



INSTRUCTION MANUAL

VHF DIGITAL REPEATER
IC-FR5300
UHF DIGITAL REPEATER
IC-FR6300



Thank you for choosing this Icom product. This product is designed and built with Icom's state of the art technology and craftsmanship. With proper care, this product should provide you with years of trouble-free operation.

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-FR5300/IC-FR6300 VHF/UHF DIGITAL REPEATERS.

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.

FEATURES

- **Up to 2 channels of operation**
You can install a channel extension module (optional UR-FR5300/UR-FR6300) into a repeater. Two channels can be operated on the same repeater when a channel extension module is installed.
- **Built-in 5-Tone decoder, DTMF encoder & decoder**
Multiple signaling systems are built-in as standard. These systems are fully compatible with Icom F-series radios.
- **DTMF remote control capability**
You can control the repeater from a remote location over the air or over a phone line with DTMF.
- **D-Sub 25 pin ACC port equipped**
You can use optional equipment through the D-sub 25 pin ACC port on the repeater's rear panel.
- **Online control and Digital Trunking operation**
Online control and digital trunking operation are available when the optional UC-FR5300 TRUNKING/NETWORK CONTROLLER is installed in the repeater.
- **Other features**
 - Wide frequency coverage
IC-FR5300 (VHF): 136 to 174 MHz
IC-FR6300 (UHF): 330 to 400 MHz,
400 to 470 MHz,
450 to 512 MHz,
450 to 520 MHz
 - PC programmable
 - 19 inch rack mount

Icom is not responsible for the destruction or damage to the Icom repeater, if the malfunction is because of:

- Force majeure, including, but not limited to, fires, earthquakes, storms, floods, lightning, other natural disasters, disturbances, riots, war, or radioactive contamination.
- The use of Icom repeaters with any equipment that is not manufactured or approved by Icom.

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PRECAUTIONS

⚠ **WARNING HIGH RF VOLTAGE! NEVER** touch an antenna or antenna connector while transmitting. This could cause an electrical shock or burn.

⚠ **WARNING HIGH RF VOLTAGE! NEVER** install the antenna at any place that person easily touch the antenna while transmitting. This could cause an electrical shock or burn.

⚠ **WARNING! NEVER** apply AC power to the DC power receptacle on the repeater rear panel. This could cause a fire or damage the repeater.

⚠ **WARNING! NEVER** apply more than 16 V DC to the DC power receptacle on the repeater rear panel. This could cause a fire or damage the repeater.

⚠ **WARNING! NEVER** remove the fuse holder on the DC power receptacle on the repeater rear panel. Excessive current caused by a short could cause a fire or damage the repeater.

⚠ **WARNING! NEVER** reverse the DC power cable polarity. This could cause a fire or damage the repeater.

⚠ **WARNING! NEVER** let metal, wire or other objects contact the inside of the repeater, or make incorrect contact with connectors on the rear panel. This could cause an electric shock or damage the repeater.

⚠ **WARNING! NEVER** operate or touch the repeater with wet hands. This could cause an electric shock or damage to the repeater.

⚠ **WARNING! NEVER** operate the repeater if you notice an abnormal odor, sound or smoke. Immediately turn OFF the power and/or remove the DC power cable. Contact your Icom dealer or distributor for advice.

⚠ **WARNING! NEVER** put the repeater on an unstable place where the repeater may suddenly move or fall. This could cause an injury or damage the repeater.

CAUTION: DO NOT expose the repeater to rain, snow or any liquids. They could damage the repeater.

CAUTION: DO NOT place or leave 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 can exceed 80°C ($+176^{\circ}\text{F}$), resulting in permanent damage to the repeater if left there for extended periods.

CAUTION: DO NOT place or leave the repeater in excessively dusty environments. This could damage the repeater.

CAUTION: DO NOT use harsh solvents such as benzene or alcohol when cleaning. This could damage the repeater surfaces. If the surface becomes dusty or dirty, wipe it clean with a soft, dry cloth.

CAUTION: DO NOT put anything on top of the repeater. This will obstruct heat dissipation.

CAUTION: DO NOT use non-Icom microphones. Other manufacturer's microphones may have different pin assignments, and could damage the connector and/or the repeater.

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

NEVER leave the repeater in an insecure place to avoid use by unauthorized persons.

SAFETY TRAINING INFORMATION



Your Icom radio generates RF electromagnetic energy during transmit mode. This radio is designed for and classified as “Occupational Use Only,” meaning it must be used only during the course of employment by individuals aware of the hazards, and the ways to minimize such hazards.

This radio is NOT intended for use by the “General Population” in an uncontrolled environment.

- For compliance with FCC and IC RF Exposure Requirements, the transmitter antenna installation shall comply with the following two conditions:
 1. The transmitter antenna gain shall not exceed 0 dBi.
 2. IC-FR5300:
Transmit only when people are at least the recommended minimum distance of 60 centimeters away from the properly installed antenna. This separation distance will ensure that there is sufficient distance from a properly installed externally-mounted antenna to satisfy the RF exposure requirements in the applicable RF exposure compliance standards.
 2. IC-FR6300:
Transmit only when people are at least the recommended minimum distance of 50 centimeters away from the properly installed antenna. This separation distance will ensure that there is sufficient distance from a properly installed externally-mounted antenna to satisfy the RF exposure requirements in the applicable RF exposure compliance standards.



