IC-230

PLL SYNTHESIZED

INSTRUCTION MANUAL

ICOM

SECTION II - DESCRIPTION

This transceiver employs a Phase Locked Loop Synthesizer which is capable of 30 kHz spaced full coverange operation between 146 MHz to 148 MHz. In addition, the transmit frequency may be increased or decreased by 600 kHz on each channel for use with repeators. The IC-230 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 straight forward electronic design throughout both transmitter, and receiver. Reliability, low current demand, compactness, unexelled performance and ease of operation are the net result.

The dual conversion reciever with its FET front end and high-Q helicalized cavity resonators boasts low noise and sensitivity of 0.4μV, 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. A zener regulated crystal-controlled first and second local oscillators produce unmatched stablity. Audio reproduction is of an unusally high order of distortion free clarity.

The transmitter section will produce a minimum of 10 watts RF output. High-Q and shielded stages provide minimum interstage spurious response. An encased low pass filter is placed at the output to further insure undesirable frequency products are not emitted. An ingenious final PA transistor protection device, (APC), is incorporated in the final output circuitry. A tiny VSWR bridge and four DC amplifier constantly monitor the output for high VSWR, a shorted or absent antenna load, or other difficulty that would cause irreparable final transistor damage Should these difficulties occur, the APC instantaneously disables the final PA without damage.

All circuitry is constructed in a series of modules which are easily removable for servicing. The modules are housed in a sturdy aluminum frame, which is, in turn, housed in a rigid metal case, providing an extremely durable and rugged unit. Great care has been taken to filter and regulate internal DC voltages. A DC input filter is provided to eliminate alternator or generator "whine" when used in a vehicle. Test points are brought up from all major circuits to facilitate maintenance checks and trouble shooting should the necessity arise.

A modern styled face plate, large S meter, small size and low profile design complete the unit's styling. The IC-230 is a welcome addition to any automoble or fixed station.

SECTION III - INSTALLATION

3.1 Unpacking:

Carefully remove your transceiver from the packing carton and examine it for signs of damage. Should any 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 handware, cables, etc., are packed with the transceiver. Make sure you have not overlooked anything.

3.2 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 AC power supply is so designed to be a stand for the transceiver.

3. 3 Power Requirement:

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 a low battery, worn generator/alternator, poor voltage regulator, etc., will impair operation of your transceiver. 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 in 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 most of the transient noise. Remember, the unit operates on a negative ground system only - it canot be used in a positive ground automobile. After making your connections, simply insert the plug into your transceiver (see Fig. 3).

When your transceiver is used 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. 4 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, for fixed or mobil use. In VHF as well as the low bands, every watt of ERP makes some difference. Therefore, 10 watts average output plus 3 db of antenna gain equals 20 watts ERP, presuming low VSWR of course. The few more dollars investment 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 or Bird Model 23 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.

Do not become alarmed if your transceiver fails to transmit at times during the antenna tune up procedure. Remember, your transceiver has a built-in Automatic Protection Circuit (APC) that will disable the transmitter if excessive VSWR, a shorted coaxial line or connector, or other antenna deficiency is present. A quick check on a good 50 ohm dummy load will show the transceiver to be working. The difficulty will lie with the antenna or its transmission line.

3. 5 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 6 mV. 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 unnecessary. To use this class of microphone is to invite distortion and possible damage to the transceiver.

3. 6 LO Spare Crystal Socket

There are 4 spare crystal sockets besides the 7 installed crystals in the LO module. When the MHz Indicator shows 146, No. 8 socket is for "A" on the 100 KHz Selector and No. 9 is for "B". When the Indicator shows 147, No. 10 socket is for "A" on the 100 KHz Selector and No. 11 socket is for "B" on the selector. Each crystal adds 10 channels with 30 KHz separation.

The frequencies are calculated as follows:

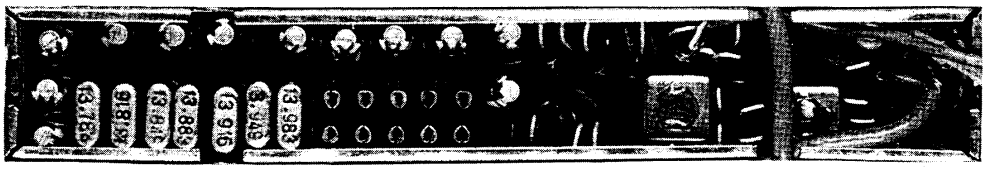
$$f\,(\text{MHz}) = \frac{\text{Desired Operating Freq.} - \text{CO}_{1\sim10}\ \text{Freq.} - 10.7\ (\text{MHz})}{9}$$

