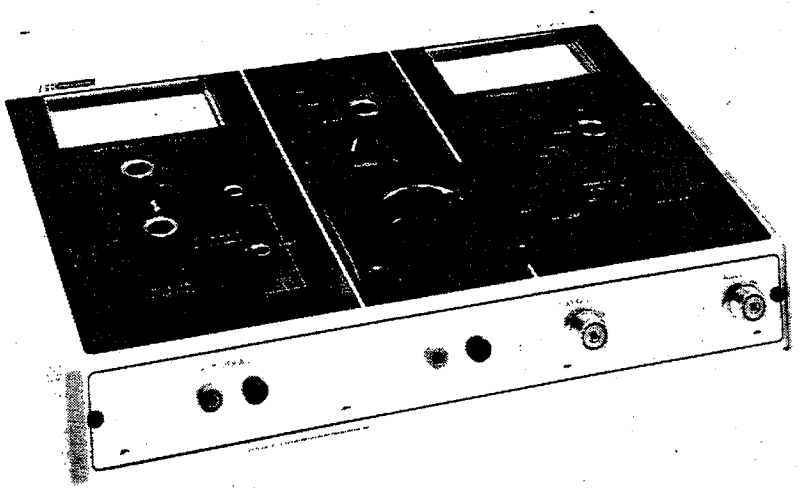
SERVICE MANUAL

B+K PRECISION Model 1040

CB SERVICEMASTER



MODEL 1040

B+K PRECISION

Product of DYNASCAN CORPORATION
6460 W. Cortland St., Chicago, Illinois 60635

DESCRIPTION

The Model 1040 CB Service Master is a high-quality test instrument designed to primarily test Class D Citizen's Band transceivers in the 27MHz band. It will also test other types and bands of two-way radio transceivers, transmitters, receivers, and audio equipment.

The Model 1040 is capable of checking receiver sensitivity, audio output power, audio distortion, transmitter frequency, modulation, PF power output, and antenna standing wave ratio (SWR) for both AM and SSB operation.

The Model 1040 is a rugged, lightweight, reliable instrument. It is completely solid state, providing instant warm-up time and low power drain. The unit operates from 120 volts, 60 Hz AC power for bench servicing or from a 12-volt power source for convenient in-vehicle testing.

SPECIFICATIONS

RF WATTMETER

Impedance	50 ohms.
Internal Load	50-ohm, 50-watt continuous, 100-watt intermittent.
External Load	Switch-selectable.
Ranges	0-10 watts, 0-50 watts, 0-100 watts.
Accuracy	±5%.
Metering Selection	Forward or reverse. Average or peak.
Frequency	27 MHz band.
SWR Scale	1:1 to 5:1 direct reading.
Insertion VSWR	Less than 1.1:1
Connector Type	
Input	Standard antenna type SO239 (UHF); mates with PL-259 antenna plug.
External Load	Standard antenna type SO239.

AUDIO WATTMETER

Load impedance	Switch-selectable. 4 ohms, 8 ohms or 16 ohms.
Load Rating	10 watts, continuous.
Ranges	0-100 milliwatts, 0-1 watt and 0-10 watts; auxiliary dB scale reads -20 dB to +3 dB.
Accuracy	±0.5 dB from 30 Hz to 15 kHz.
Connector Type	Banana plug receptacle.

DISTORTION MEASUREMENT

Type	Total harmonic distortion.
Scale	0-30% direct reading.
Accuracy	±5%.
Frequency	1 kHz, ±100 Hz.

AUDIO

Outputs	Receiver audio. 1 kHz test tone. Two-tone test signal.
Output Device	Speaker or output jack.
Level	Variable volume.
1 kHz Test Tone	
Accuracy	±10%.
Distortion	Less than 1%.
Two-tone Test Signal	500 and 2400 Hz two-tone
Speaker	Microphone modulation of transmitter.
Output Connector Type	Banana plug receptacle.

FREQUENCY COUNTER OUTPUT

Level	50 millivolts minimum at 1 watt RF input, for direct reading of transmitter carrier frequency.
Impedance	10 kΩ
Connector Type	BNC.

OSCILLOSCOPE OUTPUT

Transmit	1 MHz representation of 27 MHz carrier for visual examination of modulation envelope on any low-frequency oscilloscope.
Receive	Displays audio output of receiver.
Impedance	10 kΩ
Connector Type	BNC.

RF GENERATOR INPUT

Protection	RF generator coupled to transceiver in receive mode. In transmit mode, RF generator input automatically disconnected from transceiver antenna jack. Full protection when unit is off.
Impedance	50 ohms.
Connector Type	BNC.
Frequency	No limitation.

