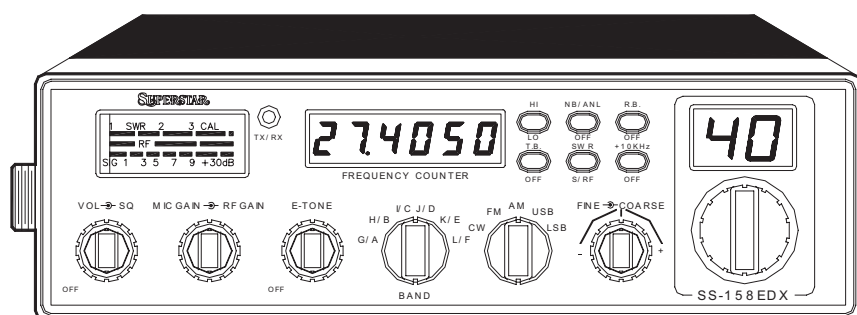


SUPERSTAR

Model SS—158 EDX (B)

© Service Manual



SS-158EDX (B)

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CHAPTER 1 SPECIFICATIONS

1.0 GENERAL

Model	SS-158EDX
Channels	480FM, 480AM, 480LSB, 480USB,
Frequency Range	28.245 ~ 29.655 MHz
Frequency Control	Phase-Lock-loop (PLL) Synthesizer
Frequency Stability	0.001%
Temperature Range	-30°C to +50°C
Antenna Impedance	50 Ohms
Antenna Connectors	Standard SO-239 type
Input Voltage	13.8V DC
Size	7 7/8" (W) x 10 3/4" (D) x 2 3/8" (H)
Weight	5.0 lbs.

1.1 TRANSMITTER

RF Power Output	AM/FM/CW: 10watts; SSB: 25watts PEP
Carrier Emission	-50 dB
Spurious Emission	-50 dB
Audio Distortion	10%
Frequency Response	300 to 2500 Hz
Microphone	Dynamic

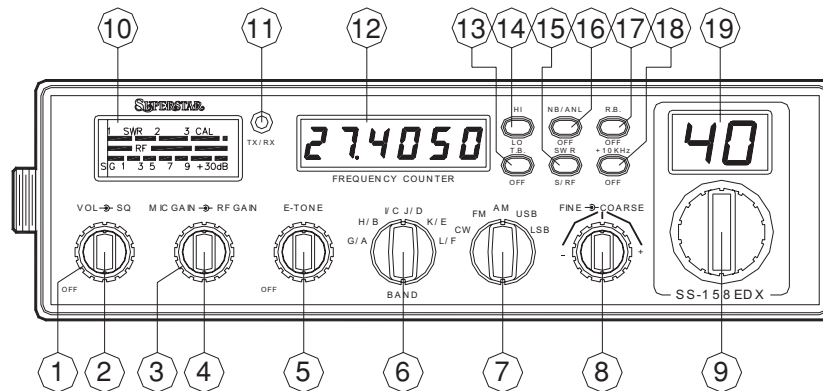
1.2 RECEIVER

Sensitivity for 10 dB (S+N)/N	CW/AM : < 1.0 μ V ; SSB : < 0.25 μ V
Sensitivity for 20 dB (S+N)/N	FM : < 0.5 μ V
Squelch Sensitivity	< 0.5 μ V
Image Rejection	More than 65 dB
AGC Figure of Merit	100 mV for 10dB Change in Audio Output
Audio Power Output	2.5W @ 10% Distortion
Audio Response	300 to 2500 Hz

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

CHAPTER 2 OPERATION

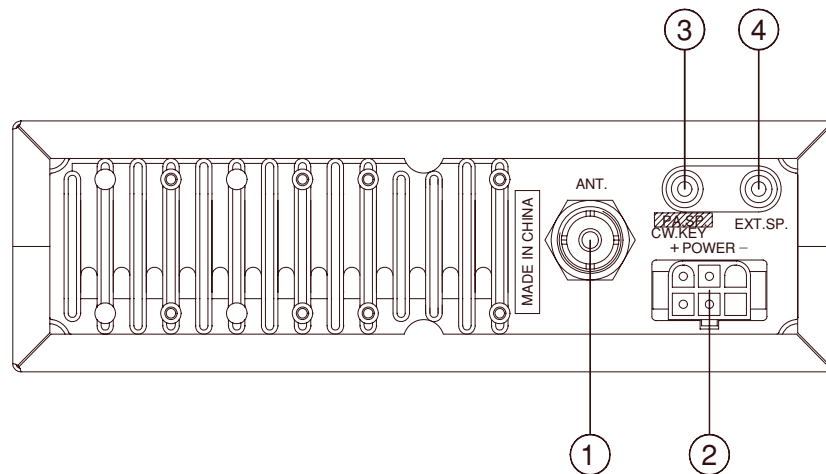
2.0 FRONT PANEL



- 1. ON/OFF VOLUME CONTROL :** This knob controls the volume and power to the radio. To turn radio on, rotate the knob clockwise. Turning the knob further will increase the volume of the receiver.
- 2. SQUELCH CONTROL :** This switch is used to eliminate background noise being heard through the receiver which can be disturbing when no transmission are being heard through the received. To use this feature, turn the switch fully counterclockwise and then turn clockwise slowly until the background noise is just eliminated. Further clockwise rotation will increase the threshold level which a signal must overcome in order to be heard. Only strong signal will be heard at a maximum clockwise setting.
- 3. MIC GAIN CONTROL :** Adjust the microphone gain in the transmit modes. This controls the gain to the extent that full talk power is available several inches away from the microphone.
- 4. RF GAIN CONTROL :** This control is used to reduce the gain of the RF amplifier under strong signal conditions.
- 5. E-TONE CONTROL :** This control is used to control the echo effects.
- 6. BAND SELECTOR :** This band selector allow the user to select the desired band.

-
7. **MODE CONTROL** : This control allows you to select one of the following operating modes : CW/FM/AM/USB/LSB.
 8. **FINE/COARSE CONTROL** : Allows variation of the receive operating frequency above or below the assigned frequency. Although this control is intended primarily to tune in SSB/CW signals, it may be used to optimize AM/FM signals as described in the Operating Procedure paragraphs. Coarse operates both TX/RX but Fine only in RX.
 9. **CHANNEL SELECTOR** : This control is used to select a desired transmit and receive channel.
 10. **FRONT PANEL METER** : The Front Panel Meter allows the user to monitor signal strength, RF output power and SWR level.
 11. **TX/RX LED** : The red LED indicates the unit is in the transmit mode. The green LED indicates the unit is in the receive mode.
 12. **FREQUENCY COUNTER** : This frequency counter indicates the selected channel frequency digitally.
 13. **TALKBACK SWITCH** : This switch is used to monitor the sound feedback effects.
 14. **HI/LOW SWITCH** : This switch select HI or LOW band of operation.
 15. **S-RF/SWR/ SWITCH** : In the S-RF position, the meter swings proportionally to the strength of the received signal. When transmitting, the meter indicates relative RF output power. When in the SWR position, the standing wave ratio is measured.
 16. **NB/ANL/OFF SWITCH** : When the switch is place in the NB/ANL position, the RF Noise Blanker (NB) and the Automatic Noise Limiter (ANL) in the audio circuits are activated. The Noise Blanker is very effective in eliminating repetitive impulse noise such as ignition interference.
 17. **ROGER BEEP** : When this switch is placed in the ROGER BEEP position, the radio automatically transmits an audio tone at the end of your transmission. This indicates the end of your transmission so that people who are having trouble hearing you will know that you are done speaking. As a courtesy to others, use the Roger Beep only when necessary.
 18. **+10KHz SWITCH** : In the +10KHz position, the transmit and receive frequency is shifted 10 KHz up.
 19. **CHANNEL DISPLAY** : The channel display indicates the current selected channel.

2.1 REAR PANEL



1. **ANTENNA** : This jack accepts 50 ohms coaxial cable with a PL-259 type plug.
2. **DC POWER** : This accepts 13.8V DC power cable with built-in fuse. The power cord provided with the radio has a black and red wire. The black goes to negative and red goes to positive.
3. **CW. KEY** : This jack is for Morse Code operation. To operate, connect a CW Key to this jack and place the Mode Control in the CW position.
4. **EXT. SP** : This jack accepts 4 to 8 ohms, 5 watts external speaker. When the external speaker is connected to this jack, the built-in speaker will be disabled.

PROCEDURE TO RECEIVE AND TRANSMIT

A. MICROPHONE

The receiver and transmitter are controlled by the push-to-talk switch on the microphone. Press the switch and the transmitter is activated, release switch to receive. When transmitting, hold the microphone two inches from the mouth and speak clearly in a normal voice. This transceiver comes complete with a low impedance dynamic microphone.

B. PROCEDURE TO RECEIVE

1. Be sure that power source, microphone and antenna are connected to the proper connectors before going to the next step.
2. Turn **VOL** knob clockwise to apply power to the radio.
3. Set the **VOL** for a comfortable listening level.
4. Set the **MODE** switch to the desired mode.
5. Listen to the background noise from the speaker. Turn the **SQ** knob slowly clockwise until the noise just disappears. The **SQ** is now properly adjusted. The receiver will remain quiet until a signal is actually received. Do not advance the control too far or some of weaker signals will not be heard.
6. Set the **CHANNEL** selector switch to the desired channel.
7. Set the **RF GAIN** control fully clockwise for maximum RF gain.
8. Adjust the **FINE/COARSE** control to clarify the SSB/CW signals or to optimize AM/FM signals.

C. PROCEDURE TO TRANSMIT

1. Select the desired channel of transmission
2. Set the **MIC GAIN** control fully clockwise.
3. If the channel is clear, depress the push-to-talk switch on the microphone and speak in a normal voice.

RECEIVING SSB SIGNALS

There are four types of signals presently used for communications in the Citizens Band : FM, AM, USB and LSB. When the MODE switch on your unit is placed in the AM position, only standard double-side band and in FM position, only frequency deviation, full carrier signals will be detected. An SSB signal may be recognized while in the AM or FM mode by its characteristic "Donald Duck" sound and the inability of the detector to produce an intelligible output. The USB and LSB modes will detect upper side band and lower side band respectively, and standard AM signals.

SSB reception differs from standard AM reception in that an SSB receiver does not require a carrier or opposite side band to produce an intelligible signal. A single-side band transmitted signal consists only of the upper or the lower side band and no carrier is transmitted. The elimination of the carrier from the AM signal helps to eliminate the biggest cause of whistles and tones heard on channels which make even moderately strong AM signals unreadable. Also, SSB takes only half the space of an AM channel, therefore two SSB conversations will fit into each channel, expanding the 40 AM channels to 80 SSB channels. The reduction in channel space required also helps in the receiver because only half of the noise and interference can be received with 100% of the SSB signal.

An SSB signal may be received only when the listening receiver is functioning in the same mode. In other words, an upper side band signal (USB) may be made intelligible only if the receiver is functioning in the USB position.

If a lower side band (LSB) signal is heard when the receiver is in the USB mode, no amount of tuning will make the signal intelligible. The reason for this may be understood if you consider that when the modulation is applied to the transmitter's microphone in the USB mode, the transmitter output frequency is increased whereas in the LSB mode the transmitter's output frequency is decreased.

The result in listening to the receiver is that when the MODE switch is in the proper position (either USB or LSB), a true reproduction of a single tone of modulation will result, and if the tone is increased in frequency (such as a low-pitched whistle or a high-pitched whistle) you will hear the increase in the output tone of the receiver. If the incorrect mode is selected, an increase in tone of a whistle applied to the transmitter will cause a decrease in the resultant tone from the receiver.

Thus when a voice is used in place of a whistle or tone, in the proper listening mode the voice will be received correctly whereas in the incorrect mode, the voice will be translated backwards and cannot be made intelligible by the FINE/COARSE control.

When listening to an AM transmission, a correct side band is heard in either mode since both upper and lower side bands are received.

Once the desired SSB mode has been selected, frequency adjustment may be necessary in order to make the incoming signal intelligible. The FINE/COARSE control allows the operator to vary frequency above or below the exact frequency of the channel. If the sound of the incoming signal is high or low pitched, adjust the operation of the FINE/COARSE.

