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ICOM

INSTRUCTION MANUAL

HF AUTOMATIC
ANTENNA TUNER

AT-130
AT-130E



Icom Inc.

IMPORTANT

READ ALL INSTRUCTIONS carefully and completely before using the AT-130 and AT-130E.

SAVE THIS INSTRUCTION MANUAL. This instruction manual contains important safety and installation instructions.

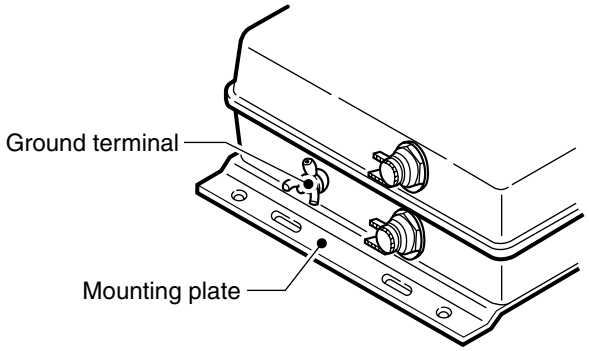
PRECAUTIONS

⚠ **DANGER HIGH VOLTAGE! NEVER** touch the antenna terminal, ground terminal, antenna or counterpoise while transmitting. Place the AT-130 or AT-130E, antenna and counterpoise in positions where no one touches them.

⚠ **WARNING! NEVER** transmit during internal adjustment. This may cause an electric shock.

NEVER use without a ground connection.

USE the ground terminal for ground connection. The mounting plate is not connected internally.



DO NOT operate your HF marine transceiver without running the boat's engine.

DO NOT use the AT-130 or AT-130E in areas where the temperature is below –30°C (–22˚F) or above +60°C (+140˚F).

EXPLICIT DEFINITIONS

The explicit definitions in this instruction manual.

WORD	DEFINITION
⚠**DANGER!**	Personal death, serious injury or an explosion may occur.
⚠**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.

FOREWORD

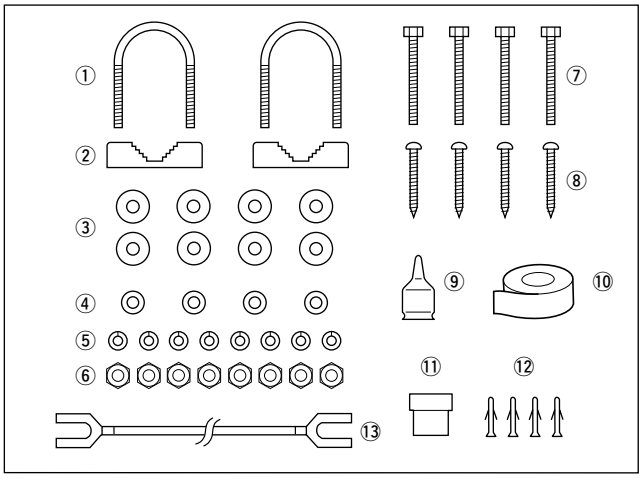
Thank you for purchasing the **AT-130** or **AT-130E HF AUTOMATIC ANTENNA TUNER**.

The AT-130 and AT-130E are designed, primarily for use with Icom HF transceivers. To meet with European regulations, the AT-130E includes an extra emergency tuner circuit for 2182 kHz operation.

Refer to your HF transceiver instruction manual for operation. If you have any questions, contact your nearest authorized Icom Dealer or Service Center.

SUPPLIED ACCESSORIES

The following parts are supplied with the AT-130/E.



	Qty.
① U-bolts	2
② U-bolt plates	2
③ Flat washers (M6 large)	8
④ Flat washers (M6 small)	4
⑤ Spring washers (M6)	8
⑥ Nuts (M6)	8
⑦ Hex head bolts (M6×50)	4
⑧ Self-tapping screws (A0 6×30)	4
⑨ Weatherproof cap	1
⑩ Rubber vulcanizing tape	1
⑪ 4-pin connector	1
⑫ Connector pins	4
⑬ Ground cable (OPC-412)	1

MISCELLANEOUS ITEMS

The following parts are required for installation, but are not supplied with the AT-130 or AT-130E.

① AWG 14×4-conductor shielded cable
*Icom offers an optional OPC-420 CONTROL CABLE.
Length: 10 m; 32.8 feet
② 50 Ω coaxial cable
③ Two PL-259 connectors

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Icom is not responsible for the destruction, damage to, or performance of any Icom or Non-Icom equipment, 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 antenna tuners with any equipment that is not manufactured or approved by Icom.

FEATURES

Matches all bands
The AT-130/E matches all frequencies on the HF marine band. For example, the tuner matches a 7 m; 23 feet long-wire antenna across 1.6–30 MHz.

Full automatic tuning
Just push the [TUNE] switch on the transceiver, the AT-130/E immediately tunes for a minimum SWR on any frequency in the HF marine band.

HF operation on any size ship
The AT-130/E allows HF operation where antenna element length is restricted due to space.

Weather resistant
The AT-130/E is housed in a durable, completely weather resistant acrylic case with a rubber gasket. The antenna tuner can be conveniently installed both on the deck or in the cabin near the antenna element.

Simple installation
Installation is simple. Just connect the control and antenna cables and short-times internal settings. After installation, you never need to open the cover for maintenance.

Preset tuning function
This function provides super fast tuning on your most-used frequency.

45 memories for shorter tuning time
To decrease the tune-up time, the AT-130/E automatically stores the matching conditions for up to 45 frequencies. Retuning for a memorized frequency takes only approximately 1 second.

Super capacitor for memory backup
Even if the AT-130/E is not used for approximately 1 week, the built-in super capacitor backs up the 45 memory contents.

