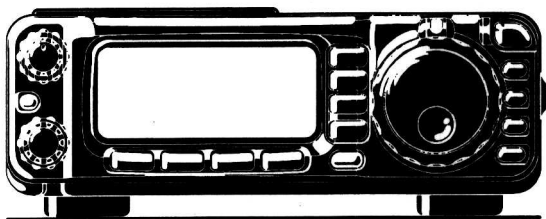




YAESU

FT-100D

OPERATING MANUAL



MICRO MOBILE

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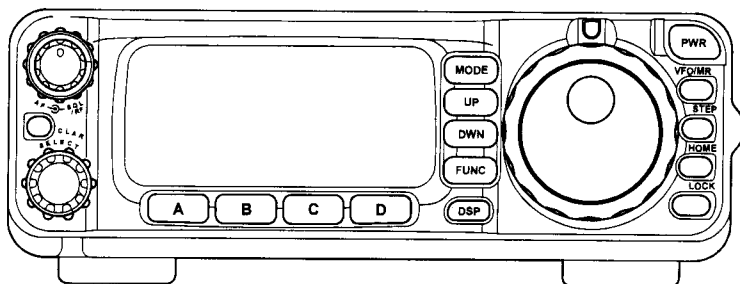
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General Description



The exciting new Yaesu FT-100 is a revolutionary multimode transceiver providing coverage of all nine MF/HF Amateur bands, plus VHF/UHF coverage of the 50, 144, and 430 MHz bands.

The FT-100's extraordinarily compact design, combined with the remote-head mounting capability (optional YSK-100 Separation Kit required) allows mounting in the most compact vehicular applications. Engineered for high performance, the FT-100 provides 100 Watts power output on the 160 through 6 meter bands, 50 Watts output on 2 meters, and 20 Watts output on 70 centimeters.

Among the leading-edge features of the FT-100 are Digital Signal Processing (Bandpass Filtering, Noise Reduction Notch, and Microphone Equalizer), Dual VFOs, four available IF bandwidths of 6 kHz, 2.4 kHz, 500 Hz, and 300 Hz (optional filters required for AM/CW), and extensive FM operating features such as CTCSS Encode (Decoder optional), DCS Encode/Decode, Automatic Repeater Shift, and ARTS (Auto-Range Transponder System). A convenient rear-panel jack allows effortless interface to Terminal Node Controllers for 300/1200/9600 bps Packet or AFSK operation on RTTY, AMTOR, and other Digital modes. CW operators will enjoy the built-in Message Memory Electronic Keyer, DSP-based narrow-bandwidth filter, and full QSK operation.

The unique Yaesu Icon display provides indication of the current operating features, along with warnings to the operator such as "High SWR," antenna problems, overheating of the power transistors, etc.

Thank you for your investment in the FT-100. We recommend that you read this manual in its entirety as soon as possible, so as to gain a fuller understanding of the many capabilities of your new transceiver.

Specifications

General

Frequency Range:	<u>Receive</u> 100 kHz – 970 MHz (European version) 100 kHz – 824 MHz, 849 – 864 MHz, and 894 – 961 MHz (U.S.A. version)
	<u>Transmit</u> 160 – 6 Meters 2 Meters 70 Centimeters (Amateur bands only) 5167.5 kHz: Alaska Emergency Frequency (U.S.A. version only)
Emission Modes:	A1 (CW), A3 (AM), A3J (LSB/USB), F1 (9600 bps Packet), F2 (1200 bps Packet), F3 (FM)
Synthesizer Steps (Min.):	1.25 Hz (CW/SSB), 100 Hz (AM), 100 Hz (FM), 1 kHz (FM)
Antenna Impedance:	50 Ω , Unbalanced
Operating Temp. Range:	–10 °C to +60 °C (14 °F to 122 °F)
Frequency Stability:	Better than ± 4 ppm (–10 °C to +50 °C) (SSB/CW/AM) Better than $\pm \{1 \text{ kHz} + 4 \text{ ppm}\}$ (FM)
Power Requirements:	DC 13.8V $\pm$ 10%, Negative Ground
Current Consumption:	Receive (Squelched): 1.2A, Receive (Max. Audio): 1.6A Transmit: 22A (@ 100W RF output)
Case Size	160(W) x 54(H) x 205(D) mm (6.3" x 2.2" x 8.0" WHD)
Weight:	3 kg. (6.6 lb.)

Transmitter

Power Output:	160 – 6m: 100 Watts (25 Watts AM carrier) 2m: 50 Watts (12.5 Watts AM carrier) 70cm: 20 Watts (5 Watts AM carrier)
Modulation Types:	SSB: Balanced Modulator FM: Variable Reactance AM: Early Stage (Low Level)
FM Maximum Deviation:	± 5 kHz (± 2.5 kHz on FM-N)
Spurious Radiation:	Harmonics: At least 40 dB down (1.8 – 29.7 MHz) At least 60 dB down (50/144/430 MHz) Non-harmonic: At least 50 dB down (1.8 – 29.7 MHz) At least 60 dB down (50/144/430 MHz)
Carrier Suppression:	At least 40 dB
Opp. Sideband Suppression:	At least 50 dB
SSB Frequency Response:	400 Hz – 2600 Hz (–6 dB)
Microphone Impedance:	200 Ω – 10k Ω (Supplied microphone: 2k Ω)

Receiver

Sensitivity:	SSB/CW	AM-N	FM
100 kHz – 150 kHz:	–	–	–
150 kHz – 250 kHz [*] :	5 μ V	40 μ V	–
250 kHz – 1.8 MHz [*] :	4 μ V	32 μ V	–
1.8 – 28 MHz [*] :	0.25 μ V	2 μ V	–
28 – 30 MHz:	0.25 μ V	2 μ V	0.50 μ V
50 – 54 MHz:	0.20 μ V	2 μ V	0.50 μ V
144/430 MHz:	0.125 μ V	2 μ V	0.20 μ V

Above specifications are worst-case.