POWER REQUIREMENTS

120 VAC, 60 Hz	3 watts.
12 VDC	150 milliamperes. Reverse polarity protection provided.
WEIGHT	2.55 Kg. (5 lbs. 10 oz.).
DIMENSIONS (HWD):	10.16 x 34.29 x 27.94 cm (4 x 13½ x 11").

DISASSEMBLY INSTRUCTIONS

TO REMOVE BOTTOM COVER

1. Remove two screws from lower back panel and three screws from bottom of case and remove bottom cover.
2. Voltage and waveform measurements, and calibration adjustments can now be performed without further disassembly.

TO REMOVE AUDIO PRINTED CIRCUIT BOARD

1. Remove knobs from the LOAD switch, RECEIVER FUNCTION switch, SET control, and NULL control.
2. Remove retainer nuts from the RECEIVER FUNCTION and LOAD switches.
3. Remove four screws holding printed circuit board to chassis.
4. Lift end of printed circuit board near front panel upward and pull toward front panel to clear power transformer.
5. Lift printed circuit board up and remove four-pin connector from board and remove printed circuit board.

TO REMOVE RF PRINTED CIRCUIT BOARD

1. Remove knobs from the RANGE switch, TRANSMITTER FUNCTION switch, RF LOAD switch, RF POWER switch, SET REF control, AC POWER switch, AUDIO SOURCE switch, SPEAKER switch, and AUDIO GAIN control.
2. Remove retainer nuts from the AUDIO GAIN control and TRANSMITTER FUNCTION switch.
3. Unsolder leads from OSCILLOSCOPE, FREQUENCY COUNTER, and RF GENERATOR connectors on rear panel.
4. Remove four screws holding printed circuit board to chassis.
5. Unsolder TRANSCEIVER input cable from printed circuit board. The board can now be moved toward the rear panel to gain access to cable connections on the front panel.
6. Unsolder EXT RF LOAD cable from connector terminals.
7. Unsolder leads from the AUDIO OUTPUT and RCVR AUDIO jack terminals.
8. Unsolder leads from speaker.
9. The printed circuit board can now be lifted up and turned over for component replacement, leaving wires to power supply connected.
10. If it is necessary to remove printed circuit board completely, disconnect all wires connected to power supply circuit.

REASSEMBLY INSTRUCTIONS

RF PRINTED CIRCUIT BOARD

1. Temporarily place RF printed circuit board in proper position onto chassis mounting brackets to allow board to be moved.
2. Reconnect the leads to the speaker, RECEIVER AUDIO, and AUDIO OUTPUT jacks on the front panel, the black leads to the black terminal and colored leads to the red terminal.
3. Reconnect cable to the EXT RF LOAD connector.
4. Reconnect cable from TRANSCEIVER connector to the printed circuit board.
5. Reconnect the cable leads to the OSCILLOSCOPE, FREQUENCY COUNTER, and RF GENERATOR connectors on the rear panel.
6. Position printed circuit board in the proper mounting position so that all control shafts and meter are seated into holes of top panel.
7. Replace the four mounting screws holding printed circuit board to chassis.
8. Replace retainer nuts on shafts of the TRANSMITTER FUNCTION switch and AUDIO GAIN control.
9. Replace all knobs on proper shafts and switch buttons.

AUDIO PRINTED CIRCUIT BOARD

1. Place printed circuit board in proper position and replace four-pin connector from RF printed circuit board.
2. Make sure that control shafts and meter are seated into proper holes in top panel. Replace four mounting screws holding printed circuit board to chassis.
3. Replace retainer nuts on shafts of RECEIVER FUNCTION switch and RF LOAD switch.
4. Replace all knobs on proper shafts.

BOTTOM COVER

1. Place bottom cover onto case and replace three screws on the bottom and two screws on lower rear panel.

CALIBRATION AND ADJUSTMENTS

The Model 1040 has been precisely calibrated at the factory for optimum performance and should not require readjustment unless a defective component has been replaced and it is absolutely certain that the unit will need to be calibrated.

Remove two screws on the back panel and three screws on bottom of unit and remove bottom cover. Refer to Fig. 1 for location of adjustment points.

EQUIPMENT REQUIRED

RF Wattmeter
Frequency Counter
Oscilloscope
Audio Generator
AC Voltmeter
Audio Amplifier

PROCEDURE

RF Wattmeter Calibration

1. Connect the RF output of a properly operating transceiver to the TRANSCEIVER input jack on the Model 1040.
2. Connect an accurate calibrated RF Wattmeter to the EXT RF LOAD jack. If the wattmeter is a thruline type, terminate the wattmeter into a 50-ohm resistive load.
3. Rotate the TRANSMITTER FUNCTION switch to FWD position, set the RANGE switch to the 10W position, and the RF LOAD switch to the EXT position.
4. Slide the 1040 POWER switch to ON, and zero the external RF wattmeter.
5. Key the transmitter with no modulation.
6. Adjust trimpot R12 until the 1040 RF OUTPUT meter and external wattmeter agree.

