

# IC-22S

PLL SYNTHESIZED  
2-METER  
TRANSCEIVER

INSTRUCTION  
MANUAL



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## SECTION I SPECIFICATIONS

### GENERAL:

Semiconductor Complement :	Transistors	34
	FET	7
	IC	13
	Diodes	33 to 128 depending on channels
Frequency Range (For Specification)		146 - 148 MHz
Voltage		13.8 VDC Negative Ground
Current Required	TX	2.0 AMP @ 10W 0.9A at 1W
	RX	700 MA at MAX Audio. 400 MA Squelched
Size		58 MM (H) x 156 MM(W) x 218 MM(D)
Weight		1.9 Kilograms
Antenna Impedance		50 OHMS
Number of Channels		23 Channels selected from any of the 132 channels on 15 KHz spacing.
Frequency Control		Stablized Master oscillator PLL programmed by diode matrix.

### TRANSMITTER:

Power Out	10 Watts or 1 Watt, Selectable
Modulation Width	5 KHz
Microphone Impedance	500 OHMS
Spurious Level	Lower Than - 60DB Below carrier

### RECEIVER:

Modulation Acceptance	16F3
Type	Double Superhet, 1st I. F. 10.7 MHZ, 2nd I.F. 455 kHz
Receiver Sensitivity	4DB Below 1 UV or Lower (0.4 micro)
1 Microvolt S+N/N	30 DB or Better S+N/N
Spurious Response	60 DB or More Attenuation
Bandpass	+/-7.5 KHz/-6DB, +/-15 KHz/-60DB
Squelch Sensitivity	-8 DB Below 1 Microvolt
Audio Output	1.5 watts or more into 8 OHMS.

## 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, 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 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 PLL controlled first and crystal-controlled second local oscillators produce very good 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 phase locked loop is employed for initial frequency stability. Twenty two (22) 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 not being emitted. Final PA transistor protection circuit is incorporated in the final circuitry. A new design heat radiator is employed to increase final amplifier reliability.

All circuitry is constructed on three printed circuit boards which are easily accessible for servicing. The printed circuit boards are housed in a sturdy 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, external speaker plug, and operating manual. A modern styled face plate, large S meter, small size and low profile design complete the unit's styling. A welcome addition to a dashboard or fixed station.

## SECTION III INSTALLATION

### 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.

### Location:

Where you place the transceiver in your automobile is not critical and should be governed by convenience and accessibility. 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, a power supply should be designed to produce 3 amps for the transceiver.

### 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, of 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 supply 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 against catastrophic failure of the power supply should be observed.

**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 a 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 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.

**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 invested in a 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 metric thread. In any event, the RF connector will mate with almost any PL-259 connector if care is taken to seat them properly.

**Microphone:**

A high quality dynamic microphone is supplied with your transceiver. Merely plug it into the proper receptacle on the front panel. Should you wish to use a different microphone, make certain it is of the high impedance type; at least 500 ohms or better. Particular care should be exercised in wiring also, as the internal electronic switching system is dependent upon it. See the schematic for the proper hook up. Under no circumstances use a "gain pre-amp" type microphone. The audio system in your transceiver is more than adequate and additional preamplification unnecessary. To use this class of microphone is to invite distortion.

