

# ***YAESU***

***The radio***

**HF/50 MHz TRANSCEIVER**

# **FT-410**

# **OPERATION MANUAL**

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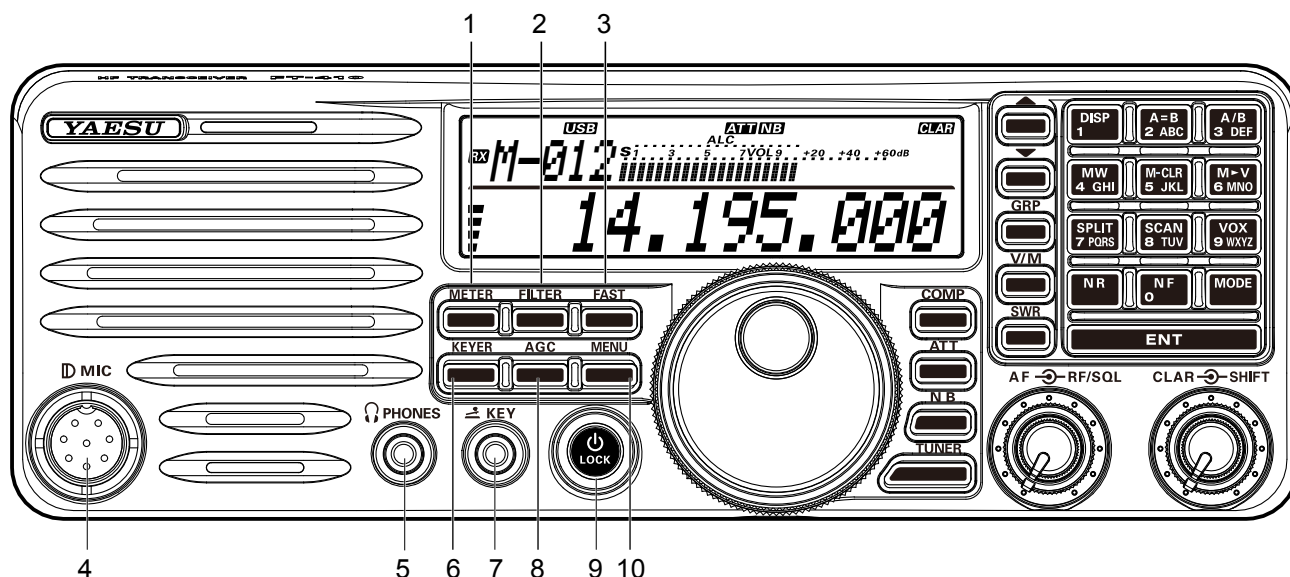
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# FRONT PANEL BUTTONS AND KNOBS



## 1. METER Button

Press this button to change the meter function in the transmit mode as follows.

PO → ALC → SWR → PO

**PO:** Indicates the average power output level.

**ALC:** Indicates the relative ALC voltage.

**SWR:** Indicates the Standing Wave Ratio (Forward/Reflected).

## 2. Filter Button

Press this button to change the filter.

## 3. FAST Button

Pressing this button will increase or decrease the tuning rate of the [MAIN DIAL] knob.

## 4. MIC Jack

This 8-pin jack accepts input from a supplied Hand Microphone.

## 5. PHONE Jack

A 3.5 mm, 3-contact jack accepts either monaural or stereo headphones with 2 or 3-contact plugs. When a plug is inserted, the loudspeaker is disabled.

### NOTE:

When wearing headphones, we recommend that you turn the AF GAIN levels down to their lowest settings before turning power on, to minimize the impact on your hearing caused by audio “pops” during switch-on.



## 6. KEYER Button

This button toggles the internal CW keyer on and off.

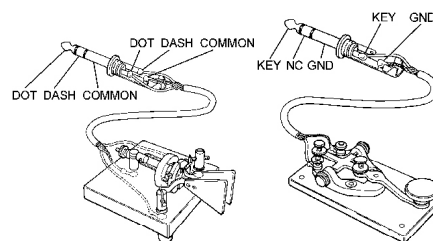
## 7. KEY Jack

This 3.5 mm, 3-contact jack accepts a CW key or keyer paddles (for the built-in electronic keyer), or output from an external electronic keyer. Pinout is shown below. Key up is 5 volts, and key down current is 0.5 mA.

*Do not use the plug except the 3.5-mm 3-pin type plug. If the plug in correct size is not used the radio may be harmed or damaged.*

*If the Keyer plug is removed from the jack while the FT-410 is in operation, the FT-410 may be switched to the transmit mode.*

*Turn off the power of the FT-410 before connecting or disconnecting the Keyer.*



## 8. AGC Button

This button selects the AGC characteristics for the receiver.

