

IC-20

INSTRUCTION MANUAL

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SECTION I - SPECIFICATIONS

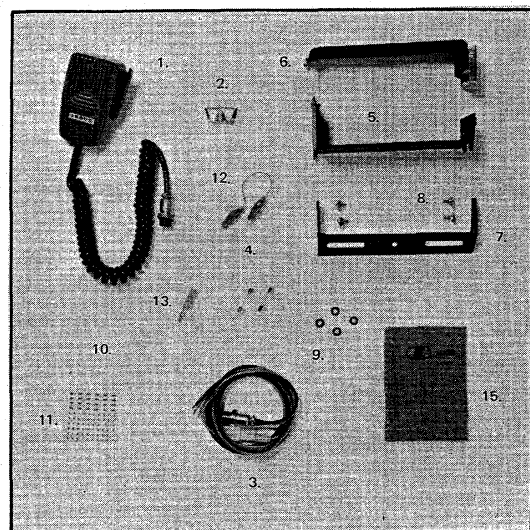
GENERAL:

Frequency coverage	144.00 to 148.00 MHz
Number of Transistors and Diodes	Transistors 33 FET 5 IC 1 Diodes 20
Modulation Type	F3
Power Voltage	DC 13.5V ±20% negative ground
Current Drain	Transmit: HI (10W) average 2.1 A LOW (1W) average 1.2 A Receive: average 150 mA
Antenna Input	50 ohms
Size	2 9/32" high x 6 1/8" wide x 8 1/2" depth.
Weight	4 1/2 lbs.
TRANSMITTER:	
RF Power Output	HI 10 W LOW 1 W
Frequency Control	Crystal (18 MHz) multiplied x 8
Maximum Frequency Deviation	Adjustable between 3 to 16 KHz
Audio Input	10 K ohms
Modulation System	Variable reactance phase modulation
Microphone	10K ohms - Dynamic microphone with push button switch
RECEIVER:	
Reception Frequencies	12 channels for 144 MHz band. Built-in crystal units for 3 channels.
Reception System	Double Superheterodyne
Intermediate Frequencies	1st intermediate: 10.7 MHz 2nd intermediate: 455 KHz
Sensitivity	a. Better than 0.4 u V 20 db quieting b. S + N/N at 1 u V input, 30 db or more
First IF	10.7 MHz
Second IF	455 KHz
Spurious Response	-60 db
Spurious Gain	-60 db, or less
Squelch	Adjustable 5 to -15 db
Band width	±15 KHz / -6 db point ±25 KHz / 50 db
Audio Output Power	1.5 W
Audio Output Impedance	8 ohms
Frequency Control	Crystal (14 MHz) multiplied x 9

ACCESSORIES

Make sure the following accessories for the model IC-20:

- (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 4
- (10) Spare indicator 1
- (11) Dial lettering 1
- (12) Clip cord for calibration 1
- (13) Plug for speaker 1
- (14) Instruction manual 1
- (15) Silicon cloth 1



SECTION II - DESCRIPTION

This transceiver is an extremely rugged, completely solid state transceiver. State of the art devices such as Integrated Circuits, Field Effect Transistors, varactor and Zener diodes are engineered into 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 uV or less. Signal gain of 90 db or more is accomplished from the second mixer back by virtue of 6 stage of 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 distortionfree 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. Twelve crystal controlled channels are provided for operating convenience and versatility. High-Q and shielded stages provide minimum interstage spurious reaction. An encased low pass filter is placed at the output to further insure undesirable frequency products not being emitted. An ingenious final PA transistor protection device, (APC), is incorporated in the final output circuitry. A tiny VSWR bridge and four DC amplifiers 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 driver and 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 aluminium frame which is, in turn, housed in a rigid metal chassis, providing an extremely durable and rugged unit. Premium 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 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 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. The non-smoker, for instance, will find the removal of the auto ashtray will provide a very handy place in most modern cars. 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-3P (or IC-3PA) AC power supply is so designed as to be a stand for the transceiver. The mated units occupy a space 6 1/4" x 6 1/4" x 7 1/2".

3.3 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-3P 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 Blue, 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 (see Fig. 3) and tighten snugly with its threaded retaining ring.

When your transceiver is mated with its matching AC power supply, the IC-3P (or IC-3PA) the power cable from the IC-3P (or IC-3PA) is simply plugged in the same receptacle in the transceiver and the AC line cord into any convenient wall receptacle. In this case (only IC-3P), the power cable also carries the necessary wiring for the built-in discriminator meter.

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, fixed or mobile. In VHF as well as the low bands, every watt of ERP makes some difference. Therefore, 12 watts average output plus 3 db of gain antenna equals 24 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.

