REALISTIC®

Service Manual

21-1634

TRC-205

CITIZENS BAND TRANSCEIVER

Catalog Number: 21-1634

CUSTOM MANUFACTURED FOR RADIO SHACK TC A DIVISION OF TANDY CORPORATION

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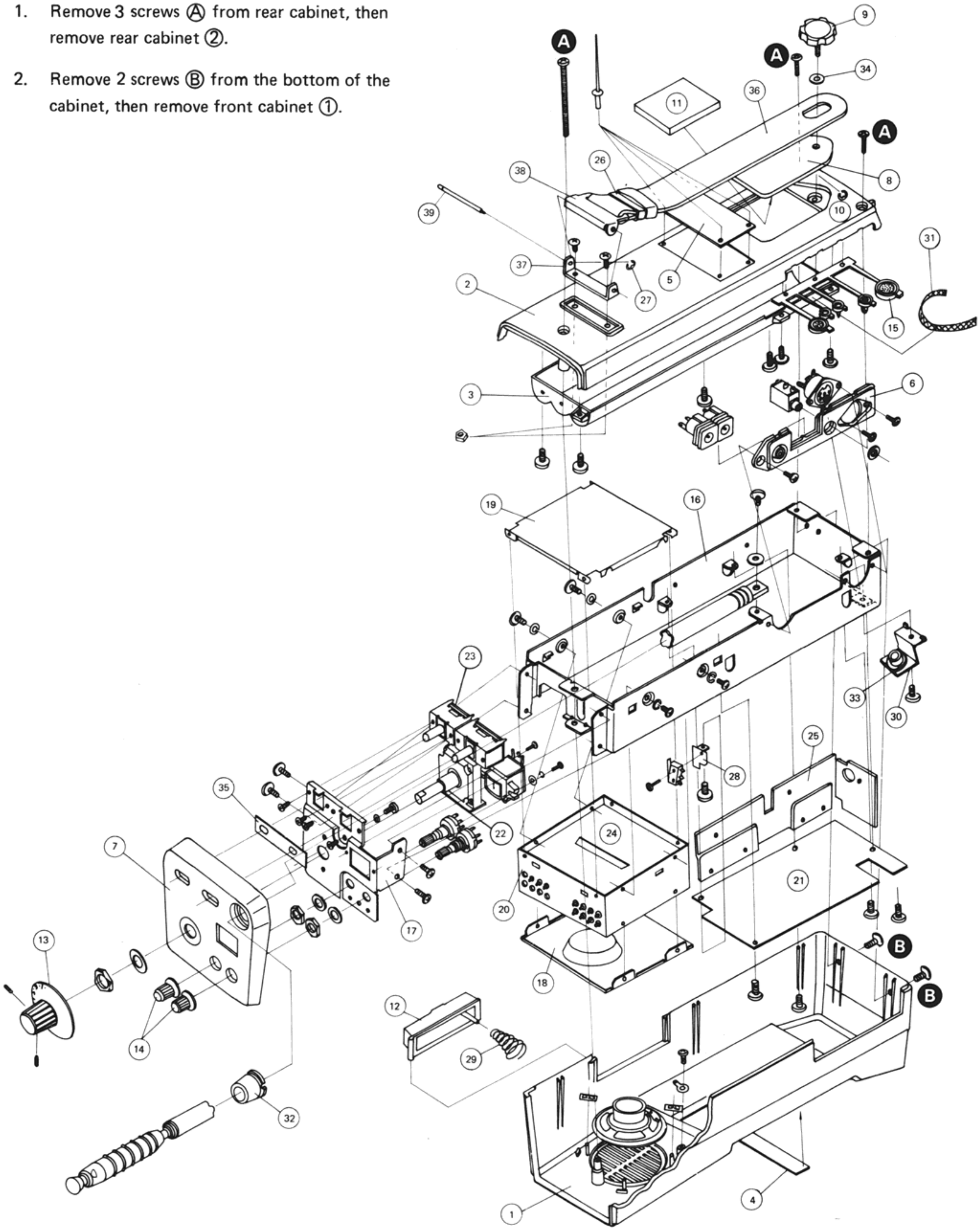
SPECIFICATIONS

RECEIVER SECTION	NOMINAL	LIMIT
Sensitivity for 10 dB (S + N) / N	0.7 μV	1.0 μV
Squelch sensitivity at threshold	0.5 μV	1.0 μV
Squelch sensitivity at tight	1000μV	250 – 2000 μV
AGC Figure of merit (input 50 mV)	80 dB	70 dB
Overall audio fidelity at 6 dB down	500 – 1900 Hz	600 – 1800 Hz
Audio output power at maximum power	3 W	2 W
Audio output power at 10% distortion	2 W	1.5 W
Spurious rejection	55 dB	50 dB
Cross modulation	55 dB	50 dB
Desensitization (± 20 kHz, 3 dB down)	55 dB	50 dB
Selectivity (± 10 kHz point)	60 dB	55 dB
Current drain at standby (squelched)	70 mA	90 mA
Current drain at maximum output	650 mA	700 mA

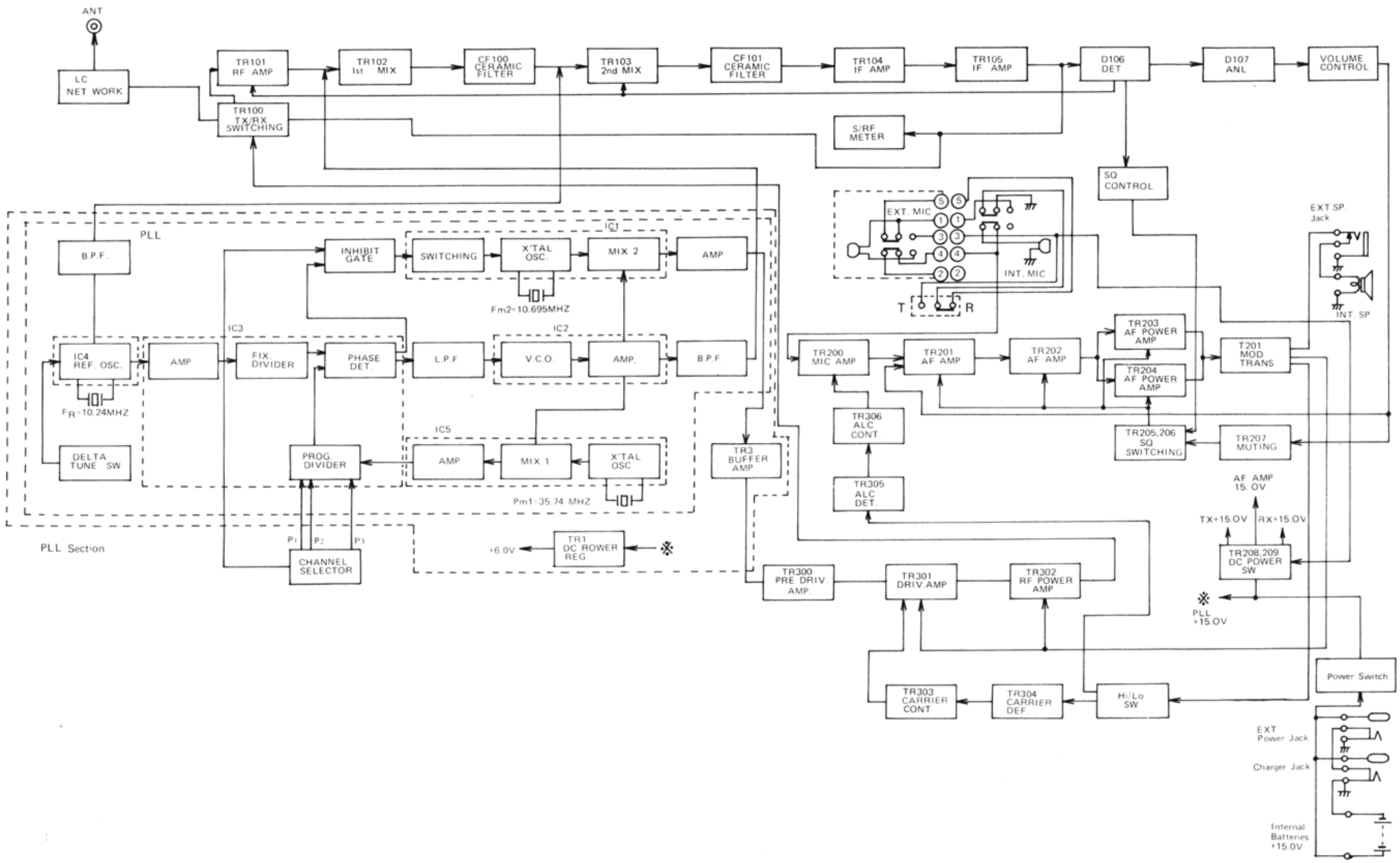
TRANSMITTER SECTION		
Frequency tolerance	±0.002%	±0.005%
RF output power on high position		
with 15 mV Mic. input	10 W PEP	8 – 12 W PEP
without modulation	0.1 W PEP	0.03 – 0.2 W PEP
RF output power on low position		
with 15 mV Mic. input	3 W PEP	1.5 – 4 W PEP
Spurious attenuation	65 dB	60 dB
AMC range	40 dB	30 dB
Mic. sensitivity for 4 W PEP RF power output	1 mV	2 mV
Modulation capability	90%	70%
Current drain		
with 15 mV Mic. input	750 mA	900 mA
without modulation	300 mA	400 mA

DISASSEMBLY INSTRUCTIONS & EXPLODED VIEW

1. Remove 3 screws Ⓐ from rear cabinet, then remove rear cabinet ②.
2. Remove 2 screws Ⓑ from the bottom of the cabinet, then remove front cabinet ①.



BLOCK DIAGRAM



ALIGNMENT OF TX CIRCUIT

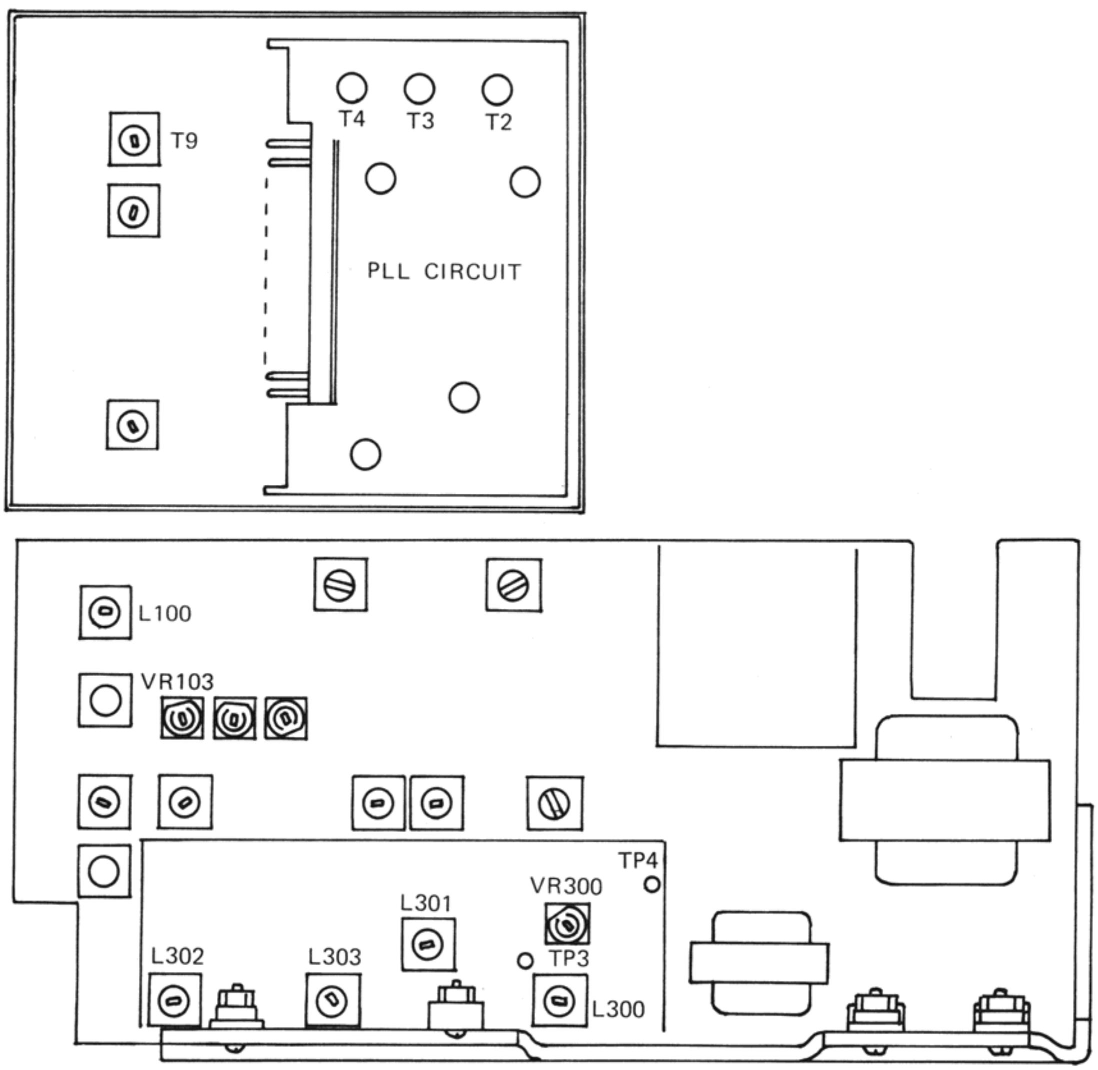
PROCEDURE

Allow test equipment and set at least 15 minutes to warm up before starting the alignment. RF output meter or 50 ohm non-inductive Dummy Load must be connected to Ext. Antenna Jack.

