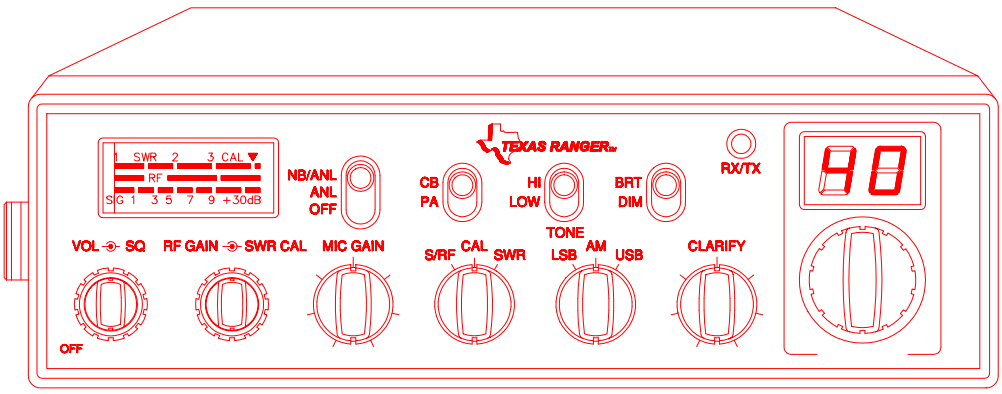
TEXAS RANGER™

CB Radios

TR-296GK / TR-296DX

Service Manual



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1.0 GENERAL

Model	TR-296GK / TR-296DX (B),(C)
Frequency Range	26.965 - 27.405MHz.
Emission Modes	AM/USB/LSB
Frequency Control	Phase Lock Loop (PLL) synthesizer.
Frequency Tolerance	± 0.005 %.
Frequency Stability	± 0.001 %.
Operating Temperature Range	-30°C to +50°C.
Microphone	Plug-in dynamic; with push-to-talk switch and coiled cord.
Input Voltage	13.8V DC nominal ±15%.
Current Drain: Transmit (AM full mod.)	<3.5A.
Current Drain: Receiver (Squelched)	<0.5A.
(Max. audio output)	<1.0A.
Antenna Connector	UHF, SO239.
Dimensions	2-3/8”(H) x 7-7/8”(W) x 9-1/4”(D).
Weight	5 lb.

1.1 TRANSMITTER

RF Power Output	AM : 4W ; USB/LSB : 12W PEP
RF Transmit Modes	AM/USB/LSB
Modulation	High and low level Class B, Amplitude Modulation: AM and SSB.
Spurious Emissions	-55 dB.
Carrier Suppression	-55 dB.
Audio Frequency Response	300 to 2500 Hz
Antenna Impedance	50 Ohms.
Output Indicators	Meter shows relative RF output power, signal strength and SWR. Transmit LED glows red when transmitter is in operation.

1.2 RECEIVER

Sensitivity For 10dB S/N (AM)	<0.5 μV.
Sensitivity For 10dB S/N (SSB)	<0.25 μV.
IF Frequency	AM: 10.695 MHz 1st IF, 455 KHz 2nd IF.
Image Rejection	-65 dB.
Adjacent Channel Selectivity	-60 dB.
RF Gain Control	45 dB adjustable for optimum signal reception.
Automatic Gain Control (AGC) Figure Of Merit	100 mV for 10 dB Change in Audio Output.
Squelch	Adjustable; threshold less than 0.5 μV.
Noise Blanker	RF type.
Audio Output Power	4 watts into 8 Ohms.
Audio Frequency Response	AM and SSB: 300 to 2500 Hz.
Built-in Speaker	8 Ohms, 5 Watts.
External Speaker (Not Supplied)	8 Ohms; disables internal speaker when connected.

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

CHAPTER 2

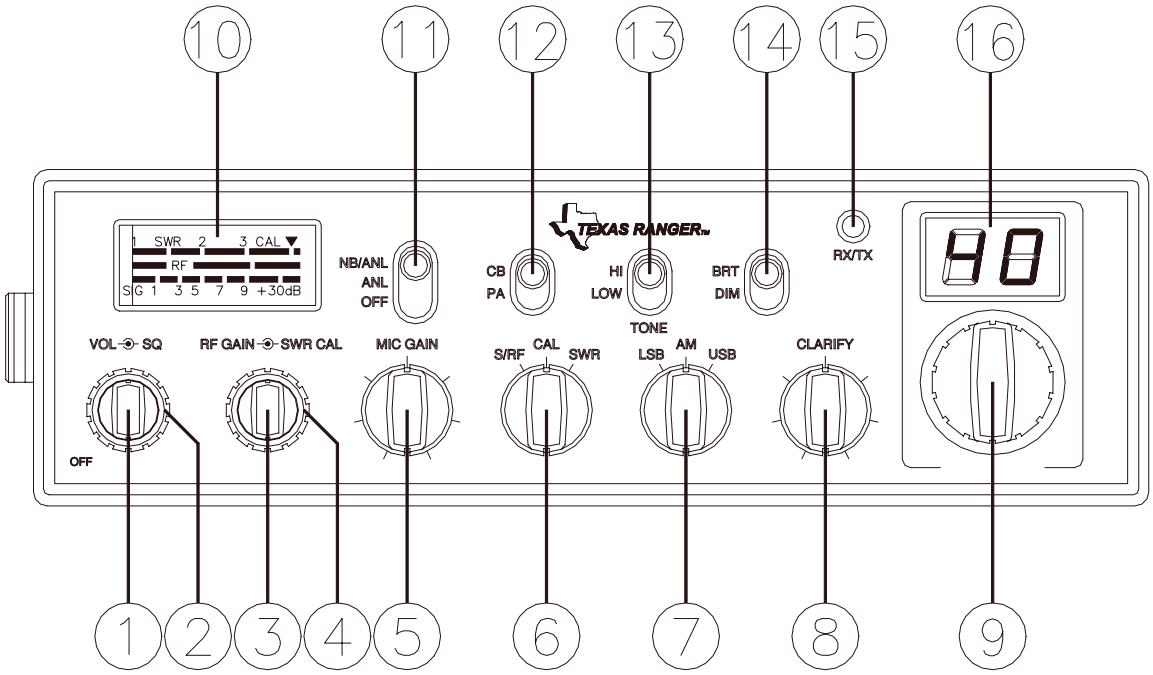


Figure 2-1 Front Panel

2.0 INTRODUCTION

This section explains the basic operating procedures for the TEXAS RANGER TR-296GK / TR-296DX mobile transceiver.

2.1 CONTROLS AND CONNECTIONS

2.1.1 FRONT PANEL

Refer to the above Figure 2-1 for the location of the following controls.

1. ON/OFF VOLUME CONTROL

Turn clockwise to apply power to the radio and to set the desired listening level.

2. SQUELCH CONTROL

This control is used to control or eliminate receiver background noise in the absence of an incoming signal. For maximum receiver sensitivity, it is desired that the control be adjusted only to the point where the receiver background noise is eliminated. Turn fully counter-clockwise, then slowly clockwise until the receiver noise disappears. Any signal to be received must now be slightly stronger than the average received noise. Further clockwise rotation will increase the threshold level which a signal must overcome in order to be heard. Only strong signals will be heard at a maximum clockwise setting.

3. RF GAIN CONTROL

This control is used to reduce the gain of the receive amplifier under strong signal conditions.

4. SWR CAL CONTROL
This SWR CAL control allows the user to calibrate the SWR meter.

5. MIC GAIN CONTROL
Adjusts the microphone gain in the transmit and PA modes. This controls the gain to the extent that full talk power is available several inches away from the microphone. In the Public Address (PA) mode, the control functions as the volume control.

6. S-RF/CAL/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 CAL position, the SWR meter can be calibrated by adjusting the SWR CAL control. When in the SWR position, the Standing Wave Ratio is measured.

7. MODE CONTROL
This control allows you to select one of the following operating modes: LSB/AM/USB.

8. CLARIFY CONTROL
Allows tuning of the receive frequency above or below the channel frequency by up to 1.5 KHz. Although this control is intended primarily to tune in SSB signals, it may be used to optimize AM signals.

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. NB/ANL/OFF SWITCH
In the ANL position, the automatic noise limiter in the audio circuits is activated. When the switch is placed in the NB/ANL position, the RF noise blanker is also activated. The noise blanker is very effective in eliminating repetitive impulse noise such as ignition interference.

12. CB/PA SWITCH
The CB is a normal operation of the radio. In the CB position, the PA function is disabled and the unit will transmit and receive on the speaker that is connected. In the PA position, the radio acts as a public address amplifier. Your voice will come out of the speaker that have plugged in to the PA. SP. jack on the rear panel. The radio does not operate when you are in the PA mode.

13. TONE HI/LO SWITCH
This switch is used to shape the tone of the received signal. In LO position, bass is increased and in HI position, treble is increased.

14. BRIGHT/DIM SWITCH
This switch controls the level of brightness for the meter lamp and channel display LED.

15. 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.

