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# SPECIFICATIONS

## GENERAL

Modulation Modes	CW, FM, AM, USB, LSB, PA
Frequency Range	28.0000-29.6999 MHz
Frequency Control	Phase-Locked Synthesizer
Frequency Tolerance	±0.005%
Frequency Stability	±0.003%
Operating Temperature Range	-30°C to +50°C
Microphone	Plug-In (6-Pin), 600 Ohm Dynamic Type
AC Input Voltage	110V 60 Hz (220V 50 Hz Optional)
AC Power Consumption	300W
Antenna Connectors	Standard SO-239 Type
Meter #1	Indicates relative RF Power Output/Antenna SWR
Meter #2	Indicators received signal strength

## TRANSMITTER

Power Output	CW/AM/FM (50W) LSB/USB (100W)
SSB Generation	Dual-Balanced Modulation
AM Modulation	Class B Amplitude, Collector Modulation
FM Deviation	±1.5 kHz @ 1,250 Hz 20mV Audio (±5 kHz max)
Clarifier Range	±5 kHz
Harmonic and Spurious Emission	Better than 60 dB
AM/FM Frequency Response	400 to 5,000 Hz
SSB Frequency Response	400 to 3,000 Hz
Output Impedance	50 Ohms Unbalanced
Output Indicators	RF Meter shows relative RF Output Power

\* Specifications subject to change without notice.

# SPECIFICATIONS

## RECEIVER

AM Sensitivity	1 $\mu$ V for 10 dB S/N
FM Sensitivity	1 $\mu$ V for 20 dB S/N
SSB Sensitivity	0.2 $\mu$ V for 10 dB S/N
AM/FM Selectivity	5 dB at 4 kHz, 50 dB at 10 kHz
SSB Selectivity	5 dB at 2 kHz
Image Rejection	More than 50 dB
IF Rejection	More than 80 dB at 455 kHz
AGC	Change in Audio Output less than 12 dB: from 10 $\mu$ V to 0.4V
Squelch	Adjustable-Threshold less than 0.7 $\mu$ V
Audio Frequency Response	400 to 2,500 Hz
Distortion	Less than 10% at 2 Watts Output into 8 Ohms
Adjacent Channel Rejection	> 75 dB
Cross Modulation	> 50 dB
Intermediate Frequency	10.695 MHz (AM-1 <sup>st</sup> , SSB), 455 kHz (AM-2 <sup>nd</sup> )
Clarifier Range	$\pm$ 5 kHz
Noise Blanker	IF Single Gate Type
Audio Output Power	More than 3 Watts into 8 Ohms
Built-In Speaker	8 Ohms
External Speaker (Optional)	Disables Internal Speaker when connected

\* Specifications subject to change without notice.

## 1.1 INTRODUCTION

Thank you for your confidence in selecting the RCI-2990 Amateur Base Station two-way radio equipment. We know you'll find your transceiver as exciting as it is practical. Many years of valuable experience designing electronic products are behind our two-way communications systems. Only the highest quality components are incorporated into **BASE STATION** radios to assure reliability and maximum performance.

Installing and operating the **BASE STATION** radio is not complicated, but the flexibility provided by its numerous operating features may not be fully appreciated until a little time is spent becoming familiar with its controls and connections. It will be to your advantage to save all the packing materials cartons, fillers, cushioning, etc., they will prove valuable preventing damage should you ever have occasion to transport or ship your **BASE STATION** radio to the Dealer.

## 2.1 INSTALLATION

### 2.1.1 Location and Connection

The transceiver should be placed in a convenient operating location close to an AC power outlet and the antenna lead-in cable(s).

The transceiver is attached with the AC power cord set. Proceed as follows to complete all necessary connections to the transceiver.

(1) Your transceiver has a standard antenna connector of type SO-239 located on rear panel; for easy connection to standard PL-259 coax plugs. If the coax antenna cable must be made longer, use coax cable with impedance of 50 Ohms and use only enough cable to suit your needs. This will insure a proper impedance match and maximum power transfer from the transmitter to the antenna.

