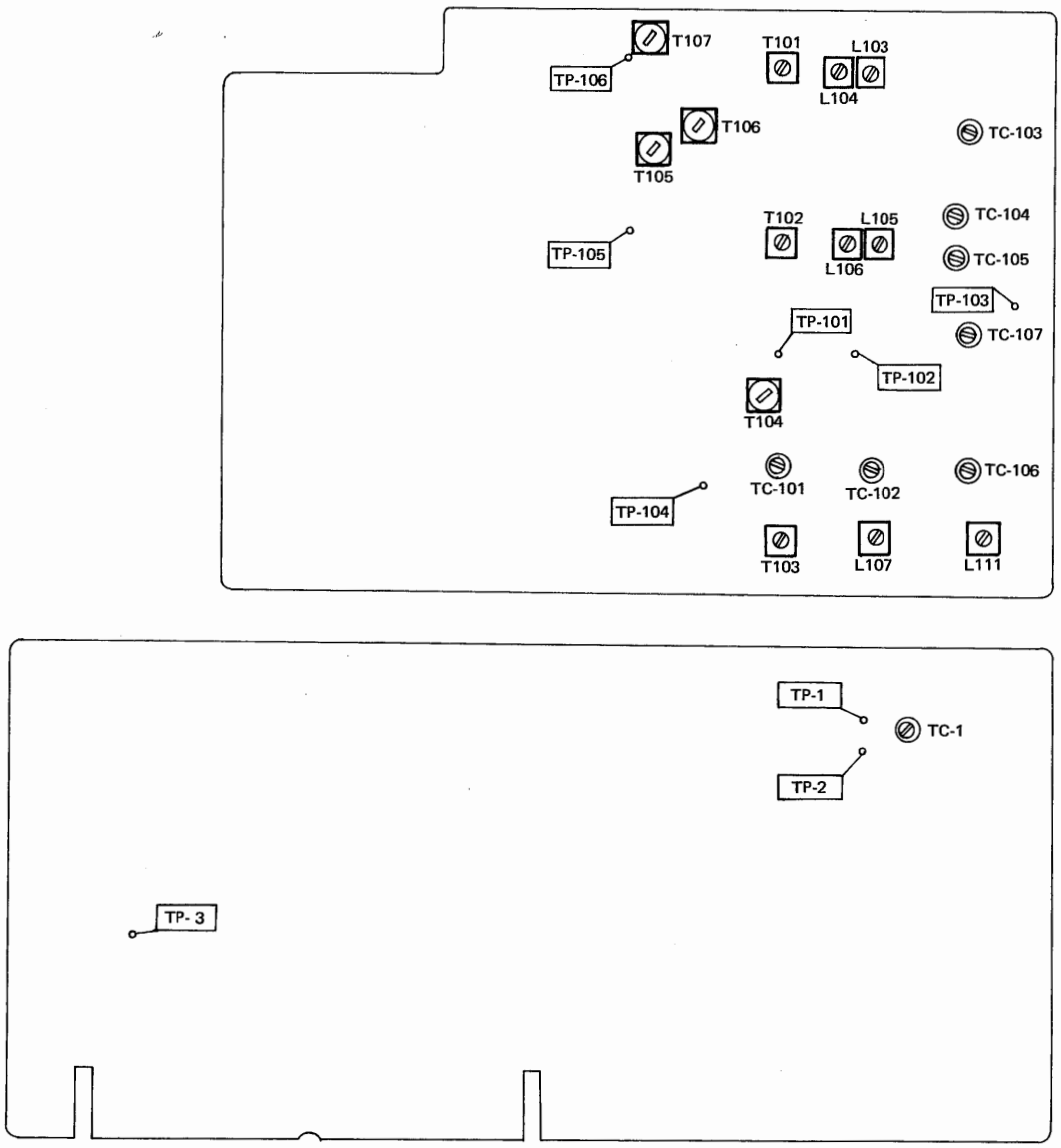




GENERAL OPERATION OUTLINE



ALIGNMENT AND TEST POINT POSITIONS



ALIGNMENT PREPARATION

Test equipment required

1. Oscilloscope (0 ~ 500 kHz, 0 ~ 50 MHz)
2. AC VTVM
3. DC VTVM
4. Frequency Counter (60 MHz)
5. 8 ohms dummy load
6. Slow Sweep Generator with variable marker (10.7 MHz)
7. VHF Sweep Generator with variable marker (68 ~ 88 MHz, 108 ~ 174 MHz)
8. UHF Sweep Generator with variable marker (380 ~ 470 MHz)
9. FM Signal Generator (68 ~ 88 MHz, 138 ~ 174 MHz, 380 ~ 470 MHz)
10. AM Signal Generator (108 ~ 136 MHz)

NOTE 1: *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.

NOTE 2: *A 9-volt battery is required to hold the memory when AC is disconnected. Always be sure the unit is loaded with a fresh 9-volt battery or the pre-programmed channels will be lost (and will have to be re-programmed).*

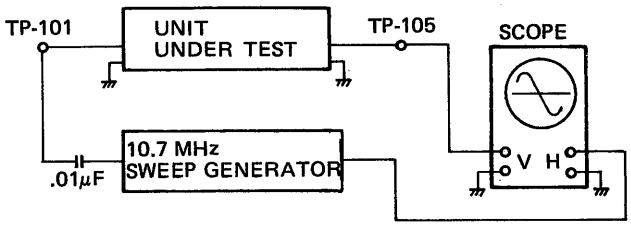
REFERENCE FREQUENCY OSC ALIGNMENT

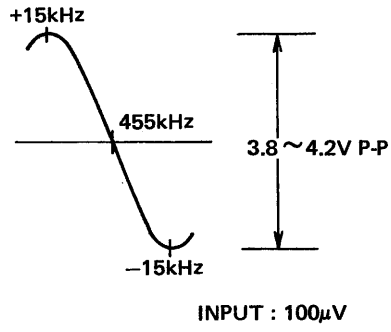
Step 1: Connect Frequency Counter to TP1 and ground. Connect the ground first to prevent IC-12 latch-up.
Step 2: Adjust TC-1 so that the frequency is 6.40000 MHz ±10 Hz.

NOTE 1: *If 6.4 MHz fails to oscillate, it may due to IC-12 latch-up.*
Unplug the power connector momentary to turn power supply completely off.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown below.





INPUT : 100μV

Step 2: Adjust T105 for maximum output so that the 455 kHz marker is in the center of the discriminator curve and for best linearity as shown above.
During Alignment, maintain Sweep Generator output at the lowest level possible to prevent overloading.

VCO ALIGNMENT

VHF BAND

Step 1: Connect a DC VTVM to TP-104 and ground
Step 2: Program CH1, 2 and 3 as follows:
CH1 (68 MHz), CH2 (78 MHz), CH3 (88 MHz)
Step 3: Select channel 3 (88 MHz) and adjust TC-101 for 9.0V on the DC VTVM
Step 4: Select channel 1 (68 MHz) and adjust T103 for 1.0V on the DC VTVM
Step 5: Repeat steps 3 and 4 until no improvement is observed.
The DC VTVM should show as below.

68 MHz	Voltage of TP-104	1.0V
78 MHz	Voltage of TP-104	3.4V ±0.3V
88 MHz	Voltage of TP-104	9.0V

VHF HI BAND AND AIRCRAFT

Step 1: Connect a DC VTVM to TP104 and ground.
Step 2: Program CH1, 2, 3, 4, 5 and 6 as follows.
CH1 (108 MHz), CH2 (120 MHz), CH3 (136 MHz), CH4 (138 MHz), CH5 (160 MHz), CH6 (174 MHz).
Step 3: Select Channel 6 (174 MHz) and adjust TC102 for 8.0V on the DC VTVM.
Step 4: Select Channel 1 (108 MHz) and adjust L107 for 1.0V on the DC VTVM.
Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should show as below.

108 MHz	Voltage at TP-104	1.0V
120 MHz	Voltage at TP-104	2.1 ± 0.3V
136 MHz	Voltage at TP-104	3.6 ± 0.3V
138 MHz	Voltage at TP-104	1.8 ± 0.3V
160 MHz	Voltage at TP-104	3.9 ± 0.3V
174 MHz	Voltage at TP-104	8.0V

UHF BAND

Step 1: Connect a DC VTVM to TP-104 and ground.

Step 2: Program CH1, 2 and 3 as follows:
CH1 (380 MHz), CH2 (430 MHz), CH3 (470 MHz).

Step 3: Select Channel 3 (470 MHz) and adjust TC-106 for 9.0 V on the DC VTVM.

Step 4: Select Channel 1 (380 MHz) and adjust L111 for 1.0 V on the DC VTVM.

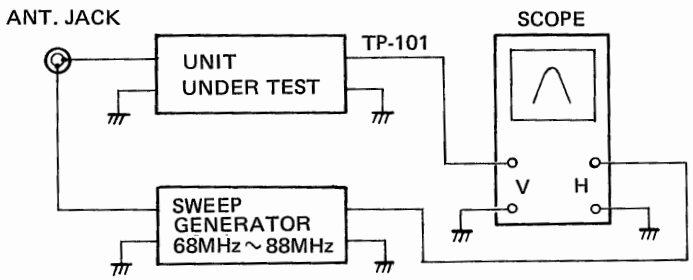
Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should show as below.

380 MHz	Voltage at TP-104	1.0 V
430 MHz	Voltage at TP-104	3.4 V ±0.3 V
470 MHz	Voltage at TP-104	9.0 V

RF AMP ALIGNMENT

VHF MID BAND

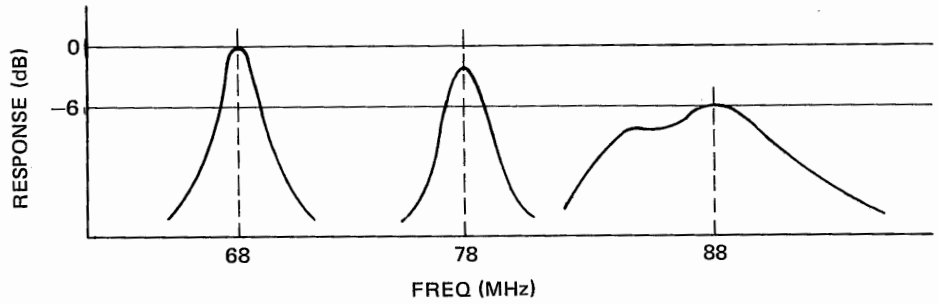
Step 1: Connect instruments as shown below.



Step 2: Program 68 MHz (CH1), 78 MHz (CH2), 88 MHz (CH3).

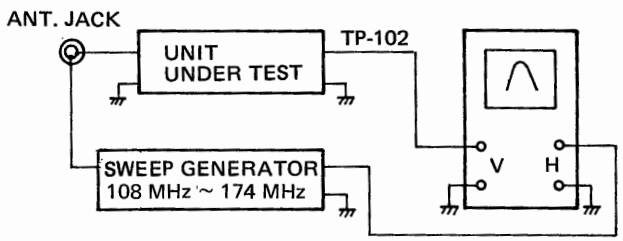
Step 3: Select Channel 1 (68 MHz) and adjust T101 and T102 for maximum RF waveform.

Step 4: Check the Channels 1 ~ 3 one by one for maximum RF waveform.
Slight deviation as shown below is tolerable.

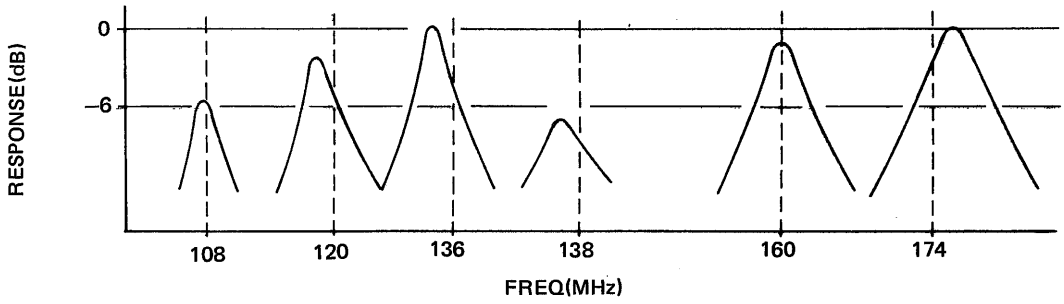


VHF HI AND AIRCRAFT

Step 1: Connect instruments as shown below.

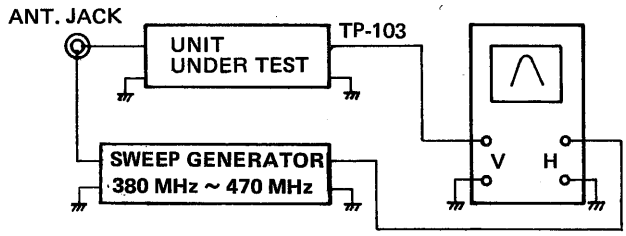


Step 2: Program 108 MHz (CH1), 120 MHz (CH2), 136 MHz (CH3), 138 MHz (CH4), 160 MHz (CH5) and 174 MHz (CH6).
Step 3: Select Channel 1 (108 MHz) and adjust L104 and L106 for maximum RF waveform.
Step 4: Select Channel 5 (160 MHz) and adjust L103 and L105 for maximum RF waveform.
Step 5: Repeat steps 3 and 4 to obtain the maximum RF waveform for each channel.
Step 6: Check the Channels 1 ~ 6 one by one for the maximum RF waveform at each frequency marker. Slight deviation as shown below is tolerable.

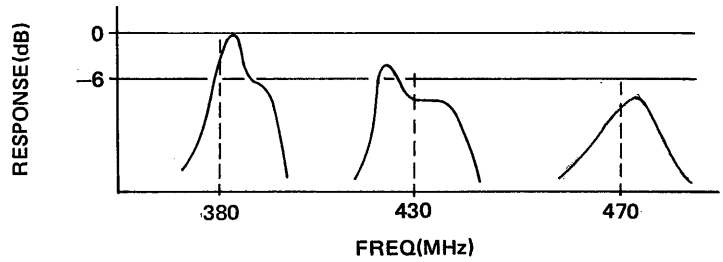


UHF BAND

Step 1: Connect instruments as shown below.



Step 2: Program 380 MHz (CH1), 430 MHz (CH2) and 470 MHz (CH3).
Step 3: Select Channel 2 (430 MHz) and adjust TC-103, TC-104, and TC-105 for maximum RF waveform.
Step 4: Select Channel 3 (470 MHz) and adjust TC-107 for maximum RF waveform.
Step 5: Check the Channels 1 ~ 3 one by one for the maximum RF waveform at each frequency marker. Slight deviation as shown below is tolerable.



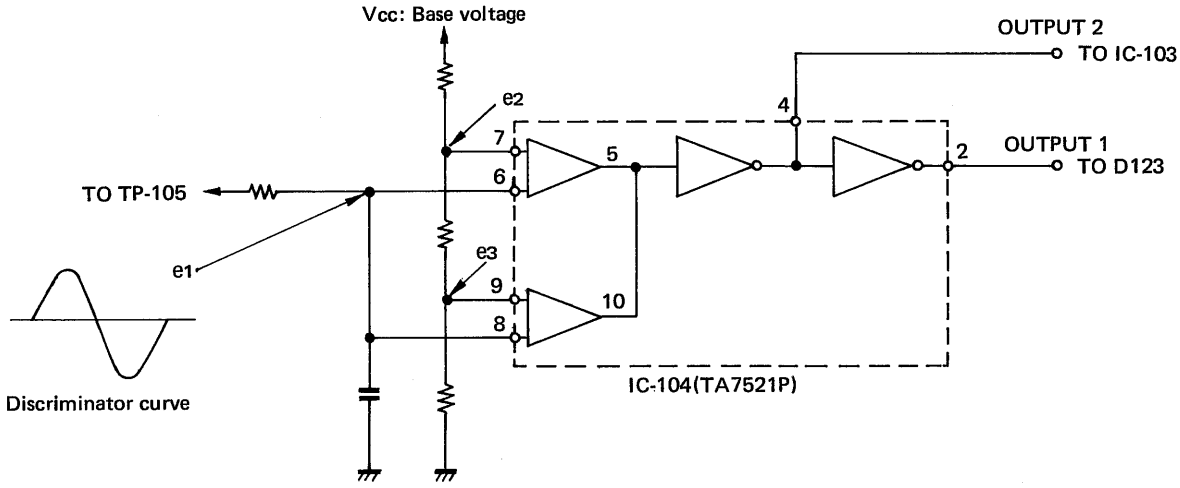
OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator (SSG) to ANTenna jack and AC VTVM to EXT. SPKR Jack.
Step 2: Turn SQUELCH fully counterclockwise. Set for reception of the channels noted in the following chart. Set the SSG to the center of each band.

CH	BAND	FREQ.
1	VHF MID	78 MHz
2	VHF HI	160 MHz
3	UHF	470 MHz
4	AIRCRAFT	120 MHz

Step 3: Set the Signal Generator frequency to 470 MHz (channel 3). Readjust TC-107 for maximum sensitivity.
Step 4: Set the Signal Generator frequency to 120 MHz (channel 4). Adjust T104, T106 and T107 for maximum sensitivity.
Step 5: For each frequency/channel, set Signal Generator to each frequency (FM: 5 kHz deviation, AM: 60% modulation). Set VOLUME control for 0 dB (0.775 V) reading on the VTVM.
Step 6: Turn off the modulation and measure the (S + N)/N ratio.