16. CHANNEL DISPLAY
The channel display indicates the current selected channel.

2.1.2 REAR PANEL
Figure 2-2 represent the location of the following connections:

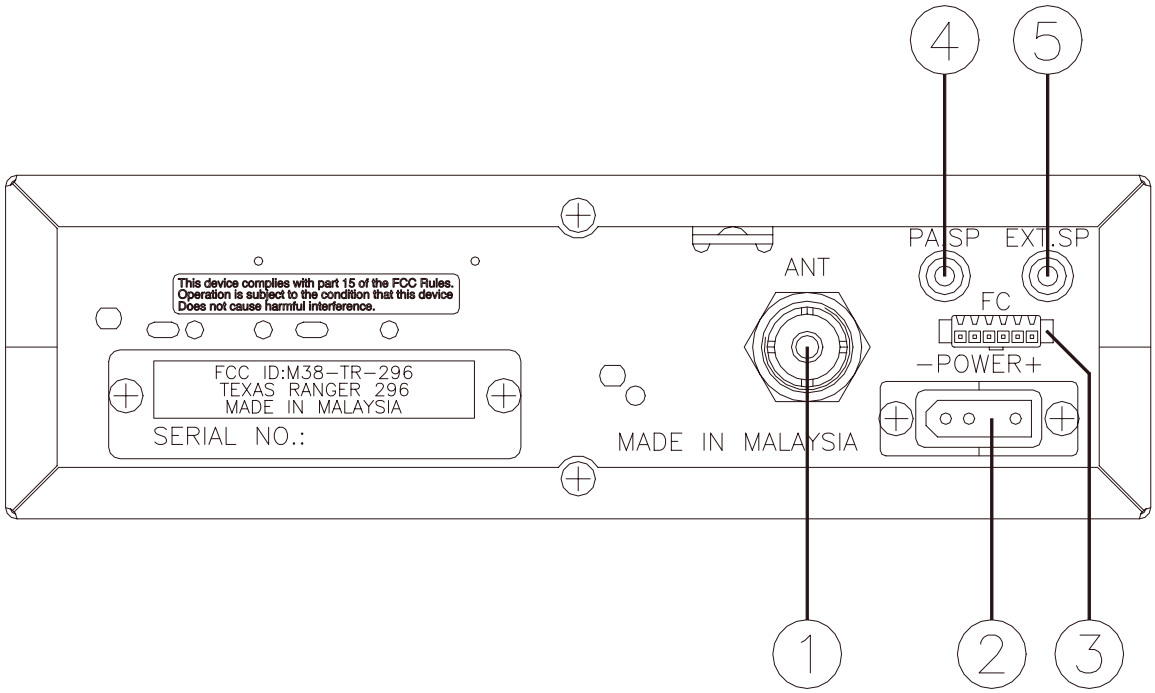


Figure 2-2 Rear Panel

1. ANTENNA
This jack accepts 50 ohms coaxial cable with a PL-259 type connector.

2. POWER
This connector 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 the red goes to positive.

3. FREQUENCY COUNTER CONNECTOR
This F. C. connector is used for an external frequency counter which indicates the frequency of the selected channel.

4. PA. SP.
This jack is for PA operation. Before operating, you must first connect a PA speaker (8 ohms, 4W) to this jack.

5. 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.

2.1.3 FREQUENCY CHART

CHANNEL	CHANNEL FREQUENCY	CHANNEL	CHANNEL FREQUENCY

1	26.965	MHz	21	27.215	MHz
2	26.975	MHz	22	27.225	MHz
3	26.985	MHz	23	27.255	MHz
4	27.005	MHz	24	27.235	MHz
5	27.015	MHz	25	27.245	MHz
6	27.025	MHz	26	27.265	MHz
7	27.035	MHz	27	27.275	MHz
8	27.055	MHz	28	27.285	MHz
9	27.065	MHz	29	27.295	MHz
10	27.075	MHz	30	27.305	MHz
11	27.085	MHz	31	27.315	MHz
12	27.105	MHz	32	27.325	MHz
13	27.115	MHz	33	27.335	MHz
14	27.125	MHz	34	27.345	MHz
15	27.135	MHz	35	27.355	MHz
16	27.155	MHz	36	27.365	MHz
17	27.165	MHz	37	27.375	MHz
18	27.175	MHz	38	27.385	MHz
19	27.185	MHz	39	27.395	MHz
20	27.205	MHz	40	27.405	MHz

2.2 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. The radio comes complete with a low impedance (500 ohm) dynamic microphone. For installation instructions of the microphone, see section 2.4 “ALTERNATE MICROPHONES AND INSTALLATION”.

2.3 OPERATION

2.3.1 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 unit on by turning **VOL** knob clockwise on transceiver.

3. Set the **VOL** to 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 receive gain.

8. Adjust the **CLARIFY** control to clarify the SSB signals or to optimize AM signals.

2.3.2 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.

2.4 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 a low output impedance characteristic. The microphones must be provided with a five-lead cable. The audio conductor and its shielded lead comprise two of the leads. The third lead is for receive control, the fourth is for grounding and fifth is for transmit control. The microphone should provide the functions shown in schematic below (Figure 2-3).

5 WIRE MIC CABLE

Pin Number	Mic Cable Lead
1	Audio Shield
2	Audio Lead
3	Receive Control
4	Grounding
5	Transmit Control

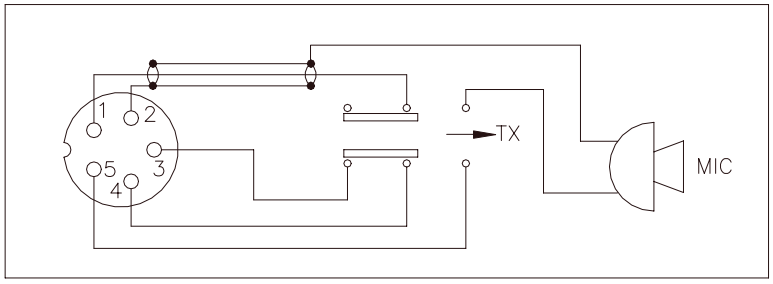


Figure 2-3 Transceiver Microphone Schematic

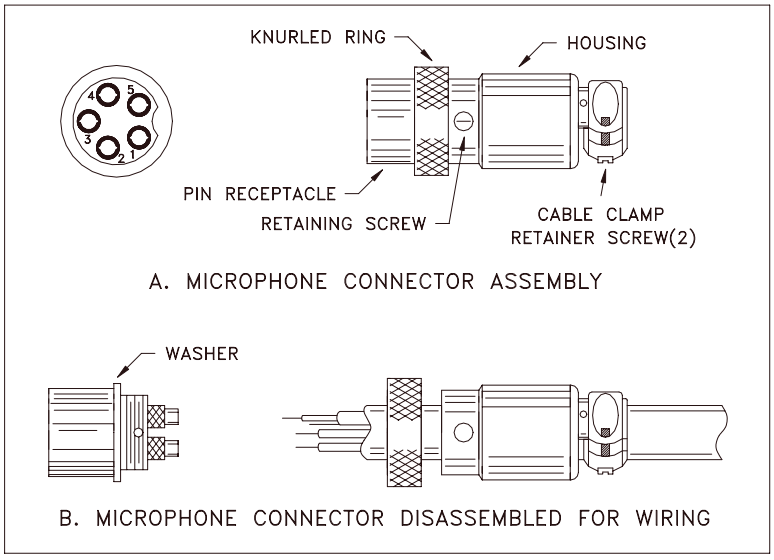


Figure 2-4 Microphone Plug Wiring

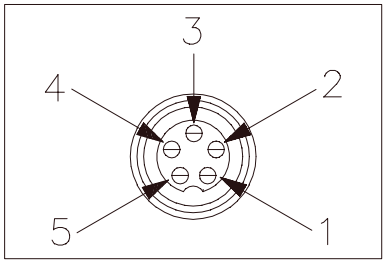


Figure 2-5 Microphone plug pin numbers viewed from rear of pin receptacle.

3.0 INTRODUCTION

This section explains the technical theory of operation for the TR-296GK / TR-296DX mobile transceiver.

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 IC1, IC2, TR20, TR29 and TR30. The PLL circuit is programmed by the rotary channel switch GPS-0668. The GPS-0668 communicates the correct binary data information to the programmable divider inside of IC1. IC1 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 receive signal comes into the radio via the antenna and into the first RF amplifier, TR14. The RF signal is fed into the mixer, TR15 and then into the AM IF section of the receiver (depending on the mode of operation). The signal is then detected by either the AM detector or product detector and then fed to the audio amplifier section of the receiver and finally out to the speaker.

3.3 TRANSMITTER MODULATION CIRCUIT

(i) 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 balanced modulator circuit.

