Standard Communications

GX1500VAA
GX1500VAB

Service Manual

25 Watt
VHF Mobile
Transceiver

CONTENTS

LAND MOBILE

GX1500VAA/GX1500VAB SERVICE MANUAL

GX1500V

VHF/FM Mobile Transceiver

This manual is intended for use by qualified technicians and includes all necessary information pertaining to the GX1500VAA and GX1500VAB operation, installation, circuit design and maintenance. Changes which occur after date of printing will be incorporated in supplemental service publications.

REVISION RECORD

GX1500V

SERVICE MANUAL

This document contains service manual information for the Standard Communications Corp. Land Mobile VHF Trunking / Conventional Transceiver.

Original Issue	June 1990
First Revision	June 1995

Summary of First Revision:

Incorporate the GX1500VAB into the Service Manual.

FOREWORD

SCOPE OF THIS SERVICE MANUAL

This manual is offered to Standard Communications Corp. (SCC) service dealers to provide service information for the indicated equipment. This information includes service diagrams, parts lists, and printed circuit board layouts.

MODEL IDENTIFICATION

SCC equipment is identified by the complete model number printed on the nameplate. Please use this complete number when requesting information or replacement parts.

PRODUCTION CHANGES

As production or engineering changes become necessary, changes to the parts lists or drawings will be indicated under the appropriate parts lists heading. Changes pertaining to a particular production run will reference the serial numbers affected. If the change affects only a specific model number, it will be noted for the specific model.

SERVICE MANUAL REVISIONS

Changes that occur after a Service Manual has been printed will be documented in a Service Manual Insert. These inserts will provide service personnel with updated information and will include any drawing affected by the changes. These inserts will then be incorporated into future printings of the document.

SAFETY INFORMATION

The equipment described in this service manual has been designed to meet all applicable Federal safety and health regulations in effect at the time of the manufacture. Proper operating and service techniques will result in continued compliance with these regulations.

WARNING

Do not operate a radio transmitter near unshielded electrical blasting caps or in other explosive environments unless it is specifically approved for such use.

CAUTION

Do not key the transmitter or press the CARRIER switch without an appropriate load connected to the output connector. Do not allow unauthorized persons to operate any radio transmitting equipment.

NOTE

Do not hold the CARRIER switch when not desiring to transmit.

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 DESCRIPTION

The Standard Communications Corp. (SCC) Model GX1500V is a VHF/FM mobile transceiver. It operates in the 150 to 174 MHz frequency range. The GX1500V is a compact, synthesized, cloneable transceiver with built-in CTCSS. A temperature-compensating circuit maintains stable frequencies over varying temperatures.

The GX1500VAA has 4-channel operation and the GX1500VAB has 8-channel operation. Both the GX1500VAA and GX1500VAB have a power output of 25 watts.

The GX1500V incorporates a microcomputer which governs the operation of the unit. This microcomputer may be programmed at the factory, or with the SCC Portable Programming System (PPS) Software Package and an IBM® or PC compatible.

1.2 LICENSING INFORMATION

The transceiver complies with U.S. and Canadian airway regulations. Both regulations require that the modulation deviation and frequency of the transmitter be checked annually.

1.2.1 FCC Information

The transceiver complies with Federal Communications Commission (FCC) requirements that regulate the Business Radio Service. The user must know and comply with all applicable parts of the FCC Rules and Regulations. Rules applicable to each service may be ordered from:

SUPERINTENDENT OF DOCUMENTS
Government Printing Office
Washington D.C. 20402

A valid station license and call sign issued by the FCC is required before operating the transceiver. It is the user's responsibility to apply for and obtain an FCC radio license.

The following data pertaining to the GX1500V should be included on the FCC license application.

Type Acceptance:

GX1500VAA	APV9T20889
GX1500VAB	APV9T20889
Type Accepted	FCC Parts 22, 90, and 95
Output Power:	
GX1500VAA	25 watts
GX1500VAB	25 watts
Emissions	16K0F3E
Frequency	150 to 174 MHz

1.2.2 DOC Information

To obtain the Canadian Department of Communications (DOC) application, contact the nearest field or regional office, or write:

Government of Canada
Department of Communications
300 Slater Street
Ottawa, Ontario
Canada, K1AOC8

Type Acceptance 363 193 S12I

1.3 ACCESSORIES

12 Amp Power Supply, Black	12/120-12B
Anti-Theft Bracket	CMB10
Flush Mount Kit, Black	CMB11B
7 Watt Extension Speaker, Gray	201S
7 Watt Extension Speaker, Brown	201SB
7 Watt Extension Speaker, Black	201SBK
Heavy Duty Microphone, Black	CMP870
Microphone, Black	CMP872
Amplified Base Station Microphone	MP602

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2 SPECIFICATIONS

Performance specifications are nominal unless otherwise indicated and subject to change without notice.

2.1 GENERAL

Frequency Range:	
F1	138 - 163 MHz
F3	150 - 174 MHz
Number of Channels	
GX1500VAA	4
GX1500VAB	8
Input Voltage	+13.8 VDC
Current Drain:	
Standby	500 mA
Receive	1.5 A
Transmit	6 A
Dimensions:	
Height	2 .0 in. (5.0 cm)
Width	5.6 in. (14.2 cm)
Depth	7.5 in. (19.0 cm)
Weight	2.9 lb (1.3 kg)
Channel Spacing	30 kHz
Color	Black
FCC Compliance	FCC Parts 22, 90, and 95
FCC Type Number:	
GX1500VAA	APV9T20889
GX1500VAB	APV9T20889
DOC Compliance	RSS 119
DOC Type Number	363 193 S12I

2.2 RECEIVER

Measurements are made in accordance with EIA Standard RS 204C.

Sensitivity:	
12 dB SINAD	0.45 µV max.
20 dB Quieting	0.5 µV max
Threshold Squelch Sensitivity	0.25 µV max
Modulation Acceptance Bandwidth	±5.5 kHz
Selectivity	65 dB
Spurious and Image Rejection	60 dB
Intermodulation Rejection	60 dB
Audio Distortion	5%
Frequency Stability(-30 °C to +60 °C)	±5 PPM
Channel Spacing	30 kHz
Bandspread	7 kHz

2.3 TRANSMITTER

Measurements are made in accordance with EIA Standards RS 152B.

RF Power Output:	
GX1500VAA	25 Watts
GX1500VAB	25 Watts
Spurious and Harmonic Emissions	60 dB
Modulation	16K0F3E
Audio Distortion	5%
Frequency Stability (-30 °C to +60 °C)	±5 PPM
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Modulation	16K0F3E
Audio Distortion	5%
Frequency Stability (-30 °C to +60 °C)	±5 PPM
Channel Spacing	30 kHz
Bandspread	7 kHz

3 CIRCUIT DESCRIPTION

3.1 DC POWER DISTRIBUTION

3.1.1 Unswitched +13.8 VDC Power Distribution

Refer to Figure 6-6 for the following description.

Power is applied to the rear of the unit through F001 (6 ampere) fuse and then applied to PB01 Booster PCB. It is routed across diodes QB10 and QB11 to protect the radio from polarity reversal. It is also applied to Automatic Power Control (APC) transistor QB05 and Final RF Amplifier QB02. It is routed through pin 5 of WB03 to pin 5 of JT50 on PT01 TX/RX PCB. It is routed through LT70 and across CT70 for low frequency filtering, through pin 5 of J301. It is routed through pin 2 of J303 and pin 2 on PG01 Volume PCB to power switch on volume control RG01.

3.1.2 Switched +13.8 VDC Power Distribution

Refer to Figure 6-2 for the following description. When the power switch is in the ON position, +13.8 VDC is routed from pin 4 of PG01 Volume PCB through WG01 pin 4 to PP01 PLL PCB. It is applied to AF Amplifier Q101, Regulator Q102, and +5V Regulator Q201. Switched +13.8 VDC is routed through J301 pin 3 and WR60 to PT01 TX/RX PCB. It is also routed to First Mixer QR05 and zener diode QT54 which sets a fixed bias to the base of APC transistor QT52.

3.1.3 +5 VDC Power Distribution

Refer to Figure 6-2 and 6-4 for the following description. +5 VDC originates on PP01 PLL PCB at +5 V Regulator Q201. This voltage is applied to PLL IC QP02, Oven Switch QP72, Oven Driver QP70, Speaker Driver Q301, J302 pin 4 and JC52 pin 14. Power applied to JC51 pin 14 is routed to PC01 CTCSS PCB. This voltage is applied to Tone Switch QC01, AF Preamp QC04, CTCSS Generator QC03, and CTCSS Interface QC02. Power applied to J302 pin 4 is routed to PL01 Control PCB. This voltage is applied to Reset Driver QL03, Squelch Switch QL12, and Microcomputer QL01. This voltage is also routed off the board through JL02 to the microphone jack and through JL01 to the LED PCB PL50.

3.1.4 All 8V Power Distribution

Refer to Figure 6-2 for the following description.

All 8 V is generated by Regulator Q102. It is applied to Active LPF QP05, FIN Amplifier QP01, and Buffer Amp QP50.

3.1.5 RX 8V Power Distribution

Refer to Figure 6-2 for the following description.

When the PTT line is high out of QP02 pin 6, Regulator Q102 outputs +8 VDC (RX 8V) to enable the receive mode. This voltage is applied to VCO PCB PV01. This voltage is applied to 2nd IF Detector QR60, 2nd IF Mixer QR30, Crystal Filters FR61 and FR62, RF Amp QR04, 2nd LO QR32, and Buffer Amp QR63.

3.1.6 TX 8V Power Distribution

Refer to Figure 6-2 and 6-6 for the following description.

Transmit +8 VDC (TX 8V) is generated by regulator Q102 after QP02 drives the PTT line low. When this voltage is present, Q103 is forward-biased to disable diode switch QC50 (tone detection), diode switch Q106 (squelch), and AF Amp Q101 during transmit. This power is also routed through diode QM02 to the base of LPF QM03, through QM01 to active LPF QP05, through Q103 to AF Amp Q101, to the collector of LPF QM03, and through QP20 to VCO PCB PV01. This voltage is also routed through J301 and WR60 to PT01 TX/RX PCB. This voltage is applied to Predriver Amplifiers QT01 and QT02, Unlock Switch QT50, and JT50 pin 3. It is then routed through WB03 pin 3 to pin 3 on PB01 Booster PCB, through RB02 and LB08 to pin diode QB03. QB03 is forward-biased, applying the TX 8V through LB13 to pin diode QB04. This voltage forward biases QB04 and shorts the input to the receiver. QB03 forward biased allows the transmit RF to pass through CB19 to the antenna connector.

3.2 PTT CIRCUIT

Refer to Figure 6-4 for the following description.

Push-to-talk (PTT) is initiated when the PTT switch on the microphone is pressed. A ground is applied through microphone connector JL02 pin 5 and applied to pin 30

on Microcomputer QL01. Once the microcomputer detects the presence of PTT, it generates Clock, Strobe,and data outputs to PLL IC QP02 on PP01 PLL PCB to pull the PTT line low. Regulator Q102 then removes the RX 8V power and applies the TX 8V power to the appropriate transmit circuitry.

A low level on the PTT line also enables CTCSS Encode switch QC51.

3.3 MICROCOMPUTER

Refre to Figure 6-4 for the following description.

Microcomputer QL01 on Control PCB PL01 controls the PLL, providing frequency generation for transmit and receive, monitors such activities as an unlocked PLL, Monitor inhibit signal from microphone hang-up, monitors squelch status, retrieves stored data for the programmable features, controls the LED display, controls the Call, Transmit, and Busy LEDs. The microcomputer also monitors the monitor switch position, provides communications with the CTCSS PCB, and either transmits or receives cloning information for field programming of the radio.

3.4 RESET CIRCUIT

Refer to Figure 6-4 for the following description.

When power is applied to the radio, it is necessary to ensure that the microcomputer always starts up the same way. To ensure that this condition exists, Reset IC QL02 is used. When power is first applied to the radio, the output of QL02 remains low, leaving reset switch QL03 off for the duration of the RC time constant determined by CL03 and RL33. The high level from QL03 is applied to the reset input on microcomputer QL01 pin 43. The microcomputer remains inactive for the duration of the reset pulse. Once capacitor CL03 is charged to a predetermined level, pin 1 of QL02 toggles the output (pin 3) to a high, turning on reset switch QL03. The conduction of QL03 pulls pin 43 on microcomputer QL01 low, releasing the reset condition on the microcomputer. The reset pulse forces the microcomputer to start reading at the first program instruction. Capacitor CL04 is used to remove transients from the base of transistor QL03 eliminating the possibility of a false reset pulse to the microcomputer.

3.5 EEPROM

Refer to Figure 6-4 for the following description.

Programmable features of the radio are stored on EEPROM QL04. This information consists of the transmit frequency, the tone frequency, the receive frequency, busy lockout function, and timeout timer function. The EEPROM communicates with the microcomputer using Clock, Strobe and Data signals. The strobe signal enables the device, the clock signal clocks the data present on the data line either into or out of the EEPROM. The microcomputer provides a read/write signal to the EEPROM, making it an input or output device.

3.6 MIC HANGUP CIRCUIT

Refer to Figure 6-4 for the following description.

The mic hangup circuit disables the monitor switch function when the microphone is placed in the microphone hanger. The mic hangup signal comes in through microphone connector JL02 pin 4 on PL01 Control PCB from the microphone. This signal is a ground routed through RL44 to drive the base of Mic Hangup Switch QL07. With a ground applied to the base of QL07, the transistor is turned on, applying +5 VDC to pin 59 on microcomputer QL01. The microcomputer detects the mic hangup signal, inhibits the PTT line, and bypasses the monitor switch so that only tone squelch is active, if the EEPROM has a stored tone for the selected operating frequency. If there is no stored tone for the operating frequency, this function is disabled.

3.7 BEEP CIRCUIT

Refer to Figure 6-2 for the following description.

The BEEP circuit consists of microcomputer QL01 pin 63, BEEP Predriver Q303, BEEP Driver Q301, and Internal Speaker EG30. The BEEP circuit exists due to the operational requirements of specific computer functions. The BEEP signal is generated when the following conditions exist:

1. when the busy lockout function is programmed and the transmitter is keyed while the squelch is open (BUSY LED ON).

2. When the timeout timer is programmed and ten seconds prior to the timeout condition.

The BEEP signal is generated by Microcomputer QL01 pin 63 and routed through WL01 pin 9 to PP01 PLL PCB J302 pin 9. This signal is applied to BEEP Driver Q301. The BEEP signal is then fed to internal speaker EG30.

3.8 RECEIVER, SQUELCH, AND IF CIRCUITS

Refer to Figure 6-6 for the following description.

The receiver utilizes a double-conversion super heterodyne receiving technique with a 21.4 MHz first intermediate frequency. The incoming signal passes through the antenna and is amplified by RF AMP QR04.

The amplified signal passes on to the gate of the first mixer QR05. The PLL signal is applied by QR20 to the source of QR05. The PLL signal is applied to the source of QR05 as the first local oscillator signal. A resultant 21.4 MHz signal output from QR05 and passed through crystal filter FR30 to improve selectivity and cross-modulation characteristics.

The signal from FR30 is applied to the base of the second mixer QR30. The 21.855 MHz second local oscillator signal from QR32, generated by third overtone crystal XR30, is applied to second mixer QR30. The resultant 455 kHz signal from QR30 is passed through ceramic filter FR60 and applied to QR60.

QR60 works as a second intermediate frequency amplifier, a detector and squelch amplifier. The detected tone and audio signals from QR60 are amplified by QC04 and applied to tone decoder/encoder QC03. The received tone is decoded and compared with the tone frequency stored in EEPROM. If the two tones match, the received audio is output from QC03, passed through a de-emphasis circuit, and applied to audio frequency volume control RG01. The audio frequency signal is level adjusted by RG01 and amplified by audio frequency amplifier Q101 which drives speaker EG30.

The signal for the squelch circuit is obtained from QR60, amplified by squelch circuit QR60, and converted to a DC voltage by diodes QR61 and QR62. The DC voltage level is adjusted by squelch control RG02. This signal is converted to the HI/LO signal by squelch switch QR60 and controls the gain of Q101.

3.8.1 AF Muting Circuit

Refer to Figure 6-2 for the following description.

Audio muting occurs when the TX 8V is present, when the squelch threshold is set to turn squelch on, and when a tone detect output is generated by CTCSS Encoder/Decoder QC03. Regulator Q102 provides TX 8V output when the PTT output from QP02 goes low. Regulator Q102 switches from receive to transmit mode. The +8 VDC from Q102 pin 8 forward biases Q103, applying +8 VDC to the mute input on AF AMP Q101. The squelch signal, generated on the TX/RX PCB is routed to diode switch Q106. When the squelch is set, this input will be a high level, forward biasing Q106 and applying +5 VDC to the mute input on AF AMP Q101.

3.9 TRANSMITTER

Refer to Figure 6-2 for the following description.

The audio signal from the microphone is passed through pre-emphasis circuit and amplified by microphone amplifier QP05. This signal is limited by diode limiter QM01 and QM02. The limited signal is attenuated 18 dB/oct by roll-off filter QM03 and applied to varactor diode QV03 in the VCO as a modulated signal. The tone encoder output from QC03 is passed through low-pass filter QC04 and applied to QV03 in the VCO as a modulated signal. The VCO output is amplified by QP50 and passed through a pre-driver stage comprised of QT01, QT02,and QT02, and amplified by a booster stage consisting of QB01 and QB02.

Harmonics are attenuated 30 dB by the final stage circuit and 60 dB by a two-stage pi low-pass filter consisting of CB20, LB11, CB21, LB12, and CB22. Components QT02 and QB01 control the power out by an automatic power control (APC) circuit consisting of QT52, QT53, and QB05. This APC circuit prevents transmissions when the PLL is unlocked. The unlock signal is derived from PLL unlock switch QT05.

3.9.1 APC Circuit

Refer to Figure 6-6 for the following description.

The Automatic Power Control (APC) circuit controls power output. The APC circuit monitors the PLL lock signal and the temperature of the heatsink assembly. If the PLL is unlocked, this circuit will turn off the driver to prevent transmission of any RF. The temperature of the heatsink assembly is monitored by using a thermal resistor. AS the temperature or the heatsink rises, the thermal resistance will increase, dropping the amount of current to the driver, thus decreasing the amount of drive to the final. The unlock switch signal is applied to the base of unlock switch QT50. In transmit, TX 8V is applied to the emitter. This forces QT50 into saturation providing +* VDC to QT51 and RT50. These two components are in parallel. AS the temperature increases, the internal resistance of QT51 will increase, changing the voltage drop across the two resistors. This voltage

will decrease, thus providing less drive through transistor QT52, dropping the drive level to QT53, decreasing the amount of drive to current driver QB05. The current flow through QB05 will decrease, providing less drive to the final.

3.9.2 Modulation Limiting Circuit

Refer to Figure 6-2 for the following description.

Audio input amplified at QP05 passes through a pre-emphasis circuit, then the amplitude of the audio input is limited by diode limiter QM01 and QM02. Frequencies above 3 kHz are attenuated 18 dB/OCT by roll-off filter QM03.

3.10 CTCSS ENCODER/DECODER

Refer to Figure 6-2 while reading this section.

