ICOM

SmarTrunk II™
Compatible

VHF TRANSCEIVER
IC-F521

UHF TRANSCEIVER
IC-F621

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-F521 VHF TRANSCEIVER** and **IC-F621 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.

CAUTIONS

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

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.

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

DO NOT use or place the transceiver in areas with tem-

peratures 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 is in transmission 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.

BE CAREFUL! The transceiver will become hot when operating continuously for long periods.
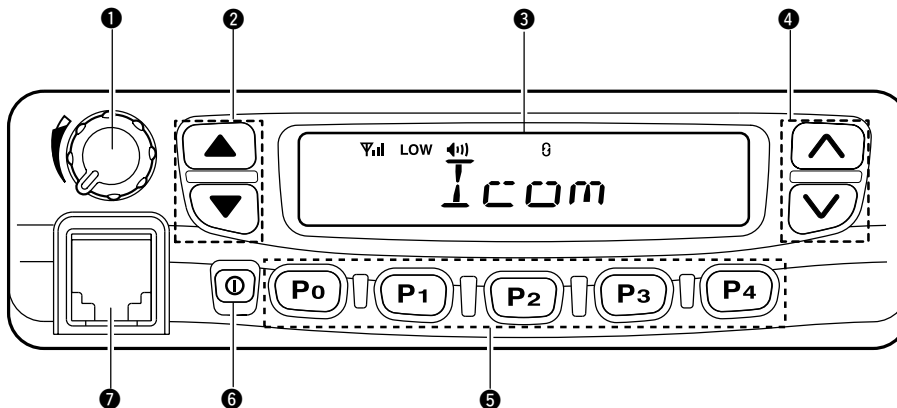
For U.S.A. only
CAUTION: Changes or modifications to this transceiver, not expressly approved by Icom Inc., could void your authority to operate this transceiver under FCC regulations.

TABLE OF CONTENTS

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 LEFT UP/DOWN [▲]/[▼] KEYS
➥One of several functions can be programmed by your Dealer. (Same as [P0] to [P4] keys)

❸ FUNCTION DISPLAY
➥Displays variety of information, such as an operating channel number/name, 2/5tone code, DTMF numbers and audible condition, etc.

NOTE: The above functions depend on pre-programming.

❹ RIGHT UP/DOWN [∧]/[∨] KEYS
➥Push to select the operating channel.
➥Can be programmed for one of several functions by your Dealer. (Same as [P0] to [P4] keys)

❺ DEALER-PROGRAMMABLE KEYS [P0] to [P4]

➥Desired functions can be programmed independently by your Dealer.

❻ POWER SWITCH [POWER]

➥Push and hold to turns the power ON and OFF.
  • The following functions are available at power ON as options:
    - Automatic scan start
    - Password prompt
    - Set mode

❼ MICROPHONE CONNECTOR

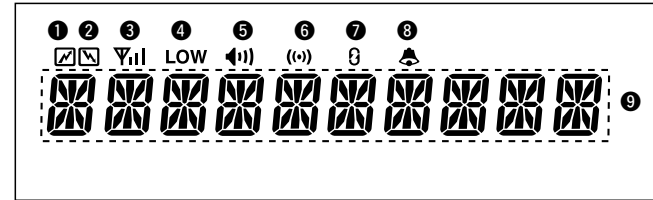➥Connect the supplied microphone or optional DTMF microphone for SmarTrunk II™ operation here.

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 hung on.
    - Automatic priority channel selection when hung off.
    - Sets to 'Inaudible' condition (mute condition) when hung on.
    - Sets to 'Audible' condition (un-mute condition) when hung off.

■ Function display

❶ TRANSMIT INDICATOR

➥Appears while transmitting or sending a 2/5tone code.

❷ BUSY INDICATOR

➥Appears while the channel is in busy.

❸ SIGNAL STRENGTH METER

➥Indicates relative signal strength level.

❹ LOW POWER INDICATOR

➥Appears when low output power is selected.

❺ AUDIBLE INDICATOR

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

❻ COMPANDER INDICATOR

➥Appears when compander function is activated.