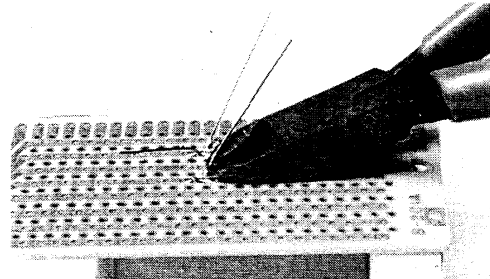
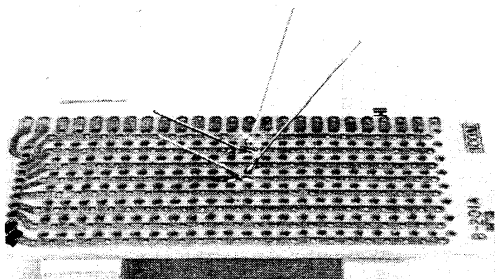
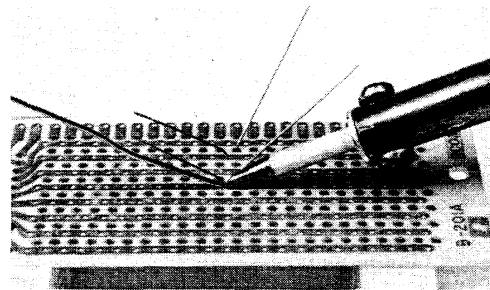
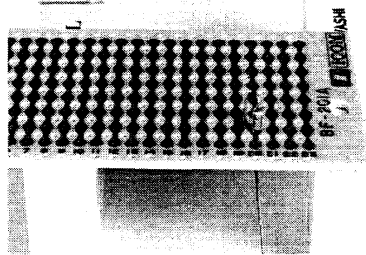
**Synthesizer Programming :**

Your transceiver does not need crystals to set the frequency. It has 22 channels selected by the channel selector switch. In addition, the channel selected has three options of how the offset is handled: receive and transmit on the programmed frequency (SPX), receive 600 kHz higher than the programmed frequency (DPX A), and transmit 600 kHz above the programmed frequency (DPX B). The programming is done on the diode matrix board by soldering computer grade diodes into the boards in the locations indicated on the diode matrix diagram. Please refer to the chart on pages 22~24 for the locations.

**CAUTION:**

**DO NOT USE A SOLDERING IRON OF MORE THAN 40 WATTS ON THE MATRIX**

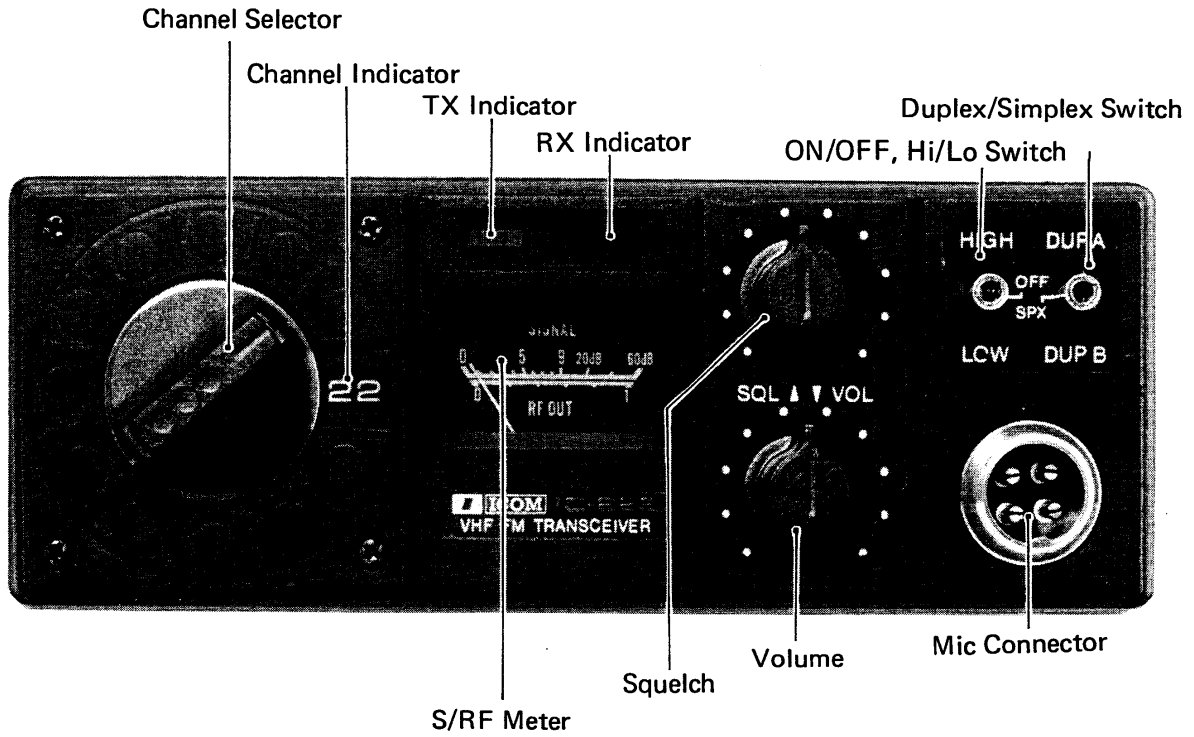
The matrix board may be removed by taking out the hold-down screw at the end of the board and pulling gently straight up on the other end to disconnect the matrix from the connector. The numbers 1 through 22 indicate the channel number to be programmed and the numbers D-0 through D-7 indicate the position in which the diode is to be placed corresponding to the insert positions on the Frequency vs Matrix Chart. Insert the diode into the line for the desired channel with the cathode pointing UP. The cathode lead is bent down to go through the board to connect to the other side. After the diodes have been inserted for the channel, turn the board over carefully so as to not have the diodes fall out and solder each of the leads with a small tip, low wattage soldering iron. Clip end diode lead off as close to the board as possible. Replace the board on its connector and replace the screw in the end.