To ensure that your exposure to RF electromagnetic energy is within the FCC and IC allowable limits for occupational use, always adhere to the following guidelines:

- **DO NOT** operate the radio without a proper antenna attached, as this may damage the radio and may also cause you to exceed FCC and IC RF exposure limits. A proper antenna is the antenna supplied with this radio by the manufacturer or an antenna specifically authorized by the manufacturer for use with this radio.
- **DO NOT** transmit for more than 50% of total radio use time (“50% duty cycle”). Transmitting more than 50% of the time can cause FCC and IC RF exposure compliance requirements to be exceeded. The radio is transmitting when the “TX indicator” lights red. You can cause the radio to transmit by pressing the “PTT” switch.

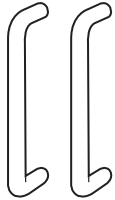
Electromagnetic Interference/Compatibility

During transmissions, your Icom radio generates RF energy that can possibly cause interference with other devices or systems. To avoid such interference, turn off the radio in areas where signs are posted to do so. **DO NOT** operate the transmitter in areas that are sensitive to electromagnetic radiation such as hospitals, aircraft, and blasting sites.

SUPPLIED ACCESSORIES

The following accessories are supplied.

Handles



For handle attachment

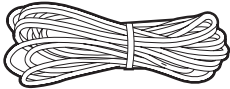
Spacers



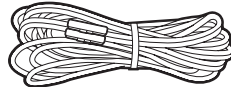
Screws



DC power cable
(OPC-1784)



DC power cable for
cooling fan (CAB-1149)



OPTIONS

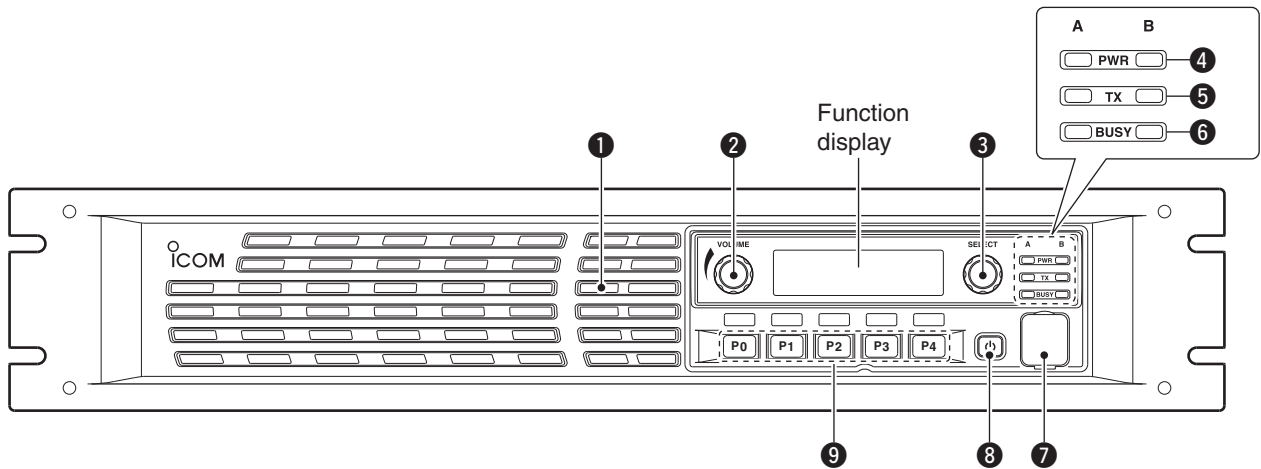
- **SP-35** EXTERNAL SPEAKER
Compact and easy-to-install.
Input impedance: 4 Ω
Rated input: 5 W
Maximum input: 7 W
- **HM-152** HAND MICROPHONE
- **SM-26** DESKTOP MICROPHONE
- **UR-FR5300/UR-FR6300**
CHANNEL EXTENSION MODULES
- **UC-FR5300** TRUNKING/NETWORK CONTROLLER

Some options may not be available in some countries. Please ask your dealer for details.

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Front panel



1 INTERNAL SPEAKER

Outputs the received audio.

2 VOLUME CONTROL [VOLUME] (p. 8)

Adjusts the audio output level.

3 SELECTOR DIAL [SELECT]

Adjusts the squelch threshold level, or selects the operating channel, depending on the presetting.

4 POWER INDICATOR [PWR]

- The 'A' module indicator lights green while the repeater is ON.
- When you install the channel extension module, the selected module indicator lights green and the unselected module indicator lights orange while the repeater is ON.

5 TRANSMIT INDICATOR [TX]

Lights red while transmitting.

6 BUSY INDICATOR [BUSY]

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

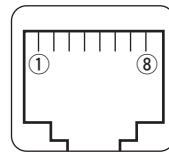
About [PWR], [TX] and [BUSY] indicators:

'A' and 'B' modules indicators are usable for the following indications. 'A' module indicator corresponds to the original module, and the 'B' module indicator corresponds to an extended module.

