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**SOLID STATE CITIZENS BAND
AM/SSB MOBILE TRANSCEIVER**

OWNER'S MANUAL

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CHAPTER 1 SPECIFICATIONS

GENERAL

Frequency Range	26.965 - 27.405 MHz
Emission	AM/USB/LSB
Frequency Control	Phase-Lock-Loop (PLL) Synthesizer
Frequency Stability	0.001%
Temperature Range	-30°C to +50°C
Input Voltage	13.8V DC
Antenna Impedance	50 Ohms
Size	7 7/8" (W) x 9 1/4" (D) x 2 3/8" (H)
Weight	5.0 lbs.

TRANSMITTER

RF Power Output	AM : 4W ; SSB : 12W PEP
Carrier Emission	-55 dB
Spurious Emission	-55 dB
Audio Distortion	10%
Frequency Response	300 to 2500 Hz
Microphone	Dynamic

RECEIVER

Sensitivity for 10 dB (S+N)/N	< 0.5 uV (AM) ; < 0.25 uV (SSB)
Squelch Sensitivity	< 0.5uV
Audio Power Output	2W at 10% THD
Image Rejection	More than 65 dB
AGC Figure of Merit	100 mV for 10 dB Change in Audio Output
Audio Response	300 to 2500 Hz

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

CHAPTER 2 INSTALLATION

LOCATION

Plan the location of the transceiver and microphone bracket before starting the installation. Select a location that is convenient for operation and does not interfere with the driver or passengers. In automobiles, the transceiver is usually mounted below the dash panel with the microphone bracket beside it.

MOUNTING THE RADIO

The transceiver is supplied with a universal mounting bracket. When mounting the bracket and radio to your car, make sure it is mechanically strong. Also, provide a good electrical grounding connection to the chassis of the vehicle. Proceed as follows to mount the transceiver :

1. After you have determined the most convenient location in your vehicle, hold the transceiver with mounting bracket in the exact location desired. If nothing will interfere with mounting it in the desired position, remove the mounting bolts. Before drilling the holes, make sure nothing will interfere with the installation of the mounting bolts.
2. Connect the antenna cable plug to the standard receptacle on the rear panel. Most transceiver antennas are terminated with a type PL-259 plug and mate with the ANT receptacle.
3. Connect the red DC power input wire (with the fuse) to +13.8V DC. This wire extends from the rear panel. In automobile installation, +13.8V DC is usually obtained from the accessory contact on the ignition switch. This prevents the set being left on accidentally when the driver leaves the car and also permits operating the unit without the engine running. Locate the accessory contact on most ignition switches by tracing the power wire from the AM broadcast receiver in the car.
4. Connect the black lead to -13.8V DC. This is usually the chassis of the car. Any convenient location with good electrical contact (remove paint) may be used.
5. Mount the microphone bracket on the right side of the transceiver or near the transceiver, using two screws supplied. When mounting in an automobile, place the bracket under the dash so that the microphone is readily accessible.

IGNITION NOISE INTERFERENCE

Use of a mobile receiver at low signal levels is normally limited by the presence of electrical noise. The primary source of noise in automobile installations is from the generator and ignition system in the vehicle. Under most operating conditions, when signal level is adequate, the background noise does not present a serious problem. Also, when extremely low level signals are being received, the transceiver may be operated with vehicle engine turned off. The unit requires very little current and therefore will not significantly discharge the vehicle battery.

Even though the transceiver has ANL and NB controls, in some installations ignition interference may be high enough to make good communications impossible. The electrical noise may come from several sources. Many possibilities exist as variations between vehicles require different solutions to reduce the noise.

ANTENNA

A vertically polarized, quarter-wavelength whip antenna provides the most reliable operation and greatest range. Shorter, loaded-type whip antennas are more attractive, compact and adequate for applications where the maximum possible distance is not required. Also, the loaded whips do not present the problems of height imposed by a full quarter-wavelength whip.

Mobile whip antennas utilize the metal body of the vehicle as a ground plane. When mounted at a corner of the vehicle they are slightly directional, in the direction of the body of the vehicle. For all practical purposes, however, the radiation pattern is non directional. The slight directional characteristic will be observed only at extreme distances. A standard antenna connector (type SO-239) is provided on the transceiver for easy connection to a standard PL-259 cable termination.

If the transceiver is not mounted on a metal surface, it is necessary to run a separate ground wire from the unit to a good metal electrical ground in the vehicle. When installed in a boat, the transceiver will not operate at maximum efficiency without a ground plate, unless the vessel has a steel hull.

Before installing the transceiver in a boat, consult your dealer for information regarding an adequate grounding system and prevention of electrolysis between fittings in the hull and water.