Consider it as performing the same function as a phonograph speed control. When the speed is set too high, voices will be high-pitched and if set too low, voice will be low-pitched. Also, there is only one correct speed that will make a particular record produce the same sound that was recorded. If the record is played on a turntable that is rotated in the wrong direction (opposite side band) no amount of speed control (FINE/COARSE) will produce an intelligible sound.

An AM signal received while listening in one of the SSB modes will produce a steady tone (carrier) in addition to the intelligence, unless the SSB receiver is tuned to exactly the same frequency by the FINE/COARSE control. For simplicity, it is recommended that the AM modes be used to listen to AM signals.

ALTERNATE MICROPHONES AND INSTALLATION

For best results, the user should select a low-impedance dynamic type microphone or a transistorized microphone.

Transistorized type microphones have low output impedance characteristics. The microphones must be provided with a four-lead cable. The audio conductor and its shielded lead comprise two of the leads. The third lead is for transmit control and fourth is for receiving control.

The microphone should provide the functions shown in schematic below.

4 WIRE MIC CABLE

<u>Pin Number</u>	<u>Mic Cable Lead</u>
1	Audio Shield
2	Audio Lead
3	Transmit Control
4	Receive Control

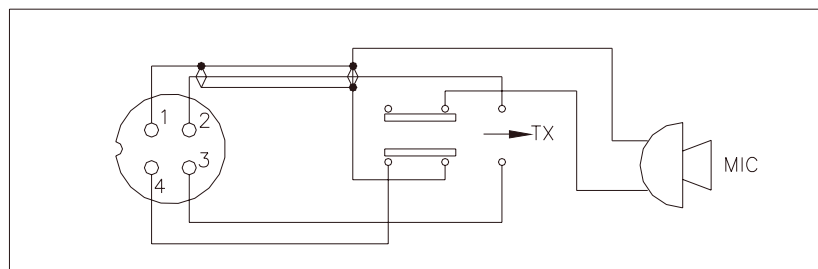


Fig. 1 Your transceiver microphone schematic.

If the microphone to be used is provided with precut leads, they must be revised as follows.

1. Cut leads so that they extend 7/16" beyond the plastic insulating jacket of the microphone cable.
2. All leads should be cut to the same length. Strip the ends of each wire 1/8" and tin the exposed wire.

Before beginning the actual wiring, read carefully the circuit and wiring information provided with the microphone you select. Use the minimum heat required in soldering

the connections. Keep the exposed wire lengths to a minimum to avoid shorting when the microphone plug is reassembled.

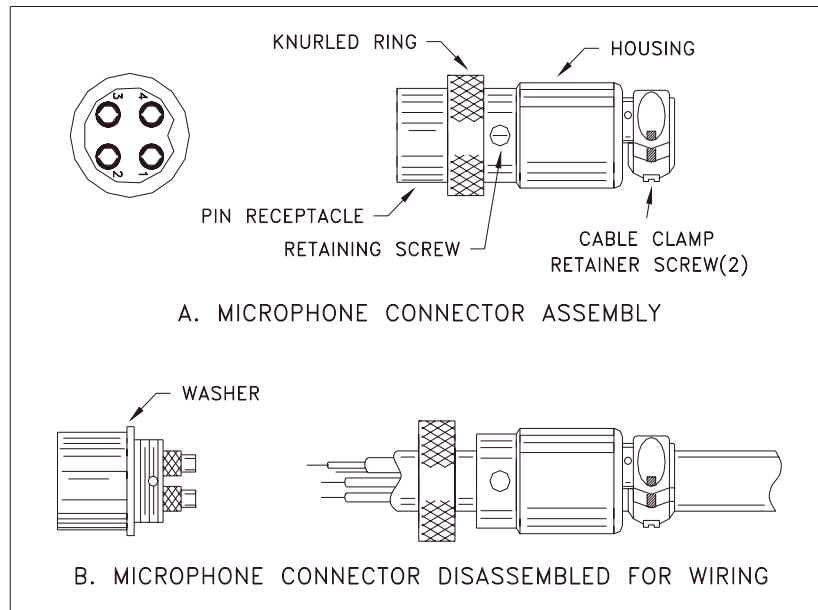


Fig. 2 Microphone plug wiring

To wire the microphone cable to the plug provided, proceed as follows :

1. Remove the retaining screw.
2. Unscrew the housing from the pin receptacle body.
3. Loosen the two cable clamp retainer screws.
4. Feed the microphone cable through the housing, knurled ring and washer as shown Figure 2.

The wires must now be soldered to the pins as indicated in the above wiring tables. If a vise or clamping tool is available it should be used to hold the pin receptacle body during the soldering operation, so that both hands are free to perform the soldering. If a vise or clamping tool is not available, the pin receptacle body can be held in a stationary position by inserting it into the microphone jack on the front panel. The numbers of the microphone plug are shown in Fig. 3, as viewed from

5. the back of the plug. Before soldering the wire to the pins, pre-tin the wire receptacle of each pin of the plug.

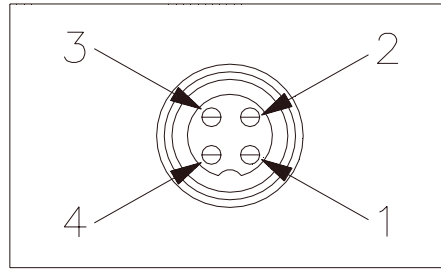


Fig. 3 Microphone plug pin numbers viewed from rear of pin receptacle.

6. Be sure that the housing and the knurled ring of Figure 2 are pushed back onto the microphone cable before starting to solder. If the washer is not captive to the pin receptacle body, make sure that it is placed on the threaded portion of the pin receptacle body before soldering.
7. If the microphone jack is used to hold the pin receptacle during soldering operation, best results are obtained when the connections to pin 1 and 3 are made first and then the connections to pins 2 and 4. Use a minimum amount of soldering and be careful to prevent excessive solder accumulation on pins, which could cause a short between the pin and the microphone plug housing.
8. When all soldering connections to the pins of the microphone are completed, push the knurled ring and the housing forward and screw the housing onto the threaded portion of the pin receptacle body. Note the location of the screw clearance hole in the plug housing with respect to the threaded hole in the pin receptacle body. When the housing is completely threaded into the pin receptacle body, a final fraction of a turn either clockwise or counterclockwise may be required to align the screw hole with the threaded hole in the pin receptacle body. When these are aligned, the retaining screw is then screwed into place to secure the housing to the pin receptacle body.
9. The two cable clamp retainer screws should now be tightened to secure the housing to the microphone cord. If the cutting directions have been carefully followed, the cable clamp should be secure to the insulation jacket of the microphone cable.
10. Upon completion of the microphone plug wiring, connect and secure the microphone plug in the transceiver.

CHAPTER 3 CIRCUIT DESCRIPTION

3.0 INTRODUCTION

This section explains the technical theory of operation for the SS—158 EDX mobile AMATEUR radio.

3.1 PLL CIRCUIT

The Phase Lock Loop (PLL) circuit is responsible for developing the receiver's first local oscillator signal and the transmitter's exciter signal. The PLL circuit consists primarily of IC2, IC3, IC4, IC5, Q25, Q27, Q28 and Q29. The PLL circuit is programmed by the rotary channel switch GPS-501. The GPS-501 & Band switch communicates the correct binary data information to the into IC4&IC5. Sum binary code inside IC3 then controls the VCO (Voltage Controlled Oscillator) to oscillate on the correct frequency. This signal is fed either into the receiver's first mixer (for receive operation) or the transmitter's mixer (for transmit operation).

3.2 RECEIVER CIRCUIT

The incoming RF signal comes into the radio via the antenna and into the front-end pre-amp, Q17. The RF signal is fed into the mixer circuit of Q18/Q19 and then into the AM/FM/SSB IF section of the receiver. AM/FM IF signal is into FL2 by Q10,Q11,Q12 AMP,AM signal then detected by the AM detector(D30,D31) and then fed to the audio amplifier(IC8) section of the receiver and finally out to the speaker.FM signal then detected by the FM detector(Q12,L4) fed to the audio amplifier(IC8) section of the receiver and finally out to the speaker.SSB IF signal is into FL3 by Q20, Q21, Q22, Q23 AMP,SSB signal then mix with be from X4' frequency and then fed to the audio amplifier(IC8) section of the receiver and finally out to the speaker.

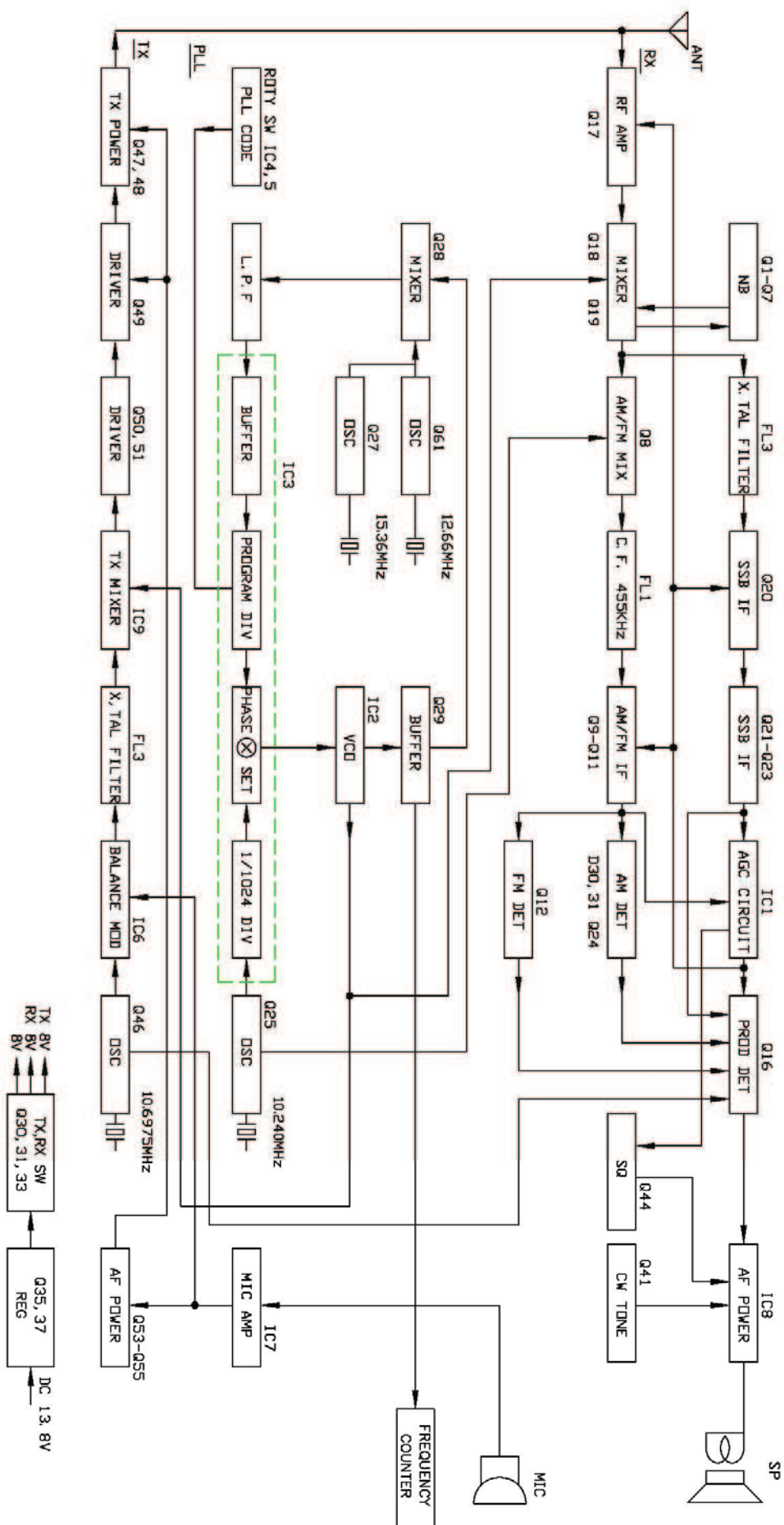
3.3 TRANSMITTER MODULATION CIRCUIT

- (1) The transmitter modulation circuit modulates the low-level RF signal from the PLL exciter circuit with the user's audio voice signal from the microphone. The audio from the microphone is then amplified and fed into the transmit amplifier circuit.
- (2) If the transceiver is in the AM mode, the AF power amplifier modulates the last RF amplifier, which produces a true amplitude modulated RF signal.
- (3) If the transceiver is in the SSB mode, the audio signal is mixed with the 10.6975MHz oscillator in IC6.
- (4) If the transceiver is in the FM mode, the audio signal is mixed with the oscillator in IC2.