ZEROMATIC FUNCTION AND HOW TO CHECK IT



* Zeromatic functions when OUTPUT 1 is in "H" level.

e_1	$0 < e_1 < e_3$	$e_3 < e_1 < e_2$	$e_2 < e_1 < V_{CC}$
OUTPUT 1 (Pin No. 2)	L	H	L
OUTPUT 1 (Pin No. 4)	H	L	H

To adjust e_1 voltage, receive signal in Manual mode, and set T105 to get half supply voltage (IC101, 4 pin). It is convenient to use National Weather Service Signal for the adjustment.
In the event Zeromatic does not function right, refer to "REFERENCE FREQUENCY OSC ALIGNMENT" and check 6.4 MHz, and adjust T105 again.

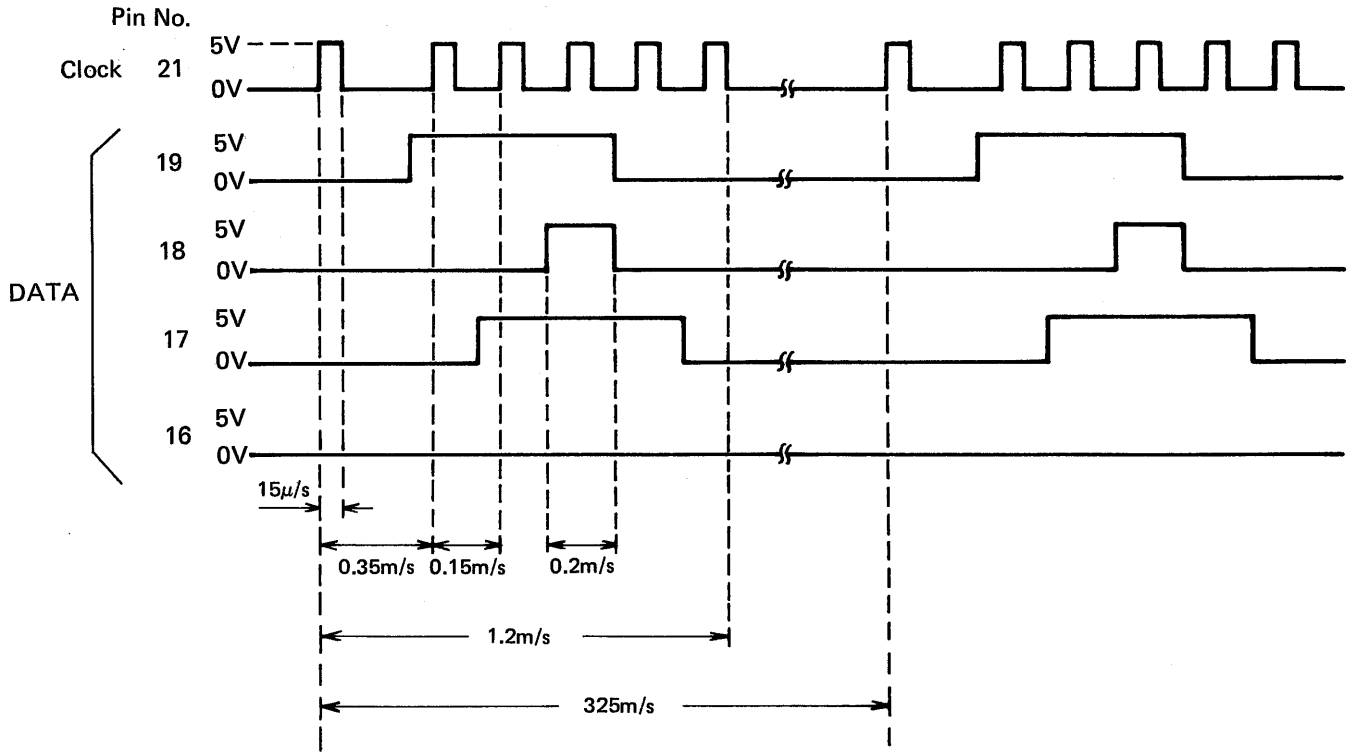
NOTE:
TP-2 is for checking PHASE Lock/Unlock Detection.
PLL circuit is locked: Low level
PLL circuit is unlocked: High level or Pulse output

TP-3 is for checking CPU Clock Oscillation:
approximetely 300 kHz. Observe 300 kHz sawtooth waveform with an oscilloscope.

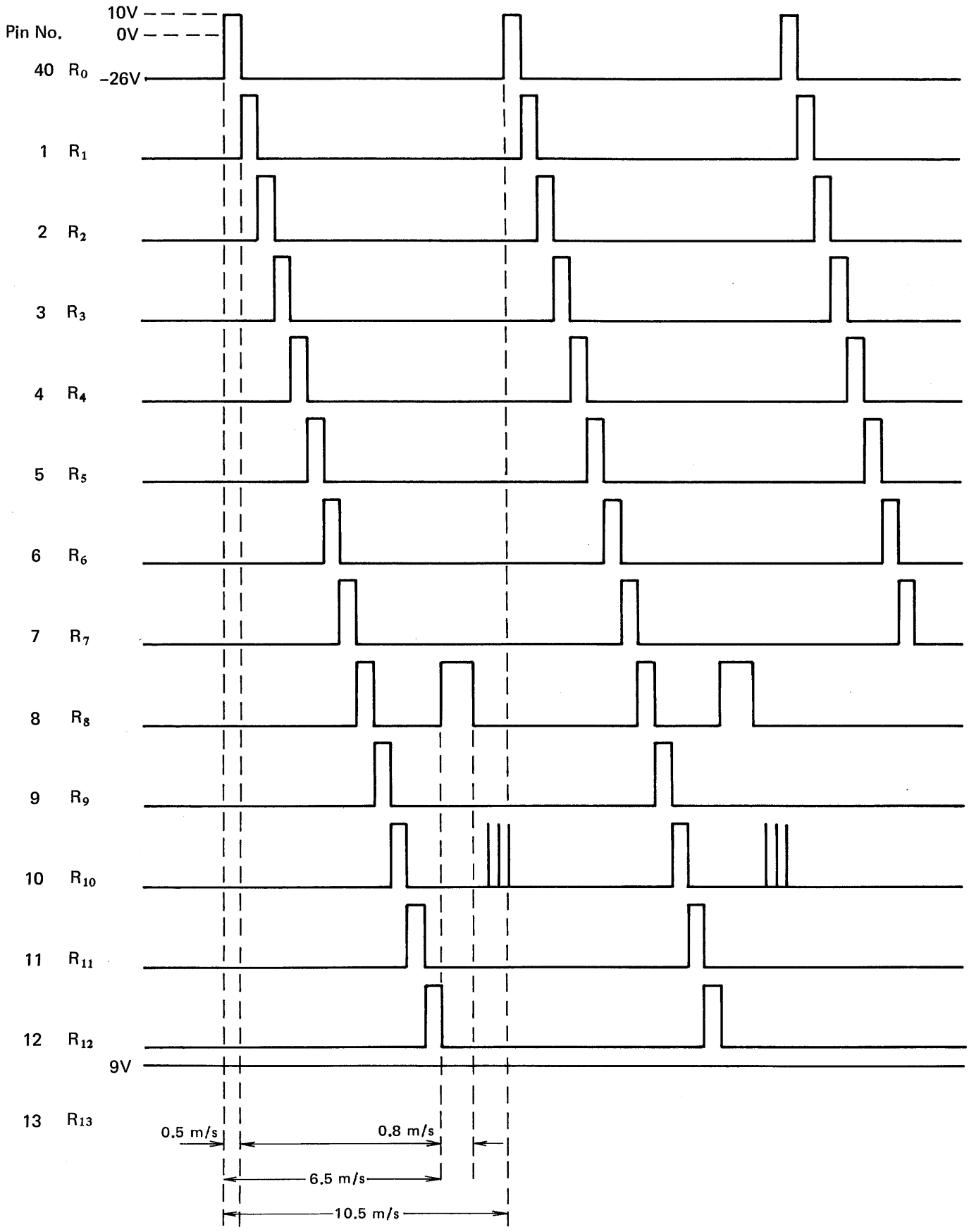
TP-106 is for checking AM Detector output.

DATA INPUT AND PLL CLOCK WAVEFORMS (IC-12)

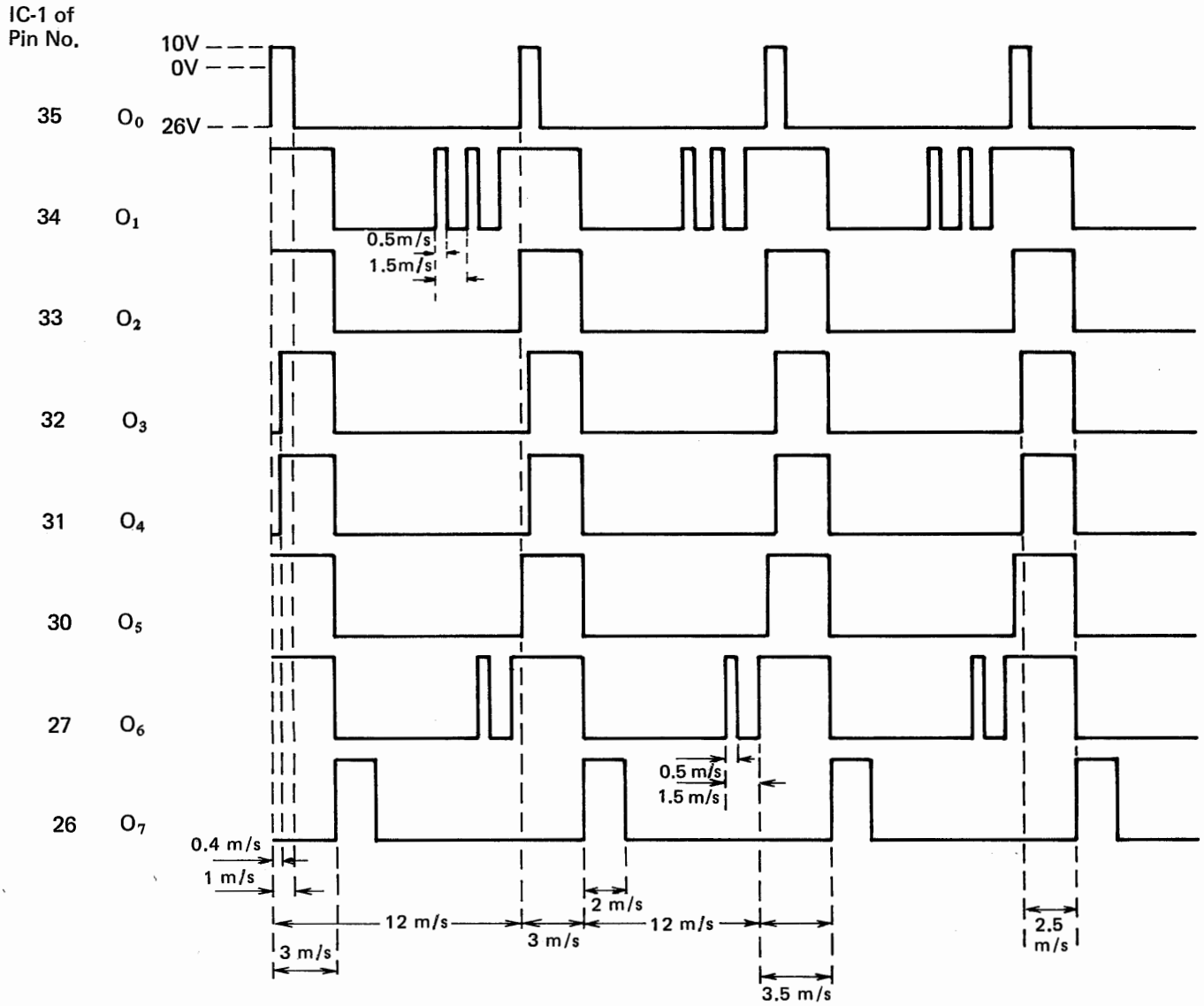
* Select Bank 1, enter 68 MHz in CH1 ~ 10, and measure the scanning waveforms.



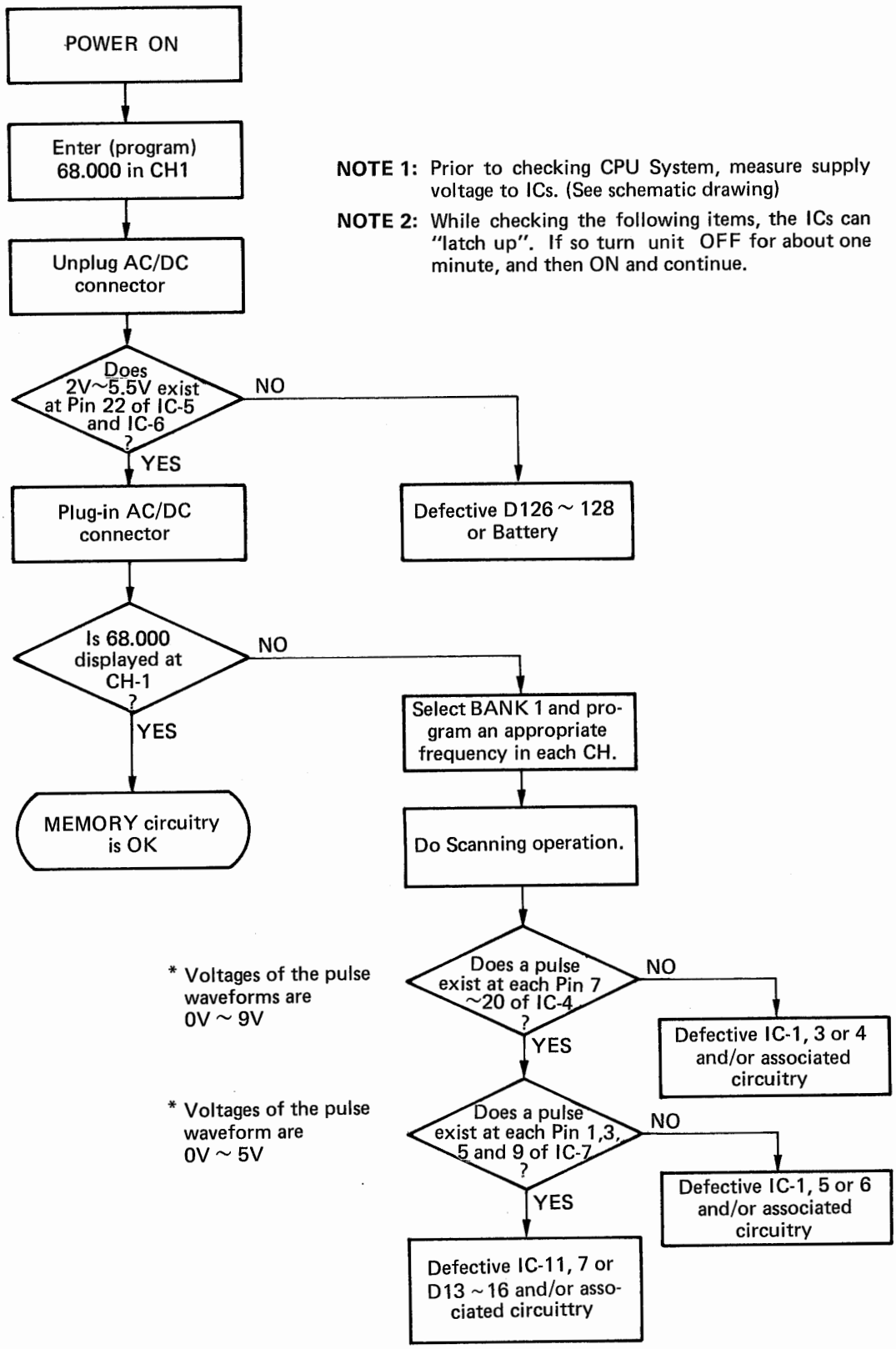
WAVEFORMS AT $R_0 \sim R_{13}$ OUTPUT TERMINALS OF CPU (IC-1)



$O_1 \sim O_7$ OUTPUT SIGNALS IN PROGRAM MODE WHEN CH1 DISPLAY 138 MHz



MEMORY CHECK



NOTE 1: Prior to checking CPU System, measure supply voltage to ICs. (See schematic drawing)

NOTE 2: While checking the following items, the ICs can "latch up". If so turn unit OFF for about one minute, and then ON and continue.

RECEPTION CHECK (When unable to receive)

NOTE 1: Prior to checking, measure supply voltage to ICs. (See schematic drawing)

NOTE 2: While checking the following items, the ICs can "latch up". If so turn unit OFF for about one minute, and then ON and continue.

