

**REALISTIC<sup>®</sup>**

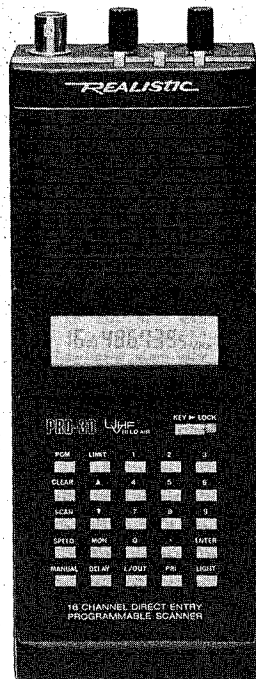
# Service Manual

20-131/9131

PRO-30

## POCKET SCAN PLL SYNTHESIZED VHF/UHF AM/FM RECEIVER

Catalog Number: 20-131/9131



CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

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# SPECIFICATIONS

Description	Nominal spec.	Limit spec.
<b>Frequency Coverage</b> VHF LOW (* or MID)  AIRCRAFT VHF HIGH UHF		30 ~ 54 MHz 5 kHz steps * or 68 ~ 88 MHz 5 kHz steps 108 ~ 136 MHz 25 kHz steps 138 ~ 174 MHz 5 kHz steps 380 ~ 512 MHz 12.5 kHz steps
<b>Sensitivity</b> VHF LOW (* or MID) FM AIRCRAFT AM VHF HIGH FM UHF FM	0.6 $\mu$ V 2.0 $\mu$ F 1.0 $\mu$ V 1.0 $\mu$ V	2 $\mu$ V 5 $\mu$ V 3 $\mu$ V 4 $\mu$ V
<b>Selectivity</b> - 6 dB -50 dB	$\pm$ 9 kHz $\pm$ 15 kHz	$\pm$ 12 kHz $\pm$ 18 kHz
<b>Spurious Rejection</b> at 40 MHz (* or 78 MHz) at 120 MHz at 150 MHz UHF (except primary image)	50 dB 50 dB 50 dB	40 dB 40 dB 40 dB Not specified
<b>IF Rejection</b> 10.7 MHz <b>Modulation Acceptance</b> (EIA RS-204-A)	50 dB $\pm$ 8 kHz	40 dB $\pm$ 5 kHz
<b>Signal to Noise Ratio</b> (AM: MOD. 60% at 1 kHz) (FM: DEV. 5 kHz at 1 kHz) VHF LOW (* or MID) AIRCRAFT VHF HIGH UHF	45 dB 35 dB 45 dB 35 dB	30 dB 25 dB 30 dB 25 dB
<b>Residual Noise (Vol. Min)</b>	1 mV	5 mV
<b>Scanning Speed</b> Fast Slow	10 channels/sec. 5 channels/sec.	7 ~ 13 channels/sec. 4 ~ 6 channels/sec.
<b>Search Rate</b> Fast Slow	10 steps/sec. 5 steps/sec.	7 ~ 13 steps/sec. 4 ~ 6 steps/sec.
<b>Priority Sampling</b>	2 sec. 100 m sec.	1 ~ 3 sec. 80 ~ 120 m sec.
<b>Scan Delay Time</b>	2 sec.	1 ~ 3 sec.
<b>Audio Output Power</b> (T.H.D. 10 %)	220 mW	150 mW
<b>Channels of Operation</b> <b>Channel, Frequency and Mode</b> <b>Display</b> <b>Receiving System</b>  <b>Power source</b>  <b>Jacks</b>	Any 16 channels in any band combination Liquid crystal, 1/4 split display  Direct Key entry Digital-Controlled Synthesizer, Superheterodyne 1st IF: 10.7 MHz 2nd IF: 455 kHz 9 V DC negative ground only Six 1.5 V Pen-light batteries or six 1.25 V Ni-cad- mium batteries and three silver oxide batteries. Antenna, Earphone, External Power and Charge	

**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.

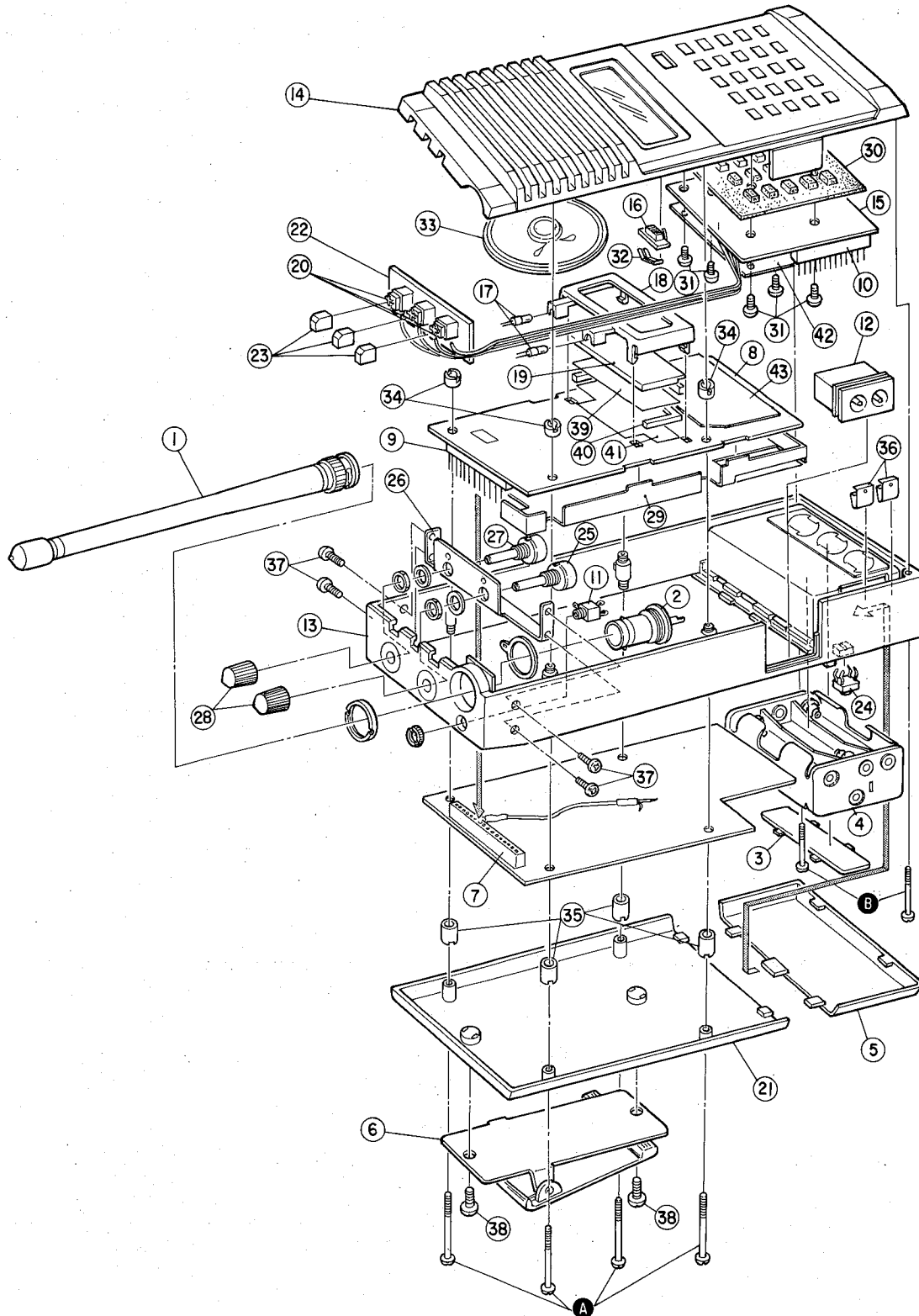
\* VHF MID (68 ~ 88 MHz) range is for European and Australian Models only.

# DISASSEMBLY DIAGRAM/ EXPLODED VIEW

Step 1 : Remove four screws (A).

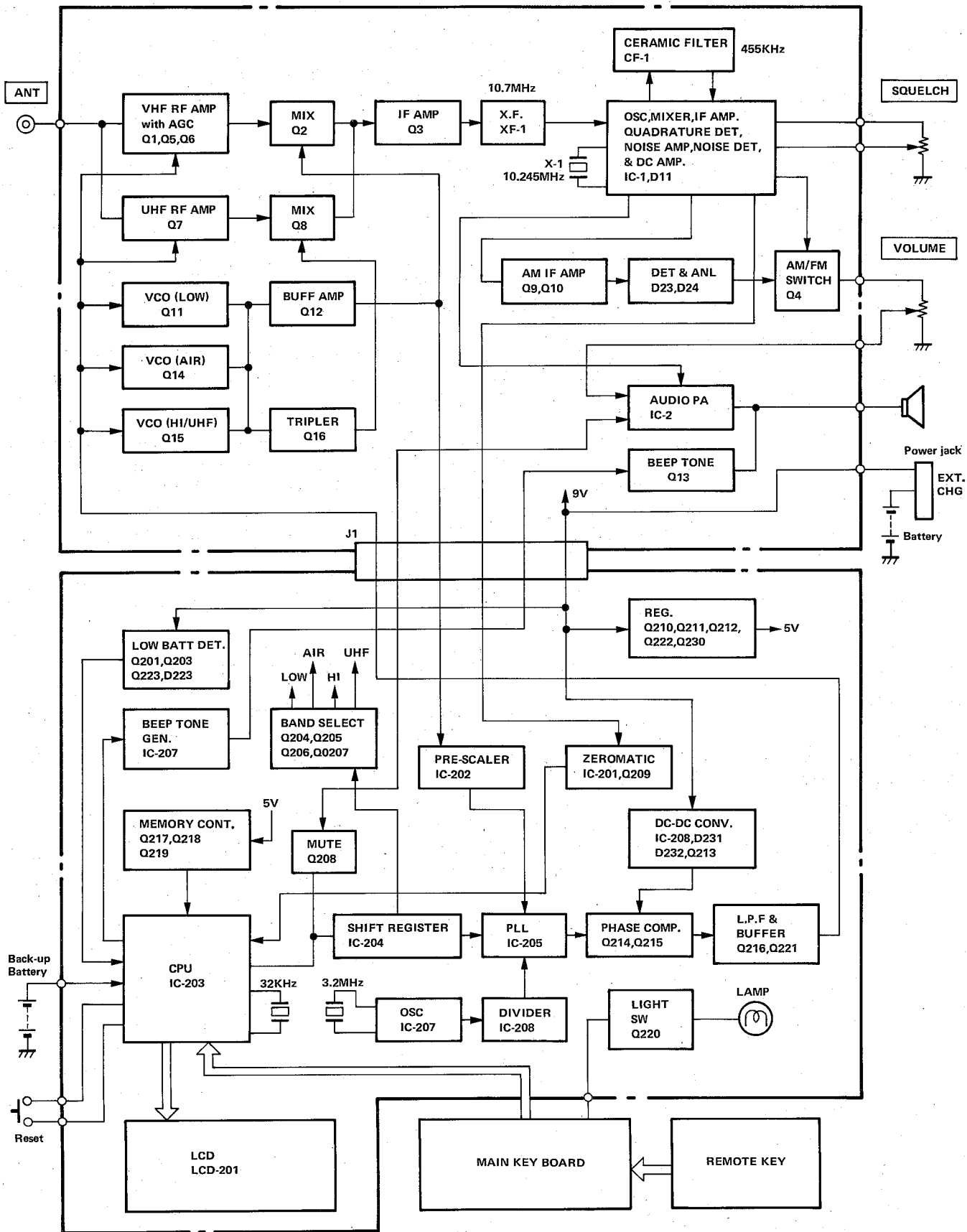
Step 2 : Remove two screws (B) ( located inside of battery cover).

Step 3 : Open the front and rear cabinet. Use care not to damage speaker leads connected to the front cabinet.





# BLOCK DIAGRAM



# PRINCIPLES OF OPERATION

The PRO-30 is a PLL (Phase Locked Loop) Synthesized VHF/UHF AM / FM Receiver, controlled by a CPU (Central Processing Unit) via the Keyboard.

The VHF Low Band (30 ~ 54 MHz) or Mid Band (68 ~ 88 MHz) and High Band (138 ~ 174 MHz) are received in 5 kHz increments. Aircraft Band (108 ~ 136 MHz) is set up for 25 kHz increments, and the UHF Band (380 ~ 512 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 Low (Mid), High and Aircraft Bands, to achieve optimum mix-modulation and mutual-modulation characteristics. Q3 amplifies the 10.7 MHz IF. A 10.7 MHz monolithic Crystal Filter is incorporated for better selectivity.

IC-1 contains the Local Oscillator, Mixer, IF Amplifier, Quadrature FM Detector, Noise Amplifier and D.C amplifier. 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 Q9 and 10, and is then applied to the next stage via the ANL circuit.

Detected output of AM and FM is applied to IC-2. IC-2 amplifies audio signals and feeds them to the speaker. Pin 3 of IC-2 controls squelch from IC-1.

The Zeromatic circuit consists of IC-201 and Q209 and functions in the search mode.

IC-203 is the CPU. The CPU does data processing, calculation, etc. Any unstable supply voltage ( $V_{DD}$ ) to the CPU can produce CPU malfunctions, such as wrong data processing, wrong data transfer, etc. To overcome this C221 and R247 "initialize" the CPU. Initialization is done when RESET switch pushed. Figure 1 shows initializing waveform.

The CPU contains two clocks. One produces the waveform shown in Fig. 2 at Pins 57 and 59, which is used for program functioning. The other waveform, which appears at Pins 20 and 21, is derived from X-201, 32.768 kHz, which is employed for determining Delay time, LCD  $\frac{1}{4}$  split display, etc., (shown in Fig. 3).

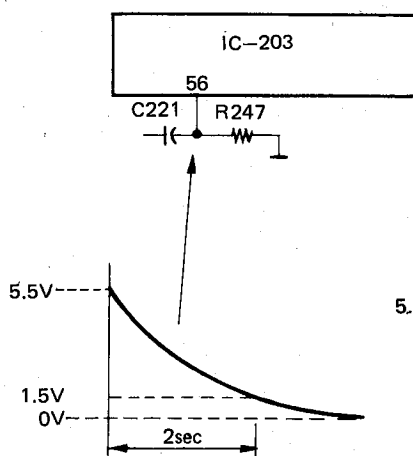


FIGURE 1

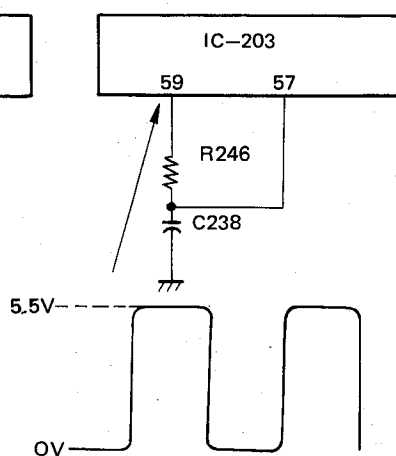


FIGURE 2

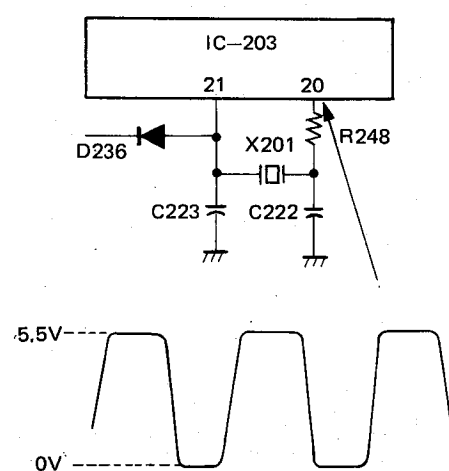


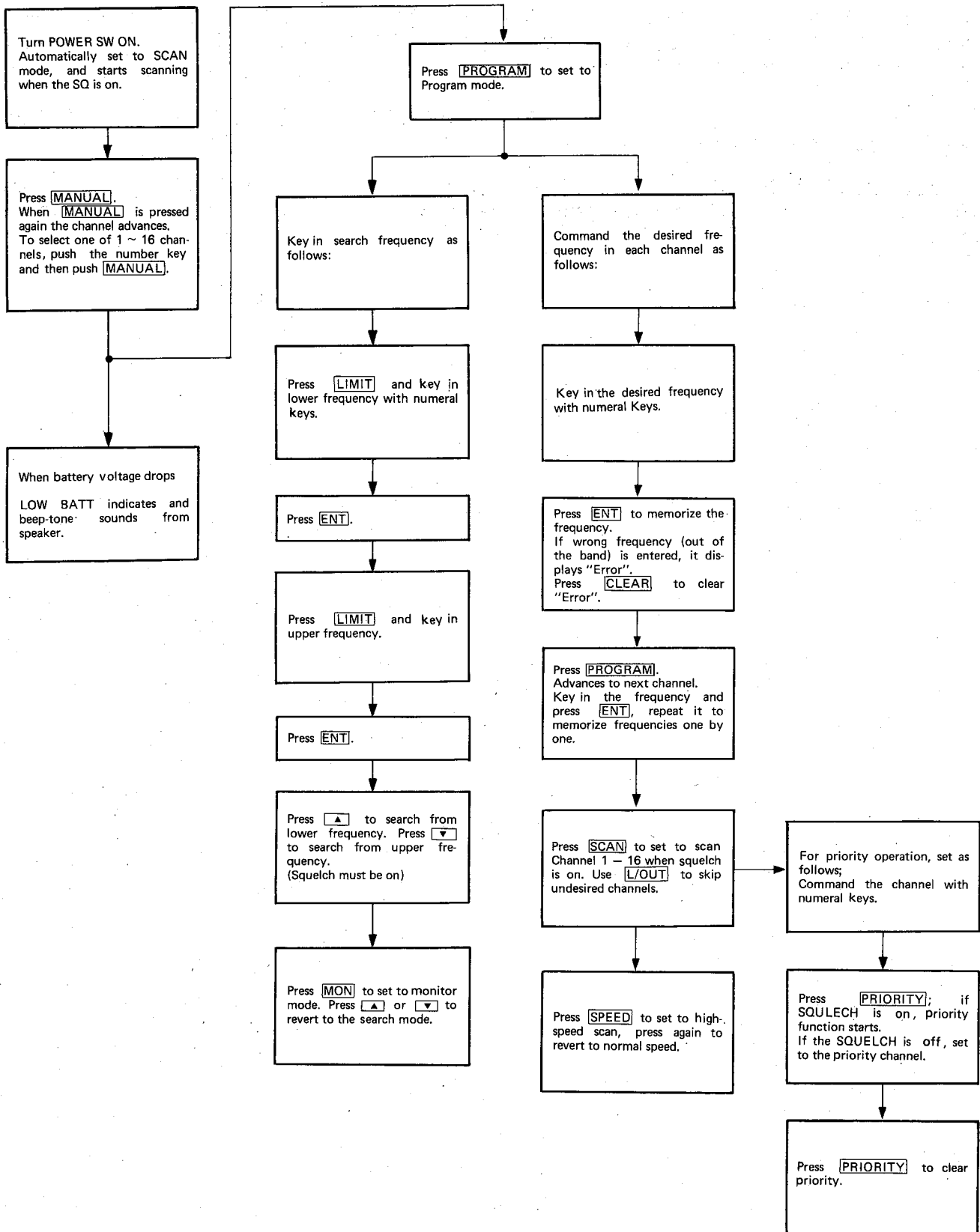
FIGURE 3

IC-207 (3/5) produces the PLL reference frequency 3.2 MHz, and IC-206 divides the frequency and supplies Pin 19 of PLL IC-205 with it. While the VCO output is 1/64 divided by Pre-scaler IC-202 and applied to Pin 10 of IC-205. Q214 and Q215 convert the output of IC-205 to DC, which is applied to VCO control and tuning variable capacitor via LPF (C217, C218 and R244). DC-DC convertor IC-208 and Q213 produce approximately 15V to keep the PLL circuit active.

When the supply voltage drops to a certain limited level, D220 detects it and sends a signal to CPU via Q203 and Q201, to give beep tone and LCD display.

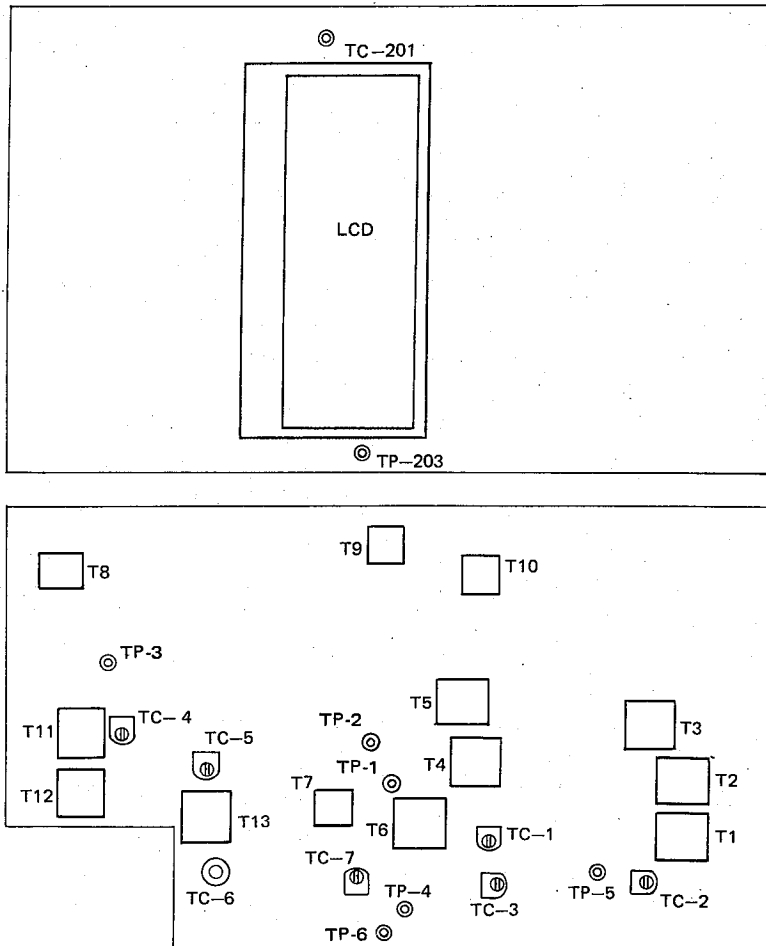
VHF-LOW, AIRCRAFT, VHF-HIGH or UHF band selection is done by the CPU, which sends a signal to Q204, Q205, Q206 and Q207 via shift register IC-204 to switch 5V B+ supply line to RF tuning and VCO circuit.