7 MICROPHONE CONNECTOR [MIC]

The 8-pin modular jack accepts an optional microphone.

KEEP the [MIC] connector cover attached to the repeater when you don't use an optional microphone.



(Front panel view)

- ① +8 V DC output (Max. 15 mA)
- ② Output port for PC programming
- ③ NC
- ④ M PTT (Input port for TX control)
- ⑤ Microphone ground
- ⑥ Microphone input
- ⑦ Ground
- ⑧ Input port for PC programming

8 POWER SWITCH [POWER]

- Push to turn ON the repeater.
- Hold down for 3 seconds to turn OFF the repeater.
- When you install a channel extension module, and while the repeater is ON, push one or two times to select the desired module to operate the repeater as a base station.
 - The power indicator of the selected module lights green, and the other lights orange.

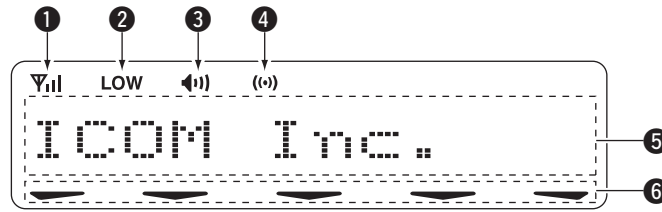
9 DEALER-PROGRAMMABLE KEYS

Desired functions can be independently preset by your dealer.

Ask your dealer for details.

- Because these keys are programmable, the functions are unique to each unit.

◇ Function display



❶ SIGNAL STRENGTH INDICATOR

Indicates the relative signal strength level.

❷ LOW POWER INDICATOR

Displayed when low output power is selected.

❸ AUDIBLE INDICATOR

Displayed when the channel is in the 'audible' (unmute) mode.

❹ GNSS INDICATOR

Displayed when a UC-FR5300 is installed, and the GNSS (Global Navigation Satellite System) positioning is established. This indicator can be deactivated using programming software.

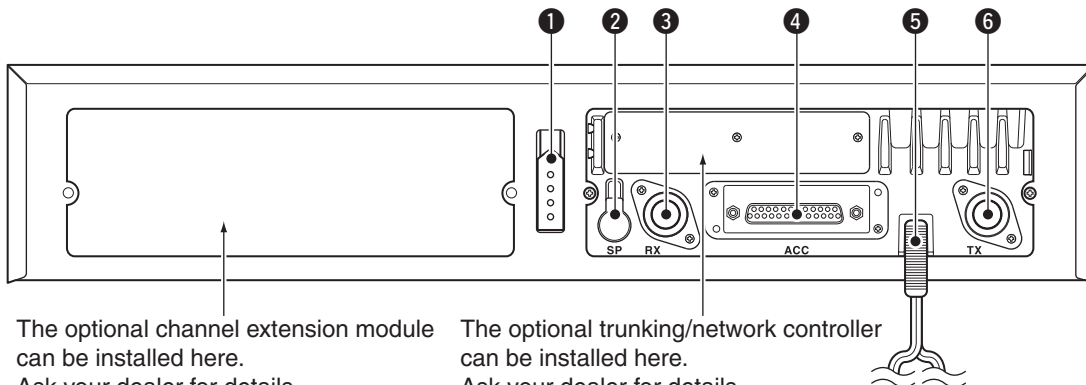
❺ ALPHANUMERIC DISPLAY

Shows a variety of text and code information.

❻ KEY ICON

Displayed when the key assigned as [Lock] or [Tx Disable] and it is active.

■ Rear panel



The optional channel extension module can be installed here. Ask your dealer for details.

The optional trunking/network controller can be installed here. Ask your dealer for details.

The repeater rear panel may be different, depending on the repeater's version.

❶ DC POWER CONNECTOR (For cooling fans)

Connects to an external DC power source using the supplied CAB-1149 DC power cable to activate the cooling fans. See page 5 for connection details.

❷ EXTERNAL SPEAKER CONNECTOR [SP]

Connects to the optional speaker SP-35.

❸ RECEIVE ANTENNA CONNECTOR [RX]

Connects to a receive antenna (impedance: 50 Ω).

❹ ACCESSORY CONNECTOR [ACC]

Connects to the accessory connector. See page 3 for the accessory connector information.

❺ DC POWER RECEPTACLE

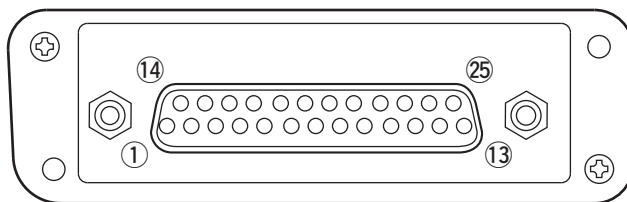
Connects to an external DC power source using the supplied OPC-1784 DC power cable. See page 5 for connection details.

❻ TRANSMIT ANTENNA CONNECTOR [TX]

Connects to a transmit antenna (impedance: 50 Ω).

