

REALISTIC[®]

Service Manual

21-1565

TRC-451 CB TRANSCEIVER Catalog Number: 21-1565



MANUFACTURED FOR RADIO SHACK  A DIVISION OF TANDY CORPORATION

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SCHEMATIC DIAGRAM/EXPLODED VIEW	SEPARATE SHEET

1. SPECIFICATIONS

GENERAL:

Channels	: 40 Channels for AM, Upper Side Band and Lower Side Band, utilizing Digital Circuitry
Frequency Range	: 26.965 MHz to 27.405 MHz
Frequency Control	: Digital (Phase Lock Loop) Synthesizer
Frequency Accuracy	: ± 100 Hz
Operating Temperature Range	: -20°C to $+50^{\circ}\text{C}$
Power Requirements	: 13.8V DC (12-16 volts DC, negative or positive ground)
Antenna	: 52 ohm (Coaxial connector)
Microphone	: 600 ohm Dynamic Type
Speaker	: 16 ohm, 3 Watt
Size (H x W x D)	: 7-1/3"(W) x 2-1/3"(H) x 8-9/10(D)
Weight	: 10 lbs. (4.5 kg)
Accessories	: DC Cord with in-line Fuse, Microphone and Microphone Bracket and Mounting Bracket

MEASUREMENT CONDITION:

Power Source	: 13.8V DC
Antenna Impedance	: 50 ohm
Test Temperature	: 25°C
AM Modulation Frequency	: 1 kHz
SSB Modulation Frequency, Transmit	: Two tone: 500 Hz and 2400 Hz Single tone: 1 kHz
Mean Signal Input Level	: $1000\ \mu\text{V}$
Reference Audio Output Power	: 0.5 W
Reference AM Modulation Percentage	: 1 kHz, 30%
Audio Frequency, SSB Receive	: 1 kHz
Audio Output Load	: 8 ohms resistive
Measuring Channel	: 19

RECEIVER:(ANL & Noise Blanker Switch OFF)

		UNIT	NOMINAL	LIMIT	
Max. Sensitivity	: AM	μV	0.5	1	
	: SSB	μV	0.25	0.5	
Sensitivity for 10 dB S/N	: AM	μV	0.5	1	
	: SSB	μV	0.25	0.5	
AGC Figure-of-Merit 100 mV for 10 dB Change in Audio Output	: AM	dB	90	80	
	: SSB	dB	90	80	
Overload AGC Characteristics from 100 mV to 100 mV	: AM	dB	± 3	± 5	
	: SSB	dB	± 3	± 5	
Overall Audio Fidelity at -6 dB Down Upper Frequency	: AM	Hz	2100	1750 ~ 2500	
	: SSB	Hz	3500	2500 ~ 5000	
Lower Frequency	: AM	Hz	450	250 ~ 650	
	: SSB	Hz	450	250 ~ 650	
Cross Modulation, RS Standard	: AM	dB	60	50	
Adjacent Channel Selectivity (10 kHz)	: AM	dB	70	60	
	: SSB	dB	70	60	
Maximum Audio Output Power	: AM	W	4	3	
	: SSB	W	4	3	
Audio Output Power at 10% THD	: AM	W	3	2.5	
	: SSB	W	3	2.5	
THD at 500 mW Audio Output	AM: 1 mV Input, 30% modulation	: AM	%	3	6
	80% modulation	: AM	%	5	8
	SSB: 1 mV Input, 1 kHz, Single-tone	: SSB	%	3	6
RF Gain Control Range at Max. Sensitivity Level	: AM	dB	40	30 ~ 60	
	: SSB	dB	40	30 ~ 60	
S/N Ratio at 1 mV Input	: AM	dB	40	34	
	: SSB	dB	40	34	
Squelch Sensitivity at Threshold	: AM	μV	0.5	2	
	: SSB	μV	0.5	2	
S Meter Sensitivity at "S-9" (No Modulation AM)	: AM	μV	100	50 ~ 200	
	: SSB	μV	100	50 ~ 200	
Image Rejection Ratio, $f_o+(2 \times 10.695 \text{ MHz})$: AM	dB	76	66	
	: SSB	dB	76	66	
1/2 IF Rejection Ratio, $f_o+10.695 \text{ MHz}/2$: AM	dB	90	80	
	: SSB	dB	90	80	
IF Rejection Ratio, 10.695 MHz	: AM	dB	85	75	
	: SSB	dB	85	75	
Oscillator Drop-out Voltage	: AM	V	9	11	
	: SSB	V	9	11	
Clarifier Range	: AM	kHz	± 1.25	$\pm 0.6 \sim \pm 2.5$	
	: SSB	kHz	± 1.25	$\pm 0.6 \sim \pm 2.5$	
Spurious Rejection Ratio	In band	: AM	dB	65	56
		: SSB	dB	65	56
	Out of Band	: AM	dB	60	50
		: SSB	dB	60	50

		UNIT	NOMINAL	LIMIT
Battery Drain at No Signal	: AM	mA	250	500
	SSB	mA	250	500
Battery Drain at Maximum Output Power	: AM	mA	1000	1500
	SSB	mA	1000	1500
PUBLIC ADDRESS:				
Microphone Sensitivity for 3W Output Power at 1 kHz		mV	1.5	3
Maximum Output Power		W	4	3
TRANSMITTER:				
Frequency Tolerance at 25° C (5 Minutes after switch on)	: AM	%	±0.0005	±0.003
	SSB	%	±0.0005	±0.003
Carrier Power at No Modulation	: AM	W	3.8	3.5 – 4.4
PEP Power, Two Tone	: SSB	W PEP	12	10 – 13.2
Modulation Distortion at 1 kHz, 80% Modulation	: AM	%	3	8
Spurious Harmonic Emission	: AM	dB	-65	-60
	SSB	dB	-65	-60
Carrier Suppression	: SSB	dB	-55	-40
Unwanted Sideband Suppression at 2.5 kHz	: SSB	dB	-55	-40
Modulation Frequency Response at -6 dB Down (1 kHz, 0 dB reference)				
Lower Frequency	: AM	Hz	450	250 ~ 650
	SSB	Hz	450	250 ~ 650
Upper Frequency	: AM	Hz	2500	2000 ~ 4000
	SSB	Hz	3500	2000 ~ 5000
Carrier Power Uniformity, Ch-to-Ch at No Modulation	: AM	W	0.3	0.4
Mic Input Level Uniformity, Ch-to-Ch for 4 watts Output 2.5 kHz Single Tone, SSB		dB	2	3
Mic Input Level Uniformity, LSB to USB for 4 watts Output, 1.5 kHz Single Tone		dB	1	3
Microphone Sensitivity				
AM: For 50% Modulation	: AM	mV	0.4	1.0
SSB: For 4 watts PEP	: SSB	mV	0.4	1.0
AMC Range				
AM: 50 ~ 100% Modulation	: AM	dB	60	40
SSB: 10 ~ 13.2 watts PEP	SSB	dB	60	40
Battery Drain at No Modulation	: AM	mA	2200	3000
	SSB	mA	500	1000
Battery Drain				
AM: Max. Modulation	: AM	mA	2200	3000
SSB: Max watts PEP, Two tone	SSB	mA	2000	3000

Note; Nominal Specs represent the design specs; all units should be able to approximate these, some will exceed and some may drop slightly below these specs.

Limit Specs represent the absolute worst condition which still might be considered acceptable, in no case should a unit perform to less than within any Limit Spec.

2. DISASSEMBLY INSTRUCTIONS

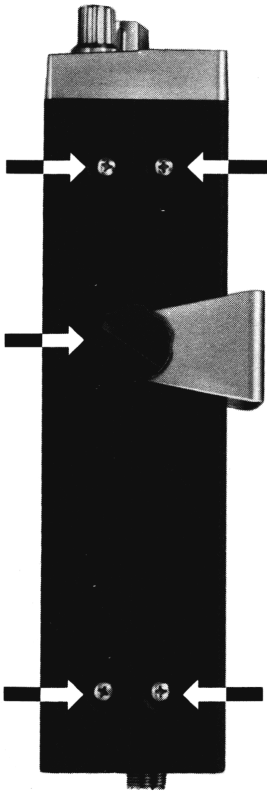


Figure 1

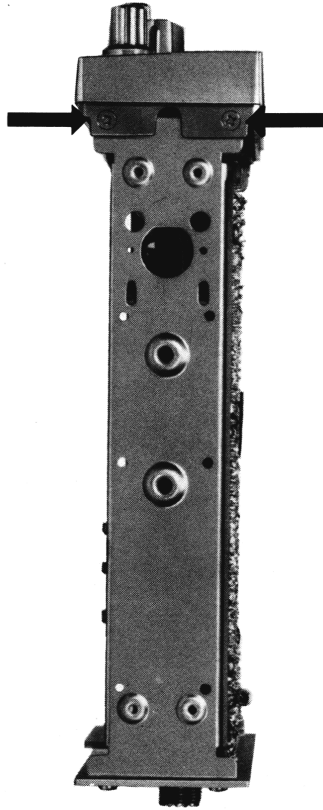
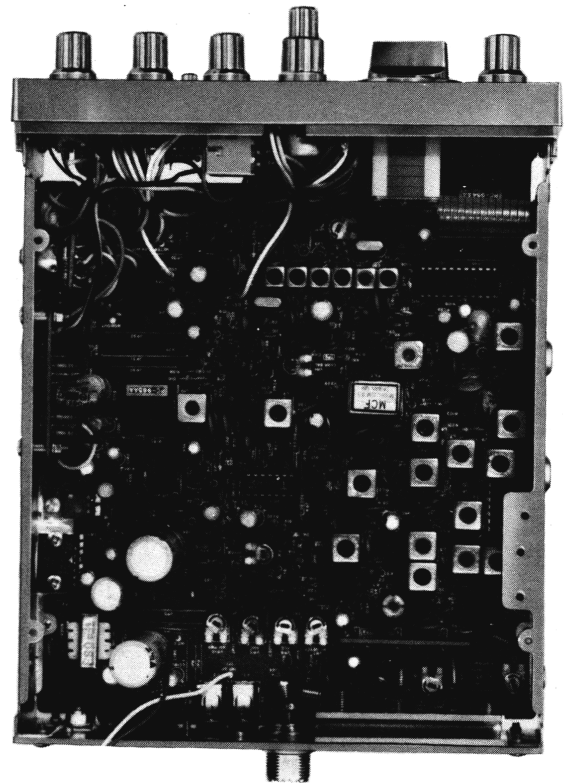
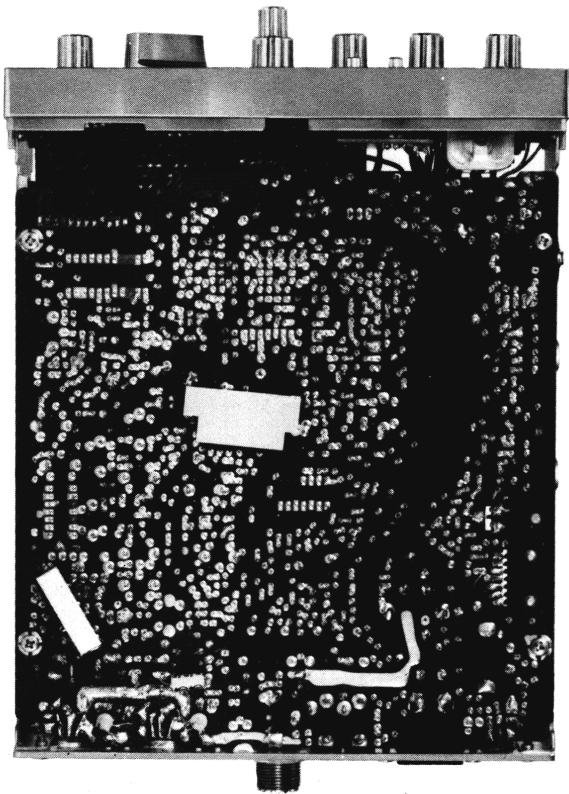
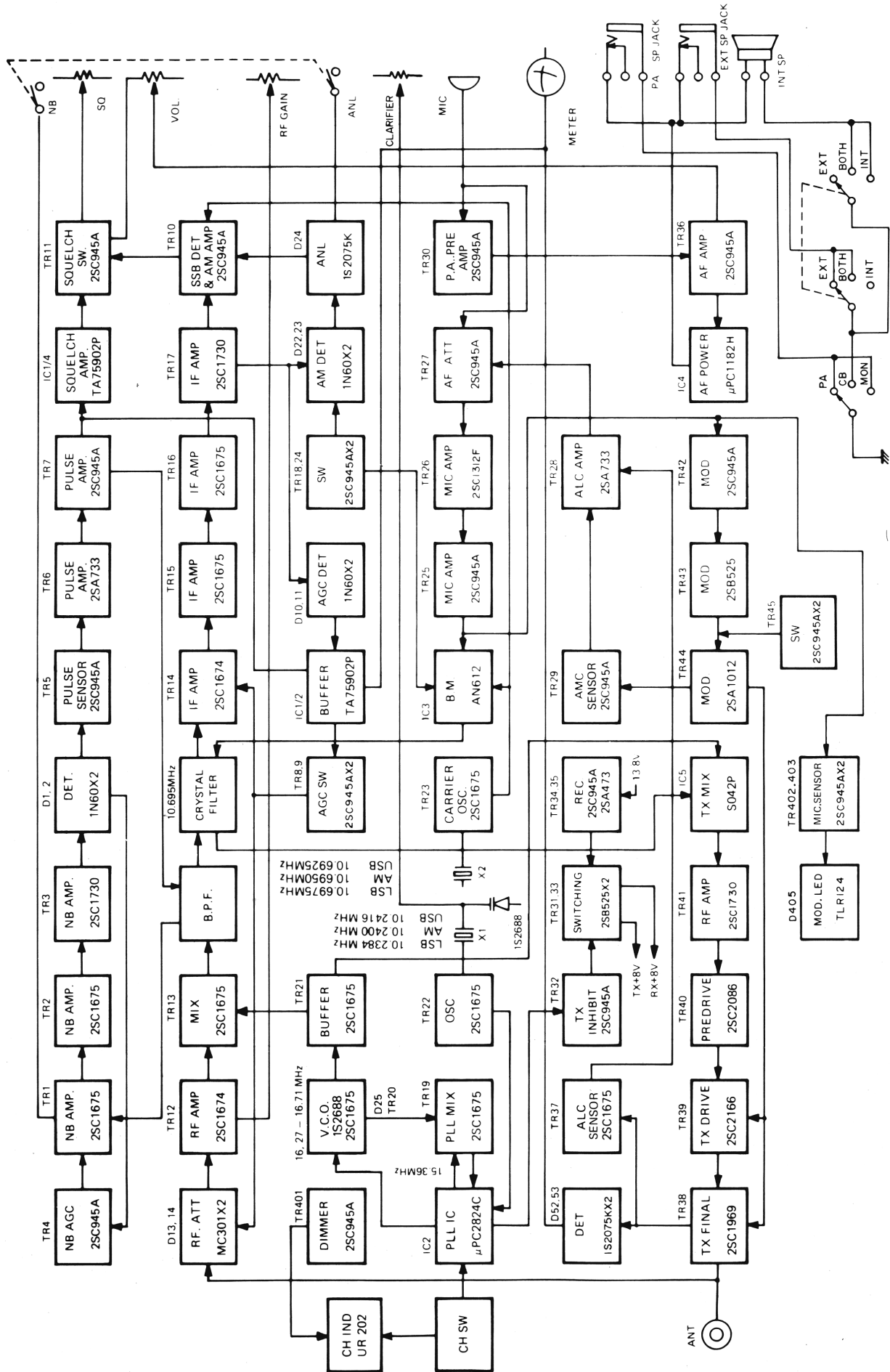


Figure 2

1. To remove Top & Bottom Cover: (Figure 1)
Remove 4 screws from each side and two screws from rear. Slide the top toward the rear of the chassis and remove.
2. To remove Front Panel: (Figure 2)
Remove 2 screws from each side.



3. BLOCK DIAGRAM

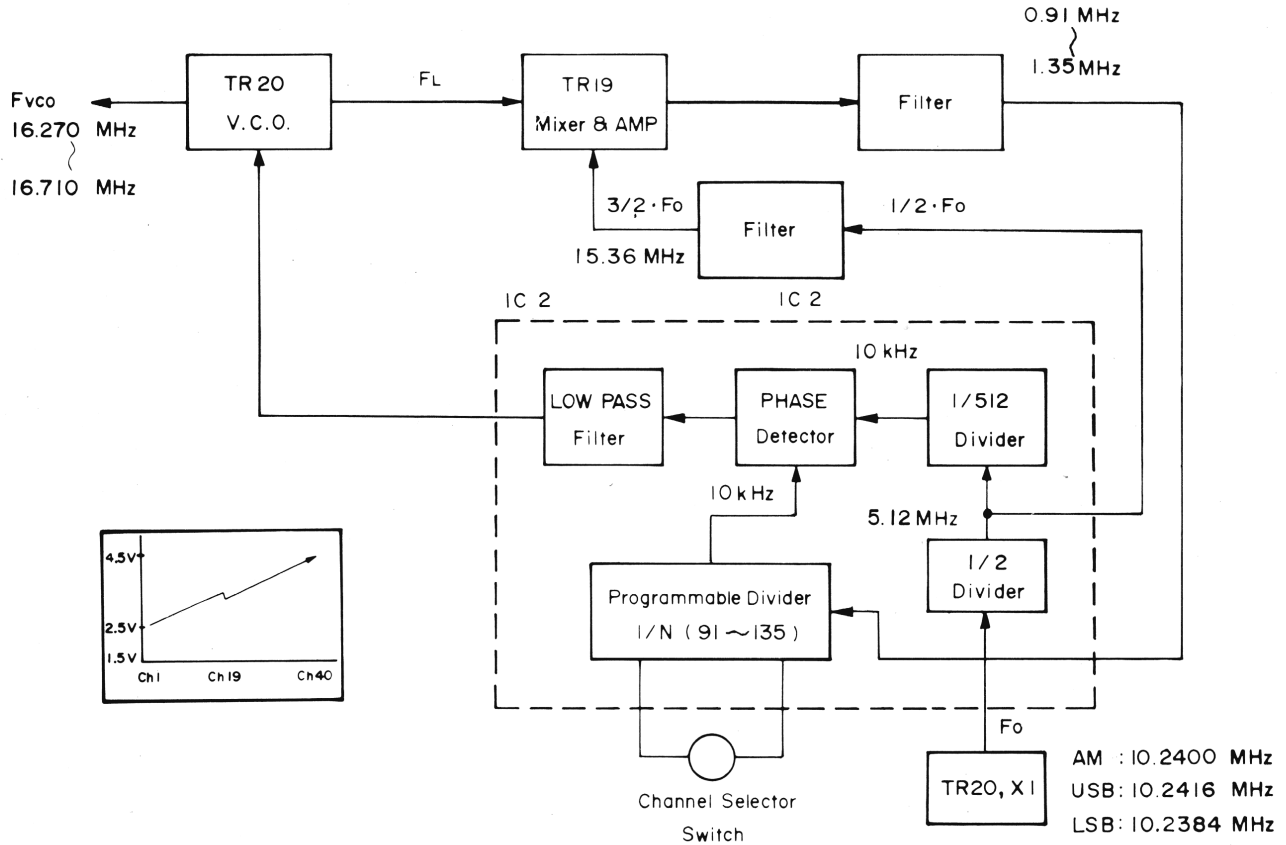


4. CIRCUIT DESCRIPTION

1. PLL

The PLL circuit (Phase Locked Loop) used in TRC-451 consists of 6 major components: VCO (Voltage Controlled Oscillator), 1/N Divider, Ref-

erence Oscillator, 1/1024 Divider, Phase Detector and Low Pass Filter.