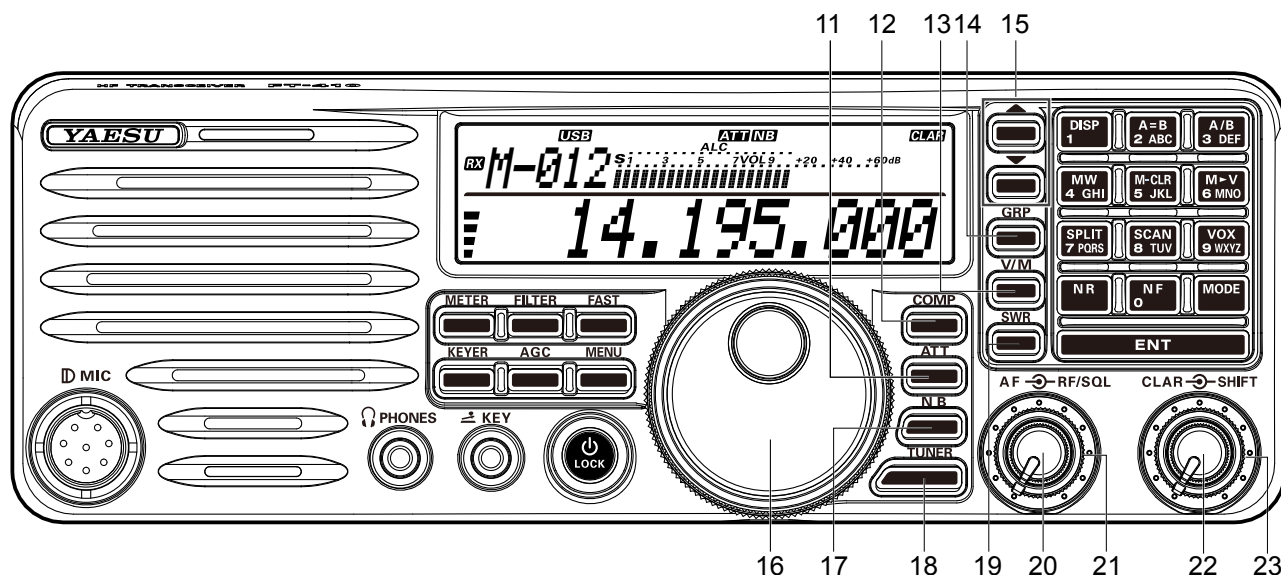
## 9. Power / LOCK Button

Press and hold in this button for one second to turn the transceiver on or off. Press this button the locking of the [MAIN DIAL] knob and some switches, to prevent accidental frequency changes.

## 10. MENU Button

Press this button, the Menu Item and a title for the Menu Mode will appear in the display.

# FRONT PANEL BUTTONS AND KNOBS



## 11. ATT Button

This button selects the ATT level.

## 12. COMP Button

This button turns the Speech Processor on and off.

## 13. V/M Button

This button toggles frequency control between VFO-A and the memory system. In memory mode.

## 14. GRP Button

Pressing this button allows you to select a memory group.

## 15. ▲/▼ Button

These buttons select the operating band.

## 16. MAIN DIAL Knob

This knob adjusts the operating frequency.

## 17. NB Button

This button turns the IF Noise Blanker on and off. Press this button to reduce short-duration pulse noise.

## 18. TUNER Button

Press this button momentarily to toggle the Automatic Antenna Tuner on/off. Press and hold in this button to begin the automatic Tuning.

## 19. SWR Button

Indicates the Standing Wave Ratio (Forward/Reflected).

## 20. AF Knob

This knob sets the receiver's audio volume level. Typically, you will operate with this control set between the 9 o'clock and 10 o'clock positions.

## 21. RF/SQL Knob

In the factory default, this knob adjusts the gain of the receiver's RF and IF stages. Using Menu Item "SQL/RF Gain", this knob may be changed to function as a Squelch control, which may be used to silence background noise when no signal is present.

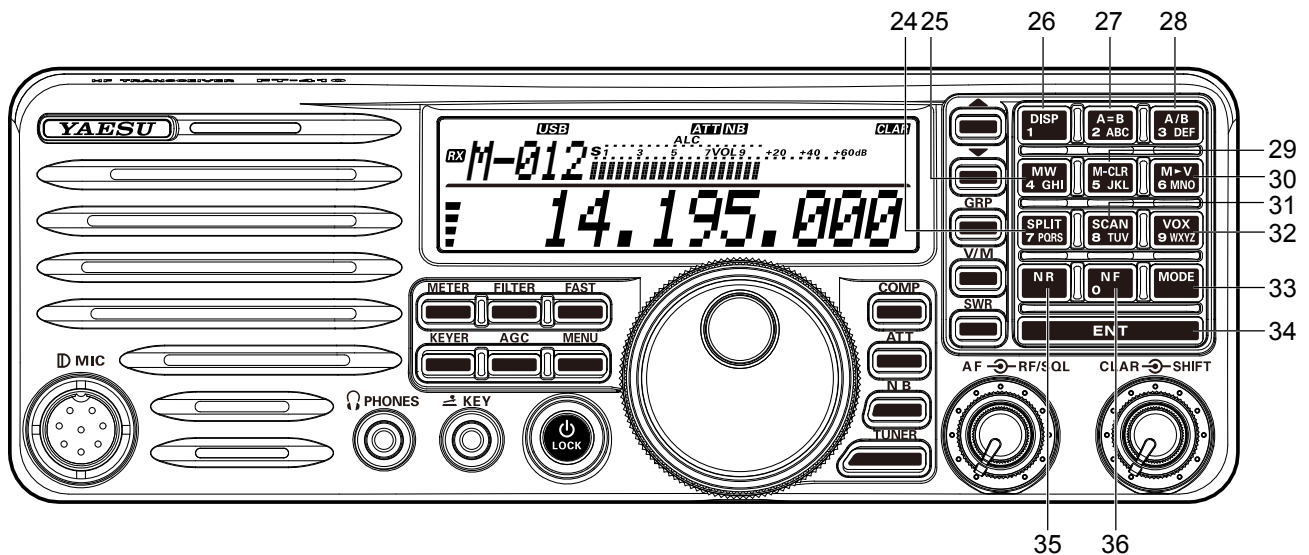
## 22. CLAR Knob

Pressing this button activates the Clarifier, to allow temporarily offsetting the receive frequency.

## 23. SHIFT Knob

This knob shifts the IF DSP passband to reduce an interfering signal which is inside the IF passband.

# FRONT PANEL BUTTONS AND KNOBS



## 24. SPLIT Button

Press this button to activate split frequency operation between VFO-A, used for reception and VFO-B, used for transmission (or vice versa).

## 25. MW Button

Pressing this button copies the current operating data into the currently selected memory channel, over-writing any previous data stored there.

## 26. DISP Button

## 27. A=B Button

Press this button momentarily to transfer data from VFO-A frequency to VFO-B, overwriting the previous contents in VFO-B. Use this key to set both VFO-A and VFO-B to the same frequency and mode.

## 28. A/B Button

This button toggles the frequency control between VFO-A and VFO-B.

## 29. M-CLR Button

Press this button, a memory channel is cleared.

## 30. M▶V Button

Press this button, a frequency and a mode of a memory channel are forwarded to VFO.

## 31. SCAN Button

Press this button to initiate the upward scanning of VFO frequencies or memory channels.

## 32. VOX Button

Press this button to activate the VOX (voice-actuated transmitter switching) feature in the SSB, and AM modes.

## 33. MODE Button

These buttons select the operating mode.

## 34. ENT Button

Press this button, setting is Operating frequency.