26 MHz Oscillator Adjustment

1. Temporarily connect a jumper from the emitter to the collector of Q11.
2. Connect an accurate frequency counter to the collector of Q1.
3. Adjust trimmer capacitor C15 using a non-metallic screwdriver for a reading of 26.255 MHz.
4. Disconnect jumper wire.

Two-Tone Amplifier Adjustment

1. Connect an oscilloscope to the AUDIO OUTPUT jacks of the 1040.
2. Rotate the AUDIO GAIN control fully clockwise.
3. Place the AUDIO SOURCE switch to the TWO-TONE position, and the SPEAKER switch to OFF.
4. Temporarily connect a .1 mfd capacitor from the collector of Q6 to ground, and adjust trimpot R92 for 1.5 volts P-P signal on scope.
5. Remove capacitor from Q6 and connect to collector of Q7. Adjust trimpot R50 for 1.5 volts P-P signal on scope.
6. Remove capacitor from Q7.

Audio Wattmeter Calibration

1. Turn the RECEIVER FUNCTION switch to the .1 WATT position.
2. Rotate the LOAD switch to the 4Ω position.
3. Adjust Trimpot R76 for zero watts on the AUDIO OUTPUT meter.
4. Connect an audio generator to the input of an external audio amplifier, and the output of the amplifier to the RECEIVER AUDIO jacks on the 1040.
5. Connect an accurate calibrated AC voltmeter across the RECEIVER AUDIO jacks on the 1040.
6. Set audio generator for a 1000Hz signal and adjust audio amplifier output for .632 volts rms (100mW at 4 ohms).
7. Adjust trimpot R73 for a full scale reading on AUDIO OUTPUT meter.
8. Rotate the LOAD switch to the 8Ω position and adjust the audio amplifier output for .894 volts rms (100mW at 8 ohms).
9. Adjust trimpot R74 for full scale reading on AUDIO OUTPUT meter.
10. Rotate the LOAD switch to the 16Ω position and adjust audio amplifier output for 1.265 volts rms (100mW at 16 ohms).
11. Adjust trimpot R75 for full scale reading on AUDIO OUTPUT meter.

