YAESU
The radio

HF/VHF/UHF ALL MODE TRANSCEIVER
FT-991
OPERATING MANUAL
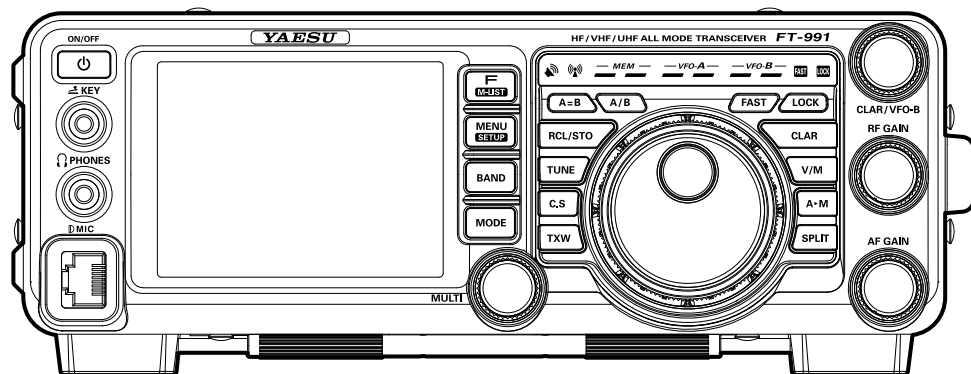
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SUPPLIED ACCESSORIES

Hand Microphone (**MH-31A8J**)	1 pc	A07890001
DC Power Cord	1 pc	T9025225
Spare Fuse (25A)	1 pc	Q0000074
Operating Manual	1 pc	
Warranty Card	1 pc	

ACCESSORIES & OPTIONS

AVAILABLE OPTIONS

MD-200A8X	Ultra-High-Fidelity Desktop Microphone
MD-100A8X	Desktop Microphone
YH-77STA	Lightweight Stereo Headphone
FH-2	Remote Control Keypad
VL-1000/VP-1000	Linear Amplifier/AC Power Supply
FC-40	External Automatic Antenna Tuner
FP-1030A	External Power Supply (13.8 VDC 25 A)
CT-118	**VL-1000** Linear Amplifier Connection Cable
CT-39A	Packet Interface Cable
CT Cable (MDIN10P - Bare Wire 2m)	Linear Amplifier Connection Cable (P/N T9207451)
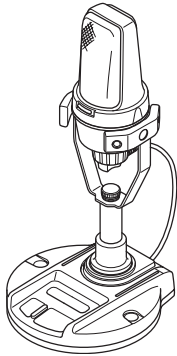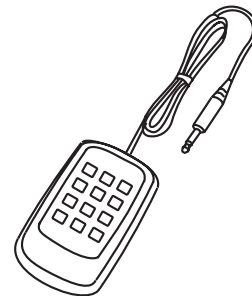
MD-200A8X   **YH-77STA**   **FH-2**
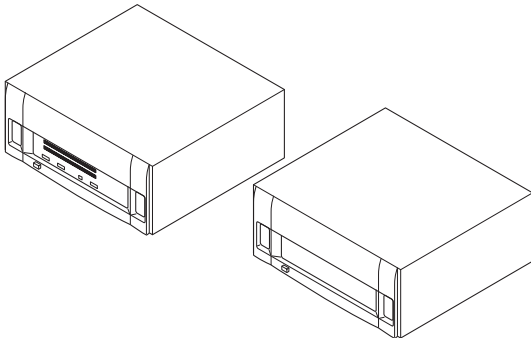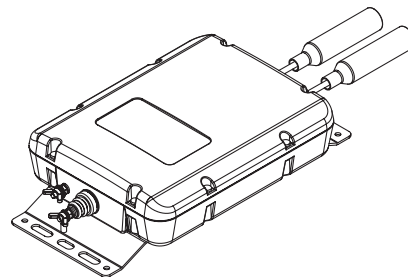
VL-1000/VP-1000   **FC-40**

ADJUSTING THE CLOCK

Use the following procedure to adjust the clock shown at the top right of the LCD display.

1. Press and hold the **MENU(SETUP)** button.
2. Touch [**TIME/DATE**] on the LCD.
3. Enter the present time with the number keys on the LCD, then touch [**ENT**].
4. Touch [**DATE**] on the LCD to switch the screen.
5. Enter month, day, and year with the number keys on the LCD, then touch [**ENT**].
6. Touch [**BACK**] on the LCD to return to the setup mode display.
7. Press the **MENU(SETUP)** button to return to the radio operation display.

MENU(SETUP) button

LCD
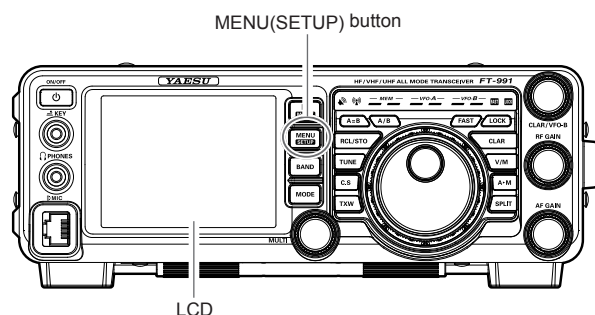
RESETTING THE MICROPROCESSOR

RESETTING MEMORIES (ONLY)

Use this procedure to reset (clear) the previously stored Memory channels, without affecting any configuration changes you may have made to the Menu settings.

1. Press the front panel **ON/OFF** switch to turn the transceiver off.
2. While holding the **A►M** button in, press and hold in the front panel **ON/OFF** switch to turn the transceiver on. Once the transceiver comes on, you may release the buttons.

ON/OFF switch   A►M button
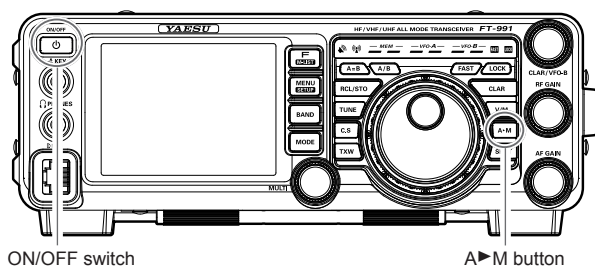
MENU RESETTING

Use this procedure to restore the Menu settings to their factory defaults, without affecting the memories you have programmed.

1. Press the front panel **ON/OFF** switch to turn the transceiver off.
2. While holding the **MENU(SETUP)** button in, press and hold in the front panel **ON/OFF** switch to turn the transceiver on. Once the transceiver comes on, you may release the buttons.

ON/OFF switch   MENU(SETUP) button
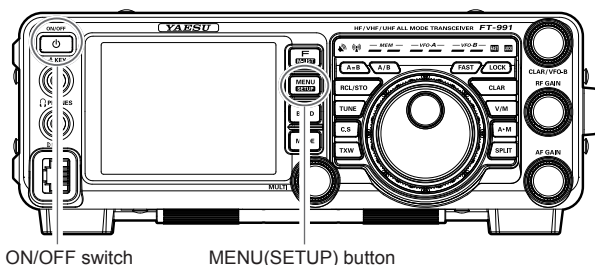
FULL RESET

Use this procedure to restore all Menu and Memory settings to their original factory defaults. All Memories will be cleared by this procedure.

1. Press the front panel **ON/OFF** switch to turn the transceiver off.
2. While holding the **FAST** and **LOCK** buttons in, press and hold in the front panel **ON/OFF** switch to turn the transceiver on. Once the transceiver comes on, you may release the buttons.

FAST button

ON/OFF switch   LOCK button
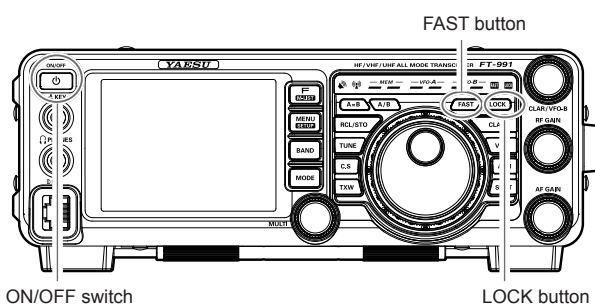
ANTENNA CONSIDERATIONS

The **FT-991** is designed for use with any antenna system providing a 50 Ohm resistive impedance at the desired operating frequency. While minor excursions from the 50-Ohm specification are of no consequence, if the Standing Wave Ratio (SWR) present at the Antenna jack is greater than 3:1, the transceiver's Automatic Antenna Tuner may not be able to reduce the impedance mismatch to an acceptable value.

Every effort should be made to ensure that the impedance of the antenna system be as close as possible to the specified 50-Ohm value. Note that the "G5RV" type antenna does not provide a 50-Ohm impedance on all HF Amateur bands. An external wide-range antenna coupler must be used with this antenna type.

Any antenna to be used with the **FT-991** must be fed from the transceiver 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.

The same precautions apply to any additional (receive-only) antennas connected to the antenna jacks. if your receive-only antennas do not have impedance near 50 Ohms at the operating frequency, you may need to install an external antenna tuner to obtain optimum performance.

ABOUT COAXIAL CABLE

Use high-quality 50-Ohm coaxial cable for the lead-in to your **FT-991** 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 connectors.

TYPICAL **PL-259** INSTALLATION
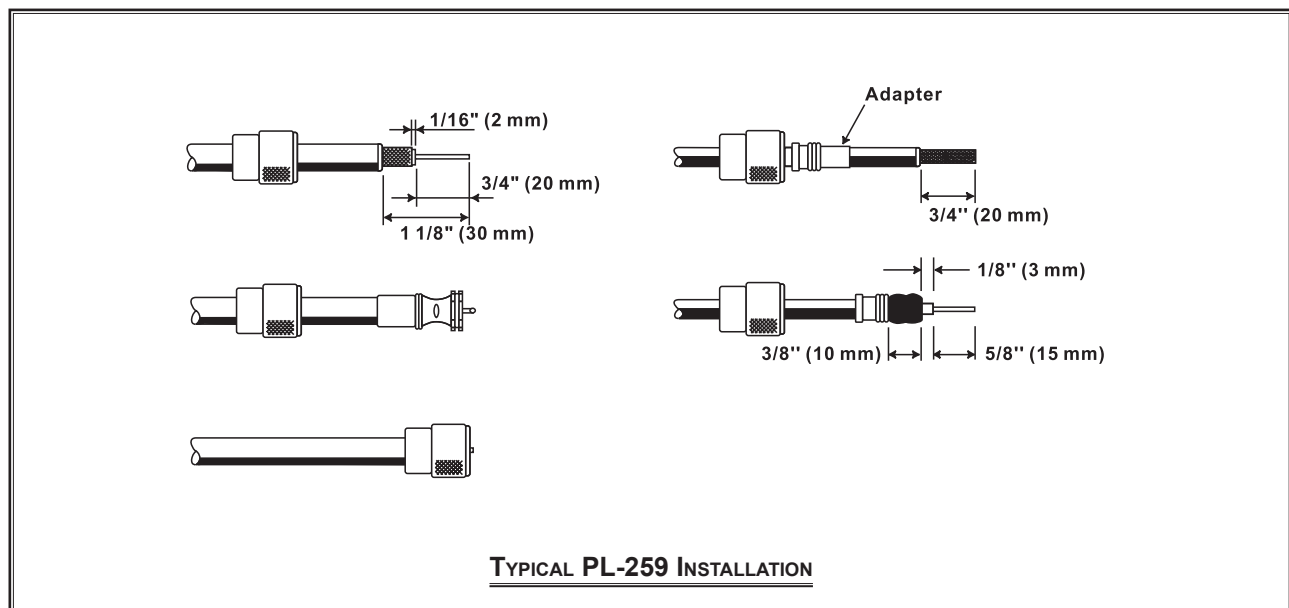
GROUNDING

The **FT-991** 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 base 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 the station, a common ground bus consisting of a copper pipe of at least 25 mm 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 transceivers, power supplies, and data communications devices (TNCs, etc.) should be made directly to the ground bus using a heavy, braided cable.

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

Inspect the ground system - inside the station as well as outside - on a regular basis to ensure continued 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.

Transceiver	Linear Amplifier	TNC
GND	GND	GND

PROPER GROUND CONNECTION

Transceiver	Linear Amplifier	TNC
GND	GND	GND
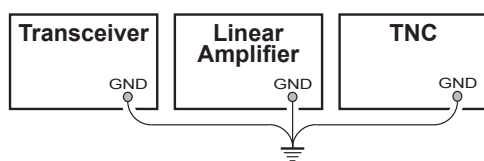
"Daisy Chain"
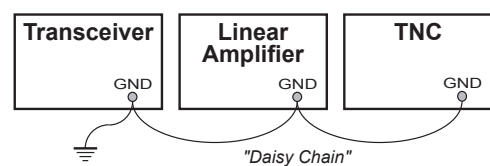
IMPROPER GROUND CONNECTION

INSTALLATION AND INTERCONNECTIONS

CONNECTION OF ANTENNA AND POWER CABLES

Please follow the outline in the illustration regarding the proper connection of antenna coaxial cables, as well as the DC power cable. The DC power connector for the **FT-991** must only be connected to a DC source providing 13.8 Volts DC (±10 %), and capable of at least 23 Amperes of current. Always observe proper polarity when making DC connection:

The RED DC power lead connects to the Positive (+) DC terminal.
The BLACK DC power lead connects to the Negative (–) DC terminal.

