



INSTRUCTION MANUAL

UHF FM REPEATER **IC-FR4000**



IMPORTANT

READ THIS INSTRUCTION MANUAL CAREFULLY before attempting to operate the repeater.

SAVE THIS INSTRUCTION MANUAL— This manual contains important safety and operating instructions for the IC-FR4000.

PRECAUTION

⚠ WARNING HIGH VOLTAGE! NEVER attach an antenna or internal antenna connector during transmission. This may result in an electrical shock or burn.

⚠ WARNING HIGH VOLTAGE! NEVER install the antenna at any place that person touch the antenna easily during transmission. This may result in an electrical shock or burn.

⚠ NEVER apply AC to the [BATTERY] terminals on the repeater rear panel. This could cause a fire or damage the repeater.

⚠ NEVER apply more than 16 V DC, such as a 24 V battery, to the [BATTERY] terminals on the repeater rear panel. This could cause a fire or damage the repeater.

⚠ NEVER let metal, wire or other objects touch any internal part or connectors on the rear panel of the repeater. This may result in an electric shock.

⚠ NEVER expose the repeater to rain, snow or any liquids.

AVOID using or placing the repeater in areas with temperatures below -30°C (-22°F) or above $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$). Be aware that temperatures on a vehicle's dashboard can exceed 80°C ($+176^{\circ}\text{F}$), resulting in permanent damage to the repeater if left there for extended periods.

AVOID placing the repeater in excessively dusty environments or in direct sunlight.

AVOID putting anything on top of the repeater. This will obstruct heat dissipation.

Place the repeater in a secure place to avoid inadvertent use by children.

EXPLICIT DEFINITIONS

WORD	DEFINITION
⚠ WARNING	Personal injury, fire hazard or electric shock may occur.
CAUTION	Equipment damage may occur.
NOTE	If disregarded, inconvenience only. No risk of personal injury, fire or electric shock.

BE CAREFUL! The heatsink will become hot when operating the repeater continuously for long periods.


BE CAREFUL! If a linear amplifier is connected, set the repeater's RF output power to less than the linear amplifier's maximum input level, otherwise, the linear amplifier will be damaged.

Use Icom microphones only (optional). Other manufacturer's microphones have different pin assignments, and connection to the IC-FR4000 may damage the repeater.

For U.S.A. only

CAUTION: Changes or modifications to this repeater, not expressly approved by Icom Inc., could void your authority to operate this repeater under FCC regulations.

CAUTION: This repeater is intended for use as a fixed base station with the antenna located outdoors on the rooftop or on antenna tower.

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DECLARATION OF CONFORMITY

For U.S.A.

This equipment complies with the Federal Communications Commission (FCC) rules and regulations governing telephone equipment and the Technical Requirements for Connection to the Telephone Network published by the industry's Administrative Council for Terminal Attachments (ACTA). On the right side of this equipment is a label that contains, among other information, a product identifier in the format US:ICMOT03BIC-FR4000. If requested, this number must be provided to the telephone company.

The applicable certification jack (connector) USOC-RJ-11C is used for this equipment.

This device can only be connected to the Public Switched Telephone Network (PSTN) using a telephone cord and modular plug that is compliant with the criteria of the telecommunication industry. This equipment is designed for connection to the telephone network or premises wiring using a compatible modular jack that is also compliant.

The Ringer Equivalence Number (or REN) is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company.

CAUTION: If this equipment is deemed potentially harmful to the telephone network, the telephone company will attempt to notify you in advance of discontinuing service. If advance notice is not practical, the telephone company will notify you as soon as possible. If service is disconnected, you will be advised of your right to file a complaint with the Federal Communications Commission (FCC) should you believe it necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of this equipment. Should this occur, advance notice you be provided in order for you to make necessary modifications to maintain uninterrupted service.

Should you experience trouble with this equipment, please contact: ICOM America, Technical Support at 425-454-7619 for repair or warranty information. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

NOTICE: Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

If your home has specially wired alarm equipment connected to the telephone line, ensure the installation of this IC-FR4000 does not disable your alarm equipment. If you have questions about what will disable alarm equipment, consult your telephone company or a qualified installer.

For CANADA

NOTICE: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

NOTICE: The Ringer Equivalence Number (REN) for this terminal equipment is 0.3. The REN assigned to each terminal equipment provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed five.

FORWARD

Thank you for purchasing this Icom product. The IC-FR4000 UHF FM REPEATER is designed and built with Icom's state of the art technology and craftsmanship. With proper care, this product should provide you years of trouble-free operation.

We want to take a couple of moments of your time to thank you for making the IC-FR4000 your repeater of choice, and hope you agree with Icom's philosophy of "technology first." Many hours of research and development went into the design of your IC-FR4000 series.

◇ FEATURES

○ 50 W continuous full duty cycle operation

This repeater looks as good as it performs. A rugged heatsink, large cooling fans and a high performance power module provide the repeater with a stable 50 W at full duty cycle operation.

○ Automatic battery backup system

A built-in backup system supports automatic switching to an external power supply (13.6 V DC) if the AC power supply fails.

○ Multiple CTCSS & DTCS tone memories with multiple memory channels

Up to 16 CTCSS/DTCS tones (TX/RX tones respectively) can be programmed in a channel. This feature allows you to share a channel with multiple user groups. You can also give priority/exclusive use to a specified group simply by programming different tones to another memory channel. Ideal for many different applications.

○ Built-in 2-Tone, 5-Tone, DTMF encoder & decoder

Multiple signaling systems are equipped as standard. These systems are fully compatible with Icom F-series radios.

○ Telephone interconnect capability

○ DTMF remote control capability

You can control the repeater from a remote location over the air or over a phone line with DTMF.

○ Other features

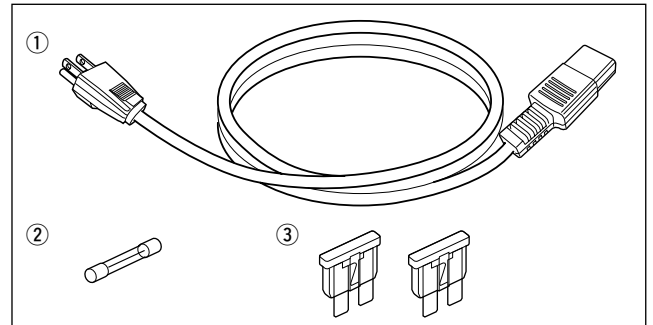
- PC programmable
- Wall or 19 inch rack mount (optional MB-77/MB-78)
- Optional Voice Scrambler Unit (UT-109 #01/UT-110 #01) for base operating mode

SUPPLIED ACCESSORIES

The following accessories are supplied with IC-FR4000 series

[AC120V version]

- ① AC power cable (OPC-510) 1
- ② Spare fuses (FGB 1 A) 1
- ③ Spare fuses (ATC 20) 2



[AC220V version]

- ① AC power cable (OPC-492) 1
- ② Spare fuses (FGB 1 A) 1
- ③ Spare fuses (ATC 20) 2

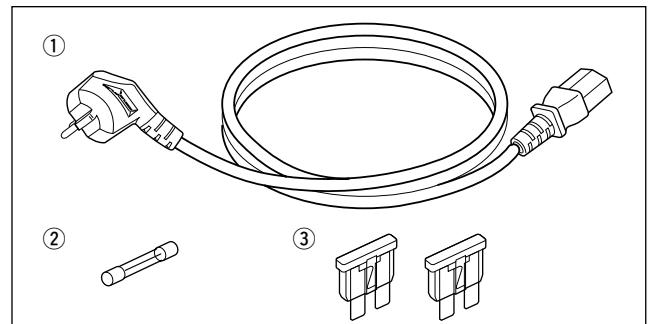
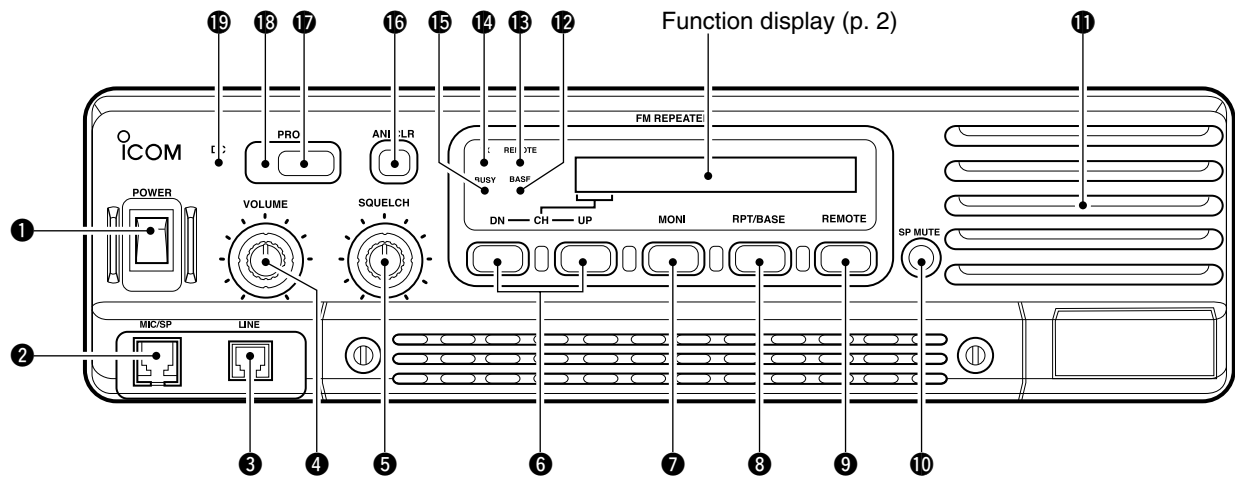