The VCO is an Oscillator whose oscillation frequency varies in accordance with input voltage changes. 1/N Divider is a programmable Divider; the "N" is varied by the Channel Selector Switch. A portion of the VCO output is mixed with a signal from TR22 by TR19, "In-Loop mixer". It is used to shift the VCO frequency. TR22, "In-Loop Local Oscillator", generates 10.24 MHz frequency (AM: 10.2400 MHz, USB: 10.24116 MHz and LSB: 10.2384 MHz). This 10.24 MHz signal is fed to TR19, Mixer, passing through the 1/2 Divider and Filter. VCO frequency is down mixed with a signal from Tripler providing 0.91 MHz through 1.35 MHz (see frequency table). The signal is fed to the 1/N Divider through the Filter. The Filter eliminates harmonics. 1/N Divider produces the 10 kHz frequency and it is fed to the Phase Detector.

Meanwhile, the 10.24 MHz frequency generated by X1, is changed to 10 kHz by 1/1024 Divider and is fed to another input of the Phase Detector. Thus the Phase Detector receives two signals (both 10 kHz). It compares the phase difference of the two and generates an error voltage which acts on the VCO to bring the two frequencies exactly in-phase. When this condition occurs, the PLL circuit is "Locked". A Low Pass Filter is used to change the AC signal to DC.

Then the VCO output is up-mixed with Local Oscillator frequency (X2 and TR23) and the resulting 27 MHz frequencies are transmitted.

By varying the constant N, the output frequency from the VCO can be varied in 10 kHz steps. The constant N is controlled by the Channel Selector Switch. A frequency shift of 2.5 kHz (required for AM, USB and LSB) is obtained by switching Diodes D29 (LSB), D28 (USB) and D27 (AM).

**2. LOCAL OSCILLATOR
(CARRIER OSCILLATOR)**

TR23 is a carrier oscillator which generates 10.6925 MHz, 10.6975 MHz or 10.6950 MHz.

In USB mode, X2 functions by D35 switching; so TR23 oscillates on 10.6925 MHz.

In LSB mode, X2 functions by D36 switching and TR23 oscillates on 10.6975 MHz.

In AM mode, when the unit is in transmitting, X2 functions by D34 switching and also TR21 oscillates on 10.6950 MHz.

Therefore TR23 oscillates on 10.6950 MHz when receiving an AM modes.

The carrier output goes to the receiver circuit for demodulation of SSB signal or goes to transmitter circuit for modulation.

3. CHANNEL SELECTION PROGRAM

The Divide Ratio N, is determined by voltage supplied to the program input terminals, pins No. 1 through 6 of IC2. The function of the program input terminals is shown in Frequency Table chart.

For example, when the unit is transmitting on Channel 19, the frequencies will be as shown in following table:

	AM mode	USB mode	LSB mode
N	113	113	113
F_o x ½ x 3 (MHz)	15.360	15.360	15.360
N x 10 kHz (MHz) output of TR19	1.130	1.130	1.130
F_L VCO Frequency (MHz)	16.490	16.490	16.470
F_{IF} (MHz) Local Oscillator Frequency	10.695	10.695	10.695
F_t Transmit Fre- quency (MHz)	27.185	27.185	27.185

FREQUENCY TABLE OF PLL

CH	ANT. Frequency (MHz)	Divide Ratio "N"	1/N INPUT FREQUENCY (MHz)	PROGRAM CODE (PIN NO. OF IC2)						LOCAL OSC (MHz) OUTPUT FREQUENCY		
				1	2	3	4	5	6	AM.RX&TX	USB	LSB
1	26.965	91	0.91	1	0	0	0	0	0	16.270	16.2725	16.2675
2	26.975	92	0.92	0	1	0	0	0	0	16.280	16.2825	16.2775
3	26.985	93	0.93	1	1	0	0	0	0	16.290	16.2925	16.2875
4	27.005	95	0.95	0	0	1	0	0	0	16.310	16.3125	16.3075
5	27.015	96	0.96	1	0	1	0	0	0	16.320	16.3225	16.3175
6	27.025	97	0.97	0	1	1	0	0	0	16.330	16.3325	16.3275
7	27.035	98	0.98	1	1	1	0	0	0	16.340	16.3425	16.3375
8	27.055	100	1.00	0	0	0	1	0	0	16.360	16.3625	16.3575
9	27.065	101	1.01	1	0	0	1	0	0	16.370	16.3725	16.3675
10	27.075	102	1.02	0	0	0	0	1	0	16.380	16.3825	16.3775
11	27.085	103	1.03	1	0	0	0	1	0	16.390	16.3925	16.3875
12	27.105	105	1.05	0	1	0	0	1	0	16.410	16.4125	16.4075
13	27.115	106	1.06	1	1	0	0	1	0	16.420	16.4225	16.4175
14	27.125	107	1.07	0	0	1	0	1	0	16.430	16.4325	16.4275
15	27.135	108	1.08	1	0	1	0	1	0	16.440	16.4425	16.4375
16	27.155	110	1.10	0	1	1	0	1	0	16.460	16.4625	16.4575
17	27.165	111	1.11	1	1	1	0	1	0	16.470	16.4725	16.4675
18	27.175	112	1.12	0	0	0	1	1	0	16.480	16.4825	16.4775
19	27.185	113	1.13	1	0	0	1	1	0	16.490	16.4925	16.4875
20	27.205	115	1.15	0	0	0	0	0	1	16.510	16.5125	16.5075
21	27.215	116	1.16	1	0	0	0	0	1	16.520	16.5225	16.5175
22	27.225	117	1.17	0	1	0	0	0	1	16.530	16.5325	16.5275
23	27.255	120	1.20	1	1	0	0	0	1	16.560	16.5625	16.5575
24	27.235	118	1.18	0	0	1	0	0	1	16.540	16.5425	16.5375
25	27.245	119	1.19	1	0	1	0	0	1	16.550	16.5525	16.5475
26	27.265	121	1.21	0	1	1	0	0	1	16.570	16.5725	16.5675
27	27.275	122	1.22	1	1	1	0	0	1	16.580	16.5825	16.5775
28	27.285	123	1.23	0	0	0	1	0	1	16.590	16.5925	16.5875
29	27.295	124	1.24	1	0	0	1	0	1	16.600	16.6025	16.5975
30	27.305	125	1.25	0	0	0	0	1	1	16.610	16.6125	16.6075
31	27.315	126	1.26	1	0	0	0	1	1	16.620	16.6225	16.6175
32	27.325	127	1.27	0	1	0	0	1	1	16.630	16.6325	16.6275
33	27.335	128	1.28	1	1	0	0	1	1	16.640	16.6425	16.6375
34	27.345	129	1.29	0	0	1	0	1	1	16.650	16.6525	16.6475
35	27.355	130	1.30	1	0	1	0	1	1	16.660	16.6625	16.6575
36	27.365	131	1.31	0	1	1	0	1	1	16.670	16.6725	16.6675
37	27.375	132	1.32	1	1	1	0	1	1	16.680	16.6825	16.6775
38	27.385	133	1.33	0	0	0	1	1	1	16.690	16.6925	16.6875
39	27.395	134	1.34	1	0	0	1	1	1	16.700	16.7025	16.6975
40	27.405	135	1.35	0	0	0	0	0	0	16.710	16.7125	16.7075

0 = Low level (0 – 1.0 volt)
 1 = High level (3.5 – 6 volts)

5. ABBREVIATED CIRCUIT DESCRIPTION OF RECEIVER

1. RF Stage

A signal from the antenna is fed to RF Amplifier, TR12. The signal is processed to Mixer, TR13. The signal is mixed with a signal from the VCO (approx. 16 MHz) by TR21 and a 10.7 MHz signal (IF frequency) is produced.

2. IF Stage

The 10.7 MHz signal is amplified by T14 through TR17.

In the AM mode, the signal is detected by D22 and D23, and passed on to TR10, AF amplifier.

In the SSB modes, the signal is fed to TR10. TR10 operates as a Demodulator in SSB modes. To demodulate the SSB signal, the 10.7 MHz signal is needed. The AF signal then goes to IC4 through TR36, AF Power Amp.

3. AF Stage

The signal from TR10 is amplified by TR36, AF Pre-Amp, and IC4, AF Power amplifier. The output is heard from the Speaker.

4. AGC

IC1 is an AGC amplifier. A portion of the IF signal is amplified by IC1 and processed to TR14, which adjusts the gain of TR14. The signal also is applied to an RF attenuator consisting of D13 and D14.

5. Squelch

A portion of IC1's output goes to the squelch circuit. The squelch circuit consists of TR11; the output of IC1 is used to cut off TR11.

6. Fine Tuning

In the Receive mode, the output of X1 is varied in frequency by D30, Varactor Diode, and Fine Tuning VR403.

In the Transmit mode, the voltage to D30 is fixed by VR3, so the frequency is stable.

7. ANL

The ANL circuit consists of D24 and related circuits. The ANL circuit is effective on AM mode only. ANL is a clipping circuit; the clipping level is automatically determined by the carrier voltage.

8. Noise Blanker

A signal, including noise signal components from the antenna, is converted to the 10.7 MHz IF frequency by TR13 and fed to TR1. The 10.7 MHz signal, including noise, is amplified by TR1, 2 and TR3 and then detected by D1 and D2. The detected signal is fed to TR5, Sensor, which

discriminates only a pulse-type noise from the signal. The pulse-type noise is amplified by TR6 and drives TR7 "on". Therefore, if noise exists, TR7 turns "on" and noise is reduced.

TR4 provides NB AGC, so that the noise blanker output is reduced or eliminated in the presence of a strong signal.

9. Transmit/Receive Control

TX/RX is controlled by pin 1, 3 and pin 5 of MIC jack. When pin 5 is shorted to pin 1, the unit is in Receive. If pin 3 is shorted to pin 1, the unit is in Transmit.

If pin 5 of MIC Jack becomes low, the DC voltage appears on collector of TR31. Collector of TR31 goes to B + of Receiver Circuit.

If pin 3 of MIC Jack becomes low, the DC voltage appears on collector of TR33. Collector of TR33 goes to TX circuit.

6. ABBREVIATED CIRCUIT DESCRIPTION OF TRANSMITTER

1. AM

An AF signal from the Mic is fed to TR26 through TR27. This signal is amplified by TR26 and TR25, Mic Amp, and is fed to TR42 and TR43. The signal amplified by TR44 is applied to TR39 and TR38 for modulation.

For the RF portion, two signals are mixed by IC5, Mixer, with a 27 MHz signal being produced. [One of these signals is 10.7 MHz which is generated by TR23 and other signal is the VCO output (approx. 16 MHz).] The 27 MHz signal is amplified by TR41 and TR40. The signal is amplified and modulated by TR39 and TR38 and is delivered to the Antenna. A portion of the signal is detected by D52 and D53 and Drives the RF PWR meter.

2. SSB

The audio signal from Mic is amplified by TR26 and TR25, it then is applied to IC3, Balanced Modulator. The carrier signal (10.6925 for USB or 10.6975 MHz for LSB) is applied to the other input of IC3. IC3 produces a carrier-suppressed DSB signal. The DSB signal is converted into SSB by FL1, Filter. In the USB mode, carrier + audio signal is produced. And in the LSB mode, carrier - audio signal is produced.

Example: In the USB mode, if 1 kHz audio signal modulates the carrier signal, two signals are produced as produced as shown below:

$$10.6925 \text{ MHz} + 1 \text{ kHz} = 10.6935 \text{ MHz}$$

But the 10.6925 MHz is suppressed by FL1, because the bandwidth of the FL1 is within ± 2.5 kHz of 10.6950 MHz.

The SSB signal is converted to 27 MHz signal by IC5. IC5 is a Mixer, and mixes the SSB signal with the VCO output of PLL.

The resulting SSB signal is amplified by TR41, 40, 39 and TR38 and is delivered to the Antenna.

3. AMC CIRCUIT

TR29 is a detector for AMC and the Input Attenuator consists of R157 and TR27. In an over-modulation condition, TR29 turns on and the detected current flows into R153. This current drives TR28 and TR27. As the C-E impedance of TR27 lowers, the input signal is lowered. The AMC circuit is not effective in SSB modes.

4. ALC CIRCUIT

TR37 is an ALC detector which detects peak RF power. If the power level exceeds a level that is selected by VR6, TR28 drives TR27 to decrease the input audio signal. ALC is effective only on SSB modes. In AM mode, the emitter voltage of TR37 is pulled up to B+, and thus the ALC circuit is inoperative.

5. UNLOCK DETECTOR

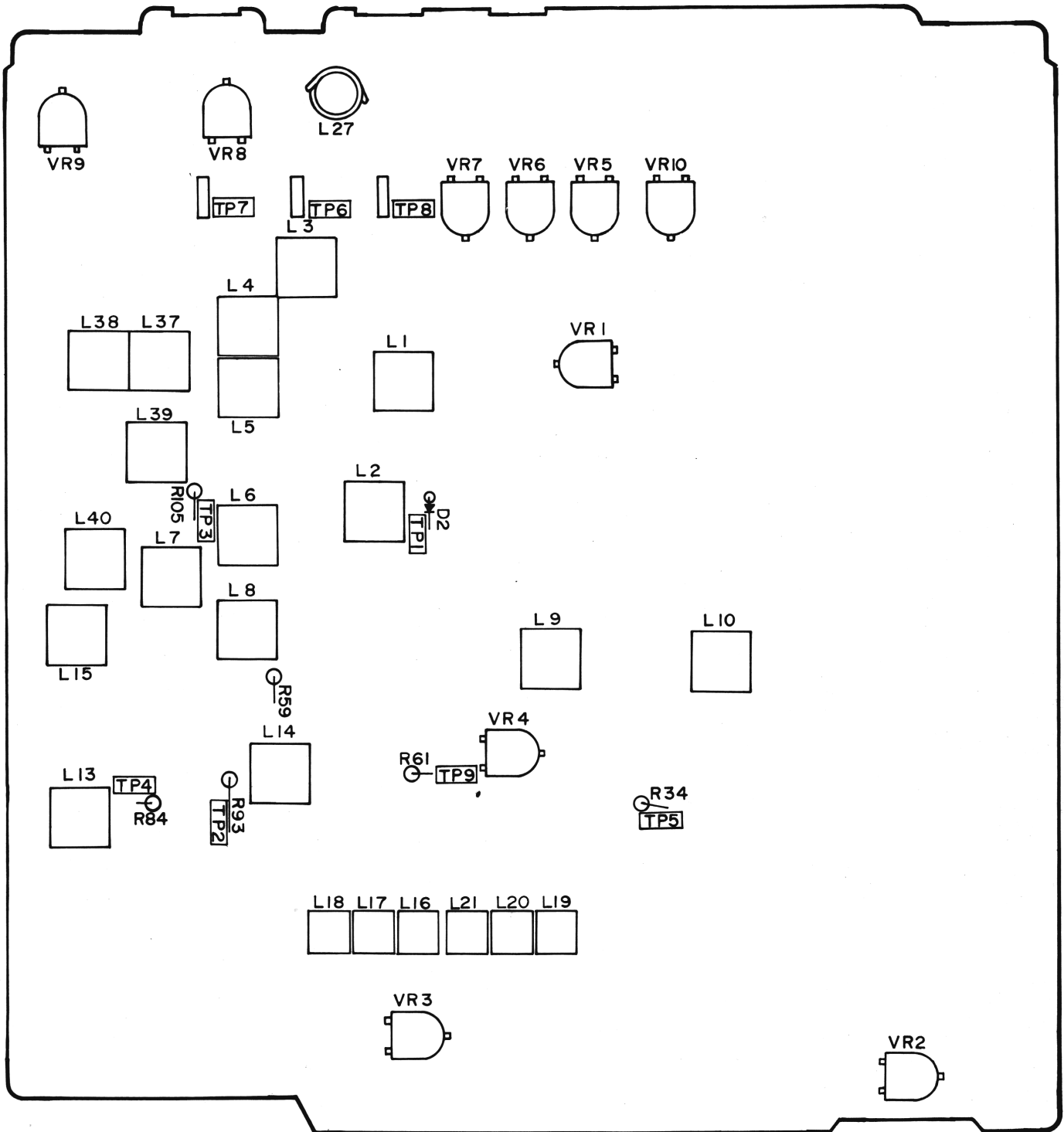
TR33 is provided to shut off the Transmit output if the PLL is unlocked. TR33 is provided to turn off TR32.

In an unlocked condition, pin 15 of IC2 goes low.

6. PUBLIC ADDRESS

A signal from the Mic is amplified by TR30 is passed on through TR401. TR36 amplifies the signal, which then is applied to IC4 where it is further amplified before output to the PA speaker.