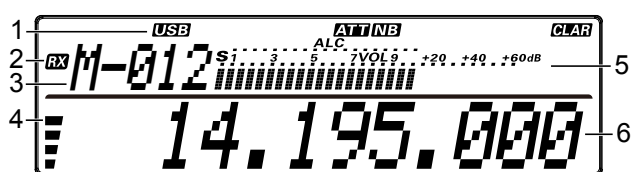
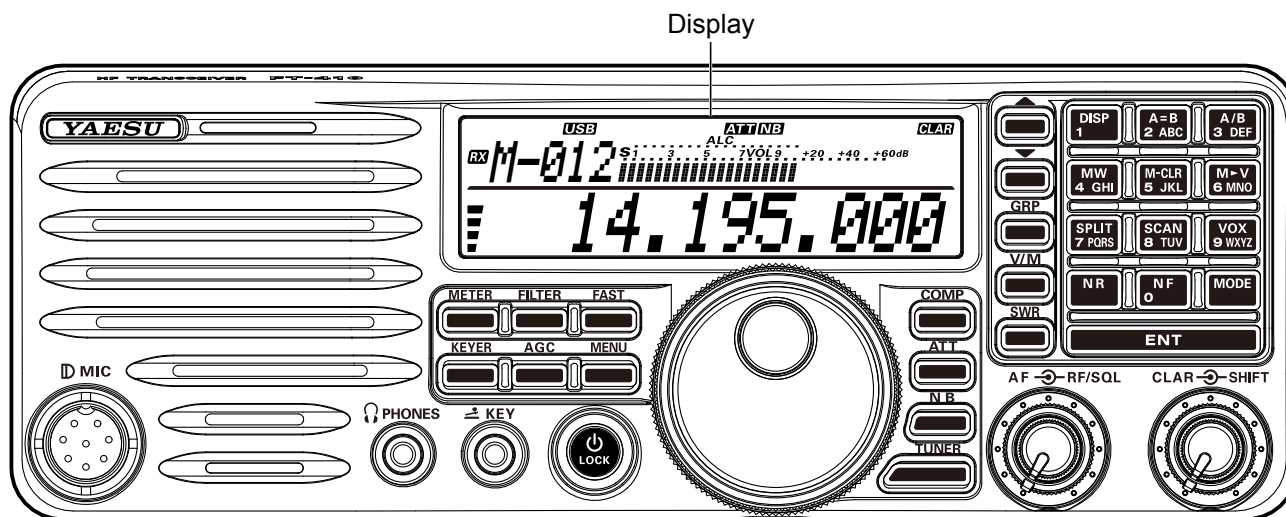
## 35. NR Button

Press this button to activate Noise Reduction operation

## 36. NF Button

Press this button to activate Notch Filter operation.

# DISPLAY INDICATIONS



## 1. Information Display

**ATT**: Indicates the RF attenuator status (“ON” or “OFF”) selected for operation by the [ATT] button.

**NB**: Indicates the Noise Blanker status (“ON” or “OFF”).

**LSB / USB / CW / AM / DATA**: Displays the currently selected operating mode.

**VOX**: This indicator appears whenever the VOX (automatic voice-actuated transmitter switching) circuit is activated.

**CLAR**: This indicator appears whenever the Clarifier function is activated.

## 2. TX / RX Display

**TX**: This indicator appears during transmission.

**RX**: This indicator appears whenever the receiver squelch is open.

## 3. Indicates the operating band name, and memory channel

When in VFO mode, the operating band name (A or B) is displayed. While in memory mode, and the memory channel number are displayed.

## 4. AF level indication

## 5. Meter

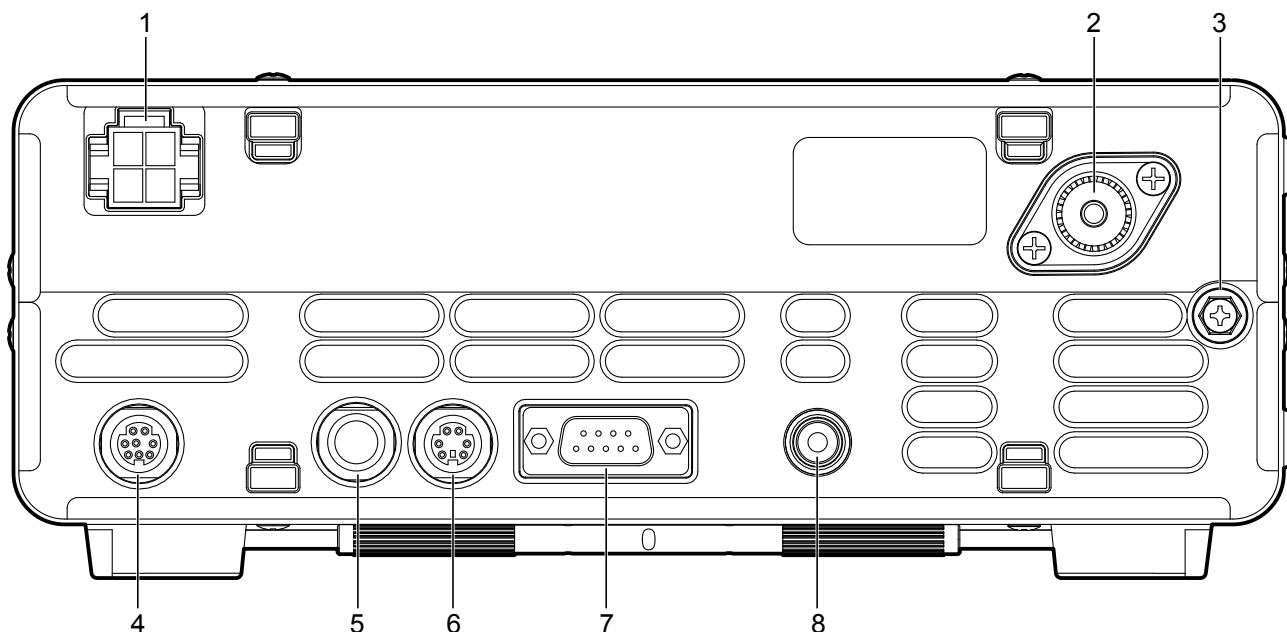
While receiving, the received signal strength is displayed.

While transmitting, the meter displays PO, ALC, or SWR (determined by the [METER/DIM] button).

## 6. Frequency Display

The operating frequency is displayed.

# REAR PANEL JACKS



## 1. DC IN Jack

This is the DC power supply connection for the transceiver. Use the supplied DC cable to connect directly to the car battery or to a DC power supply, which must be capable of supplying at least 22 A @13.8 VDC.