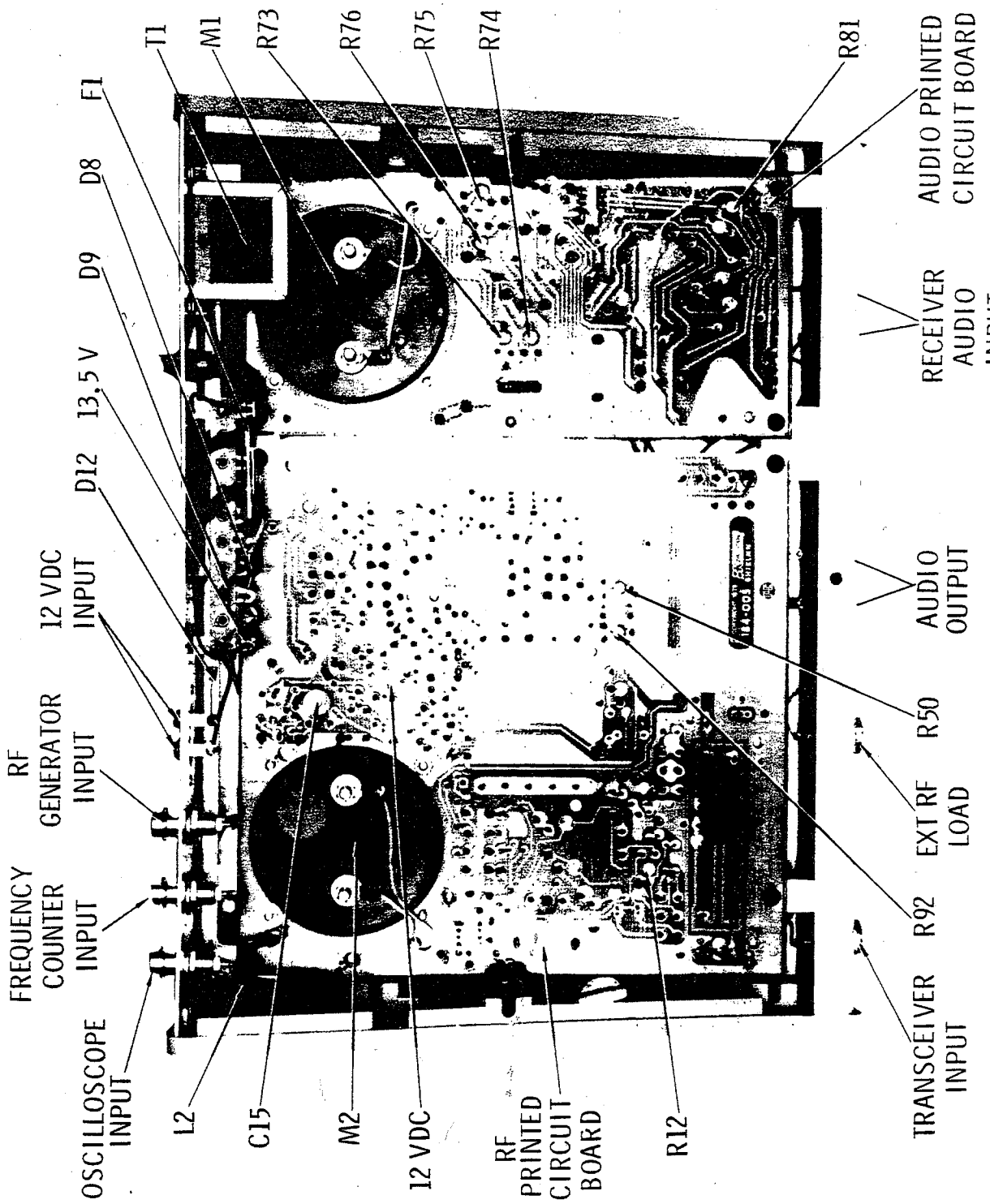


Fig. 1. Bottom View of Chassis, Parts Location and Adjustment Points.

TROUBLESHOOTING

All troubleshooting procedures, such as voltage and resistance measurements, can be made from the bottom side of the printed circuit board. Refer to Figs. 4 and 6, and the schematic in Fig. 7 for test point locations and the Voltage Measurements chart on page 10 for correct voltages. Disassembly of the printed circuit boards will only be necessary if a component needs replacing.

TROUBLESHOOTING CHART

Symptom	Check
Unit does not turn on; power lamp LED-1 does not light.	1. Fuse, F1. 2. Power switch, S6. 3. Lamp assembly LED-1. 4. Transformer, T1. 5. Diodes D8 and D9.
Unit inoperative; lamp LED-1 lights.	1. Transistor, Q9. 2. 12-volt supply and associated circuitry.
Unit operates on 117VAC source, but not on 12VDC source.	1. Connection to 12VDC source. 2. Diode, D11.
Does not measure RF power output.	1. Integrated circuit, IC2. 2. RF sensing circuit and associated components. 3. TRANSMITTER FUNCTION switch, S7. 4. RF LOAD switch, S3. 5. RF OUTPUT meter, M2.
Modulation not displayed on scope.	1. Integrated circuit, IC2. 2. Transistors Q1, Q2, Q10, Q11, and associated circuitry. 3. Relay, RLY1.
No audio output reading when receiving signal. Receiver noise heard from speaker.	1. LOAD switch in proper position. 2. Integrated circuit, IC1. 3. RECEIVER FUNCTION switch, S9. 4. Audio output meter, M1.
No 500Hz and 2400Hz tone signal.	1. Transistors Q5, Q6, Q7, Q8, and associated circuitry. 2. AUDIO SOURCE switch, S4.
No 1000Hz tone signal.	1. Transistors Q3, Q4, and associated circuitry. 2. AUDIO SOURCE switch, S4.
No receiver noise heard from speaker.	1. AUDIO SOURCE switch, S4. 2. AUDIO GAIN control, R32. 3. Integrated circuit, IC3. 4. SPEAKER switch, S5. 5. Speaker, SPK1.