7. ALIGNMENT INSTRUCTIONS



ALIGNMENT OF PLL AND CARRIER OSCILLATOR

1. Test Equipment required:

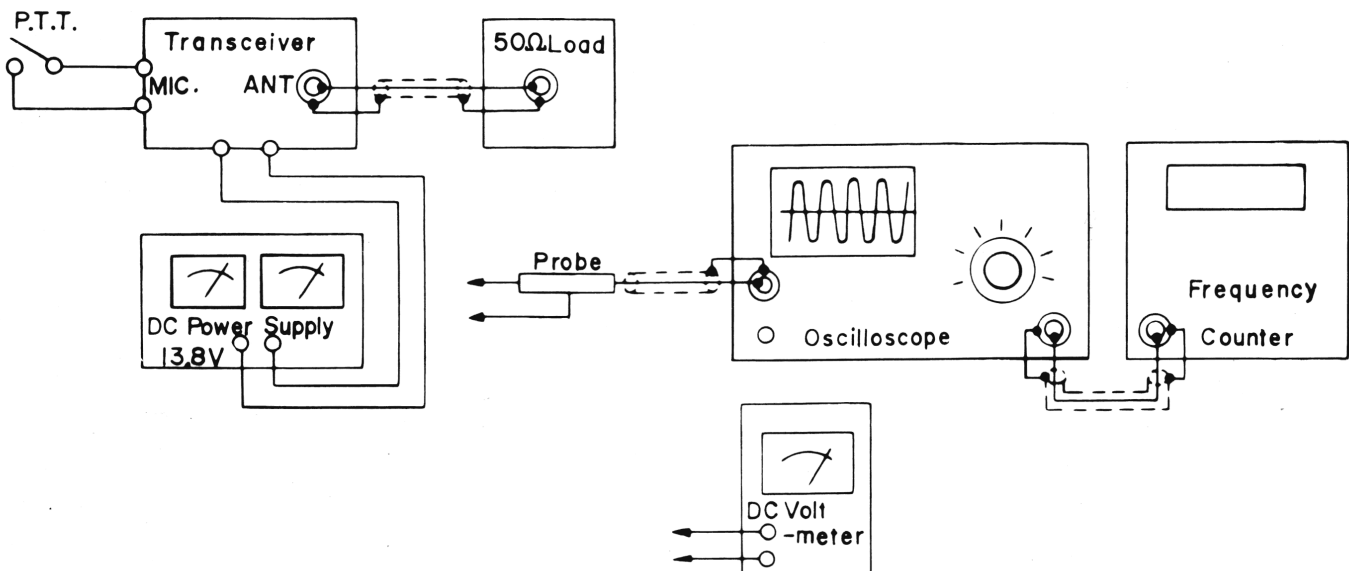
- a. Oscilloscope (DC – 50 MHz)
- b. Frequency Counter (0 – 30 MHz)
- c. DC Power Supply
- d. 50 ohm Load

2. Alignment Procedure:

Connect test equipment as shown below.

STEP	PRESET TO	CONNECTION	ADJUSTMENT
1	CH: 40, AM, RX, Clarifier in center	TP-2	Adjust L-14 for 4.5V DC reading on Oscilloscope. (Oscilloscope in DC mode)
2	Same as step 1. CH: 1.	TP-2	Check that the voltage is more than 2V DC on Oscilloscope.
3	Same as step 1. CH: 19, USB, RX	TP-4	Adjust L-13 for maximum reading on Oscilloscope. (Oscilloscope in AC mode).
4	Same as step 3.	TP-3	Adjust L-15 for maximum reading on Oscilloscope.
5	Same as step 3.	TP-3	Adjust L-17 for 16.4925 MHz \pm 20 Hz
6	Same as step 1. CH: 19, AM, RX	TP-1	Adjust L-16 for 16.4900 MHz \pm 20 Hz
7	Same as step 1. CH: 19, LSB, RX	TP-1	Adjust L-18 for 16.4875 MHz \pm 20 Hz
8	Same as step 1. CH: 19, LSB, TX.	TP-1	Adjust VR-3 for 16.4875 MHz \pm 20 Hz
9	Same as step 1. CH: 19, LSB, RX.	TP-5	Adjust L-20 for 10.6925 MHz $\begin{matrix} +0 \\ -5 \end{matrix}$ Hz
10	Same as step 1. CH: 19, USB, RX.	TP-5	Adjust L-21 for 10.6975 MHz $\begin{matrix} +5 \\ -0 \end{matrix}$ Hz
11	Same as step 1. CH: 19, TX, AM. Disconnect TP-6, TP-7, TP-8	TP-9	Adjust L-19 for 10.6950 MHz \pm 5Hz

PLL AND CARRIER OSCILLATOR TEST EQUIPMENT SETUP



ALIGNMENT OF RECEIVER SECTION

1. Equipment Required:

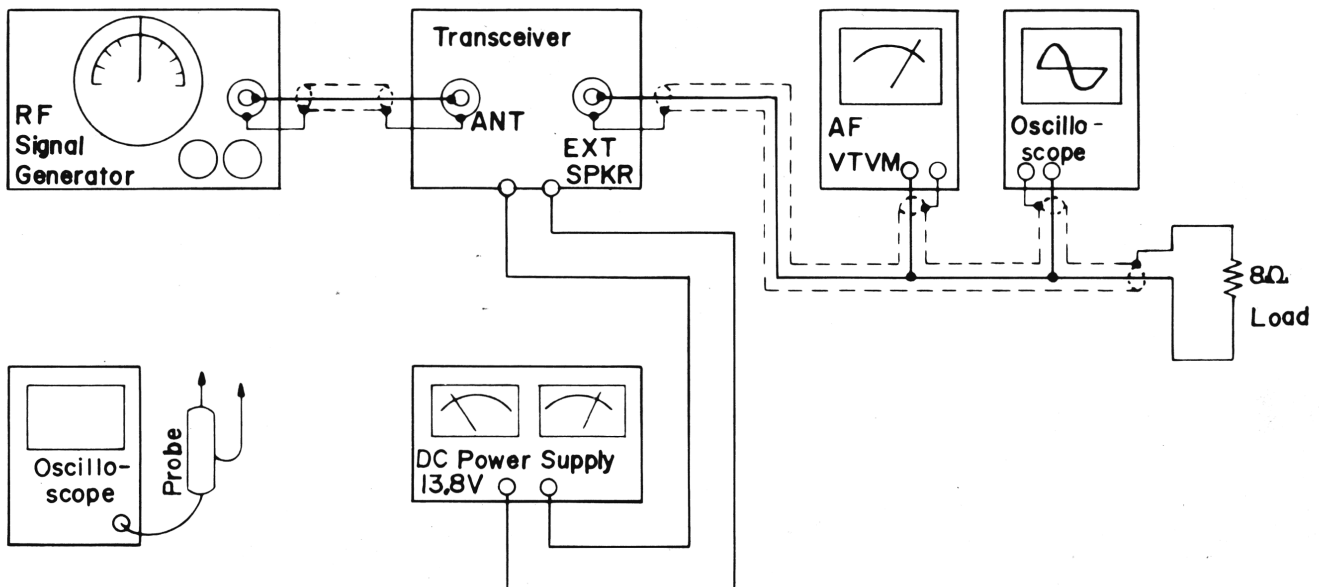
- a. RF Signal Generator (27 MHz Band, 50 ohm output impedance)
- b. AF VTVM
- c. Oscilloscope (For AF Signal)
- d. DC Power Supply
- e. 8 ohm Load
- f. Oscilloscope (0 – 50 MHz)

2. Procedure

Connect Test Equipment as shown below.

STEP	PRESET TO	ADJUSTMENT	PROCEDURE
1	Channel : 19 Clarifier : center Volume : fully CW. RF GAIN : fully CW. Squelch : fully CCW. NB/ANL : off Mode : AM		Set the SG on channel 19, 27.185 MHz with 1 kHz, 30% modulation.
2	Same as step 1	L10,9,8,7,6,5,4 and 3.	Adjust the level of SG to obtain 2V reading on AF VTVM. Then adjust coils for maximum reading on AF VTVM. Repeat this step reducing the SG output.
3	Same as step 1	L3	Adjust L3 for max. reading on AF VTVM. Check the sensitivity difference between CH1 and 40. If it is over 1 dB, re-adjust L3 to obtain within 1 dB.
4	Same as step 1 except squelch is fully CW.	VR2	Set the level of SG to 1000 μ V. Then adjust VR2 so that the AF signal will just appear on Oscilloscope.
5	Same as step 1	VR1	Set the level of SG to 100 μ V. Then adjust for "S-9" reading on Transceiver's meter.
6	Same as step 1 except NB/ANL switch is ON.	L1 and 2.	Connect the Oscilloscope to TP-1. Adjust the level of SG to approx. 1.6 μ V. Then adjust for max. DC reading.

RECEIVER TEST EQUIPMENT SETUP



ALIGNMENT OF TRANSMITTER SECTION

1. Equipment Required:

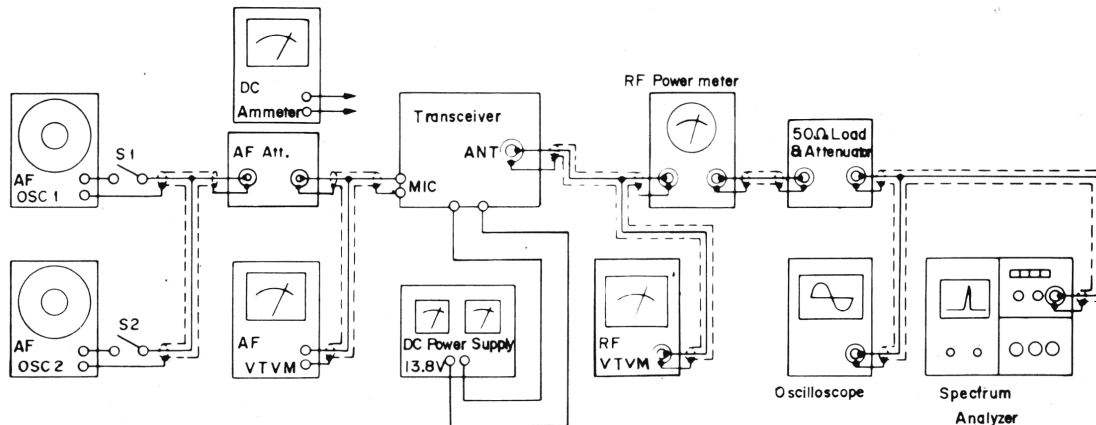
- | | |
|--|--|
| a. AF Oscillator (two required) | f. Oscilloscope |
| b. AF VTVM (Full scale: 1V DC with RF probe) | g. RF VTVM |
| c. DC Ammeter | h. Monitor Receiver or Spectrum Analyzer |
| d. RF Power Meter | i. DC Power Supply (13.8 V/3 Amp.) |
| e. 50 ohm load and Attenuator | |

2. Alignment Procedure:

Connect test equipment as shown below.

STEP	PRESET TO	ADJUSTMENT	REMARKS
1	CH: 19, PA/CB: CB USB mode, TX S1 and S2: OFF	VR9	Break circuit at TP8, and TP7 place DC mA meter in series. Adjust for 10 mA.
2	Same as step 1	VR8	Break circuit at TP8 and TP6, place DC mA meter in series. Adjust for 100 mA ₋₀ ⁺⁵ mA.
After STEPs 1 and 2, restore circuit at TP8 and TP7.			
3	Same as step 1 OSC1: 500 Hz OSC2: 2400 Hz S1,S2: ON	L40,39,38,37 and 27	Set VR6 to full CW rotation (ALC "off" condition). Keep the AF ATT for approx. 20V reading on RF VTVM. Then adjust coils for max. reading. Repeat this adjustment several times, reducing the AF input level to the microphone circuit.
4	Same as step 3	L40,39,38 and 37	Adjust Coils for max. reading on RF VTVM. Check the power difference between CH1 and CH40. If it is over 1V on RF VTVM, readjust coils to obtain within 1V.
5	Same as step 1 AM mode OSC1: 1 kHz S1: ON, S2: OFF	L27	Adjust level of OSC1 for 5 mV reading on AF VTVM, then adjust L27 for maximum reading on RF VTVM.
6	Same as step 1 S1, S2: OFF	VR4	Adjust for minimum carrier leakage for both USB and LSB on Spectrum Analyzer or Oscilloscope.
7	Same as step 3 OSC1: 500 Hz S1,S2: ON	VR6	Adjust OSC1 and OSC2 for 5 mV reading on AF VTVM, then adjust VR6 for 24.5V reading on RF VTVM.
8	Same as step 1 AM mode S1, S2: OFF	VR10	Adjust for 4.0W reading on RF Power meter.
9	Same as step 8	VR7	Adjust for "4W" reading on the Transceiver's meter.
10	Same as step 5	VR5	Adjust output of OSC1 for 200 mV reading on AF VTVM then adjust VR5 for 95 to 98% modulation on Scope.

TRANSMITTER TEST EQUIPMENT SETUP



8. SEMICONDUCTOR VOLTAGE CHART

Measurement condition: Following voltages were measured with no signal input.

IC1 TA75902P (SQ. CCW)

Pin No.	1	2	3	4	5	6	7	8	9	10
Voltage	7.2	0.6	0.7	8.5	0	0	0	0	3.0	2.2
								7.0		4.3
								(SQ.CW)		(SQ.CW)
Pin No.	11	12	13	14						
Voltage	0	0.3	0.3	0.8						

IC2 μ PD2824C

Pin No.	1	2	3	4	5	6	7	8	9	10	11
Voltage	5.0	0	0	5.0	5.0	0	5.0	0	0	*	5.0
Pin No.	12	13	14	15	16	17	18	19	20	21	22
Voltage	2.6	2.6	*	5.0	5.0	3.4	3.4	3.3	0.2	0	2.4

IC3 AN612

Pin No.	1	2	3	4	5	6	7
Voltage	AM 1	3.4	3.4	0	6.1	7.6	RX 7.8
Voltage	SSB 3.1						TX 4.0

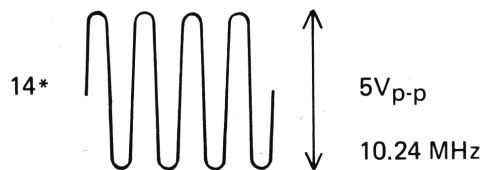
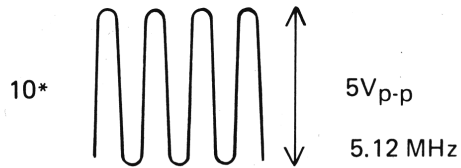
IC4 μ PC1182H

Pin No.	1	2	3	4	5	6	7
Voltage	0	1.9	1.2	0	6.8	12.7	13.7

IC5 SO42P (TX ONLY)

Pin No.	1	2	3	4	5	6	7	8	9	10
Voltage	0	8.0	8.0	0	8.0	0	2.8	2.8	0	0
Pin No.	11	12	13	14						
Voltage	0	0	0	0						

IC2.



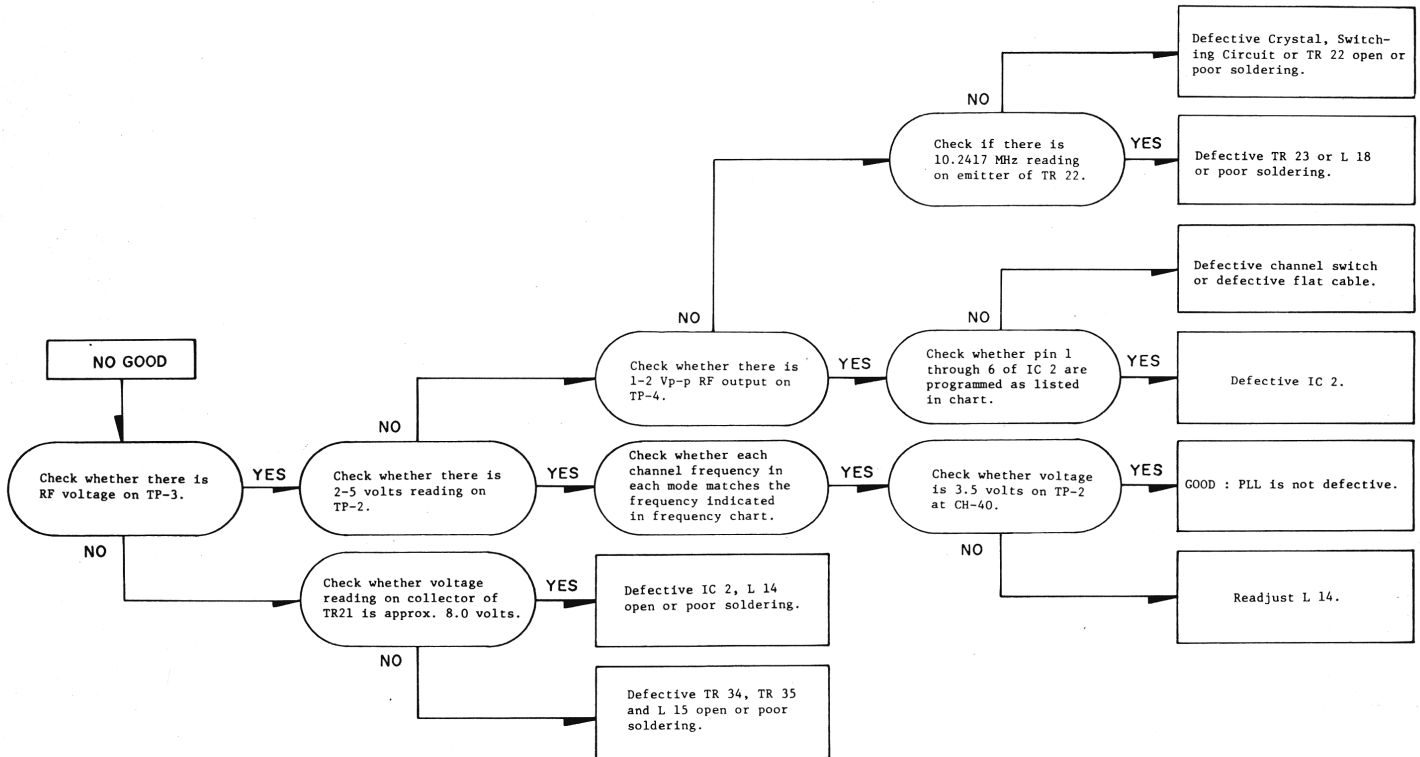
BIPOLAR TRANSISTOR

No.	Emitter	Collector	Base		Remarks
TR 1	1.1	8.0	1.8	RX	SSB, NB : ON
2	0	2.8	0.7	RX	SSB, NB : ON
3	2.0	8.0	2.8	RX	SSB, NB : ON
4	1.1	8.4	0	RX	SSB, NB : ON
5	0	7.8	0	RX	SSB, NB : ON
6	8.4	0	7.8	RX	SSB, NB : ON
7	0	0	0	RX	SSB, NB : ON
8	0	0	0		AM
	0	0	0.7		SSB
9	0	0	0.7		AM
	0	0.7	0		SSB
10	0.2	7.5	0.7		
11	0	0	0(0.7)		SQ,CCW(SQ,CW)
12	1.7	8.0	2.5	RX	
13	0.2	8.2	0.8	RX	
14	0.9	8.4	1.6	RX	
	7.6	8.4	2.5	TX	
15	0	4.0	0.7	RX	
16	3.2	7.2	4.0	RX	
17	2.4	7.3	3.2	RX	
18	0	0	0.7		AM
	0	2.3	0		SSB
19	0.9	5.2	1.5		
20	1.7	8.1	2.4		
21	1.8	8.0	2.5		
22	2.6	7.2	3.3		
23	2.8	7.1	3.3		
24	0	0	0.7		AM
	0	3.1	0		SSB
25	1.2	2.8	1.9		
26	0.4	1.9	1.0		
27	0	0	0.6	RX	
	0	0	0	TX	
28	8.5	0.6	8.5	RX	
	8.5	0	8.5	TX	
29	4.3	8.5	1.1		
30	1.8	3.7	2.4		
31	8.5	8.4	7.7	RX	
	8.4	0.3	7.9	TX	
	8.5	0	8.5	PA	
32	5.1	8.0	5.1	RX	
	0	0	0.7	TX	
33	8.5	0	7.9	RX	
	8.4	8.3	7.6	TX	
34	1.0	13.0	1.6		
35	13.7	8.5	13.0		
36	0.2	3.9	0.8		

No.	Emitter	Collector	Base	Remarks
TR37	0.6	8.5	0	
38	0	5.0	0.7	AM
	0	13.6	0.7	SSB
39	0	5.0	0.6	AM
	0	13.6	0.6	SSB
40	1.0	8.3	1.4	
41	0.8	8.3	1.4	
42	5.1	12.0	5.7	AM
	13.6	13.2	5.7	SSB
43	12.6	5.1	12.0	AM
	13.0	13.6	13.2	SSB
44	13.8	5.1	12.6	AM
	13.8	13.6	13.0	SSB
45	0	12.6	0	AM
	7.5	13.0	8.1	SSB
46	0	0	0.7	AM
	0	8.1	0	SSB

9. TROUBLESHOOTING HINTS

PLL TROUBLESHOOTING HINTS



UNIT WILL NOT TURN ON

1. Broken/defective DC Power cable.
2. Fuse blown. Be sure you check for the cause.
3. Defective power switch.
4. Defective wires or poor soldering in power supply circuit.