> ⚠ **To prevent damage from lightning, atmospheric electricity, electrical shock etc., please provide a good earth ground.** Use a short, thick, braided cable to connect your station equipment to the buried ground rod (or alternative earth ground system).

> ⚠ **Check the DC voltage and current rating (+13.8 V, 23 A) of the power supply before connecting to the transceiver.**

We recommend the use of the **FP-1030A** (USA market only) AC Power Supply. Other models of power supplies may be used with the **FT-991**, but the 13.8 VDC input voltage, 23 Ampere current capability, and DC cable polarity guidelines described above must be strictly followed.

Note that other manufacturers may use the same type of DC power connections as does your **FT-991** transceiver, however, the wiring configuration may be different from that specified for your transceiver. Serious damage can be caused if improper DC connections are made; consult with a qualified service technician when in doubt.

⚡ The 100 V RF voltage (@100 W/50-ohm) is applied to the TX RF section of the transceiver while transmitting. Do not touch the TX RF section absolutely while transmitting.

⚠ Permanent damage can result when improper supply voltage, or reverse-polarity voltage, is applied to the **FT-991**. The Limited Warranty on this transceiver does not cover damage caused by application of AC voltage, reverse polarity DC, or DC voltage outside the specified range of 13.8 V ±10 %. When replacing fuses, be certain to use a fuse of the proper rating. The **FT-991** requires a 25 A blade fuse.

ADVICE:

❒ Do not position the **FT-991** in a location with direct exposure to sunshine.

❒ Do not position the **FT-991** in a location exposed to dust and/or high humidity.

❒ Ensure adequate ventilation around the **FT-991**, to prevent heat build-up and possible reduction of performance due to high heat.
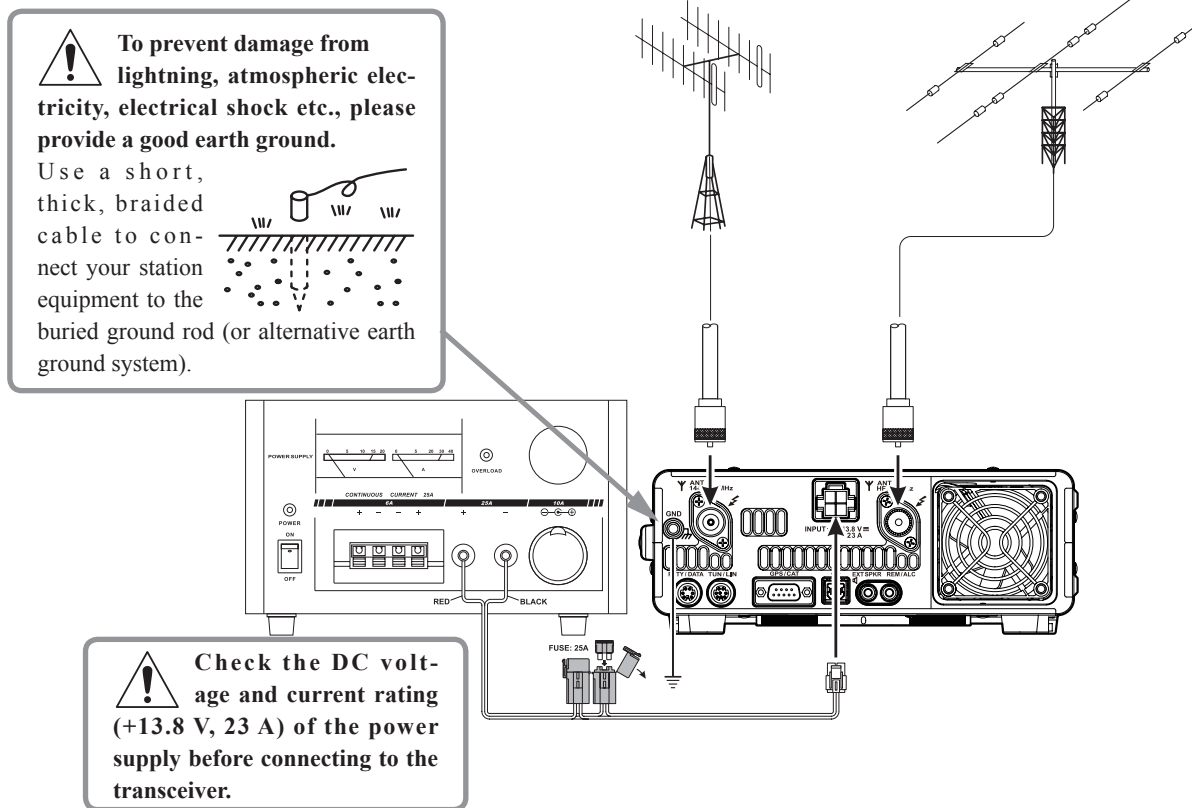
❒ Do not install the **FT-991** on an unstable desk or table. Do not place in a location where objects may fall onto it from above.

❒ 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.

❒ Ensure that the DC power cord is not subject to undue stress or bending, which could damage the cable or cause it to be accidentally unplugged from the rear panel **DC IN** jack.

❒ Be certain to install your transmitting antenna(s) so they cannot possibly come in contact with TV/FM radio or other antennas, or with power or telephone lines.

INSTALLATION AND INTERCONNECTIONS

CONNECTION OF MICROPHONE AND HEADPHONE

① DOWN
② UP
③ +5V
④ MIC GND
⑤ MIC
⑥ PTT
⑦ GND
⑧ FAST
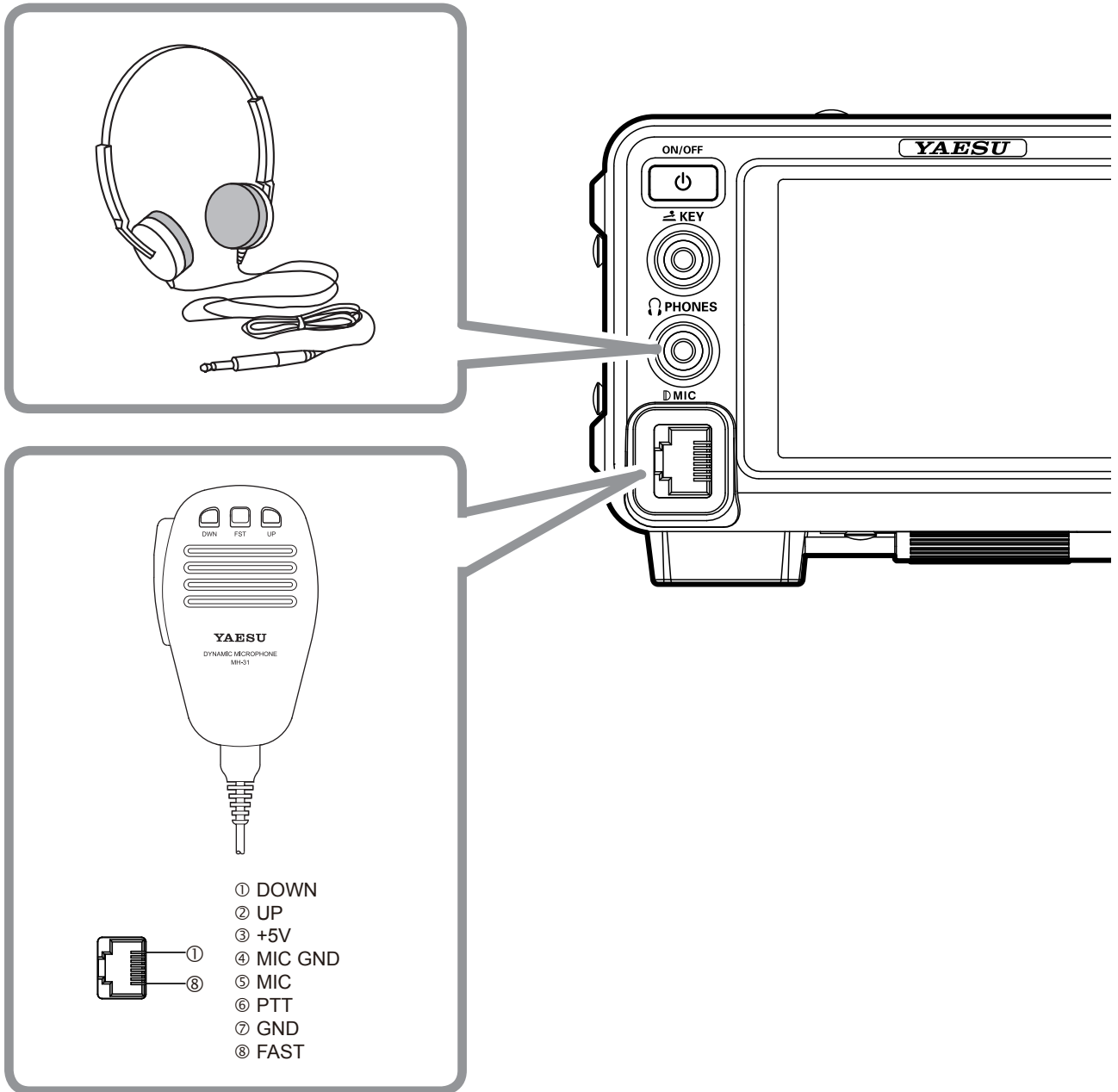
INSTALLATION AND INTERCONNECTIONS

KEY, KEYER, AND COMPUTER-DRIVEN KEYING INTERCONNECTIONS

The **FT-991** includes many features for the CW operator. These functions will be detailed in the "Operation" section later. Besides the built-in Electronic Keyer, two key jacks are provided, one on the front and one on the rear panel, for convenient connection to keying devices.

The Menu selections allow you to configure the front panel **KEY** jack according to the device you wish to connect. For example, you may connect your keyer paddle to the front panel **KEY** jack, and use Menu item "018 F KEYER TYPE" for paddle input.

The **KEY** jack on the **FT-991** utilize "Positive" keying voltage. Key-up voltage is approximately +3.3V DC, and key-down current is approximately 4 mA. When connecting a key or other device to the **KEY** jack, use *only* a 3-contact ("stereo") 1/4" phone plug; a 2-contact plug will place a short between the ring and (grounded) shaft of the plug, resulting in a constant "key-down" condition in some circumstances.
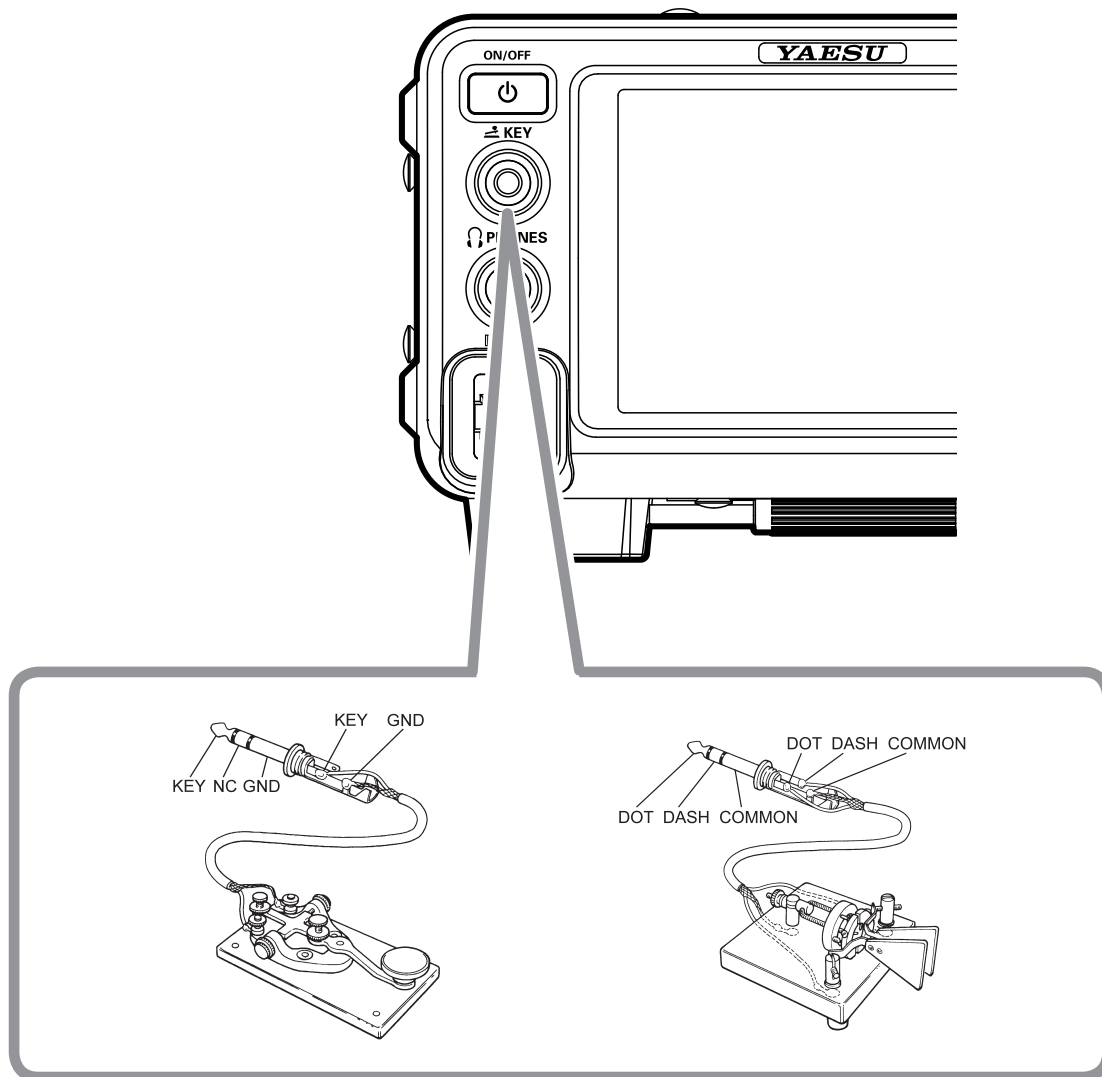
Installation and Interconnections

VL-1000 Linear Amplifier Interconnections

Be sure that both the **FT-991** and **VL-1000** are turned off, and then follow the installation recommendations contained in the illustration.