2

❼ SCRAMBLER INDICATOR
➥Appears when scrambler function is activated. (Optional UT-109 (#02)/UT110 (#02) SCRAMBLER UNIT is required.)

❽ 2/5TONE INDICATOR
➥Appears when specified 2/5tone call is received.

❾ ALPHANUMERIC DISPLAY
➥Displays the CH number, 2/5tone indication, DTMF numbers, Audible indication, etc.

■ Programmable function keys

The following functions can be assigned to **[P0], [P1], [P2], [P3], [P4], [▲], [▼], [∧]** and **[∨]** programmable function keys.

Consult your Icom Dealer or System operator for details concerning your transceivers programming.

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

[CH UP] *CH UP AND DOWN KEYS*
[CH DN] • Select an operating channel.
          • Select a transmit code channel after pushing the [**TX CH**] key.
          • Select a DTMF channel after pushing the [**DTMF**] key.
          • Select a scan group while pushing and holding the [**SCAN**] key.

[CH1] *OPERATING CHANNEL KEYS*
[CH2] Select an operating channel directly.
[CH3]
[CH4]

[PRI A] *PRIORITY CHANNEL KEYS*
[PRI B] Select priority A or priority B channel with each push.

[BANK] *BANK KEY*

Select and determine a bank number.

• When the optional UT-105 is installed, push **[BANK]** then push **[CH UP]**/**[CH DN]** to select operating bank number, and then push **[BANK]** to determine the bank number.

[SCAN A] *SCAN START/STOP KEY*

[SCAN B] Push this key to start scanning; and push again to stop.

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

Push and hold this key to indicate the scan group, then push to select the desired group.

[TAG] *SCAN TAG KEY*

Adds or deletes the selected channel to the scan group.

[LOCK] *LOCK KEY*

Electronically locks all programmable keys except the following:

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

[MONI] *MONITOR KEY*

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 the mute and unmute conditions (toggles '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 the 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.

[W/N] *WIDE/NARROW KEY*

Push **[W/N]** to toggle bandwidth between wide or narrow.

[H/L] *OUTPUT POWER SELECTION KEYS*

Select the transmit output power temporarily or permanently depending on the pre-setting.

• Ask your Dealer or System Operator for the output power level for each selection.

1 PANEL DESCRIPTION

[T A]   **_TALK AROUND KEY_**
Turns the talk around function ON and OFF.
• The talk around function equalises the transmit
frequency to the receive frequency for mobile-
to-mobile communication.

[CALL]   **_CALL KEYS_**
Transmit a 2-tone code.
• Call transmission is necessary before you call
another station depending on your signaling
system.

[EMER]   **_EMERGENCY KEY_**
Push and hold the key to transmit an emergency call.
• If you want to cancel the emergency call, push
(or push and hold) the key again before trans-
mitting the call.
• The emergency call is transmitted one time only
or repeatedly until receiving a control code
depending on the pre-setting.

[CODE]   **_TX CODE CHANNEL UP/DOWN KEY_**
Push to selects a TX code channel directory.

[DTMF]   **_DTMF CHANNEL SELECT KEY_**
Push this key to select a DTMF channel.
• Push this key, then select the desired DTMF
channel using the [∧]/[∨] keys.
Push the key to transmit the selected DTMF
code.

[TONE]   **_C. TONE CHANNEL ENTER KEY_**
Push this key then input a continuous tone mem-
ory channel number using [∧]/[∨] keys to
change the tone frequency.

[ID MR]   *ID MEMORY READ KEY*
Recalls detected ID codes.
• Push this key, then push [∧]/[∨] for selection.
• Up to 5 ID's are memorized.
Push and hold this key to erase all memorized IDs.

[GRP]   *TRUNKING GROUP KEY*
Push to select the Trunking group.

[COMP]   *MIC COMPANDER KEY*
Push to toggle the mic compander function ON or OFF.

[SET]   *USER SET MODE KEY*
Changes the contents of the items in the User Set mode.
• Push and hold **[SET]** for 1 sec. to enter set mode, push **[SET]** momentarily to select the item. Push [∧] and [∨] to set the desired level/condition.
 Push and hold **[SET]** again to exit set mode.

• User set mode also available via the 'Power ON function'. Please refer p. 10 also.