(viewed from rear panel)

## 2. ANT Jack

Connect your antenna here, using a type-M (PL-259) coaxial connector and 50 Ohm coaxial feedline.

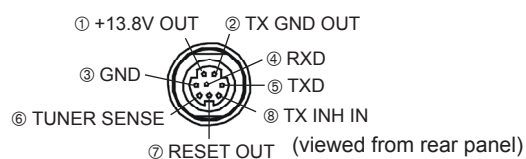
Warning!: High Power RF voltage is present at the TX RF section of the transceiver while transmitting. Absolutely! Do not touch the TX RF section while transmitting.

## 3. GND Terminal

For safety and optimum performance, use this terminal to connect the transceiver to a good earth ground. Use a large diameter, short braided cable for making ground connections. Refer to page 12 for other notes about proper grounding.

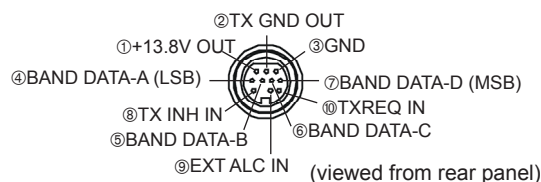
## 4. TUNER Jack

This 8-pin jack is used for Connection to the FC-40 External Automatic Antenna Tuner.



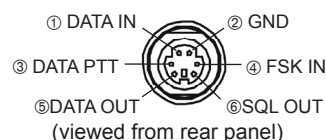
## 5. LINEAR Jack

This 10-pin output jack provides band selection data, which may be used for control of the optional VL-1000 Solid-State Linear Amplifier.



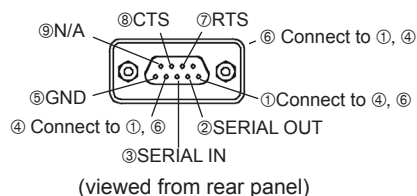
## 6. DATA Jack

This 6-pin input/output jack provides receiver audio and squelch signals, and accepts transmit (AFSK) audio and PTT control, from an external packet TNC.



## 7. CAT Jack

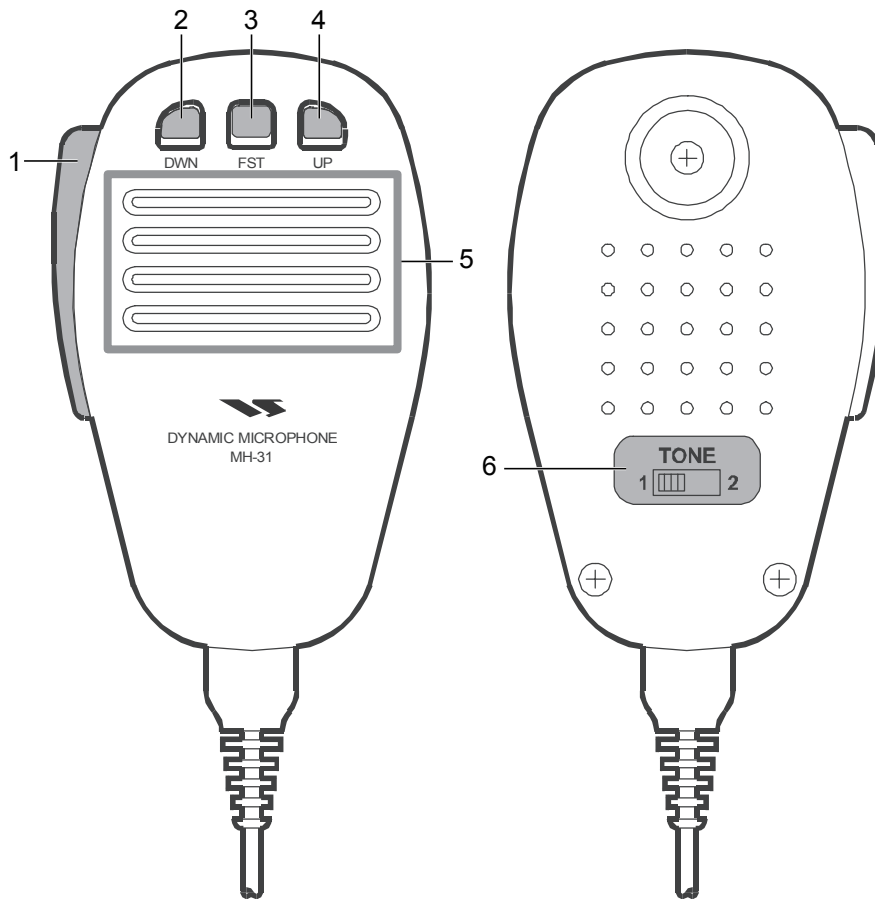
This 9-pin serial DB-9 jack allows external computer control of the FT-410. Connect a (straight) serial cable here and to the RS-232C COM port on your personal computer (no external interface is required).



## 8. EXT SPKR Jack

This 3.5-mm, 2-pin jack provides variable audio output for an external speaker. The audio output impedance at this jack is 4 - 16 Ohms and the level varies according to the setting of the front panel's [AF] knob. Inserting a plug into this jack disables the internal loudspeaker.

# SUPPLIED MH-31B8 MICROPHONE



## 1. PTT Switch

Press this Switch to transmit, and release it to receive after your transmission is completed.

## 2. DWN Key

Press to tune down, hold to start scanning.

## 3. FST (FAST) Key

The FST Button on the transceiver should be set for momentary operation.

## 4. UP Key

Press to tune up, hold to start scanning.

## 5. MIC

The microphone is located here. Speak into the microphone in a normal voice level.

The microphone should be positioned within 2 inches (5 cm) from the mouth for optimum performance.

## 6. TONE Switch

Position 1 provides flat-audio-characteristic transmit audio.

Position 2 attenuates low audio tones, for improved clarity in moderate band conditions, or if you have a naturally deep voice.



