

REALISTIC[®]

ServiceManual

21-1510

TRC-417 CB 40-CHANNEL TRANSCEIVER Catalog Number: 21-1510



CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

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NOTE: For disassembly instructions refer to Exploded View/Disassembly Instructions on page 26.

SPECIFICATIONS

GENERAL

Description

Transmitter.....Crystal controlled PLL synthesizer, amplitude modulation
 Receiver.....Crystal controlled double conversion, superheterodyne system
 Communication frequencies.....All 40 CB channels (26.965 to 27.405 MHz)
 Voltage operation.....12-16V DC (positive or negative ground vehicles)
 Temperature and humidity range...-22°F to +140°F (-30°C to +60°C) and 10% to 90%
 Transmitter/Receiver switching..... Electrical

STANDARD TEST CONDITIONS

Power supply voltage.....13.8V DC
 Modulation.....1000Hz, 30%
 Receiver output power.....500mW at external SP
 Receiver output impedance.....8 ohms, non-inductive
 Ant. load impedance of transmitter.....50 ohms, non-inductive
 Measuring channel.....18
 Ambient conditions
 temperature.....77°F (25°C)
 humidity.....40 to 70%

TRANSMITTER

	UNIT	NOMINAL	LIMIT
Frequency tolerance at 77°F (25°C) (5 minutes after switch on)	Hz	<u>+100</u>	<u>+1300</u>
Carrier power at no mod.	W	3.9	3.6-4.4
Modulation attack time	msec	18	25
Modulation release time	msec	300	100-500
Modulation distortion at 1kHz 80% mod.	%	3	6
Spurious emission 2nd/3rd/4th/6th 7th/8th/9th/10th	dB	70	60
Modulation 100% capability positive/negative	%	90/95	80/80
Current drain at no mod.	mA	1100	1300
at 80% mod.	mA	1400	1800
Modulation freq. resp. (1kHz 0dB ref.)			
upper at 2.5kHz, EIA	dB	-6	-6 <u>+3</u>
lower at 450Hz, EIA	dB	-6	-6 <u>+3</u>
Carrier power uniformity CH to CH at no mod.	W	0.2	0.5
Mic sens. AM for 50% mod	mV	1.0	2.0
AMC range at AM between 50 to 100% mod.	dB	40	30
Occupied band width + 5.0kHz	dB	-35	-28
+ 7.5kHz	dB	-35	-28
+10.0kHz	dB	-45	-38
+12.5kHz	dB	-45	-38
+15.0kHz	dB	-45	-38
+17.5kHz	dB	-45	-38
+20.0kHz	dB	-65	-61
+22.5kHz	dB	-65	-61

RECEIVER

	UNIT	NOMINAL	LIMIT
Max. sensitivity	μV	0.25	0.5
Sensitivity for S/N	μV	0.5	1.0
Squelch sens. at threshold	μV	0.6	1.2
at tight	μV	1000	355-2820
AGC fig. of merit 50mV for 10dB change in audio output	dB	95	85
Overload AGC characteristics from 50mV to 1V	dB	1	+6
Overall audio fidelity			
upper frequency 2500Hz	dB	-6	-6 +3
lower frequency 450Hz	dB	-6	-6 +3
Adjacent channel selectivity (10kHz)	dB	80	60
Max. audio output power	W	6.0	4.5
Audio output power at 10% THD	W	5.0	3.5
THD at 500mW AM: 1mV input			
30% mod.	%	1.5	4
50% mod.	%	2	6
80% mod.	%	3	8
S/N ratio at input 1mV	dB	45	35
Image rejection ratio(1st IF/2nd IF)	dB	90/95	60/50
1/2 IF rejection ratio (2nd IF)	dB	70	60
IF rejection ratio (1st IF/2nd IF)	dB	85/90	70/70
Spurious rejection ratio	dB	70	60
Skirt rejection, 20kHz single signal	dB	100	90
Cross modulation, RS standard	dB	60	50
Desensitivity at 100 μV desired, 20kHz away, 3dB desensitivity	dB	60	55
Signal Meter sens. at "D4"	μV	50	10-100
Oscillator on voltage	V	6.5	11
Current drain at no signal	mA	200	300
Current drain at max. output	mA	1000	1500
Noise limiter test at pulse (at pulse 0.5V signal 0.5 μV no mod.)	dB	18	10
Noise limiter test at level (at 1 μV input)	dB	-1.5	-6
Local emission (Ant. Terminal)	dBm	-73	-67

	UNIT	NOMINAL	LIMIT
Maximum output power	W	6.0	4.5
10% THD output power	W	5.0	3.5
Mic. sens. for PA 4-W output at 1kHz	mV	3	10
Frequency response			
upper frequency 2500Hz	dB	-6	-6 $\pm$ 3
lower frequency 450Hz	dB	-6	-6 $\pm$ 3
Current drain at max. power	mA	1200	1500

Fuse.....	2 Amp.
General power requirement.....	12-16V DC
Dimensions.....	1-3/8" x 5-33/64" x 7-1/4" (35mm x 140mm x 185mm) H.W.D.
Weight.....	2 lbs 2 oz (1kg)

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CIRCUIT DESCRIPTION

GENERAL

The TRC-417 is a 40-channel, crystal controlled mobile transceiver that consists of a PLL-synthesizer circuit, a receiver circuit and a transmitter circuit. Diode D15 is a polarity-protector. Power is supplied by a car battery (13.8 VDC). Refer to the Block Diagram and the Schematic Diagram as you read the following descriptions.

PLL SYNTHESIZER SECTION

The TRC-417 uses a Phase-Locked-Loop (PLL) circuit to synthesize the local-oscillator frequencies for receiving and transmitting. It employs one IC and only one crystal. IC1 is a CMOS large scale integrated circuit containing a reference oscillator, phase detector, active low pass filter, reference divider (1/4096 for transmit, 1/2048 for receive) and a programmable divider.

The programmable divider directly divides the output of the VCO (voltage controlled oscillator) down to a 2.5 kHz (5 kHz for the receiver) signal. Crystal X1 provides a reliable frequency standard which controls the local-oscillator frequencies. The reference-frequency divider inside IC1 counts down the oscillator signal to 1/4096, and passes it on to the phase detector, where it is compared with the 2.5 kHz (5 kHz for receiver) signal from the programmable divider. An error voltage is generated by the phase detector, which is proportional to the phase difference between the two 2.5 kHz (5 kHz for receiver) signals.

This error voltage appears at pin 15 of IC1 and passes through the active LPF (low pass filter), where the error voltage is integrated and harmonics and noise are filtered out. The resulting DC voltage is applied to the varicap diode (D3). Its capacity varies with the applied DC voltage. Because of this capacity change, the output frequency of the VCO is corrected. With proper circuit design and precise adjustments, the VCO frequency is accurate and precise when the system is "locked".

This means that the phase detector senses no phase differences between the two 2.5 kHz (5 kHz for receiver) signals, and the VCO generates a frequency that is as accurate and stable as the reference crystal oscillator. The VCO circuit consists of D3, Q10 and T6.

The circuit is connected in the form of a Hartley oscillator with varicap diode D3 as part of the tank circuit. The VCO circuit generates a signal ranging from 13.4825 to 16.710 MHz. The IC1 also includes an unlock-signal-detector circuit. Should the condition occur, the output at pin 14 of IC1, which is normally open, will be shorted to ground. This means that VCO frequency (1st local oscillator for receiving, 1/2 carrier for transmitting) is "sunk" to pin 14 of IC1 through D4, and the transmitter & receiver circuits are inhibited.

TRANSMITTER CIRCUIT

RF Amplification

The output of doubler amp Q14 is fed through doubler tuning (27MHz) T7 and T8 to the base of buffer amp Q15. The output is then supplied through tuning circuit T9 to RF driver amp Q16. The Q16 output capacitance is divided by tuning circuit L9, C59 and C60 and passed through tuning circuit L10 and C65 to the base of final RF stage Q17.

Suppression of Spurious Radiation

The tuning circuit between frequency synthesizer and final amp Q17, and 3-stage "PI" network C63, L3, C66, L2, C67, L1 and C301 in the Q17 output circuit serve to suppress spurious radiation. This network serves to impedance match Q17 to the antenna and to reduce spurious content to acceptable levels. In-band spurious is reduced to acceptable levels by filtering and layout in the frequency synthesizer.

Limiting Power

During factory alignment, the series base resistor of final Q17 (R58) is selected to limit the available power to slightly more than 4 watts. The tuning is adjusted so the actual power is from 3.6 to 3.9 watts, there are no other controls for adjusting power.

Modulation

The mic input is fed to mic amp IC3 and then to audio power IC4, which feeds the signal to the modulation transformer T10. The audio output at the secondary of T10 is fed in series with the B+ voltage through diode D12 to the collectors of Q16 and final Q17 to collector modulate both these stages.

Limiting Modulation

A portion of the modulating voltage is rectified by D10 and Q18 to turn on Q19, which attenuates the mic input to mic amp IC3. The resulting feedback loop keeps the modulation from exceeding 100 percent for inputs approximately 40dB greater than required to produce 50 percent modulation. The attack time is about 13 msec. and the release time is about 320 msec.

RECEIVER CIRCUIT

Receiver

The receiver is a double conversion superheterodyne with the first IF at 10.695MHz and the second IF at 455MHz. The synthesizer supplies the first local oscillator 10.695MHz below the received frequency and the second local oscillator at 10.240MHz. The detector output provides reverse AGC to all previous stages except Q8. The AGC voltage is also amplified by IC3-4 and used to drive RF attenuator Q1, squelch amp IC3-2 and LED amp IC2.

Indicators

Two additional wafers on the selector switch provide appropriate voltage to a two digit seven segment LED display which indicates the selected channel.

When receiving: The AGC voltage is amplified at IC3-4 and its output is fed to pin 8 of signal indicator IC 2. LD204 will light depending on the strength of the signal.

When transmitting: The "PI" network is coupled with C68. The output voltage is rectified by D6 and supplied to pin 8 of IC2. The transmitted RF power is indicated on LD204. When transmission power becomes 4W, 4 LEDs of LD204 will light altogether.

The modulation voltage is used to switch Q9 which drives LD202 to indicate relative modulation.