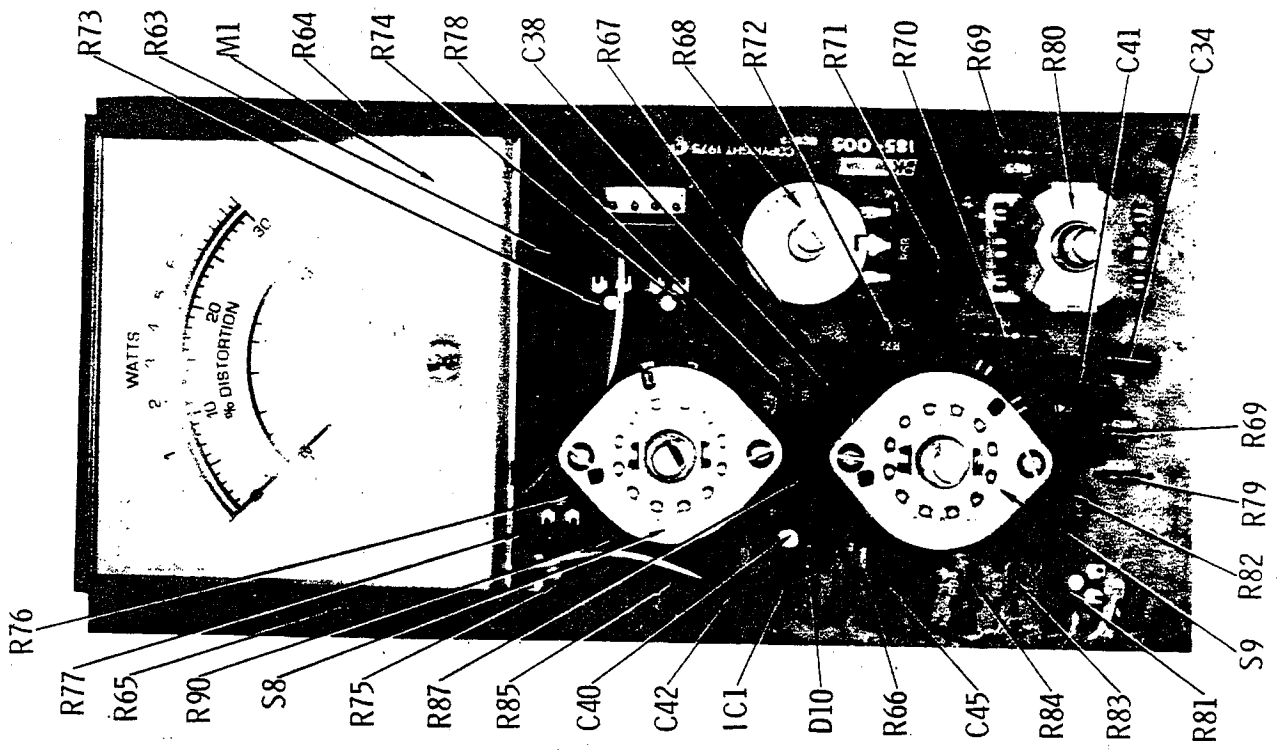


Fig. 2. Audio Printed Circuit Board, Top View, Parts Location.

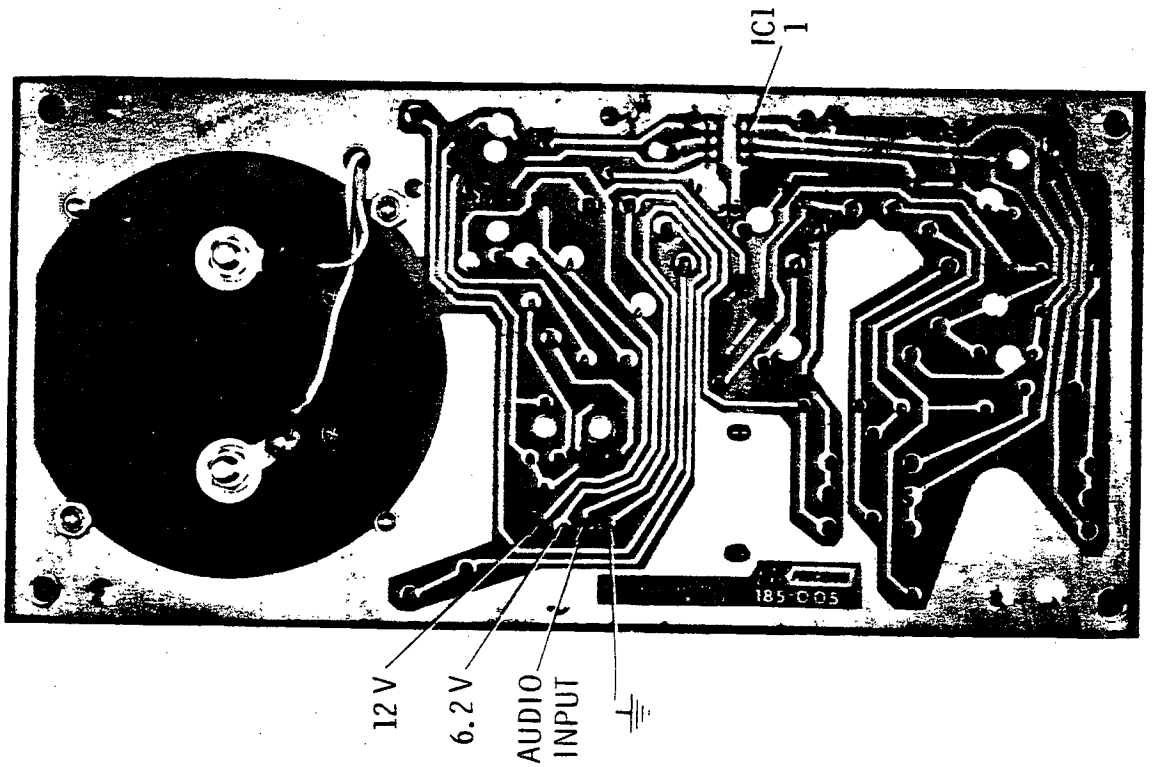


Fig. 3. Audio Printed Circuit Board, Bottom View, Voltage Points.