# ACCESSORIES & OPTIONS

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## SUPPLIED ACCESSORIES

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Hand Microphone (MH-31B8)	1 pc	P/N: M3090086A
DC Power Cord with Fuse	1 pc	P/N: T9025225
Fuse	1 pc	P/N: Q0000074
Operation Manual	1 pc	
Warranty Card	1 pc	

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## AVAILABLE OPTIONS

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External Automatic Antenna Tuner (for Wire Antenna)	<b>FC-40</b>
Active-Tuning Antenna System	<b>ATAS-25</b>
Active-Tuning Antenna System	<b>ATAS-120A</b>
Solid-State Linear Amplifier/AC Power Supply	<b>VL-1000 / VP-1000</b>
Band Data Cable (for <b>VL-1000</b> )	<b>CT-118</b>
Desktop Microphone	<b>MD-100</b>
Hand Microphone	<b>MH-31B8</b>
Lightweight Stereo Headphone	<b>YH-77STA</b>
Mobile Mounting Bracket	<b>MMB-90</b>
Carrying Handle	<b>MHG-1</b>
Linear Amplifier Connection Cable	<b>SCU-28</b>

# INSTALLATION

## CONNECTION OF ANTENNA AND POWER SUPPLY

The **FT-410** is designed for use with any antenna system providing a 50 Ohm resistive impedance at the desired operating frequency. Every effort should be made to ensure the impedance of the antenna system is as close as possible to the specified 50-Ohm value. Note that the “G5RV” type antenna does not provide 50-Ohm impedance on all HF Amateur bands, and an external wide-range antenna coupler must be used with this antenna type.

Any antenna to be used with the **FT-410** must, ultimately, be fed with 50 Ohm coaxial cable. Therefore, when using a “balanced” antenna such as a dipole, remember that a balun or other matching/balancing device must be used to ensure proper antenna performance.

### ⚠ Warning!

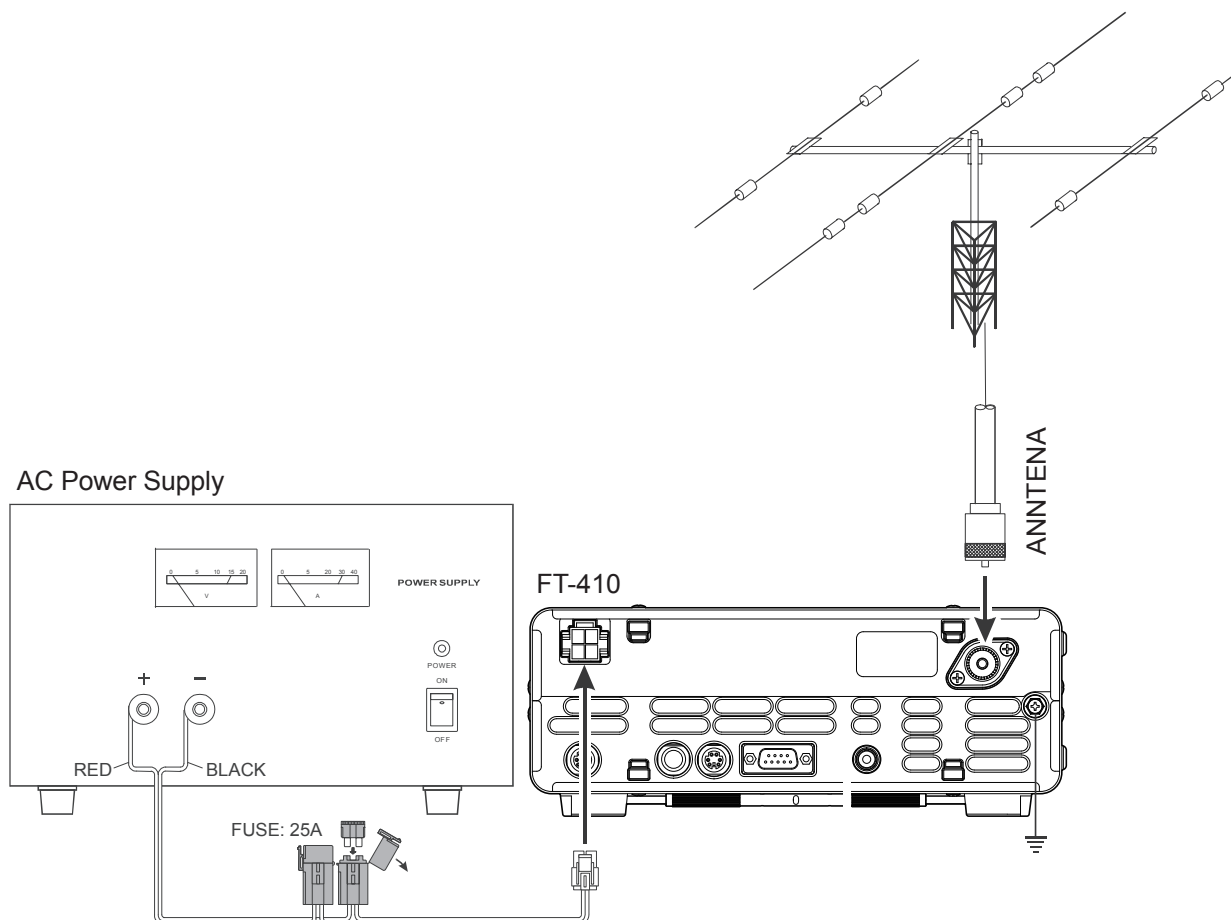
The 100V RF voltage (@100 W/50  $\Omega$ ) is applied to the TX RF section of the transceiver while transmitting.

Do not touch the TX RF section absolutely while transmitting.

### CAUTION

Permanent damage can result if improper supply voltage, or reverse-polarity voltage, is applied to the FT-410. The Limited Warranty on this transceiver does not cover damage caused by application of AC voltage, reversed polarity DC, or DC voltage outside the specified range of 13.8V  $\pm$ 15%.

When replacing fuses, be certain to use a fuse of the proper rating. The FT-410 requires a 25A fast-blow fuse.