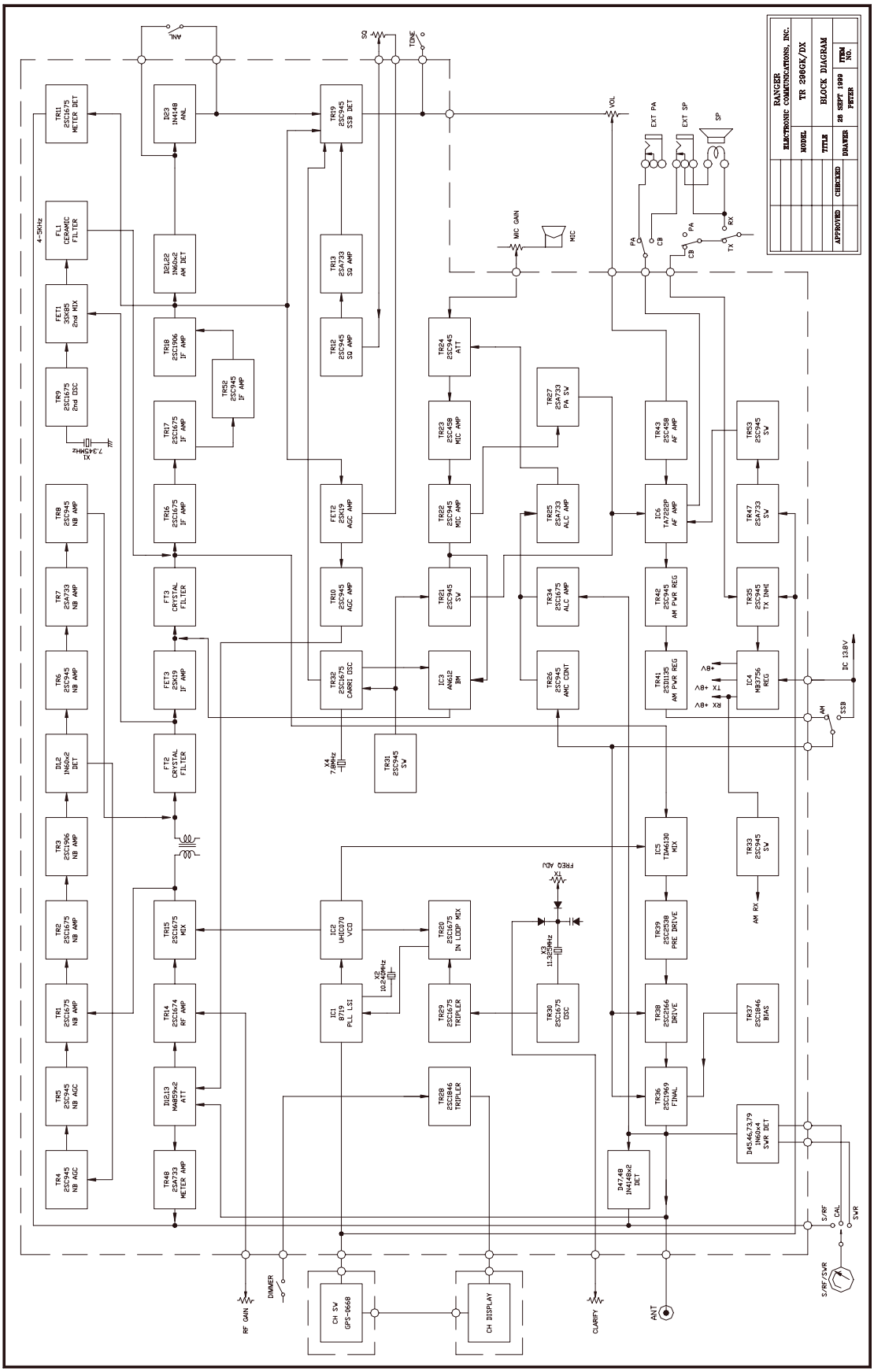
(ii) If the transceiver is in the AM mode, the AF amplifier controls the gain of the last RF amplifier which produces a true AM signal.

(iii) If the transceiver is in the SSB mode, the audio signal is mixed with 7.800MHz oscillator in IC3.

3.4 TRANSMITTER AMPLIFIER CIRCUIT

The transmitter takes the basic exciter signal from the TX mixer and amplifies it through a series of amplifiers consisting of TR39, TR38 and TR36 where it is sent out to the antenna connector.

TR-296GK/DX BLOCK DIAGRAM


RANGER
ELECTRONIC COMMUNICATIONS, INC.
MODEL
TR 296GK/DX
TITLE
BLOCK DIAGRAM
APPROVED
CHECKED
DRAWER
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PETER
ITEM NO.
ANL
SQ
TONE
VOL
EXT PA
EXT SP
SP
MIC GAIN
MIC
PA
CB
TX
RX
4-5KHz
TR11 2SC1675 METER DET
D23 1N4148 ANL
TR19 2SC945 SSB DET
FL1 CERAMIC FILTER
D21,22 1N60x2 AM DET
TR13 2SA733 SQ AMP
FE11 3SK85 2nd MIX
TR18 2SC1906 IF AMP
TR12 2SC945 SQ AMP
TR24 2SC945 ATT
TR9 2SC1675 2nd OSC
TR52 2SC945 IF AMP
X1 7.345MHz
TR17 2SC1675 IF AMP
TR27 2SA733 PA SW
TR23 2SC458 MIC AMP
TR43 2SC458 AF AMP
TR53 2SC945 SW
TR8 2SC945 NB AMP
TR16 2SC1675 IF AMP
FE12 2SK19 AGC AMP
TR22 2SC945 MIC AMP
TR25 2SA733 ALC AMP
IC6 TA7222BP AF AMP
TR47 2SA733 SW
TR7 2SA733 NB AMP
FT3 CRYSTAL FILTER
TR10 2SC945 AGC AMP
TR21 2SC945 SW
TR34 2SC1675 ALC AMP
TR48 2SC945 AM PWR REG
TR35 2SC945 TX INHI
TR6 2SC945 NB AMP
FET3 2SK19 IF AMP
TR32 2SC1675 CARRI OSC
IC3 AN612 BM
TR26 2SC945 AMC CONT
TR41 2SD325 AM PWR REG
IC4 MB3756 REG
+8V
TX +8V
RX +8V
DC 13.8V
AM
SSB
D1,2 1N60x2 DET
FT2 CRYSTAL FILTER
X4 7.8MHz
TR31 2SC945 SW
TR3 2SC1906 NB AMP
IC5 TA4420 MIX
TR33 2SC945 SW
FREQ ADJ
X3
TR2 2SC1675 NB AMP
TR15 2SC1675 MIX
IC2 UHC070 VCO
TR20 2SC1675 IN LOOP MIX
TR39 2SC2053 PRE DRIVE
AM RX
X2 10.240MHz
X2 11.325MHz
TR1 2SC1675 NB AMP
TR14 2SC1674 RF AMP
IC1 8719 PLL LSI
TR29 2SC1675 TRIPLER
TR30 2SC1675 OSC
TR38 2SC2166 DRIVE
TR37 2SC1846 BIAS
TR5 2SC945 NB AGC
D12,13 MA859x2 ATT
TR28 2SC1846 TRIPLER
TR36 2SC1969 FINAL
D45,46,73,79 1N60x4 SWR DET
TR4 2SC945 NB AGC
TR48 2SA733 METER AMP
D47,48 1N4148x2 DET
S/RF
CAL
SWR
S/RF/SWR
RF GAIN
DIMMER
CH SW GPS-0668
CH DISPLAY
CLARIFY
ANT

4.0 REQUIRED TEST EQUIPMENT

① DC Power Supply (13.8VDC, 10A)
② RF Wattmeter (25~60 MHz, 25W)
③ Multimeter
④ Automatic Modulation Meter
⑤ Audio Signal Generator
⑥ Frequency Counter (100 MHz)
⑦ RF Signal Generator (100 MHz)
⑧ Automatic Distortion Meter
⑨ Oscilloscope (50 MHz)
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 Transmitter Test Setup and Figure 4-2 Receiver Test Setup. These test setup are used in part or total during the following adjustments and refer to Figure 4-3 for adjustment location.

4.1.1 PLL ALIGNMENT

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
VCO Voltage	Set radio to CH 1, AM RX mode. Clarify setting in 12 o'clock position. Connect DC Voltmeter to TP9 (R207). Connect Oscilloscope to TP10 (R101). Connect Oscilloscope to TP1 (R106).	 L19 L21 L20	 2.5 VDC ± 0.1 CH 1 & CH 40 Max. Output and Balance.
AM Frequency	Set radio to CH 1, AM RX mode. Connect frequency counter to TP1 (R106).	L23	34.76500 MHz ± 20 Hz
LSB Freq.	Set radio to CH 1, LSB RX mode. Connect frequency counter to TP1 (R106).	L22	34.76350 MHz ± 20 Hz
USB Freq.	Set radio to CH 1, USB RX mode. Connect frequency counter to TP1 (R106).	L59	34.76650 MHz ± 20 Hz
TX Frequency	Set radio to CH 1, AM TX mode. Connect frequency counter to TP1 (R106).	VR5	34.76500 MHz ± 20 Hz
AM TX Freq.	Set radio to CH 19, AM TX mode. Set Mic Gain fully counter clockwise.	L31	27.18500 MHz ± 20 Hz
LSB TX Freq.	Set radio to CH19, LSB TX mode. Set Mic Gain fully clockwise. AF signal 25 mV, 1 KHz to microphone.	L30	27.18400 MHz ± 20 Hz
USB TX Freq.	Set radio to CH19, USB TX mode. Set Mic Gain fully clockwise. AF signal 25 mV, 1 KHz to microphone.	CT2	27.18600 MHz ± 20 Hz

4.1.2 TRANSMITTER ALIGNMENT

ITEM	U.U.T. SETTING	ADJUST POINT	MEASUREMENT
BIAS Current	Set radio to CH 19, USB TX mode. MOD off. Connect current meter to TP8 (+) and green lead wire (-). Connect current meter to TP7 (+) and violet lead wire (-).	 VR9 VR8	 30 mA 50 mA
AM TX Power	Set radio to CH 19, AM TX mode. Connect RF power meter to antenna jack. MOD off.	L48, L47, L46, L45, L38, L36 L38 VR10	RF Power Output MAX Balance Power between CH 1 and CH 40. 4W.
SSB ALC	Set radio to CH 19, USB TX mode. Set Mic Gain fully clockwise. AF signal 25 mV, 1 KHz to microphone.	VR11	12 W.
SSB Carrier Balance	Set radio to CH 19, USB TX mode. Connect Oscilloscope to L44 (TR39C). Mic Gain off.	VR4	Spurious Emission to minimum.
AM Modulation	Set radio to CH 19, AM TX mode. Set Mic Gain fully clockwise. AF signal 30 mV, 1 KHz to microphone.	VR7	95%
RF Power Meter	Set radio to CH 19, AM TX mode. MOD off.	VR6	Adjust RF Power meter needle until it is in-between the green and red bar on PWR scale.