NO RECEIVE SOUND

1. Defective RF circuit in receiver.
2. Defective Noise Blanker.
3. Defective audio power IC, IC4.
Check Voltage at pin 5 of IC4; if approximately 6V, problem is not with this IC.
4. Squelch is "ON" all the time.
If voltage at Base of TR11 is approx. 0V with Squelch Control in fully CCW, problem is not with squelch circuit.
Defective TR11.
5. Check whether the transceiver's signal strength meter deflects when a signal (27 MHz carrier with 1 kHz, 30% modulation, 100 μ V level) is applied to antenna.
 - a. The meter indicates "S-9".
You can assume that antenna through IF stage are OK.
NO AM Checks should be made on Detector (D22 and 23) ANL circuit (D24), TR18 and AF stage (TR10, TR11, VR401, TR36 and IC-4).
 - NO SSB BUT AM OK Check frequency and level on TP5, if no signal, checks should be made on X-tals and TR23.
 - NO SSB Checks should be made on Detector, TR10, TR11 and AF stage, VR401, TR36 and IC4.
 - b. No deflecting of meter.
Checks should be made on RF stage (TR12 and TR13), IF stage (TR14, TR15, TR16 and TR17) or AGC circuit (D4, D10, D11 and IC1). Or trouble may be in PLL circuit. Check frequency on TP3; if it is as listed in Table, problem is not with PLL circuit.
6. Defective AGC circuit.
7. Defective PLL circuit.
8. Defective antenna connector.

NO NOISE

1. Broken or bad contact in microphone connector and/or push-to-talk switch.
2. Defective RX power circuit.
3. Defective RX audio circuit.
4. Defective PLL circuit and/or channel switch.
5. Defective squelch.
6. Defective PA-CB switch.

NO TRANSMISSION

1. Broken or bad contact in microphone connector and/or push-to-talk switch.
2. Broken or bad contact in antenna connector.
3. Defect in power supply.
4. Defect in PLL and/or Carrier Oscillator (Improper adjustment).
5. Inoperative microphone amplifier and/or balanced modulator in SSB mode.
6. Check the frequency at TP3; carrier oscillation may have stopped; if no carrier, check TR23, D34,35,36 and X2.
7. Carrier is OK, but no TX; check the frequency at TP3. If not same as listed in Frequency Table, PLL circuit defective. If OK, check IC3,5, TR38,39,40 and 41.
8. If no TX on SSB modes and no modulation on AM mode, Mic amplifier or ALC/AMC section is defective. Check TR42,43,44,45 and 46.

NO MODULATION

1. Defective microphone.
2. Defective microphone connector.
3. Inoperative microphone amplifier, (both AM and SSB modes.)

NO NOISE BLANKER OPERATION

With NB Switch ON, apply a 27 MHz carrier signal to antenna. Then check DC voltage at TP-1 varying the carrier signal from 1 μ V to 100 μ V.

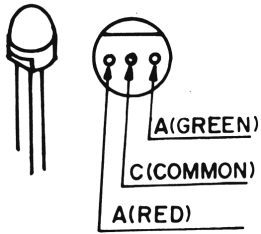
1. When TR1 voltage stays on and does not vary: Check TR1,2,3,4,5, D1 and D2.
2. When TP1 voltage varies from 0V to approx. 2V. Check TR6, 7 and 8.
3. If (A) and (B) are alright, L1 and/or L2 may be misaligned; go to alignment procedure for adjusting L1 and L2.

CHANNEL LED DOES NOT LIGHT

When a specific segment fails to light, it is probable there is an open-circuit in the LED display or bad contact in the channel selector switch.

10. SEMICONDUCTOR PIN CONNECTIONS

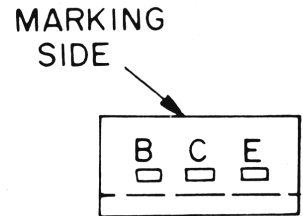
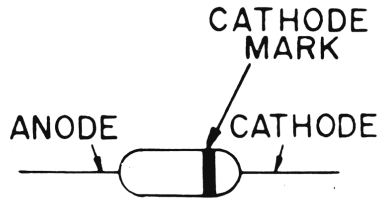
TLRG 101



MC301
RD5.1EB2
RD7.5EB2

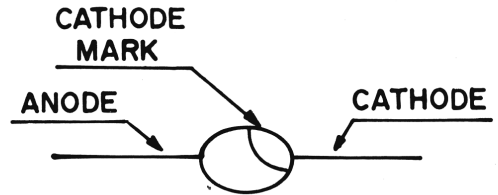
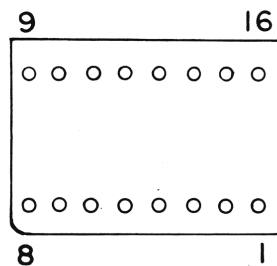
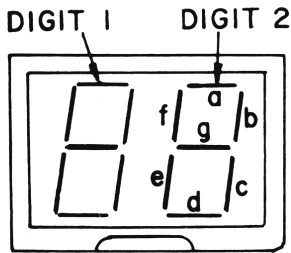
1N60
1S2075K
1S2688B
1N4003

2SA473-O
2SA1012-O
2SC1969-B
2SC2166-C



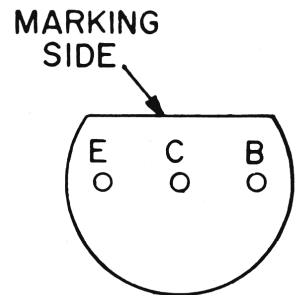
UR-202

KB-262

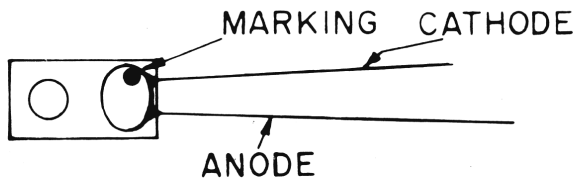


Pin No.		Pin No.	
1	c-1	9	g-2
2	e-1	10	a-2
3	d-1	11	f-2
4	common-1	12	b-2
5	common-2	13	b-1
6	d-2	14	f-1
7	e-2	15	a-1
8	c-2	16	g-1

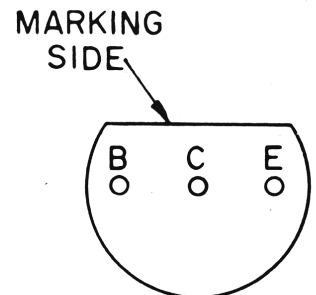
2SA733P
2SC945A-Q
2SC1674L
2SC1675L
2SC1730



MV-1Y

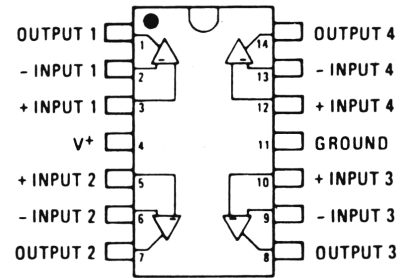
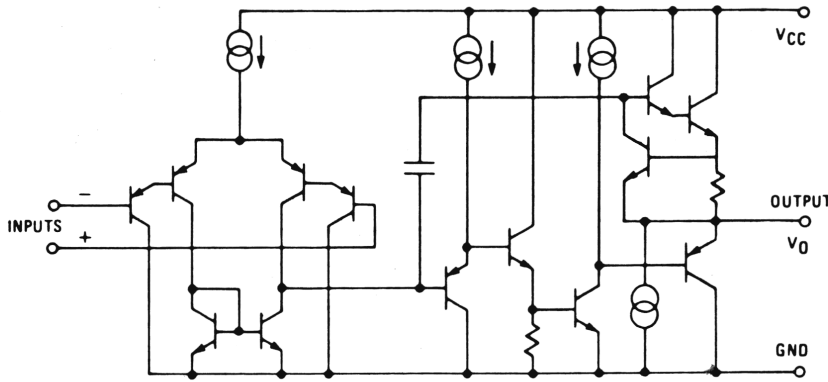


2SB525-C
2SC2086-D



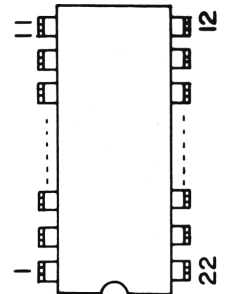
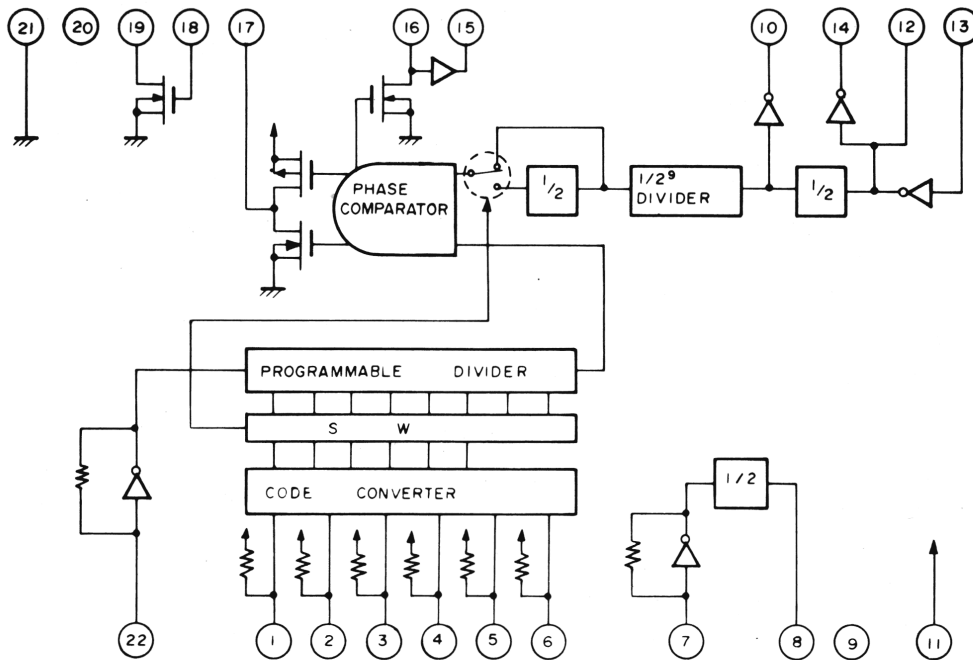
11. IC INTERNAL DIAGRAMS

IC1. TA75902P

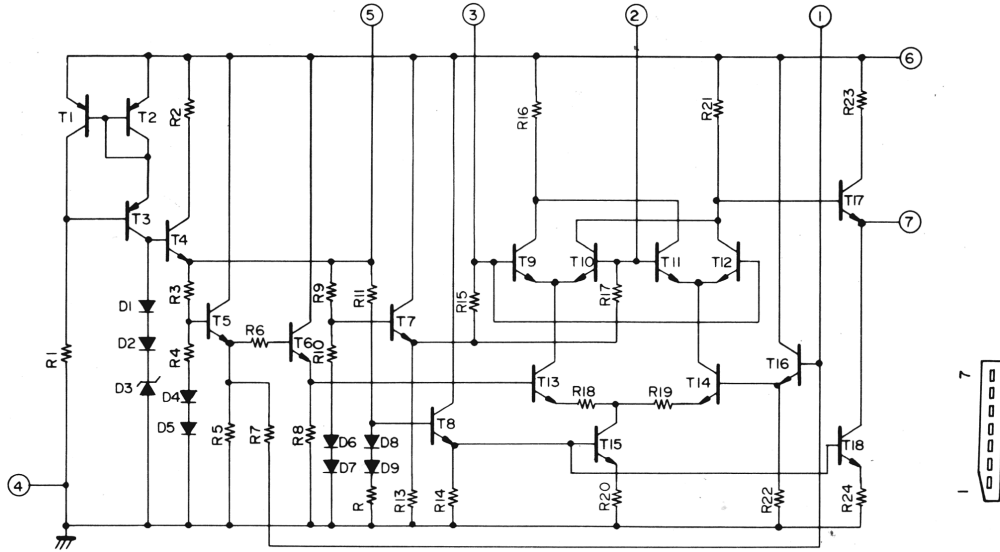


(Top View)