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■ Front panel

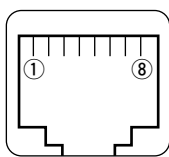


1 POWER SWITCH [POWER]

Toggles to turn the repeater power ON or OFF.

2 MICROPHONE/SPEAKER CONNECTOR [MIC/SP]

This 8-pin modular jack accepts the optional microphone.



- ① +9 V DC output (Max. 10 mA)
- ② I/O port for PC programming
- ③ NC
- ④ M PTT (Input port for TX control)
- ⑤ Microphone ground
- ⑥ Microphone input
- ⑦ Ground
- ⑧ M MONI (Input port for monitor control)

3 LINE CONNECTOR [LINE]

This 4-pin modular jack accepts to connect to 2 wire system telephone cable.

• See p. 7 for line connector information.

4 VOLUME CONTROL [VOLUME] (p. 12)

Adjusts the audio output level.

5 SQUELCH CONTROL [SQUELCH]

➔ While in base operating mode, adjusts the squelch threshold level. (p. 12)

➔ While in repeater operating mode, this knob is not activate.

6 CHANNEL SELECT SWITCHES [DN/UP]

Push either switch to select the operating channel.

7 MONITOR SWITCH [MONI]

➔ Push to monitor the operating frequency.

8 MODE SELECT SWITCH [RPT/BASE]

Toggles the repeater or base operating mode when pushed.

- When setting up a repeater system using IC-FR4000 only, select a repeater operating mode.
- When using IC-FR4000 as full (or half) duplex transceiver or setting up a repeater system connecting an external controller, select a base operating mode.

9 REMOTE CONTROL SWITCH [REMOTE]

Toggles to activate or inactivate the remote control operation when pushed.

10 AF MUTE CONTROL [SP MUTE]

Mutes the audio output.

11 INTERNAL SPEAKER

Monitors received signals.

12 BASE OPERATING MODE INDICATOR

Lights green while in base operating mode.

13 REMOTE CONTROL MODE INDICATOR

Lights green while in remote control operation.

14 TRANSMIT INDICATOR

Lights red while transmitting.

15 BUSY INDICATOR

Lights green while receiving a signal or when the noise squelch is open.

16 ANI CLEAR SWITCH [ANI CLR]

- Push momentarily to turn OFF the alert tone when receiving a call with ANI code.
- Push for 1 sec. to clear the received ANI ID indication on the display and returns to original indication.

NOTE: This switch is no function available for some versions.

17 DEALER-PROGRAMMABLE SWITCH [PROG]

Toggles the pre-programmed function ON or OFF when pushed.

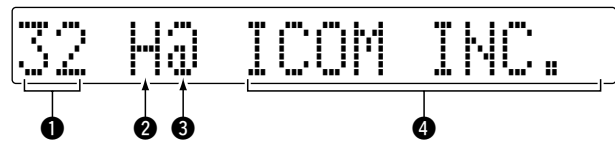
18 PROGRAMMED FUNCTION INDICATOR

Lights green while pre-programmed function is activated.

19 DC INDICATOR

Lights green when in DC operation.

◇Function display



1 MEMORY CHANNEL INDICATOR

Shows the selected memory channel.

2 TRANSMIT POWER INDICATOR

Shows the output power level.

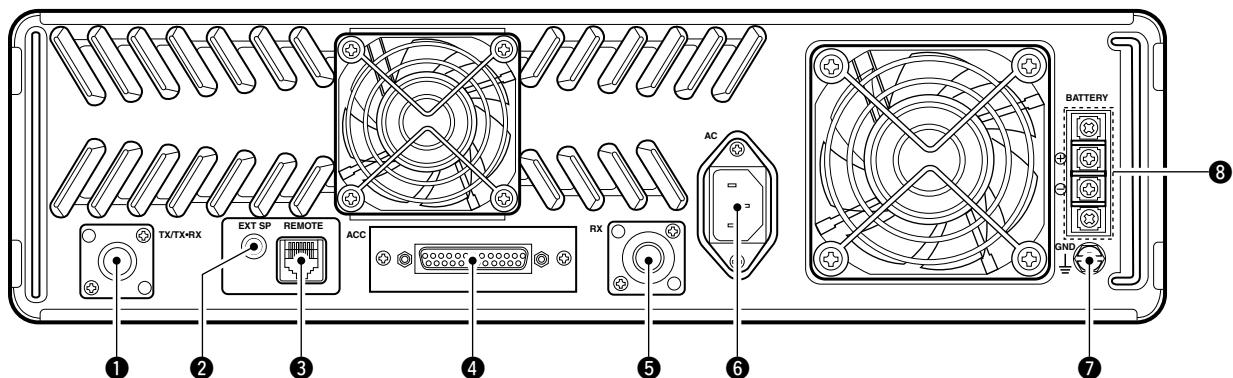
3 AUDIBLE INDICATOR

“@” appears in an audible condition, disappears in an inaudible condition. (When an audible condition, audio mute is cancelled.)

4 ALPHANUMERIC INDICATORS

Shows the variety text or code information.

■ Rear panel



1 TRANSMIT ANTENNA CONNECTOR [TX/TX•RX]

- Connects a transmit antenna (impedance: 50 Ω) and outputs transmit signals.
- When installing an optional internal duplexer (supplied by third party), this connects the transmit receive to an antenna.

2 EXTERNAL SPEAKER CONNECTOR [EXT SP]

Accepts a 4 Ω external speaker.

3 REMOTE CONNECTOR [REMOTE]

Connects to the remote controller.
• See p. 3 for remote connector information.

4 ACCESSORY CONNECTOR [ACC]

Connects to the remote controller.
• See pgs. 3, 4 for accessory connector information.

5 RECEIVE ANTENNA CONNECTOR [RX]

- Connects a receive antenna (impedance: 50 Ω) and inputs receiving signals.

➤ When installing an internal duplexer (supplied by third party), do not use this connector.

6 AC POWER SOCKET [AC]

Connects the supplied AC power cable to a domestic AC outlet.

7 GROUND TERMINAL [GND]

Ground the repeater through this terminal to prevent electric shocks, TVI, BCI and other problems.

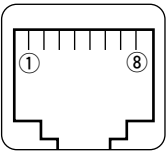
8 DC POWER INPUT TERMINALS [BATTERY]

Connects the 12 V storage battery for the repeater backup when the AC power is interrupted. These terminals are also used for DC power operation.

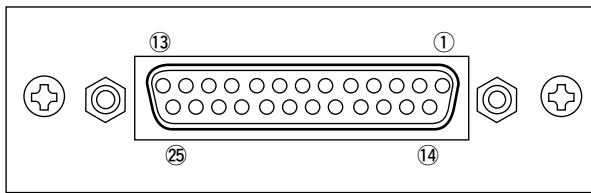
CAUTION: NEVER short the (+) line of the DC power cable to repeater’s chassis, when connecting DC power cable to the [BATTERY] terminals. Otherwise, there is danger of electric shock and/or equipment damage.