(2) **AC POWER OPERATION:** Use 110 (for 220 volts AC operation, consult your dealer) volts AC power for the Base station.

### 2.1.2 Noise Interference

There are several kinds of noise interfering you may encounter in Base station operation. Some of these noise sources are; fluorescent buzz, nearby commercial broadcast, electrical appliance, lawnmower and electrical storms. Commercial products are available to reduce interference from these sources. Consult your dealer or professional amateur radio supply shops.

### 2.1.3 Antennas

For best transmission and reception, your transceiver should use an antenna especially designed for a frequency of 28 MHz. Antennas are purchased separately and include installation instructions. Numerous type of antennas are available that range from emphasis on ease of installation to emphasis on performance. Often the difference in performance between many of the antenna is modest.

**(1) VERTICAL GROUND PLANE ANTENNAS:** These are omnidirectional antennas that provide optimum performance for contacting other fixed stations using vertical type antennas in addition to all mobile stations. For medium long range communications work.

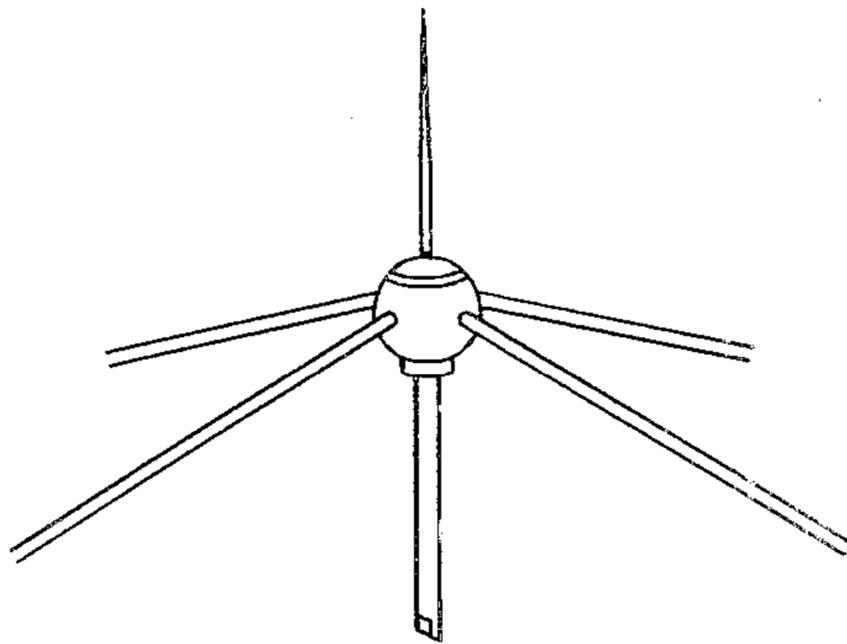
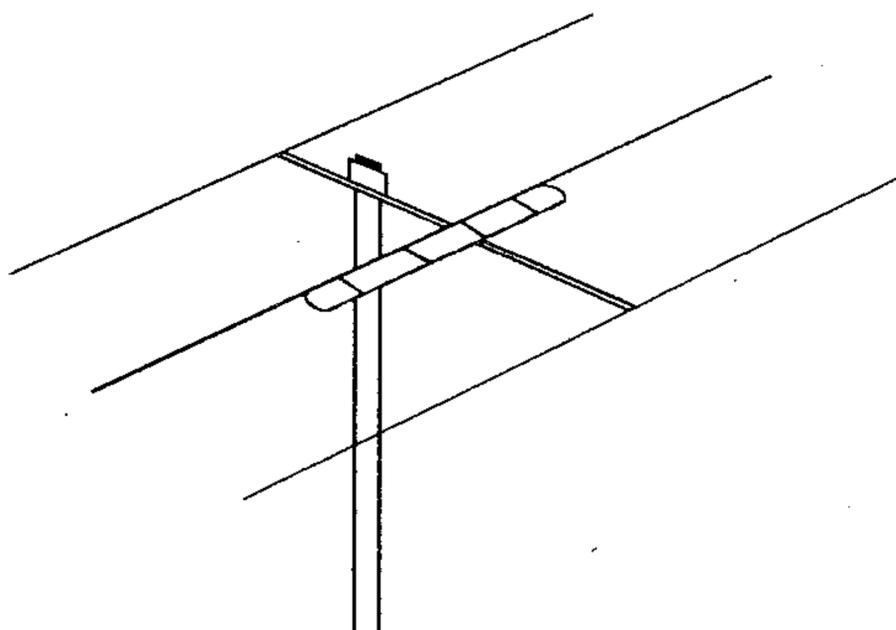