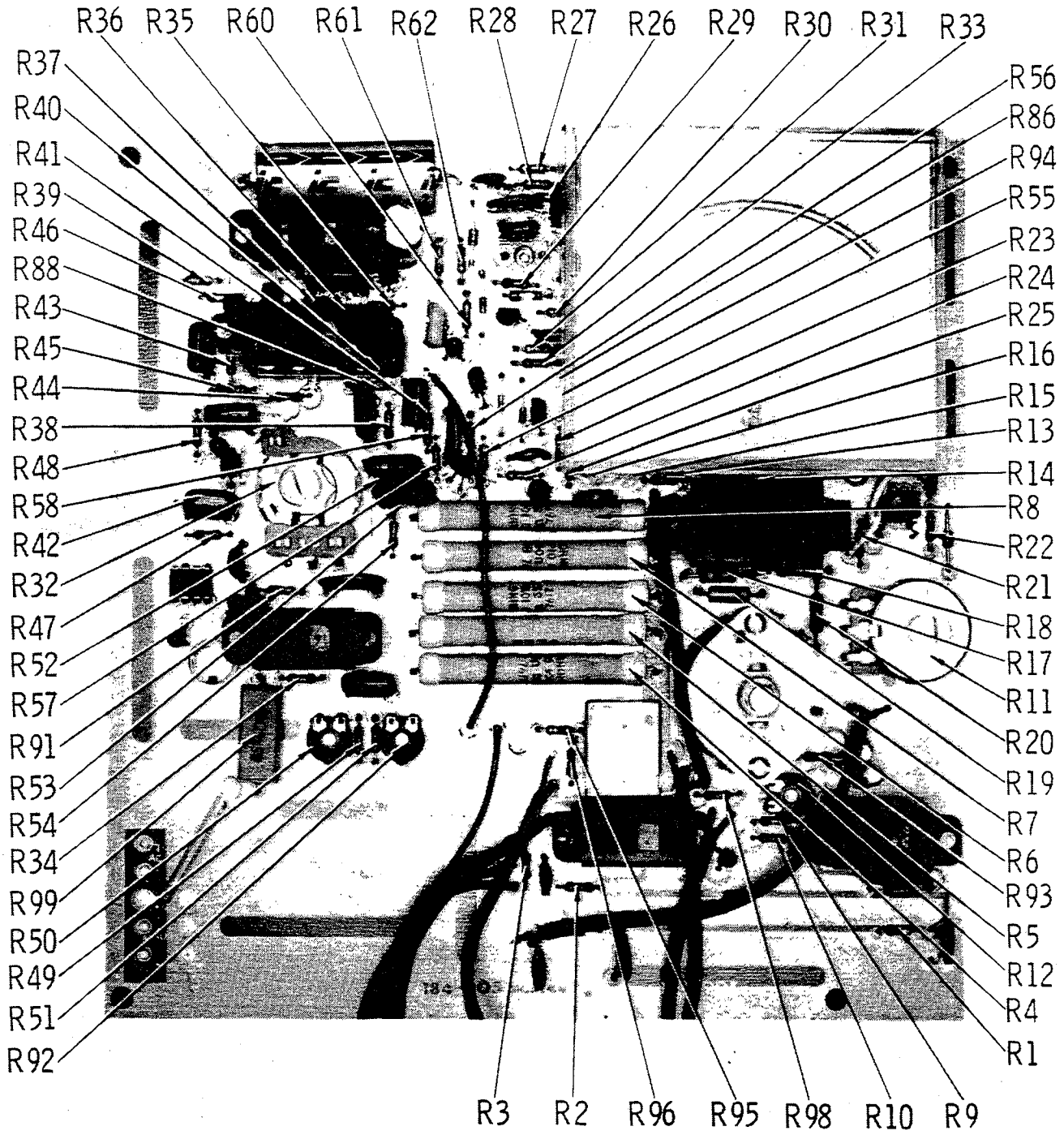


Fig. 4. RF Printed Circuit Board, Top View, Parts Location.

