

ICOM[®]

INSTRUCTION MANUAL

VHF TRANSCEIVER

IC-F111

IC-F121

UHF TRANSCEIVER

IC-F211

IC-F221

**SmarTrunk II™
Compatible**



Icom Inc.


IMPORTANT

READ ALL INSTRUCTIONS carefully and completely before using the transceiver.

SAVE THIS INSTRUCTION MANUAL — This instruction manual contains important operating instructions for the **IC-F111/F121 VHF TRANSCEIVER** and **IC-F211/F221 UHF TRANSCEIVER**.

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.

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PRECAUTION

⚠ WARNING! NEVER connect the transceiver to an AC outlet. This may pose a fire hazard or result in an electric shock.

CAUTION! NEVER touch the transceiver (especially the heat sink) when transmitting continuously for long periods. It will become hot.

NEVER connect the transceiver to a power source of more than 16 V DC such as a 24 V battery. This connection will ruin the transceiver.

NEVER cut the DC power cable between the DC plug and fuse holder. If an incorrect connection is made after cutting, the transceiver might be damaged.

NEVER place the transceiver where normal operation of the vehicle may be hindered or where it could cause bodily injury.

NEVER allow children to touch the transceiver.

NEVER expose the transceiver to rain, snow or any liquids.

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USE the supplied microphone only. Other microphones have different pin assignments and may damage the transceiver.

DO NOT use or place the transceiver in areas with temperatures below -22°F (-30°C) or above +140°F (+60°C), or in areas subject to direct sunlight, such as the dashboard.

AVOID operating the transceiver without running the vehicle's engine. The vehicle's battery will quickly run out if the transceiver transmits while the vehicle's engine OFF.

AVOID placing the transceiver in excessively dusty environments.

AVOID placing the transceiver against walls. This will obstruct heat dissipation.

AVOID the use of chemical agents such as benzine or alcohol when cleaning, as they damage the transceiver surfaces.

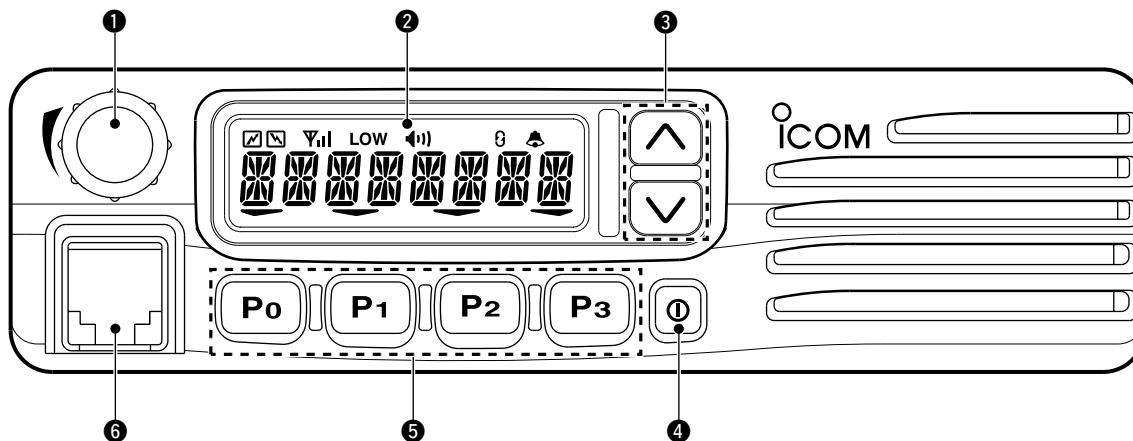
For U.S.A. only

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

1

PANEL DESCRIPTION

■ Front panel



❶ AF VOLUME CONTROL KNOB

Rotate the knob to adjust the audio output level.

- Minimum audio level is pre-programmed.

❷ FUNCTION DISPLAY

Displays a variety of information, such as an operating channel number/name, 5-tone code, DTMF numbers and audible condition, etc.

NOTE: The above functions depend on pre-programming.

❸ UP/DOWN [^]/[v] KEYS

- ➔ Push to select the operating channel.
- ➔ Can be programmed for one of several functions by your dealer. (Same as [P0] to [P3] keys)

❹ POWER SWITCH [POWER]

Push to turn the power ON and OFF.