1 PANEL DESCRIPTION

◇ REMOTE CONNECTOR

	Pin No.	Pin Name	Description	Specification
	1	-PTT	Input terminals to transmit the repeater in relation to the external equipment. An opto-isolator is provided to facilitate PTT signals.	High voltage=PTT ON (transmits) Hi-Z=PTT OFF
	2	+PTT		
	3	-AFOUT	Output terminal for AF signals from the AF detector circuit via the bandpass filter. Output level is fixed, regardless of [AF] control.	Output impedance: 600 Ω
	4	+AFOUT		
	5	-EXTMOD	Input terminal for the modulation circuit.	Input impedance: 600 Ω
	6	+EXTMOD		
	7	-BUSY	Output terminal for squelch condition (Open/Close). An opto-isolator is provided to facilitate BUSY signals.	Open collector=BUSY OFF 0 V=BUSY ON (Squelch is opened)
	8	+BUSY		

◇ ACCESSORY CONNECTOR



Pin No.	Pin Name	Description	Specification
1	BUSY OUT	Output terminal for busy signal.	Open collector=OFF, 0 V=ON
2	COAXIAL SW	Output terminal for coaxial switching (antenna switching) signal.	Open collector=OFF 0 V=ON
3	M/S IN	Input terminal for master/slave signal.	+5 V pull up, Active=L
4	D1	Input terminal for selecting memory channel.	+5 V pull up, Active=L
5	D3	Input terminal for selecting memory channel.	+5 V pull up, Active=L
6	EXT RPT/BASE	Input terminal for repeater/base operating mode switching signal.	+5 V pull up Active=L
7	EXT MONI	Input terminal for monitor function.	+5 V pull up, Active=L
8	EXT DTCS	Input terminal for continuous tone (CTCSS/DTCS) signal.	Input impedance: 100 kΩ (approx.)
9	EXTMOD IN B	Input terminal for the modulation signals applied to input of the splutter filter circuit.	Input impedance: 600 Ω (approx.)
10	EXTMOD IN A	Input terminal for the modulation signal applied to input of the pre-emphasis circuit via the bandpass filter.	Input impedance: 600 Ω (approx.)
11	AF OUT	Output terminal for AF signals from the AF detector circuit via the bandpass filter. Output level is fixed, regardless of [AF] control.	Output impedance: 1 kΩ (approx.)
12	DISC OUT	Output terminal for AF signals from the AF detector circuit. Output level is fixed, regardless of [AF] control.	Output impedance: 1 kΩ (approx.)
13	+15V	Output terminal for +15V DC while in AC operation. (While in DC operation, same as input DC.)	Output current: Less than 1 A
14	TX OUT	Output terminal for transmission state.	Open collector=OFF, 0 V=ON

ACCESSORY CONNECTOR (continued)

Pin No.	Pin Name	Description	Specification
15	M/S OUT	Output terminal for master/slave signal.	Open collector=OFF, 0V=ON
16	D0	Input terminal for selecting memory channel.	+5 V pull up, Active=L
17	D2	Input terminal for selecting memory channel.	+5 V pull up, Active=L
18	D4	Input terminal for selecting memory channel.	+5 V pull up, Active=L
19	EXT PTT	Input terminal for PTT signal.	+5 V pull up, Active=L
20	RSSI	Output terminal for RSSI (Received Signal Strength Indicator) signal.	Output impedance: 1 k Ω (approx.)
21–24	AGND	Analog ground	
25	DC GND	Ground for +15 V DC	

- Pin 4, pin 5, pins 16–18 select one of the 32 pre-programmed memory channels. (see table below)
[0]: Hi-Z, [1]: 0 V (D0–D4: +5 V pull up)

Channel	D4 (pin 18)	D3 (pin 5)	D2 (pin 17)	D1 (pin 4)	D0 (pin 16)	Channel	D4 (pin 18)	D3 (pin 5)	D2 (pin 17)	D1 (pin 4)	D0 (pin 16)
1	0	0	0	0	0	17	1	0	0	0	0
2	0	0	0	0	1	18	1	0	0	0	1
3	0	0	0	1	0	19	1	0	0	1	0
4	0	0	0	1	1	20	1	0	0	1	1
5	0	0	1	0	0	21	1	0	1	0	0
6	0	0	1	0	1	22	1	0	1	0	1
7	0	0	1	1	0	23	1	0	1	1	0
8	0	0	1	1	1	24	1	0	1	1	1
9	0	1	0	0	0	25	1	1	0	0	0
10	0	1	0	0	1	26	1	1	0	0	1
11	0	1	0	1	0	27	1	1	0	1	0
12	0	1	0	1	1	28	1	1	0	1	1
13	0	1	1	0	0	29	1	1	1	0	0
14	0	1	1	0	1	30	1	1	1	0	1
15	0	1	1	1	0	31	1	1	1	1	0
16	0	1	1	1	1	32	1	1	1	1	1

■ Unpacking

After unpacking, immediately report any damage to the delivering carrier or dealer. Keep the shipping cartons.

For a description and a diagram of accessory equipment included with the IC-FR4000, see 'Supplied accessories' on p. iii of this manual.

■ Selecting a location

Select a location for the repeater that allows adequate air circulation, free from extreme heat, cold, or vibrations, and away from TV sets, TV antenna elements, radios and other electromagnetic sources.

■ Antenna connection

For radio communications, the antenna is of critical importance, along with output power and sensitivity. Select antenna(s), such as a well-matched 50 Ω antenna, and feedline. 1.5:1 or better of Voltage Standing Wave Ratio (VSWR) is recommended for desired band. Of course, the transmission line should be a coaxial cable.

CAUTION: Protect repeater from lightning by using a lightning arrestor.

NOTE: There are many publications covering proper antennas and their installation. Check with your local dealer for more information and recommendations.

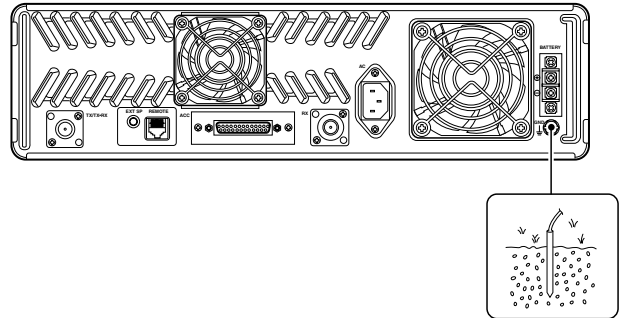
■ Duplexer

A duplexer is separately required when only one antenna is used for both transmitting and receiving. Select a duplexer according to the transmitting and receiving frequencies. Ask your Dealer for details.

■ Grounding

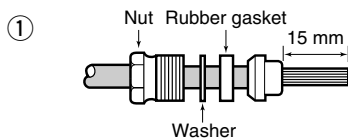
To prevent electrical shock, television interference (TVI), broadcast interference (BCI) and other problems, ground the transceiver through the [GND] terminal on the rear panel.

For best results, connect a heavy gauge wire or strap to a long earth-sunk copper rod. Make the distance between the [GND] terminal and ground as short as possible.

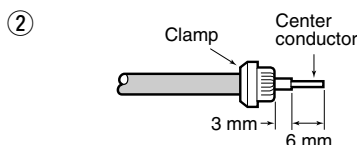


WARNING: NEVER connect the [GND] terminal to a gas or electric pipe, since the connection could cause an explosion or electric shock.

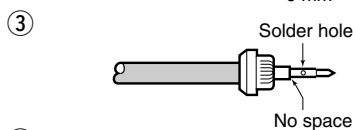
TYPE-N CONNECTOR INSTALLATION EXAMPLE



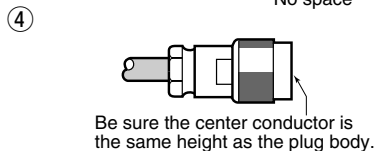
Slide the nut, flat washer, rubber gasket and clamp over the coaxial cable, then cut the end of the cable evenly.



Strip the cable and fold the braid back over the clamp.