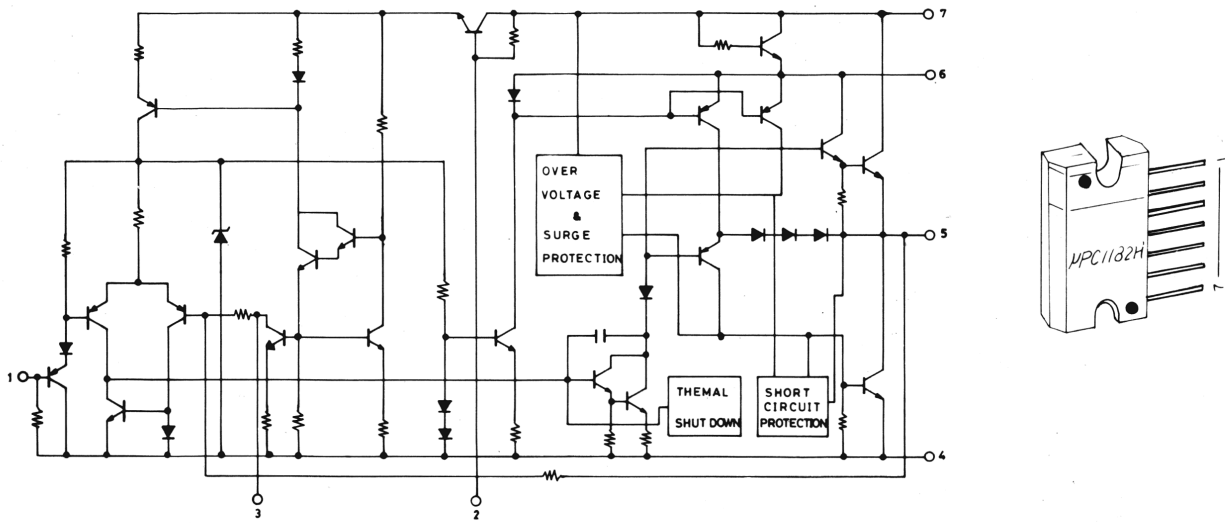
IC2. μ PD2824C



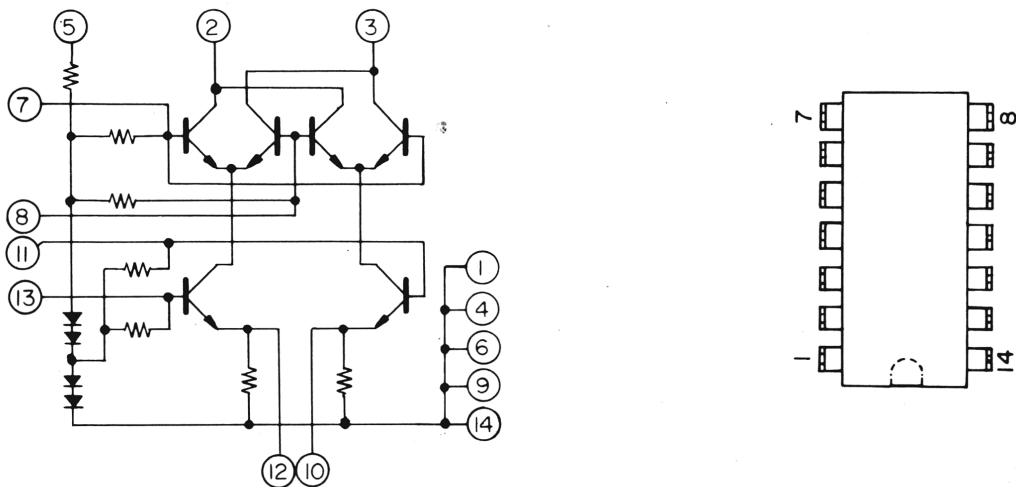
IC3. AN612



IC4. μ PC1182H

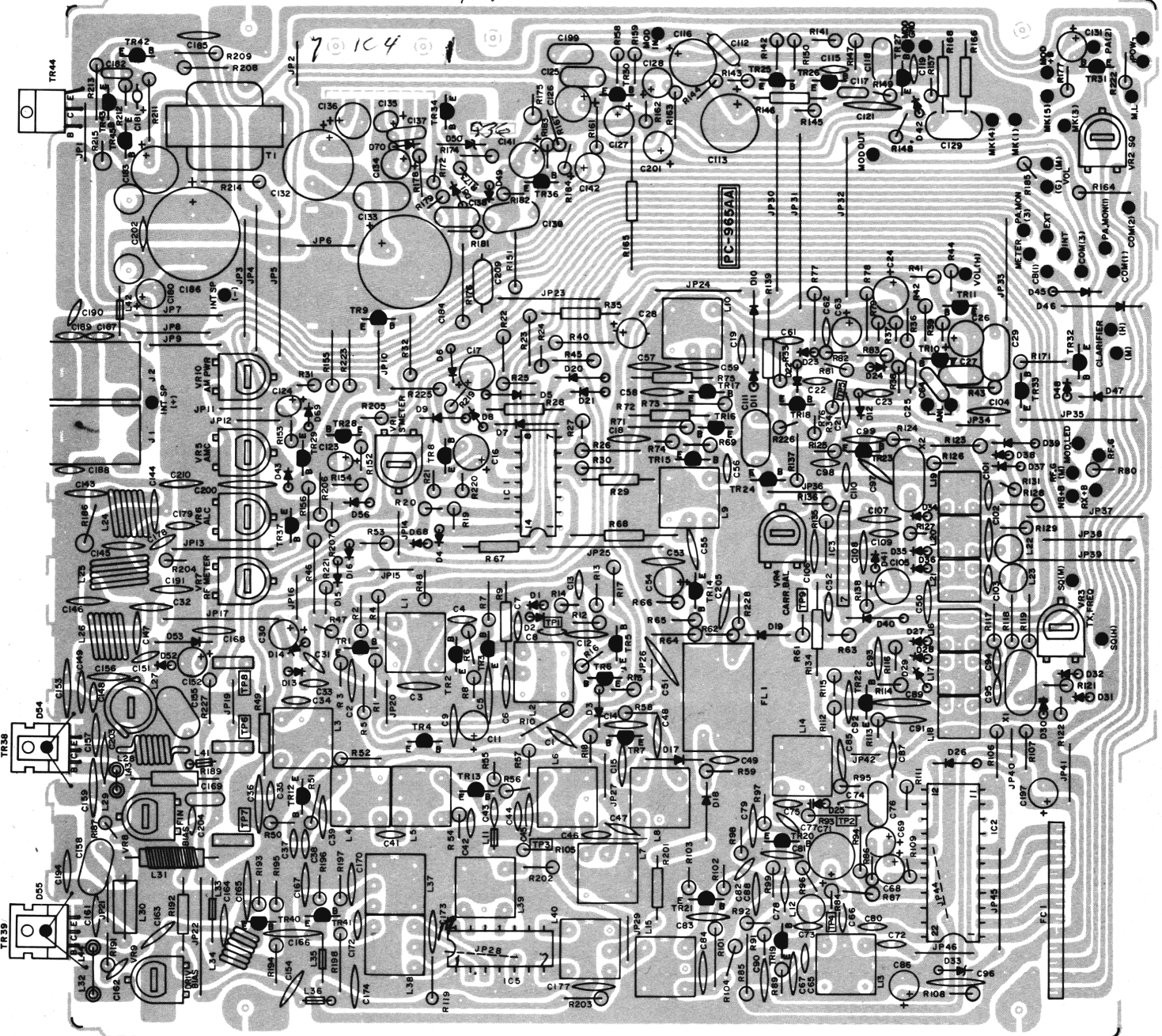


IC5. SO42P

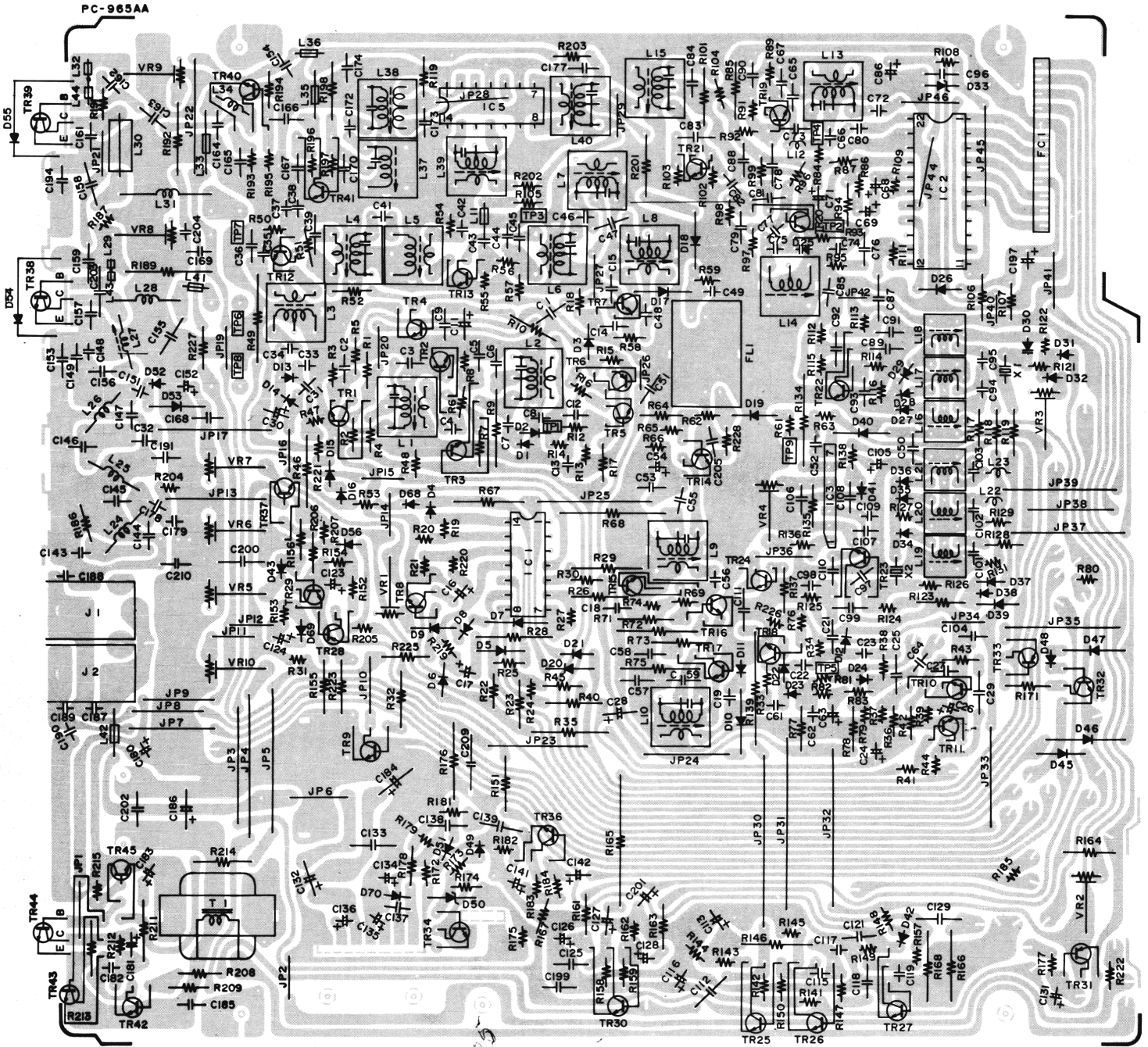


12. MAIN P.C. BOARD (TOP VIEW)

TR35

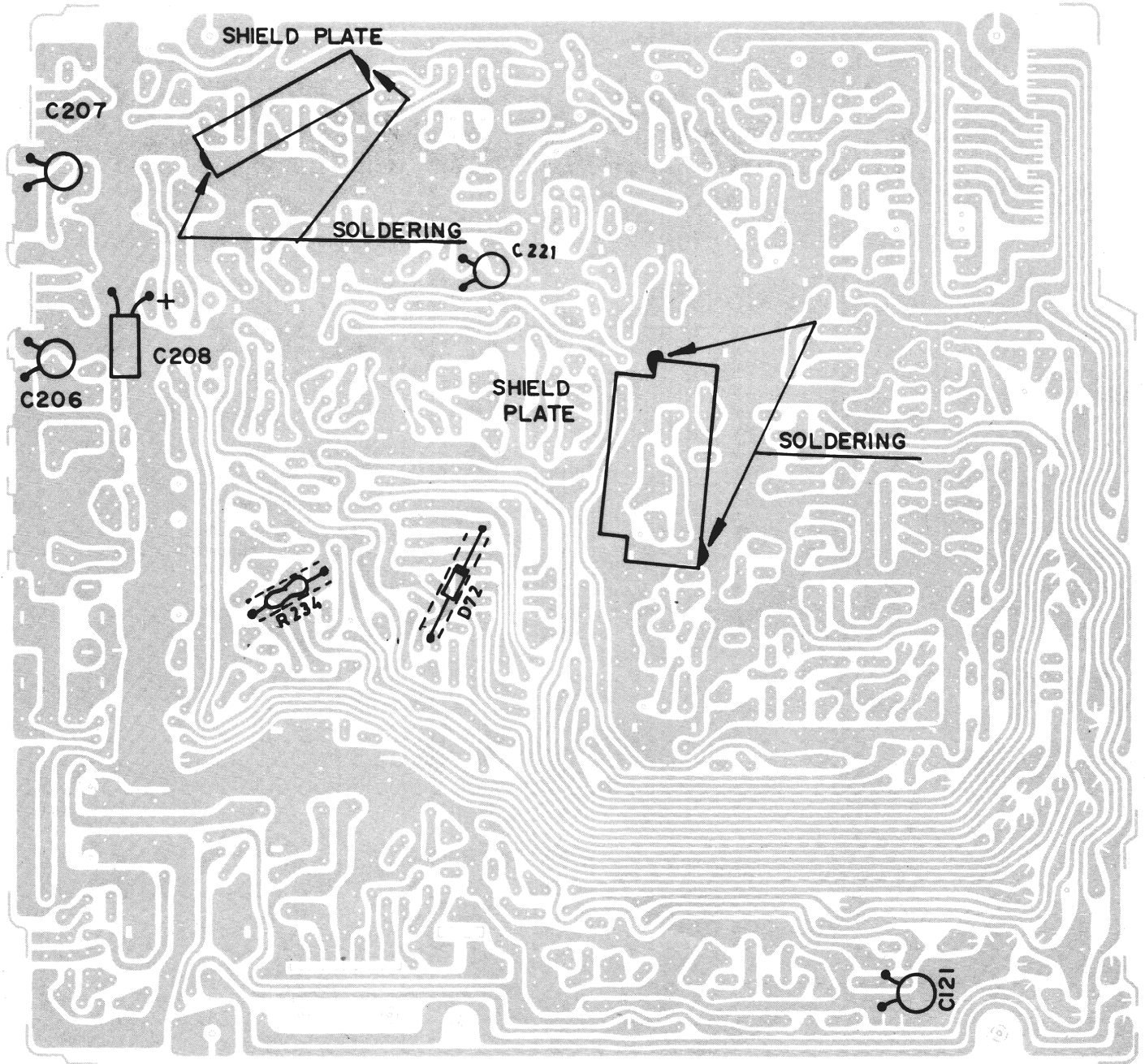


13. MAIN P.C. BOARD (BOTTOM VIEW)



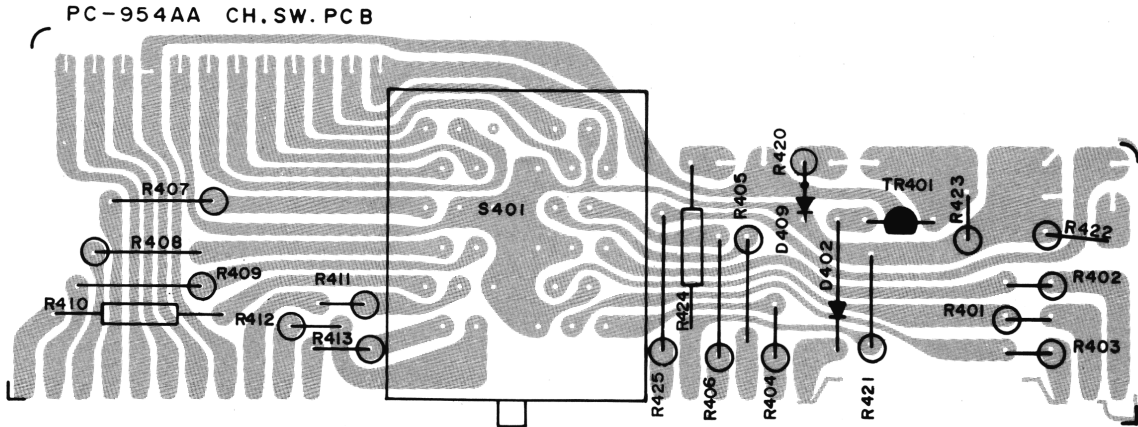
14. ADDITIONAL PARTS ON THE P.C. BOARD BOTTOM

PC-965

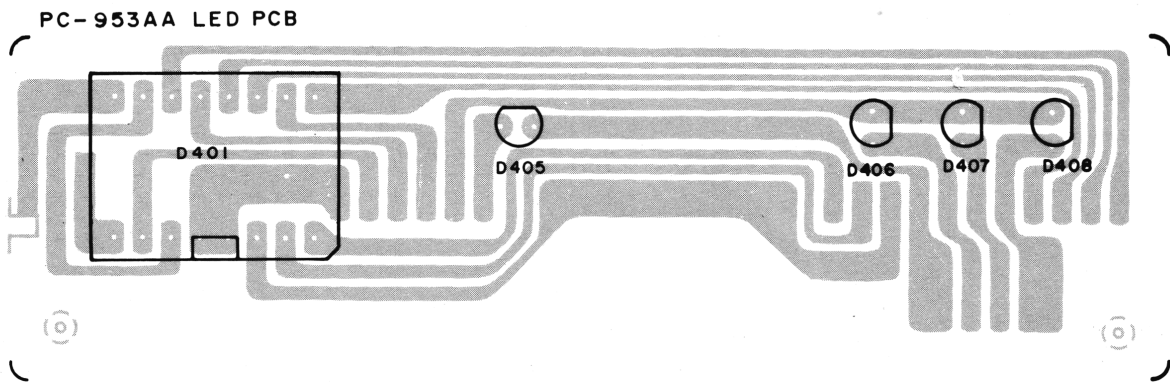


15. OTHER P.C. BOARDS

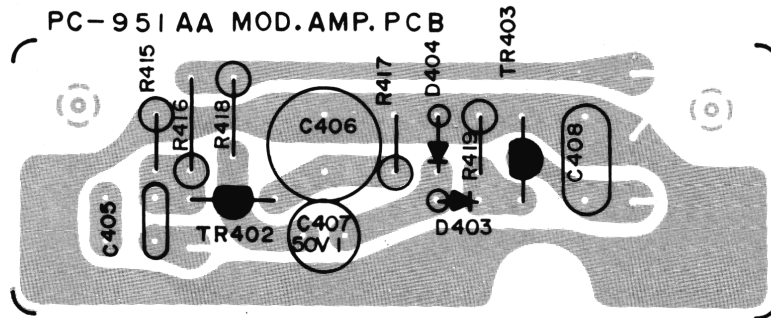
CH. SW. P.C.B.



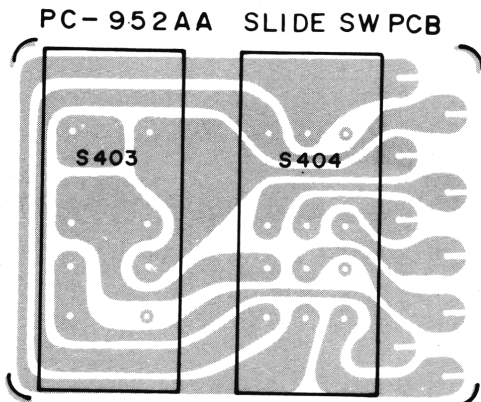
LED P.C.B.



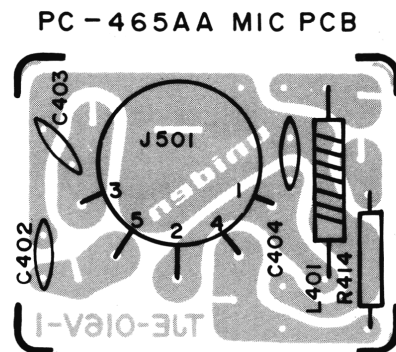
MOD. AMP. P.C.B.



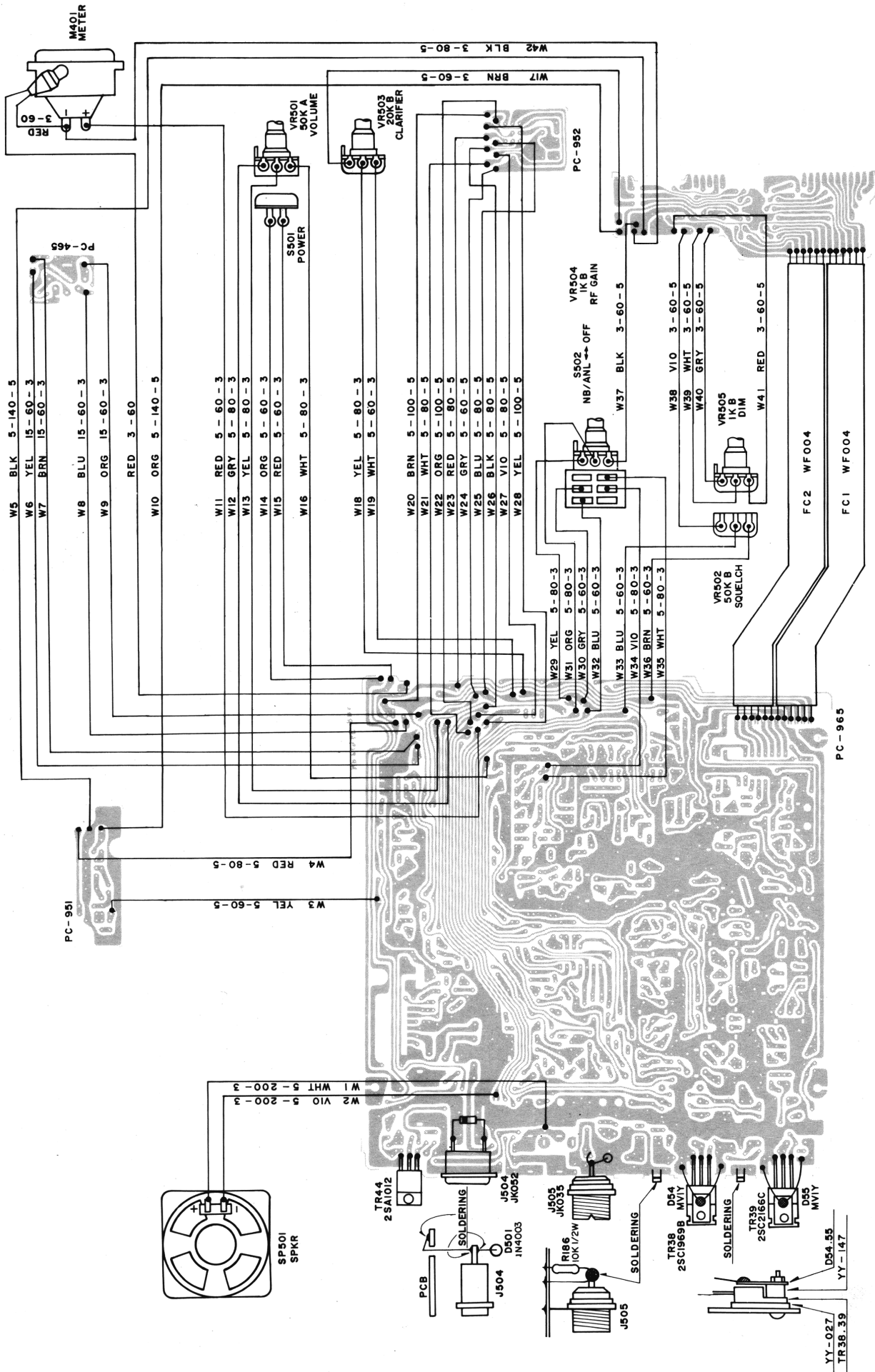
SLIDE SW P.C.B.