- The following functions are available at power ON as options:
 - Automatic scan start
 - Password prompt
 - Set mode

5 DEALER-PROGRAMMABLE KEYS [P0] to [P3]

Desired functions can be programmed independently by your dealer.

6 MICROPHONE CONNECTOR

Connect the supplied microphone or optional DTMF microphone for SmarTrunk II™ operation here.

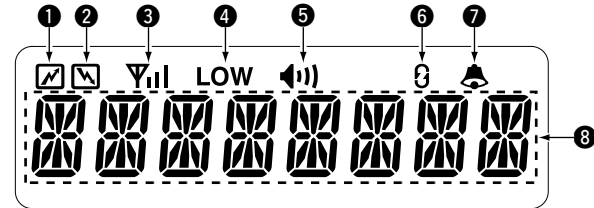
NEVER connect non-specified microphones. The pin assignments may be different and the transceiver may be damaged.

◇ MICROPHONE

The supplied microphone has a PTT switch and a hanger hook.

- The following functions are available when the microphone is on or off hook:
 - Automatic scan start when on hook.
 - Automatic priority channel selection when off hook.
 - Sets to 'Inaudible' condition (mute condition) when on hook.
 - Sets to 'Audible' condition (unmute condition) when off hook.

■ Function display



1 TRANSMIT INDICATOR

Appears while transmitting.

2 BUSY INDICATOR

Appears while the channel is busy.

3 SIGNAL STRENGTH METER

Indicates relative receive signal strength level.

4 LOW POWER INDICATOR

Appears when low output power is selected.

5 AUDIBLE INDICATOR

Appears when the channel is in the 'Audible' condition (unmute condition).

6 SCRAMBLER INDICATOR

Appears when the scrambler function is activated. (Optional UT-109 (#02)/UT-110 (#02) SCRAMBLER UNIT is required.)

1 PANEL DESCRIPTION

7 2/5TONE INDICATOR

Appears when the specified 2/5-tone call is received.

8 ALPHANUMERIC DISPLAY

Displays the CH number, 5-tone indication, DTMF numbers, Audible indication, etc.

■ Programmable function keys

The following functions can be assigned to [P0], [P1], [P2], [P3], [^] and [v] programmable function keys.

Consult your Icom dealer for details concerning your transceiver's programming.

In the following explanations, programmable function names are bracketed. The specific switch used to activate the function depends on programming.

● CH UP AND DOWN KEYS

- CH UP** ➔ Select an operating channel.
- CH DN** ➔ Select a transmit code channel after pushing the [TX CH] key.
- ➔ Select a DTMF channel after pushing the [DTMF] key.
- ➔ Select a scan group after pushing and holding the [SCAN] key.



● BANK KEY

- BANK** Select and determine a bank number.
 - When the optional UT-105 is installed, push one or more times to select a channel bank for conventional channels or SmarTrunk II™ channels.

● **SCAN START/STOP KEY**

SCAN A Push this key to start scanning; and push again to stop.

SCAN B

 **NOTE:** Place the microphone on hook to start scanning.
 Take the microphone off hook to stop scanning.

● **SCAN TAG KEY**

TAG Adds or deletes the selected channel to the scan group.

● **PRIORITY CHANNEL KEYS**

PRI A Push these keys to select priority A or priority B channel, respectively.

PRI B

● **OPERATING CHANNEL KEYS**

CH1 Select an operating channel directly.

CH2


CH3

CH4

● **MONITOR KEY**

MONI Activates one of (or two of) the following functions on each channel independently:

- Push and hold the key to unmute the channel (audio is emitted; 'Audible' condition).
- Push the key to toggle between the mute and unmute conditions (toggles between 'Audible' and 'Inaudible').
- Push the key to mute the channel (sets to 'Inaudible' only).
- Push the key to unmute the channel (sets to 'Audible' only).
- Push the key after communication is finished to send a 'reset code'.

 **NOTE:** The unmute condition ('Audible' condition) may automatically return to the mute condition ('Inaudible' condition) after a specified period depending on the pre-setting.

● **LOCK KEY**

LOCK Push this key for 1 sec. to lock all programmable keys except the following:

- **[CALL]** (incl. **[CAL A]** and **[CAL B]**), **[MONI]** and **[EMER]** keys.