3.4 TRANSMITTER AMPLIFIER CIRCUIT

The transmitter takes the basic exciter signal from IC9 of the TX mixer and amplifies it through a series of amplifiers consisting of Q52, Q51, Q49 ,Q47and Q48 where it is sent out to the antenna connector.

SS-158EDX(B) BLOCK DIAGRAM



CHAPTER 4 ALIGNMENT

4.0 REQUIRED TEST EQUIPMENT

- | | |
|----------------------------------|---------------------------------|
| ① DC Power Supply (13.8VDC, 10A) | ⑥ Frequency Counter (100 MHz) |
| ② RF Wattmeter (10W) | ⑦ RF Signal Generator (100 MHz) |
| ③ Multi-meter | ⑧ Automatic Distortion Meter |
| ④ Automatic Modulation Meter | ⑨ Oscilloscope (50 MHz) |
| ⑤ Audio Signal Generator | ⑩ Sinad Meter |

4.1 ALIGNMENT PROCEDURES

This transceiver has been aligned at the factory and does not require any adjustments at installation. The required test equipment listed are used for the test setup or alignment shown in Figure 4.1.2 Transmitter Test Setup and Figure 4.1.3 Receiver Test Setup. These test setups are used in part or total during the following adjustments. Refer to page 22 for adjustment locations.

4.1.1 PLL ALIGNMENT

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
VCO	Disconnect 'short PCB' from TP7, TP8 and TP9. Set radio to CH 40 BAND L AM RX mode. Connect Multi-meter to TP2.	L14	6.0 VDC \pm 0.1
	Set CLARIFIER Control to 12 o'clock. Connect Oscilloscope to TP3.	L15	Adjust for max.
AM Frequency	Set radio to CH 1 BAND G AM RX mode. Connect Frequency Counter to TP3.	L17	16.2700MHz \pm 20Hz
AM Frequency	Set radio to CH 1 BAND A AM RX mode. Connect Frequency Counter to TP3.	L20	13.5700MHz \pm 20Hz
USB Frequency	Set radio to CH 1 BAND G USB RX mode. Connect Frequency Counter to TP3.	L18	16.2725MHz \pm 20Hz

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
USB Frequency	Set radio to CH 1 BAND A USB RX mode. Connect Frequency Counter to TP3.	L21	13.5725MHz \pm 20Hz
LSB Frequency	Set radio to CH 1 BAND G USB RX mode. Connect Frequency Counter to TP3.	L19	16.2675MHz \pm 20Hz
LSB Frequency	Set radio to CH 1 BAND A USB RX mode. Connect Frequency Counter to TP3.	L22	13.5675MHz \pm 20Hz
TX Offset Frequency	Set radio to CH 1 BAND G AM TX mode. Connect Frequency Counter to TP3.	VR7	16.2700MHz \pm 20Hz
AM OSC	Set radio to CH 1 BAND G AM TX mode. Connect Frequency Counter to TP5.	L23	10.6950MHz \pm 10Hz
USB OSC	Set radio to CH 1 BAND G AM TX mode. Connect Frequency Counter to TP5. Set VR6 fully clockwise	L24	10.6925MHz \pm 10Hz
LSB OSC	Set radio to CH1 BAND G AM TX mode.Connect Frequency Counter to TP5. Set VR6 back to mid position when finished.	L25	10.6975MHz \pm 10Hz

4.1.2 TRANSMITTER ALIGNMENT

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
BIAS Current	Set radio to CH 1 BAND G USB TX mode. Modulation Off. Set VR10,11 fully clockwise Set VR12 fully anticlockwise. Remove “short PCB” from TP7, TP8, TP9. Connect current meter to TP7(+) and TP9 (-) Connect current meter to TP7(+) and TP8 (-) Connect current meter to TP7(+) and TP8,TP9(short) (-)	VR12 VR10 VR11	50 mA 50 mA 100mA

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
SSB APC	Set radio to CH 19 USB RX mode. Connect Multi-meter to TP7.	VR17	12.5 VDC
SSB TX Power	Connect “short PCB” to TP7 and TP9. Connect RF Power Meter to antenna jack. Set radio to CH 1 BAND G USB TX mode. AF signal 30mV, 1 KHz to microphone. Set RF PWR fully clockwise. Set MIC GAIN fully clockwise.	L40,L42, L43,L44	MAX > 28W Spurious Emission Minimum. Balance Power Between CH1 A and CH40 L.
SSB ALC	Set radio to CH 1 BAND G USB TX mode. AF signal 30mV, 1 KHz to microphone.	VR13	25 W
SSB Carrier Balance	Set radio to CH 1 BAND G USB TX mode. Set MIC GAIN fully counter-clockwise. Connect Oscilloscope to antenna connector.	VR6	Spurious Emission to Minimum.
AM TX High Power	Set radio to CH 1 BAND G AM TX mode. Modulation Off. Set RF POWER fully clockwise.	VR14	10 W
AM TX Low Power	Set RF POWER fully counterclockwise.	VR18	1W±0.5W
RF Power Meter	Set radio to CH 1 BAND G AM TX mode. Set RF POWER fully clockwise. Set SWR/MOD/PWR Switch to PWR position.	VR9	For a needle reading of “red-green” on TX PWR scale.
AM Modulation	Set radio to CH 1 BAND G AM TX mode. AF signal 30mV, 1 KHz to microphone. Set MIC Gain fully clockwise.	VR16	For a needle reading of 90% on the external modulation meter.
FM Modulation	Set radio to CH 40 BAND L FM TX mode. AF signal 30mV, 1 KHz to microphone. Set MIC Gain fully clockwise.	VR5	For a needle reading of 4.8K on the external modulation meter.
SWR Meter	Set radio to CH 1 BAND G AM TX mode. Connect 100Ω Load to ANT Set S/RF/SWR/CAL Switch to SWR position	VR1(SWR PCB)	For a needle reading of 2 on the SWR scale.
CW	Set radio to CH 1 BAND G CW mode. CW Key on	VR8	Audio Output 200±20 mV

4.1.3 RECEIVER ALIGNMENT

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
AM Sensitivity	Set radio to CH 40 BAND F RX mode. Set RF GAIN Fully Clockwise. Set SQ Fully Counter Clockwise. Set VOL Control at 2 o'clock. Set NB/ANL switch to OFF position. Set CLARIFIER Control to 12 o'clock. Connect RF SG to antenna jack Frequency 26.955 MHz, 1uV. Mod 30%.	L2,L3,L5,L6, L7,L8,L9,L10	Audio Output > 2V S/N > 10 dB.
	Set radio to CH 40 L AM RX mode. RF SG setting 29.655 MHz. Set radio to CH 1 A AM RX mode. RF SG setting 24.265 MHz.	L5,L6,L7	For Balance Between CH 1 A and CH 40 L.
USB Sensitivity	Set radio to CH40 BAND F USB RX mode. Set VOL Control Fully Clockwise. RF SG setting 26.956 MHz, 0.25uV. Mod off.	L11,L12	Audio Output > 2V S/N > 10dB.
LSB Sensitivity	Set radio to CH40 BAND F LSB RX mode. Set VOL Control Fully Clockwise. RF SG setting 26.954 MHz, 0.25uV. Mod off.	L11,L12	Audio Output > 2V S/N > 10dB.
FM Sensitivity	Set radio to CH40 BAND F FM RX mode. Set VOL Control Fully Clockwise. RF SG setting 26.955 MHz, 1mV. Mod 3K. RF SG setting 26.955 MHz, 0.5uV. Mod 3K	L4	Audio Output MAX > 5V S/N > 10dB.
NB Adjust	Set radio to CH 39 F AM RX mode RF SG setting 26.955 MHz, 1000uV. Mod off. Set NB/OFF switch to ON position. Connect Multi-meter to TP1 (D2 cathode).	L1	DC Voltage to max. (> 2.0V)
AM Squelch	Set radio to CH 40 BAND F AM RX mode. Set SQ Control Fully Clockwise. RF SG setting 26.955 MHz, 1mV. Mod 30%.	VR4	Adjust very slowly until squelch just closes.
SSB Squelch	Set radio to CH 40 BAND F USB RX mode. Set SQ Control Fully Clockwise. RF SG setting 26.966 MHz, 1 mV. Mod off.	VR3	Adjust very slowly until squelch just closes

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
AM S-Meter	Set radio to CH 40 BAND F AM RX mode. RF SG setting 26.955 MHz, 100uV. Mod 30%.	VR1	For a reading of “9” on the “S” scale.
SSB S-Meter	Set radio to CH 19 USB RX mode. RF SG setting 26.966 MHz, 100uV. Mod off.	VR2	For a reading of “9” on the “S” scale