# GENERAL OPERATION OUTLINE



# ALIGNMENT/ADJUSTMENT

## ALIGNMENT AND TEST POSITIONS



## ALIGNMENT PREPARATION

### Test equipment required

1. Oscilloscope (0 ~ 500 kHz, 0 ~ 50 MHz)
2. AC VTVM
3. DC VTVM
4. Frequency Counter (200 MHz)
5. 16-ohm dummy load
6. Slow Sweep Generator with variable marker (10.7 MHz)
7. VHF Sweep Generator with variable marker (30 ~ 54 MHz, 108 ~ 174 MHz)
8. UHF Sweep Generator with variable marker (380 ~ 512 MHz)
9. FM Signal Generator (30 ~ 54 MHz, 138 ~ 174 MHz, 380 ~ 512 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:** Three silver oxide batteries are required to hold the memory when main battery is disconnected. Always be sure the unit is loaded with fresh batteries or the pre-programmed channels will be lost (and will have to be re-programmed).

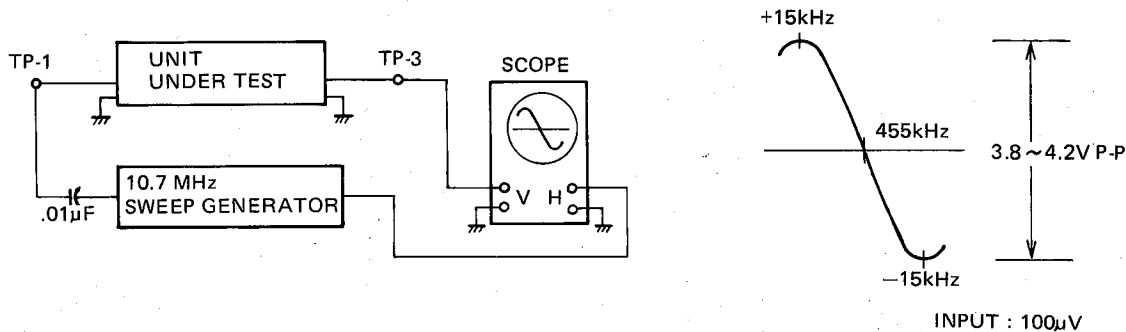
**NOTE 3:** For servicing VHF Mid band of European/Australian models, see Appendix on pages 48, 49 and 50.

## REFERENCE FREQUENCY OSC ALIGNMENT

- Step 1: Connect Frequency Counter to TP-203 and ground. Connect the ground first to prevent IC-206 latch-up.
- Step 2: Adjust TC-201 so that the frequency is 1.600 MHz  $\pm$  10 Hz if UHF frequency is entered, and 1.280 MHz  $\pm$  10 Hz if VHF frequency is entered.
- NOTE 1: If 3.2 MHz fails to oscillate, it may be due to IC-206 latch-up.

## IF SECTION ALIGNMENT

- Step 1: Connect instruments as shown below.



- Step 2: Adjust T8 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 LO BAND

- Step 1: Connect a DC VTVM to TP-5 and ground.
- Step 2: Program CH1, 2 and 3 as follows:  
CH1 (30 MHz), CH2 (40 MHz), CH3 (54 MHz).
- Step 3: Select Channel 3 (54 MHz) and adjust TC-4 for 10V on the DC VTVM.
- Step 4: Select Channel 1 (30 MHz) and adjust T11 for 1.0V on the DC VTVM.
- Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should read as below.
- |        |                 |             |
|--------|-----------------|-------------|
| 30 MHz | Voltage at TP-5 | 1.0V – 1.5V |
| 40 MHz | Voltage at TP-5 | 2.5V – 3.6V |
| 54 MHz | Voltage at TP-5 | 9.5V – 11V  |

### AIRCRAFT

- Step 1: Connect a DC VTVM to TP-5 and ground.
- Step 2: Program CH1, 2, and 3 as follows:  
CH1 (108 MHz), CH2 (120 MHz), CH3 (136 MHz)
- Step 3: Select Channel 3 (136 MHz) and adjust TC5 for 10V on the DC VTVM.
- Step 4: Select Channel 1 (108 MHz) and adjust T12 for 1.0V on the DC VTVM.
- Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should read as below.
- |         |                 |             |
|---------|-----------------|-------------|
| 108 MHz | Voltage at TP-5 | 1.1V – 1.6V |
| 120 MHz | Voltage at TP-5 | 3.5V – 4.5V |
| 136 MHz | Voltage at TP-5 | 9.5V – 11V  |

## VHF HI BAND AND UHF BAND

Step 1: Connect a DC VTVM to TP-5 and ground.

Step 2: Program CH1, 2, 3, 4 and 5 as follows:

CH1 (380 MHz), CH2 (138 MHz), CH3 (150 MHz), CH4 (450 MHz), CH5 (174 MHz), CH6 (512 MHz)

Step 3: Select Channel 3 (512 MHz) and adjust TC-6 for 10V on the DC VTVM.

Step 4: Select Channel 1 (380 MHz) and adjust T13 for 1.0V on the DC VTVM.

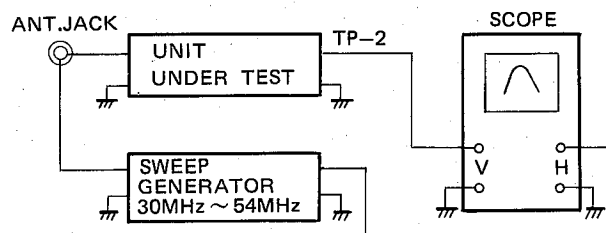
Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should read as below.

380 MHz	Voltage at TP-5	0.8V – 1.3V
138 MHz	Voltage at TP-5	1.3V – 2V
150 MHz	Voltage at TP-5	3V – 3.9V
450 MHz	Voltage at TP-5	4.3V – 5.2V
174 MHz	Voltage at TP-5	8.5V – 10V
512 MHz	Voltage at TP-5	9.8V – 11V

## RF AMP ALIGNMENT

### VHF LO BAND

Step 1: Connect instruments as shown below.

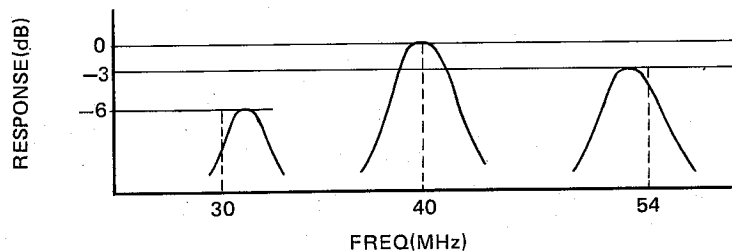


Step 2: Program 30 MHz (CH1), 40 MHz (CH2) and 54 MHz (CH3).

Step 3: Select Channel 1 (30 MHz) and adjust T-1 and T-6 for maximum RF waveform.

Step 4: Select Channel, 3 (54 MHz) and adjust TC-1 for maximum RF waveform.

Step 5: Check Channels 1 through 3 for the maximum RF waveform. Slight deviation as shown below is acceptable.



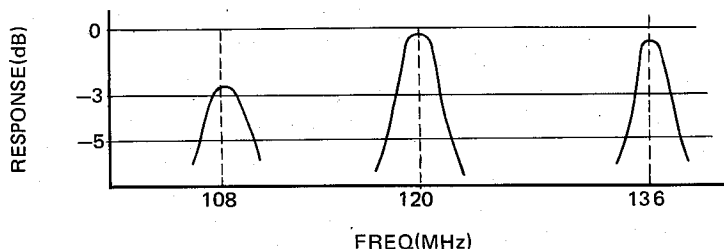
### VHF HI AND AIRCRAFT BAND

Step 1: Connect instruments: Same connection as VHF Lo band except Sweep Generator frequency, change to 108 MHz to 174 MHz.

Step 2: Program 108 MHz (CH1), 120 MHz (CH2), 136 MHz (CH3)

Step 3: Select Channel 1 (108 MHz) and adjust T2 and T4 for maximum RF waveform.

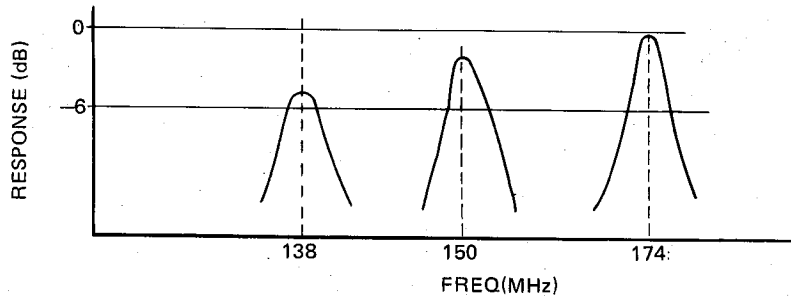
Step 4: Check Channels 1 through 3 for maximum RF waveform. Slight deviation as shown below is acceptable.



**VHF-HI BAND**

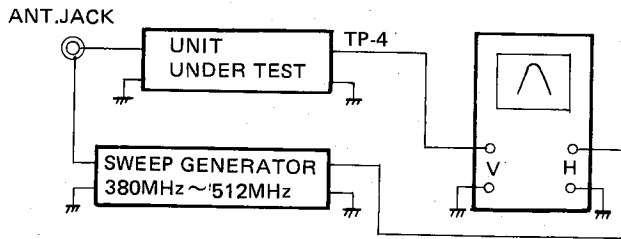
**108 MHz (CH1), 120 MHz (CH2), 136 MHz (CH3), 138 MHz (CH4), 150 MHz (CH5) and 174 MHz**

- Step 1: Connect instruments: Same connection as VHF Lo band except Sweep Generator frequency, change to 138 MHz to 174 MHz.
- Step 2: Program 138 MHz (CH-1), 150 MHz (CH-2), 174 MHz (CH-3).
- Step 3: Select Channel 1 (138 MHz) and adjust T3 and T5 for maximum RF waveform.
- Step 4: Check Channels 1 through 3 for maximum RF waveform. Slight deviation as shown below is acceptable.

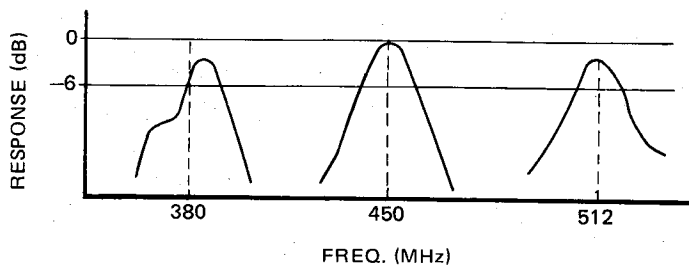


**UHF BAND**

Step 1: Connect instruments as shown below:



- Step 2: Program 380 MHz (CH1), 450 MHz (CH2) and 512 MHz (CH3).
- Step 3: Select Channel 1 (380 MHz) and adjust TC-3 and TC-7 for maximum RF waveform.
- Step 4: Select Channel 3 (512 MHz) and adjust TC-2 for maximum RF waveform.
- Step 5: Check Channels 1 ~ 3 for the maximum RF waveform at each frequency marker. Slight deviation as shown below is acceptable.





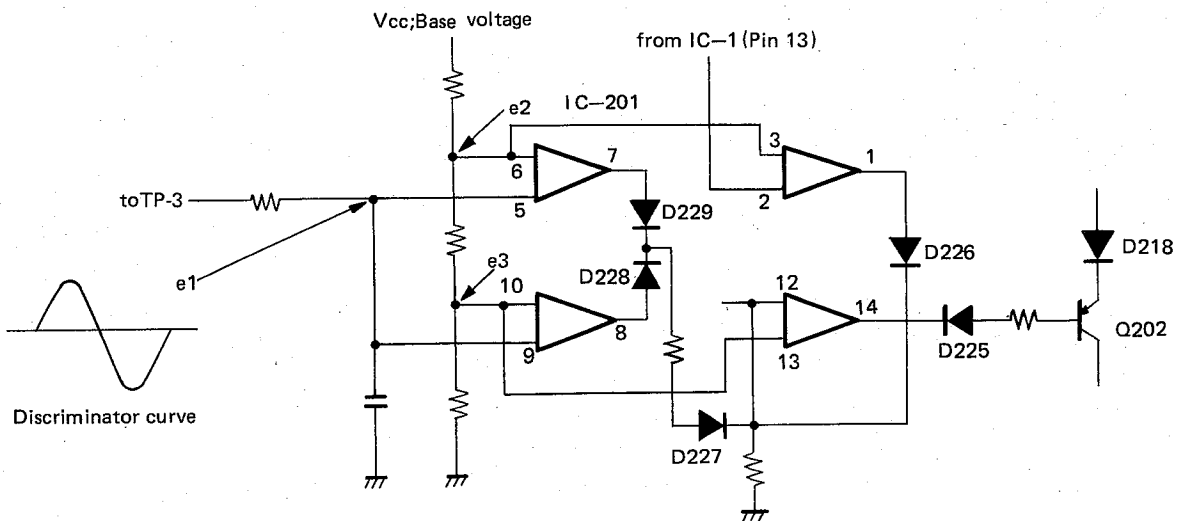
## OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

- Step 1: Connect FM Signal Generator (SSG) to the ANTenna jack and the AC VTVM to EXT. SPKR Jack across 16 ohm dummy load.
- 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 LO (MID)	40 MHz (78 MHz)
2	VHF HI	150 MHz
3	UHF	512 MHz
4	AIRCRAFT	120 MHz

- Step 3: Set the Signal Generator frequency to 512 MHz (channel 3). Readjust TC-7 for maximum sensitivity.
- Step 4: Connect AM Signal Generator and set the Signal Generator frequency to 120 MHz (channel 4). Adjust T7, T9 and T10 for maximum sensitivity.
- Step 5: For each frequency/channel, set Signal Generator to each frequency (FM: 3 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 is in "L" level.)

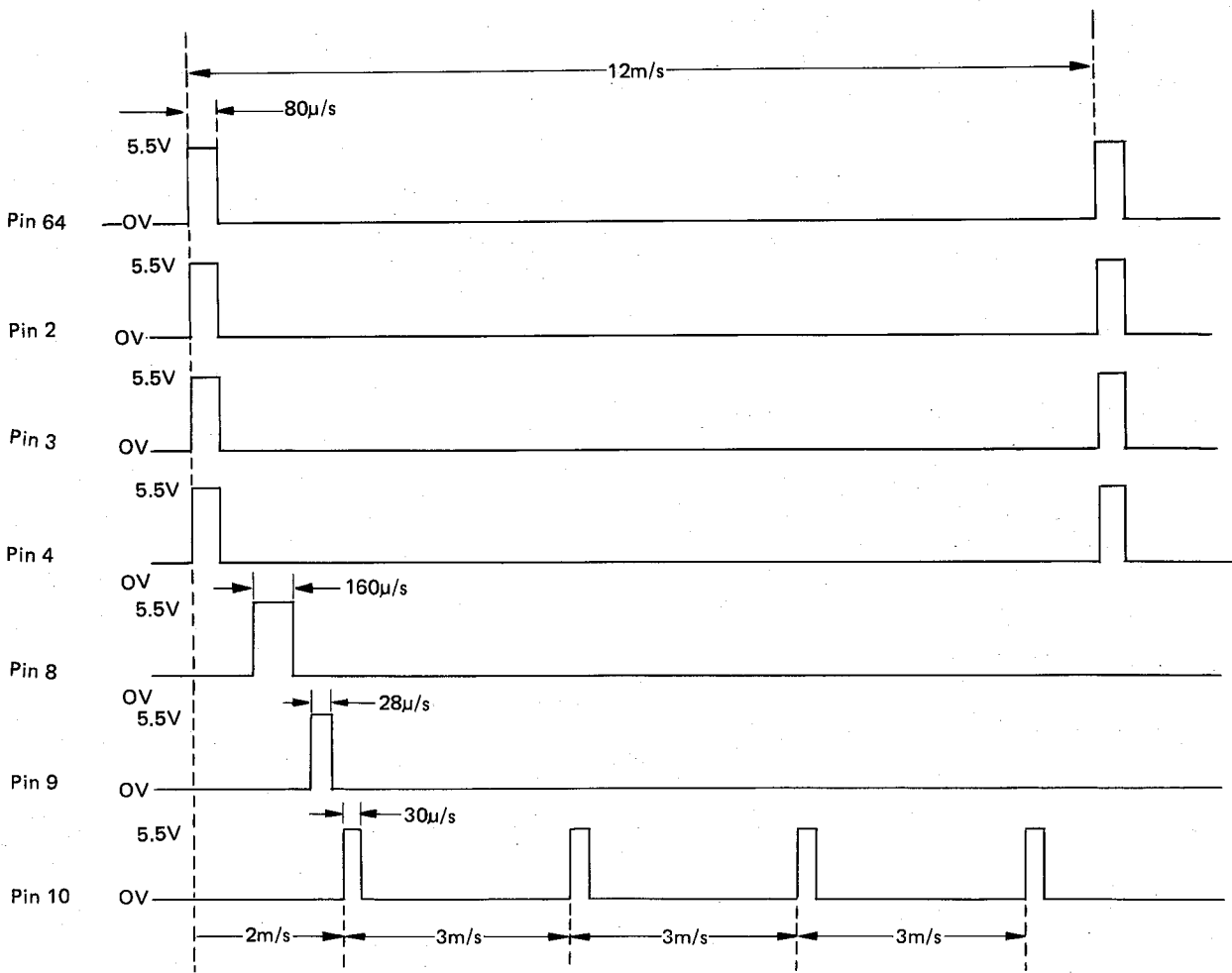
	$0 < e_1 < e_3$	$e_3 < e_1 < e_2$	$e_2 < e_1 < V_{CC}$
OUTPUT (Pin No. 14)	H	L	H

Output of Pin 14 controls CPU via D225 and Q202.

To adjust  $e_1$  voltage, receive signal in Manual mode, and set T8 to obtain 2.7V ( $1/2V_{CC}$ ) at TP-3. It is convenient to use the National Weather Service Signal for the adjustment.

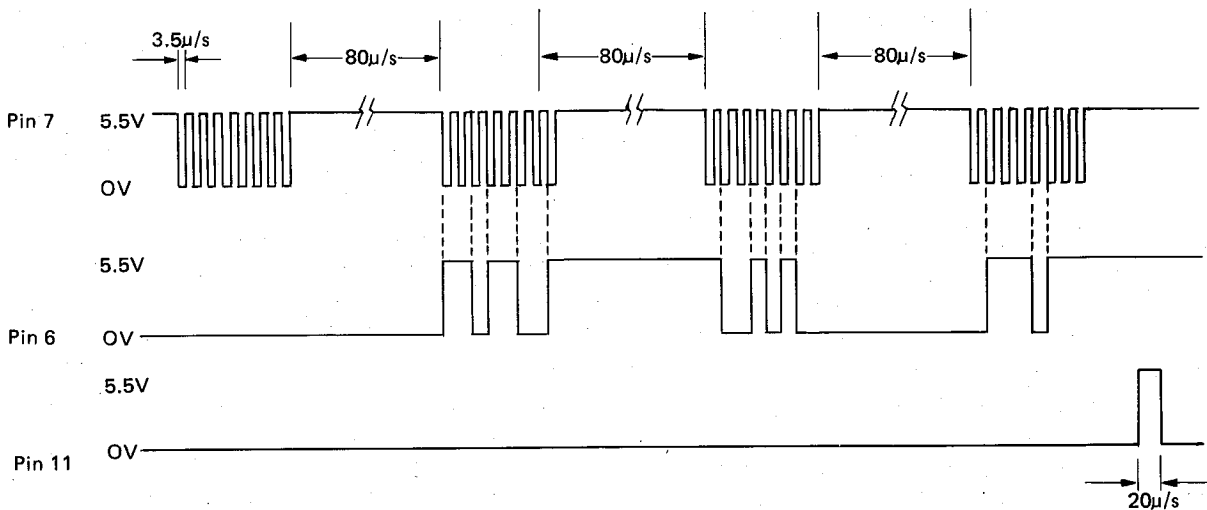
In the event Zeromatic does not function correctly, refer to "REFERENCE FREQUENCY OSC ALIGNMENT" and check 3.2 MHz, and adjust T8 again at 2.7V D.C while a Signal is being received.

## KEYS ACCESS PULSE OUTPUT(IC-203)

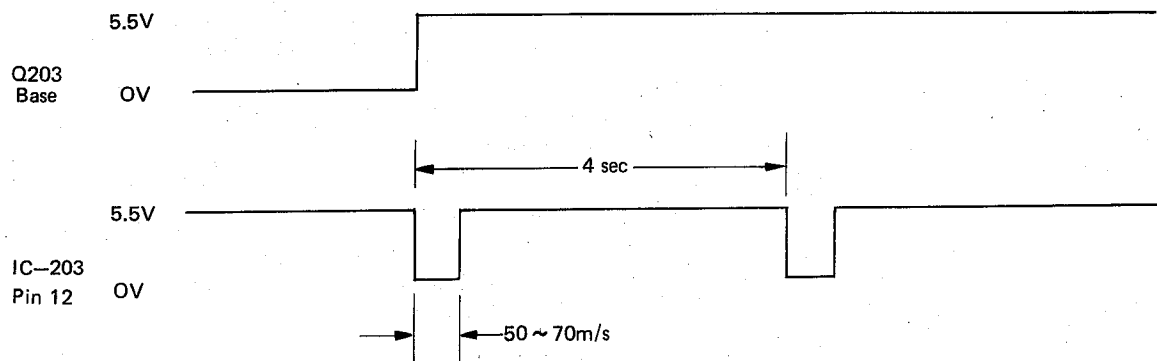


## PLL CLOCK WAVEFORMS(IC-203)

( Enter 150.000 MHz )



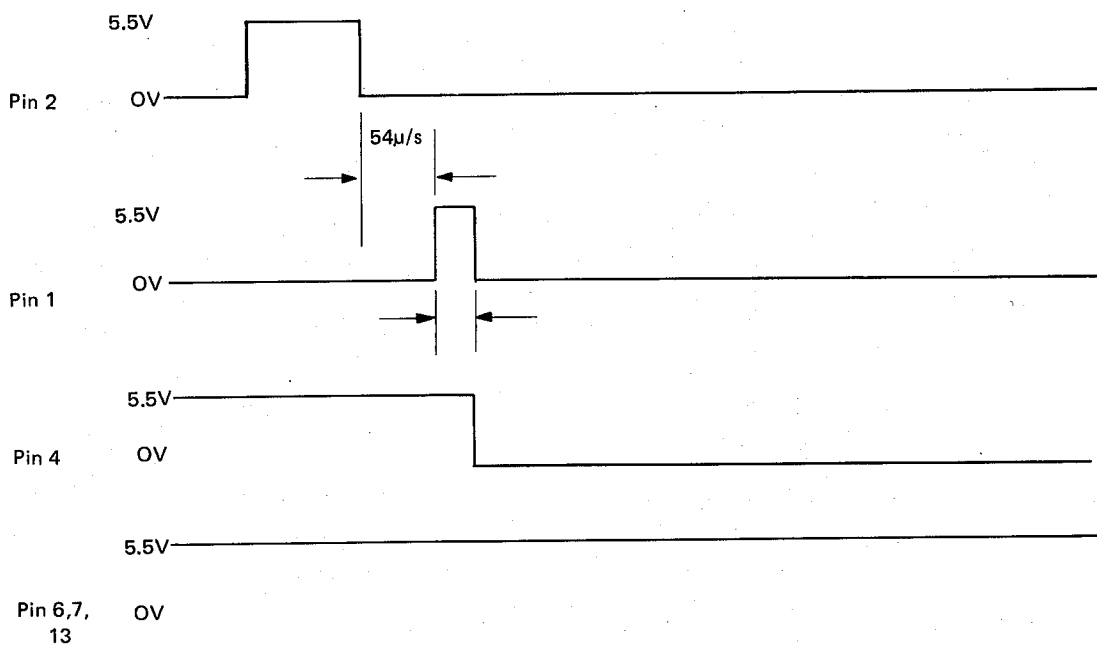
## LOW BATTERY ALARM OPERATION



- 1) Beep tone and LOW BATT indicator operate simultaneously.
- 2) Q203 base voltage changes at low supply voltage condition.

## BAND SELECTOR (IC-204)

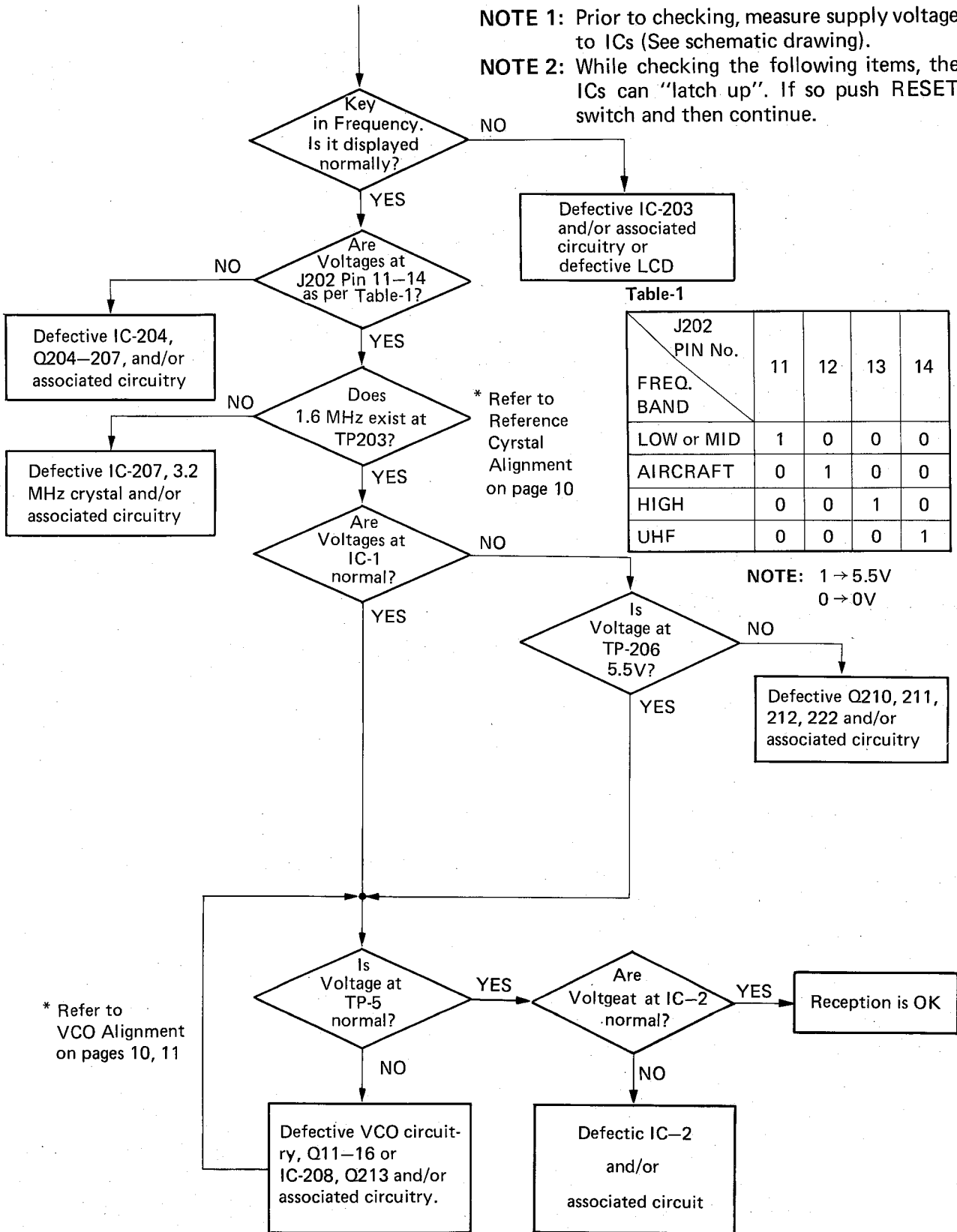
(Enter Low Band frequency in CH 1 ~ 16)



# 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 push RESET switch and then continue.



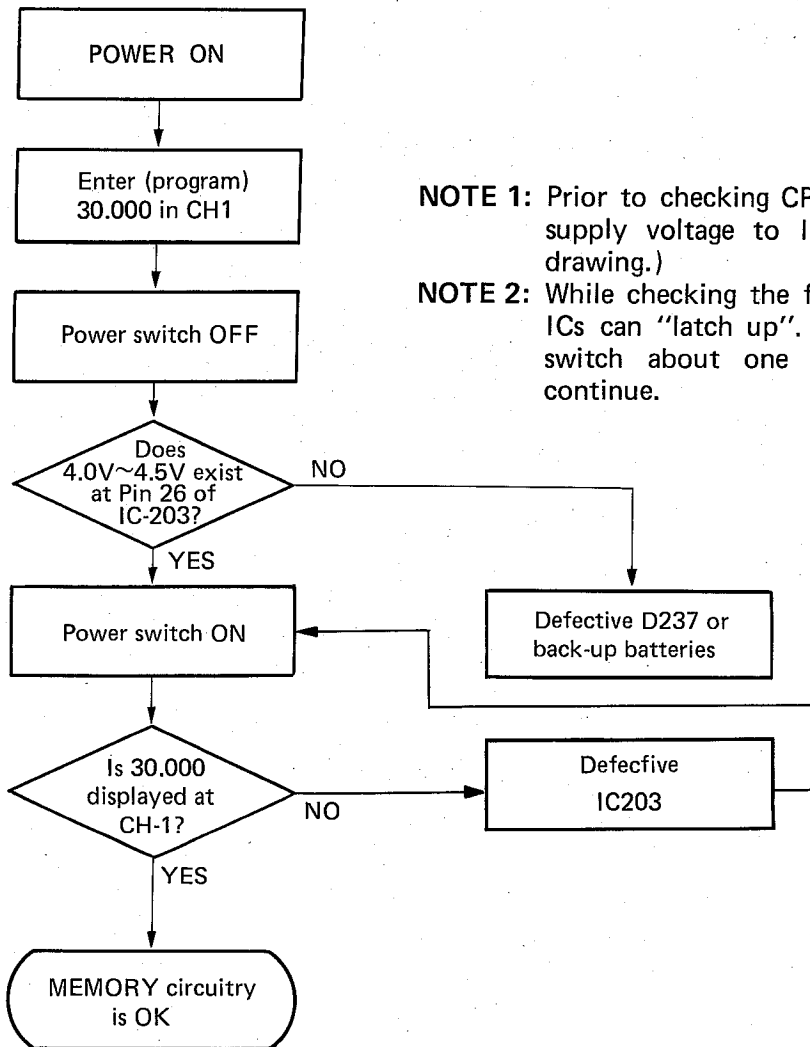
**Table-1**

J202 PIN No.	11	12	13	14
FREQ. BAND				
LOW or MID	1	0	0	0
AIRCRAFT	0	1	0	0
HIGH	0	0	1	0
UHF	0	0	0	1

**NOTE:** 1 → 5.5V  
0 → 0V

\* Refer to VCO Alignment on pages 10, 11

# 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 push RESET switch about one minute, and then continue.

# TROUBLESHOOTING

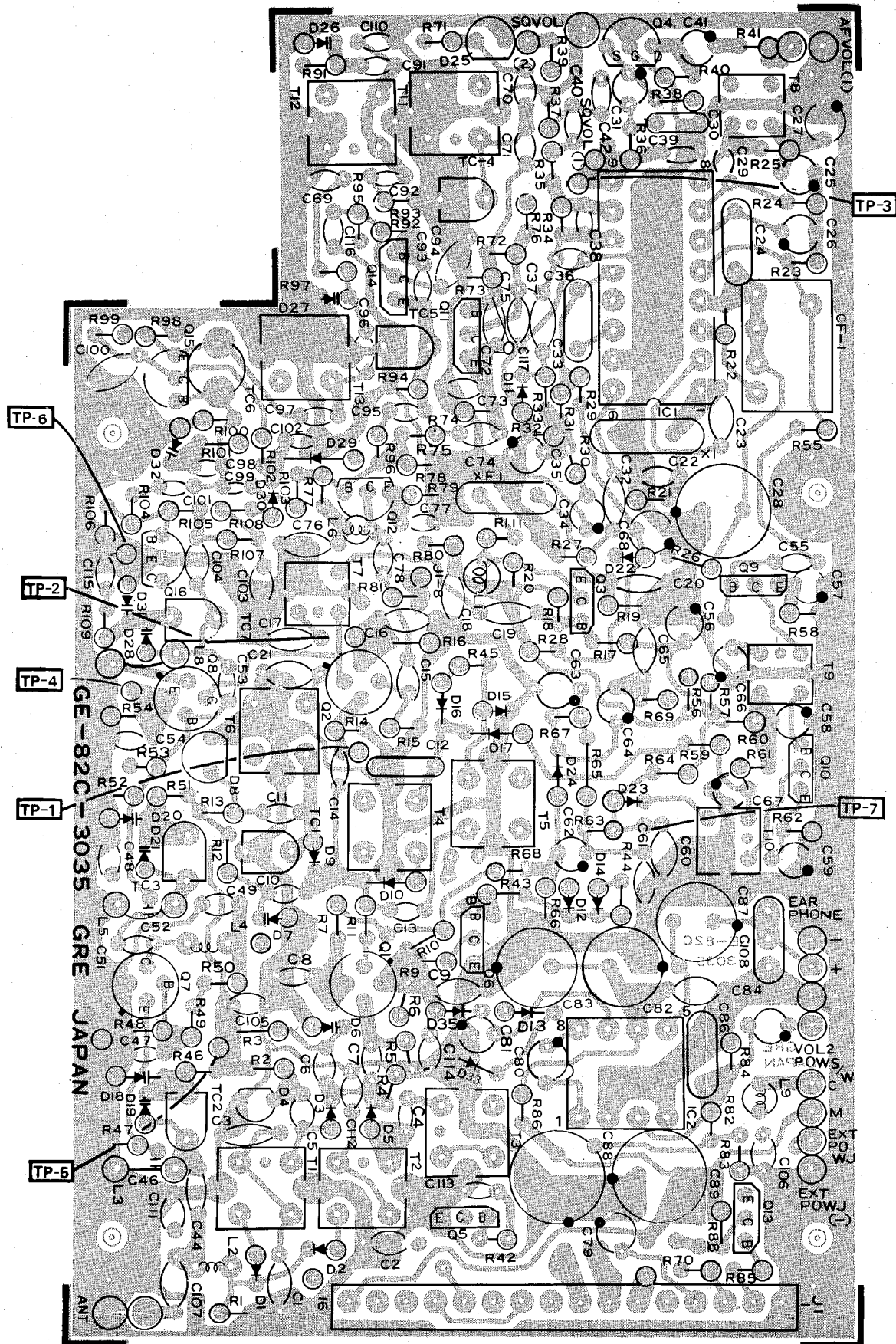
Symptom	Possible Cause
1) Display does not light and no sound when POWER is on. Volume control: MAX. Squelch control: counterclockwise (CCW)	1) Defective Battery 2) Defective External power jack or charge jack 3) Defective ON-OFF switch on volume control 4) Defective L9
2) Display lights but no sound Volume control: MAX. Squelch control: CCW	1) Defective speaker or EXT. SPKR jack 2) Defective audio amplifier IC-2, and/or associated circuit components 3) Defective IF amplifier IC-1 and/or associated circuit components 4) Defective functional squelch control and mute switching Q208, and/or associated circuit components
3) Sound but display does not light Volume control: MAX. Squelch control: CCW	1) Defective LCD or rubber connector
4) Does not scan and squelch does not operate	1) Defective IC-201 and/or associated circuit components 2) Defective squelch circuit consisting of IC-1, D11, D22
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-201 and/or associated circuit components
6) Displays incorrectly and/or unable to key in correctly when RESET switch is pushed	1) Defective Keyboard and/or associated circuit 2) Defective CPU (IC-203) and/or associated circuit
7) Displays correctly at the time of programming, but after scanning becomes faulty	1) Defective CPU (IC-203) and/or associated circuit 2) Defective IC-204 and/or associated circuit 3) Defective IC-205 and/or associated circuit
8) MANUAL select operates but SCAN does not operate	1) All channels are skipped (lockout): At least a channel must be left not locked out 2) Squelch control is not adjusted right
9) "Zeromatic" does not operate or holds on a drifted frequency at search operation	1) Defective Q209, IC-201 in Zeromatic circuit 2) Discriminator coil is out of adjustment. TP-3 shall have 1/2 VCC (approx. 2.7V) in normal receiving mode. 3) Is 3.2 MHz adjusted correctly?
10) All bands do not operate but display OK	1) Faulty connection between Linear and Logic PCBs 2) Defective Q221 in Low-pass filter 3) Defective IC-204 and/or associated circuit 4) Defective Q204-7 and/or associated circuit 5) Defective IC-202 and/or associated circuit
11) Lo (Mid) band does not operate but Air, Hi, UHF band operate	1) Defective D1, D3, T1, T4 and/or Q11 VCO circuit 2) Defective Q204 and/or associated circuit
12) Aircraft band does not operate but Lo, Hi, UHF operate	1) Defective D2, D5, T2, T4 and/or associated circuit 2) Defective AM IF Amp including Q9, Q10, D23, D24 3) Defective Q205 in band switch circuit

Symptom	Possible Cause
13) Hi band does not operate but Lo, Air, UHF band operate	1) Defective Q5, D15, T3, T5 and/or in Q15 VCO circuit 2) Defective Q206 in band switch circuit
14) UHF band does not operate but Lo, Air, Hi band operate	1) Defective Q7, Q8, Q15 in RF Amp mixer and/or Q15 VCO circuit 2) Defective Q207 in band switch circuit
15) Does not make beep tone	1) Defective IC-207 and/or associated circuit 2) Defective Q13 and/or associated circuit
16) LOW BATT does not indicate when battery voltage down	1) Defective Q201, Q203, Q223, D220 and/or associated circuit 2) Defective Clock back-up circuit consisting of Q135, 136, D128, 136 ~ 138

**Important Note:**

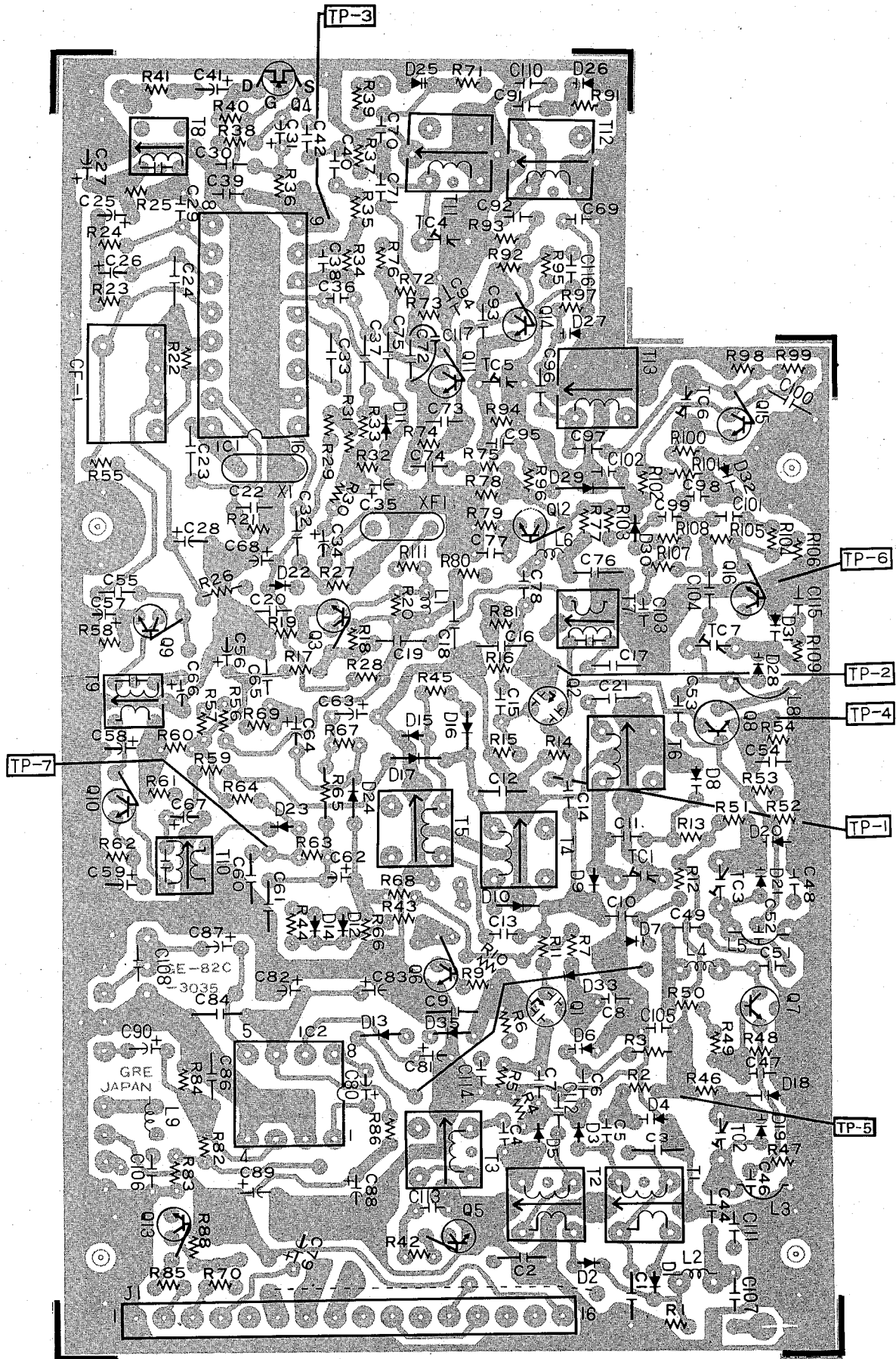
Pulse generated while checking circuitries and/or certain combinations of key operation may cause improper operation. To clear the malfunction, re-initialization of CPU is necessary: Push and hold RESET switch while turning Power ON. All channels (16 ch) will be cleared and frequency indicator displays 000.0000.

# LINEAR P.C.BOARD (TOP VIEW)

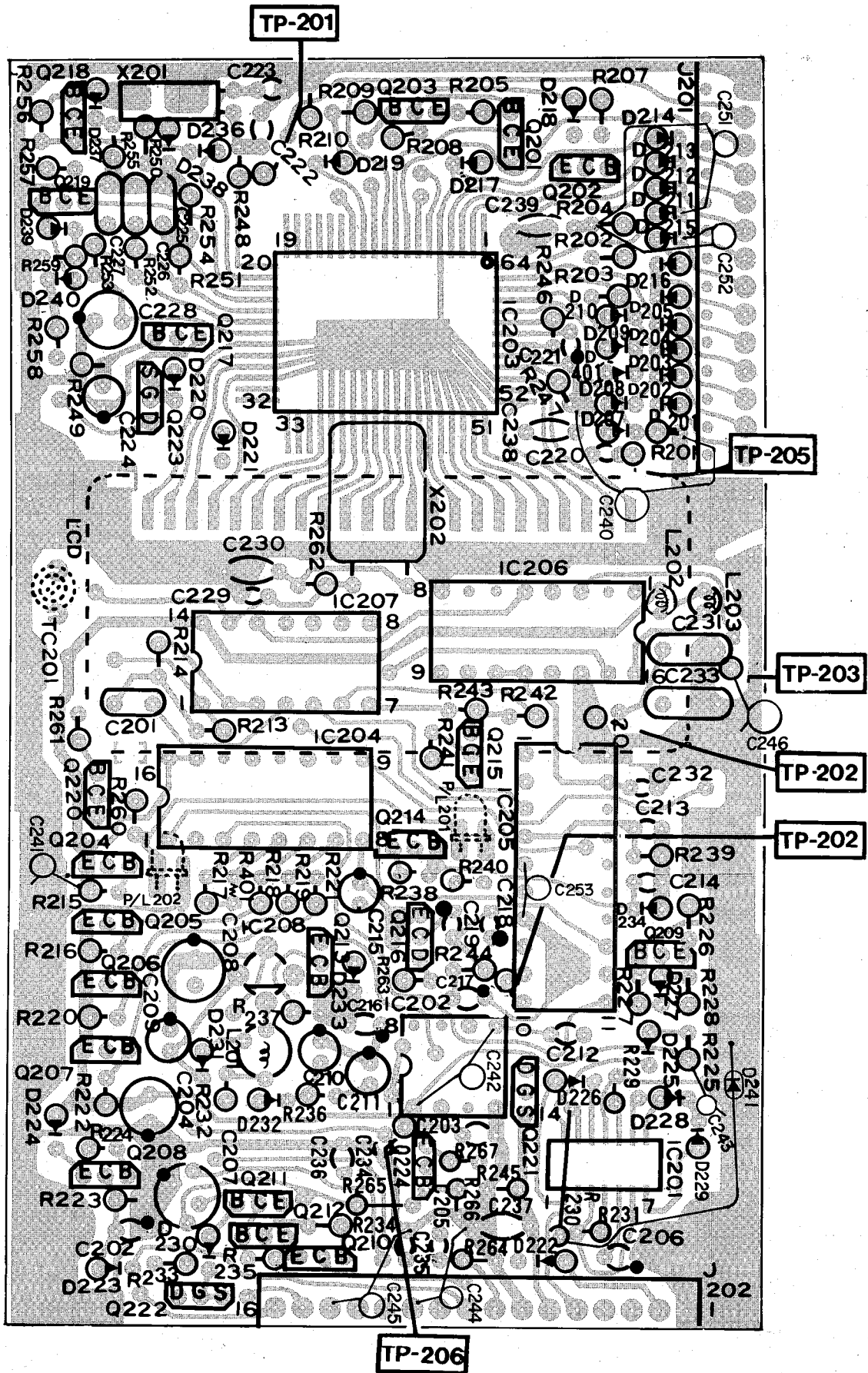




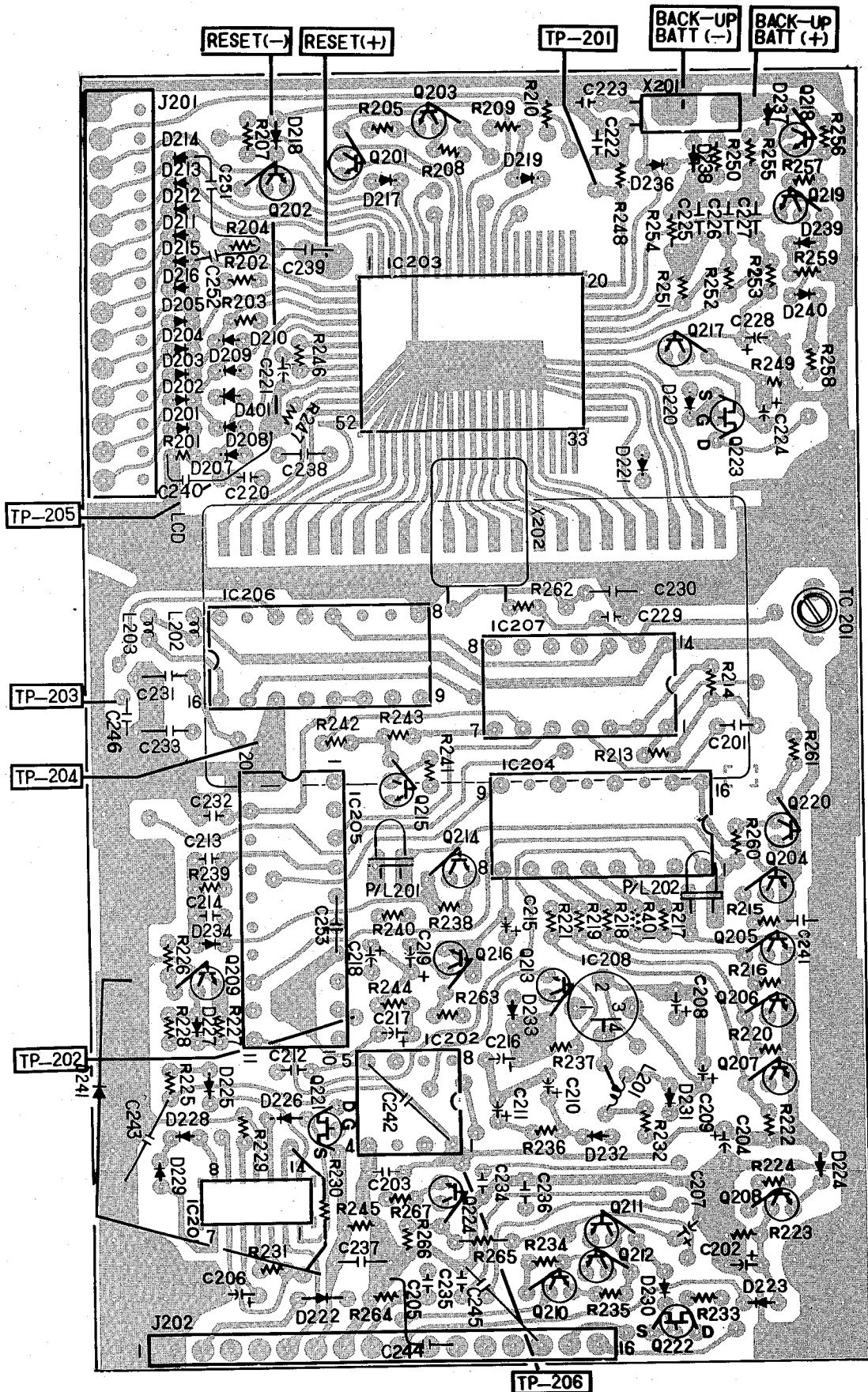
# LINEAR P.C.BOARD (BOTTOM VIEW)



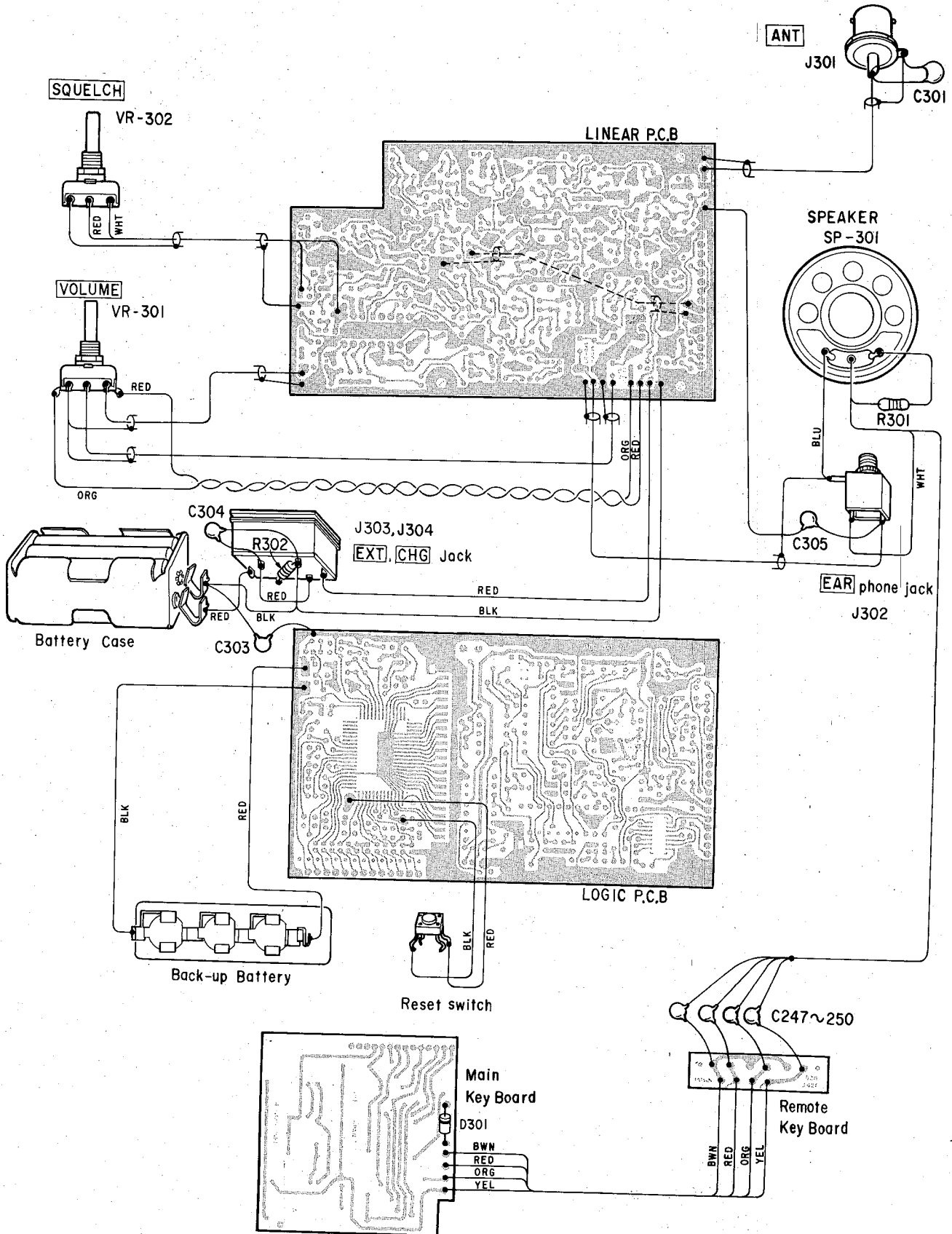
# LOGIC P.C.BOARD (TOP VIEW)



# LOGIC P.C.BOARD (BOTTOM VIEW)



# WIRING DIAGRAM



# ELECTRICAL PARTS LIST

CAPACITORS						
Ref. No.	Description				RS Part Number	MFR's Part Number
C1	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C2	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C3	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C4	Ceramic	22pF	50WV	$\pm$ 10%	CC-220KJCP	HE40SJCH220K
C5	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C6	Ceramic	330pF	50WV	$\pm$ 10%	CC-331KJCP	HE40SJYB331K
C7	Ceramic	100pF	50WV	$\pm$ 10%	CC-101KJCP	HE50SJSL101K
C8	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C9	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C10	Ceramic	330pF	50WV	$\pm$ 10%	CC-331KJCP	HE40SJYB331K
C11	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C12	Mylar	0.047 $\mu$ F	50WV	$\pm$ 10%	CC-473KJMP	AMZ473K50
C13	Ceramic	22pF	50WV	$\pm$ 10%	CC-220KJCP	HE40SJCH220K
C14	Ceramic	10pF	50WV	$\pm$ 1pF	CC-100FJCP	HE40SJCH100F
C15	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C16	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C17	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C18	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C19	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C20	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C21	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C22	Ceramic	120pF	50WV	$\pm$ 10%	CC-121KJCP	HE50SJSL121K
C23	Ceramic	180pF	50WV	$\pm$ 10%	CC-181KJCP	HE60SJSL181K
C24	Mylar	0.047 $\mu$ F	50WV	$\pm$ 10%	CC-473KJMP	AMZ473K50
C25	Tantalum	0.1 $\mu$ F	35WV	$\pm$ 20%	CC-104MGTP	ECSF1VE104
C26	Tantalum	0.1 $\mu$ F	35WV	$\pm$ 20%	CC-104MGTP	ECSF1VE104
C27	Tantalum	22 $\mu$ F	6.3WV	$\pm$ 20%	CC-226MBTP	ECSFOJE226
C28	Electrolytic	220 $\mu$ F	10WV	$\pm$ 20%	CC-227MCAP	ECEA1ASS221
C29	Ceramic	5pF	50WV	$\pm$ 0.5pF	CC-050DJCP	HE40SJCH050D
C30	Mylar	0.033 $\mu$ F	50WV	$\pm$ 10%	CC-333KJMP	AMZ333K50
C31	Tantalum	1 $\mu$ F	35WV	$\pm$ 20%	CC-105MGTP	ECSF1VE105
C32	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C33	Mylar	0.1 $\mu$ F	50WV	$\pm$ 10%	CC-104KJMP	AMZ104K50
C34	Tantalum	0.68 $\mu$ F	35WV	$\pm$ 20%	CC-684MGTP	ECSF1VE684
C35	Tantalum	0.1 $\mu$ F	35WV	$\pm$ 20%	CC-104MGTP	ECSF1VE104
C36	Ceramic	33pF	50WV	$\pm$ 10%	CC-330KJCP	HE50SJCH330K
C37	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C38	Ceramic	3pF	50WV	$\pm$ 0.5pF	CC-030DJCP	HE40SJCJ030D
C39	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C40	Ceramic	470pF	50WV	$\pm$ 10%	CC-471KJCP	HE40SJYB471K
C41	Tantalum	1 $\mu$ F	35WV	$\pm$ 20%	CC-105MGTP	ECSF1VE105
C42	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C43	Not used					
C44	Ceramic	5pF	50WV	$\pm$ 0.5pF	CC-050DJCP	HE40SJCH050D
C45	Not Used					
C46	Ceramic	22pF	50WV	$\pm$ 10%	CC-220KJCP	HE40SJCH220K
C47	Ceramic	33pF	50WV	$\pm$ 10%	CC-330KJCP	HE50SJCH330K
C48	Ceramic	33pF	50WV	$\pm$ 10%	CC-330KJCP	HE50SJCH330K
C49	Ceramic	33pF	50WV	$\pm$ 10%	CC-330KJCP	HE50SJCH330K
C50	Not used					
C51	Ceramic	8pF	50WV	$\pm$ 0.5pF	CC-080DJCP	HE40SJCH080D
C52	Ceramic	10pF	50WV	$\pm$ 1pF	CC-100FJCP	HE40SJCH100F
C53	Ceramic	2pF	50WV	$\pm$ 0.5pF	CC-020DJCP	HE40SJCJ020D
C54	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K
C55	Ceramic	330pF	50WV	$\pm$ 10%	CC-331KJCP	HE40SJYB331K
C56	Tantalum	4.7 $\mu$ F	10WV	$\pm$ 20%	CC-475MCTP	ECSF1AE475



Ref. No.	Description					RS Part Number	MFR's Part Number
C57	Tantalum	0.1 $\mu$ F	35WV	$\pm$ 20%	CC-104MGTP	ECSF1VE104	
C58	Tantalum	10 $\mu$ F	6.3WV	$\pm$ 20%	CC-106MBTP	ECSF0JE106	
C59	Tantalum	10 $\mu$ F	6.3WV	$\pm$ 20%	CC-106MBTP	ECSF0JE106	
C60	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z	
C61	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z	
C62	Tantalum	1 $\mu$ F	35WV	$\pm$ 20%	CC-105MGTP	ECSF1VE105	
C63	Tantalum	1 $\mu$ F	35WV	$\pm$ 20%	CC-105MGTP	ECSF1VE105	
C64	Tantalum	1 $\mu$ F	35WV	$\pm$ 20%	CC-105MGTP	ECSF1VE105	
C65	Mylar	0.033 $\mu$ F	50WV	$\pm$ 10%	CC-333KJMP	AMZ333K50	
C66	Tantalum	0.1 $\mu$ F	35WV	$\pm$ 20%	CC-104MGTP	ECSF1VE104	
C67	Tantalum	10 $\mu$ F	6.3WV	$\pm$ 20%	CC-106MBTP	ECSF0JE106	
C68	Tantalum	0.1 $\mu$ F	35WV	$\pm$ 20%	CC-104MGTP	ECSF1VE104	
C69	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C70	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C71	Ceramic	470pF	50WV	$\pm$ 10%	CC-471KJCP	HE40SJYB471K	
C72	Ceramic	47pF	50WV	$\pm$ 10%	CC-470KJCP	HE60SJRH470K	
C73	Ceramic	15pF	50WV	$\pm$ 10%	CC-150KJCP	HE40SJCH150K	
C74	Ceramic	10pF	50WV	$\pm$ 1pF	CC-100FJCP	HE40SJCH100F	
C75	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z	
C76	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z	
C77	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C78	Ceramic	0.0047 $\mu$ F	50WV	+80 -20%	CC-472ZJCP	HE50SJYF472Z	
C79	Tantalum	10 $\mu$ F	10WV	$\pm$ 20%	CC-106MCTP	ECSF1AE106	
C80	Tantalum	2.2 $\mu$ F	10WV	$\pm$ 20%	CC-225MCTP	ECSF1AE225	
C81	Tantalum	10 $\mu$ F	10WV	$\pm$ 20%	CC-106MCTP	ECSF1AE106	
C82	Electrolytic	100 $\mu$ F	10WV	$\pm$ 20%	CC-107MCAP	ECEA1ASS101	
C83	Electrolytic	100 $\mu$ F	10WV	$\pm$ 20%	CC-107MCAP	ECEA1ASS101	
C84	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z	
C85	Not used						
C86	Mylar	0.047 $\mu$ F	50WV	$\pm$ 10%	CC-473KJMP	AMZ473K50	
C87	Electrolytic	47 $\mu$ F	10WV	$\pm$ 20%	CC-476MCAP	ECEA1AK470	
C88	Electrolytic	220 $\mu$ F	10WV	$\pm$ 20%	CC-227MCAP	ECEA1ASS221	
C89	Electrolytic	220 $\mu$ F	10WV	$\pm$ 20%	CC-227MCAP	ECEA1ASS221	
C90	Tantalum	1 $\mu$ F	35WV	$\pm$ 20%	CC-105MGTP	ECSF1VE105	
C91	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C92	Ceramic	470pF	50WV	$\pm$ 10%	CC-471KJCP	HE40SJYB471K	
C93	Ceramic	15pF	50WV	$\pm$ 10%	CC-150KJCP	HE40SJCH150K	
C94	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z	
C95	Ceramic	5pF	50WV	$\pm$ 0.5pF	CC-050DJCP	HE40SJCH050D	
C96	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C97	Ceramic	470pF	50WV	$\pm$ 10%	CC-471KJCP	HE40SJYB471K	
C98	Ceramic	100pF	50WV	$\pm$ 10%	CC-101KJCP	HE50SJSL101K	
C99	Ceramic	5pF	50WV	$\pm$ 0.5pF	CC-050DJCP	HE40SJCH050D	
C100	Ceramic	0.01 $\mu$ F	50WV	+80 -20%	CC-472ZJCP	HE70SJYF103Z	
C101	Ceramic	10pF	50WV	$\pm$ 1pF	CC-100FJCP	HE40SJCH100F	
C102	Ceramic	0.0047 $\mu$ F	50WV	+80 -20%	CC-472ZJCP	HE50SJYF472Z	
C103	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C104	Ceramic	5pF	50WV	$\pm$ 0.5pF	CC-050DJCP	HE40SJCH050D	
C105	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C106	Ceramic	100pF	50WV	$\pm$ 10%	CC-101KJCP	HE50SJSL101K	
C107	Ceramic	47pF	50WV	$\pm$ 10%	CC-470KJCP	HE60SJCH470K	
C108	Mylar	0.1 $\mu$ F	50WV	$\pm$ 10%	CC-104KJMP	AMZ104K50	
C109	Not used						
C110	Ceramic	5pF	50WV	$\pm$ 0.5pF	CC-050DJCP	HE40SJCH050D	
C111	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C112	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C113	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C114	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C115	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	
C116	Ceramic	0.001 $\mu$ F	50WV	$\pm$ 10%	CC-102KJCP	HE50SJYB102K	

Ref. No.	Description				RS Part Number	MFR's Part Number
C117	Ceramic	15pF	50WV	±10%	CC-150KJCP	HE40SJCH150K
C200	Not used					
C201	Mylar	0.0033μF	50WV	±10%	CC-332KJMP	AMZ332K50
C202	Tantalum	3.3μF	10WV	±20%	CC-335MCTP	ECSF1AE335
C203	Ceramic	0.0047μF	50WV	+80 -20%	CC-103ZJCP	HE50SJYF472Z
C204	Electrolytic	47μF	10WV	±20%	CC-476MCAP	ECEA1AK470
C205	Ceramic	0.0047μF	50WV	+80 -20%	CC-472ZJCP	HE50SJYF472Z
C206	Tantalum	0.1μF	35WV	±20%	CC-104MGTP	ECSF1VE104
C207	Electrolytic	100μF	6.3WV	±20%	CC-107MBAP	ECEA0JK101
C208	Electrolytic	47μF	10WV	±20%	CC-476MCAP	ECEA1AK470
C209	Electrolytic	1μF	50WV	±20%	CC-105MJAP	ECEA1HK010
C210	Electrolytic	0.1μF	50WV	±20%	CC-104MJAP	ECEA1HK0R1
C211	Electrolytic	1μF	50WV	±20%	CC-105MJAP	ECEA1HK010
C212	Ceramic	0.0047μF	50WV	+80 -20%	CC-472ZJCP	HE50SJYF472Z
C213	Ceramic	22pF	50WV	±10%	CC-220KJCP	HE40SJCH220K
C214	Ceramic	0.0047μF	50WV	+80 -20%	CC-472ZJCP	HE50SJYF472Z
C215	Electrolytic	4.7μF	25WV	±20%	CC-475MEAP	ECEA1EK4R7
C216	Tantalum	0.1μF	35WV	±20%	CC-104MGTP	ECSF1VE104
C217	Tantalum	1μF	35WV	±20%	CC-105MGTP	ECSF1VE105
C218	Tantalum	0.1μF	35WV	±20%	CC-104MGTP	ECSF1VE104
C219	Tantalum	0.33μF	35WV	±20%	CC-334MGTP	ECSF1VE334
C220	Ceramic	10pF	50WV	±1pF	CC-100FJCP	HE40SJCH100F
C221	Tantalum	3.3μF	10WV	±20%	CC-335MCTP	ECSF1AE335
C222	Ceramic	33pF	50WV	±10%	CC-330KJCP	HE50SJCH330K
C223	Ceramic	22pF	50WV	±10%	CC-220KJCP	HE40SJCH220K
C224	Electrolytic	22μF	10WV	±20%	CC-226MCAP	ECEA1AK220
C225	Mylar	0.01μF	50WV	±10%	CC-103KJMP	AMZ103K50
C226	Mylar	0.01μF	50WV	±10%	CC-103KJMP	AMZ103K50
C227	Mylar	0.01μF	50WV	±10%	CC-103KJMP	AMZ103K50
C228	Electrolytic	100μF	6.3WV	±20%	CC-107MBAP	ECEA0JK101
C229	Ceramic	27pF	50WV	±10%	CC-270KJCP	HE40SJUJ270K
C230	Ceramic	47pF	50WV	±10%	CC-470KJCP	HE60SJRH470K
C231	Mylar	0.047μF	50WV	±10%	CC-473KJMP	AMZ473K50
C232	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C233	Mylar	0.047μF	50WV	±10%	CC-473KJMP	AMZ473K50
C234	Ceramic	0.001μF	50WV	±10%	CC-102KJCP	HE50SJYB102K
C235	Ceramic	0.001μF	50WV	±10%	CC-102KJCP	HE50SJYB102K
C236	Ceramic	0.001μF	50WV	±10%	CC-102KJCP	HE50SJYB102K
C237	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C238	Ceramic	36pF	50WV	±5%	CC-360KJCP	HE50SJCH360J
C239	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C240	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C241	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C242	Ceramic	47pF	50WV	±10%	CC-470KJCP	HE40SJSJL470K
C243	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C244	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C245	Ceramic	0.01μF	50WV	±10%	CC-103ZJCP	HE70SJYF103Z
C246	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C247	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C248	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C249	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C250	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C251	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C252	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C253	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z
C301	Ceramic	3pF	50WV	±0.5pF	CC-030DJCP	HE40SJCJ030D
C302	Electrolitic	220μF	10WV	±20%	CC-227MCAP	ECEA1ASS221
C303	Ceramic	100pF	50WV	±10%	CC-101KJCP	HE50SJSJL101K
C304	Ceramic	0.001μF	50WV	±10%	CC-102KJCP	HE50SJYB102K
C305	Ceramic	0.01μF	50WV	+80 -20%	CC-103ZJCP	HE70SJYF103Z

**DIODES**

Ref. No.	Description	RS Part Number	MFR's Part Number
D1	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D2	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D3	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D4	Varactor FC54M (Silicon)	DX-0548	FC54M
D5	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D6	Varactor 1SV89B-01-S2 (Silicon)	DX-1402	1SV89B-01-S2
D7	Varactor 1SV89B-01-S2 (Silicon)	DX-1402	1SV89B-01-S2
D8	Varactor FC52M (Silicon)	DX-1134	FC52M
D9	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D10	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D11	1S1588 (Silicon)	DX-0273	1S1588
D12	1S1588 (Silicon)	DX-0273	1S1588
D13	1S1588 (Silicon)	DX-0273	1S1588
D14	1N60 or 1K60 (Germanium)	DX-0161	1N60 or 1K60
D15	1SS85-S2 (Silicon)	DX-0233	1SS85-S2
D16	1S1555 (Silicon)		1S1555
D17	1S1555 (Silicon)		1S1555
D18	Varactor BB221 (Silicon)	DX-2008	BB221
D19	Varactor 1S2090-S2 (Silicon)	DX-1031	1S2090-S2
D20	Varactor BB221 (Silicon)	DX-2008	BB221
D21	Varactor 1S2090-S2 (Silicon)	DX-1031	1S2090-S2
D22	1S1588 (Silicon)	DX-0273	1S1588
D23	1N60 or 1K60 (Germanium)	DX-0161	1N60 or 1K60
D24	1N60 or 1K60 (Germanium)	DX-0161	1N60 or 1K60
D25	Varactor FC52M (Silicon)	DX-1134	FC52M
D26	Varactor 1SV89B-01-S2 (Silicon)	DX-1402	1SV89B-01-S2
D27	Varactor 1SV89B-01-S2 (Silicon)	DX-1402	1SV89B-01-S2
D28	Varactor 1S2090-S2 (Silicon)	DX-1031	1S2090-S2
D29	1S1555 (Silicon)		1S1555
D30	1S1555 (Silicon)		1S1555
D31	Varactor 1S2090-S2 (Silicon)	DX-1031	1S2090-S2
D32	Varactor 1S2090-S2 (Silicon)	DX-1031	1S2090-S2
D33	1S1588 (Silicon)	DX-0273	1S1588
D34	Not Used		
D35	1S1588 (Silicon)	DX-0273	1S1588
D201	1S1588 (Silicon)	DX-0273	1S1588
D202	1S1588 (Silicon)	DX-0273	1S1588
D203	1S1588 (Silicon)	DX-0273	1S1588
D204	1S1588 (Silicon)	DX-0273	1S1588
D205	1S1588 (Silicon)	DX-0273	1S1588
D206	Not Used		
D207	1S1588 (Silicon)	DX-0273	1S1588
D208	1S1588 (Silicon)	DX-0273	1S1588
D209	1S1588 (Silicon)	DX-0273	1S1588
D210	1S1588 (Silicon)	DX-0273	1S1588
D211	1S1588 (Silicon)	DX-0273	1S1588
D212	1S1588 (Silicon)	DX-0273	1S1588
D213	1S1588 (Silicon)	DX-0273	1S1588
D214	1S1588 (Silicon)	DX-0273	1S1588
D215	1S1588 (Silicon)	DX-0273	1S1588
D216	1S1588 (Silicon)	DX-0273	1S1588
D217	1S1588 (Silicon)	DX-0273	1S1588
D218	1S1588 (Silicon)	DX-0273	1S1588
D219	1S1588 (Silicon)	DX-0273	1S1588
D220	HZ-6A1L Zener (Silicon)	DX-1414	HZ-6A1L
D221	1S1588 (Silicon)	DX-0273	1S1588



Ref. No.	Description	RS Part Number	MFR's Part Number
D222	1S1588 (Silicon)	DX-0273	1S1588
D223	1S1588 (Silicon)	DX-0273	1S1588
D224	1S1588 (Silicon)	DX-0273	1S1588
D225	1S1588 (Silicon)	DX-0273	1S1588
D226	1S1588 (Silicon)	DX-0273	1S1588
D227	1S1588 (Silicon)	DX-0273	1S1588
D228	1S1588 (Silicon)	DX-0273	1S1588
D229	1S1588 (Silicon)	DX-0273	1S1588
D230	HZ-6A1L Zener (Silicon)	DX-1414	HZ-6A1L
D231	1S1585 (Silicon)	DX-2026	1S1585
D232	1S1585 (Silicon)	DX-2026	1S1585
D233	HZ-11A3L Zener (Silicon)	DX-1316	HZ-11A3L
D234	HZ-11A3L Zener (Silicon)	DX-1316	HZ-11A3L
D235	Not Used		Not Used
D236	1S1588 (Silicon)	DX-0273	1S1588
D237	1S1588 (Silicon)	DX-0273	1S1588
D238	1S1588 (Silicon)	DX-0273	1S1588
D239	1S1588 (Silicon)	DX-0273	1S1588
D240	HZ-4BLL Zener (Silicon)	DX-1192	HZ-4BLL
D241	1S1588 (Silicon)	DX-0273	1S1588
D301	1S1588 (Silicon)	DX-0273	1S1588

#### INTEGRATED CIRCUIT

Ref. No.	Description	RS Part Number	MFR's Part Number
IC-1	MC3357P or MPS5071	MX-3439	MC3357P or MPS5071
IC-2	LM386N-3	MX-3650	LM386N-3
IC-201	$\mu$ PC324G (Zeromatic Cont.) BIPOLAR	MX-5543	$\mu$ PC324G
IC-202	$\mu$ PB571C (Pre Scaler) BIPOLAR	MX-5544	$\mu$ PB571C
IC-203	GRE8110 (CPU) C-MOS	MX-5545	GRE8110
IC-204	$\mu$ PD4094BC (BAND SELECT) C-MOSS	MX-5546	$\mu$ PD4094BC
IC-205	MC145156P (PLL) G-MOSS	MX-5547	MC145156P
IC-206	TC40H192P (DIVIDER) C-MOSS	MX-5548	TC40H192P
IC-207	TC40H004P (REF OSC/BEEP TONE GEN) C-MOS	MX-5549	TC40H004P
IC-208	TCA720 (DC/DC CONVERTER) BIPOLAR	MX-5550	TCA720

#### TRANSISTORS

Ref. No.	Description	RS Part Number	MFR's Part Number
Q1	F.E.T. 3SK45	3SK-45	F.E.T. 3SK45
Q2	F.E.T. 3SK60	3SK-60	F.E.T. 3SK60
Q3	2SC2668(O)(NPN)	2SC-2668	2SC2668(O)
Q4	F.E.T. 2SK30A(R)	2SK-30	F.E.T. 2SK30A(R)
Q5	2SC2668(O)(NPN)	2SC-2668	2SC2668(O)
Q6	2SC2458(BL)(NPN)	2SC2458	2SC2458(BL)
Q7	2SC1117(NPN)	2SC-1117	2SC1117
Q8	2SC1117(NPN)	2SC-1117	2SC1117
Q9	2SC2668(O)(NPN)	2SC-2668	2SC2668(O)
Q10	2SC2458(Y)(NPN)	2SC-2458	2SC2458(Y)
Q11	2SC2668(O)(NPN)	2SC-2668	2SC2668(O)
Q12	2SC2347(NPN)	2SC-2347	2SC2347
Q13	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q14	2SC2668(O)(NPN)	2SC-2668	2SC2668(O)
Q15	2SC2347(NPN)	2SC-2347	2SC2347
Q16	2SC2471(NPN)	2SC-2471	2SC2471

Ref. No.	Description	RS Part Number	MFR's Part Number
Q201	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q202	2SA1048(GR)(PNP)	2SA-1048	2SA1048(GR)
Q203	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q204	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q205	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q206	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q207	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q208	2SA1048(GR)(PNP)	2SA-1048	2SA1048(GR)
Q209	2SC2458(GR)(NPN)	2SA-2458	2SC2458(GR)
Q210	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q211	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q212	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q213	2SC2458(GR)(NPN)	2SC2458	2SC2458(GR)
Q214	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q215	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q216	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q217	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q218	2SA1150(Y)(PNP)	2SC-2458	2SA1150(Y)
Q219	2SC2458(GR)(NPN)	2SC-2458	2SC2458(GR)
Q220	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)
Q221	F.E.T. 2SK118(R)	2SK-118	F.E.T. 2SK118(O),(R)
Q222	F.E.T. 2SK118(R)	2SK-118	F.E.T. 2SK118(R)
Q223	F.E.T. 2SK118(R)	2SK-118	F.E.T. 2SK118(R)
Q224	2SA1150(Y)(PNP)	2SA-1150	2SA1150(Y)

RESISTORS						
Ref. No.	Description				RS Part Number	MFR's Part Number
R1	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R2	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R3	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R4	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R5	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R6	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J
R7	Carbon film	22k $\Omega$	1/6W	$\pm 5\%$	N-0311ECC	RD-1/6AR223J
R8	Not used					
R9	Carbon film	22 $\Omega$	1/6W	$\pm 5\%$	N-0078ECC	RD-1/6AR220J
R10	Carbon film	2.2k $\Omega$	1/6W	$\pm 5\%$	N-0216ECC	RD-1/6AR222J
R11	Carbon film	10 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR100J
R12	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R13	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R14	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J
R15	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R16	Carbon film	470 $\Omega$	1/6W	$\pm 5\%$	N-0169ECC	RD-1/6AR471J
R17	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J
R18	Carbon film	220k $\Omega$	1/6W	$\pm 5\%$	N-0396ECC	RD-1/6AR224J
R19	Carbon film	220 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR221J
R20	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J
R21	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0321ECC	RD-1/6AR333J
R22	Carbon film	3.3k $\Omega$	1/6W	$\pm 5\%$	N-0230ECC	RD-1/6AR332J
R23	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0230ECC	RD-1/6AR472J
R24	Carbon film	470k $\Omega$	1/6W	$\pm 5\%$	N-0423ECC	RD-1/6AR474J
R25	Carbon film	22k $\Omega$	1/6W	$\pm 5\%$	N-0311ECC	RD-1/6AR223J
R26	Carbon film	10 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR100J

Ref. No.	Description					RS Part Number	MFR's Part Number
R27	Carbon film	2.2K $\Omega$	1/6W	$\pm 5\%$	N-0216ECC	RD-1/6AR222J	
R28	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J	
R29	Carbon film	220k $\Omega$	1/6W	$\pm 5\%$	N-0396ECC	RD-1/6AR224J	
R30	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R31	Carbon film	2.2k $\Omega$	1/6W	$\pm 5\%$	N-0216ECC	RD-1/6AR222J	
R32	Carbon film	27k $\Omega$	1/6W	$\pm 5\%$	N-0316ECC	RD-1/6AR273J	
R33	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J	
R34	Carbon film	1M $\Omega$	1/6W	$\pm 5\%$	N-0445ECC	RD-1/6AR105J	
R35	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J	
R36	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R37	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J	
R38	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J	
R39	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R40	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J	
R41	Carbon film	2.2k $\Omega$	1/6W	$\pm 5\%$	N-0216ECC	RD-1/6AR222J	
R42	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J	
R43	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J	
R44	Carbon film	22k $\Omega$	1/6W	$\pm 5\%$	N-0311ECC	RD-1/6AR223J	
R45	Carbon film	12k $\Omega$	1/6W	$\pm 5\%$	N-0288ECC	RD-1/6AR123J	
R46	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J	
R47	Carbon film	470 $\Omega$	1/6W	$\pm 5\%$	N-0169ECC	RD-1/6AR471J	
R48	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J	
R49	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R50	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R51	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR473J	
R52	Carbon film	270k $\Omega$	1/6W	$\pm 5\%$	N-0402ECC	RD-1/6AR274J	
R53	Carbon film	1M $\Omega$	1/6W	$\pm 5\%$	N-0445ECC	RD-1/6AR105J	
R54	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J	
R55	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0274ECC	RD-1/6AR472J	
R56	Carbon film	120k $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR124J	
R57	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J	
R58	Carbon film	470 $\Omega$	1/6W	$\pm 5\%$	N-0169ECC	RD-1/6AR471J	
R59	Carbon film	10 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR100J	
R60	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R61	Carbon film	82k $\Omega$	1/6W	$\pm 5\%$	N-0360ECC	RD-1/6AR823J	
R62	Carbon film	330 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR331J	
R63	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R64	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R65	Carbon film	2.2k $\Omega$	1/6W	$\pm 5\%$	N-0216ECC	RD-1/6AR222J	
R66	Carbon film	15k $\Omega$	1/6W	$\pm 5\%$	N-0297ECC	RD-1/6AR153J	
R67	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R68	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J	
R69	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J	
R70	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J	
R71	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J	
R72	Carbon film	3.9k $\Omega$	1/6W	$\pm 5\%$	N-0237ECC	RD-1/6AR392J	
R73	Carbon film	5.6k $\Omega$	1/6W	$\pm 5\%$	N-0257ECC	RD-1/6AR562J	
R74	Carbon film	2.2k $\Omega$	1/6W	$\pm 5\%$	N-0216ECC	RD-1/6AR222J	
R75	Carbon film	220 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR221J	
R76	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R77	Carbon film	18k $\Omega$	1/6W	$\pm 5\%$	N-0303ECC	RD-1/6AR183J	
R78	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J	
R79	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R80	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R81	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J	
R82	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0324ECC	RD-1/6AR333J	
R83	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J	
R84	Carbon film	18k $\Omega$	1/6W	$\pm 5\%$	N-0303ECC	RD-1/6AR183J	
R85	Carbon film	12k $\Omega$	1/6W	$\pm 5\%$	N-0288ECC	RD-1/6AR123J	

Ref. No.	Description				RS Part Number	MFR's Part Number
R86	Carbon film	10 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR100J
R87	Not used					
R88	Carbon film	470 $\Omega$	1/6W	$\pm 5\%$	N-0169ECC	RD-1/6AR471J
R89	Not used					
R90	Not used					
R91	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R92	Carbon film	3.9k $\Omega$	1/6W	$\pm 5\%$	N-0237ECC	RD-1/6AR392J
R93	Carbon film	5.6k $\Omega$	1/6W	$\pm 5\%$	N-0257ECC	RD-1/6AR562J
R94	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J
R95	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J
R96	Carbon film	220 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR221J
R97	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R98	Carbon film	5.6k $\Omega$	1/6W	$\pm 5\%$	N-0257ECC	RD-1/6AR562J
R99	Carbon film	3.9k $\Omega$	1/6W	$\pm 5\%$	N-0237ECC	RD-1/6AR392J
R100	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J
R101	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R102	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J
R103	Carbon film	220 $\Omega$	1/6W	$\pm 5\%$		RD-1/6AR221J
R104	Carbon film	22 $\Omega$	1/6W	$\pm 5\%$	N-0078ECC	RD-1/6AR220J
R105	Carbon film	56k $\Omega$	1/6W	$\pm 5\%$	N-0345ECC	RD-1/6AR563J
R106	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J
R107	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J
R108	Carbon film	100 $\Omega$	1/6W	$\pm 5\%$	N-0132ECC	RD-1/6AR101J
R109	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R110	Not used					
R111	Carbon film	1k $\Omega$	1/6W	$\pm 5\%$	N-0196ECC	RD-1/6AR102J
R112	Not used					
R113	Not used					
R114	Not used					
R201	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0324ECC	RD-1/6AR333J
R202	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0324ECC	RD-1/6AR333J
R203	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0324ECC	RD-1/6AR333J
R204	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0324ECC	RD-1/6AR333J
R205	Carbon film	33k $\Omega$	1/6W	$\pm 5\%$	N-0324ECC	RD-1/6AR333J
R206	Not used					
R207	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J
R208	Carbon film	22k $\Omega$	1/6W	$\pm 5\%$	N-0311ECC	RD-1/6AR223J
R209	Carbon film	68k $\Omega$	1/6W	$\pm 5\%$	N-0354ECC	RD-1/6AR683J
R210	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R211	Not used					
R212	Not used					
R213	Carbon film	1M $\Omega$	1/6W	$\pm 5\%$	N-0445ECC	RD-1/6AR105J
R214	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R215	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R216	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R217	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R218	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R219	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R220	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R221	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R222	Carbon film	4.7k $\Omega$	1/6W	$\pm 5\%$	N-0247ECC	RD-1/6AR472J
R223	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J
R224	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J
R225	Carbon film	22k $\Omega$	1/6W	$\pm 5\%$	N-0311ECC	RD-1/6AR223J
R226	Carbon film	47k $\Omega$	1/6W	$\pm 5\%$	N-0340ECC	RD-1/6AR473J
R227	Carbon film	100k $\Omega$	1/6W	$\pm 5\%$	N-0371ECC	RD-1/6AR104J
R228	Carbon film	10k $\Omega$	1/6W	$\pm 5\%$	N-0281ECC	RD-1/6AR103J
R229	Carbon film	3.3k $\Omega$	1/6W	$\pm 5\%$	N-0230ECC	RD-1/6AR332J

Ref. No.	Description				RS Part Number	MFR's Part Number
R230	Carbon film	3.3kΩ	1/6W	±5%	N-0230ECC	RD-1/6AR332J
R231	Carbon film	3.3kΩ	1/6W	±5%	N-0230ECC	RD-1/6AR332J
R232	Carbon film	22Ω	1/6W	±5%	N-0078ECC	RD-1/6AR220J
R233	Carbon film	22kΩ	1/6W	±5%	N-0311ECC	RD-1/6AR223J
R234	Carbon film	2.2kΩ	1/6W	±5%	N-0216ECC	RD-1/6AR222J
R235	Carbon film	47kΩ	1/6W	±5%	N-0340ECC	RD-1/6AR473J
R236	Carbon film	1.2kΩ	1/6W	±5%	N-0199ECC	RD-1/6AR122J
R237	Carbon film	22kΩ	1/6W	±5%	N-0311ECC	RD-1/6AR223J
R238	Carbon film	4.7kΩ	1/6W	±5%	N-0247ECC	RD-1/6AR472J
R239	Carbon film	10kΩ	1/6W	±5%	N-0281ECC	RD-1/6AR103J
R240	Carbon film	560Ω	1/6W	±5%	N-0176ECC	RD-1/6AR561J
R241	Carbon film	560Ω	1/6W	±5%	N-0176ECC	RD-1/6AR561J
R242	Carbon film	4.7kΩ	1/6W	±5%	N-0247ECC	RD-1/6AR472J
R243	Carbon film	4.7kΩ	1/6W	±5%	N-0247ECC	RD-1/6AR472J
R244	Carbon film	1kΩ	1/6W	±5%	N-0196ECC	RD-1/6AR102J
R245	Carbon film	10kΩ	1/6W	±5%	N-0281ECC	RD-1/6AR103J
R246	Carbon film	56kΩ	1/8W	±1%	N-0345ECC	ERO-10CKF5602
R247	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R248	Carbon film	330kΩ	1/6W	±5%	N-0410ECC	RD-1/6AR334J
R249	Carbon film	12kΩ	1/6W	±5%	N-0288ECC	RD-1/6AR123J
R250	Carbon film	47kΩ	1/6W	±5%	N-0340ECC	RD-1/6AR473J
R251	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R252	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R253	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R254	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R255	Carbon film	1.2kΩ	1/6W	±5%	N-0199ECC	RD-1/6AR122J
R256	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R257	Carbon film	6.8kΩ	1/6W	±5%	N-0262ECC	RD-1/6AR682J
R258	Carbon film	5.6kΩ	1/6W	±5%	N-0257ECC	RD-1/6AR562J
R259	Carbon film	3.3kΩ	1/6W	±5%	N-0230ECC	RD-1/6AR332J
R260	Carbon film	47Ω	1/6W	±5%	N-0340ECC	RD-1/6AR470J
R261	Carbon film	6.8kΩ	1/6W	±5%	N-0262ECC	RD-1/6AR682J
R262	Carbon film	1MΩ	1/6W	±5%	N-0445ECC	RD-1/6AR105J
R263	Carbon film	10kΩ	1/6W	±5%	N-0281ECC	RD-1/6AR103J
R264	Carbon film	100Ω	1/6W	±5%	N-0132ECC	RD-1/6AR101J
R265	Carbon film	100kΩ	1/6W	±5%	N-0371ECC	RD-1/6AR104J
R266	Carbon film	470kΩ	1/6W	±5%	N-0423ECC	RD-1/6AR474J
R267	Carbon film	18kΩ	1/6W	±5%	N-0230ECC	RD-1/6AR182J
R301	Metal film	8.2Ω	1/2W	±5%	N-0058EFE	ERX-12ANJ8R2
R302	Solid film	27Ω	1/2W	±5%	N-0082EFC	ERC-12GJ270

SWITCH			
Ref. No.	Description	RS Part Number	MFR's Part Number
②① SW-302	Key, Scan/Manual/Speed		KEG10901
②④	Switch Reset	S-2985	KHH10906

COILS & TRANSFORMERS			
Ref. No.	Description	RS Part Number	MFR's Part Number
T1	Coil, RF (LOW)	CA-8680	GR-N692
T2	Coil, RF (AIRCRAFT)	CA-8681	GR-N690
T3	Coil, RF/VCO (HI/LOW)	CA-8682	GR-N544
T4	Coil, RF/VCO (AIRCRAFT)	CA-8683	GR-N688
T5	Coil, RF/VCO (HI/LOW)	CA-8682	GR-N544
T6	Coil, RF (LOW)	CA-8684	GR-N693
T7	Coil, IFT (455kHz)	CA-8685	GR-D680
T8	Coil, IFT (455kHz)	CA-8686	GR-D622
T9	Coil, IFT (455kHz)	CA-8687	GR-D681
T10	Coil, IFT (455kHz)	CA-8688	GR-D682
T11	Coil, RF/VCO (HI/LOW)	CA-8682	GR-N544
T12	Coil, RF/VCO (AIRCRAFT)	CA-8683	GR-N688
T13	Coil, VCO (HI/UHF)	CA-8689	GR-M691
L1	Coil, Choke (8.2 $\mu$ H)	CA-8690	FL3H8R2K
L2	Coil, Choke	CA-8693	4LNC-195
L3	Coil, Choke	CA-8692	8LNR-093
L4	Coil, Choke	CA-8693	4LNC-195
L5	Coil, Choke	CA-8692	8LNR-093
L6	Coil, Choke (8.2 $\mu$ H)	CA-8690	FL3H8R2K
L7	Not Used		
L8	Coil, Choke	CA-8692	8LNR-093
L9	Coil, Choke (10 $\mu$ H)	CA-8691	LF1-100K
L10	Not used		
L201	Coil, DC/DC Convertor	CA-8694	6PNO-196
L202	Coil, Choke (8.2 $\mu$ H)	CA-8690	FL3H8R2K
L203	Coil, Choke (8.2 $\mu$ H)	CA-8690	FL3H8R2K

CAPACITOR, TRIMMER			
Ref. No.	Description	RS Part Number	MFR's Part Number
TC-1	Trimmer 10pF	C-1344	CTZ31C
TC-2	Trimmer 10pF	C-1344	CTZ31C
TC-3	Trimmer 10pF	C-1344	CTZ31C
TC-4	Trimmer 10pF	C-1344	CTZ31C
TC-5	Trimmer 10pF	C-1344	CTZ31C
TC-6	Trimmer 30pF	C-1345	ECR-GA010D30
TC-7	Trimmer 10pF	C-1344	CTZ31C
TC-201	Trimmer 35pF	C-1346	ECRPN035L27A

VARIABLE RESISTOR			
Ref. No.	Description	RS Part Number	MFR's Part Number
27 VR301	Volume with Switch 10k $\Omega$ (A)	P-7467	V12M4-1S(SJ) 15FH15A10K
29 VR302	Squelch 50k $\Omega$ (C)	P-7468	V12M4-1N 15FHC50K

CRYSTAL & FILTER			
Ref. No.	Description	RS Part Number	MFR's Part Number
X-1	Crystal HC-18U Type	10.245MHz	MX-2162
XF-1	Filter Crystal	(10.7MHz)	C-0846
X201	Crystal HT-38 Type	32.768kHz	MX-1039
X202	Crystal HC-18U Type	3.200MHz	MX-1040
CF-1	Filter Ceramic	(455kHz)	C-1044
			10.245MHz
			10M15A
			32.768kHz
			3.200MHz
			LF-H18S

MISCELLANEOUS			
Ref. No.	Description	RS Part Number	MFR'S Part Number
⑧ J201	Connector, Housing	J-5073	5124-14BHPB
⑨ J202	Connector, Pin	J-5074	3022-16A
② J301	Jack, Antenna	J-5077	GE-82D-3616
① J302	Jack, Earphone	J-1084	SJ-289-1-5
⑫ J303	Jack, Ext. Power Charge	J-0624	EC-002-1-1
⑫ J304	Jack, Ext. Power Charge	J-0624	EC-002-1-1
⑩ J305	Connector, Pin	J-5076	3022-14B
TP-1	Pin, Test	J-5015	ERD-25TCO
TP-2	Pin, Test	J-5015	ERD-25TCO
TP-3	Pin, Test	J-5015	ERD-25TCO
TP-4	Pin, Test	J-5015	ERD-25TCO
TP-5	Pin, Test	J-5015	ERD-25TCO
TP-6	Pin, Test	J-5015	ERD-25TCO
TP-7	Pin, Test	J-5015	ERD-25TCO
TP-201	Pin, Test	} J-5015	} ERD-25JCO
TP-202	Pin, Test		
TP-203	Pin, Test		
TP-204	Pin, Test		
TP-205	Pin, Test		
TP-206	Pin, Test		

## MECHANICAL PARTS LIST

MISCELLANEOUS			
Ref. No.	Description	RS Part Number	MFR's Part Number
①	Antenna Rubber (Lo, Hi, U, Air)	A-0468	GE-82D-3272
② J301	Jack, Antenna	J-5077	GE-82D-3616
③	Cover, Back-up Battery	DB-0544	GE-82D-3383
④	Case, Battery	B-0733	GE-82D-3490
⑤	Cover, Battery	J-4960	GE-82C-3382
	Terminal, Battery		GE-80D-1215
⑥	Clip Ass'y, Belt (Non repairable)		GA-80D-1531
	Base, Belt Clip		GE-80D-1533
	Cover, Belt Clip	GE-80D-1532	
	Spring, Belt Clip	GE-80D-1534	

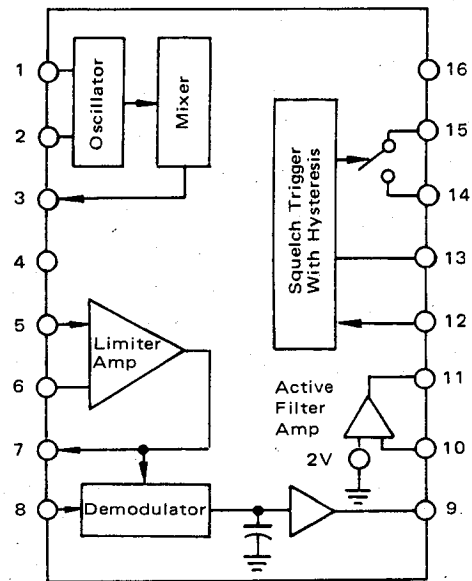
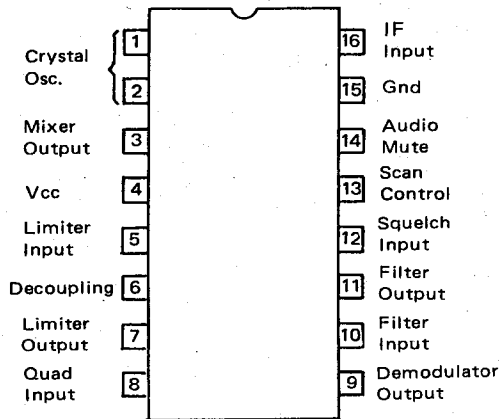
Ref. No.	Description	RS Part Number	MFR's Part Number
⑦ J1	Connector, Housing	J-5072	3024-16CH
⑧ J201	Connector, Housing	J-5073	5124-14BHPB
⑨ J202	Connector, Pin	J-5074	3022-16A
⑩ J305	Connector, Pin 14 Pin (male)	J-5076	3022-14B
⑪ J302	Jack, Earphone	J-1084	SJ-289-1-5
⑫ J303,304	Jack, Ext, Power, Charge	J-0624	EC-002-1-1
⑬	Frame Ass'y (Non repairable)	Z-7298	GA-82D-3398
	Terminal (A), Back-up (L)		GE-82D-3393
	Terminal (B), Back-up (S)		GE-82D-3394
	Frame		GE-82B-3380
	Escutcheon, Top		GE-82C-3379
⑭	Case Ass'y Front (Non repairable)	Z-7297	GA-82D-3397
	Case, Front		GE-82D-3377
	Window, LCD		GE-82D-3378
	Keyboard Ass'y	K-5538	GA-82D-3409
⑮ KB-301	Keyboard (Main)		GE-82D-3501
⑳	Keypop, Rubber Key Board		GE-82D-3389
㉑	Knob, Key-Lock Switch	K-5541	GE-82D-3385
㉒ P/L201,202	Lamp 6V 30mA L 25mm		BP2,6V-30mA
㉓	Holder, LCD	HC-3212	GE-82D-3386
	P.C. Board Ass'y, Linear	X-9673	GA-82D-3407
	P.C. Board Ass'y, Logic	X-9675	GA-82D-3408
⑲ LCD-201	LCD	L-1578	PU5AU03A01(S-U04)
⑳ SW-302	Key, Sen, Manual, Speed		
㉑	Case Ass'y, Rear (Non repairable)	Z-7299	GA-82D-3432
	Label, Model (U.S.A)		GE-82D-3278
	Case, Rear		GE-82C-3381
㉒ KB-302	Keyboard, Remote		GE-82D-3426
㉓	Knob, Remote Key		GE-82D-3384
㉔ SW-303	Switch, Reset		
㉕ VR-302	Control, Squelch	P-7468	V12M4-1(6φx5)N -N15FHC50KΩ
㉖	Chassis, Top		GE-82D-3392
㉗ VR-301/ SW-301	Control, Volume w/Power Switch 10KΩA		V12M4-1 (6φx5)S
㉘	Knob, Volume, Squelch	K-5540	GE-21D-6020
㉙	Case, Shield Logic		GE-82D-3391
㉚	Screw, Self Tapping ⊕2 x 3 (B)		
㉛	Contact, Key Lock Switch	J-5078	GE-82D-3395
㉜ SP-301	Speaker 0.3W 16Ω	SP-5105	P50-2516
㉝	Nut, Stud Logic P.C.B.	HC-3216	GE-82D-3508
㉞	Nut, Stud Linear P.C.B.	HC-3217	GE-82D-3509
㉟	Terminal, Battery		GE-80D-1215
㊱	Screw, Pan Head ⊕2.6 x 5 (B)		
㊲	Screw, Truss Head ⊕3 x 4		
㊳	Filter, LCD		GE-83D-3758
㊴	Spacer, LCD		GE-83D-3759
㊵	Reflector, LCD		GE-83D-3760
㊶	Screw, 2 x 36 Pan head		
㊷	Screw, 2 x 28 Pan head		
㊸	Shield, Key Board		GE-82D-3390
㊹	Shield, CPU		GE-83D-4046



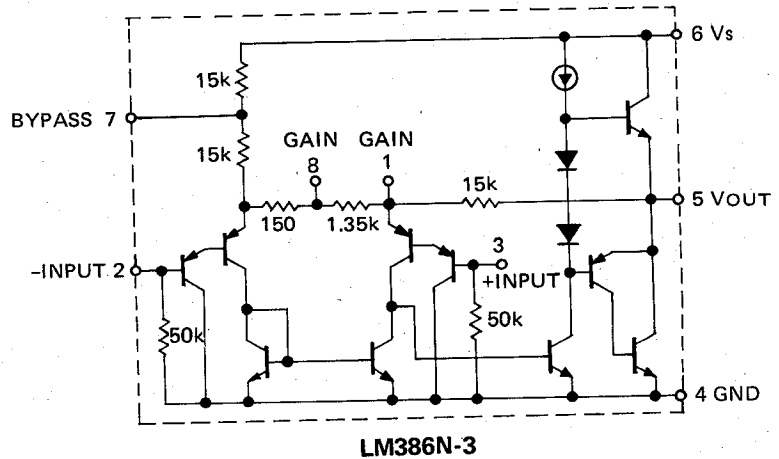
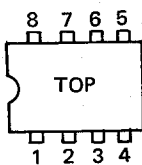
# SEMICONDUCTOR LEAD IDENTIFICATION AND IC CIRCUIT DIAGRAM

## INTEGRATED CIRCUIT LEAD IDENTIFICATION

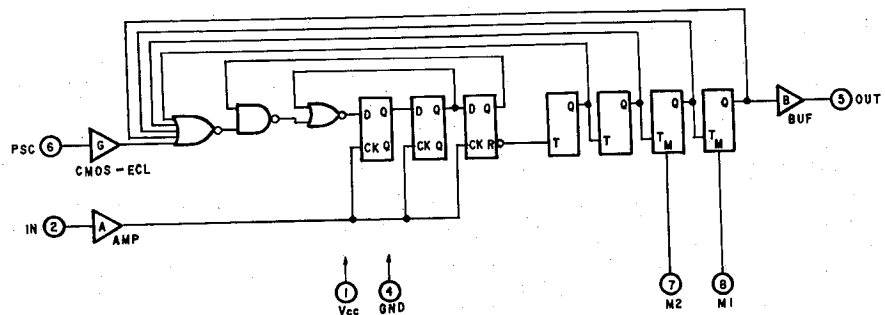
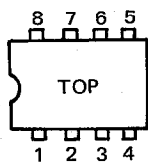
IC-1 MC3357 or MPS5071



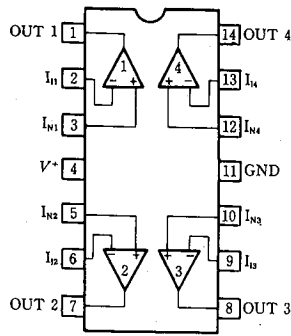
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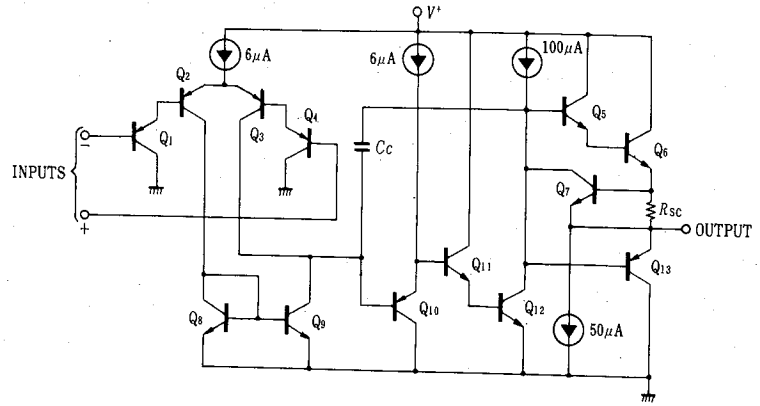
IC-202  $\mu$ PB571C



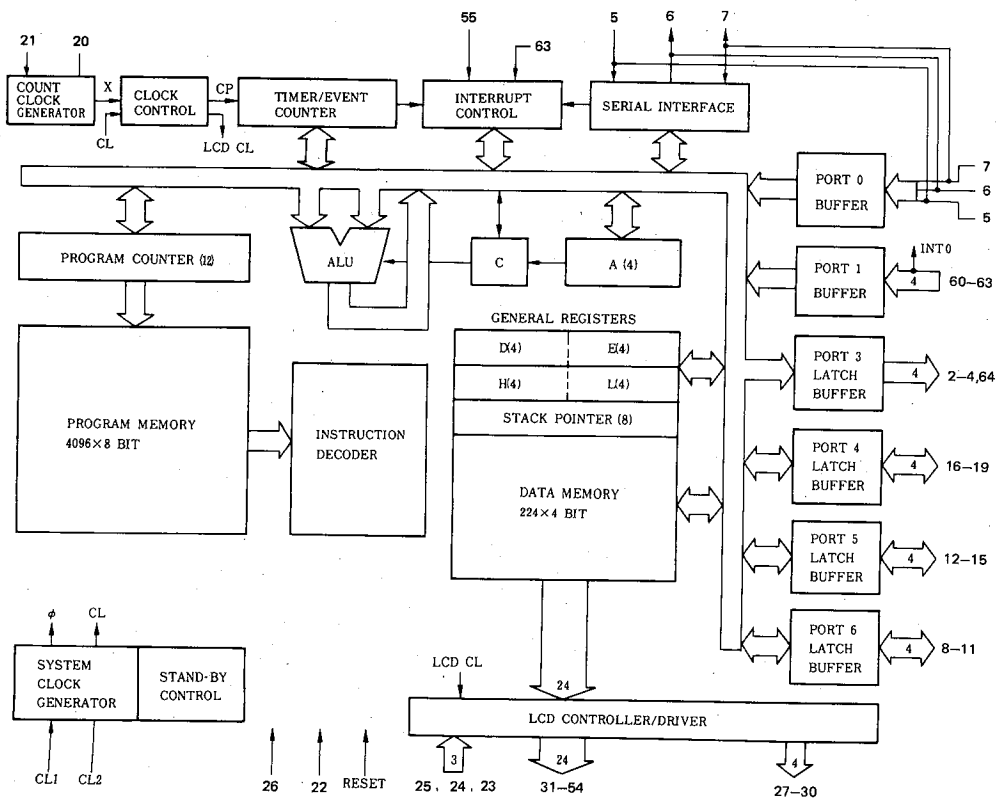
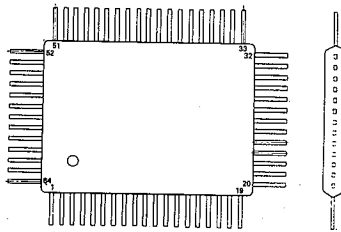
IC-201  $\mu$ PC324G