1 PANEL DESCRIPTION

● **OUTPUT POWER SELECTION KEYS**

- H/L** Select the transmit output power temporarily, or permanently, depending on the pre-setting.
- Contact your dealer for the output power level for each selection.

● **TALK AROUND KEY**

- TA** Turns the talk around function ON and OFF.
- The talk around function equalizes the transmit frequency to the receive frequency for mobile-to-mobile communication.

● **WIDE/NARROW KEY**

- W/N** Push this key to toggle the bandwidth between wide or narrow.

● **DTMF AUTODIAL KEY**

- DTMF** Push this key to display the text of the DTMF channel number and set the desired channel number via the [**^**]/[**v**] key. Then, push this key again to transmit a specified DTMF code.

● **CALL KEY**

- CALL** Transmit a 2-tone, 5-tone code.
- Call transmission is necessary before you call another station depending on your signaling system.
- CAL A** • The [**CAL A**] and/or [**CAL B**] keys may be available when your system employs selective 'Individual/Group' calls. Contact your dealer about which call is assigned to each key.
- CAL B**

● **EMERGENCY KEY**

- EMER** Push and hold the key to transmit an emergency call.
- If you want to cancel the emergency call, push and hold (or push) the key again before transmitting the call.
 - Depending on the pre-setting, the emergency call is transmitted one time only, or repeatedly, until receiving a control code.

● **HOOK SCAN**

- HOOK** When the Hook Scan function is turned ON, push this key to stop scanning temporarily. Push this key again to re-start scanning.

● **TX CODE KEY**

- TX CH** Select a transmit 5-tone code (station code) channel.

● **SCRAMBLER KEY**

- SCRM** ➔ Push and hold to turn the voice scrambler function ON.
- ➔ Push this key to turn the voice scrambler function OFF.

NOTE:

- The optional UT-109 (#02) or UT-110 (#02) VOICE SCRAMBLER UNIT is required.
 - UT-109: Non-rolling type. 32 codes are available.
 - UT-110: Rolling type. Provides higher communication security. 1020 (4 groups × 255) codes are available.
- This transceiver requires version #02 of these units. Do not install version #01, as they are not compatible.
- Some PC board modifications are required when installing UT-109 or UT-110. Please refer to 'Optional UT-109 or UT-110 installation'. (p.16)
- Please contact your dealer for details.

● **USER SET MODE KEY**

- SET** Changes the contents of the items in the User Set mode. Please refer to p. 10.
 - Push and hold this key for 1 sec. to enter set mode. Push this key again momentarily to select the desired item. Push [**^**]/[**v**] to set the desired level/condition. Push and hold this key again to exit set mode.
 - User set mode also available via the 'Power ON function'.

■ Turning power ON

- ① Push [**ⓐ**] to turn the power ON.
- ② If the transceiver is programmed for a start up passcode, input the digit codes as directed by your dealer.
 - The keys in the table below can be used for password input:
 - The transceiver detects numbers in the same block as identical. Therefore “01234” and “56789” are same.

KEY	P₀	P₁	P₂	P₃	ⓐ
NUMBER	0 5	1 6	2 7	3 8	4 9

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

■ Channel selection

Several types of channel selection are available. The methods may differ according to your system setup.

NON-BANK TYPE:

Push [**^**]/[**v**] to select the desired operating channel in sequence; or, push one of the [**CH 1**] to [**CH 4**] keys to select a channel directly.

BANK-TYPE:

Push [**BANK**] to select the desired bank number or name.

AUTOMATIC SCAN TYPE:

Channel setting is not necessary for this type. When turning the power ON, the transceiver automatically starts scanning. Scanning stops when receiving a call or when taking the microphone off hook.

■ Receiving and transmitting

RECEIVING:

- ① Push [**Ⓚ**] to turn the power ON.
- ② Push [**▲**] and [**▼**] to select a channel.
- ③ When receiving a call, adjust the audio output level to a comfortable listening level.

TRANSMITTING:

- ④ Take the microphone off hook.
 - 2-tone, 5-tone mute may be released. (The 'audible' condition is selected and " **🔊** " appears.)
 - A priority channel may be selected automatically.
- ⑤ Wait for the channel to become clear.
 - The channel is busy when " **🔊** " appears.
- ⑥ Push the [**CALL**] key when initiating a call from your side.
 - Coded audio may be heard from the transceiver, then " **🔊** " appears.
 - This operation may not be necessary depending on your signaling system. Contact your dealer.
- ⑦ While pushing and holding [PTT], speak into the microphone at your normal voice level.
- ⑧ Release [PTT] to receive.