Figure 2.1 Ground Plane

**(2) DIRECTIONAL BEAM ANTENNAS:** Highly efficient and directional antennas generally intended for fixed-to-fixed very long range communications.



**FIGURE 2.2 REMOTE SPEAKER**

### **2.1.4 Remote Speaker**

The external speaker jack (EXT. SP) on the rear panel is used for remote receiver monitoring. The external speaker should have 8 Ohms impedance and be able to handle at least 3 Watts. When the external speaker is plugged in, the internal speaker is disconnected.

.....  
: **NOTE** :  
: *The PHONE jack on the front panel overrides both external and internal* :  
: *speakers. When the plug from a headphone is plugged to the PHONE* :  
: *jack, both internal and external speakers are silenced simultaneously.* :  
.....

### **2.1.5 Public Address**

An external 8 Ohm, 3 Watt speaker must be connected to the PA jack located on the rear panel when the transceiver is used as a public address system. The speaker should be directed away from the microphone to prevent acoustic feedback. Physical separation or isolation of the microphone and speaker is important when operating the PA at high output levels.



(7) **RF GAIN:** This control is used primarily to optimize the reception in strong signal areas. Under normal operating conditions the control should be turned fully clockwise. When strong overloading or distorted signals are received rotate this control counterclockwise to reduce gain.

.....  
:  
:  
:  
: **NOTE** :  
:  
: *The Squelch Control 15 may require readjustment with reduce RF Gain* :  
: *control.* :  
.....

(8) **MICROPHONE GAIN:** A preamplifier circuit is built into this unit to increase microphone gain. Experiment with this control for the setting that will best suit your individual use.

(9) **CHANNEL SELECTOR:** Has 40 detents in a turn and selects one of the channels desired. The selected channel is digitally displayed in the window above the selector.

(10) **CLARIFIER CONTROL:** Allows variation of the receiver operating frequencies above and below the assigned frequency. Although this control is intended primarily to tune in SSB signals, it may be used to optimize AM/FM signals as described in the Operating Procedure Paragraphs.

(11) **SQUELCH:** This control is used to cut off 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 just or ambient background noise is eliminated. Turn fully counterclockwise 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.

(12) **AF GAIN:** Permits you to adjust the listening level when receiving.

(13) **MODE SELECTOR:** Selects the mode of operation in either PA, CW, standard FM, AM or USB and LSB. Transmissions in any mode can only be communicated to stations operating in the same mode.

(14) **PHONE JACK:** Accepts a plug from a headset of 4 to 32 Ohm impedance. Insertion of the plug will silence the built in speaker (and external speaker connected to External Speaker jack).

(15) **FUNCTION INDICATORS:** LED indicators located in the LED area permit you to know instantly the mode to which the unit is engaged.

(16) **S [Signal] METER:** The left hand meter provides a relative indication of the signal strength of a received signal in S units during reception. Note that SSB signals will respond this meter only during voice modulation. This is due to the fact that SSB transmissions do not contain a continuous RF carrier as is found on AM, FM and CW.

(17) **RF/SWR METER:** Used for two purpose - to indicate relative transmitter power when transmitting and to indicate antenna SWR [standing wave ratio]. Note that the power meter has separate scales for AM, FM, SSB and CW transmission, respectively.