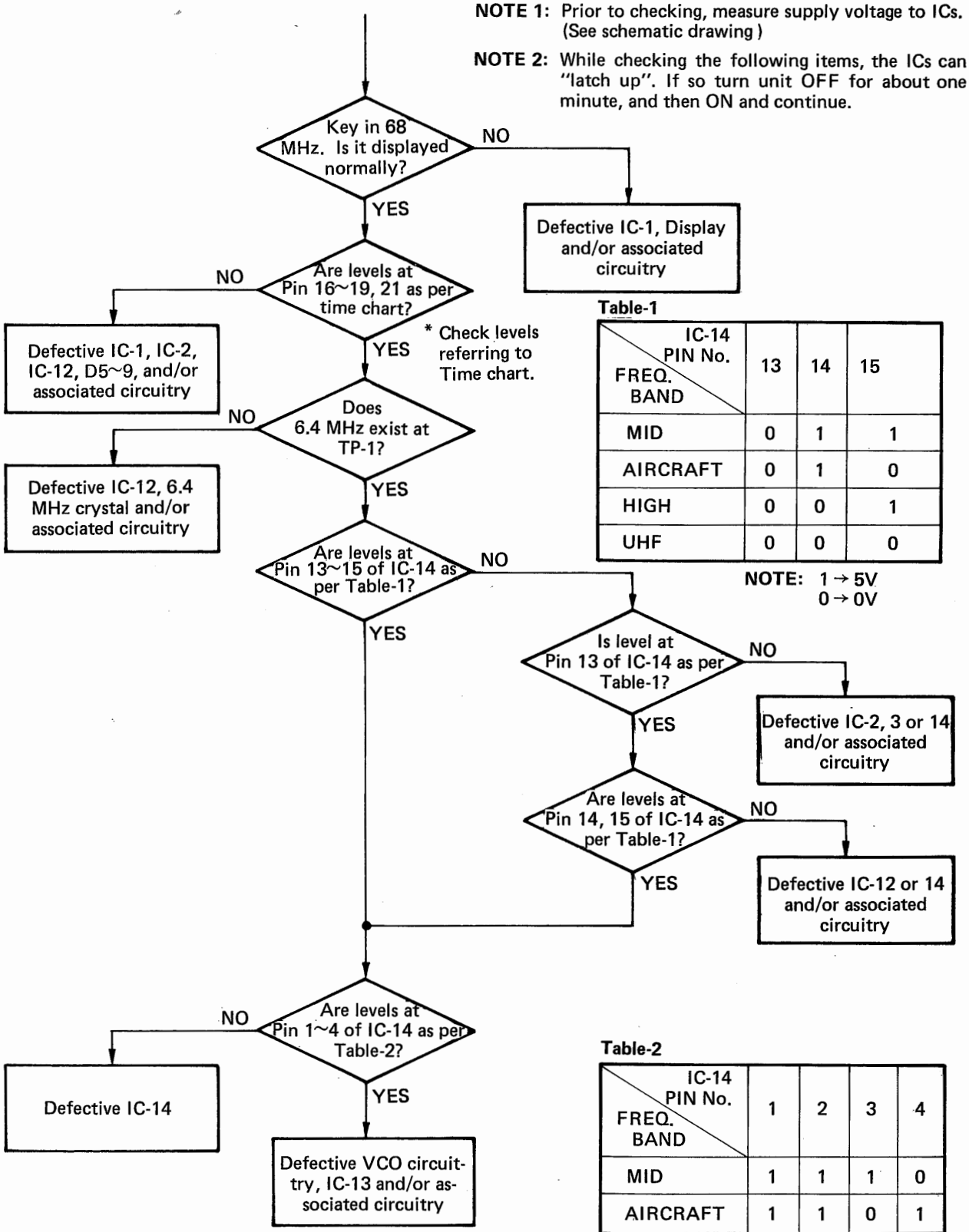


Table-1

IC-14 PIN No. / FREQ. BAND	13	14	15
MID	0	1	1
AIRCRAFT	0	1	0
HIGH	0	0	1
UHF	0	0	0

NOTE: 1 → 5V
0 → 0V

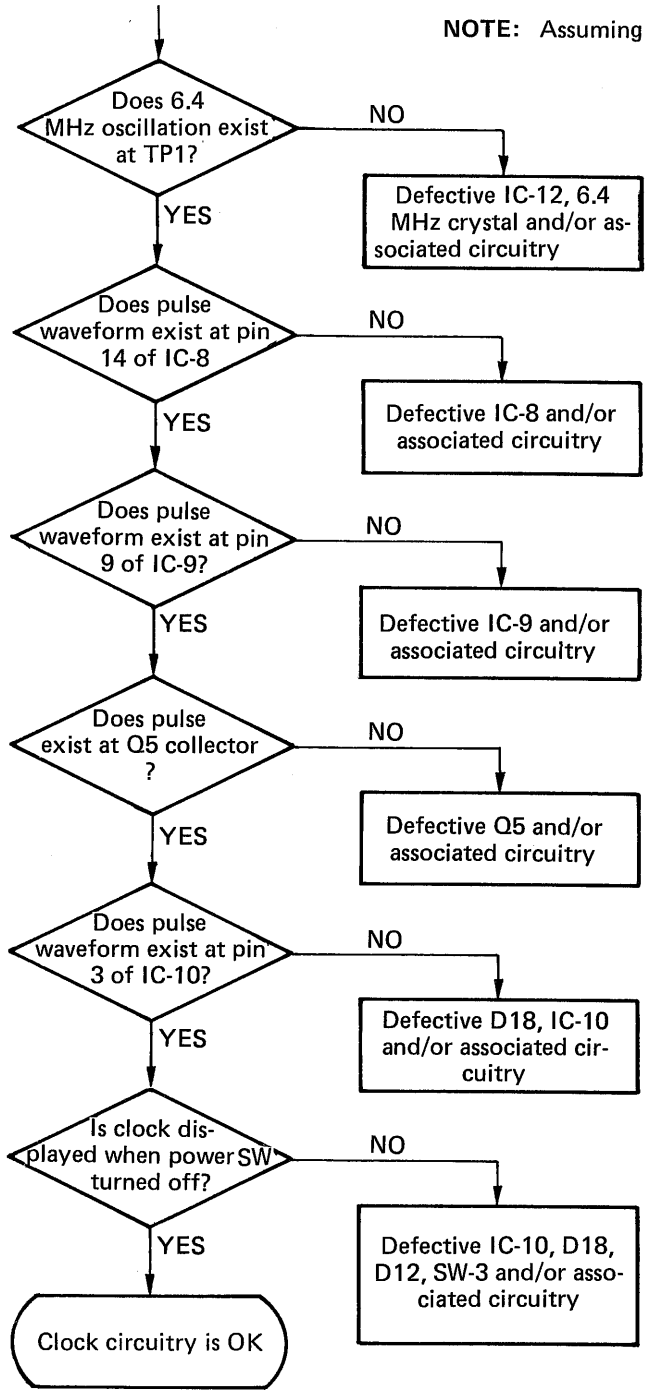
Table-2

IC-14 PIN No. / FREQ. BAND	1	2	3	4
MID	1	1	1	0
AIRCRAFT	1	1	0	1
HIGH	1	0	1	1
UHF	0	1	1	1

NOTE: 1 → 7.6V
0 → 0V

CLOCK FUNCTION CHECK

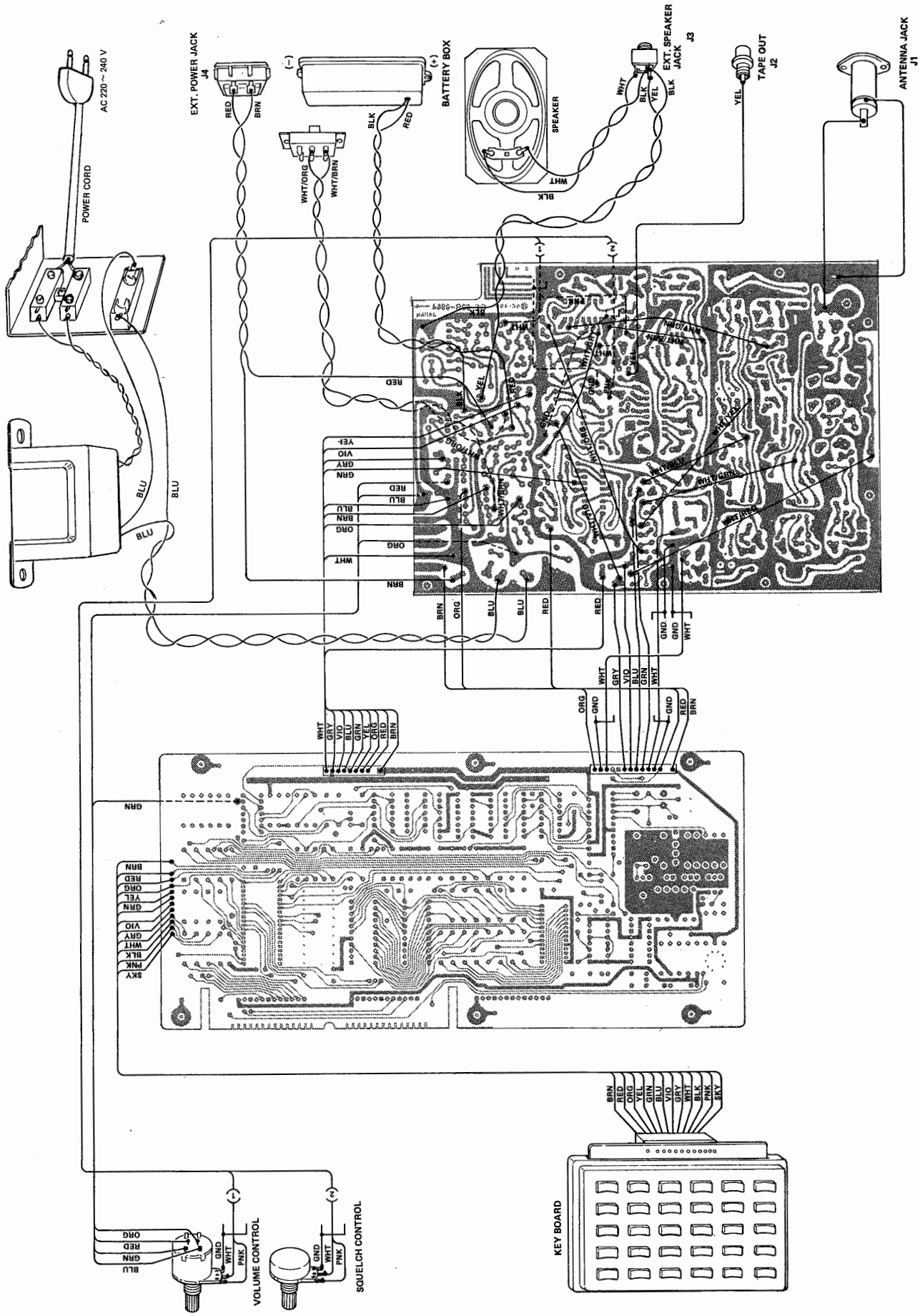
NOTE: Assuming the CPU works normally.



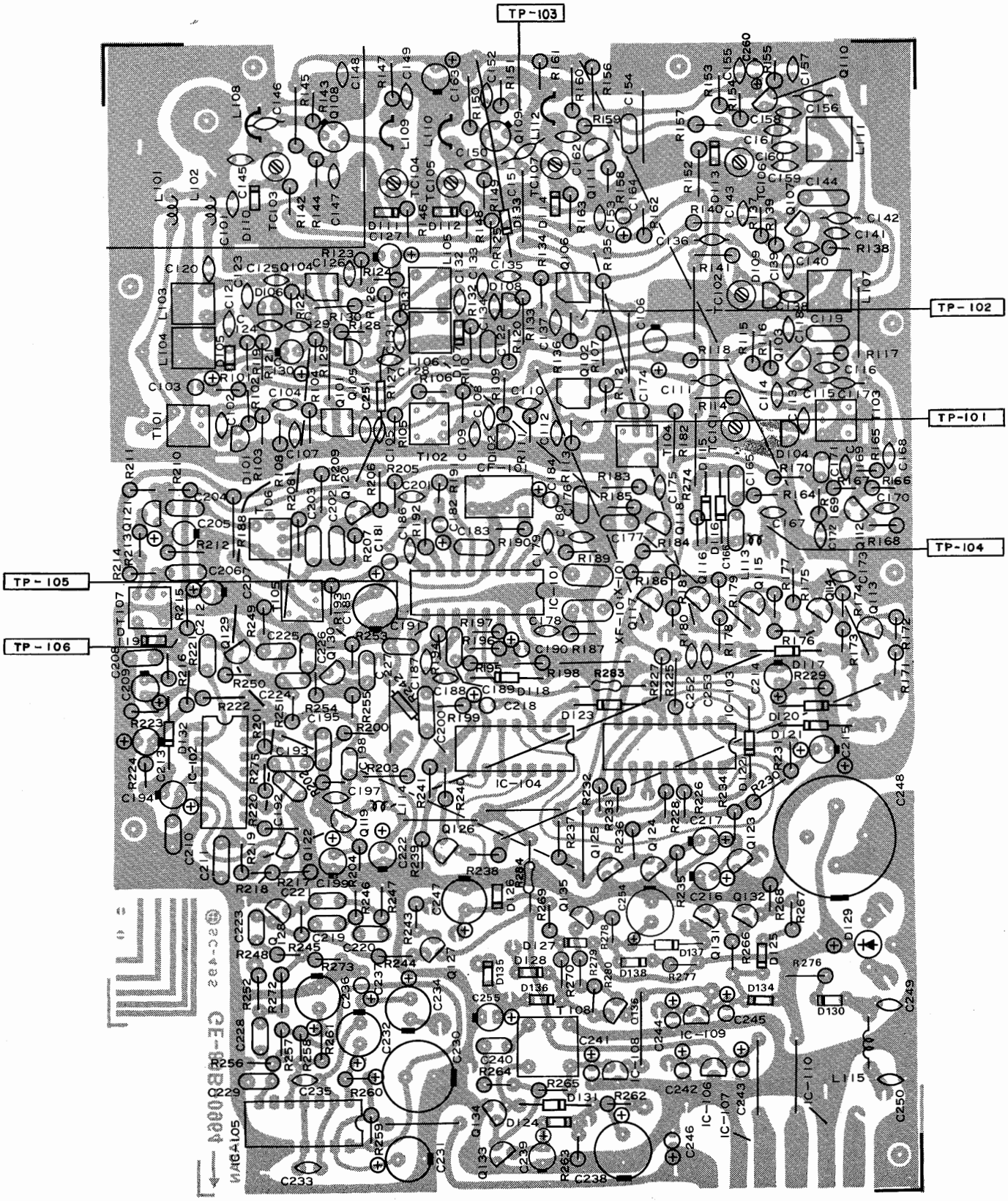
(SW-1/SW-3: Dual type with volume control)

* Voltage level of each waveform in the flow chart shall be 0V ~ 5V.