For exampl, if you desire to operate on 146.02 MHz

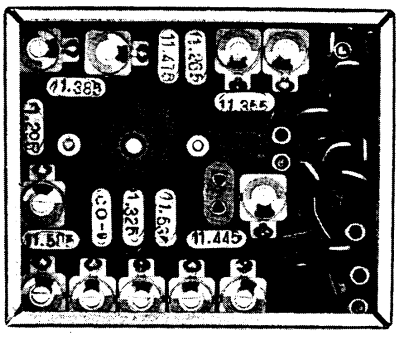
$$f\,(\text{MHz}) = \frac{146.02\ (\text{MHz}) - 11.265\ (\text{MHz}) - 10.7\ (\text{MHz})}{9} = \quad 13.784\ (\text{MHz})$$

If you put a crystal of 13.784 MHz into the spare socket No. 8 or No. 9, 10 frequencies with 30 KHz separation will be produced. They are 146.02, 146.05, 146.08, 146.11, 146.14, 146.17, 146.20, 146.23, 146.26 and 146.29 MHz.

LO MODEL



CO MODEL



3. 7 CO Spare Crystal Socket

There is a spare crystal socket along with the 10 installed crystals in the CO module. The spare socket is for "C" on the 10 KHz Selector for both 146 and 147 MHz. This crystal adds 7 channels with 300 KHz separation.

The frequencies are calculated as follows.

f (MHz) = Desired Operating Freq. – ($LO_{1\sim7}$ Freq. x 9) – 10.7 (MHz)

For example, if you desire to operate on 146.05 MHz

f (MHz) = 146.05 (MHz) – 13.783 (MHz) x 9 – 10.7 (MHz) = 11.305 (MHz)

If you put a 11.305 MHz crystal into the CO spare socket, 7 frequencies with 300 KHz separation will be produced. They are 146.05, 146.350, 146.650, 146.950, 147.250, 147.550 and 147.850 MHz.

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
LO Frequency:	13.783 – 13.983 MHz
CO Frequency:	11.265 – 11.535 MHz
Cut:	"AT" optimum angle ±2 min.

CAUTION: BEFORE YOU INSTALL ANY SPARE CRYSTAL, CHOOSE A FREQUENCY THAT WILL NOT ALLOW ANY POSITION ON THE 100 KHz OR 10 KHz SELECTOR TO PRODUCE A FREQUENCY THAT IS OUT OF THE 146 MHz - 148 MHz BAND, WHILE USING THE NEWLY INSTALLED CRYSTAL.

Due to the 30 kHz separation in the United States, not all selectable frequencies are available. If the meter light goes out after selecting a frequency, you will know that that frequency is outside the 30 kHz separation.

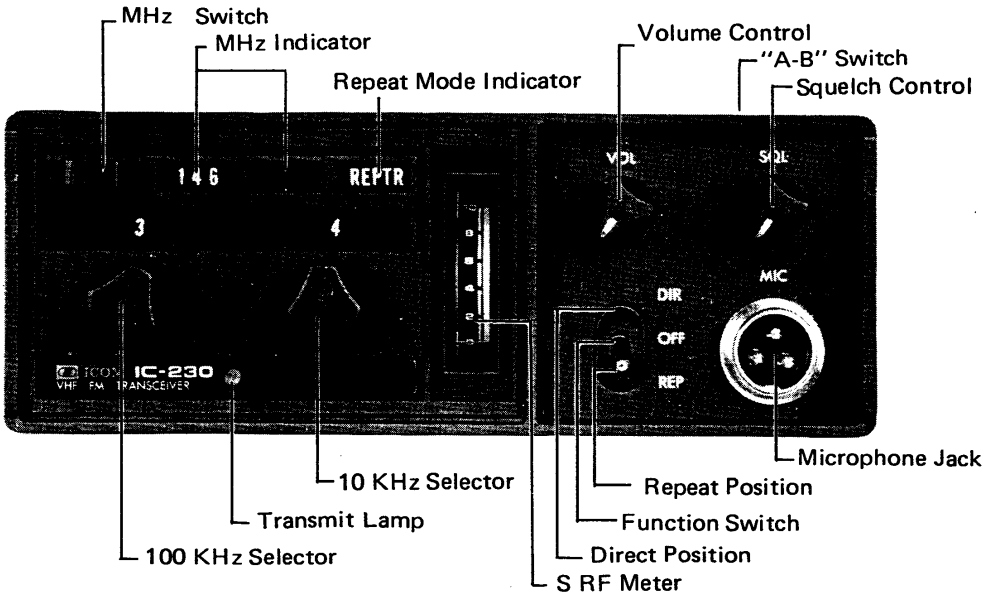
3. 8 External Speaker:

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.