FREQUENCIES GENERATED AND MIXED TO OBTAIN EACH CHANNEL

RECEIVE

*VCO FREQUENCY = (N/2048) × REFERENCE FREQUENCY(10.240MHz)

TRANSMIT

*VCO FREQUENCY = (N/4096) × REFERENCE FREQUENCY(10.240MHz)

*TRANSMIT FREQUENCY = VCO FREQUENCY × 2

CHANNEL NUMBERS	BCD INPUT TO IC1								RECEIVE		TRANSMIT		
	IC1 PIN NUMBERS								N	VCO FREQUENCY (MHz)	N	VCO FREQUENCY (MHz)	TRANSMIT FREQUENCY (MHz)
	8	7	6	5	4	3	2	1					
1	1	1	1	0	1	1	1	1	3254	16.270	5393	13.4825	26.965
2	1	1	1	0	0	0	0	1	3256	16.280	5395	13.4875	26.975
3	1	1	1	0	1	0	0	1	3258	16.290	5397	13.4925	26.985
4	1	1	1	0	1	0	1	0	3262	16.310	5401	13.5025	27.005
5	1	1	1	1	1	0	0	0	3264	16.320	5403	13.5075	27.015
6	1	1	1	1	0	0	0	0	3266	16.330	5405	13.5125	27.025
7	1	1	1	0	1	1	0	0	3268	16.340	5407	13.5175	27.035
8	1	1	1	0	0	0	0	0	3272	16.360	5411	13.5275	27.055
9	1	1	1	0	1	0	0	0	3274	16.370	5413	13.5325	27.065
10	1	1	0	0	0	1	0	0	3276	16.380	5415	13.5375	27.075
11	1	1	0	0	1	1	1	1	3278	16.390	5417	13.5425	27.085
12	1	1	0	0	0	0	0	1	3282	16.410	5421	13.5525	27.105
13	1	1	0	0	1	0	0	1	3284	16.420	5423	13.5575	27.115
14	1	1	0	0	1	0	1	0	3286	16.430	5425	13.5625	27.125
15	1	1	0	1	1	0	0	0	3288	16.440	5427	13.5675	27.135
16	1	1	0	1	0	0	0	0	3292	16.460	5431	13.5775	27.155
17	1	1	0	0	1	1	0	0	3294	16.470	5433	13.5825	27.165
18	1	1	0	0	0	0	0	0	3296	16.480	5435	13.5875	27.175
19	1	1	0	0	1	0	0	0	3298	16.490	5437	13.5925	27.185
20	0	0	1	0	0	1	0	1	3302	16.510	5441	13.6025	27.205
21	1	0	1	0	0	0	0	1	3304	16.520	5443	13.6075	27.215
22	1	0	1	0	0	0	0	1	3306	16.530	5445	13.6125	27.225
23	1	0	1	0	1	0	0	1	3312	16.560	5451	13.6275	27.255
24	1	0	1	0	1	0	1	0	3308	16.540	5447	13.6175	27.235
25	1	0	1	1	1	0	0	0	3310	16.550	5449	13.6225	27.245
26	1	0	1	1	0	0	0	0	3314	16.570	5453	13.6325	27.265
27	1	0	1	0	1	1	0	0	3316	16.580	5455	13.6375	27.275
28	1	0	1	0	0	0	0	0	3318	16.590	5457	13.6425	27.285
29	1	0	1	0	1	0	0	0	3320	16.600	5459	13.6475	27.295
30	1	0	0	0	0	1	0	0	3322	16.610	5461	13.6525	27.305
31	1	0	0	0	1	1	1	1	3324	16.620	5463	13.6575	27.315
32	1	0	0	0	0	0	0	1	3326	16.630	5465	13.6625	27.325
33	1	0	0	0	1	0	0	1	3328	16.640	5467	13.6675	27.335
34	1	0	0	0	1	0	1	0	3330	16.650	5469	13.6725	27.345
35	1	0	0	1	1	0	0	0	3332	16.660	5471	13.6775	27.355
36	1	0	0	1	0	0	0	0	3334	16.670	5473	13.6825	27.365
37	1	0	0	0	1	1	0	0	3336	16.680	5475	13.6875	27.375
38	1	0	0	0	1	0	0	0	3338	16.690	5477	13.6925	27.385
39	1	0	0	0	1	0	0	0	3340	16.700	5479	13.6975	27.395
40	0	1	0	0	0	1	0	0	3342	16.710	5481	13.7025	27.405

ALIGNMENT PROCEDURES

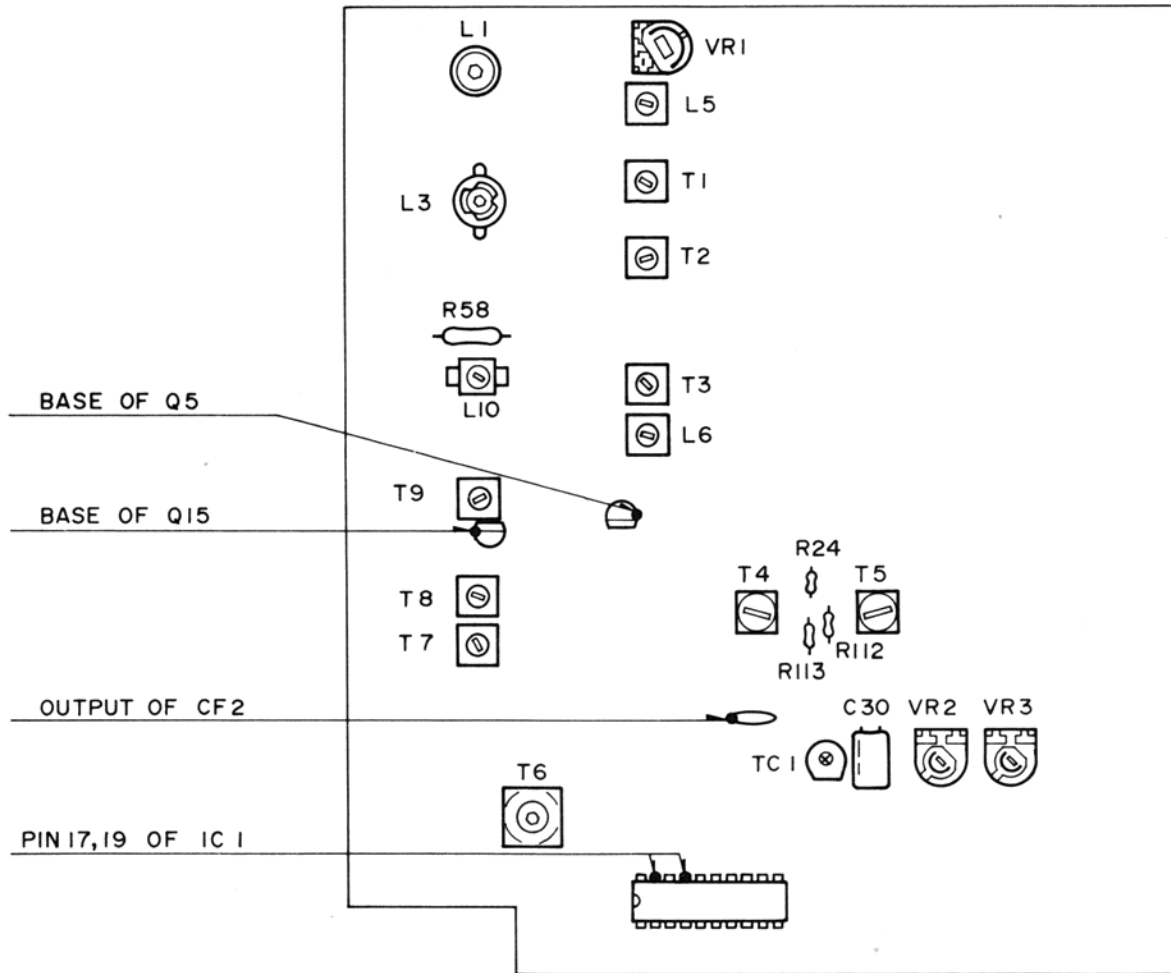


Figure 1

A. PLL SECTION

1. Test Equipment Required

- Frequency Counter
- DC Voltmeter (about 100k ohm)
- DC Power Supply (13.8V, 2.5 Amp)

NOTE: Figure 1 provides all alignment location information.

2. Test Set-up

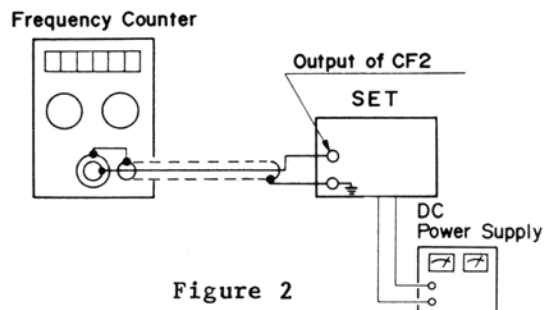


Figure 2

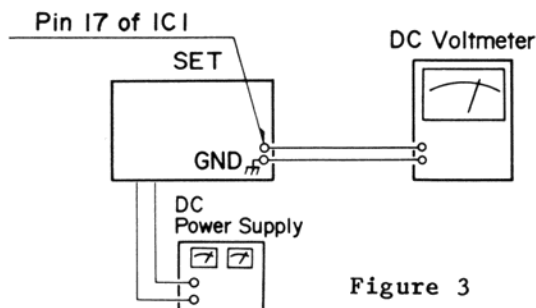


Figure 3

3. Alignment Procedure

STEP	CONTROL SETTING	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
1	Alignment of Ref. Osc.			
	Mic: Receive Power: On Volume: Optional Squelch: Optional Channel Selector: Channel 19 CB-PA SW: CB ANL SW: Optional	Connect Frequency Counter to output of CF2. (Figure 2)	TC1	Adjust for 10.240 MHz ± 100 Hz Indication on Frequency Counter.
2	Alignment of VCO			
	Mic: Transmit Power: On Volume: Optional Squelch: Optional Channel Selector: Channel 40 CB-PA SW: CB ANL SW: OUT	Connect DC Voltmeter to pin 17 of IC1. (Figure 3)	T6	Adjust for 4.5V indication on DC Voltmeter.
3	Mic: Receive Power: On Volume: Optional Squelch: Optional Channel Selector: Channel 1 CB-PA SW: CB ANL SW: Optional	Same as step 2.	Check the indication on DC Voltmeter (must be 2.5-3.5V). If DC Voltmeter does not indicate 2.5-3.5V, readjust T6 and return to step 2.	

B. TRANSMITTER SECTION

1. Test Equipment Required

- | | |
|------------------------------------|-------------------------|
| a. RF Power Meter | e. Field Strength Meter |
| b. 50 ohm Load (non-inductive) | (or Spectrum Analyzer) |
| c. RF Voltmeter | f. Frequency Counter |
| d. DC Power Supply(13.8V, 2.5 Amp) | g. Coupler |

NOTE: Figure 1 provides test point and all alignment location information.