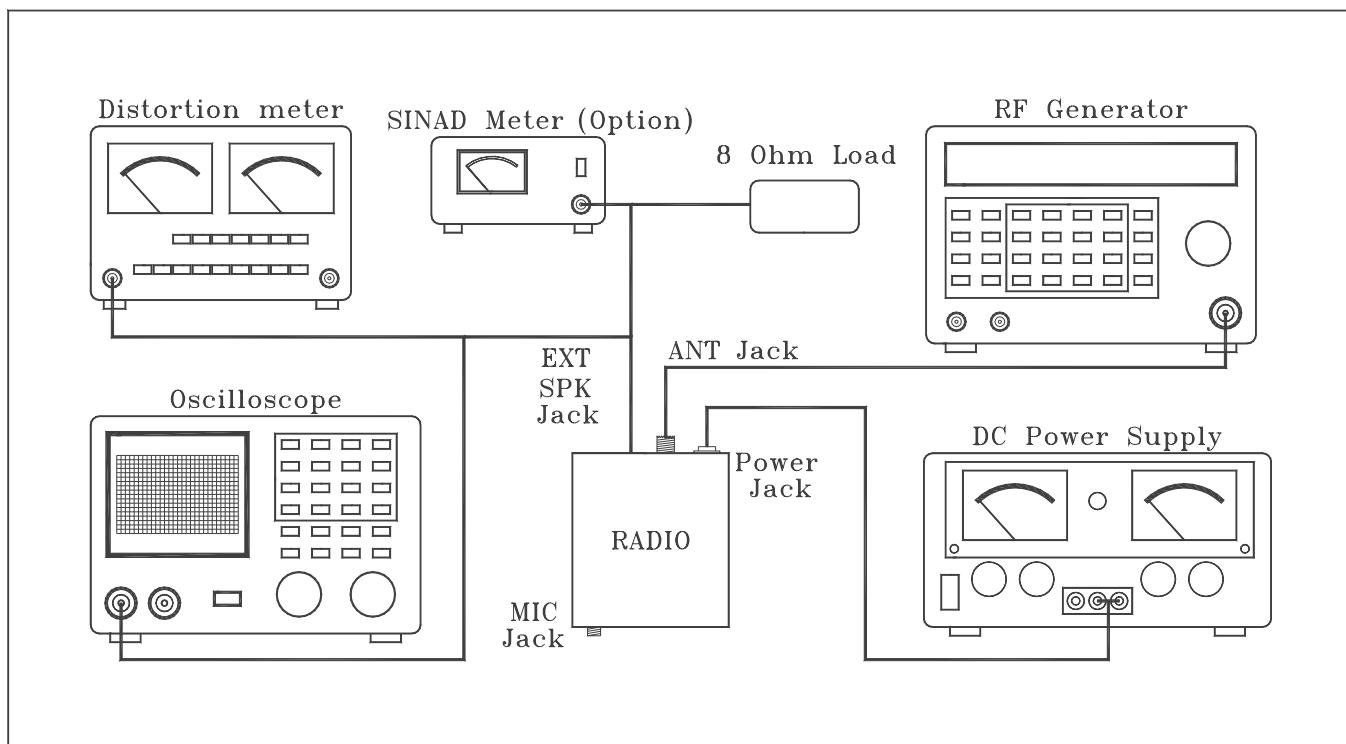


Figure 4.1.2 Transmitter test setup

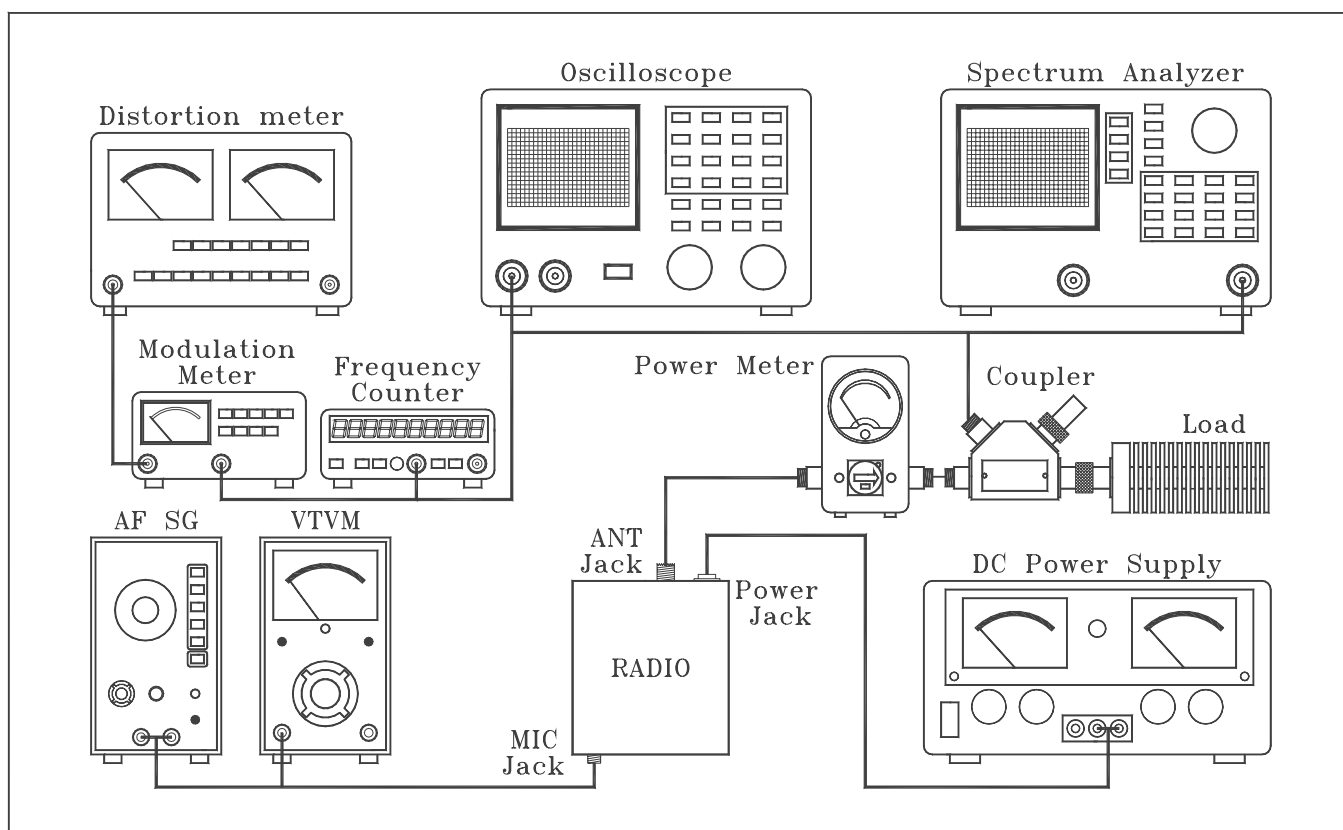
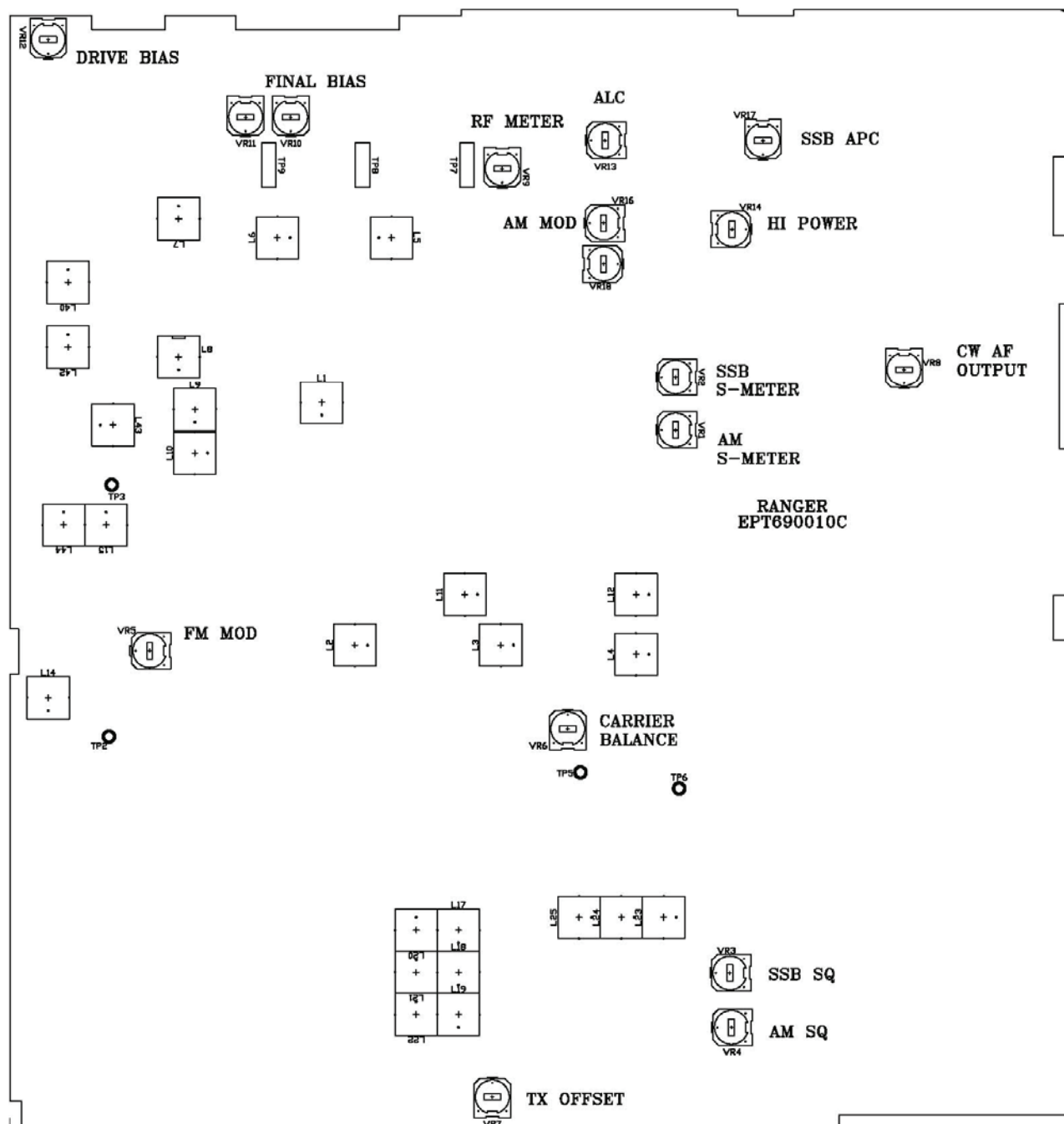


Figure 4.1.3 Receiver test setup

SS-158EDX (B) MAIN PCB ADJUSTMENT LOCATION



CHAPTER 5

MAINTENANCE

5.0 PRECAUTIONS

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

- (i) Never key the transmitter unless an antenna or suitable dummy load is connected to the antenna receptacle.
- (ii) Ensure that the input voltage does not exceed 16 VDC or fall below 11.
- (iii) Transmitting over long periods can cause heat built-up and cause transmitter damage.

5.1 PERIODIC INSPECTION

This unit is aligned at the factory to deliver maximum performance. However, continued performance cannot be expected without periodic inspection and maintenance. Important points to be checked regularly are as follows;

Check Item	Action
Whip antenna (option)	If cracked or broken, replace it.
Coaxial cable	If sheath is cracked or immersed in water, install new coaxial cable.
Coaxial & power plug connections	If loosened, reconnect. If corroded, clean contacts.
Battery connection	If corroded, clean power terminals.
Ground terminal	If corroded, clean terminal.

5.2 FUSE REPLACEMENT

To protect the equipment from serious damage, a fuse is provided on the power supply lines. The fuse protects against over voltage / reverse polarity or internal fault of the equipment. If the fuse has blown, first find out the cause of the trouble before replacing it. A fuse rated for more than the transceiver requirement should not be used, since it may permanently damage the equipment. Damage due to over fusing is not covered by the warranty.

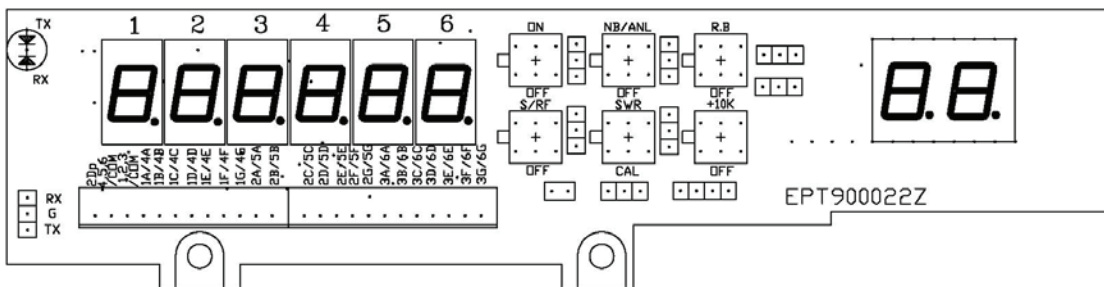
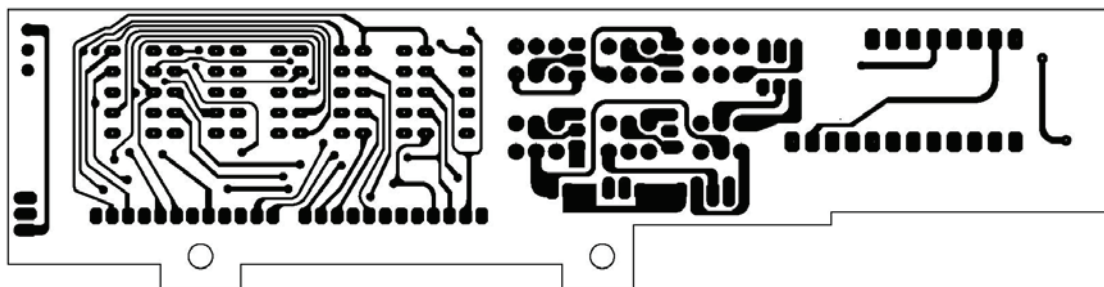
CHAPTER 6

DIAGRAMS & PARTS LIST

6.0 GENERAL

Information on most electrical and mechanical parts is included in the parts list. The reference designators are in alphanumeric order.

A stylized graphic of a circuit board, rendered in black and white. The design features a complex network of traces and components, including a large central block with a grid-like pattern, several smaller rectangular components, and a series of vertical lines on the right side. The overall shape is elongated and horizontal, with a notched top edge.