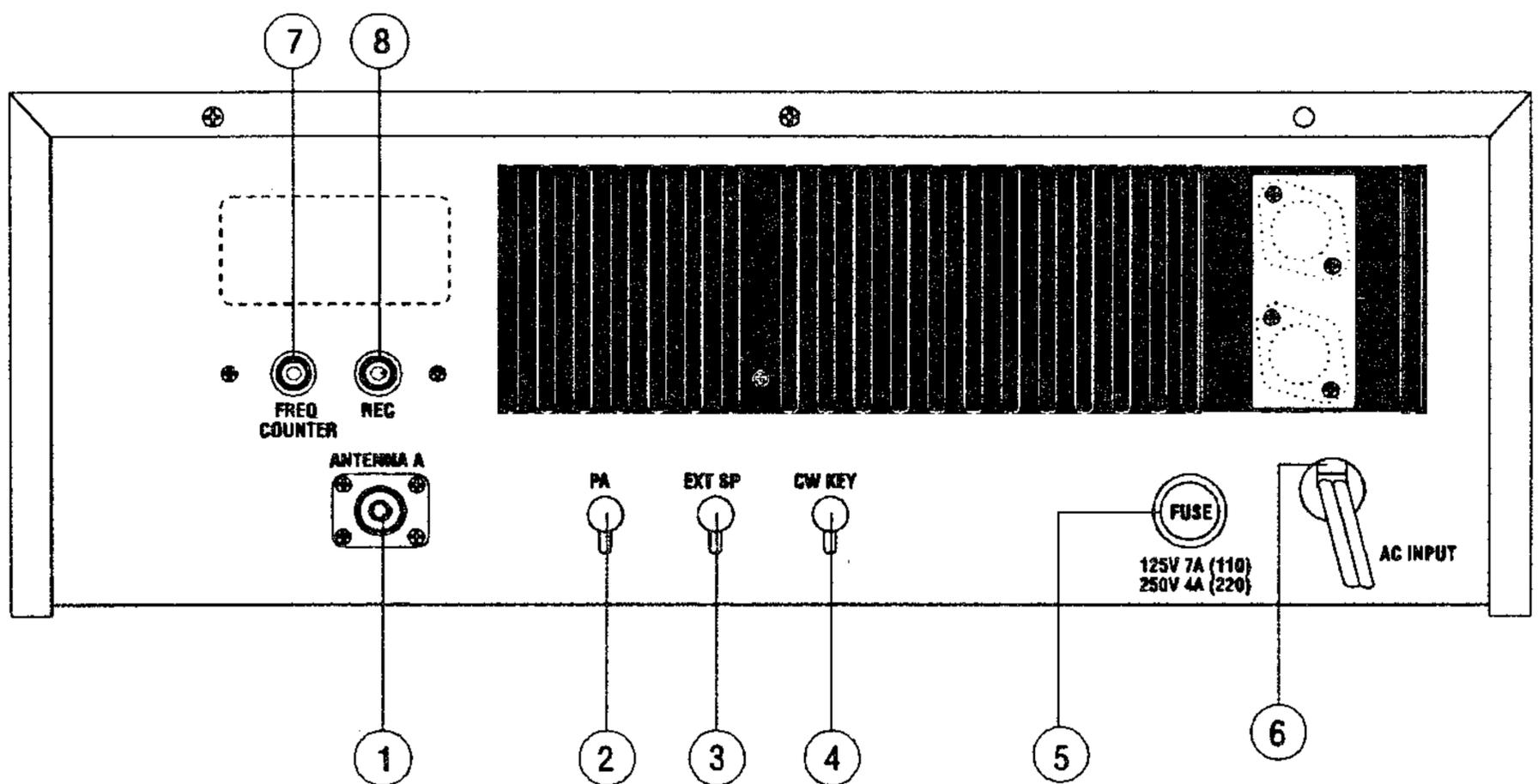
(18) **FREQUENCY COUNTER:** The frequency counter indicates the frequency of the selected channel you wish to operate on.