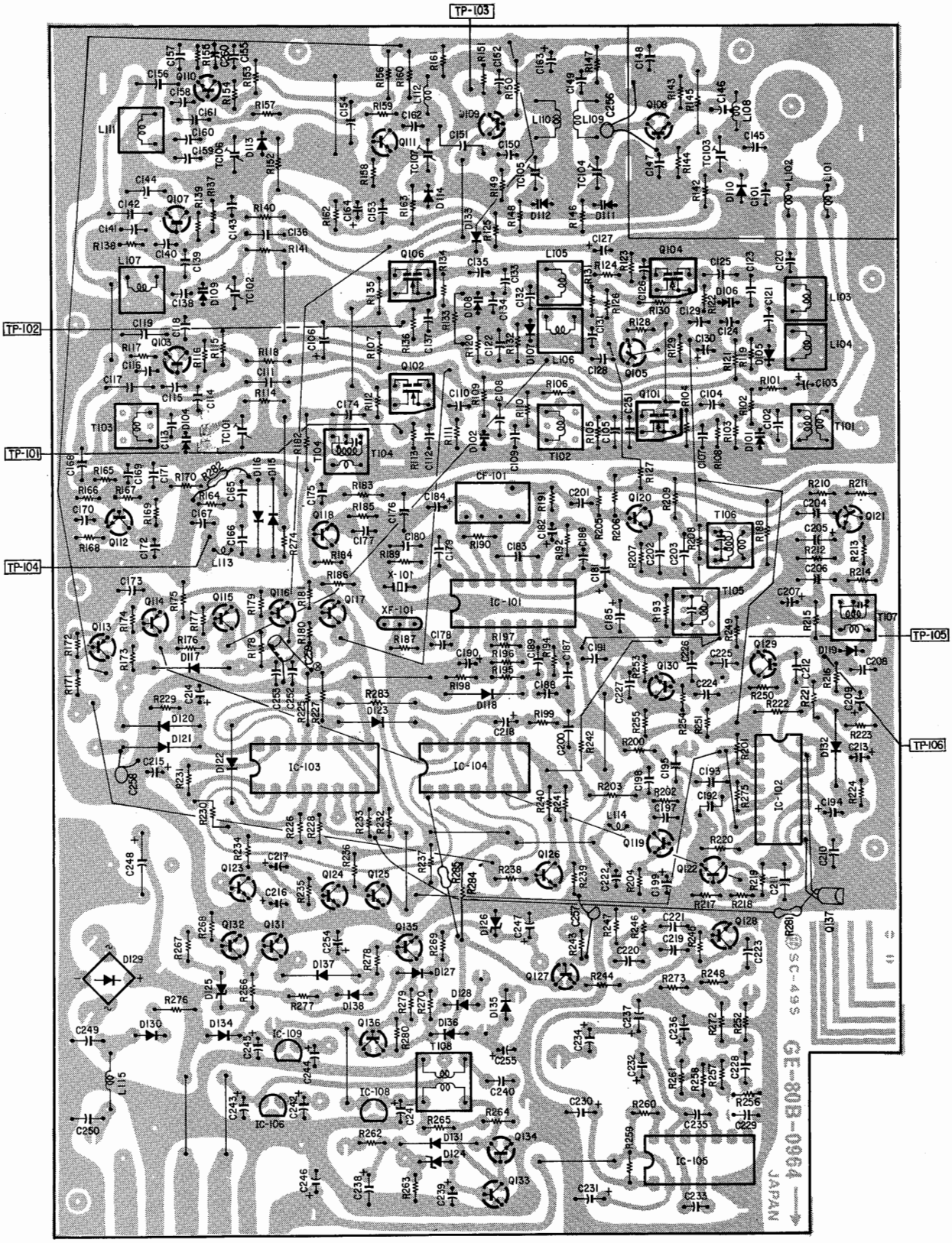
WIRING DIAGRAM



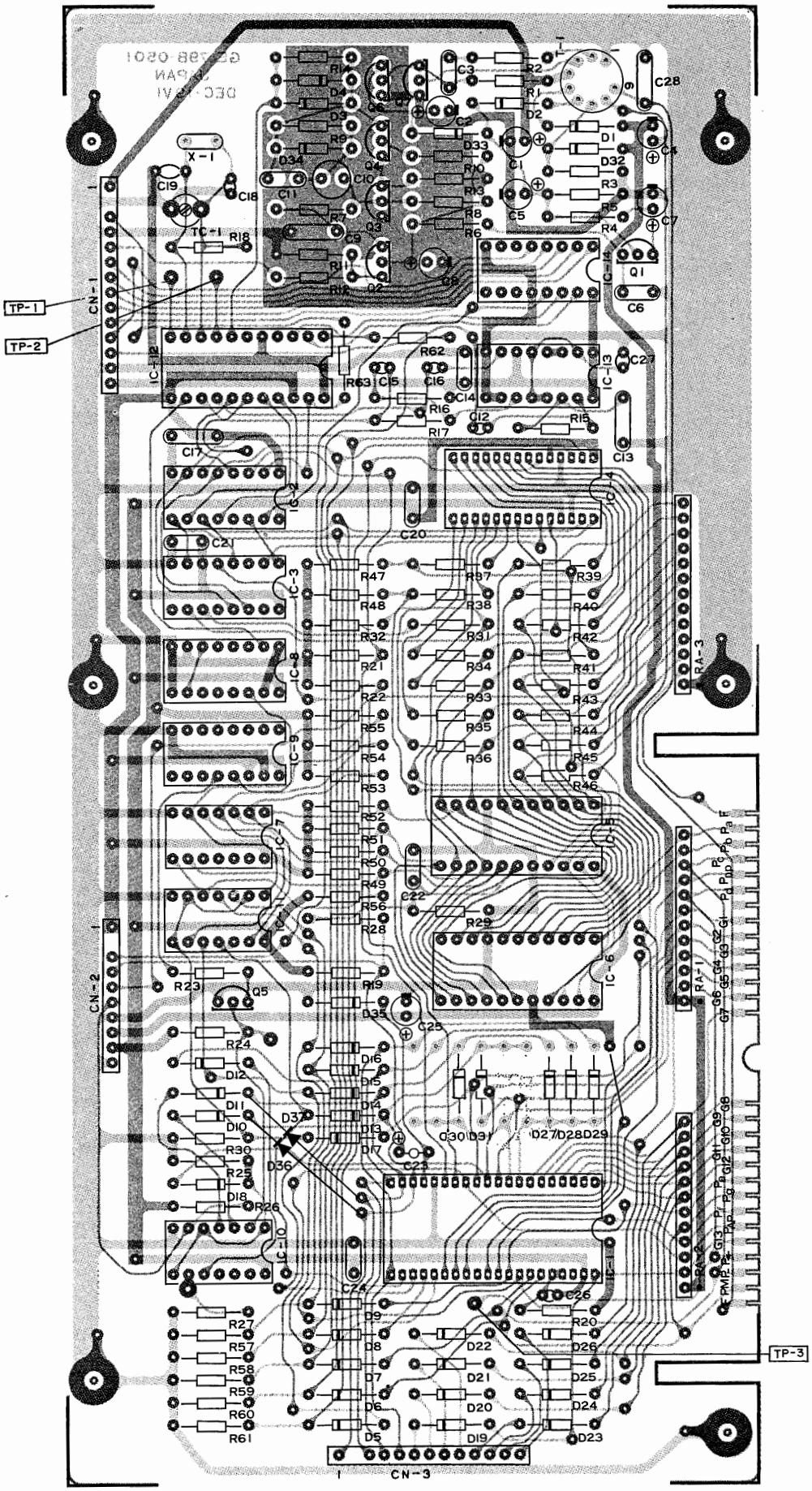
LINEAR P.C.BOARD (TOP VIEW)



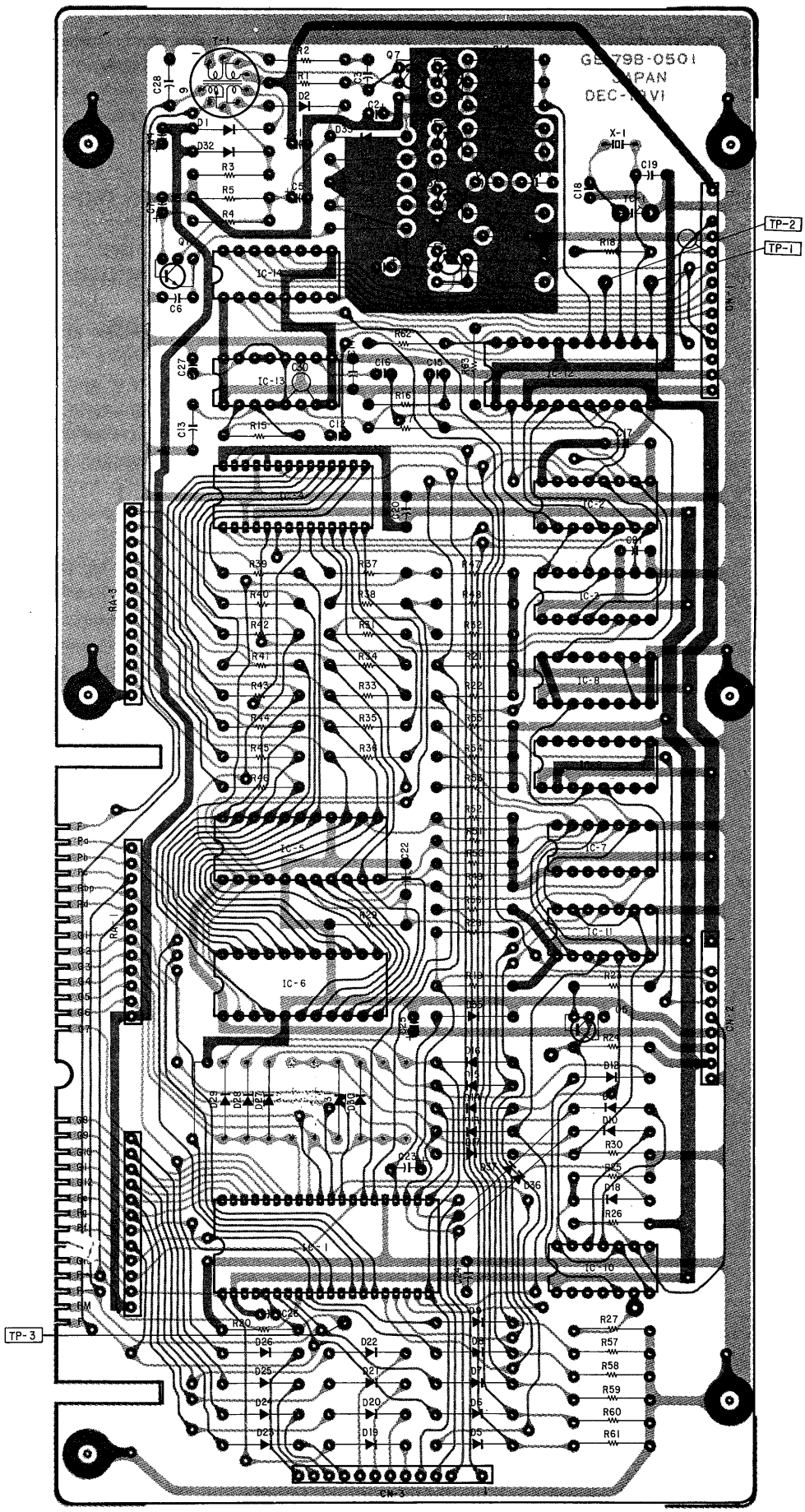
LINEAR P.C.BOARD (BOTTOM VIEW)



LOGIC P.C.BOARD (TOP VIEW)



LOGIC P.C.BOARD (BOTTOM VIEW)



TROUBLESHOOTING

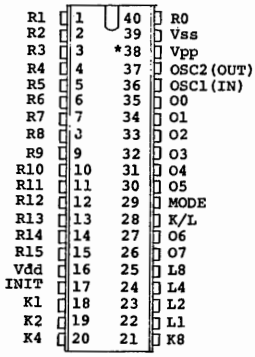
Symptom	Possible Cause
1) Display does not light and no sound when POWER is on. Volume control: MAX. Squelch control: counterclockwise (CCW)	1) Faulty power cord. 2) Defective power transformer. 3) Defective power switch. 4) Defective rectifier D129 or Polarity Protector D130.
2) Display lights but no sound. Volume control: MAX. Squelch control: CCW	1) Defective speaker or EXT. SPKR jack. 2) Defective audio amplifier IC-105, Q129, 130 and/or associated circuit components. 3) Defective IF amplifier IC-101 and/or associated circuit components. 4) Defective functional squelch control and mute switching IC-102, 103 and/or associated circuit components.
3) Sound but display does not light. Volume control: MAX. Squelch control: CCW	1) Defective DC–DC converter consisting of Q1, 6, 7, D1, 2, 32, 33. 2) Defective fluorescent display tube. 3) Defective voltage Regulator IC-110. 4) Defective converter consisting of Q133, 134, D124, 131. 5) Defective voltage Regulator IC-108. 6) Defective CPU (IC-1) or associated circuit components.
4) Does not scan and squelch does not operate.	1) Defective Q119 and/or associated circuit components. 2) Defective IC-1, D118 and/or associated circuit components. 3) Defective squelch circuit consisting of IC-102, 103.
5) Does not scan but squelch operates.	1) Faulty connection between Linear and Logic P.C.B. 2) Defective Keyboard and/or associated circuit components. 3) Defective IC-1, 10 and/or associated circuit components.
6) Displays incorrectly and/or unable to key in correctly.	1) Defective Keyboard and/or associated circuit. 2) Defective CPU (IC-1) and/or associated circuit. 3) Defective IC-10, 11 and/or associated circuit.
7) Displays correctly at the time of programming, but after scanning becomes faulty.	1) Defective memory IC-5, 6 and/or associated circuit. 2) Defective IC-3 ~ 7, 11 and/or associated circuit. 3) Defective IC-1 and/or associated circuit.
8) MANUAL scan operates but AUTO scan does not operate.	1) All channels are skipped (lockout): each BANK must have at least a channel left not locked out. 2) In the event, stuck in MANUAL mode and unable to turn to AUTOMATIC scan mode, advance the channel one by one by MANUAL scan, (BANK 1: CH1 to 10, BANK 2: CH11 to 20, BANK 3: CH21 to 30, BANK 4: CH31 to 40, BANK 5: CH41 to 50) and release at least a channel from the "lock" in each BANK. 3) Squelch control is not adjusted right.
9) "Zeromatic" does not operate or holds on a drifted frequency at search operation.	1) Defective Q126, IC-104 in Zeromatic circuit. 2) Discriminator coil is out of adjustment. TP-105 shall have 1/2 V_{CC} (approx. 3.1V) in normal receiving mode. 3) Is 6.4 MHz adjusted correctly?

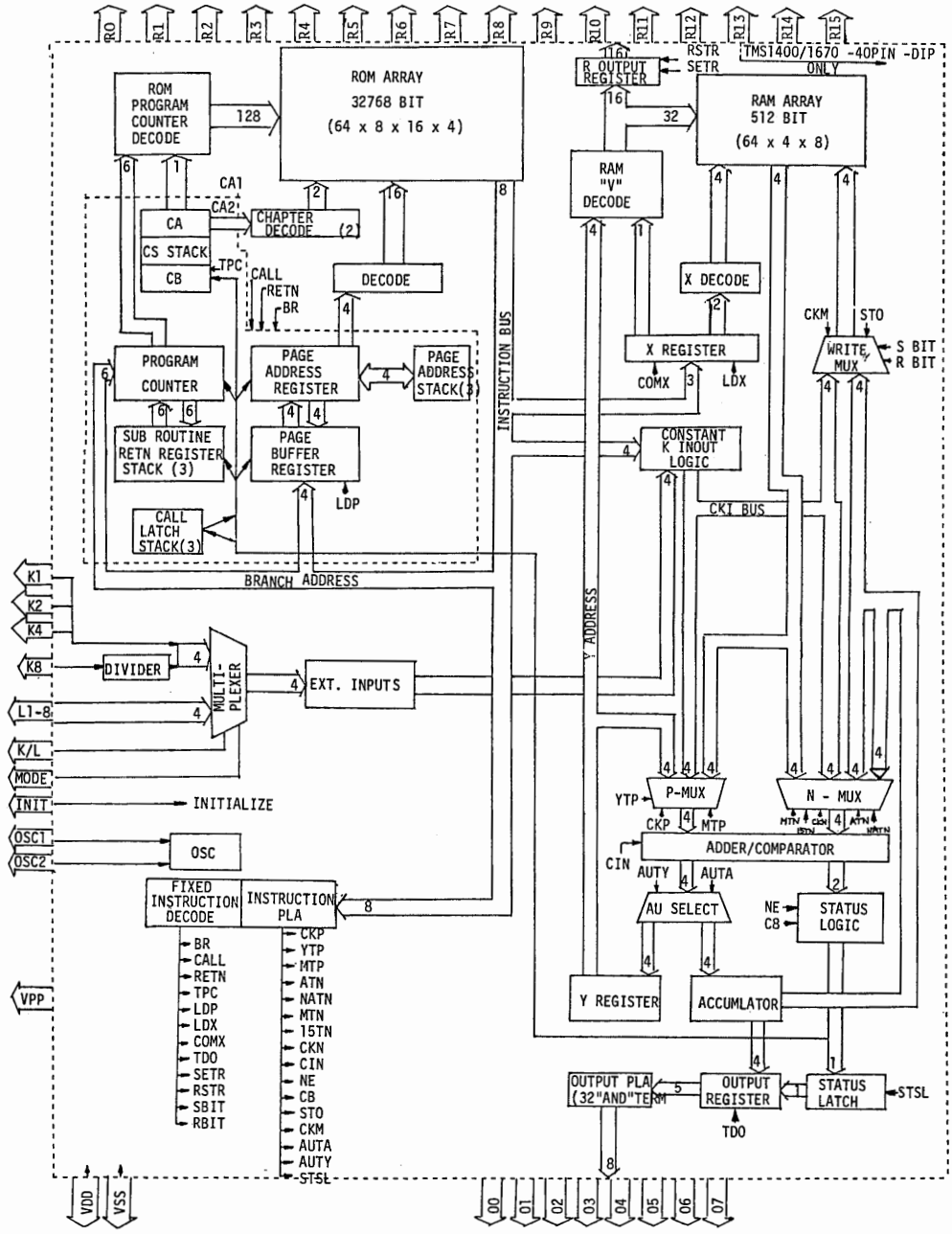
Symptom	Possible Cause
10) All bands do not operate but display OK.	1) Faulty connection between Linear and Logic PCBs. 2) Defective Q2 ~ 5 in Low-pass filter. 3) Defective IC-12, 13 and/or associated circuit. 4) Defective IC-14 and/or associated circuit. 5) Defective Q112 and/or associated circuit.
11) Mid band does not operate but Air, Hi, UHF band operate.	1) Defective Mid band RF Amp, mixer and/or VCO circuit. 2) Defective IC-14, Q117 and/or associated circuit.
12) Aircraft band does not operate but Mid, High, UHF operate.	1) Defective D105, 107, Q114, 115 and/or associated circuit. 2) Defective AM IF Amp including Q120, 121, D119.
13) Aircraft and High band do not operate but Low, UHF band operate.	1) Defective Q104 ~ 106 in RF Amp mixer and/or in VCO circuit. 2) Defective Q114 ~ 116 in band switch circuit.
14) UHF band does not operate but Mid Air, High band operate.	1) Defective Q108 ~ 111 in RF Amp mixer and/or VCO circuit. 2) Defective Q113 in band switch circuit.
15) Stays in Clock mode when Power switch is turned on.	1) Defective SW-3. (SW-3/SW-1: Dual type with Volume control) 2) Faulty wiring for SW-3.
16) Clock does not keep time. Displays "E00,00,00" even with momentary power failure.	1) Discharged 9V battery. 2) Defective Clock backup circuit consisting of Q135, 136, D128, 136 ~ 138.