*SSB/CW/AM-N figures are for 10 dB S/N, 12 dB SINAD on FM
^{*}: IPO off*

Squelch Sensitivity:	SSB/CW/AM	FM
1.8 – 28 MHz:	2.5 μ V	–
28 – 30 MHz:	2.5 μ V	0.32 μ V
50 – 54 MHz:	1.12 μ V	0.20 μ V
144/430 MHz:	0.8 μ V	0.16 μ V

Intermediate Frequencies:	1st IF: 68.985 MHz (SSB/CW/FM/Digital)
	67.980 MHz (W-FM)
	2nd IF: 11.705 MHz (SSB/CW/FM/Digital)
	10.700 MHz (W-FM)
	3rd IF: 455 kHz (FM)

Image Rejection:	Better than 70 dB (1.8 – 30 MHz, 50 – 54 MHz)
	Better than 60 dB (144 – 148 MHz, 430 – 440 MHz)

IF Rejection:	Better than 70 dB (1.8 – 30 MHz)
	Better than 60 dB (50 – 54 MHz, 144 – 148 MHz, 430 – 440 MHz)

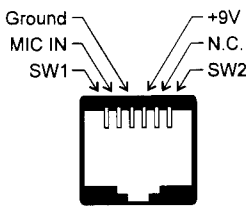
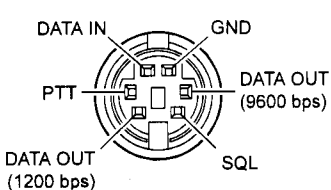
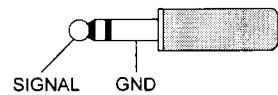
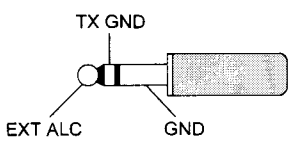
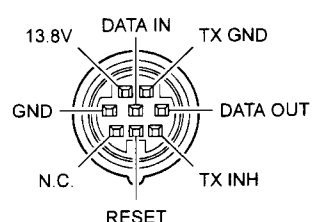
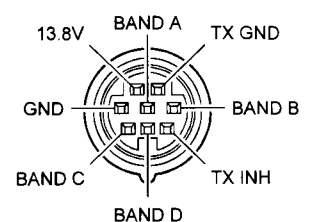
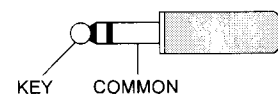
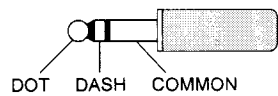
Selectivity (–6/–60 dB):	SSB/CW: 2.2 kHz/5.2 kHz
	CW: 450 Hz/1.8 kHz (Optional XF-117C installed)
	CW-N: 250 Hz/1.2 kHz (Optional XF-117CN installed)
	AM: 5.2 kHz/18 kHz (Optional XF-117A installed)
	FM: 15 kHz/25 kHz (–6/–50 dB)

Audio Output:	At least 1.5W into 8 Ω @ 10% THD
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Audio output impedance:	4 Ω – 8 Ω
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Specifications are subject to change without notice, and are guaranteed within amateur bands only.

Plug/Connector Pinout Diagrams

MIC Jack 	DATA Jack 
EXT SP Jack 	ACC Jack 
BAND DATA Cable Pigtail  (Internal Connection = CAT/TUNER:Default)  (Internal Connection = LINEAR)	
KEY Jack  (Straight Key)  (Internal Keyer)  Do not use 2-conductor type plug	

Accessories & Options

SUPPLIED ACCESSORIES

Hand Microphone	MH-42B6JS or MH-36B6JS (depending on transceiver version)
Power Cable	T9021925
Spare Fuse	25A (Q0000074)
Mobile Mounting Bracket	MMB-48
Operating Manual	