4.1.3 RECEIVER ALIGNMENT

ITEM	SETTINGS	ADJUST	MEASUREMENT

		POINT	
AM Sensitivity	Set radio to CH 20, AM RX MODE. Clarify setting in 12 o'clock. Set RF gain fully clockwise. Set SQ fully counter clockwise. Set VOL control to 2 o'clock. Set NB/ANL to OFF position. Connect RF SG to antenna jack. Frequency 27.205 MHz, Level 1 uV. MOD 30%, 1KHz. Set radio to CH 40 AM mode. RF SG setting 27.405 MHz. Set radio to CH 1 AM mode. RF SG setting 26.965 MHz.	L13, L15, L3, L4, L5, L6, L7, L8, L9, L10	Audio output > 2V S/N > 10 dB
USB Sensitivity	Set radio to CH 20, USB RX mode. MOD off. Set VOL control fully clockwise. RF SG setting 27.206 MHz, Level 1 uV.	L12, L14	Audio output > 4.5V S/N > 20 dB
LSB Sensitivity	Set radio to CH 20, LSB RX mode. MOD off. VOL control fully clockwise. RF SG setting 27.204 MHz, Level 1 uV.	L12, L14	Audio output > 4.5V S/N > 20 dB
NB/ANL Adjust	Set radio to CH 20, AM RX mode. RF SG setting 27.205 MHz, Level 100 uV. MOD 30%, 1KHz. Set NB/ANL/OFF switch to NB/ANL. Connect Voltmeter to D2 (Cathode).	L1, L2	DC voltage to max. (>1.5V)
AM Squelch	Set radio to CH 20, AM RX mode. Set SQ control at fully clockwise. RF SG setting 27.205 MHz, Level 1 mV. MOD 30%, 1KHz.	VR3 Slowly	Adjust very slowly until quelch just open
AM S/RF Meter	Set radio to CH 20 AM RX mode. MOD off. Set S-RF/CAL/SWR switch to S/RF position. RF SG setting 27.205 MHz, Level 100 uV.	VR1	Meter needle to S9 on the S scale
SSB S/RF Meter	Set radio to CH 20, USB RX mode. MOD off. Set S-RF/CAL/SWR switch to S/RF position. RF SG setting 27.206 MHz, Level 100 uV	VR2	Meter needle to S9 on the S scale

Figure 4-1 Transmitter test setup

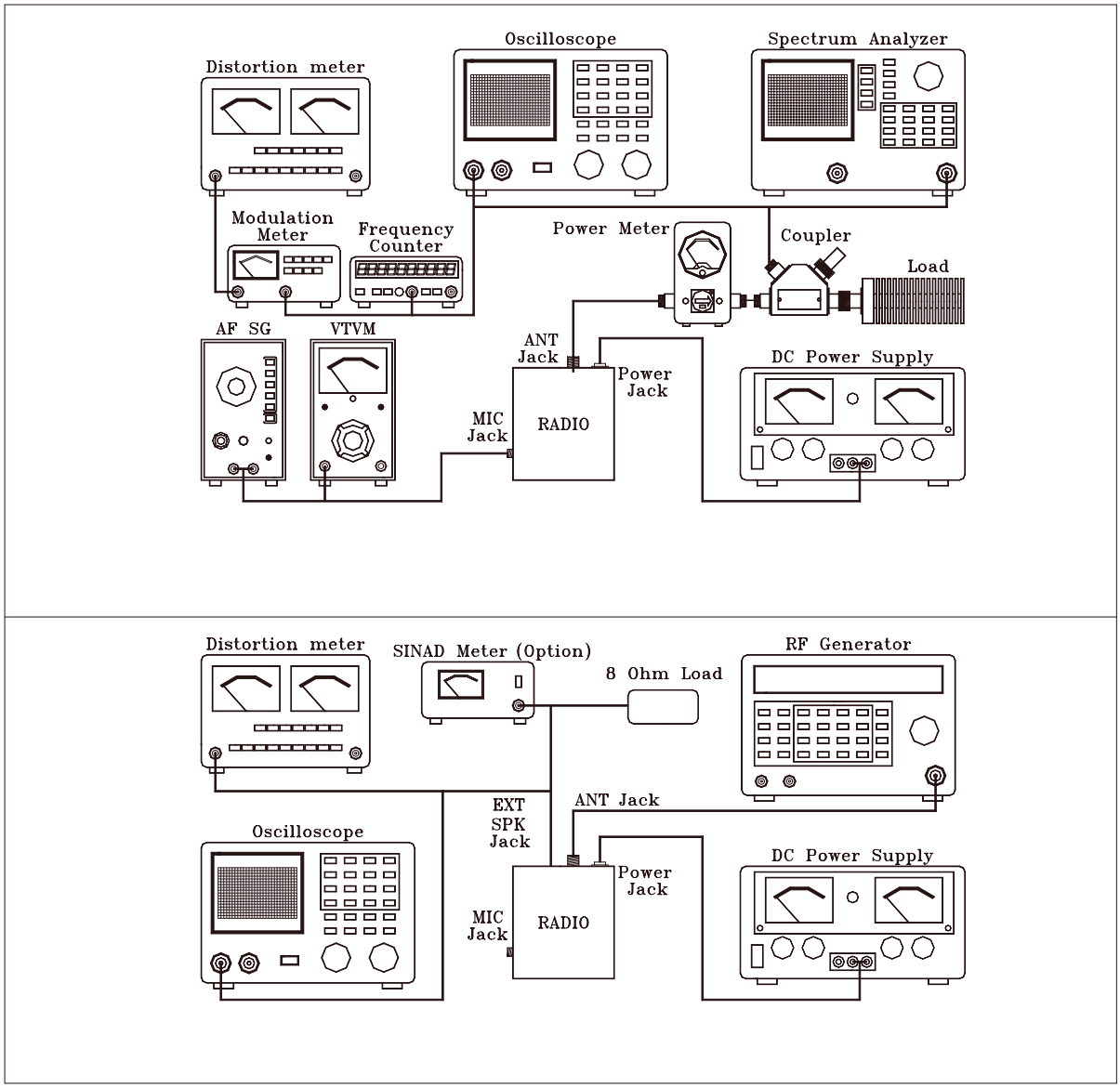


Figure 4-2 Receiver test setup

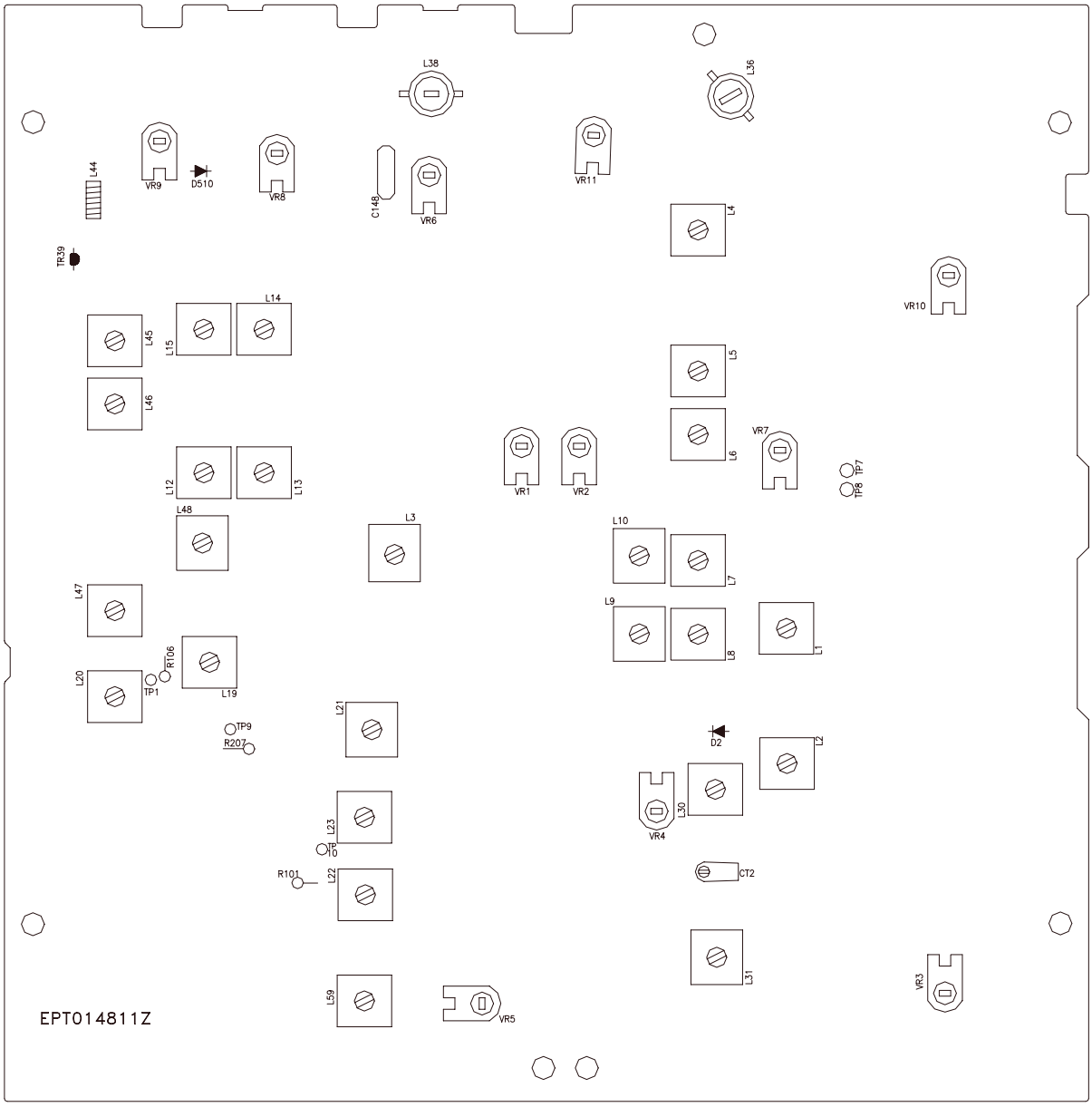


Figure 4-3 Main PCB Adjustment Location

CHAPTER 5

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 VDC.