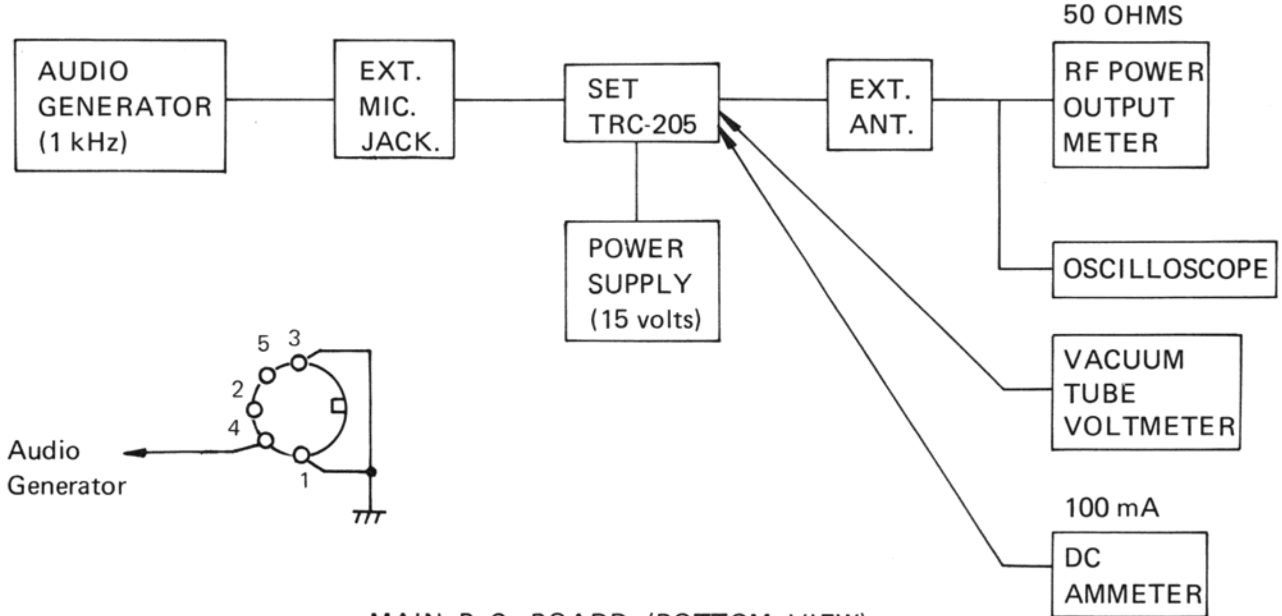
EQUIPMENT REQUIRED

RF Power Output Meter . . . . 5 Watts, 50 ohms
Audio Generator . . . . Sine wave, 1,000 Hz
Scope
RF Voltmeter (VTVM) . . . . RF Vacuum tube voltmeter
DC Ammeter . . . . 100 mA Range
DC Power Supply 15V, 1A

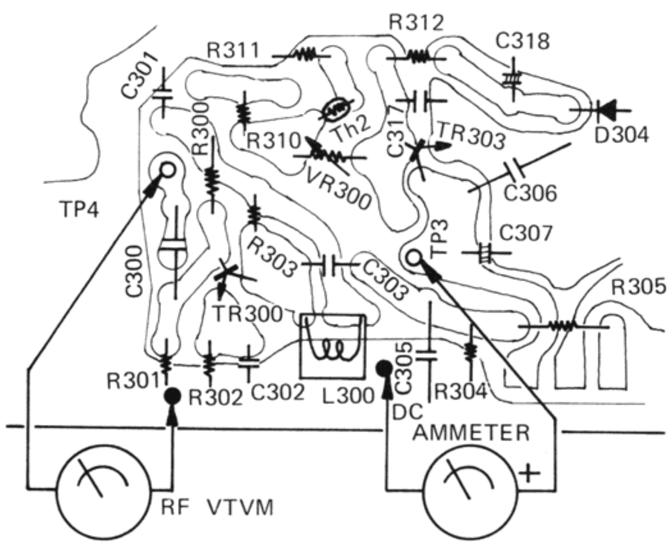
ALIGNMENT POINTS



CONNECTION OF EQUIPMENT FOR TRANSMITTER ALIGNMENT



MAIN P. C. BOARD (BOTTOM VIEW)



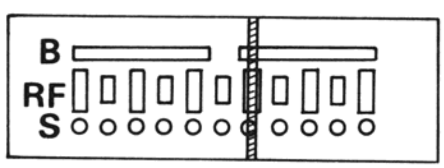
NOTE: 1. Connect DC Ammeter and RF VTVM to TP3 and TP4 on the Main P. C. Board.

REMARK: By connecting the DC Ammeter as above, collector of TR303 is grounded and therefore Controlled Carrier Circuit does not function. Thus you can measure current under no modulation, without breaking the circuit.

Step	Item	Set condition	AF generator	Adjustment	Remarks
1	RF Output	CH : Channel 18 27.175 MHz HI-LO Switch : HI Push to Talk Switch: ON DC AMMETER : Connected	OFF	T 9	TP 4 : RF VTVM Adjust for max. RF output voltage
2	RF Output	Same as Step 1	OFF	T 2 T 3 T 4 T 9	TP 4 : RF VTVM Adjust for max. RF output voltage
3	Remove the RF VTVM				
4	RF Output	Same as Step 1	OFF	L300 L301 L302 L303 L100 T 9	RF Power Output Meter : Adjust for max. RF power output
5	RF Output	Same as Step 1	OFF	L301	TP 3 : DC AMMETER Adjust for min. DC current
6	Repeat Steps 4 and 5 until no further improvement is noted.				
7	Remove the DC AMMETER				
8	Initial Power (No Modulation)	CH : Channel 18 HI-LO Switch : HI Push to Talk Switch: ON	OFF	VR300	RF Power Output Meter: Adjust for 0.1 W RF power output
9	RF Output	Same as Step 8	ON Input : 15 mV Freq. : 1000 Hz	L303	Scope Adjust for 8 – 12 watts P E P (Peak Envelope Power)
10	RF-Meter	Same as Step 9	Same as Step 9	VR103	See Fig. below.

REMARK: T1, T5, T6 and VC1 of PLL unit are all factory aligned. Do not try to adjust these. If these adjustments have been tampered with, see page 9.

S / RF / BATT. METER



TRANSMIT Meter Pointer Setting

NOTE : 2. In Step 10, adjust VR103 to obtain the meter pointer position as illustrated above.

ALIGNMENT OF RX CIRCUIT

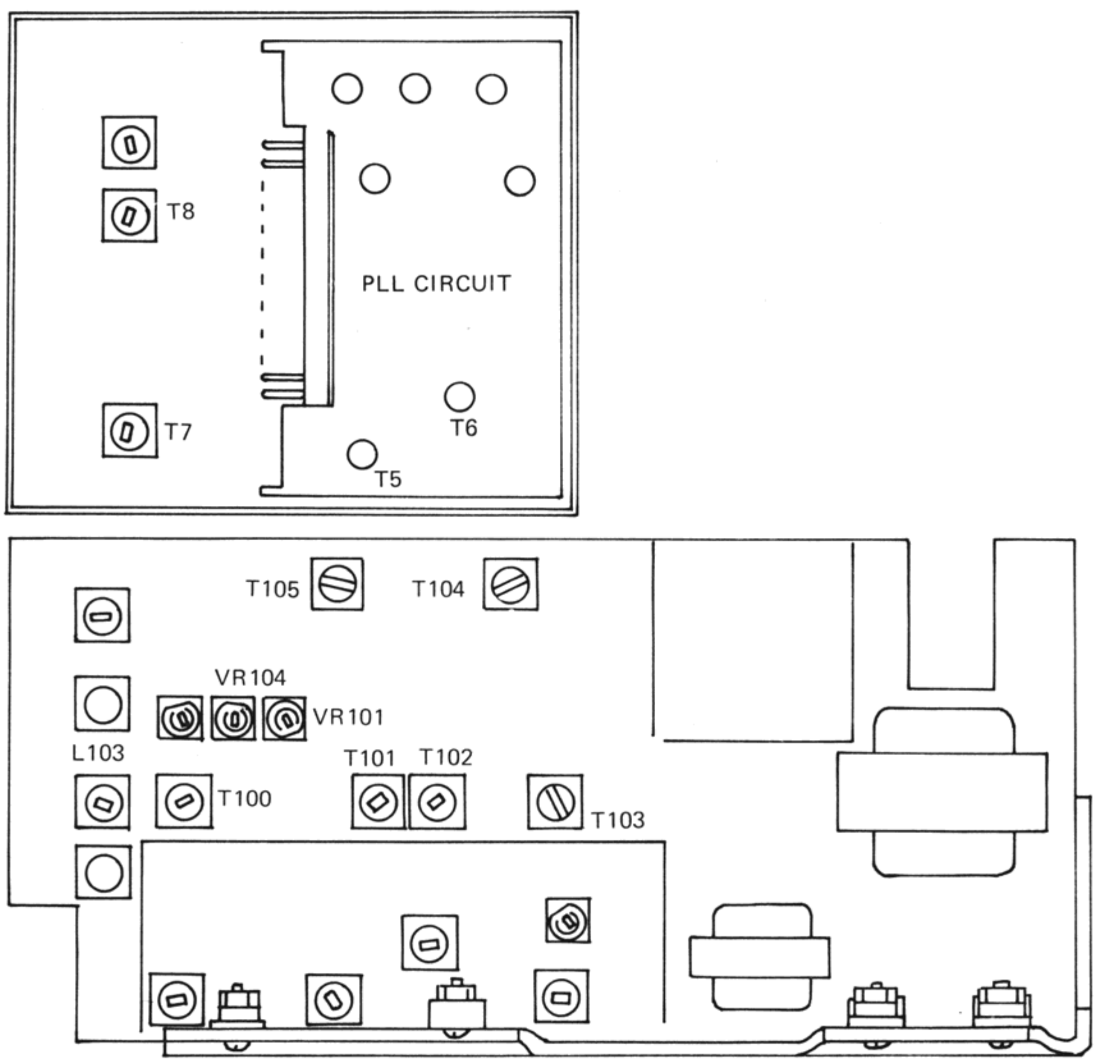
PROCEDURE

Allow test equipment and set at least 15 minutes to warm up before starting the alignment. Keep signal generator output low enough to prevent AGC overload (below 2 volts on output meter).

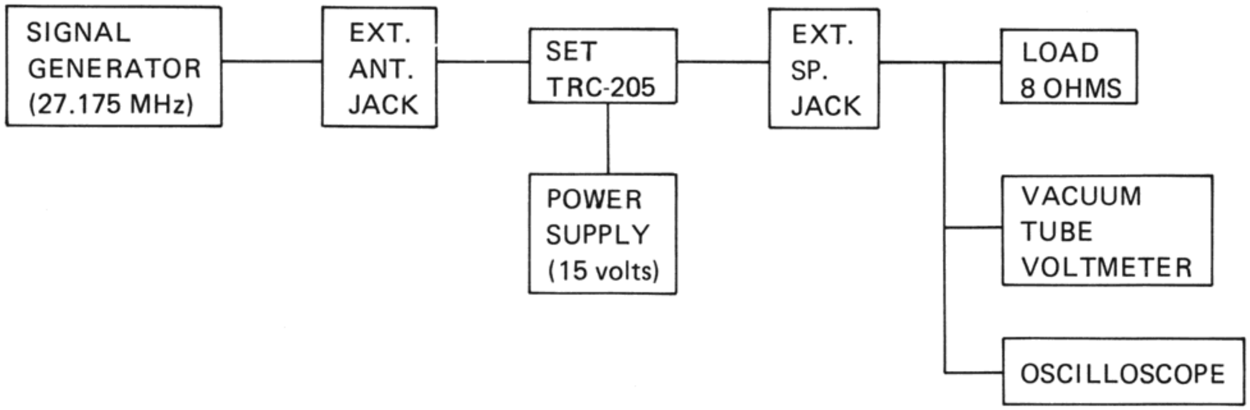
EQUIPMENT REQUIRED

Signal Generator . . . . 27 MHz band (26.965 ~ 27.405 MHz), 1,000 Hz, 30% mod, AM
AF Dummy Load . . . . 8 ohms
Voltmeter . . . . Vacuum tube voltmeter
Scope
Power Supply . . . . DC 15V, 1A

ALIGNMENT POINTS

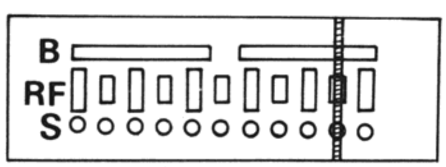


CONNECTION OF EQUIPMENT FOR RECEIVER ALIGNMENT



Step	Item	Set condition	Signal generator	Adjustment	Remarks
1	Sensitivity	VOLUME: Full clockwise SQUELCH: Full counter-clockwise DELTA TUNE : (0)	Ch: 18 27.175 MHz Mod.: 1000 Hz 30%	T100 T101 T102	Adjust for max. output on VTVM (Keep input from Signal Generator as low as possible and still obtain output readings)
2	Repeat Step 1 until no further improvement is noted.				
3	Sensitivity	Same as Step 1	Same as Step 1	T103 T104 T105	Same as Step 1
4	Repeat Step 3 until no further improvement is noted.				
5	Sensitivity	Same as Step 1	Same as Step 1	T 7 T 8	Adjust for max. output on VTVM
6	S-Meter	Same as Step 1	CH: 18 Input: 100μV	VR104	See illustration below
7	SQUELCH	VOLUME: Full clockwise DELTA TUNE: (0) SQUELCH: Full clockwise	CH: 18 Mod.: 1000 Hz 30% Input: 1000μV	VR101	Adjust so that output is 2V when input from SG is 1000μV

S / RF / BATT. METER



Receiver Meter Pointer Setting

NOTE : 3. L103 should not be adjusted.