N.B.
Pulse generated while checking circuitries and/or certain combinations of key operation may cause improper operation. To clear the malfunction re-initialization of CPU is necessary: keep pushing [LIMIT] and [▼] simultaneously, and turn power switch off and on. All channels (50 CH) will be cleared and frequency indicator displays 000.0000.

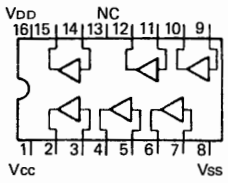
INTEGRATED CIRCUIT LEAD IDENTIFICATION

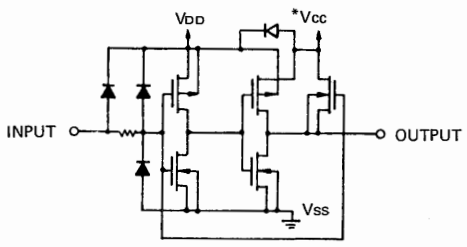
IC-1 GRE-7832 or GRE-7832A



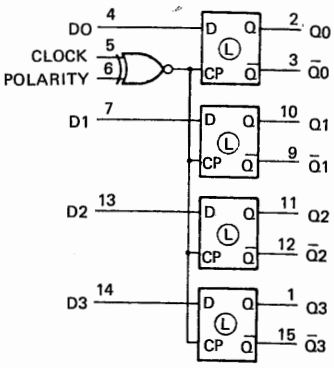


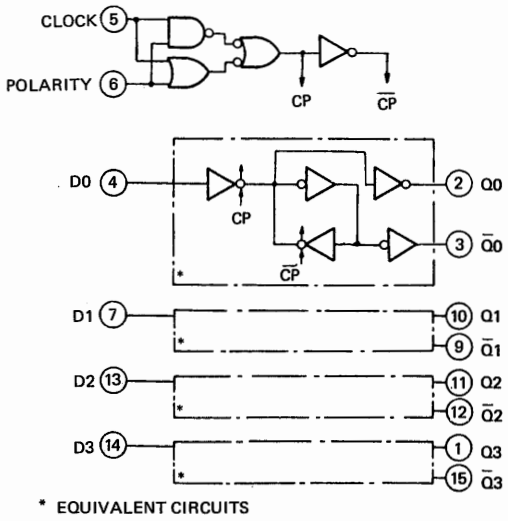
IC-2 TC4010BP



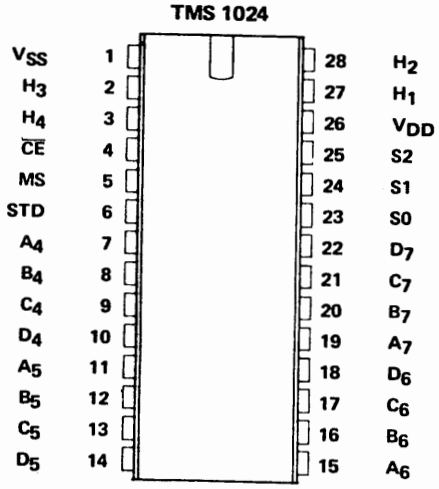


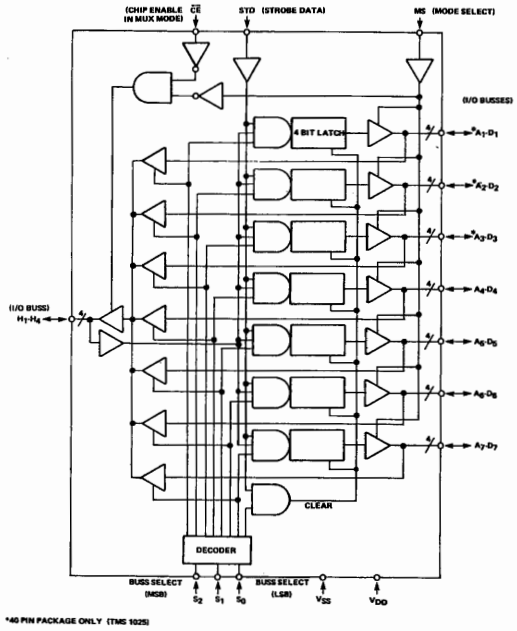
IC-3 TC4042BP



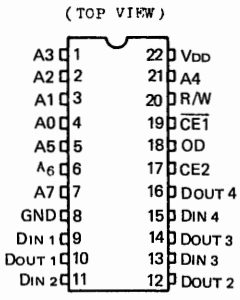


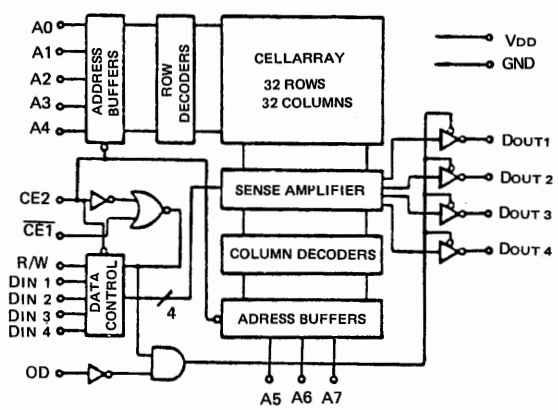
IC-4 TMS1024NLL



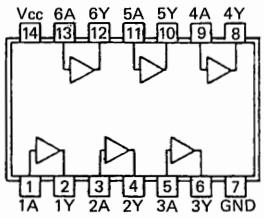


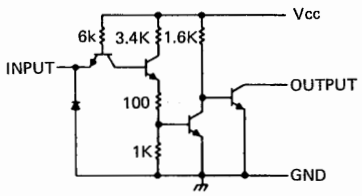
IC-5,6 TC5501P



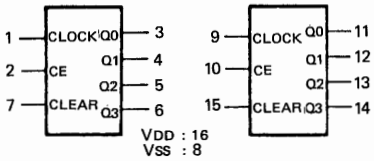


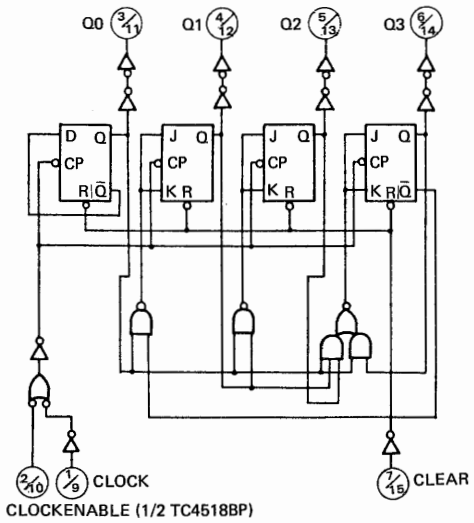
IC-7 SN7407N



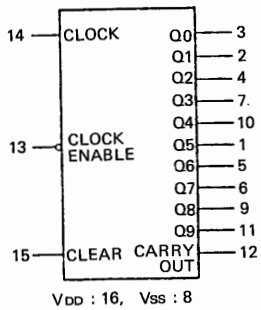


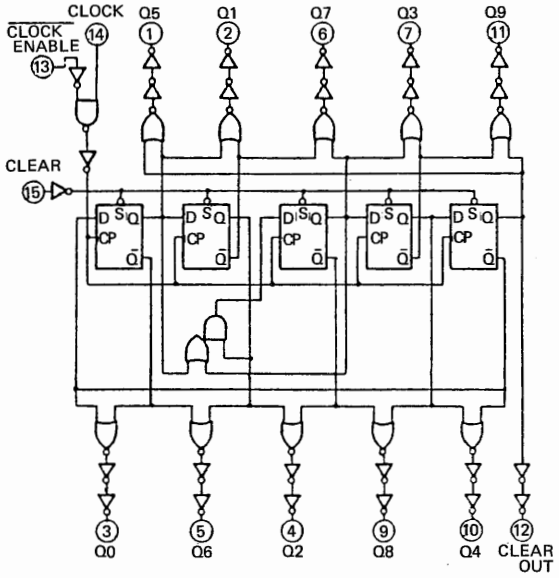
IC-8 TC4518BP



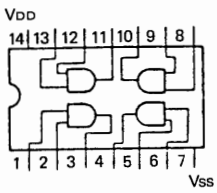


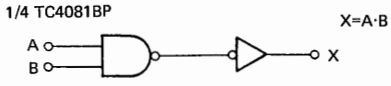
IC-9 TC4017BP



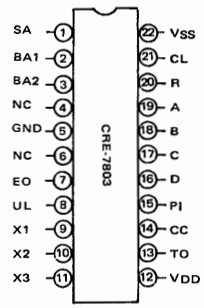


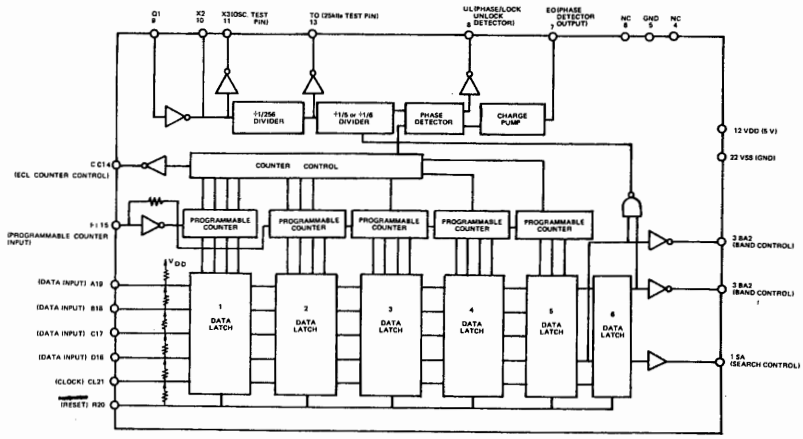
IC-10,11 TC4081BP



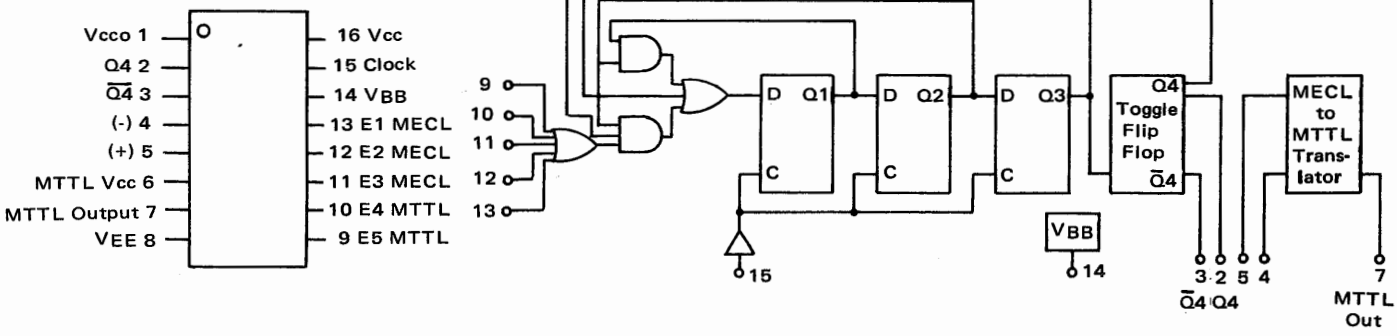


IC-12 GRE-7803A

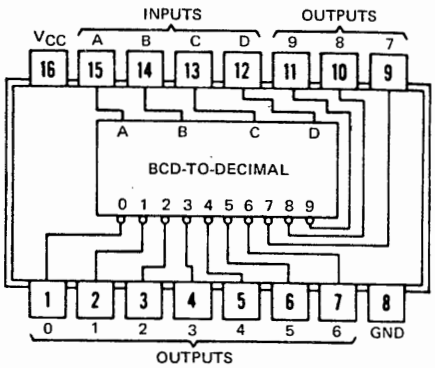


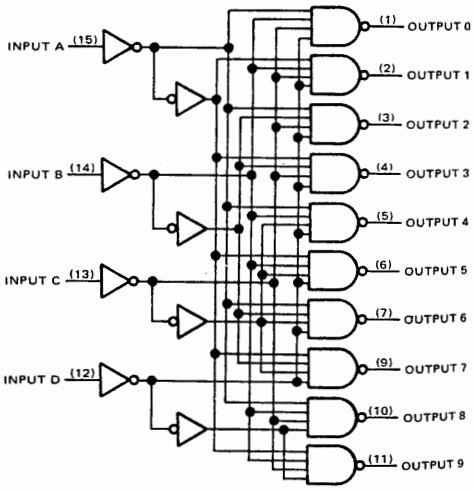


IC-13 MC12013P

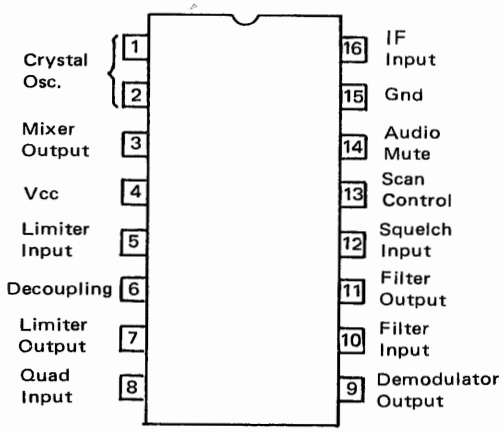


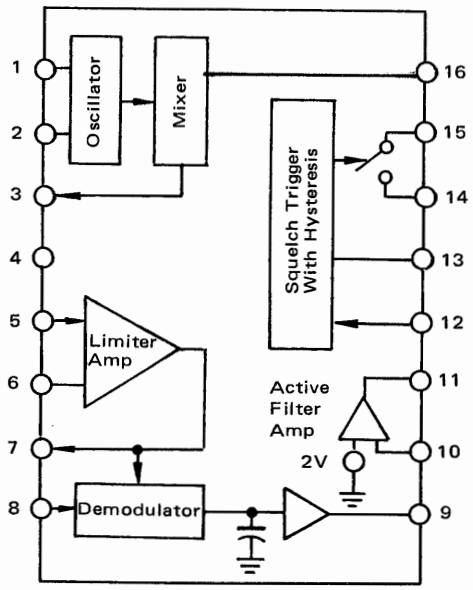
IC-14 SN74145



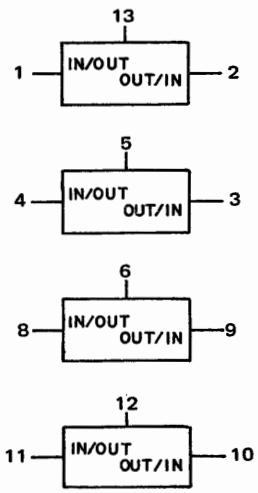


IC-101 MC3357 or MPS5071



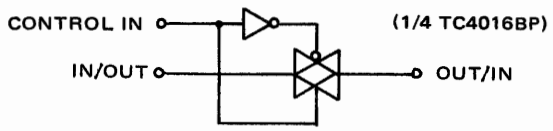


IC-102 TC4016BP

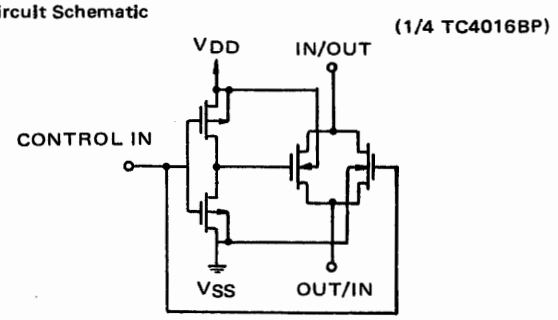


V_{DD} : 14, V_{SS} : 7

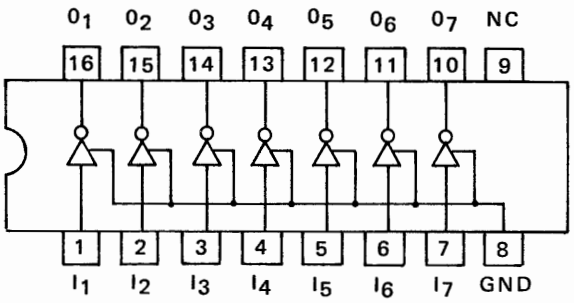
Logic Symbol

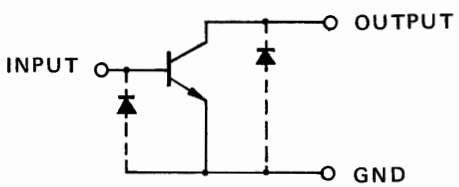


Circuit Schematic

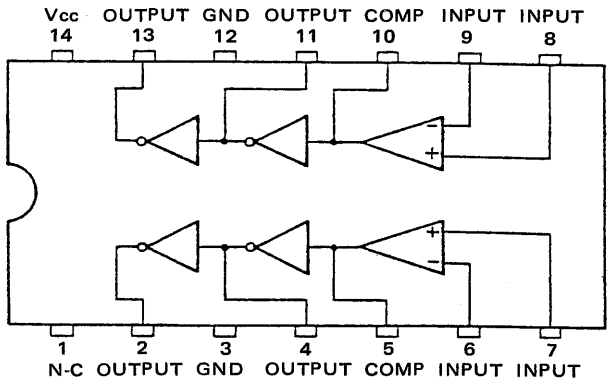


IC-103 TD62501P

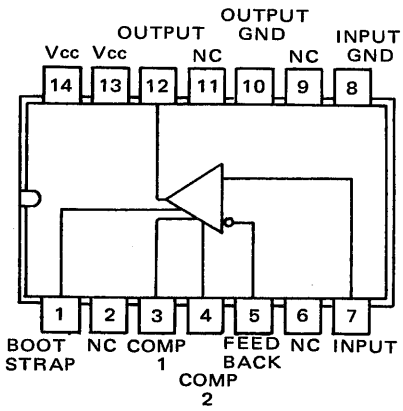


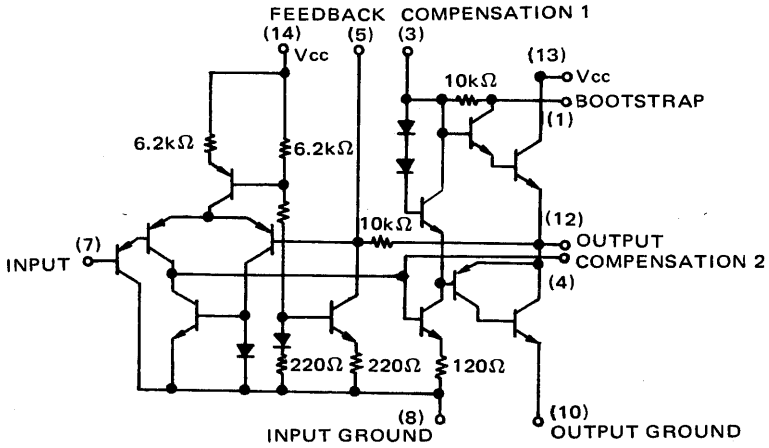


IC-104 TA7521P

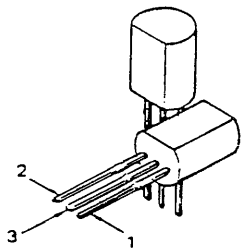


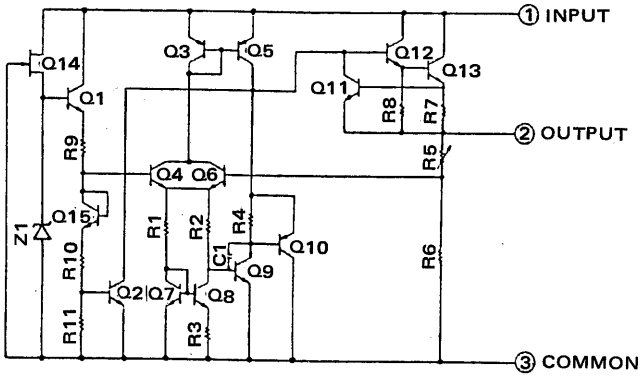
IC-105 SN76007N



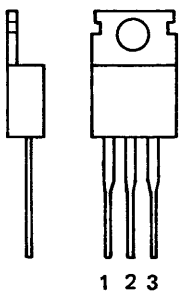


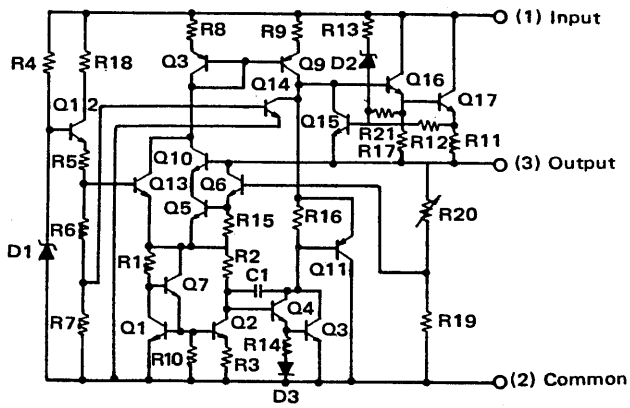
IC-106,108,109 TA78L005





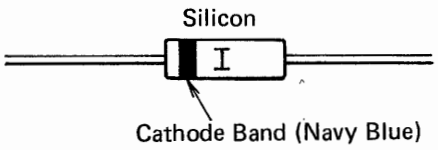
IC-107,110 HA17808P



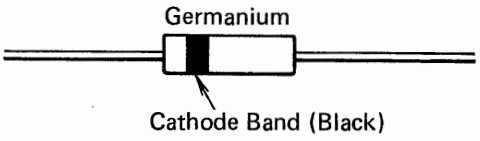


DIODE IDENTIFICATION AND LEAD POLARITY

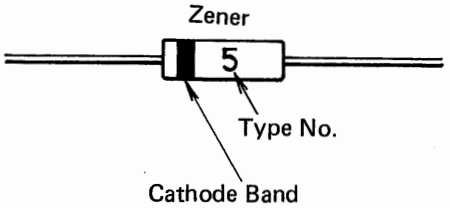
A) 1S2076A



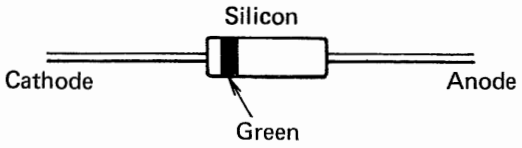
B) 1N60