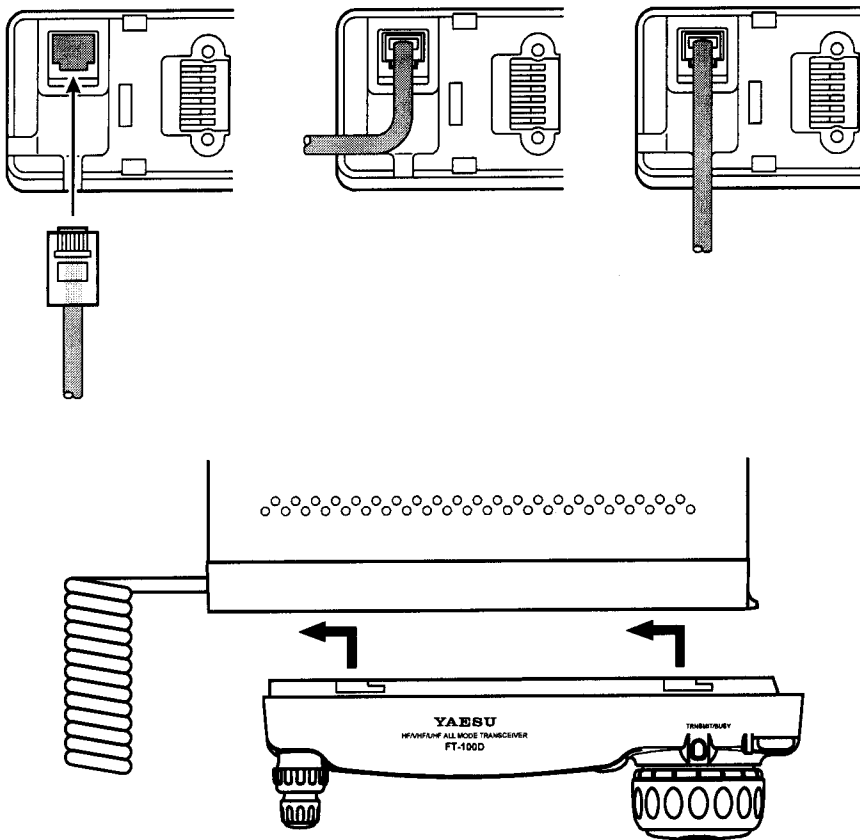
AVAILABLE OPTIONS

Separation Kit	YSK-100
External Automatic Antenna Tuner	FC-20
Active-Tuning Antenna System	ATAS-100
Antenna Base Kit	ATBK-100
High-Stability Reference Oscillator	TCXO-8
External AC Power Supply (30A)	FP-1030A
Compact Power Supply (23A)	FP-1023A (U.S.A. only)
Solid-State Linear Amplifier	VL-1000
CW Filter (300 Hz)	XF-117CN
CW Filter (500 Hz)	XF-117C
AM Filter (6 kHz)	XF-117A
Interface Cable (for VL-1000)	CT-58
Mobile Remote Head Bracket	MMB-62
Quick-Release Mobile Bracket	MMB-67
CTCSS Decoder Unit	FTS-27
DTMF Microphone	MH-36B6JS
Hand Microphone	MH-42B6JS
Packet Interface Cable	CT-39
CAT Interface Cable	CT-62

Installation

INSTALLING THE MICROPHONE AND FRONT PANEL

1. Insert the microphone's plug into the recessed jack on the transceiver, as shown in the drawing.
2. You can position the microphone cable so as to cause it to exit from the side or the bottom of the transceiver. Just route the cable into the appropriate channel provided, as shown in the illustration.
3. Install the front panel by sliding it into the position shown; you will hear a "click" when the panel locks into place.
4. To remove the front panel, use your right thumb to pry open (slightly) the latch on the right-hand of the panel, then slide the panel outward and away from the transceiver.



Installation

POWER CONNECTIONS

The DC power connector for the FT-100 must only be connected to a DC source providing 13.8 Volts DC ($\pm 10\%$), and capable of at least 22 Amperes of current. Always observe proper polarity when making DC connections:

**The RED DC power lead connects to the POSITIVE (+) DC terminal; and
The BLACK DC power lead connects to the NEGATIVE (–) DC terminal.**

For base station installations, Yaesu recommends the use of the FP-1023, FP-1025, or FP-1030A AC power supplies. Other models of power supplies may be used with the FT-100, but the 13.8V DC input voltage, 22-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-100 transceiver, but the wiring configuration of the other manufacturer's plug 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.

In mobile installations, noise pickup may be minimized by connecting the DC cable directly to your vehicle's battery, rather than to the ignition switch or "accessory" circuitry. Direct connection to the battery also provides the best voltage stability.

Tips for Successful Mobile Installations:

- ☐ Before connecting the DC cable to the battery, measure the voltage across the battery terminals with the engine running fast enough to show a charge. If the voltage is above 15 Volts, the vehicle's voltage regulator should be adjusted to reduce the charging voltage to 14 Volts or lower.
- ☐ Route the DC cable as far away from the ignition cables as possible.
- ☐ If the DC cable is not long enough, use #12 AWG (minimum) stranded, insulated wire to extend it. Be certain to solder the connections at the splice securely, and provide ample insulation for the soldered splice (heat shrink tubing plus black electrical tape work well).
- ☐ Check the battery terminal connections frequently to be sure they are tight and not corroded.

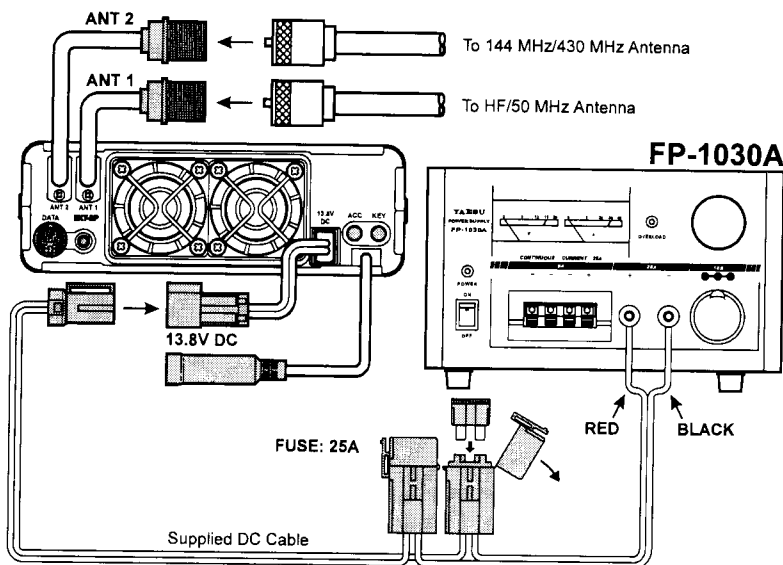
Caution

Permanent damage can result if improper supply voltage, or reverse-polarity voltage, is applied to the FT-100. 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 $\pm 10\%$. *Never attempt to connect the FT-100 to a 24 Volt battery system.*