(19) **PUSH-TO-TALK 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 the 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 the low impedance dynamic microphone (supplied).

.....  
• **NOTE** •  
• *Depressing the PUSH-TO-TALK switch on the microphone is also required* •  
• *to activate the PA system.* •  
.....

(20) **NB/ANL SWITCH:** The Noise Blanker is very effective in eliminating repetitive impulse noise such as ignition interference. In the ANL position, the automatic noise limiter in the audio circuits is activated.

- (21) **ROGER BEEP SWITCH:** This switch activates the ROGER BEEP circuit when its function is selected.
- (22) **SPLIT SWITCH:** This switch enables you to operate on different transmitter and receiver frequencies for FM repeater operation.
- (23) **PROGRAM SWITCH:** This switch is used to program operating or scanning frequencies into memory. See the OPERATION section of the manual for details.
- (24) **MANUAL SWITCH:** This is used to return to the manual mode.
- (25) **SHIFT SWITCH:** This is used to select 100 Hz, 1 kHz, 10 kHz, 100 kHz or 1 MHz frequency steps.
- (26) **DIM SWITCH:** This switch adjusts the display backlighting in four different steps to best match the environment.
- (27) **SWR:** This switch is used to check SWR.
- (28) **SCAN:** This switch is used to scan frequencies in each band segment. The OPERATION section, pg. 4, of this manual provides detailed information on using this scan control.
- (29) **MEMORY SWITCH:** This is used to program memory channels. Detailed information on how to use this control is provided in the OPERATION section of the manual.
- (30) **ENTER SWITCH:** This is used to program frequencies in memory. See the OPERATION section, pg. 4, of the manual for more information on using this control.
- (31) **LOCK SWITCH:** This switch is used to lock a selected frequency. Press it to activate the switch. In that position, it disables Frequency Selector Control, UP/DOWN buttons on the front control panel, or remote UP/DOWN buttons on the microphone. Repressing the switch will unlock the frequency.
- (32) **▲ UP/ ▼ DOWN SELECTOR:** These buttons are used to move frequency upward or downward to select a desired frequency.



**Figure 3.2 Rear Panel Connectors**

### 3.1.2 Rear Panel Connectors

- (1) **ANTENNA:** Accepts 50 Ohm coaxial cable with a type PL-259 plug to connected.
- (2) **PA SPEAKER JACK:** Used for public address operation. The PA speaker should be connected to this jack using  $\frac{1}{8}$ " (3.5 mm) diameter plug. Insertion of an external speaker into the External Speaker jack will not interrupt the PA operation.
- (3) **EXTERNAL SPEAKER JACK:** Used to connect an external speaker for extra sound source. Use  $\frac{1}{8}$ " (3.5 mm) diameter plug for connection. Insertion of the plug into this jack will silence the internal speaker.
- (4) **CW KEY:** Use for morse code operation. Connect a CW key to this jack and place the CW/FM/AM/USB/LSB switch in the CW position.
- (5) **FUSE:** Accommodates a fuse for AC input circuit protection. Use 125V 7A (for 220 VAC operation, use 250V 4A fuse) fuse for replacement.

.....  
**NOTE**  
.....

• *Before replacing the fuse, see your dealer to check to find out the reason* •  
• *why the fuse was blown. Replacing without check may only blow the* •  
• *fuse again.* •  
.....

**(6) AC POWER CORD:** Connects to AC power outlet for AC mains supply.

**(7) FREQUENCY COUNTER OUTPUT JACK:** The RCA type (pin) jack provides output for connecting an optional frequency counter so that you can watch channel frequency digitally. The frequency counter readout will be possible on transmit mode only.

**(8) RECORDING OUTPUT JACK:** The RCA type (pin) jack provides output for connection to a tape recorder to permit recording of received signals or your modulating voice.

### **3.1.3 Operating Procedure To Receive**

***IMPORTANT:*** *Make sure that the ANTENNA, POWER SOURCE, and MICROPHONE re connected before you operate.*

**(1)** Set the ECHO switch to OFF position.

**(2)** Turn the unit on by setting the POWER SWITCH to ON position. Now the meters, Channel Indicator, and Function Indicators will be illuminated.