NOTE:

❒ Refer to the **VL-1000** Operating Manual for details regarding amplifier operation.
❒ Do not attempt to connect or disconnect coaxial cables when your hands are wet.
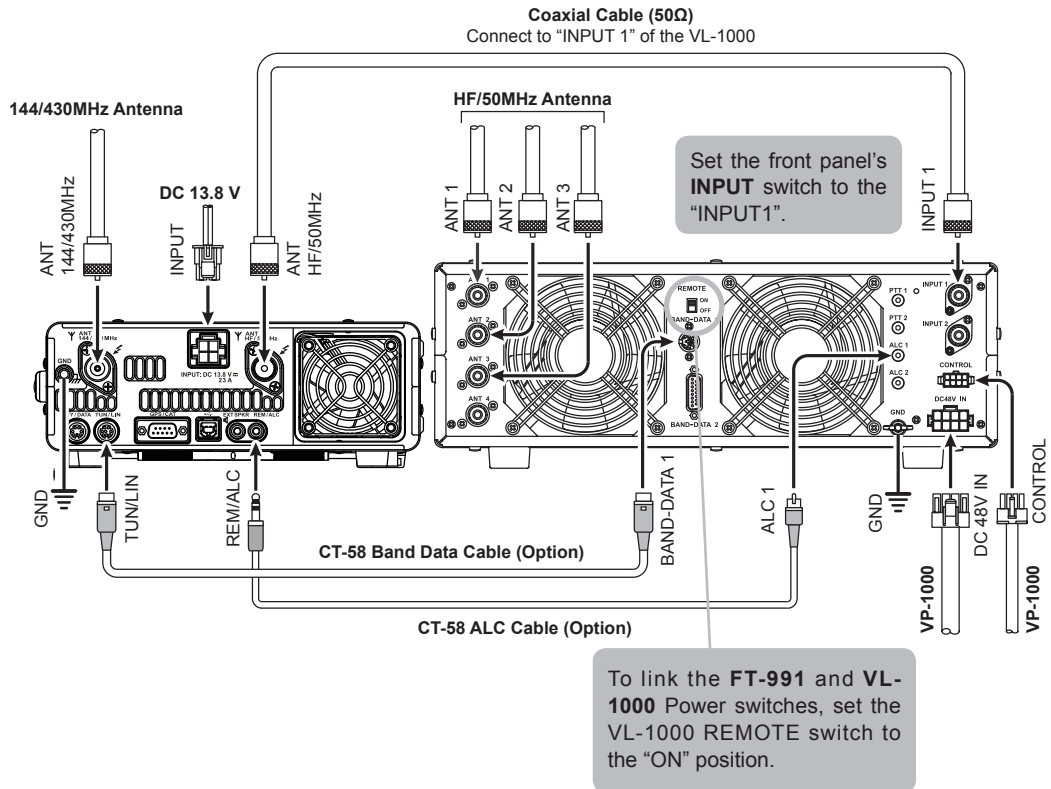
INTERFACING TO OTHER LINEAR AMPLIFIERS

Coaxial Cable (50Ω)
Connect to "INPUT" of the linear amplifier

144/430MHz Antenna

HF/50MHz Antenna

DC 13.8 V

Linear Amplifier Connection Cable
(Option: T9207451)
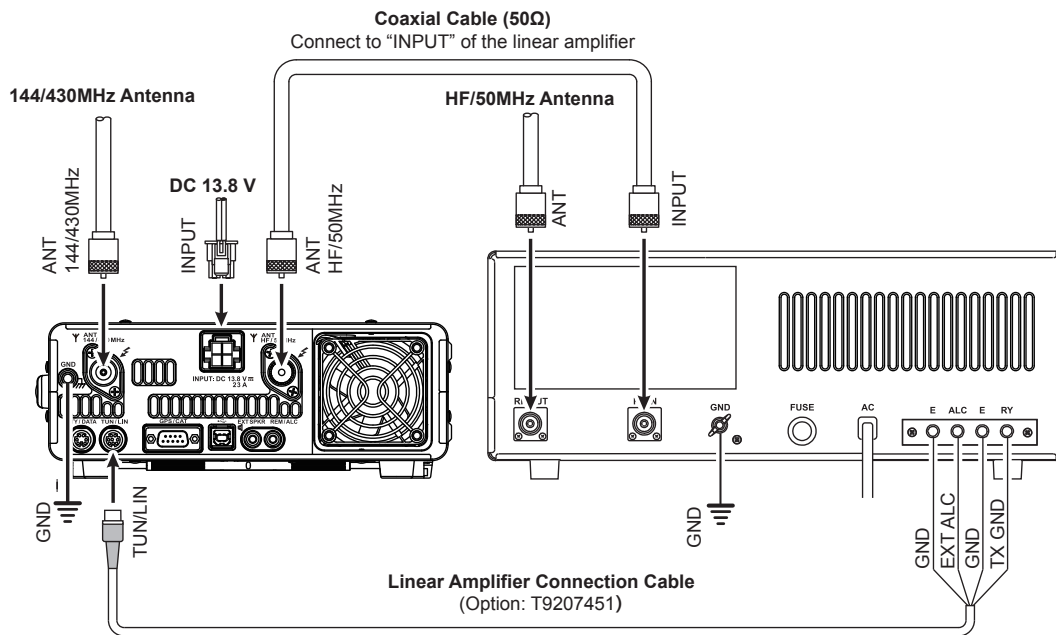
NOTE

❒ The TX GND OUT pin (pin 2) of the **TUN/LIN** jack is a transistor "open collector" circuit. It is capable of handling positive relay coil voltages up to +60VDC at 200 mA or +30 VDC at 1 A. If you plan to use multiple linear amplifiers for different bands, you must provide external band switching of the "Linear Tx" relay control line from the "TX GND OUT" line at the **TUN/LIN** jack.

❒ The specified range for ALC voltage to be used with the **FT-991** is 0 to -4 Volts DC.

❒ Amplifier systems utilizing different ALC voltages will not work correctly with the **FT-991**, and their ALC lines must not be connected if this is the case.

IMPORTANT NOTE!

❒ Do not exceed the maximum voltage or current ratings for the "TX GND OUT" pin (pin 2) of the **TUN/LIN** jack. This line is not compatible with negative DC voltages, or 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-991** will easily accommodate such amplifiers.
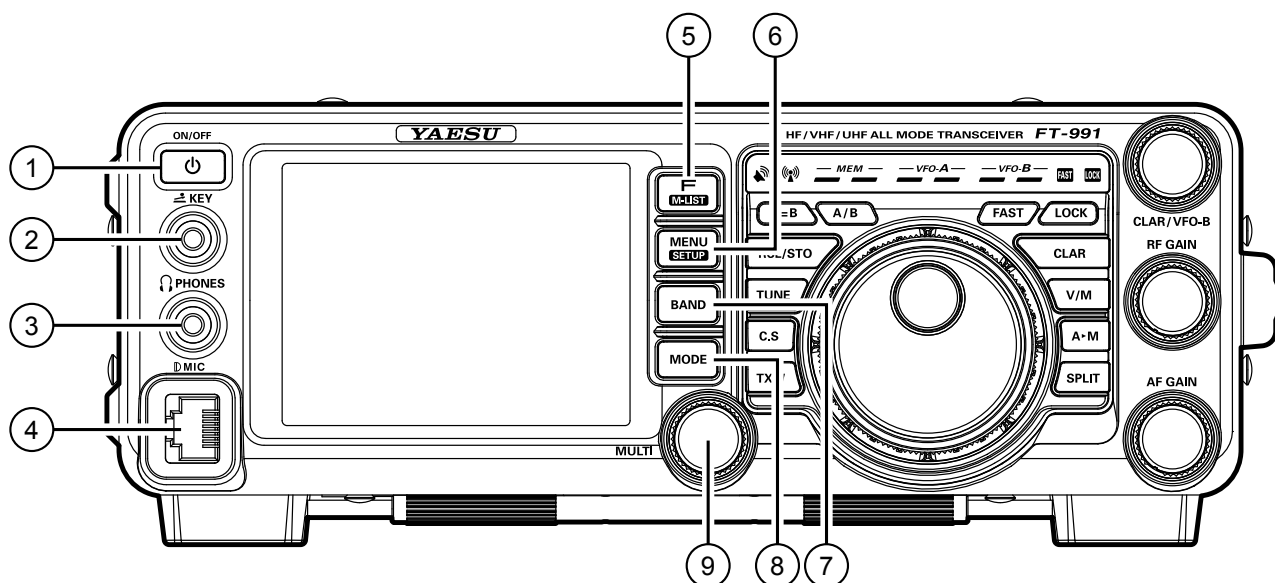
① ON/OFF Switch

Press and hold in this switch for one second to turn the transceiver on. Similarly, press and hold in this switch for one second to turn the transceiver off.

② KEY Jack

This 1/4-inch, 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 on page ##. Key up voltage is +3.3 V DC, and key down current is 4 mA. This jack may be configured for keyer, "Bug", "straight key", or computer keying interface operation via Menu item "O11 F CW KEYER" (see page ##).

NOTE:
You cannot use a 2-contact plug in this jack (to do so produces a constant "key down" condition).

③ PHONES Jack

A 1/4-inch, 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.

④ MIC Jack

This 8-pin jack accepts input from a microphone utilizing a traditional YAESU HF transceiver pinout.

⑤ **F(M-LIST)** Button

F

This button is used to display function list. The following functions can be accessed from the function list:

NAR/WIDE, NB, AGC, ATT, IPO, NOTCH, CONT, DNR, DNF, SHIFT, WIDTH, MOX, VOX, MONI, MIC-EQ, PROC, BK-IN, SPEED, SQL

M-LIST

Pressing and holding this button will show the memory channel list. ....

⑥ **MENU(SETUP)** Button

MENU

This button is used to access the Menu system. The various transceiver characteristics may be configured.

SETUP

Pressing and holding this button will ....

⑦ **BAND** Button

These keys allow one-touch selection of the desired Amateur band (1.8 ~ 50 MHz).

The keys may also be used for direct entry of a desired operating frequency during VFO operation.

⑧ **MODE** Button

This button selects the operating mode. The selections available are:

LSB, USB, AM, CW (LSB), CW (USB), FM,

RTTY (LSB), RTTY (USB), C4FM, DATA (LSB),

DATA (USB), DATA (FM)

⑨ **MULTI** Knob

This knob allows you to select the Menu items and settings.
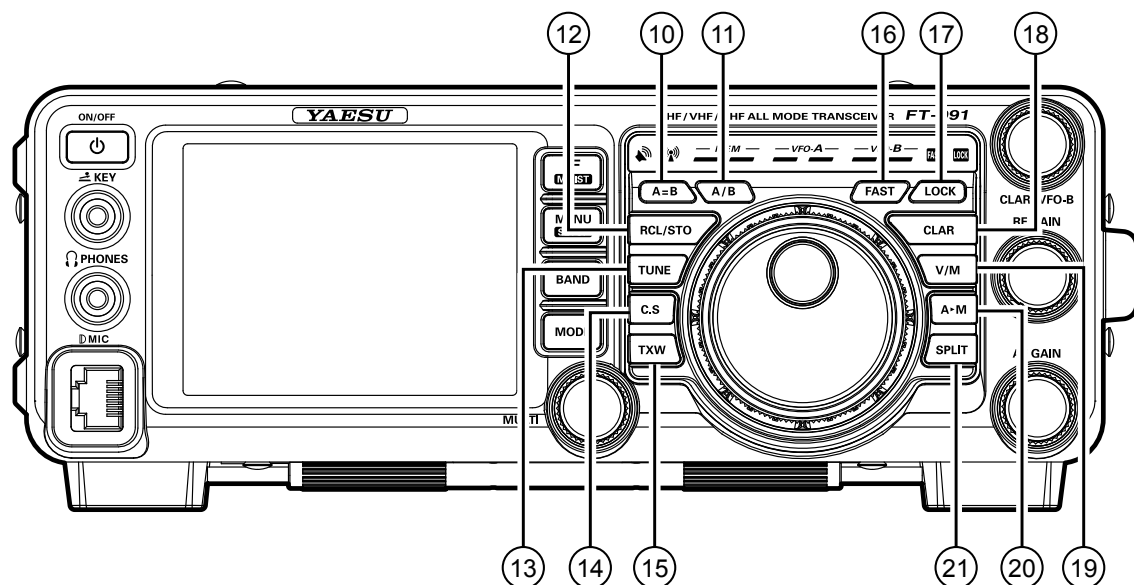
⑩ A=B Button

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

⑪ A/B Button

Pressing this button momentarily, exchanges the frequency or memory channel data, of VFO-A and VFO-B.