[SCRM]   *SCRAMBLER KEY*
• Push and hold to turn the voice scrambler function ON.
• Push to turn the voice scrambler function OFF.

NOTE:
• 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) cods are available.
• This transceiver requires version #02 unit, do not install version #01, as they are not compatible.
• UT-109 and UT-110 require some PC board modifications. Please refer '■ Optional UT-109/UT-110 installation'. (p.17)
• Please contact your Dealer for details.

2 OPERATION

■ Turning power ON

① Push [POWER] to turn the power ON.
  • A power-up alert tone sounds for about 1 sec. and an opening message may appear.

② If the transceiver is programmed for a start up passcode, input 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 the same.

KEY	[P0]	[P1]	[P2]	[P3]	[P4]
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 may be incorrect. Turn power off and start over in this case.

■ Channel selection

Several types channel selections are available, methods may differ according to your system set up.

NON-BANK TYPE:
Push **[CH UP]**/**[CH DN]** to select the desired operating channel, in sequence; or, push one of the **[CH 1]** to **[CH 4]** to select a channel directly.

BANK-TYPE:
Push **[BANK]** to select the desired bank number.

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 [POWER] to turn the power ON.

② Push **[CH UP]** or **[CH DN]** 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.
  • 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. Ask 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:

(1) Pause briefly after pushing [PTT]

(2) 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.
  - No matched (or matched) CTCSS 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

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

① Push **[DTMF]** — a DTMF code channel appears.
② Push **[CH UP]**/**[CH DN]** to select the desired DTMF channel.
③ Push and hold **[DTMF]** to transmit the selected DTMF.

◊ Scrambler function
UT-109 (#02) or UT-110 (#02) optional voice scrambler unit provides high performance private communication between stations with the same scrambler codes.
① Push and hold **[SCRM]** to turn the scrambler function ON.
② " ɞ " appears.
③ 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 enter user set mode. Push [P0] momentarily to select the item.
   Then push [∧] and [∨] to set the desired level/condition.
   Available set mode functions:
   • Backlight   :AUTO, DIM, OFF or ON
   • Beep   :ON or OFF
   • Beep Level   :1 to 5 or Link (links to audio output level)
   • SQL Level   :0 to 255
   • AF Min level :0 to 255
   • Audio Filter :3000, 3400, 0 or 300
   • Mic Gain   :1 to 5

③ Push [POWER] (or push and hold [P0]) again to exit set mode.

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

3 OPTIONAL SmarTrunk II™ OPERATION

■ 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 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 [∗] 2times 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 SpeeDials ([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.
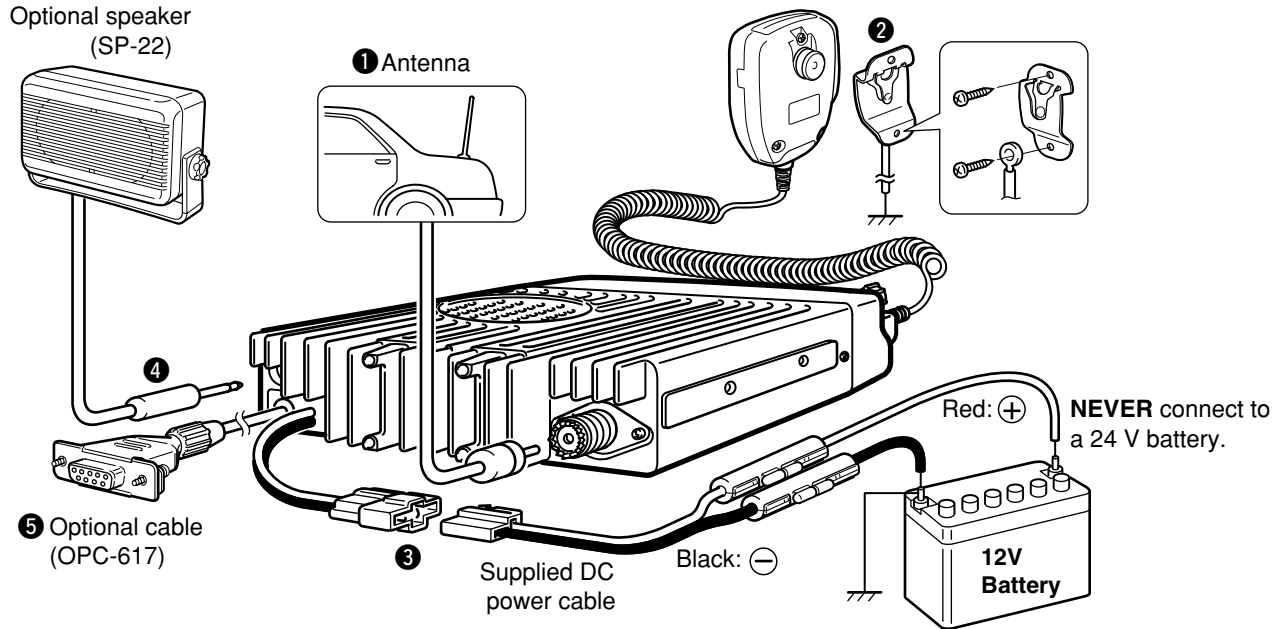• Contact your dealer for details.