**(3)** Temporarily, set MODE switch in AM position.

**(4)** Set the SQUELCH CONTROL in fully counterclockwise position and adjust the AF gain control for a comfortable listening level.

**(5)** Listen to the background noise from the speaker. Turn the SQUELCH CONTROL slowly clockwise until the noise just disappears (no signal should be present). Leave the SQUELCH CONTROL at this setting. The SQUELCH CONTROL is now properly adjusted.

The receiver will remain quiet until a signal is actually received. Do not advance the SQUELCH CONTROL to far clockwise or some of the weaker signals will not be heard.

(6) Set the CLARIFIER to the center (12 o'clock) position.

(7) Select a desired mode of operation, CW, FM, AM, USB or LSB and adjust the CLARIFIER.

(8) Select a channel you desire by the CHANNEL SELECTOR or control key pad.

### 3.1.4 Operating Procedure To Transmit

(1) Select the desired channel and mode of transmission.

(2) If the channel is clear, depress the Push-to-Talk switch on the microphone. Speak in a normal tone of voice.

### 3.1.5 Standby-Beep

A special provision has been built in your radio to give other stations a sign which tells that you are turning to receive. Without needing switching operation to activate this feature, a beep tone is automatically transmitted at each time you release the Push-to-Talk switch on the microphone to turn to receive mode.

.....  
• **NOTE** •  
• *When the microphone gain control is set to maximum, ambient noise* •  
• *may also be picked up by the microphone. In high noise situations, low* •  
• *microphone gain setting may produce the best results. The microphone* •  
• *gain control is also used to adjust PA loudness.* •  
.....

### 3.1.6 Public Address Operation

To use this feature of the transceiver, a speaker having a voice coil impedance of 8 to 16 Ohms and a power handling capability of at least 3 Watts should be connected to the PA SP jack on the rear panel. Be sure that there is physical separation between the microphone and the PA speaker itself. If the PA speaker is located very close to the microphone, acoustic feedback will result when the PA amplifier is operated at high volume (or when PA is used indoors). Adjustment of PA volume is made with the MIC GAIN control.

### 3.1.7 SWR Measurement

Most antennas are factory tuned, but the antenna efficiency may be peaked by slightly adjusting the length of antenna using the SWR meter built into the unit. This adjustment may improve the antenna standing wave ratio (SWR). The SWR permits you to determine how well matched the antenna and its cables are to your transceiver.

- (1) Set the unit in the receive mode as instructed under the Operating Procedure to Receive section.
- (2) Set the Mode switch to AM position.
- (3) Press the Push-to-Talk switch on the microphone and turn the Calibrate Control clockwise (past click) so that the SWR meter pointer exactly coincides with the Set mark on the scale. Release the Push-to-Talk switch.
- (4) Push the SWR button. Press the Push-to-Talk switch again. The SWR of your antenna is read directly on the scale.

.....  
• **NOTE** •  
• *An SWR below 2 or less is desired as this indicates that over 95% of the* •  
• *transmitted power is broadcast into the air.* •  
.....

## 4.1 MICROPHONES AND INSTALLATIONS

### 4.1.1 Alternate Microphones and Installation

For best results, the user should select a low-impedance dynamic type microphone or a transistorized microphone. The microphone should provide the functions shown in Figure 4.1 (Schematic Diagram).

