

IC-22A

2 METER BAND
FM TRANSCEIVER

INSTRUCTION
MANUAL



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SECTION I - SPECIFICATIONS

GENERAL:

Frequency coverage	144.00 to 146.00 MHz or 146.00 to 148.00 MHz
Number of Transistors and Diodes	Transistors 22 FET 4 IC 3 Diodes 16
Modulation Type	F3
Power Voltage	DC 13.8V \pm 15% negative ground
Current Drain	Transmit: HI (10W) average 2.1A LOW (1W) average 1.2A Receive:average 180mA
Antenna Input	50 ohms
Size	2-9/32" high x 6-1/8" wide x 8-1/2" depth.
Weight	4 lbs.

TRANSMITTER:

RF Power Output	HI 10W LOW..... 1W
Spurious Response	-60 db
Frequency Control	Crystal (18 MHz) multiplied x 8
Maximum Frequency Deviation	Adjustable between 3 to 16 KHz
Audio Input	500 ohms
Moduration System	Variable reactance phase modulation
Microphone	500 ohms - Dynamic microphone with push button switch

RECEIVER:

Reception Frequencies	22 channels for 2 meter band
Reception System	Double Superheterodyne
Intermediate Frequencies	1st IF: 10.7 MHz 2nd IF: 455 KHz
Sensitivity	a. Better than 0.4 μ V 20 db quieting b. S + N/N at 1 μ V input, 30 db or more
Spurious Response	-60 db, or less
Squelch	Ajustable 5 to -15 db
Band width	\pm 8 KHz/ -6 db point \pm 15KHz/ -50 db
Audio Output Power	1.5W
Audio Output Impedance	8 ohms
Frequency Control	Crystal (14/15 MHz) multiplied x 9

SECTION II - DESCRIPTION

This transceiver is extremely rugged and completely solid state. State of the art devices such as Integrated Circuits, Field Effect Transistors, Varactor and Zener diodes are engineered into a tight knit straightforward electronic design throughout both transmitter, and receiver. Reliability, low current demand, compactness, unexcelled performance and ease of operation are the net result.

The dual conversion receiver with its FET front end and high-Q helicalized cavity resonators boasts low noise and sensitivity of $0.4\mu\text{V}$ or less. Signal gain of 90 db or more is accomplished from the second mixer back by virtue of a 6 stage IF amplifier. The need for additional front end RF amplification is thus eliminated. Zener regulated crystal-controlled first and second local oscillators produce unmatched stability. Audio reproduction is of an unusually high order of distortion free clarity.

The transmitter section will produce a minimum of 10 watts RF output. Again, a Zener regulated crystal oscillator is employed for initial frequency stability. Twenty-two crystal controlled channels are provided for operating convenience and versatility. High-Q stages provide minimum interstage spurious response. A low pass filter is placed at the output to further insure undesirable frequency products are not emitted.

All circuitry is constructed on two printed circuit boards which are easily accessible for servicing. The printed circuit boards are housed in a sturdy aluminum frame which is, in turn, housed in a rigid metal case providing an extremely durable and rugged unit. Care has been taken to filter and regulate internal DC voltages. A DC input filter is provided to eliminate alternator or generator "whine" generated in the vehicle environment. Test points are brought up from all major circuits to facilitate maintenance checks and trouble shooting should the necessity arise.

Each unit comes complete with built-in speaker, a high-quality dynamic microphone, mobile mounting bracket, microphone clip, DC cabling and plug, and external speaker plug.

A modern styled face plate, large S meter, small size and low profile design complete the unit's styling. A welcome addition to any dashboard or fixed station.

SECTION III - INSTALLATION

3.1 Unpacking:

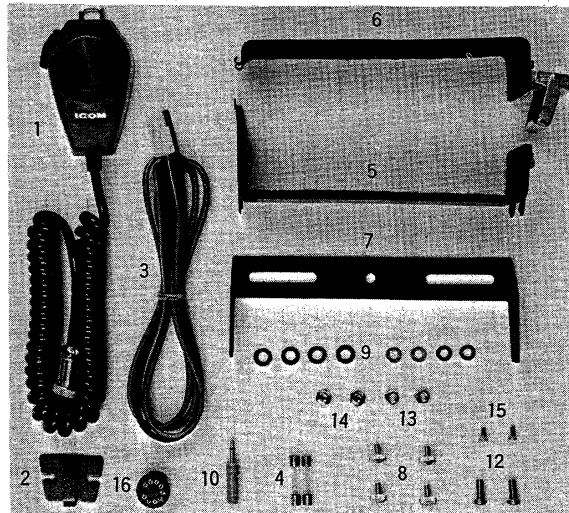
Carefully remove your transceiver from the packing carton and examine it for signs of shipping damage. Should any shipping damage be apparent, notify the delivering carrier or dealer immediately, stating the full extent of the damage. It is recommended you keep the shipping cartons. In the event storage, moving, or reshipment becomes necessary, they come in handy. Accessory hardware, cables, etc., are packed with the transceiver. Make sure you have not overlooked anything.