(iii) During alignment, do not transmit for more than 10 seconds at a time. 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, seal with vinyl tape. If immersed with 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 protect against overvoltage / 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 4A should not be used, since it may permanently damage the equipment. Damage due to overfusing is not covered by the warranty.

6.0 GENERAL

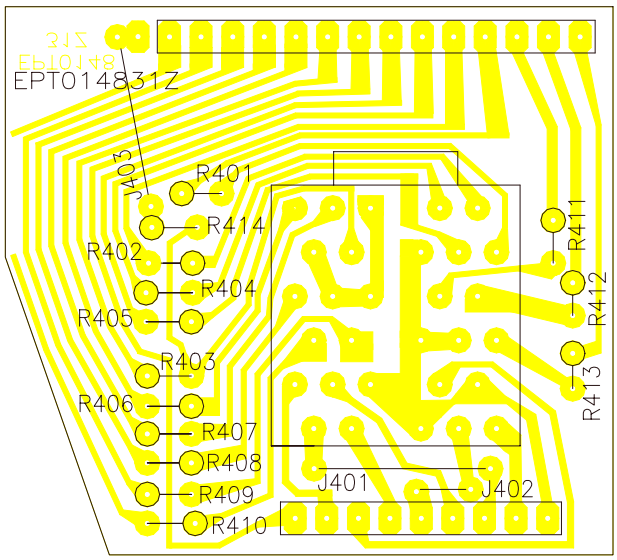
Information on most electrical and mechanical parts is included in the parts list. The reference designators are in alphanumeric order.

6.1 ORDERING REPLACEMENT PARTS

Parts orders should be referred to the parts department at:

- Ranger Communications, Inc.
  3377 Carmel Mountain Road
  San Diego, CA 92121

Tel: 858-259-0287
Fax: 858-259-0437

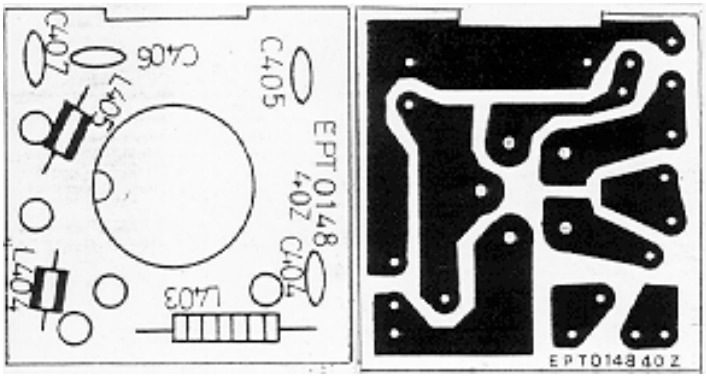


PART LIST:

TR-296GK/DX ROTARY SW. P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT014831Z	ROTARY SW. P.C.B
2	ROTARY SW PCB	EWRT32059S	ROTARY SW
3	R401-R414	RCU146814Z	680 ohm 1/4W
4	J402	WX01070705	JUMPER WIRE
5	J401	WX01070715	JUMPER WIRE
6	J403	WX01070712	JUMPER WIRE

REMARK:
SOLDER SIDE (BLUE)

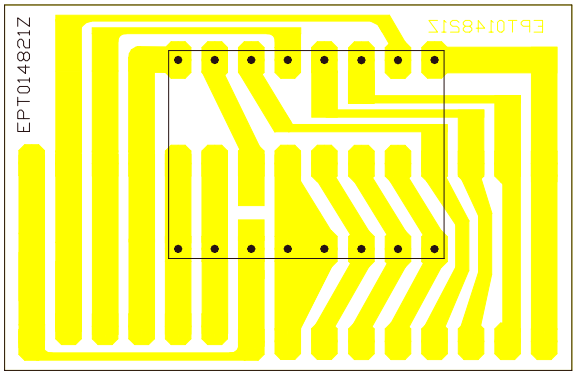


PART LIST:

TR-296GK/DX MIC P.C.B

ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT014840Z	MIC P.C.B
2	C404-C407	CC0501027L	0.001µF 50V
3	L404,L405	ECBAD18558	BEAD COIL

REMARK:
LEFT: COMPONENT SIDE
RIGHT: SOLDER SIDE

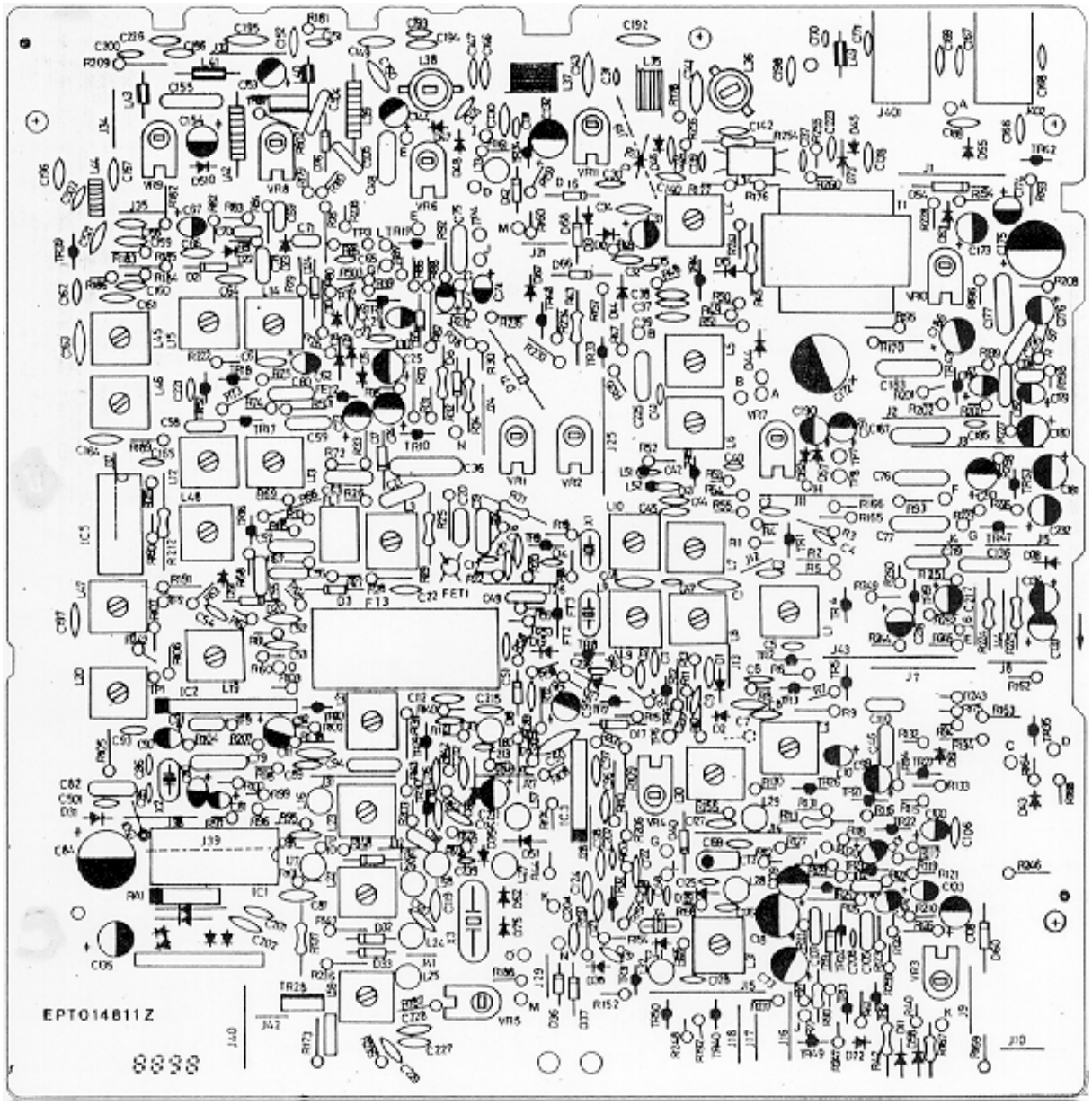


PART LIST:

