

IC-471A/E

430MHz ALL MODE TRANSCEIVER

INSTRUCTION MANUAL



TABLE OF CONTENTS

SECTION	1	SPECIFICATIONS	1
SECTION	2	FEATURES	2
SECTION	3	INSTALLATION	3
SECTION	4	OPERATING CONTROLS.....	5
	4-1	FRONT PANEL.....	5
	4-2	CONTROLS UNDER THE ACCESS COVER.....	7
	4-3	REAR PANEL CONNECTIONS.....	8
SECTION	5	OPERATING INSTRUCTIONS.....	9
	5-1	HOW TO TUNE	9
	5-2	MEMORY CHANNEL OPERATION	14
	5-3	TUNING BY UP/DOWN BUTTON ON THE MICROPHONE.....	15
	5-4	SCANNING OPERATION.....	16
	5-5	SSB OPERATION	17
	5-6	CW OPERATION.....	18
	5-7	FM OPERATION.....	19
SECTION	6	INSIDE VIEWS	20
SECTION	7	OPTION INSTALLATION.....	22
SECTION	8	TROUBLESHOOTING.....	25
SECTION	9	VOLTAGE CHARTS.....	26
SECTION	10	BLOCK DIAGRAM	29
SECTION	11	SCHEMATIC DIAGRAM.....	SEPARATE

SECTION 1 SPECIFICATIONS

GENERAL

Number of Semiconductors:

Transistors	108 (IC-471A: 110)
FET	10
IC (Includes CPU)	55 (IC-471A: 59)
Diodes	174 (IC-471A: 178)

Frequency Coverage:

430.0 ~ 440.0MHz
(IC-471A: 430.0 ~ 450.0MHz)

Frequency Control:

CPU based 10Hz step PLL synthesizer.
Independent Transmit-Receive Frequency Capability
32 Memory Channels provided
Programmed Scan, Memory Channel Scan and Mode-Selective Scan Capability

Frequency Resolution:

SSB 10Hz steps (Automatic 100Hz steps shift)
FM 5KHz steps
1KHz steps with TUNING RATE switch depressed

Frequency Readout:

7 digit Luminescent display 100Hz readout

Frequency Stability:

Within 0.001% in the range of $-10^{\circ}\text{C} \sim +60^{\circ}\text{C}$

RIT Frequency Coverage:

$\pm 9.9\text{KHz}$ from displayed receive frequency

Power Supply Requirements:

DC 13.8V $\pm 15\%$ Negative ground Current drain 8A max.
AC power supply is available for AC operation.

Current Drain (at 13.8V DC):

Transmitting	25 watts output	Approx.	8.0A
	1 watt output	Approx.	2.5A
Receiving	At max. audio output		1.4A
	Squelched		1.2A

Antenna Impedance:

50 ohms Unbalanced

Weight:

6.0 Kg

Dimensions:

110mm(H) x 285mm(W) x 275mm(D)

TRANSMITTER

RF Output Power:

SSB (A_3J) 25 Watts PEP
CW (A_1), FM (F_3) 25 Watts
Continuously Adjustable Output power 1 watt ~ Max.

Emission Mode:

SSB (A_3J USB/LSB), CW (A_1), FM (F_3)

Modulation System:

SSB: Balanced modulation
FM: Variable reactance frequency modulation

Max. Frequency Deviation:

$\pm 5\text{KHz}$

Harmonic Output:

More than 60dB below peak power output

Spurious Output:

More than 60dB below peak power output

Carrier Suppression:

More than 40dB below peak power output

Unwanted Sideband:

More than 40dB down at 1000Hz AF input

Microphone:

600 ohm electret condenser microphone with push-to-talk switch and scanning buttons (IC-471E: with 1750Hz tone-burst unit)
(IC-471A: Supplies an 8-pin plug instead of the microphone.)