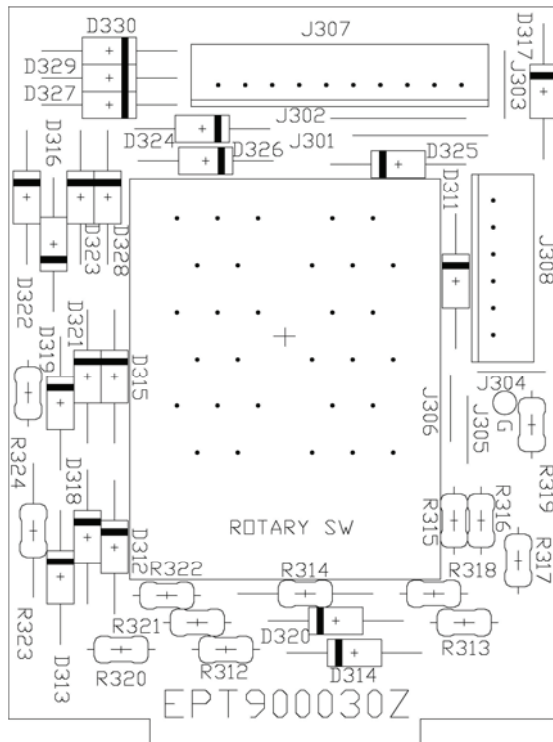
(COMPONENT SIDE)

PART LIST:

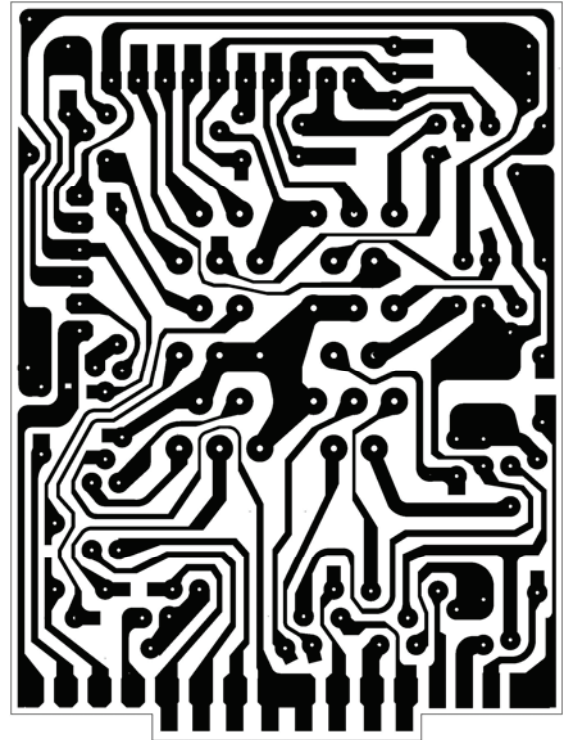
SS—158 EDX (B) DISPLAY P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT90022Z	DISPLAY PCB
2	CHANNEL DISPLAY	EX03N40521	LED DISPLAY
3	COUNTER DISPLAY	EX03N40516	BLUE LED DISPLAY
3	TX/RX LED	EX01N40004	RED/GREEN LED
4	TALKBACK ,HI/LOW, S-RF/SWR, NB/ANL/OFF, ROGER BEEP, +10KHz	EWPS33033X	PUSH SW
5	CN1,CN2	EX07N48928	PCB CONNECTOR/S 12P
6	J10,+10K.S/F	EX07N48223	PCB CONNECTOR/S 2P
7	J2,J5,J6	EX07N48350	PCB CONNECTOR/S 3P
8	J13	EX07N48490	PCB CONNECTOR/S 4P
9	RX/G/TX	EX07N48947	PCB CONNECTOR/S 3P

SS—158(B) EDX ROTARY SWITCH PCB (EPT900030Z)



(COMPONENT SIDE)

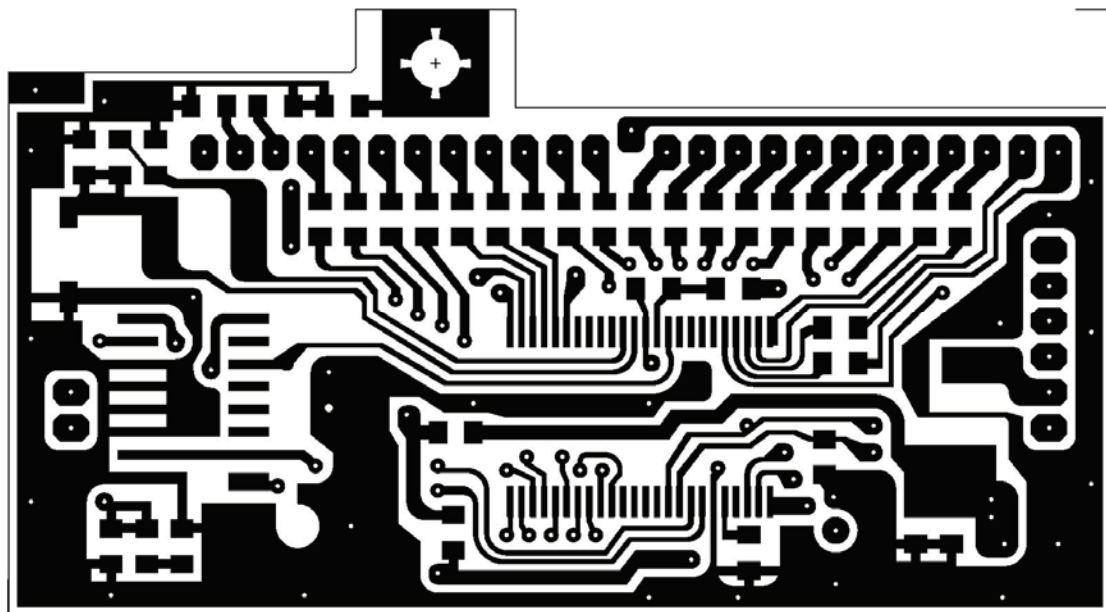


(COPPER SIDE)

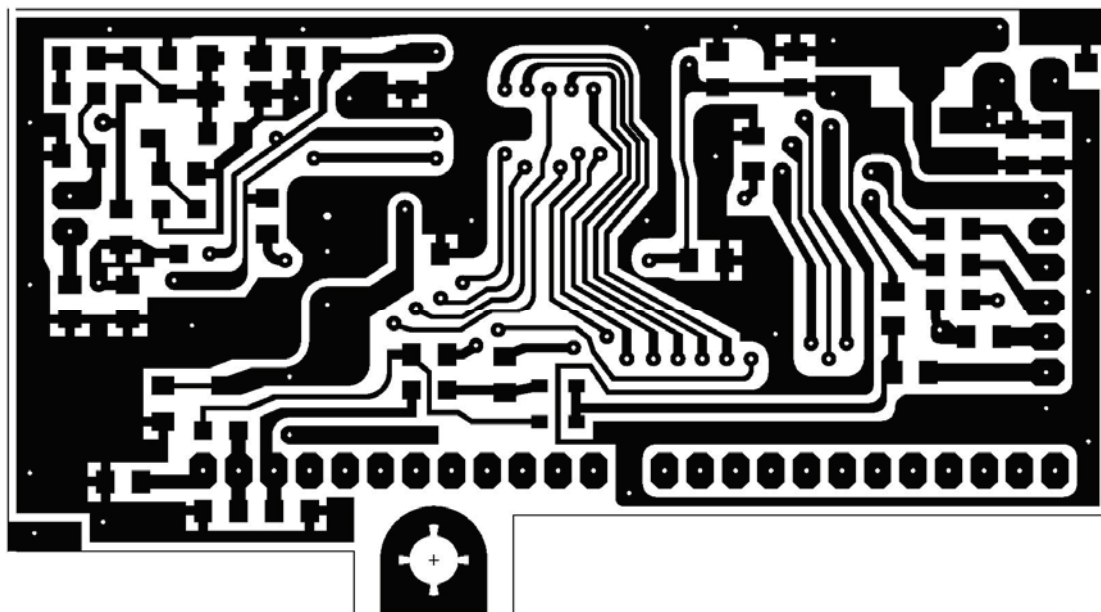
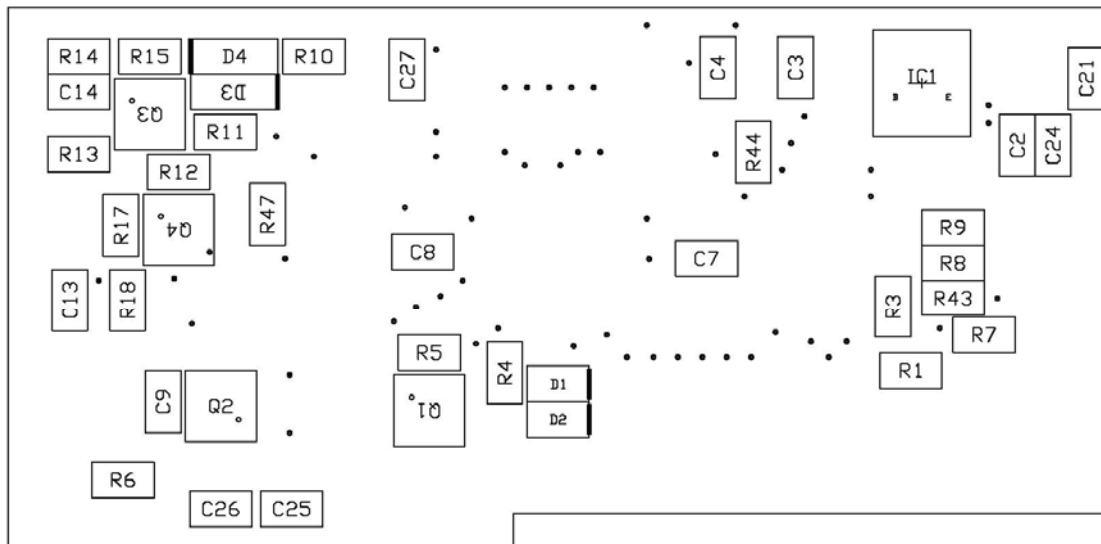
PART LIST:

SS—158 EDX (B) ROTARY SWITCH P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT900030Z	
2	R315(BLUE)	RCP161024Z	1K OHM 1/16W P
3	R312,313,314,316-324(BLUE)	RCP161524Z	1.5K OHM 1/16W P
3	J303,304,305,306	WX01070705	JUMPER WIRE 7x5x7
4	J308	WX01070708	JUMPER WIRE 7x8x7
5	J301,J302,D311,D312,D313,D314,D315,D316,D323,D324,D325,D326	WX01070710	JUMPER WIRE 7x10x7
6	J307	EX07N48209	PCB CONNECTOR/S 10P
7	ROTARY SWITCH	EWRT32000S	GPS-0501



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(COPPER SIDE)

PART LIST:

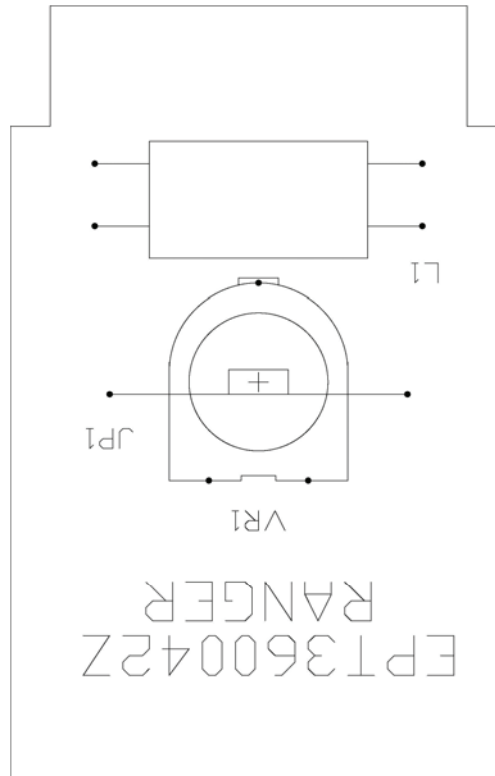
SS—158 EDX (B) COUNTER P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT900043Z	COUNTER P.C.B
2	R2,16	RCY014704Z	47 OHM 0.1W
3	R10	RCY011014Z	100 OHM 0.1W
3	R10,29,30,31,32,33,34,35,36,37,38,39,40,41	RCY012214Z	220 OHM 0.1W
4	R18,21-41	RCY013314Z	330 OHM 0.1W
5	R14,46	RCY011024Z	1K OHM 0.1W(0805)
6	R1	RCY012724Z	2.7K OHM 0.1W
7	R4,5	RCY014724Z	4.7K OHM 0.1W
8	R3,7,8,9,11,13,43,44,45	RCY011034Z	10K OHM 0.1W(0805)
9	R15	RCY013934Z	39K OHM 0.1W
10	R20	RCY011044Z	100K OHM 0.1W
11	R19	RCY011054Z	1M OHM 0.1W
12	C7,8,9,11,12,14,15,20	CK1103AB6U	0.01UF 50WV M Z5U
13	C2,3,4,13,19,21,22,23,24,25,26,27	CK1104AB7R	0.1uF 50WV ZF 5V
14	C17	CK1150AB4A	15PF 50WV J CH
15	C1,5,10,16	CEM161077A	100UF 16WV H=5mm
16	IC1	YNJR78L05Z	NJM78L05-UA(SD)
17	IC2	YNPHHC161D	74HC161D 16PIN
18	IC3	YNRGFC04SP	48PINHT48R50A-48 (SMD)
19	X1	EYCAP04500	HC-49U 4.500MHz
20	D1,2	EDSS00355Y	1SS355
21	D3,4	ED1N04148Y	1N4148
22	Q4	TY2SA1162G	2SA1162GR-TE85L
23	Q1,2	TY2SC2712G	2SC2712GR-TE85L
24	Q3	TY2SC2714Z	2SC2714-TE85L
25	VC1	CV038200AY	TZC03P200A110 20PF
26	L1	YCTLI1073F	100UH TF J (4532)
27	CN2	EX07N48223	2P PH=2MM
28	CN1	EX07N48224	7P PH=2MM
29	CN3,CN4	EX07N48927	12P