2. Test Set-up

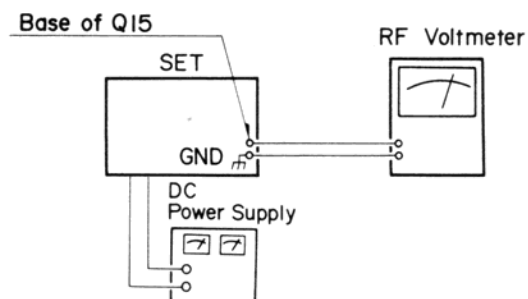


Figure 4

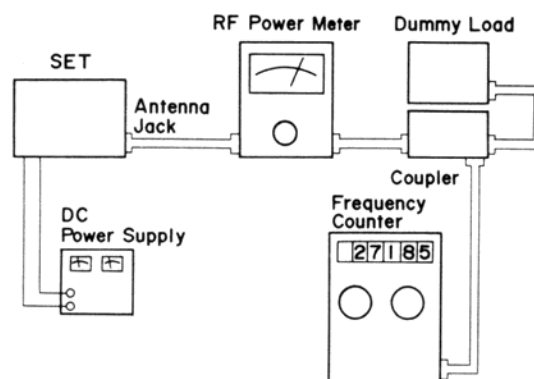


Figure 5

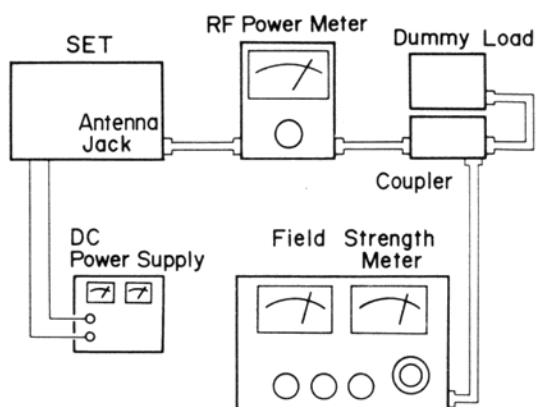


Figure 6

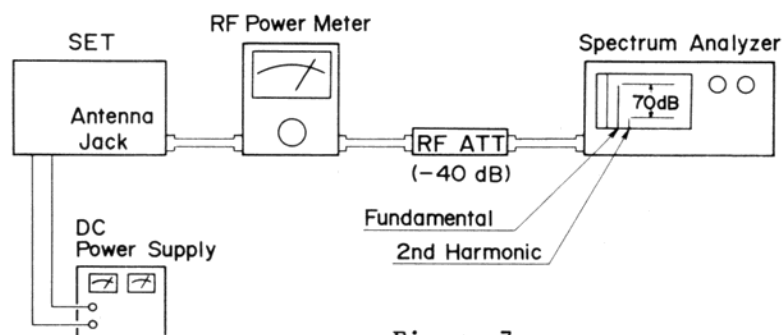


Figure 7

3. Alignment Procedure

STEP	CONTROL SETTING	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
1	Set Channel Selector to Channel 19.			
2	Disconnect R58.			
3	Alignment of Predriver Stage			
		Connect RF Voltmeter to base of Q15. (Figure 4)	T7, T8	Adjust for maximum indication on RF Voltmeter.
4	Be sure that the level difference between Channel 1 and Channel 40 is within 30mV on RF Voltmeter. Be sure that the levels on Channel 1 to Channel 40 are above 650mV on RF Voltmeter. If the level difference is over 30mV or the level is below 650mV, repeat step 3 as necessary to obtain maximum output.			
5	Re-connect R58.			
6	Set Channel Selector to Channel 19.			
7	Alignment of Driver and Final Stage			
		Connect Dummy Load and Frequency Counter through Coupler to RF Power Meter. Connect RF Power Meter to EXT. ANT. Jack on Set. (Figure 5)	T9, L1 L10 L3	Adjust for maximum indication on RF Power Meter. Adjust for 4W indication on RF Power Meter.
8		Same as step 7	Check that RF output power is 3.8 to 4.2W on all channels with no modulation. If it is not within the above range, go back steps 3 through 7 and readjust. If still improper change R58 value.	

STEP	CONTROL SETTING	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
9		Connect Dummy Load and Field Strength Meter through Coupler to RF Power Meter. Connect RF Power Meter to EXT. ANT. Jack on Set. (Figure 6) Tune to 2nd harmonic frequency (54.37MHz) on Field Strength Meter. Or Connect Spectrum Analyzer and RF Power Meter to EXT. ANT. Jack on Set. (Figure 7)		Check level of fundamental and 2nd harmonic frequency (54.37MHz). Check suppression of 2nd harmonic frequency (54.37MHz) compared to fundamental (must be better than 60dB). Check all channels and if necessary, make sure that is more than -60dB on all channels with no modulation. (Reference: -70dB)
Alignment of Transmitter Frequency				
10	Return to Channel 19.	Same as step 8.	TC1	Make sure that the transmitter frequency is 27.185 MHz $\pm$ 400Hz on Frequency Counter. If not, readjust TC1.
Alignment of LED RF Meter				
11	Same as step 10.	Same as step 10.	VR1	Adjust for fourth LED on S/RF LED Meter lights.

C. RECEIVER SECTION

1. Test Equipment Required

- | | |
|------------------------|--------------------------------------|
| a. RF Signal Generator | d. AF Voltmeter |
| b. RF Voltmeter | e. Dummy Load (8 ohm) |
| c. Distortion Meter | f. DC Power Supply (13.8V, 2.5 Amp.) |

2. General Alignment Conditions

- Signal input must be kept as low as possible, to avoid overload and clipping. (Use highest possible sensitivity of output indicator.)
- Standard modulation is 1000Hz at 30% amplitude.
- A non-metallic alignment tool must be used all for adjustments.
- Power Supply is adjusted for 13.8V DC, 2A.

NOTE: Figure 1 provides all alignment location information.

3. Test Set-up

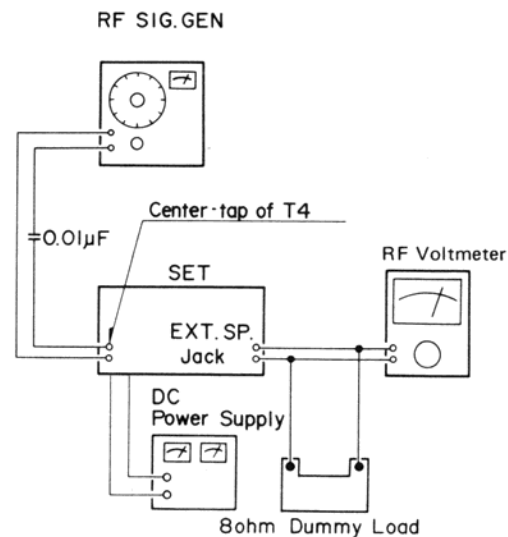
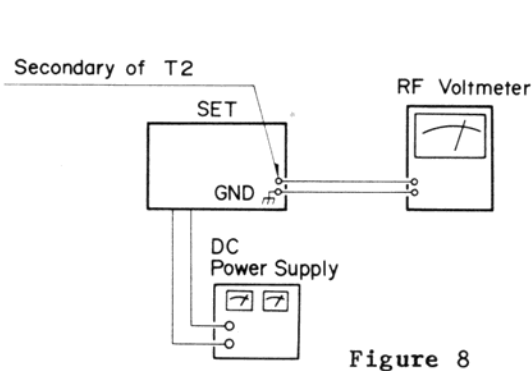


Figure 9

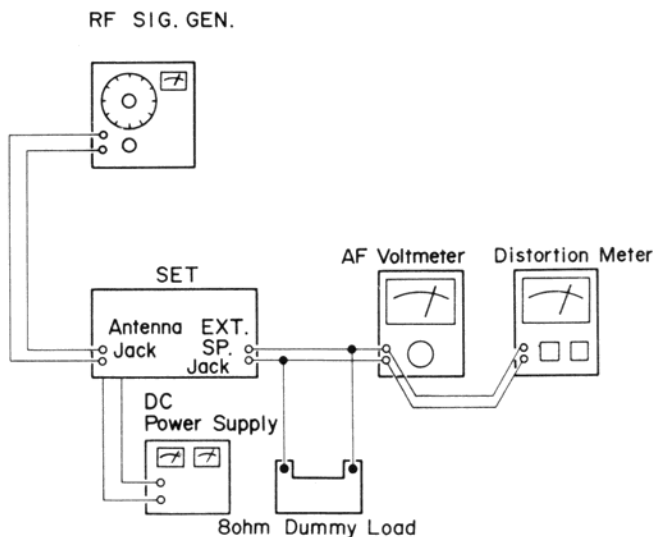


Figure 10

4. Alignment Procedure

STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
1	Set Channel Selector to Channel 19.			
2	Turn VR203 (SQUELCH) fully counterclockwise.			
3	Set ANL Switch to OUT and CB-PA Switch to CB.			
4	Turn VR201/2 (VOLUME) fully clockwise.			
5	Alignment of 1st Local OSC			
		Connect RF Voltmeter to secondary of T2. (Figure 8)	L6	Adjust for maximum output.
6	Alignment of 2nd IF			
	Connect RF Signal Generator (455kHz, 30%) to center-tap of T4 through 0.01 μ F capacitor. (Figure 9)	Connect RF Voltmeter across EXT. Speaker Jack with 8 ohm dummy load. (Figure 9)	T4, T5	Adjust for maximum output.
7	Alignment of Overall			
	1) Set RF Signal Generator: 1mV at 1kHz, 80% mod. 2) Audio output from RF Signal Generator is 500mW.	1) Connect RF Signal Generator to Ant. Connector. 2) Connect AF Voltmeter and Distortion Meter across Ext. Speaker Jack with 8 ohm dummy load. (Figure 10)	L5, T1, T2, T3, T4	Adjust for maximum indication on Voltmeter.
8	Repeat step 7 as necessary to obtain maximum output.			
9	Alignment of T5			
	Same as step 7.	Same as step 7.	T5	Adjust for minimum indication on Distortion Meter.
10	Alignment of IF Gain			
	Set RF Signal Generator to 0.25 μ V (-12dB) output, at 1kHz 30% Mod.	Same as step 7.	R24, R112, R113	Choose the value of combination of R24, R112 and R113 to obtain 50mW audio output. (Table 1)

STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
Alignment of Squelch				
11	Set RF Signal Generator to 1mV (60dB) output. SQUELCH: Fully clockwise	Same as step 7.	VR3	Turn VR3 so that audio output is on.
Alignment of LED S/RF Meter				
12	Set RF Signal Generator to 50 μ V (34dB) output.	Same as step 7.	VR2	Adjust VR2 for the fourth LED on S/RF Meter lights.
13	Check the five LEDs light at the input of 2-100mV.			

	R112	R113	R24	TOTAL VALUES
1	22	--	--	22
2	--	6.8	--	6.8
3	--	--	8.2	8.2
4	22	6.8	--	28.8
5	22	--	8.2	30.2
6	--	6.8	8.2	15
7	22	6.8	8.2	37

Table 1

TROUBLESHOOTING HINTS

SYMPTOM	CAUSE	REMEDY
A. Unit will not turn on	1. Defective power switch SW1. 2. Fuse blown. 3. Broken DC power cable. 4. Poor solder connection or other open connection in power circuit.	Replace. Replace. Replace. Repair or replace.
B. Won't receive sound	1. Defective external speaker jack. 2. Poor contact on microphone connector. 3. Defective push switch on microphone. 4. Defective internal speaker. 5. Defective Q1-Q8 circuit. 6. Check the PLL circuit and defective component(s) in PLL and VCO circuit.	Repair or replace. Repair as required. Repair or replace microphone. Replace. Replace the defective component(s). Replace the defective component(s).
C. No noise from speaker	1. Measure transistor & IC voltages in all audio stages and receiver section. Compare with voltages noted on the IC & Transistor Voltage Chart. 2. Improper local oscillator adjustment. 3. Defective squelch circuit (D14, IC3, VR202 and VR3). 4. If MOD indicator is bright when power switch is on, speaker circuit is open.	Re-adjust. Replace the defective component(s).
D. No transmission	1. Defective microphone. 2. Defective push switch on microphone. 3. Improper adjustment of carrier oscillator. 4. If you have checked all channels and obtain no RF output, check VCO and/or signal track through transmitter circuit. 5. Defective CB-PA switch (SW202-b). 6. Defective antenna connector. 7. Defective Q14-Q17 circuit.	Repair or replace the microphone. Replace. Re-adjust. Replace. Replace. Replace the defective component(s).