Low power tune up
The AT-130/E emits low output power during tuning. This feature reduces the possibility of causing interference to other stations.

Emergency tuner circuit (AT-130E)
To meet with European regulations, the Europe version AT-130E includes an emergency tuner circuit for 2182 kHz operation. If any signal from the control cable indicates an abnormal condition, this circuit is automatically selected.

About CE

CE Versions of the AT-130E which display the "CE" symbol on the serial number seal, comply with the essential requirements of the European Radio and Telecommunication Terminal Directive 1999/5/EC.

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1 ANTENNA SYSTEM

■ Antenna for ship

Required antenna element length

Required antenna element length to achieve full performance varies according to the lowest frequency:

The lowest frequency	Required antenna element length
1.6 MHz band	7 m; 23.0 feet or longer
4 MHz band	3 m; 9.8 feet or longer

The longer the antenna element, the better the antenna efficiency.

Undesirable antenna element lengths

DO NOT use an antenna element such as multiples of ½λ lengths (half wavelength), since tuning becomes difficult.

L : Antenna element length to be avoided [m]
f : Operating frequency [MHz]
n : Natural number (n = 1, 2, 3, ...)

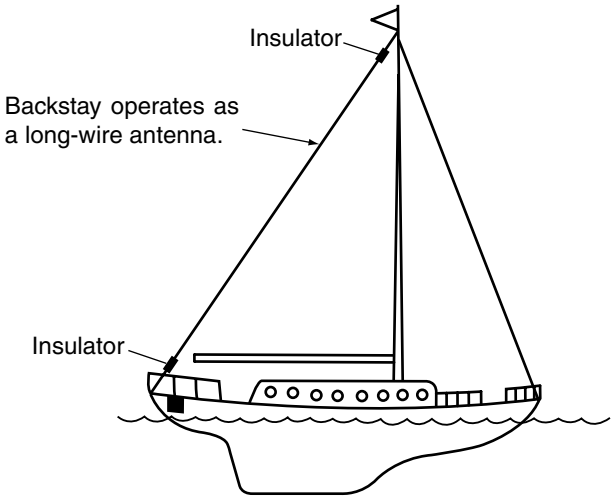
$$L = \frac{300}{f} \times \frac{1}{2} \times n$$

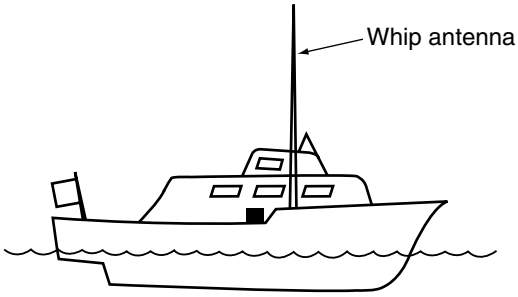
[Example]
At an operating frequency of 16 MHz, avoid the following antenna element lengths:

$$L = \frac{300}{16} \times \frac{1}{2} \times n \approx 9.4, 18.8, \ldots$$

1 m ≈ 39 inches

For example, if 15 m (49.2 feet) is selected for an antenna element length, you have no problem in the 1.6–25 MHz marine bands range.



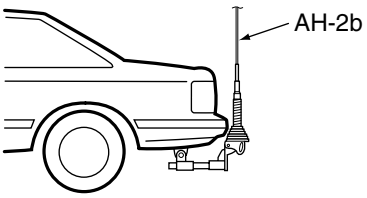


NOTE: Keep antennas as far away from other objects as possible, especially metal objects.

■ Antenna for land operation

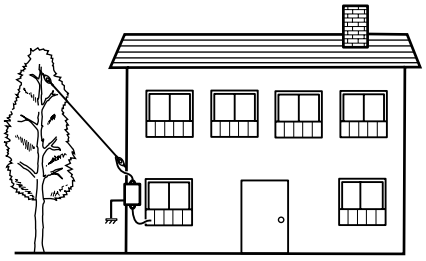
In some countries, HF transceivers can be used for land mobile operation. Ask your Icom Dealer for details, since the radio law varies according to countries.

For land mobile operation on 4 MHz or above, an optional AH-2b ANTENNA ELEMENT is available. The AH-2b includes a sturdy tow hook mount system for holding a 2.5 m (8.2 feet) stainless steel antenna element plus all the necessary hardware.



Refer to the AH-2b instruction manual for the AH-2b and AT-130/E installation to your vehicle. Ask your Icom Dealer for details.

Connect a suitable antenna element for a coastal station. To achieve full performance, refer to “Required antenna element length” above.



■ Coaxial cable

Insulate the lead-in cable of the AT-130/E antenna terminal and antenna element from other metal objects.

To prevent interference, keep cables as far as possible from an antenna, electric pump and other electronic equipment.

To prevent erroneous indications, keep cables as far away as possible from the flux gate compass.

Use suitable noise filters for alternators, fluorescent lights, etc. Ask your Dealer for details.

■ Ground and counterpoise

Why a ship's ground is required

The AT-130/E's ground terminal **MUST** be connected to your ship's ground. Grounding prevents electric shocks, interference to other equipment and other problems. Grounding also ensures effective signal transmission.

⚠ **DANGER! NEVER** connect the ground terminal to the following points. These connections may cause an explosion or electric shocks:
- Gas or electrical pipe
- Fuel tank
- Oil-catch pan

IMPORTANT: The mounting plate is **NOT** connected to the AT-130/E's internal ground. Non-through mast is **NOT** electrically connected to sea water.