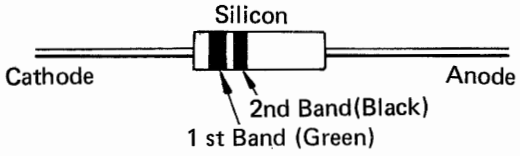
C) HZ5C-2, HZ9LC-1, HZ9LA-2
HZ12LC-3, HZ16LC-1



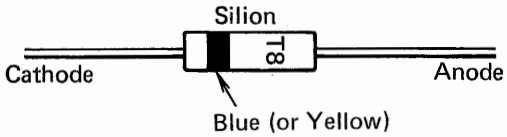
D) 1SS81



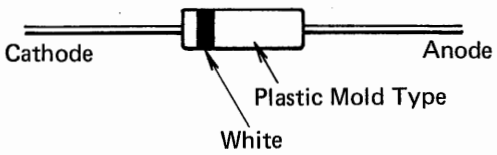
E) 1SS85



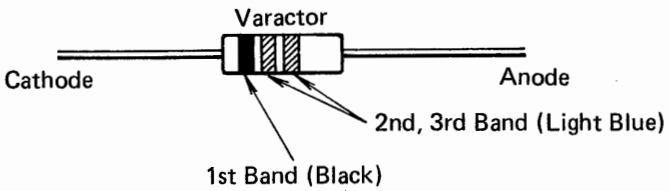
F) 1S1588 (or HV-80)



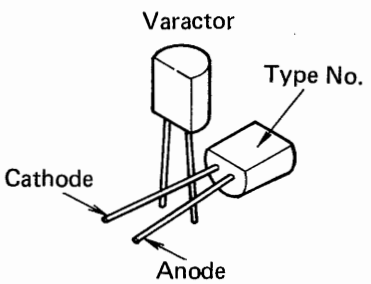
G) S5277B



H) 1SV89B



I) FC-54



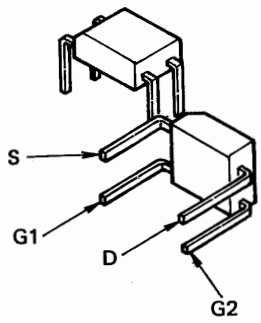
SEMICONDUCTOR LEAD IDENTIFICATION

A) 3SK77 (GR)

B) 2SC1923 (O), 2SC1815 (O),(Y) (GR), 2SA1015 (O), 2SC2347, 2SC732 (BL), 2SC1384 (R), 2SC1959 (Y), 2SA950 (Y)

C) 2SC535 (B)
D) 2SC1117

Ⓐ



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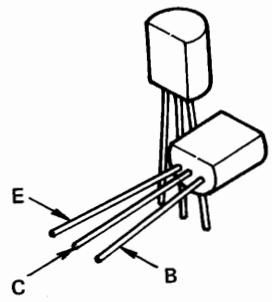

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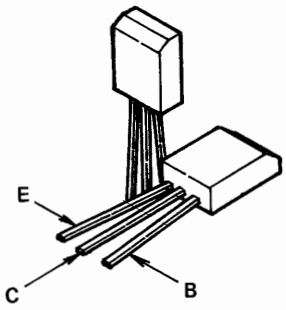
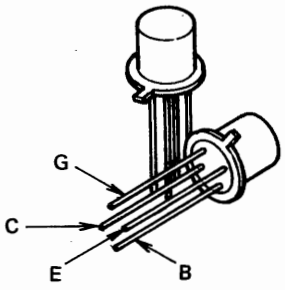
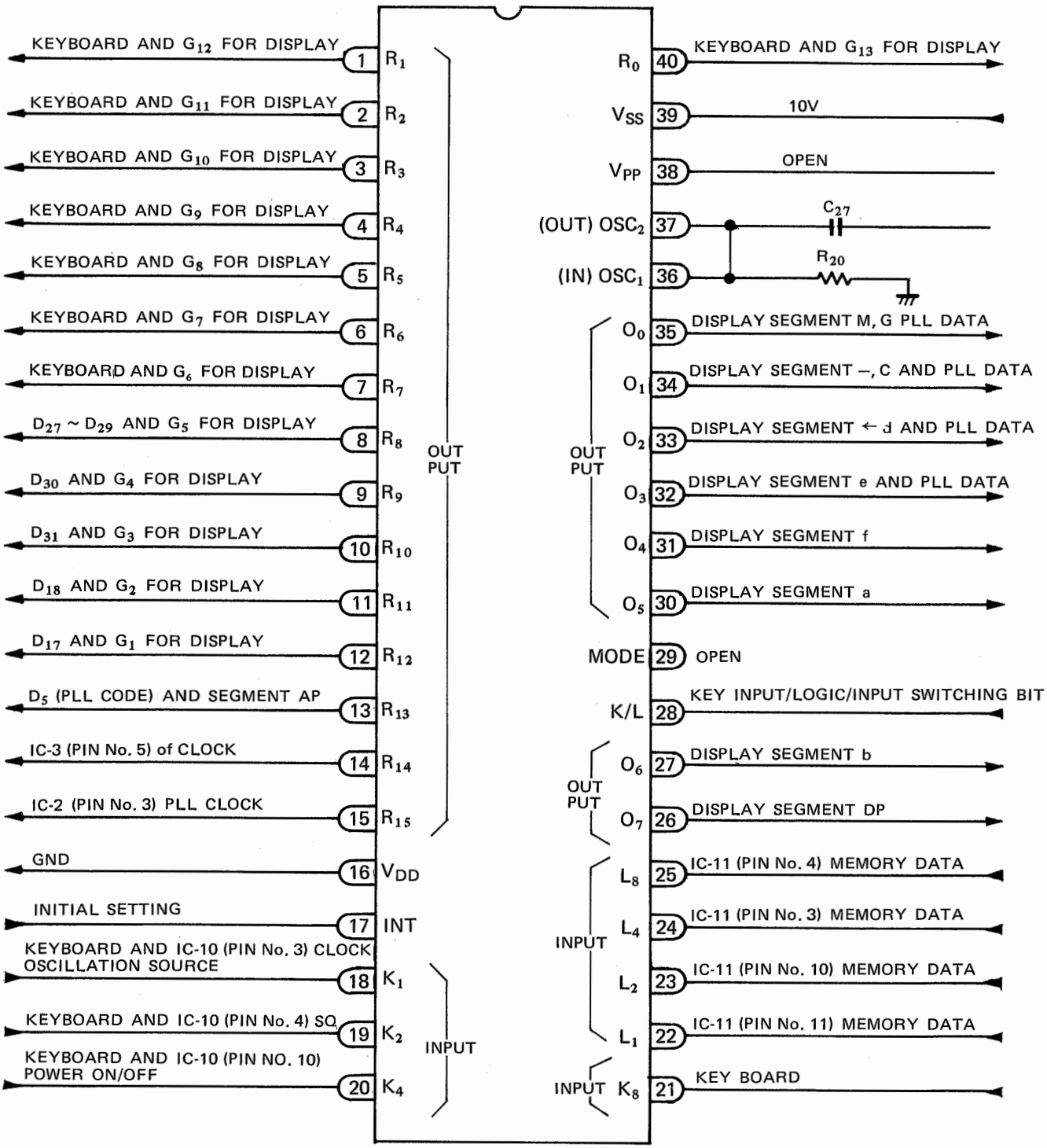


Ⓓ



MICRO-COMPUTER (IC-1) PORT FORMAT



PARTS LIST

CAPACITORS				
Ref. No.	Value	Voltage (V)	Tolerance (%)	Material
C1	100μF	16	−10+50	Electrolytic
C2	10μF	16	−10+50	Electrolytic
C3	.01μF	50	±10	Mylar
C4	4.7μF	35	−10+50	Electrolytic
C5	47μF	16	−10+50	Electrolytic
C6	.01μF	50	±10	Mylar
C7	10μF	16	−10+50	Electrolytic
C8	47μF	16	−10+50	Electrolytic
C9	.1μF	50	±10	Mylar
C10	1μF	50	±30	Electrolytic (non-Polarity)
C11	.047μF	50	±10	Mylar
C12	.001μF	50	±10	Ceramic
C13	.1μF	50	±10	Mylar
C14	.01μF	50	±10	Mylar
C15	27pF	50	±10	Ceramic
C16	.001μF	50	±10	Ceramic
C17	.1μF	50	±10	Mylar
C18	22pF	50	±10	Ceramic
C19	56pF	50	±50	Ceramic
C20	.01μF	50	±10	Mylar
C21	.01μF	50	±10	Mylar
C22	.01μF	50	±10	Mylar
C23	1μF	35	±20	Tantalum
C24	.01μF	50	±10	Mylar
C25	1μF	50	−10+50	Electrolytic
C26	68pF	50	±10	Ceramic
C27	100pF	50	±10	Ceramic
C28	.1μF	50	±10	Mylar
C29	100pF	50	±10	Ceramic
C30	10pF	50	±0.5pF	Ceramic
C101	2pF	50	±0.5pF	Ceramic
C102	33pF	50	±10	Ceramic
C103	.1μF	35	±20	Tantalum
C104	10pF	50	±0.5pF	Ceramic
C105	.001μF	50	±10	Ceramic
C106	10μF	16	−10+50	Electrolytic
C107	.001μF	50	±10	Ceramic
C108	33pF	50	±10	Ceramic
C109	.001μF	50	±10	Ceramic
C110	47pF	50	±10	Ceramic
C111	.001μF	50	±10	Ceramic
C112	.001μF	50	±10	Ceramic
C113	47pF	50	±10	Ceramic
C114	33pF	50	±10	Ceramic
C115	33pF	50	±10	Ceramic
C116	5pF	50	±0.5pF	Ceramic
C117	5pF	50	±0.5pF	Ceramic
C118	100pF	50	±10	Ceramic
C119	.047μF	50	±10	Mylar
C120	5pF	50	±0.5pF	Ceramic
C121	.001μF	50	±10	Ceramic
C122	.01μF	50	±10	Mylar
C123	82pF	50	±10	Ceramic
C124	4pF	50	±10	Ceramic
C125	100pF	50	±10	Ceramic
C126	.001μF	50	±10	Ceramic
C127	10μF	16	−10+50	Electrolytic
C128	.001μF	50	±10	Ceramic
C129	.001μF	50	±10	Ceramic
C130	1μF	50	−10+50	Electrolytic