NOTE : 4. For Step 6, with an RF Signal Generator input level of 100μV, adjust VR104 for a Meter pointer position as illustrated above.

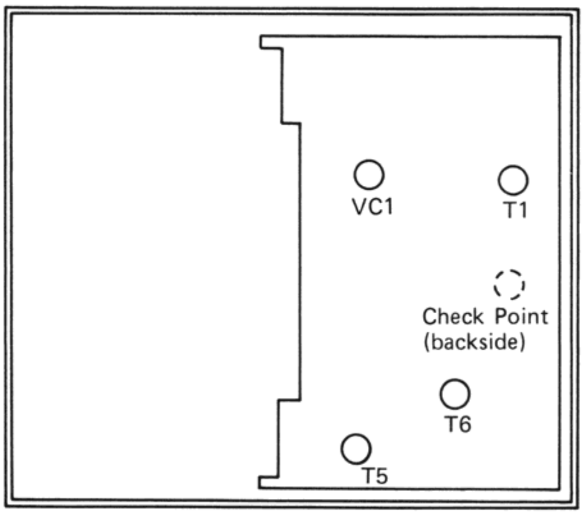
If these parts have been adjusted by mistake, the following procedure can be used.

(1) T5 : Set to channel 18, Receive mode. Set DELTA TUNE Switch to "0" position and connect Frequency Counter to TP2. Adjust T5 to obtain a frequency of 10.240 MHz ± 200 Hz.

(2) T6 : In receive mode, channel 18, connect Frequency Counter to the base of TR102 (1st Mix.). Adjust T6 to obtain the frequency of 37.870 MHz ± 200 Hz.

(3) T1 : Remove PLL Unit from the set and connect +6.0V DC to 7 terminal of the Unit. Next, connect DC Voltmeter to the check point (see illustration) and adjust T1 to obtain 2.5 ~ 2.6V.

(4) VC1 : Set to channel 18, Transmit mode. Connect Frequency Counter to Transmitter Output. Adjust VC1 to obtain 27.175 MHz ± 200 Hz frequency.



PRINCIPLES OF OPERATION OF SPECIAL CIRCUITS

A. PLL CIRCUIT

A Digital Phase-Locked Loop (PLL) synthesizer is employed to determine and stabilize the operating frequency, using a CMOS/LSI device in combination with a VCO (voltage controlled oscillator).
To understand the operation of the PLL synthesizer, refer to Figure A and the Schematic Diagram provided.

IC 4 reference oscillator generates a 10.240 MHz crystal controlled frequency. This 10.240 MHz is applied to pin 6 (Q_{in}) of IC 3 (MSM5807). The 10.240 MHz is divided by a 1024 fixed divider in IC 3 to provide 10 kHz. Output of the fixed divider is applied to the Phase Detector.

The PLL synthesis process selected for the TRC-205 is a down-mixing configuration. If the mixing were up, a complex programmable counter would be required to achieve the desired frequency increment. Of course, mixing down requires a high-frequency reference for heterodyning, but the programmable divider can operate at low frequency: this reference frequency is obtained from X3 and IC5 to produce 35.74 MHz.

The output of Crystal Oscillator 1 (IC-5, 35.74 MHz) is mixed internally by IC-5, where it is combined with the output of VCO (IC 1). This mixed signal is amplified in IC 5 and fed into Pin F_{in} of IC 3. The signal at Pin F_{in} is applied to the Programmable Divider. The Programmable Divider provides the channel selection via 8 binary input control lines, selected by the Channel Selector Switch. The signal applied to the Programmable Divider is divided by "N" which is determined by the Channel Selector Switch. The output of Programmable Divider is coupled to the Phase Detector.
The Phase Detector compares the frequency and phase of the signal from the Programmable Divider with output of the Fixed Divider. If the two signals differ in frequency and/or phase, an error voltage is generated and applied through Low Pass Filter to the VCO, causing it to correct in the direction required for decreasing the difference. The correction continues until lock is achieved, after which the VCO will continue to follow the reference frequency. That means fr' must be equal to fr when the Phase-Locked Loop is locked. Therefore the following rule applies:

$$f_{vco} = N\,fr + Fm1 = \frac{N}{1024}\,FR + Fm1 \qquad (1)$$

Fm1 = 35.74 MHz
FR = 10.24 MHz
Where N : positive integer

When Fm1 and FR are constant, f_{vco} can be changed in 10 kHz steps by varying N and thus produce stable and accurate frequencies (as long as the Phase-Locked-Loop is locked).
The accuracy and stability of these PLL/VCO signals is kept as stable as a crystal oscillator. To maintain PLL locking, great care is exercised in selection of components, operating point of active devices, voltage stability, etc. When the circuit is in a locked condition a lock-detector circuit provides a low voltage to an inhibit gate; in an unlocked condition, a high voltage is delivered to the inhibit gate which is used to turn off the Transmitter. More on this later.

The output of the VCO is amplified (in IC1), processed by a Band Pass Filter and applied to the First Mixer of the Receiver circuit (TR102). Thus, output from the VCO must be either of the following:

$$f_{vco} = fc \pm f_{IF}$$

fc : channel frequency
f_{IF} : first intermediate freq. = fm2

High side injection is used.

Therefore

$$f_{vco} = fc + f_{IF} \qquad (2)$$

$$f_{IF} = f_{m2} = 10.695 \text{ MHz}$$

For $fc = 26.965$ MHz (channel 1)

$$f_{vco} = 26.965 + 10.695 = 36.66 \text{ MHz}$$

For $fc = 27.405$ MHz (channel 40)

$$f_{vco} = 27.405 + 10.695 = 38.10 \text{ MHz}$$

As for "N", from equation (1)

N = 192 (channel 1)

N = 236 (channel 40)

The channel selection is done by the Channel Selector Switch.
The Channel Selector Switch provides a control signal in 8 bit binary code to the Programmable Divider in IC 3. The Channel Selector Switch can provide the codes corresponding to the frequencies assigned for CB transceiver only.
Following are examples of binary code for channel selection. (For complete listing, see page 17.)

Channel frequency	26.965 (CH 1)								27.405 (CH 40)							
N	P8	P7	P6	P5	P4	P3	P2	P1	P8	P7	P6	P5	P4	P3	P2	P1
Binary code	1	1	0	0	0	0	0	0	1	1	1	0	1	1	0	0

"1" = High level "0" = Low level

To produce the transmitter frequency, Mixer II (IC 2) is used to heterodyne the signal from VCO with an injection signal from the Crystal Oscillator 2 (IC 2) which generates $f_{IF} = f_{m2} = 10.695$ MHz.

$$f_{TX} = f_{VCO} - f_{IF} \qquad (3)$$

The output of Mixer II is fed through T_3, T_3 and T_4 to amplifier, TR_3, and then coupled to the RF stages of the transmitter.

As mentioned previously, when the PLL circuitry is unlocked, transmitter operation is stopped. The principle of operation for this is as follows:
The Phase Detector Output (L_D terminal) is at low level when PLL is locked, and at high level when not locked.
L_D terminal is connected to Pin 3 of IC2 through D3 and C12. When L_D terminal level is high, the Switching Transistor in IC 2 turns the 10.695 MHz X'tal (X1) off.
Thus, transmission is inhibited. Also, in between channel positions of the Channel Selector provides a high level input to the Inhibit Gate (thus no transmission is possible between channels).

Delta Tune is performed by varying Reference Frequency 10.24 MHz within the range of ± 1.2 ~ 1.5 kHz. The Reference Oscillator consists of IC4, X2 and D4. Note that D4 is a Variable Capacitor Diode, which changes capacitance in proportion to the variance of the voltage applied. By changing the position of Delta Tune Switch S5, the voltage applied to Pin 16 of the PLL unit changes between 3.5V and 6.8V because of R142 and R146. Through this voltage change, D4 changes capacitance and therefore the Reference Oscillator Frequency changes.

The total $\triangle F$ Variation is as follows.

$$\triangle F = \pm (\triangle F_R - \triangle f_{VCO})$$
$$= \pm (\triangle F_R - \frac{N}{1024} \triangle F_R) \qquad (4)$$

$\triangle F$ = Variation of Standard Frequency (Variation of 2nd Local Frequency)
$\triangle f_{VCO}$ = Variation of VCO Frequency (Variation of 1st Local Frequency)

During transmission, the voltage at Pin 16 of PLL unit is zero. So the constant voltage (about +5V DC) derived from IC2 and divided across R3 and R4 is applied to D4 and therefore the Reference Oscillator Frequency is stabilized at one frequency.

Any frequency drift with temperature can be determined as follows.

$$\triangle f_{TX} = \frac{N}{1024} \triangle F_R + \triangle Fm1 + \triangle Fm2$$

where $\triangle f_{TX}$: Drift of the transmitter frequency
$\triangle FR$: Drift of the reference oscillator
$\triangle Fm1$: Drift of the crystal oscillator 1
$\triangle Fm2$: Drift of the crystal oscillator 2

The temperature characteristics specification of the crystals is as follows.

For the reference oscillator	±25ppm	over the range from −30°C to 50°C
For the crystal oscillator 1	±25ppm	
For the crystal oscillator 2	±25ppm	

The worst case will be on channel 40 (27.405 MHz) where "N" is 236.

$$\triangle f_{TX} \text{ at CH 40} = \frac{236}{1024} \times (10.24\ \text{MHz} \times 2.5 \times 10^{-5})$$
$$+ (35.74\ \text{MHz} \times 2.5 \times 10^{-5})$$
$$+ (10.695\ \text{MHz} \times 2.5 \times 10^{-5})$$
$$= 59.0 + 893.5 + 267.4 = 1219.9\ \text{Hz}$$

Thus, the worst frequency tolerance is

$$\frac{1219.9\ \text{Hz}}{27.405\ \text{MHz}} = 44.5\ \text{ppm}$$

This meets FCC requirement, 50 ppm (0.005%)