3.10.1 General

Continuous Tone Controlled Squelch System (CTCSS), when activated for the channel, quiets the receiver until a signal with the proper tone-encoding is received and encodes the transmitted signal with a tone that will allow access to other transceivers programmed to decode the same tone. One of thirty eight different tone frequencies from 67.0 to 250.3 Hz, based on EIA Standard RS-220A may be programmed for each channel in S-RAM QU02.

3.10.2 Encoder

If a tone has been programmed for the channel, it will be generated in QC03 during transmit and output from QC03 pin 26 (CTCSS ENC). The signal is presented to the trimming resistor RC53 to adjust the FM transmit deviation level. The tone signal is then mixed with the audio from the microphone circuitry and both are presented to the modulation circuit in the VCO ZZ01.

3.10.3 Decoder

Received audio from the AF Pre-Amp QC04 is routed to tone IC QC03 pin 23. Low frequency (tone) components are removed and the high frequency (audio) portion (pin 18) is routed to AF Volume Control RG01 and to AF Power Amp Q101.

The CTCSS tone passes through QC03 (pin 23) to tone switch QC01 for comparison with programmed CTCSS signal information in EEPROM QL04. If the channel is CTCSS tone squelched and the recovered CTCSS tone matches that stored in memory, then the receiver will unsquelch and the voice message will be heard.

3.11 PLL

Refer to Figure 6-2 for the following description.

The phase-locked loop (PLL) is used as a first local oscillator during receive and as an oscillator during transmit. QP02 is a PLL IC containing a prescaler, programmable divider, reference oscillator, divider, and phase detector. Crystal oscillator XP01 generates a 12.8 MHz reference frequency. PLL IC QP02 divides the reference frequency by 2560 to produce a 5.0 kHz reference frequency.

The VCO output is amplified by FIN amplifier and applied to the prescaler of QP02 to be divided by 128 or 129. The output is also divided by N by the programmable divider. The dividing ratio is determined by a 21-bit signal from the microcomputer QL01.

The reference frequency from XP01 and the VCO output pass through QP02 and are compared by the phase detector. The phase detector output is applied to active low-pass filter QP05.

The lock detector output prevents transmission when the PLL is unlocked or when the PLL IC is receiving information from the microcomputer.

The signal passed through QP05 is applied to varactor diode QV01 to control the frequency of the VCO.

The VCO output is amplified by QP50 and applied to the first stage during transmit or applied to the first mixer as the first local oscillator signal during receive.

3.11.1 Frequency Stability Circuit (Temperature Compensation)

The PLL frequency stability is determined by the stability of the reference oscillator XP01. XP01 is a highly-stabilized, temperature-controlled crystal, controlled by CP04, CP05, CP06, and the oven circuit, which prevents the maximum frequency variation from exceeding ± 5 ppm.

A PLL is used to control the receiver first local and transmit oscillator circuits. QP02 is a PLL IC containing a prescaler, a programmable counter, a reference oscillator, a reference frequency divider, and a phase comparator. The output of the phase comparator is passed through active low-pass filter QP05, converted to a DC voltage, and applied to the VCO.

3.11.2 Oven Circuit

The oven circuit consists of RP71, thermal sensor QP73, CP70, oven switch QP72, RP70, RP72, oven driver QP70, oven heater QP71 (XP01), and RP73 and RP74. +5 VDC is applied to voltage divider RP71 (fixed value) and QP73 (temperature sensitive). As the temperature increases, the resistance of QP73 decreases, dropping the voltage applied to oven switch QP72. When the voltage at the base of oven switch QP72 reaches approximately 0.6 VDC, oven switch QP72 turns on, grounding voltage divider RP70 and RP72, biasing oven driver QP70 on. Current flows through heater QP71 thus heating the crystal. Resistors RP73 and RP74 provide current limiting for the oven driver and heater.

Reference oscillator XP01 produces a reference frequency of 12.8 MHz and divides the frequency to produce 6.25 kHz. The VCO output passes through FIN amplifier QP01 and divided then compared to the reference 6.25 kHz signal by the phase comparator. The VCO output is supplied to both the transmit predriver and to the first receive mixer.

3.11.3 Unlock Circuit

The unlock circuit prevents the transmitter from keying when the PLL is not locked. This eliminates the possibility of transmitting on the wrong frequency.

The unlock signal originates from PLL IC QP02 pin 10 on PP01 PLL PCB. This signal is routed to PL01 Control PCB to the microcomputer as a status input and to PT01 TX/RX PCB to Unlock Switch QT50 to control the APC circuit. QT50 applies the TX 8V signal to the APC circuit when the PLL is locked.

4 MAINTENANCE

4.1 CONTROLS AND CONNECTIONS

See Figure 4-1 for the location of the controls and connections on the GX1500V and Figure 4-2 for the location of the microphone connections.

4.2 PRECAUTIONS

The inherent quality of the solid state components used in the transceiver will provide many years of continuous use. Take the following precautions to prevent damage to the mobile transceiver.

- Keep the microphone jack covered at all times to prevent corrosion of electrical contacts.
- Ensure that the input voltage does not exceed 16 VDC.
- Never key the transmitter unless an antenna or dummy load is connected to the transceiver antenna receptacle.
- Use only approved SCC accessories and replacement parts.

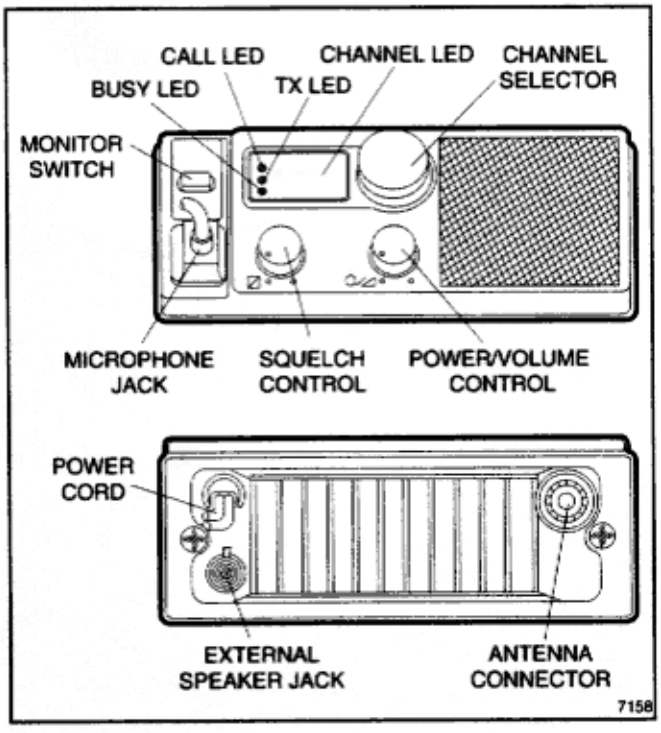


Figure 4-1. Controls and Connections

4.3 TEST APPLICATIONS

Performance Test - Conducted to check overall transceiver operation. This should be performed upon transceiver sale.

Alignment Test - Conducted if the transceiver fails the performance test or if a critical electrical component has been replaced. SCC recommends that alignment be performed whenever maintenance is performed.

4.4 TEST EQUIPMENT

The following pieces of equipment, or their equivalent, are recommended to test the transceiver's performance or alignment. The Personal Computer, A3500 and PP8 Programming Package are not required if only the Performance Test will be performed.

- Personal Computer, IBM PC or compatible.
- Programming System, SCC Programming Package Number 8 (PP8) with A3500 and programming cable.
- AC Voltmeter with dB Scale.
- RF Signal Generator, part of Service Monitor.
- FM Communications Monitor.

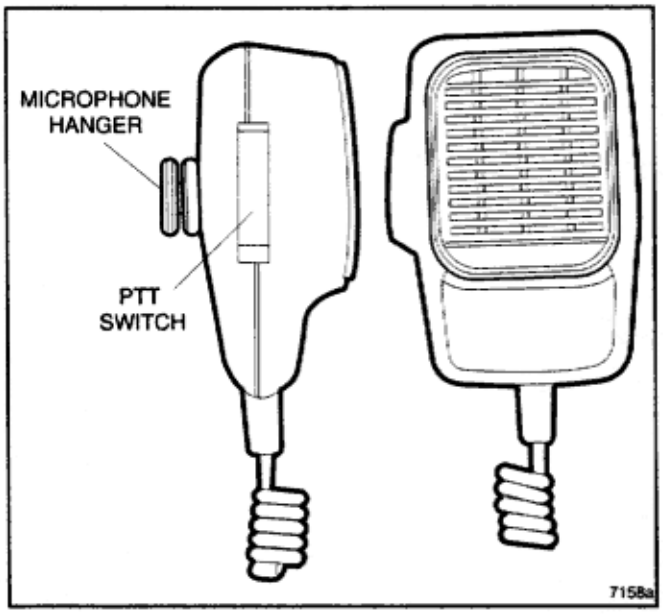


Figure 4-2. Microphone Controls

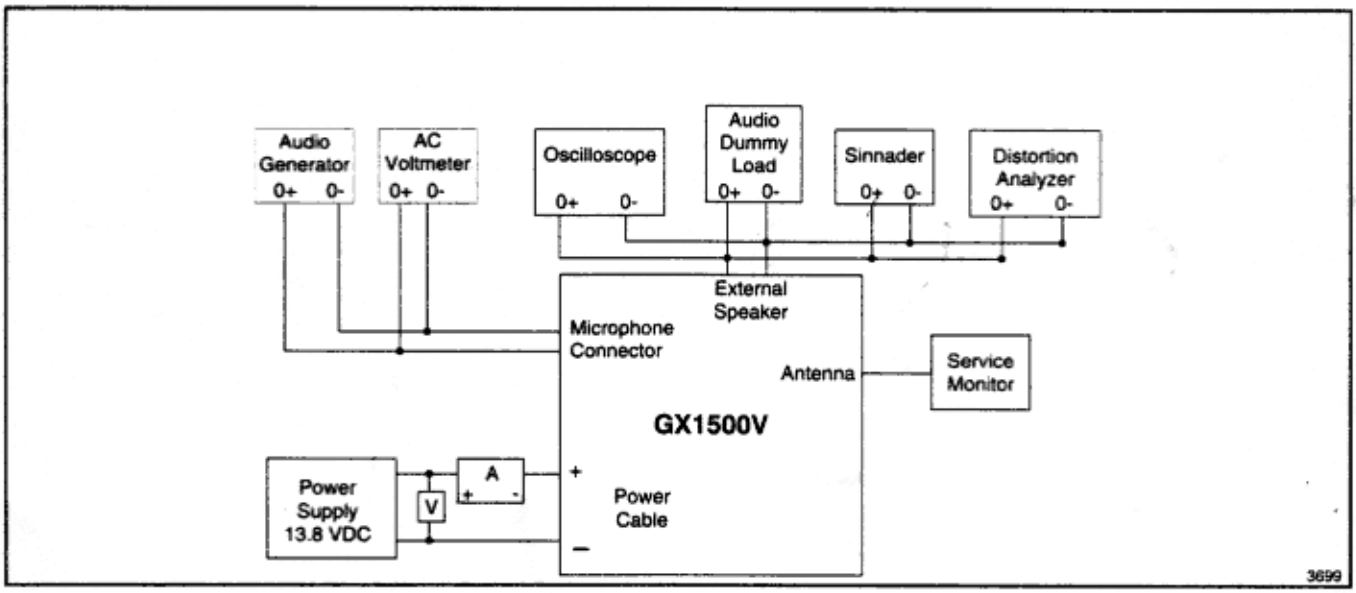


Figure 4-3. Receiver Test Setup

- Frequency Counter.
- Oscilloscope.
- Power Supply 13.8 VDC; 7 A.
- RF Wattmeter with 50-Ohm load, 50 Watts, 1,000 MHz.
- 20 db Power Tap.
- Ammeter.
- SINAD Meter, Sinadder.
- Spectrum Analyzer, Hewlett Packard 8558B.
- RF Dummy Load, 50-Ohm, 50 Watts.
- Distortion Analyzer

4.5 PERFORMANCE TEST

4.5.1 Current Test

1. Set up the equipment as shown in Figure 4-3. Verify the voltage from the power supply is 13.8 VDC measured at the battery leads. Be sure that a suitable dummy load is connected to the antenna terminal.

2. Turn the unit on. Set the Squelch control fully counterclockwise. If the channel is tone protected, press the Monitor switch, or remove the microphone from its grounded hanger.

3. Turn the Volume control fully clockwise. Verify the measured current is no more than 1.5 A. Turn the Volume control fully counterclockwise, but not off.

4. Press the PTT switch on the microphone. Verify the measured TX current is no more than 6A. Release the PTT switch.

5. Disconnect the test equipment plugged into the rear panel External Speaker jack. Connect an external speaker to this jack. Increase the volume and listen for normal audio. Turn the volume control to minimum (but not off) and reconnect the test equipment to the External Speaker jack.

4.5.2 Time-Out Timer

When programmed, the Time-Out Timer stops transmission after a preset time period has been exceeded. Releasing the PTT button momentarily will reset the Time-Out Timer, unless Transmit Inhibit Timer has been programmed. This would require the PTT button to be released for a preset time before transmission could be restarted.

1. If the transceiver is programmed with transmit Time-Out Timer, press the PTT button and hold for the time-out time.

2. Confirm that the beeper sounds 10 seconds prior to the time-out time and the TX LED stops illuminating red after the time out.

3. If Transmit Inhibit Timer is programmed, verify that the transceiver will not transmit for the pro-

grammed time after Time-Out Timer has been activated.

4.5.3 Busy Lock-Out

1. If the transceiver is programmed with Busy Lock-Out, rotate the Squelch control fully counterclockwise. If the channel is tone protected, press the Monitor switch.

2. Press the PTT button. Confirm that the beeper sounds and the TX LED does not illuminate red.

4.5.4 CTCSS Decode

1. Connect the test equipment as illustrated in Figure 4-3.

2. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . Off
Output Level CTCSS . . . . . 10 dB

3. Set the transceiver into the non-monitor condition. Confirm that the audio mutes.

4. Slowly increase modulation of the RF signal generator with the proper CTCSS tone until the transceiver unmutes. Record the tone deviation as the CTCSS tone sensitivity.

4.5.5 Receiver

1. Maintain the test equipment setup as shown in Figure 4-3. If customer ordered frequencies have been programmed, use those frequencies for testing and perform the following tests on the center frequency except where noted. Otherwise, use the factory programmed frequencies in Table 4-1 for GX1500VAA and Table 4-2 for GX1500VAB.

Table 4-1. GX1500VAA RX Frequencies

CH #	F3 MHz	CTCSS Hz
1	162.0000	179.9
2	159.5000	67.0
3	164.5000	250.3
4	162.0000	———

Table 4-2. GX1500VAB RX Frequencies

CH #	F3 MHz	F1 MHz	CTCSS Hz
1	159.5000	148.0000	———
2	162.0000	150.5000	———
3	164.5000	153.0000	———
4	162.0000	150.5000	67.0
5	162.0000	150.5000	179.9
6	162.0000	150.5000	250.3
7	160.0000	149.0000	67.0
8	163.0000	151.0000	250.3

4.5.5.1 Sensitivity (20dB Quieting)

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . Off
Output Level . . . . . Minimum

2. Set the Squelch control to minimum. If the channel is tone protected, press the Monitor switch.

3. Rotate the volume control until 0 db (approximately 0.8 VAC) is displayed on the AC voltmeter.

4. Increase the signal generator RF output level until the AC voltmeter drops 20 db (approximately 0.08 VAC). Record this level, it will be necessary when performing the Tight Squelch measurement.

5. Repeat steps 2 through 4 for the center and highest programmed receive channels.

6. Confirm that the signal generator RF output level does not exceed 0.7 µV for the low and high frequency and 0.5 µV for the medium frequency.

4.5.5.2 Sensitivity (12dB SINAD)

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHZ tone ± 3 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to minimum. If the channel is tone protected press the Monitor switch. Select the lowest programmed receive channel.

3. Set the volume control for approximately 0.8 VAC on the AC voltmeter.

4. Increase the signal generator RF output level until the SINAD meter reads 12 db.

5. Confirm that the signal generator RF output level does not exceed 0.45 µV.

4.5.5.3 Receiver Offset

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation kHz tone . . 1 kHz tone ± 5 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to minimum and set the Volume control for approximately 0.8 VAC on the AC voltmeter.

3. Adjust the frequency of the RF signal generator to obtain maximum SINAD reading.

4. Confirm that the frequency of the RF signal generator is within ± 1.5 kHz of the programmed frequency.

4.5.5.4 Threshold Squelch

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHz tone ± 3 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to minimum and set the Volume control for approximately 0.8 VAC on the AC voltmeter.

3. Slowly increase the Squelch control until the transceiver squelches. If the channel is tone protected, press the Monitor switch.

4. Slowly increase the signal generator RF output level until the transceiver unsquelches.

5. Confirm that the signal generator output level does not exceed 0.45 µV.

4.5.5.5 Tight Squelch

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHz tone ± 3 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to maximum (clockwise).

3. Slowly increase the signal generator RF output level until the transceiver unsquelches. If the channel is tone protected, press the Monitor switch.

4. Confirm that the signal generator RF output level is not more than 3 db below nor more than 10 db above the RF level measured to obtain the 20 db Quieting Sensitivity.

4.5.5.6 Audio Power

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHz tone ± 3 kHz deviation
Output Level . . . . . 1,000 mV

2. Turn the volume control to minimum. If the channel is tone protected, press the Monitor switch. Rotate the Squelch control fully counterclockwise.

3. Increase the volume control until the radio produces audio with 5% distortion. Confirm the level is at least 4.1 Vrms.

4.5.5.7 Audio Sound

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receiver Frequency
Modulation . . . . . Off
Output Level . . . . . 1,000 µV

2. Connect a 4 Ohm speaker to the rear panel External Speaker jack. Set the Squelch control to minimum. Press the Monitor switch.

3. Rotate the Volume control fully clockwise and confirm there are no microphonics or wobbling from the speaker. Rotate the Volume control to minimum.

4.5.6 Transmitter

Connect the test equipment as illustrated in Figure 4-4. If customer ordered frequencies have been programmed, use those frequencies for testing and perform the following tests on the center frequency except where noted. Otherwise, use the factory programmed frequencies in Table 4-3 for GX1500VAA and Table 4-4 for GX1500VAB.