◇ **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 [∗], [∗] immediately to re-dial the last number.

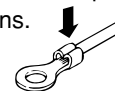**NOTE:** For additional operating instructions, contact your Dealer or System Operator.

CONNECTION AND MAINTENANCE

■Rear panel and connection

Optional speaker
(SP-22)

➊ Antenna

➋

➍

➎ Optional cable
(OPC-617)

➌

Supplied DC
power cable

Black: ⊖

Red: ⊕   **NEVER** connect to
a 24 V battery.

**12V
Battery**

Note: Use the terminals
for the cable connections.

Crimp

Solder

q ANTENNA CONNECTOR

Connects to an antenna. Ask your Dealer about antenna selection and placement.

w MICROPHONE HANGER

Connect the supplied microphone hanger to the vehicle's ground for microphone on/off hook functions.

e 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.
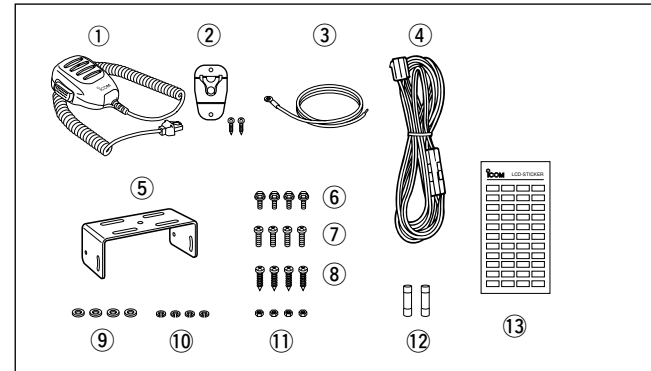
r EXTERNAL SPEAKER JACK

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

t OPTIONAL CABLE (OPC-617)

Connect an external modem unit, LCD backlight control, etc.

■ Supplied Accessories

q Microphone 1
w Microphone hanger and
   screw set .... 1 set
e Microphone hanger cable . 1
r DC power cable
   (OPC-346) 1
t Mounting bracket 1
y Bracket bolts 4
u Mounting screws (M5×12) . 4
i Self-tapping screws
   (M5×20) 4
o Flat washers 4
!0 Spring washers 4
!1 Nuts 4
!2 Fuse s (20 A) 2
!3 Function name stickers*
   (1705 LCD SEAL(D)) 1

*Function name stickers
There are no names on the programmable function keys since the needed functions can be assigned to these keys.
Attach the supplied function name stickers above the appropriate keys.