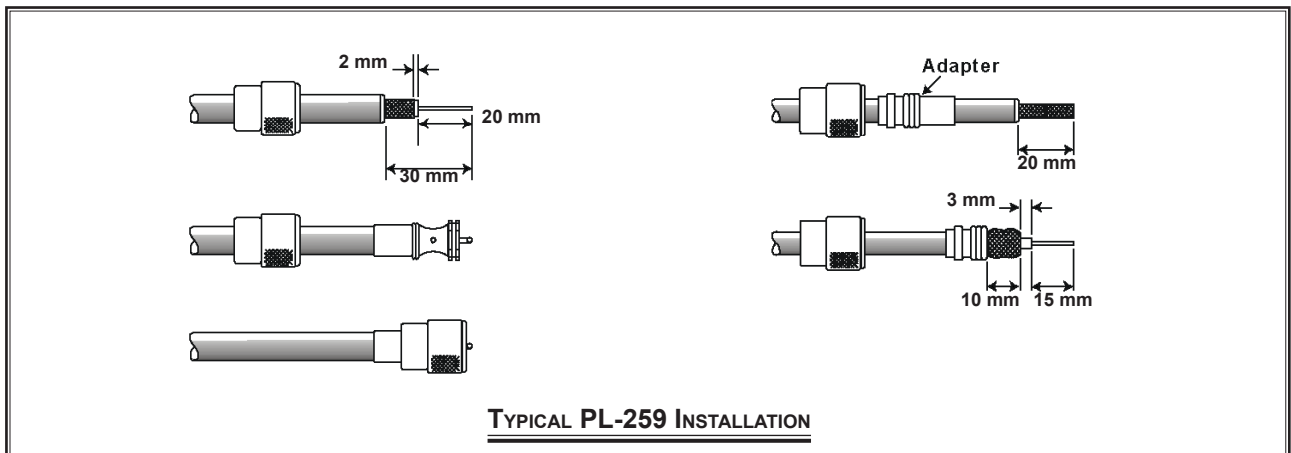
# INSTALLATION

## ⚠ CAUTION ⚠

- Do not position this apparatus in a location with direct exposure to sunshine.
- Do not position this apparatus in a location exposed to dust and/or high humidity.
- Do not expose the apparatus to dripping or splashing. Do not put objects with liquids on the apparatus.
- Ensure adequate ventilation around this apparatus, so as to prevent heat build-up and possible reduction of performance due to high heat.
- Do not install this apparatus in a mechanically-unstable location, or where objects may fall onto this product from above.
- To minimize the possibility of interference to home entertainment devices, take all precautionary steps including separation of TV/FM antennas from Amateur transmitting antennas to the greatest extent possible, and keep transmitting coaxial cables separated from cables connected to home entertainment devices.
- Be absolutely certain to install your transmitting antenna(s) such that they cannot possibly come in contact with TV/FM radio or other antennas, nor with outside power or telephone lines.

## ABOUT COAXIAL CABLE

Use high-quality 50-Ohm coaxial cable for the lead-in to your **FT-410** transceiver. All efforts at providing an efficient antenna system will be wasted if poor quality, lossy coaxial cable is used. This transceiver utilizes standard "M" ("PL-259") type connector.



# INSTALLATION

## GROUNDING

The **FT-410** transceiver, like any other HF communications apparatus, requires an effective ground system for maximum electrical safety and best communications effectiveness. A good ground system can contribute to station efficiency in a number of ways:

- ❑ It can minimize the possibility of electrical shock to the operator.
- ❑ It can minimize RF currents flowing on the shield of the coaxial cable and the chassis of the transceiver. Such currents may lead to radiation, which can cause interference to home entertainment devices or laboratory test equipment.
- ❑ It can minimize the possibility of erratic transceiver/accessory operation caused by RF feedback and/or improper current flow through logic devices.

An effective earth ground system may take several forms. For a more complete discussion, see an appropriate RF engineering text. The information below is intended only as a guideline.

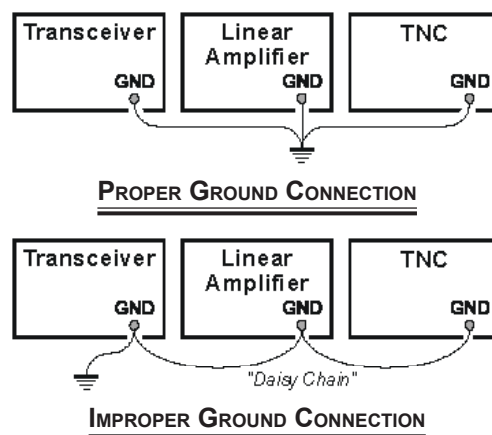
Typically, the ground connection consists of one or more copper-clad steel rods, driven into the ground. If multiple ground rods are used, they should be positioned in a "V" configuration, and bonded together at the apex of the "V" which is nearest the station location. Use a heavy, braided cable (such as the discarded shield from type RG-213 coaxial cable) and strong cable clamps to secure the braided cable(s) to the ground rods. Be sure to weatherproof the connections to ensure many years of reliable service. Use the same type of heavy, braided cable for the connections to the station ground bus (described below).

Inside of the station, a common ground bus consisting of a copper pipe of at least 25 mm (1") diameter should be used. An alternative station ground bus may consist of a wide copper plate (single-sided circuit board material is ideal) secured to the bottom of the operating desk. Grounding connections from individual devices such as transceivers, power supplies, and data communications devices (TNCs, etc.) should be made directly to the ground bus using a heavy, braided cable.

Do not make ground connections from one electrical device to another, and thence to the ground bus. This so-called "Daisy-Chain" grounding technique may nullify any attempt at effective radio frequency grounding. See the drawing at the right for examples of proper grounding techniques.

Inspect the ground system - inside the station as well as outside - on a regular basis so as to ensure maximum performance and safety.

Besides following the above guidelines carefully, note that household or industrial gas lines must never be used in an attempt to establish an electrical ground. Cold water pipes may, in some instances, help in the grounding effort, but gas lines represent a significant explosion hazard, and must never be used.