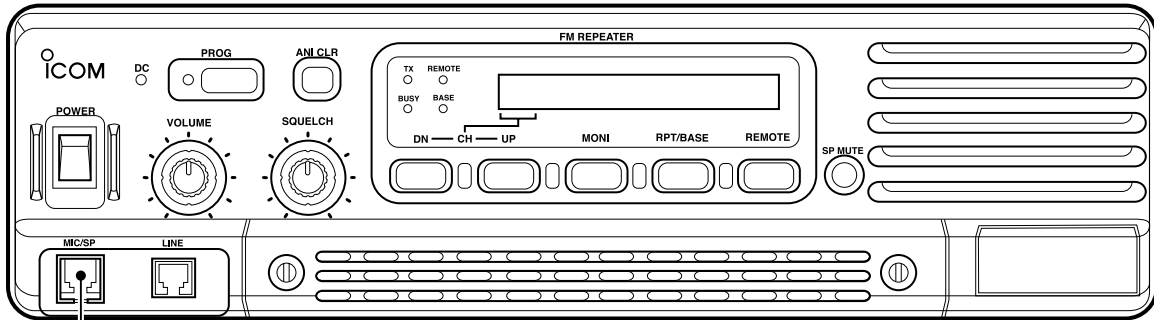
Soft solder the center conductor. Install the center conductor pin and solder it.



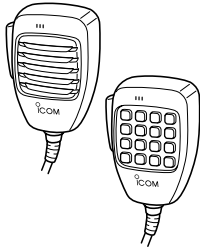
Carefully slide the plug body into place aligning the center conductor pin on the cable. Tighten the nut onto the plug body.

30 mm ≈ 9/8 in 10 mm ≈ 3/8 in 1-2 mm ≈ 1/16 in

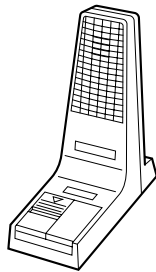
Required connections



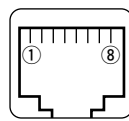
HM-100/TN HAND MICROPHONE
(optional)



SM-25 DESKTOP MICROPHONE
(optional)



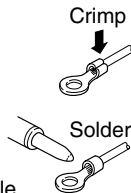
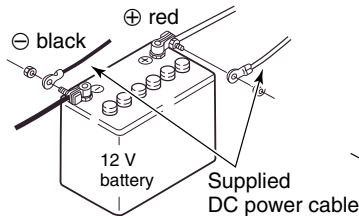
MICROPHONE CONNECTOR (Front panel view)



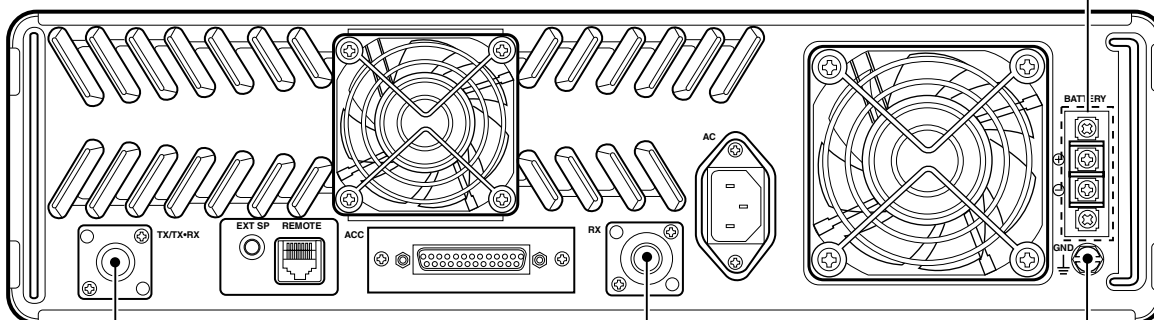
- ① +9 V DC output (Max. 10 mA)
- ② I/O port for PC programming
- ③ NC
- ④ M PTT (Input port for TX control)
- ⑤ Microphone ground
- ⑥ Microphone input
- ⑦ Ground
- ⑧ M MONI (Input port for monitor control)

CAUTION: DO NOT short pin 1 to ground as this can damage the internal 9 V regulator. DC voltage is applied to pin 1 for microphone operation. Take care when using a non-Icom microphone.

[DC POWER INPUT TERMINAL] (p. 8)



Make sure the back up battery is correctly connected. Use a cable with following current capacity. Solder or clamp the cable lug when connecting the power cable to the backup battery to prevent voltage drops.
Power cable current capacity: 25 A or more



[TX(TX•RX) ANT] (p. 5)

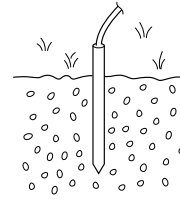


TX•RX antenna required for installing an internal duplexer.

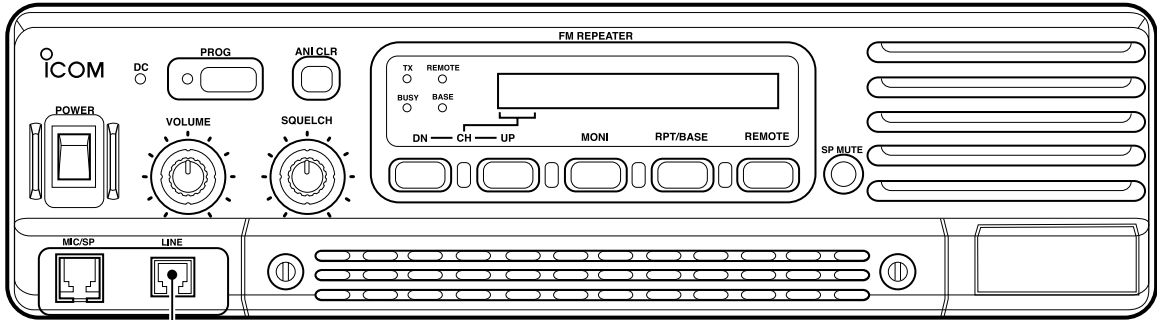
[RX ANT] (p. 5)



GROUND (p. 5)



■ Advanced connections



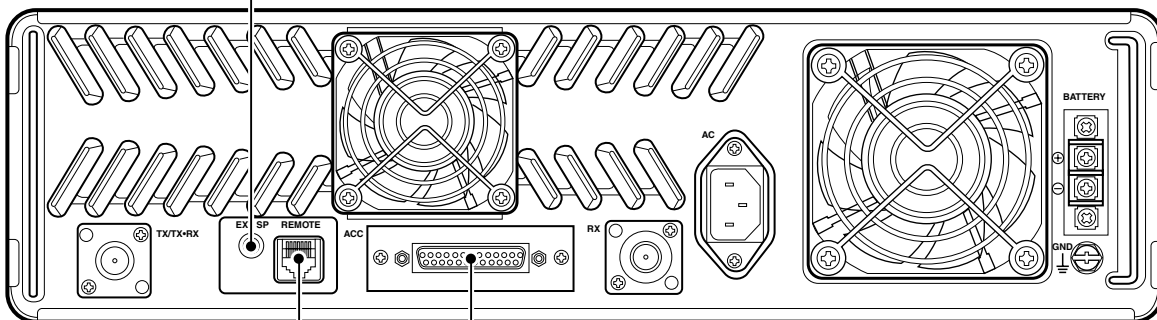
LINE CONNECTOR (Front panel view)

- ① NC (No connection)
- ② L1 input/output
- ③ L2 input/output
- ④ NC (No connection)

* This illustration is example only.
Telephone connector type is different for some countries.

EXTERNAL SPEAKER

Use a 4 Ω speaker.



[REMOTE] (p. 3)
Used for external equipment control.

ACC CONNECTOR (pgs. 3, 4)
Used for external equipment control.

■ Power

Make sure the [POWER] switch is turned OFF when connecting an AC power cable and a backup battery (emergency power supply).

The IC-FR4000 series can operate with an AC or DC power supply. If AC power is interrupted when operating the repeater with an AC power supply, power is automatically provided to the [BATTERY] terminals.

NOTE: When repeat to turn the repeater ON and OFF quickly, the repeater may not turn ON. In this case turn OFF the power switch and wait for a while, then turning power ON again.

◇ IN AC OPERATION

- The [DC] indicator turns OFF.
- Use the supplied AC power cable for connection to a domestic AC outlet.
- Extension cords should not be used unless absolutely necessary. Using improper extension cords could result in fire risk.
- Usually the battery is continuously charged with a small amount of current from an AC power supply through the regulator circuit in the repeater. Discharging is therefore prevented even if the battery is not used for a long time.

◇ IN DC OPERATION

CAUTION: Voltages greater than 16 V DC will damage the repeater. Check the source voltage before connecting the power cable.