1 PANEL DESCRIPTION

◇ Accessory connector



Pin No.	Pin Name	Description	Specification
1	NC	No connection	—
2	TXD	Input terminal for serial communication data.	—
3	RXD	Output terminal for serial communication data.	—
4	RTS	Input terminal for request-to-send data.	—
5	CTS	Output terminal for clear-to-send data.	—
6	NC	No connection	—
7	GND	Serial/digital signal ground	—
8	MOD IN	Modulation input from an external terminal unit.	Input level: 85 mV rms
9	DISC OUT	Output terminal for AF signals from the AF detector circuit. Output level is fixed, regardless of the [AF] control setting.	Output level: 300 mV rms
10	EXT. D/A	Output terminal. The desired function can be assigned.* (Default: Null)	—
11	VCC	13.6 V DC output	Output current: Less than 100 mA
12	NC	No connection	—
13	NC	No connection	—
14	GND	Ground	—
15	EXT.I/O 15	A desired function can be assigned.* (Default: Null)	—
16	EXT.I/O 16	A desired function can be assigned.* (Default: P0 Monitor Output)	—
17	EXT.I/O 17	A desired function can be assigned.* (Default: Busy Output)	—
18	EXT.I/O 18	A desired function can be assigned.* (Default: Null)	—
19	EXT.I/O 19	A desired function can be assigned.* (Default: Null)	—
20	NC	No connection	—
21	EXT.I/O 21	A desired function can be assigned.* (Default: Analog Audible Output)	—
22	AF OUT	The AF detector Output.	—
23	EXT.I/O 23	A desired function can be assigned.* (Default: Mic Mute Output)	—
24	EXT.I/O 24	A desired function can be assigned.* (Default: Null)	—
25	EXT.I/O 25	A desired function can be assigned.* (Default: Null)	—

* A desired function can be assigned using the optional programming software CS-FR5300. Ask your dealer for details.

■ 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 repeater, see 'SUPPLIED ACCESSORIES' on page iv 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 other electromagnetic sources.

Never place the transceiver in areas such as:

- Temperatures below -30°C (-22°F) or above $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$).
- An unstable place that slopes or vibrates.
- In direct sunlight.
- High humidity and temperature environments.
- Dusty environments.
- Noisy environments.

■ Antenna connection

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

CAUTION: DO NOT install the repeater without a lightning arrestor to help protect the repeater from lightning.

NOTE: Many publications describe proper antennas and their installation. Check with your local dealer for more information and recommendations.

■ Power supply connection

Confirm the repeater is OFF before connecting the DC power cable.

WARNING! NEVER apply more than 16 V DC to the DC power receptacle on the repeater rear panel. This could cause a fire or damage the repeater.

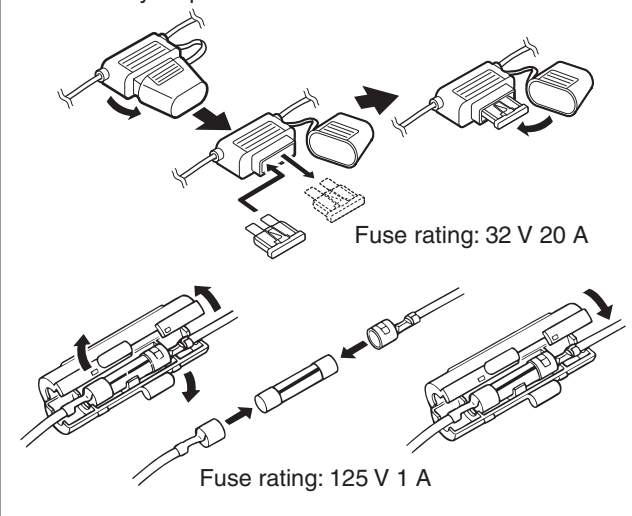
■ Replacing fuse

If a fuse blows, or the repeater stops functioning, find the source of the problem, repair it, and then replace the damaged fuse with a new rated one.

CAUTION: DO NOT replace the fuse with the DC power cable connected to the power source. Disconnect the cable to prevent electric shock and/or equipment damage.

◇ Line fuse replacement

USE only a specified fuse.

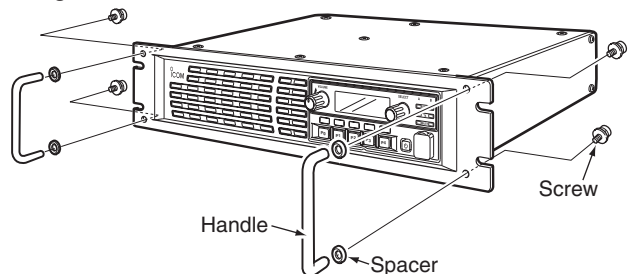


■ Mounting the repeater

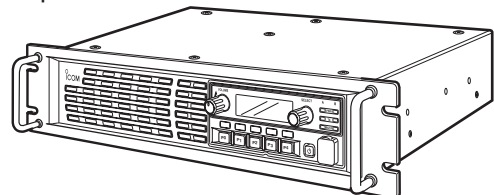
◇ Using the supplied handles

When mounting the repeater into a 19-inch rack, use the supplied handles. Install the handles on the repeater's front panel, as described below.