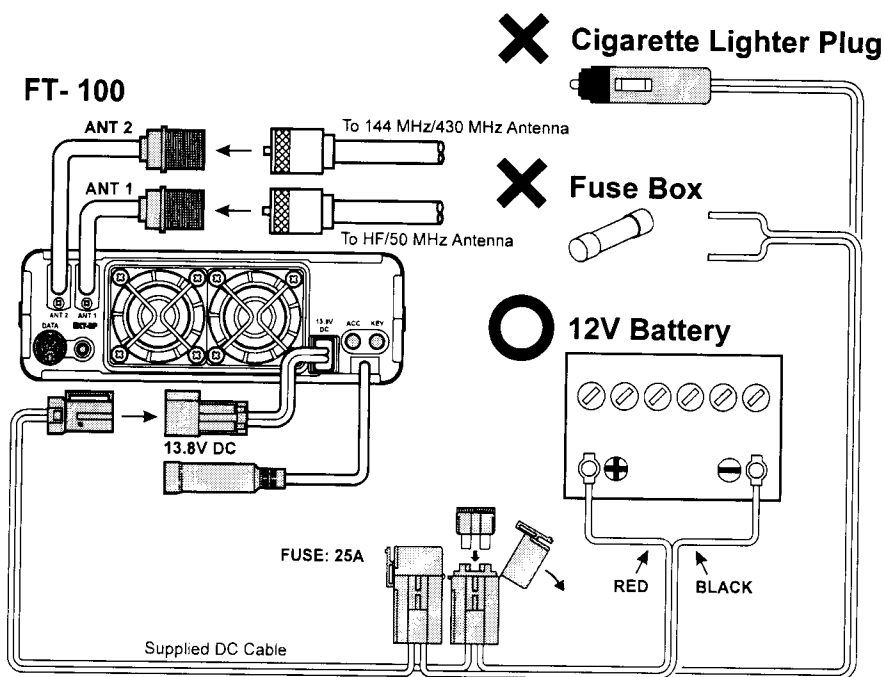
When replacing fuses, be certain to use a fuse of the proper rating. The FT-100 requires a 25A fast-blow fuse.

POWER CONNECTIONS

FT- 100



FT- 100



GROUNDING

The provision of an effective ground system is important in any successful communications station. 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 which may cause interference to nearby home entertainment devices or laboratory test equipment.
- ☐ It can minimize the possibility of erratic transceiver operation caused by RF feedback 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 presented below is intended only as a guideline.

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

Mobile Station Grounding

Although satisfactory grounding in most installations will be achieved via the DC cable's negative lead and the antenna system's coaxial cable shield, it is often recommended that you provide a direct ground connection to the vehicle chassis *at the mounting location of the transceiver* (installation using the MMB-48 Mobile Bracket will accomplish this, if the MMB-48 itself is mounted to the vehicle's chassis). Due to unexpected resonances which may naturally occur in any location, improper communication system performance may result from insufficient grounding. These symptoms may include:

- ☐ RF feedback (resulting in distortion on your transmitted signal);
- ☐ Unintended frequency change;
- ☐ Blinking or blanking of the frequency display;
- ☐ Noise pickup; and/or
- ☐ Loss of memory.

Note that these conditions may occur in *any* communications installation. The FT-100 includes extensive filtering designed to minimize the chance of such problems; however, random currents set up by insufficient RF grounding can nullify such filtering. Bonding the rear panel Ground lug of the FT-100 transceiver to the vehicle or vessel's ground system should clear up any such difficulties.

Yaesu does not recommend the use of "on glass" mobile antennas unless the shield of the coaxial cable is securely grounded near the feedpoint of the antenna. Such antennas frequently are responsible for the ground-related difficulties described above.

GROUNDING

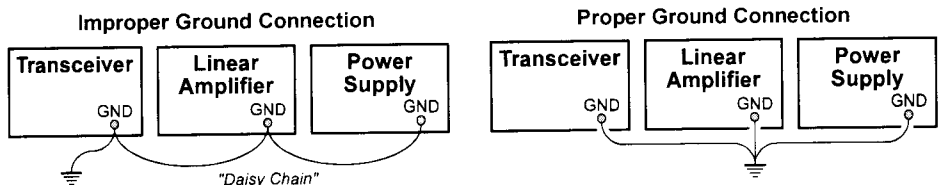
Base Station Earth Grounding

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 configured 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 cables 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).

Do not use gas line pipes in an attempt to provide a ground connection! To do so creates a serious risk of explosion!!

Inside 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 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 drawings below for examples of proper and improper ground connections. If your coaxial cable does not connect directly to the station ground bus, you may connect a ground cable to the FT-100 using one of the mounting bolts from the MMB-48 Mobile Bracket.



Installation

ANTENNA CONSIDERATIONS

The antenna systems connected to your FT-100 transceiver are, of course, critically important in ensuring successful communications. The FT-100 is designed for use with any antenna system providing a 50Ω resistive impedance at the desired operating frequency. While minor excursions from the 50Ω specification are of no consequence, the power amplifier's protection circuitry will begin to reduce the power output of there is more than a 50% divergence from the specified impedance (less than 33Ω or greater than 75Ω , corresponding to a Standing Wave Ratio (SWR) of 1.5:1).

Two antenna connector "pigtailes" are provided on the rear panel of the FT-100. The "**ANTENNA 1**" connection is used for HF and 50 MHz, while the "**ANTENNA 2**" connector is used for 144 MHz and 430 MHz.

Guidelines for successful base and mobile station installations are shown below.

Mobile Antenna Installations

Mobile antennas for the HF bands, with the possible exception of those designed for 28 MHz, display very high "Q" due to the fact that they must be physically shortened, then resonated using a loading coil. Additional system bandwidth may be realized using the Yaesu **FC-20** Automatic Antenna Tuner, which will present a 50Ω impedance to your transceiver on the 1.8 ~ 50 MHz bands so long as the SWR on the coaxial line connected to the **FC-20** is below 3:1.

On the VHF and UHF bands, coaxial line losses increase so rapidly in the presence of SWR that we recommend that all impedance matching to 50Ω be performed at the antenna feedpoint.

Yaesu's Active-Tuned Antenna System (**ATAS-100**) is a unique HF/VHF/UHF mobile antenna system, which provides automatic tuning when used with the FT-100. See page 62 for full details on the **ATAS-100**.