- The [DC] indicator lights up green.
- **DO NOT** place the backup battery on or near the repeater. Lead-acid batteries should be placed at least 5 m (16.4 ft.) away from the repeater. Use a heavy duty cable to make the connection and be sure both the positive (red) and negative (black) terminals are correctly connected.
- When connecting to the battery, keep in order to connect the DC power cable to the repeater first, then the positive (red) terminal and negative (black) terminal to the battery to prevent an electric shock.
- After the battery is connected and the [POWER] switch is ON, the repeater continuously supplies approx. 1 A for charging the battery. If the repeater stops functioning while connected to the battery, disconnect the battery, recharge it, then connect the battery to continue operation after the battery is charged. During repeater transmission, approx. 17 A of battery power is consumed.

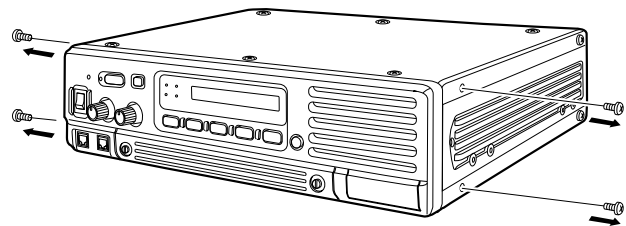
■ Mounting the repeater

◇ Using the optional MB-78

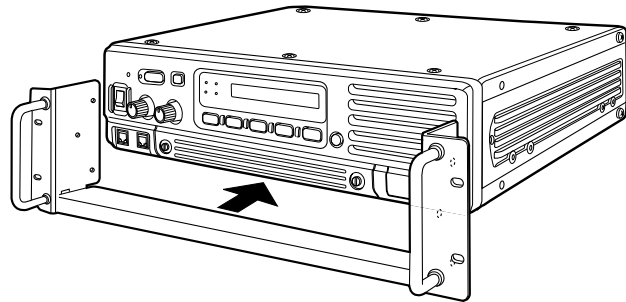
An optional MB-78 19 INCH RACK MOUNT BRACKET is available for mounting the repeater into a 19 inch rack. The MB-78 can install the repeater's bottom side and top side.

• Bottom side installation

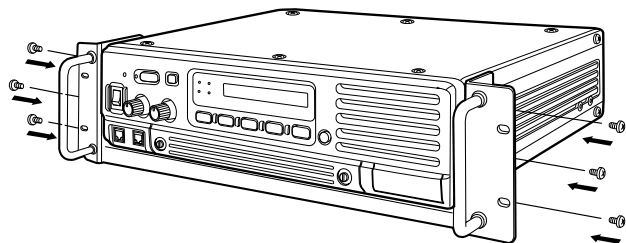
- ① Remove the 2 screws (M4 × 8) from both side of the side panel (front-end).



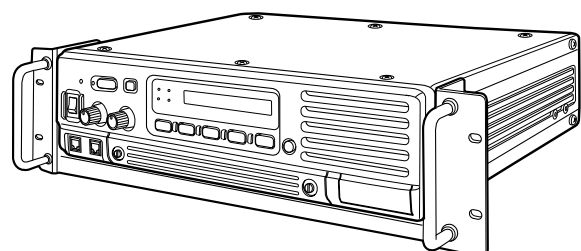
- ② Attach the MB-78 to the bottom side of the repeater.



- ③ Tighten the 1 supplied screws (M4 × 8) and 2 removed screws to each side. (6 screws at total)



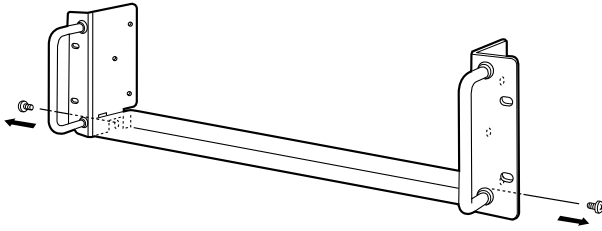
- ④ The completed bottom side installation should look like below.



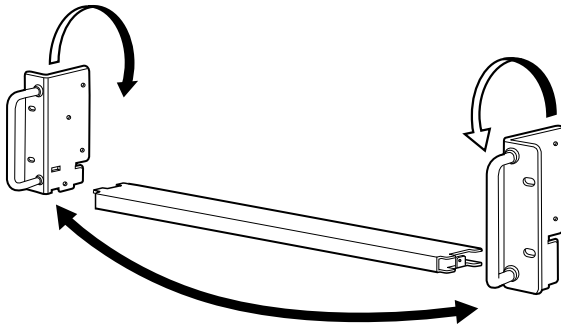
2 INSTALLATION AND CONNECTIONS

• Top side installation

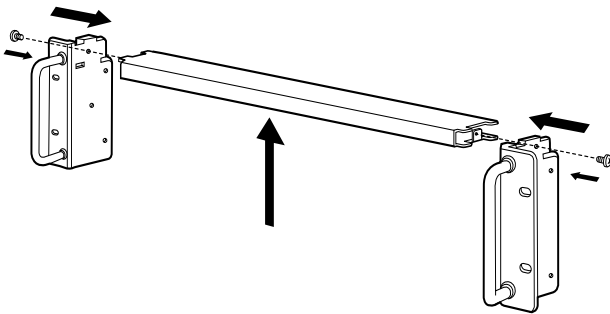
- ① Remove the 1 screw (M4 × 8) from both side of the MB-78.



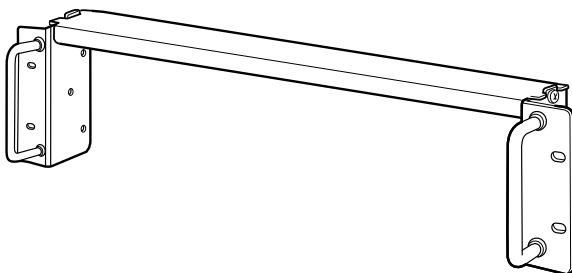
- ② Remove the handles from bottom bar. And turn the handles upside down, then replace the handles right side and left side.



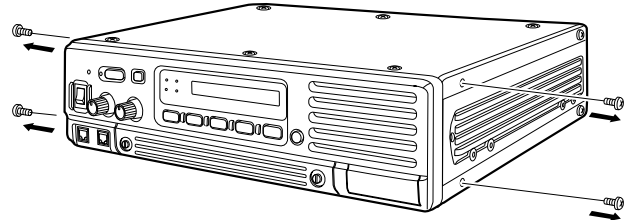
- ③ Attach the handles to the bar, then tighten the screws.



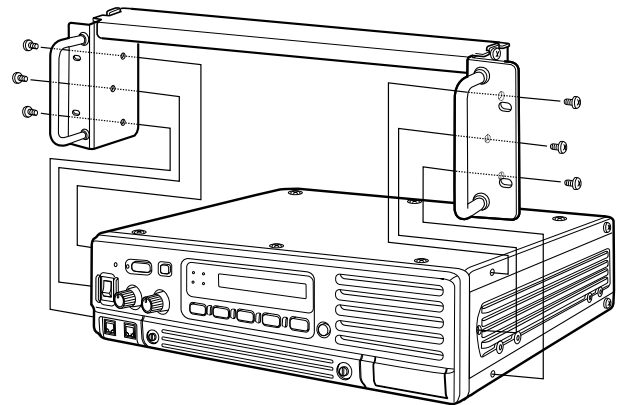
- ④ The completed MB-78 should look like below.



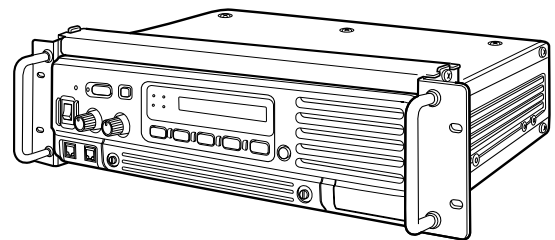
- ⑤ Remove the 2 screws (M4 × 8) from both side of the side panel (front-end).