■ Mounting the transceiver

The front panel can be inverted for correct viewing while leaving the built-in speaker facing away from the mounting surface.
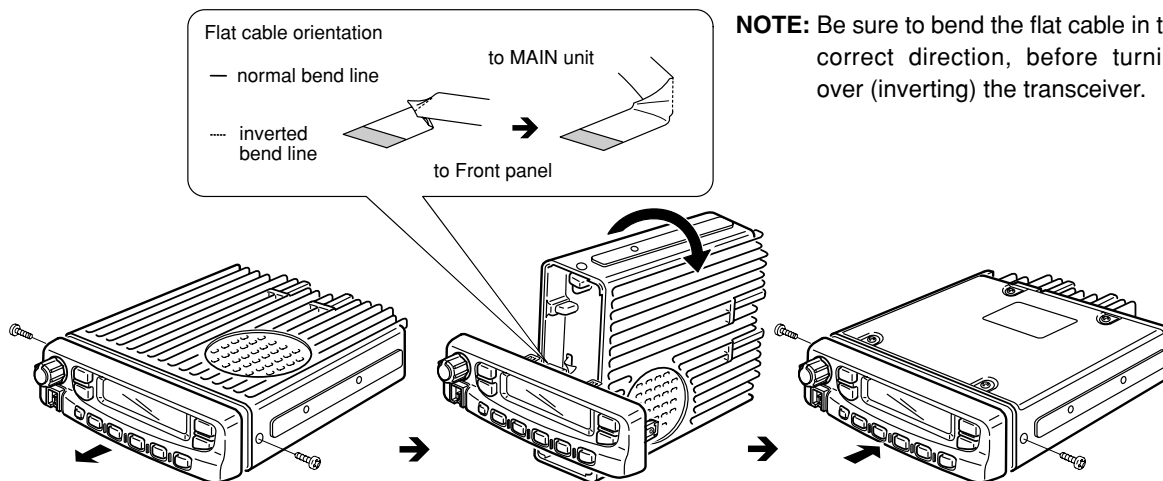
◇ Inverting the Front panel

①Unscrew the 2-side screws.

②Detach the Front panel forward from the transceiver.

③Bend the flat cable between Front panel and main unit as shown in the following diagram.

④Invert the transceiver 180 degrees clockwise as below.

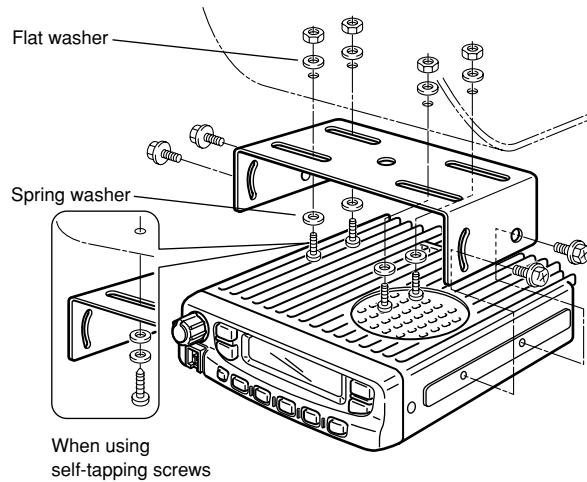⑤Re-attach the Front panel to the transceiver.

⑥Tighten the 2 screws.

CAUTION:

•**NEVER** rotate the transceiver more than 180 degrees.

•**DO NOT** bend the flat cable too hard. Damage may occur.

NOTE: Be sure to bend the flat cable in the correct direction, before turning over (inverting) the transceiver.

Flat cable orientation

— normal bend line

···· inverted bend line

to MAIN unit

to Front panel

◇ **Mounting the transceiver**

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

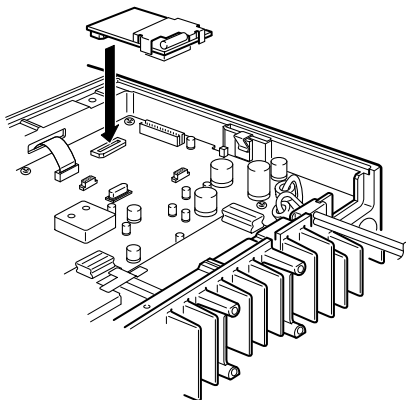•Mount the transceiver securely with the 4 supplied screws to a thick surface which can support more than 1.5 kg.