Ref. No.	Value	Voltage (V)	Tolerance (%)	Material
C131	.001μF	50	±10	Ceramic
C132	.001μF	50	±10	Ceramic
C133	82pF	50	±10	Ceramic
C134	4pF	50	±10	Ceramic
C135	47pF	50	±10	Ceramic
C136	.001μF	50	±10	Ceramic
C137	.001μF	50	±10	Ceramic
C138	330pF	50	±10	Ceramic
C139	47pF	50	±10	Ceramic
C140	33pF	50	±10	Ceramic
C141	5pF	50	±0.5pF	Ceramic
C142	5pF	50	±0.5pF	Ceramic
C143	.001μF	50	±10	Ceramic
C144	.047μF	50	±10	Mylar
C145	5pF	50	±0.5pF	Ceramic
C146	10pF	50	±0.5pF	Ceramic
C147	33pF	50	±10	Ceramic
C148	33pF	50	±10	Ceramic
C149	33pF	50	±10	Ceramic
C150	22pF	50	±10	Ceramic
C151	1pF	50	±0.5pF	Ceramic
C152	.001μF	50	±10	Ceramic
C153	100pF	50	±10	Ceramic
C154	.047μF	50	±10	Mylar
C155	100pF	50	±10	Ceramic
C156	5pF	50	±0.5pF	Ceramic
C157	5pF	50	±0.5pF	Ceramic
C158	33pF	50	±10	Ceramic
C159	220pF	50	±10	Ceramic
C160	33pF	50	±10	Ceramic
C161	5pF	50	±0.5pF	Ceramic
C162	10pF	50	±0.5pF	Ceramic
C163	10μF	16	−10+50	Electrolytic
C164	.22μF	35	±20	Tantalum
C165	.01μF	50	±10	Mylar
C166	.01μF	50	±10	Mylar
C167	100pF	50	±10	Ceramic
C168	.001μF	50	±10	Ceramic
C169	10pF	50	±0.5pF	Ceramic
C170	.001μF	50	±10	Ceramic
C171	.01μF	50	±10	Mylar
C172	5pF	50	±0.5pF	Ceramic
C173	.001μF	50	±10	Ceramic
C174	.01μF	50	±10	Mylar
C175	.001μF	50	±10	Ceramic
C176	.047μF	50	±10	Mylar
C177	.01μF	50	±10	Mylar
C178	.001μF	50	±10	Ceramic
C179	56pF	50	±10	Ceramic
C180	120pF	50	±10	Ceramic
C181	.1μF	35	±20	Tantalum
C182	.1μF	35	±20	Tantalum
C183	.047μF	50	±10	Mylar
C184	.1μF	35	±20	Tantalum
C185	220μF	10	-10+50	Electrolytic
C186	22pF	50	±10	Ceramic
C187	470pF	50	±10	Ceramic
C188	470pF	50	±10	Ceramic
C189	.01μF	50	±10	Mylar
C190	.22μF	35	±20	Tantalum
C191	.01μF	50	±10	Mylar
C192	.01μF	50	±10	Mylar
C193	.01μF	50	±10	Mylar

Ref. No.	Value	Voltage (V)	Tolerance (%)	Material
C194	1μF	50	−10+50	Electrolytic
C195	.001μF	50	±10	Mylar
C196				Not used
C197	22pF	50	±10	Ceramic
C198	.001μF	50	±10	Mylar
C199	1μF	50	−10+50	Electrolytic
C200	.047μF	50	±10	Mylar
C201	470pF	50	±10	Ceramic
C202	.047μF	50	±10	Mylar
C203	.047μF	50	±10	Mylar
C204	.01μF	50	±10	Mylar
C205	10μF	16	−10+50	Electrolytic
C206	.047μF	50	±10	Mylar
C207	47μF	16	−10+50	Electrolytic
C208	.01μF	50	±10	Mylar
C209	1μF	50	−10+50	Electrolytic
C210	.01μF	50	±10	Mylar
C211	.047μF	50	±10	Mylar
C212	.0047μF	50	±10	Mylar
C213	1μF	50	−10+50	Electrolytic
C214	1μF	50	−10+50	Electrolytic
C215	10μF	16	−10+50	Electrolytic
C216	1μF	50	−10+50	Electrolytic
C217	10μF	16	−10+50	Electrolytic
C218	.1μF	35	±20	Tantalum
C219	.001μF	50	±10	Mylar
C220	.0022μF	50	±10	Mylar
C221	.0022μF	50	±10	Mylar
C222	10μF	16	−10+50	Electrolytic
C223	.01μF	50	±10	Mylar
C224	.0022μF	50	±10	Mylar
C225	.01μF	50	±10	Mylar
C226	.0047μF	50	±10	Mylar
C227	.01μF	50	±10	Mylar
C228	.047μF	50	±10	Mylar
C229	.01μF	50	±10	Mylar
C230	470μF	16	−10+50	Electrolytic
C231	100μF	16	−10+50	Electrolytic
C232	47μF	16	−10+50	Electrolytic
C233	.001μF	50	±10	Ceramic
C234	47μF	16	−10+50	Electrolytic
C235	100pF	50	±10	Ceramic
C236	47μF	16	−10+50	Electrolytic
C237	3.3μF	16	±20	Tantalum
C238	100μF	16	−10+50	Electrolytic
C239	10μF	16	−10+50	Electrolytic
C240	.0068μF	50	±10	Mylar
C241	.1μF	35	±20	Tantalum
C242	.1μF	35	±20	Tantalum
C243	.33μF	35	±20	Tantalum
C244	.1μF	35	±20	Tantalum
C245	.33μF	35	±20	Tantalum
C246	.1μF	35	±20	Tantalum
C247	47μF	16	−10+50	Electrolytic
C248	2200μF	25	−10+30	Electrolytic
C249	.01μF	50	−20+80	Ceramic
C250	.01μF	50	−20+80	Ceramic
C251	47pF	50	±10	Ceramic
C252	100pF	50	±10	Ceramic
C253	100pF	50	±10	Ceramic
C254	100μF	10	−10+50	Electrolytic
C255	1μF	50	−10+50	Electrolytic

Ref. No.	Value	Voltage (V)	Tolerance (%)	Material
C256	33pF	50	±10	Ceramic
C257	.001μF	50	±10	Ceramic
C258	.001μF	50	±10	Ceramic
C259	470μF	10	−20+50	Electrolytic
C260	4.7μF	35	−10+50	Electrolytic
C261	10pF	50	±0.5pF	Ceramic

RESISTORS

NOTE: Unless otherwise specified all resistors are carbon film, wattage 1/4W, tolerance ±5%

Ref. No.	Value		Wattage (W)	Tolerance (%)	Material
R1	2.2KΩ				
R2	27Ω				
R3	10KΩ				
R4	470Ω				
R5	2.2KΩ				
R6	100Ω				
R7	470Ω				
R8	2.2KΩ				
R9	3.3kΩ				
R10	1kΩ				
R11	1kΩ				
R12	100Ω				
R13	1MΩ				
R14	33kΩ				
R15	1kΩ				
R16	5.6kΩ				
R17	5.6kΩ				
R18	100kΩ				
R19	2.2kΩ				
R20	47kΩ				
R21	33kΩ				
R22	33kΩ				
R23	3.3kΩ				
R24	47kΩ				
R25	100kΩ				
R26	33kΩ				
R27	470kΩ				
R28	47kΩ				
R29	47kΩ				
R30	33kΩ				
R31	220kΩ				
R32	270kΩ				
R33	220kΩ				
R34	220kΩ				
R35	220kΩ				
R36	220kΩ				
R37	220kΩ				
R38	220kΩ				
R39	220kΩ				
R40	220kΩ				
R41	220kΩ				
R42	220kΩ				
R43	220kΩ				
R44	220kΩ				
R45	220kΩ				

Ref. No.	Value		Watt-age (W)	Toler-ance (%)	Material
R46	220kΩ				
R47	270kΩ				
R48	270kΩ				
R49	10kΩ				
R50	10kΩ				
R51	10kΩ				
R52	10kΩ				
R53	2.2kΩ				
R54	2.2kΩ				
R55	2.2kΩ				
R56	2.2kΩ				
R57	33kΩ				
R58	33kΩ				
R59	33kΩ				
R60	33kΩ				
R61	33kΩ				
R62	22kΩ				
R63	10kΩ				
R101	10kΩ				
R102	47kΩ				
R103	4.7kΩ				
R104	47kΩ				
R105	10kΩ				
R106	47kΩ				
R107	2.2kΩ				
R108	100Ω				
R109	47kΩ				
R110	100Ω				
R111	47kΩ				
R112	47kΩ				
R113	2.2kΩ				
R114	4.7kΩ				
R115	4.7kΩ				
R116	10kΩ				
R117	1kΩ				
R118	100Ω				
R119	4.7kΩ				
R120	10kΩ				
R121	47kΩ				
R122	47kΩ				
R123	47kΩ				
R124	47kΩ				
R125	2.2kΩ				
R126	100kΩ				
R127	1kΩ				
R128	22Ω				
R129	33kΩ				
R130	100kΩ				
R131	100Ω				
R132	4.7kΩ				
R133	47kΩ				
R134	47kΩ				
R135	47kΩ				
R136	2.2kΩ				
R137	4.7kΩ				
R138	1kΩ				
R139	10kΩ				
R140	100Ω				
R141	22kΩ				
R142	47kΩ				
R143	470Ω				

Ref. No.	Value		Watt-age (W)	Toler-ance (%)	Material
R144	4.7kΩ				
R145	10kΩ				
R146	47kΩ				
R147	100Ω				
R148	47kΩ				
R149	3.3kΩ				
R150	33kΩ				
R151	1kΩ				
R152	22kΩ				
R153	4.7kΩ				
R154	10kΩ				
R155	1kΩ				
R156	1kΩ				
R157	22Ω				
R158	10kΩ				
R159	100kΩ				
R160	1kΩ				
R161	2.2kΩ				
R162	1kΩ				
R163	47kΩ				
R164	1.5kΩ				
R165	47Ω				
R166	10kΩ				
R167	33kΩ				
R168	100Ω				
R169	470Ω				
R170	100Ω				
R171	10kΩ				
R172	22kΩ				
R173	10kΩ				
R174	2.2kΩ				
R175	1kΩ				
R176	10kΩ				
R177	22kΩ				
R178	10kΩ				
R179	22kΩ				
R180	10kΩ				
R181	22kΩ				
R182	100Ω				
R183	4.7kΩ				
R184	220kΩ				
R185	1kΩ				
R186	2.2kΩ				
R187	3.3kΩ				
R188	470Ω				
R189	100kΩ				
R190	3.3kΩ				
R191	3.3kΩ				
R192	47kΩ				
R193	22kΩ				
R194	1MΩ				
R195	4.7kΩ				
R196	33kΩ				
R197	47kΩ				
R198	68kΩ				
R199	100kΩ				
R200	22kΩ				
R201	100kΩ				
R202	1MΩ				
R203	2.2kΩ				
R204	470Ω				

Ref. No.	Value		Watt-age (W)	Toler-ance (%)	Material
R205	22kΩ				
R206	100kΩ				
R207	470Ω				
R208	4.7kΩ				
R209	470Ω				
R210	22kΩ				
R211	100kΩ				
R212	470Ω				
R213	100Ω				
R214	100Ω				
R215	10kΩ				
R216	4.7kΩ				
R217	10kΩ				
R218	47kΩ				
R219	47kΩ				
R220	1kΩ				
R221	10kΩ				
R222	470kΩ				
R223	10kΩ				
R224	10kΩ				
R225	22kΩ				
R226	22kΩ				
R227	22kΩ				
R228	2.2kΩ				
R229	10kΩ				
R230	4.7kΩ				
R231	1kΩ				
R232	10kΩ				
R233	10kΩ				
R234	22kΩ				
R235	22kΩ				
R236	10kΩ				
R237	100kΩ				
R238	470kΩ				
R239	3.3kΩ				
R240	2.2kΩ				
R241	5.6kΩ				
R242	3.3kΩ				
R243	2.2kΩ				
R244	3.3kΩ				
R245	2.2MΩ				
R246	10kΩ				
R247	10kΩ				
R248	470kΩ				
R249	1kΩ				
R250	1MΩ				
R251	4.7kΩ				
R252	10kΩ				
R253	1kΩ				
R254	1MΩ				
R255	2.2kΩ				
R256	22kΩ				
R257	1.5MΩ				
R258	120kΩ				
R259	470Ω				
R260	100Ω				
R261	47Ω				
R262	100kΩ				
R263	10kΩ				
R264	39Ω				
R265	2.2kΩ				
R266	4.7kΩ				
R267	470Ω				
R268	470Ω				
R269	330Ω				
R270	10kΩ				
R271	Not used				
R272	470kΩ				
R273	47kΩ				
R274	4.7kΩ				
R275	100kΩ				
R276	2.2Ω		1	5	Metal film
R277	1kΩ				
R278	4.7kΩ				
R279	1kΩ				
R280	47kΩ				
R281	100kΩ				
R282	100kΩ				
R283	1kΩ				
R284	10Ω				
R285	10Ω				

TRANSISTORS

Ref. No.	Type No.		Substitute Type No.
Q1	2SC1815 (GR)		
Q2~4	2SC732 (BL)		
Q5,6	2SC1815 (GR)		
Q7	2SC1384 (R)		
Q101,102	3SK77 (GR)		
Q103	2SC1923 (O)		
Q104	3SK77 (GR)		
Q105	2SC1815 (GR)		
Q106	3SK77 (GR)		
Q107	2SC1923 (O)		
Q108,109	2SC1117		
Q110	2SC1923 (O)		
Q111	2SC2347		
Q112	2SC535 (B)		
Q113~117	2SA1015		
Q118	2SC1815 (Y)		
Q119	2SC1815 (O)		
Q120,121	2SC1815 (Y)		
Q122~130	2SC1815 (GR)		
Q131	2SC1959 (Y)		
Q132,133	2SC1815 (GR)		
Q134	2SC1384 (R)		
Q135	2SC1815 (GR)		
Q136	2SA950 (Y) or 2SA966 (Y)		
Q137	2SC1815 (GR)		

COILS & TRANSFORMERS

Ref. No.	Description		MFR's Part No.
T1	DC-DC Converter Transformer		GRE-022
T101	RF Coil		GR-N553
T102	RF Coil		GR-N553
T103	OSC Coil		GR-N544
T104	I.F.T. (10.7 MHz)		119LC470033N3 or (GR-A470033)
T105	Quad. (455 kHz)		7MC-452503N4 or (GR-P452503)
T106	I.F.T. (455 kHz)		7MC-352203N9 or (GR-P352203)
T107	I.F.T. (455 kHz)		GR-P4202
T108	DC-DC Converter Transformer		GRE-023
T109	Power Transformer		K7087
L101	Choke Coil		4LNC-092
L102	Choke Coil		4LNC-0122
L103	RF Coil		6.5SNO-097
L104	RF Coil		6.5SNO-086
L105	RF Coil		6.5SNO-097
L106	RF Coil		6.5SNO-086
L107	OSC Coil		6.5SNO-097
L108~110	UHF RF Coil		GR-M-545
L111	OSC Coil		6.5SNO-097
L112	UHF RF Coil		GR-M-545
L113	Choke Coil		LF4-100K
L114	Choke Coil		FL-7H222K
L115	Choke Coil		SN-8D-500

INTEGRATED CIRCUITS

Ref. No.	Type No.		Substitute Type No.
IC1	GRE-7832 or GRE-7832A		
IC2	TC4010BP		
IC3	TC4042BP		
IC4	TMS1024NLL		
IC5,6	TC5501P-1		
IC7	SN7407N		
IC8	TC4518BP		
IC9	TC4017BP		
IC10,11	TC4081BP		
IC12	GRE-7803A		
IC13	MC12013P		
IC14	SN74145N or DM74145N		
IC101	MC3357P or MSP5071		
IC102	TC4016BP		
IC103	TD62501P		
IC104	TA7521P		
IC105	SN76007N		
IC106	TA78L005		
IC107	HA17808P		
IC108,109	TA78L005		
IC110	HA17808P		

DIODES

Ref. No.	Description		MFR's Part No.
D1	Silicon		1SS81
D2	Silicon		1S2076A
D3,4	Silicon		1S1588 or HV-80
D5~9	Silicon		1S2076A
D10~16	Silicon		1S1588 or HV-80
D17~31	Silicon		1S2076A
D32	Zener		HZ12LC-3
D33	Zener		HZ16L-1
D34~37	Silicon		1S1588 or HV-80
*D101~104	Varactor		FC-54
D105	Silicon		1SS85
D106	Varactor		FC-54
D107	Silicon		1SS85
D108,109	Varactor		FC-54
D110~114	Varactor		1SV89B
D115,116	Silicon		1S1588 or HV-80
D117	Germanium		1N60
D118	Silicon		1S1588 or HV-80
D119~123	Germanium		1N60
D124	Zener		HZ9LC-1
D125,126	Zener		HZ5C-2
D127	Silicon		S5277B
D128	Silicon		1S1588 or HV-80
D129	Rectifier		1B4B1
D130	Silicon		S5277B
D131	Silicon		1S2076A
D132,133	Silicon		1S1588 or HV-80
D134,135	Silicon		SS277B
D136	Silicon		1S1588 or HV-80
D137	Silicon		1S1588 or HV-80
D138	Zener		HZ9LA-2

* D103 Not used

CRYSTALS & FILTERS

Ref. No.	Description		MFR's Part No.
X-1	6.4 MHz Crystal		6.4 MHz
X-101	10.245 MHz Crystal		10.245 MHz
XF-101	Crystal Filter		10M15A
CF-101	Ceramic Filter		LF-H18S
B.T.F.	Trap Filter		20LTR-141