TR-296GK/DX CH DISPLAY P.C.B

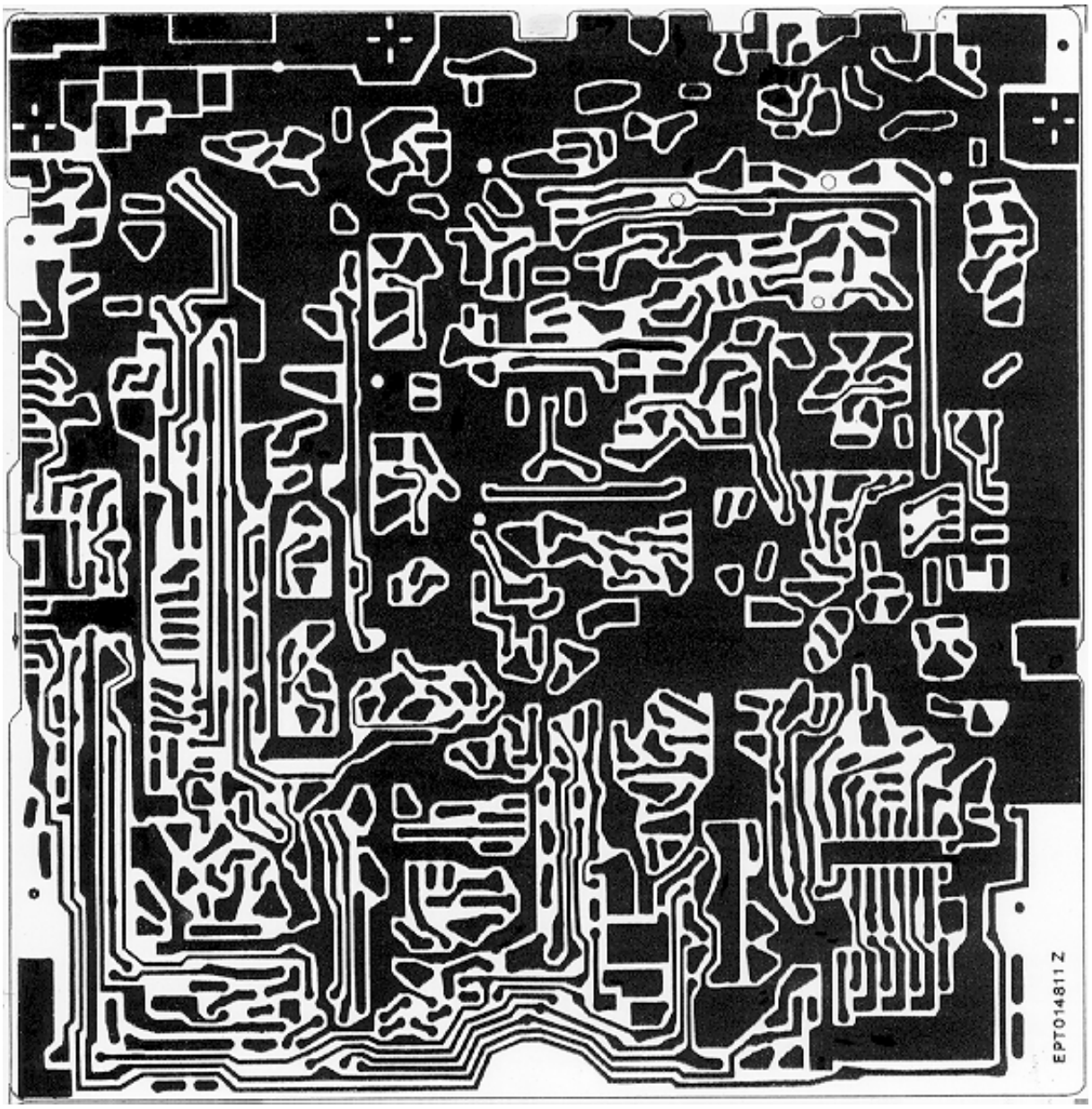
ITEM	REFERENCE NUMBER	RANGER PART NUMBER	DESCRIPTION
1		EPT014821Z	CH DISPLAY P.C.B
2	CH DISPLAY PCB	EX03N40003	LED DISPLAY

REMARK:
SOLDER SIDE (BLUE)



TR-296GK/DX MAIN PCB.

REMARK:
COMPONENT SIDE



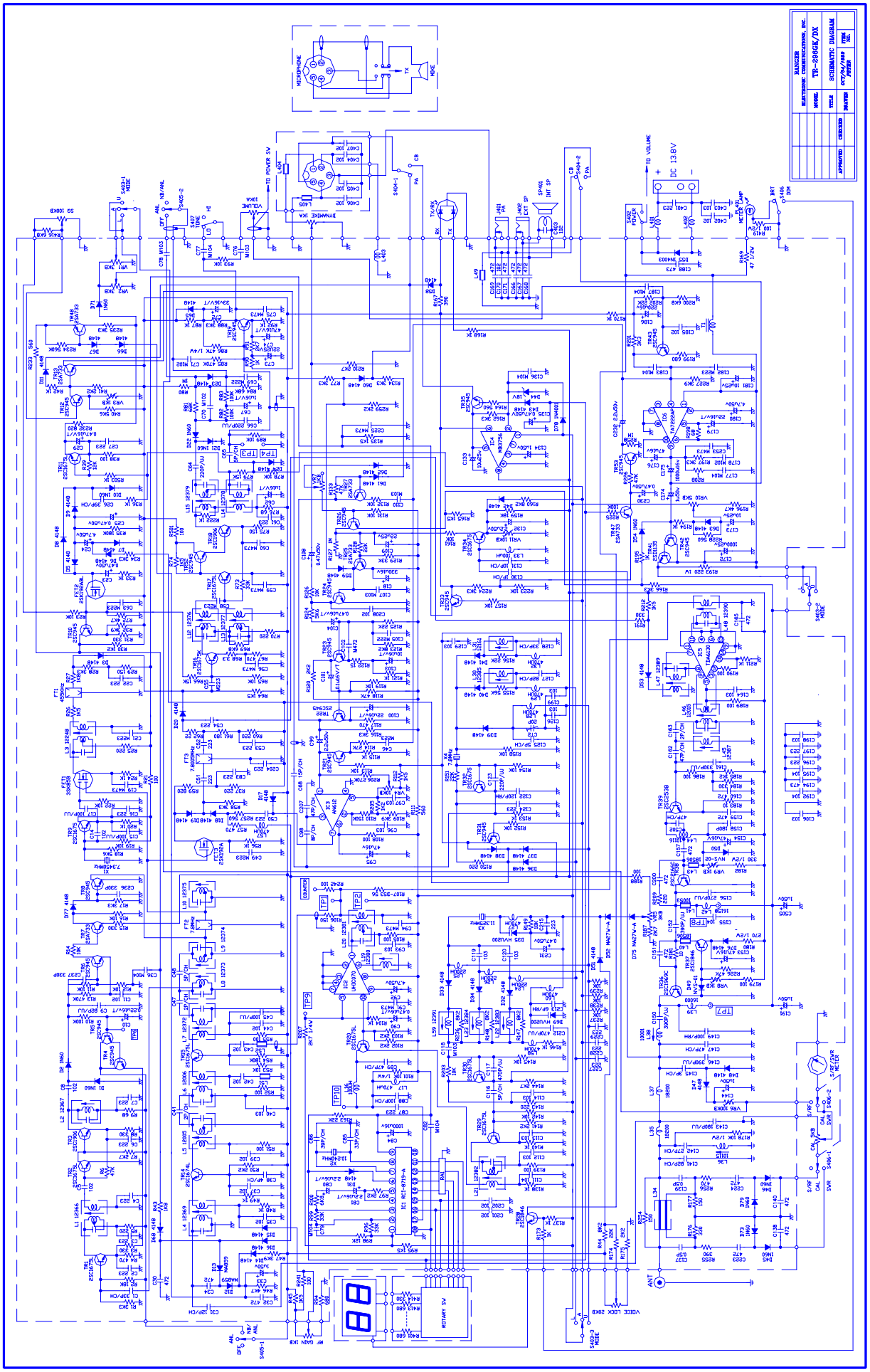
TR-296GK/DX MAIN PCB.