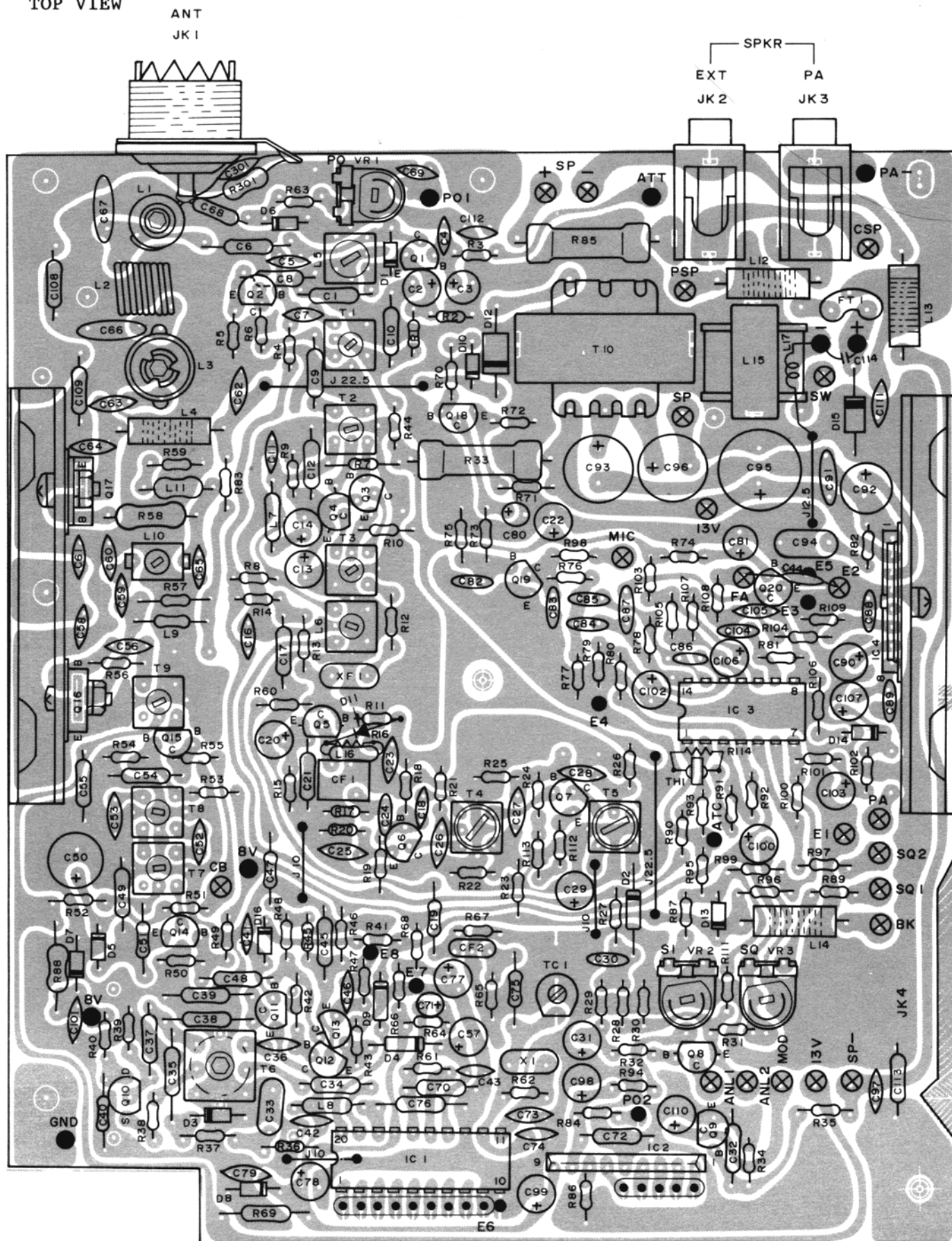
SYMPTOM	CAUSE	REMEDY
E. No modulation	1. Defective microphone. 2. Poor audio output/defective modulator. 3. Defective microphone amplifier (IC3 and IC4). 4. Defective microphone connector. 5. Defective AMC circuit (Q18, Q19, D10 and D12).	Repair or replace. Replace the defective component(s). Replace the defective component(s). Replace. Replace the defective component(s).
F. No squelch	1. Defective IC3, VR3 and VR203 circuit. 2. Improper adjustment of VR3.	Replace the defective component(s). Re-adjust.
G. Meter does not operate but CB operate normally	1. Defective LD204. 2. Defective IC2 and IC3. 3. Defective D6, VR1 or VR2.	Replace. Replace. Replace the defective component(s).
H. Modulation indicator does not light	1. Defective LD202 or Q9. 2. Check the modulation.	Replace the defective component(s). Refer to "E. No modulation".

/

MEMO

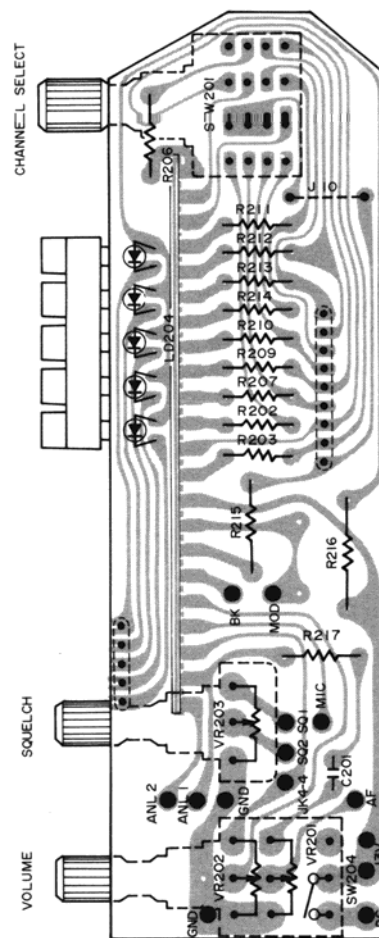
MAIN PCB
TOP VIEW

PRINTED CIRCUIT BOARD (TOP & BOTTOM VIEWS)