⑫ RCL/STO Button

RCL (Recall)

Pressing this button, recalls one of up to five Quick Memory Bank memories for operation.

STO (Store)

Pressing this button copies the contents (frequency, mode, bandwidth, FM repeater offset, and CTCSS settings) of VFO-A, into consecutive QMB Memories.

⑬ TUNE Button

This is the on/off switch for the **FT-991**'s Automatic Antenna Tuner.

Pressing this button momentarily places the antenna tuner in line between the transmitter final amplifier and the antenna jack (The "**TUNER**" icon will appear in the display). Reception is not affected.

Pressing and holding in this button for two seconds, while receiving in an amateur band, activates the transmitter for a few seconds while the automatic antenna tuner rematches the antenna system impedance for minimum SWR. The resulting setting is automatically stored in one of the antenna tuner's 100 memories for instant automatic recall later when the receiver is tuned near the same frequency.

Pressing this button momentarily, while the Tuner is engaged, will take the Automatic Antenna tuner out of the transmit line.

NOTE:

When the Automatic Antenna Tuner is tuning itself, a signal is being transmitted. Therefore, be certain that an antenna or dummy load is connected to the selected antenna jack before pressing and holding in the **TUNE** button to start antenna tuning.

⑭ **C.S** Button

Press this button momentarily to directly recall a favorite Menu Selection.

To program a Menu selection to the **C.S** button, press the **MENU(SETUP)** button to enter the Menu. Select the Menu item you want to set as the short cut. Press the **C.S** button, then press the **MENU(SETUP)** button; this will lock in the selected Menu item as the short cut.

⑮ **TXW** (TX Watch) Button

Pressing and holding this button lets you monitor the transmit frequency when split frequency operation is engaged. Release the button to return to normal split frequency operation.

⑯ **FAST** Button

Pressing this button will change the tuning of the Main Tuning Dial knob (VFO-A) to a higher step rate.

When this function is activated, the "**FAST**" indicator in the LED indicators area illuminates.

⑰ **LOCK** Button

This button toggles locking on/off for the Main Tuning Dial knob (VFO-A). With "Lock" on, the Main Tuning Dial knob can still be turned, but the frequency will not change, and the "**LOCK**" indicator in the LED indicators area illuminates.

⑱ **CLAR** Button

RX

Pressing this button activates the RX Clarifier. This will allow you to temporarily adjust the receive frequency up to ±9.999 kHz with the **CLAR/VFO-B** knob. Press this button once more to return the receiver to the original frequency; the Clarifier offset will be remembered, in case you want to use it again. To cancel the Clarifier offset, press the [**CLEAR**] button.

Pressing this switch during Split operation will change the tuning rate of the **CLAR/VFO-B** knob (VFO-B) to 100 Hz/step.

When this function is activated, the "**FAST**" indicator in the LED indicators area illuminates.

TX

Pressing this button activates the TX Clarifier, to allow offsetting the transmit frequency temporarily. Press this button once more to return the transmitter to the original frequency; the Clarifier offset will be remembered, though, in case you want to use it again. To cancel the Clarifier offset, press the [**CLEAR**] button.

⑲ **V/M** Button

This button toggles frequency control between VFO-A and the memory system. In memory mode, "**MEM**" (Memory Channel) will be shown in the display to indicate the current selection. Pressing the **V/M** button displays the original memory frequency, and the "**MEM**" will be displayed. Pressing it once more returns frequency operation to VFO-A, and the icon will no longer be displayed.

⑳ **A▶M** Button

Pressing this button momentarily, displays the contents of the currently-selected memory channel for 10 seconds.

Pressing and holding in this key for one second (until the double beep) copies the current operating data into the currently selected memory channel, overwriting any previous data stored there.

㉑ **SPLIT** Button

Press this button to operate split frequency between VFO-A (used for reception) and VFO-B (used for transmission). If you press and hold in the **SPLIT** button for one second, the "Quick Split" feature will be engaged. VFO-B transmit will automatically be set to a frequency 5 kHz higher than the VFO-A receive frequency, with the same operating mode. The transceiver will operate in the Split mode.
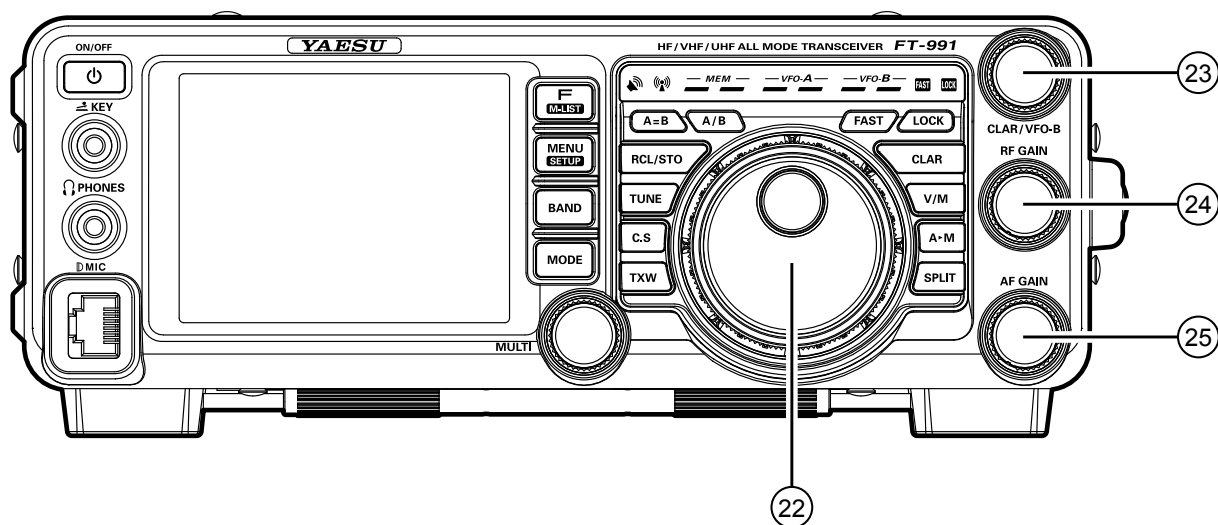
㉒ Main Tuning Dial Knob

This large knob adjusts the operating frequency of VFO-A. Clockwise rotation of this knob increases the frequency. Default tuning increments are 10 Hz (CW, SSB), 50 Hz (RTTY/DATA), 100 Hz (AM/FM). When the **FAST** button is pressed, the tuning steps increases. The available steps are:

OPERATING MODE	1 STEP	1 DIAL ROTATION
LSB/USB/CW	10 Hz (100 Hz)	10 kHz (100 kHz)
AM/FM	100 Hz (1 kHz)	100 kHz (1 MHz)
RTTY/DATA	5 Hz (100 Hz)	5 kHz (100 kHz)

Numbers in parentheses indicate steps when the **FAST** button is On.

㉓ CLAR/VFO-B Knob

During the VFO-A operation, this knob tunes the Clarifier offset frequency up to ±9.999 kHz.

During Split operation, this knob adjusts the operating frequency of VFO-B.

㉔ RF GAIN Knob

The **RF GAIN** knob is the receiver RF gain control, which adjusts the gain of the receiver RF and IF amplifier stages. This control is normally left in the fully clockwise position.

㉕ AF GAIN Knob

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

LCD Display
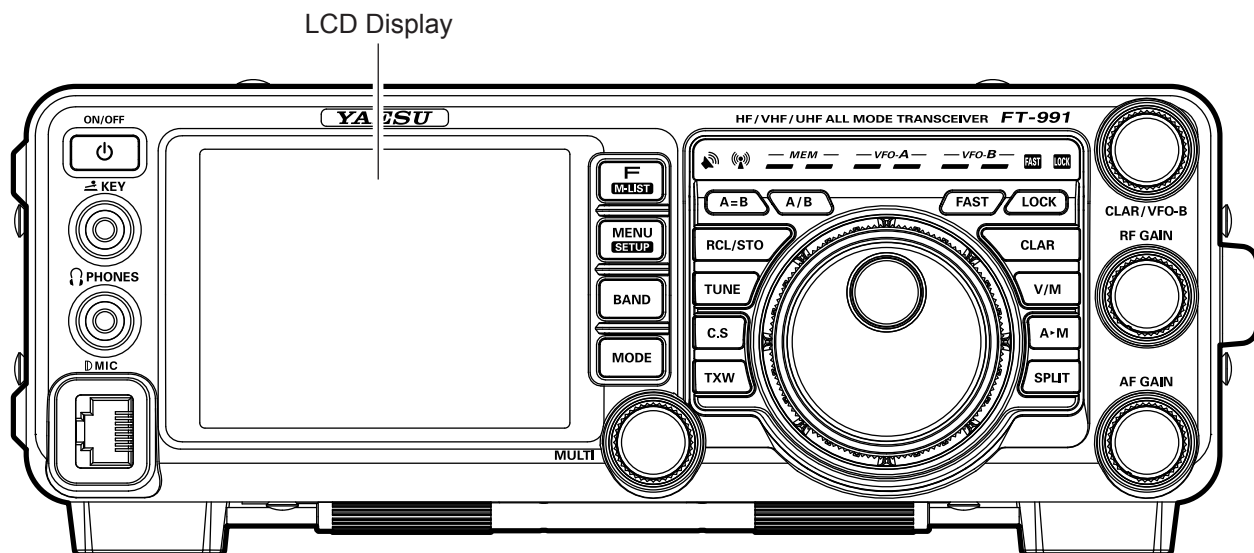
① Mode Indicator
Displays the current operating mode.

② VFO-A Frequency Display
Shows the main band (VFO-A) frequency.

③ Tuning Offset Indicator
This indicates the relative offset of the CW-TUNE, μ-TUNE, Clarifier, etc.

④ Configuration Indicator
TUNER
This indicator appears when the internal Automatic Antenna Tuner is activated.

VOX
This indicator appears when the automatic voice-actuated transmitter switches in the SSB, AM, and FM modes.

PROC
This indicator appears whenever the DSP Speech Processor is activated.

MIC EQ
This indicator appears whenever the Three-Band Parametric Microphone Equalizer is activated via the Menu.

NAR
This indicator appears whenever the receiver's narrow IF DSP filter is engaged.

REC
This indicator appears while the optional Voice Memory Unit is recording your voice message, or the Contest Keyer is recording your CW keying.

PLAY
This indicator appears while the optional Voice Memory Unit is playing back the recorded voice message, or the recorded Contest CW keying.

[+]/[-]
During FM repeater operation, a negative frequency shift will be indicated by "[-]" while a positive frequency shift will be indicated by "[+]".

DNR
This indicator appears whenever the Digital Noise Reduction feature is activated.

DNF
This indicator appears whenever the Digital Notch Filter is activated.

⑤ **VFO-B Frequency Display**

Shows the sub band (VFO-B) frequency during Split operation.

⑥ **S/PO Meter**

On reception, this indicates the received signal strength from S-0 to S-9+60dB.

On transmission, this indicates the RF Power Output, from 0 to 150 Watts.

ADVICE:

❐ The S/PO meters can be set to the Peak-hold function (BAR type only) via the menu item "008 BAR MTR PEAK HOLD".

⑦ **Scope Display**

⑧ **Function Keys**

⑨ **Clock**

Indicates the current time.