MIC P.C.B.



16. WIRING DIAGRAM



17. ELECTRICAL PARTS LIST

The first code indicates tolerance of capacitors; C = $\pm 0.25\mu\text{F}$, D = $\pm 0.5\mu\text{F}$, F = $\pm 1\mu\text{F}$, G = $\pm 2\%$, J = $\pm 5\%$, K = $\pm 10\%$, M = $\pm 20\%$, Z = $+80\% -20\%$

The second code indicates variation of capacitance against temperature; YA = $\pm 5\%$, YB = $\pm 10\%$, YD = $+20 -30\%$, YE = $+20 -50\%$, YF = $+30 -80\%$, ($-25 \sim +85^\circ\text{C}$), ZF = $+30 -80\%$ ($-10 \sim +70^\circ\text{C}$), CH = $0\pm 60\text{ppm}/^\circ\text{C}$, RH = $-220\text{ppm}/^\circ\text{C}\pm 60\text{ppm}/^\circ\text{C}$, TH = $-4700\text{ppm}/^\circ\text{C}\pm 60\text{ppm}/^\circ\text{C}$, SL = $+350\text{ppm}/^\circ\text{C} \sim -1000\text{ppm}/^\circ\text{C}$, UJ = $-750\text{ppm}/^\circ\text{C}\pm 120\text{ppm}/^\circ\text{C}$

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
CAPACITORS			
C-1	Capacitor, Ceramic 10 pF 50V K SL		CCGZ 811025
C-2	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-3	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-4	Capacitor, Ceramic 100 pF 50V K SL		CCGZ 811015
C-5	Capacitor, Ceramic 0.047 μF 50V Z ZF		CKCZ 814730
C-6	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-7	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-8	Capacitor, Ceramic 82 pF 50V K SL		CKGZ 818205
C-9	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-10	- Not used -		
C-11	Capacitor, Electrolytic 0.47 μF 50V		CELZ 814700
C-12	Capacitor, Ceramic 330 pF 50V K SL		CCGZ 813315
C-13	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-14	Capacitor, Ceramic 330 pF 50V K SL		CCGZ 813315
C-15	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-16	Capacitor, Electrolytic 47 μF 10V		CELZ 114700
C-17	Capacitor, Electrolytic 47 μF 10V		CELZ 114700
C-18	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-19	Capacitor, Ceramic 15 pF 50V K SL		CCGZ 811505
C-20	- Not used -		
C-21	Capacitor, Ceramic 18 pF 50V K SL		CCGZ 811805
C-22	Capacitor, Ceramic 5 pF 50V C SL		CCGZ 815091
C-23	Capacitor, Ceramic 15 pF 50V K SL		CCGZ 811505
C-24	Capacitor, Electrolytic 47 μF 10V		CELZ 114700
C-25	Capacitor, Mylar 0.001 μF 50V K		CQMZ811025
C-26	Capacitor, Electrolytic 47 μF 10V		CELZ 114700
C-27	Capacitor, Mylar 0.047 μF 50V K		CQMZ814735
C-28	Capacitor, Electrolytic 22 μF 10V		CELZ 112200
C-29	Capacitor, Mylar 0.1 μF 50V K		CQMZ811045
C-30	Capacitor, Electrolytic 10 μF 16V		CELZ 311000
C-31	Capacitor, Ceramic 0.0047 μF 50V Z YF		CKGZ 814720
C-32	Capacitor, Ceramic 18 pF 50V Z RH		CCRZ 811805
C-33	Capacitor, Ceramic 0.0047 μF 50V Z YF		CKGZ 814720
C-34	Capacitor, Ceramic 0.0047 μF 50V Z YF		CKGZ 814720
C-35	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-36	Capacitor, Ceramic 0.047 μF 50V Z ZF		CKCZ 814730
C-37	Capacitor, Ceramic 10 pF 50V K SL		CCGZ 811005
C-38	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-39	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030
C-40	- Not used -		
C-41	Capacitor, Ceramic 1 pF 50V C SL		CCGZ 812091
C-42	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-43	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-44	Capacitor, Ceramic 0.001 μF 50V Z YF		CKGZ 811020
C-45	Capacitor, Ceramic 0.01 μF 50V Z YF		CKGZ 811030

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
C-46	Capacitor, Ceramic	2 pF 50V C SL	CCGZ 812091
C-47	Capacitor, Ceramic	2 pF 50V C SL	CCGZ 812091
C-48	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 911030
C-49	Capacitor, Ceramic	5 pF 50V C SL	CCGZ 815091
C-50	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-51	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-52	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-53	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-54	Capacitor, Electrolytic	0.47 μ F 50V	CELZ 814700
C-55	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-56	Capacitor, Ceramic	33 pF 50V K SL	CCGZ 813305
C-57	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-58	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-59	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-60		— Not used —	
C-61	Capacitor, Ceramic	10 pF 50V K SL	CCGZ 811005
C-62	Capacitor, Ceramic	47 pF 50V K SL	CCGZ 814705
C-63	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-64	Capacitor, Mylar	0.01 μ F 50V K	COMZ 811035
C-65	Capacitor, Ceramic	27 pF 50V K SL	CCGZ 812705
C-66	Capacitor, Ceramic	56 pF 50V K SL	CCGZ 815605
C-67	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-68	Capacitor, Electrolytic	2.2 μ F 25V	CELZ 512290
C-69	Capacitor, Electrolytic	2.2 μ F 25V	CELZ 512290
C-70		— Not used —	
C-71	Capacitor, Electrolytic	100 μ F 10V	CELZ 111010
C-72	Capacitor, Ceramic	2 pF 50V C SL	CCGZ 812091
C-73	Capacitor, Ceramic	5 pF 50V C SL	CCGZ 815091
C-74	Capacitor, Ceramic	0.002 μ F 50V Z YF	CKGZ 811020
C-75	Capacitor, Ceramic	47 pF 50V K UJ	CCUZ 814705
C-76	Capacitor, Mylar	0.047 μ F 50V K	COMZ 814735
C-77	Capacitor, Ceramic	33 pF 50V K CH	CCCZ 813305
C-78	Capacitor, Ceramic	10 pF 50V K SL	CCGZ 811005
C-79	Capacitor, Ceramic	270 pF 50V K SL	CCGZ 812715
C-80	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-81	Capacitor, Ceramic	390 pF 50V K SL	CCGZ 813915
C-82	Capacitor, Ceramic	10 pF 50V K SL	CCGZ 811005
C-83	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-84	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-85	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-86	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-87	Capacitor, Ceramic	22 pF 50V K SL	CCGZ 812205
C-88	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-89	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-90	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-91	Capacitor, Ceramic	120 pF 50V K SL	CCGZ 811215
C-92	Capacitor, Ceramic	290 pF 50V K SL	CCGZ 813915
C-93	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-94	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-95	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-96	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-97	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-98	Capacitor, Ceramic	100 pF 50V K SL	CCGZ 811015
C-99	Capacitor, Ceramic	270 pF 50V K SL	CCGZ 812715
C-100		— Not used —	
C-101	Capacitor, Ceramic	22 pF 50V K CH	CCCZ 812205
C-102	Capacitor, Ceramic	82 pF 50V K RH	CCRZ 818205
C-103	Capacitor, Ceramic	15 pF 50V K RH	CCRZ 811505

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
C-104	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-105	Capacitor, Electrolytic	100 μ F 10V	CELZ 111010
C-106	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-107	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-108	Capacitor, Ceramic	150 pF 50V K SL	CCGZ 811515
C-109	Capacitor, Ceramic	47 pF 50V K SL	CCGZ 814705
C-110	Capacitor, Ceramic	10 pF 50V K SL	CCGZ 811005
C-111	Capacitor, Mylar	0.1 μ F 50V K	CQMZ 811045
C-112	Capacitor, Mylar	0.01 μ F 50V K	CQMZ 811035
C-113	Capacitor, Electrolytic	220 μ F 6.3V	CELZ 902210
C-114		– Not used –	
C-115	Capacitor, Ceramic	330 pF 50V K SL	CCGZ 813315
C-116	Capacitor, Electrolytic	100 μ F 10V	CELZ 111010
C-117	Capacitor, Mylar	0.0047 μ F 50V K	CQMZ 814725
C-118	Capacitor, Mylar	0.047 μ F 50V K	CQMZ 814735
C-119	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-120		– Not used –	
C-121	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-122		– Not used –	
C-123	Capacitor, Tantalum	22 μ F 6.3V M	CSEZ 902206
C-124	Capacitor, Tantalum	2.2 μ F 25V M	CSEZ 512296
C-125	Capacitor, Mylar	0.047 μ F 50V K	CQMZ 814735
C-126	Capacitor, Electrolytic	47 μ F 10V	CELZ 114700
C-127	Capacitor, Electrolytic	0.47 μ F 50V	CELZ 814700
C-128	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-129	Capacitor, Mylar	0.1 μ F 50V K	CQMZ 811045
C-130		– Not used –	
C-131	Capacitor, Electrolytic	4.7 μ F 25V	CELZ 514790
C-132	Capacitor, Electrolytic	330 μ F 16V	CELZ 313310
C-133	Capacitor, Mylar	0.1 μ F 50V K	CQMZ 811045
C-134	Capacitor, Electrolytic	4.7 μ F 25V	CELZ 514790
C-135	Capacitor, Tantalum	10 μ F 10V M	CSEZ 111006
C-136	Capacitor, Electrolytic	47 μ F 10V	CELZ 114700
C-137	Capacitor, Mylar	0.01 μ F 50V K	CQMZ 811035
C-138	Capacitor, Mylar	0.047 μ F 50V K	CQMZ 814735
C-139	Capacitor, Mylar	0.068 μ F 50V K	CQMZ 816835
C-140		– Not used –	
C-141	Capacitor, Electrolytic	47 μ F 10V	CELZ 114700
C-142	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-143	Capacitor, Ceramic	82 μ F 50V K SL	CCGZ 818205
C-144	Capacitor, Ceramic	39 pF 50V K SL	CCGZ 813905
C-145	Capacitor, Ceramic	180 pF 50V K SL	CCGZ 811815
C-146	Capacitor, Ceramic	180 pF 50V K SL	CCGZ 811815
C-147	Capacitor, Ceramic	39 pF 50V K SL	CCGZ 813905
C-148	Capacitor, Ceramic	47 pF 50V K SL	CCGZ 814705
C-149	Capacitor, Ceramic	390 pF 50V K SL	CCGZ 813915
C-150		– Not used –	
C-151	Capacitor, Ceramic	1 pF 50V C SL	CCGZ 811091
C-152	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-153	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-154	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-155	Capacitor, Mylar	0.1 μ F 50V K	CQMZ 811045
C-156	Capacitor, Ceramic	390 pF 50V K UJ	CCUZ 812215
C-157	Capacitor, Ceramic	220 pF 50V K UJ	CCUZ 811015
C-158	Capacitor, Mylar	0.1 μ F 50V K	CQMZ 811045
C-159	Capacitor, Ceramic	470 pF 50V K SL	CCGZ 814715
C-160		– Not used –	
C-161	Capacitor, Ceramic	100 pF 50V K UJ	CCUZ 811015

REF. NO.	DESCRIPTION	RS PART NO.	MFRS PART NO.
C-162	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-163	Capacitor, Ceramic	270 pF 50V K SL	CCGZ 812715
C-164	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-165	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-166	Capacitor, Ceramic	470 pF 50V K SL	CCGZ 814715
C-167	Capacitor, Ceramic	0.0047 μ F 50V M YD	CKDZ 814726
C-168	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-169	Capacitor, Mylar	0.01 μ F 50V K	CQMZ811035
C-170	Capacitor, Ceramic	270 pF 50V K SL	CCGZ 812715
C-171		— Not used —	
C-172	Capacitor, Ceramic	1 pF 50V C SL	CCGZ 811091
C-173	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-174	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-175		— Not used —	
C-176		— Not used —	
C-177	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-178	Capacitor, Ceramic	3 pF 50V D UJ	CCUZ 813092
C-179	Capacitor, Ceramic	22 pF 50V K CH	CCCZ 812205
C-180	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-181	Capacitor, Tantalum	0.22 μ F 25V M	CSEZ 512246
C-182	Capacitor, Mylar	0.0047 μ F 50V K	CQMZ814725
C-183	Capacitor, Electrolytic	100 μ F 10V	CELZ 111010
C-184	Capacitor, Electrolytic	1000 μ F 25V	CELZ 511020
C-185	Capacitor, Ceramic	0.0047 μ F 50V Z YF	CKGZ 814720
C-186	Capacitor, Electrolytic	1000 μ F 25V	CELZ 511020
C-187	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-188	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-189	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-190	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-191	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811020
C-192		— Not used —	
C-193		— Not used —	
C-194	Capacitor, Ceramic	0.0047 μ F 50V Z YF	CKGZ 814720
C-195		— Not used —	
C-196		— Not used —	
C-197	Capacitor, Electrolytic	4.7 μ F 25V	CELZ 514790
C-198	Capacitor, Ceramic	0.0047 μ F 50V M YD	CKDZ 814726
C-199	Capacitor, Mylar	0.047 μ F 50V K	CQMZ814735
C-200	Capacitor, Ceramic	0.047 μ F 50V Z ZF	CKCZ 814730
C-201	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-202	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-203	Capacitor, Ceramic	0.0047 μ F 50V Z YF	CKGZ 814720
C-204	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-205	Capacitor, Ceramic	0.01 μ F 50V Z YF	CKGZ 811030
C-206	Capacitor, Ceramic	150 pF 50V Z YF	CKGZ 811526
C-207	Capacitor, Ceramic	180 pF 50V Z YF	CKGZ 811826
C-208	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-209	Capacitor, Ceramic	0.047 μ F 50V Z YF	CKGZ 814735
C-210	Capacitor, Ceramic	0.0047 μ F 50V Z YF	CKGZ 814720
C-221	Capacitor, Ceramic	15 pF 50V SL	CCCZ 811505
C-401		— Not used —	
C-402	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-403	Capacitor, Ceramic	0.001 μ F 50V Z YF	CKGZ 811020
C-404	Capacitor, Ceramic	0.0047 μ F 50V Z YF	CKGZ 814720
C-405	Capacitor, Mylar	0.0068 μ F 50V K	CQMZ816825
C-406	Capacitor, Electrolytic	100 μ F 10V	CELZ 111010
C-407	Capacitor, Electrolytic	1 μ F 50V	CELZ 811090
C-408	Capacitor, Mylar	0.033 μ F 50V K	CQMZ813335

REF. NO.	DESCRIPTION		RS. PART NO.	MFRS PART NO.
COILS				
L-1	Coil	LA-120		LLAY 120001
L-2	Coil	LA-277		LLAY 277001
L-3	Coil	LA-279		LLAY 279001
L-4	Coil	LA-260		LLAY 260001
L-5	Coil	LA-259		LLAY 259001
L-6	Coil	LA-350		LLAY 350001
L-7	Coil	LA-350		LLAY 350001
L-8	Coil	LA-350		LLAY 350001
L-9	Coil	LA-277		LLAY 277001
L-10	Coil	LA-351		LLAY 351001
L-11	Coil	LD-077		LLDY 077001
L-12	Coil	LZ-016	470 μ H	LLZY 016004
L-13	Coil	LA-166		LLAY 166001
L-14	Coil	LA-165		LLAY 165001
L-15	Coil	LA-166		LLAY 166001
L-16	Coil	LB-137		LLBY 209001
L-17	Coil	LB-144		LLBY 144001
L-18	Coil	LB-137		LLBY 137001
L-19	Coil	LB-137		LLBY 137001
L-20	Coil	LB-137		LLBY 137001
L-21	Coil	LB-209		LLBY 209001
L-22	Coil	LZ-016	470 μ H	LLZY 016004
L-23	Coil	LZ-016	470 μ H	LLZY 016004
L-24	Coil	LE-088		LLEY 088001
L-25	Coil	LE-089		LLEY 089001
L-26	Coil	LE-088		LLEY 088001
L-27	Coil	LC-072		LLCY 072001
L-28	Coil	LE-187		LLEY 187001
L-29	Coil	LD-087		LLDY 087001
L-30	Coil	LE-188		LLEY 188001
L-31	Coil	LD-033		LLDY 033001
L-32	Coil	LD-087		LLDY 087001
L-33	Coil	LD-087		LLDY 087001
L-34	Coil	LE-151		LLEY 151001
L-35	Coil	LD-087		LLDY 087001
L-36	Coil	LD-087		LLDY 087001
L-37	Coil	LA-352		LLAY 352001
L-38	Coil	LA-220		LLAY 220001
L-39	Coil	LA-166		LLAY 166001
L-40	Coil	LA-350		LLAY 350001
L-41	Coil	LD-087		LLDY 087001
L-42	Coil	LD-087		LLDY 087001
L-43	Coil	LD-087		LLDY 087004
L-244	Coil	LD-087		LLDY 087001
L-401	Coil	LD-089		LLDY 089001
CRYSTALS				
X-1	Crystal	QX-122	10.2417 MHz	QQXY122001
X-2	Crystal	QX-122	10.6975 MHz	QQXY122002
DIODES				
D-1	Diode	1N60AM		DDAY001001
D-2	Diode	1N60AM		DDAY001001
D-3	Diode	1S2075K		DDAY063001