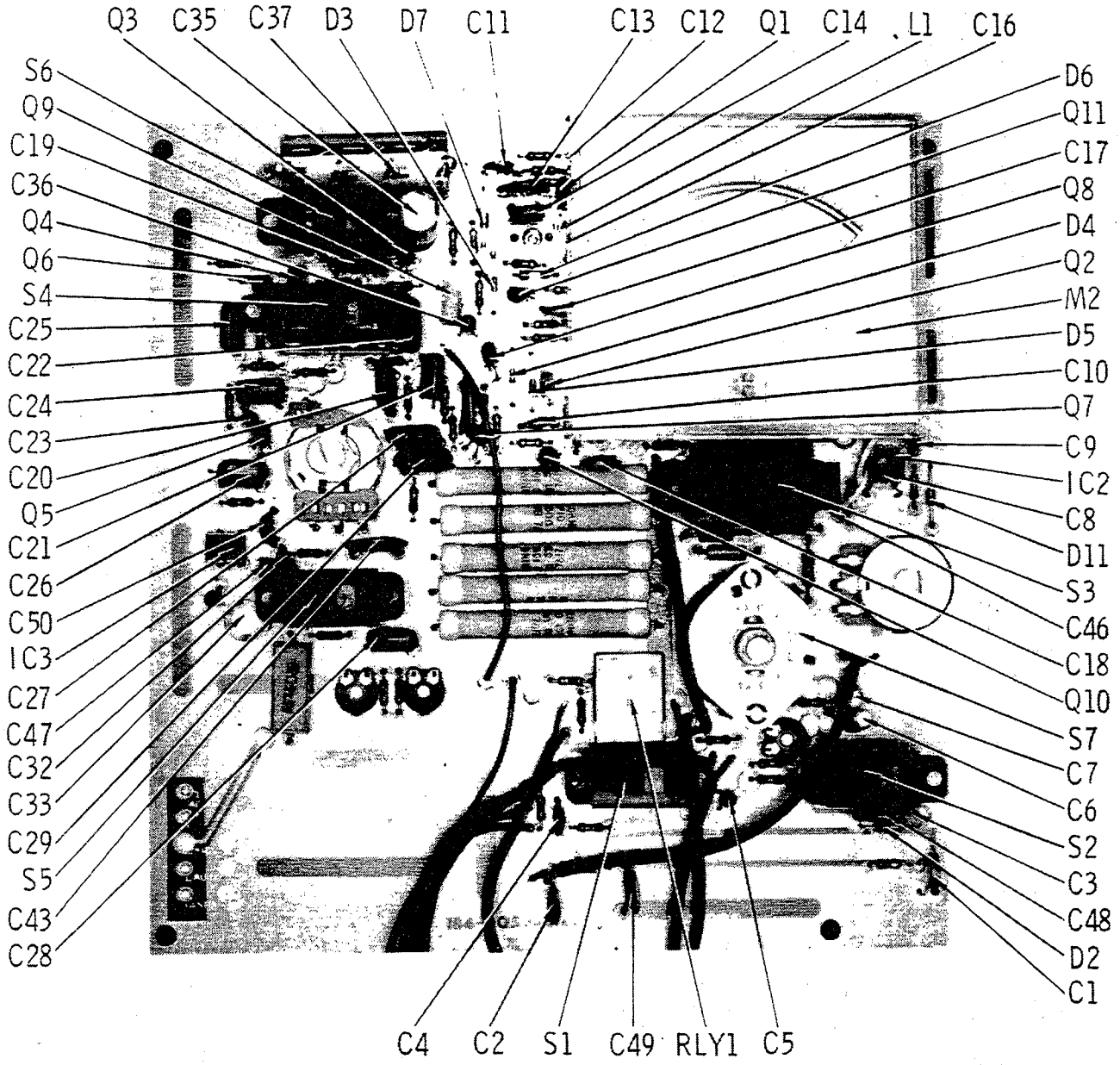


Fig. 5. RF Printed Circuit Board, Top View, Parts Location.