#### 6 WIRE MIC CABLE

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

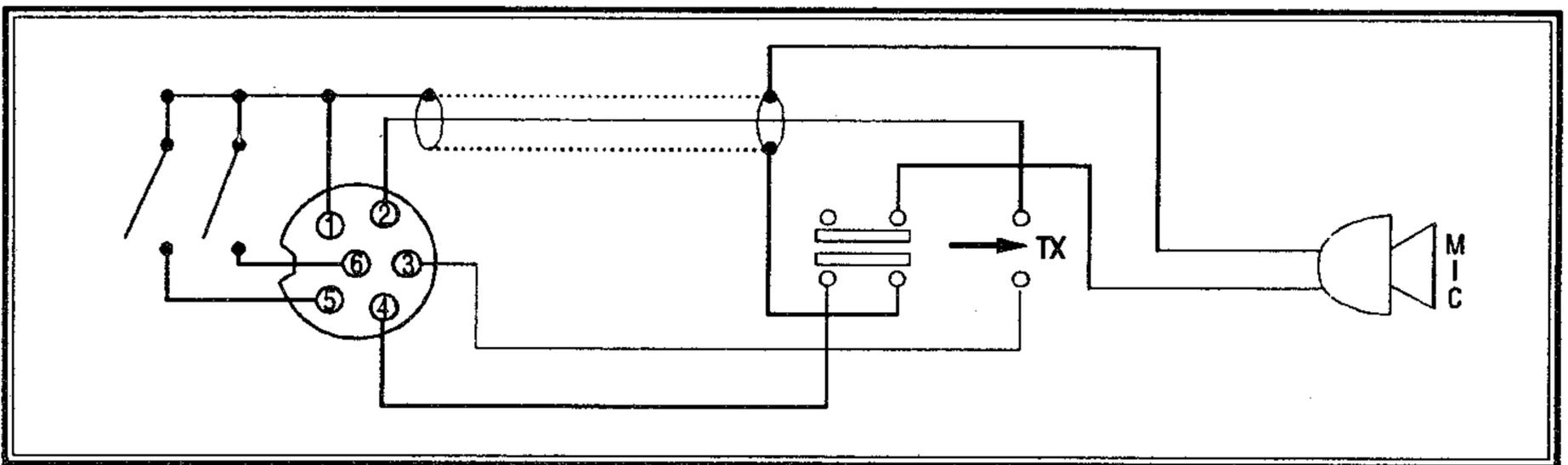


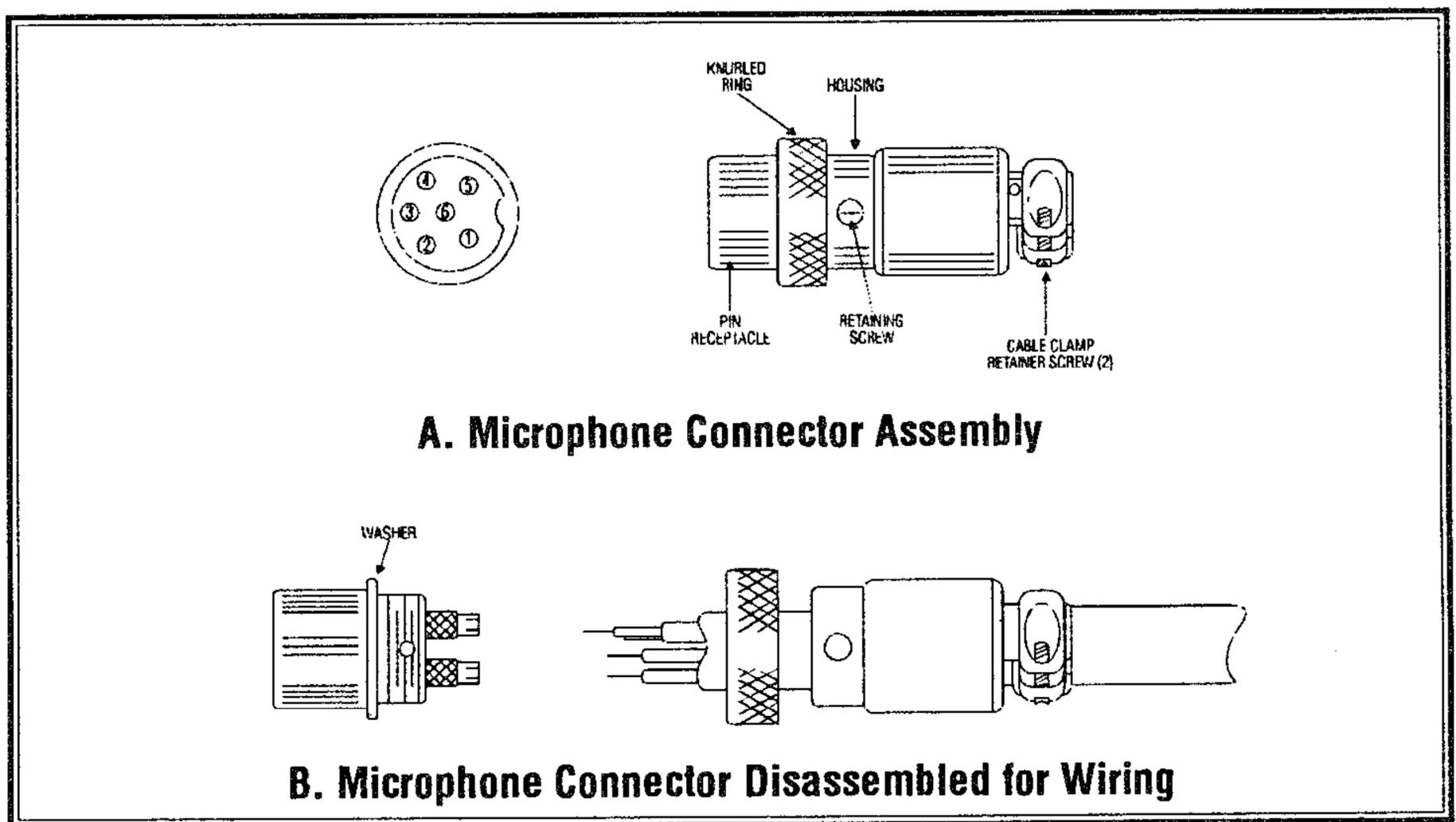
Figure 4.1 Transceiver Microphone Schematic Diagram