Flat washer

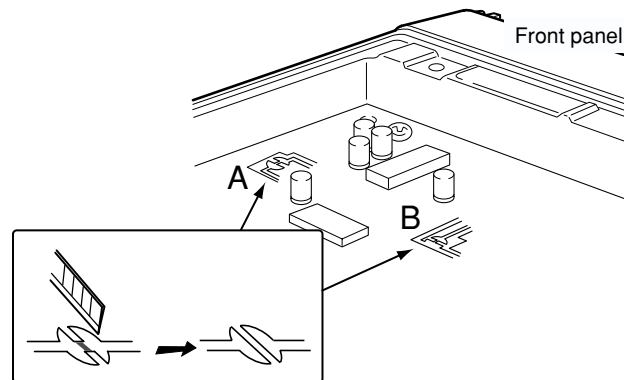Spring washer

When using
self-tapping screws

■ Optional UT-105 and UT-108 installation

The optional UT-105 and UT-108 units install as follows:

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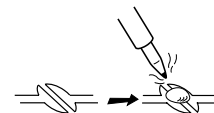④ Replace the bottom cover and screws, then the DC power cable.

■ Optional UT-109 /UT-110 installation

① Turn power OFF, then disconnect the DC power cable.
② Unscrew the 4 screws, then remove the bottom cover.
③ Cut the print pattern on the PCB at the TX mic circuit (A) and RX AF circuit (B) as shown in the following figure.
④ Install the scrambler unit as shown in the left.
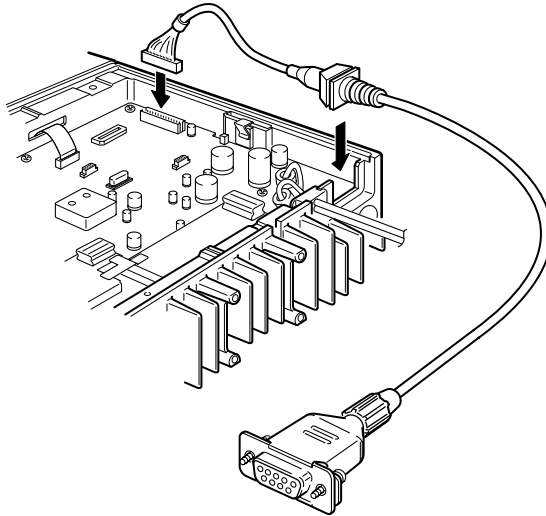⑤ Return the bottom cover and screws to the original position.

Front panel

A

B

NOTE: Be sure to re-solder above disconnected points, otherwise no TX modulation or AF output is available when you remove the scrambler units.
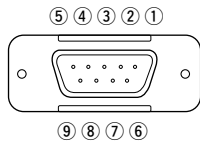
■ Optional OPC-617 installation
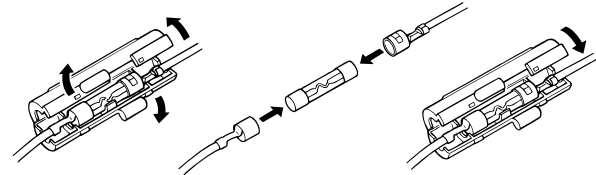
Install the OPC-617 as shown below.

■ Antenna

A key element in the performance of any communication system is an antenna. Ask 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

OPTIONAL CABLE PIN ASSIGNMENT

⑤④③②①

⑨⑧⑦⑥

① LCD backlit cont. IN
② AF OUT
③ Det. AF OUT
④ Mod. IN
⑤ PTT control IN
⑥ Horn drive cont. OUT
⑦ AF GND
⑧ Det. AF GND
⑨ Mod. GND

■ Cleaning

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

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

5 OPTIONS

SP-22 EXTERNAL SPEAKER
Compact and easy-to-install.
Input impedance: 4 Ω
Max. input power: 5 W

HM-152/HM-152T/HM-148 HAND MICROPHONE
• HM-152 : Hand microphone. The same as that supplied
with the transceiver.
• 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 oprtation.

OPC-617 ACC CABLE
Allows you to connect to an external terminal.

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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-F521:
The transmitter antenna is required to be located outside of a vehicle and kept at a separation distance of 63 centimeters or more between the transmitter antenna of this device and persons during operation.
3. IC-F621:
The transmitter antenna is required to be located outside of a vehicle and kept at a separation distance of 50 centimeters or more between the transmitter antenna of this device and persons during operation.

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!