Ideal ground points

One of following points is ideal:
- Ship's ground terminal
- External ground plate
- External copper screen

Good ground points

If electrically connected to sea water, one of the following points is usable:
- Stainless steel tuna tower
- Stainless steel stanchion
- Through mast
- Through hull
- Metal water tank

Undesirable ground points

These connections may cause noise or electrolysis:
- Engine block
- Keel bolt

Electrolysis

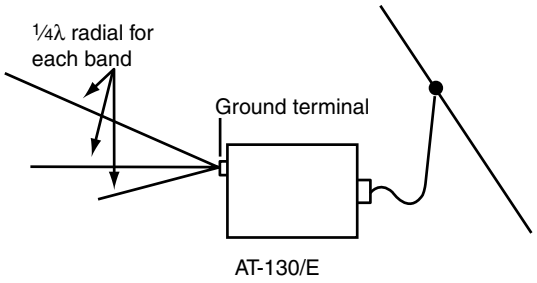
All ground cables from the AT-130/E, HF transceiver, etc. on your ship should be connected to only one ship's ground.

DO NOT connect to two or more points. Voltage difference between two or more ship's grounds may cause electrolysis.

DO NOT connect between dissimilar metals where an electric current is present. These connections may cause electrolysis.

Counterpoise

If your ship is made of FRP, etc. and a good ship's ground is not available, connect a counterpoise.



¼λ (quarter wavelength) radial for each band is suitable for a counterpoise. Install the counterpoise directly below the AT-130/E's ground terminal. Insulate the ends of each radial from other metal objects. Layout the radial horizontally and as straight as possible.

L : Counterpoise length for the operating frequency [m]
f : Operating frequency [MHz]

$$L = \frac{300}{f} \times \frac{1}{4}$$

[Example]
At an operating frequency of 16 MHz, use a counterpoise with the following length:

$$L = \frac{300}{16} \times \frac{1}{4} \approx 4.7 \text{ [m]}$$

1 m ≈ 39 inches

Ground cable

For best results, use the heaviest gauge wire or metal strap available. Make the distance between the AT-130/E's ground terminal and ship's ground as short as possible.

The supplied ground cable can be used for ground connection through a mast. Confirm that the through mast is electrically connected to sea water.

⚠ **WARNING!— *When grounding to metal hull***
Use a Zinc anode to protect the hull from electrolysis. Ask your technical dealer or installer, or refer to a technical book for RF ground details.

2 INSTALLATIONS

■ Installation outline

① Remove the top cover.

② Install a control cable and coaxial cable.
- Refer to "Cable installation" as described below.

③ Connect and solder the PL-259 connector to the coaxial cable.
- Refer to "PL-259 connector" as described below.

④ Connect the control cables to the AT-130/E.
- Refer to page 4, "Cable connections."

⑤ Mount the AT-130/E in the desired location.
- Refer to page 6, "Mounting."

⑥ Connect an antenna, ship's ground or counterpoise.
- Refer to page 1, "Antenna for ship" and page 2, "Ground and counterpoise."

⑦ Connect the control cable and the coaxial cable to the transceiver.
- Refer to page 4, "Control cable."

⑧ Perform preset tuning setting. For the AT-130E, also perform emergency tuning setting.
- Refer to page 7, "Preset tuning" and page 8, "Emergency tuning."

⑨ Select the mode switch (J31 or S1) to NORMAL mode. Replace the top cover.
- Refer to page 7, "Mode Switch."

■ Cable installation

① Remove the 10 screws from the top cover. Remove the top cover.

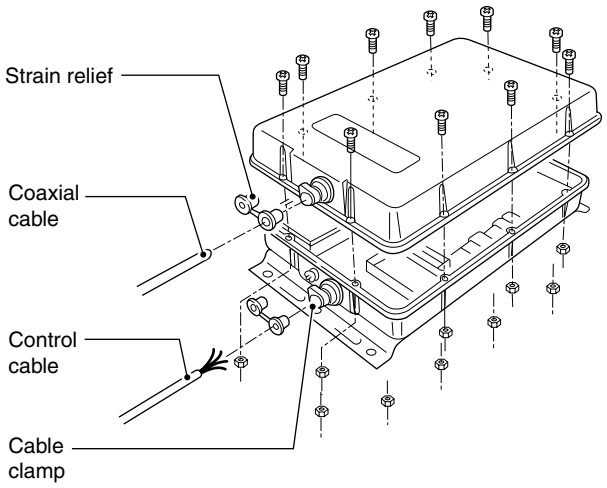
② Loosen the screws on both cable clamps.

③ Set or remove the strain relief inserts corresponding to the diameters of the cables.

④ Install the coaxial cable through the top cover cable clamp. Install the control cable through the bottom cover cable clamp.

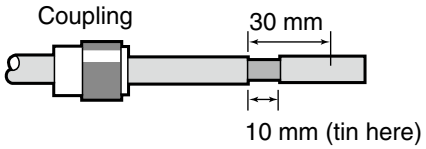
⑤ After connecting the coaxial cable and control cables, perform the preset tuning setting.
- For the AT-130E, also perform emergency tuning setting.

⑥ After internal adjustments, tighten the cable clamp screws.

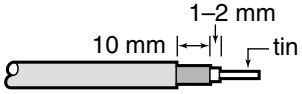


■ PL-259 connector

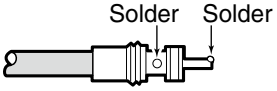
① Slide the coupling ring down.
Strip the cable jacket and tin the shield.



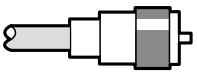
② Strip the cable as shown below.
Tin the center conductor.



③ Slide the connector body on and solder it.



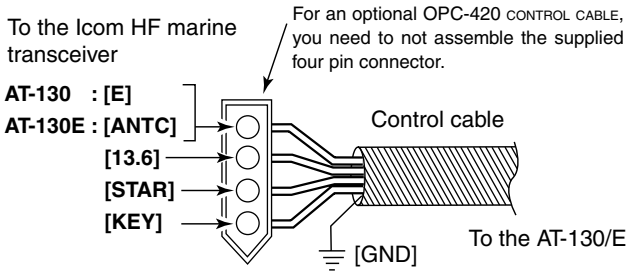
④ Screw the coupling ring onto the connector body.