DISPLAY INDICATIONS
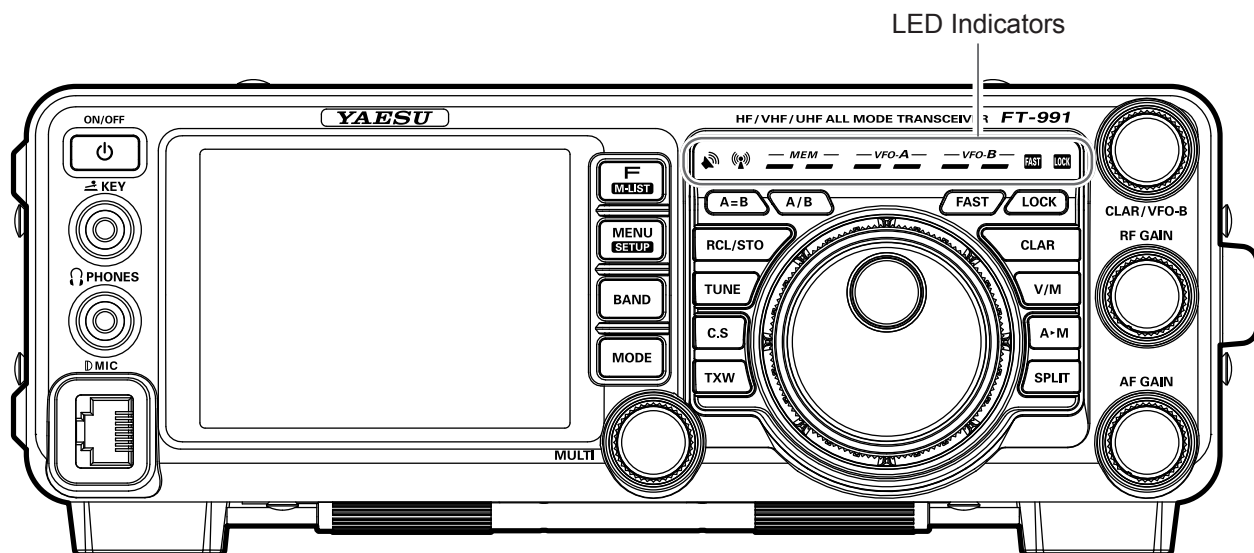
LED Indicators

⑪ **RX Indicator**

This indicator illuminates when the squelch opens.

⑫ **TX Indicator**

This indicator illuminates during transmission.

⑬ **Memory Mode RX/TX Indicators**

Green (Left):

This indicator illuminates when the receiver is active on the memory channel.

Red (Right):

This indicator illuminates when the transmitter is active on the memory channel.

⑭ **Main Band RX/TX Indicators**

Green (Left):

This indicator illuminates when the receiver is active on the main band (VFO-A).

Red (Right):

This indicator illuminates when the transmitter is active on the main band (VFO-A).

⑮ **Sub Band RX/TX Indicators**

Green (Left):

This indicator illuminates when the receiver is active on the main band (VFO-B).

Red (Right):

This indicator illuminates when the transmitter is active on the main band (VFO-B).

⑯ **FAST/LOCK Indicators**

FAST:

This indicator appears when the Main Tuning Dial knob tuning rate is set to "fast".

LOCK:

This indicator appears when the Main Tuning Dial knob is locked.
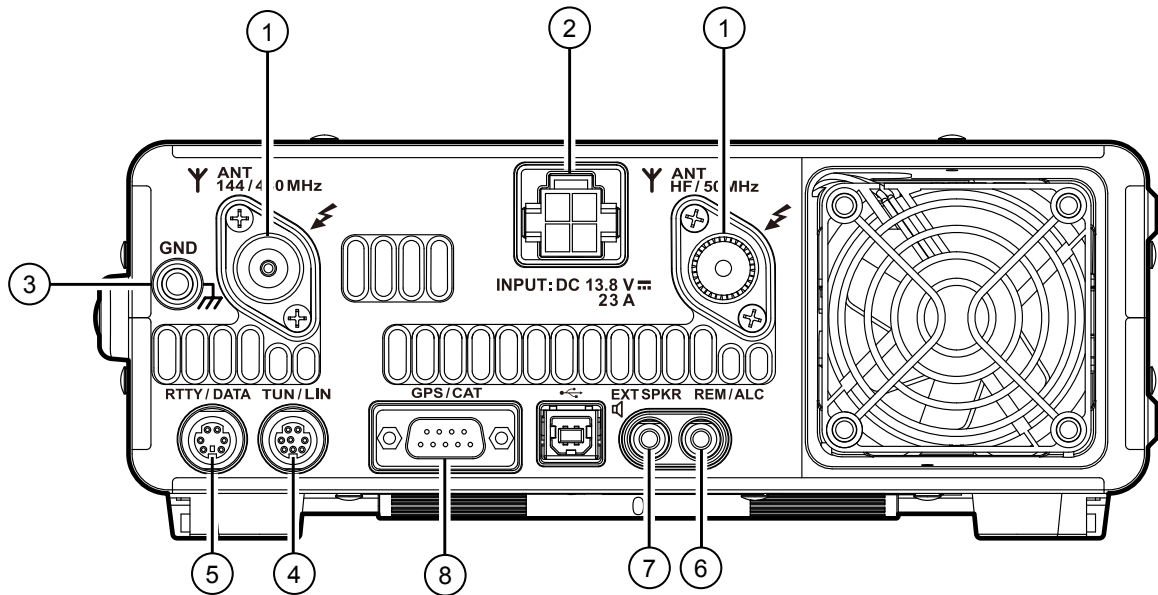
① ANT Jack

Connect your main antenna(s) here, using type-M (PL-259) connectors and coaxial feed lines. The internal antenna tuner affects only the antenna(s) connected here, and only during transmission.

⚠ Warning!

The 100V RF voltage (@100 W/50 Ω) is applied to the TX RF section of the transceiver while transmitting. Do not touch the TX RF section while transmitting.

② DC IN Jack

This is the DC power supply connection for the transceiver. Use the supplied DC cable to connect directly to a DC power supply, which must be capable of supplying at least 23 A @13.8 VDC.

③ GND

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

⚠ **To prevent damage from lightning, atmospheric electricity, electrical shock, etc., be certain to provide a good earth ground.**

④ TUN/LIN Jack

TUN (Tuner)

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

LIN (Linear)

This 8-pin output jack provides band selection data, which may be used for control of optional accessories such as the **VL-1000** Solid-state Linear Amplifier.

⑤ RTTY/DATA Jack

This 6-pin input/output jack accepts AFSK input from a Terminal Node Controller (TNC) or an optional interface unit; it also provides fixed level (100-mV @600 Ohms) receiver audio output, and FSK keying line.

⑥ REM/ALC Jack

REM (Remote)

By plugging the optional **FH-2** Remote Control Keypad into this gold-plated jack, direct access to the **FT-991** CPU is provided for control functions such as contest memory keying, plus frequency and function control.

ALC (   )

REAR PANEL

⑦ **EXT SPKR** Jack

This 3.5-mm, 2-contact, gold-plated jack provides variable audio output for an external loudspeaker. The audio output impedance at this jack is 4 - 8 Ohms, and the level varies according to the setting of the front panel **AF GAIN** knob. Inserting a plug into this jack disables the internal loudspeaker.

⑧ **GPS/CAT** Jack

This 9-pin serial DB-9 jack allows external computer control of the **FT-991**. Connect a serial cable here and to the RS-232C COM port on your personal computer (no external interface is required).

MH-31A8J MICROPHONE SWITCHES
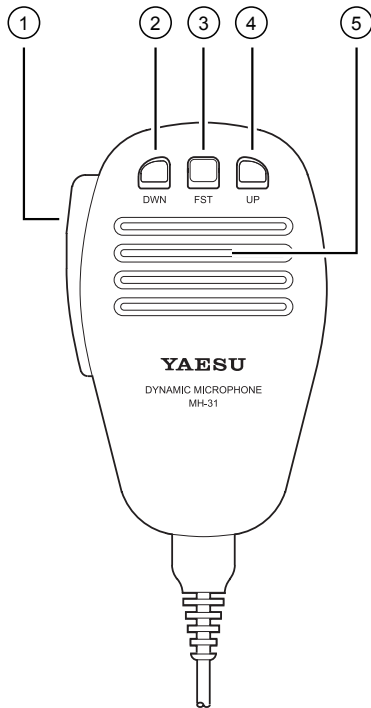
① **PTT** Switch
Press and hold the **PTT** (Push To Talk) switch to start transmission.

② **DWN** Button
Press the **DWN** (Down) button to scan the frequency downward.

③ **FST** Button
Press the **FST** (Fast) button to increase the tuning rate by a factor of ten when scanning the frequency.

④ **UP** Button
Press the **UP** button to scan the frequency upward.

⑤ Microphone
Speak into here during transmission.

The optional Remote Control Keypad **FH-2** can be used to control the optional DVS-6 Voice Memory capability for the SSB/AM/FM modes; the contest memory keyer for the CW mode; and the text memory for the RTTY/DATA modes. Some specific capabilities of the **FH-2** are:

❍ On SSB/AM/FM modes, five channels of storage and playback of voice memory (20 seconds each), using your own voice for recording (see page 71).

❍ On CW mode, the **FH-2** provides storage and recall of CW messages for repetitive CQ and contest automatic number transmissions (see page 85).

❍ On RTTY/DATA mode, the **FH-2** provides storage and recall of TEXT messages for repetitive CQ transmissions (see pages 104, 106).

① [1], [2], [3], [4], [5] Buttons

These buttons work as the Voice Memory and CW Message Memory Selection Key.

In the case of Voice Memory, up to 20 seconds of audio may be stored on each channel.

For CW Messages and CW Text Messages, up to 50 characters ("PARIS" specification) may be stored into each channel.

② [◄], [►], [▲], [▼] Buttons

Usually, these buttons are used for tuning the VFO frequency. Press the [▲]/[▼] buttons to change the frequency in the same incr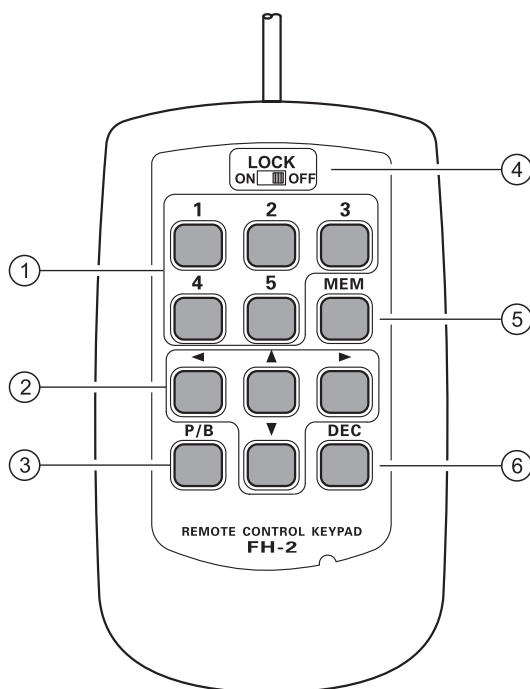ements as the microphone [**UP**]/[**DWN**] switches. Press the [◄]/[►] buttons to change the frequency by 100 kHz steps.

When programming the Contest Memory Keyer, these buttons are used to move the cursor and select the text characters.

③ [P/B] Button

This button can be used to insert a space into the position where the cursor is blinking.

④ [LOCK] Button

This button may be used to lock out the **FH-2** key buttons, to prevent accidental activation of **FH-2** operations.

⑤ [MEM] Button

Press this button to store either a Voice Memory, or a Contest Keyer Memory.

⑥ [DEC] Button

When utilizing the sequential contest number capability of the Contest Keyer, press this button to decrement (decrease) the current Contest Number by one digit (i.e. to back up from #198 to #197, etc.).

Before turning on the main power, please verify the following items once more.

❒ Have you made all ground connections securely? See page ## for details.

❒ Do you have your antenna(s) connected to the rear-panel Antenna jack(s)? See page ## for details.

❒ Is your microphone (and/or key or paddle) connected? See pages ##, ## for details.

❒ If using a linear amplifier, have all interconnections been successfully completed? See pages ##, ## for details.

❒ Please rotate the **AF GAIN** control to the fully counter-clockwise position, to avoid a loud blast of audio when the transceiver turns on. See page ## for details.