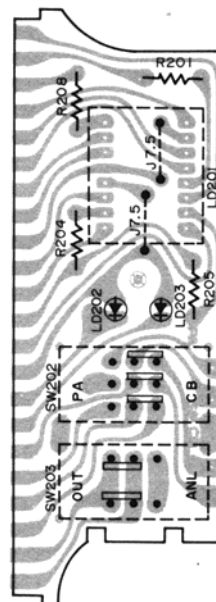


LED PCB

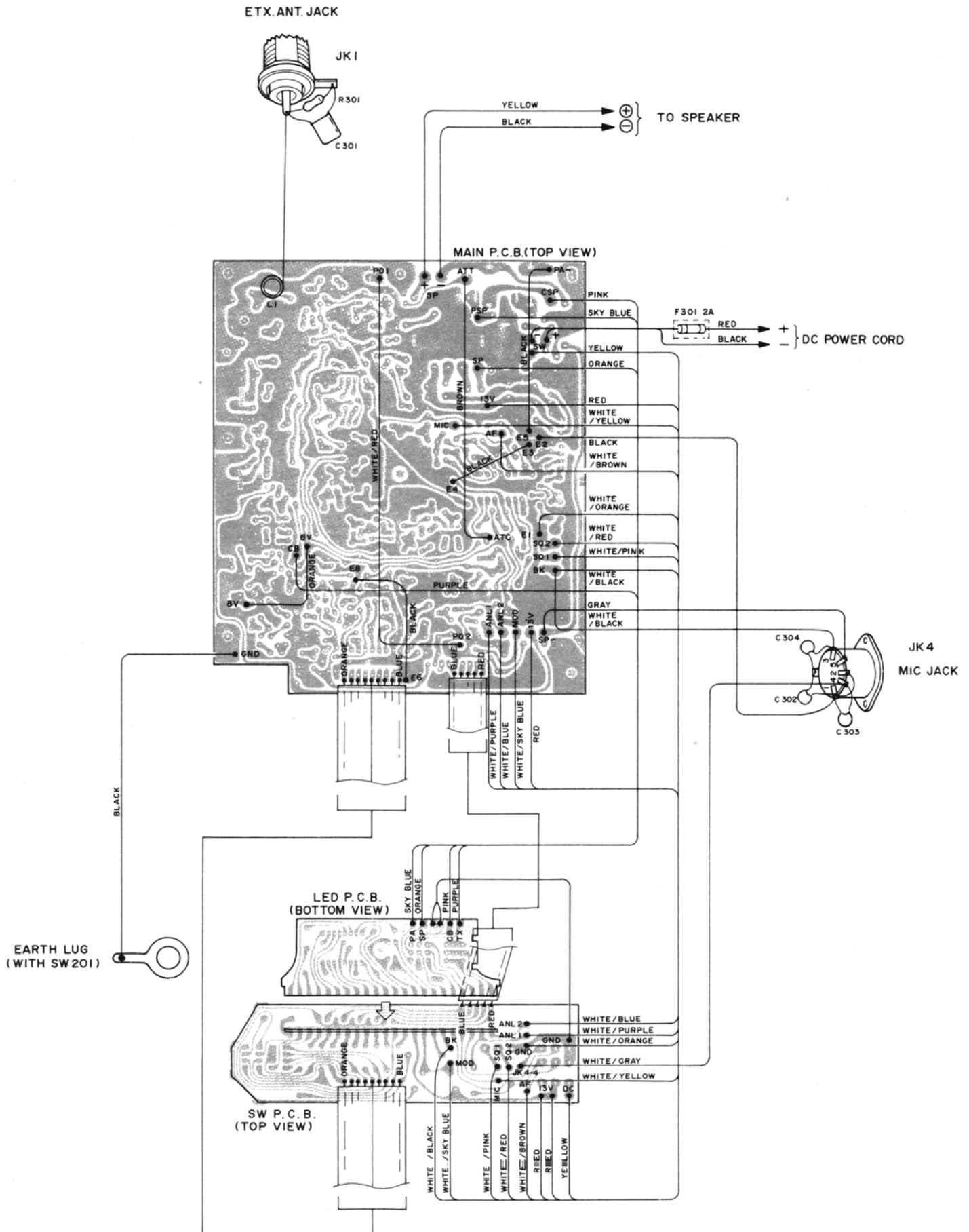
BOTTOM VIEW



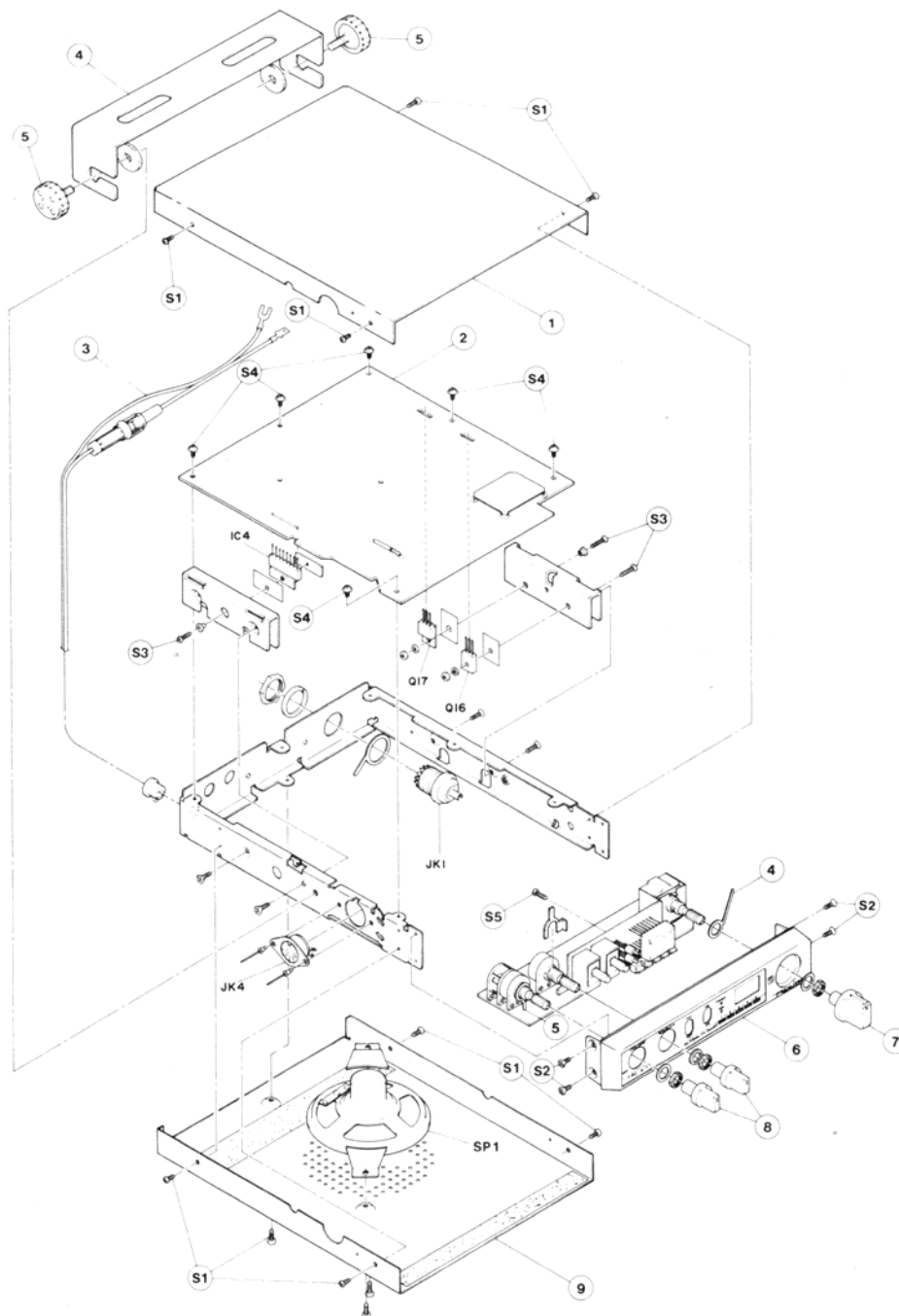
BOTTOM VIEW



WIRING DIAGRAM



EXPLODED VIEW/DISASSEMBLY INSTRUCTIONS



DISASSEMBLY INSTRUCTIONS

To Remove Cabinet:

Remove 9 screws (S1) from the top and bottom cabinets.

To Remove PCB:

Remove 3 screws (S3) from the heat sink.

Remove 6 screws (S4) from the main PCB.

Unsolder some parts from the Ant. Jack and Din Jack.

Remove 4 screws (S2) from the front PCB assembly.

Remove 1 screw (S5) and 3 VR nuts from the front PCB assembly.

CAUTION: Some wires are attached to the bottom cover.

ELECTRICAL PARTS LIST

CAPACITORS						
Ref. No.	Description				RS Part No.	Mfr's Part No.
C1	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C2	Electrolytic	22 μ F	25V	+ -20%	CC-226MFAP	CEACI226M*
C3	Electrolytic	4.7 μ F	25V	+ -20%	CC-475MFAP	CEACI475M*
C4	Ceramic	0.01 μ F	25V	+ -10%	CC-103KFCP	CGJXI103KT or
					CC-103KFCP	CGJHI103KK
C5	Mica	22pF	50V	+ -5%	CC-220JJWP	CMQFK220J*
C6	Ceramic N220	33pF	50V	+ -5%		CCBVK330JT
C7	Ceramic NPO	1pF	50V+ -0.25pF		CF-1010	CCJBK1R0CT
C8	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C9	Ceramic	1.5pF	50V	+ -10%		CCBVK1R5MT
C10	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C11	Ceramic	1000pF	25V	+ -10%	CC-102KFCP	CGJXI102KT or
					CC-102KFCP	CGJHI102KK
C12	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C13	Electrolytic	22 μ F	25V	+ -20%	CC-226MFAP	CEACI226M*
C14	Electrolytic	3.3 μ F	50V	+ -20%	CC-335MJAP	CEACK335M*
C15	Not used					
C16	Ceramic	0.01 μ F	25V	+ -10%	CC-103KFCP	CGJXI103KT or
					CC-103KFCP	CGJHI103KK
C17	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C18	Ceramic NPO	1pF	50V+ -0.25pF		CF-1010	CCJBK1R0CT
C19	Ceramic	22pF	50V	+ -5%	CC-220JJCA	CCBVK220JT
C20	Electrolytic	22 μ F	25V	+ -20%	CC-226MFAP	CEACI226M*
C21	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C22	Electrolytic	33 μ F	16V	+ -20%		CEACG336M*
C23	Ceramic	0.022 μ F	25V	+ -10%	CC-223KFCP	CGJXI223KT or
					CC-223KFCP	CGJHI223KK
C24	Mylar*	1000pF	50V	+ -10%	CC-102KJMP	CQQMK102K*
C25-28	Ceramic	0.047 μ F	25V	+ -10%	CC-473KFCP	CGJXI473KT or
					CC-473KFCP	CGJHI473KK
C29	Electrolytic	10 μ F	25V	+ -20%	CC-106MFAP	CEACI106M*
C30	Mylar	4700pF	50V	+ -10%	CC-472KJMP	CQQMK472K*
C31	Electrolytic	1 μ F	50V	+ -20%	CC-105MJAP	CEACK105M*
C32	Ceramic	1000pF	50V	+ -10%	CC-102KJCA	CKBEK102KT
C33	Mylar	0.047 μ F	50V	+ -10%	CC-473KJMP	CQQMK473K*
C34	Ceramic	100pF	50V	+ -5%	CC-101JJCA	CCBVK101JT
C35	Ceramic	82pF	50V	+ -5%	CC-820JJCA	CCAHK820JT
C36	Ceramic	10pF	50V	+ -1%	CF-1515	CCJVK100F*
C37	Ceramic NPO	47pF	50V	+ -5%	CF-1360	CCBBK470JT
C38	Ceramic	68pF	50V	+ -5%	CC-680JJCA	CCAHK680JT
C39	Ceramic	75pF	50V	+ -5%	CC-750JJCA	CCAHK750JT
C40	Ceramic	0.01 μ F	25V	+ -30%	CC-103NFCA	CGBXI103NT
C41/42	Ceramic	0.01 μ F	25V	+ -10%	CC-103KFCP	CGJXI103KT or
					CC-103KFCP	CGJHI103KK

NOTE: *Mylar is a registered trademark of E. I. Du Pont de Nemours and Company.

Ref. No.	Description					RS Part No.	Mfr's Part No.
C43	Ceramic	0.01μF	25V	+-10%		CC-103KFCEP CC-103KFCEP	CGJXI103KT or CGJHI103KK
C44	Mylar	0.01μF	50V	+-10%		CC-103KJMP	CQQMK103K*
C45	Ceramic	0.01μF	25V	+-30%		CC-103NFCA	CGBXI103NT
C46	Ceramic	0.01μF	25V	+-10%		CC-103KFCEP CC-103KFCEP	CGJXI103KT or CGJHI103KK
C47	Ceramic	22pF	50V	+-5%		CC-220JJCA	CCBVK220JT
C48	Ceramic	220pF	50V	+-10%		CC-221KJCA	CKBEK221KT
C49	Ceramic	0.01μF	25V	+-30%		CC-103NFCA	CGBXI103NT
C50	Electrolytic	100μF	16V	+-20%		CC-107MDAP	CEACG107M*
C51	Ceramic	0.01μF	25V	+-30%		CC-103NFCA	CGBXI103NT
C52	Ceramic NPO	7pF	50V+-0.5pF			CF-1115	CCJBK7ROD*
C53	Ceramic NPO	100pF	50V	+-10%		CF-1424	CCJBK101K*
C54/55	Ceramic	0.01μF	25V	+-30%		CC-103NFCA	CGBXI103NT
C56	Ceramic	220pF	50V	+-5%		CC-221JJCP	CKVK221J*
C57	Electrolytic	47μF	10V	+-20%			CEACE476M*
C58	Ceramic	0.01μF	25V	+-10%		CC-103KFCEP CC-103KFCEP	CGJXI103KT or CGJHI103KK
C59	Mica	33pF	50V	+-5%		CC-330JJWP	CMQFK330J*
C60	Mica	68pF	50V	+-5%		CC-680JJWP	CMQFK680J*
C61	Ceramic	0.01μF	25V	+-10%		CC-103KFCEP CC-103KFCEP	CGJXI103KT or CGJHI103KK
C62	Ceramic	4700pF	50V	+-10%		CC-472KJCP	CKJEK472K*
C63	Mica	100pF	50V	+-5%		CC-101JJWP	CMQFK101J*
C64	Mica	68pF	50V	+-5%		CC-680JJWP	CMQFK680J*
C65	Mica	47pF	50V	+-5%		CC-470JJWP	CMQFK470J*
C66/67	Mica	330pF	50V	+-5%		CC-331JJWP	CMQFK331J*
C68	Ceramic	1pF	50V	+-20%		CC-010MJCA	CCBVK1ROMT
C69	Ceramic	0.01μF	25V	+-10%		CC-103KFCEP CC-103KFCEP	CGJXI103KT or CGJHI103KK
C70	Ceramic	4700pF	50V	+-30%		CC-472NJCA	CGBXK472NT
C71	Tantalum	0.68μF	35V	+-10%		CC-684KGTP	CSEEB684K*
C72	Ceramic	0.01μF	25V	+-30%		CC-103NFCA	CGBXI103NT
C73	Ceramic NPO	68pF	50V	+-5%		CF-1987	CCJBK680J*
C74	Ceramic NPO	22pF	50V	+-5%		CF-1245	CCJBK220J*
C75	Ceramic NPO	10pF	50V	+-5%		CF-1893	CCBBK100JT
C76	Ceramic	0.022μF	16V	+-30%		CC-223NDCA	CGBUG223NT
C77/78	Electrolytic	47μF	10V	+-20%			CEACE476M*
C79	Ceramic	0.022μF	25V	+-10%		CC-223KFCEP CC-223KFCEP	CGJXI223KT or CGJHI223KK
C80	Tantalum	47μF	3.15V	+-20%		CC-476MATP	CSEEB476M*
C81	Electrolytic	1μF	50V	+-20%		CC-105MJAP	CEACK105M*
C82	Mylar	4700pF	50V	+-10%		CC-472KJMP	CQQMK472K*
C83	Mylar	1000pF	50V	+-10%		CC-102KJMP	CQQMK102K*
C84	Mylar	1800pF	50V	+-10%		CC-182KJMP	CQQMK182K*
C85	Mylar	0.027μF	50V	+-10%			CQQMK273K*
C86	Mylar	1000pF	50V	+-10%			CQQMK102K*
C87	Mylar	0.022μF	50V	+-10%		CC-223KJMP	CQQMK223K*
C88/89	Mylar	4700pF	50V	+-10%		CC-472KJMP	CQQMK472K*
C90	Tantalum	3.3μF	25V	+-10%			CSEEB335K*
C91	Mylar	0.047μF	50V	+-10%		CC-473KJMP	CQQMK473K*
C92	Electrolytic	100μF	10V	+-20%			CEACE107M*
C93	Electrolytic	330μF	10V	+-20%		CC-337MCAP	CEACE337M*
C94	Mylar	0.1μF	50V	+-10%		CC-104KJMP	CQQMK104K*
C95	Electrolytic	1000μF	16V	+-20%		CC-108MDAP	CEACG108M*
C96	Electrolytic	220μF	16V	+-20%		CC-227MDAP	CEACG227M*