3.2 Accessories:

Make sure the following accessories for the IC-22 A are included.

- (1) Microphone (dynamic type)..... 1
- (2) Microphone hook 1
- (3) Power cord 1
- (4) Spare fuses (5A)..... 2
- (5) Installing holder A..... 1
- (6) Installing holder B..... 1
- (7) Installing angle joint 1
- (8) Gimp nuts 4
- (9) Flat washers 6
- (10) Plug for speaker 1
- (11) Instruction manual 1
- (12) Mounting screws 2
- (13) Mounting screw's nuts..... 2
- (14) Screws for additional bracket..... 2
- (15) Flat head screw's nuts 2
- (16) Acc. plug 1

Fig. 1



3.3 Location:

Where you place the transceiver in your automobile is not critical and should be governed by convenience and accessibility entirely. Since the unit is so compact, many mobile possibilities present themselves. In general, the mobile mounting bracket will provide you with some guide as to placement. Any place where it can be mounted with metal screws, bolts, or pop-rivets will work. For fixed station use, the IC-3PA power supply is designed to be a stand for the transceiver.

3.4 Power Requirements:

The transceiver is supplied ready to operate from any regulated 13.5 VDC, 2.5 ampere negative ground source. An automobile, 12 volt, negative ground, system is usually more than adequate. Some note must be taken, however, to the condition of the vehicle's electrical system. Items such as low battery, worn generator/alternator, poor voltage regulator, etc., will impair operation of your transceiver as well as the vehicle. High noise generation or low voltage delivery can be traced to these deficiencies. If an AC power supply other than the matching IC-3PA is used with your transceiver, make certain it is adequately regulated for both voltage and current. Low voltage while under load will not produce satisfactory results from your transceiver. Receiver gain and transmitter output will be greatly impaired.

CAUTION: Excessive Voltage (above 15VDC) will cause damage to your transceiver. Be sure to check the source voltage before plugging in the power cord.

Included with your transceiver is a DC power cable with plug attached. The Red Wire is positive (+), the Black, negative (-). If your mobile installation permits, it is best to connect these directly to the battery terminals. This arrangement eliminates random noise and transient spikes sometimes found springing from automotive accessory wiring. If such an arrangement is not possible, then any convenient B+ lead in the interior of the vehicle and the negative frame can be utilized. Your transceiver provides an internal DC filter that will take out the large amount of transient difficulties anyway. Remember,

the unit operates on a negative ground system only - it cannot be used in a positive ground automobile. After making your connections, simply insert the plug into your transceiver.

When your transceiver is mated with its matching AC power supply, the IC-3PA the power cable from the IC-3PA is simply plugged in the same receptacle in the transceiver and the AC line cord into any convenient wall receptacle.

3.5 Antenna:

The most important single item that will influence the performance of any communication system is the antenna. For that reason, a good, high-quality, gain antenna of 50 ohms impedance is recommended, fixed or mobile. In VHF as well as the low bands, every watt of ERP, makes some difference. Therefore, 10 watts average output plus 3 db of gain antenna equals 20 watts ERP, presuming low VSWR of course. The few more dollars investment in gain type antenna is well worth it.

When adjusting your antenna, whether mobile or fixed, by all means follow the manufacturer's instructions. There are some pitfalls to be aware of. For example, do not attempt to adjust an antenna for lowest VSWR when using a diode VSWR meter not engineered for VHF applications. Such readings will invariably have error of 40% or more. Rather, use an in line watt meter similar to the Drake WV-4, Bird Model 43 or Sierra Model 164B with VHF cartridge. Further, when adjusting a mobile antenna, do so with the motor running preferably above normal idling speed. This will insure proper voltage level to the transceiver.

The RF coaxial connector on the rear chassis mates with a standard PL-259 connector. Some models may have a metric thread. In any event, the RF connector will mate with almost any PL-259 connector if care is taken to seat them properly.

3.6 Microphone:

A high quality dynamic microphone is supplied with your transceiver. Merely plug it into the proper receptacle on the front panel.