For VHF/UHF weak-signal (CW/SSB) operation, remember that the antenna polarization standard for these modes is horizontal, not vertical, so you must use a loop or otherwise horizontally-polarized antenna so as to avoid cross-polarization loss of signal strength (which can be 20 dB or more!). On HF, signals propagated via the ionosphere develop mixed polarizations, so antenna selection may be made strictly on mechanical considerations; vertical antennas are almost always utilized on HF for this reason.

ANTENNA CONSIDERATIONS

Base Station Antenna Installations

When installing a “balanced” antenna such as a Yagi or dipole, remember that the FT-100 is designed for use with an (unbalanced) coaxial feedline. Always use a balun or other balancing device so as to ensure proper antenna system performance.

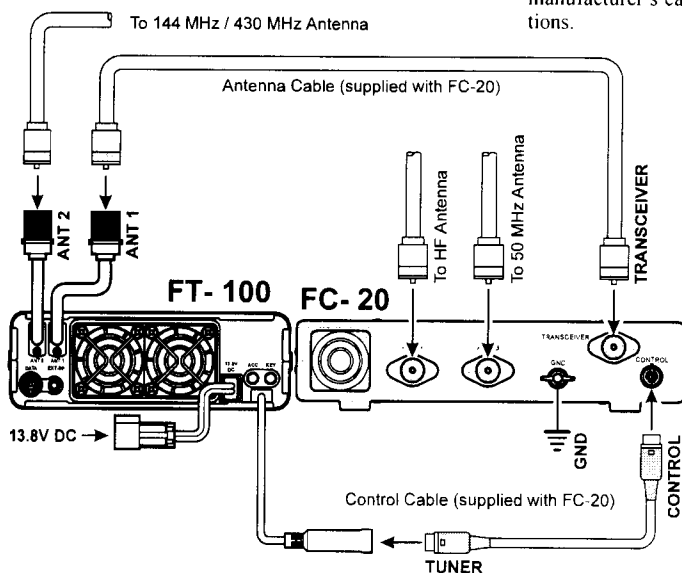
Use high-quality 50Ω coaxial cable for the lead-in to your FT-100 transceiver. All efforts at providing an efficient antenna system will be wasted if poor quality, lossy coaxial cable is used. Losses in coaxial lines increase as the frequency increases, so a coaxial line with 0.5 dB of loss at 7 MHz may have 6 dB of loss at 432 MHz (thereby consuming 75% of your transceiver’s power output!). As a general rule, smaller-diameter coaxial cables tend to have higher losses than larger-diameter cables, although the precise differences depend on the cable construction, materials, and the quality of the connectors used with the cable. See the cable manufacturers’ specifications for details.

For reference, the chart below shows approximate loss figures for typically- available coaxial cables frequently used in HF installations.

**Loss in dB per 30m (100 feet)
for Selected 50Ω Coaxial Cables**

CABLE TYPE	Loss		
	1.8 MHz	28 MHz	432 MHz
RG-58A	0.55	2.60	>10
RG-58 Foam	0.54	2.00	8.0
RG-8X	0.39	1.85	7.0
RG-8A, RG-213	0.27	1.25	5.9
RG-8 Foam	0.22	0.88	3.7
Belden 9913	0.18	0.69	2.9
7/8" "Hardline"	<0.1	0.25	1.3

Loss figures are approximate; consult cable manufacturer’s catalogs for complete specifications.