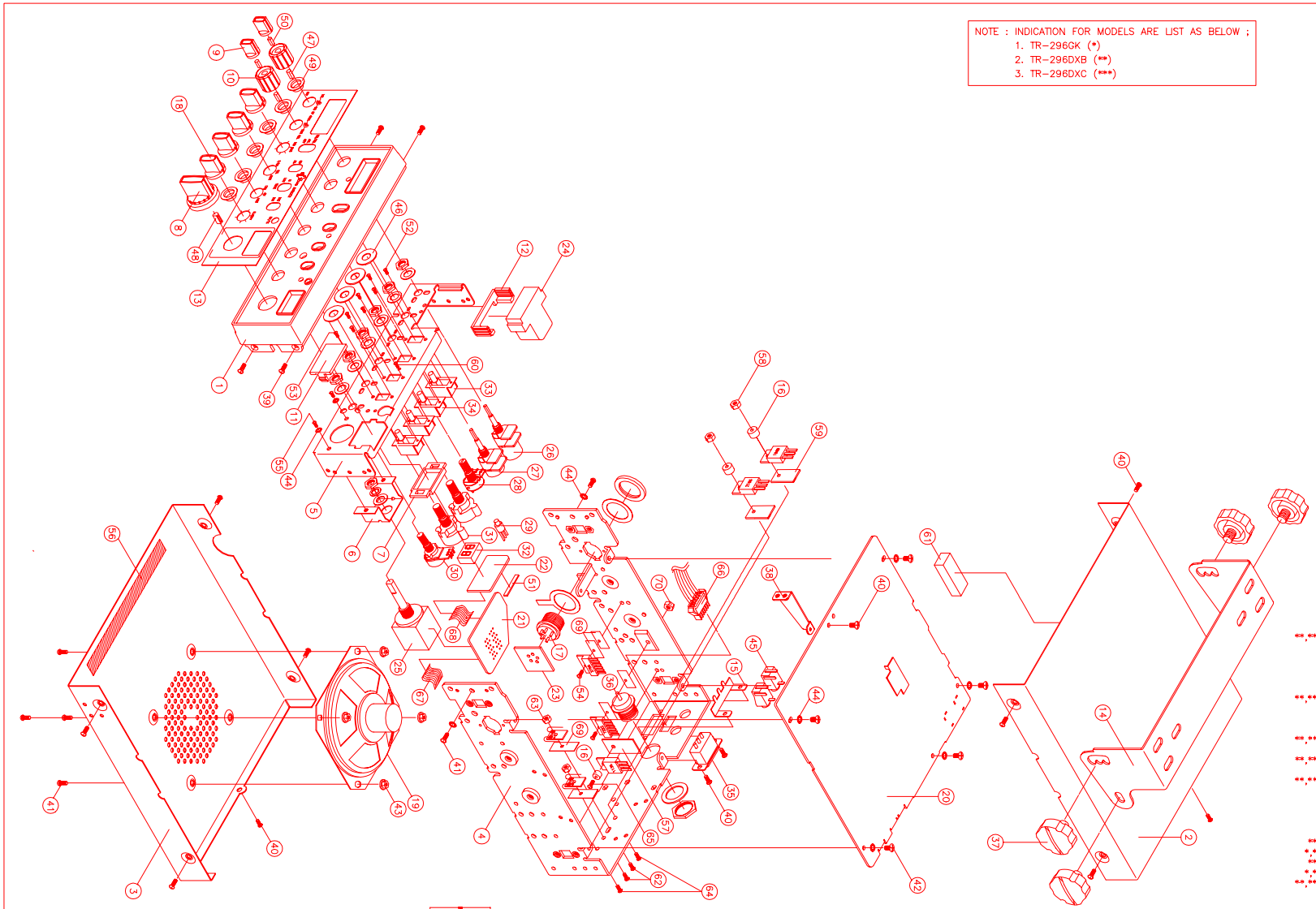
REMARK:
COPPER SIDE

REFERENCE NUMBER	RANGER PART NO.	DESCRIPTION
	EPT014813Z	MAIN P.C.B
R208	RCU141094Z	1 Ω 1/4W
R68	RCU143394Z	3.3 Ω 1/4W
R181,183	RCU141004Z	10 Ω 1/4W
R122	RCU141504Z	15 Ω 1/4W
R62	RCU142204Z	22 Ω 1/4W
R9,76,198	RCU146804Z	68 Ω 1/4W
R38,51,52,55,105,108,139.186,188,190,241,501,179,189,242.	RCU141014Z	100 Ω 1/4W
R75,177	RCU141514Z	150 Ω 1/4W
R61	RCU141814Z	180 Ω 1/4W
R25,37,60,70,143,150,209,5	RCU142214Z	220 Ω 1/4W
R8,15,31,191,233,184,176,3	RCU143314Z	330 Ω 1/4W
R255	RCU143914Z	390 Ω 1/4W
R4,57,67,117,256	RCU144714Z	470 Ω 1/4W
R111,164,228,257	RCU145614Z	560 Ω 1/4W
R94,199	RCU146814Z	680 Ω 1/4W
R59,232	RCU148214Z	820 Ω 1/4W
R20,24,33,36,48,49,56,87,90,92,104,115,121,138,140,146,211,153,168,170,173,194,195,222,503	RCU141024Z	1K Ω 1/4W
R30,185,205	RCU141224Z	1.2K Ω 1/4W
R26,64,95,74,112,135,165	RCU141524Z	1.5K Ω 1/4W
R27	RCU141824Z	1.8K Ω 1/4W
R41,50,97,102,103,120,141,175,259	RCU142224Z	2.2K Ω 1/4W
R7,91,144,187,210	RCU142724Z	2.7K Ω 1/4W
R47,109,227	RCU143924Z	3.9K Ω 1/4W
R17,28,58,88,116,134,162,197,201,235,166,1	RCU143324Z	3.3K Ω 1/4W
R46,72,196	RCU144724Z	4.7K Ω 1/4W
R18,40,124	RCU145624Z	5.6K Ω 1/4W
R69,100,200	RCU146824Z	6.8K Ω 1/4W
R44,123,147,148,160,236	RCU148224Z	8.2K Ω 1/4W
R11,12,14,16,19,22,53,65,78,89,93,237,119,126,131,142,145,152,154,157,158,161,203,223,238,239,132,23	RCU141034Z	10K Ω 1/4W
R98,39	RCU141234Z	12K Ω 1/4W
R66,79	RCU141534Z	15K Ω 1/4W
R2,149,159	RCU141834Z	18K Ω 1/4W
R125,128,151,156,163,202,174	RCU142234Z	22K Ω 1/4W
R114	RCU142734Z	27K Ω 1/4W
R73,96,129,99	RCU143334Z	33K Ω 1/4W
R6,118,133,226	RCU144734Z	47K Ω 1/4W
R155	RCU145634Z	56K Ω 1/4W
R81,84	RCU146834Z	68K Ω 1/4W
R82,83	RCU141044Z	100K Ω 1/4W
R110	RCU141544Z	150K Ω 1/4W
R35,54	RCU141844Z	150K Ω 1/4W
R206	RCU142744Z	270K Ω 1/4W
R13,85	RCU144744Z	470K Ω 1/4W
R234	RCU145644Z	560K Ω 1/4W
R80,127,258	RCU141054Z	1M Ω 1/4W
R167	RCM143914A	390Ω 1/4W
R77	RCM143324A	3.3K Ω 1/4W
R21	RCM141014B	100 Ω 1/4W
R29,254	RCM141514B	150 Ω 1/4W
R42,137	RCM141024B	1K Ω 1/4W
R45	RCM141524B	1.5K Ω 1/4W
R43	RCM141824B	1.8K Ω 1/4W
R34,224	RCM143324B	3.3K Ω 1/4W
R32	RCM143924B	3.9K Ω 1/4W
R113	RCM141034B	10K Ω 1/4W
R225	RCM141044B	100K Ω 1/4W
R107-D53	RCP145604Z	56 Ω 1/4W
R106	RCP141514Z	150 Ω 1/4W
R212	RCP141524Z	1.5K Ω 1/4W
R207	RCP142724Z	2.7K Ω 1/4W
R101	RCP141034Z	10K Ω 1/4W
R86	RCP144734Z	47K Ω 1/4W
R178	RCP121034Z	10K Ω 1/4W
R10	RCP141044Z	100K Ω 1/4W
R193	RCP102214Z	220 Ω 1W
R180	RCP122714Z	270 Ω 1/2W
R169	RCP124704Z	47 Ω 1/2W
R182	RCP123314Z	330 Ω 1/2W
RA1	CCS0573002	C/ARRAY 0.001uF 5P
C145	CC0500301A	3PF 50WV
C130	CC0500101A	1PF 50WV
C41,47,163	CC0500201A	2PF 50WV
C38	CC0500401A	4PF 50WV
C48,65,116,125	CC0500501A	5PF 50WV
C98	CC0500802A	8PF 50WV
C131	CC0501004A	10PF 50WV
C31	CC0501204A	12PF 50WV
C68	CC0501504A	15PF 50WV
C142	CC0502704A	27PF 50WV
C1,128,85	CC0503304A	33PF 50WV
C26,86	CC0503904A	39PF 50WV
C89,147,162,207,502	CC0504704A	47PF 50WV
C127,141	CC0508204A	82PF 50WV
C88	CC0501015A	100PF 50WV
C9	CC0508204G	82PF 50WV
C15,17,45	CC0501015G	100P 50WV
C143	CC0501815G	180PF 50WV
C123,64,66	CC0502215G	220PF 50WV
C156	CC0502715G	270PF 50WV
C146,150,152	CC0503915G	390PF 50WV
C117,212	CC0504715G	470PF 50WV
C161	CC0503315G	330PF 50WV
C213	CC0500602D	6PF 50WV
C149	CC0501015D	100PF 50WV
C122	CC0501215D	120PF 50WV
C158	CC0501815L	180PF 50WV
C139,137	CC0500591L	0.5PF 50WV
C236,237	CC0503315L	330PF 50WV
C155,192,195,111	CC0251047L	0.1uF 25WV
C93,96,97,106,112,113,114,119,120,126,129,164,198,199,40	CC0501037L	0.01uF 50WV
C8,11,14,35,37,39,42,5,43,44,170,185,208,201,202	CC0501027L	0.001uF 50WV
C3,4,6,7,16,22,27,50,51,52,53,54,61,83,87,124,196,197,204,215,227,229,2	CC0502237L	0.022uF 50WV
C188	CC0504737L	0.047uF 50WV
C32,34,140,151,171,157,160,165,169,200,223,224,30,138,167,166,168,159	CC0504725T	0.0047uF 50WV
C194	CCM254737I	0.047uF 50WV
C36,77,79,82,177,183,187,136	CM0501045Z	0.1uF 50WV
C76,78,107,110,118	CM0501035Z	0.01uF 50WV
C70,71,178	CM0501024Z	0.001uF 50WV
C21,46,49,55,58,182,63	CM0502235Z	0.022uF 50WV
C19,56,59,60,75,225,235,91,94	CM0504735Z	0.047uF 50WV
C69,105	CM0502225Z	0.0022uF 50WV
C102	CM0504725Z	0.0047uF 50WV