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

3.5 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 10 K ohms or better. Particular care should be exercised in wiring also, as the internal electronic switching system is dependant 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 pre-amplification unnecessary. To use this class of microphone is to invite distortion and possible damage to the transceiver.

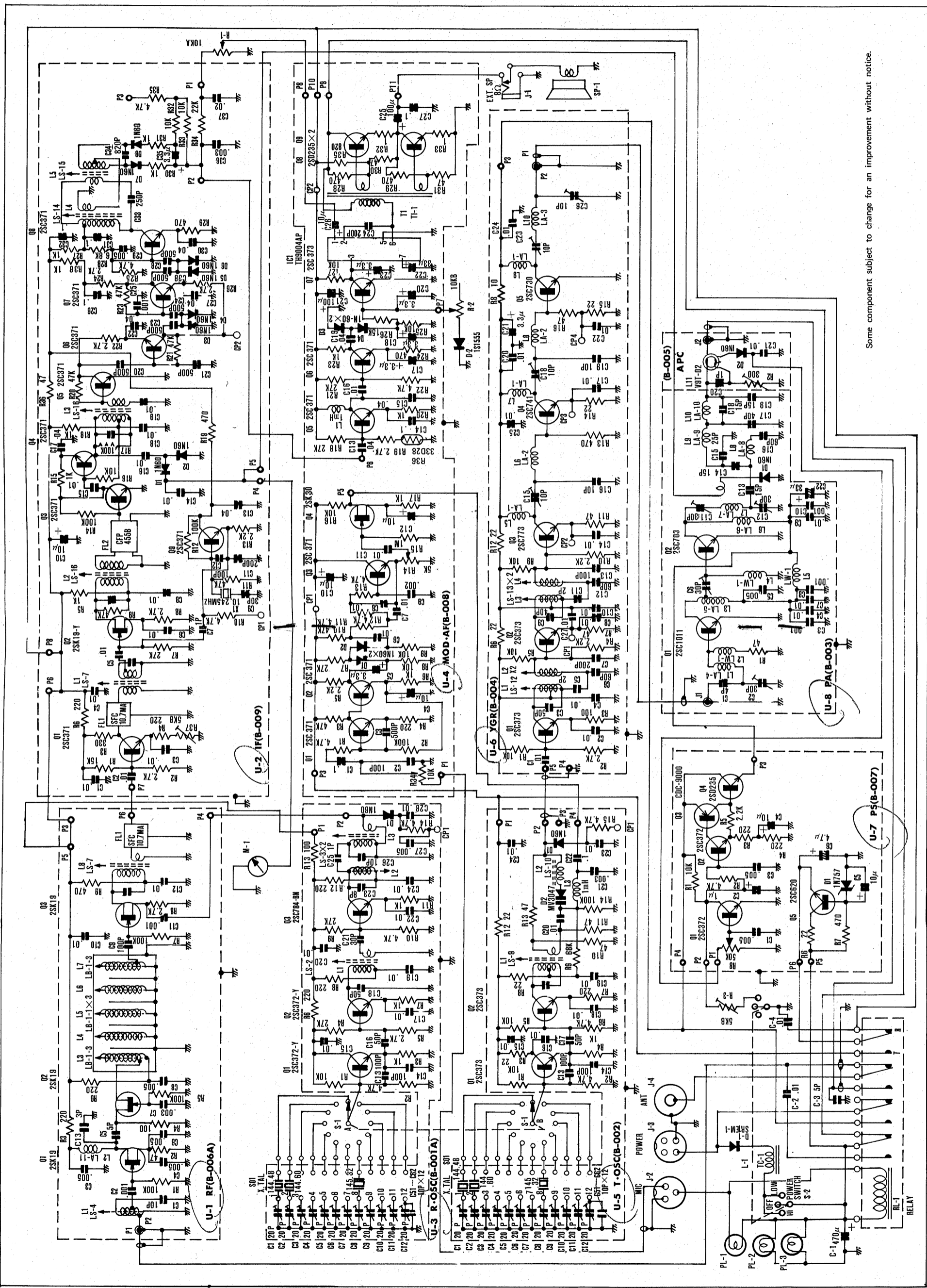
3.6 Crystals:

Your transceiver has twelve channels, both transmit and receive, or a total of 24 crystal positions. The channel selector switch selects one transmit and one receive channel in each of its twelve 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
Transmit Crystal:	Crystal Frequency <u>Desired Operating Frequency</u> 8
Receive Crystal:	Crystal Frequency <u>Desired Operating Frequency—10.7 MHz</u> 9



Some component subject to change for an improvement without notice.