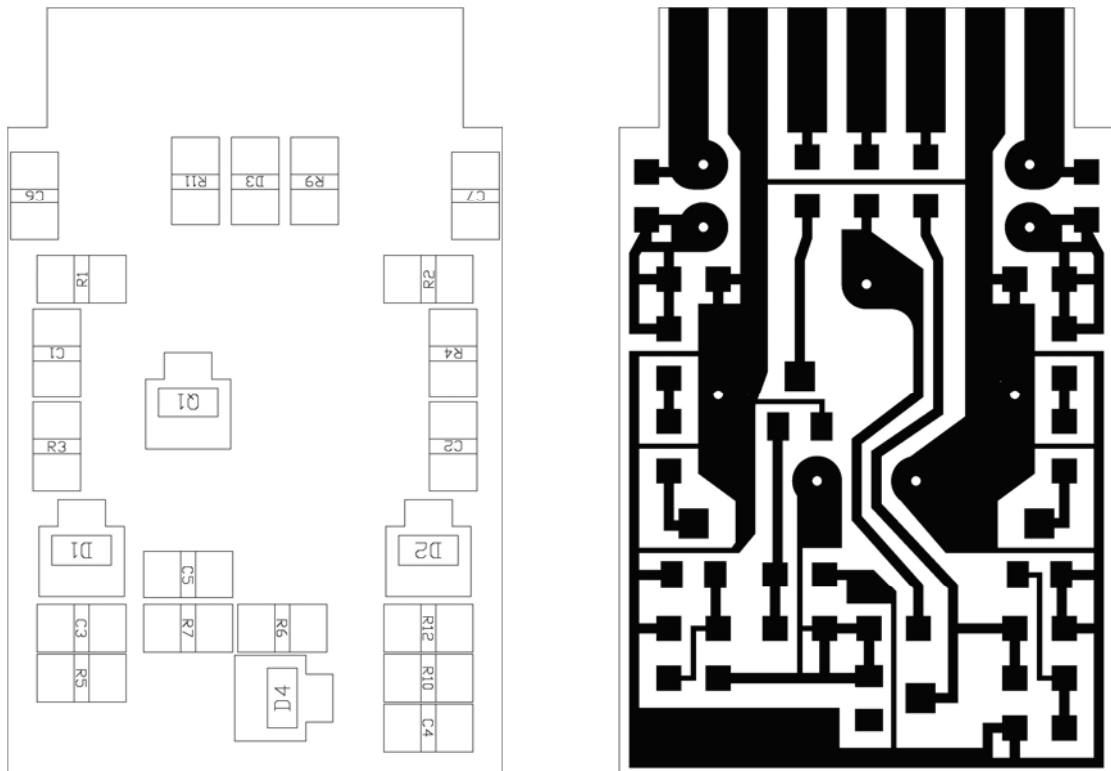
SS-158 EDX (B) VR P.C.B

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SS—158 (B) ANT PCB (EPT360042Z)



(COMPONENT SIDE)



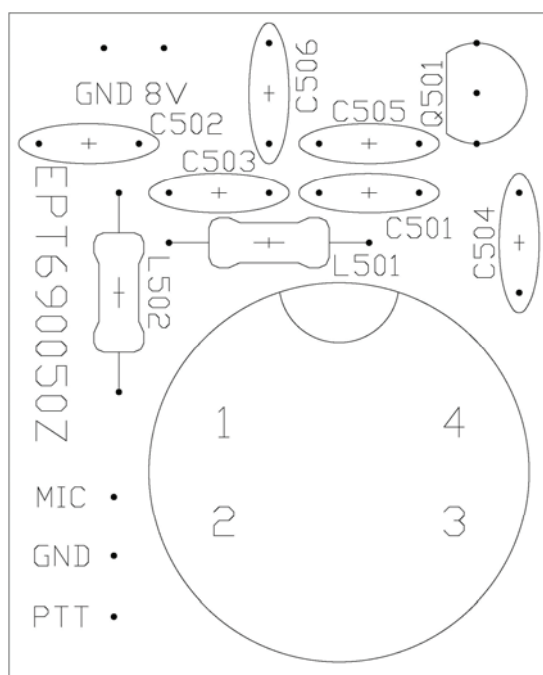
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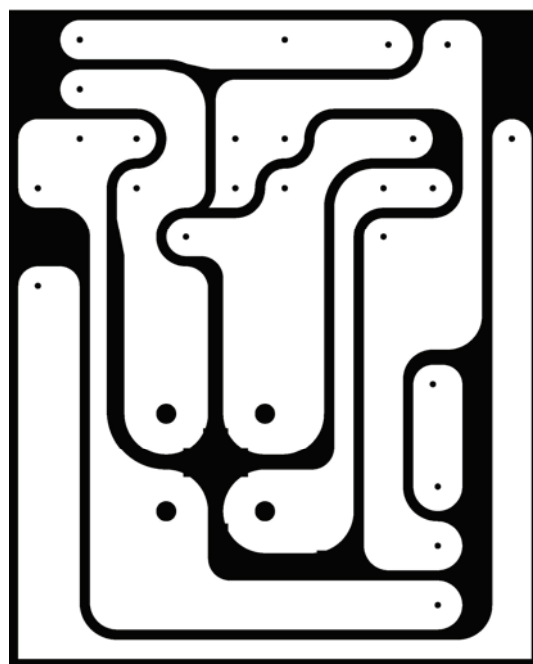
SS—158 EDX (B) ANT P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT360042Z	ANT PCB
2	R9	RCY010004Z	0 OHM 0.1W
3	R1	RCY014714Z	470 OHM 0.1W
3	R3,4	RCY011014Z	100 OHM 0.1W
4	R2	RCY013314Z	330 OHM 0.1W
5	R5,11	RCY011024Z	1K OHM 0.1W(0805)
6	R10,12	RCY012224Z	2.2K OHM 0.1W(0805)
7	R7,C5	RCY011034Z	10K OHM 0.1W(0805)
8	C7	CK1059AB1A	0.5PF 50WV C CH
9	C6	CK1030AB1A	3PF 50WV C CH
10	C3,4	CK2104AB7R	0.1UF 25WV Z Y5V
11	C1,2	CK1102AB7L	0.001UF 50WV Z SL
12	Q1	TY2SC2712G	2SC2712GR-TE85L
13	D3	EDSS00355Y	1SS355
14	D1,2	EDHM0198SY	HSM198S
15	D4	EDMA0028TY	MA28T
16	L1	ECRFZ10204	BF2159576
17	VR1	RE10300009	10K OHM L
18	JP1	WX01070715	7x15x7

SS—158 (B) MIC PCB (EPT690050Z)



(COMPONENT SIDE)



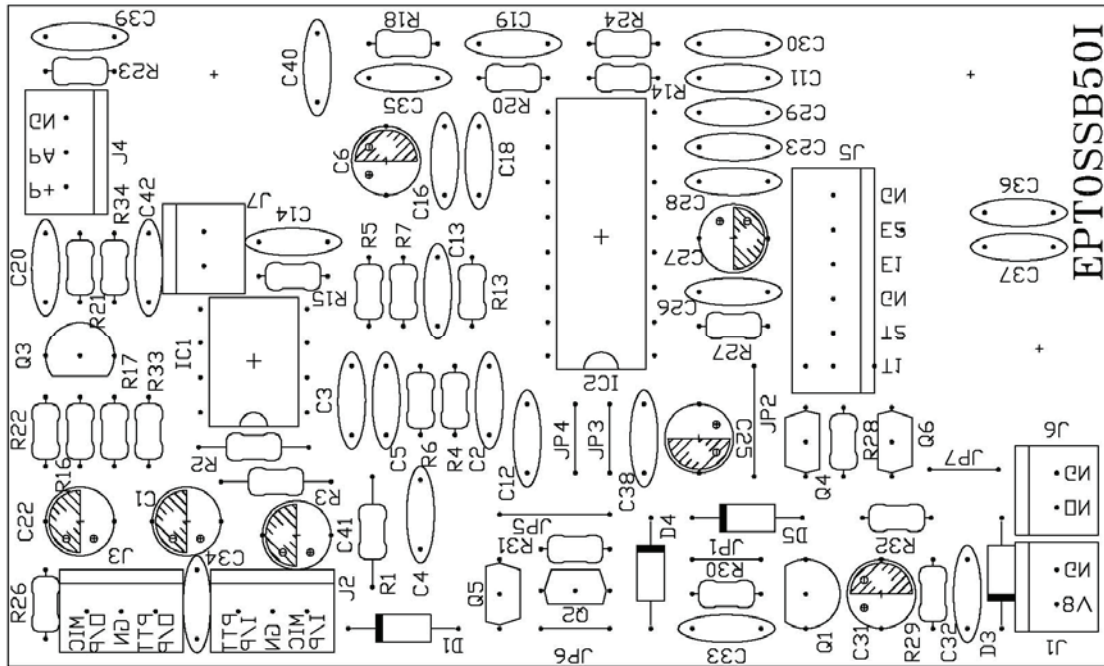
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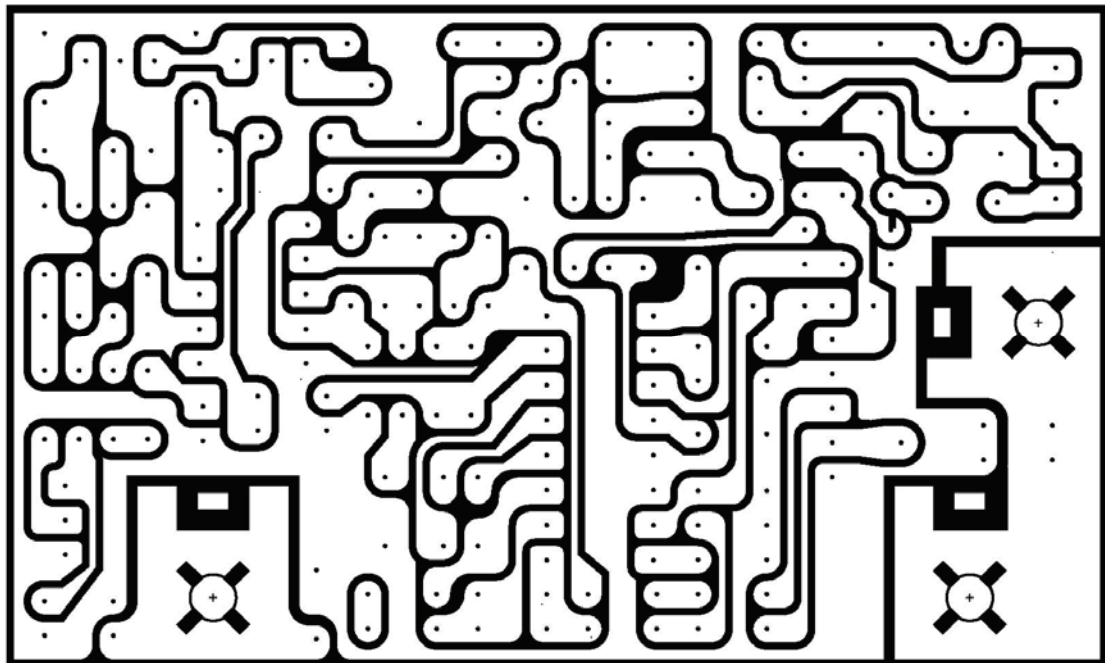
SS—158 EDX (B) MIC P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT6900050Z	MIC PCB
2	C502,503,504,501	CC0501027L	0.001UF 50WV SL Z
3	C505,506	CC0501037L	0.01UF 50WV SL Z
3	Q501	TDTA0124ES	DTA124ES
4	L501	ECCHK16001	5.6UH
5	L502	ECBAD18526	3.5x6x1.2
6	MIC seat	EX06N41020	SCS-16-4(R)
7	MIC-50I(J3)	EX07N48903	3P L=140MM PH=2.5