C132	CE0502257H	2.2uF 50V
C23,25,108,135,230,231	CE050474Z	0.47uF 50WV
C33,134,144,174,191,505	CE0501057Z	1uF 50WV
C99,232	CE0502257Z	2.2uF 50WV
C24,92,180	CE0504757Z	4.7uF 50WV
C181,133,173	CE0251067Z	10uF 25WV
C73,109	CE0252267Z	22uF 25WV
C95,153,154,176	CE0164767Z	47uF 16WV
C18	CE0163377Z	330uF 16WV
C84,175	CE0161087Z	1000uF 16WV
C172	CE0251087Z	1000uF 25WV
C186	CE0162277Z	220uF 16WV
C101	CT0161046Z	0.1uF 16WV
C10	CT0162246Z	0.22uF 16WV
C29,90,104	CT0164746Z	0.47uF 16WV
C62,67	CT0161056Z	1uF 16WV
C80,81	CT0162256Z	2.2uF 16WV
C103	CT0161066Z	10uF 16WV
C100,179	CT0162266Z	22uF 16WV
C72	CT0163366Z	33uF 16WV
C74	CT0164766Z	47uF 16WV
J401,J402	EX06N41045	EAR JACK 3.5mm
IC3	ENMA00612Z	I.C AN-612 7PIN
IC5	ENSM06130Z	I.C TDA6130 14PIN
IC1	ENRG871997	I.C 8719 18PIN
IC2	ENNOHIC070	I.C UHIC070
TR14	T2SC01674L	TR2SC1674L
TR1,2,9,11,15,17,20,29,30,32,34	T2SC01675L	TR 2SC1675L
TR4,5,6,8,10,12,19,21,22,23,24,26,31,33,35,42,43,52,53	T2SC00945P	TR 2SC945P
TR7,13,25,27,47,48	T2SA00733P	TR 2SA733P
TR3,18	T2SC01906Z	TR2SC1906
TR28,37	T2SC01846Z	TR 2SC1846
TR39	T2SC02538Z	TR 2SC2538
TR16	T2SC01675K	TR 2SC1675K
FET1	F3SK00085B	F.E.T 3SK85B
FET3	F2SK00192R	F.E.T 2SK192A-GR
FET2	F2SK00192L	F.E.T 2SK192ABL
X2	EYCAB10240	CRYSTAL 10.240MHZ
X4	EYCAM07800	CRYSTAL 7.800MHZ
X1	EYCAE07345	CRYSTAL 7.3455MHZ
X3	EYCAL11325	CRYSTAL 11.325MHZ
FL1	EFCFW455HT	C/FILTER CFW-455HT
FT2	EFX2078002	C/FILTER 7.800MHZ
FT3	EFX27Z22C9	C/FILTER 7.800MHZ
D44	EDZD05180Z	ZENER DIODE UZ-18V 0.5W
D3,5,6,7,8,9,11,14,15,16,17,18,19,20,23,24,31,32,33,34,36,37,38,39,40,41,42,43,47,48,51,58,59,60,61,62,63,65,66,67,68,76,77,R107-TP2	ED1N04148Z	DIODE 1N4148
D2,10,21,22,45,46,54,71,1,73,79	ED1N00060P	DIODE 1N60P
D12,13	EDMA00859Z	DIODE MA859
D55,78	ED1N04003Z	DIODE 1N4003
D52,75	EDMA00027W	DIODE MA27W-A
L1	ECIFT12366	I.F.T
L2	ECIFT12367	I.F.T
L3	ECIFT12248	I.F.T
L4	ECIFT12369	I.F.T
L5	ECIFT12005	I.F.T
L6	ECIFT12006	I.F.T
L7	ECIFT12372	I.F.T
L8	ECIFT12373	I.F.T
L9	ECIFT12374	I.F.T
L10	ECIFT12375	I.F.T
L12	ECIFT12376	I.F.T
L13	ECIFT12377	I.F.T
L14	ECIFT12378	I.F.T
L15	ECIFT12379	I.F.T
L19	ECIFT12380	I.F.T
L20	ECIFT12381	I.F.T
L21	ECIFT12382	I.F.T
L22	ECIFT12383	I.F.T
L23	ECIFT12384	I.F.T
L30	ECIFT12385	I.F.T
L31	ECIFT12161	I.F.T
L45	ECIFT12387	I.F.T
L46	ECIFT12015	I.F.T
L47	ECIFT12389	I.F.T
L48	ECIFT12390	I.F.T
L59	ECIFT12391	I.F.T
L35,37	ECSPG18200	SPRING COIL
L34,41	ECRFZ10053	TDK BRAND CORE
L36	ECRFZ10115	RF COIL0
L44	ECRFZ10116	RF COIL 50UH
L38	ECRFZ10001	RF COIL 0.23UH
L39,DCx2	ECCHK16000	CHOKE COIL 0.47UH
L16,33	ECCHK16002	CHOKE COIL 100UH
L17,27,28,29,32,57,58,60	ECCHK16003	CHOKE COIL 470UH
L24,25,26	ECCHK16089	CHOKE COIL 220UH
L42	ECCHK16158	CHOKE COIL 1UH
	ECCHK16159	CHOKE COIL 5.6UH
L51,52	ECBAD18504	BEAD COIL 3.5x6X1.2
l40,43,49	ECBAD18506	BEAD COIL 3.5x6x1.2
CT2	CV050200AZ	TRIMMER/C 20PF 5Q
VR3,7,9,8	RE10200003	1K Ω L
VR1,2,5	RE30200019	3K Ω L
VR10	RE50200006	5K Ω
VR4,11	RE10300009	10K Ω L
VR6	RE10400020	100K Ω L
T1	ETP2820101	TRANSFORMER EI-28
C148-TP8	WK0519017F	SHIELD WIRE
D510-TP7	WK0719017F	SHIELD WIRE
J41	WX01070705	JUMPER WIRE
J12,J42,L501	WX01070706	JUMPER WIRE
J10,13,17,21,28,29,32,35,44	WX01070708	JUMPER WIRE
J4,6,8,18,27,34	WX01070710	JUMPER WIRE
J24	WX01070712	JUMPER WIRE
J30	WX01070709	JUMPER WIRE
J5,9,16,26,33,38	WX01070713	JUMPER WIRE
J31,37,40	WX01070715	JUMPER WIRE
J1,7	WX01070718	JUMPER WIRE
J2,11,15,19,25	WX01070720	JUMPER WIRE
J14	WX01070722	JUMPER WIRE
J3,43	WX01070723	JUMPER WIRE
J39	WX01070727	JUMPER WIRE
B-B	WL0408009Z	LEAD WIRE
R130-VR7(H)	WL1212009Z	LEAD WIRE
N-N	WL0316009Z	LEAD WIRE
K-K	WL0517009Z	LEAD WIRE
C184-A	WL0814009Z	LEAD WIRE
A-A	WL0916009Z	LEAD WIRE
C-D44	WL0017009Z	LEAD WIRE
E-C148	WL0620009Z	LEAD WIRE
M-M	WL0120009Z	LEAD WIRE
I-I	WL0421009Z	LEAD WIRE
O-O	WL0217009Z	LEAD WIRE

D-D	WL0125009Z	LEAD WIRE
J-J	WL0725009Z	LEAD WIRE
MAIN	WP0818005Z	SHIELD WIRE
MAIN	WP0923005Z	SHIELD WIRE
TP7,8	GZZZ50145Z	PIN
D35,69(COPPER SIDE)	EDHU00200Y	DIODE(SMD)
R502(COPPER SIDE)	RCP146804Z	68 Ω 1/4W
MAIN(COPPER SIDE)	WP0812005Z	SHIELD WIRE
FREQ. COUNTER	EX07N48793	WIRE CONN/H
DCx1	CC0501027L	0.001uF 50WV
DCx1	CC0501037L	0.01uF 50WV
DCx1	CC0502237L	0.022uF 50WV
D49	EDNV00001Z	DIODE NVS-01
D50	EDNV00002Z	DIODE NVS-02
IC4	ENFU03756Z	IC MB3756
IC6	ENTA07222A	IC TA7222AP
TR36	T2SC01969C	TR 2SC1969C
TR38	T2SC02166C	TR 2SC2166C
TR41	T2SD01135Z	TR 2SD1135


RANGER
ELECTRONIC COMMUNICATIONS, INC.
TR-28RGX/DX
SCHEMATIC DIAGRAM
MICROPHONE
TO VOLUME
DC 13.8V
TO POWER 5V
DYNAMIC 1KA
VOLUME 10KA
VOICE LOCK 20KB
RF GAIN 1KB
ANT
S-METER



NOTE : INDICATION FOR MODELS ARE LIST AS BELOW ;
1. TR-296GK (*)
2. TR-296DXB (**)
3. TR-296DXC (***)

PE-020-R001

NO.	PART NO.	Q'TY
70	JN243024ZS	1
69	LZZZ61008Z	6
68	WX02215004	1
67	WX02109007	1
66	EX07N48793	1
65	JS052008MN	1
64	JS052012MN	2
63	JN242618ZS	2
62	JS052606MN	2
61	XZZZ90021Z	1
60	JS053006TH	1
59	XZZZ90358Z	2
58	JN242012ZS	2
57	XZZZ90064Z	2
56	LZZZ60082Z	2
55	JS013008TH	2
54	JS013006MV	2
53	JS052004MN	6
52	JS052605MN	2
51	XZZZ90187Z	1
50	MT3600090T	2
49	PT3600090A	6
48	MT3600080T	1
47	MT3600100T	2
46	XZZZ90296A	4
45	EX06N41045	2
44	JW323006CN	9
43	JN263035ZS	4
42	JS053008TN	5
41	JS053008MN	8
40	JS053006MN	13
39	JS033008MN	4
38	MT0148020X	1
37	XZZZ90007Z	4
36	EX06T41019	1
35	EX06T40007	1
34	EWSL31001S	3
33	EWSL31000S	1
32	EX03N40003	1
31	EWRT32001S	2
30	RV20303392	1
29	EX01N40004	1
28	RV10203404	1
27	RV10203375	1
26	RV10303480	1
25	EWRT32059S	1
24	EX03N40005	1
23	EPT014840Z	1
22	EPT014821Z	1
21	EPT014831Z	1
20	EPT014813Z	1
19	ES300835SQ	1
,*	18 PT3600120A	4
*	18 PT3600120H	4
17	EX06N41094	1
16	XZZZ90003Z	3
15	MT3600050X	1
14	MT3600050S	1
,*	13 BT148N010Y	1
*	13 BT148N020B	1
12	PT3600080A	1
11	PT3600070A	1
,*	10 PT3600130A	2
*	10 PT3600130H	2
,*	9 PT3600110A	2
*	9 PT3600110H	2
,*	8 PT3600101A	1
*	8 PT3600101H	1
7	MT0148031X	1
6	MT3600041S	1
5	MT3600010S	1
4	MT3001024M	1
***	3 MT3600071M	1
*,**	3 MT3600071X	1
***	2 MT3600061M	1
*,**	2 MT3600061X	1
,*	1 BT148N010A	1
*	1 BT148N010H	1

MODEL	⚠	⚠	⚠	⚠	⚠	⚠
MODEL 1						
MODEL 2						
ECN/MIC NO.						

REMARKS:

APPROVED	CHECKED	DRAWN

SCALE | UNITS mm

DRAWING DATE 7 OCT. 1999

PAGE NO : 1/1

RANGER COMMUNICATIONS (M) SDN. BHD.

TITLE EXPLODE DRAWING

FILE NAME : 296_EXP | A2

RANGER
Communications, Inc.

AT0296040A