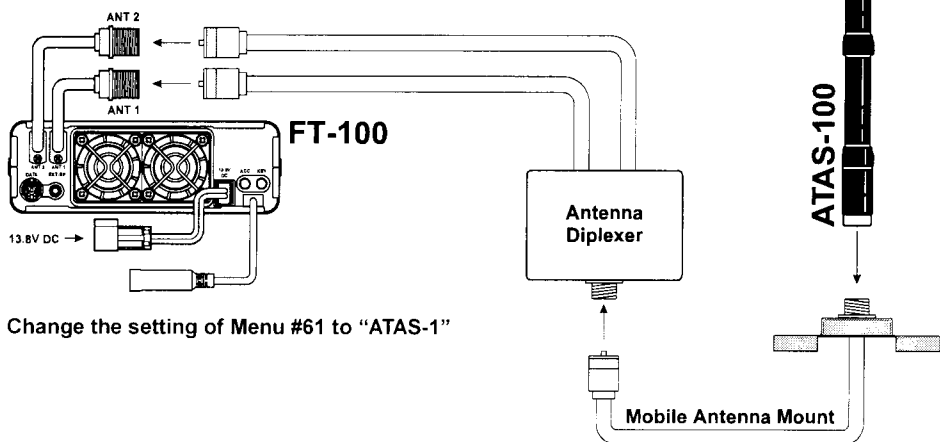
Installation

ANTENNA CONSIDERATIONS

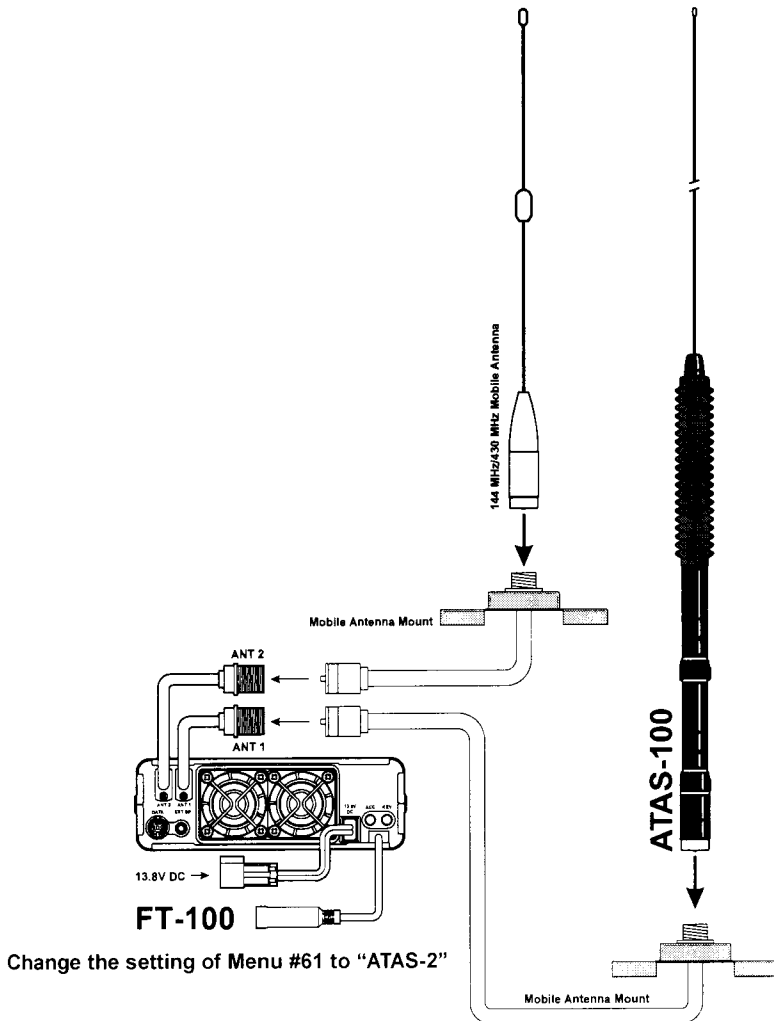
Always locate antennas such that they can *never* come in contact with outdoor power lines in the event of a catastrophic support or power-pole structural failure. Ground your antennas' support structure(s) adequately, so as to dissipate energy absorbed during a lightning strike. Install appropriate lightning arrestors in the antenna coaxial cables (and rotator cables, if rotary antennas are used).

In the event of an approaching electrical storm, disconnect all antenna lead-in, rotator cables, and power cables *completely* from your station **if the storm is not immediately in your area**. Do not allow disconnected cables to touch the case of your FT-100 transceiver or accessories, as lightning can easily jump from the cable to the circuitry of your transceiver via the case, causing irreparable damage. If a lightning storm is in progress in your immediate area, do not attempt to disconnect the cables, as you could be killed instantly if lightning should strike your antenna structure or a nearby power line.

If a vertical antenna is utilized, be certain that humans and/or pets and farm animals are kept away both from the radiating element (to prevent electrical shock and RF exposure danger) *and* the ground system (in the event of an electrical storm). The buried radials of a ground-mounted vertical antenna can carry lethal voltages outward from the center of the antenna in the event of a direct lightning strike.



ANTENNA CONSIDERATIONS



RF FIELD EXPOSURE

This transceiver is capable of power output in excess of 50 Watts, so customers in the United States *may* be required to demonstrate compliance with Federal Communications Commission (FCC) regulations concerning maximum permissible exposure to radio frequency energy. Compliance is based on the actual power output used, feedline loss, antenna type and height, and other factors which can only be evaluated as a system.

Information regarding these regulations may be available from your Dealer, your local radio club, from the FCC directly (press releases and other information can be found on the FCC's site on the World Wide Web at <<http://www.fcc.gov>>), or from the American Radio Relay League, Inc. (225 Main St., Newington CT 06111 or <<http://www.arrl.org>>).

Although there is negligible radio frequency (RF) leakage from the FT-100 transceiver itself, its antenna system should be located as far away from humans and animals as practicable, so as to avoid the possibility of shock due to accidental contact with the antenna or excessive long-term exposure to RF energy. During mobile operation, do not transmit if someone is standing adjacent to your antenna, and use the lowest power possible.

Never stand in front of an antenna (during testing or operation) when RF power is applied, *especially* in the case of 430 MHz directional arrays. The 20 Watt power output supplied by the FT-100, combined with the directivity of a beam antenna, can cause immediate heating of human or animal tissues, and may cause other undesirable medical effects.

ELECTROMAGNETIC COMPATIBILITY

If this transceiver is used with, or in the vicinity of, a computer or computer-driven accessories, you may need to experiment with grounding and/or Radio Frequency Interference (RFI) suppression devices (such as ferrite cores) to minimize interference to *your* communications caused by energy from the computer. Computer-generated RFI is usually a result of inadequate shielding of the computer's cabinet or I/O and peripheral connections. While computer equipment may "comply" with RF emission standards, this does *not* ensure that sensitive Amateur Radio receivers like the FT-100 will not experience interference from the device!

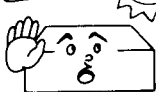
Be certain to use only shielded cables for TNC-to-Transceiver connections. You may need to install AC line filters on the power cord(s) of the suspected equipment, and decoupling ferrite toroidal chokes may be required on interconnecting patch/data cables. As a last resort, you can try installing additional shielding within the computer's case, using appropriate conductive mesh or conductive shielding tape. Especially check "RF holes" where plastic is used for cabinet front panels.

For further information, consult amateur radio reference guides and publications relating to RFI suppression techniques.

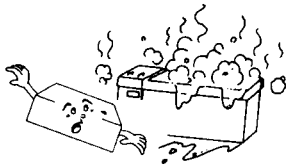
HEAT AND VENTILATION

To ensure long life of the components, be certain to provide adequate ventilation around the cabinet of the FT-100. The cooling system of the transceiver must be free to draw cool air in from the side of the transceiver and expel warm air from the rear of the transceiver.