Ref. No.	Description				RS Part No.	Mfr's Part No.
C97	Ceramic	3300pF	25V	+-10%	CC-332KFCP	CGJXI332KT or
					CC-332KFCP	CGJHI332KK
C98	Electrolytic	1μF	50V	+-20%	CC-105MJAP	CEACK105M*
C99	Electrolytic	10μF	25V	+-20%	CC-105MJAP	CEACI106M*
C100	Electrolytic	47μF	10V	+-20%		CEACE476M*
C101	Ceramic	0.022μF	25V	+-10%	CC-223KFCP	CGJXI223KT or
					CC-223KFCP	CGJHI223KK
C102	Electrolytic	10μF	25V	+-20%	CC-106MFAP	CEACI106M*
C103	Electrolytic	47μF	10V	+-20%		CEACE476M*
C104	Mylar	0.01μF	50V	+-10%	CC-103MJMP	CQQMK103K*
C105	Ceramic	150pF	50V	+5%		CCKVK151J*
C106	Electrolytic	47μF	10V	+-20%		CEACE476M*
C107	Electrolytic	1μF	50V	+-20%	CC-105MJAP	CEACK105M*
C108/109	Ceramic	0.01μF	25V	+-30%	CC-103NFCA	CGBXI103NT
C110	Electrolytic	33μF	16V	+-20%		CEACG336M*
C111	Ceramic	0.047μF	25V	+-10%	CC-473KFCP	CGJXI473KT or
					CC-473KFCP	CGJHI473KK
C112	Ceramic	0.01μF	25V	+-10%	CC-103KFCP	CGJXI103KT or
					CC-103KFCP	CGJHI103KK
C113	Ceramic	0.01μF	25V	+-30%	CC-103NFCA	CGBXI103NT
C114	Ceramic	0.022μF	50V	+80-20%	CC-223KFCP	CKJPK223Z*
C201	Mylar	0.01μF	50V	+-10%	CC-103KJMP	CQQMK103K*
C301	Mica	220pF	50V	+5%	CC-332KFCP	CMQFK221J*
C302	Ceramic	3300pF	25V	+-10%	CC-332KFCP	CGJXI332KT or
					CC-332KFCP	CGJHI332KK
C303	Ceramic	1000pF	25V	+-10%	CC-102KFCP	CGJXI102KT or
					CC-102KFCP	CGJHI102KK
C304	Ceramic	3300pF	25V	+-10%	CC-332KFCP	CGJXI332KT or
						CGJHI332KK

TRIMMER CAPACITOR

Ref. No.	Description				RS Part No.	Mfr's Part No.
TC1	Trimmer	20pF			C-1446	154010220A

DIODES

Ref. No.	Description				RS Part No.	Mfr's Part No.
D1	Silicon	1SS202	Prot./Sw/Det		DX-0022	SDSI00072-
D2	Germanium	1N60	Det./AGC		DX-0161	SDGE00001- or
					DX-0161	SDGE00003-
D3	Varicap	1SV54-GJ		or	DX-1440	SDVC00015- or
		ITT310(S)			DX-1080	SDVC00005S
D4-6	Silicon	1SS202	Prot./Sw/Det		DX-0022	SDSI00072-
D7	Zener	RD8.2E-B(2)	Regulator		DX-1440	SZRD8.2EB2

Ref. No.	Description	RS Part No.	Mfr's Part No.
D8	Zener RD6.2E-B(3) Regulator	DX-1247	SZRD6.2EB3
D9-11	Silicon ISS202 Sw/Det/Comp.	DX-0022	SDSI00072-
D12	Silicon DSF10B Feeder/Prot. or	DX-0022	SDSI00092- or
	IN4002	DX-0206	SDSI00007-
D13	Germanium 1N60 Det./AGC	DX-0161	SDGE00001- or
			SDGE00003-
D14	Silicon 1SS202 Gate/Sw or	DX-0022	SDSI00072- or
	GMA-01		SDSI00097-
D15	Silicon DSF10B Feeder/Prot. or	DX-0022	SDSI00092- or
	IN4002	DX-0206	SDSI00007-
D16	Silicon 1SS202 Gate/Sw	DX-0022	SDSI00072- or
	GMA-01		SDSI00097-

LEDs AND MODULE

Ref. No.	Description	RS Part No.	Mfr's Part No.
LD201	LED Channel Display	L-1871	555010121A
LD202	Red SLP-144B	L-1868	SL-R00027-
LD203	Green SLP-244B	L-1869	SL-G00017-
LD204	5 Gang SLP-152B	L-1870	SL-R00020

FILTERS

Ref. No.	Description	RS Part No.	Mfr's Part No.
CF1	Ceramic	C-0915	392100611A
CF2	Ceramic	C-0914	392400530B
XF1	Crystal 10.695MHz or	MX-1094	392000540B or
		MX-1094	392000541A or
			392000542A or
			392000543A
FT1	Filter	C-0914	524010180A

FUSE

Ref. No.	Description	RS Part No.	Mfr's Part No.
F301	125V, 2A	HF-1274	251001150A

ICs

Ref. No.	Description	RS Part No.	Mfr's Part No.
IC1	LC7132 Linear PLL	MX-6057	SILC7132--
IC2	LB1413 Linear LED Amp	MX-5942	SILB1413--
IC3	NJM2902N Linear OP-Amp	MX-5942	SINM2902N-
IC4	MB3712(H)M Linear Power Amp	MX-4486	SIMB3712MH

CONNECTORS

Ref. No.	Description	RS Part No.	Mfr's Part No.
JK1	M-Type	J-5575	193010011A
JK2/3	3.5mm	J-0957	191201330A
JK4	DIN	J-6572	193401310B

COILS

Ref. No.	Description	RS Part No.	Mfr's Part No.
L1	Filter 0.3 μ H	CA-9617	143310300A
L2	Air Filter	CA-9618	141110210A
L3	Filter 27MHz	CA-9132	143301570A
L4	Inductor 0.4 μ H	CA-9619	142310100A
L5	Antenna 27MHz	CA-3543	143100381A
L6	Filter 16MHz	CA-9620	143111150A
L7	Inductor 100 μ H	ACA-8339	142011510A
L8/9	Inductor 2.2 μ H	CA-9623	142011320A
L10	Filter 50MHz	CA-5760	143302470A
L11	Inductor 0.47 μ H	CA-9621	142011240A
L12-14	Inductor 1 μ H +15%	CA-9622	142300980A
L15	Choke 0.2mH	CB-2607	144005221A
L16	Inductor 1mH		142011630A
L17	Inductor 1 μ H	CA-9134	142401560A

TRANSISTORS

Ref. No.	Description	RS Part No.	Mfr's Part No.
Q1	KTC1815(BL)NPN Sw/Amp	2SC-1815	STKC1815-B
Q2	2SC1674(L) NPN RF Amp or	2SC-1674	ST2C1674-L or
	LC1674(L)	2SC-1674	STLC1674-L
Q3/4	2SC930(D) NPN Mixer	2SC-930	ST2C930--D
Q5	2SC930(E) NPN Mixer	2SC-930	ST2C930--E
Q6/7	2SC945(P) NPN Amp/Buffer or	2SC-945	ST2C945--P or
	LC945(P)	2SC-945	STLC945--P
Q8	KTA1015(GR)PNP Gate/Sw/Comparator	MX-4373	STKA1015-G
Q9	KTC1815(Y) NPN Sw/Amp	2SC-1815	STKC1815-Y
Q10	2SK246(GR) FET	2SK-246	SF2K246--G
Q11	KTA1015(GR)PNP Gate/Sw/Comparator	MX-4373	STKA1015-G

Ref. No.	Description	RS Part No.	Mfr's Part No.
Q12	2SC945(P) NPN Amp/Buffer or LC945(P)	2SC-945 2SC-945	ST2C945--P or STLC945--P
Q13/14	KTC1815(Y) NPN Sw/Amp	2SC-1815	STKC1815-Y
Q15	KTC1815(GR)NPN Amp/Att./Sw	2SC-1815	STKC1815-G
Q16	2SC2314(E) NPN Driver	2SC-2314	ST2C2314-E
Q17	2SC2166 NPN Amp or 2SC2078(D)	2SC-2166 2SC-2166	ST2C2166-- or ST2C2078-D
Q18	KTA1015(GR)PNP Gate/Sw/Comparat	MX-4373	STKA1015-G
Q19/20	KTC1815(GR)NPN Amp/Att./Sw	2SC-1815	STKC1815-G

RESISTORS

Ref. No.	Description	RS Part No.	Mfr's Part No.
R1/2	Carbon 1.0kohm 1/6W +-5%	N-0916ECC	RC0XP102J*
R3	Carbon 470 ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R4	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R5	Carbon 1.0kohm 1/6W +-5%	N-0196ECC	RC0XP102J*
R6	Carbon 220(47-470)ohm 1/6W +-5%	N-0146ECC	RC0XP221J*
R7	Carbon 150kohm 1/6W +-5%	N-0384ECC	RC0XP154J*
R8	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R9	Carbon 150 ohm 1/6W +-5%	N-0142ECC	RC0XP151J*
R10	Carbon 220 ohm 1/6W +-5%	N-0146ECC	RC0XP221J*
R11	Carbon 330kohm 1/6W +-5%	N-0410ECC	RC0XP334J*
R12/13	Carbon 1.0kohm 1/6W +-5%	N-0196ECC	RC0XP102J*
R14	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R15	Carbon 470ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R16/17	Carbon 2.2kohm 1/6W +-5%	N-0216ECC	RC0XP222J*
R18	Carbon 470kohm 1/6W +-5%	N-0423ECC	RC0XP474J*
R19	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R20	Carbon 1.0kohm 1/6W +-5%	N-0196ECC	RC0XP102J*
R21	Carbon 470 ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R22	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R23	Carbon 33kohm 1/6W +-5%	N-0324ECC	RC0XP333J*
R24	Carbon 8.2 ohm 1/6W +-5%	N-0058ECC	RC0XP8R2J*
R25	Carbon 470 ohm 1/6W +-5%	N-0169CC	RC0XP471J*
R26	Carbon 330 ohm 1/6W +-5%	N-0159ECC	RC0XP331J*
R27	Carbon 22kohm 1/6W +-5%	N-0311ECC	RC0XP223J*
R28	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R29	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R30	Carbon 100kohm 1/6W +-5%		RC0XP104J*
R31	Carbon 390(560-220)kohm 1/6W +-5%	N-0354ECC	RC0XP394J*
R32	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R33	M-Oxide 390 ohm 2W +-5%	N-0162EHD	RX02H391J*
R34	Carbon 68kohm 1/6W +-5%	N-0354ECC	RC0XP683J*
R35	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R36	Carbon 22kohm 1/6W +-5%	N-0311ECC	RC0XP223J*
R37	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R38	Carbon 100 ohm 1/6W +-5%	N-0132ECC	RC0XP101J*
R39	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R40	Carbon 470 ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R41	Carbon 1.2kohm 1/6W +-5%	N-0199ECC	RC0XP122J*