SS-158 (B) ECHO PCB (EPT0SSB50I)



(COMPONENT SIDE)



(COPPER SIDE)

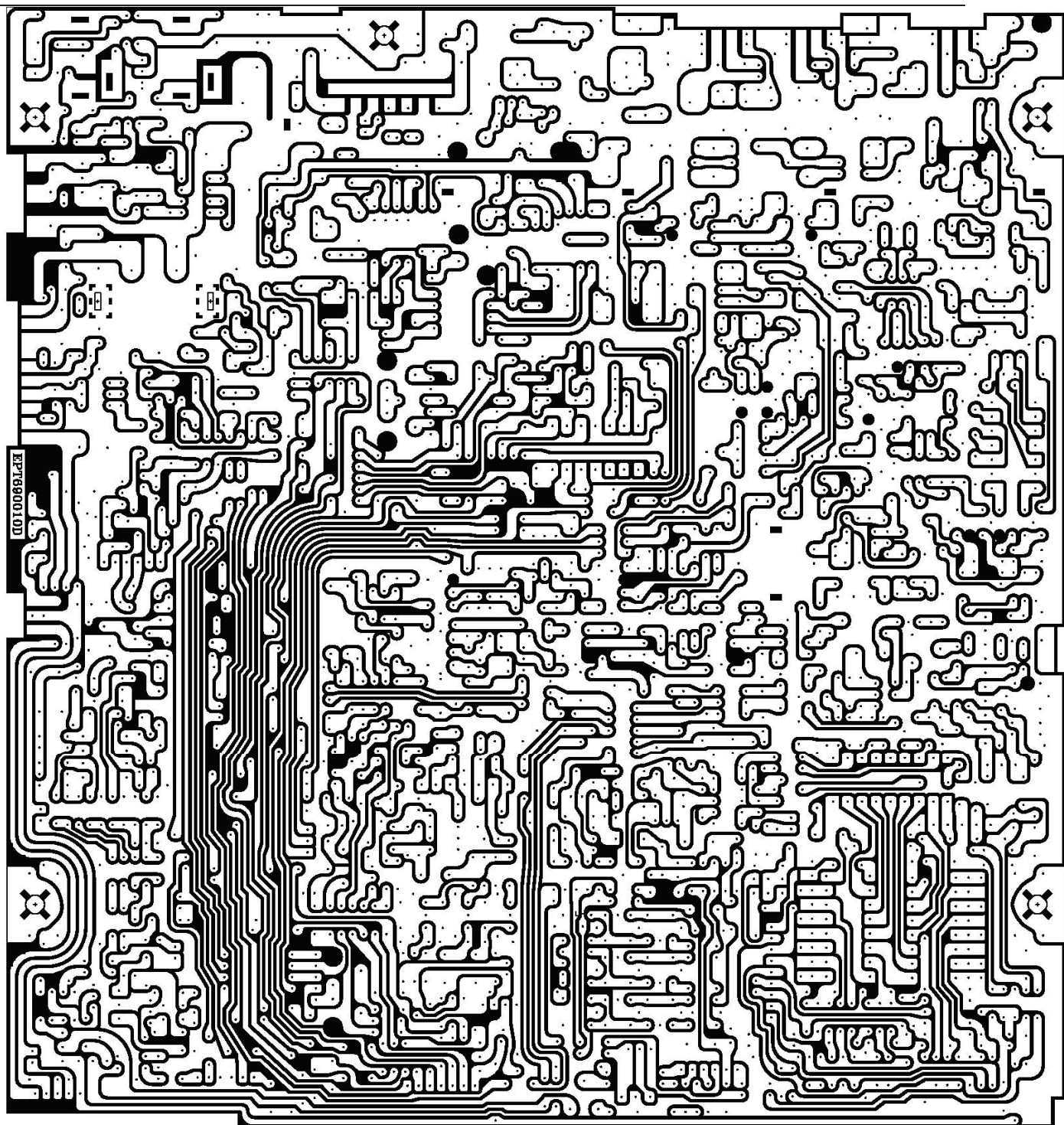
PART LIST:

SS—158 EDX (B) ECHO P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT0SSB50I	ECHO PCB
2	R3	RCM1610048	10 OHM 1/16W
3	R27	RCM1610145	100 OHM 1/16W
3	R17	RCM1610245	1K OHM 1/16 W
4	R7,16,26	RCM1622245	2.2K OHM 1/16W
5	R29,30	RCM1647245	4.7K OHM 1/16W
6	R22,23,24,32	RCM1610345	10K OHM 1/16W
7	R5,18,28	RCM1622345	22K OHM 1/16W
8	R1,2	RCM1622348	22K OHM 1/16W
9	R6,13,15	RCM1633345	33K OHM 1/16W
10	R14	RCM1639345	39K OHM 1/16W
11	R4,20,33,34	RCM1647345	47K OHM 1/16W
12	R21	RCM1610445	100K OHM 1/16W
13	R31	RCM1610545	1M OHM 1/16W
14	C26	CC0503315A	330PF 50WV CH
15	C5,13	CC0505615L	560PF 50WV SL
16	C12	CC0501027L	0.001UF 50WV SL
17	C4,19,23,34	CC0501037L	0.01UF 50WV SL
18	C2,3,20,28,29,30,32,33,,36,37 ,38,39,40,42	CC0501047L	0.1UF 50WV SL
19	C11	CC0501537L	0.015UF 50WV SL
20	C35	CC0502237L	0.022UF 50WV SL
21	C14	CC0502227L	0.0022UF 50WV SL
22	C16,18	CC0504737L	0.047UF 50WV SL
23	C6,25,41	CE0501057Z	1UF 50WV
24	C22	CE0502257Z	2.2UF 50WV
25	C1,31	CE0504757Z	4.7UF 50WV
26	C27	CE0164767Z	47UF 16WV
27	IC1	ENJR04558D	NJM4558D 8PIN
28	IC2	ENES56033E	ES56033E 16PIN
29	Q1,3	T2SC00945P	2SC945P
30	Q2,5,6	TDTC0124ES	DTC124ES
31	Q4	F2SK00118Z	2SK118
32	D1,4,5	ED1N04148Z	1N4148
33	D3	EDZD05569Z	5.6V 0.5W
34	J6,7	EX07N41226	2P T
35	J1	EX07N41330	2P T (UL)
36	J4	EX07N41216	3P T
37	J2,J3	EX07N41227	3P T (UL)

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
38	J5	EEX07N41266	6P T
39	JP1,3,4,6,7	WX01070705	7x5x7
40	JP2,5	WX01070708	7x8x7

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(COPPER SIDE)

PART LIST:

SS－158 EDX (B) MAIN P.C.B

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
	EPT690010D	MAIN PCB
R258	RCP160004Z	0 OHM 1/16W P
R246	RCM1647945	4.7OHM 1/16W
R267	RCM1615045	15 OHM 1/16W
R241,242	RCM1622045	22 OHM 1/16W
R281	RCM1633045	33 OHM 1/16W
R133,253	RCM1647045	47 OHM 1/16W
R130,220	RCM1656045	56 OHM 1/16W
R101	RCM1668045	68 OHM 1/16W
R3,5,8,30,33,76,95,26 0,174,204,259,263,JP2	RCM1610145	100 OHM 1/16W
R32,100,245	RCM1615145	150 OHM 1/16W
R23	RCM1618145	180 OHM 1/16W
R140,163	RCM1622145	220 OHM 1/16W
R31,99	RCM1627145	270 OHM 1/16W
R6,10,24,248,254	RCM1633145	330 OHM 1/16W
R141,188,250,268,280 ,293,299,298	RCM1647145	470 OHM 1/16W
R266	RCM1656145	560 OHM 1/16W
R4,50,89,209	RCM1668145	680 OHM 1/16W
R74	RCM1682145	820 OHM 1/16W

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
R36,67,98,115,116,27 0,271,118,123,136-138 ,143,144,154-156,160, 164,166,167,179,186,2 05,206,214,217,303,23 2,240,261,292,295,291 ,282	RCM1610245	1K OHM 1/16 W M
R88	RCM1612245	1.2K OHM 1/16W
R54,79,80,87,97,132,20 7,247,255,273,233	RCM1615245	1.5K OHM 1/16W
R9,25,28	RCM1627245	2.7K OHM 1/16W
R18,22,60,66,110,128, 191,129,171,274	RCM1633245	3.3K OHM 1/16W
R52,57	RCM1639245	3.9K OHM 1/16W
R26,35,84,165,190,19 5,196,199,200,131	RCM1647245	4.7K OHM 1/16W
R70,83,92,264,265	RCM1656245	5.6K OHM 1/16W
R14,40,41,82,127,148	RCM1668245	6.8K OHM 1/16W
R90	RCM1682245	8.2K OHM 1/16W
R1,13,17,37,38,56,65,68 ,86,142,153,159,161,29 4,168,173,175,181,202, 210,216,227,229-230,27 2,296,262,297,172	RCM1610345	10K OHM 1/16W
R109,178	RCM1612345	12K OHM 1/16W
R180	RCM1615345	15K OHM 1/16W
R91,187,208	RCM1622345	22K OHM 1/16W
R121	RCM1627345	27K OHM 1/16W
R2	RCM1633345	33K OHM 1/16W
R46	RCM1639345	39K OHM 1/16W

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
R7,29,61,63,96,126,14 9-151,157,185,236,224	RCM1647345	47K OHM 1/16W
R21,85,105,107	RCM1668345	68K OHM 1/16W
R45	RCM1682345	82K OHM 1/16W
R12,42-44,51,53,77,78 ,104,108,112,182,184, 221,225,256,257	RCM1610445	100K OHM 1/16W
R117,135,139,194,201	RCM1622445	220K OHM 1/16W
R49,170,176	RCM1627445	270K OHM 1/16W
R47,59	RCM1622448	220K OHM 1/16W
R55	RCM1627448	270K OHM 1/16W
R15,34,111,183,203	RCM1647445	470K OHM 1/16W
R113,213	RCM1647048	47 OHM 1/16W
R215	RCM1656048	56 OHM 1/16W
R11	RCM1668048	68 OHM 1/16W
R48	RCM1682445	820K OHM 1/16W
R106	RCM1610545	1M OHM 1/16W
R193	RCM1615545	1.5M OHM 1/16W
R124	RCM1610645	10M OHM 1/16W
VR18-J17	RCM164724A	4.7K OHM 1/16W
JP264	RCM142204A	22 OHM 1/4W
R243,244	RCM121514A	150 OHM 1/2W
R239	RCM121034A	10K OHM 1/2W
R81,169	RCM1610148	100 OHM 1/16W
R177	RCM1622148	220 OHM 1/16W
R16,300	RCM1633148	330 OHM 1/16W