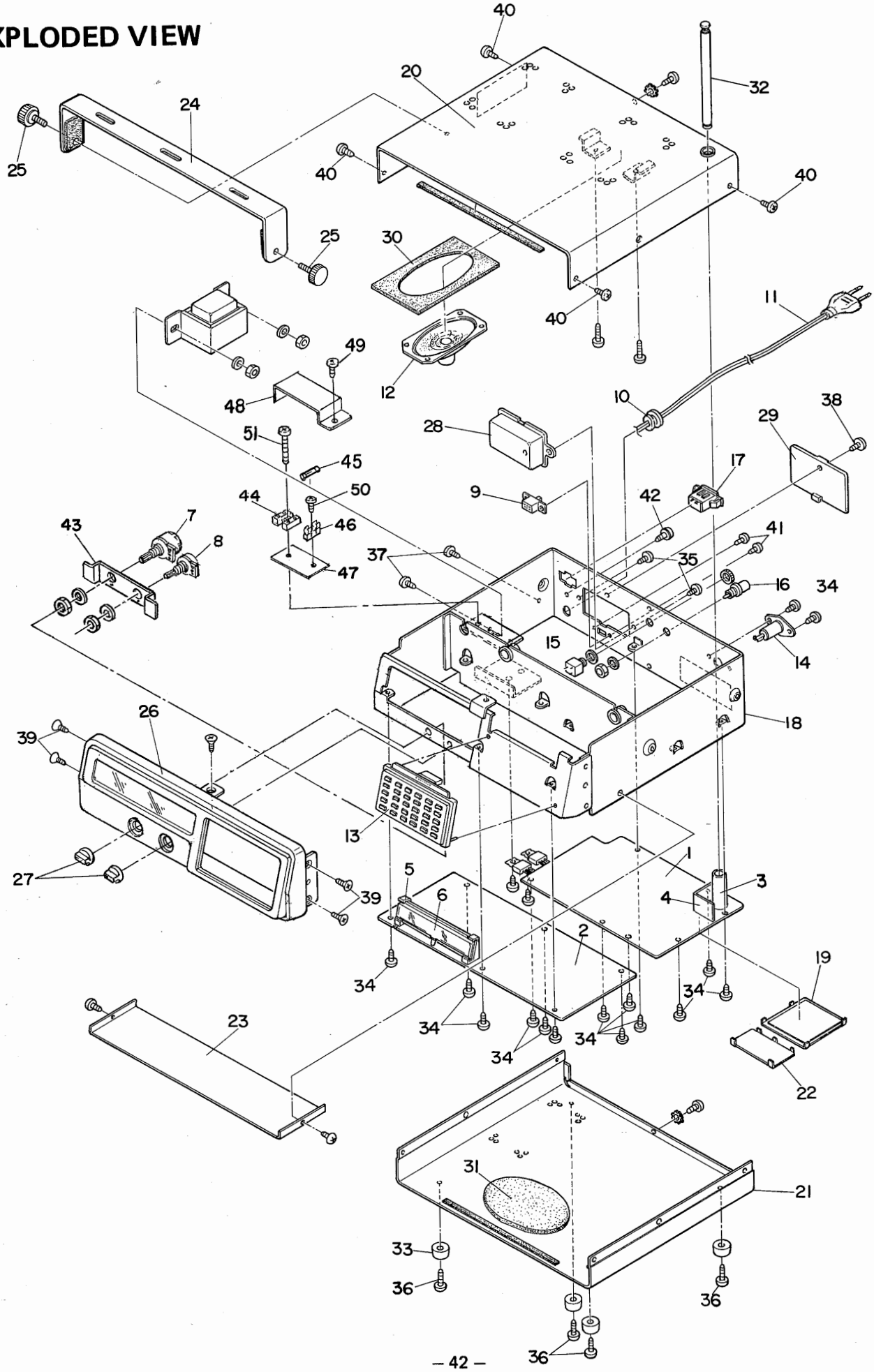
VARIABLE CAPACITORS

Ref. No.	Description		MFR's Part No.
TC1	Trimmer (20P)		ECV-1ZW20X53
TC101-107	Trimmer (10P)		ECV-1ZW10X53

MISCELLANEOUS			
Ref. No.	**Description**		**MFR's Part No.**
RA-1	Resistor Array		EXB-P811-104K
RA-2	Resistor Array		EXB-P811-104K
RA-3	Resistor Array		EXB-P812-274K
	Short Jumper		ERD-14TOA
TP-1 ~ 3	Test Pin		CHP-01
TP-101 ~ 106	Test Pin		CHP-01
	Linear P.C. Board		GE-80D-0964
1	Linear P.C. Board Ass'y		
	Logic P.C. Board		GE-79B-0501
2	Logic P.C. Board Ass'y		
3	Antenna Guide		GE-22D-6428
4	RF Shield Plate		GE-79D-0110
5	Display Holder		GE-80D-0961
6	Fluorescent Display Devices		FG-137D6
7	Volume Control W/SW (VR-1)		VM11A-50KA-15A
8	Squelch Control (VR-2)		VM10A-50KB-15A
9	DC Clock/OUT Switch		SSF12-07 or SSF-22-07
	Battery Snap		1 type
10	Line Cord Strain Relief		SR-4N-4
11	AC Cord		HAR CLASS-2 (2m)
	Nylon Bushing		OCB-500
	Snap Bushing		SB-437-5
12	Speaker		EP-100715ST
13	Key Board W/Connector		KEA7A015
14	Antenna Jack		JA-C-020
15	EXT. SPKR. Jack		JA-C-011
16	Tape Out Jack		LR205-2
17	DC Jack		GE-22D-6940
CN-1	P.C. Board Connector		5048-13A
CN-2	P.C. Board Connector		5048-09A
18	Chassis		GE-80A-1182
19	RF Shield Plate (Bottom)		GE-80D-1031
	RF Shield Plate Fiber		GE-80D-1032
20	Cabinet (Top)		GE-80D-1136
21	Cabinet (Bottom)		GE-21B-5724
22	VCO Shield Plate		GE-79D-0348
	VCO Shield Plate Fiber		GE-79D-0349
23	Logic Shield Plate		GE-80C-1139
24	Car Mounting Bracket		GE-21C-5725
	Car Mounting Bracket Spacer		GE-19D-4815
25	Car Mounting Bracket Screw		GE-23D-7587
26	Bezel Ass'y		
	Front Escucheon		GE-80A-1185
	Display Window		GE-79D-0624
27	Volume & Squelch Knob		GE-20D-5514
28	Battery Compartment		GE-21D-5728
29	Battery Compartment Cover		GE-79D-0113
	Battery Cushion		GE-21D-5795

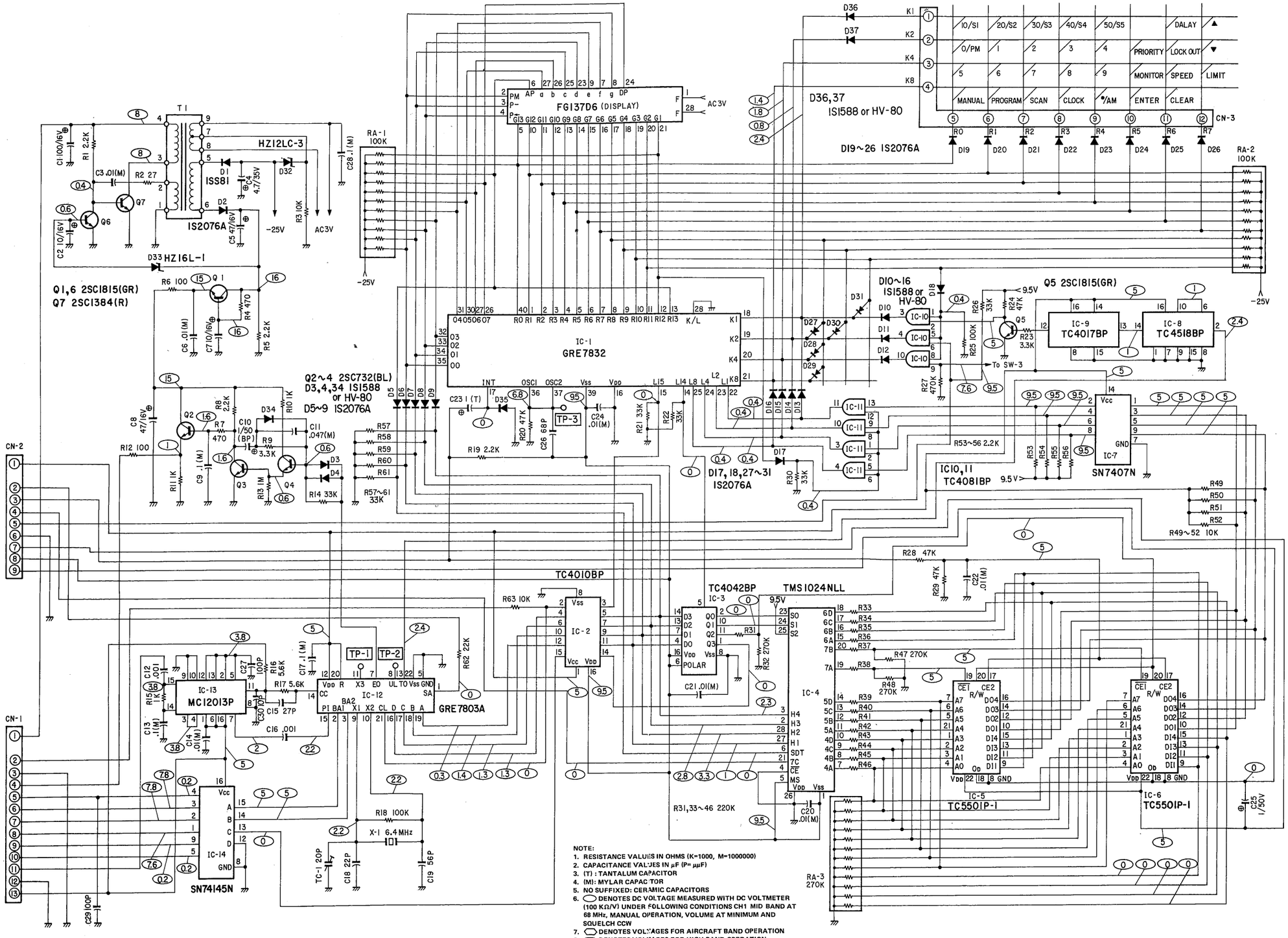
Ref. No.	Description		MFR's Part No.
30	Speaker Pad		GE-21D-5982
31	Cabinet Pad		GE-21D-5981
	Caution Label		GE-19D-4860
	Model Label		GE-80D-1203
	DC Cable Label		GE-80D-1200
	Ground Wire Label		GE-80D-1201
	DC Cable Fuse Caution Label		GE-79D-0062
	DC Cable Ass'y		GE-80D-1193
32	Telescopic Antenna		F-2007-113
33	Foot		No. 7101
	1A Fuse UL Listed		
CN-1'	Connector Ass'y (Linear P.C. B → Logic P.C.B.)		5047-13
CN-2'	Connector Ass'y (Linear P.C.B. → Logic P.C.B.)		5047-09
CN-3'	Connector Ass'y (Logic P.C.B. → Key Board)		5047-12
34	Round-Head Self Tapping Screws		3 x 6 mm
35	Round-Head Self Tapping Screws		3 x 8 mm
36	Pan-Head Screws		3 x 10 mm
	Pan-Head Screws		3 x 12 mm
37	Pan-Head Screws		4 x 8 mm
38	Screw for Battery Cover		GE-80D-0968 (3 x 8)
39	Flat-Head Screws		3 x 6 mm
40	Binding-Head Screws (Black)		3 x 8 mm
41	Pan-Head Screws		2 x 5 mm
42	Pan-Head Screw with Spring Lock Washer		4 x 6 mm
	Internal Star Lock Washer		3ϕ
	Internal Star Lock Washer		4ϕ
	Internal Star Lock Washer		6ϕ
43	Mounting Bracket for Variable Resistor		GE-80D-1183
44	Terminal Block		323-HDS-12P
45	Fuse (250V/1A)		
46	Fuse Holder		HN 1150 #2
47	AC Terminal Fiber		GE-23D-7097
48	Terminal Block Cover		GE-80D-1402
49	Pan-Head Screw		2.6 x 6 mm
50	Pan-Head Screw		2.6 x 8 mm
51	Binding-Head Screw		3 x 15 mm

EXPLODED VIEW



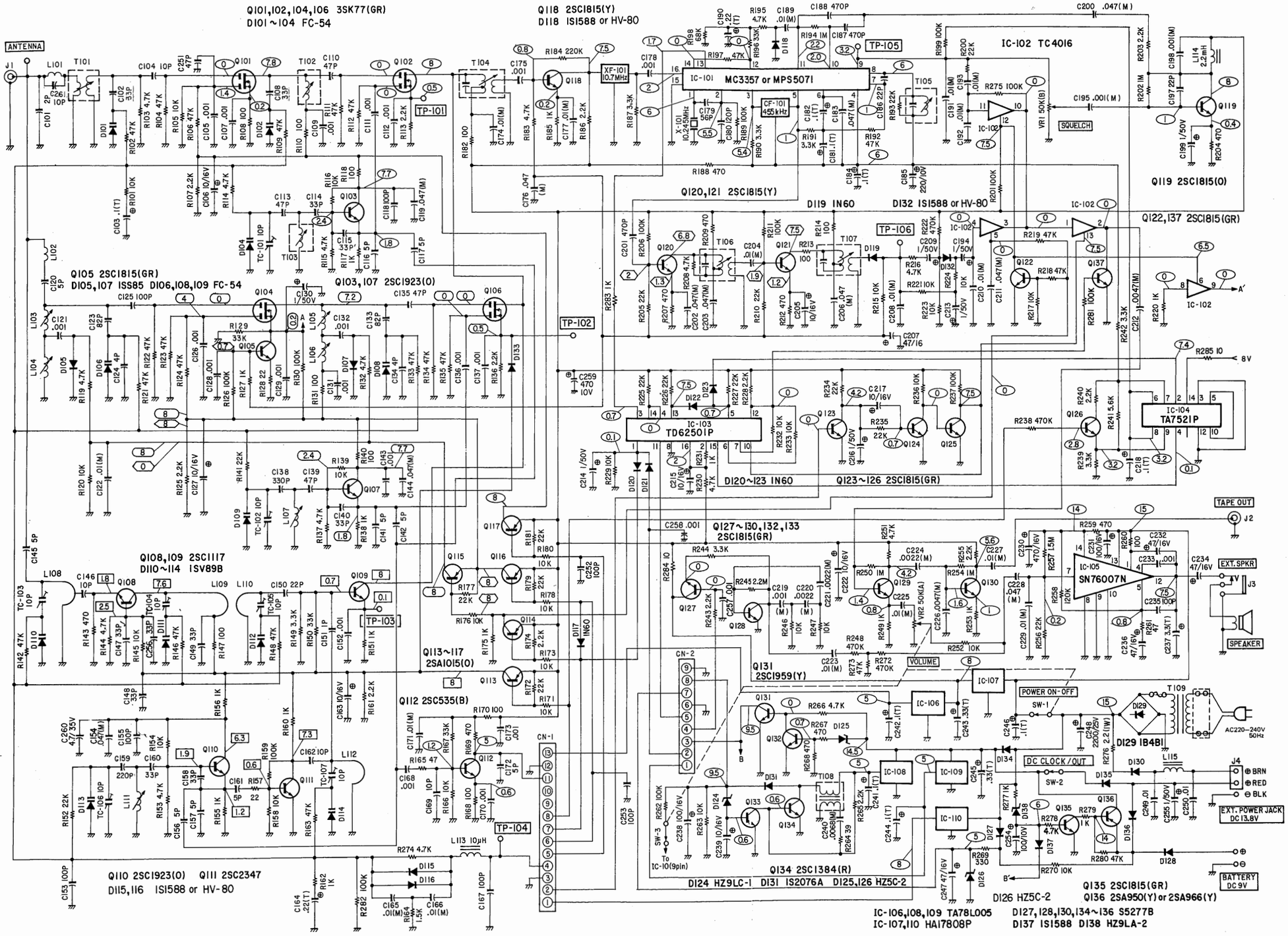
Notes

SCHEMATIC DIAGRAM (LOGIC SECTION)



NOTE:
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. NO SUFFIXED: CERAMIC CAPACITORS
6. ⬭ DENOTES DC VOLTAGE MEASURED WITH DC VOLTMETER (100 KΩ/V) UNDER FOLLOWING CONDITIONS CH1 MID BAND AT 68 MHz, MANUAL OPERATION, VOLUME AT MINIMUM AND SQUELCH CCW
7. ⬭ DENOTES VOLTAGES FOR AIRCRAFT BAND OPERATION
8. ⬭ DENOTES VOLTAGES FOR HIGH BAND OPERATION
9. ▭ DENOTES VOLTAGES FOR UHF BAND OPERATION
10. RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

SCHEMATIC DIAGRAM (LINEAR SECTION)



NOTE:
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. NO SUFFIXED: CERAMIC CAPACITORS
6. ⬭ DENOTES DC VOLTAGE MEASURED WITH DC VOLTMETER (100 KΩ/V) UNDER FOLLOWING CONDITIONS CH1 MID BAND AT 68 MHz, MANUAL OPERATION, VOLUME AT MINIMUM AND SQUELCH CCW.
7. ⬭ DENOTES VOLTAGES FOR AIRCRAFT BAND OPERATION
8. ⬭ DENOTES VOLTAGES FOR HIGH BAND OPERATION
9. ▭ DENOTES VOLTAGES FOR UHF BAND OPERATION
10. RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE