PLS PERSONAL RADIO SERVICE SECTION

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INTRODUCTION

The recommended troubleshooting procedure, as illustrated in Figure 1, is to isolate the fault to a specific section of the PLS Personal radio; the radio section; the control logic section or the battery pack. Then, further localize the fault to a specific stage of the section suspected to be defective. The last step is to isolate and identify the defective component.

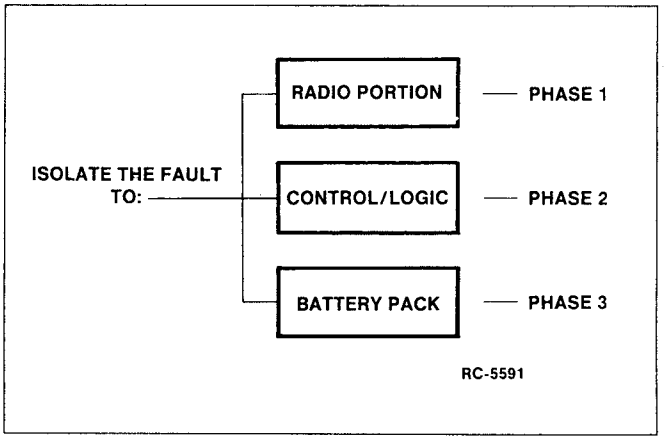


FIGURE 1 - RECOMMENDED TROUBLESHOOTING PROCEDURE

The following list of test equipment is recommended when servicing or troubleshooting the PLS Personal radio.

Recommended Test Equipment:

- Audio Analyzer
- Digital Voltmeter
- DC Power Supply
- Multimeter
- Oscilloscope

PHASE 1: RADIO SECTION TROUBLESHOOTING

Functional Troubleshooting

Once the fault has been isolated to the radio section, the next step is to further isolate the fault to a specific stage of the radio section; Frequency Synthesizer (SYN), Receive (RX) and Transmit (TX). The flow chart (See Page 3) will assist in isolating the fault to a specific stage of the section.

Synthesizer

The following flow chart can be used to isolate a defective stage in the synthesizer circuit.

Synthesizer Flow Chart:

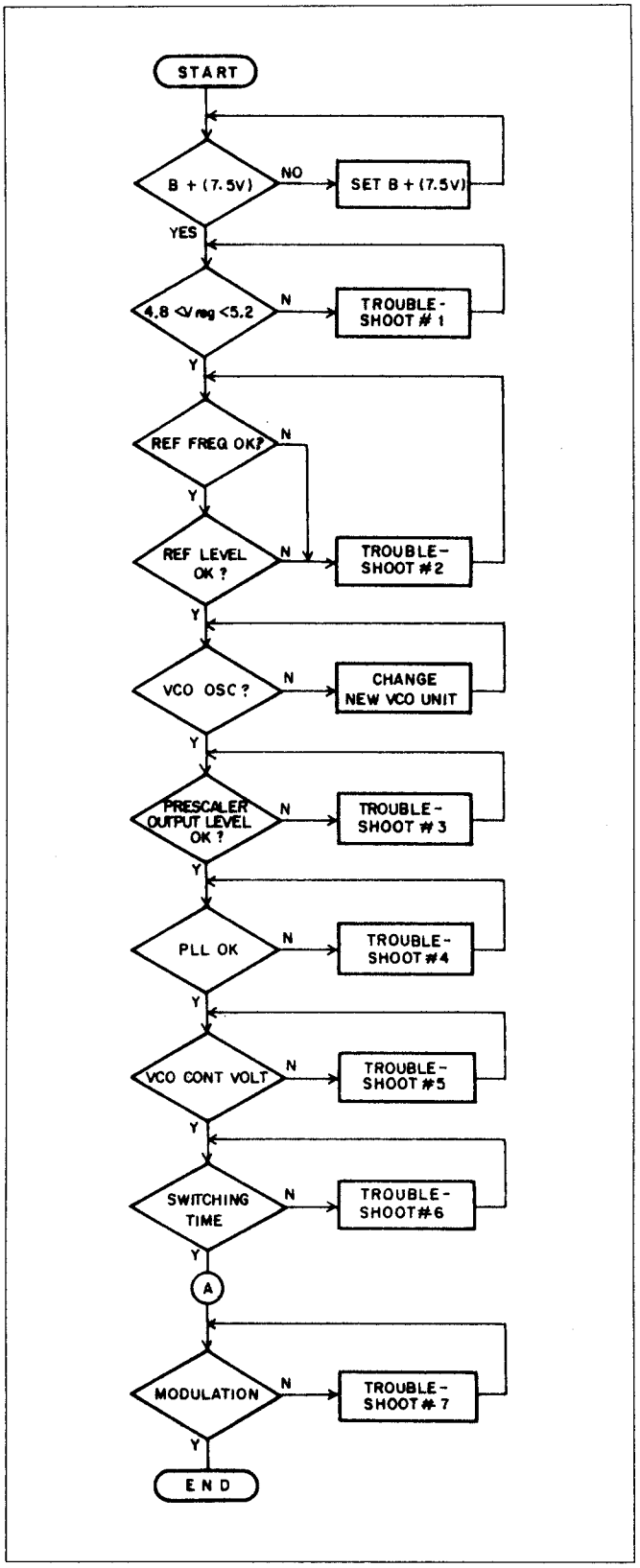
Troubleshooting and repair:

1. 5.4 Volt Regulator (Refer to Table 1):

   The 5.4 Volt regulator consists of IC A107, operational amplifier A104 (1/2) and transistors Q103 or Q109. If a fault is found with the regulated 5.4 Volt output line, trace the fault source along this line back to the regulator. A typical current is shown in the following Table 1 for the VHF, UHF and Low Band frequency bands. Typical voltages for the synthesizer are shown in Table 2.

   Any repair should be made so that the current and voltage at each assembly and component agrees with the typical values.

Synthesizer Flow Chart:



Functional Troubleshooting Flow Chart:

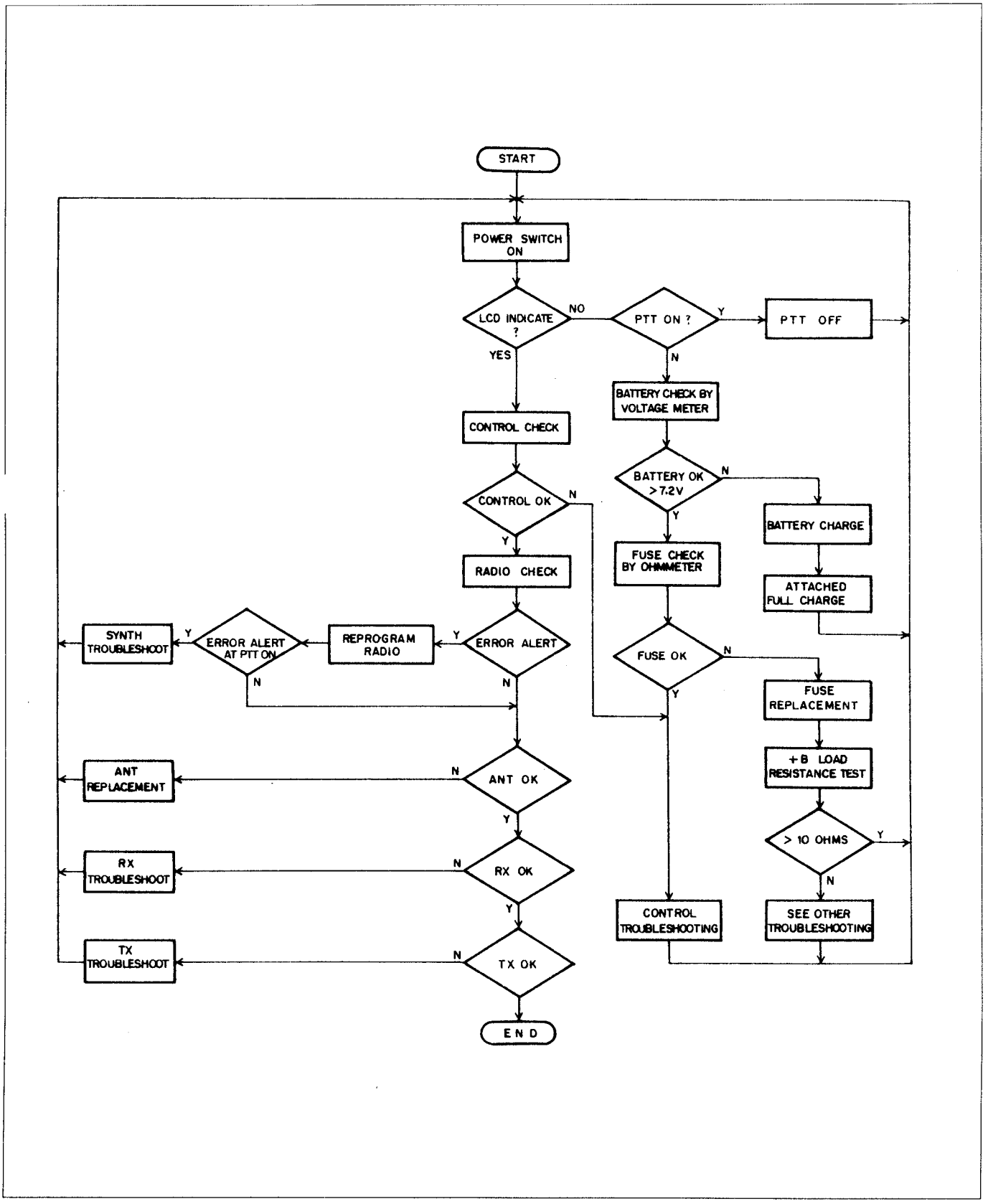


Table 1 - Typical 5.4 Volt Regulator Current (milliamperes)

Frequency Band	Typical Currents
Low Band	20
VHF	23
UHF	25

2. **Reference Oscillator TCXO (A103):**

The reference oscillator consists of A105 and transistor Q107 or Q106. If a problem is found with this assembly, replace it with a new one. Typical data, when the reference oscillator is working properly, is shown in the following Table 3.

Table 3 - Typical Data for Reference Oscillator

Item	Typical Value	Remarks
Supply Voltage	5 VDC	
Current Drain	1.5 to 1.8 mA	5 PPM/VHF, UHF
Output Frequency	10.24 MHz 13.3 MHz 12.8 MHz	LB VHF UHF
Output Level	1 to 2 Vpp	

3. **Prescaler Output level:**

VCO A106 has an output level of about 0 dBm. The output is applied to the input of the prescaler, which is operating under 32/33 (Low Band), 64/65 (VHF/UHF), modular control. The input level to the prescaler ranges from 0.02 volts to 0.2 volts peak to peak. A typical prescaler output level is 1 volt peak to peak, which is applied to the input of the phase lock loop (PLL).

When adjusting the prescaler, refer to the typical value in Table 2.

NOTE

One Prescaler is used for VHF and UHF bands and a different one is used for Low Band.

4. **Phase Lock Loop (A2):**

a. Check for approximately 1 to 1.5 Volts peak to peak reference signal input at Pin 2 of A102.

b. Check that the reference signal frequency is 13.2 MHz and that frequency deviation is + 5 PPM for the VHF and the UHF.

c. Measure the input from the prescaler at Pin 10 of A102 and verify approximately 1 volt peak to peak input level.

d. Verify that approximately 5 volts peak to peak (Vss-Vcc) control pulse is present at Pin 10 of prescaler control A102.

e. Cause the PLL to unlock. Then check for the presence of approximately 5 volts peak to peak (Vss-Vcc) PD and FD pulse outputs at Pin 6 and Pin 17 of A102 respectively. Also check for approximately 7 volts (Vss-Vcc) at Pin 7 of A104. If the pulse output is absent or shifted to either the Vss or the Vcc side, the PLL may fail to lock over a certain section of the frequency range or the entire range. If this fault occurs, the possible trouble source is ramp resistor R108, ramp capacitor C108 or hold capacitor C110.

f. Verify that the local voltages at the test points listed in Table 2 agree with the typical values also listed in Table 2.

g. Verify that the STROBE, DATA and ENABLE signals coming from the Control Unit are at the proper level and the proper duration (refer to Figure 4).

If the STROBE and DATA are improper, the PLL operaton will become erratic. If the duration of the ENABLE is shorter than 10 milliseconds, which is the minimum value, the PLL may fail to lock.

NOTE

If parts other than those specified in the parts list are used in the associated circuit of the PLL, the switching time may be affected. Whenever any parts are replaced in the associated circuit, check the switching time.

Table 2 - Synthesizer Typical Voltages

Test Points		Voltage (V)		Remarks
No.		LB	VHF	UHF
1	A101 (1)			
2	A101 (2)			
3	A101 (3)		3.81	3.84
4	A101 (4)			
5	A101 (5)		3.27	3.25
6	A101 (6)		3.27	3.25
7	A101 (7)		4.84	4.81
8	A101 (8)		4.84	4.81
9	A102 (1)		3.97	4.17
10	A102 (2)		2.45	2.43
11	A102 (5) (19)	5.30	5.26	
12	A102 (6) (17)	0.71	0.44	
13	A102 (8)			
14	A102 (9)		5.29	5.25
15	A102 (10)		2.57	2.50
16	A102 (11)			
17	A103 (12)		4.94	4.94
18	A102 (13)			
19	A102 (15)		0.54	146 mV
20	A102 (18)		1.83	1.07
21	A102 (20)		3.97	3.95
22	A103 Vcc		5.42	5.42
23	A104 (1)		0.78	0.79
24	A104 (2)		2.73	2.69
25	A104 (3)		2.72	2.69

Test Points		Voltage (V)		Remarks
26	A104 (5)	0.71	0.44	
27	A104 (6)	0.71	0.44	
28	A104 (7)	1.42	1.41	
29	A104 (8)	7.51	7.51	
30	A105 (1) (4)	1.42	1.41	
31	A105 (2) (3)	1.42	1.41	
32	A105 (5) (13)			
33	A105 (6) (12)	0	0	
34	A105 (7)	0	0	
35	A105 (8) (11)	1.42	0	
36	A105 (9) (10)	1.42	0	
37	A105 (14)	5.30	5.26	
38	A106 CONT	1.42	1.41	
39	A106 MOD	5.29	5.25	
40	A106 RS	68.9mV	65.2mV	In Rx mode
41	A106 TS	5.04	4.99	In Rx mode
42	A106 BS			In Rx mode
43	A106 TO	0	0	
44	A106 RO	0	0	
45	A106 OUT			
46	A106 PS	5.31	5.26	
47	Q101	1.07	0.93	Base
48	Q101	0.375	0.402	Emitter
49	Q101	4.85	4.81	Collector
50	Q102	6.85	6.85	Base
51	Q102	7.51	7.51	Emitter
52	Q102	5.42	5.38	Collector

Test Points		Voltage (V)		Remarks
53	103	0.78	0.79	Base
54	Q103	0.24	0.25	Emitter
55	Q103	6.85	6.85	Collector
56	Q104	0.66	0.65	Base (In Rx mode)
57	Q104	69 mA	65 mA	Collector (In Rx mode)
58	Q105			Base (In Rx mode)
59	Q105	5.04	4.99	Collector (In Rx mode)
60	Q106	0.60	1.356	Base
61	Q106	0	1.14	Emitter
62	Q106	6.46	7.09	Collector
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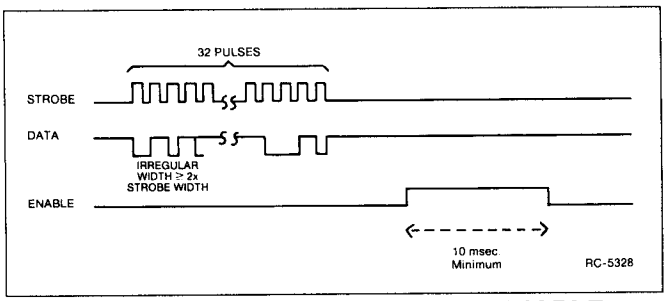


FIGURE 4 - STROBE, DATA AND ENABLE SIGNALS

5. **VCO Control Voltage:**

   a. VCO Control Voltage Should be:

   - Approximately 3 Volts at the highest channel for Low Band.
   - Approximately 4 Volts at the highest channel for VHF and UHF.
   - Approximately 1 volt or more at the lowest channel for any band.

   Verify the VCO control voltage at the CONT terminal of A106 using a high impedance oscilloscope.

   b. If the VCO control voltage differs from the above values, remove the top cover of the VCO assembly A106 and adjust until the voltage does agree.

   Remove the cover.

   Adjust the Receiver Frequency Control.

   Key the radio and adjust the transmit VCO.

   c. After the adjustments, replace and bond the cover completely. If the cover is not replaced or bonded properly, howling may be caused when the speaker volume is raised.

   d. After the cover is replaced and bonded, again verify the VCO control voltage according to step 5 (a).

6. **Switching Time:**

The channel frequency must be locked within 25 milliseconds, which is the duration of the ENABLE pulse. That is, the switching time is restricted by the ENABLE pulse.

   a. Switching time is largely influenced by the leakage current characteristics of capacitors C108, C110, C114 and C116. Be sure to use parts having the ratings specified on the Parts List when replacing these parts. Also, if moisture collects on the printed wire board, the insulation resistance of the board may be lowered, also affecting the switching time.

   b. The channel switching sequence and the action of the related functions are shown in Figure 5.

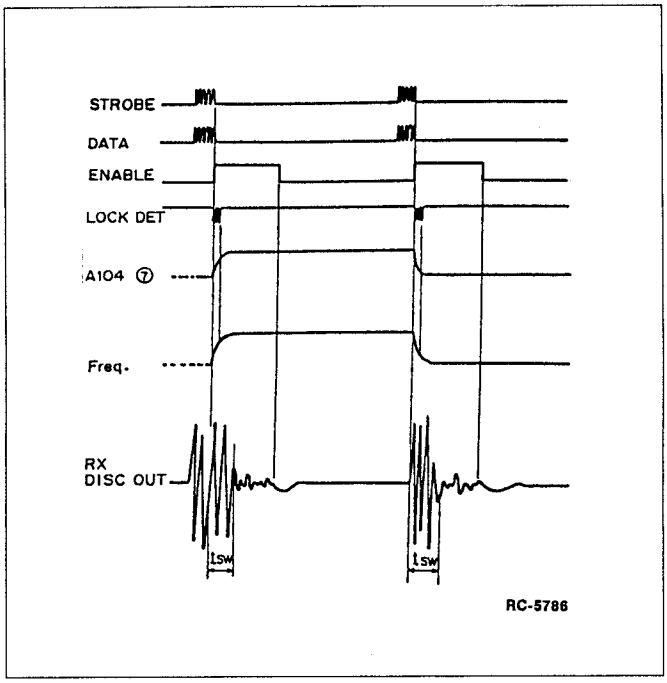


FIGURE 5 - LOGIC FORMAT

7. **Modulation Degree vs Modulation Flatness:**

The PLS equipment can be modulated with audio beginning with 50 Hz. For this reason, the same modulation signal is applied to VCO.

NOTE

1. Adjust modulation flatness with the radio section only.
2. For this adjustment, select the center channel.

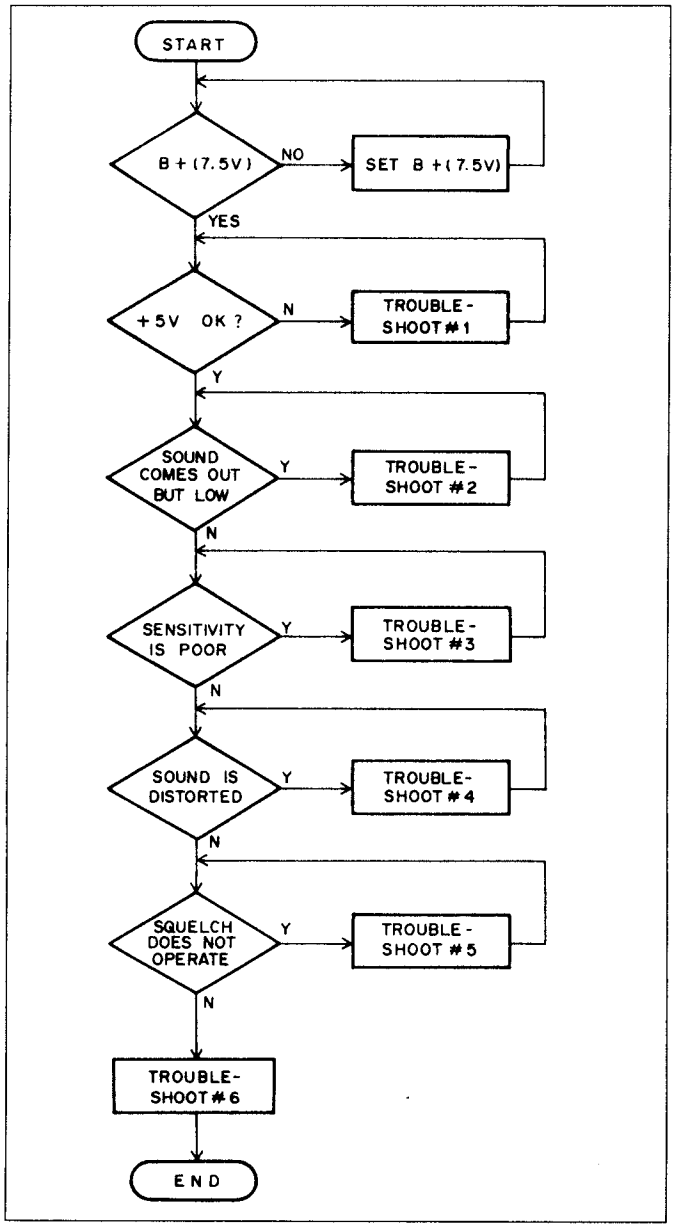
Procedure:

Apply 0.55 V rms/1 KHz signal at the TX audio terminal and adjust R120 (VHF), R126 (UHF) for 3 KHz deviation.

NOTE

For this test, the modulation analyzer must have low frequency response to less than 50 Hz.

Flow Chart:



Receive

The following flow chart can be used to isolate a defective stage in the receive circuit.

Troubleshooting and Repair for the Receiver:

1. **Low Voltage:** Measure the voltage at J102 (P102) Pin 6. When the voltage is less than 5.4 volts, the 5.4 volts regulator circuit is probably faulty. The 5.4 volt regulator circuit consists of precision reference IC A9, operational amplifier A7, transistors Q2, Q3, Q10 and Q11 located on the Controller Board.

   a. Local voltages are shown in Table 3.

   b. Especially check if local voltages are much different from typical values listed in Table 4. Repair that section.

2. **No Volume Control:** If sound comes out of the receiver, but the volume does not increase, the problem may be due to either the radio section or the control section.

   a. Radio Section: Check the output signal for about 200 mV peak to peak at the audio terminal of the RX section (J101, Pin 4) when a standard modulated signal (1 KHz at 3 KHz frequency deviation) of 1 mV (-47 dBm) is supplied at the antenna connector. If the signal level at the audio terminal of the RX is substantially low, IC A302 is suspected to be defective.

   b. Control Board: The receive RF signal comes into P101, Pin 4 and is amplified by audio amplifier A5. The signal is then applied through a 300-3000 Hz BPF and a 46 dB volume level control in Audio IC. The signal is then amplified by audio amplifier A4 and SPKR amplifier A10 to drive the speaker. Typical levels needed to obtain a 1 KHz, 0.365 Watt receive rated audio output are shown in Figure 8.

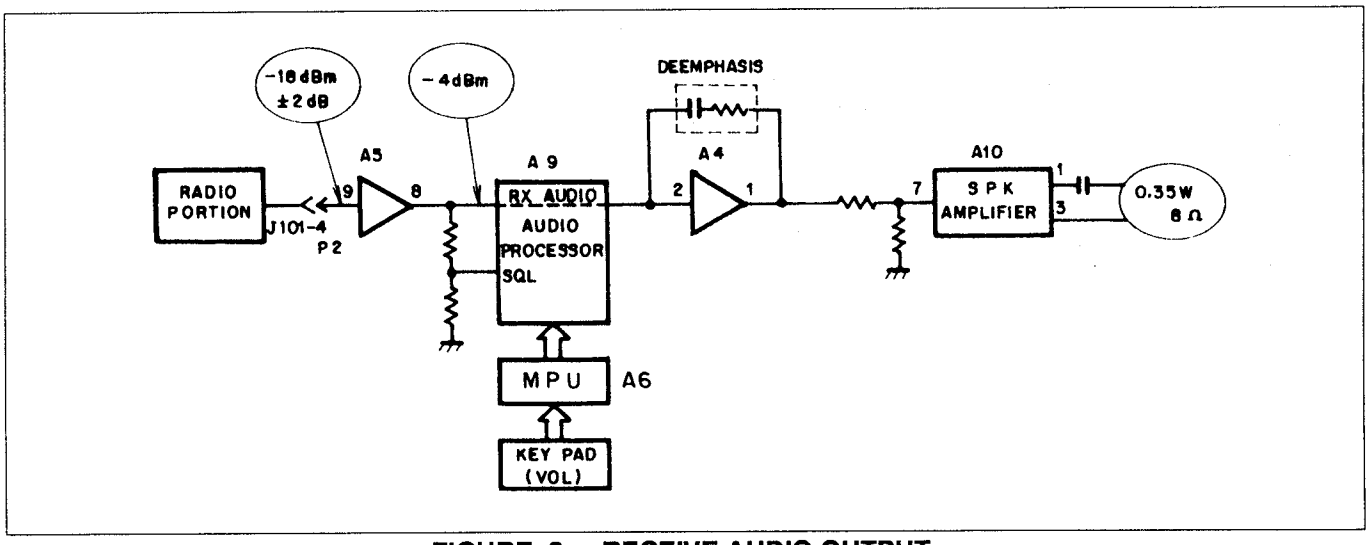


FIGURE 8 - RECEIVE AUDIO OUTPUT

3. **Poor Sensitivity:** When receive sensitivity is poor, refer to the Radio Section Schematic Diagram: A2WE03983 (Low Band), A3WE03858 (VHF) or A3EW03859 (UHF) and typical voltages shown on Table 4. The receive section consists of low noise amplifier Q301. Local oscillator amplifier Q106, first IF amplifier Q302 and Q303 and second IF circuit A302.

   a. **Level Diagram:** A Frequency Relation-ship Diagram is shown in Figure 9 and a Typical Level Diagram is shown in Figure 10.

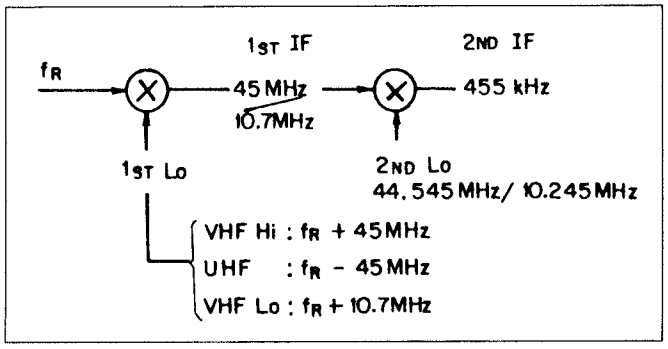


FIGURE 9 - FREQUENCY RELATIONSHIP DIAGRAM

   b. **Adjustments:**

   1. T303 is provided for the adjustment of the second local oscillator. Set the core of T303 to the same level as the top of the case.

   2. When the desired channel frequency with standard modulation is applied to the antenna terminal, adjust T304 for maximum output at RX Audio.

   3. Adjustment of T301 and T302.

   a. Adjust T301 and T302 in this order to obtain the best SINAD sensitivity.

   b. Next, adjust T302 and T301 in this order or obtain the minimum distortion of RX Audio Output; when receiving a standard modulated signal at 1 mW (-47 dBm).

   c. If there is more than half a turn difference in the settings of T301 and T302 in the adjustment steps (a.) and (b.) above, a defective FL303, FL304 or the matching circuit is likely.

   d. Receiver First Local Oscillator Level: Local input level to A301 is designed to be +7 dBm/50 ohms. Generally the input level is +6 to +8 dBm. If local input level is 3 dBm or less, sensitivity, intermodulation and second IF spurious will be degraded.

NOTE

The receiver front end filter is pretuned at the factory and does not normally require service. Proper adjustment requires an RF network analyzer or the equivalent of an accurate spectrum analyzer/tracking generator system. The following information is provided for a suitably equipped service shop or service depot.

Table 4 - Receive Section Typical Voltages

Test Points		Voltage (V)			Remarks
No.		LB	VHF	UHF	
1	Q301		0.74	0.74	Base
2	Q301		6.95	7.00	Collector
3	Q302		0.74	0.738	Base
4	Q302		4.93	4.95	Collector
5	Q303		0.74	0.738	Base
6	AQ303		4.93	4.96	Collector
7	Q106		0.61	1.356	Base
8	Q106		6.47	7.09	Collector
9	Q106		0	1.14	Emitter
10	A302 (1)		1.44	1.35	
11	A302 (2)		5.41	5.41	
12	A302 (3)		0.82	0.812	
13	A302 (5)		5.06	5.06	
14	A302 (7)		4.50	4.47	
15	A302 (9)		4.49	4.47	
16	A302 (11)		4.49	4.47	
17	A302 (13)		5.41	5.41	
18	A302 (14)		2.32	2.16	Changed by receiving input level
19	A302 (15)		5.41	5.41	
20					
21					
22					
23					
24					

If the receiver sensitivity changes by more than 5 dB across the band (24 MHz/VHF, 20 MHz/UHF,) a circuit defect associated with FL301 and FL302 is likely. The adjustment sequence for the VHF and UHF is as follows:

1. Apply the output of the network analyzer to the RF coaxial input terminal and connect the loose coupled output from the FL302 output port to the network analyzer input (see Figure 11).

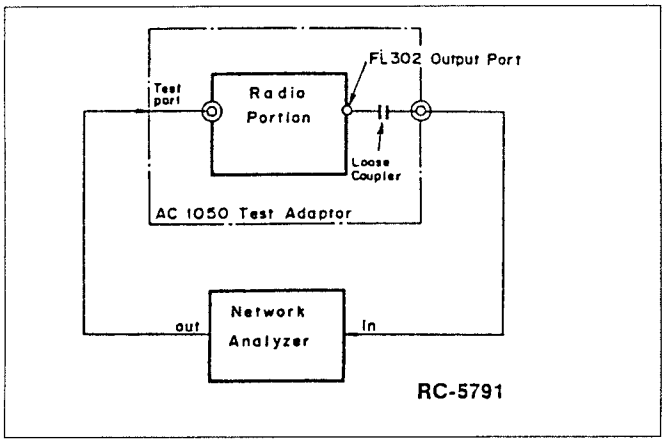


FIGURE 11 - ADJUSTMENT METHOD FOR FL301/FL302

2. Set the sweep frequency of the Network Analyzer to f(M) + 100 MHz and apply markers to f(M), f(L) and f(H) (see Figure 12).

3. Set the level of the Network Analyzer at -20 dB.

4. Set the Network Analyzer to monitor mode S11 and S21.

5. Adjust FL301 for the minimum return loss (S11).

6. Adjust FL302 for optimum gain (S21).

7. Low Noise Amplifier (LNA) is inserted between FL301 and FL302. As S12 is about -15 to -20 dB, FL301 and FL302 have mutual effect. So repeat steps 5 and 6 several times.

8. The Network Analyzer is shown in Figure 12. The guide line for the return loss within the bandwidth is -8 dB or less. The guide line for the gain deviation within the bandwidth is 3 dB or less.

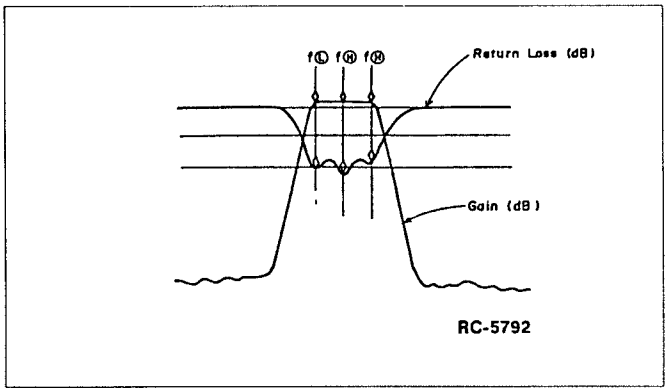


FIGURE 12 - RF FREQUENCY RESPONSE

4. **High Distortion:** If distortion in the received signal is substantially high, try to perform checks with the Radio and Control System individually.

   a. Check the Local Oscillator Frequency: Check the frequency after connecting a frequency counter through a 1 PF capacitor to the collector of transistor Q106. The frequency relation at various stages is shown in Figure 10. If a frequency error is 1 PPM or more in the temperature range of 20 to 25°C, adjust the frequency of TCXO (A103). The frequency of TCXO is UHF-12.8 MHz, VHF-13.2 MHz, LB-10.24 MHz.

   b. Check the Usable Band Width: Usable band width is generally + 2.5 KHz or more of the desired receiving frequency. If the + balance is greatly different, the received signal may be distorted. This time, the problem is probably caused by FL303, FL304 FL305 or its associated components.

   c. Distortion Check: When the radio receives a standard modulated signal, the audio output at the Audio terminal (J101-4, P101-4) is about 200 mV peak to peak. At this point, the distortion will be about 3%. This is because the receiver discriminator output is connected to the RX Audio terminal and de-emphasis and BP filtering has not at this point, been provided. Because considerable noise is contained from low audio frequencies to high audio frequencies, use test equipment with a high input impedance (>100K ohms) for the distortion measurement.

d. The signal from the Radio Board is applied to Control Board at P101-4 and then to the speaker through A8-C, A3, A6-A and A4. Check distortion at each point shown in Figure 9.

e. Even if there are no electrical problems with the audio circuits on the control board, the speaker itself may cause distortion mechanically. The voice coil may rub or the diaphragm may be damaged or touching another part of the radio.

5. **Noise Squelch Does Not Operate:** A part of receiver discriminator output is applied to the Control Board through J2-4 (P101-4).

   a. The operation of squelch is controlled by Audio Processor A9 on the Control Board (refer to Figure 13).

   b. The squelch operation level is set in the channel data RAM. Set squelch ON level and OFF level in the RAM. (Refer to RAM Programming).

6. **Other Problems and Cautions:**

   a. A Polyimide Flex circuit is used at the Control Unit. If the Control Unit is repeatedly disassembled for main-tenance, the flex circuit can be damaged. Accordingly, keep dis-assembly of the Control Unit at a minimum.

   b. Tightening clamp screws (seven places) and egg crate mounting screws (three points) on the Radio Unit may greatly affect transmitting and receiving spurious. If the Radio Unit is disassembled for maintenance, when reassembling, tighten the screws in the unit properly (refer to Figure 14).

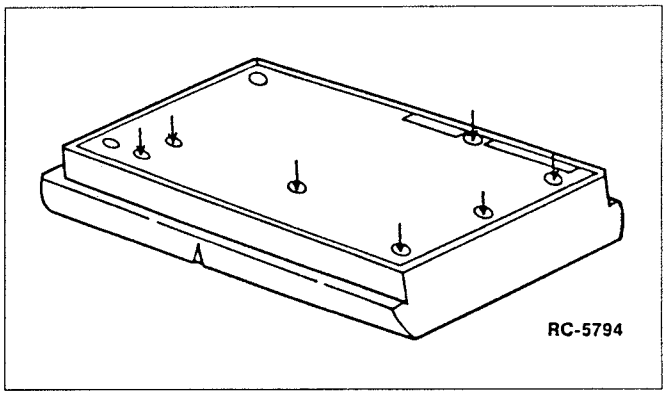


FIGURE 14 - RF SECTION W/BACK CASTING

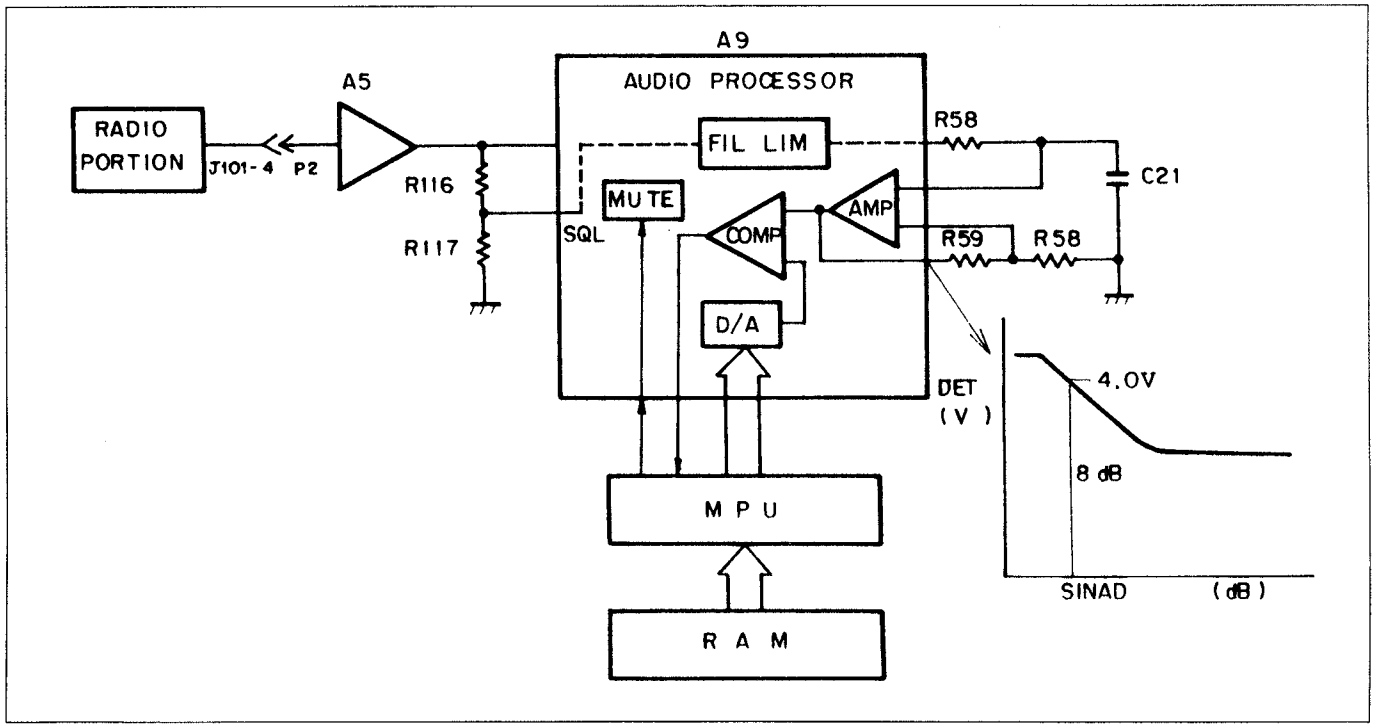


FIGURE 13 - AUDIO PROCESSOR BLOCK DIAGRAM AT SQUELCH

Transmit Circuit

The following Flow Chart and NOTES in the following section Troubleshooting and Repair for the Transmit Circuit can be used to isolate a defective stage in the transmit circuit. Also refer to Table 5 - Typical Transmit Circuit Voltage Flow Chart:

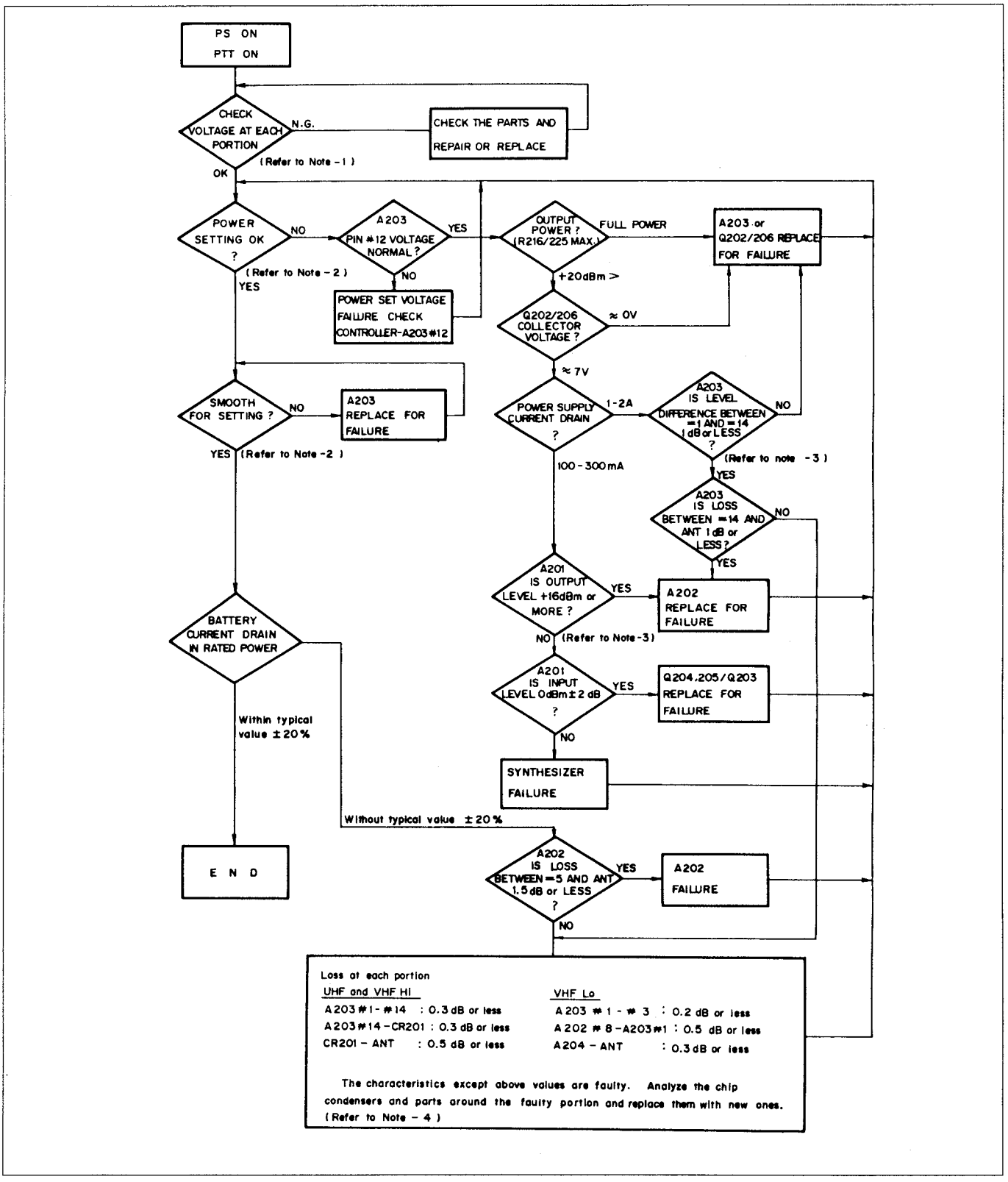


Table 5 - Typical Transmit Voltage

No.	Test Points	Voltage (V) LB	VHF	UHF	Remarks
1	A201 (15)		0	0	
2	A201 (4)		5.44	5.35	
3	A201 (10)		5.44	5.35	
4	A201 (13)		5.44	5.35	
5	A201 (16)		7.50	7.50	
6	A201 (2)		0	0	
7	A202 (1)		0	0	
8	A202 (2)		1.13	4.15	Changed by PWR level
9	A202 (3)		4.84	4.76	
10	A202 (4)		7.50	7.50	
11	A202 (5)		0	0	
12	A203 (3)		0.57	1.48	
13	A203 (5)		6.73	6.54	
14	A203 (6)		7.50	7.50	
15	A203 (11)		5.44	5.34	
16	A203 (14)		0	0	
17					
18					
19					
20					
21					
22					
23					
24					

Troubleshooting And Repair For The Transmit Circuit

Preparation:

1. Set the power supply for 7.5 volts. (Turn on the ammeter.)

2. Connect the output to the power meter.

3. Periodically it is necessary to check to insure that the antenna is tightened securely.

   As prescribed in the preventive maintenance section of the applicable maintenance manual, periodically clean the contact of the antenna switch by blowing compressed air on it. Otherwise, dust and dirt will collect on the contact and result in contact failure.

4. Check Typical Voltages as follows:

NOTE 1

Voltage At Each Section (typical Value)		
Frequency	Component	Typical Value
Low Band	A202, Pin 3	5 Volts
	Pin 5	7.5 Volts
	Pin 7	7. 5 Volts
	A203, Pin 7	1.5 - 5 volts
	Pin 13	5 volts
	Pin 14	1 - 2 Volts
	A204, Pin 4	5 Volts
VHF & UHF	A202, Pin 3	5 Volts
	Pin 4	7.5 Volts
	A203, Pin5	7 Volts
	Pin 11	5 Volts
	Pin 12	1 - 2 Volts
	CR201, Anode	1.2 - 1.5 Volts

NOTE 2

Check RF output: If the transmit circuit can be set for the rated output by adjusting R216/R225, the transmit circuit is working properly.

Adjustment Procedure

1. Select the center channel of the frequency range.

2. Set the power set voltage for approximately 2 volts on the center of R216/R225.

3. Verify that the transmit RF output is:

   - 6 Watts for Low Band
   - 5 Watts for VHF
   - 4 Watts for UHF

Checking Procedure

1. When the rated power output cannot be obtained **smoothly** with R216/R225, check A203.

2. If the rated power output cannot be obtained at all with R216/R225 check transistors Q202/Q206 or A203.

NOTE 3

Test Method

1. Disconnect the input and the output line and measure with 50 ohms impedance.

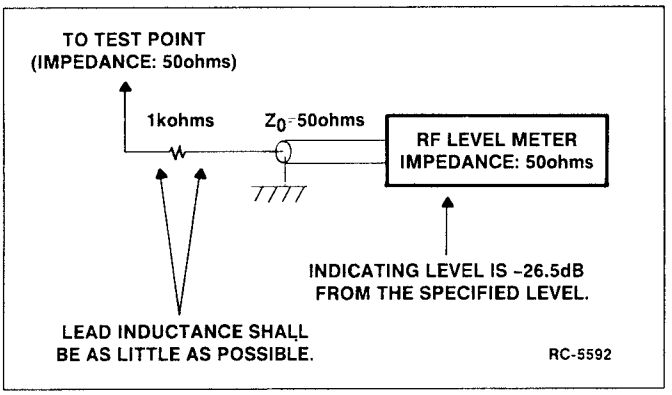
For transistors Q203 (VHF)/Q204, Q205 (UHF):

Remove R201, R219 (VHF)/R210, R223 (UHF) and measure the level across R220 (VHF)/R224 (UHF).

For A203:

Remove CR201 and measure level at A203, Pin 3 (Low Band)/A203, Pin 14 (VHF, UHF).

2. Measure with High Impedance



NOTE 4

Test after removing the coupling capacitor at each block and DC cut.

PHASE 2: CONTROL/LOGIC TROUBLE-SHOOTING

Major Troubleshooting: (Internal Display and Switch Action)

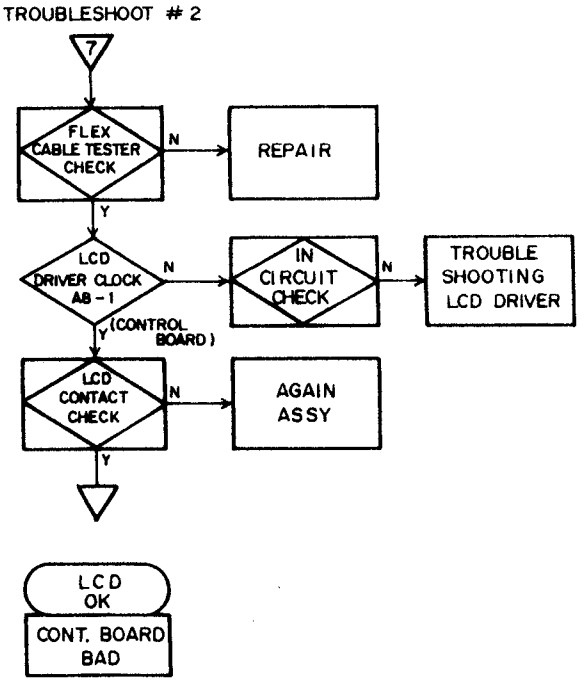
The flow chart (Internal Display and Switch Action) can be used to isolate any defective stage located on the Control/Logic Board.

Functional Troubleshooting: (External Input and Output Action)

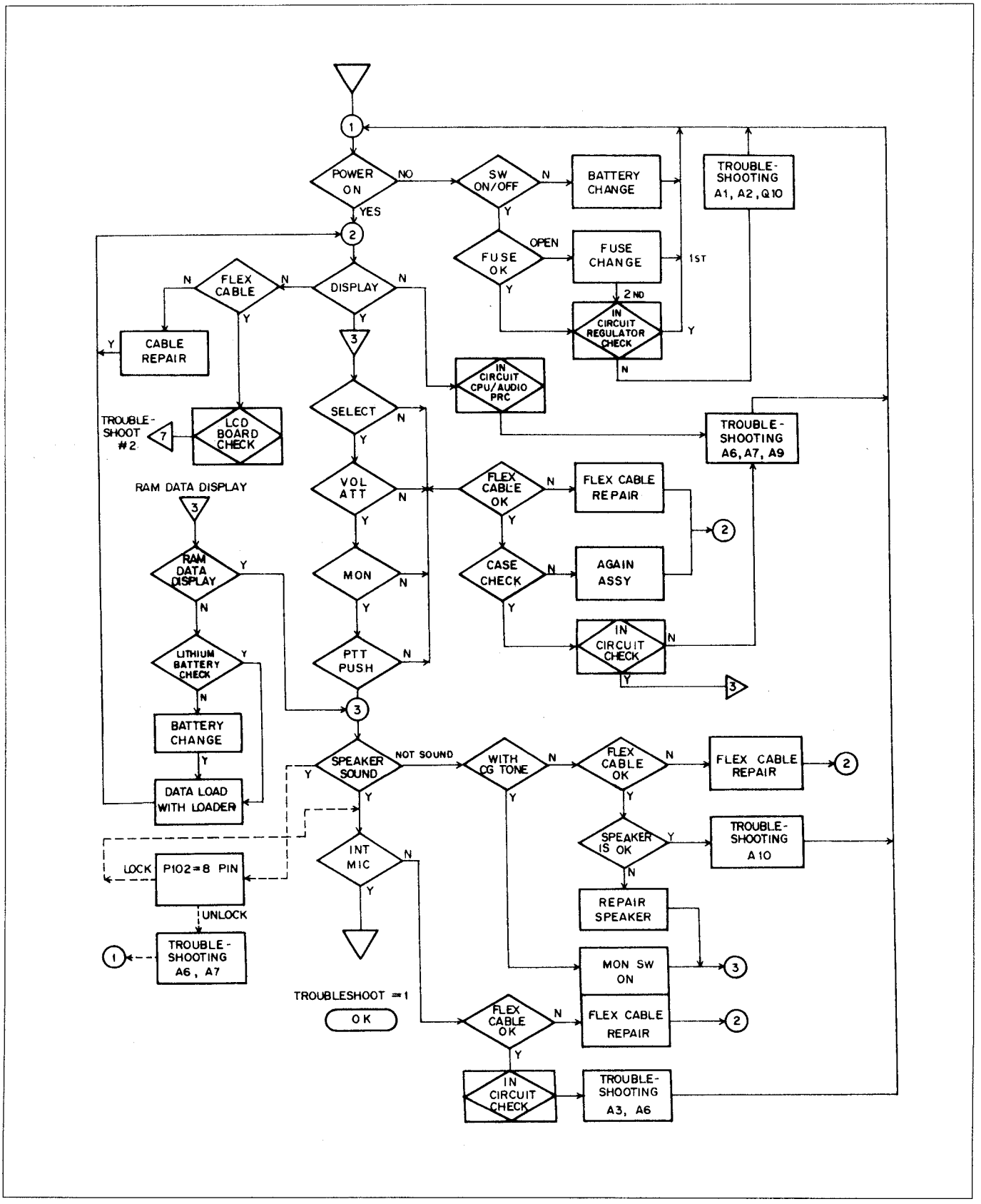
The flow chart (External (Input and Output Action) can be used to externally function test the Control/Logic Board through the **EXT JACK.**

LCD Board: The flow chart can be used to isolate any defective stage located on the **FLEXABLE-BOARD**

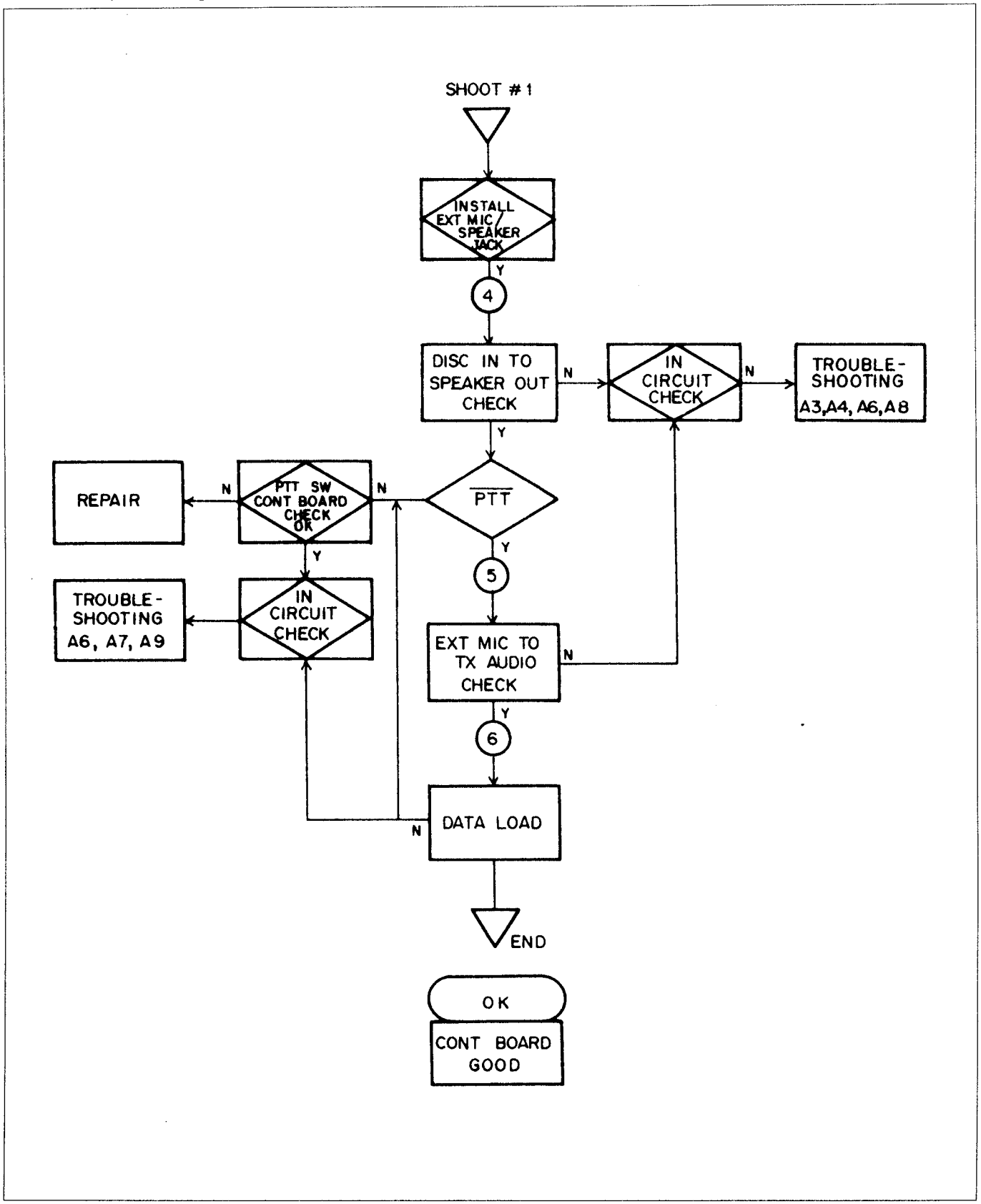
Flow Chart: (LCD Board)



Flow Chart: (Internal Display and Switch Action)



Flow Chart: (External Input and Output Action)



TROUBLESHOOTING AND REPAIR FOR CONTROL/LOGIC

1. This troubleshooting should be made with the Control Board isolated from the radio RF unit.

2. If the result is OK at Step 1, the RAM data (Channel Number) is displayed when power is ON. In the unlocked state of the Phase Lock Loop (PLL) the 1 KHz is turned on and off at PTT.

3. If the result is OK at Step 2, the display should flicker in the unlocked state.

4. When verification up to Step 3 has been made, connect a 1 K ohm resistor between Pin 8 of P102 (LOCK) and (5 volt regulator output) to turn the PLL from "unlock" to "lock". This action is represented with a dashed line.

5. Step 3 indicated that the various switches are actuated in the sequence determined by the RAM data.

6. At Step 4, with a 1 KHz, -17 dBm signal applied to the DISC IN terminal, check for 0.35 Watt/8 ohm output to be present at the EXTERNAL SPEAKER OUT JACK.

   It should also be noted that when the initial VOL ATT setting is not at 0.35 Watt, operate the UP/DOWN of the VOL ramp switch for a volume level of 0.35 Watt. When VOL ATT is about 24, audio output should be 0.35 Watt.

7. At Step 5, when the PTT signal is at ground, the radio set is switched to the TRANSMIT mode (i.e. TX data is ground). Then the PTT button on the side of the radio should be replaced or EXT PTT signal connected to ground.

   When the transmit mode is verified, apply a 1 KHz signal at -28dBm to the EXT MIC terminal from the Audio Analyzer. Check that a -4 dBm +1 dB signal (typical) appears at the TX AUDIO terminal (Pin 1 of P102). Take note that the output at TX AUDIO is not subjected to limiting and without Channel Guard Tone.

8. At Step 6, generate an arbitrary radio data with General Electric's Universal Suit Case Programmer TQ2310 and try to load the data into the RAM. Check that data is loaded properly.

9. To perform an internal microphone (INT MIC) test, press and hold the PTT button and speak into the internal microphone. Check that an audio signal appears at Pin 1 of P102 (TX AUDIO terminal).

10. To check functions other than those mentioned in the flow chart, follow the Control Board Alignment Procedure.

RECONFIGURATION/FIXED DATA

The Fixed Data section of the RAM module (A7) contains factory test data for all channels in the radio located in the Channels section of the Reconfiguration Option. Unlike the Channels section, the Fixed Data section has five bytes allocated for squelch and RF power parameters and three bytes allocated for modulation. This allows each frequency band to be split into five segments and the parameters set for each segment (three for modulation). The factory test data is located on a label affixed to an insulator board installed between the control and RF sections of the radio. A sample printout of the Fixed Data is shown in Figure 15. Figure 16 defines the Fixed Data Format and Figure 17 is a sample copy of the programmed factory data.

The Fixed Data is generally not programmed in the field and is provided here only as reference data in the unlikely event that the RAM programming is lost due to battery failure or from major component changes in the control section of the radio.

WARNING

Incorrect data entered under the Fixed Data Option can result in an inoperative radio or loss of communications. Fixed Data should only be altered by a certified electronics technician familiar with the operation of two-way FM radio.

```
        FIXED DATA
        ----------
LOC  0-- 3  C4  C2  C0  C0
LOC  4-- 7  C0  CE  CC  CA
LOC  8--11  CA  CA  17  16
LOC 12--15  14  13  12  00
LOC 16--19  00  00  00  00
LOC 20--23  00  00  00  00
LOC 24--27  00  00  00  00
LOC 28--31  00  DC  00  80
```

FIGURE 15 - FIXED DATA

FIXED DATA

LOC	0-- 3	C4	C2	C0	C0	←SQUELCH OPEN
LOC	4-- 7	C0	CE	CC	CA	←SQUELCH CLOSE
LOC	8--11	CA	CA	17	16	←MODULATOR
LOC	12--15	14	13	12	00	
LOC	16--19	00	00	00	00	
LOC	20--23	00	00	00	00	←NOT USED
LOC	24--27	00	00	00	00	
LOC	28--31	00	00	00	00	←CHECKSUM

RC-5522

FIGURE 16 - FIXED DATA FORMAT

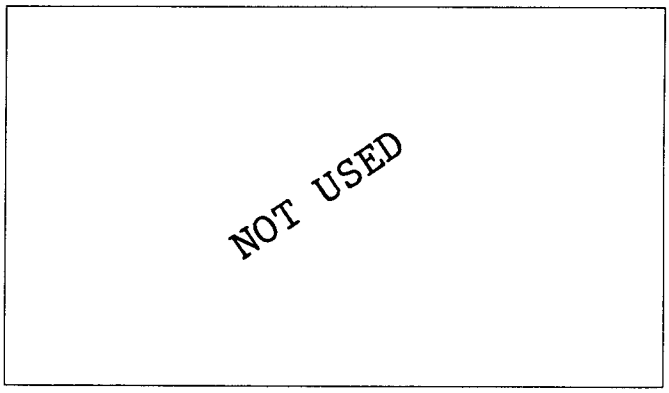


FIGURE 17 - PREPROGRAMMED FACTORY DATA

REPLACING LITHIUM BATTERY BT1

The PLS Radio Personality Data (operating frequencies, Channel Guard tones, options,...etc.) is programmed into RAM circuit A7 located on the Control Board (A3WE03855). Lithium battery BT1 is a back up voltage supply for maintaining the data in memory. To prevent loss of this data battery BT1 should be changed on a regularly scheduled basis; about once every three years (under normal conditions the battery should last much longer).

Before attempting to replace the lithium battery, the user may want to copy the Personality Data into the Universal Radio Programmer (URP) TQ2310 preventing any possibility of losing the data during the change over process. However, it is completely possible to accomplish the battery change without loss of data as follows.

Procedure:

1. Separate the front housing from the RF section (refer to the Disassembly Procedure) and remove the five (5) screws holding the Control Board in the radio.
2. Unplug the Control Board from the flex strip.
3. To maintain the data content in the RAM it is necessary to attach a power source (6.5 -9.0 VDC) to the control board using clip leads. Attach the clip leads to the screw holes at the bottom of the board (refer to the Outline Diagram showing these connections).

WARNING

Be certain supply polarity is correct or damage will occur to the Control Board.

NOTE

If The RAM data has been copied to the URP and its not necessary to maintain RAM content, the external power supply should not be connected.

4. Remove the plastic cover from the lithium battery.

NOTE

The battery case is positive and the tab is negative (Backwards from what would be expected!).

5. Unsolder the wire from the tab and remove the old battery from the clip.

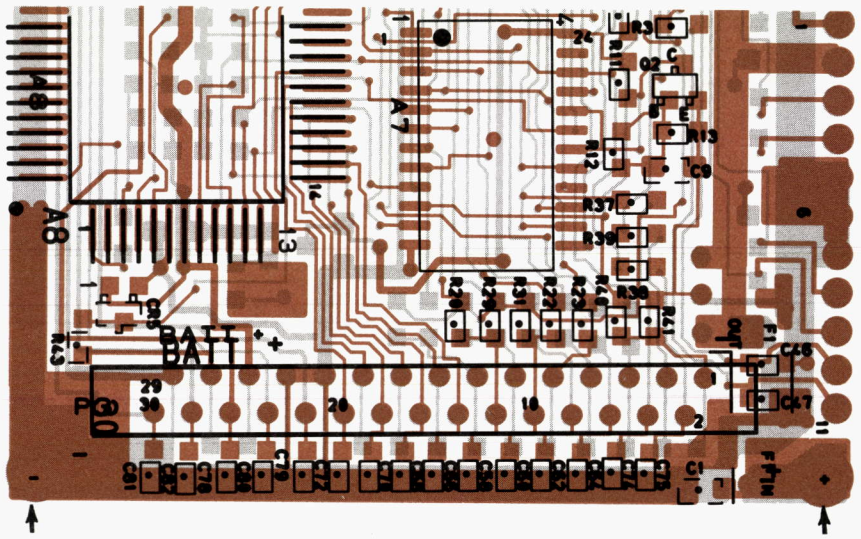
6. Insert the new battery, making sure that the battery case does not touch the ground strap on the side of the Control Board (refer to the appropriate diagram).

7. Solder the wire to the tab of the new battery.

8. Re-attach the plastic cover to the new battery.

9. Remove the external power supply if one was used.

10. Re-assemble the radio.



Using leads with alligator clips, connect the negative side of the supply voltage to the screw hole on the battery (BT1) side of the control Board as shown above. Connect the positive side of the supply voltage to the screw on the opposite side of the board also as shown above. The positive side has a metal strip with a piece of tape for insulation.

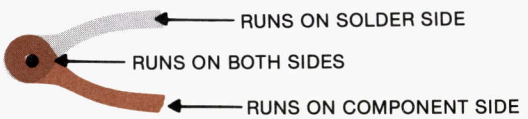


Figure 18 - Outline Diagram for connecting A Battery supply to the Controller Board

REPLACING CHIP COMPONENTS

Replacement of chip capacitors should always be done with a temperature - controlled soldering iron, using a controlled temperature of 700°F (371°C). DO NOT touch the black metal film of the resistors or the ceramic body of the capacitors with the soldering iron.

NOTE

The metalized end terminations of these parts may be touched with the soldering iron without causing damage.

REMOVING CHIP COMPONENTS

1. Grip the component with tweezers or needle nose pliers.
2. Alternately heat each end of the chip in rapid succession until solder flows and then remove and discard the chip.
3. Remove excess solder with a vacuum solder extractor or Solderwick®.
4. Carefully remove the epoxy adhesive and excess flux to prevent damage to the printed board.

REPLACING CHIP COMPONENTS

1. Using as little solder as possible, "tin" one end of the component and one of the pads on the printed wiring board.
2. Place the "tinned" end of the component on the "tinned" pad on the board. Simultaneously touch the component and the pad with a well "tinned" soldering iron while pressing the compnonent down on the board.
3. Place the "tinned" soldering iron on the other end of the component and the pad simultaneously. Apply solder to the top of the end of the component until the solder starts to flow. Use as little solder as possible while getting a good solder joint.
4. After the component has cooled, remove all flux from the component and printed wiring board area with denatured alcohol.

ERICSSON

Ericsson GE Mobile Communications Inc.
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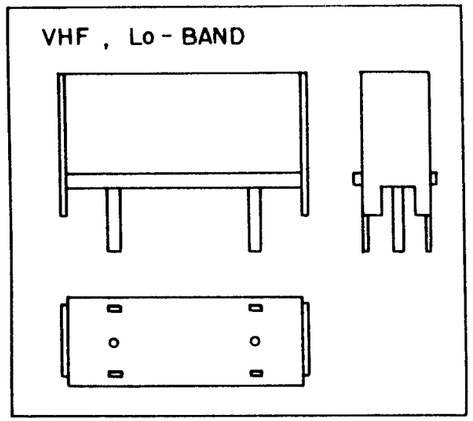
Printed in U.S.A.

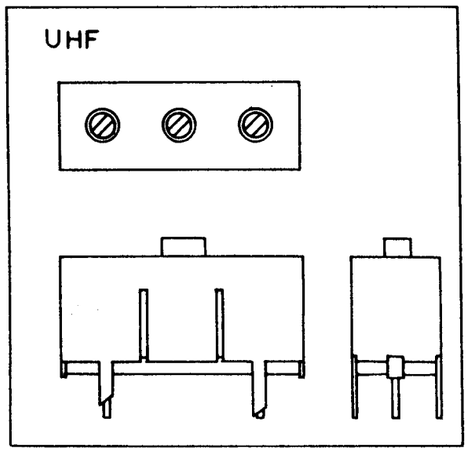
Rx BAND PASS FILTER

VHF , Lo - BAND



FREQ. RANGE (MHz)
150 — 174
30 - 36
36 - 42
42 - 50

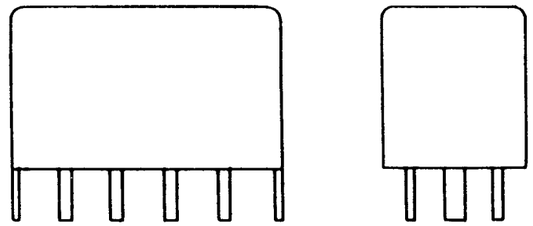
UHF

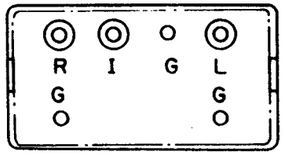


FREQ. RANGE (MHz)
450 - 470

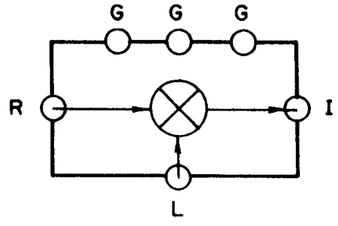
DBM

DOUBLE BALANCED MIXER





(BOTTOM VIEW)



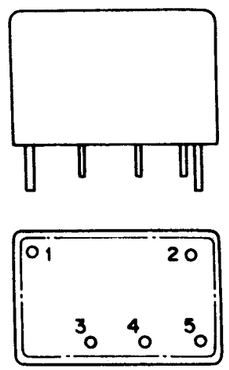
R : RF INP

I : IF OUT

L : LOCAL. INP

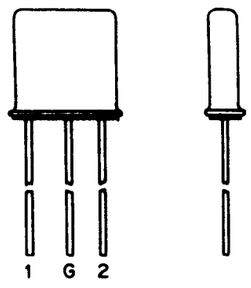
G : GND

455 kHz IF FILTER CFWM 455E



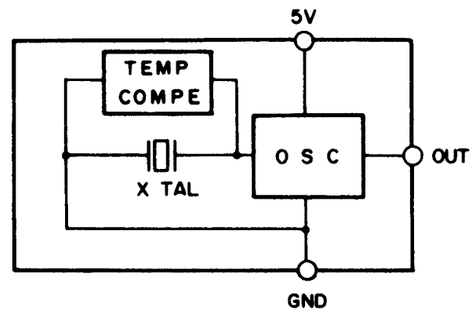
1 : INP / OUT
2 : INP / OUT
3 : GND
4 : GND

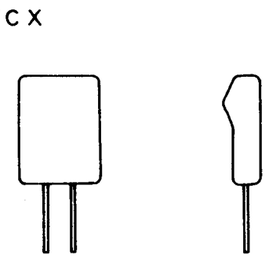
1ST IF FILTER

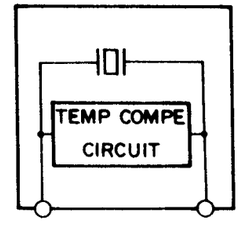


1 : INP / OUT
2 : INP / OUT
G : GND

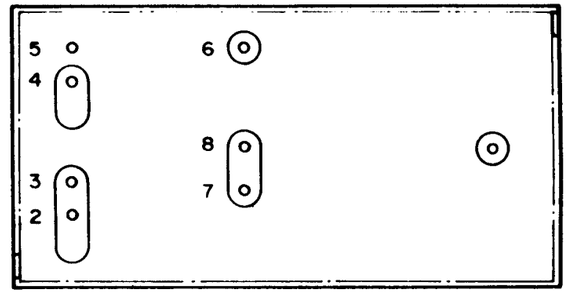
TCX





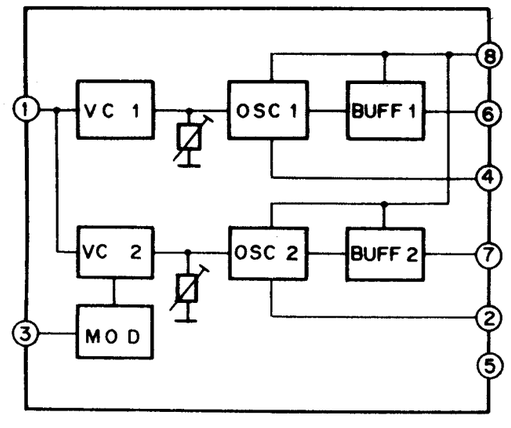


VCO (VHF) (UHF) (Lo-BAND)

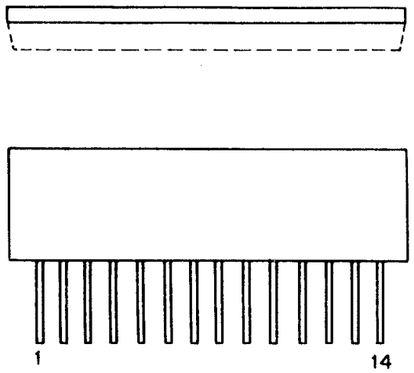


(BOTTOM VIEW)

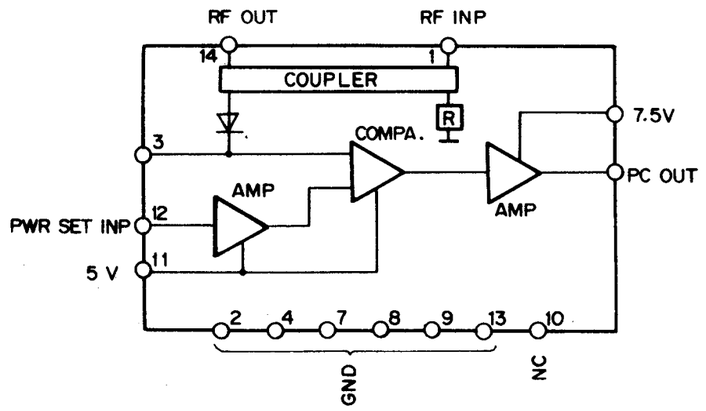
1. Voltage Control
2. Tx Switch
3. Modulation Input
4. Rx Switch
5. GND
6. Rx Output
7. Tx Output
8. 5 V (Vcc)



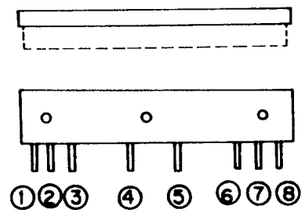
POWER CONT HYBRID



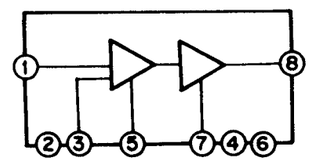
FREQ. RANGE (MHz)	MODEL
450 - 470	KLH 8514
150 - 174	KLH 8516
30 - 50	KLH 8517



PA PACK (Lo - BAND)

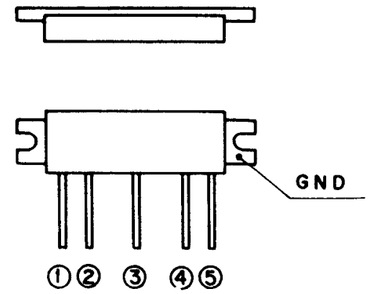


FREQ. RANGE (MHz)
30 - 36
36 - 42
42 - 50



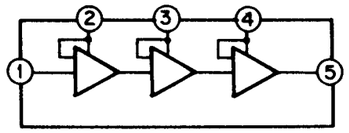
① : RF INPUT (50 ohm)
② : GND
③ : BIAS (5 V)
④ : GND
⑤ : Vcc 1 (7.5 V)
⑥ : GND
⑦ : Vcc 2 (7.5 V)
⑧ : RF OUTPUT (50 ohm)

PA PACK

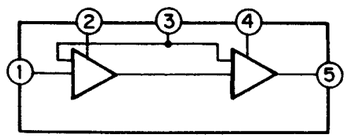


FREQ. RANGE (MHz)	MODEL
450 - 470	M57799M
150 - 174	M57783H

UHF



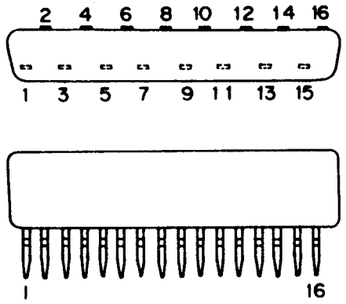
VHF

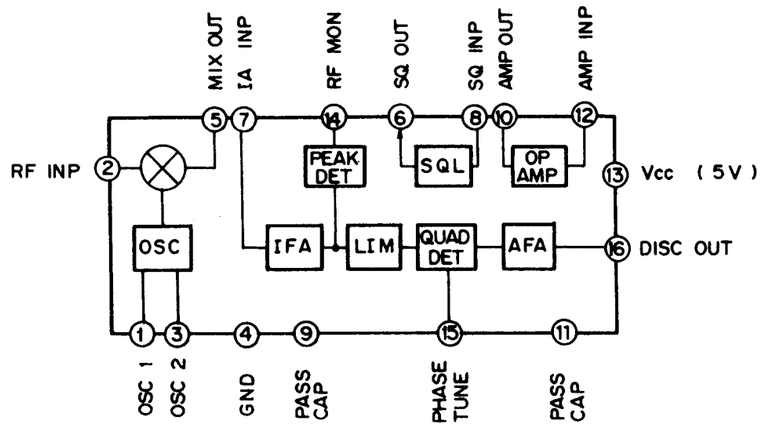


① RF INP (50 ohm)
② Vcc 1 (AGC)
③ Vcc 2 (7.5 V)
④ Vcc 3 (7.5 V)
⑤ RF OUT (50 ohm)

IF IC HA12442V

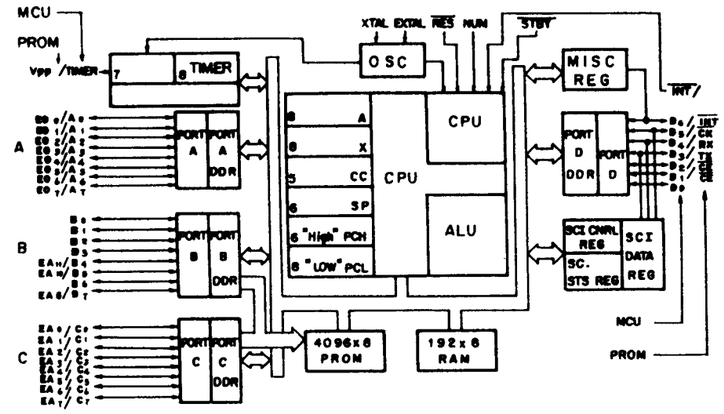
(TOP VIEW)