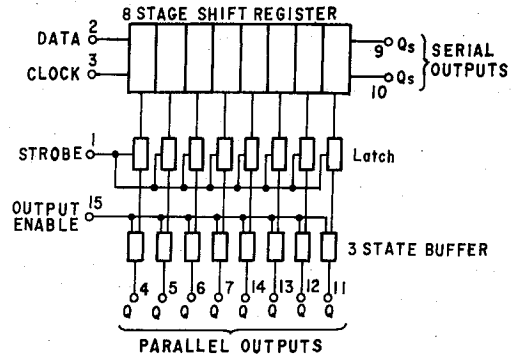
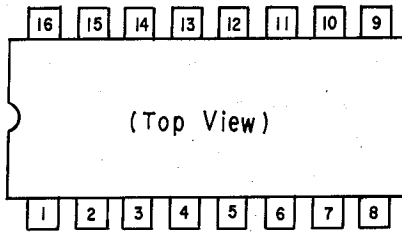
$\mu$ PC324G(1/4)



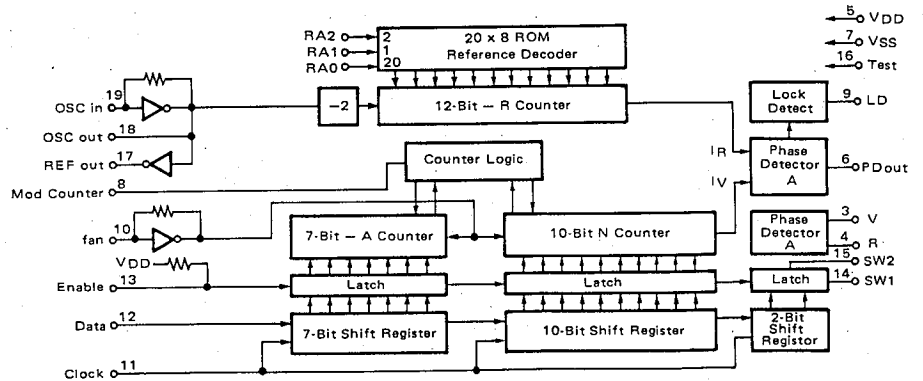
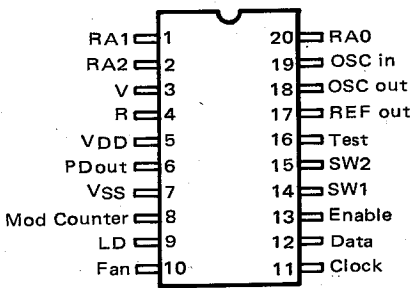
IC-203 GRE-8110



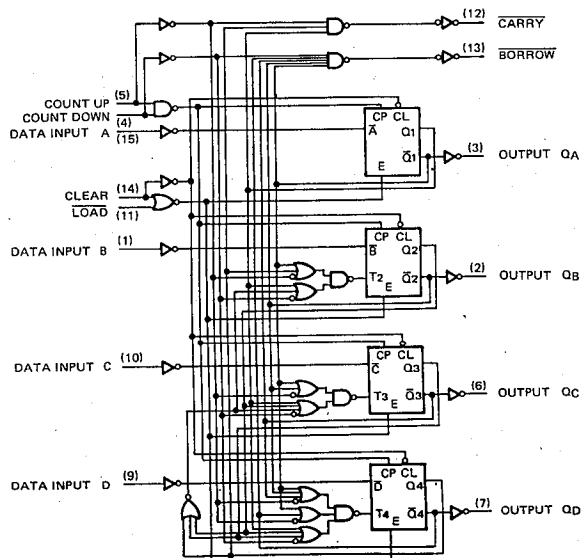
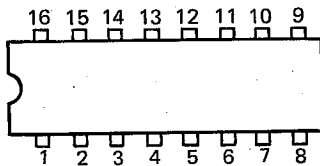
IC-204  $\mu$ PD4094BC



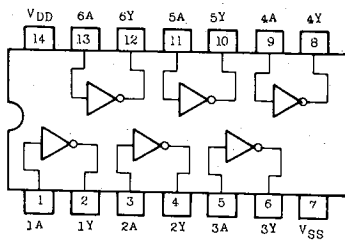
IC-205 MC145156P



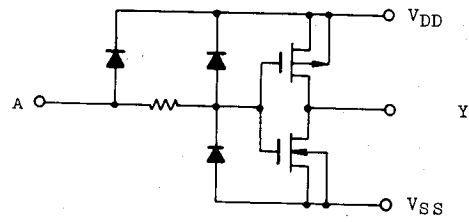
IC-206 TC40H192P



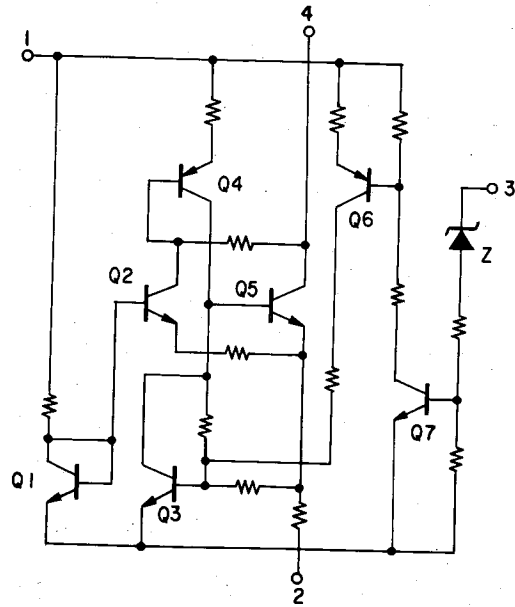
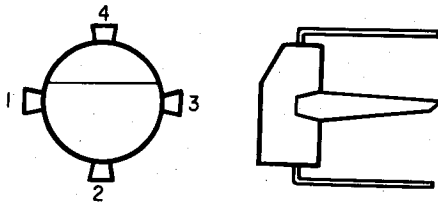
IC-207 TC40H004P



$Y = \bar{A}$

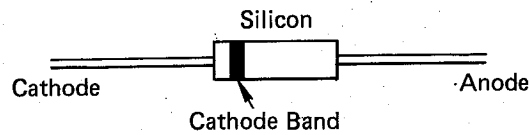


IC-208 TCA720

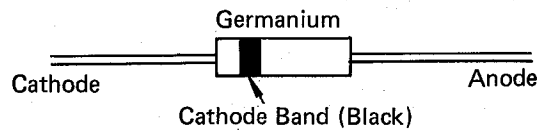


# DIODE IDENTIFICATION AND LEAD POLARITY

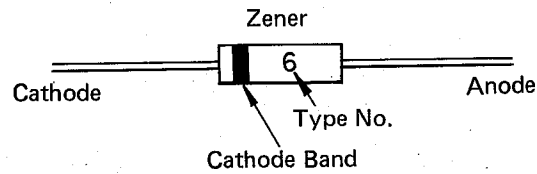
A) 1S1555



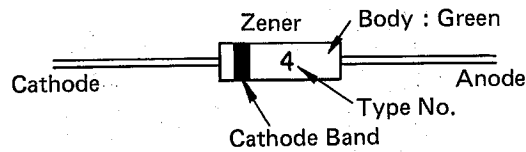
B) 1N60, 1K60



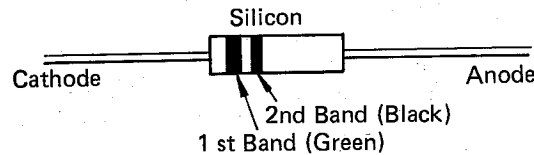
C) HZ6A1L, HZ-11A3L



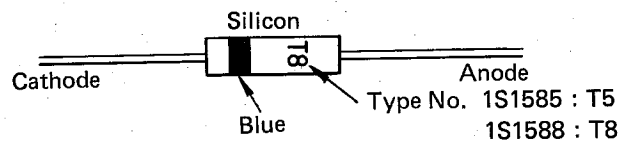
D) HZ4BLL



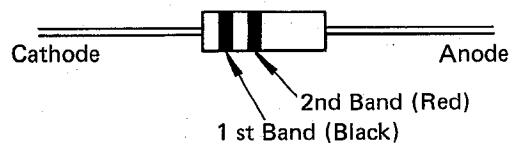
E) 1SS85



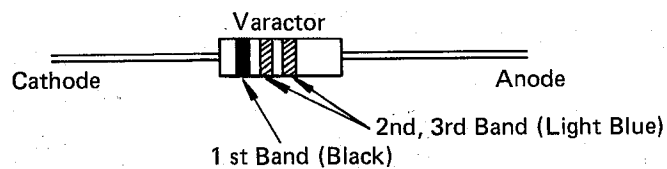
F) 1S1585, 1S1588



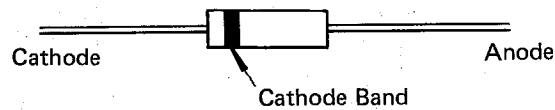
G) 1S2090



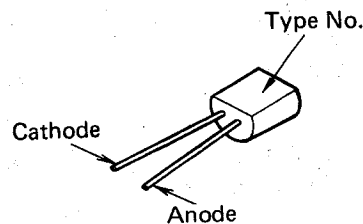
H) 1SV89



I) BB221

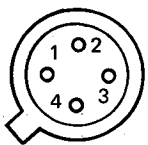
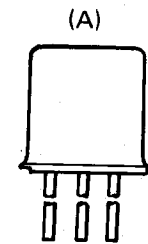


J) FC-52, FC-54

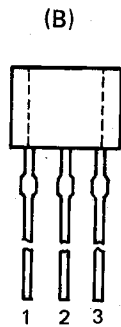


# TRANSISTOR LEAD IDENTIFICATION

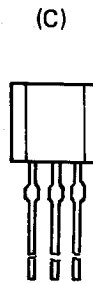
- A) 3SK45, 3SK60
- B) 2SC2668(O), 2SC2458(BL), (Y), (GR), 2SA1150(Y)  
2SC1048(GR)
- C) 2SK30A(R)
- D) 2SC1117(H)
- E) 2SC2347
- F) 2SC2471
- G) 2SK118(R), (O)



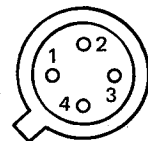
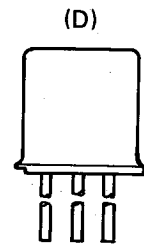
- 1. DRAIN
- 2. GATE 2
- 3. GATE 1
- 4. SOURCE (CASE)



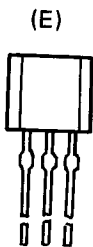
- 1. EMITTER
- 2. COLLECTOR
- 3. BASE



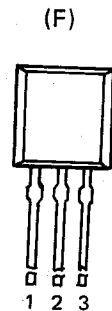
- 1. SOURCE
- 2. GATE
- 3. DRAIN



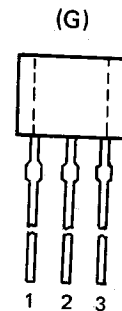
- 1. EMITTER
- 2. BASE
- 3. COLLECTOR
- 4. SHIELD (CASE)



- 1. EMITTER
- 2. COLLECTOR
- 3. BASE

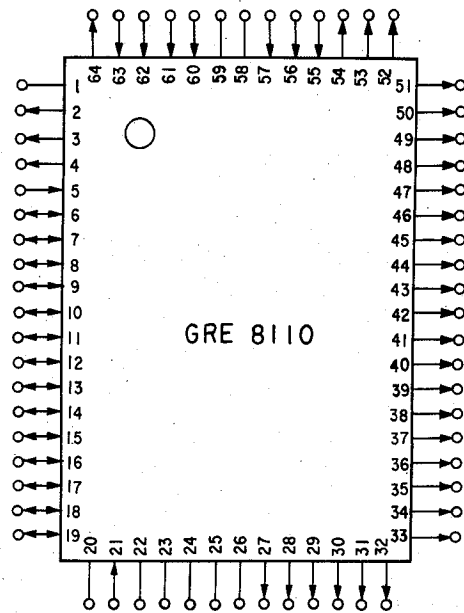


- 1. BASE
- 2. EMITTER
- 3. COLLECTOR



- 1. SOURCE
- 2. GATE
- 3. DRAIN

# MICRO-COMPUTER(IC-203) PORT FORMAT



Pin No.		Pin No.	
1	N.C	33	N.C
2	Keyboard	34	N.C
3	Keyboard	35	N.C
4	Keyboard	36	LCD
5	Keyboard, SCAN, Low batt.	37	LCD
6	PLL data, Band select data	38	LCD
7	Clock	39	LCD
8	Keyboard	40	LCD
9	Keyboard	41	LCD
10	Keyboard	42	LCD
11	PLL Data Latch	43	LCD
12	Beep tone	44	LCD
13	Zeromatic control	45	LCD
14	N.C	46	LCD
15	N.C	47	LCD
16	N.C	48	LCD
17	N.C	49	LCD
18	N.C	50	LCD
19	N.C	51	LCD
20	Count clock oscillator	52	LCD
21	Count clock oscillator	53	LCD
22	GND	54	LCD
23	LCD bias	55	GND
24	LCD bias	56	RESET
25	LCD bias	57	System clock oscillator
26	VDD	58	VDD
27	LCD	59	System clock oscillator
28	LCD	60	Keyboard
29	LCD	61	Keyboard
30	LCD	62	Keyboard
31	N.C	63	Keyboard
32	N.C	64	Keyboard

# APPENDIX

## VHF-MID Band Alignment for European/Australian models

### CIRCUIT REVISION

1. Following parts should be changed as shown below.

Ref. No.	Low band	Mid band
T1	GRN692	GRN690
T6	GRN693	GRN690
T11	GRN544	GRN690
D8	FC-52	FC-54 (Varactor)
D25	FC-52	FC-54 (Varactor)
C401	Not used	22pF ( $\pm 10\%$ ) Ceramic
D207	1S1588	Not used
D401	Not used	1S1588 (Silicon)

2. R217 changed to IC-204 pin 5 from IC-204 pin 4.

### VCO ALIGNMENT

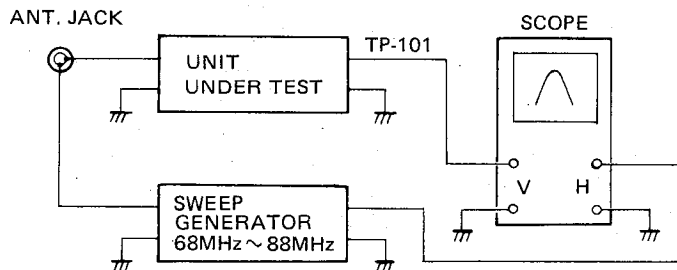
- Step 1: Connect a DC VTVM to TP-5 and ground.  
 Step 2: Program CH1, 2 and 3 as follows:  
 CH1 (68 MHz), CH2 (78 MHz), CH3 (88 MHz)  
 Step 3: Select channel 3 (88 MHz) and adjust TC-4 for 10V on the DC VTVM.  
 Step 4: Select channel 1 (68 MHz) and adjust T11 for 1.0V on the DC VTVM.  
 Step 5: Repeat steps 3 and 4 until no improvement is observed.

The DC VTVM should show as below.

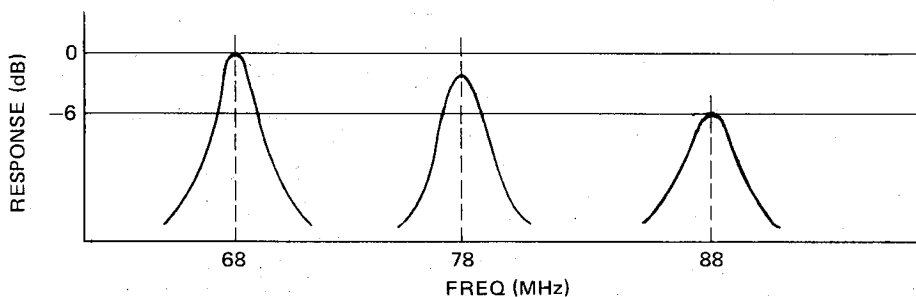
68 MHz	Voltage of TP-104	1.0V
78 MHz	Voltage of TP-104	2.8V $\pm 0.3V$
88 MHz	Voltage of TP-104	10V

### RF AMP ALIGNMENT

Step 1: Connect instruments as shown below.

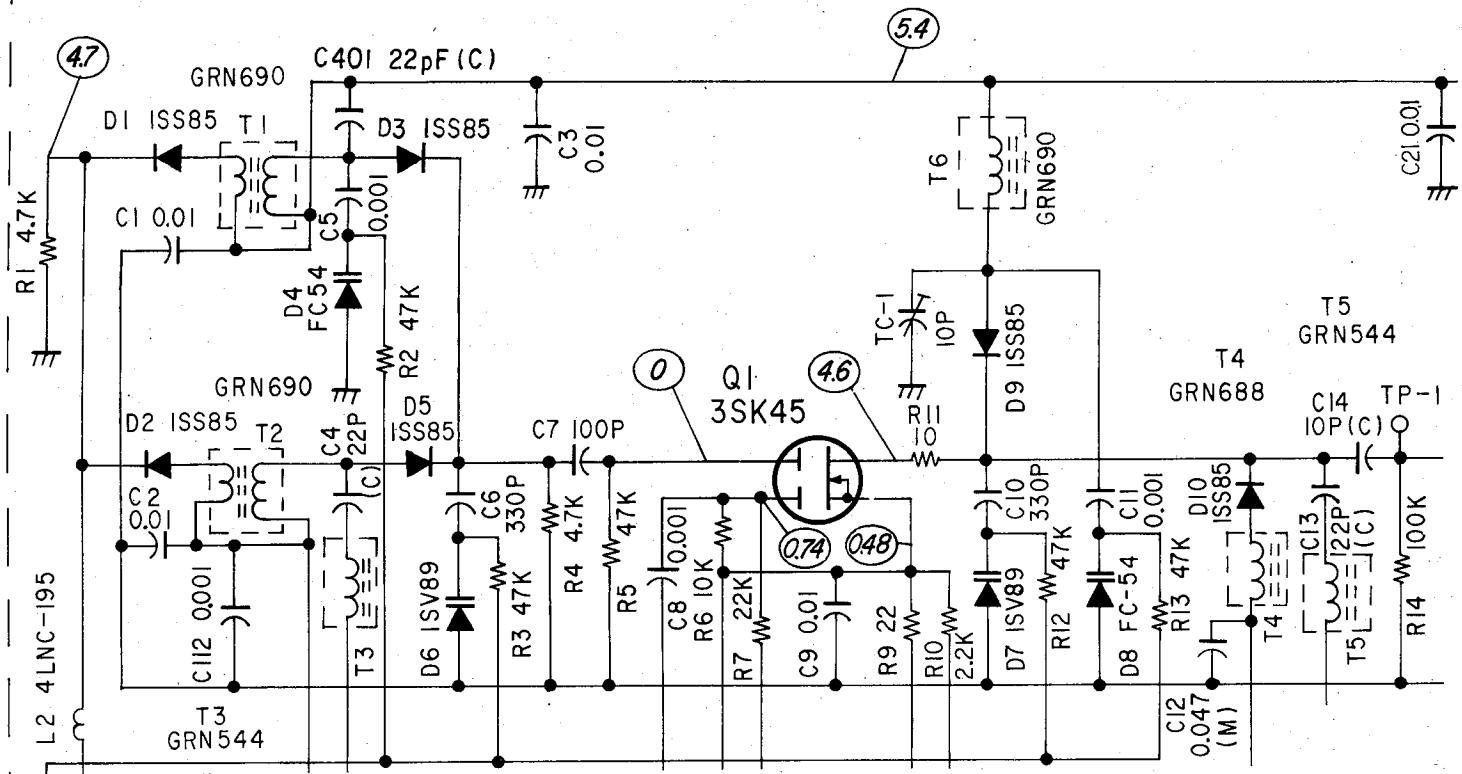


- Step 2: Program 68 MHz (CH1), 78 MHz (CH2), 88 MHz (CH3).  
 Step 3: Select Channel 1 (68 MHz) and adjust T1 and T6 for maximum RF waveform.  
 Step 4: Check the Channels 1 ~ 3 one by one for maximum RF waveform.  
 Slight deviation as shown below is acceptable