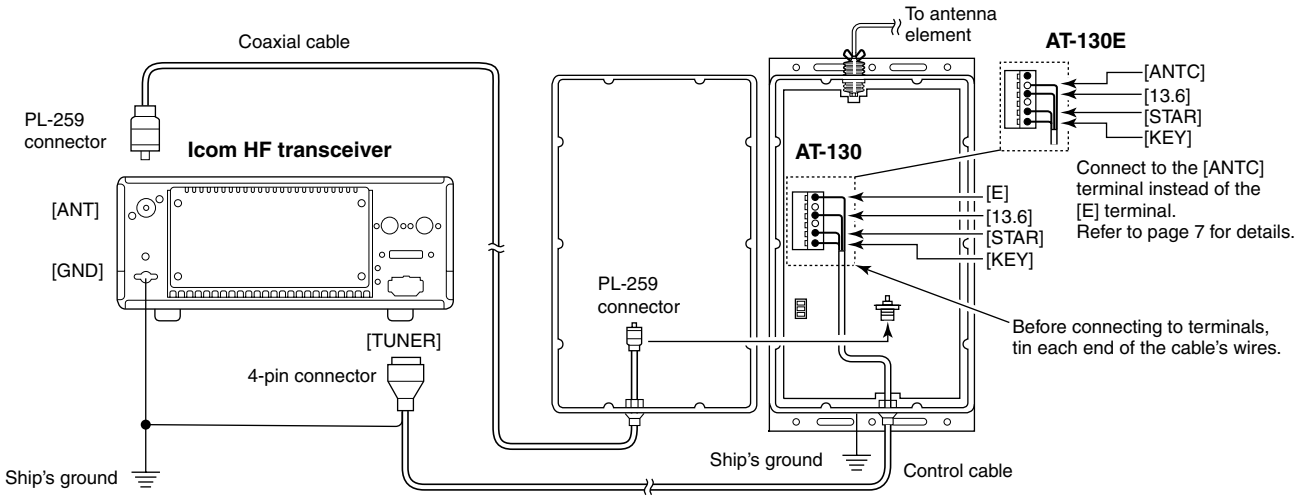
30 mm (1 3/16 inches) 10 mm (13/32 inches) 1–2 mm (1/32–3/32 inches)

■ Control cable

Between the AT-130/E and HF marine transceiver, connect four control signal lines as shown at right. To prevent RF feedback, use a four conductor shielded cable. Connect the shield line to the [GND] terminal on the transceiver.
Icom offers the 10 m (32.8 feet) long control cable, OPC-420 CONTROL CABLE.
Refer to page 9 “Terminal information” and “Transceiver switch” for details.



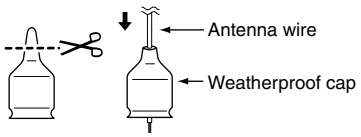
■ Cable connections



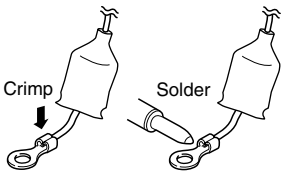
■ Waterproofing the antenna connection

CAUTION: If you skip the following steps, moisture will get into the connector, and this could damage the antenna tuner.

① Cut off just the top of the weatherproof cap, and pass the antenna wire through the cap.

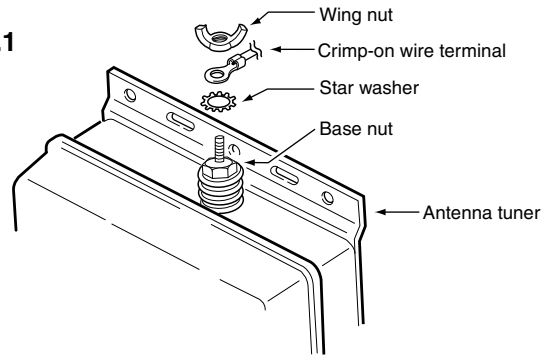


② Insert the antenna wire into the opening of the crimp-on wire terminal.
- Crimp or solder the antenna wire.



③ Put the star washer, crimp-on wire terminal, and wing nut on the base nut, in that order, then, tighten the wing nut.
- Make sure the base nut is tightened firmly, before you tighten the wing nut. (See the Fig.1 to the right.)
- Carefully bend the wire terminal up, after you tighten the wing nut. (See the Fig.2 to the right.)

Fig.1

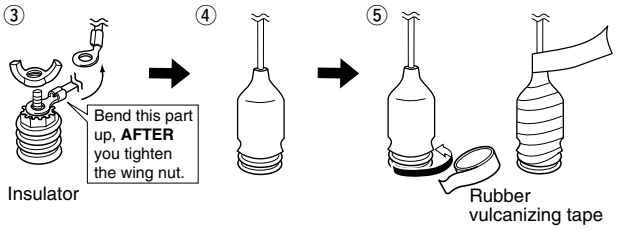


④ Place the weatherproof cap over as much of the insulator as possible.
- How far down it will go depends on the height of the wing nut.

⑤ Start wrapping the rubber vulcanizing tape at the bottom of the insulator, then the weatherproof cap and finally the antenna wire to prevent water seeping.
- Wrap electrical tape* over the rubber vulcanizing tape to secure waterproofing.

* The electrical tape is not supplied with the AT-130/E.