This microphone is of 500 ohms impedance with a normal output of 6mV. Should you wish to use a different microphone, make certain it is of equal impedance and output level. Under no circumstances use a "gain pre-amp" or ceramic type microphone. The audio system in your transceiver is more than adequate and additional pre-amplification is unnecessary. To use this class of microphone is to invite distortion and possible damage to the transceiver.

3.7 Crystals:

Your transceiver has 22 channels, both transmit and receive, or a total of 44 crystal sockets. The channel selector switch selects one transmit and one receive channel in each of its 22 positions.

To order additional crystals from a manufacturer, the following correlation data is provided. Remember to specify high activity as prerequisite to your acceptance.

Crystal Data

Holder Type:	HC-25/u
Calibration Tolerance:	0.0025%
Load Capacitance:	20 pF
Effective Resistance:	15 ohms or less

Cut: "AT" optimum angle ± 2 min.

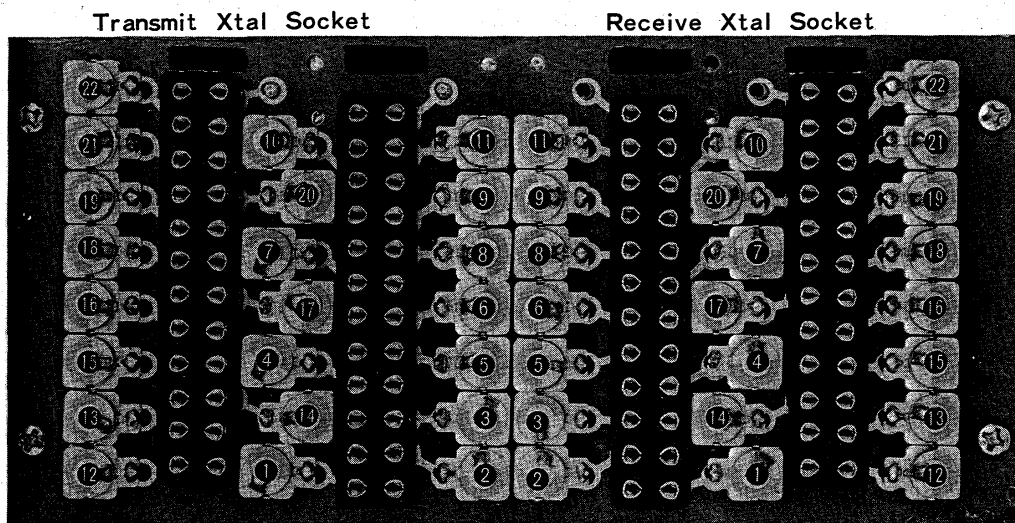
Transmit Crystal: Crystal Frequency = $\frac{\text{Desired Operating Frequency}}{8}$

Receive Crystal: Crystal Frequency = $\frac{\text{Desired Operating Frequency} - 10.7 \text{ MHz}}{9}$

Trimmers have been placed on the crystal board to assist you in "tweaking" new crystals on frequency. Consult the trimmer location chart (Fig. 2) for their positions.

The amount of frequency spread between any two receiving or any two transmitting frequencies should not exceed 2 MHz. Since the receiver and transmitter are independent of each other, you may have any practical amount of frequency separation you wish here. Only two or more widely spaced frequencies for the receiver alone or for the transmitter alone need be considered under the 2 MHz limitation.

CRYSTAL POSITION CHART Fig. 2



3.8 External Speaker:

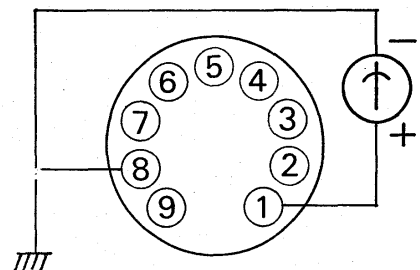
An external speaker jack and plug is supplied with your unit in the event another speaker is desirable. The external speaker impedance should be 8 ohms. The use of the external speaker jack will disable the internal speaker. An 8 ohm headset can be utilized as well. (See Fig. 5)

3.9 Accessory Socket :

1. Discriminator output
8. Ground.

The discriminator output from Pin 1 is used for an indication of the frequency difference between an incoming signal and the receive frequency. A 50 uA center meter is connected to Pin 1 and Pin 8. The other 7 pins may be used for whatever you wish. Some examples might be power supply voltage, audio output, frequency check, remote control, etc.

Fig. 3





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