TUNING THE ANTENNA FOR OPTIMUM SWR

Since there is such a wide variety of base and mobile antennas, this section will strictly concern itself to the various types of mobile adjustable antennas. Because the antenna length is directly related to the channel frequency, it must be tuned to resonate optimally on all channels of the transceiver.

Channel 1 requires a longer antenna than Channel 40 because it is a lower frequency. Due to the various methods of adjusting antennas for proper S.W.R., we have chosen what we think is the optimum method :

A. Antenna with adjustable screws (set screws).

1. Start with the antenna extended and tighten the set screw lightly enough so that the antenna can be lightly tapped with your finger for easy adjustment.
2. Set your transceiver to Channel 20. Press the PTT (push-to-talk) switch, and tap the antenna (making it shorter). The S.W.R. meter will show a lower reading each time the antenna is tapped. By continuing to shorten the antenna, you will notice the S.W.R. reading will reach a low point and then start rising again. This means that you have passed the optimum point for Channel 20.

Extend the antenna a short distance and again follow the procedure above. When the lowest point has been reached, switch to Channel 1 and then to Channel 40 and compare S.W.R. readings. They should be almost equal.

NOTE

The proper setting is achieved when the SWR is 1.5 or below, and when it has the same reading for channels 1 and 40.

B. Antennas which must be cut to proper length

1. Follow the same procedure as above, but adjust the length by cutting in 1/8" increments until a good match is obtained.
2. Be very careful not to cut too much at one time, as once it is cut, it can no longer be lengthened.
3. The whip is easily cut by filing a notch all the way around and breaking the piece off with pliers.

If you are having difficulties in adjusting your antenna, check the followings :

- a. All doors must be closed when adjusting the antenna.
- b. Make sure the antenna base is grounded.
- c. Check your coaxial cable routing (it may be pinched when routed into the car.)
- d. Try a different location on your car (keeping in mind the radiation pattern you wish.)
- e. Is the antenna perfectly vertical ?
- f. Try a different location in your neighborhood. Stay away from large metal objects when adjusting (metal telephone or lamp post, fences, etc.)

NOTE

The transceiver will operate into an SWR of 2 to 1 indefinitely and sustain an SWR of 20 : 1 for a maximum of 5 minutes at rated operating conditions .

EXTERNAL SPEAKER

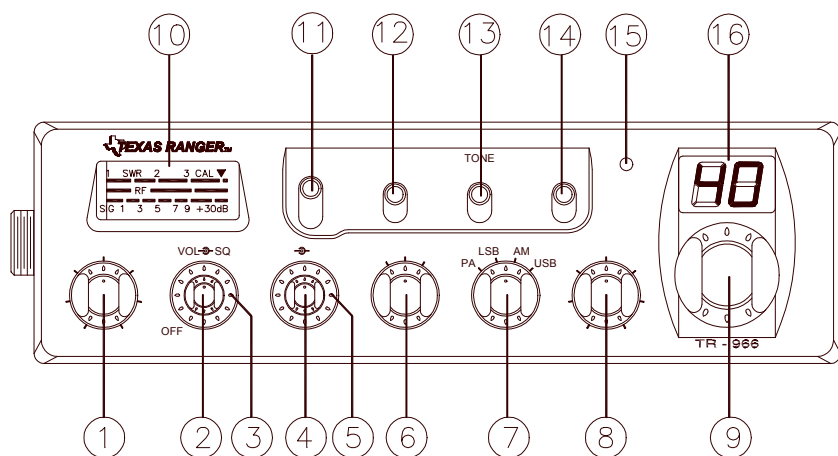
The external speaker jack (EXT. SP.) on the rear panel is used for remote receiver monitoring. The external speaker should have 8 ohms impedance and be able to handle at least 4 watts. When the external speaker is plugged in, the internal speaker is disconnected.

PUBLIC ADDRESS

To use the transceiver as a public address system, connect an external 8 ohms speaker (4 watts minimum) to the PA. SP. jack located on the rear panel. Direct speaker 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.