- IMPORTANT!:** To maximize the readability of your signal;
- ➡ Pause briefly after pushing [PTT].
 - ➡ Hold the microphone 2 to 5 cm from your mouth, then speak into the microphone at a normal voice level.

◆ Transmitting notes

• Transmit inhibit function

The transceiver has several inhibit functions which restrict transmission under the following conditions:

- The channel is in mute condition ('Inaudible' condition; " **🔊** " does not appear).
- Channel is busy.
- A matched/un-matched CTCSS code is received.
- The selected channel is a 'receive only' channel.

• Time-out timer

After continuous transmission for a pre-programmed period, the time-out timer is activated causing the transceiver to stop transmitting and automatically select receive.

• Penalty timer

Once the time-out timer is activated, transmission is further inhibited for a period determined by the penalty timer.

2 OPERATION

◇ TX code channel selection

If the transceiver has a [TX CH] key, the display can be toggled between the operating channel number (or name) and TX code channel number (or name). When the TX code channel number (or name) is displayed, the [^]/[v] keys select the TX code channel.

To select a TX channel:

- ① Push [TX CH]—a TX code channel appears.
- ② Push [^]/[v] to select the desired TX code channel.
- ③ Push [CALL] to transmit the selected TX code.
- ④ Push [TX CH] again to return to the channel display.

◇ TX code number selection

If the transceiver has a [TX CH] key, TX code contents can be changed within the allowable digits.

To select a TX code:

- ① Push [TX CH]—a TX code number appears and the first digit blinks.
- ② Push [^]/[v] to select the desired number of the blinking digit.
- ③ Push [TX CH] to enter the selected number and the next digit will start blinking automatically.
- ④ Repeat step ② and ③ to input all allowed digits.
- ⑤ Push [CALL] to transmit the selected TX code.

◇ DTMF transmission

If the transceiver has a [DTMF] key, the automatic DTMF transmission function is available. Up to 7 DTMF channels may be available.

To transmit a DTMF code:

- ① Push [DTMF]—a DTMF code channel appears.
- ② Push [^]/[v] to select the desired DTMF channel.
- ③ Push and hold [DTMF] to transmit the DTMF code on the selected DTMF channel.

◇ Scrambler function

The UT-109 (#02) or UT-110 (#02) optional voice scrambler unit provides high performance private communication between stations with the same scrambler codes.

To turn the scrambler function ON and OFF:

- ① Push and hold [SCRM] to turn the scrambler function ON.
- ② Push [SCRM] to turn the function OFF.

◇ User set mode

User set mode is accessed at power ON and allows you to set seldom-changed settings. In this case you can “customize” transceiver operation to suit your preferences and operating style.

Entering the user set mode:

- ① While pushing and holding [**▲**] and [**▼**], push [POWER] to enter user set mode ON, allowing you to set seldom-changed settings.
- ② Push and hold [**P0**] to select the appropriate item. Then, push [**▲**] or [**▼**] to set the desired level/mode.
 - Available set mode functions;
 - Backlight : OFF, Dim, Auto or ON
 - Beep : OFF or ON
 - SQL Level : 0 to 255
 - AF Min level : 0 to 255
- ③ Push [POWER] (or push and hold [**P0**]) again to exit set mode.


User set mode is also available via a programmable key. Please refer to p. 6 [**SET**] section.

■ SmarTrunk II™ and conventional modes

This transceiver is capable of SmarTrunk II™ functions.

The optional UT-105 allows communication in conventional channels or SmarTrunk II™ channels. Select a channel bank for SmarTrunk II™ before trunking operation.

- Push **[BANK]** several times to select a channel bank for conventional channels or SmarTrunk II™ channels.
 - Scanning starts when a channel bank for SmarTrunk II™ operation is selected.
 - Contact your dealer for channel bank details.

 **NOTE:** Optional HM-100TN DTMF MICROPHONE is required. Contact your dealer for details.

■ SmarTrunk II™ operation

These features are enabled by a dealer and may not be available in your system. Contact your dealer for details.