Here is the typical start-up procedure for normal operation:

ON/OFF Switch

BAND Button

MODE Button   Main Tuning Dial Knob   AF GAIN Knob
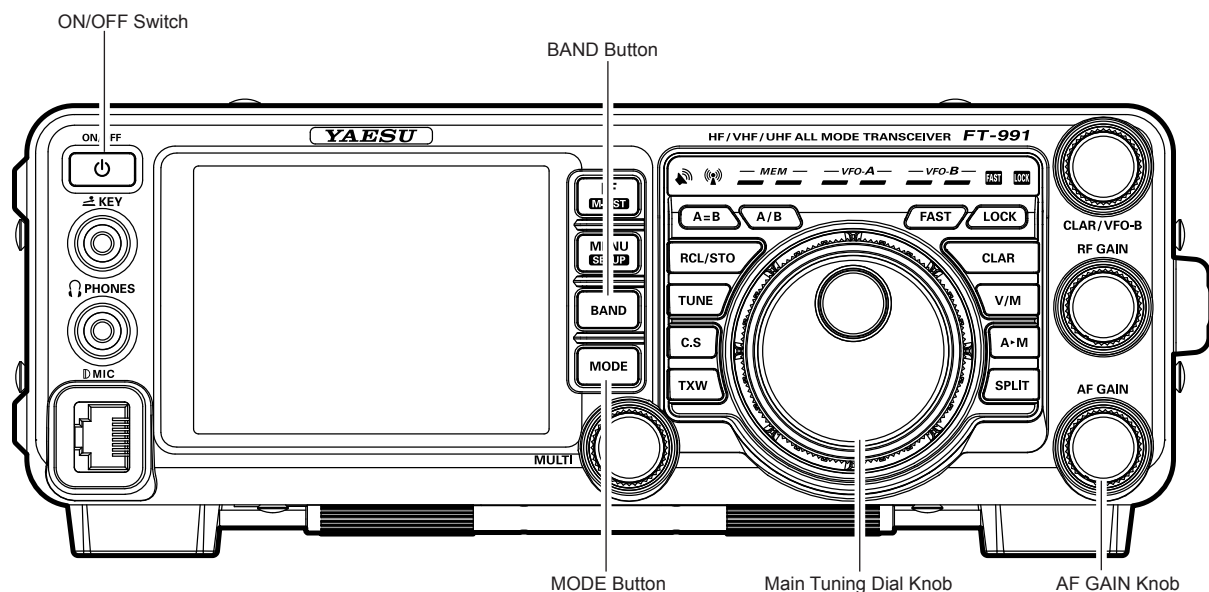
1. Turn on the external DC power supply.
2. Press and hold in the front-panel **ON/OFF** switch until the transceiver turns on. After about five seconds, the transceiver is ready for full operation.
3. The transceiver will start up on 7.000.00 MHz LSB, (or the previously used operating frequency) and normal operation may begin.
   NOTE:
   To turn power off, press and hold in the front panel **ON/OFF** switch for one second.
4. Rotate the **AF GAIN** knob to set a comfortable audio level of the incoming signals or noise. Clockwise rotation of the **AF GAIN** knob increases the volume level.
   NOTE:
   When using headphones, start by rotating the **AF GAIN** knob counter-clockwise, then bring the volume level up after you put the headphones on. This will minimize the chance of damage to your hearing caused by an unexpectedly high audio level.
5. Press the **BAND** button to display the list of Amateur bands on the LCD, then touch a key corresponding to the band on which you wish to begin operation.
   ADVICE:
   ❒ One-touch selection of each Amateur band between 1.8 and 50 MHz, 144 MHz, and 430 MHz is provided.
   ❒ The **FT-991** utilizes a triple band-stack VFO selection technique, which permits storing up to three favorite frequencies and modes onto each VFO band register. For example, you may store one frequency each on 14 MHz CW, RTTY, and USB, then recall these frequencies by successive, momentary touches of the [**14**] on the screen displayed by pressing the **BAND** button. Each

Amateur band key may similarly have up to three frequency/mode settings applied.
   When [**MHz**] is touched, the "**MHz**" notation will appear in the display, and then rotation of the **CLAR/VFO-B** knob will change the frequency in 1 MHz steps.
6. Press the **MODE** button to display the available selections.
   Touch the corresponding key to select the desired operating mode.
   ADVICE:
   ❒ By convention in the Amateur bands, LSB is used on the 7 MHz and lower bands (with the exception of 60 meters), while USB is utilized on the 14 MHz and higher bands.
   ❒ When changing modes from SSB to CW, you will observe a frequency shift on the display. This shift represents the BFO offset between the "zero beat" frequency and the audible CW pitch (tone) you can hear (the pitch is programmed via the Menu item "060 CW FREQ DISPLAY"), even though the actual tone that you hear is not changing.
   ❒ When operating on the FM mode, repeatedly touch [**SQL**] (Squelch) on the screen displayed by pressing the **F(M-LIST)** button to point where the background noise is just silenced. This is the point of maximum sensitivity to weak signals. Excessive advancement of [**SQL**] will decrease the ability of the receiver to detect weak signals.

7. Rotate the Main Tuning Dial knob to tune around the band, and begin normal operation.

ADVICE:

❏ Clockwise rotation of the Main Tuning Dial knob increases the operating frequency, one "step" of the synthesizer at a time; similarly, counter-clockwise rotation of the Main Tuning Dial knob will decrease the frequency. Two settings, one "normal" and one "fast", are available for each operating mode. Pressing the **FAST** button en-gages the "Fast" tuning selection (see chart be-low).

MAIN TUNING DIAL KNOB TUNING RATE

OPERATING MODE	1 STEP	1 DIAL ROTATION
LSB/USB/CW/ RTTY/DATA	1 / 5 / 10 Hz (100 Hz)	1 / 5 / 10 kHz (100 kHz)
AM/FM	100 Hz (1 kHz)	100 kHz (1 MHz)

Numbers in parentheses indicate steps when the **FAST** button is On.

❏ If you want to effect rapid frequency change, there are several techniques available:
- Direct keyboard entry of the frequency.
- Use the microphone's **UP**/**DWN** scanning keys, if your microphone is so equipped.

OPERATION ON 60-METER (5 MHZ) BAND (U.S. VERSION ONLY)

The recently-released 60-meter band is covered, in the **FT-991**, by fixed memory channels. These channels are set to USB or CW, and they appear between the "last" PMS channel ("P9U") and the first "regular" memory channel (Channel 1):

1. Press the **V/M** button once to enter the "Memory" mode; the "**MEM**" icon will appear in the display.
2. Touch [**MCH**] on the screen displayed by pressing the **F(M-LIST)** button. The "**MCH**" notation and a memory channel number will appear on the display to signify that rotation of the **MULTI** knob will allow selection of the memory channel.
3. Memory channels ("501" through "510") are pre-programmed, at the factory, with the permitted frequencies in the 5 MHz band, and the USB or CW mode is automatically selected on these channels.
4. To exit from 60-meter operation and return to the VFO mode, just press the **V/M** button.

NOTE:

The frequencies and operating mode for 5 MHz band operation are fixed, and may not be changed.

F(M-LIST) Button   V/M Button

MULTI Knob   Main Tuning Dial Knob
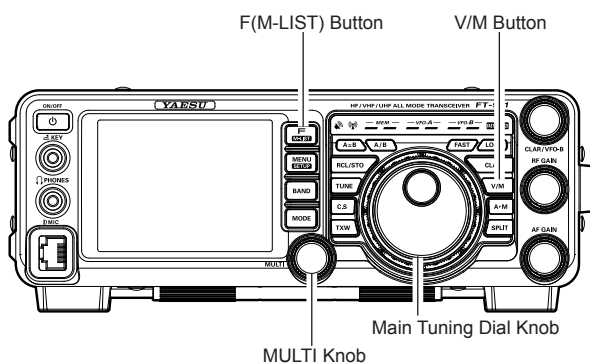
CHANNEL NUMBER	FREQUENCY
501	5.332000 MHz
502	5.348000 MHz
503	5.358500 MHz
504	5.373000 MHz
505	5.405000 MHz
506	5.332000 MHz
507	5.348000 MHz
508	5.358500 MHz
509	5.373000 MHz
510	5.405000 MHz

CLAR (CLARIFIER) OPERATION

The **CLAR** button and **CLAR/VFO-B** knob are used to offset the receive frequency, the transmit frequency, or both, from their settings on the VFO-A frequency. Four small numbers on the TFT Display show the current Clarifier offset. The Clarifier controls on the **FT-991** are designed to allow you to preset an offset (up to ±9.99 kHz) without actually re-tuning, and then to activate it via the Clarifier **CLAR** button. This feature is ideal for following a drifting station, or for setting the small frequency offsets sometimes utilized in DX "Split" work.

Here is the technique for utilizing the Clarifier:

1. Press the **CLAR** button. The "**RX**" notation will appear in the TFT Display, and the programmed offset will be applied to the receive frequency.
2. Rotation of the **CLAR/VFO-B** knob will allow you to modify your initial offset on the fly. Offsets of up to ±9.99 kHz may be set using the Clarifier.

To cancel Clarifier operation, press the **CLAR** button. The "**RX**" notation will disappear from the display.

ADVICE:

❒ Turning the Clarifier off merely cancels the application of the programmed offset from the receive and/or the transmit frequencies. To clear the Clarifier offset, and reset it to "zero," press and hold the **CLAR** button. The programmed offset is displayed in the small multi-channel window of the frequency display.

❒ The Clarifier operation (including the offset frequency) will be memorized independently on each VFO stack of VFO-A and VFO-B.

CLAR/VFO-B Knob

CLAR Button
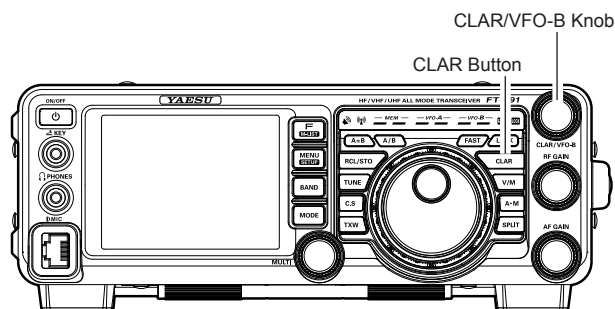
LOCK

You may lock the setting of the Main Tuning Dial knob (for VFO-A frequency tuning) and the **CLAR/VFO-B** knob (for VFO-B frequency tuning during Split operation), to prevent accidental frequency change.

Main Tuning Dial Knob Lock

To lock the Main Tuning Dial knob, press the **LOCK** button that is located to the right of the Main Tuning Dial knob. To unlock the Dial setting, and restore normal tuning, press the **LOCK** button once more.

ADVICE:

The lock feature will be memorized independently on the Main Tuning Dial knob and the **CLAR/VFO-B** knob.
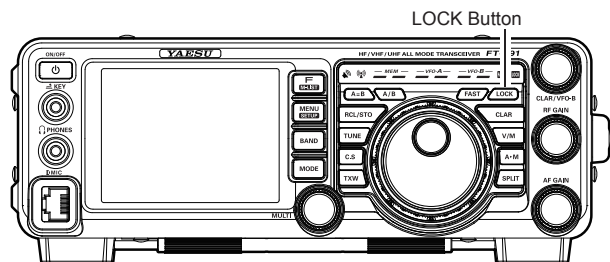
LOCK Button

DIMMER

The illumination level of the TFT display and LED indicators (above the Main Tuning Dial knob), may be adjusted via Menu items 009 and 010.

To adjust the illumination level:

1. Press the **MENU** button to enter the Menu mode.
2. Rotate the **MULTI** knob to select Menu item "006 DIMMER LED" (for LED indicators) or "007 DIMMER TFT" (for TFT display).
3. Touch [**SELECT**] on the LCD then rotate the **MULTI** knob to select the desired illumination level.
4. Touch [**ENTER**] on the LCD, then touch [**BACK**] on the LCD or press the **MENU** button to save the new setting and exit to normal operation.

MENU Button
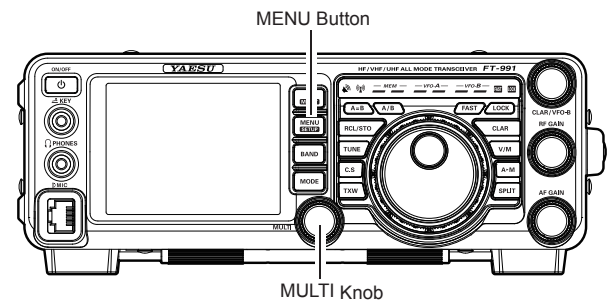
MULTI Knob

VFO COLOR

The background color of the VFO-A frequency in the TFT display may be selected via Menu item 007.

1. Press the **MENU** button to enter the Menu mode.
2. Rotate the **MULTI** knob to select Menu item "005 DISPLAY COLOR".
3. Touch [**SELECT**] on the LCD, then rotate the **MULTI** knob to select from the following colors: BLUE (default) / SKY BLUE / GREEN / PURPLE / RED / ORANGE / GRAY
4. Touch [**ENTER**] on the LCD, then touch [**BACK**] on the LCD or press the **MENU** button to save the new setting and exit to normal operation.

14.195.000

Background color

MENU Button

MULTI Knob
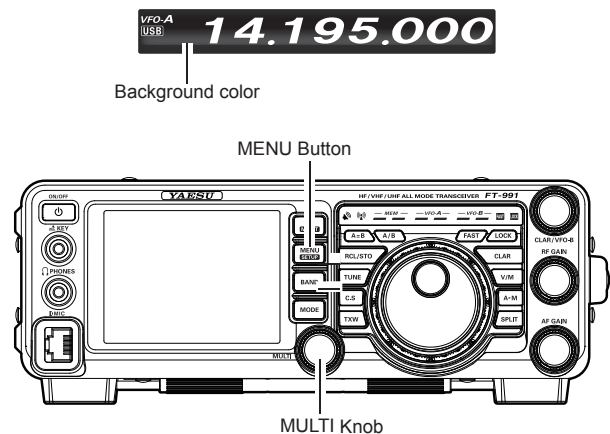
BAND STACK OPERATION

The **FT-991** utilizes a triple band-stack VFO selection technique, that permits you to store up to three favorite frequencies and modes onto each band's VFO register. For example, you may store one frequency each on 14 MHz CW, RTTY, and USB, then recall these VFOs by successive, momentary touches of [**14**] on the screen displayed by the **BAND** button. Each Amateur band key may similarly have up to three frequency/mode settings applied. Note that only the VFO-A system has the band stacks.