CHAPTER 3 OPERATION

FRONT PANEL

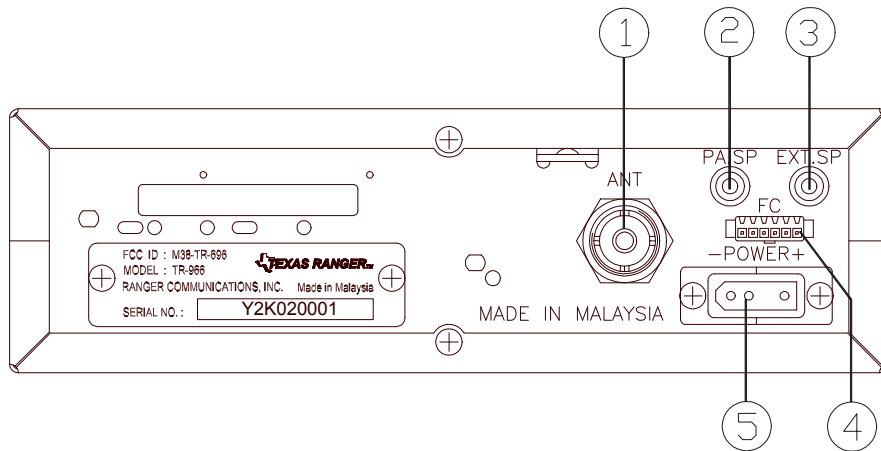


1. **MIC GAIN/ANF CONTROL** : This is a multi function switch which controls both the gain to the microphone as well as the ANF (Advanced Noise Filter). In the outer position, the switch controls the ANF which improves the signal to noise ratio when receiving a marginal signal. When the switch is in the inner position it controls the amount of gain to the microphone.
2. **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.
3. **SQUELCH CONTROL** : This switch is used to eliminate background noise being heard through the receiver which can be disturbing when no transmission are being 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 signals will be heard at a maximum clockwise setting.
4. **RF GAIN CONTROL** : This control is used to reduce the gain of the RF amplifier under strong signal conditions.

5. **SWR CAL CONTROL** : This SWR CAL control allows the user to calibrate the SWR meter.
6. **S-RF/CAL/SWR SWITCH** : In the S-RF position, the meter will indicate the strength of the signal being received, as well as the relative RF output of transmission. When calibrating the SWR meter, you need to put this switch in the CAL position. To use the meter to measure the standing wave ratio, turn the switch to the SWR position.
7. **MODE CONTROL** : This control allows you to select one of the following operating modes : PA/ LSB/AM/USB.
8. **CLARIFIER 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 signal, 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** : This is a three position switch. Move the switch all the way up to activate the Noise Blanker (NB) and Automatic Noise Limiter (ANL). The Noise Blanker is very effective in eliminating repetitive impulse noise such as ignition interference. When the switch is moved to the middle position, only the Automatic Noise Limiter (ANL) is engaged. Move the switch to the bottom position to turn off the ANL and NB.
12. **CH19/OFF SWITCH** : The Channel 19 switch is used for instant access to Channel 19, which is often used by truckers for transmission of traffic and weather conditions.
13. **TONE SWITCH HI/LO** : This switch changes tone quality in receive only. In LO position, bass is increased and in HI position, treble is increased.
14. **DIM/BRT SWITCH** : This switch controls the level of brightness for the meter lamp and channel displays.
15. **TX/RX LED** : The red LED indicates the units 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.

REAR PANEL



1. **ANTENNA :** This jack accepts 50 ohm coaxial cable with a PL-259 type plug.
2. **PA. SP. :** This jack is for PA operation. Before operating, you must first connect a PA speaker (8 ohms, 4W) to this jack.
3. **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.
4. **F.C. :** This connector is used for an external frequency counter which indicates the frequency of the selected channel.
5. **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 the red goes to positive.

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

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. The 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 **CLARIFIER** control to clarify the SSB signals or to optimize AM 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 three types of signals presently used for communications in the Citizens Band : AM, USB, LSB. When the MODE switch on your unit is placed in the AM position, only standard double-side band, full carrier signals will be detected. An SSB signal may be recognized while in the AM 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 CLARIFIER 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 CLARIFIER 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 CLARIFIER.

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 (CLARIFIER) 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 CLARIFIER 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 a 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 the fourth is 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

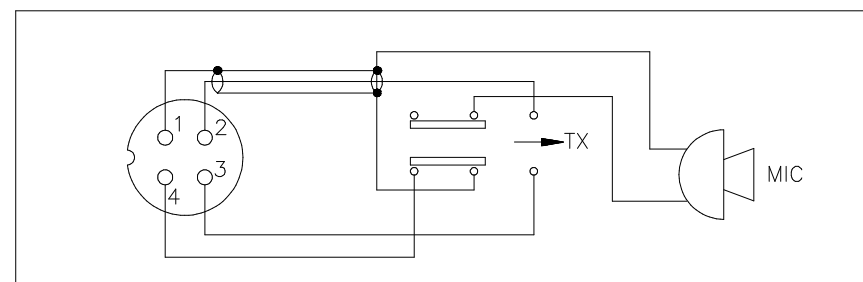


Fig. 1 Your transceiver microphone schematic.