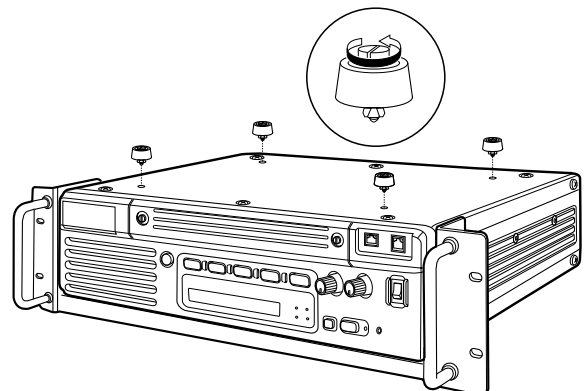
- ⑥ Attach the MB-78 to the top side of the repeater. Then tighten the 1 supplied screws (M4 × 8) and 2 removed screws to each side. (6 screws at total)



- ⑦ The top side installation should look like below.



- ⑧ Turn the repeater upside down, then removing the 4 legs for mounting the 19 inch rack.



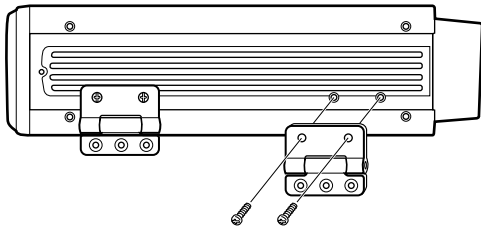
◇ Using the optional MB-77

An optional MB-77 WALL MOUNT BRACKET is available for mounting the repeater to a flat surface.

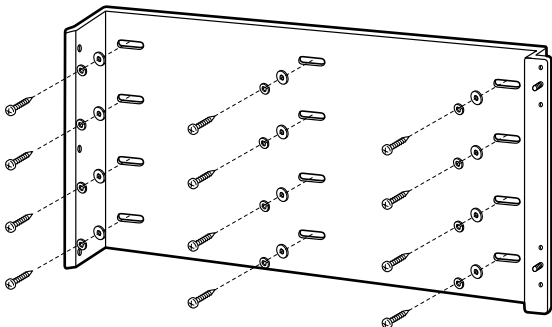
⚠ **WARNING: NEVER** mount the repeater on the MB-77 by yourself. At least two people are required to mount the repeater since it weights approx. 12 kg (26 lb).

• Mount the MB-77 securely with the 12 supplied screws (M6 × 30) to a surface which is more than 50 mm thick and can support more than 20 kg. The unit must be mounted on a flat hard surface only.

- ① Attach the hinges at right side of the repeater as shown below.
- ② Tighten the 2 supplied screws (M5 × 12) for each.

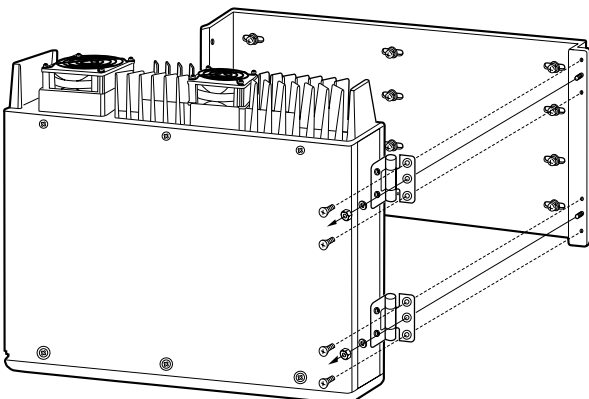


- ③ Put the MB-77 on the wall (or wherever you plan to mount the repeater).
- ④ Tighten the 12 supplied screws (M6 × 30) using flat washers and spring washers.

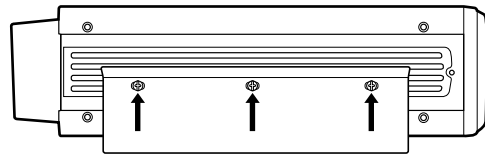


⚠ **NOTE:** Put this way to repeater's front panel will be bottom side.

- ⑤ Attach the hinges with repeater to MB-77 and tighten the 4 supplied screws (M5 × 10) and 2 nuts (with spring washer).

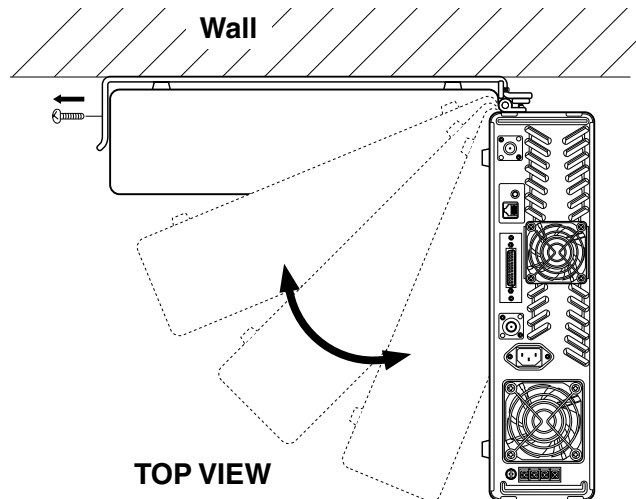
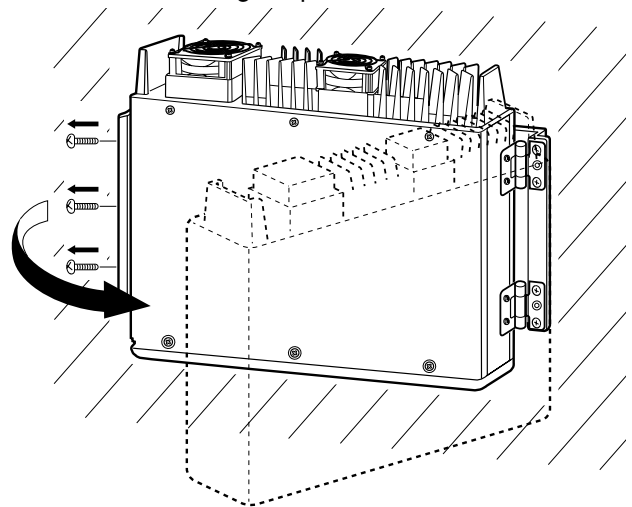


- ⑥ Tighten the 3 supplied screws (M5 × 12) to other side.



• For setting up the repeater with MB-77

- ① Remove the 3 screws (M5 × 12) at left side of the MB-77 when repeater's front panel is bottom side.
- ② Pull the left side of the repeater.
- ③ Remove the screws and open the bottom cover or top cover of the repeater, then set the repeater up.
- ④ Return the top or bottom cover of the repeater and MB-77 to their original positions.

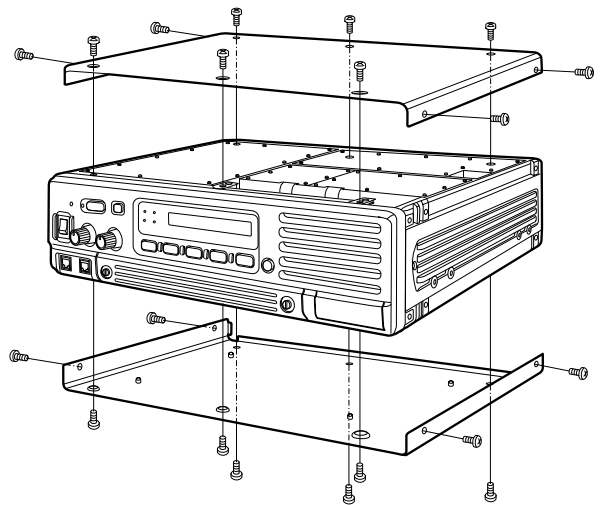


Opening the repeater's case

Follow the case and cover opening procedures shown here when an optional unit is installed or adjust the internal units, etc.

CAUTION: DISCONNECT the AC power cable and/or DC power cable from the repeater. Otherwise, there is danger of electric shock and/or equipment damage.

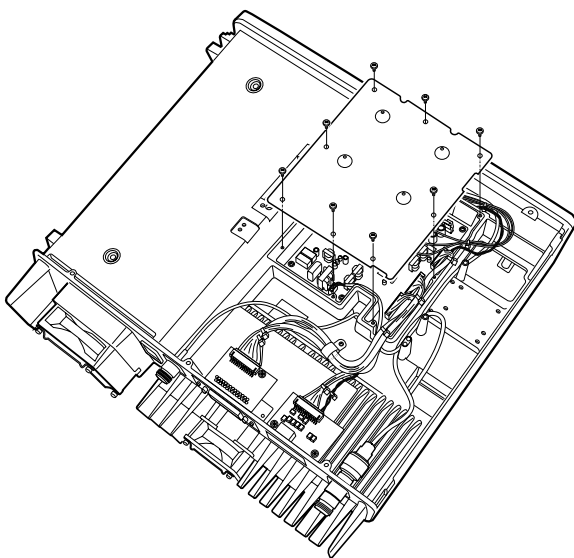
- ① Remove 6 screws from the top of the repeater and 4 screws from the sides, then lift up the top cover.
- ② Turn the repeater upside down.
- ③ Remove 6 screws from the bottom of the repeater, and 4 screws from the sides, then lift up the bottom cover.