SECTION IV - CONTROL FUNCTIONS

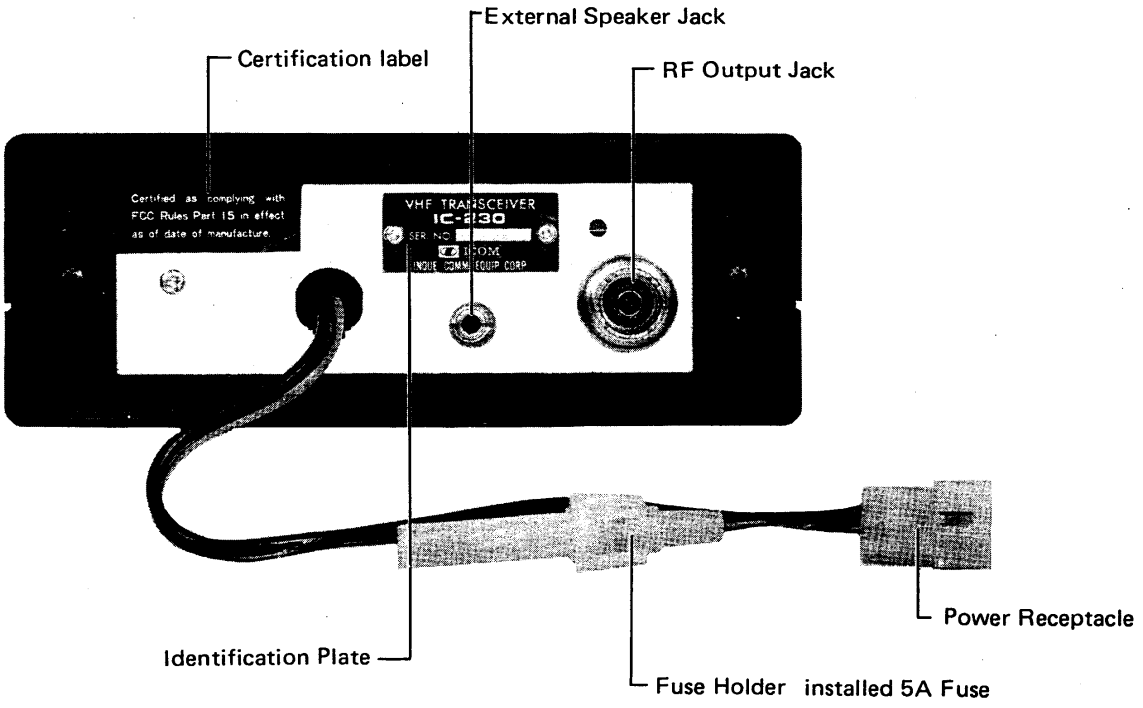
4. 1 Front Control

Volume Control: controls audio output level of the receiver.
Squetch Control: controls the squetch threshold point of the receiver.
Microphone Jack: accepts 3 prong mike plug.
S-RF Meter: reads S signal strength in receive mode and relative RF output in transmit mode. The meter light is on only when the frequency selected is avaible.