Table 4-3. GX1500VAA TX Frequencies

CH #	F3 MHz	CTCSS Hz
1	162.1000	179.9
2	159.6000	67.0
3	164.6000	250.3
4	162.1000	———

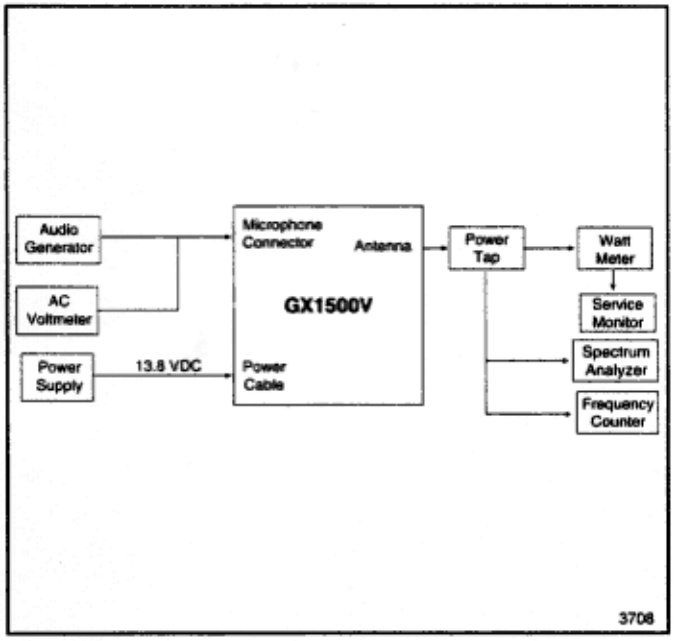


Figure 4-4. Transmitter Test Setup

4.5.6.1 Power Output

1. Verify that the voltage supplied to the battery terminal is 13.8 VAC.
2. Select the lowest programmed transmit channel. Press the PTT switch and confirm that the RF power meter reads between 19 and 31 watts.
3. Release the PTT switch
4. Repeat steps 2 and 3 for the center and highest programmed transmit channels.

4.5.6.2 Frequency

1. Select the lowest programmed transmit channel. Press the PTT switch.
2. Confirm that the frequency reading is within 1 kHz of the assigned frequency as measured on the Frequency Counter. If additional channels are programmed, confirm the frequency reading of the channels are within 1 kHZ of the assigned frequency.

4.5.6.3 Modulation

1. Connect an audio generator to the Mic jack using the setup shown in Figure 4-4. Adjust the audio signal generator to an output of a 1 kHz sinewave. Set the GX1500V to the transmit mode.
2. Adjust the output level of the audio signal generator to obtain a deviation reading of ± 3 kHz on the service monitor.

Table 4-4. GX1500VAB TX Frequencies

CH #	F3 MHz	F1 MHz	CTCSS Hz
1	159.6000	148.1000	———
2	162.1000	150.6000	———
3	164.6000	153.1000	———
4	162.1000	150.6000	67.0
5	162.1000	150.6000	179.9
6	162.1000	150.6000	250.3
7	160.0000	149.0000	67.0
8	163.0000	151.0000	250.3

2. Set the Squelch control to minimum. If the channel is tone protected press the Monitor switch. Select the lowest programmed receive channel.

3. Set the volume control for approximately 0.8 VAC on the AC voltmeter.

4. Increase the signal generator RF output level until the SINAD meter reads 12 db.

5. Confirm that the signal generator RF output level does not exceed 0.45 µV.

4.5.5.3 Receiver Offset

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation kHz tone . . 1 kHz tone ± 5 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to minimum and set the Volume control for approximately 0.8 VAC on the AC voltmeter.

3. Adjust the frequency of the RF signal generator to obtain maximum SINAD reading.

4. Confirm that the frequency of the RF signal generator is within ± 1.5 kHz of the programmed frequency.

4.5.5.4 Threshold Squelch

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHz tone ± 3 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to minimum and set the Volume control for approximately 0.8 VAC on the AC voltmeter.

3. Slowly increase the Squelch control until the transceiver squelches. If the channel is tone protected, press the Monitor switch.

4. Slowly increase the signal generator RF output level until the transceiver unsquelches.

5. Confirm that the signal generator output level does not exceed 0.45 µV.

4.5.5.5 Tight Squelch

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHz tone ± 3 kHz deviation
Output Level . . . . . Minimum

2. Set the Squelch control to maximum (clockwise).

3. Slowly increase the signal generator RF output level until the transceiver unsquelches. If the channel is tone protected, press the Monitor switch.

4. Confirm that the signal generator RF output level is not more than 3 db below nor more than 10 db above the RF level measured to obtain the 20 db Quieting Sensitivity.

4.5.5.6 Audio Power

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receive Frequency
Modulation . . . . . 1 kHz tone ± 3 kHz deviation
Output Level . . . . . 1,000 mV

2. Turn the volume control to minimum. If the channel is tone protected, press the Monitor switch. Rotate the Squelch control fully counterclockwise.

3. Increase the volume control until the radio produces audio with 5% distortion. Confirm the level is at least 4.1 Vrms.

4.5.5.7 Audio Sound

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Receiver Frequency
Modulation . . . . . Off
Output Level . . . . . 1,000 µV

2. Connect a 4 Ohm speaker to the rear panel External Speaker jack. Set the Squelch control to minimum. Press the Monitor switch.

3. Increase the audio level by 20 dB. Confirm that the deviation is between ± 4 kHz and ± 5 kHz. Set the transceiver to the receive mode. Disconnect the microphone interface cable and reconnect the microphone.

4.5.6.4 Spurious Emissions

1. Set the RF signal generator as follows:

Frequency . . . . . Transceiver Frequency
Modulation . . . . . 1 kHz tone
Output Level . . . . . Minimum

2. Press the PTT switch. Adjust the signal generator audio output level for a deviation reading of ± 1.5 kHz on the service monitor.

3. Without changing any other controls, change the frequency of the audio generator to 2.5 kHz and increase the signal generator audio output level by 20dB.

4. Confirm that spurious emissions are more than 65 dB below the transmitter carrier as measured on the Spectrum Analyzer.

5. Release the PTT switch.

4.5.6.5 CTCSS Tones

NOTE

Perform this test only if CTCSS tone protection has been programmed.

1. Key up the transmitter and confirm that each programmed channel has been programmed with the correct CTCSS frequency.

2. Confirm that the CTCSS tone deviates the carrier between ± 400 Hz and ± 800 Hz on each channel and that the Lissajous figure on the Service Monitor is stationary.

3. Release the PTT switch.

4.6 ALIGNMENT PROCEDURE

NOTE

Prior to tuning, the transceiver must be programmed using the A3500 with the Programming Package Number 8 (PP8) and a programming cable.

Use the factory-programmed frequencies stored in channel locations 1, 2, and 3 as shown in Table 4-5 when performing the alignment procedure or use the customer's frequencies. Note the customer's lowest, highest, and approximate center frequencies and use these frequencies when called for in the alignment procedure.

Table 4-5. Factory Programmed Frequencies

	Frequency Range	Tone Frequency
Channel 1: TX	162.1 MHz	179.9 MHz
Channel 1: RX	162.0 MHz	179.9 MHz
Channel 2: TX	162.1 MHz	67.0 MHz
Channel 2: RX	159.6 MHz	67.0 MHz
Channel 3: TX	164.6 MHz	250.3 MHz
Channel 3: RX	164.5 MHz	250.3 MHz

4.6.1 Disassembly Procedure

1. Place the transceiver on a table with the rear of the transceiver facing you.

2. Remove the two screws that secure the cover to the chassis.

3. Grasp the front panel with one hand and gently pull the cover towards the rear of the transceiver.

4. Ensure that the power cable does not hang up on the cover.

5. Refer to the exploded parts view for further disassembly.

4.6.2 General

1. Set up the test equipment as shown in Figure 4-4.

2. Position the channel selector to channel 2.

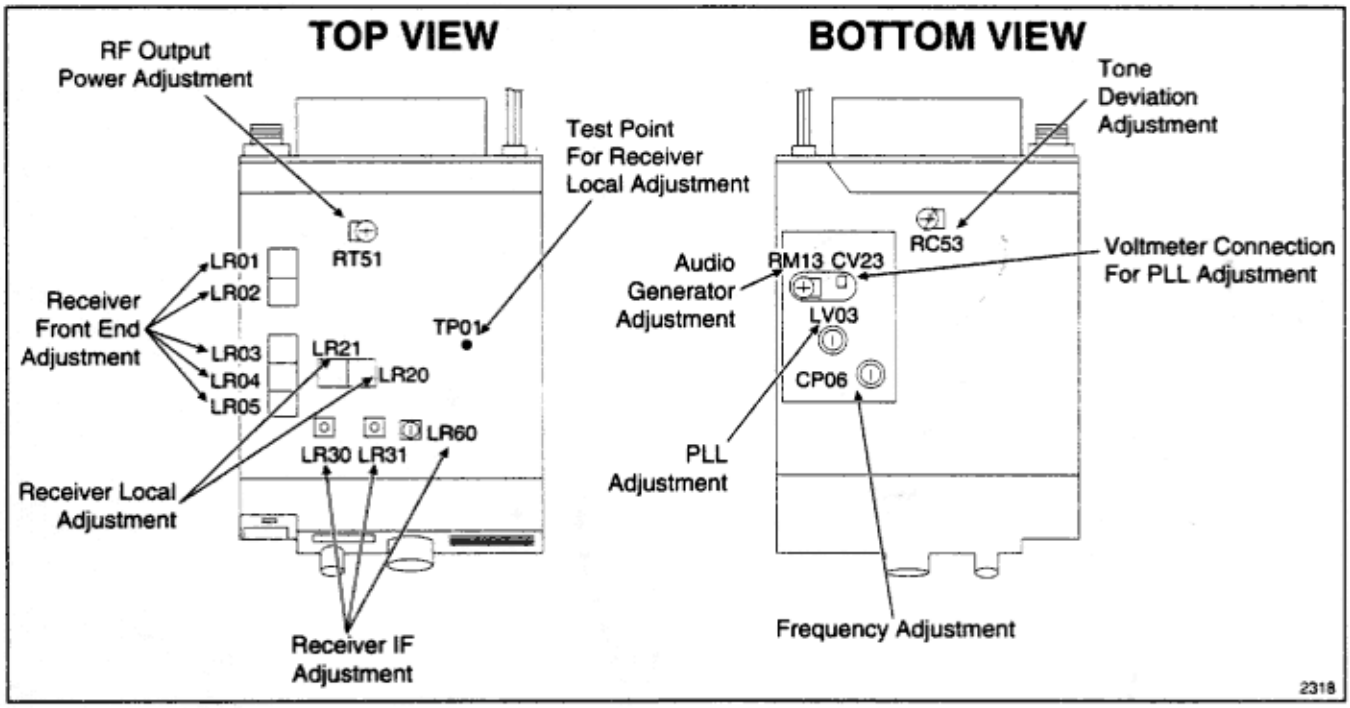


Figure 4-5. Alignment Reference Points

3. Confirm that the power supply voltage at the transceiver is 13.8 VDC.
4. Set the squelch control fully counterclockwise.
5. Set the volume control to its approximate mechanical center.

4.6.3 Phase-Locked Loop

1. Connect the voltmeter (with an internal resistance greater than 500 k-ohms) to CV23 and to the chassis.
2. Position the channel selector to the center frequency.
3. Adjust LV03 for a reading of 3.0 volts. See Figure 4-5 for location of LV03.

4.6.4 Transmitter - TX Deviation

1. Maintain the same test equipment setup shown in Figure 4-4.
2. Turn RC53 fully counterclockwise.

NOTE

Attach a 10 µF/16 V electrolytic capacitor between the audio generator and the tip of the microphone jack. Connect the "+" side of the capacitor to the transceiver. See Figure 4-6 on how to connect the capacitor.

3. Apply a sine wave signal of approximately 50 mV, 1 kHz to the capacitor mentioned in the above note.

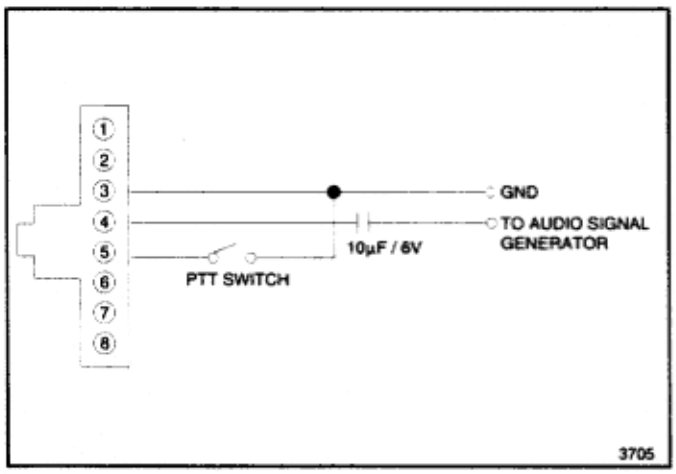


Figure 4-6. TX Deviation Test Circuit

4. Key the transmitter and adjust the output of the audio signal generator for a deviation of ± 3 kHz.

5. Increase the audio generator output level by 20 dB. Adjust RM13 to within ± 4.5 kHz deviation.

6. Decrease the audio generator output level by 20 dB and check for ± 3 kHz of deviation.

7. Repeat steps 4, 5, and 6 several times until further adjustment is unnecessary.

8. Key the transmitter and adjust CP06 for the correct frequency.

9. Key the transmitter and adjust RT51 for 25 watts. Confirm that any spurious output is less than 60 dB below the carrier.

4.6.5 Transmitter - Tone Deviation

1. Select the center frequency.

2. Maintain test equipment setup as shown in Figure 4-4. Turn off the external modulation.

3. Key the transmitter and adjust RC53 for a tone deviation ± 0.6 kHz.

4.6.6 Receiver

1. Connect the test equipment as shown in Figure 4-3 and select the center frequency.

2. Rotate the volume control clockwise to its mechanical center. Rotate the squelch control and check for proper squelch operation. Leave in the open squelch (noise) position, then rotate the volume control to check for proper operation. Position the squelch control to the point where the noise just disappears and set the volume control to minimum (counterclockwise) position.

3. Turn the cores of LR01, LR02, LR04, LR05 and LR06 five turns down from the top of the transformer shield, see Figure 4-7.

4. Monitor TP01 with a VTVM or digital voltmeter.

5. Adjust the signal generator output so the voltmeter reads approximately 0.5 VDC.

6. Adjust each tuning point respectively for maximum meter reading:

   a. LR01, LR02, LR04, LR05, LR06

   b. LR20, LR21, LR30, LR31, and LR60

7. Select the highest frequency.

8. Adjust LR01 and LR04 for maximum meter reading.

9. Select the lowest frequency.

10. Adjust LR02 and LR05 for maximum meter reading.

11. Adjust LR05 for balance in sensitivity on the low and high band spread frequencies.

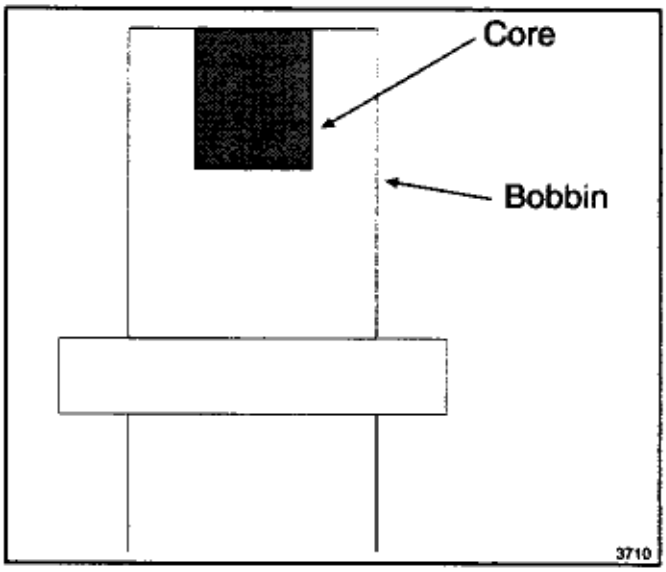


Figure 4-7. Adjustment Coil

5 PARTS LIST

5.1 GENERAL

Information on most electrical and mechanical parts is included in the parts list. The parts are listed in alphabetical order.

- Use only SCC - approved accessories.
- Use only SCC - approved parts.

5.1.1 Ordering Replacement Parts

Parts orders should be referred to the Parts Department at (310) 532-5300, (800) 767-6695, FAX (310) 515-7197 or write:

Standard Communications Corp.
Parts Department
P.O. Box 92151
Los Angeles, CA 90009-2125

Please note that SCC may not be able to fill replacement parts order without such identifying information as:

- Reference Designator
- Value
- Description
- Part Number
- Unit Model Number

5.2 PRODUCT SUPPORT

Product support questions should be referred to the Salt Lake City Product Support Group at (800) 767-2464, FAX (801) 359-5069 or write:

Standard Communications Corp.
Product Support
4876 W. North Temple St.
Salt Lake City, Utah 84116

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
CAPACITORS				
CB01	AAF3		Capacitor, Ceramic Chip 22 pF	DD55220300
CB01	ABF1		Capacitor, Ceramic Chip 27 pF	DD55270330
CB01	ABF3		Capacitor, Ceramic Chip 22 pF	DD55220300
CB02			Capacitor, Ceramic Chip 15 pF	DD55150300
CB03			Capacitor, Trimming 27 pF	CT12500060
CB05			Capacitor, Ceramic Chip 150 pF	DD45151300
CB08			Capacitor, Trimming 27 pF	CT12500060
CB09	AAF3		Capacitor, Ceramic Chip 22 pF	DD45220300
CB09	ABF1		Capacitor, Ceramic Chip 22 pF	DD45220300
CB09	ABF3		Capacitor, Ceramic Chip 18 pF	DD45180300
CB10			Capacitor, Ceramic Chip 150 pF	DD45151300
CB11			Capacitor, Ceramic Chip 150 pF	DD45151300
CB13			Capacitor, Mica Chip 220 pF	DF95221500
CB14			Capacitor, Mica Chip 100 pF	DF95101500
CB15			Capacitor, Ceramic 10 pF	DD11100300
CB15	AAF3		Capacitor, Ceramic 10 pF	DD11100300
CB15	ABF1		Capacitor, Ceramic 13 pF	DD15130300
CB15	ABF3		Capacitor, Ceramic 10 pF	DD11100300
CB16			Capacitor, Trimming 27 pF	CT12500060
CB18			Capacitor, Ceramic 0.001 µF	DK16102300
CB19			Capacitor, Ceramic 0.001 µF	DK16102300
CB20			Capacitor, Ceramic 18 pF	DD15180300
CB21			Capacitor, Ceramic 36 pF	DD15360300
CB22			Capacitor, Ceramic 18 pF	DD15180300
CB23			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CB24			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CB25			Capacitor, Ceramic 18 pF	DD15180300
CB26			Capacitor, Ceramic 18 pF	DD15180300
CB27			Capacitor, Ceramic 0.001 µF	DK16102300
CB30			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CB31			Capacitor, Ceramic Chip 0.001µF	DK56102300
CB32			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CB33			Capacitor, Elect 10 µF 25V	EJ10602510
CB34			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CB35			Capacitor, Ceramic Chip 0.001µF	DK56102300
CB36			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CB37			Capacitor, Elect 10 µF 25V	EJ10602510
CB40		U080001	Capacitor, Elect 220 µF 25V	EA22702510
CC01			Capacitor, Tantalum Chip 1µF 16V	EY10501610
CC02			Capacitor, Tantalum Chip 10µF 16V	EY10600610
CC03			Capacitor, Tantalum Chip 1µF 16V	EY10501610
CC04			Capacitor, Tantalum Chip 0.22µF 35V	EY22403510
CC05			Capacitor, Tantalum Chip 0.22µF 35V	EY22403510
CC06			Capacitor, Tantalum Chip 47 µF 4V	EY47600410
CC07			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CC08			Capacitor, Tantalum Chip 10 µF 16V	EY10600610
CC10			Capacitor, Ceramic Chip 15 pF	DD55150300
CC11			Capacitor, Ceramic Chip 15 pF	DD55150300
CC12			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CC20			Capacitor, Ceramic 0.0047 µF	DK56472300
CC21			Capacitor, Ceramic Chip 0.068 µF	DK58683300
CC22			Capacitor, Ceramic 270 pF	DK56271300
CC23			Capacitor, Ceramic 1500 pF	DK56152300
CC24			Capacitor, Tantalum Chip 10µF 16V	EY10600610
CC25			Capacitor, Ceramic 0.022 µF	DK56223300
CC26			Capacitor, Ceramic 0.015 µF	DK56153300
CC50			Capacitor, Elect 0.22µF 50V	EA22405010

* REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
CC51			Capacitor, Elect 1 µF 50V	EA10505090
CL01			Capacitor, Ceramic Chip 30 pF	DD55300300
CL02			Capacitor, Ceramic Chip 30 pF	DD55300300
CL03			Capacitor, Tantalum 10 µF 6V	EV10600660
CL04			Capacitor, Tantalum 1 µF 16V	EV10501670
CL05			Capacitor, Ceramic Chip 0.001µF	DK56102300
CL07			Capacitor, Tantalum Chip 10µF 16V	EY10600610
CL08			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CL09			Capacitor, Ceramic Chip 0.001µF	DK56102300
CL10			Capacitor, Ceramic Chip 0.01 µF	DK56103300
CM01			Capacitor, Ceramic 1000 pF	DA16102110
CM02			Capacitor, Elect 1 µF 50V	EA10505090
CM03			Capacitor, Film 0.1 µF	DF15104350
CM04			Capacitor, Elect 10 µF 16V	EA10601690
CM05			Capacitor, Film 0.01 µF	DF15103350
CM06			Capacitor, Film 0.01 µF	DF15103350
CM07			Capacitor, Ceramic 220 pF	DK16221300
CM08			Capacitor, Film 0.15 µF	DF15154350
CM09			Capacitor, Elect 10 µF 16V	EA10601690
CM10			Capacitor, Elect 10 µF 16V	EA10601690
CM11			Capacitor, Film 0.01 µF	DF15103350
CP01			Capacitor, Ceramic 3 pF	DD10030300
CP02			Capacitor, Ceramic 1000 pF	DA16102110
CP03			Capacitor, Ceramic 1000 pF	DA16102110
CP04			Capacitor, Ceramic 47 pF	DD15470360
CP05			Capacitor, Ceramic 7 pF	DD11070360
CP06			Capacitor, Trimming 7 pF	CT10600090
CP07			Capacitor, Tantalum 3.3 µF 10V	EV33501070
CP08			Capacitor, Tantalum 3.3 µF 10V	EV33501070
CP09			Capacitor, Semiconductor 0.047 µF	DS17473010
CP10			Capacitor, Semiconductor 0.022 µF	DS17223010
CP11			Capacitor, Elect 0.1 µF 16V	EV10401670
CP12			Capacitor, Elect 10 µF 16V	EA10601690
CP13			Capacitor, Ceramic 0.022 µF	DA17223110
CP14			Capacitor, Elect 10 µF 16V	EA10601690
CP20			Capacitor, Elect 47 µF 10V	EA47601010
CP21			Capacitor, Elect 100 µF 10V	EA10701090
CP22			Capacitor, Ceramic 1000 pF	DA16102110
CP23			Capacitor, Ceramic 1000 pF	DA16102110
CP24			Capacitor, Ceramic 470 pF	DK16471300
CP25			Capacitor, Ceramic 0.022 µF	DA17223110
CP26			Capacitor, Elect 10 µF 16V	EA10601690
CP27			Capacitor, Ceramic 1000 pF	DA16102110
CP28			Capacitor, Ceramic 0.022 µF	DA17223110
CP50			Capacitor, Ceramic 1000 pF	DA16102110
CP51			Capacitor, Elect 10 µF 16V	EA10601690
CP52			Capacitor, Ceramic 1000 pF	DA16102110
CP53			Capacitor, Ceramic 1000 pF	DA16102110
CP70			Capacitor, Ceramic 1000 pF	DA16102110
CR01			Capacitor, Ceramic 27 pF	DD15270310
CR02			Capacitor, Ceramic 9 pF	DD11090300
CR03			Capacitor, Ceramic 18 pF	DD15180300
CR04			Capacitor, Ceramic 3 pF	DD10030300
CR05			Capacitor, Ceramic 22 pF	DD15220300
CR06			Capacitor, Ceramic 8 pF	DD11080300
CR07			Capacitor, Ceramic 5 pF	DD10050300
CR08			Capacitor, Ceramic 1000 pF	DA16102110
CR09			Capacitor, Ceramic 3 pF	DD10030300

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
CR10			Capacitor, Ceramic 7 pF	DD11070300
CR11			Capacitor, Ceramic 3 pF	DD10030300
CR12			Capacitor, Ceramic 12 pF	DD15120300
CR13			Capacitor, Ceramic 7 pF	DD11070300
CR14			Capacitor, Ceramic 1000 pF	DA16102110
CR15			Capacitor, Ceramic 1000 pF	DA16102110
CR16	ABF1		Capacitor, Ceramic 1 pF	DD10010300
CR17	ABF1		Capacitor, Ceramic 1 pF	DD10010300
CR18	ABF1		Capacitor, Ceramic 1 pF	DD10010300
CR20			Capacitor, Ceramic 12 pF	DD15120300
CR21			Capacitor, Ceramic 1000 pF	DA16102110
CR22	AAF3		Capacitor, Ceramic 9 pF	DD11090330
CR22	ABF1		Capacitor, Ceramic 10 pF	DD11100330
CR22	ABF3		Capacitor, Ceramic 9 pF	DD11090330
CR23			Capacitor, Ceramic 1000 pF	DA16102110
CR24			Capacitor, Ceramic 1000 pF	DA16102110
CR25	AAF3		Capacitor, Ceramic 0.5 pF	DD10005300
CR25	ABF1		Capacitor, Ceramic 0.8 pF	DD10008370
CR25	ABF3		Capacitor, Ceramic 0.5 pF	DD10005300
CR26	AAF3		Capacitor, Ceramic 9 pF	DD11090330
CR26	ABF1		Capacitor, Ceramic 10 pF	DD11100330
CR26	ABF3		Capacitor, Ceramic 9 pF	DD11090330
CR30			Capacitor, Ceramic 470 pF	DK16471300
CR31			Capacitor, Ceramic 3 pF	DD10030300
CR32			Capacitor, Ceramic 0.047 µF	DA17473110
CR33			Capacitor, Ceramic 0.047 µF	DA17473110
CR34			Capacitor, Ceramic 1000 pF	DA16102110
CR35			Capacitor, Ceramic 15 pF	DD15150300
CR36			Capacitor, Ceramic 51 pF	DD15510300
CR37			Capacitor, Ceramic 51 pF	DD15510300
CR38			Capacitor, Ceramic 51 pF	DD15510300
CR39			Capacitor, Ceramic 0.022µF	DA17223110
CR40			Capacitor, Tantalum 10 µF 10V	EV10601060
CR60			Capacitor, Elect 1 µF 50V	EA10505090
CR61			Capacitor, Semiconductor 0.047 µF	DS17473010
CR62			Capacitor, Ceramic 0.0022 µF	DK16222300
CR63			Capacitor, Ceramic 220 pF	DK16221300
CR65			Capacitor, Elect 1 µF 50V	EA10505090
CR66			Capacitor, Elect 1 µF 50V	EA10505090
CR67			Capacitor, Ceramic 0.022 µF	DA17223110
CR68			Capacitor, Ceramic 0.022 µF	DA17223110
CR69			Capacitor, Ceramic 39 pF	DD15390300
CR70			Capacitor, Elect 0.1 µF 16V	EV10401670
CR71			Capacitor, Ceramic 0.047 µF	DA17473110
CR72			Capacitor, Ceramic 100 pF	DD15101300
CR73			Capacitor, Ceramic 0.022µF	DA17223110
CR74			Capacitor, Ceramic 1000 pF	DA16102110
CR75			Capacitor, Ceramic 1000 pF	DA16102110
CR76			Capacitor, Ceramic 0.001 µF	DK16102300
CR80			Capacitor, Elect 1 µF 50V	EA10505090
CT01			Capacitor, Ceramic 1000 pF	DA16102110
CT02			Capacitor, Ceramic 1000 pF	DA16102110
CT03	AAF3		Capacitor, Ceramic 7 pF	DD11070300
CT03	ABF1		Capacitor, Ceramic 7 pF	DD11070300
CT03	ABF3		Capacitor, Ceramic 5 pF	DD10050300
CT04			Capacitor, Ceramic 1000 pF	DA16102110
CT05			Capacitor, Ceramic 1000 pF	DA16102110
CT06	AAF3		Capacitor, Ceramic 27 pF	DD15270310

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
CT06	ABF1		Capacitor, Ceramic 43 pF	DD15430300
CT06	ABF3		Capacitor, Ceramic 33 pF	DD15330300
CT08			Capacitor, Ceramic 1000 pF	DA16102110
CT09			Capacitor, Elect 10 µF 16V	EA10601690
CT10			Capacitor, Ceramic 1000 pF	DA16102110
CT11			Capacitor, Ceramic 1000 pF	DA16102110
CT12			Capacitor, Ceramic 1000 pF	DA16102110
CT13			Capacitor, Elect 10 µF 16V	EA10601690
CT50			Capacitor, Elect 4.7 µF 35V	EQ47503530
CT51			Capacitor, Ceramic 1000 pF	DA16102110
CT52			Capacitor, Ceramic 1000 pF	DA16102110
CT53			Capacitor, Ceramic 1000 pF	DA16102110
CT54			Capacitor, Ceramic 1000 pF	DA16102110
CT55			Capacitor, Elect 10 µF 16V	EA10601690
CT70			Capacitor, Elect 470 µF 25V	EA47702510
C101			Capacitor, Elect 22 µF 16V	EA22601690
C102			Capacitor, Ceramic 1000 pF	DA16102110
C105			Capacitor, Elect 10 µF 16V	EA10601690
C106			Capacitor, Film 0.15 µF	DF15154350
C107			Capacitor, Elect 100 µF 16V	EA10701610
C108			Capacitor, Elect 470 µF 10V	EA47701010
C109			Capacitor, Elect 470 µF 25V	EA47702590
C110			Capacitor, Film 0.15µF	DF15154350
C201			Capacitor, Ceramic 1000 pF	DA16102110
C202			Capacitor, Elect 100 µF 10V	EA10701090
C203			Capacitor, Elect 22 µF 25V	EA22602590
C204			Capacitor, Ceramic 1000 pF	DA16102110
INDUCTORS				
LB01			Coil, Choke 0.050 µH	LC15000110
LB02			Coil, Choke 0.20 µH	LC12010010
LB03			Link	4704121070
LB05			Coil, Choke 0.060 µH	LC16000010
LB06			Coil, Choke 0.20 µH	LC12010010
LB07			Coil, Choke 0.025 µH	LC12500040
LB08			Coil, Choke 1T	LC12000030
LB09			Coil, Choke 0.050 µH	LC15000110
LB10			Coil, Choke 2.7 µH	LC12720020
LB11			Coil, Air 4T	ML04007010
LB12			Coil, Air 4T	ML04007010
LB13			Coil, Air 4T	ML04007010
LB14			Coil, Choke 0.20 µH	LC12010010
LB15			Coil, Choke 0.060 µH	LC16000010
LP20			Coil, Choke 390 µH	LC13940010
LP50			Coil, Air-Core 8T	LL635008A0
LR01			Coil, Antenna MC119 TYPE 1	LA70340020
LR02			Coil, Antenna MC119 TYPE 1	LA70340020
LR03			Coil, Choke 2.7 µH	LC12720120
LR04			Coil, Antenna MC119 TYPE 2	LA70340030
LR05			Coil, Antenna MC119 TYPE 2	LA70340030
LR06			Coil, Antenna MC119 TYPE 1	LA70340020
LR20			Coil, Antenna	LA70196120
LR21			Coil, Antenna	LA70196120
LR30			I.F.T.	LI70280030
LR31			I.F.T.	LI70280030
LR60			I.F.T. 455KHZ 1F COIL	LI71016220
LT01			Coil, Air Core 7T	LL635007A0
LT02			Coil, Choke 1T	LC12000040
LT03			Coil, Choke 0.20 µH	LC12010010

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
CR10			Capacitor, Ceramic 7 pF	DD11070300
CR11			Capacitor, Ceramic 3 pF	DD10030300
CR12			Capacitor, Ceramic 12 pF	DD15120300
CR13			Capacitor, Ceramic 7 pF	DD11070300
CR14			Capacitor, Ceramic 1000 pF	DA16102110
CR15			Capacitor, Ceramic 1000 pF	DA16102110
CR16	ABF1		Capacitor, Ceramic 1 pF	DD10010300
CR17	ABF1		Capacitor, Ceramic 1 pF	DD10010300
CR18	ABF1		Capacitor, Ceramic 1 pF	DD10010300
CR20			Capacitor, Ceramic 12 pF	DD15120300
CR21			Capacitor, Ceramic 1000 pF	DA16102110
CR22	AAF3		Capacitor, Ceramic 9 pF	DD11090330
CR22	ABF1		Capacitor, Ceramic 10 pF	DD11100330
CR22	ABF3		Capacitor, Ceramic 9 pF	DD11090330
CR23			Capacitor, Ceramic 1000 pF	DA16102110
CR24			Capacitor, Ceramic 1000 pF	DA16102110
CR25	AAF3		Capacitor, Ceramic 0.5 pF	DD10005300
CR25	ABF1		Capacitor, Ceramic 0.8 pF	DD10008370
CR25	ABF3		Capacitor, Ceramic 0.5 pF	DD10005300
CR26	AAF3		Capacitor, Ceramic 9 pF	DD11090330
CR26	ABF1		Capacitor, Ceramic 10 pF	DD11100330
CR26	ABF3		Capacitor, Ceramic 9 pF	DD11090330
CR30			Capacitor, Ceramic 470 pF	DK16471300
CR31			Capacitor, Ceramic 3 pF	DD10030300
CR32			Capacitor, Ceramic 0.047 µF	DA17473110
CR33			Capacitor, Ceramic 0.047 µF	DA17473110
CR34			Capacitor, Ceramic 1000 pF	DA16102110
CR35			Capacitor, Ceramic 15 pF	DD15150300
CR36			Capacitor, Ceramic 51 pF	DD15510300
CR37			Capacitor, Ceramic 51 pF	DD15510300
CR38			Capacitor, Ceramic 51 pF	DD15510300
CR39			Capacitor, Ceramic 0.022µF	DA17223110
CR40			Capacitor, Tantalum 10 µF 10V	EV10601060
CR60			Capacitor, Elect 1 µF 50V	EA10505090
CR61			Capacitor, Semiconductor 0.047 µF	DS17473010
CR62			Capacitor, Ceramic 0.0022 µF	DK16222300
CR63			Capacitor, Ceramic 220 pF	DK16221300
CR65			Capacitor, Elect 1 µF 50V	EA10505090
CR66			Capacitor, Elect 1 µF 50V	EA10505090
CR67			Capacitor, Ceramic 0.022 µF	DA17223110
CR68			Capacitor, Ceramic 0.022 µF	DA17223110
CR69			Capacitor, Ceramic 39 pF	DD15390300
CR70			Capacitor, Elect 0.1 µF 16V	EV10401670
CR71			Capacitor, Ceramic 0.047 µF	DA17473110
CR72			Capacitor, Ceramic 100 pF	DD15101300
CR73			Capacitor, Ceramic 0.022µF	DA17223110
CR74			Capacitor, Ceramic 1000 pF	DA16102110
CR75			Capacitor, Ceramic 1000 pF	DA16102110
CR76			Capacitor, Ceramic 0.001 µF	DK16102300
CR80			Capacitor, Elect 1 µF 50V	EA10505090
CT01			Capacitor, Ceramic 1000 pF	DA16102110
CT02			Capacitor, Ceramic 1000 pF	DA16102110
CT03	AAF3		Capacitor, Ceramic 7 pF	DD11070300
CT03	ABF1		Capacitor, Ceramic 7 pF	DD11070300
CT03	ABF3		Capacitor, Ceramic 5 pF	DD10050300
CT04			Capacitor, Ceramic 1000 pF	DA16102110
CT05			Capacitor, Ceramic 1000 pF	DA16102110
CT06	AAF3		Capacitor, Ceramic 27 pF	DD15270310

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
LT04			Coil, Air Core 3T	LL635003A0
LT05			Coil, Air Core	LL635006A0
LT06			Coil, Choke 0.20 µH	LC12010010
LT70	AA		Coil, Choke 1.0 MH	LC21060030
SEMICONDUCTORS				
QB01			Transistor 2SC1971	HT31971100
QB02			Transistor 2SC1946A	HT31946100
QB03			Diode MI308	HD20006200
QB04			Diode MI308	HD20006200
QB05			Transistor, 2SA1725	HT117251B0
QB10			Diode, DSF10C	HD20022030
QB11			Diode, DSF10C	HD20022030
QC01			Simiconductor, Comp RN2402	BA10006050
QC02			I.C., UPD4094BG	HC409406Z0
QC03			I.C., MN6520	HC10061020
QC04			I.C., NJM062M	HC10054090
QC05			Diode, Chip 1SS294	HZ20013050
QC50			Diode MA165 OR 1SS133	HD20005020
QC51			Diode MA165 OR 1SS133	HD20005020
QC52			Transistor 2SC2785	HT327851H0
QL01			I.C., Microprocessor HD614043F	HU10020010
QL02			I.C., RST523D	HC10010550
QL03			Transistor, Chip 2SC2712 (BL)	HX327121B0
QL04			I.C. EEPROM CXK1013P	HC10019250
QL05			Diode, Chip 1SS294	HZ20013050
QL07			Transistor, Chip 2SA1162 (GR)	HX111621A0
QL08			Diode, Chip 02CZ5.6Y	HZ30006050
QL09			Diode, Chip 02CZ5.6Y	HZ30006050
QL10			Diode, Chip 02CZ5.6Y	HZ30006050
QL12			Transistor, Chip 2SC2712 (BL)	HX327121B0
QL50			Semiconductor, Comp FMG8	BA90002210
QL51			Semiconductor, Comp FMG8	BA90002210
QL53			LED 7 Segment GL-9E03D	HI11205320
QL54			Semiconductor, Comp FMG8	BA90002210
QL55			Semiconductor, Comp FMG8	BA90002210
QL56			LED Green PG3433SY	HI10069300
QL57			LED Red PR3433S	HI10070300
QL58			LED Yellow PY3433S	HI10071300
QM01			Diode MA165 OR 1SS133	HD20005020
QM02			Diode MA165 OR 1SS133	HD20005020
QM03			Transistor 2SC2785	HT327851H0
QP01			Transistor 2SC2347	HT32347100
QP02			I.C., M54959P	HC10051200
QP03			Diode MA165 OR 1SS133	HD20005020
QP04			Diode MA165 OR 1SS133	HD20005020
QP05			I.C., NJM062D	HC10044090
QP20			Diode MA165 OR 1SS133	HD20005020
QP50			Transistor 2SC3354	HT333541S0
QP70			Transistor 2SB562 C	HT205621C0
QP71			Varistor	HP00020230
QP72			Transistor 2SC2062	HT320621C0
QP73			Thermistor ERT-D2FGL102S	HH00023020
QR01			Diode MA165 OR 1SS133	HD20005020
QR02			Diode MA165 OR 1SS133	HD20005020
QR03			Diode MA165 OR 1SS133	HD20005020
QR04			F.E.T. 2SK507	HHF205071B0
QR05			F.E.T. 2SK507	HHF205071B0
QR20			Transistor 2SC3354	HT333541S0
QR30			Transistor 2SC461	HT304611B0