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
R94	RCM1668148	680 OHM 1/16W
R62,64,72,237,238	RCM1610248	1K OHM 1/16W
R192	RCM1612248	1.2K OHM 1/16W
R251	RCM1615248	1.5K OHM 1/16W
R73,283	RCM1622248	2.2K OHM 1/16W
R58,219,277	RCM1633248	3.3K OHM 1/16W
R252	RCM1647248	4.7K OHM 1/16W
R275	RCM1682248	8.2K OHM 1/16W
R145,212,231,276	RCM1610348	10K OHM 1/16W
R218,234,235	RCM1647348	47K OHM 1/16M
R278	RCM1610448	100K OHM 1/16W
C79	CC0500501L	5PF 50WV SL
C1,49,119,122,14,279	CC0501004L	10PF 50WV SL
C76,195	CC0501804L	18PF 50WV SL
C36	CC0502704L	27PF 50WV SL
C24,287	CC0503304L	33PF 50WV SL
C8	CC0508204L	82PF 50WV SL
C4,53,70	CC0501015L	100PF 50WV
C137	CC0501515L	150PF 50WV SL K
C56,222	CC0501815L	180PF 50WV SL K
C28,220	CC0502215L	220PF 50WV SL K
C31,136	CC0502715L	270PF 50WV SL K
C11,14	CC0503315L	330PF 50WV SL K
C23	CC0505615L	560PF 50WV SL K

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
C197	CC0500591A	0.5PF 50WV CH
C52	CC0500201A	2PF 50WV CH
C190,286,225	CC0500301A	3PF 50WV CH
C61,62,90,226	CC0500501A	5PF 50WV CH
C108	CC0501004A	10PF 50WV CH J
C89	CC0501504A	15PF 50WV CH J
C43,224	CC0501804A	18PF 50WV CH J
C150	CC0502204A	22PF 50WV CH J
C84	CC0502704A	27PF 50WV CH J
C95	CC0503904A	39PF 50WV CH J
C202	CC0504704A	47PF 50WV CH J
C88,116,117	CC0506804A	68PF 50WV CH J
C192	CC0508204A	82PF 50WV CH J
C191,284	CC0501015A	100PF 50WV CH K
C194	CC0501515A	150PF 50WV CH K
C196,295	CC0501815A	180PF 50WV CH K
C139,141	CC0503904D	39PF 50WV RH J
C140	CC0501515D	150PF 50WV RH K
C130	CC0500401G	4PF 50WV UJ C
C281	CC0501015G	100PF 50WV UJ
C282	CC0501815G	180PF 50WV K
C128	CC0500602G	6PF 50WV UJ D
C124	CC0506804G	68PF 50WV UJ
C123	CC0501215G	120PF 50WV UJ

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
C86	CC0502715G C/C	270PF 50WV UJ
C85,201,203,209,210	CC0503915G	390PF 50WV UJ
C199	CD3005614Z MICA/C	560P 300WV J
C7,47,50,74,99,100,110,118,120,129,131,168,174,183,244,246	CC0501027L	0.001UF 50WV SL Z
C161	CC0501537L	0.015UF 50WV SL
C81,83,111,113,126,173,193,206,207,211-213,228,234,236,249,250,256,259,268,272,280,288,292,177,215,R302,C270	CC0501047L	0.1UF 50WV SL Z
C5,18,20,48,65,68,72,87,92,96,102,105,106,143,151,160,233,240,251-253,257,258,260-263,266	CC0504737L	0.047UF 50WV SL Z
C32,42,45,46,162,163,221,64	CC0504727L	0.0047UF 50WV SL
C155,166	CC0502237L	0.022UF 50WV SL
C200	CC1001037L	0.01UF 100WV Z
C2,3,6,9,15-17,19,25,51,57,58,60,63,66,69,73,109,114,121,127,133,134,135,138,142,145,146,164,165,167,189,205,216,217,219,229,230,232,247,254,255,265,267,269,271,277,278,285,188,184,223	CC0501037L	0.01UF 50WV SL Z
C149	CT0161046Z T/C	0.1UF 16WV M
C154	CT0162246Z T/C	0.22UF 16WV M
C97	CT0164746Z T/C	0.47UF 16WV M
C98	CT0162256Z T/C	2.2UF 16WV M

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
C112	CT0161056Z T/C	1UF 16WV M
C40,178,171,235	CM0501045Z M/C	0.1UF 50WV K
C26,27,77,237	CM0501024Z M/C	0.001UF 50WV J
C29,41,78,185	CM0501035Z M/C	0.01UF 50WV K
C39	CM0502235Z M/C	0.022UF 50WV K
C176	CM0504725Z M/C	0.0047UF 50WV K
C34	CM0504735Z M/C	0.047UF 50WV K
C12,30,101	CM0502225Z M/C	0.0022UF 50WV K
C10	CE0504747Z E/C	0.47UF 50WV Z
C67,75,153,157,170,1 86,198	CE0501057Z E/C	1UF 50WV Z
C148,159,214,242	CE0502257Z E/C	2.2UF 50WV Z
C38,103,182	CE0504757Z E/C	4.7UF 50WV Z
C13,21,22,44,82,115,1 32,158,172,275,276	CE0251067Z E/C	10UF 25WV Z
C80,169,181	CE0252267Z E/C	22UF 25WV Z
C33,37,144,175	CE0254767Z E/C	47UF 25WV Z
C107,156,238,293	CE0161077Z E/C	100UF 16WV Z
C152,179	CE0163377Z E/C	330UF 16WV Z
C91	CE0104777Z E/C	470UF 10WV Z
C243,248	CE0251087Z E/C	1000UF 25WV Z
C35	CEM254767Z E/C	47UF 25WV Z
FL1	EFCFW455HT	CFW-455HT
FL2	EFCFE107MX	SFE10.7MX RED
FL3	EFX8106952	10M4D(10.695M HZ)
X1	EYCAB10240	10.240MHZ 20PPM

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
X2	EYCAA15360	15.360MHZ 20PPM
X3	EYBAA12660	12.660MHZ 10PPM
X4	EYBAE10697	10.6975MHZ 10PPM
IC1	ENHI17324Z	HI17324 14PIN
IC6	ENRCI0612Z	RCI-612
IC3	ENRG145106	RCI-145106P 18PIN
IC4,5	ENMC14008B	MC14008BCP 16PIN
IC7	ENJR04558D	NJM4558D 8PIN
IC9(B107)	ENRCI6130A	RANGERRCI-61 30 14PIN
VCO	ENRG0IC090	(RANGER)IC090 10PIN
Q8,17,20	T2SC02786Z TR	2SC2786 NEC
Q51	T2SC02314F TR	2SC2314F
Q23,52	T2SC01906Z TR	2SC1906
Q26,36,59	TDTC0124ES TR	DTC124ES
Q24,43	TDTC0114ES T/R	DTC114ES
Q30,33,62	T2SA01282E TR	2SA1282AE
Q1,2,9,10-12,21,22,25, 27-29,46,50,61	T2SC02787Z TR	2SC2787 NEC
Q3-5,7,13-16,31,32,35 ,39,40-42,44,53,56-58	T2SC00945P TR	2SC945P
Q6,38	T2SA00733P TR	2SA733P
Q55	T2SA01869Z TR	2SA1869
Q34(B325)	TDTC0114GS TR	DTC114GS
Q18,19	FMOJ00310Z F.E.T	J310(MOTOROL A)
D5,6,25,63,67,75,78,8 9,90,91,92,93,96,115,1 27,131,33,144,151,102	ED1NM41488 DIODE	1N4148

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
D3,4,7-10,13-15,20-24 ,26-29,32,34-38,40,46- 48,50-58,60-62,66,68, 74,76,77,80,81,84-88,9 5,97,98,101,106,107,1 08,111-114,116-126,1 28-130,132-141,143,1 47,149,82,JP191,64 D1,2,11,12,30,31	ED1NM41485 DIODE	1N4148
D1,2,11,12,30,31	ED1N00060P DIODE	1N60P(2-1K60)
D110	ED1N04003Z DIODE	1N4003
D109	ED1N04007Z DIODE	1N4007
D16,17	EDSS00053Z DIODE	1SS53
D59,72,94	EDMA00027W DIODE	MA27W-A
D71,103,145	EDMA00027T DIODE	MA27T-A
D18,19,42,45,49,99,10 0,146,148	EDSV00251Z DIODE	SVC-251SPA
D70	EDZD05519Z	5.1V 0.5W
D73	EDZD05759Z	7.5V 0.5W
L2,3	ECIFT12002	I.F.T.
L6	ECIFT12290	I.F.T.
L17-22	ECIFT12012	I.F.T.
L25	ECIFT12013	I.F.T.
L23,24	ECIFT12016	I.F.T.
L1,11	ECIFT12252	I.F.T.
L44	ECIFT12255	I.F.T.
L9,10	ECIFT12256	I.F.T.
L12	ECIFT12257	I.F.T.
L15	ECIFT12258	I.F.T.

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
L43	ECIFT12265	I.F.T.
L40	ECIFT12262	I.F.T.
L14	ECIFT12558	I.F.T.
L5	ECIFT12253	I.F.T.
L7,42	ECIFT12440	I.F.T.
L8	ECIFT12492	I.F.T.
L4	ECIFT12526	I.F.T.
L26,27,45,46	ECCHK16003	470UH
T1	ECCHK16004	1.1MH EI-19
L33,34,37	ECCHK16070	22UH
L47	ECCHK16176	4.7UH 2.4mm
L16	ECCHK16246	22UH 2.4MM
L28	ECSPG18003	0.8x6.5x7.5t
L30	ECSPG18077	0.8x6x6.5t
L29	ECSPG18075	0.8x6x8.5t
L31(B353)	ECSPG18412	1.0x6.5x7.5tmm
L35	ECSPG18090	0.8x3x4t
L38	ECRFZ10048	25UH
L13,39,41	ECBAD18526	3.5x6x1.2
R249(2314F)	ECBAD18506	3.5x6x1.2
VR7,8,12,16	RE10200041	1K VM6CK PV(1S)
VR13,14	RE50200042	5K VM6CK PV(1S)
VR1,2,5,6,17	RE10300078	10K OHM
VR9	RE10400043	100K VM6CK PV(1S)

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
VR3,4	RE50400087	500K OHM
VR10,11	RE10100074	100 OHM(KVVSF6-63
RA101	RCS0870014	47K 8P
RA102	RCS0970015	47K 9P
RA103	RCS0670025	100K/200K 6P
Q60,J29	WX01070703	7x3MMx7
JP1-3,5,7-9,15,20,21,2 3,24,26,31-33,38,39,50 ,54-57,59,61,62,65,66, 71,72,79,80,82,83,86,8 7,90-93,100,105,106,1 13-115,118-122,124-1 26,128,135,138-142,14 4,190,149,152-157,159 ,160,163-166,168,170- 175,177-179,181-184, 188-189	WX01060605	6x5x6
P200-202,204,205,209 ,211,214,217,219,220, 224,226,231-233,235,2 36,238,239,242,243,24 5,250,252,253,255-260 ,262,263,265,271-273, 276,278-280,285,R19, R119,R305,J18,Q45,J P267,JP291,C245	WX01070705	7x5x7
JP6,10-13,16-19,22,27 ,28,34-37,40-49,51-53, 58,60,64,67,70,88,94-9 6,101-104,107-112,11 6,117,123,127,129-133 ,136,137,143,147,148, 150,151,158,161,162,1 67,169,176,195,196,19 8	WX01060610	6X10X6

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
JP215,218,222,223,22 5,227-230,234,240,241 ,244,246-249,251,254, 261,266,274,275,277,2 86,287,L36	WX01070710	7x10x7
JP69,75,77,78,81,193, 197	WX01070712	7x12x7
JP99	WX01070713	7x13x7
JP76	WX01070715	7x15x7
J501,502	EX06N41045	3.5mm
J10, J20, J22, J27, J7×2	EX07N48223	2P PH=2MM
J2,6,11	EX07N48350	3P PH=2MM
J3,21	EX07N48490	4P PH=2MM
J5	EX07N48222	5P PH=2MM
J9,13,14	EX07N48331	6P PH=2MM
J1	EX07N48543	9P
J12	EX07N41227	3P T (UL)
SP	EX07N41330	2P T (UL)
J4	EX07N49140	2P
J28	EX07N48151	SHORT PIN
TP2,3,5,6	EX07N48612	1PIN L=11.8
J28	EX07N48244	3P
TP7,8,9	XZZZ90006Z	PCB STOPPER



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