Operating Mode:

Simplex, Duplex (Any in-band 10KHz steps frequency separation programmable)

RECEIVER

Receiving System:

SSB, CW Double conversion superheterodyne
FM Triple conversion superheterodyne

Receiving Mode:

A_1 , A_3J (USB, LSB), F_3

Intermediate Frequencies:

SSB, CW 70.4515MHz, 10.75MHz
FM 70.4515MHz, 10.75MHz, 455KHz

Sensitivity:

SSB, CW Less than 0.3 microvolts for 10dB S+N/N
FM Less than 0.3 microvolts for 12dB SINAD
Less than 0.5 microvolts for 20dB noise quieting

Squelch Sensitivity:

SSB, CW Less than 1.0 microvolt
FM Less than 0.3 microvolts

Spurious response rejection ratio:

More than 60dB

Selectivity:

SSB, CW More than 2.4KHz at -6dB point
Less than 4.8KHz at -60dB point
FM More than 15KHz at -6dB point
Less than 30KHz at -60dB point

Audio Output Power:

More than 2.0 watts (at 8 ohm 10% distortion)

Audio Output Impedance:

8 ohms

Specifications are approximate and are subject to change without notice or obligation.

SECTION 2 FEATURES

430MHz ALL-MODE TRANSCEIVER INCORPORATING A MICROCOMPUTER

CPU control with ICOM's original programs provides various operating capabilities. A no-backlash dial controls by ICOM's unique rotary encoder circuit. The Band-edge detector and the Endless System provides out-of-band protection. Variable capacitors and dial gear are not utilized and therefore provide problem-free use. The IC-471A/E provides FM, USB, LSB, CW coverage in the 430 ~ 440MHz (IC-471A: 430 ~ 450MHz) frequency range. Thus the IC-471A/E can be used for mobile, DX, local calls, satellite work, and moonbounce.

MULTI-PURPOSE SCANNING

Memory Scan allows you to monitor all different memory channels or only those stored with a particular mode. Program Scan provides scanning between two programmed frequencies. Auto-stop scanning when a signal is received, in any mode.

DUAL VFO'S AND 32 MEMORY CHANNELS

Two separate VFO's can be used either independently or together for simplex operation, and any desired frequency split in duplex operation.

The IC-471A/E has 32 memory channels and each channel stores the operating frequency as well as the mode, duplex/simplex and subaudible tone frequency (IC-471E provides tones only when an optional unit is installed).

CONTINUOUS TUNING SYSTEM

ICOM's new continuous tuning system features a luminescent display that follows the tuning knob movement and provides an extremely accurate readout. Frequencies are displayed in 7 digits representing 100MHz to 100Hz digits.

Automatic recycling restarts tuning at the top of the band, i.e., the high edge when the dial goes below the low edge. Recycling changes the high edge to the low edge as well. Quick tuning in 1KHz steps is available, and fine tuning in 10Hz steps in the SSB and CW modes, and 5KHz steps and 1KHz steps in the FM mode, is provided for trouble-free QSO.

EASY-TO-READ DISPLAY

The IC-471A/E employs an easy-to-read large luminescent display. This displays the operating frequency as well as the VFO in use, operating mode, RIT shift frequency, duplex mode, scan mode, etc.

EASIER OPERATION AND LIGHTER WEIGHT

The IC-471A/E is the most compact, lightest weight all-mode 430MHz transceiver. It is the first to use a pulse power supply (option) in communication equipment, for light weight. A 50mm-diameter large tuning control knob is provided for smooth and easy tuning. Easy to use control knobs are provided for both receiving and transmitting. An LED indicates the transmit or receive mode.

SUITABLE FOR BOTH FIXED AND PORTABLE STATIONS

The transceiver can be operated with a self-contained 117/240V AC (option) or 12V DC power supplies. A convenient Dial Lock switch is included for mobile operation as well as an easy-carry handle. An effective Noise Blanker reduces pulse noise. The IC-SM6, high quality stand microphone (option), is suitable for fixed station operation. A powerful audio output, 2.0 watts at 8 ohm, provides easy listening even in noisy surroundings.

OUTSTANDING PERFORMANCE

The RF amplifier and the first mixer circuit incorporate FET's, and other circuits provide excellent Cross Modulation and Two-Signal Selectivity characteristics. The IC-471A/E has excellent sensitivity demanded especially for mobile operation, high stability, and utilizes Crystal Filters having high shape factors and exceptional selectivity.