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
QR31			Varistor, MA27T-B	HV00014020
QR32			Transistor 2SC2785	HT327851H0
QR60			I.C., TK10420	HC10007420
QR61			Diode 1SS198	HD20022010
QR62			Diode 1SS198	HD20022010
QR63			Transistor 2SC2785	HT327851H0
QR64			Diode 1SS198	HD20022010
QT01			Transistor 2SC3354	HT333541S0
QT02			Transistor 2SC2538	HT32538100
QT50			Transistor 2SA1175	HT111751R0
QT51			Varistor PTH487A01BE222T	HP00004230
QT52			Transistor 2SA1175	HT111751R0
QT53			Transistor 2SD468	HT404681B0
QT54			Diode, ZENER 9.1V	HD30911000
Q101			I.C., TA7252P	HC10120050
Q102			I.C., MB3756	HC10003180
Q103			Diode MA165 OR 1SS133	HD20005020
Q104			Diode MA165 OR 1SS133	HD20005020
Q105			Diode MA165 OR 1SS133	HD20005020
Q106			Diode MA165 OR 1SS133	HD20005020
Q201			I.C., NJM7805	HC38905090
Q301			Transistor 2SA1175	HT111751R0
Q302			Diode MA165 OR 1SS133	HD20005020
Q303			Semiconductor, Comp DTC144TS	BA20016210
RESISTORS				
RB01			Resistor, Carbon Film 10 Ohm 1/4W	GD05100140
RB02			Resistor, MTL Oxide Film 120 Ohm 1W	GJ05121010
RB03		U310001	Resistor, Carbon Film 4.7K 1/4W	GD05472140
RC01			Resistor, Chip 2.2K Ohm 1/10W	NI05222110
RC02			Resistor, Chip 220K Ohm 1/10W	NI05224110
RC03			Resistor, Chip 12K Ohm 1/10W	NI05123110
RC05			Resistor, Chip 10K Ohm 1/10W	NI05103110
RC06			Resistor, Chip 47K Ohm 1/10W	NI05473110
RC07			Resistor, Chip 10K Ohm 1/10W	NI05103110
RC08			Resistor, Chip 10K Ohm 1/10W	NI05103110
RC09			Resistor, Chip 47K Ohm 1/10W	NI05473110
RC10			Resistor, Chip 56K 1/8W	RI05563180
RC20			Resistor, Chip 15K Ohm 1/10W	NI05153110
RC21			Resistor, Chip 10K Ohm 1/10W	NI05103110
RC22			Resistor, Chip 47K Ohm 1/10W	NI05473110
RC23			Resistor, Chip 12K Ohm 1/10W	NI05123110
RC24			Resistor, Chip 68K Ohm 1/10W	NI05683110
RC25			Resistor, Chip 68K Ohm 1/10W	NI05683110
RC26			Resistor, Chip 33K Ohm 1/10W	NI05333110
RC27			Resistor, Chip 100K Ohm 1/10W	NI05104110
RC30			Resistor, Chip 0 Ohm 1/10W	NI05000110
RC31			Resistor, Chip 0 Ohm 1/10W	NI05000110
RC50			Resistor, Carbon Film 120K 1/6W	GD05124160
RC51			Resistor, Carbon Film 10K Ohm 1/6W	GD05103160
RC53			Resistor, Trimming 10K Ohm	RA01030750
RC54			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RG01			Resistor, Variable 20K Ohm (D)	RB12030200
RG02			Resistor, Variable 20K Ohm (B)	RB02030300
RL02			Resistor, Chip 100K Ohm 1/10W	NI05104110
RL08			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL10			Resistor, Chip 0 Ohm 1/10W	NI05000110
RL16			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL17			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL18			Resistor, Chip 10K Ohm 1/10W	NI05103110

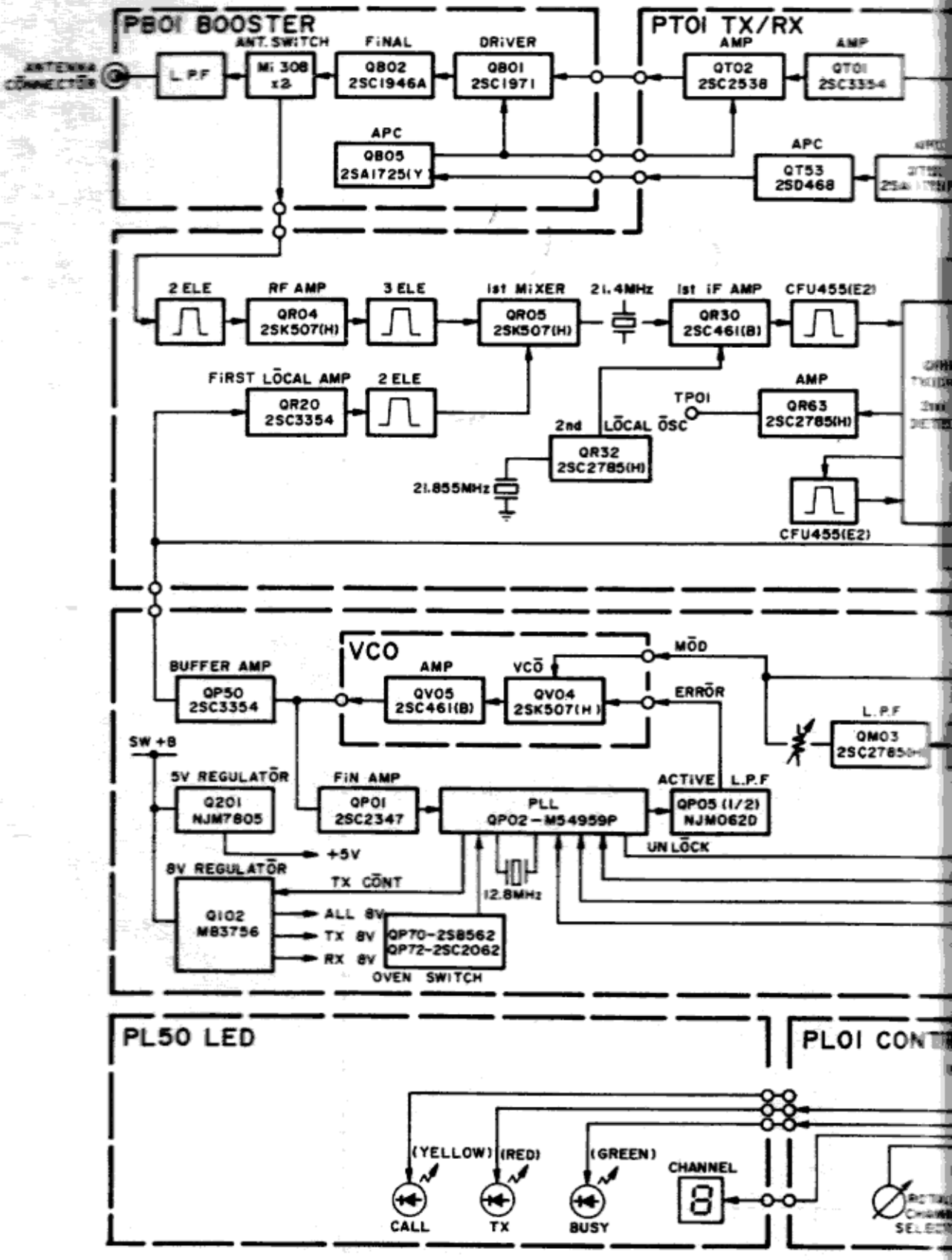
REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
RL23			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL26			Resistor, Chip 100K Ohm 1/10W	NI05104110
RL33			Resistor, Chip 1.2K Ohm 1/10W	NI05122110
RL34			Resistor, Chip 47K Ohm 1/10W	NI05473110
RL35			Resistor, Chip 47K Ohm 1/10W	NI05473110
RL36			Resistor, Chip 1M Ohm 1/10W	NI05105110
RL37			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL38			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL39			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL40			Resistor, Chip 4.7K Ohm 1/10W	NI05472110
RL42			Resistor, Chip 4.7K Ohm 1/10W	NI05472110
RL44			Resistor, Chip 6.8K Ohm 1/10W	NI05682110
RL45			Resistor, Chip 1K Ohm 1/10W	NI05102110
RL46	AB	U220001	Resistor, Chip 0 Ohm 1/10W	NI05000110
RL47			Resistor, Chip 10K Ohm 1/10W	NI05103110
RL49	AA		Resistor, Chip 0 Ohm 1/10W	NI05000110
RL72			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL73			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL74			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL75			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL76			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL77			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL78			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL79			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL80			Resistor, Chip 220 Ohm 1/10W	NI05221110
RL81	AB		Resistor, Chip 220 Ohm 1/10W	NI05221110
RM01			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RM02			Resistor, 470K Ohm J 1/16W	GD05474160
RM03			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RM04			Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
RM05			Resistor, Carbon Film 47K Ohm 1/6W	GD05473160
RM06			Resistor, Carbon Film 8.2K Ohm 1/6W	GD05822160
RM07			Resistor, Carbon Film 39K Ohm 1/6W	GD05393160
RM08			Resistor, Carbon Film 33K Ohm 1/16W	GD05333160
RM09			Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
RM10			Resistor, Carbon Film 33K Ohm 1/16W	GD05333160
RM11			Resistor, Carbon Film 33K Ohm 1/16W	GD05333160
RM12			Resistor, Carbon Film 2.2K Ohm 1/6W	GD05222160
RM13			Resistor, Trimming 4.7K	RA04720750
RM14			Resistor, Carbon Film 33K Ohm 1/16W	GD05333160
RP01			Resistor, Carbon Film 10K Ohm 1/6W	GD05103160
RP02			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RP03			Resistor, Carbon Film 220 Ohm 1/6W	GD05221160
RP04			Resistor, Carbon Film 5.6K Ohm 1/6W	GD05562160
RP05			Resistor, Carbon Film 2.7K 1/16W	GD05272160
RP05		U220001	Resistor, Carbon Film 2.7K 1/16W	GD05272160
RP06			Resistor, Carbon Film 150 Ohm 1/6W	GD05151160
RP06			Resistor, Carbon Film 8.2K Ohm 1/6W	GD05822160
RP06		U220001	Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
RP07			Resistor, Carbon Film 560 Ohm 1/6W	GD05561160
RP08			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RP09			Resistor, Carbon Film 2.7K 1/16W	GD05272160
RP10			Resistor, Carbon Film 2.2K Ohm 1/6W	GD05222160
RP20			Resistor, Carbon Film 0 Ohm 1/6W	GD05000160
RP21			Resistor, Carbon Film 0 Ohm 1/6W	GD05000160
RP22			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
RP23			Resistor, Carbon Film 0 Ohm 1/6W	GD05000160
RP24			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
RP25			Resistor, Carbon Film 0 Ohm 1/6W	GD05000160

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
RP50			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RP51			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RP52			Resistor, Carbon Film 33 Ohm 1/6W	GD05330160
RP53			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
RP70			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RP71			Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
RP72			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RP74			Resistor, Carbon Film 150 Ohm 1/6W	GD05151160
RP81			Resistor, Carbon Film 0 Ohm 1/6W	GD05000160
RR01			Resistor, Carbon Film 100 Ohm 1/6W	GD05101160
RR02			Resistor, Carbon Film 100 Ohm 1/6W	GD05101160
RR03			Resistor, Carbon Film 5.6K Ohm 1/6W	GD05562160
RR04			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RR05			Resistor, Carbon Film 100 Ohm 1/6W	GD05101160
RR20			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
RR21			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RR22			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RR23			Resistor, Carbon Film 22 Ohm 1/6W	GD05220160
RR24			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
RR30			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RR31			Resistor, Carbon Film 3.3K Ohm 1/6W	GD05332160
RR32			Resistor, Carbon Film 330 Ohm 1/6W	GD05331160
RR33			Resistor, Carbon Film 120K 1/6W	GD05124160
RR34			Resistor, Carbon Film 47K Ohm 1/6W	GD05473160
RR35			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RR36			Resistor, Carbon Film 100 Ohm 1/6W	GD05101160
RR37			Resistor, Carbon Film 4.7K 1/6W	GD05472160
RR38			Resistor, Carbon Film 3.9K Ohm 1/6W	GD05392160
RR39			Resistor, Carbon Film 8.2K Ohm 1/6W	GD05822160
RR40			Resistor, Carbon Film 2.2K Ohm 1/6W	GD05222160
RR41			Resistor, Carbon Film 100 Ohm 1/6W	GD05101160
RR60			Resistor, Carbon Film 10K Ohm 1/6W	GD05103160
RR61			Resistor, Carbon Film 390K 1/6W	GD05394160
RR62			Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
RR63			Resistor, Carbon Film 3.3K Ohm 1/6W	GD05332160
RR64			Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
RR65			Resistor, Carbon Film 220K 1/6W	GD05224160
RR66			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RR67			Resistor, Carbon Film 5.6K Ohm 1/6W	GD05562160
RR68			Resistor, Carbon Film 0 Ohm 1/4W	GD05000140
RR69			Resistor, Carbon Film 22K Ohm 1/6W	GD05223160
RR70			Resistor, Carbon Film 2.2K Ohm 1/6W	GD05222160
RR72			Resistor, Carbon Film 47K Ohm 1/6W	GD05473160
RR73			Resistor, Carbon Film 1.5K Ohm 1/6W	GD05152160
RR74			Resistor, Carbon Film 33K Ohm 1/16W	GD05333160
RR80			Resistor, Carbon Film 2.2K Ohm 1/6W	GD05222160
RT01			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
RT02			Resistor, Carbon Film 1K Ohm 1/6W	GD05102160
RT03			Resistor, Carbon Film 5.6K Ohm 1/6W	GD05562160
RT04			Resistor, Carbon Film 22 Ohm 1/6W	GD05220160
RT05			Resistor, Carbon Film 33 Ohm 1/6W	GD05330160
RT06			Resistor, Carbon Film 2.2K Ohm 1/6W	GD05222160
RT07			Resistor, Carbon Film 120 Ohm 1/6W	GD05121160
RT50			Resistor, Carbon Film 3.3K Ohm 1/6W	GD05332160
RT51			Resistor, Trimming 22K Ohm	RA02230750
RT52			Resistor, Carbon Film 5.6K Ohm 1/6W	GD05562160
RT53			Resistor, Carbon Film 3.3K Ohm 1/6W	GD05332160
RT54			Resistor, Metal Oxide 47 Ohm 2W	GA05470020
RT55			Resistor, Carbon Film 220 Ohm 1/6W	GD05221160

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
RT56			Resistor, Carbon Film 330 Ohm 1/6W	GD05331160
R101			Resistor, Metal Oxide Film 6.8 Ohm 2W	GA05068020
R102			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
R103			Resistor, Carbon Film 1.5K Ohm 1/6W	GD05152160
R104			Resistor, Carbon Film 220 Ohm 1/6W	GD05221160
R105			Resistor, Carbon Film 10K Ohm 1/6W	GD05103160
R301			Resistor, Carbon Film 1.5K Ohm 1/6W	GD05152160
R302			Resistor, Carbon Film 56 Ohm 1/6W	GD05560160
R303			Resistor, Carbon Film 6.8K Ohm 1/6W	GD05682160
MISCELLANEOUS ELECTRICAL				
EG30			Speaker, Mylar 4.6 CM	QK00468020
FB01			Core, Ferrite	FC90050010
FB02			Core, Ferrite	FC90050010
FR30			Crystal Filter 21.4 MHZ	XU421400N5
FR60			Filter, Ceramic 455 KHZ	FG455304E0
FR61			Filter, Ceramic 455 KHZ	FG455304E0
FR62			Discriminator, Ceramic CDB455C7	FH455301B0
FT50			Core, Ferrite	FC90050010
FT51			Core, Ferrite	FC90050010
F001	AA		Fuse, 6 AMP	FS10600600
F001	AB		Fuse, 6 AMP	FS10600530
JB01			Jack, Antenna	YJ10002980
JC50			Jack, 7 Pin	YJ06004120
JC51			Jack, 5 Pin	YJ06004130
JC52			Jack, 2 Pin	YJ06004140
JL01			Jack, 13 Pin	YJ06004110
JL02			Jack, 8 Pin Modular	YJ90000770
JP50			Jack	YJ07000360
JR01			Jack	YJ07000360
JT01			Jack	YJ07000360
J101			Jack, RCA Type PCB Mount	YT02010460
J301			Jack, 9 Pin	YJ06003090
J302			Jack, 12 Pin	YJ06003120
J303			Jack, 6 Pin	YJ06003060
J304			Jack, 2 Pin	YJ06003020
PB01			Assembly, Booster PWB	ZZ431C0210
PC01			Assembly, PWB	ZZ431C0020
PG01			Assembly, Volume PCB	ZZ431C2330
PL01			Assembly, Front PWB	ZZ431C2310
PL50			Assembly, LED PWB	ZZ431C2320
PP01			Assembly, PLL PWB	ZZ431C1210
PT01			Assembly, T/R PWB	ZZ431C1220
SL01			Switch, Push	SP02011260
SL04			Switch, Rotary 16 Position	SR01040070
WB01			Cord, Connective Mini PIN RF Cbl	YB00102370
WB02		U040001	Cord, Connective Mini PIN RF Cbl	YB00102370
WB03			Cord, Connective, 5 Pin	YB00060792
WG01			Cord, Connective, 6 Pin	YB00102380
WG30			Cord, Connective, 2 Pin	YB00102390
WL01		U050001	Cord, Connective, 12 Pin	YB00130630
WR20			Coaxial Cable, 20 MM	YB00100590
WR60			Cord, Connective, 9 Pin	YB00080690
XC01			Crystal, 4.19304 MHZ	XL112002L2
XL01			Vibrator, Ceramic	FQ02004010
XP01			Crystal, 12.8 MHZ	JX12004110
XR30			Crystal, 21.855 MHZ	XB101001G0
Y001			Cord, Connective	YB00400400
ZZ01			Assembly, VC0 F3	ZZ431C3010
ZZ02		U070001	Connective Cord, 2.5-3P	YB01002730