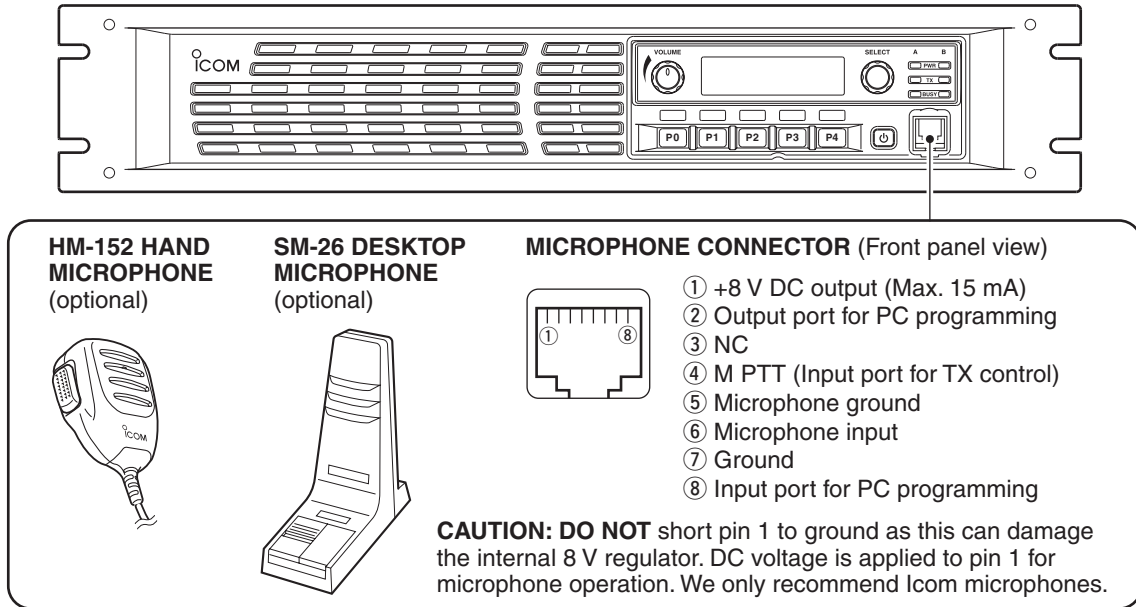
1. Attach the supplied handles to both sides of the repeater's front panel with the spacers, and then tighten the screws.



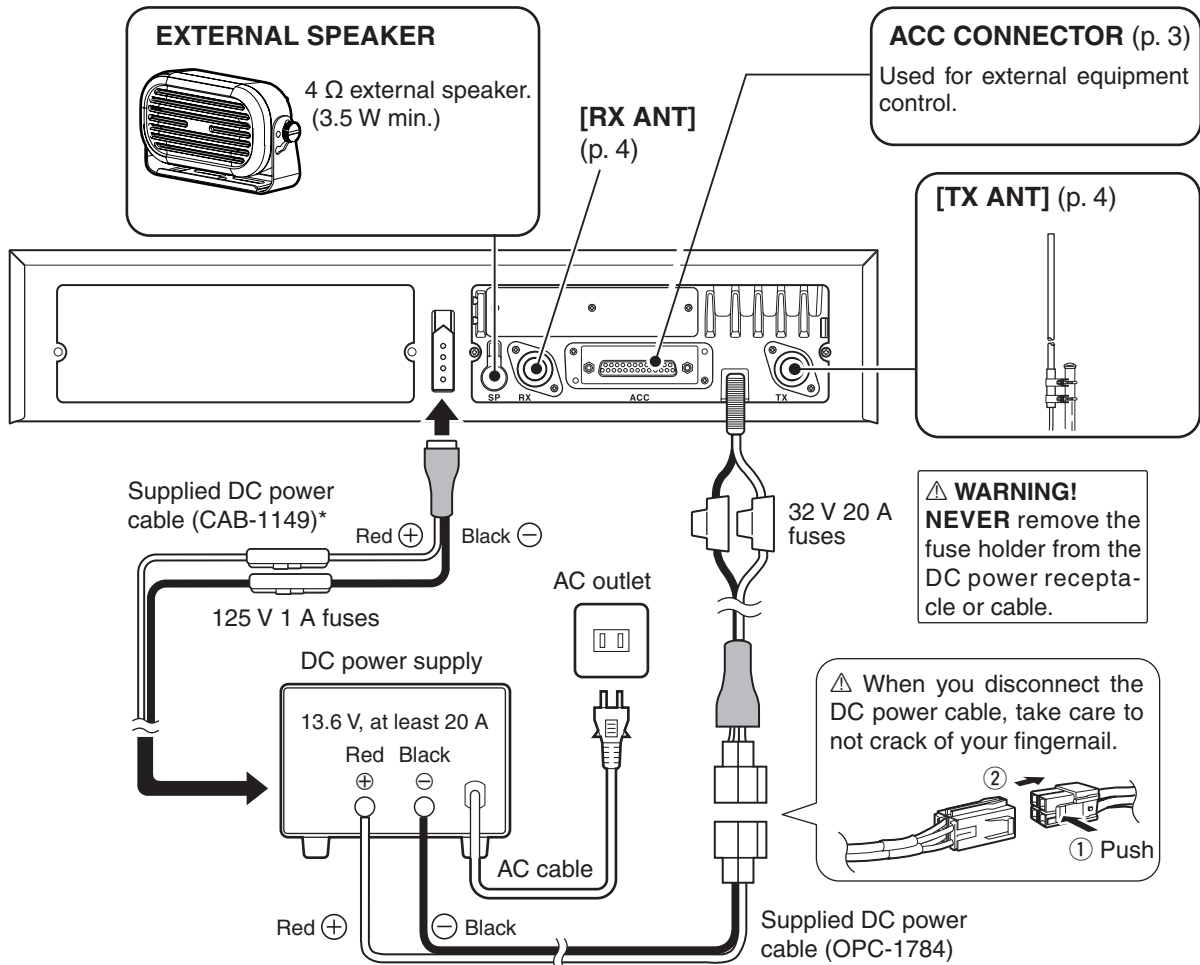
2. The completed installation should look like this.