Ref. No.	Description	RS Part No.	Mfr's Part No.
R42	Carbon 470kohm 1/6W +-5%	N-0423ECC	RC0XP474J*
R43	Carbon 2.2kohm 1/6W +-5%	N-0216ECC	RC0XP222J*
R44	Carbon 470 ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R45/46	Carbon 100(47-220)ohm 1/6W +-5%	N-0132ECC	RC0XP101J*
R47	Carbon 470 ohm 1/6W +-5%	N-016ECC	RC0XP471J*
R48	Carbon 1.0kohm 1/6W +-5%	N-0196EC	RC0XP102J*
R49	Carbon 5.6kohm 1/6W +-5%	N-0257ECC	RC0XP562J*
R50	Carbon 4.7kohm 1/6W +-5%	N-0247ECC	RC0XP472J*
R51	Carbon 330 ohm 1/6W +-5%	N-0159ECC	RC0XP331J*
R52	Carbon 220 ohm 1/6W +-5%	N-0146ECC	RC0XP221J*
R53/54	Carbon 4.7kohm 1/6W +-5%	N-0247ECC	RC0XP472J*
R55/56	Carbon 220 ohm 1/6W +-5%	N-0146ECC	RC0XP221J*
R57	Carbon 680 ohm 1/6W +-5%	N-0183ECC	RC0XP681J*
R58	Carbon 5.6(10-33)ohm 1/2W +-5%	N-0052EFC	RCSHP5R6J*
R59	Carbon 15 ohm 1/6W +-5%	N-0074ECC	RC0XP150J*
R60	Carbon 1.0kohm 1/6W +-5%	N-0196ECC	RC0XP102J*
R61	Carbon 2.2kohm 1/6W +-5%	N-0216ECC	RC0XP222J*
R62	Carbon 330kohm 1/6W +-5%	N-0410ECC	RC0XP334J*
R63	Carbon 33Kohm 1/6W +-5%	N-0324ECC	RC0XP333J*
R64	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R65	Carbon 330 ohm 1/6W +-5%	N-0159ECC	RC0XP331J*
R66	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R67	Carbon 330 ohm 1/6W +-5%	N-0159ECC	RC0XP331J*
R68	Carbon 2.2kohm 1/6W +-5%	N-0216ECC	RC0XP222J*
R69	Carbon 470 ohm 1/4W +-5%	N-0169EEC	RCSQP471J*
R70	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R71	Carbon 1.5kohm 1/6W +-5%	N-0206ECC	RC0XP152J*
R72	Carbon 470(330-1k)ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R73	Carbon 2.2kohm 1/6W +-5%	N-0216ECC	RC0XP222J*
R74	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R75	Carbon 15kohm 1/6W +-5%	N-0297ECC	RC0XP153J*
R76	Carbon 10kohm 1/6W +-5%	N-0281ECC	RC0XP103J*
R77	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R78	Carbon 82kohm 1/6W +-5%	N-0360ECC	RC0XP823J*
R79/80	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R81	Carbon 470 ohm 1/6W +-5%	N-0169ECC	RC0XP471J*
R82	Carbon 1.0 ohm 1/6W +-5%	N-0022ECC	RC0XP1R0J*
R83	Carbon 4.7 ohm 1/6W +-5%	N-0047ECC	RC0XP47J*
R84	Carbon 100kohm 1/6W +-5%	N-0371ECC	RC0XP104J*
R85	M-Film 10 ohm 2W +-5%	N-0063EHE	RM02H100J*
R86	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R87	Carbon 33kohm 1/6W +-5%		RC0XP333J*
R88	Carbon 150 ohm 1/2W +-5%	N-0142ECC	RCSHP151J*
R89	Carbon 8.2(4.7-10)kohm 1/6W +-5%	N-0271ECC	RC0XP822J*
R90	Carbon 56kohm 1/6W +-5%		RC0XP563J*
R91	Carbon 5.6kohm 1/6W +-5%		RC0XP562J*
R92	Carbon 47kohm 1/6W +-5%	N-0340ECC	RC0XP473J*
R93	Carbon 470kohm 1/6W +-5%	N-0423ECC	RC0XP474J*
R94	Carbon 100kohm 1/6W +-5%	N-0371ECC	RC0XP104J*
R95	Carbon 4.7kohm 1/6W +-5%	N-0247ECC	RC0XP472J*
R96	Carbon 1.0Mohm 1/6W +-5%	N-0445ECC	RC0XP105J*
R97	Carbon 33kohm 1/6W +-5%	N-0324ECC	RC0XP333J*

Ref. No.	Description				RS Part No.	Mfr's Part No.
R98	Carbon	2.2kohm	1/6W	+5%	N-0311ECC	RCOXP222J*
R99	Carbon	100kohm	1/6W	+5%	N-0216ECC	RCOXP104J*
R100	Carbon	1.0Mohm	1/6W	+5%	N-0445ECC	RCOXP105J*
R101/102	Carbon	4.7kohm	1/6W	+5%	N-0247ECC	RCOXP472J*
R103	Carbon	56kohm	1/6W	+5%		RCOXP563J*
R104	Carbon	330kohm	1/6W	+5%	N-0410ECC	RCOXP334J*
R105	Carbon	47kohm	1/6W	+5%	N-0340ECC	RCOXP473J*
R106	Carbon	220kohm	1/6W	+5%	N-0146ECC	RCOXP221J*
R107	Carbon	150kohm	1/6W	+5%	N-0384ECC	RCOXP154J*
R108	Carbon	47kohm	1/6W	+5%	N-0340ECC	RCOXP473J*
R109	Carbon	33kohm	1/6W	+5%	N-0324ECC	RCOXP333J*
R110	Not used					
R111	Carbon	150kohm	1/6W	+5%		RCOXP154J*
R112	Carbon	22 ohm	1/6W	+5%		RCOXP220J*
R113	Carbon	6.8ohm	1/6W	+5%		RCOXP6R8J*
R114	Carbon	3.9(4.7-22)kohm	1/6W	+5%		RCOXP392J*
R201-214	Carbon	2.2kohm	1/6W	+5%	N-0216ECC	RCOXP222J*
R215	Carbon	820 ohm	1/2W	+5%		RCSHP821J*
R216	M-Oxide	82 ohm	1W	+5%	N-0122EGD	RX01P820J*
R217	Carbon	10kohm	1/6W	+5%	N-0281ECC	RCOXP103J*
R301	Carbon	1.5kohm	1/2W	+5%	N-0206EFC	RCSHP152J*

POTENTIOMETERS

Ref. No.	Description				RS Part No.	Mfr's Part No.
VR1-3	Semi-fixed 10kB				P-6877	175206192A or 175210370A
VR201/202	Rotary	10kAx2			P-8014	171610490A
VR203	Rotary	10kB			P-8013	171210530A

SWITCHES

Ref. No.	Description				RS Part No.	Mfr's Part No.
SW201	Rotary	Channel			S-3379	181110100A
SW202	Slide	CB/PA			S-3380	183110820A
SW203	Slide	ANL			S-3332	183110690A
SW204	Rotary	Power			P-8014	171610490A
	(With VR201)					

COILS			
Ref. No.	Description	RS Part No.	Mfr's Part No.
T1	27MHz	CA-5426	143101040A
T2	27MHz	CA-5427	143101050A
T3	IFT 10.7MHz	CA-8094	133000530A
T4	IFT 455 Hz	CA-8696	131000660A
T5	IFT 455 Hz	CA-7973	131000670A
T6	VCO 16.2HMz	CA-9127	143101920A
T7/8	Filter 27.185MHz	CA-9215	143102450A
T9	Filter 27.185MHz	CA-9215	143102460A
T10	Modulation	TD-0228	10301005SA

THERMISTOR			
Ref. No.	Description	RS Part No.	Mfr's Part No.
TH1	Thermistor 23D27H		SDTH00017-

CRYSTAL			
Ref. No.	Description	RS Part No.	Mfr's Part No.
X1	10.240MHz	MX-1093	391010310A or
		MX-1093	391010140A or
			391012040A

EXPLODED VIEW PARTS LIST

Ref. No.	Description	RS Part No.	Mfr's Part No.
1	Cabinet, Top w/Insulation Sheet		
2	PCB Unit	XB-0635	U-25417A
3	Cord Ass'y, DC	W-3141	197210040A
4	Lug, Ground	HC-3940	199109290A
5	Lug, Ground	HC-3939	HAL#10500A
6	Panel Ass'y, Front	Z-8480	M-00481
	Panel, Front	Z-8480	702810020A
	Plate, Front	Z-8480	711210160A
7	Knob, Channel	K-5998	652510390A
8	Knob, Vol/Sq.	K-5936	652510400A
9	Cabinet, Bottom w/Net	Z-8481	601310840A
SP1	Speaker, D77 8ohm 2W	SP-5155	271000510A

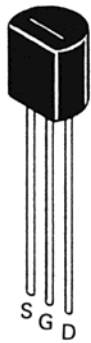
HARDWARES

Ref. No.	Description	RS Part No.	Mfr's Part No.
S1	Screw, Taptite 3x6BT-C(w/Nail)	HW-210510	HCBCA001SB
S2	Screw, 2.6x5FC		HMCOAD01SY
S3	Screw, Binding head 3x10B		HMB03001SY
S4	Screw, Polywave tap 3x6PLT-2		HQP53006SY
S5	Screw, Taptite		HCPB2608SY

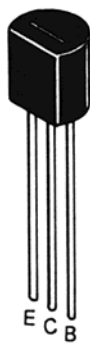
MISCELLENOUS

Ref. No.	Description	RS Part No.	Mfr's Part No.
	Microphone Unit		273000630A
(F301)	Fuse	HF-1274	251001150A

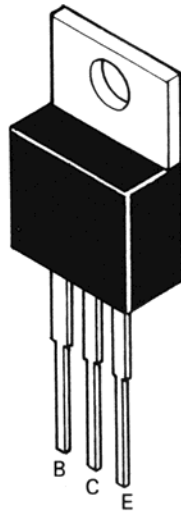
IC & TRANSISTOR LEAD IDENTIFICATION AND IC INTERNAL DIAGRAM



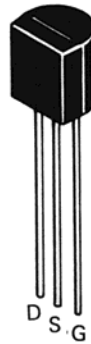
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2SC1674
2SC930
2SC945
KTA1015
LC1674
LC945



2SC2078

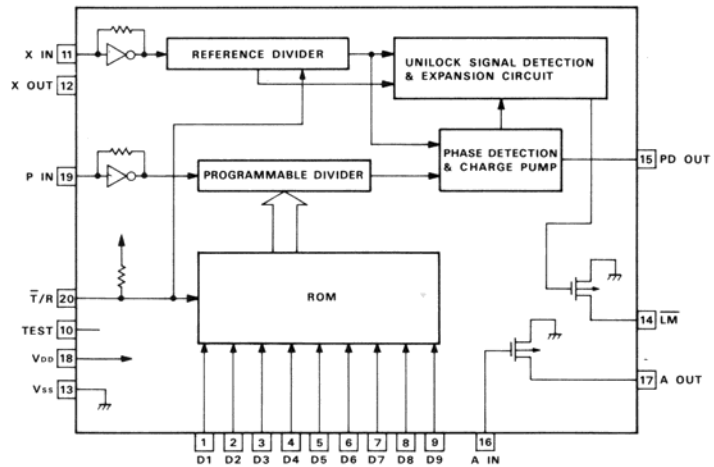
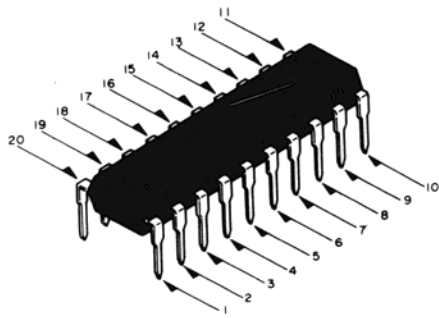