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
ZZ03		U060001	Cloning Cable	YB01002750
ZZ04		U070001	Crystal, 20.945 MHZ	XB101002G0
ZZ05		U070001	Capacitor, Ceramic 39 pF	DD15390300
MISCELLANEOUS MECHANICAL				
001B			Assembly, Front Case	431C064500
008B			Logo, Standard	012S251010
020B			Cover, Button	431C053010
024B			Screen, Speaker	420C107010
024S	AA		Bracket, Mounting (black)	420C160100
026S	AA		Washer, Mounting Bracket	420C056040
027B			Knob, Channel	431C154500
028S	AA		Knob, Mounting (black)	414C154040
032S			Bolt, Hex Head P	52030520B9
036B			Knob, Volume/squelch	431C154020
036S			Washer, Flat	54020501E0
040S			Washer, Spring	54040502N0
044S			Nut, Hex	53110503E9
048B			Nut, Circular	53218069E0
049S			Label, Channel	148C861010
052B			Button, Monitor	431C270010
064B			Packing, Button	431C277020
068B			Chassis, Front	431C105010
069B			Screw, B.H Tap	51282604B0
069B			Screw, B.H. Tap	51282605B0
070B			Washer	431C012010
072B			Screw, B.H. Tap	51282606B0
073B		U310001	Insulator	355C120010
076B			Spacer, Led	431C118010
078B			Spacer, Led	419C118010
080B			Buffer	101C056060
084B			Screw, B.H. Tap	51282606B0
085B			Buffer	348H056010
088B			Bracket, Main PWB Support	431C160010
096B			Chassis, Side	431C105020
097B	AB		Label	101C861040
098B			Screw, B.H.M.	51102605A0
100B			Screw, B.H. Tap	51282605B0
105B			Clamp	431C005010
110B			Insulator	431C120030
137B		U060001	Adhesive	412C122022
148B			Shield Coil Case	420C109020
156B			Screw, P.H.M.	51060310E9
157B			Collar	101C055020
158B			Screw, B.H.M.	51100315E9
164B			Screw, P.H.M.	51060312E9
165B			Screw, F.H. TAP	51502608B0
168B			Seal, External Speaker	420C277050
172B			Bushing, DC Cord	1455259130
176B			Screw, F.H. Tap	51502608B0
182B			Heatsink	431C267020
184B			Insulator	431C120040
190B			Seal, Rear	420C277040
198B			Heatsink	431C267010
202B			Screw, P.H. TAP	51302610B0
203B			Screw, B.H. Tap.	51282606B0
204B		U020001	Screw, P.H. TAP	51302610B0
205B			Washer, T.L. OR	54052600R0
210B			Indicator	431C265012
210B	AA		Indicator	431C265012

REFERENCE DESIGNATOR	EFF. MODEL	SERIAL NUMBER	DESCRIPTION	PART NUMBER
210B	AB		Indicator	431C265200
214B			Rivet	5508245710
218B			Gasket, Rear Case (black)	431C277010
222B	AA		Case, Sleeve (black)	420C064100
224B		U200001	Cover	432C053010
226B			Bushing, (black)	4618259150
228B		U330001	Washer, (black)	457C118030
232B			Screw, Washer Flat	51480310E9
233B		U070001	Label	159C861020


PB01 BOOSTER
ANT. SWITCH
FINAL
DRIVER
AMP
AMP
ANTENNA CONNECTOR
L.P.F
Mi 308 x2
QB02 2SC1946A
QB01 2SC1971
PT01 TX/RX
QT02 2SC2538
QT01 2SC3354
APC
QB05 2SA1725(Y)
APC
QT53 2SD468
2 ELE
RF AMP
3 ELE
1st MIXER
21.4MHz
1st IF AMP
CFU455(E2)
QR04 2SK507(H)
QR05 2SK507(H)
QR30 2SC461(B)
FIRST LOCAL AMP
2 ELE
AMP
TP01
QR20 2SC3354
QR63 2SC2785(H)
2nd LOCAL OSC
QR32 2SC2785(H)
21.855MHz
CFU455(E2)
VCO
MOD
BUFFER AMP
AMP
VCO
QP50 2SC3354
QV05 2SC461(B)
QV04 2SK507(H)
ERROR
L.P.F
QM03 2SC2785
SW +8
5V REGULATOR
FIN AMP
ACTIVE L.P.F
Q201 NJM7805
QP01 2SC2347
PLL QP02-M54959P
QP05 (1/2) NJM062D
UNLOCK
+5V
8V REGULATOR
TX CONT
12.8MHz
Q102 M83756
ALL 8V
TX 8V
RX 8V
QP70-2SB562 QP72-2SC2062
OVEN SWITCH
PL50 LED
PL01 CON
(YELLOW)
(RED)
(GREEN)
CHANNEL
8
CALL
TX
BUSY

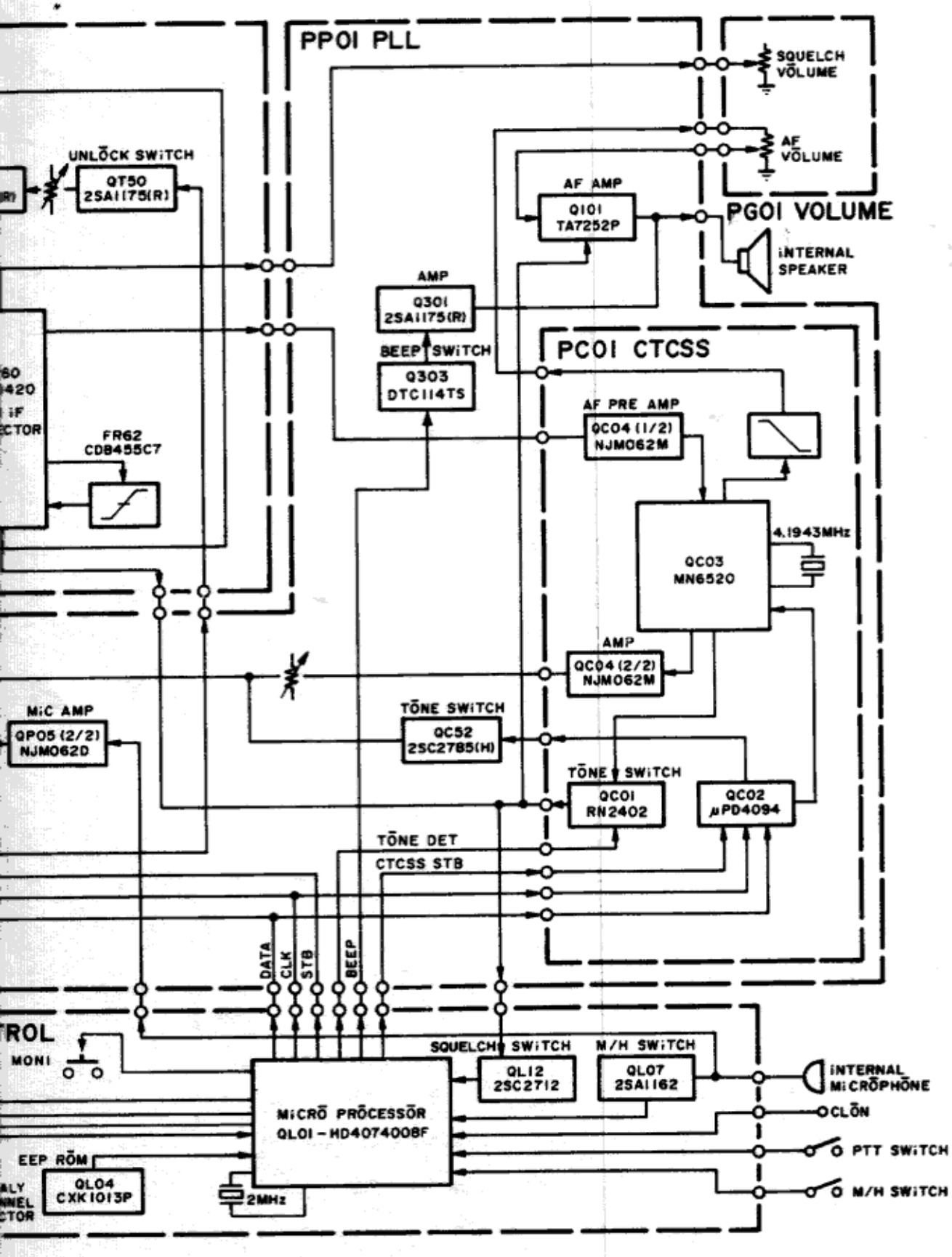
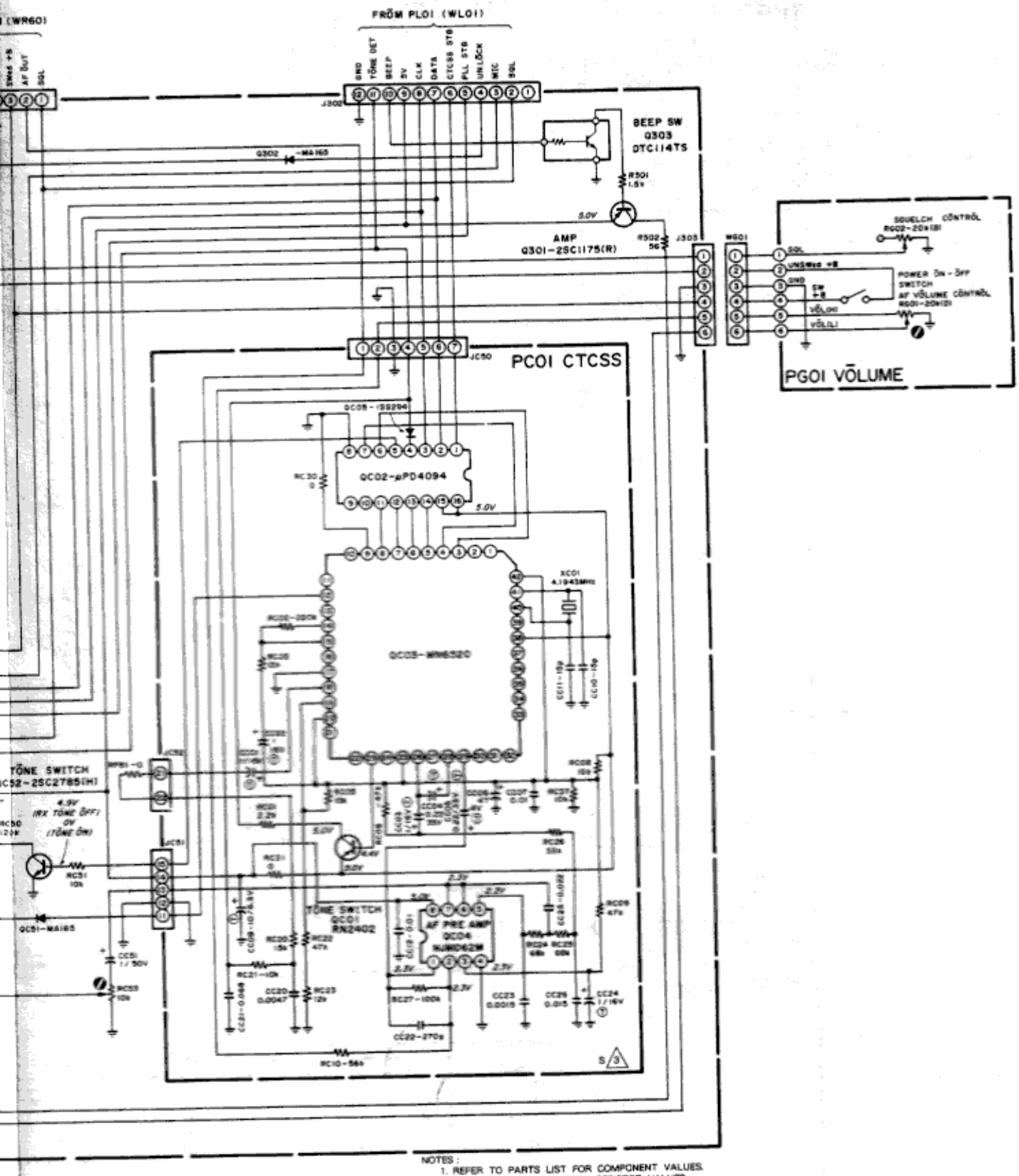
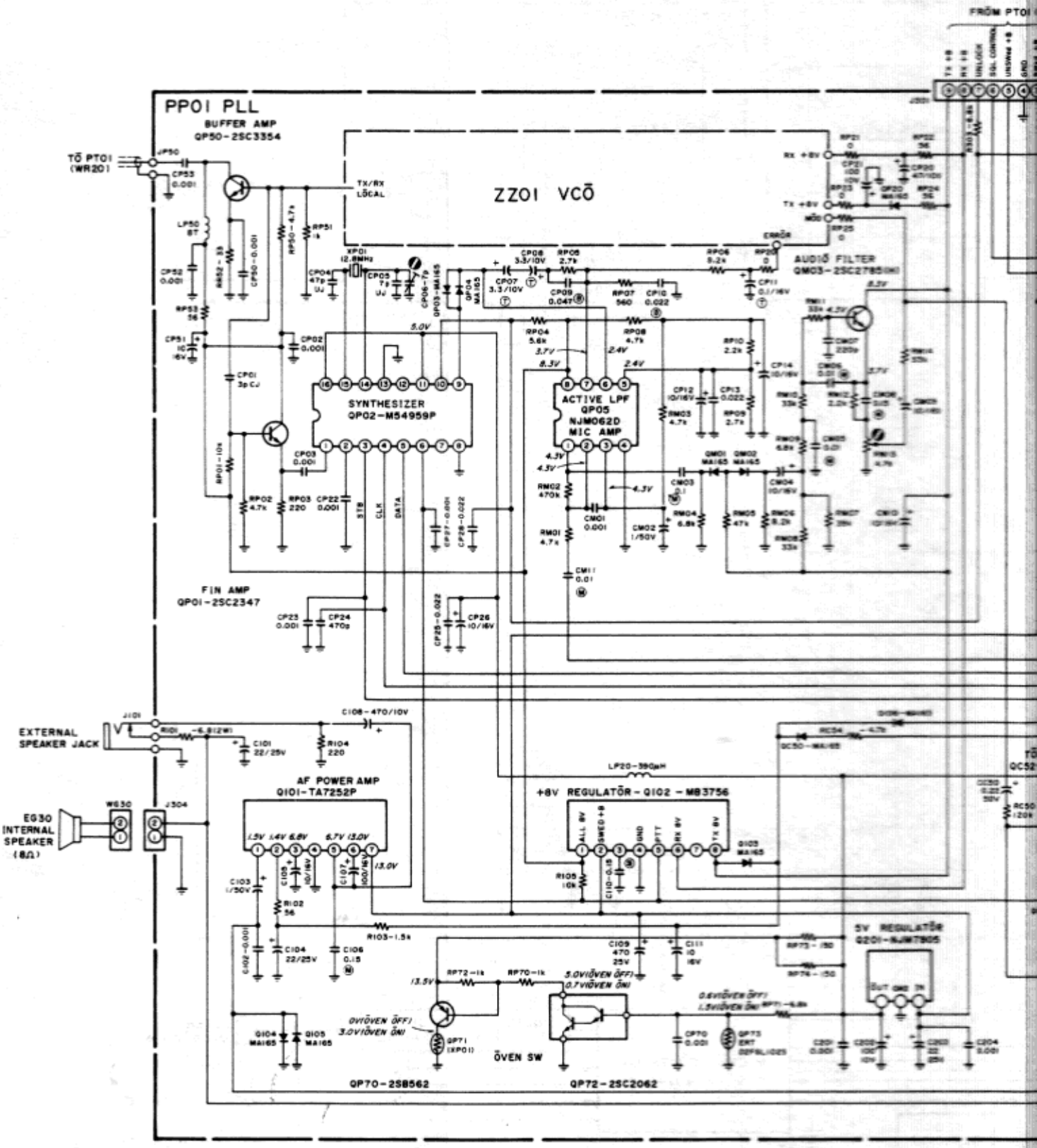


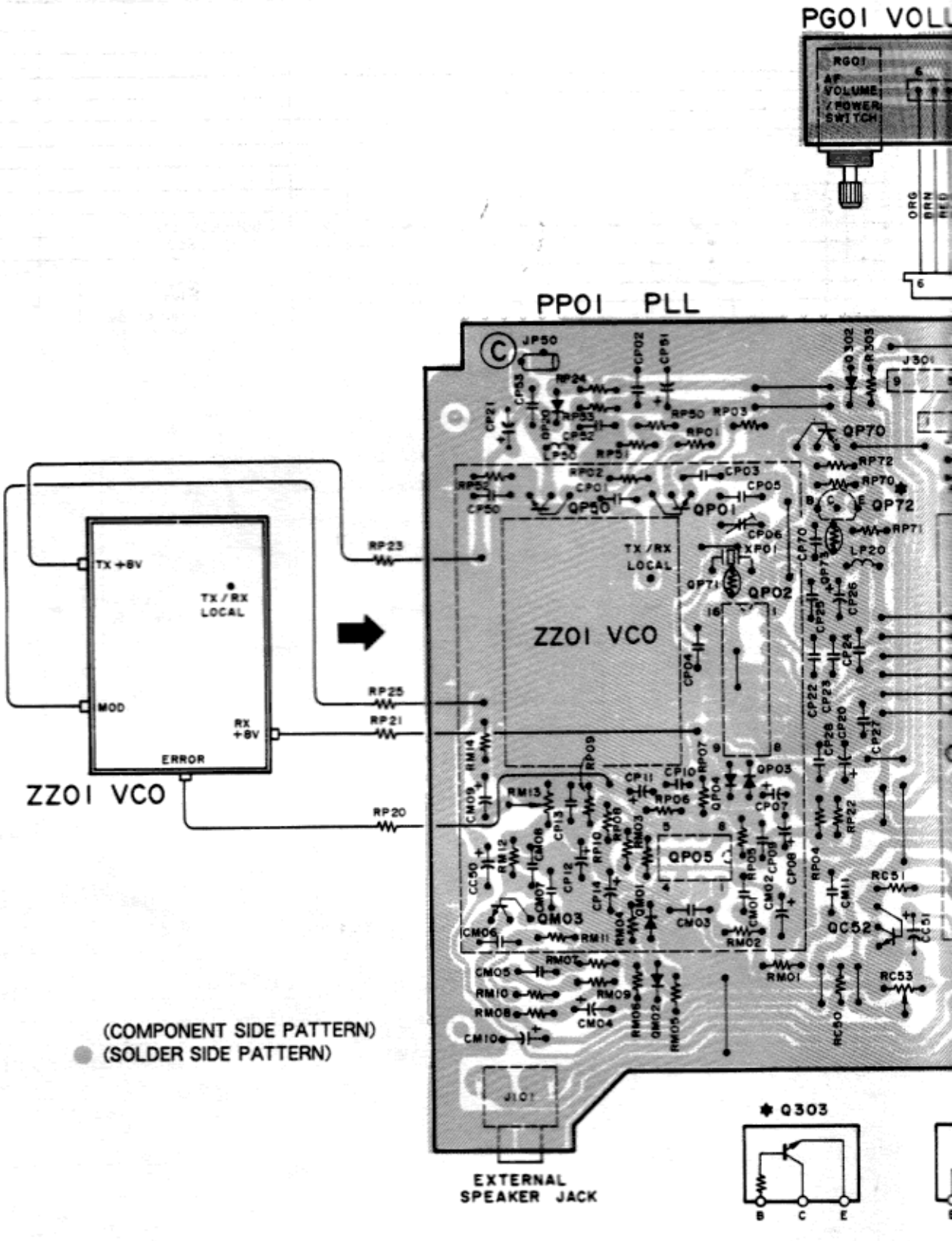
Figure 6-1. Block Diagram



NOTES :
1. REFER TO PARTS LIST FOR COMPONENT VALUES.
2. UNLESS OTHERWISE NOTED RESISTOR VALUES ARE IN OHMS, AND CAPACITOR VALUES ARE IN MICROFARADS.