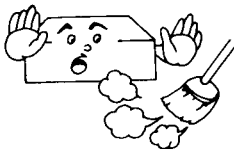
Do not install the transceiver on top of another heat-generating device (such as a linear amplifier), and do not place equipment, books, or papers on top of the transceiver. Place the transceiver on a hard, flat, stable surface. Avoid heating vents and window locations that could expose the transceiver to excessive direct sunlight, especially in hot climates.



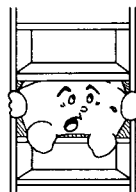
Heat



Water & Moisture



Dust



Ventilation

ACCESSORY INTERFACING

The FT-100 may be connected to a wide variety of accessories in your amateur station, whether you're at home or away. Due to the compact size of the FT-100, many of the rear-panel connectors are used for more than one purpose. The sections to follow will describe the interfacing procedures.

Linear Amplifier Interfacing

The FT-100 provides the switching and drive-control lines required for easy interfacing to most all commonly-available amplifiers sold today.

These include:

- The Antenna Cable Pigtails (#1 and #2);
- A T/R control line (open circuit on RX, closure to ground on TX); and
- A negative-going ALC jack (control voltage range: 0V to -4V DC).
- When interfacing to the VL-1000 Solid State 1 KW Linear Amplifier, the optional **CT-58** Interface Cable provides for easy interconnection.

The rear-panel **ACC** jack is a miniature stereo type, which accepts ALC control voltage input on the tip connection, and T/R control on the ring connection. The main shaft is used for the ground connection.

Typical amplifier interface circuits are shown below.

Note that some amplifiers, particularly VHF or UHF “brick” amplifiers, offer two methods of T/R switching: application of +13V *or* a closure to ground.

Be sure to configure your amplifier so that it switches via a *closure to ground*, as provided by your FT-100. Alternatively, many of these amplifiers use “RF Sensing” to control their relays; if yours is not in this category, you may then use the T/R control line from the ring of the **ACC** jack for control of your HF linear amplifier, if desired.

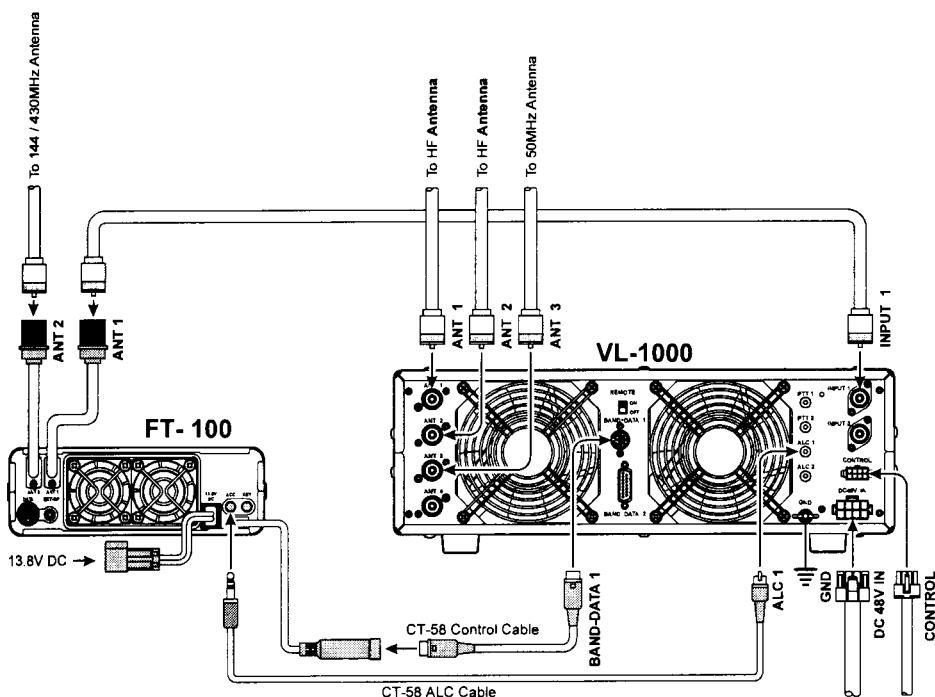
The T/R control line is a transistor “open collector” circuit, capable of handling *positive* amplifier relay coil voltages of up to +50V DC and current of up to 400 mA. If you plan on using multiple linear amplifiers for different bands, you must provide external band-switching of the “LIN TX” relay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

Important Note!

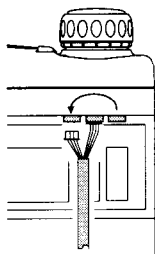
Do not exceed the maximum voltage or current ratings for the **ACC** jack. This jack is not compatible with negative DC voltages, nor AC voltages of any magnitude.

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-100 will easily accommodate such amplifiers.

ACCESSORY INTERFACING



When operating the FT-100 with the VL-1000 Solid State 1KW Linear Amplifier, change the internal connections of the FT-100, as shown below.



Bottom Side

This connection matches the "LINEAR" configuration shown on Page 4.

Installation

ACCESSORY INTERFACING

AFSK TNC Connections (for RTTY, Packet, etc.)

The FT-100 is easy to connect to most all Terminal Node Controllers (TNCs) or other digital modem units used for RTTY, HF Packet, and other digital modes which utilize USB or LSB as the fundamental operating mode.

Audio Frequency-Shifted Keying (AFSK) operation for HF Baudot, AMTOR, 300 bps Packet, etc. is provided via the rear-panel **DATA** jack. Pin 1 of this jack accepts AFSK input from the TNC's "TX Audio" line. Pin 3 is used for PTT control (the TNC closes this line to ground to cause the FT-100 to transmit). Pin 5 is used for "RX Audio" which is sent to the TNC for decoding. Pin 2 is used for Ground for all lines.

The optimum levels/impedances are shown below:

Pin 1 (Data In): 40 mV @ 10 k Ω

Pin 5 (Data Out): 300 mV @ 10 k Ω

When operating on AFSK, the microphone is automatically disconnected when the radio's microprocessor detects PTT control from the **DATA** jack. Therefore, it is not necessary to disconnect the microphone during digital mode operation.