BLOCK DIAGRAM OF PLL SYNTHESIZER

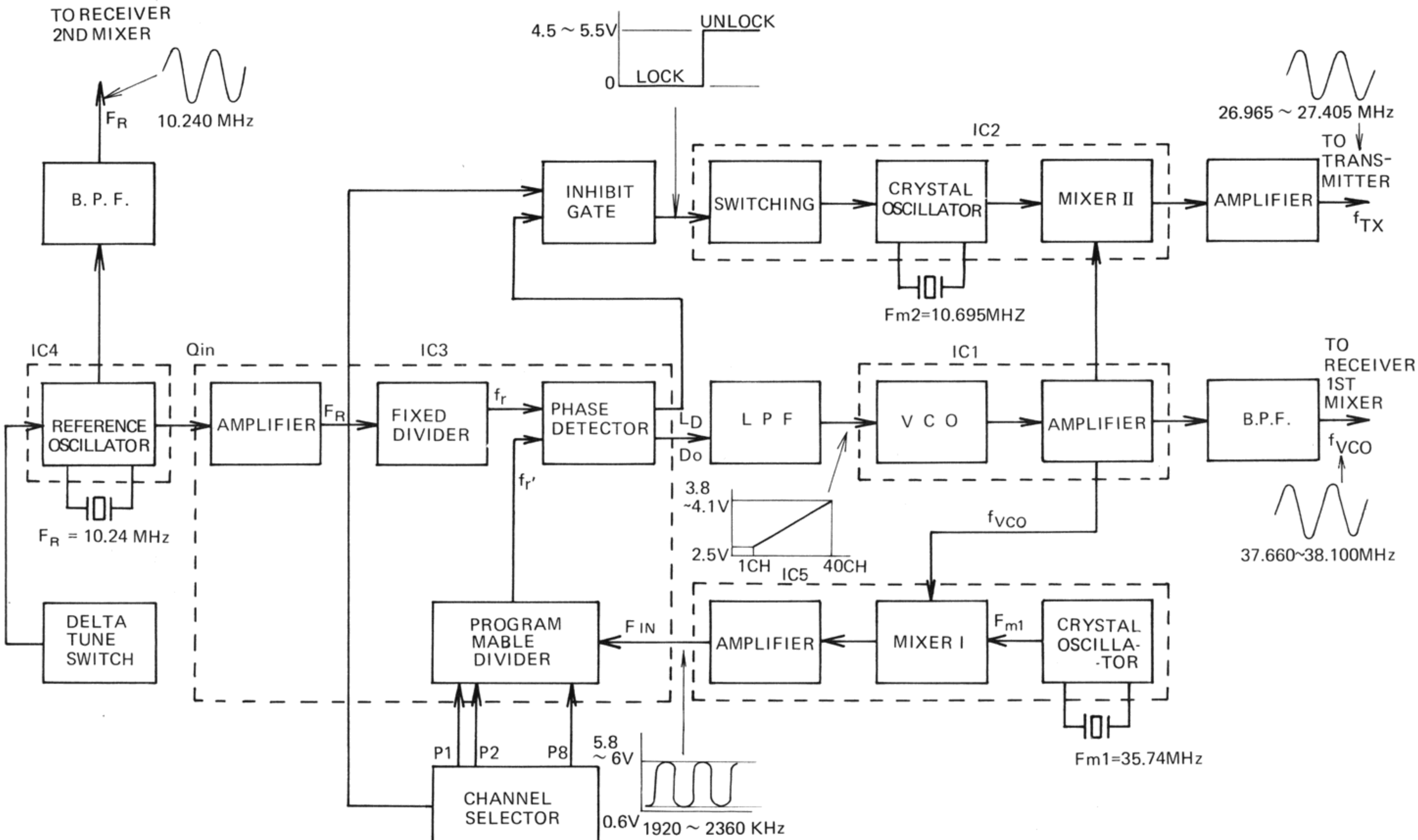


Figure A

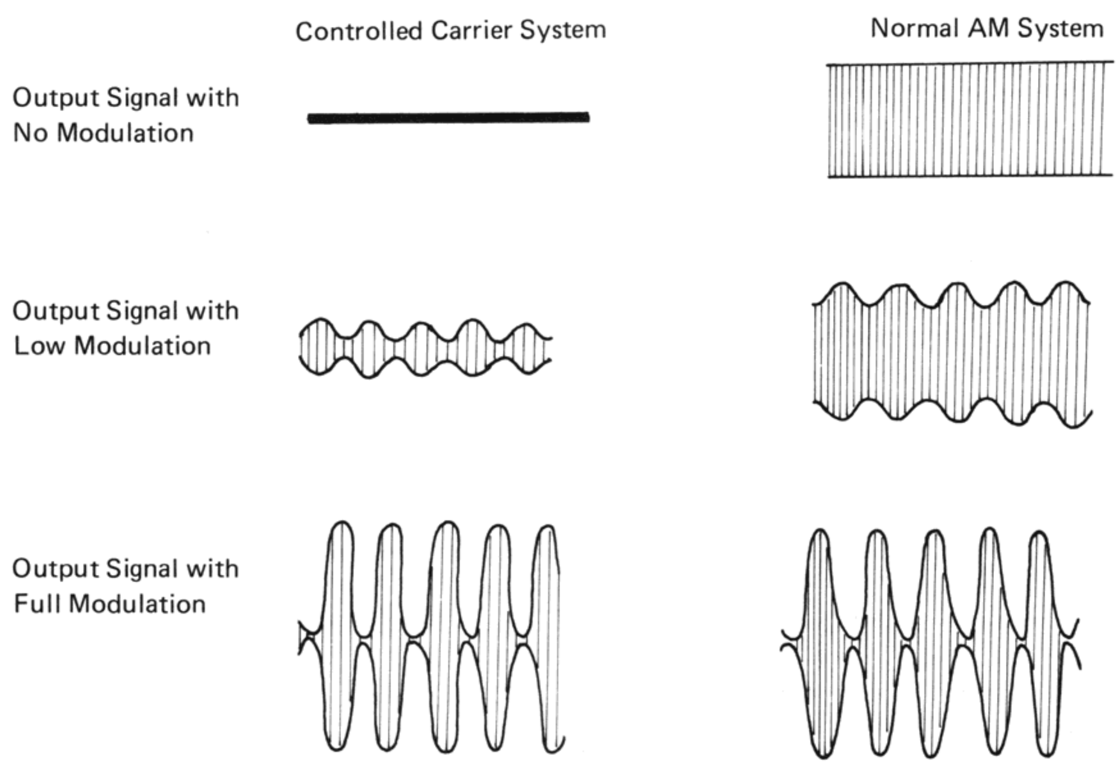
B. What is the Controlled Carrier System ?

The TRC-205 incorporates the Controlled Carrier System. This provides two benefits: conserving battery drain and obtaining higher level of transmitted intelligence (up to 12 watts P.E.P.).

With a conventional AM system, full carrier power is always transmitted, whenever the Talk switch is "on" (this of course is very power-consuming) and when modulation occurs, the carrier is amplitude-modulated. When there is no modulation signal, the carrier does not need to be transmitted (for it carries no intelligence). Also, when modulation levels are low, the full carrier power is still transmitted – and the carrier is taking up spectrum space and causing interference. The ideal would be to do away with the carrier entirely (that's what SSB does), but with the Controlled Carrier System, we only transmit as much carrier as we need for the modulation signal that is present.

Thus, with AM systems, full carrier is always transmitted – no modulation, low modulation or full modulation – and this carrier takes power (a full 4 watts in an AM system for max. FCC output powers). With a Controlled Carrier System, hardly any carrier power is transmitted under no-modulation conditions. Then as the modulation signal increases, more carrier is generated – since the carrier level is controlled by the modulation signal.

The difference between the Controlled Carrier System and conventional AM is illustrated below:



By controlling the carrier power which is transmitted in accordance with the level of the modulation input signals, it is possible to reduce the amount of power used when transmitting (and thus prolong the life of the batteries).
The controlled carrier system adopts the same method of transmission as that of the normal AM system and so it is possible to communicate with AM stations.

In addition, with some similarities and advantages of SSB, you do not have the disadvantage of having to adjust a Clarifier.

The Controlled Carrier Circuit consists of TR304, TR303 and associated components and functions as follows: The RF final stage TR302 is modulated by swinging its collector supply voltage from the AF output of modulation transformer T201 via D301. At the same time, RF driver stage TR301 is also modulated via Hi-Lo switch S2b and D302.
Collector-modulated class C amplifier presents 100% modulation when its collector supply voltage swings from zero volts up to 2 Vcc volts, and any excess modulation signal will cause over-modulation. The supply voltage swung by the audio output is also fed to the base of TR304 via Hi-Lo switch S2b and R314. The values of R313 and R314 are chosen so that TR304 is just cut-off when the negative peaks of the swinging supply voltage reach almost zero volts. So, if some peaks reach zero, positive pulses appear at the collector of TR304, these pulses are rectified and filtered by D303, D304 and C318, and applied to the base of TR303 via R312.
Consequently, the conductivity of TR303 is increased and the power gain of RF driver TR301 is increased to generate enough carrier to automatically prevent over-modulation. In other words, carrier power is always controlled to present almost 100% modulation in accordance with modulation signal level. In addition, the base of TR303 is biased by means of R310 and VR300 so as to generate an initial power level of about 0.1 Watt, without modulation.

C. Theory of AMC (Automatic Modulation Control) Circuit

Automatic Modulation Control (AMC) processes the microphone audio to prevent overmodulation, while giving the modulator proper audio drive for high modulation over a wide range of audio amplitudes. It does so over the entire 300 ~ 3000 Hz voice frequency range with very low distortion.
The AMC circuit begins to function as soon as the Controlled Carrier circuit reaches maximum carrier level. In other words, the carrier level increases first in accordance with the modulation input level up to the max. permissible level (this will prevent the possibility of overmodulation), then the AMC circuit, TR305 and TR306, begins to function to prevent overmodulation due to further increase of modulation signals after TR303 in the Controlled Carrier circuit reaches to its full conductivity.
For detailed explanation of the Controlled Carrier circuit, refer to the previous section.
The AMC circuit operates as a controlled loop which continuously monitors the output from the modulator and controls the modulation level by the regulating the loop gain. Refer to Schematic Diagram.
The power supply line to the RF amplifiers TR301 and TR302 (which is varied by the modulation signal), is connected to the base of TR305 and one end of R322 via Hi-Lo Switch (S2b) and R315. The other end of R322 is connected to the collector of TR303 of the Controlled Carrier circuit.
The values of R315 and R322 are chosen so as to make TR305 cut-off when the Vcc is swung up to 100% Mod and its negative peaks just reach to almost zero volts when TR303 is fully driven to its maximum conductivity; i.e. at full carrier.
Thus, positive pulses will appear at the collector of TR305 when modulation signals exceed 100% modulation at full carrier.
These pulses are rectified and filtered by D300 and C322, then fed to the base of TR306 to increase its conductivity.
The attenuation of audio input signal from the microphone is thus controlled to prevent overmodulation at the attenuator composed of R203 and TR306.

FREQUENCY OF EACH CHANNEL

Ch	Frequency f_c	V.C.O. Frequency f_{vco}	Programmable Divider Input Frequency f_{vco}-f_{m1}	Reference Oscillator Frequency F_R	Transmitter Oscillator Frequency f_{m2}	Local Oscillator Frequency f_{m1}
1	26.965 MHz	37.660 MHz	1920 kHz	10.240 MHz	10.695 MHz	35.740 MHz
2	26.975	37.670	1930	10.240	10.695	35.740
3	26.985	37.680	1940	10.240	10.695	35.740
4	27.005	37.700	1960	10.240	10.695	35.740
5	27.015	37.710	1970	10.240	10.695	35.740
6	27.025	37.720	1980	10.240	10.695	35.740
7	27.035	37.730	1990	10.240	10.695	35.740
8	27.055	37.750	2010	10.240	10.695	35.740
9	27.065	37.760	2020	10.240	10.695	35.740
10	27.075	37.770	2030	10.240	10.695	35.740
11	27.085	37.780	2040	10.240	10.695	35.740
12	27.105	37.800	2060	10.240	10.695	35.740
13	27.115	37.810	2070	10.240	10.695	35.740
14	27.125	37.820	2080	10.240	10.695	35.740
15	27.135	37.830	2090	10.240	10.695	35.740
16	27.155	37.850	2110	10.240	10.695	35.740
17	27.165	37.860	2120	10.240	10.695	35.740
18	27.175	37.870	2130	10.240	10.695	35.740
19	27.185	37.880	2140	10.240	10.695	35.740
20	27.205	37.900	2160	10.240	10.695	35.740
21	27.215	37.910	2170	10.240	10.695	35.740
22	27.225	37.920	2180	10.240	10.695	35.740
23	27.255	37.950	2210	10.240	10.695	35.740
24	27.235	37.930	2190	10.240	10.695	35.740
25	27.245	37.940	2200	10.240	10.695	35.740
26	27.265	37.960	2220	10.240	10.695	35.740
27	27.275	37.970	2230	10.240	10.695	35.740
28	27.285	37.980	2240	10.240	10.695	35.740
29	27.295	37.990	2250	10.240	10.695	35.740
30	27.305	38.000	2260	10.240	10.695	35.740
31	27.315	38.010	2270	10.240	10.695	35.740
32	27.325	38.020	2280	10.240	10.695	35.740
33	27.335	38.030	2290	10.240	10.695	35.740
34	27.345	38.040	2300	10.240	10.695	35.740
35	27.355	38.050	2310	10.240	10.695	35.740
36	27.365	38.060	2320	10.240	10.695	35.740
37	27.375	38.070	2330	10.240	10.695	35.740
38	27.385	38.080	2340	10.240	10.695	35.740
39	27.395	38.090	2350	10.240	10.695	35.740
40	27.405	38.100	2360	10.240	10.695	35.740

CODE LIST OF CHANNEL SELECTOR SWITCH

Channel No.	Binary Code							
	P1	P2	P3	P4	P5	P6	Y	Com.
1							X	X
2	X						X	X
3		X					X	X
4			X				X	X
5	X		X				X	X
6		X	X				X	X
7	X	X	X				X	X
8	X			X			X	X
9		X		X			X	X
10	X	X		X			X	X
11			X	X			X	X
12		X	X	X			X	X
13	X	X	X	X			X	X
14					X		X	X
15	X				X		X	X
16	X	X			X		X	X
17			X		X		X	X
18	X		X		X		X	X
19		X	X		X		X	X
20				X	X		X	X
21	X			X	X		X	X
22		X		X	X		X	X
23	X		X	X	X		X	X
24	X	X		X	X		X	X
25			X	X	X		X	X
26		X	X	X	X		X	X
27	X	X	X	X	X		X	X
28						X	X	X
29	X					X	X	X
30		X				X	X	X
31	X	X				X	X	X
32			X			X	X	X
33	X		X			X	X	X
34		X	X			X	X	X
35	X	X	X			X	X	X
36				X		X	X	X
37	X			X		X	X	X
38		X		X		X	X	X
39	X	X		X		X	X	X
40			X	X		X	X	X

X .... High level
P7 .... High level (constant)
P8 .... High level (constant)
Y .... Inhibit signal

TROUBLESHOOTING

1. RECEIVER SECTION

(1) No noise from speaker

a. Check the power switch S1.
b. Check the speaker wiring circuit.
c. Check if Squelch circuit works.
d. Check TR203 and TR204.
e. Check Volume Control (VR102).
f. Check D109.

(2) No reception

a. Check TR209 for power transfer.
b. Check the local injection level obtained from PLL.
c. 1st local injection level. . . . . 0.5V or more
   2nd local injection level . . . . 0.5V or more
c. Check D106.

(3) S-Meter operation is not normal.

a. Check D105.
b. Check VR104.
c. Check the meter change-over switch.
d. Check the meter.

(4) Delta Tune is not normal.

a. Check S5 switch
b. Check the wiring of Delta Tune Circuit.
c. Check D115.

2. TRANSMITTER SECTION

(1) No RF output

a. Check "Push to Talk Switch".
b. Check TR208 for power transfer.
c. Check TR300, TR301 and TR302.
d. Check TR303.
e. Check the microphone.
f. Check AF circuit.
g. Check the output obtained from PLL.

NOTE: With the Controlled Carrier system, there should be very little RF output with no modulation.
To check RF output under no modulation conditions, short E & C of TR303.

(2) RF power meter operation is not normal.

a. Check D110.
b. Check VR103.

c. Check the meter change-over switch S2.
d. Check the meter.

3. PLL SECTION

(1) PLL Section operation is abnormal.