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
D-4	Diode	1S2075K	DDAY063001
D-5	Diode	1N60AM	DDAY001001
D-6	Diode	1S2075K	DDAY063001
D-7	Diode	1S2075K	DDAY063001
D-8	Diode	1S2075K	DDAY063001
D-9	Diode	1S2075K	DDAY063001
D-10	Diode	1N60AM	DDAY001001
D-11	Diode	1N60AM	DDAY001001
D-12	Diode	1S2075K	DDAY063001
D-13	Diode	MC301	DDAY090001
D-14	Diode	MC301	DDAY090001
D-15	Diode	1S2075K	DDAY063001
D-16	Diode	1S2075K	DDAY063001
D-17	Diode	1S2075K	DDAY063001
D-18	Diode	1S2075K	DDAY063001
D-19	Diode	1S2075K	DDAY063001
D-20	Diode	1S2075K	DDAY063001
D-21	Diode	1S2075K	DDAY063001
D-22	Diode	1S2075K	DDAY063001
D-23	Diode	1S2075K	DDAY063001
D-24	Diode	1S2075K	DDAY063001
D-25	Diode	1S2688EB	DDAY006009
D-26	Diode	1S2075K	DDAY063001
D-27	Diode	1S2075K	DDAY063001
D-28	Diode	1S2075K	DDAY063001
D-29	Diode	1S2075K	DDAY063001
D-30	Diode	1S2688EB	DDAY006009
D-31	Diode	1S2075K	DDAY063001
D-32	Diode	1S2075K	DDAY063001
D-33	Diode	RD5.1EB2	DDAY086014
D-34	Diode	1S2075K	DDAY063001
D-35	Diode	1S2075K	DDAY063001
D-36	Diode	1S2075K	DDAY063001
D-37	Diode	1S2075K	DDAY063001
D-38	Diode	1S2075K	DDAY063001
D-39	Diode	1S2075K	DDAY063001
D-40	Diode	1S2075K	DDAY063001
D-41	Diode	1S2075K	DDAY063001
D-42	Diode	1S2075K	DDAY063001
D-43	Diode	1S2075K	DDAY063001
D-44		- Not used -	
D-45	Diode	1S2075K	DDAY063001
D-46	Diode	1S2075K	DDAY063001
D-47	Diode	1S2075K	DDAY063001
D-48	Diode	1S2075K	DDAY063001
D-49	Varistor, Diode	KB262	DDFY004002
D-50	Zener, Diode,	RD7.5EB2	DDAY086009
D-51	Diode	1S2075K	DDAY063001
D-52	Diode	1S2075K	DDAY063001
D-53	Diode	1S2075K	DDAY063001
D-54	Varistor, Diode	MV-1Y	DDFY020001
D-55	Varistor, Diode	MV-1Y	DDFY020001
D-56	Diode	1S2075K	DDAY063001
D-66		- Not used -	
D-68	Diode	1S2075K	DDAY063001
D-69	Diode	1N60AM	DDAY001001
D-70	Diode	1S2075K	DDAY063001
D-72	Diode, Zener	RD5.1EB2	DDAY086014
D-401	Diode, LED	UR-202	DDAY113001

REF. NO.	DESCRIPTION			RS. PART NO.	MFRS PART NO.
D-402	Diode	1S2075K		DX-1118	DDAY 063001
D-403	Diode	1N60AM			DDAY 001001
D-404	Diode	1N60AM			DDAY 001001
D-405	Diode, LED	TLR-124			DDAY 100001
D-406	Diode, LED	TLR-124			DDAY 100001
D-407	Diode, LED	TLR-124			DDAY 100001
D-408	Diode, LED	TLR-124			DDAY 100001
D-409	Diode	1S2075K			DDAY 063001
D-501	Diode	1N4003			DDAY 133001
INTEGRATED CIRCUITS					
IC-1	Integrated Circuit	TA-75902P	LINEAR		DDEY 284001
IC-2	Integrated Circuit	μ PD2824C	DIGITAL		DDEY 190001
IC-3	Integrated Circuit	AN612	LINEAR		DDEY 130001
IC-4	Integrated Circuit	μ PC1182H	LINEAR		DDEY 149001
IC-5	Integrated Circuit	SO42P	LINEAR		DDEY 132001
RESISTORS					
	Tolerance Code	J = 5%			
		K = 10%			
R-1	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-2	Resistor, Carbon Film	33K ohm	1/8W J		RUBZ 183334
R-3	Resistor, Carbon Film	680 ohm	1/8W J		RUBZ 186814
R-4	Resistor, Carbon Film	220 ohm	1/8W J		RUBZ 182214
R-5	Resistor, Carbon Film	330 ohm	1/8W J		RUBZ 183314
R-6	Resistor, Carbon Film	47K ohm	1/8W J		RUBZ 184734
R-7	Resistor, Carbon Film	2.7K ohm	1/8W J		RUBZ 182724
R-8	Resistor, Carbon Film	330 ohm	1/8W J		RUBZ 183314
R-9	Resistor, Carbon Film	68 ohm	1/8W J		RUBZ 186804
R-10	Resistor, Carbon Film	100K ohm	1/8W J		RUBZ 181044
R-12	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-13	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-14	Resistor, Carbon Film	470K ohm	1/8W J		RUBZ 184744
R-15	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-16	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-17	Resistor, Carbon Film	330 ohm	1/8W J		RUBZ 183314
R-18	Resistor, Carbon Film	3.3K ohm	1/8W J		RUBZ 183324
R-19	Resistor, Carbon Film	100K ohm	1/8W J		RUBZ 181044
R-20	Resistor, Carbon Film	82K ohm	1/8W J		RUBZ 188234
R-21	Resistor, Carbon Film	39K ohm	1/8W J		RUBZ 183934
R-22	Resistor, Carbon Film	560K ohm	1/8W J		RUBZ 185644
R-23	Resistor, Carbon Film	180K ohm	1/8W J		RUBZ 181804
R-24	Resistor, Carbon Film	4.7M ohm	1/8W J		RUBZ 184754
R-25	Resistor, Carbon Film	270K ohm	1/8W J		RUBZ 182744
R-26	Resistor, Carbon Film	100K ohm	1/8W J		RUBZ 181044
R-27	Resistor, Carbon Film	100K ohm	1/8W J		RUBZ 181044
R-28	Resistor, Carbon Film	680 ohm	1/8W J		RUBZ 186814
R-29	Resistor, Carbon Film	100 ohm	1/8W J		RUBZ 181044
R-31	Resistor, Carbon Film	1K ohm	1/8W J		RUBZ 181024
R-32	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-33	Resistor, Carbon Film	22K ohm	1/8W J		RUBZ 182234
R-34	Resistor, Carbon Film	3.3K ohm	1/8W J		RUBZ 183324
R-35	Resistor, Carbon Film	1K ohm	1/8W J		RUBZ 181024
R-36	Resistor, Carbon Film	47K ohm	1/8W J		RUBZ 184734
R-37	Resistor, Carbon Film	10K ohm	1/8W J		RUBZ 181034
R-38	Resistor, Carbon Film	220K ohm	1/8W J		RUBZ 182244
R-39	Resistor, Carbon Film	1K ohm	1/8W J		RUBZ 181024
R-40	Resistor, Carbon Film	3.3K ohm	1/8W J		RUBZ 183324

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
R-41	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-42	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-43	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-44	Resistor, Carbon Film 5.6K ohm 1/8W J		RUBZ 185624
R-45	Resistor, Carbon Film 15K ohm 1/8W J		RUBZ 181534
R-46	Resistor, Carbon Film 8.2K ohm 1/8W J		RUBZ 188224
R-47	Resistor, Carbon Film 2.2K ohm 1/8W J		RUBZ 182224
R-48	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-49	Resistor, Carbon Film 1K ohm 1/8W J		RPBZ 181024
R-50	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-51	Resistor, Carbon Film 2.2K ohm 1/8W J		RUBZ 182224
R-52	Resistor, Carbon Film 100 ohm 1/8W J		RUBZ 181014
R-53	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-54	Resistor, Carbon Film 100 ohm 1/8W J		RUBZ 181014
R-55	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-56	Resistor, Carbon Film 82K ohm 1/8W J		RUBZ 188234
R-57	Resistor, Carbon Film 100 ohm 1/8W J		RUBZ 181014
R-58	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-59	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-60	— Not used —		
R-61	Resistor, Carbon Film 1K ohm 1/8W J		RPBZ 181024
R-62	Resistor, Carbon Film 1.1K ohm 1/8W J		RUBZ 181224
R-63	Resistor, Carbon Film 8.2K ohm 1/8W J		RUBZ 188224
R-64	Resistor, Carbon Film 22K ohm 1/8W J		RUBZ 182234
R-65	Resistor, Carbon Film 5.6K ohm 1/8W J		RUBZ 185624
R-66	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-67	Resistor, Carbon Film 2.2K ohm 1/8W J		RPBZ 182224
R-68	Resistor, Carbon Film 100 ohm 1/8W J		RPBZ 181014
R-69	Resistor, Carbon Film 47K ohm 1/8W J		RUBZ 184734
R-70	— Not used —		
R-71	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-72	Resistor, Carbon Film 100 ohm 1/8W J		RPBZ 181014
R-73	Resistor, Carbon Film 270 ohm 1/8W J		RUBZ 182714
R-74	Resistor, Carbon Film 150 ohm 1/8W J		RUBZ 181514
R-75	Resistor, Carbon Film 68 ohm 1/8W J		RUBZ 186804
R-76	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-77	Resistor, Carbon Film 1.5M ohm 1/8W J		RUBZ 181554
R-78	Resistor, Carbon Film 220K ohm 1/8W J		RUBZ 182244
R-79	Resistor, Carbon Film 47K ohm 1/8W J		RUBZ 184734
R-80	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-81	Resistor, Carbon Film 47K ohm 1/8W J		RUBZ 184734
R-82	Resistor, Carbon Film 100K ohm 1/8W J		RUBZ 181044
R-83	Resistor, Carbon Film 100K ohm 1/8W J		RUBZ 181044
R-84	Resistor, Carbon Film 3.3K ohm 1/8W J		RPBZ 183324
R-85	Resistor, Carbon Film 15 ohm 1/8W J		RUBZ 181504
R-86	Resistor, Carbon Film 5.6K ohm 1/8W J		RUBZ 185624
R-87	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-89	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-91	Resistor, Carbon Film 2.2K ohm 1/8W J		RUBZ 182224
R-92	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-93	Resistor, Carbon Film 22K ohm 1/8W J		RPBZ 182234
R-94	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-95	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-96	Resistor, Carbon Film 15K ohm 1/8W J		RUBZ 181534
R-97	Resistor, Carbon Film 6.8K ohm 1/8W J		RUBZ 186824
R-98	Resistor, Carbon Film 330 ohm 1/8W J		RUBZ 183314
R-99	Resistor, Carbon Film 56 ohm 1/8W J		RUBZ 185604
R-101	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
R-102	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-103	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-104	Resistor, Carbon Film 100 ohm 1/8W J		RUBZ 181014
R-105	Resistor, Carbon Film 56 ohm 1/8W J		RPBZ 185604
R-106	Resistor, Carbon Film 100 ohm 1/8W J		RUBZ 181014
R-107	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-108	Resistor, Carbon Film 22K ohm 1/8W J		RUBZ 182234
R-109	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-111	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-112	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-113	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-114	Resistor, Carbon Film 22K ohm 1/8W J		RUBZ 182234
R-115	Resistor, Carbon Film 22K ohm 1/8W J		RUBZ 182234
R-116	Resistor, Carbon Film 1.8K ohm 1/8W J		RUBZ 181824
R-117	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-118	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-119	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-121	Resistor, Carbon Film 100K ohm 1/8W J		RUBZ 181044
R-122	Resistor, Carbon Film 15K ohm 1/8W J		RUBZ 181534
R-123	Resistor, Carbon Film 220 ohm 1/8W J		RUBZ 182214
R-124	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-125	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-126	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-127	Resistor, Carbon Film 2.2K ohm 1/8W J		RUBZ 182224
R-128	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-129	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-131	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-134	Resistor, Carbon Film 100 ohm 1/8W J		RPBZ 181014
R-135	Resistor, Carbon Film 180K ohm 1/8W J		RUBZ 181844
R-136	Resistor, Carbon Film 270K ohm 1/8W J		RUBZ 182744
R-137	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-138	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-139	Resistor, Carbon Film 5.6K ohm 1/8W J		RPBZ 185624
R-141	Resistor, Carbon Film 220 ohm 1/8W J		RUBZ 182214
R-142	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-143	Resistor, Carbon Film 10 ohm 1/8W J		RUBZ 181004
R-144	Resistor, Carbon Film 820 ohm 1/8W J		RUBZ 188214
R-145	Resistor, Carbon Film 270 ohm 1/8W J		RUBZ 182714
R-146	Resistor, Carbon Film 100K ohm 1/8W J		RPBZ 181044
R-147	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-148	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-149	Resistor, Carbon Film 390 ohm 1/8W J		RUBZ 183914
R-150	Resistor, Carbon Film 15K ohm 1/8W J		RUBZ 181534
R-151	Resistor, Carbon Film 390 ohm 1/8W J		RUBZ 183914
R-152	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-153	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-154	Resistor, Carbon Film 22K ohm 1/8W J		RUBZ 182234
R-155	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-156	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-157	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-158	Resistor, Carbon Film 2.2K ohm 1/8W J		RUBZ 182224
R-159	Resistor, Carbon Film 10K ohm 1/8W J		RPBZ 181034
R-161	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-162	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-163	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-164	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-165	Resistor, Carbon Film 22K ohm 1/8W J		RUBZ 182234
R-167	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
R-168	Resistor, Carbon Film 10K ohm 1/8W J		RPBZ 181034
R-171	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-172	Resistor, Carbon Film 47 ohm 1/8W J		RUBZ 184704
R-173	Resistor, Carbon Film 56 ohm 1/8W J		RUBZ 185604
R-174	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-175	Resistor, Metal Film 100 ohm 1W K		RSJZ 101015
R-176	Resistor, Carbon Film 15K ohm 1/8W J		RUBZ 181534
R-177	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-178	Resistor, Carbon Film 1.8K ohm 1/8W J		RUBZ 181824
R-179	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-181	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-182	Resistor, Carbon Film 220 ohm 1/8W J		RUBZ 182214
R-183	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-184	Resistor, Carbon Film 680K ohm 1/8W J		RUBZ 186844
R-185	Resistor, Carbon Film 12K ohm 1/8W J		RUBZ 181234
R-186	Resistor, Carbon Film 10K ohm 1/2W J		RPBZ 121034
R-187	Resistor, Carbon Film 47 ohm 1/8W J		RUBZ 184704
R-189	Resistor, Carbon Film 150 ohm 1/2W J		RPBZ 121514
R-191	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-192	Resistor, Carbon Film 330 ohm 1/8W J		RPBZ 183314
R-193	Resistor, Carbon Film 10 ohm 1/8W J		RUBZ 181004
R-194	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-195	Resistor, Carbon Film 330 ohm 1/8W J		RUBZ 183314
R-196	Resistor, Carbon Film 47 ohm 1/8W J		RUBZ 184704
R-197	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-198	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-199	Resistor, Carbon Film 100 ohm 1/8W J		RUBZ 181014
R-201	Resistor, Carbon Film 560 ohm 1/8W J		RPBZ 185614
R-202	Resistor, Carbon Film 330 ohm 1/8W J		RUBZ 183314
R-203	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-204	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-205	Resistor, Carbon Film 1.5K ohm 1/8W J		RUBZ 181524
R-206	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
R-207	Resistor, Carbon Film 18K ohm 1/8W J		RUBZ 181034
R-208	Resistor, Carbon Film 3.3K ohm 1/8W J		RUBZ 183324
R-209	Resistor, Carbon Film 5.6K ohm 1/8W J		RUBZ 185624
R-211	Resistor, Carbon Film 8.2 ohm 1/8W J		RUBZ 188204
R-212	Resistor, Carbon Film 560 ohm 1/8W J		RUBZ 185614
R-213	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-214	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-215	Resistor, Carbon Film 150 ohm 1/2W J		RPBZ 181514
R-219	Resistor, Carbon Film 3.9K ohm 1/8W J		RUBZ 183924
R-220	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-221	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-222	Resistor, Carbon Film 47 ohm 1/8W J		RUBZ 184704
R-223	Resistor, Carbon Film 180K ohm 1/8W J		RUBZ 181844
R-225	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-226	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-228	Resistor, Carbon Film 1.2K ohm 1/8W J		RUBZ 181224
R-229	Resistor, Carbon Film 1.2K ohm 1/8W J		RUBZ 181224
R-230	Resistor, Carbon Film 1.2K ohm 1/8W J		RUBZ 181224
R-234	Resistor, Carbon Film 4.7K ohm 1/8W J		RUBZ 184724
R-401	Resistor, Carbon Film 330 ohm 1/8W J		RUBZ 183314
R-402	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-403	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-404	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-405	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-406	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
R-407	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-408	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-409	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-410	Resistor, Carbon Film 680 ohm 1/8W J		RPBZ 186814
R-411	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-412	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-413	Resistor, Carbon Film 680 ohm 1/8W J		RUBZ 186814
R-414	Resistor, Carbon Film 100 ohm 1/8W J		RPBZ 181014
R-415	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-416	Resistor, Carbon Film 47K ohm 1/8W J		RUBZ 184734
R-417	Resistor, Carbon Film 820 ohm 1/8W J		RUBZ 188214
R-418	Resistor, Carbon Film 6.8K ohm 1/8W J		RUBZ 186824
R-419	Resistor, Carbon Film 10K ohm 1/8W J		RUBZ 181034
R-420	Carbon Film Resistor 39K ohm 1/8W J		RPBZ 183934
R-421	Resistor, Carbon Film 2.2K ohm 1/8W J		RUBZ 182224
R-422	Resistor, Carbon Film 3.9K ohm 1/8W J		RUBZ 183924
R-423	Resistor, Carbon Film 1K ohm 1/8W J		RUBZ 181024
R-424	Resistor, Carbon Film 820 ohm 1/8W J		RPBZ 188214
R-425	Resistor, Carbon Film 470 ohm 1/8W J		RUBZ 184714
SEMI-FIXED RESISTORS			
VR-1	Semi-fixed Resistor RV-182 5K ohm B		RRVY 182004
VR-2	Semi-fixed Resistor RV-182 200K ohm B		RRVY 182009
VR-3	Semi-fixed Resistor RV-182 50K ohm B		RRVY 182007
VR-4	Semi-fixed Resistor RV-182 10K ohm B		RRVY 182005
VR-5	Semi-fixed Resistor RV-182 1K ohm B		RRVY 182002
VR-6	Semi-fixed Resistor RV-182 10K ohm B		RRVY 182005
VR-7	Semi-fixed Resistor RV-182 100K ohm B		RRVY 182008
VR-8	Semi-fixed Resistor RV-182 100 ohm B		RRVY 182019
VR-9	Semi-fixed Resistor RV-182 3K ohm B		RRVY 182012
VR-10	Semi-fixed Resistor RV-182 5K ohm B		RRVY 182004
SWITCHES			
S-401	Switch (Channel) SR-241		SSRY 241001
S-402	Switch (MODE) SR-312		SSRY 312001
S-403	Switch (EXT. SP/BOTH/INT SP) SW-252		SSWY 252001
S-404	Switch (PA/CB/MON) SW-253		SSWY 253001
S-501	Switch (POW. SW) WITH VR501		RRVY 320001
S-502	Switch (NB/ANL) WITH VR504		RRVY 353001
TRANSISTORS			
TR-1	Transistor 2SC1675-L		DDBY 259001
TR-2	Transistor 2SC1675-L		DDBY 269001
TR-3	Transistor 2SC1730-L		DDBY 269001
TR-4	Transistor 2SC945A-Q		DDBY 224003
TR-5	Transistor 2SC945A-Q		DDBY 224003
TR-6	Transistor 2SA733-P		DDBY 003001
TR-7	Transistor 2SC945A-Q		DDBY 224003
TR-8	Transistor 2SC945A-Q		DDBY 224003
TR-9	Transistor 2SC945A-Q		DDBY 224003
TR-10	Transistor 2SC945A-Q		DDBY 224003
TR-11	Transistor 2SC945A-Q		DDBY 224003
TR-12	Transistor 2SC1674-L		DDBY 295002
TR-13	Transistor 2SC1675-L		DDBY 259001
TR-14	Transistor 2SC1674-L		DDBY 295002