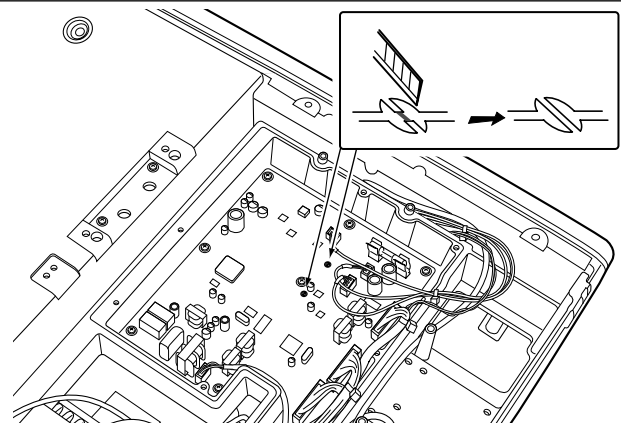
Voice scrambler unit installation

The UT-109 (#01)/UT-110 (#01) provides high performance private communication for base operating mode. In order to receive or send scrambled transmissions, the UT-109 (#01)/UT-110 (#01) must be installed and to activate the scrambler function.

- ① Remove the top and bottom covers as shown above.
- ② Remove 8 screws from the LOGIC shielding plate, then remove the plate.

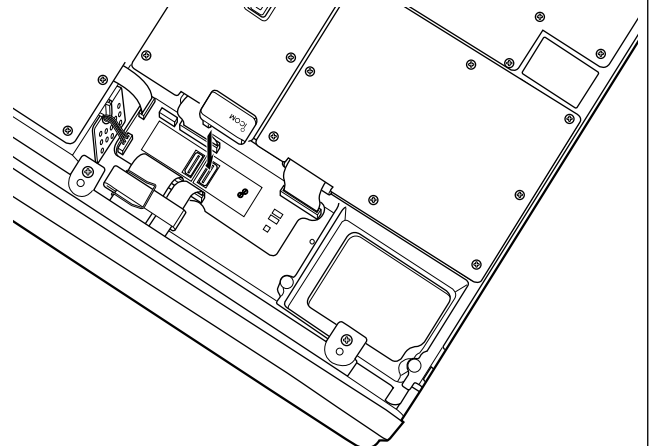


- ③ Cut the pattern on the PCB at the RX AF circuit (CP1) and TX mic circuit (CP2) on the LOGIC unit as shown at right.



NOTE: Be sure to re-solder above disconnected points, otherwise no TX modulation or AF output is available when you remove the scrambler unit.

- ④ Turn the repeater upside down, then install the scrambler unit as shown below.



- ⑤ Return the LOGIC shielding plate, top and bottom covers to their original positions.

■ Turning power ON

- ① Push [POWER] to turn power ON.
- ② If the repeater is programmed for a power on password by an Icom Dealer, input digit codes directly.
 - The keys in the table below can be used for password input.
 - The repeater detects numbers in the same block as identical. Therefore “01234” and “56789” are the same.

KEY	[DN]	[UP]	[MONI]	[RPT/BASE]	[REMOTE]
NUMBER	0	1	2	3	4
	5	6	7	8	9

- ③ When the “PASSWORD” indication does not clear after inputting 4 digits, the input code number may be incorrect. Turn power off and start over in this case.

■ Receiving and transmitting

◇ Receiving

- ① Push [POWER] to turn power ON.
- ② Set the audio and squelch levels.
 - ➔ Rotate [SQUELCH] fully counterclockwise in advance.
 - ➔ Rotate [VOLUME] to adjust the audio output level.
 - ➔ Rotate [SQUELCH] clockwise until the noise disappears.
- ③ Push [UP] or [DN] to select the desired channel.
 - When receiving a signal, BUSY indicator turns ON and audio is emitted from the speaker.
 - Further adjustment of [VOLUME] to a comfortable listening level may be necessary at this point.

◇ Transmitting

- ① Take the microphone off hook.
- ② Wait for the channel to become clear.
- ③ Push and hold [PTT] to transmit, then speak into the microphone at your normal voice level.
- ④ Release [PTT] to receive.

IMPORTANT:

- To maximize the readability of the transmitted signal:
- (1) Pause briefly after pushing [PTT].
 - (2) Hold the microphone 1 to 2 inch (2.5 to 5 cm) from your mouth, then speak into the microphone at a normal voice level.

■ Troubleshooting

The following chart is designed to help correct problems which are not equipment malfunctions.

If you are unable to locate the cause of a problem or solve it through the use of this chart, contact the nearest Icom Dealer or Service Center.

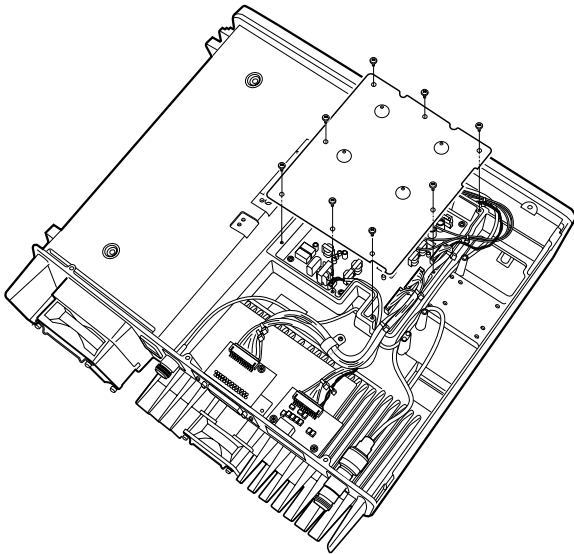
PROBLEM	POSSIBLE CAUSE	SOLUTION	REF.
Power does not come on when [POWER] switch is ON.	<ul style="list-style-type: none"> <DC operation> • DC power cable is improperly connected. <AC/DC common> • Fuse is blown. 	<ul style="list-style-type: none"> • Re-connect the DC power cable correctly. • Check the cause, then replace the fuse with a spare one. (Fuses are installed in the internal REG unit and LOGIC unit.) 	<p>p. 6</p> <p>p. 14</p>
No sounds from the speaker.	<ul style="list-style-type: none"> • Volume level is too low. • The squelch is closed. • The audio mute function is activated. • A selective call or squelch function is activated such as 2/5 tone call or tone squelch. • While in base operating mode, the repeater is in the transmitting condition. 	<ul style="list-style-type: none"> • Rotate [VOLUME] clockwise to obtain a suitable listening level. • While in base operating mode, rotate [SQUELCH] to counterclockwise to open the squelch. • Push [SP MUTE] to the audio mute function OFF • Turn the appropriate function OFF. • Push [PTT] on the microphone to receive or check the PTT line of an external unit, if connected. 	<p>p. 12</p> <p>p. 12</p> <p>p. 1</p> <p>—</p> <p>—</p>
Sensitivity is low and only strong signals are audible.	<ul style="list-style-type: none"> • Antenna feedline or the antenna connector has a poor contact or short-circuited. 	<ul style="list-style-type: none"> • Check and re-connect (or replace if necessary), the antenna feedline or antenna connector. 	<p>p. 5</p>
Received signal cannot be understood.	<ul style="list-style-type: none"> • Optional voice scrambler is turned OFF. • Scrambler code is not set correctly. 	<ul style="list-style-type: none"> • Turn the optional voice scrambler ON. • Reset the scrambler code. 	<p>—</p> <p>—</p>
Output power is too low.	<ul style="list-style-type: none"> • Output power is set to Low. 	<ul style="list-style-type: none"> • Push channel selector to select the high power operating channel. 	<p>p. 1</p>
No contact possible with another station.	<ul style="list-style-type: none"> • The other station is using tone squelch. • While in base operating mode, the repeater is set to duplex. 	<ul style="list-style-type: none"> • Turn the tone squelch function ON. • Set the repeater to simplex, when other transceiver is set to simplex. 	<p>—</p> <p>—</p>