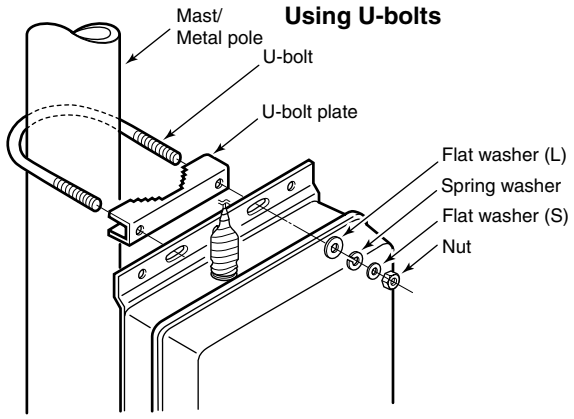
Fig.2



■ Mounting

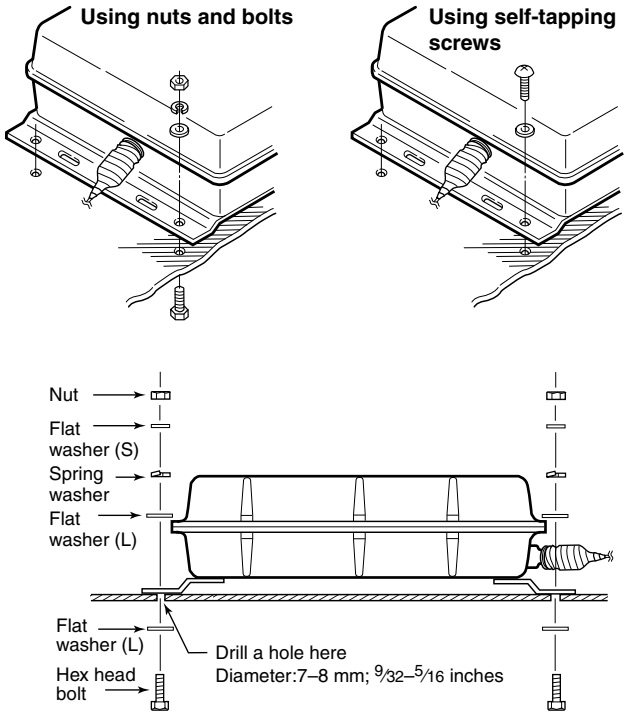
CAUTION: Mount the AT-130/E in a horizontal position or in a vertical position with the antenna terminal up.

Mounting on a Mast/Metal pole



⚠ **WARNING!** Mount the AT-130/E securely with the supplied bolts and nuts. Otherwise, vibrations and shocks due to waves could loosen the antenna tuner, causing personal injury.

Mounting on a flat surface



3 INTERNAL SETTINGS

■ Before internal settings

Before operation, preset tuning setting and emergency tuning setting are required.

What is preset tuning
Preset tuning setting provides fast tuning on your most-used frequency.

What is emergency tuning
The Europe version, AT-130E, includes an emergency tuner circuit for 2182 kHz operation separated from the automatic tuner circuit. If any signal from the control cable becomes abnormal, the emergency tuner is automatically selected.

■ Mode switch

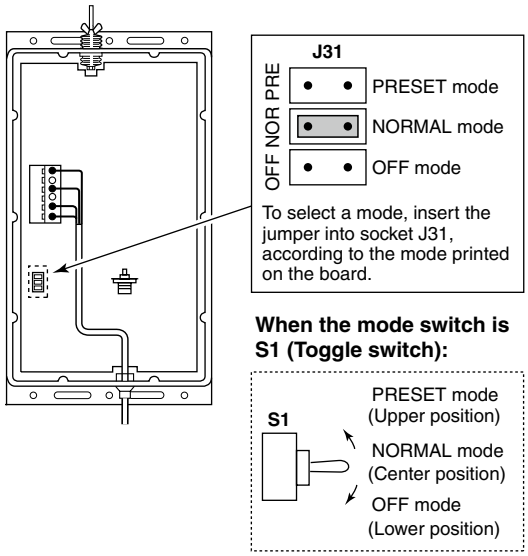
According to the mode switch (J31), the AT-130/E operates as follows:

Mode	Print	Description
PRESET	PRE	Used only for preset tuning. Refer “Preset tuning” for details.
NORMAL	NOR	Operates in automatic tuning. For fast tune up, preset switches (S3, S4, S5) information is also used.
OFF	OFF	Operates in automatic tuning only. This mode is for some non-Icom HF transceivers. Refer to page 9 for details.

After internal settings are performed, select the mode switch (J31) to NORMAL mode.

NOTE: The mode switch may be S1 (Toggle switch) instead of J31, depending on the antenna tuner version. See the illustration right for details.

Mode switch (J31) location



■ Preset tuning

⚠ **WARNING! NEVER** touch internal parts while transmitting. Stop transmitting when internal adjustments are performed.

① Connect an SWR meter between an HF transceiver and the AT-130/E.

② Confirm the mode switch (J31*) is in NORMAL mode.

③ Select your most-used operating frequency.

④ Push the [TUNE] switch on the HF transceiver.
- When the AT-130/E succeeds in automatic tuning, an LED (DS24) lights up.
- Confirm that SWR reading is less than 2:1.

⑤ Make a note of which LED’s (DS1–DS23) light up.

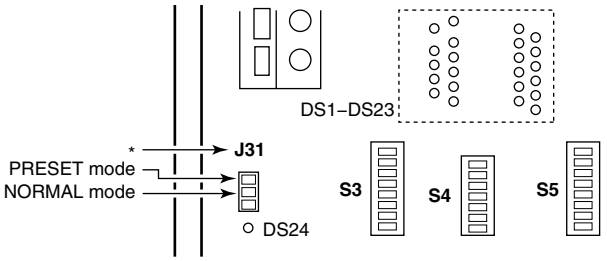
⑥ Select J31* to PRESET mode.