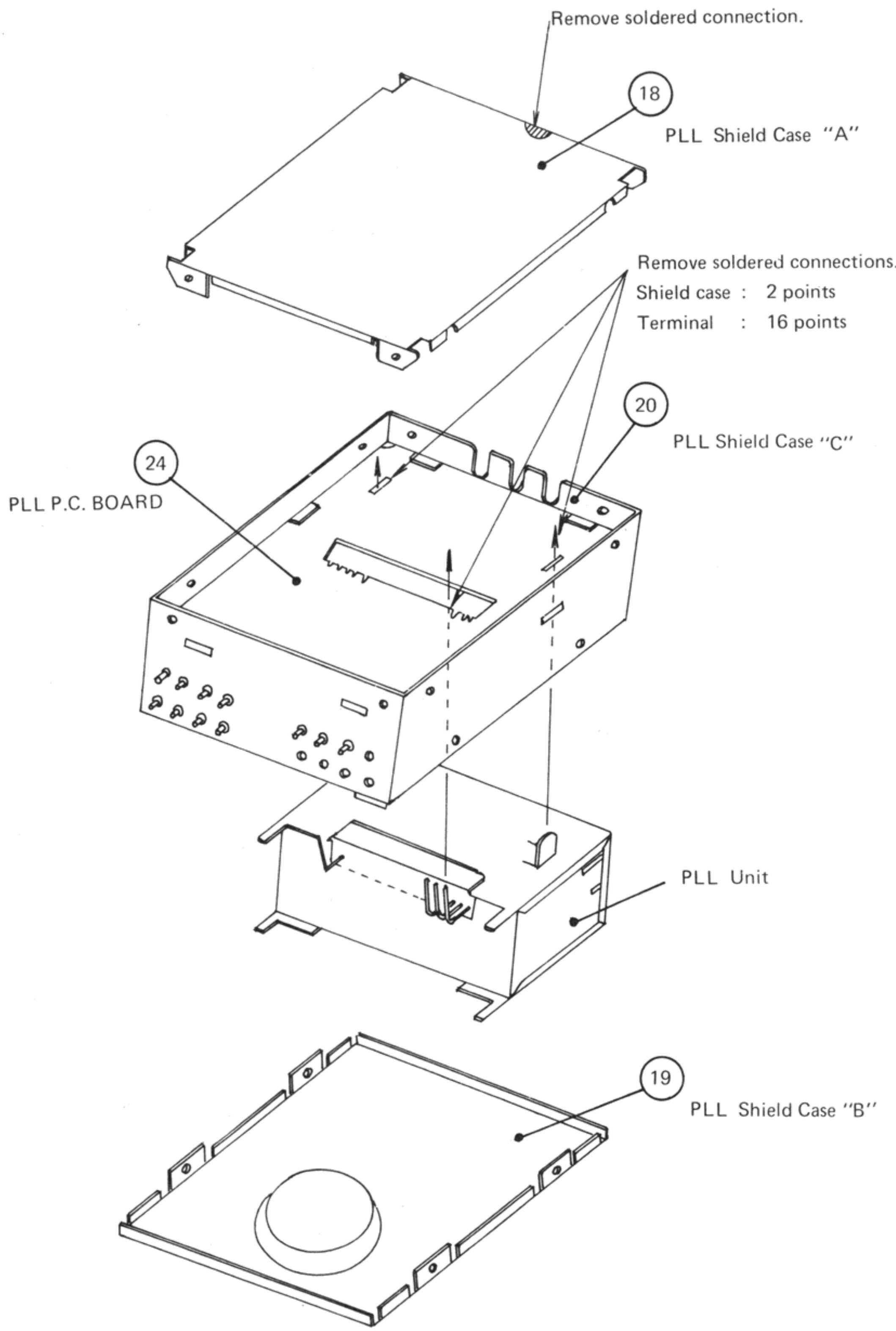
a. Check TR1 and D5 power circuit regulator.
b. Check T7.
c. Check T8.
d. Check TR2.
e. Check TR3 and T9.
f. Check the voltage at PLL Unit Pin No. 7.
g. Check the voltage at PLL Unit Pin No. 3.

(2) Channel frequency is not matched to channel.

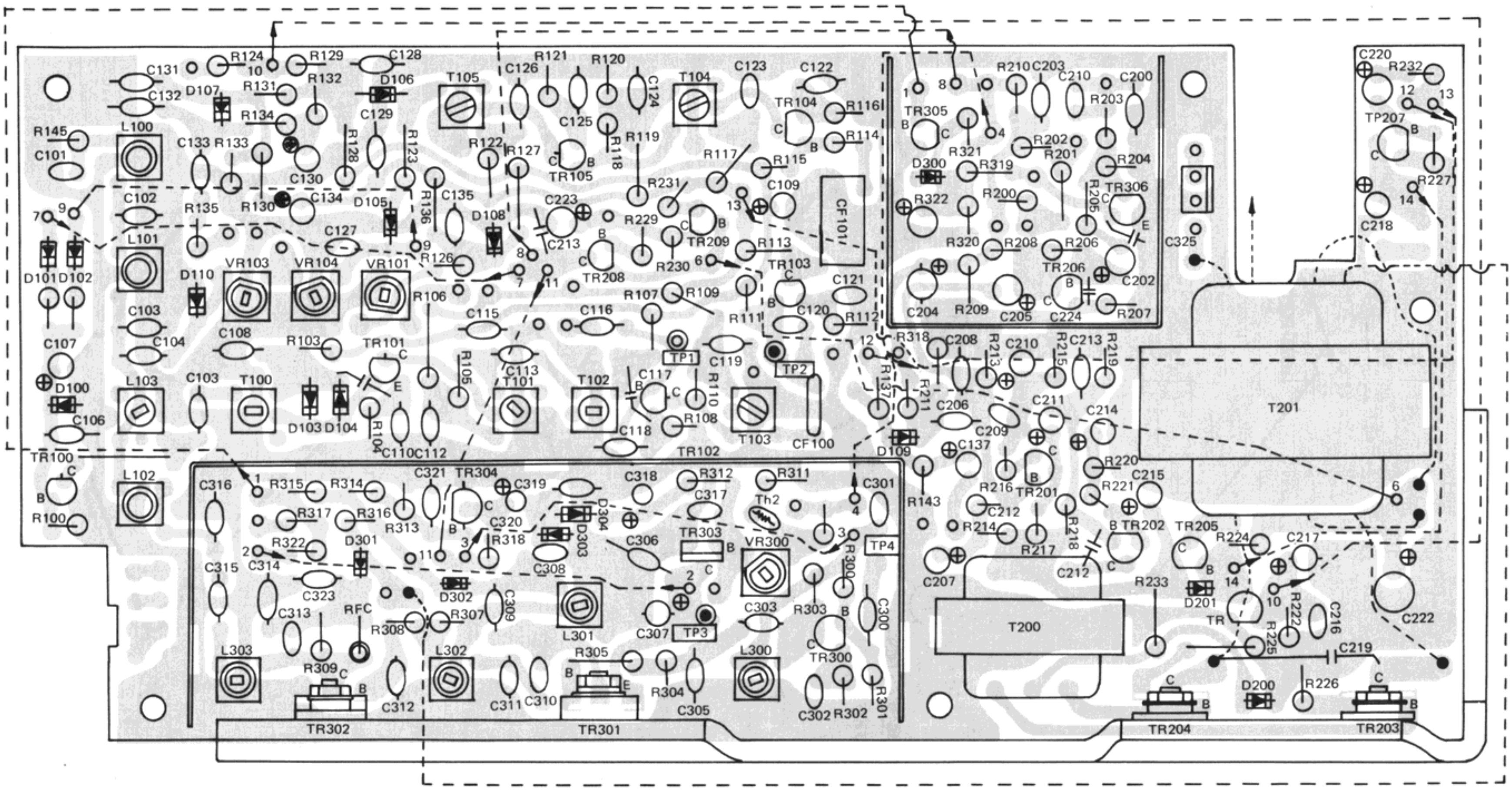
a. Check if the channel knob is properly mounted.
b. Check the channel selector and wiring.
c. Check the wiring between the channel selector and PLL Unit Pin No. 8 (p1) ~ Pin No. 13 (p6).

CAUTION : PLL Unit is precisely aligned at factory. Do not try to replace part(s) or align except T2, T3 and T4. When PLL Unit is defective, replace entire Unit.

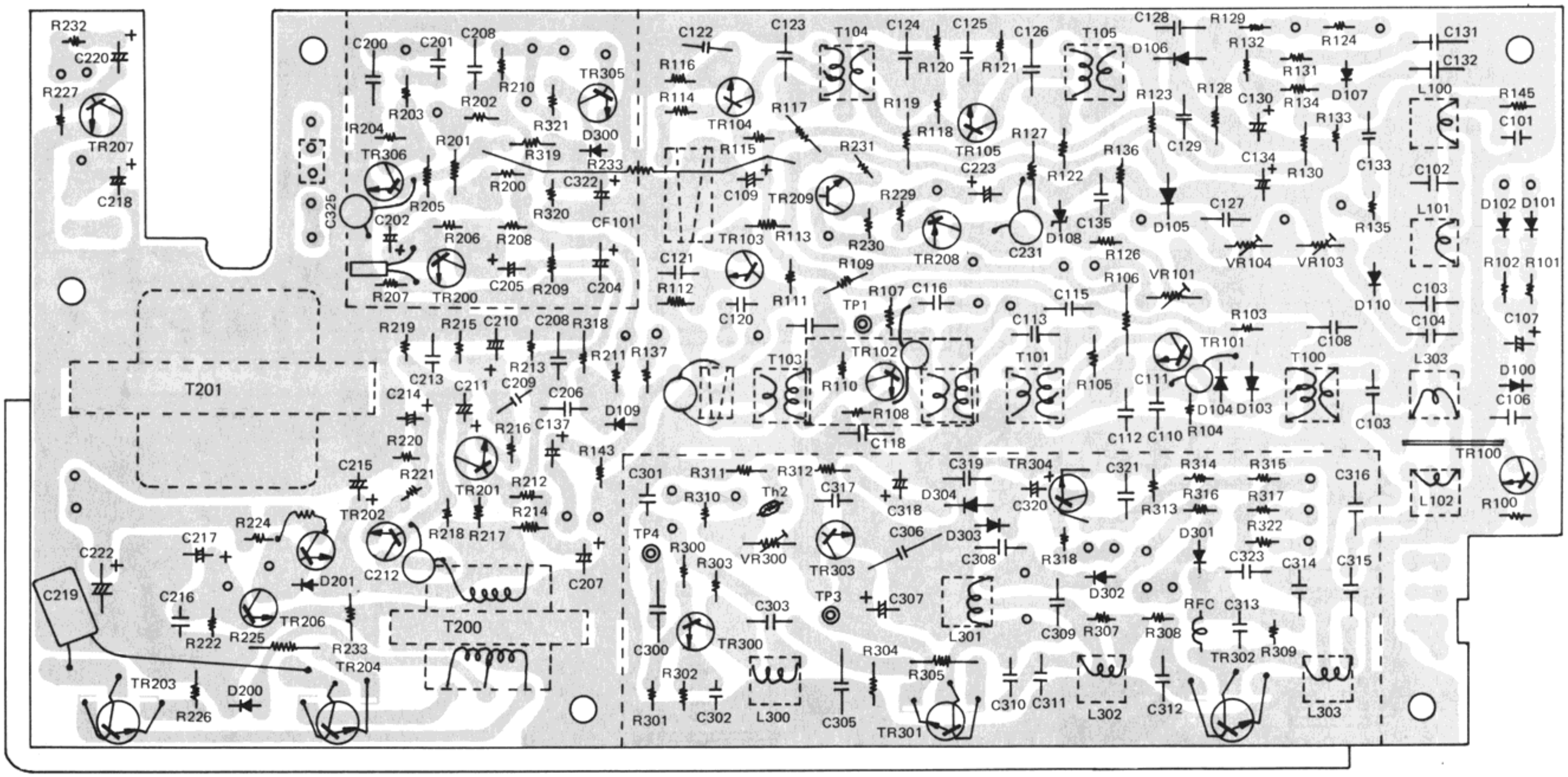
REPLACING THE PLL CIRCUIT



MAIN P. C. BOARD (TOP VIEW)

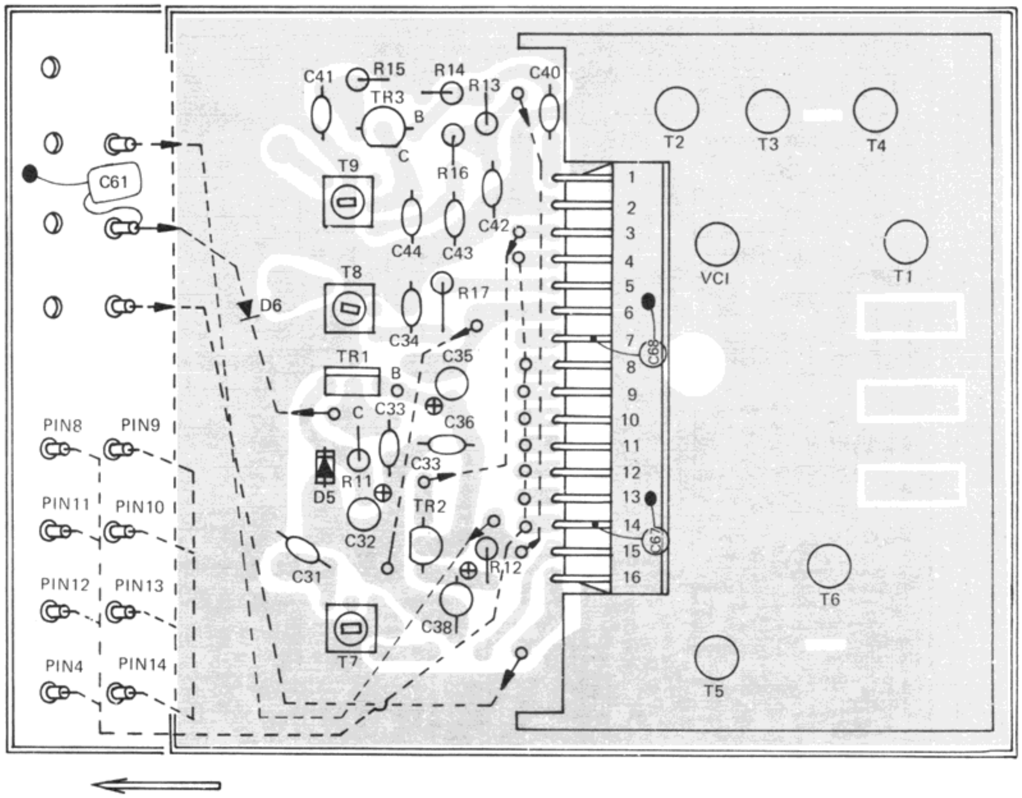


MAIN P. C. BOARD (BOTTOM VIEW)