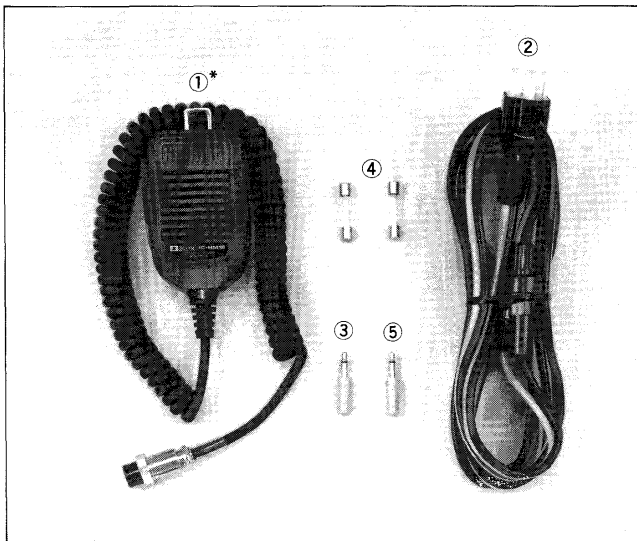
The transmitter uses a balanced mixer in a double conversion system, a band-pass filter and a high-performance low-pass filter. This system provides distortion-free signals with a minimum spurious radiation level.

SECTION 3 INSTALLATION

BE SURE TO READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE OPERATION

3 - 1 UNPACKING

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



- | | |
|--------------------------------|---|
| 1. Microphone (IC-HM15) | 1 |
| 2. DC Power Cord | 1 |
| 3. External Speaker Plug | 1 |
| 4. Spare Fuses (15 Amp) | 2 |
| 5. Key Plug | 1 |

*NOTE: IC-471A supplies an 8-pin plug instead of the mic.

3 - 2 RECOMMENDATIONS FOR INSTALLATION

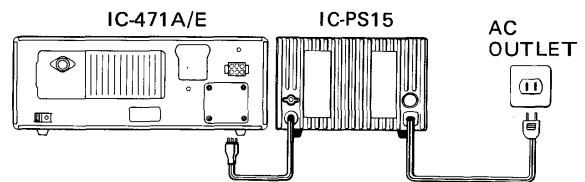
1. Avoid placing the IC-471A/E in direct sunlight, high temperature, dusty or humid places.
2. The temperature of the set will usually become relatively warm during transmission. Any equipment should be at least 1 inch (3cm) away from the unit so as to provide good ventilation. Be sure that nothing is on and just behind the rear PA heatsink to ensure good ventilation. Also avoid places near outlets of heaters, air conditioners, etc.
3. Place the unit so that the controls and switches can easily be handled and the frequency indication and meter can easily be read.
4. For mobile installation, an optional mounting bracket is available. Select the best location that can stand the weight of the unit and that does not interfere with your driving in any way.
5. Use the Ground Lug!

3 - 3 POWER SUPPLY

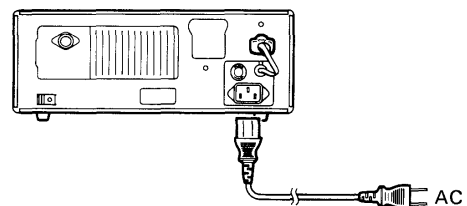
For AC operation, use the special power supply IC-PS15, or optional built-in power supply IC-PS25. If you would like to use your car battery or any other DC power supply, be sure that its output voltage is 12-15 Volts and the current capacity is at least 8 Amps. The maximum power consumption of the set during transmission runs about 8 Amps, so keep that in mind if the unit is installed in your automobile, and turn it on after you have started the engine. Attention should also be paid to the condition of the battery and electrical system.

The connection of the DC power cord supplied with the IC-471A/E is done in the following way: First make sure that the power switch of the unit is in the OFF position and the T/R switch is in the receive position. Connect the cord to a DC power supply with the RED lead to the positive terminal and the BLACK lead to the negative terminal. (Reverse connection will cause the protection circuit to operate and blow the fuse.) Connect the DC plug to the socket on the rear panel of the IC-471A/E. Refer to the drawing below.