■ Fuse replacement

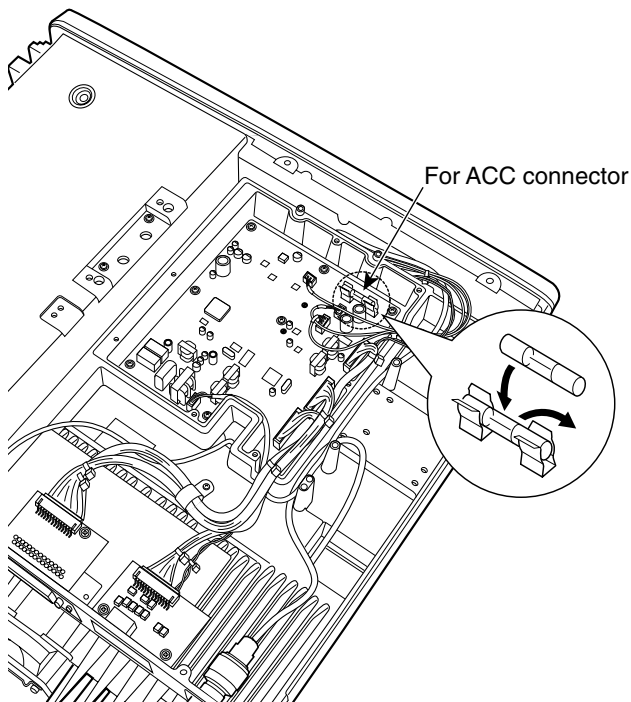
If a fuse blows or the repeater stops functioning, try to find the source of the problem, and replace the damaged fuse with a new, rated fuse.

◇ LOGIC unit

- ① Remove the bottom cover as shown on p. 11.
- ② Remove 8 screws from the LOGIC shielding plate, then remove the plate.



- ③ Replace the circuitry fuse as shown below.

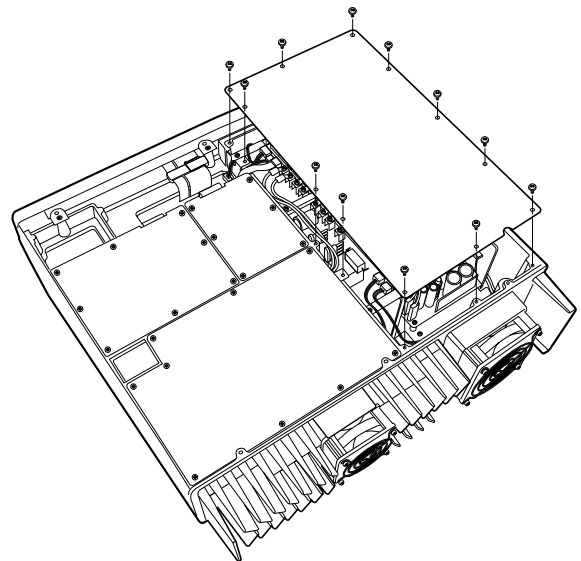


- ④ Return the LOGIC shielding plate and bottom cover.

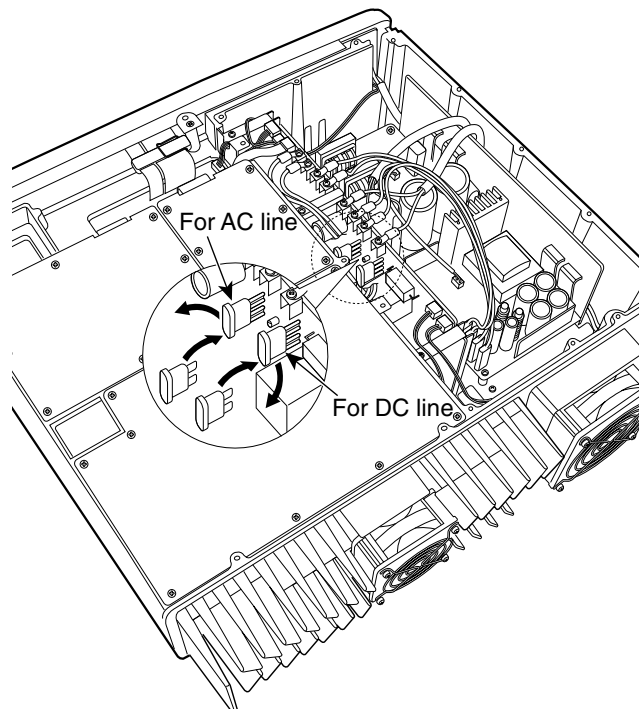
CAUTION: DISCONNECT the AC power cable and/or DC power cable from the repeater. Otherwise, there is danger of electric shock and/or equipment damage.

◇ REG unit

- ① Remove the top cover as shown on p. 11.
- ② Remove the 12 screws from the REG shielding plate, then remove the plate.



- ③ Replace the circuitry fuse as shown below.



- ④ Return the REG shielding plate and top cover.

■ Specifications

Specifications are measured in accordance with EIA/TIA-603.

◆ General

- Frequency coverage : 400.000–430.000 MHz
430.000–450.000 MHz
450.000–480.000 MHz
- Channel spacing : 12.5/25.0 kHz type
- PLL channel step : 5.0, 6.25 kHz
- Frequency stability : ± 1.5 ppm*/ ± 2.5 ppm*
* Depends on version
- Number of channels : Max. 32 channel
- Antenna connector : N-type $\times 2$ (50 Ω)
- Operating temp. range : -30°C to $+60^{\circ}\text{C}$
(-22°F to $+140^{\circ}\text{F}$)
- Power supply voltage : 100–120 V AC (50/60 Hz)*
220–240 V AC (50/60 Hz)*
13.6 V DC (negative ground)
* Depends on version
- Current drain (at 13.6 V) : TX high (50 W) 20.0 A typical
Max. audio 2.0 A typical
Stand-by 1.0 A typical
- Dimensions : 410(W) \times 110(H) \times 360(D) mm
(Projections not included) 16 $\frac{1}{8}$ (W) \times 4 $\frac{1}{8}$ (H) \times 14 $\frac{1}{4}$ (D) in
- Weight (approx.) : 12 kg; 26 lb 7 oz

◆ Transmitter

- RF output power : 50 W
- Modulation system : Variable reactance frequency modulation system
- Max. frequency deviation : ± 5.0 kHz (Wide),
 ± 2.5 kHz (Narrow)
- Spurious emissions : -70 dBc typical
- Adjacent channel power : More than 70 dB (Wide),
More than 60 dB (Narrow)
- Audio harmonic distortion : 3.0% typical
(at 1 kHz, 40% deviation)
- Hum and noise : More than 40 dB (Wide),
More than 34 dB (Narrow)
- Microphone impedance : 600 Ω (8-pin modular)

◆ Receiver

- Receive system : Double conversion
superheterodyne system
- Sensitivity (12 dB SINAD) : 0.25 μV typical
- Intermediate frequencies : 1st; 70.0 MHz, 2nd; 455 kHz
- Adjacent channel selectivity : More than 70 dB (Wide),
More than 60 dB (Narrow)
- Spurious response : More than 70 dB
- Intermodulation : More than 70 dB
- Hum and noise : More than 40 dB (Wide),
More than 34 dB (Narrow)
- Audio output power : 2.5 W typical at 10% distortion
with a 4 Ω load
- External speaker connector : 2-conductor 3.5 (d) mm ($\frac{1}{8}$ ") 4 Ω

■ Options

- **MB-77 WALL MOUNT BRACKET** (p. 10)
For mounting the repeater to a wall.
- **MB-78 19 INCH RACK MOUNT BRACKET** (pgs. 9, 10)
For mounting the repeater into a 19 inch rack.
- **HM-100N HAND MICROPHONE**
- **HM-100TN DTMF MICROPHONE**
Hand microphone with a DTMF keypad.
- **SM-25 DESKTOP MICROPHONE**
- **UT-109 (#01) VOICE SCRAMBLER UNIT** (p. 11)
Non-rolling type (max. 32 codes).
- **UT-110 (#01) VOICE SCRAMBLER UNIT** (p. 11)
Rolling type (max. 1020 codes).

The scrambler systems of the UT-109 and UT-110 are not compatible with each other.

Count on us!