◇ Placing a telephone call

Enter the phone number followed by [1], [*].

- A high-pitched beep indicates that the number is accepted.
- When the called party answers, push the [PTT] switch to talk, and release it to listen.

◇ Calling another local system subscriber

Enter the subscriber number followed by [3], [*].

- A high-pitched beep indicates that the number is accepted.
- You hear ringing, then two short beeps when the subscriber answers.
- If the other subscriber is on another call or out of range, you hear a fast busy signal and the call terminates automatically.

◇ Receiving a call

When you hear ringing, push [*] to answer.

- For a group call, you hear a short ring followed by two short beeps. You do not have to answer a group call to hear it over the air.

◇ Terminating a call

After completing a call, push [#] to disconnect (hang up).

IMPORTANT!: If one person in the conversation terminates a call, all participants will be cut off.

◇ Last number re-dial

Push [*] 2 times to automatically re-dial the last called number.

- A high-pitched beep indicates that the number is accepted.

◇ Memory speed-dialling

To automatically dial a commonly used number from memory:

- Push [*] followed by the memory location (0–9).

◇ Turbo Speedial

To automatically dial a commonly used number with one push:

- Push one of the turbo Speedial keys ([A], [B], [C] or [D]).

◇ Programming memory speed dial

- ① Push and hold [*] until you hear a high-pitched beep.
- ② Enter the memory location (0–9, A, B, C, D), the telephone or subscriber number, then [1], [*] (or [3], [*] if for another system subscriber).
 - A high-pitched beep indicates successful programming.
 - Memories [A]–[D] are used for the Turbo Speedial.

◇ System busy indication

If all channels are busy, three low beeps sound after you initiate a call. Try the call again later.

◇ PTT dispatch operation

- ① Push [PTT] once (without dialling) to initiate a dispatch call.
- ② Begin talking after you hear three beeps (one short, high-pitched, two very-short, low-pitched).
- ③ Receiving a dispatch call is indicated by the same three-beep sequence.
 - It is not necessary to push [*] to answer a dispatch call.

◇ Emergency call

Push [0], [*] to initiate an emergency call.

- Contact your dealer for details.

◇ Clear channel alerting

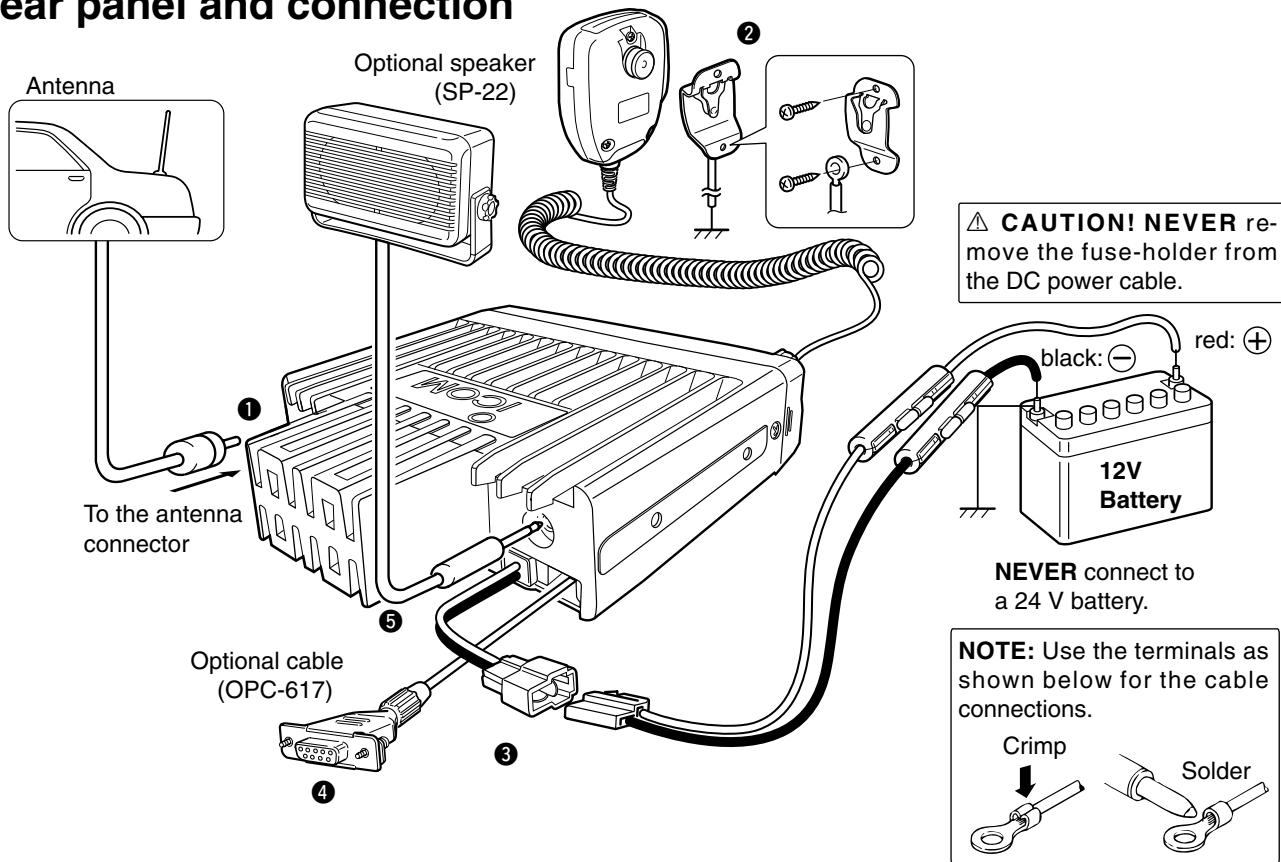
If all channels are busy, the transceiver automatically begins searching for an open channel and beeps every ten seconds. When two short beeps (low-pitched, then high-pitched) are heard, a channel is available. Push [*] two times immediately to re-dial the last number.