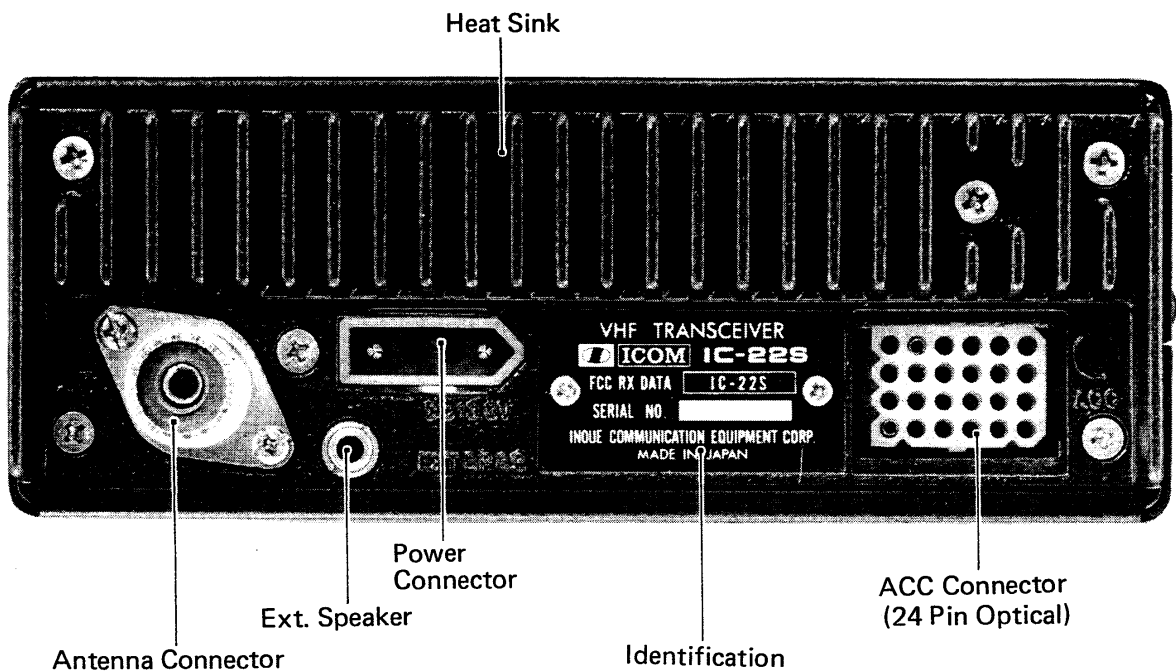
**External Speaker:**

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. 2B)

## FRONT VIEW



## BACK VIEW







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