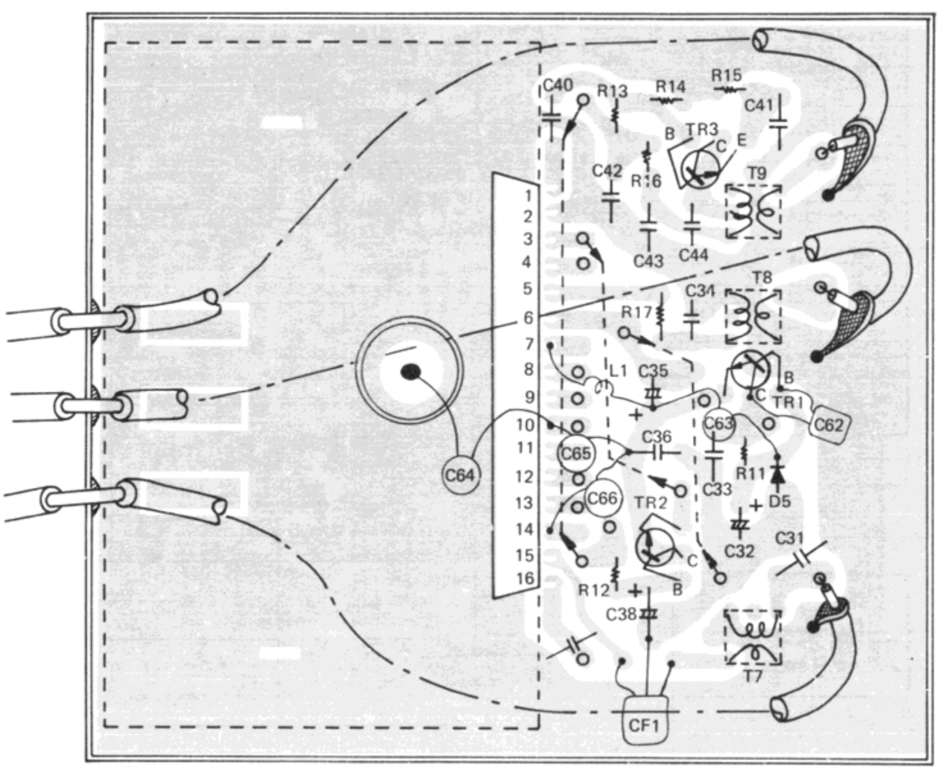


PLL P.C. BOARD

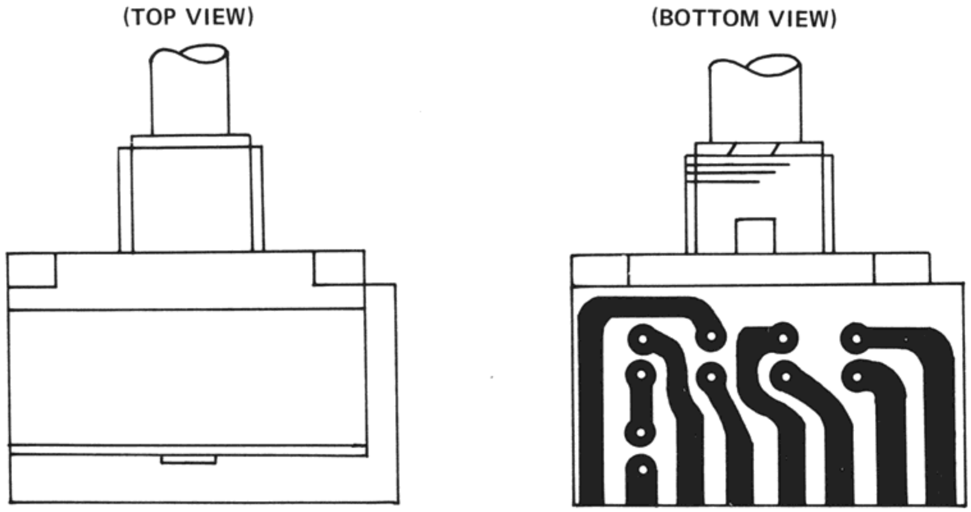
(TOP VIEW)



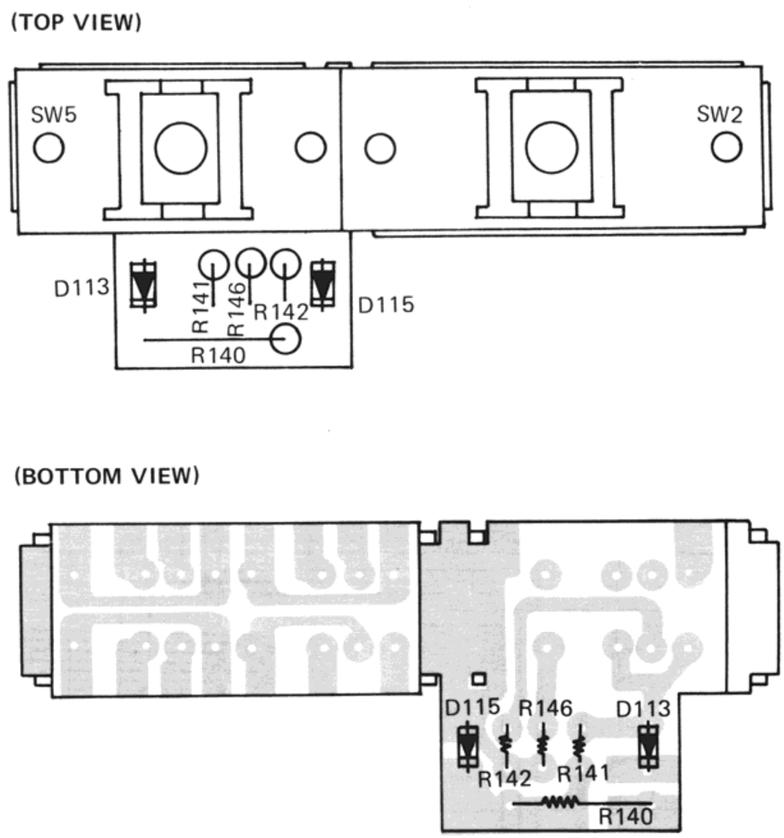
(BOTTOM VIEW)



CHANNEL SELECT SWITCH AND SWITCH P.C. BOARD

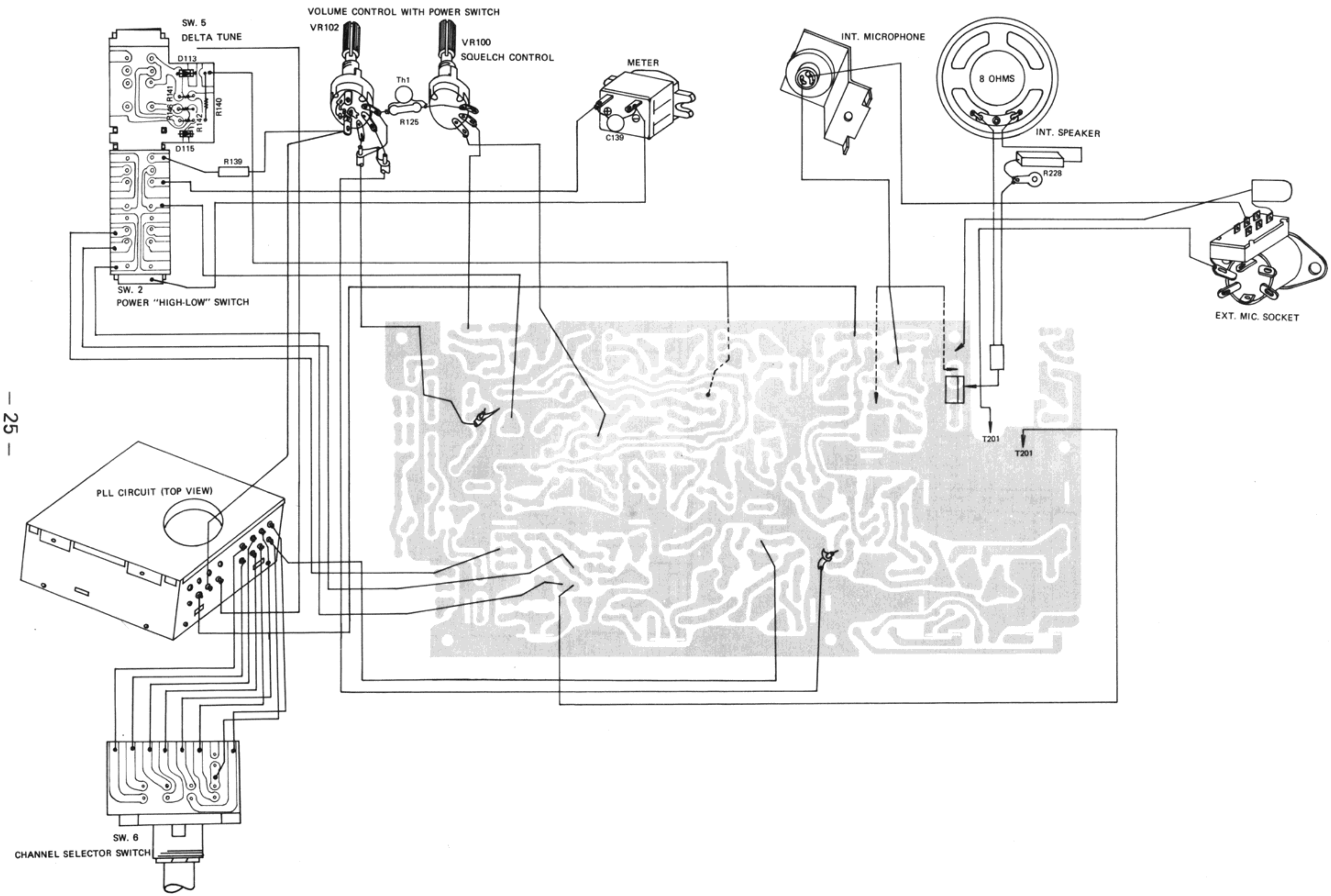


Channel Select Switch P. C. B.

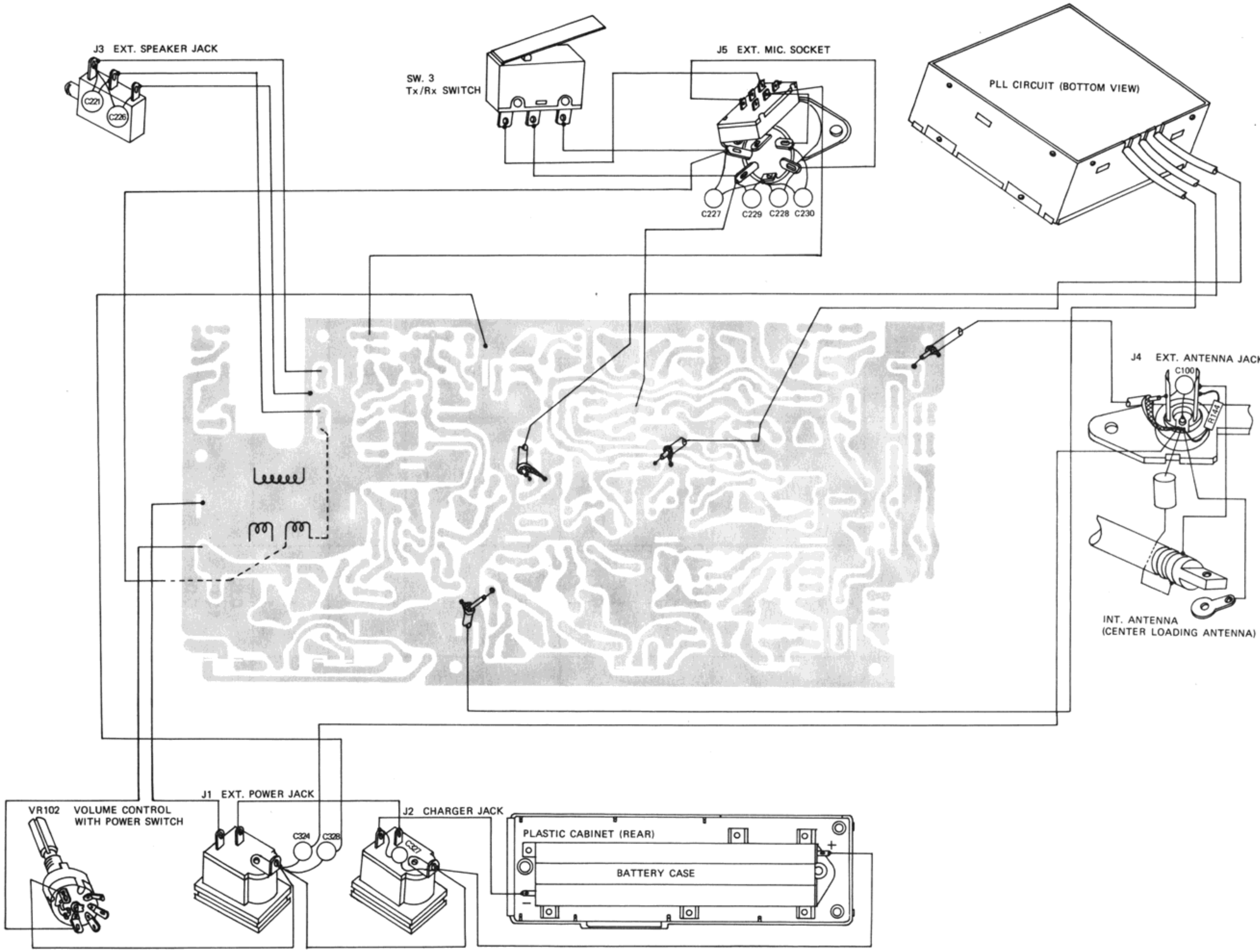


Switch P. C. B.