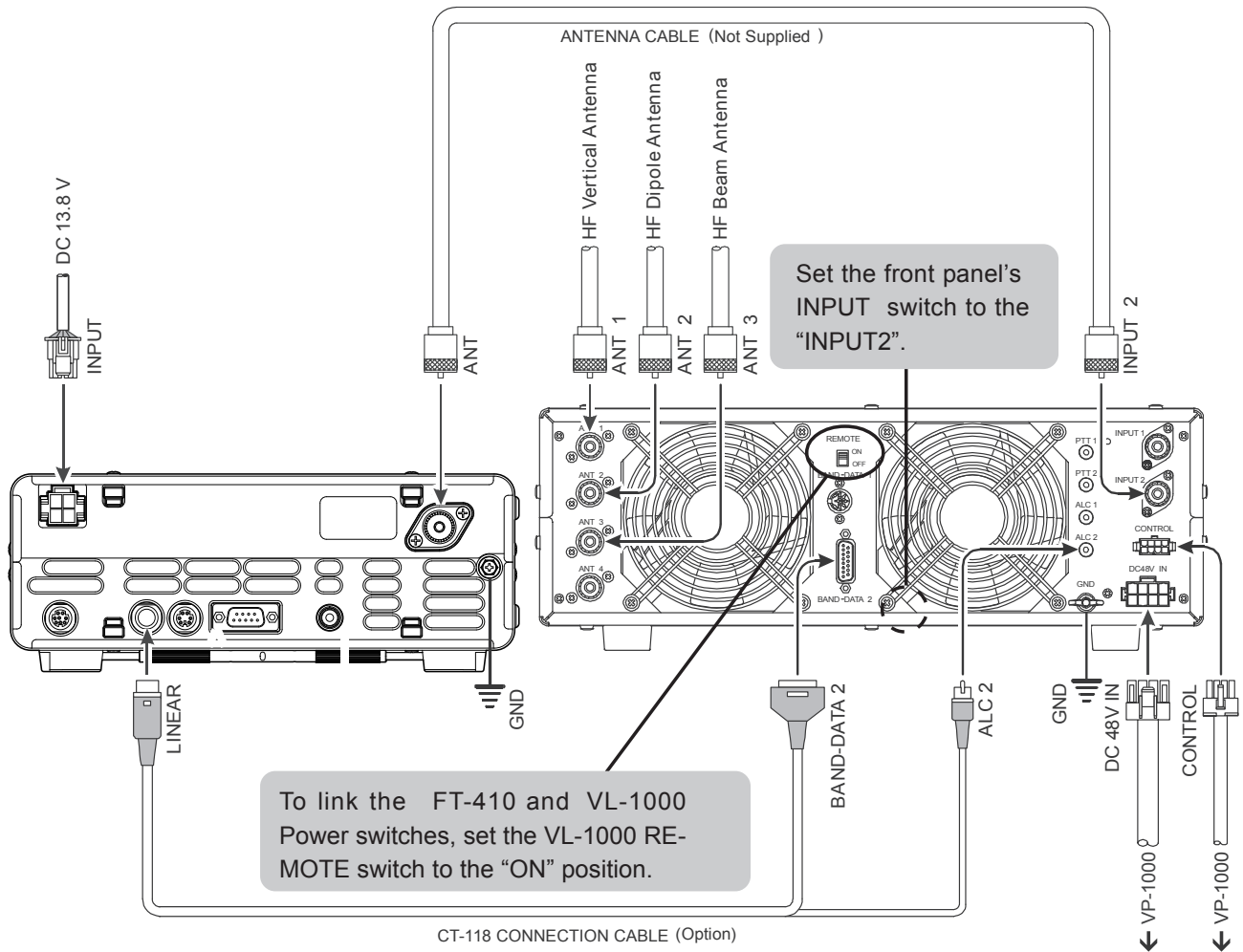
# INSTALLATION

## VL-1000 LINEAR AMPLIFIER INTERCONNECTION

Be sure that both the **FT-410** and **VL-1000** are turned off, then follow the installation recommendations contained in the illustration.

### Note

- Please refer to the **VL-1000** Operating Manual for details regarding amplifier operation.
- Please do not attempt to connect or disconnect coaxial cables when your hands are wet.