⑦ Select the preset switches (S3, S4, S5) so that the same LED’s light up as in step 5).

⑧ Select J31* to NORMAL mode.

⑨ Replace the top cover of the AT-130.
- For the AT-130E, perform emergency tuning settings.

Switch and LED locations



* The mode switch may be S1 (Toggle switch) instead of J31, depending on the antenna tuner version. Refer “Mode switch” for details.

Switch and LED relationship

S3–1	DS16	S4–1	DS9	S5–1	DS1
S3–2	DS17	S4–2	DS10	S5–2	DS2
S3–3	DS18	S4–3	DS11	S5–3	DS3
S3–4	DS19	S4–4	DS12	S5–4	DS4
S3–5	DS20	S4–5	DS13	S5–5	DS5
S3–6	DS21	S4–6	DS15	S5–6	DS6
S3–7	DS22	S4–7	DS14	S5–7	DS7
S3–8	DS23	—	—	S5–8	DS8

OFF position: Lights up

ON position: Goes out

■ Emergency tuning

For the AT-130E, before operation, perform emergency tuning setting.

⚠ **WARNING! NEVER** touch internal parts while transmitting. Stop transmitting when internal adjustments are performed. 2182 kHz is used for distress calls, etc. Listen on the frequency before transmitting.

① Connect an SWR meter between an HF transceiver and the AT-130E.

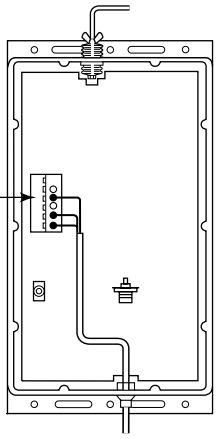
② Remove the top cover of the AT-130E.

③ Select 2182 kHz and AM (H3E) mode for the HF transceiver.
- Refer to each transceiver's instruction manual for details.

CAUTION: If another frequency is selected, the AT-130E may be damaged.

13.6 V DC cable

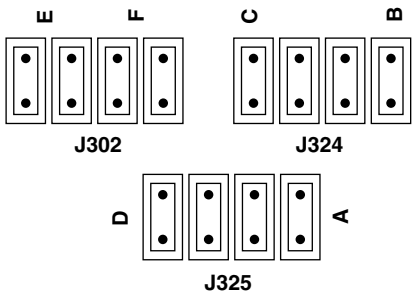
Disconnect 13.6 V DC cable from the [13.6] terminal. Reconnect after emergency tuning.



Pin connections

Set the pin connections on J302, J324 and J325 to obtain minimum SWR setting.

The letters, A–F, indicate the capacity of the tuning condenser. "A" has the minimum capacity.




The condenser is connected.


The condenser is disconnected.

④ Disconnect the 13.6 V DC cable from the [13.6] terminal. Tape the end of the wire.
- **NEVER** allow the 13.6 V DC cable end to touch any other parts.

⑤ Disconnect all six pins on J302, J324 and J325 as shown below.

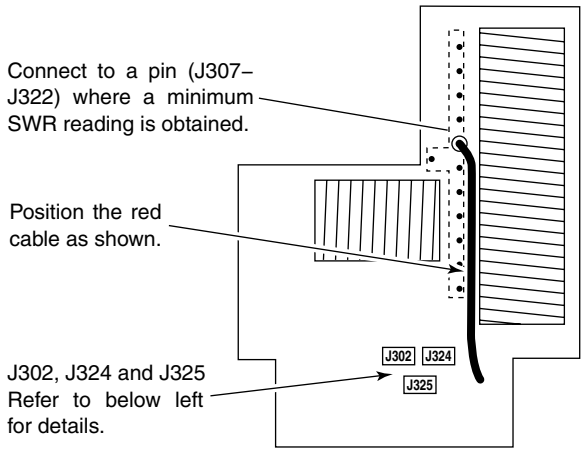
⑥ Connect a red cable to a pin (J307–J322) where minimum SWR reading is obtained.

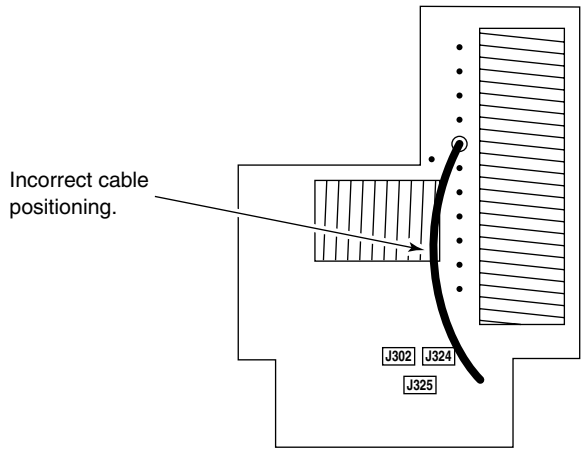
⑦ Connect pins on J302, J324 and J325 to obtain a minimum SWR reading.
- DO NOT transmit for more than 5 seconds
- "A" has the minimum capacity.
- Selection in alphabetical order may speedup tuning.

⑧ Connect the 13.6 V DC cable to the [13.6] terminal.

⑨ Replace the top cover of the AT-130E.