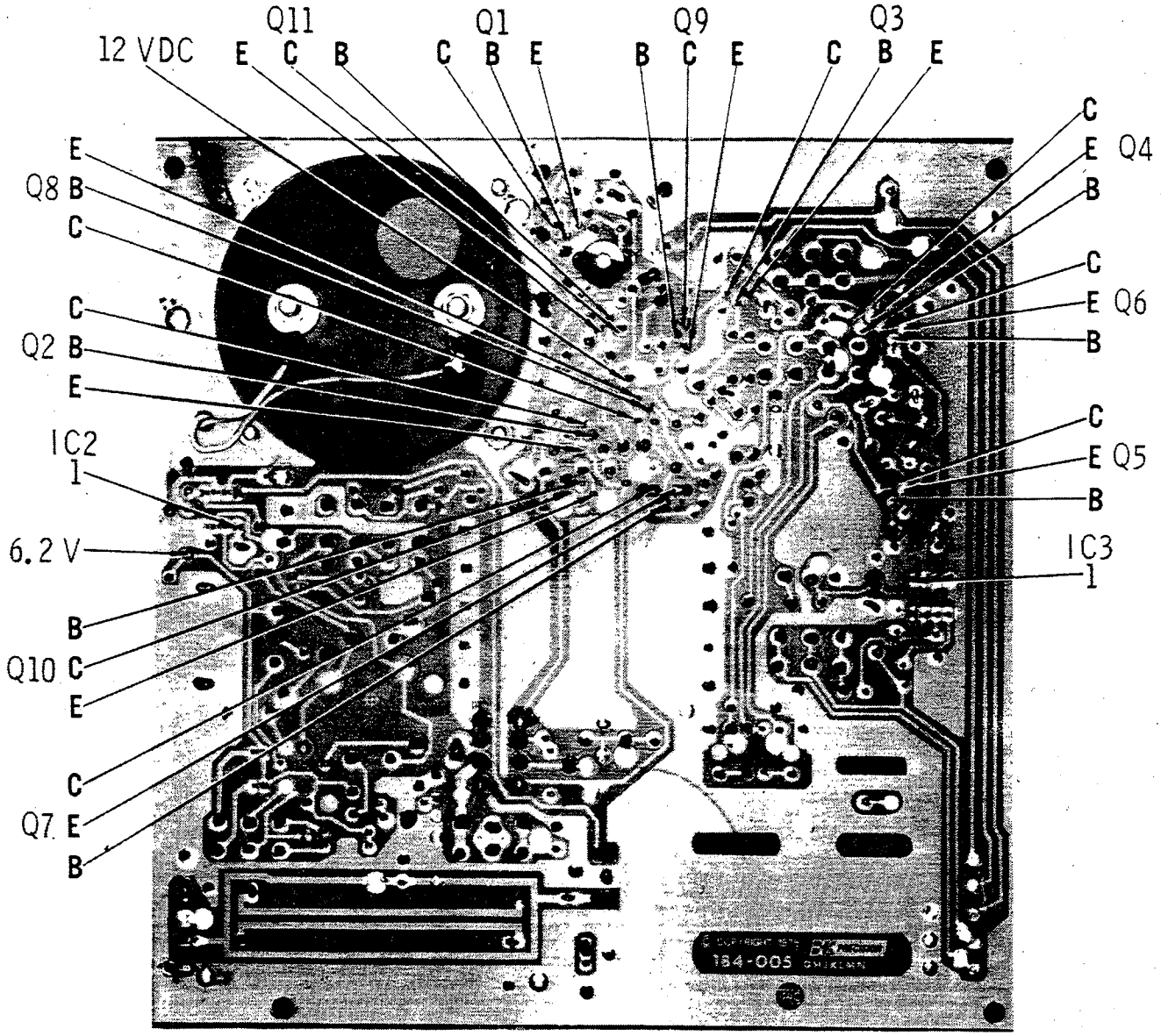


Fig. 6. RF Printed Circuit Board, Bottom View, Voltage Measurement Points.

VOLTAGE MEASUREMENTS

Ref. No.	E	B	C	Ref. No.	E	B	C
Q1	4.7V	4.8V	.001V	Q7	.34V	.94V	5.7V
Q2	11V	11.7V	.29V	Q8	4.8V	5.3V	12V
Q3	4.5V	5.0V	12V	Q9	12V	12.2V	13.5V
Q4	.4V	1.0V	5.1V	Q10	10.3V	9.5V	10.3V
Q5	4.8V	5.4V	12V	Q11	3.3V	2.7V	0V
Q6	.33V	.93V	5.9V				

	Pin No.							
Ref. No.	1	2	3	4	5	6	7	8
IC1	3.0V	3.0V	2.9V	0V	11.6V	5.9V	5.9V	5.9V
IC2	7.4V	7.4V	7.4V	0V	12V	11.5V	6.1V	6.3V
IC3	1.4V	0V	.01V	0V	1.4V	7.4V	14.8V	7.7V

NOTES:
1. Voltages measured with controls and switches in position indicated on schematic in Fig. 7.
2. Voltages on Q1, Q2, Q10, Q11 and IC2 were measured with a transceiver connected to unit and transmitter being keyed.
3. All voltages measured with a VTVM or equivalent meter from chassis ground. Supply voltage maintained at 117 volts AC, 60 Hz.