■ Front panel connection



■ Rear panel connection

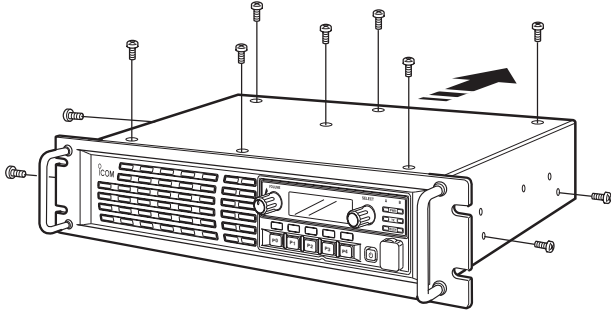


*This connection is used to activate the cooling fan on the front panel.

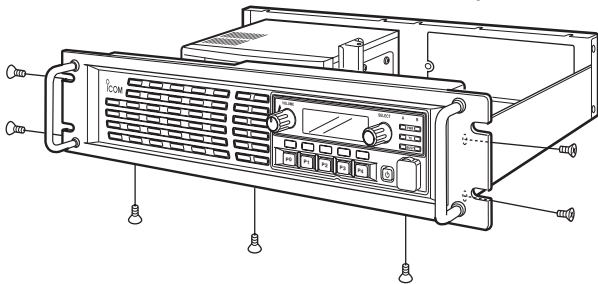
■ Installing the Channel extension module

◇ Opening Case

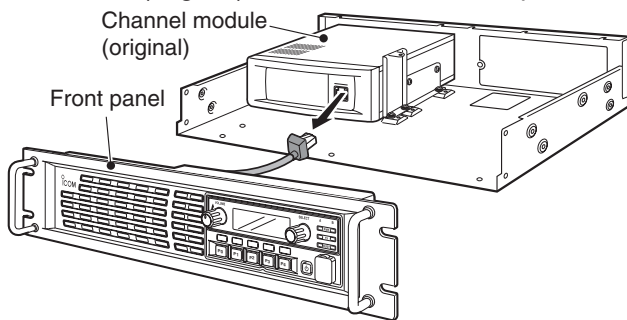
1. Remove the 7 screws from the top and the 2 screws each from both sides of the repeater, then slide off the top cover in the direction of the arrow, as illustrated below.



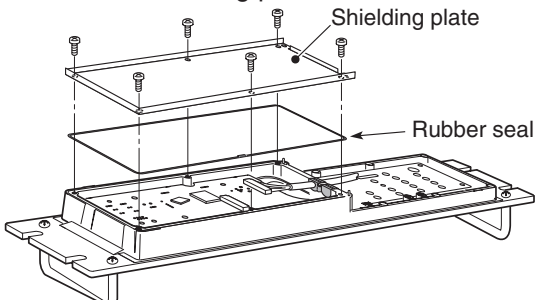
2. Remove the 3 screws from the bottom and the 2 screws each from both sides of the repeater.



3. Disconnect the control cable from the channel module (original), then remove the front panel.



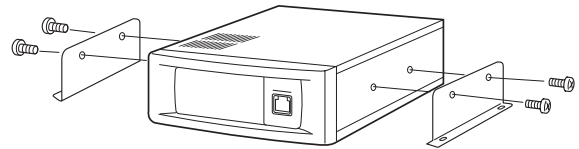
4. Remove the 6 screws from the front panel, then remove the shielding plate and rubber seal.



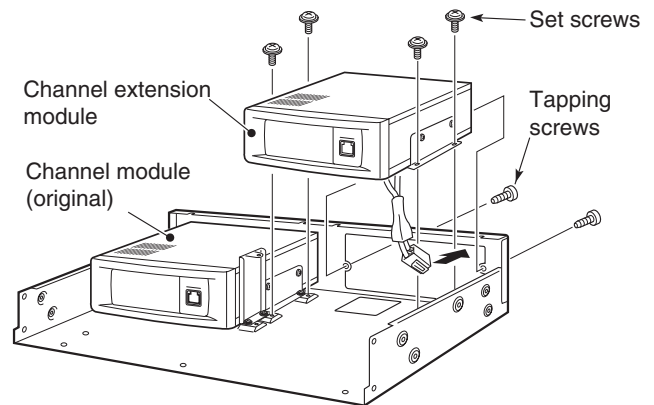
◇ Installation

• Install the UR-FR5300 or UR-FR6300 (channel extension module)

1. Attach the supplied single brackets to both sides of the channel extension module, and tighten the 2 supplied screws (M4 × 8 mm) on each side.