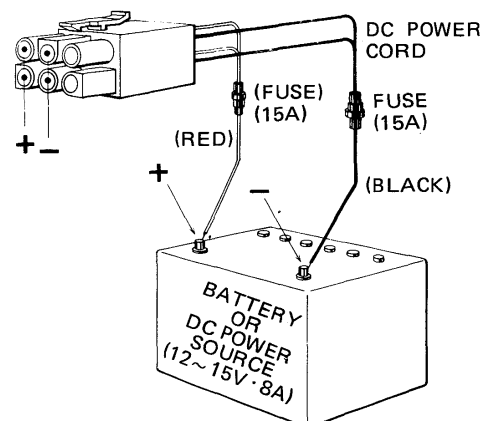
For AC operation (with IC-PS15)



For AC operation (when optional IC-PS25 is installed).



For DC operation



3-4 ANTENNA

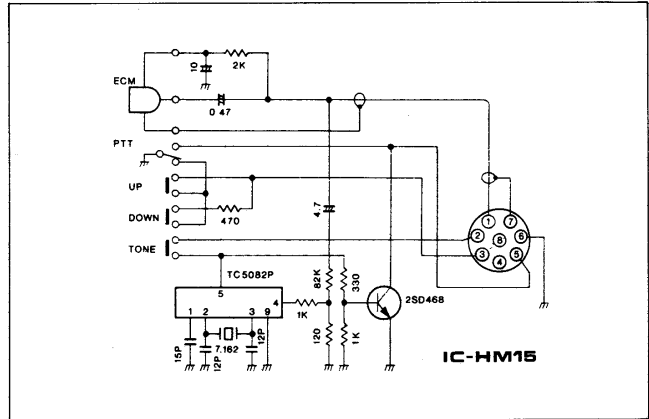
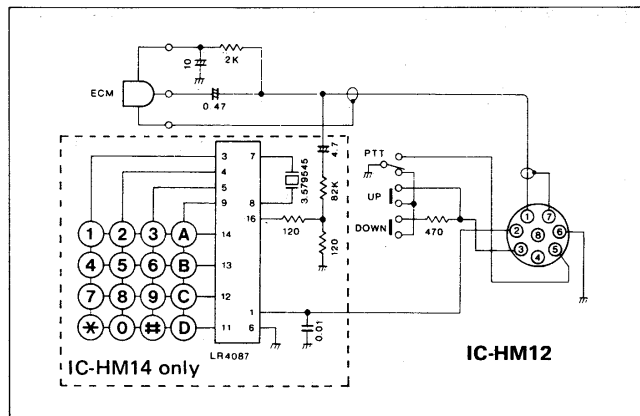
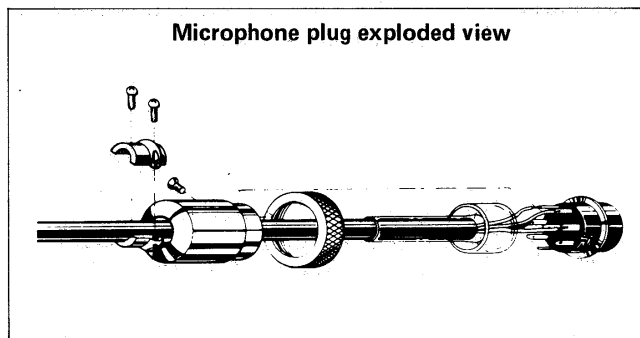
The single most important item that will influence the performance of any communication system is the antenna. For that reason, a good, high-quality, gain antenna of 50 ohms impedance is recommended, for fixed or mobile. In UHF as well as the low bands, every watt of ERP makes some difference. Therefore, 25 watts average output plus 3dB of gain antenna equals 50 watts ERP, presuming low VSWR of course. The few extra dollars invested in a gain types antenna is well worth it. When adjusting your antenna, whether mobile or fixed, by all means follow the manufacturer's instructions.