Red cable positioning



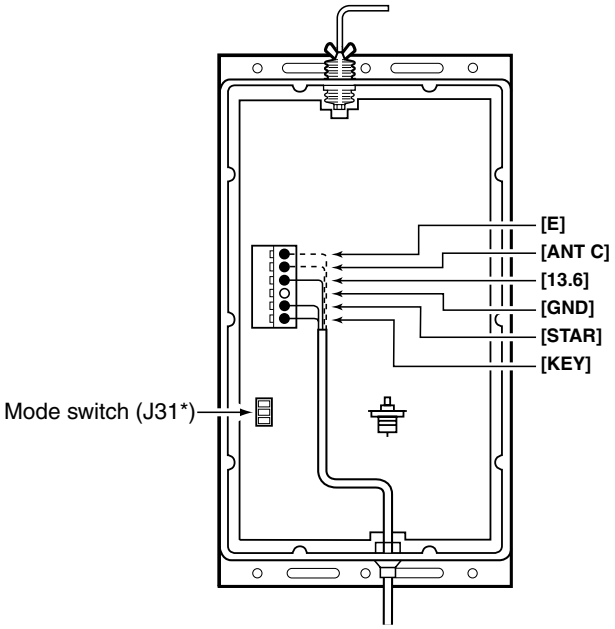


4 CONTROL CABLE SIGNALS

■ Terminal information

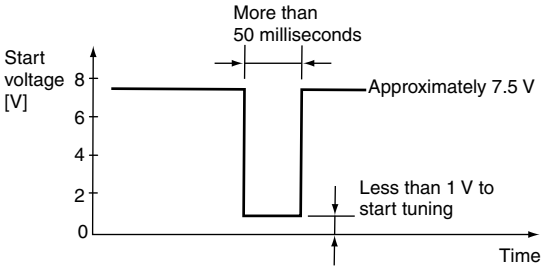
Consider the following points when using a non-Icom transceiver.

Terminal	Description
[E]	⊖ terminal.
[ANT C]	AT-130: No connection. AT-130E: Antenna current detector output from the emergency tuner.
[13.6]	13.6 V DC ⊕ input terminal. Maximum current drain; 2 A
[GND]	The same voltage as the ground terminal at the bottom. No need to connect from this terminal.
[STAR]	Receives start voltage. Maximum current drain; 100 mA
[KEY]	Key voltage. Grounded during tuning. Maximum current drain; 100 mA.



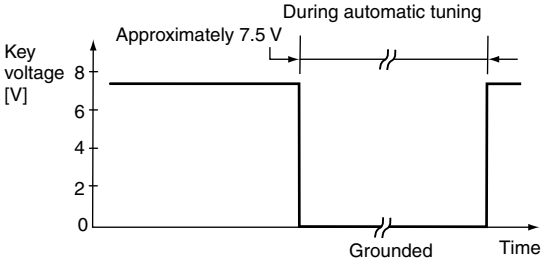
Start voltage [STAR]

When a start voltage (less than 1 V) is received, the AT-130/E begins automatic tuning.

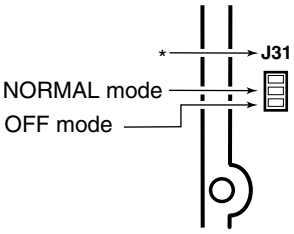


Key voltage [KEY]

During automatic tuning, the AT-130/E grounds key voltage line, and the HF transceiver reduces output power.



If the key voltage is more than 8 V, select the mode switch (J31*) to OFF mode.

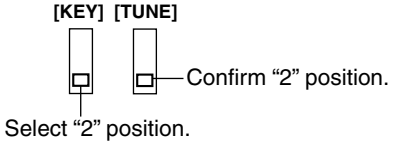


* The mode switch may be S1 (Toggle switch) instead of J31, depending on the antenna tuner version.
Refer to page 7 for details.

■ Transceiver setting

IC-M700 with serial number 2500 and below

In the IC-M700, change the [TUNE] switch setting from the "1" position to the "2" position. Confirm that the [KEY] switch is in the "2" position. Refer to the IC-M700 instruction manual page 9 for details.



Other HF transceiver

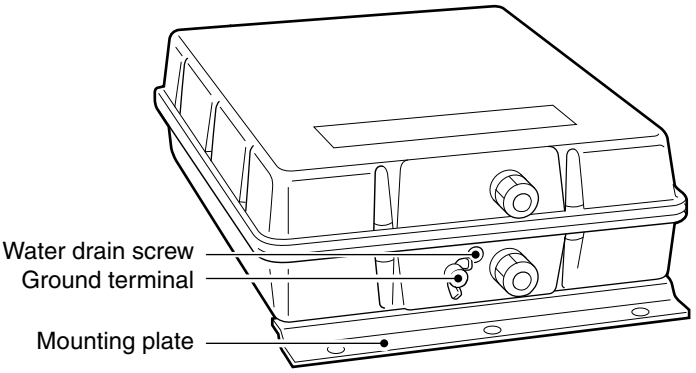
Some Icom HF transceivers have internal [KEY] and [TUNE] switches. Suitable switch settings for the AT-130/E are performed before shipping.

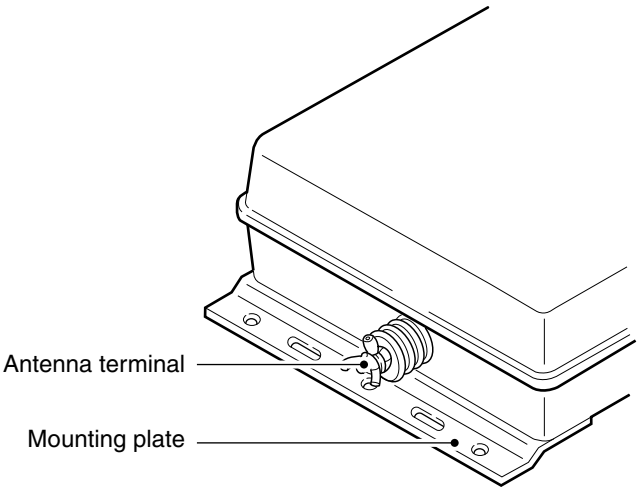
However, if a non-Icom automatic tuner was previously used, confirm the switch settings. Refer to the instruction manual for details.