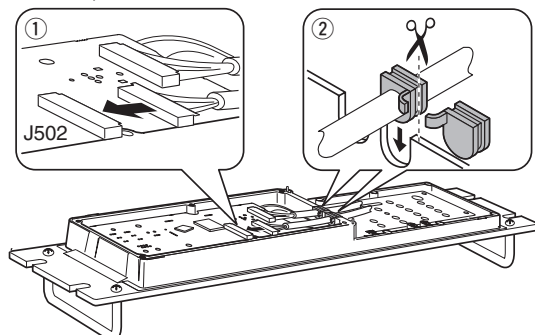


2. Install the channel extension module using the supplied screws (Tapping screws: M3 × 8 mm, Set screws: M3 × 6 mm), as shown below.



• Connect the control cable

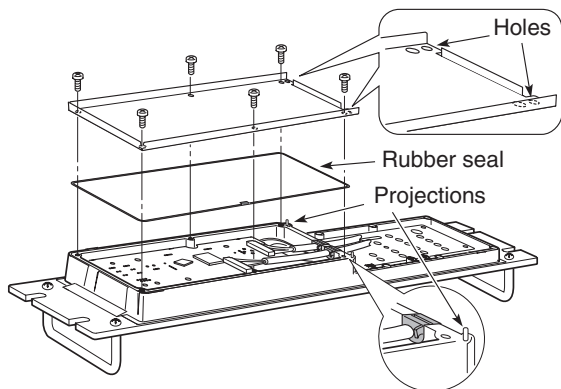
1. Connect the supplied control cable to J502 on the front board, as shown below.
2. Cut the rubber caps of the control cables, then insert the rubber caps to the front panel's chassis, as shown below.



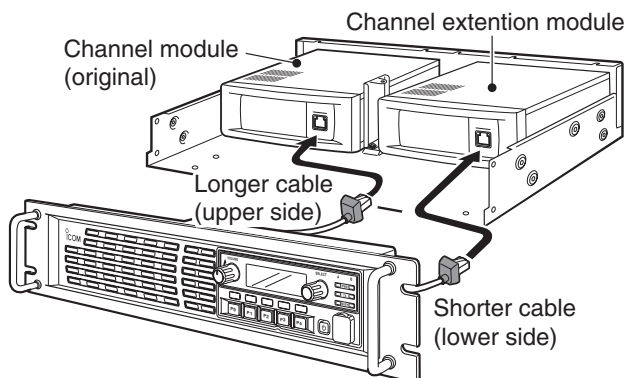
2 INSTALLATION AND CONNECTIONS

◇ Assemble the unit

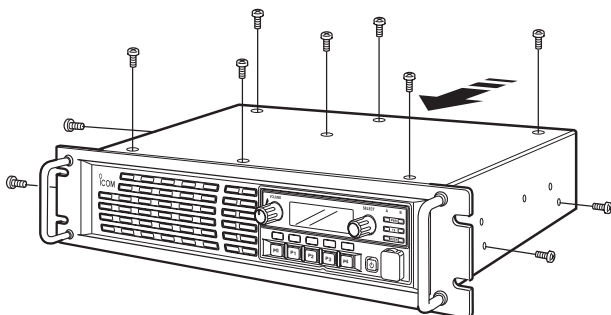
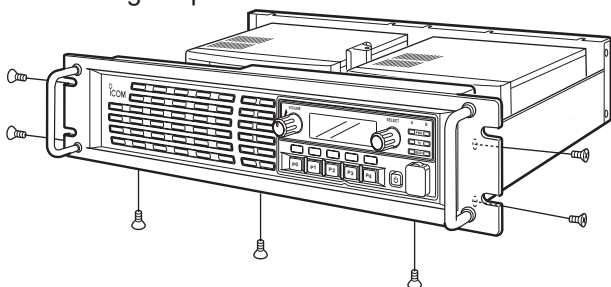
1. Replace the rubber seal and shielding plate on the front panel, then tighten the 6 screws.
 - Make sure the rubber seal is correctly seated in the groove of the chassis.
 - Be sure to match the correct positions of the holes of the shielding plate and projections of the front panel's chassis.



2. Connect the control cables to the channel modules.



3. Return the front panel, top cover, and screws to their original positions.




■ Receiving and transmitting

◇ Repeater operation

Ask your dealer for details of the repeater's presettings.

- When the repeater is ON, the [PWR] indicator lights green. (p. 1)
- The [TX] or [BUSY] indicator lights simultaneously while transmitting/receiving a signal.
 - The [TX] indicator lights red.
 - The [BUSY] indicator lights green.

 **NOTE:** The repeater has a built-in power amplifier protector. A protector circuit is activated when the repeater temperature becomes exceptionally high, due to long periods of transmitting, to reduce the transmit output power level. The output power will return to its normal level when the repeater has cooled down.