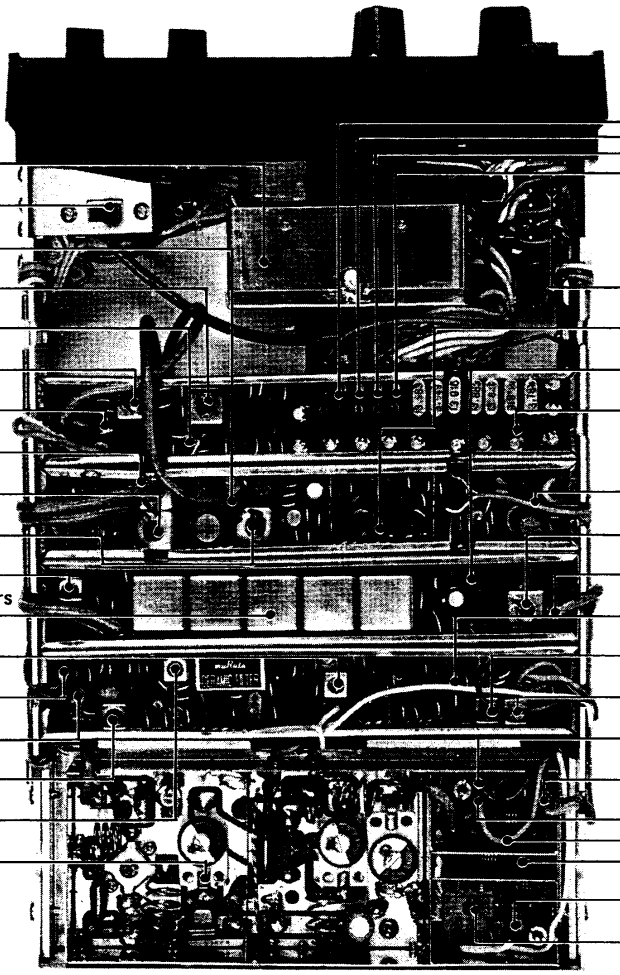
4. 2 Rear Panel

RF Output Jack: accepts standard PL-259 coaxial connector.
External Speaker Jack: this jack mates with the plug supplied for an external 8 ohm speaker or headset use.

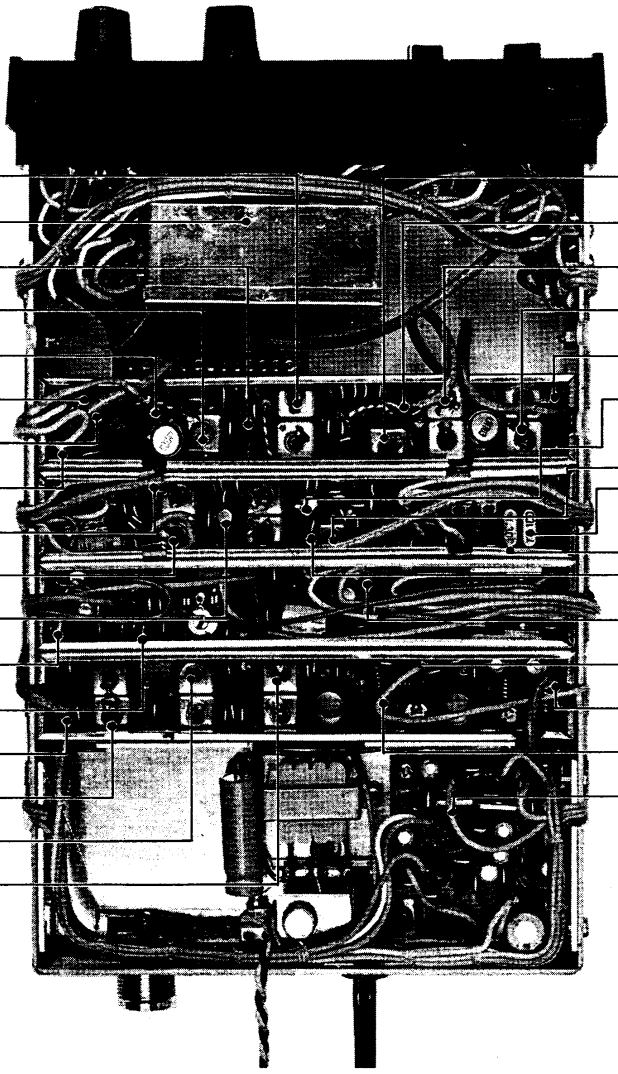


Power Receptacle: mates with DC cord plug supplied.
Identification Plate: states model, serial number and date of manufacture.

TOP VIEW


CO Module
"A-B" switch
J5
L1
J6
L2
J1
J7
L4
L2
L8
helicalized cavity resonators
L3
J7
J8
L1
L2
PA Module
B position (147 MHz)
A position (147 MHz)
B position (146 MHz)
A position (146 MHz)
MHZ Switch
L1
RF Module
LO Module
VCO Module
L1
J1
IF Module
L4
L5
J3
J1
J4
Filter Module
J7
APC Circuit

BUTTOM VIEW


L9
CO Module
PD Module
L5
J7
J10
J5
J9
J6
L2
MIX Module
Mic Garn Control
Deviation Control
J5
L1
L4
L6
L8
J3
L4
L1
J1
L4
L5
–600 kHz Use
+600 kHz Use
J8
AF Module
J3
J1
YGR Module
EPS Module

INOUE COMMUNICATION
EQUIPMENT CORPORATION

3-8 KAMIKURAZUKURI-CHO,
HIGASHISUMIYOSHI-KU,
OSAKA JAPAN