WIRING (TOP VIEW)



WIRING (BOTTOM VIEW)



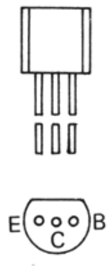
TRANSISTOR AND IC VOLTAGE CHART

1. POWER SUPPLY VOLTAGE : 15 volts
2. CONDITION : Rx . . . . . no signal Tx . . . . . modulation: input 15mV, 1 kHz
3. MEASUREMENT BY MULTITESTER : 20 KΩ/volt

TR No.		Rx	Tx
TR 1	B	6.8	6.8
	E	6.2	6.2
	C	15.2	14.8
TR 2	B	0	6.9
	C	6.2	6.2
	E	0	6.18
TR 3	B		5.5
	C		14.5
	E		5.0
TR100	B	0	0.84
	C	0	0
	E	0	0
TR101	B	1.13	
	C	8.22	
	E	0.93	
TR102	B	1.18	
	C	10.5	
	E	0.83	
TR103	B	1.12	
	C	6.35	
	E	1.06	
TR104	B	1.75	
	C	10.9	
	E	1.22	
TR105	B	1.75	
	C	8.9	
	E	1.15	
TR200	B		0.62
	C		2.5
	E		0.37
TR201	B	1.53	
	C	11.8	
	E	1.05	
TR202	B	1.93	
	C	1.93	
	E	1.4	
TR203	B	0.63	
	C	15.0	
	E	0.028	
TR204	B	0.63	
	C	15.0	
	E	0.023	
TR205 (SQ)	B (ON)	0.02	
	B (OFF)	14.3	
	C (ON)	15.0	
	C (OFF)	15.0	
	E (ON)	0	
	E (OFF)	13.5	

TR No.		Rx	Tx
TR206 (SQ)	B (ON)	0.69	
	B (OFF)	0.42	
	C (ON)	0.02	
	C (OFF)	14.3	
	E (ON)	0	
	E (OFF)	0	
TR207	B	0	
	C	0	
	E	0	
TR208	B	14.5	14.0
	C	0.023	14.8
	E	15.0	15.0
TR209	B	14.5	0
	C	15.0	15.0
	E	11.5	0
TR300	B		4.1
	C		14.8
	E		3.0
TR301	B		–0.11
	C	14.5	13.5
	E		0.063
TR302	B		–0.35
	C	14.5	13.5
	E		0
TR303	B	0.57	0.71
	C		0.063
	E		0
TR304	B	0.63	0.63
	C	0	2.27
	E	0	0
TR305	B	0.71	
	C	0.032	
	E	0	
TR306	B	0	
	C	0	
	E	0	
PLL UNIT	Pin 16 (+)	6.8	5.0
	Pin 16 (0)	5.0	5.0
	Pin 16 (–)	3.5	5.0
	Pin 15	0	
	Pin 14	6.2	
	Pin 13 ~ Pin 8	channel code (see page 17)	
	Pin 7	6.2	
	Pin 4	0 (Locked condition)	
	Pin 3	6.18	

TRANSISTOR VIEW

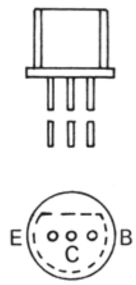


2SC945

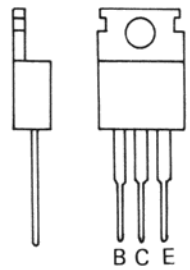
2SC839

2SC815

2SC1047



2SA562



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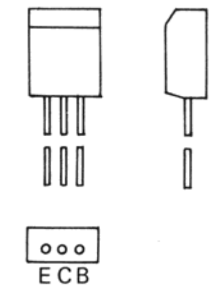
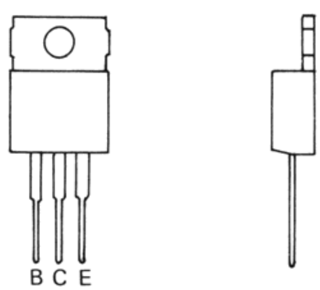
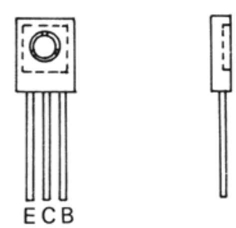


2SD471



2SC1909



2SC1957

PARTS LIST

CAPACITORS

Ref. No.	Description	RS Part No.
C31	33pF ±5% Ceramic Disc.	
C32	33μF 16V Electrolytic	
C33	0.01μF +80, −20% Ceramic Disc.	
C34	22pF ±5% Ceramic Disc.	
C35	33μF 16V Electrolytic	
C36	0.01μF +80,−20% Ceramic Disc.	
C37	0.01μF +80,−20% Ceramic Disc.	
C38	10μF 16V Electrolytic	
C39		
C40	33pF ±5% Ceramic Disc.	
C41	0.01μF +80,−20% Ceramic Disc.	
C42	0.01μF +80,−20% Ceramic Disc.	
C43	0.01μF +80,−20% Ceramic Disc.	
C44	56pF ±5% Ceramic Disc.	
C45		
C46		
C47	0.002μF +80,−20% Feed Through	
C48	0.002μF +80,−20% Feed Through	
C49	0.002μF +80,−20% Feed Through	
C50	0.002μF +80,−20% Feed Through	
C51	0.002μF +80,−20% Feed Through	
C52	0.002μF +80,−20% Feed Through	
C53	0.002μF +80,−20% Feed Through	
C54	0.002μF +80,−20% Feed Through	
C55	0.002μF +80,−20% Feed Through	
C56	0.002μF +80,−20% Feed Through	
C57		
C58	0.002μF +80,−20% Feed Through	
C61	0.047μF ±20% Mylar	
C62	0.022μF ±20% Mylar	
C63	0.01μF +80,−20% Ceramic	
C64	0.01μF +80,−20% Ceramic	
C65	0.01μF +80,−20% Ceramic	
C66	0.001μF +80,−20% Ceramic	
C67	0.001μF +80,−20% Ceramic	
C68	0.001μF +80,−20% Ceramic	
C100	47pF ±5% Ceramic Disc.	
C101	56pF ±5% Ceramic Disc.	
C102	250pF ±5% Ceramic Disc.	
C103	500pF ±5% Ceramic Disc.	
C104	2pF ±0.5pF Ceramic Disc.	
C105	33pF ±5% Ceramic Disc.	

Ref. No.	Description	RS Part No.
C106	0.01μF +80,−20% Ceramic Disc.	
C107	10μF 16V Electrolytic	
C108	0.01μF +80,−20% Ceramic Disc.	
C109	10μF 16V Electrolytic	
C110	0.01μF +80,−20% Ceramic Disc.	
C111	0.01μF +80,−20% Ceramic Disc.	
C112	0.01μF +80,−20% Ceramic Disc.	
C113	1pF ±0.25pF Ceramic Disc.	
C114		
C115	0.033μF ±20% Mylar	
C116	100pF ±5% Ceramic Disc.	
C117	0.01μF +80,−20% Ceramic Disc.	
C118	0.01μF +80,−20% Ceramic Disc.	
C119	0.01μF +80,−20% Ceramic Disc.	
C120	15pF ±5% Ceramic Disc.	
C121	0.047μF ±20% Mylar	
C122	0.047μF ±20% Mylar	
C123	0.047μF ±20% Mylar	
C124	0.047μF ±20% Mylar	
C125	0.047μF ±20% Mylar	
C126	0.047μF ±20% Mylar	
C127	0.01μF +80,−20% Ceramic Disc.	
C128	0.033μF ±20% Mylar	
C129	0.047μF ±20% Mylar	
C130	10μF 16V Electrolytic	
C131	0.01μF +80,−20% Ceramic Disc.	
C132	0.022μF ±20% Mylar	
C133	0.047μF ±20% Mylar	
C134	10μF 16V Electrolytic	
C135	0.01μF +80,−20% Ceramic Disc.	
C136	0.01μF +80,−20% Ceramic Disc.	
C137	1μF 50V Electrolytic	
C138		
C139	0.01μF +80,−20% Ceramic Disc.	
C200	0.01μF +80,−20% Ceramic Disc.	
C201	1μF 50V Electrolytic	
C202	0.033μF ±20% Mylar	
C203	0.01μF +80,−20% Ceramic Disc.	
C204	47μF 10V Electrolytic	
C205	1μF 50V Electrolytic	
C206	0.047μF ±20% Mylar	
C207	10μF 16V Electrolytic	
C208	0.01μF +80,−20% Ceramic Disc.	

Ref. No.	Description	RS Part No.
C209	0.01μF +80,−20% Ceramic Disc.	
C210	10μF 10V Tantalum	
C211	1μF 50V Electrolytic	
C212	220pF ±5% Ceramic Disc.	
C213	0.01μF +80,−20% Ceramic Disc.	
C214	33μF 3.15V Tantalum	
C215	10μF 16V Electrolytic	
C216	0.01μF +80,−20% Ceramic Disc.	
C217	10μF 16V Electrolytic	
C218	10μF 16V Electrolytic	
C219	0.47μF ±20% Mylar	
C220	1μF 50V Electrolytic	
C221	0.01μF +80,−20% Ceramic Disc.	
C222	470μF 16V Electrolytic	
C223	1μF 50V Electrolytic	
C224	0.001μF ±20% Mylar	
C225		
C226	0.01μF +80,−20% Ceramic Disc.	
C227	0.001μF +80,−20% Ceramic Disc.	
C228	0.01μF +80,−20% Ceramic Disc.	
C229	0.01μF +80,−20% Ceramic Disc.	
C230	0.01μF +80,−20% Ceramic Disc.	
C231	0.01μF +80,−20% Ceramic Disc.	
C232	0.047μF ±20% Mylar	
C300	68pF ±5% Ceramic Disc.	
C301	0.01μF +80,−20% Ceramic Disc.	
C302	0.01μF +80,−20% Ceramic Disc.	
C303	100pF ±5% Ceramic Disc.	
C304		
C305	220pF ±5% Ceramic Disc.	
C306	0.01μF ±20% Ceramic Disc.	
C307	100μF 3.15V Tantalum	
C308	0.01μF +80,−20% Ceramic Disc.	
C309	56pF ±5% Ceramic Disc.	
C310	27pF ±5% Ceramic Disc.	
C311	150pF ±5% Ceramic Disc.	
C312	500pF ±5% Ceramic Disc.	
C313	12pF ±5% Ceramic Disc.	
C314	0.01μF +80,−20% Ceramic Disc.	
C315	330pF ±5% Ceramic Disc.	
C316	500pF ±5% Ceramic Disc.	
C317	0.01μF +80,−20% Ceramic Disc.	
C318	4.7μF 50V Electrolytic	
C319	0.01μF +80,−20% Ceramic Disc.	
C320	3.3μF 50V Electrolytic	
C321	0.01μF +80,−20% Ceramic Disc.	
C322	33μF 3.15V Tantalum	
C323	0.033μF ±20% Mylar	
C324	0.047μF +80,−20% Ceramic Disc.	
C325	0.01μF +80,−20% Ceramic Disc.	
C326		
C327	0.01μF +80,−20% Ceramic Disc.	
C328	0.01μF +80,−20% Ceramic Disc.	