NOTE: For additional operating instructions, contact your dealer.

4

CONNECTION AND MAINTENANCE

■ Rear panel and connection



1 ANTENNA CONNECTOR

Connects to an antenna. Contact your dealer about antenna selection and placement.

2 MICROPHONE HANGER

Connect the supplied microphone hanger to the vehicle's ground for microphone on/off hook functions. (See p. 2)

3 DC POWER RECEPTACLE

Connects to a **12 V DC** battery. Pay attention to polarities. **NEVER** connect to a **24 V** battery. This could damage the transceiver.

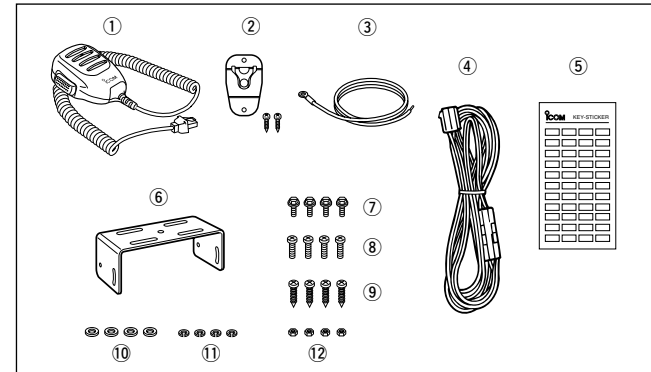
4 OPTIONAL CABLE (OPC-617)

Connect an external modem unit, dimmer control, etc.

5 EXTERNAL SPEAKER JACK

Connect a 4–8 Ω external speaker, if desired.

Supplied Accessories



- | | | | |
|---|-------|-------------------------------------|---|
| ① Microphone | 1 | ⑥ Mounting bracket | 1 |
| ② Microphone hanger and screw set | 1 set | ⑦ Bracket bolts | 4 |
| ③ Microphone hanger cable . | 1 | ⑧ Mounting screws (M5×12) . | 4 |
| ④ DC power cable (OPC-1132) | 1 | ⑨ Self-tapping screws (M5×20) | 4 |
| ⑤ Function name stickers* (KEY STICKER) | 1 | ⑩ Flat washers | 4 |
| | | ⑪ Spring washers | 4 |
| | | ⑫ Nuts | 4 |

***Function name stickers**

There are no names on the programmable function keys since the functions can be freely assigned to these keys.