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

**(1)** Cut leads so that they extend  $\frac{7}{16}$ " 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  $\frac{1}{8}$ " 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.



**Figure 4.2 Microphone Plug Wiring**

**(1)** Remove the retaining screw.

**(2)** Unscrew the housing from the pin receptacle body.

**(3)** Loosen the two cable clamp retainer screws.



## LIMITED WARRANTY

Ranger Communications, Inc. (Ranger) warrants to the original purchaser **ONLY** this product against defects in material or workmanship as follows:

(1) Ranger warrants the product to be free of defects in material and workmanship for a period of ninety (90) days after initial retail purchase. After this period, the original purchaser must pay for any parts and labor at the prevailing rates either at an authorized Ranger warranty repair facility or at the factory. In addition, Ranger will supply, at no charge, new or rebuilt replacements for defective parts during the warranty period.

(2) In the event of a defect during the warranty period, Ranger shall, at its option, repair or replace the defective product. Such action shall constitute the purchaser's exclusive remedy under this warranty.

(3) A **RETURN AUTHORIZATION NUMBER** must be obtained from the Ranger Customer Service Department before any return for warranty repair will be accepted. Send the defective product **POSTAGE-PAID**, along with proof of the date of purchase (photocopy of the original invoice or receipt) to:

**RANGER**  
Communications, Inc.

3377 Carmel Mountain Road  
San Diego, CA 92121  
(619) 259-9714 • FAX (619) 259-0437

(4) This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, improper installation, **UNAUTHORIZED MODIFICATION** or any action in violation of the product's instruction manual. This warranty is valid **ONLY** in the United States of America.

(5) This warranty is valid **ONLY** if the serial number appears on the product.

(6) Ranger reserves the right to void a warranty or make reasonable charges for the repair of a product which displays evidence of misuse, abuse, neglect, accident or modification of the basic design.

(7) Warranties give you, the buyer, specific legal rights. You may also have other rights which may vary from state to state. This warranty is extended only to Ranger products purchased and shipped to locations in the United States of America or its possessions.

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