◇ Base station operation

Receiving

1. Push [POWER] to turn ON the power.
2. Set the audio and squelch levels.
 - Rotate [SELECT]^{*1} fully counterclockwise in advance.
 - Rotate [VOLUME] to adjust the audio output level.
 - Rotate [SELECT]^{*1} clockwise until the noise just disappears.
3. Push [CH Up]^{*2} or [CH Down]^{*2} to select the desired channel.
 - When receiving a signal, the [BUSY] indicator lights green, and audio is heard from the speaker.
 - Further adjustment of [VOLUME] to a comfortable listening level may be necessary at this point.

*1 When the [SQL Level Up/Down] key function is assigned to [SELECT].

*2 When the [CH Up]/[CH Down] key functions are assigned.

Transmitting

1. Take the microphone off the hook.
2. Wait for the channel to become open.
3. Hold down [PTT] to transmit, then speak into the microphone at your normal voice level.
4. Release [PTT] to receive.

IMPORTANT:

To maximize the audio quality of the transmitted signal:

1. Pause briefly after pushing [PTT].
2. Hold the microphone 5 to 10 cm (2 to 4 inch) from your mouth, then speak at your normal voice level.

■ Troubleshooting

The following chart is designed to help you correct problems that 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 your nearest Icom Dealer or Service Center.

PROBLEM	POSSIBLE CAUSE	SOLUTION	REF.
Power does not come on when [POWER] is pushed.	<ul style="list-style-type: none"> • DC power cable is improperly connected. • Fuse is blown. 	<ul style="list-style-type: none"> • Correctly reconnect the DC power cable. • Find the cause and repair it, then replace the fuse with a rated one. 	pp. 4, 5 p. 4
No sound comes from the speaker.	<ul style="list-style-type: none"> • The 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 5-Tone call or tone squelch. • The front speaker is set to OFF. 	<ul style="list-style-type: none"> • Rotate [VOLUME] clockwise to obtain a suitable listening level. • While in the base operating mode, rotate [SELECT] to counterclockwise to open the squelch. (When the [SQL Level Up/Down] key function is assigned to [SELECT].) • Push [MONI] (if assigned) to turn the audio mute function OFF. • Turn OFF the appropriate function. • Turn ON the front speaker using the optional programming software CS-FR5300. Ask your dealer for details. 	p. 8 p. 8 — — —
Sensitivity is low, and only strong signals are audible.	<ul style="list-style-type: none"> • Antenna feedline or the antenna connector has a poor connection or short-circuited. 	<ul style="list-style-type: none"> • Check and reconnect (or replace if necessary), the antenna feedline or antenna connector. 	p. 5
Output power is too low.	<ul style="list-style-type: none"> • Output power is set to Low. • The power amplifier protector circuit is activated. 	<ul style="list-style-type: none"> • Push [HIGH/LOW] (if assigned) to select High power. • Cool down the repeater or stop accessing the repeater until it has cooled down. 	— —
No contact possible with another station.	<ul style="list-style-type: none"> • The other station is using signaling squelch. • The operation mode is set to the Full-duplex mode. (Base station operation) 	<ul style="list-style-type: none"> • Turn the signaling squelch function ON. • Set the operation mode to the Simplex mode, if the other station is in the Simplex mode. 	— —

■ FCC INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

■ VOICE CODING TECHNOLOGY

The AMBE+2™ voice coding Technology embodied in this product is protected by intellectual property rights including patent rights, copyrights and trade secrets of Digital Voice Systems, Inc. This voice coding Technology is licensed solely for use within this Communications Equipment.

The user of this Technology is explicitly prohibited from attempting to extract, remove, decompile, reverse engineer, or disassemble the Object Code, or in any other way convert the Object Code into a human-readable form. U.S. Patent Nos.

#8,595,002, #8,359,197, #8,315,860, #8,200,497, #7,970,606, and #6,912,495 B2.

■ FREQUENCY AND TX POWER

VHF Digital Repeater

Model	Version	Frequency Range	Output Power
IC-FR5300	USA-01	136 – 174 MHz	50 W
	EXP-01		
	CAN-01		
	AUS-01		

- Channel spacing
 USA: 6.25 kHz, 12.5 kHz
 EXP: 6.25 kHz, 12.5 kHz, 20 kHz, 25 kHz
 CAN, AUS: 6.25 kHz, 12.5 kHz, 25 kHz

UHF Digital Repeater

Model	Version	Frequency Range	Output Power
IC-FR6300	USA-01	400 – 470 MHz	50 W
	EXP-01		
	CAN-01		
	EXP-03	330 – 400 MHz	
	USA-03	450 – 512 MHz	
	EXP-05	450 – 520 MHz	
	AUS-03		

- Channel spacing
 USA: 6.25 kHz, 12.5 kHz
 EXP: 6.25 kHz, 12.5 kHz, 20 kHz, 25 kHz
 CAN, AUS: 6.25 kHz, 12.5 kHz, 25 kHz

■ DISPOSAL



The crossed-out wheeled-bin symbol on your product, literature, or packaging reminds you that in the European Union, all electrical and electronic products, batteries, and accumulators (rechargeable batteries) must be taken to designated collection locations at the end of their working life. Do not dispose of these products as unsorted municipal waste. Dispose of them according to the laws in your area.

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Count on us!