A typical setup, for the 14 MHz band, might be arranged like this:

BAND Button

1. Program 14.025 MHz, CW Mode, press the **BAND** button, then touch [**14**] on the LCD;
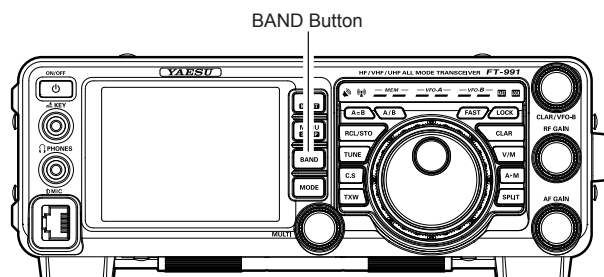2. Program 14.080 MHz, RTTY Mode, press the **BAND** button, then touch [**14**] on the LCD;
3. Program 14.195 MHz, SSB Mode, press the **BAND** button, then touch [**14**] on the LCD.

With this configuration, successive momentary touches of [**14**] on the screen displayed by the **BAND** button will allow you to step sequentially through these three VFOs.

C.S (CUSTOM SWITCH)

The front panel **C.S** button may be programmed to directly access an often-used Menu Mode selection.

C.S Setup

MENU button   C.S button

1. Press the **MENU** button to engage the Menu mode; the Menu list will appear on the display.
2. Rotate the **MULTI** knob to select the Menu item you want to access with the front panel **C.S** button.
3. Press the **C.S** button to lock in your selection.
4. Press the **MENU** button or touch [**BACK**] on the LCD to save the new configuration and exit to normal operation.

MULTI Knob

Menu Selection Recall via C.S button

Press the **C.S** button.

The programmed Menu item will appear on the display. Press the **MENU** button or touch [**BACK**] on the LCD exit to normal operation.
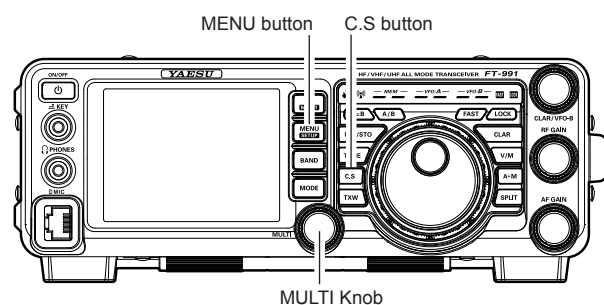
SCOPE

This function displays a convenient spectrum scope for monitoring the band conditions. Both strong and weak signals can be displayed in an easy-to-understand manner on the TFT screen. This multifunctional scope takes into consideration the operator's preference, by switching between the convenient CENTER mode where the VFO frequency is constantly in the center of the screen (for monitoring conditions on both sides of your operating frequency), and the FIX mode, where the frequency is fixed to the left side of the screen (for convenience in monitoring in the band).

Note: Since the **FT-991** has only one receiver the audio will be muted while the spectrum scope is scanning.

1. Press the [**SCOPE**] button momentarily to display the scope screen.
   Five different screens are shown on the TFT display by pressing the [**SCOPE**] button.
   ADVICE:
   ❏ During continuous sweeping, no audio will be heard.
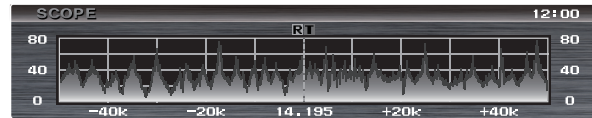
Spectrum scope display

↓
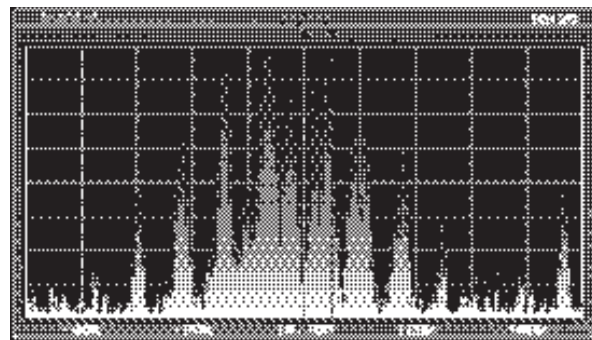
Full screen spectrum scope display

MORE FREQUENCY NAVIGATION TECHNIQUES

Keyboard Frequency Entry

The Operating frequency may be entered directly into the current VFO, using the keyboard screen displayed by pressing the front panel **BAND** button.

Example: Enter 14.250.00 MHz

1. Press the **BAND** button to begin the direct frequency entry process.
2. Touch [**ENT**] on the LCD. The first digit of the frequency (the leftmost digit) will blink.
3. Enter, in order, the digits of the operating frequency, touching the keys on the LCD
   The decimal point after the "MHz" portion of the frequency must be entered, but no decimal point is required after the "kHz" portion.
3. Touch [**ENT**] on the LCD once more to complete the operating frequency entry. A short "beep" will confirm that the entry was successful, and the new operating frequency will appear on the display.

   ADVICE:

   If you attempt to enter a frequency outside the operating range of 30 kHz ~ 56 MHz, the microprocessor will ignore the attempt, and you will be returned to the previous operating frequency. If this happens, please try again, taking care not to repeat the error in the frequency entry process.

Using the UP/DWN buttons of the supplied MH-31A8J Hand Microphone

The **UP**/**DWN** buttons on the supplied **MH-31A8J** Hand Microphone may also be used to manually scan the frequency upward or downward.

The microphone's **UP**/**DWN** buttons utilize the tuning steps of the Main Tuning Dial knob.

When the microphone **FST** button is pressed, the tuning rate increases by a factor of ten, in a manner similar to the transceiver front panel **FAST** button.
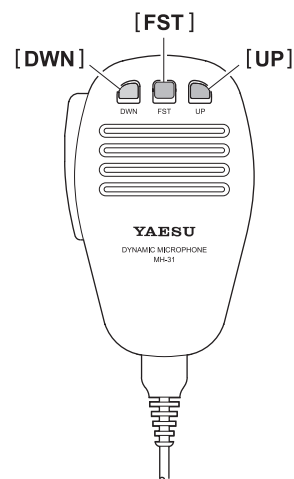
CONVENIENCE FEATURES

RECEIVER OPERATION (FRONT END BLOCK DIAGRAM)

The **FT-991** includes a wide range of special features to suppress the many types of interference that may be encountered on the HF bands. However, real world interference conditions are constantly changing, so optimum setting of the controls is somewhat of an art, requiring familiarity with the types of interference and the subtle effects of some of the controls. Therefore, the following information is provided as a general guideline for typical situations, and a starting point for your own experimentation.

The **FT-991** interference-fighting circuitry begins in its "RF" stages, and continues throughout the entire receiver section. **FT-991** allows configuration of the features described below.

CONTOUR Filter

The DSP Contour filter has the unique ability to provide either a null or a peak in tunable segments of the receiver passband. You may suppress interference and excessive frequency components on an incoming signal, or you may peak those tunable frequency segments. The level of the null or peak, and the bandwidth, over which it is applied, are adjustable via the Menu.

IF SHIFT

The passband center frequency of the IF DSP filter may be moved up or down by adjusting this control.

IF WIDTH

The width of the IF DSP filtering may be adjusted using this control.

IF NOTCH

The IF Notch filter is a high-Q notch filter that can eliminate, or significantly reduce an interfering carrier.

DNF (Digital Notch filter)

When multiple interfering carriers are encountered during reception, the Digital Notch Filter can significantly reduce the level of these signals.

DNR (Digital Noise Reduction)

The DSP's Digital Noise Reduction (DNR) feature utilizes 15 different mathematical algorithms to analyze and suppress different noise profiles encountered on the HF/50 MHz bands. Choose the selection that provides the best noise suppression, and allows the signal to rise up out of the noise.

AGC

The AGC system is highly adaptable to changing signal and fading characteristics, making reception possible under the most difficult conditions.

FRONT END BLOCK DIAGRAM

ATT (ATTENUATOR)

When extremely strong local signals or high noise degrades reception, you can use [**ATT**] displayed by pressing the **F(M-LIST)** button to insert 6, 12, or 18-dB of RF attenuation in front of the RF amplifier.

1. Press the **F(M-LIST)** button, then touch [**ATT**] on the LCD several times to set the desired attenuation level, per the chart below.

   OFF: Attenuator is Off

   -6dB: The incoming signal power is reduced by 6 dB (Signal voltage reduced by 1/2)

   -12dB: The incoming signal power is reduced by 12 dB (Signal voltage reduced to 1/4)

   -18dB: The incoming signal power is reduced by 18 dB (Signal voltage reduced to 1/8)

   The selected attenuation level will be indicated in the ATT column of the Key Function Display on the TFT display.

2. To restore full signal strength through the Attenuator circuit area, touch [**ATT**] on the LCD to restore the ATT display to the "OFF" position.

F(M-LIST) Button

ADVICE:

❐ If background noise causes a high S-meter indication on clear frequencies, touch [**ATT**] on the LCD until the S-meter drops to about "S-1". This setting optimizes the trade-off between sensitivity, noise, and interference immunity. Also, once you have tuned in a station you want to work, you may want to reduce sensitivity further (add more attenuation) by touching [**ATT**] on the LCD to a higher setting. This reduces the strength of all signals (and noise) and can make reception more comfortable, important especially during long QSOs. When looking for weak signals on a quiet band, you will want maximum sensitivity, so the IPO should be disabled and [**ATT**] on the LCD should be set to "OFF." This situation is typical during quiet times on frequencies above 21 MHz, and when using a small or negative-gain receiving antenna on other bands.

INTERFERENCE REJECTION

IPO (INTERCEPT POINT OPTIMIZATION)

The IPO feature allows the operator to optimize the characteristics of the receiver front end, depending on the current noise level and the strength of incoming signals.
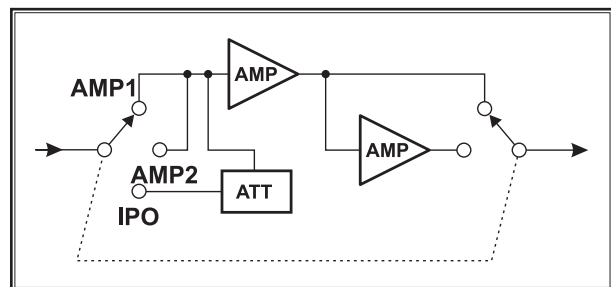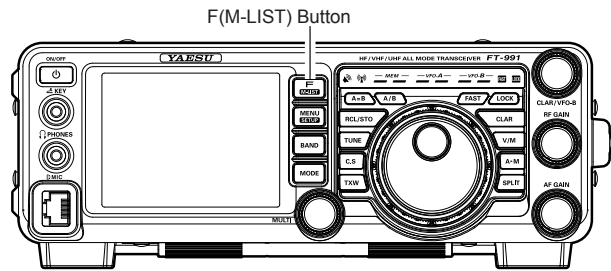
Touch [**IPO**] displayed by pressing the **F(M-LIST)** button repeatedly, to set the desired characteristic of the receiver front end, according to the chart below.

AMP1: Amplifies the incoming signals, using a low distortion RF preamplifier (gain: approx. 10 dB).

AMP2: Amplifies the incoming signals, using a 2-stage low-distortion RF preamplifier (total gain: approx. 20 dB).

IPO: Bypasses the RF preamplifier, yielding direct feed to the first mixer.

The selected receiver RF preamplifier will be indicated in the IPO column of the Key Function Display on the TFT display.


F(M-LIST) Button

ADVICE:
❐ On the 10 MHz and lower bands, it generally is not necessary to use any preamplifier at all; selecting the "IPO" position as described above will increase the strong-signal-handling capability of the receiver, and generally will result in more pleasant reception due to reduced noise. If you can hear band noise with the preamplifiers disengaged, then a preamplifier is generally not needed.

IF NOISE BLANKER (NB) OPERATION

The **FT-991** includes an effective IF Noise Blanker, which can significantly reduce noise caused by automotive ignition systems.

1. Touch [**NB**] displayed by pressing the **F(M-LIST)** button briefly to reduce *short duration pulse noise* such as from switching transients, automobile ignitions and power lines. The "**NB ON**" will appear in the display to confirm that the Narrow-NB is operating.
2. Touch [**NB**] on the LCD again to reduce *longer-duration man-made pulse noise*. The "**NBW ON**" will appear in the display to confirm that the Wide-NB is operating.
3. If desired, you may adjust the Noise Blanker level via Menu item "024 NB LEVEL" to the point where the offending noise is best reduced or eliminated. See box below for details.
4. To end Noise Blanker operation, touch [**NB**] on the LCD once more. The "**NB OFF**" will appear in the display, confirming that the Noise Blanker is no longer in operation.