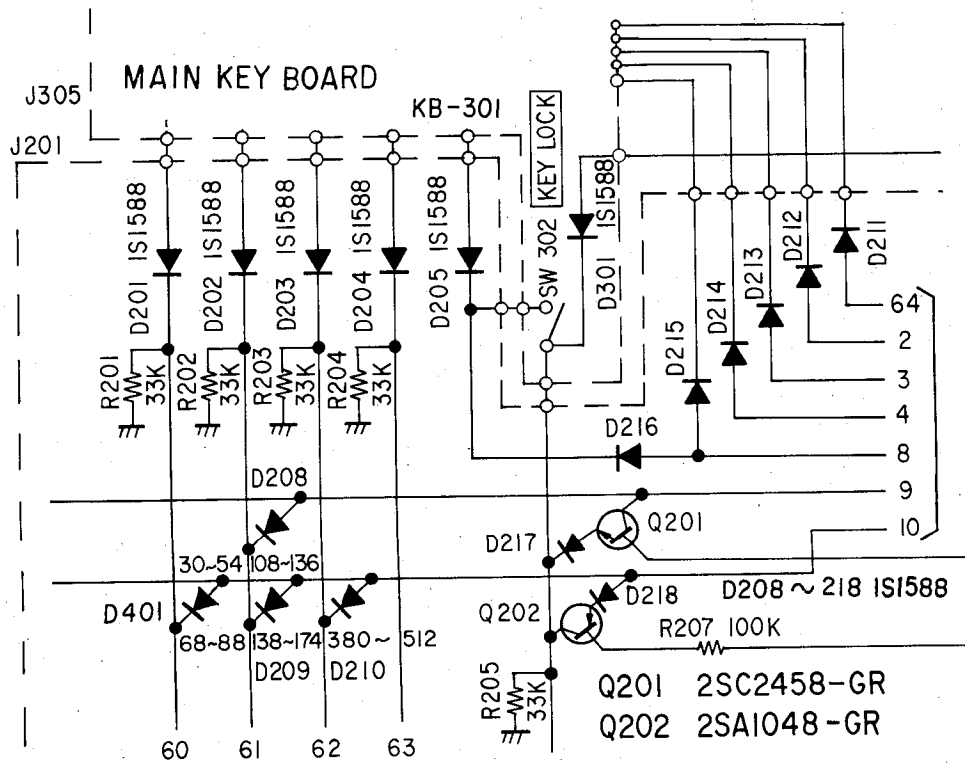




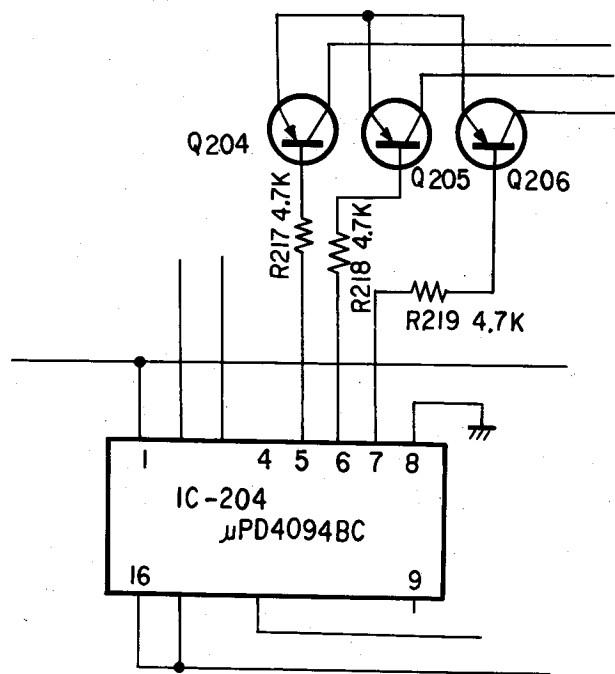
# MID BAND RF SECTION SCHEMATIC DIAGRAM



# LOGIC SECTION SCHEMATIC DIAGRAM



# LOGIC SECTION SCHEMATIC DIAGRAM (BAND SECTION)





**U.S. PATENT NOS.**

3,794,925

3,801,914

3,961,261

3,962,644

4,027,251

4,092,594

4,123,715

4,245,348

**RADIO SHACK, A DIVISION OF TANDY CORPORATION**

**U.S.A.: FORT WORTH, TEXAS 76102**

**CANADA: BARRIE, ONTARIO L4M 4W5**

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**TANDY CORPORATION**

**AUSTRALIA**

91 KURRAJONG AVENUE  
MOUNT DRUITT, N.S.W. 2770

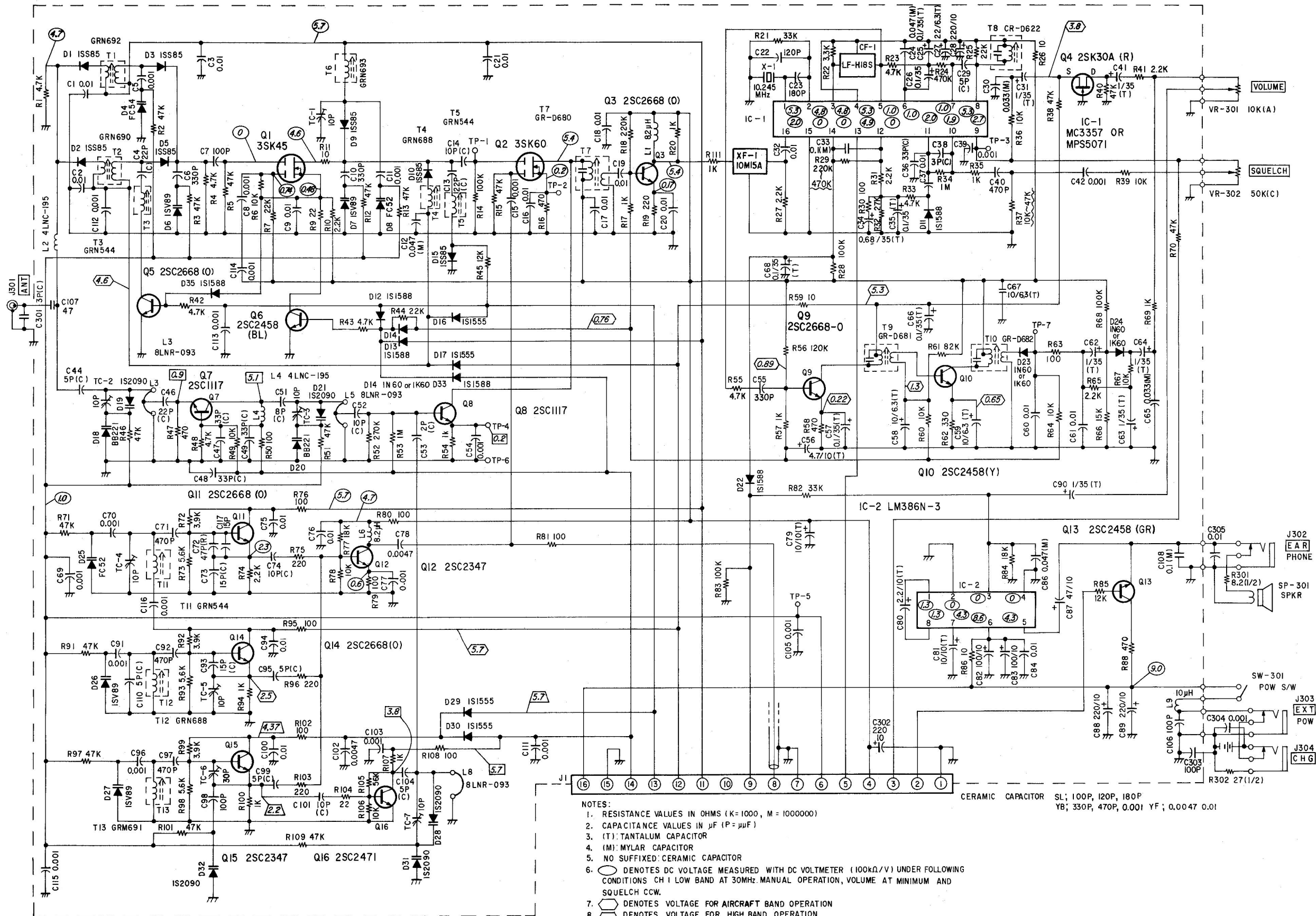
**BELGIUM**

PARC INDUSTRIEL DE NANINNE  
5140 NANINNE

**U. K.**

BILSTON ROAD WEDNESBURY  
WEST MIDLANDS WS10 7JN

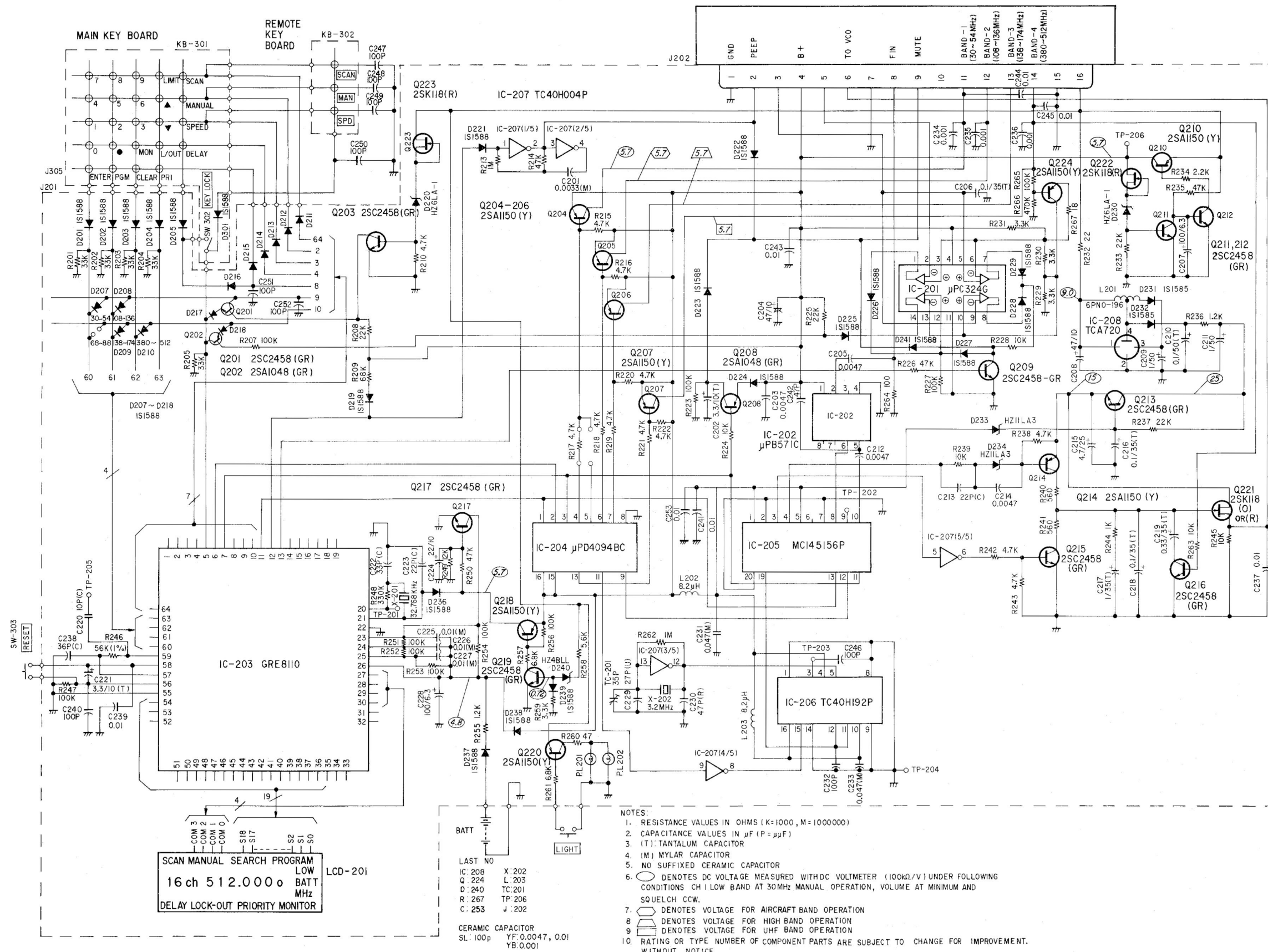
# SCHEMATIC DIAGRAM (LINEAR SECTION)



- NOTES:
1. RESISTANCE VALUES IN OHMS (K=1000, M=1000000)
  2. CAPACITANCE VALUES IN  $\mu\text{F}$  (P= $\mu\text{P}$ )
  3. (T): TANTALUM CAPACITOR
  4. (M): MYLAR CAPACITOR
  5. NO SUFFIXED: CERAMIC CAPACITOR
  6.  $\odot$  DENOTES DC VOLTAGE MEASURED WITH DC VOLTMETER (100k $\Omega$ /V) UNDER FOLLOWING CONDITIONS CH I LOW BAND AT 30MHz. MANUAL OPERATION, VOLUME AT MINIMUM AND SQUELCH CCW.
  7.  $\odot$  DENOTES VOLTAGE FOR AIRCRAFT BAND OPERATION
  8.  $\odot$  DENOTES VOLTAGE FOR HIGH BAND OPERATION
  9.  $\odot$  DENOTES VOLTAGE FOR UHF BAND OPERATION
  10. RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT. WITHOUT NOTICE

LAST NO,	T; 13	IC; 2	R; 111	XF; 1
	L; 9	D; 35	C; 117	CF; 1
	Q; 16	TC; 7	X; 1	TP; 7

# SCHEMATIC DIAGRAM (LOGIC SECTION)



## APPENDIX

### VHF-MID Band Alignment for European/Australian models

#### CIRCUIT REVISION

1. Following parts should be changed as shown below.

Ref. No.	Low band	Mid band
T1	GRN692	GRN690
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D401	Not used	1S1588 (Silicon)

2. R217 changed to IC-204 pin 5 from IC-204 pin 4.

#### VCO ALIGNMENT

Step 1: Connect a DC VTVM to TP-5 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-4 for 10V on the DC VTVM.

Step 4: Select channel 1 (68 MHz) and adjust T11 for 1.0V on the DC VTVM.

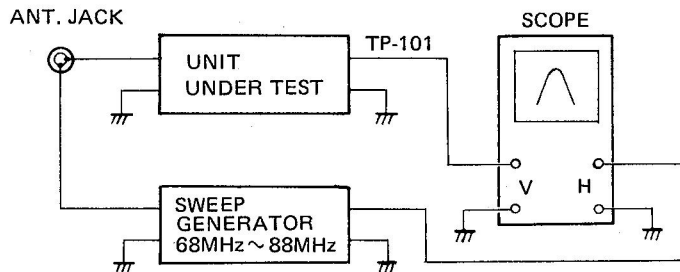
Step 5: Repeat steps 3 and 4 until no improvement is observed.

The DC VTVM should show as below.

68 MHz	Voltage of TP-104	1.0V
78 MHz	Voltage of TP-104	2.8V $\pm 0.3V$
88 MHz	Voltage of TP-104	10V

#### RF AMP ALIGNMENT

Step 1: Connect instruments as shown below.

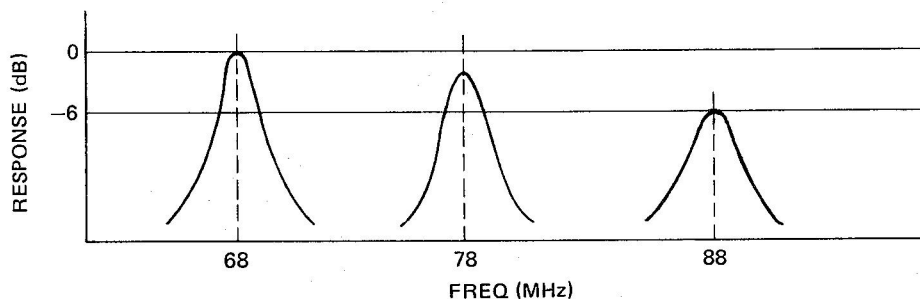


Step 2: Program 68 MHz (CH1), 78 MHz (CH2), 88 MHz (CH3).

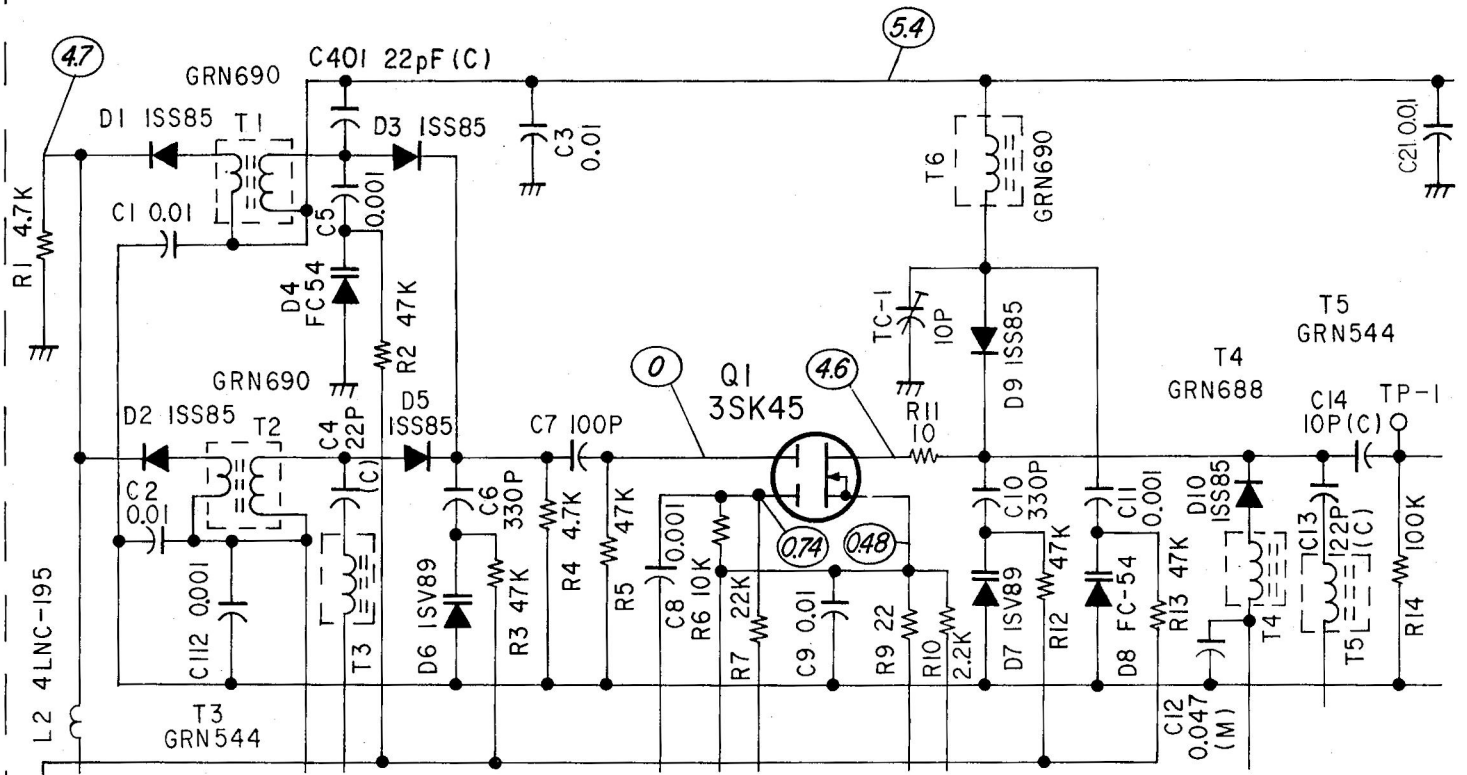
Step 3: Select Channel 1 (68 MHz) and adjust T1 and T6 for maximum RF waveform.

Step 4: Check the Channels 1 ~ 3 one by one for maximum RF waveform.

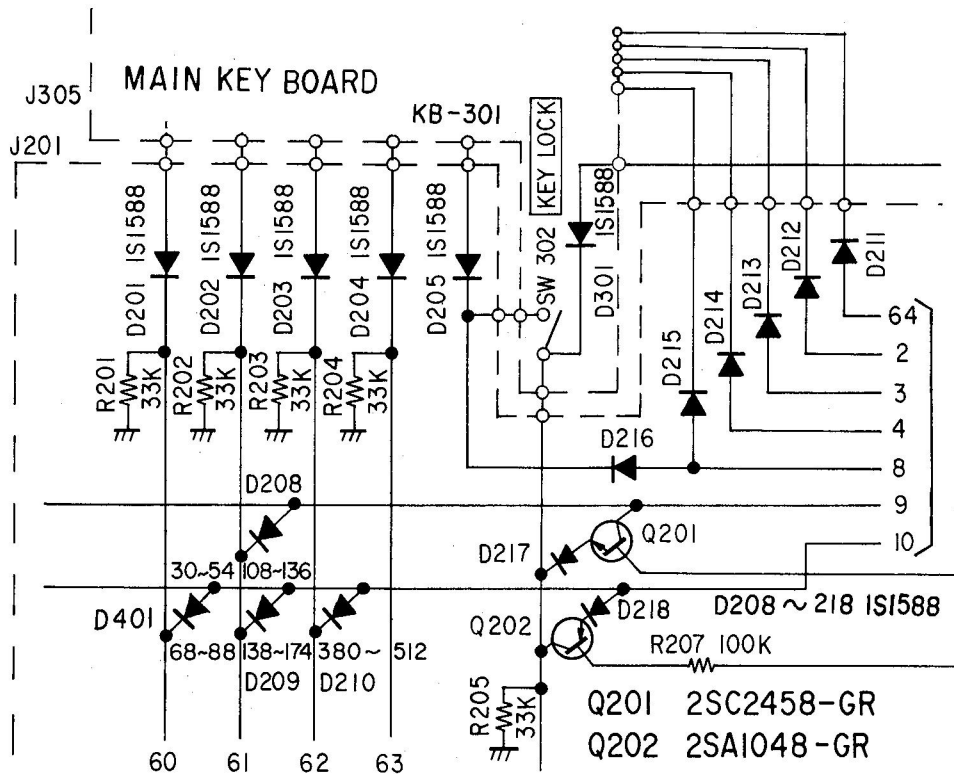
Slight deviation as shown below is acceptable



# MID BAND RF SECTION SCHEMATIC DIAGRAM



# LOGIC SECTION SCHEMATIC DIAGRAM





# LOGIC SECTION SCHEMATIC DIAGRAM (BAND SECTION)