Figure 6-2. PP01, PC01 Schematic


PP01 PLL
BUFFER AMP
QP50-2SC3354
TÕ PT01 (WR20)
ZZ01 VCÕ
TX/RX LÕCAL
SYNTHESIZER
QP02-M54959P
ACTIVE LPF
QP05
NJM062D
MIC AMP
AUDIÕ FILTER
QM03-2SC2785
FIN AMP
QP01-2SC2347
EXTERNAL SPEAKER JACK
AF POWER AMP
Q101-TA7252P
EG30 INTERNAL SPEAKER (8Ω)
+8V REGULATÕR-Q102-MB3756
5V REGULATÕR
Q201-NJM7805
ÕVEN SW
QP70-2SB562
QP72-2SC2062
FROM PT01


PG01 VOLU
RG01
AF VOLUME / POWER SWITCH
ORG
BRN
RED
PP01 PLL
ZZ01 VCO
TX +8V
TX / RX LOCAL
MOD
RX +8V
ERROR
RP23
RP25
RP21
RP20
TX / RX LOCAL
QP70
QP72
QP50
QP01
QP02
QP03
QP05
QM03
QC52
Q303
B C E
(COMPONENT SIDE PATTERN)
(SOLDER SIDE PATTERN)
J101
EXTERNAL SPEAKER JACK

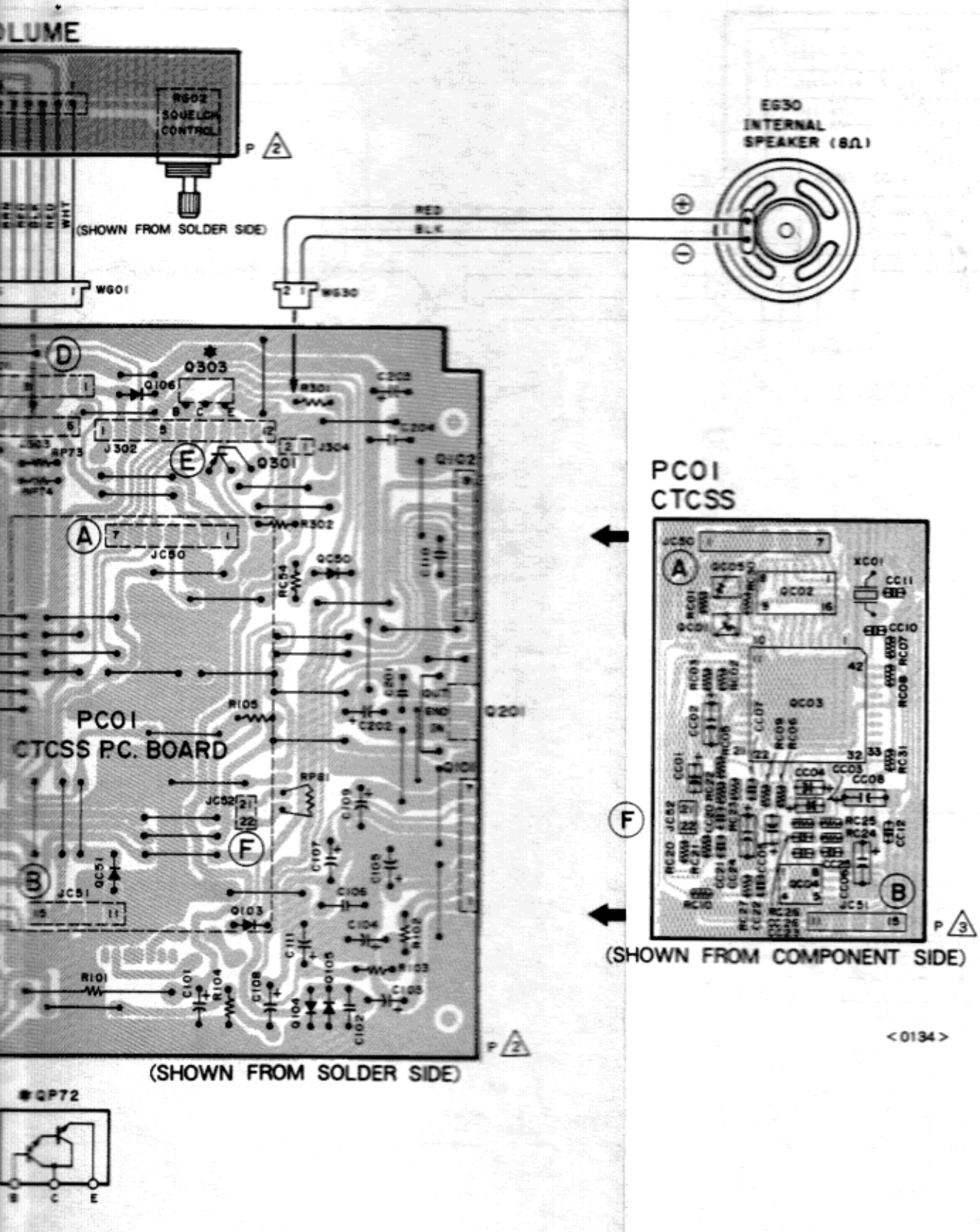
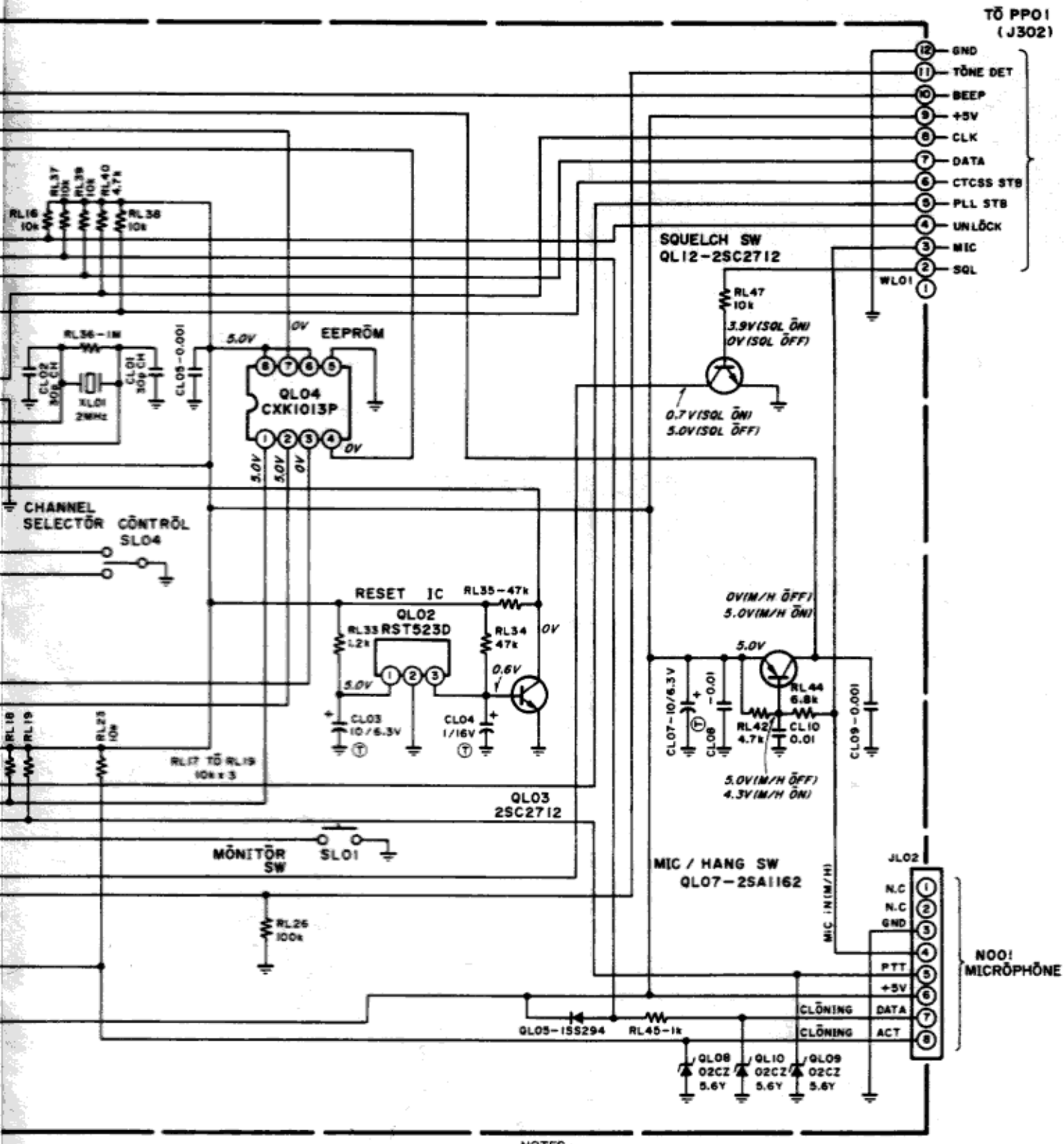


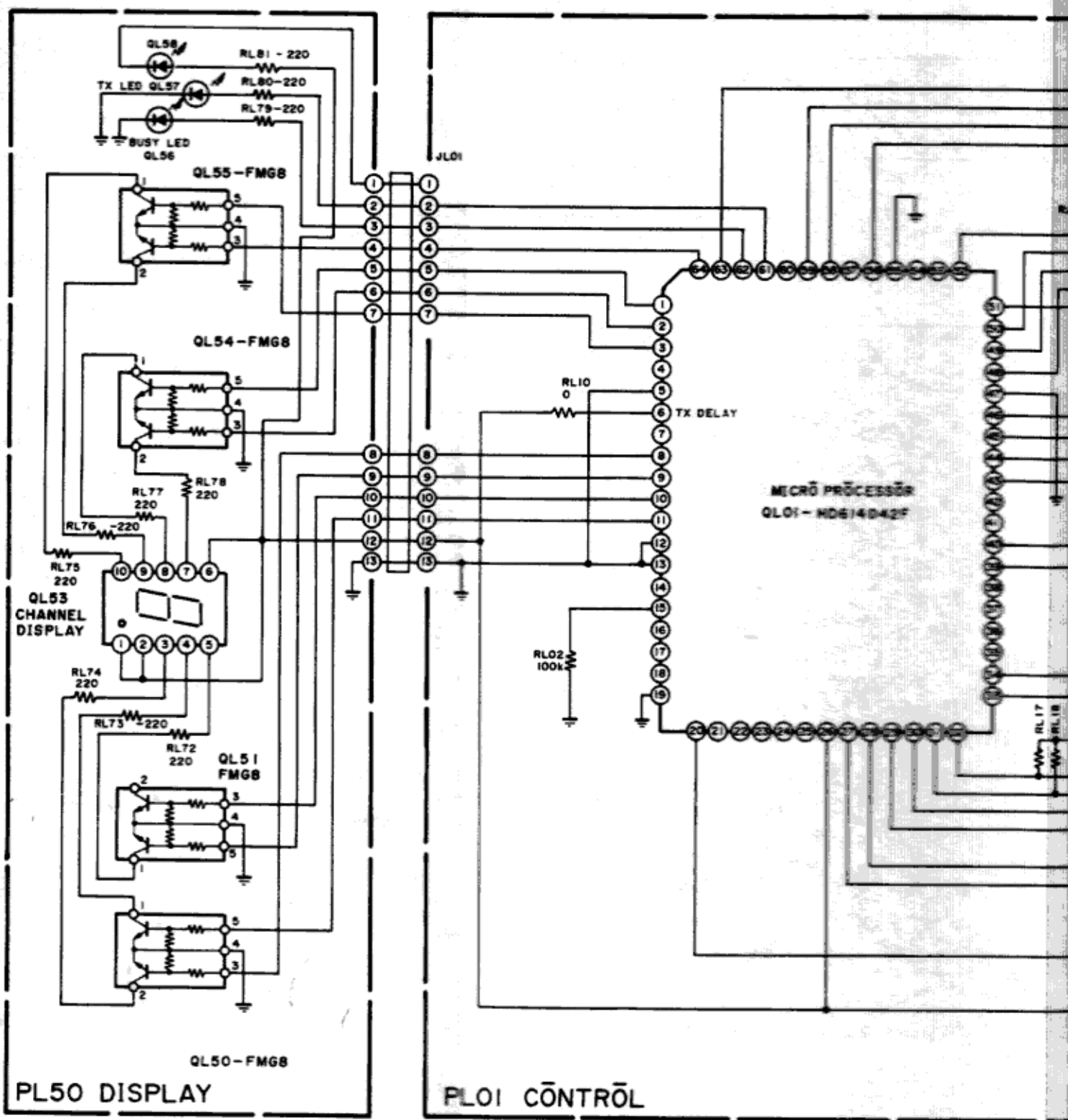
Figure 6-3. PP01, PC01 Wiring Diagram



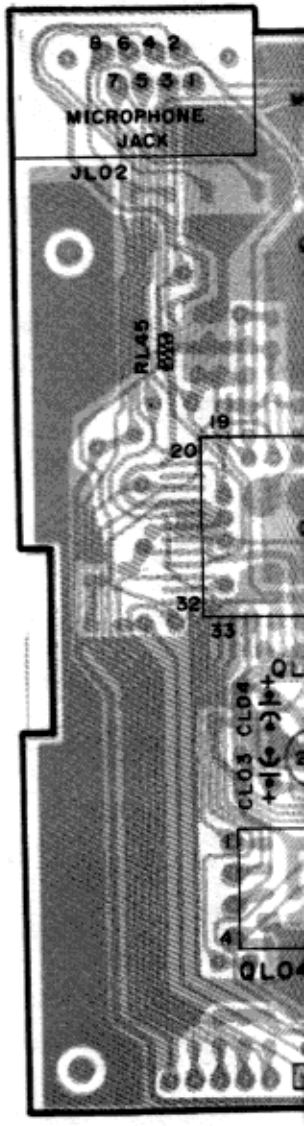
NOTES :

1. REFER TO PARTS LIST FOR COMPONENT VALUES.
2. UNLESS OTHERWISE NOTED RESISTOR VALUES ARE IN OHMS, AND CAPACITOR VALUES ARE IN MICROFARADS.

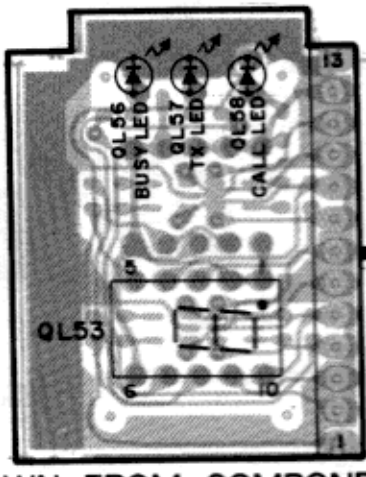
Figure 6-4. PL01, PL50 Schematic


QL58
RL81 - 220
TX LED QL57
RL80-220
RL79-220
BUSY LED QL56
QL55-FMG8
QL54-FMG8
RL77 220
RL78 220
RL76 -220
RL75 220
QL53 CHANNEL DISPLAY
RL74 220
RL73 220
RL72 220
QL51 FMG8
QL50-FMG8
PL50 DISPLAY
JL01
RL10 0
TX DELAY
MICRO PROCESSOR
QL01 - MD6140425
RL02 100k
PL01 CONTROL

PL01 CONT

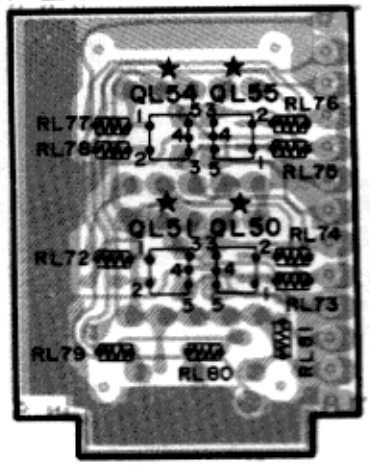


PL50 DISPLAY



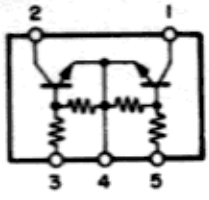
(SHOWN FROM COMPONENT SIDE)

PL50 DISPLAY



P 2

★ QL50,QL51
QL54,QL55

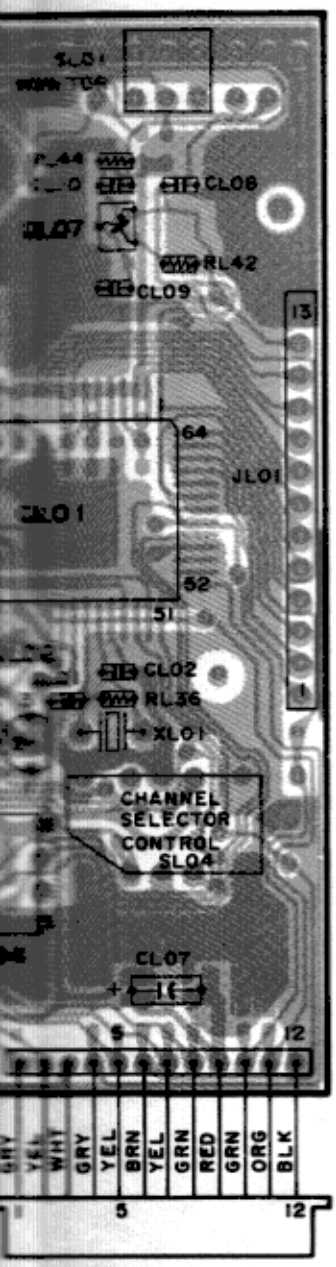


(SHOWN FROM SOLDER SIDE)

(SHOWN FROM

WL01

TROL

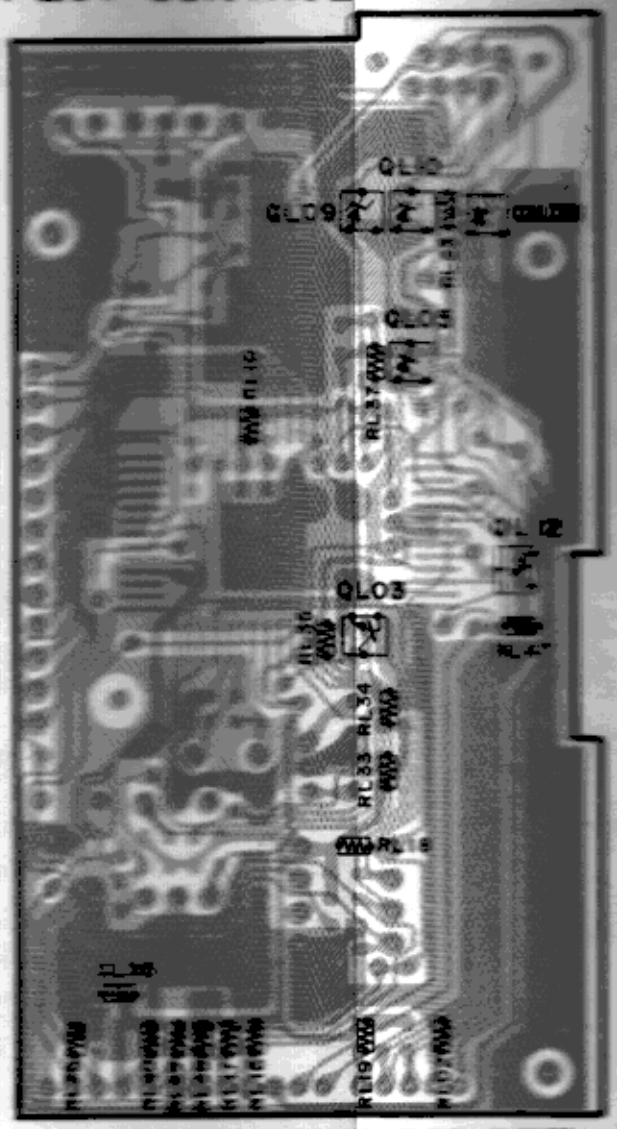


TO PP01 (J302)