# INSTALLATION

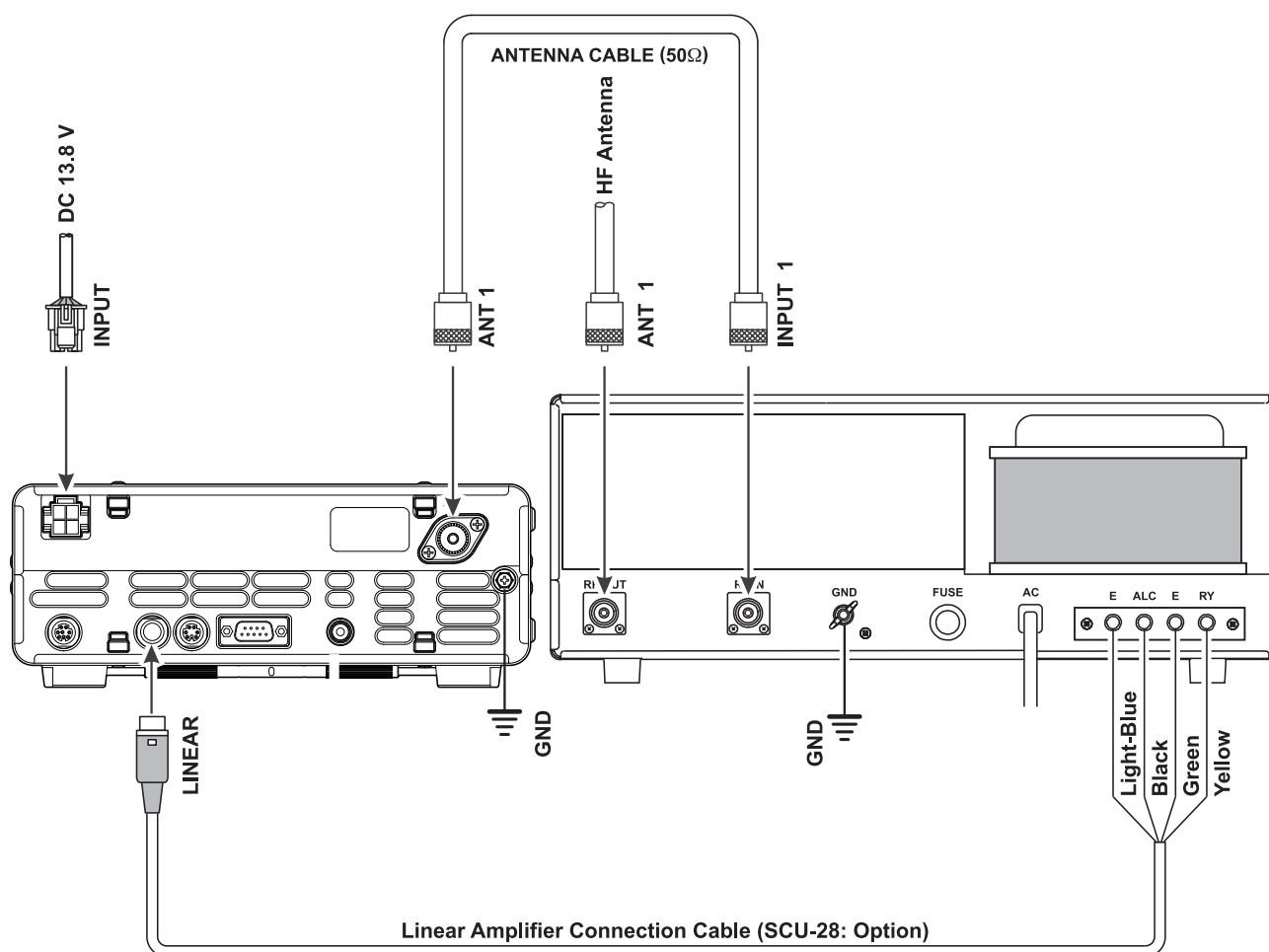
## INTERFACING TO OTHER LINEAR AMPLIFIER

The T/R control line is a transistor “open collector” circuit, capable of handling positive amplifier relay coil voltages of up to +50V DC and current of up to 400 mA. If you plan on using multiple linear amplifiers for different bands, you must provide external band-switching of the “Lin Tx” relay control line from the “**TX GND OUT**” line at the **LINEAR** jack.

### Important Note!

Do not exceed the maximum voltage or current ratings for the “**TX GND OUT**” line at the **LINEAR** jack. This line is not compatible with negative DC voltages, nor AC voltages of any magnitude.

Most amplifier control relay systems require only low DC voltage/current switching capability (typically, +12V DC at 25 ~ 75 mA), and the switching transistor in the **FT-410** will easily accommodate such amplifiers.

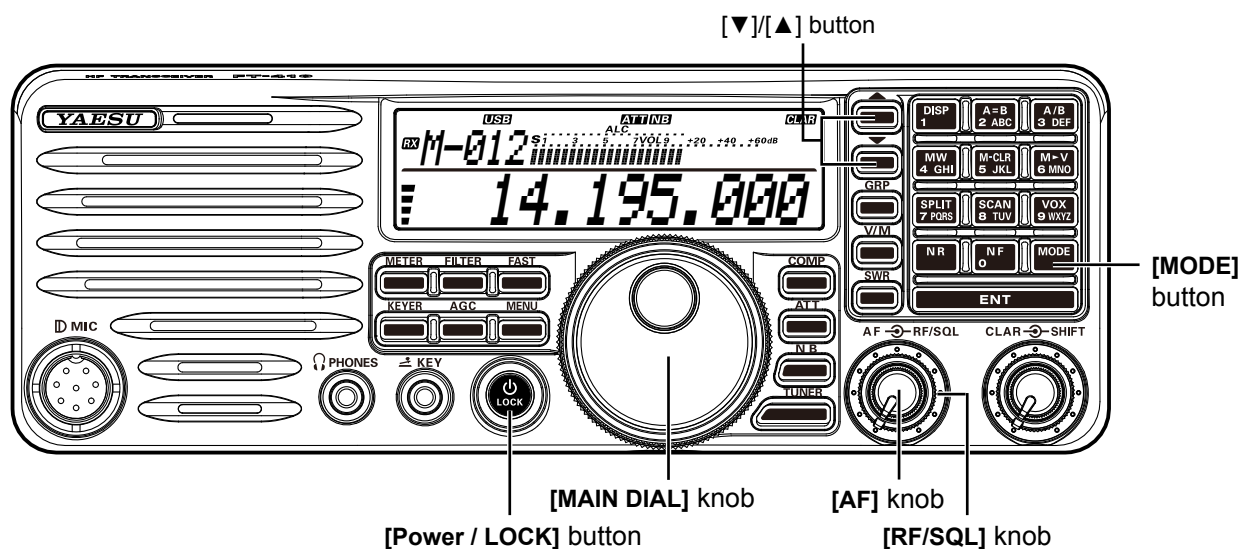


Linear Amplifier Connection Cable (SCU-28)

#### Color Code Information

Wire Color	LINEA Jack (Pin Number)	Function
Orange	1	+13.8 V
Yellow	2	TX GND OUT
Green	3	GND
Red	4	BAND DATA A
White	5	BAND DATA B
Blue	6	BAND DATA C
Violet	7	BAND DATA D
Brown	8	TX INH
Black	9	EXT ALC IN
Gray	10	TX REQ IN
Light Blue	Case	Shield

# EASY OPERATION



## RECEIVING

1. Connect your antenna to the ANT jack on the rear panel.
2. Connect the after-market DC power supply (or car battery) using the supplied DC power cable, and set the **POWER** switch of the DC power supply to on.
3. Press and hold in the **[Power / LOCK]** switch for one second to turn the transceiver on.
4. Rotate the **[RF/SQL]** knob to the fully clockwise position.
5. Rotate the **[AF]** knob to set a comfortable audio level on incoming signals or noise. Clockwise rotation of the **[AF]** knob increases the volume level.
6. Press the **[▼]/[▲]** button to select the amateur band which you wish to begin operating.
7. Press the **[MODE]** button to select the desired operating mode.
8. Rotate the **[MAIN DIAL]** knob to set the desired frequency.

## TRANSMIT

1. Connect the Microphone to the **MIC** jack on the front panel.
2. To transmit, press the microphone's **PTT** (Push To Talk) switch, speak into the microphone in a normal voice level.
3. Release the **PTT** switch to return to the receive mode.

## MENU OPERATION

The Menu System allows you to customize a wide variety of transceiver performance aspects and operating characteristics. After you have initially customized the various Menu procedures, you will find that you will not have to resort to them frequently during everyday operation.

1. Press the **[MENU]** button to enter the Menu Mode. The "Menu." will appear on the display.
2. Rotate the **[MAIN DIAL]** knob to select the Menu Item to be adjusted.
3. Press the **[GRP]** button to enable adjustment of the selected Menu Item. The ">>" will appear on the display.
4. Rotate the **[MAIN DIAL]** knob to adjust or select the parameter to be changed.
5. Press the **[GRP]** button to save the selection. The icon appears continuously.
6. Press the **[MENU]** button to return to normal operation.