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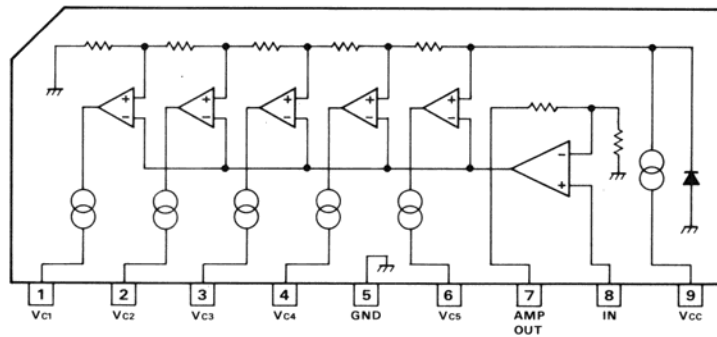
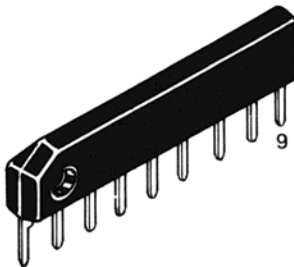


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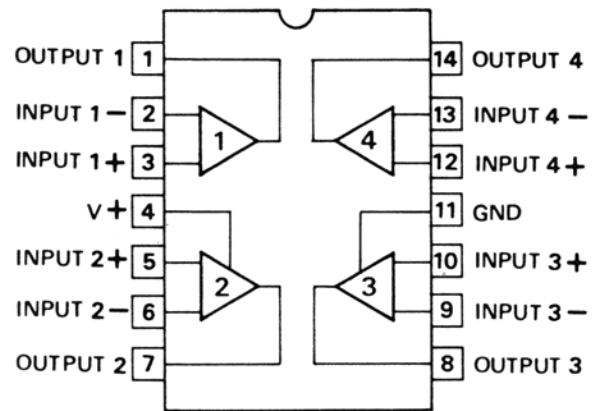
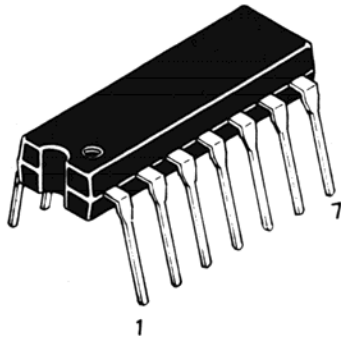
IC-1 LC7132



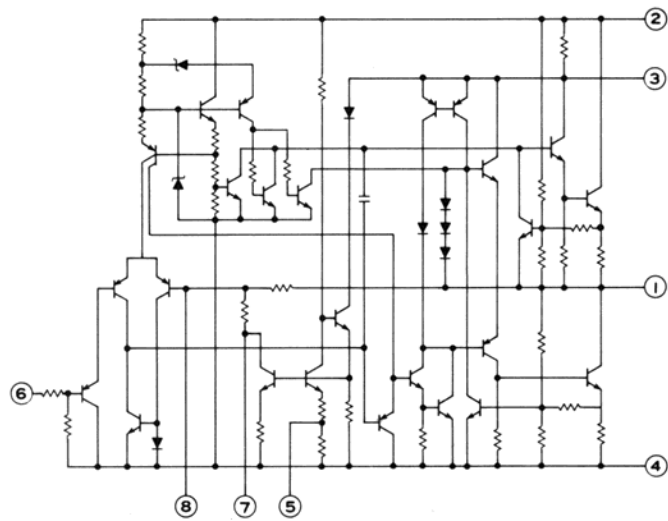
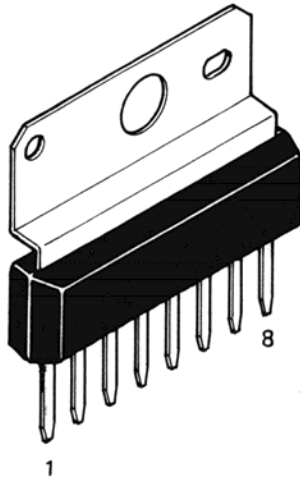
IC-2 LB1413



IC-3 NJM2902N
or LM324N



IC-4 MB3712(H)/M



IC & TRANSISTOR VOLTAGE CHART

IC Voltage Chart

IC1	PIN NO. MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	TX	0	0	0	0	0	0	11.9	11.9	0	0	3.2	3.2	3.2	1.8	1.6
	RX	0	0	0	0	0	0	12.3	12.3	0	0	3.2	3.2	0	1.8	1.7
		16	17	18	19	20										
	TX	1.6	3.8	6.3	3.3	0.5										
	RX	1.7	3.4	6.4	3.3	6.4										
IC2		1	2	3	4	5	6	7	8	9						
	TX	6.9	6.9	6.9	6.9	0	7.5	1.8	0.2	6.3						
	RX	12.3	12.3	12.3	12.3	0	12.3	0.1	0	6.4						
IC3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	TX	6.1	0.9	0.9	8.0	0	0.6	0	0	0	0	0	4.0	4.0	4.0	
	RX	0.1	0.9	0.9	8.0	3.9 0	0.9 0.9	7.0 0.7	4.0	4.0	4.0	0	4.0	4.0	4.0	
IC4		1	2	3	4	5	6	7	8							
	TX	6.9	13.4	12.8	0	0.1	0	0.6	0.6							
	RX	7.0	13.8	13.1	0	0.1	0	0.6	0.6							

NOTE: Squelch On/Off

All voltage values are indicated in volts with no signal and measured from common ground with DDM (Digital Multi Meter, 10M ohm input impedance).

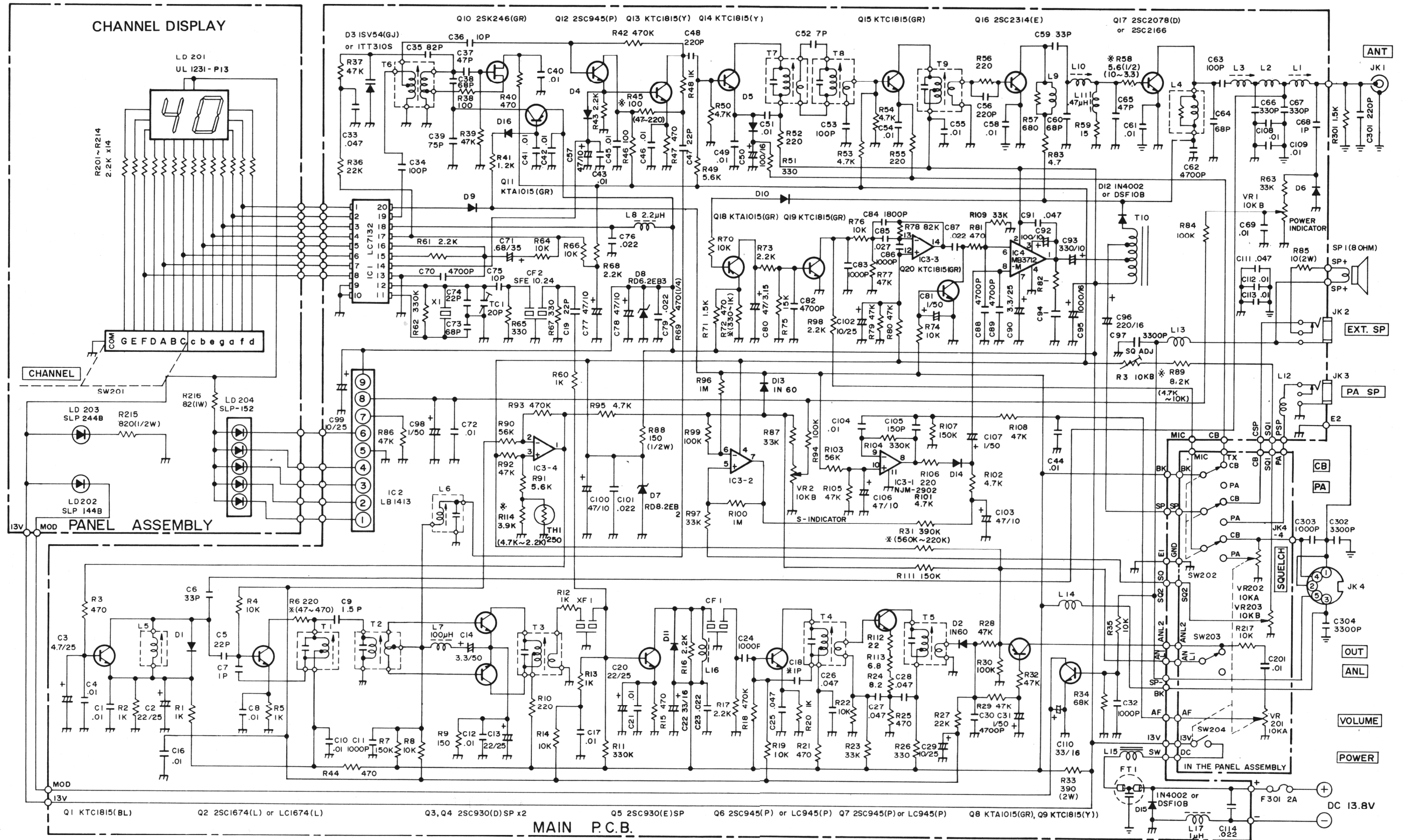
IC1 ① - ⑧ pin voltages depend on channel No.

Transistor Voltage Chart

Transistor No.	PIN MODE	E	C	B	Transistor No.	PIN MODE	E	C	B
Q1	TX	3.0	3.0	3.6	Q13	TX	1.3	4.3	2.0
	RX	3.6	3.6	0.1		RX	1.3	4.3	2.0
Q2	TX	0	1.0	0.3	Q14	TX	3.8	11.4	3.8
	RX	0.3	7.0	1.0		RX	4.5	13.8	3.9
Q3	TX	0	0	0.3	Q15	TX	4.3	13.4	4.1
	RX	0.5	8.2	1.2		RX	8.8	13.8	4.3
Q4	TX	0	0	0.3	Q16	TX	0	11.2	-0.1
	RX	0.5	8.2	1.2		RX	0	13.4	0
Q5	TX	0	0	0.3	Q17	TX	0	11.7	-0.2
	RX	0.5	8.9	1.2		RX	0	13.4	0
Q6	TX	0	0	0.3	Q18	TX	3.2	0	2.6
	RX	0.5	8.7	1.1		RX	3.3	0	2.7
Q7	TX	0	0	0	Q19	TX	0	0	0
	RX	1.4	8.0	2.0		RX	0	0	0
Q8	TX	0.65	0.65	0.17	Q20	TX	0	0	0
	RX	0.6	0.6	0.15		RX	0	0	0.7
Q9	TX	0	12.3	0					
	RX	0	12.3	0					
Q10	TX	(S)0.23	(G)0	(D)7.3					
	RX	(S)0.23	(G)0	(D)7.4					
Q11	TX	6.4	6.3	5.6					
	RX	6.4	0	5.9					
Q12	TX	2.0	8.0	2.6					
	RX	2.0	8.1	2.6					

NOTE: All voltage values are indicated in volts with no signal and measured from common ground with DMM (Digital Multimeter, 10M ohm input impedance.)

SCHEMATIC DIAGRAM



- NOTES: (1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" (K = 10^3 OHM, M = 10^6 OHM)
 (2) ALL CAPACITANCE VALUES ARE INDICATED IN " μ F" (P = 10^{-6} μ F)
 (3) NOT INDICATED DIODE ARE ISS202 or GMA-01
 (4) * : MAY VARY FROM UNIT TO UNIT FOR BEST PERFORMANCE.