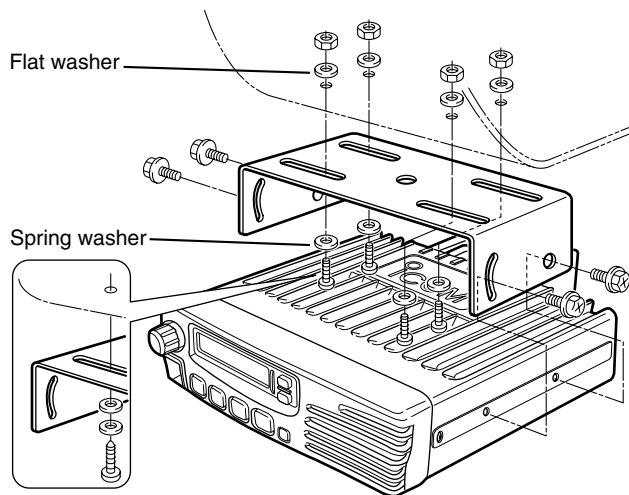
Attach the supplied function name stickers above the appropriate keys for easy recognition of that key's assigned function.

4 CONNECTION AND MAINTENANCE

■ Mounting the transceiver

The universal mounting bracket supplied with your transceiver allows overhead mounting.

- Mount the transceiver securely with the 4 supplied screws to a thick surface which can support more than 1.5 kg.

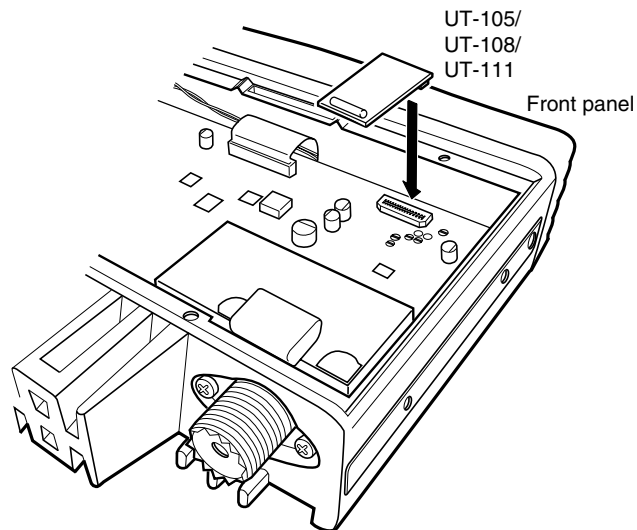


When using self-tapping screws

■ Optional UT-105, UT-108 or UT-111 installation

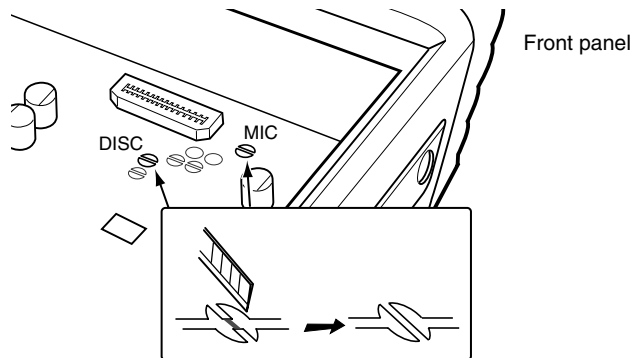
Install the optional UT-105, UT-108 or UT-111 unit as follows:

- ① Turn the power OFF, then disconnect the DC power cable.
- ② Unscrew the 4 cover screws, then remove the bottom cover.
- ③ Install the unit as shown in the diagram below.
- ④ Replace the bottom cover and screws, then re-connect the DC power cable.

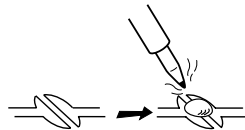


Optional UT-109 or UT-110 installation

- ① Turn the power OFF, then disconnect the DC power cable.
- ② Unscrew the 4 cover screws, then remove the bottom cover.
- ③ Cut the pattern on the PCB at the TX mic circuit (MIC) and RX AF circuit (DISC) as shown below.
- ④ Install the scrambler unit as described in the installation of optional UT-105, UT-108 or UT-111 as on the page at left.
- ⑤ Replace the bottom cover and screws.