Integrated Circuit / MPU (HD6305V0FP/HD63705V0FP)

BLOCK DIAGRAM



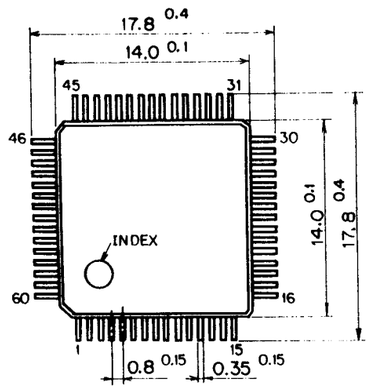
(Top View)

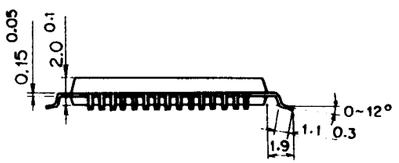
AUDIO PROCESSOR

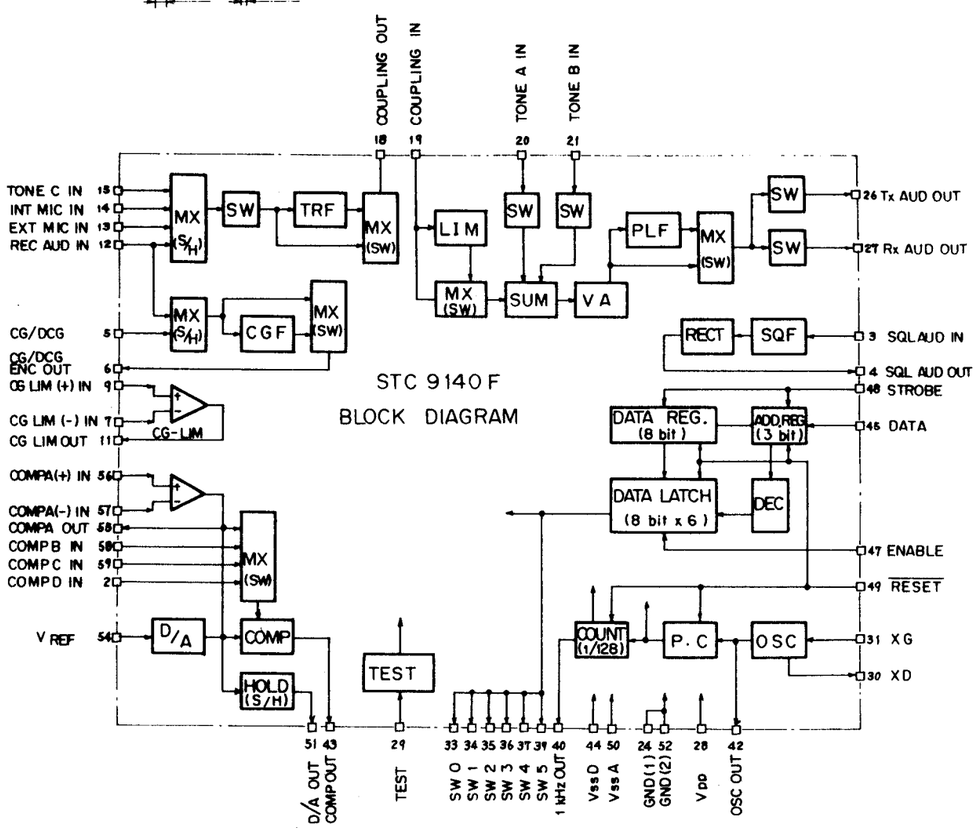
STC 9140F

F60-2

60 - pin PP

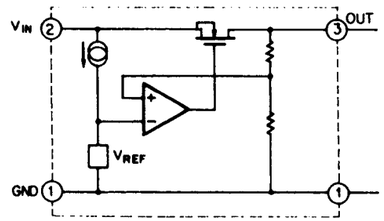




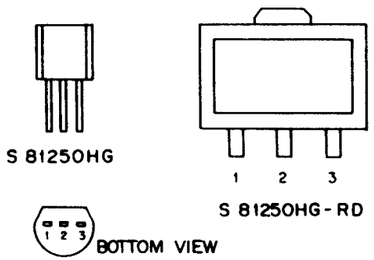


VOLTAGE REGULATOR (S-81250HG, S-81250HG-RD)

BLOCK DIAGRAM

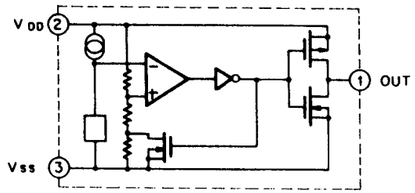


PIN ARRANGMENT

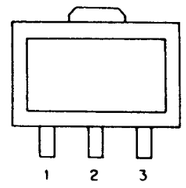


VOLTAGE DETECTOR (S-8054ALR-LN)

BLOCK DIAGRAM



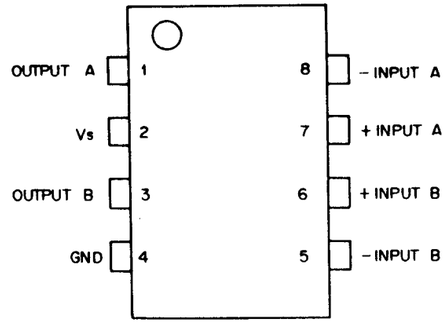
PIN ARRANGMENT



AUDIO IC

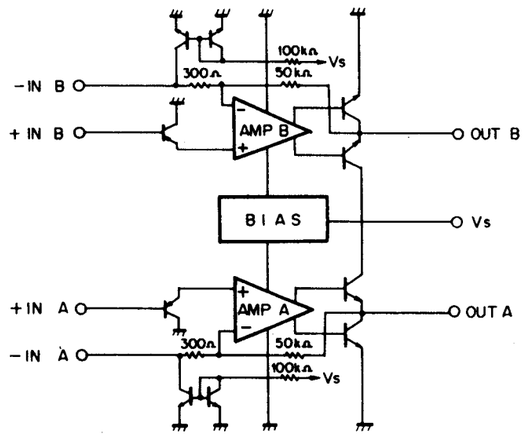
NJM2073D

Pin Arrangment



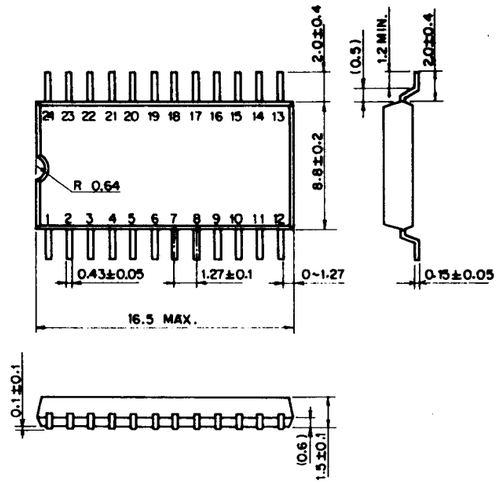
(TOP VIEW)

Block Diagram

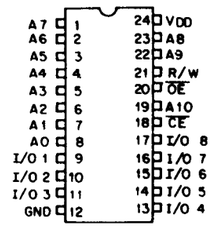


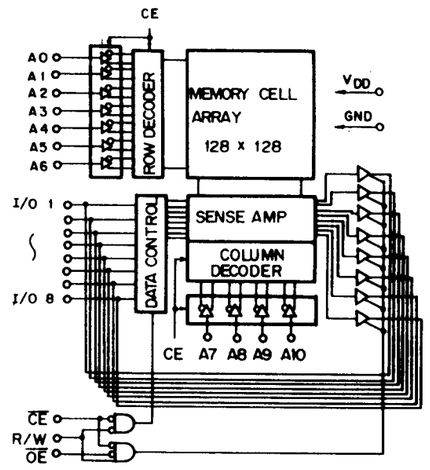
S-RAM

TC5517AFL / AFL

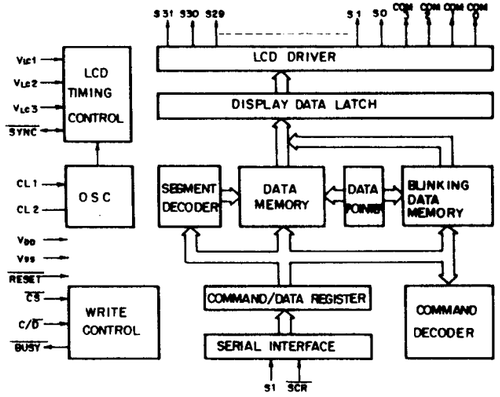


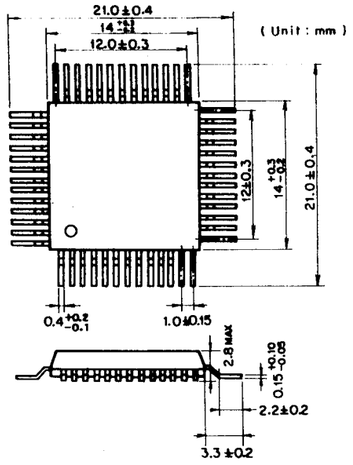
(TOP VIEW)

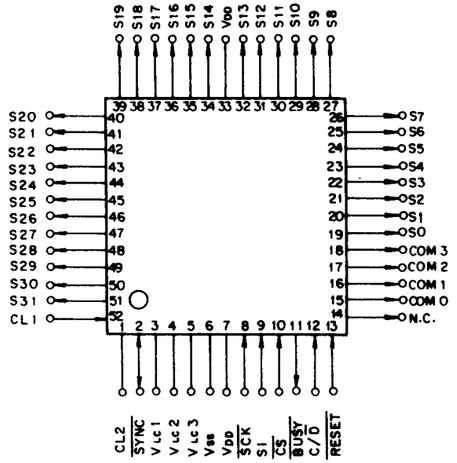




INTEGRAT CIRCUIT / LCD CONTROLLER DRIVER (μPD7225G)

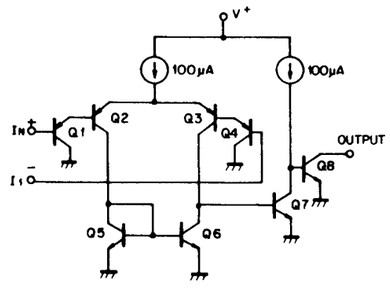




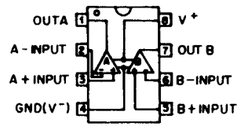


INTEGRATED CIRCUIT / OP-AMPLIFIER (μPC1251G/μPC451G)

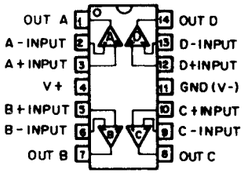
Equivalent Circuit (1/2 Circuit)



μPC1251G



μPC451G



INTEGRATED CIRCUIT/ BI-LATERAL SWITCH (μPD4066BC/4066BG)

CONNECTION DIAGRAM (TOP VIEW)