There are however 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 UHF applications. Such readings will invariably have an error of 40% or more. Instead, use an in-line watt meter similar to the Bird model 43 or Sierra model 164B with UHF cartridge. Further, when adjusting a mobile antenna, do so with the engine 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 N-type (UG-21/U) connector.

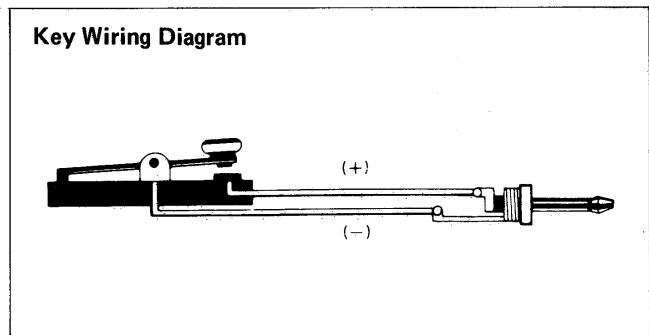
3-5 MICROPHONE

A high quality electret condenser microphone is supplied with your transceiver (some versions do not supply a microphone). Merely plug it into the proper receptacle on the front panel. Should you wish to use a different microphone, make certain it has proper output level. Particular care should be exercised in wiring also, as the internal electrical switching system is dependent upon it. See the schematic for the proper hookup.



3-6 CW KEY

When operating CW, connect a key to the Key Jack with the plug supplied. The connection of the plug is shown below.



If the terminals have polarity, be sure to make the correct connection. Note that the keyed voltage when switching with semiconductors or relays with resistors in the circuit, should be adjusted to be below 0.4 Volts!

3-7 EXTERNAL SPEAKER

The IC-471A/E contains an internal speaker, and is also designed so that it can drive an external speaker from the external (EXT) speaker jack on the rear panel. Be sure the impedance of the external speaker is 8 ohms, and remember that with the external speaker connected, the internal speaker is disabled.

3-8 HEADPHONES

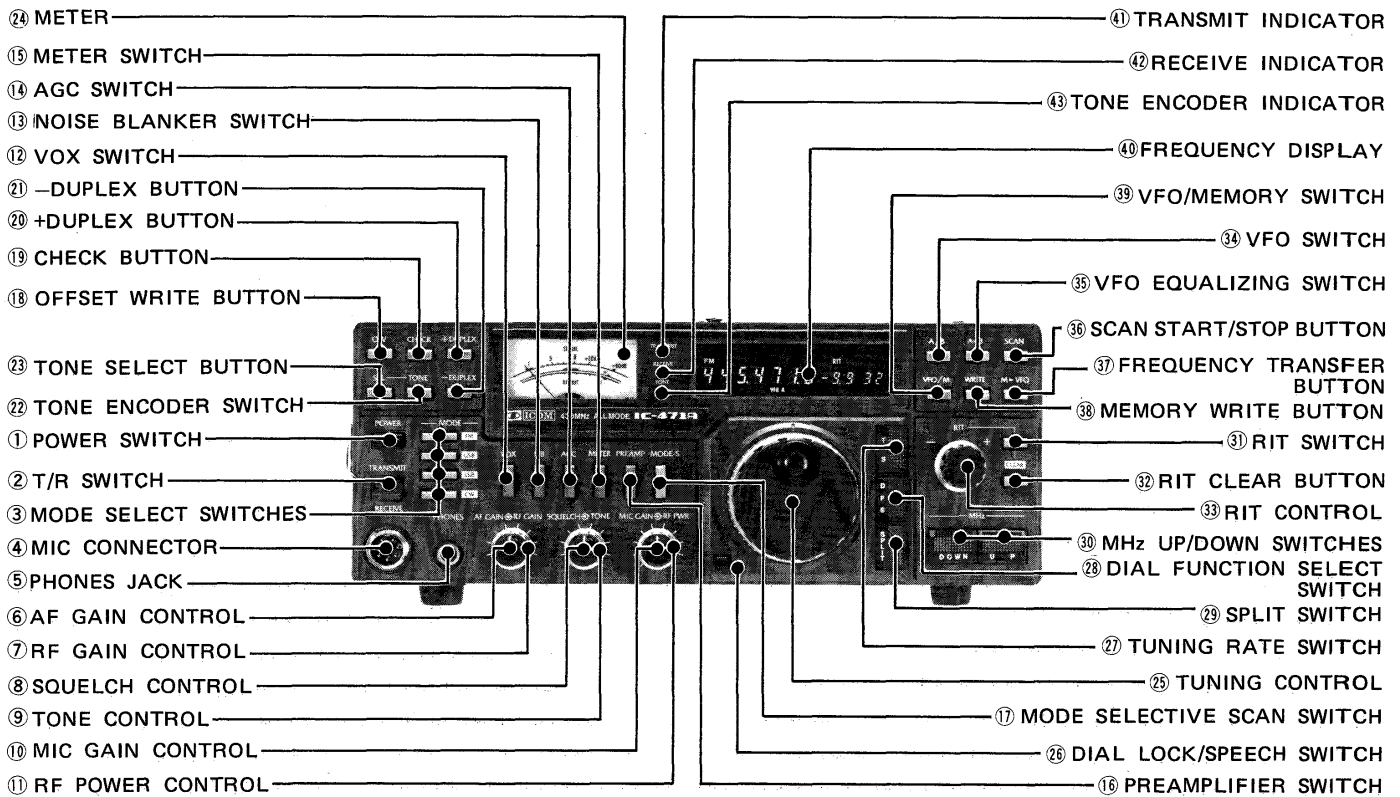
Any good headphone set, including stereo type, that have 4-16 ohms impedance can be used. With the plug inserted halfway into the PHONES jack, both the headphone and speaker will operate. This is convenient when others wish to listen in on the station, or you wish to record contacts using a tape recorder connected to the headphone jack. With a stereo headphone set inserted this way, however, the headphone will lose the sound on one side. With the plug inserted completely, only the headphone works.