F(M-LIST) Button
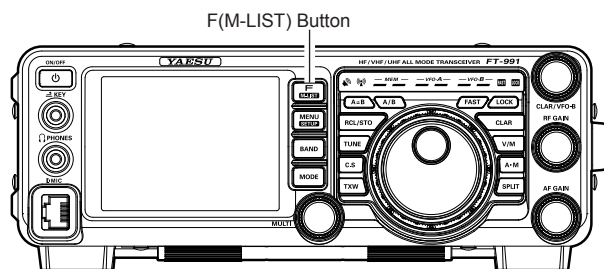
Adjusting the Noise Blanker Level

1. Press the **MENU** button to engage the Menu mode.
2. Rotate the **MULTI** knob to select Menu item "024 NB LEVEL".
3. Touch [**SELECT**] on the LCD
4. Rotate the **MULTI** knob to the point where the offending noise is best reduced or eliminated.
5. Touch [**ENTER**] on the LCD, then press the **MENU** button or touch [**BACK**] on the LCD to lock in the new setting and exit to normal operation.

MENU button

MULTI Knob
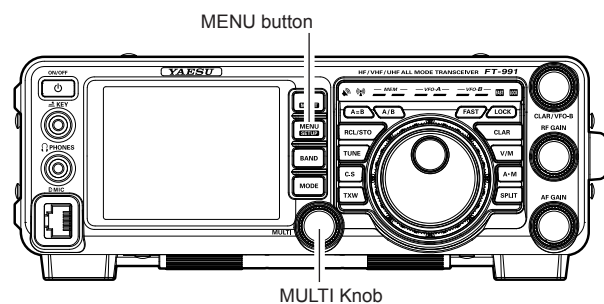
CONTOUR CONTROL OPERATION

The Contour filter system provides a gentle perturbation of the IF filter passband. The Contour is set to either suppress, or boost specific frequency components, and thus enhances the sound and readability of a received signal.

1. Touch [**CONT**] displayed by pressing the **F(M-LIST)** button to activate the Contour filter. The DSP graphic display will illuminate and the current "null" (or "peak") position of the Contour filter will appear in the CONTOUR indicator on the display.
2. Rotate the **MULTI** knob to achieve the most natural-sounding audio reproduction on the incoming signal.
   ADVICE:
   The display will show the Contour frequency whenever [**CONT**] on the LCD is touched.
3. To cancel Contour tuning, touch [**CONT**] on the LCD.
   ADVICE:
   Alternate touches of [**CONT**] on the LCD will switch the Contour filter between on and off.

ADVICE:
❒ The Contour filter level (either a null or a peak) may be adjusted using Menu item "112 CONTOUR LEVEL". The factory default setting is for a null of –15 (dB).
❒ The bandwidth over which the Contour filter effect is applied may be adjusted using Menu item "113 CONTOUR WIDTH". The factory default setting is 10. When the set value is increased, the bandwidth becomes wider.

F(M-LIST) Button
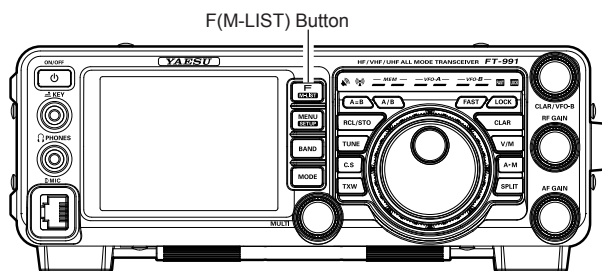
Refer to Figure "**B**", this illustrates an "indentation" of the Contour filter in the center of the passband. The Contour filter places a low-Q "notch" in the passband, per the settings of Menu items "112 CONTOUR LEVEL" and "113 CONTOUR WIDTH" (referenced above). Counterclockwise rotation (to the left) of the **MULTI** knob causes the notch to move toward a lower frequency within the passband, while clockwise rotation (to the right) causes the notch to move toward a higher frequency within the passband. By removing interference or unwanted frequency components of the incoming signal, it is possible to make the desired signal rise out of the background noise/interference, enhancing intelligibility.
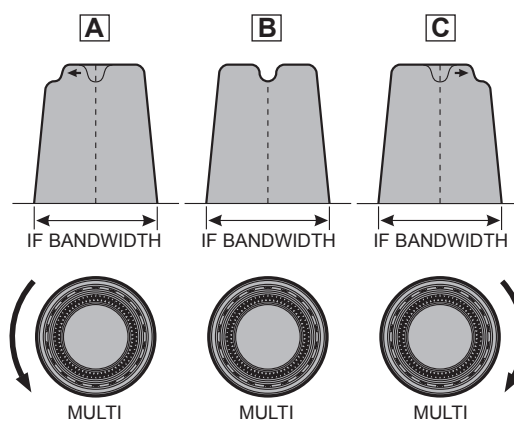
QUICK POINT:
By judicious use of the Contour filter, the "shoulder" of the passband response may be altered, or components may be removed from within the passband, allowing the desired signal to rise above the background noise and interference in a manner not obtainable with other filtering systems.
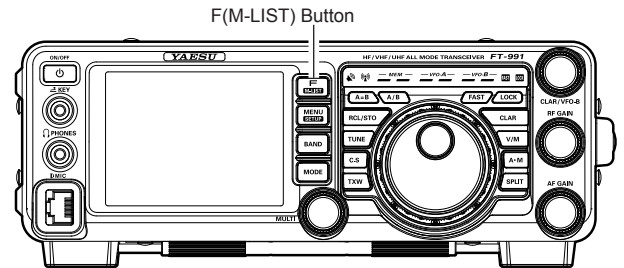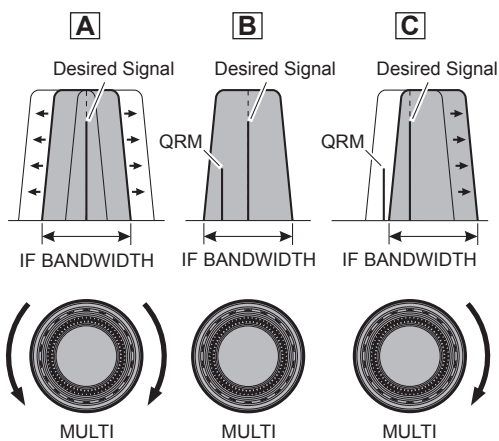
IF SHIFT OPERATION (SSB/CW/RTTY/PKT MODES)

IF SHIFT allows you to move the DSP filter passband higher or lower, without changing the pitch of the incoming signal, and thus reduces or eliminates interference. Because the carrier tuning frequency is not varied, there is no need to re-tune the operating frequency to eliminate the interference. The total passband tuning range for the IF SHIFT system is ±1 kHz.

1. Touch [**SHIFT**] displayed by pressing the **F(M-LIST)** button repeatedly to reduce the interference.

   ADVICE:

   The display will show the shift value of the IF SHIFT whenever [**SHIFT**] on the LCD is touched.

F(M-LIST) Button

Referring to Figure "**A**", note the depiction of the IF DSP filter as the thick line, with **MULTI** knob in the 12 o'clock position. In Figure "**B**", an interfering signal has appeared inside the original passband. In Figure "**C**", you can see the effect of rotating the **MULTI** knob. The interference level is reduced by moving the filter passband so that the interference is outside of the passband.

| A	B	C
Desired Signal	Desired Signal	Desired Signal
	QRM	QRM
IF BANDWIDTH	IF BANDWIDTH	IF BANDWIDTH
MULTI	MULTI	MULTI

INTERFERENCE REJECTION

WIDTH (IF DSP BANDWIDTH) TUNING (SSB/CW/RTTY/DATA MODES)

The IF WIDTH tuning system allows you to vary the width of the DSP IF passband, to reduce or eliminate interference. Moreover, the bandwidth may actually be *expanded* from its default setting, should you wish to enhance incoming signal fidelity when interference on the band is low.

1. Touch [**WIDTH**] displayed by pressing the **F(M-LIST)** button repeatedly to reduce the interference.
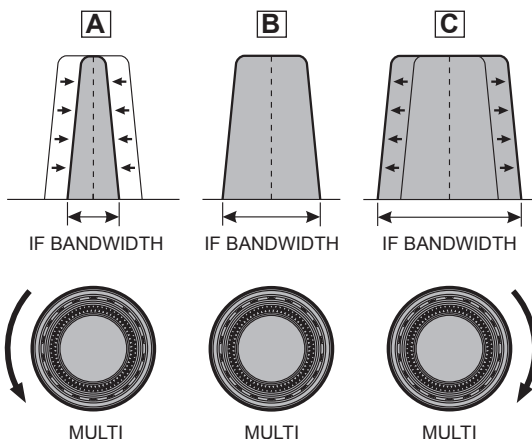   **ADVICE:**
   The frequency display will show the bandwidth of the IF passband whenever [**WIDTH**] is touched.

F(M-LIST) Button
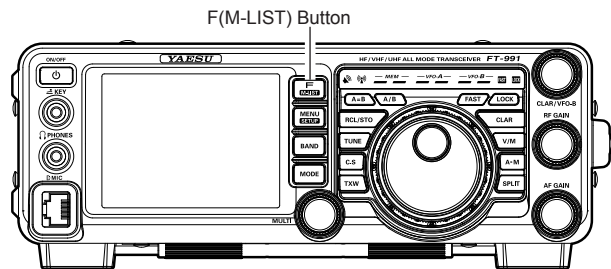
Referring to Figure "**B**", you can see the default bandwidth on the SSB mode.
By rotating the **MULTI** knob to the left, the bandwidth will narrow (see Figure "**A**", while rotation of the **MULTI** knob to the right, as depicted in Figure "**C**", will increase the bandwidth.


The default bandwidths, and total bandwidth adjustment range, will vary according to the operating mode:
SSB Mode: 1.8 kHz ~ 4.0 kHz (default: 2.4 kHz).
CW Mode: 500 Hz ~ 2.4 kHz (default: 2.4 kHz)
RTTY/DATA Modes: 500 Hz ~ 2.4 kHz (default: 500 Hz)

Using IF SHIFT and WIDTH Together

The IF SHIFT and Variable IF WIDTH features together form a very effective interference-fighting filtering system.

For example, in Figure "**A**", you can see how interference has appeared both on the high and low sides of the desired signal. Touch [**WIDTH**] on the LCD, the interference from one side can be eliminated (Figure "**B**"). Next, rotate the **MULTI** knob to re-position the passband (Figure "**C**"), the interference on the opposite side can be removed, without re-introducing the interference previously eliminated in Figure "**B**".
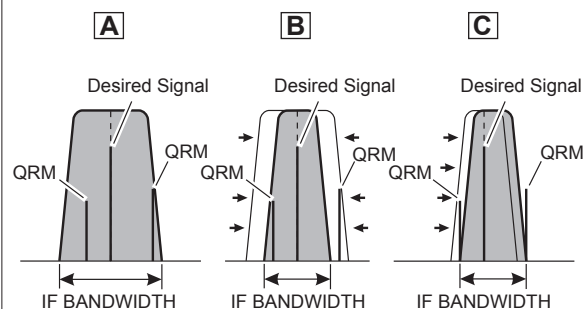
ADVICE:
For best interference reduction, the WIDTH and SHIFT features are the primary tools you should use, after narrowing the bandwidth (WIDTH) and/or adjusting the center of the passband (SHIFT). The Contour control may then yield additional signal-enhancement benefits on the net residual bandwidth. Even more, the IF NOTCH Filter (described later) may also be used, in conjunction with these filter systems, to significant advantage.

NARROW (NAR) ONE-TOUCH IF FILTER SELECTION

Touching [**NAR/WIDE**] displayed by pressing the **F(M-LIST)** button provides one-touch, mode-specific, selection of a narrow IF DSP filter setting that does not require resetting the bandwidth control to the WIDTH/SHIFT system.

Touching [**NAR/WIDE**] on the LCD once more returns the bandwidth control to the WIDTH/SHIFT system. The factory default bandwidths are:

F(M-LIST) Button

OPERATING MODE	[NAR/WIDE] TOUCH KEY	
	"ON"	"OFF"
SSB	200 Hz ~ 1.8 kHz✕ (1.5 kHz)	1.8 ~ 3.0 kHz✕ (2.4 kHz)
CW	50 ~ 500 Hz✕ (500 Hz)	500 Hz ~ 3.0 kHz✕ (2.4 kHz)
RTTY/DATA	50 ~ 500 Hz✕ (300 Hz)	500 Hz ~ 2.4 kHz✕ (500 Hz)
AM	6 kHz	9 kHz
FM (28/50/144/430 MHz Bands)	9 kHz	16 kHz

✕: Depends on the [**WIDTH**] setting
(   ): Default Bandwidth

ADVICE:
❒ When the narrow bandwidth is selected, the "**NAR**" icon will appear in the display.
❒ If [**NAR/WIDE**] on the LCD has been touched to engage the narrow filter, you may still adjust the narrow IF bandwidth with [**WIDTH**] on the LCD and the **MULTI** knob. The IF SHIFT is also operational.
❒ When you touch [**NAR/WIDE**] on the LCD in the FM mode, both transmit and receive bandwidths are narrowed.