RESISTORS

Ref. No.	Description	RS Part No.	Ref. No.	Description	RS Part No.
R 1			R128	3.3KΩ ±10% ¼ Carbon Film	
R 2			R129	3.3KΩ ±10% ¼ Carbon Film	
R 3			R130	150KΩ ±10% ¼ Carbon Film	
R 4			R131	4.7KΩ ±10% ¼ Carbon Film	
R 5			R132	3.9KΩ ±10% ¼ Carbon Film	
R 6			R133	1.5KΩ ±10% ¼ Carbon Film	
R 7			R134	8.2KΩ ±10% ¼ Carbon Film	
R 8			R135	5.6KΩ ±10% ¼ Carbon Film	
R 9			R136	2.2KΩ ±10% ¼ Carbon Film	
R10			R137	470KΩ ±10% ¼ Carbon Film	
R11	560Ω ±10% ¼ Carbon Film		R138	100KΩ ±10% ¼ Carbon Film	
R12	4.7KΩ ±10% ¼ Carbon Film		R139	120KΩ ±10% ¼ Composition	
R13	18KΩ ±10% ¼ Carbon Film		R140	3.3KΩ ±10% ¼ Carbon Film	
R14	12KΩ ±10% ¼ Carbon Film		R141	2.2KΩ ±10% ¼ Carbon Film	
R15	1.2KΩ ±10% ¼ Carbon Film		R142	5.6KΩ ±10% ¼ Carbon Film	
R16	100Ω ±10% ¼ Carbon Film		R143	470KΩ ±10% ¼ Carbon Film	
R17	1KΩ ±10% ¼ Carbon Film		R144	1KΩ ±10% ½ Composition	
			R145	3.3KΩ ±10% ½ Composition	
R100	22KΩ ±10% ¼ Carbon Film		R146	2.7KΩ ±10% ¼ Carbon Film	
R101	820Ω ±10% ¼ Carbon Film				
R102	22KΩ ±10% ¼ Carbon Film		R200	2.7KΩ ±10% ¼ Carbon Film	
R103	27KΩ ±10% ¼ Carbon Film		R201	4.7KΩ ±10% ¼ Carbon Film	
R104	1KΩ ±10% ¼ Carbon Film		R202	2.7KΩ ±10% ¼ Carbon Film	
R105	10KΩ ±10% ¼ Carbon Film		R203	47KΩ ±10% ¼ Carbon Film	
R106	3.3KΩ ±10% ¼ Carbon Film		R204	100KΩ ±10% ¼ Carbon Film	
R107	22KΩ ±10% ¼ Carbon Film		R205	2.2KΩ ±10% ¼ Carbon Film	
R108	470Ω ±10% ¼ Carbon Film		R206	220KΩ ±10% ¼ Carbon Film	
R109	470Ω ±10% ¼ Carbon Film		R207	470Ω ±10% ¼ Carbon Film	
R110	6.8KΩ ±10% ¼ Carbon Film		R208	4.7KΩ ±10% ¼ Carbon Film	
R111	22KΩ ±10% ¼ Carbon Film		R209	10KΩ ±10% ¼ Carbon Film	
R112	470Ω ±10% ¼ Carbon Film		R210	4.7KΩ ±10% ¼ Carbon Film	
R113	2.2KΩ ±10% ¼ Carbon Film		R211	47 KΩ ±10% ¼ Carbon Film	
R114	1KΩ ±10% ¼ Carbon Film		R212	33KΩ ±10% ¼ Carbon Film	
R115	2.2KΩ ±10% ¼ Carbon Film		R213	4.7KΩ ±10% ¼ Carbon Film	
R116	680Ω ±10% ¼ Carbon Film		R214	220Ω ±10% ¼ Carbon Film	
R117	470Ω ±10% ¼ Carbon Film		R215	2.2KΩ ±10% ¼ Carbon Film	
R118	330Ω ±10% ¼ Carbon Film		R216	68Ω ±10% ¼ Carbon Film	
R119	22KΩ ±10% ¼ Carbon Film		R217	3.3KΩ ±10% ¼ Carbon Film	
R120	4.7KΩ ±10% ¼ Carbon Film		R218	18KΩ ±10% ¼ Carbon Film	
R121	22Ω ±10% ¼ Carbon Film		R219	3.3KΩ ±10% ¼ Carbon Film	
R122	470Ω ±10% ¼ Carbon Film		R220	470Ω ±10% ¼ Carbon Film	
R123	1KΩ ±10% ¼ Carbon Film		R221	10Ω ±10% ¼ Carbon Film	
R124	1.5KΩ ±10% ¼ Carbon Film		R222	15KΩ ±10% ¼ Carbon Film	
R125	10KΩ ±10% ¼ Composition		R223	2.2KΩ ±10% ¼ Carbon Film	
R126	3.3KΩ ±10% ¼ Carbon Film		R224	10KΩ ±10% ¼ Carbon Film	
R127	6.8KΩ ±10% ¼ Carbon Film		R225	2.2Ω ±10% ½ Composition	

Ref. No.	Description	RS Part No.	Ref. No.	Description	RS Part No.
R226	2.2Ω ±10% ½ Composition				
R227	47KΩ ±10% ¼ Carbon Film				
R228	10Ω ±10% 3 Wire Wound				
R229	2.2KΩ ±10% ¼ Carbon Film				
R230	4.7KΩ ±10% ¼ Carbon Film				
R231	150Ω ±10% ¼ Carbon Film				
R232	10KΩ ±10% ¼ Carbon Film				
R233	100KΩ ±10% ¼ Composition				
R234	100Ω ±10% ¼ Composition				
R300	18KΩ ±10% ¼ Carbon Film				
R301	12KΩ ±10% ¼ Carbon Film				
R202	270Ω ±10% ¼ Carbon Film				
R303	3.3KΩ ±10% ¼ Carbon Film				
R304	220Ω ±10% ¼ Carbon Film				
R305	2.2Ω ±10% ¼ Composition				
R306					
R307	33Ω ±10% ¼ Carbon Film				
R308	2.2Ω ±10% ¼ Composition				
R309	1.5KΩ ±10% ½ Composition				
R310	10KΩ ±10% ¼ Carbon Film				
R311	2.7KΩ ±10% ¼ Carbon Film				
R312	4.7KΩ ±10% Carbon Film				
R313	3.9KΩ ±10% ¼ Carbon Film				
R314	33KΩ ±10% ¼ Carbon Film				
R315	15KΩ ±10% ¼ Carbon Film				
R316	150Ω ±5% 1 Metal Film				
R317	27KΩ ±10% ¼ Carbon Film				
R318	1.5KΩ ±10% ¼ Carbon Film				
R319	10KΩ ±10% ¼ Carbon Film				
R320	27KΩ ±10% ¼ Carbon Film				
R321	3.9KΩ ±10% ¼ Carbon Film				
R322	2.7KΩ ±10% ¼ Carbon Film				

Ref. No.	Description	RS Part No.	MFR. Part No.
FILTERS			
CF 1	SFE 10.24MA or 10.7MF-C	C–0867	
CF100	SFE 10.7MJ or CFM 107F 12	C–0868	
CF101	CFW455HT or CF455A		
DIODES			
D 5	RD6.8EB	DX–1043	
D 6	F14B	DX–0721	
D100	1S2473, 1S1588 or 1SS53	DX–0299	
D101	1S2473, 1S1588 or 1SS53	DX–0299	
D102	1S2473, 1S1588 or 1SS53	DX–0299	
D103	1N60, 1K60A or SD46	DX–0161	
D104	1N60, 1K60A or SD46	DX–0161	
D105	1S2473, 1S1588 or 1SS53		
D106	1N60, 1K60A or SD46	DX–0161	
D107	1N60, 1K60A or SD46	DX–0161	
D108	RD5.6EB	DX–1043	
D109	1S2473, 1S1588 or 1SS53	DX–0299	
D110	1S2473, 1S1588 or 1SS53	DX–0299	
D111			
D112			
D113	1S2473, 1S1588 or 1SS53	DX–0299	
D114			
D115	RD7.5EB		
D200	VD1123 **(VARISTOR)**	DX–0514	
D201	1S2473, 1S1588 or 1SS53	DX–0299	
D300	1S2473, 1S1588 or 1SS53	DX–0299	
D301	F14B, F14C or V06C	DX–0721	
D302	1S2473, 1S1588 or 1SS53	DX–0299	
D303	1S2473, 1S1588 or 1SS53	DX–0299	
D304	1S2473, 1S1588 or 1SS53	DX–0299	
JACKS AND SOCKET			
J 1	Ext. Power Jack	J–0924	EC-317-1-4
J 2	Changer Jack		EC-317-1-4
J 3	Ext. Speaker Jack	J–0922	JJ-J009
J 4	Ext. Antenna Jack	J–0923	
J 5	Ext. Mic. Socket	J–6532	CS163-1-2
J 6	Int. Speaker Connector (Socket)	J–0925	5045-02A
COILS			
L 1	RF Choke Coil		CH-H104SB
L100	RF Coil	CA–3874	L-R486SA
L101	RF Coil	CA–3870	L-R491SA

Ref. No.	Description		RS Part No.	MFR. Part No.
L102	RF Coil		CA–3871	L-R490SA
L103	RF Coil		CA–3085	T-T036SA
L300	RF Coil			L-R376SA
L301	RF Coil			L-R376SA
L302	RF Coil		CA–3872	L-R375SA
L303	RF Coil		CA–3873	L-R376SA
RFC	RF Choke Coil		CB–2210	LR151SB
SWITCHES				
S 2	Power "HIGH-LOW" Switch		S–5049	SLE74302A
S 3	Tx/Rx Switch		S–6053	AH2524
S 5	Delta Tune Switch		S–5050	SLE62302A
S 6	Channel Selector Switch		S–1295	STF-40A
TRANSFORMERS				
T 7	RF Transformer	10.240 MHz	CA–3869	T-T060SA
T 8	RF Transformer	38 MHz	CA–3714	T-T052SA
T 9	RF Transformer	27 MHz	CA–3086	T-T037SA
T100	RF Transformer	27 MHz	CA–3867	T-T048SC
T101	RF Transformer	27 MHz	CA–3868	T-T049SC
T102	RF Transformer	27 MHz		T-T049SC
T103	IF Transformer	10.695 MHz	CA–7832	T-M056SA
T104	IF Transformer	455 kHz	CA–7356	T-M054SA
T105	IF Transformer	455 kHz	CA–7357	T-M055SB
T200	Audio Driver Transformer		TN–0122	T-A091SC
T201	Audio Power Transformer		TD–0168	T-D040SD
THERMISTORS				
TH 1	D33A		T–1202	
TH 2	D33A		T–1202	
TRANSISTORS				
TR 1	2SD471 (K)			
TR 2	2SC945 (R, P or Q) or 2SC828 (P, Q or R)			
TR 3	2SC839 (E or F) or 2SC829 (B or C)			
TR100	2SC839 (E or F) or 2SC829 (B or C)			
TR101	2SC1047 (C) or 2SC1394			
TR102	2SC1047 (C) or 2SC1394			
TR103	2SC839 (E or F) or 2SC829 (B or C)			
TR104	2SC839 (E or F) or 2SC829 (B or C)			
TR105	2SC839 (E or F) or 2SC829 (B or C)			

Ref. No.	Description	RS Part No.	MFR. Part No.
TR200	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
TR201	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
TR202	2SC945 (Q) or 2SC828 (Q)		
TR203	2SC1061 (B)		
TR204	2SC1061 (B)		
TR205	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
TR206	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
TR207	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
TR208	2SA562		
TR209	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
TR300	2SC815 or 2SC1906		
TR301	2SC1957, 2SC1846, 2SC781 or 2SC1760		
TR302	2SC1909, 2SC1974 or 2SC1816		
TR303	2SD471 (K)		
TR304	2SC945 (Q) or 2SC828 (Q)		
TR305	2SC945 (Q) or 2SC828 (Q)		
TR306	2SC945 (R, P or Q) or 2SC828 (P, Q or R)		
VARIABLE RESISTORS			
VR102	Variable Resistor 10KΩA VOLUME with S1 (POWER)	P–1846	
VR100	Variable Resistor 10KΩ-C SQUELCH	P–0817	
SEMI VARIABLE RESISTORS			
VR101	Semi Variable 2 KΩ-B	P–6473	
VR103	Semi Variable 50 KΩ-B	P–6480	
VR104	Semi Variable 10 KΩ-B	P–6474	
VR300	Semi Variable 50 KΩ-B	P–6480	
OTHER ELECTRICAL PARTS			
	Int. Speaker 32 ohm	S–4729	P-50-1732C
	Int. Mic.	M–1089	WM-034Z
	Meter (S/RF/Batt.)	M–0243	M-A116SA
	Int. Antenna (Center Loading Antenna)	CA–0292	AR-0003
	Int. Speaker Connector (Receptacle)		Z-A038SA
	PLL Unit Ass'y	X–7626	TCH-A32F

Ref. No.	Description	RS Part No.	MFR. Part No.
MISCELLANEOUS (Refer to Disassembly Instruction & Exploded View)			
1	Plastic Cabinet (Front)		XCI-1P001
2	Plastic Cabinet (Rear)	Z–3865	XCI-2P002
3	Battery Case		XCI-3P004
4	Front Name Plate		XCI-4P025
5	Rear Name Plate		XCI-4P015
6	Jack Plate		XCI-3P006
7	Control Panel	Z–3864	XCI-2P003
8	Battery Cover		XCI-3P005
9	Screw for Battery Cover		
10	E Ring for Battery Cover		
11	Cushion		XCI-4P032
12	Push to Talk Switch Button		XCI-3P008
13	Channel Select Knob	K–2815	XCI-4P009
14	Control Knob (VOLUME and SQUELCH)	K–2816	XCI-4P010
15	Cap for Jack	HB–7195	XCI-3P007
16	Chassis		XCI-2P011
17	Sub-panel	Z–3866	XCI-3P012
18	PLL Shield Case "A"		XCI-4P020
19	PLL Shield Case "B"		XCI-4P021
20	PLL Shield Case "C"		XCI-3P019
21	Main P. C. Board		XCI-3P105
22	Channel Select Switch P. C. Board		XCI-4P120
23	Switch P. C. Board		XCI-4P113
24	PLL P. C. Board		XCI-4P106
25	Heat Sink		XCI-3P022
26	Hand Strap Ring		XCI-4P013
27	E Ring for Hand Strap		
28	Bracket for Tx/Rx Switch		XCI-4P023
29	Spring for Push to Talk Switch		XCI-4P028
30	Bracket for Int. Microphone		XCI-4P024
31	Ribbon		
32	Antenna Rubber Ring	A–4407	XBN-4P015
33	Rubber Bushing	HB–7205	G48-No. 7148
34	Plastic Washer		4.2ϕ
35	Proof Dust Net		XCI-4P041
36	Hand Strap		XCI-3P030
37	Hand Strap Mounting Bracket		XCI-4P016
38	Hand Strap Bracket		XCI-4P017
39	Metal Bar (Hand Strap)		XCI-4P018