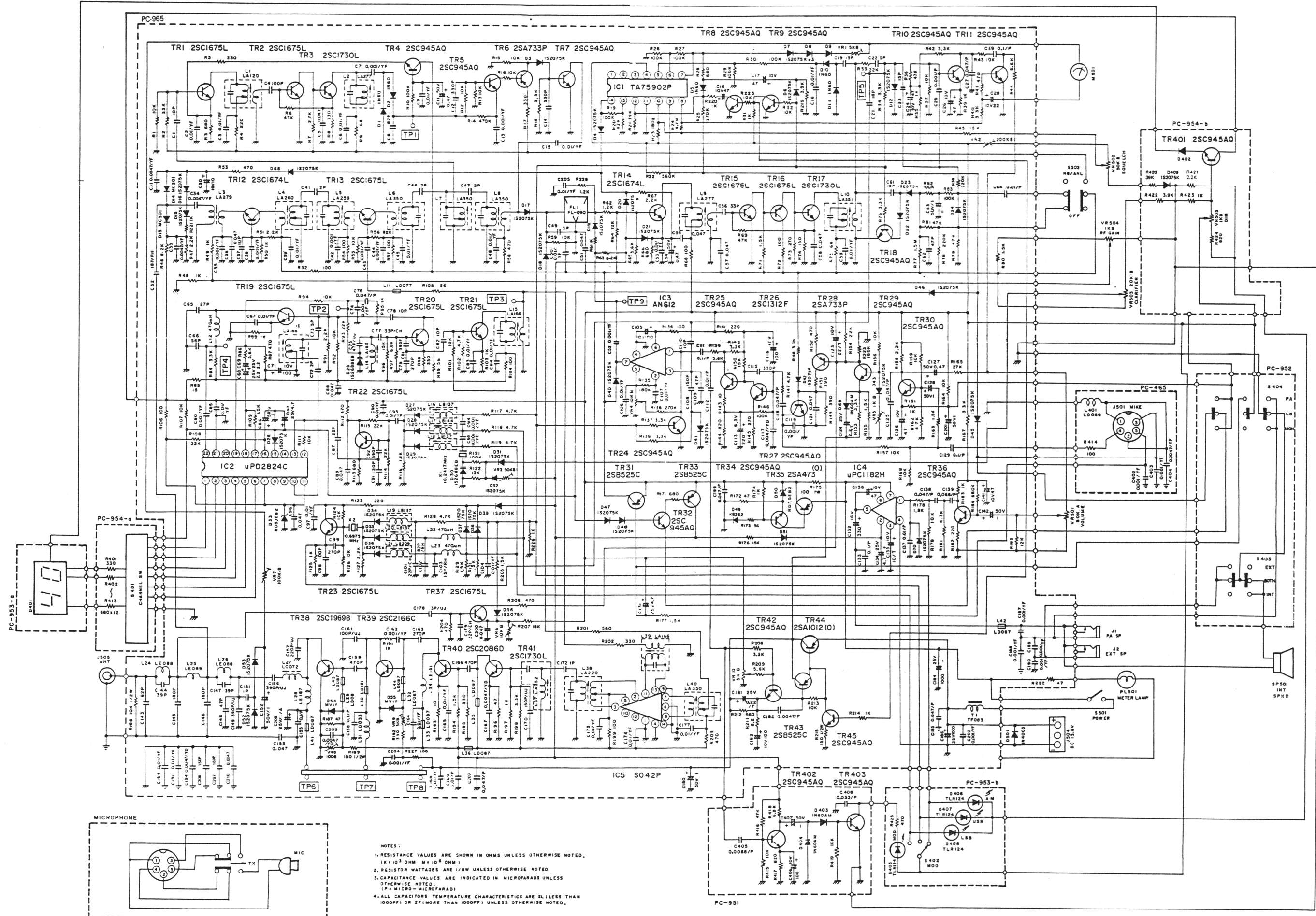
REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.	
TR-15	Transistor 2SC1675-L		DDBY 259001	
TR-16	Transistor 2SC1675-L		DDBY 259001	
TR-17	Transistor 2SC1730-L		DDBY 269001	
TR-18	Transistor 2SC945A-Q		DDBY 224003	
TR-19	Transistor 2SC1675-L		DDBY 259001	
TR-20	Transistor 2SC1675-L		DDBY 259001	
TR-21	Transistor 2SC1675-L		DDBY 259001	
TR-22	Transistor 2SC1675-L		DDBY 259001	
TR-23	Transistor 2SC1675-L		DDBY 259001	
TR-24	Transistor 2SC954A-Q		DDBY 224003	
TR-25	Transistor 2SC954A-Q		DDBY 224003	
TR-26	Transistor 2SC1312F		DDBY 317001	
TR-27	Transistor 2SC945A-Q		DDBY 224003	
TR-28	Transistor 2SA733-P		DDBY 003001	
TR-29	Transistor 2SC945A-Q		DDBY 224003	
TR-30	Tranaistor 2SC945A-Q		DDBY 224003	
TR-31	Transistor 2SB525-C		DDBY 106003	
TR-32	Transistor 2SC945A-Q		DDBY 224003	
TR-33	Transistor 2SB525-C		DDBY 106003	
TR-34	Transistor 2SC945A-Q		DDBY 224003	
TR-35	Transistor 2SA473-O		DDBY 028001	
TR-36	Transistor 2SC945A-Q		DDBY 224003	
TR-37	Transistor 2SC1675-L		DDBY 259001	
TR-38	Transistor 2SC1969-B		DDBY 307001	
TR-39	Transistor 2SC2166-C		DDBY 331002	
TR-40	Transistor 2SC2086-D		DDBY 228002	
TR-41	Transistor 2SC1730-L		DDBY 269001	
TR-42	Transistor 2SC945A-Q		DDBY 224003	
TR-43	Transistor 2SB525-C		DDBY 106003	
TR-44	Transistor 2SA1012-O		DDBY 029001	
TR-45	Transistor 2SC945A-Q		DDBY 224003	
TR-401	Transistor 2SC945A-Q		DDBY 224003	
TR-402	Transistor 2SC945A-Q		DDBY 224003	
TR-403	Transistor 2SC945A-Q		DDBY 224003	
VARIABLE RESISTORS				
VR-501	Variable Resistor (Volume)	RV-320	50K ohm A WITH S501	RRVY320001
VR-502	Variable Resistor, (Squelch)	RV-515	50K ohm B WITH VR505	RRVY515001
VR-503	Variable Resistor (Clari)	RV-222	20K ohm B	RRVY222001
VR-504	Variable Resistor (RF Gain)	RV-353	1K ohm B WITH S502	RRVY353001
VR-505	Variable Resistor (DIM)	RV-515	1K ohm B WITH VR502	RRVY515001
MISCELLANEOUS				
	PC Board, Main Assy			524CPC965
	PC Board, Mod, AMP Assy			524CPC951
	PC Board, SW Assy			524CPC952
	PC Board, CH SW Assy			524CPC954
	PC Board, Mic Jack Assy			524CPC465
	PC Board, Check Point			524CPC834
TP-6	Terminal, Check Point	TP-044		JJPY 044001
TP-7	Terminal, Check Point	TP-044		JJPY 044001
TP-8	Terminal, Check Point	TP-044		JJPY 044001

REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
FL-1	Filter, Crystal	FL-090	FFLY 090001
SP-501	Speaker	SP-057	ASPY 057001
M-401	Meter	MT-193	ZMTY 193001
	Microphone	MK-115	AMKY115001
J-504	Receptacle, DC Power	JK-052 (BL)	JJKY 052001
J-505	Jack, Antenna	JK-068	JJKY 068001
J-501	Jack, Microphone	JK-125	JJKY 125001
J-1	Jack, Speaker	JK-089	JJKY 089001
J-2	Jack, Speaker	JK-089	JJKY 089001
	Transformer, AF Choke	TF-083	TTFY 083001
	Insulation Sheet	YD-047, for IC-4	ZYDY 047001
	Insulation Sheet	YD-005004, for TR35,44	ZYDY 005004
	Insulation Sheet	YY-027, for TR38,39	ZYYY 027001
	Bushing, Tight Ceramic	YY-147, for 38,39,44	ZYYY 147001
	Fuse	FS-014 4(A)	ZFSY 014003
	DC Power Cord	W-070234	WZDZ 070734
FC-1	Flat Cable	WF-004	WWZY004001
FC-2	Flat Cable	WF-004	WWZY004001

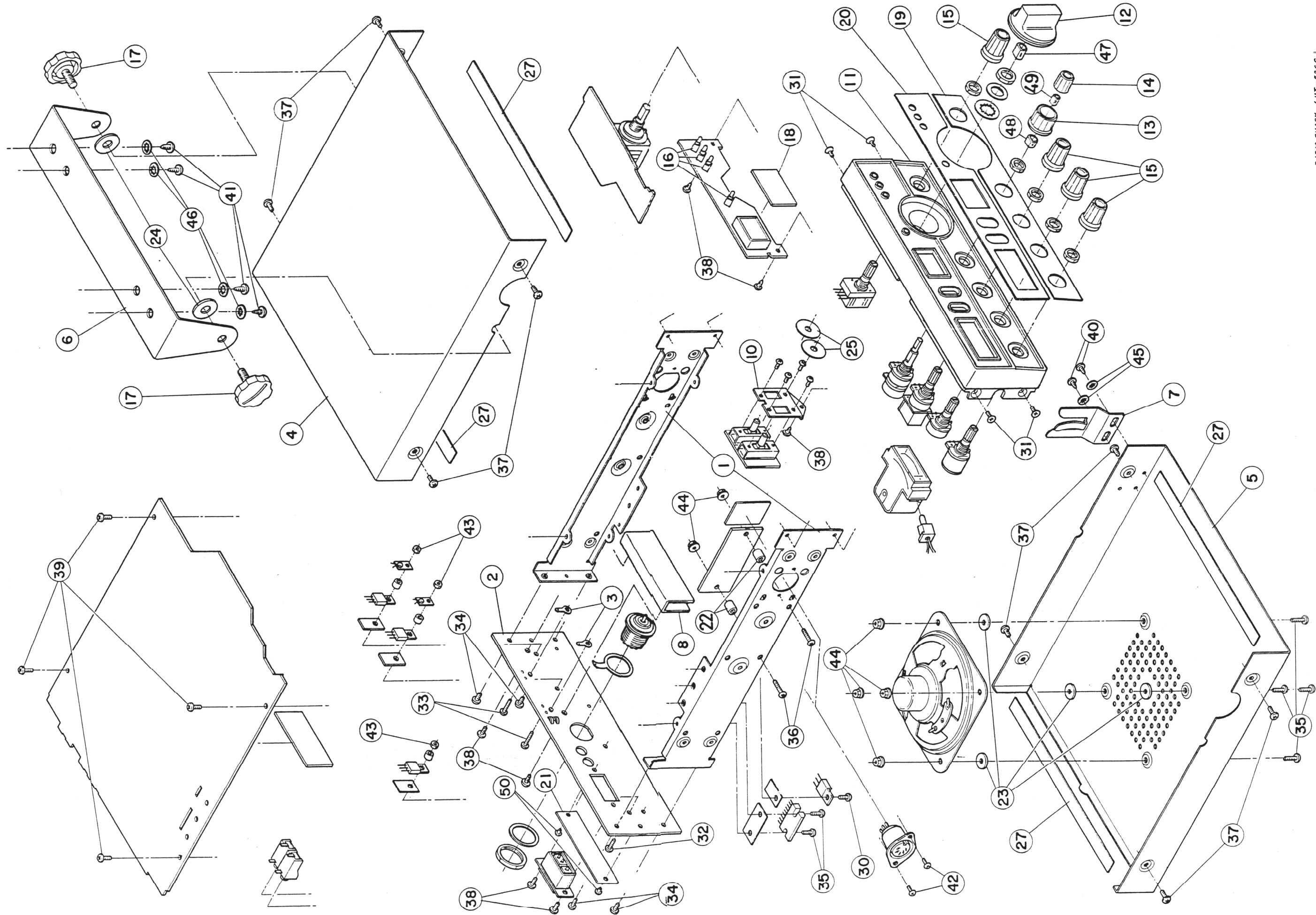
18. MECHANICAL PARTS LIST


REF. NO.	DESCRIPTION	RS. PART NO.	MFRS PART NO.
1	Chassis, Side	SPCC ZMC t=1.0	MDBP 310092A
2	Chassis, Rear	ALPL t=2.0	MDBA 310094
3	Lug Terminal, Ground	BsPL Ni t=0.3	MZTT 150007
4	Cover, Top	SBK-08S t=1.0	MDBP 205979A
5	Cover, Bottom	SBK-08S t=1.0	MDBP 205980A
6	Mounting Bracket	SPCC ZMC t=1.6	MDBP 406058
7	Hanger, Microphone	SPCC Ni t=1.0	MDBP 402919
8	Heat Sink	ALPL t=2.0	MDBP 411016
	Ground Plate	SPT t=0.3	MDBP 402163
10	Holder, Switch	SPCC ZMC	MDBP 411043
11	Panel, Front	ABS Cr-1	MDMP 208130A
12	Knob Channel	ABS Cr-1	MDMP 404011
13	Knob	ABS Cr-1	MDMP 404151
14	Knob	ABS Cr-1	MDMP 403072
15	Knob	ABC Cr-1	MDMP 401728
16	Holder, LED	EPT	MDMP 403877
17	Screw, Mounting	ABS	MDMC 405736
18	Optical Filter, Channel Display	t=1.0	MDAP 411051
19	Nameplate, Control	ALP t=0.5	MDNP 408132A
20	Nameplate, Brand	ALP t=0.5	MDNP 411044
21	ID Plate, FCC	ALP t=1.0	MDNP 411045
22	Stud		MDHP 401698
23	Washer, Rubber		MDMP 409915
24	Washer, Rubber	t=2.0	MDZP 400638
25	Optical Shielding Cloth	t=0.3	MDZP 404304
	Insulation Plate		MDZP 410274
27	Label, Production Date		MDLP 402854
	Label, Fuse	50 μ	MDLP 408137
	Label, Warning, DC Cord		MDLP 402800
30	Screw, Pan Hd Plastic	M3 x 6	MZSS 123006
31	Screw, Flat Hd	M3 x 5 Ni	MZSN 133005
32	Screw, Bind Hd	M2.6 x 10 Ni	MZSN 192610
33	Screw, Bind Hd	M2.6 x 12 Ni	MZSN 192612
34	Screw, Bind Hd	M3 x 6 Ni	MZSN 193006
35	Screw, Bind Hd	M3 x 8 Ni	MZSN 193008
36	Screw, Bind Hd	M3 x 16 Ni	MZSN 193016
37	Screw, Bind Hd	M3 x 5 Ni	MZSB 193005
38	Tapping Screw, Bind Hd	ϕ 3 x 6 Ni	MZSN 263006
39	Tap Tight Screw, Bind Hd	M3 x 6 ZMC	MZSZ 343006
40	Tapping Screw, Round Hd	ϕ 3.5 x 8 ZMC	MZSZ 293508
41	Tapping Screw, Pan Hd	ϕ 5 x 16 ZMC	MZSZ 235016
42	Tapping Screw, Flat Hd	ϕ 2.5 x 6	MZSZ 342506
43	Nut, Hex	M2.6 Ni	MZSN 430026
44	Nut, Flange	M3 ZMC	MZSZ 480030
45	Washer, Lock	3.5 ZMC	MZSZ 530035
46	Washer, Star	5 ZMC	MZSZ 540050
47	Spring Plate, Knob	#6600	MZTT 200003
48	Spring Plate, Knob	#8500	MZTT 200002
49	Spring Plate, Knob	#7800	MZTT 200001
50	Rivet, AL, ID Plate	ϕ 3.2 x 5L	MZTT 213250

SCHEMATIC DIAGRAM For TRC-451 (21-1565)



EXPLODED VIEW



RADIO SHACK  A DIVISION OF TANDY CORPORATION
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TANDY CORPORATION

AUSTRALIA

**280-316 VICTORIA ROAD
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BELGIUM

**PARC INDUSTRIEL DE NANINNE
5140 NANINNE**

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**BILSTON ROAD, WEDNESBURY
WEST MIDLANDS WS10 7JN**