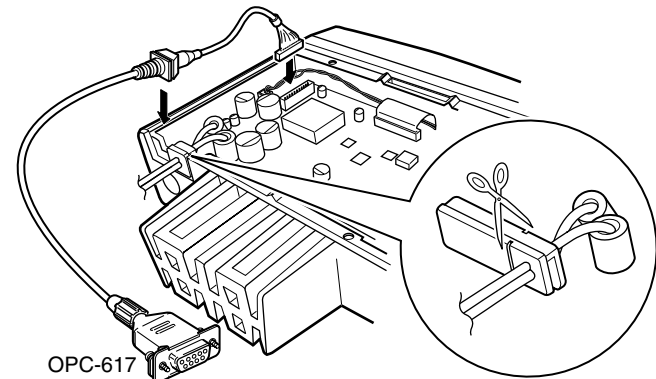


NOTE: Be sure to re-solder the above disconnected points when you remove the scrambler units. Otherwise no TX modulation or AF output is available.



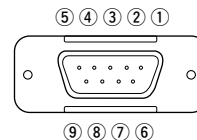
Optional OPC-617 installation

Install the OPC-617 as shown below.



Cut off the bushing as in the illustration, when you install the optional OPC-617.

OPTIONAL CABLE PIN ASSIGNMENT



- | | |
|--|------------------------|
| ① Dimmer cont. IN or
IGSW cont. IN | ⑥ Horn drive cont. OUT |
| ② AF OUT | ⑦ AF GND |
| ③ Det. AF OUT | ⑧ Det. AF GND |
| ④ Mod. IN | ⑨ Mod. GND |
| ⑤ PTT control IN or
FTSW control IN | |

4 CONNECTION AND MAINTENANCE

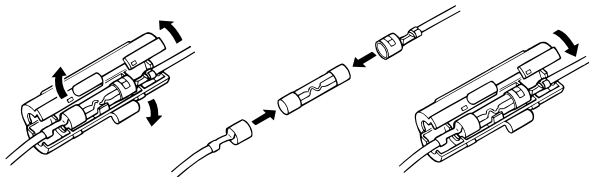
■ Antenna

A key element in the performance of any communication system is an antenna. Contact your dealer about antennas and the best places to mount them.

■ Fuse replacement

Two fuses are installed in the supplied DC power cable. If a fuse blows or the transceiver stops functioning, track down the source of the problem if possible, and replace the damaged fuse with a new rated one.

□ Fuse rating: 20 A



■ Cleaning

If the transceiver becomes dusty or dirty, wipe it clean with a soft, dry cloth.



AVOID the use of solvents such as benzene or alcohol, as they may damage the transceiver surfaces.

SP-22 EXTERNAL SPEAKER

Compact and easy-to-install.

Input impedance : 4 Ω

Max. input power : 5 W

HM-100N/HM-100TN/HM-152/HM-152T/HM-148

- HM-100TN/HM-152T : DTMF microphone
- HM-148 : Heavy duty microphone

SM-25

Desktop microphone.

UT-105 SmarTrunk II™ Logic Board

Provides SmarTrunk II™ capabilities.

UT-108 DTMF DECODER UNIT

Provides pager and code squelch capabilities.

UT-109/UT-110 (#02) VOICE SCRAMBLER UNIT

- UT-109 : Non-rolling type (max. 32 codes)
- UT-110 : Rolling type (max. 1020 codes)

UT-111 TRUNKING BOARD

Provides trunking operation.

OPC-617 ACC CABLE

Allows you to connect to an external terminal.



WARNING

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 Industry Canada 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-F121:

The antenna is required to be located outside of a vehicle and kept at a distance of 1 meter or more between the transmitting antenna of this device and any persons during operation. For small vehicle as worst case, the antenna shall be located on the roof top at any place on the centre line along the vehicle in order to achieve 1 meter separation distance. In order to ensure this distance is met, the installation of the antenna must be mounted at least 1 meter away from the nearest edge of the vehicle in order to protect against exposure to bystanders.

3. IC-F221:

The antenna is required to be located outside of a vehicle and kept at a distance of 79 centimeters or more between the transmitting antenna of this device and any persons during operation. For small vehicle as worst case, the antenna shall be located on the roof top at any place on the centre line along the vehicle in order to achieve 79 centimeters separation distance. In order to

ensure this distance is met, the installation of the antenna must be mounted at least 79 centimeters away from the nearest edge of the vehicle in order to protect against exposure to bystanders.



CAUTION

To ensure that your exposure to RF electromagnetic energy is within the FCC 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 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 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.

Count on us!

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