(E)

COMPONENT SIDE)

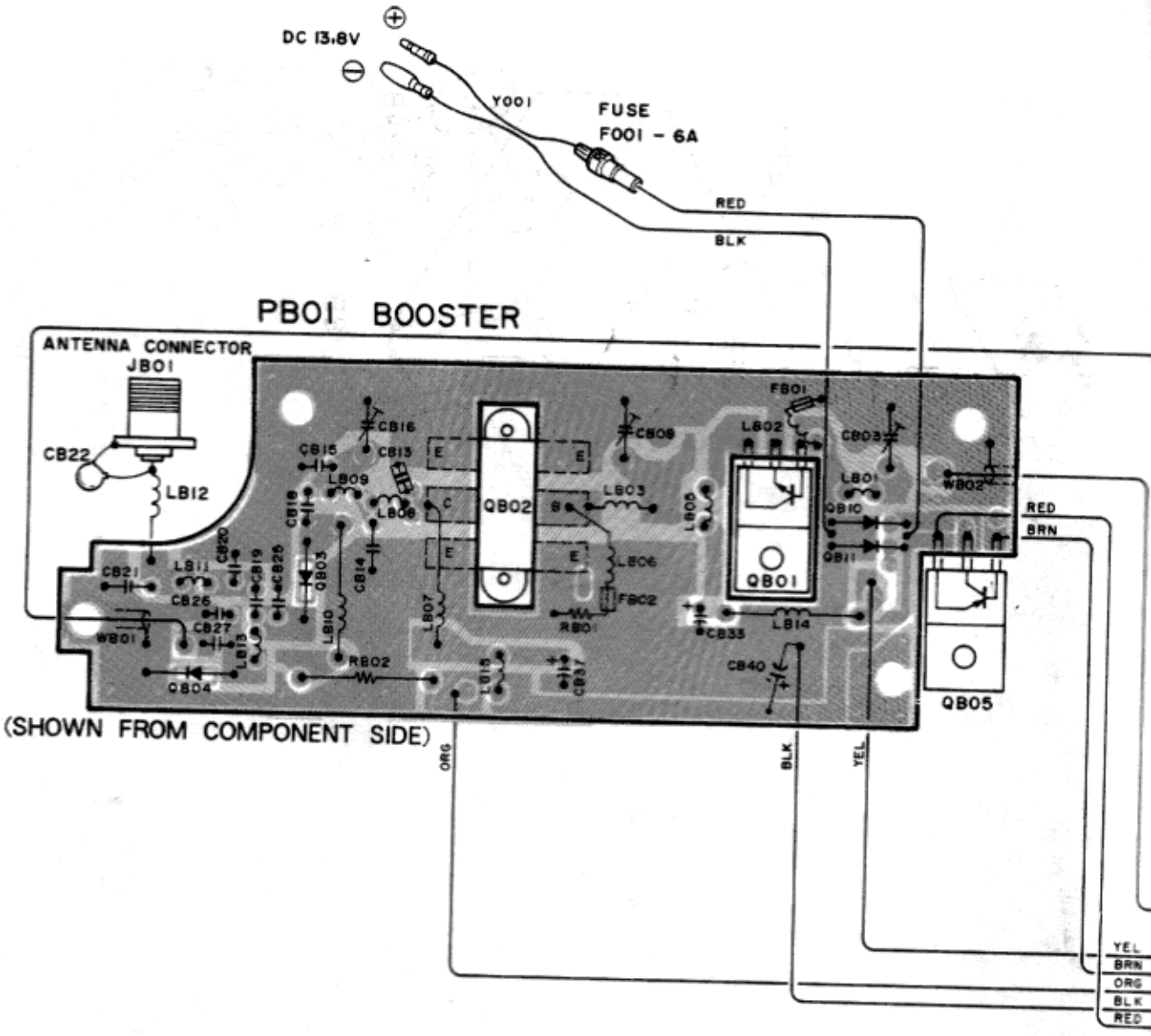
PL01 CONTROL

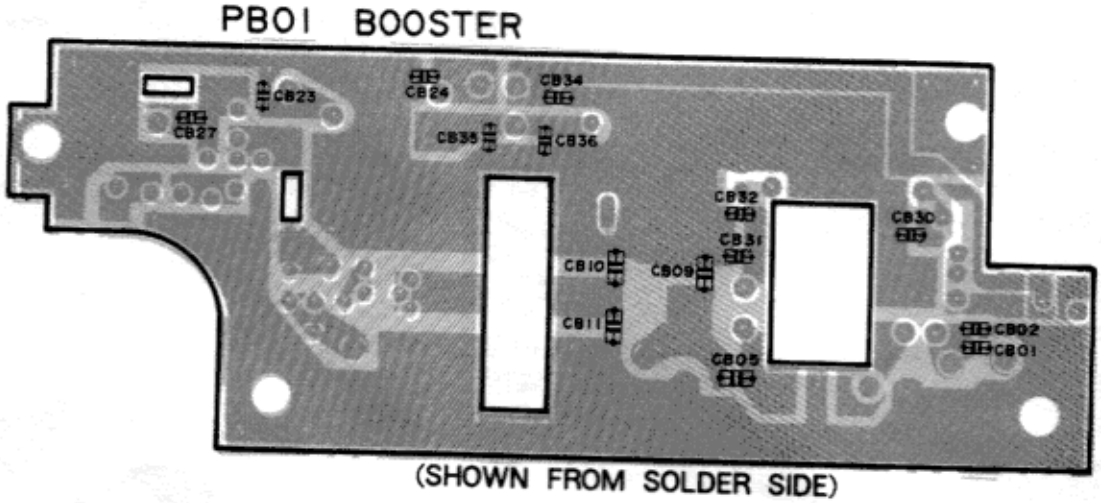


(SHOWN FROM SOLDER SIDE)

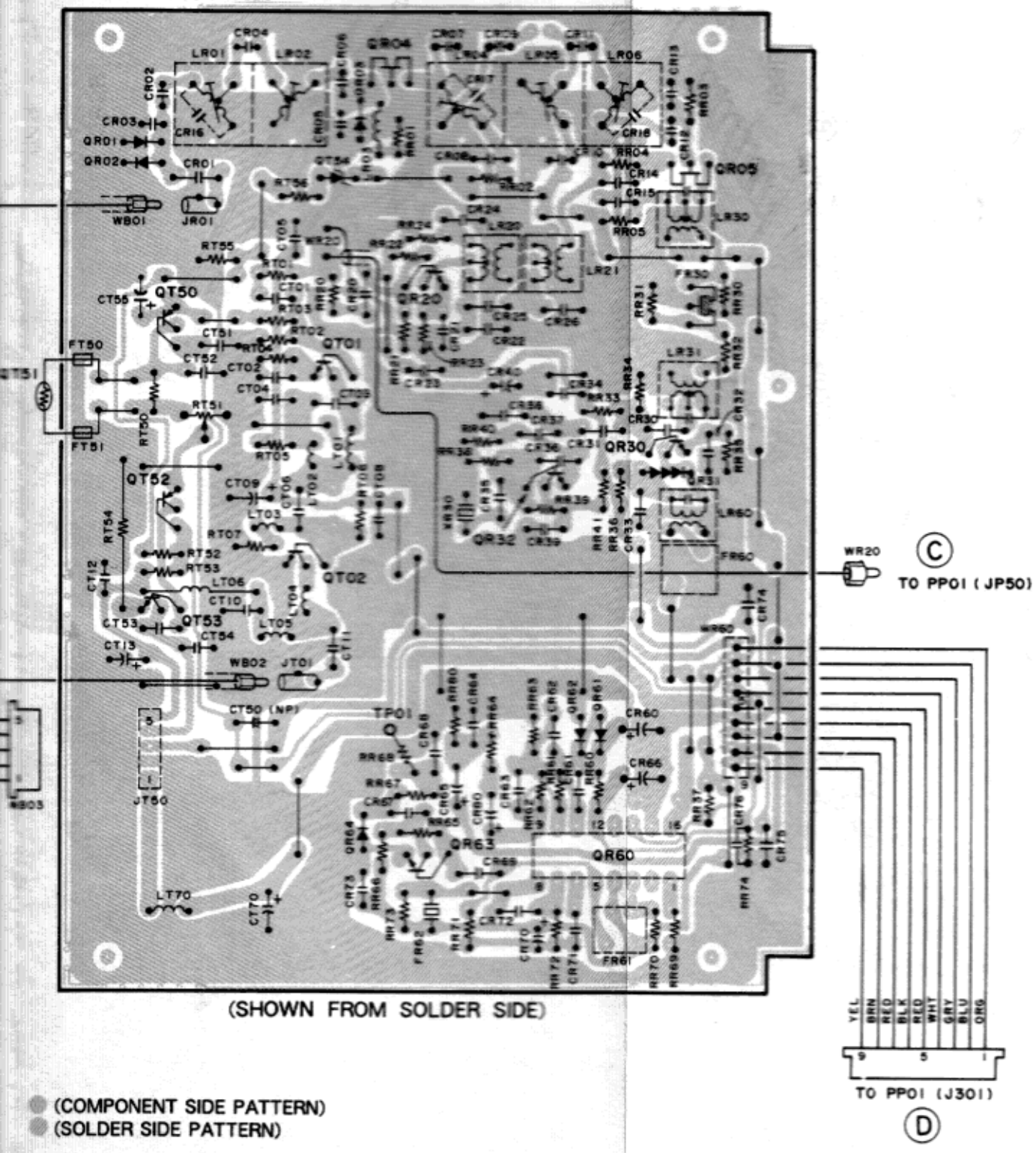
● (COMPONENT SIDE PATTERN)
● (SOLDER SIDE PATTERN)

Figure 6-5. PL01, PL50 Wiring Diagram


DC 13.8V
⊕
⊖
Y001
FUSE
F001 - 6A
RED
BLK
PB01 BOOSTER
ANTENNA CONNECTOR
JB01
CB22
LB12
CB15
CB16
CB13
LB09
LB08
CB18
CB20
CB19
CB25
CB21
LB11
CB26
CB27
WB01
LB13
QB04
QB03
CB14
LB10
RB02
QB02
E
C
B
LB07
LB15
CB37
CB09
LB03
LB06
FB02
RB01
CB33
CB40
LB14
LB05
QB01
LB02
FB01
CB03
LB01
QB10
QB11
WB02
QB05
RED
BRN
ORG
BLK
YEL
(SHOWN FROM COMPONENT SIDE)
YEL
BRN
ORG
BLK
RED


PB01 BOOSTER
CB23
CB27
CB24
CB34
CB35
CB36
CB32
CB31
CB30
CB10
CB09
CB11
CB02
CB01
CB05
(SHOWN FROM SOLDER SIDE)

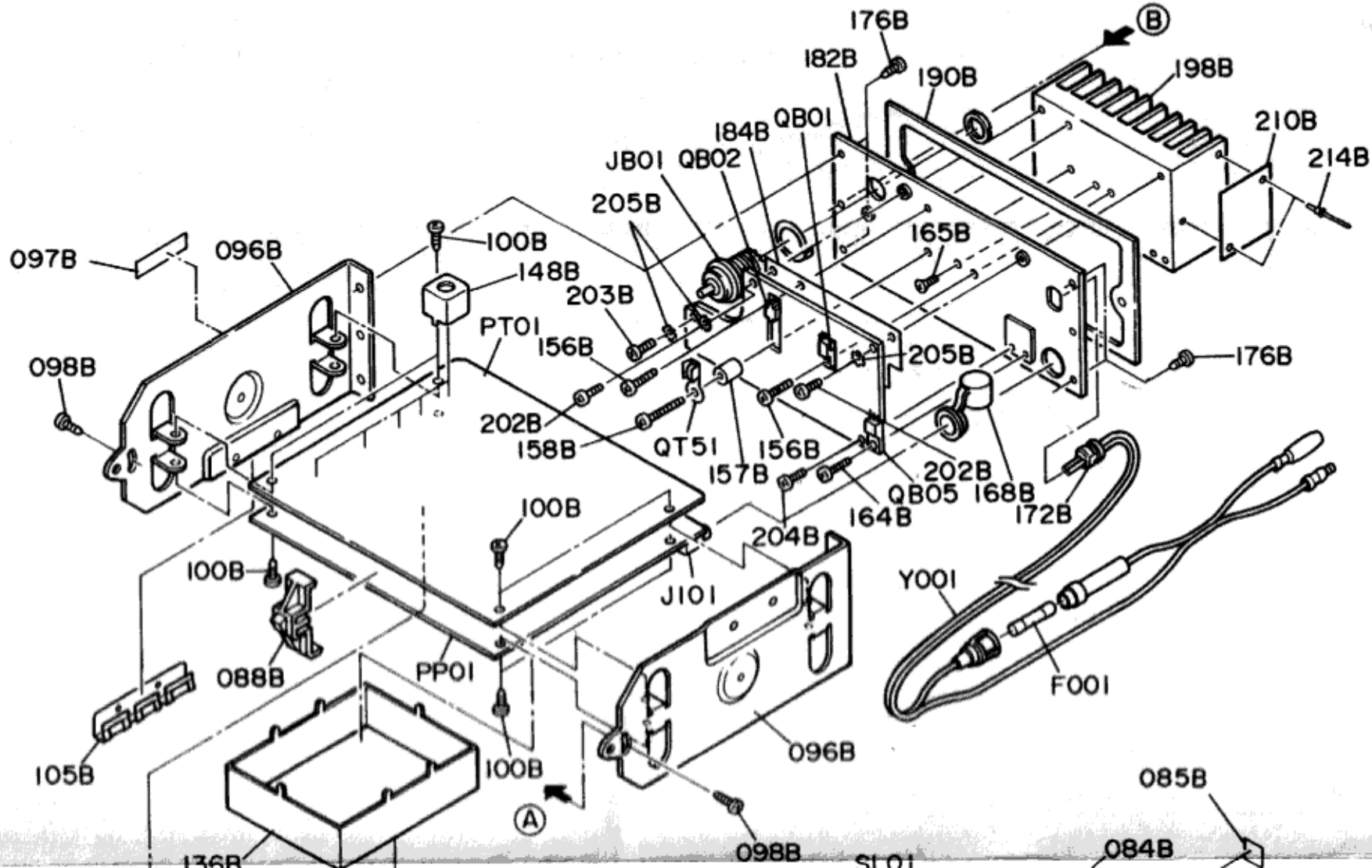
PT01 TX / RX



(SHOWN FROM SOLDER SIDE)

● (COMPONENT SIDE PATTERN)
● (SOLDER SIDE PATTERN)

Figure 6-7. PB01, PT01 Wiring Diagram


176B
182B
190B
198B
210B
214B
184B
QB01
JB01
QB02
205B
165B
097B
096B
100B
148B
203B
PT01
156B
205B
176B
098B
202B
158B
QT51
157B
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202B
QB05
168B
172B
164B
204B
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088B
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F001
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098B
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084B
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SL01

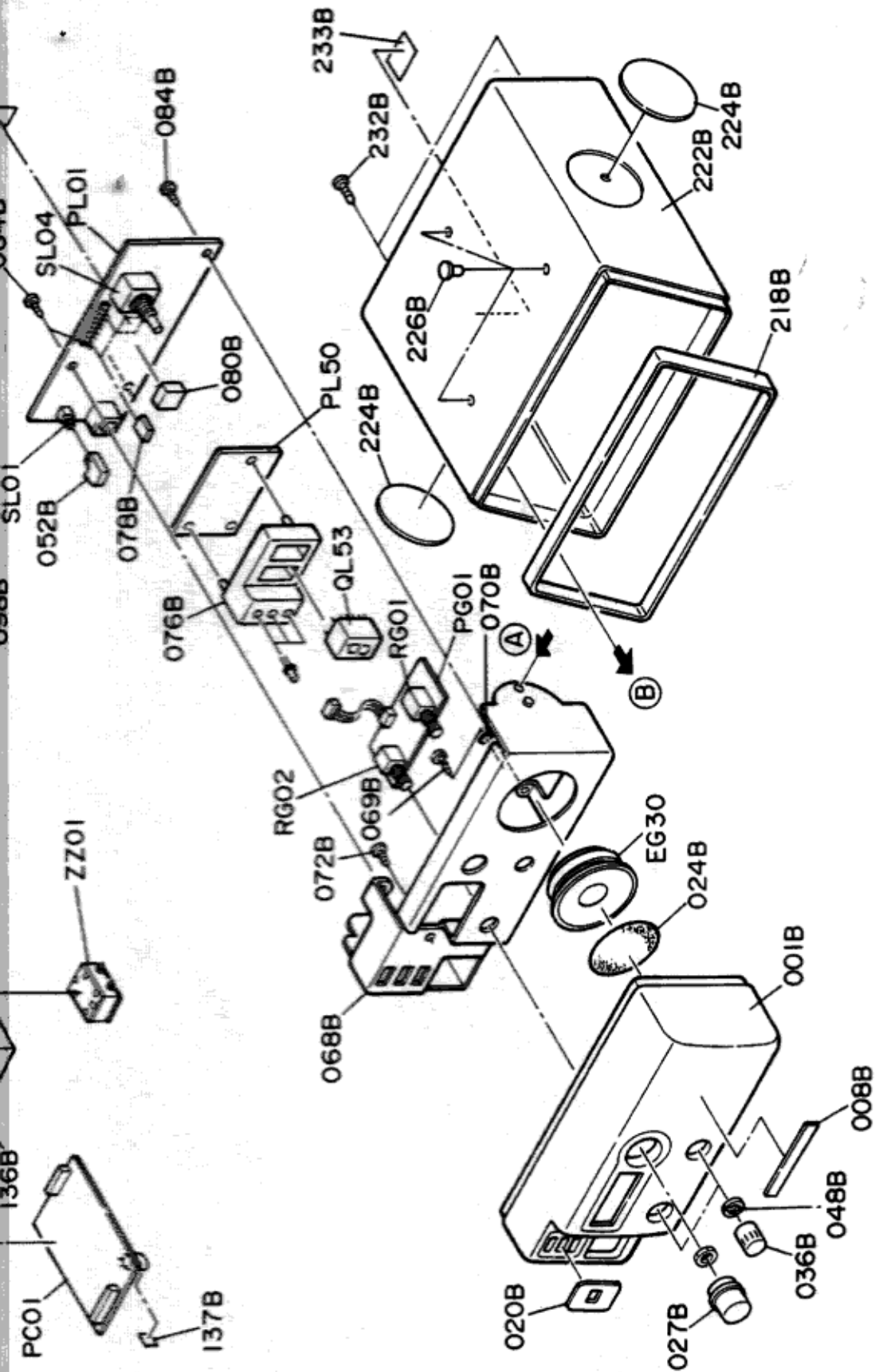

Figure 6-8. Exploded Parts View

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