Non-Icom HF transceiver

Select correct settings for the start voltage and key voltage. Refer to your HF transceiver instruction manual for details.

■ Unit description



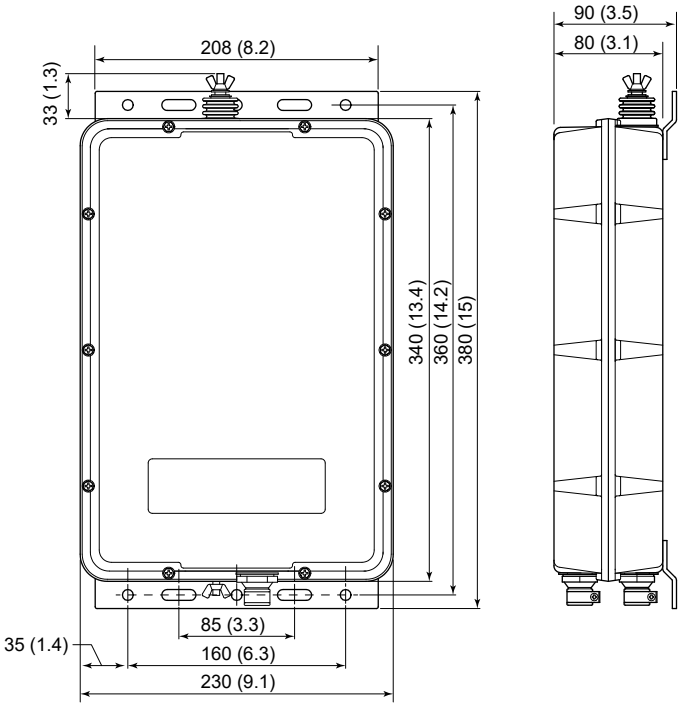


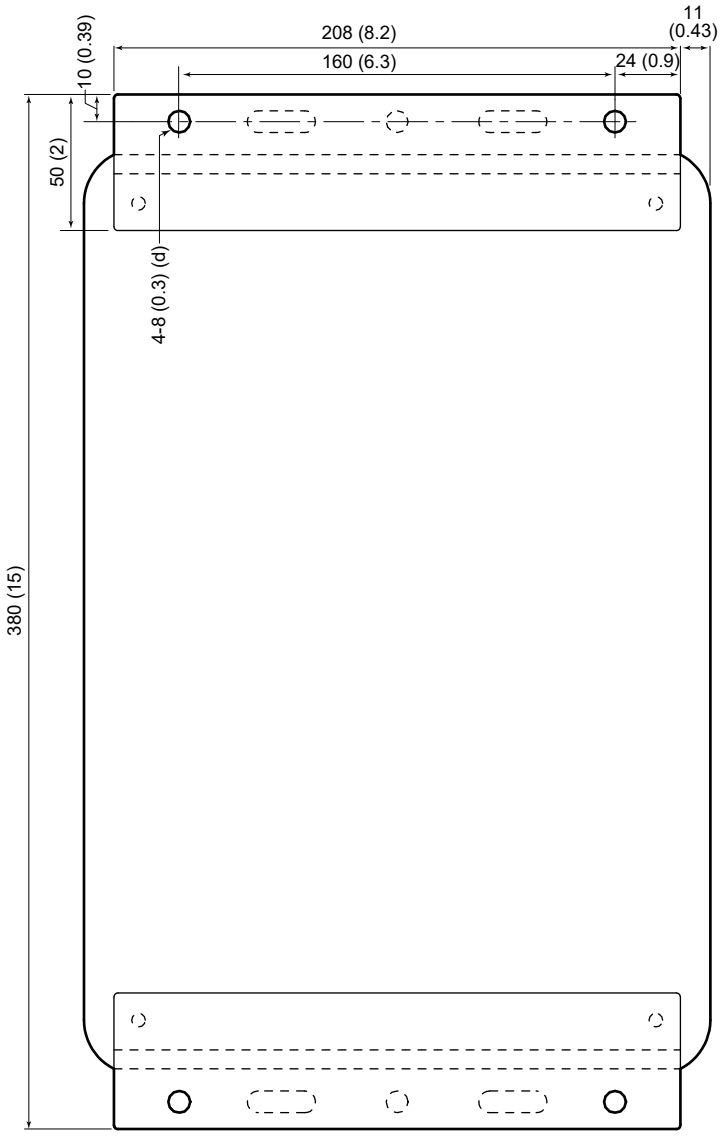
■ Specifications

• Frequency coverage	: 1.6–30 MHz (With a wire antenna longer than 7 meters, and the ground terminal connected to the vessel's ground point, or a counterpoise wire longer than 7 meters.)
• Power supply requirement	: 13.6 V DC ±15% (supplied from the HF transceiver)
• Current drain	: AT-130 (#61, 67) 1.0 A or less AT-130 (except #61, 67) 2.0 A or less AT-130E 2.0 A or less
• Operating temperature range	: –30°C to +60°C; –22˚F to +140˚F
• Weight (approximately)	: AT-130 2.5 kg; 5.5 lb AT-130E 2.7 kg; 6.0 lb
• Antenna connector	: SO-239 (50 Ω)
• Maximum Input power	: 150 W (PEP) 100 W (continuous)
• Automatic tuning time	: Approximately 2 to 3 seconds (general condition) Maximum 15 seconds Approximately 1 second (retuning for a memorized frequency)
• Automatic tuning accuracy	: SWR 2.0:1 or less (after tuning, except for multiples of ½λ)
• Usable pole diameter	: 32 to 60 mm; 1.3 to 2.4 inches

All stated specifications are subject to change without notice or obligation.

6 DIMENSIONS





Unit: mm (inch)

MEMO

How the World Communicates

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