3-9 GROUND

In order to prevent electrical shocks, TVI, BCI and other problems, be sure to connect a heavy wire ground, as short as possible, from a good earth point to the ground terminal on the rear panel.

SECTION 4 OPERATING CONTROLS

4-1 FRONT PANEL



1. POWER SWITCH

The POWER SWITCH is a push-lock type switch which controls the input DC power to the IC-471A/E. When the external AC power supply (IC-PS15) or optional built-in AC power supply (IC-PS25) is used, the switch also acts as the AC power supply switch. When the switch is pushed in and locked, power is supplied to the set. When the switch is pushed again and released, power is cut to all circuits except the PA unit.

2. T/R (TRANSMIT/RECEIVE) SWITCH

This switch is for manually switching from transmit to receive and vice versa. Set the switch to RECEIVE (down) and the IC-471A/E is in the receive mode. Set the switch to TRANSMIT (up) and it switches to transmit. When switching with the PTT switch on the microphone or with the VOX switch set to ON, the T/R switch must be in the RECEIVE position.

3. MODE SELECT SWITCHES

Selects any one of four operating modes of FM, USB, LSB and CW, by simply pushing the desired switch.

4. MIC CONNECTOR

Connect the supplied microphone or optional microphone to this connector. If you wish to use a different microphone, refer to the drawings on page 4.

5. PHONES JACK

Accepts a standard 1/4 inch headphone plug for headphones of 4 ~ 16 ohms. Stereo phones can be used without modification.

6. AF GAIN CONTROL

Controls the audio output level in the receive mode. Clockwise rotation increases the level.

7. RF GAIN CONTROL

Controls the gain of the RF section in the receiver. Clockwise rotation gives the maximum gain. As the control is rotated counterclockwise, the needle of the METER rises, and only signals stronger than the level indicated by the needle will be heard.

8. SQUELCH CONTROL

Sets the squelch threshold level. To turn OFF the squelch function, rotate this control completely counterclockwise. To set the threshold level higher, rotate the control clockwise.

9. TONE CONTROL

Controls the receiver audio tone. Adjust the control to provide comfortable reception.



ICOM INCORPORATED
1-6-19, KAMI KURATSUKURI, HIRANO-KU,
OSAKA JAPAN