Typical interconnection information is presented below.

For operation on RTTY, HF Packet, etc., several Menu selections must be set appropriately. These include:

MENU #21 (HF TX PO): Set to 50W after adjusting AFSK Level (see page 88)

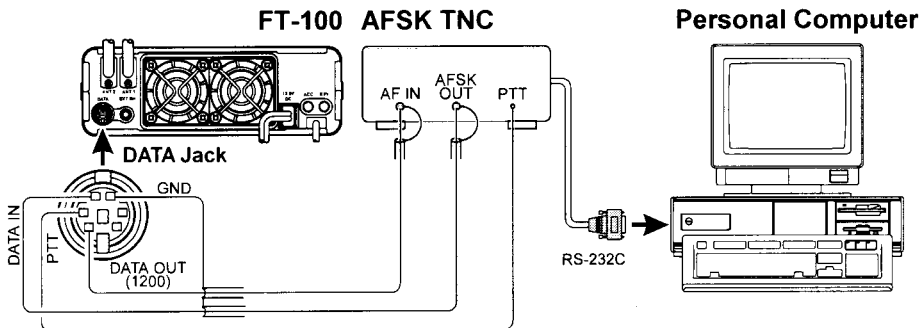
MENU #28 (AFSK LEVEL): Set for 4 "dots" of ALC indication (see page 89)

MENU #34 (AFSK MODE): Set for desired mode

MENU #35 (RTTY SHIFT): Set to match shift set in your TNC

MENU #36 (RTTY DISPLY): Set for offset or non-offset frequency display

Details regarding these and other MENU settings may be found beginning on page 82.



ACCESSORY INTERFACING

FM Packet TNC Interfacing

The rear-panel **DATA** jack is also used for connections to a TNC for FM Packet work. The FM Packet connections are in accordance with a standard adopted by many Amateur-product manufacturers. However, we recommend that you verify the connections to any cable you may already own by comparing it to the pictorial below.

The FT-100's **DATA** jack connections are optimized for the data transmission and reception speed in use. In accordance with the aforementioned industry standards, the signal levels, impedances, and bandwidths are significantly different on 9600 bps as opposed to 1200 bps. If your TNC does not provide multiple lines to accommodate such optimization, you may still be able to utilize your TNC if it is designed for multiple-radio use; connect the TNC "Radio 1" port to the 1200 bps lines on the FT-100, and the "Radio 2" port to the 9600 bps lines.

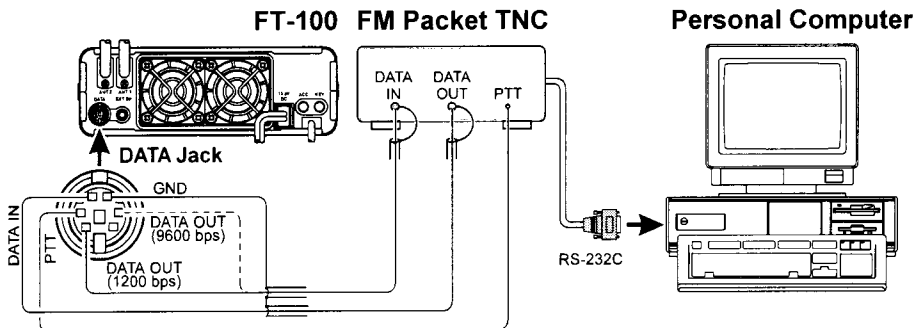
For ease in making connections to your packet TNC, the optional **CT-39** Packet Cable is available from your Yaesu dealer. With reference to the "**DATA Jack Pin Connections**" chart and the **DATA** jack pinout on page 4, you may connect your TNC in minutes using the color-coded information provided.

Most modern TNCs use a PLL-type DCD (Data Carrier Detect) circuit, so you will generally not need to connect anything to the Squelch Control line (Pin 6) of the **DATA** jack.

Note that 9600 bps packet transmit-deviation adjustment is very critical to successful operation, and can only be accomplished using a calibrated deviation meter (such as that

DATA Jack Pin Connections

Pin	Label	Notes
1	PKD	Packet Data Input Impedance: 10 k Ω Max. Input Level: 40 mV pp @ 1200bps 2.0 V pp @ 9600bps
2	GND	Signal Ground
3	PTT	Ground on Transmit
4	RX9600	9600bps Packet Data Out Impedance: 10 k Ω Max. Output Level: 500 mV pp
5	RX1200	1200bps Packet Data Out Impedance: 10 k Ω Max. Output Level: 300 mV pp
6	SQL	Squelch Control Squelch Open: +5V Squelch Closed: 0V



Installation

ACCESSORY INTERFACING

found on an FM Service Monitor used in a communications service center). In most cases, the Packet Data Input level (set via a potentiometer inside the TNC) must be adjusted to provide a deviation of ± 2.75 kHz (± 0.25 kHz). Check with your packet node's sysop if you have any questions about the appropriate deviation level for your network.

The setting of the 1200 bps Packet Data Input level is much less critical, and satisfactory adjustment to the optimum ($\pm 2.5 \sim \pm 3.5$ kHz) deviation can usually be done "by ear" by adjusting the TNC's 1200 bps TX Audio Level potentiometer so that the outgoing packets (as monitored on a separate VHF or UHF receiver) are slightly lower than the level of your speech. If you have the optional **MH-36B6JS** DTMF Microphone, set your TNC's tone output to be about the same level as that of the DTMF tones produced by the **MH-36B6JS**.

The "RX 1200" and "RX 9600" lines are fixed-level audio outputs, not affected by the setting of the **AF** (GAIN) control.

CW Key/Keyer Connections

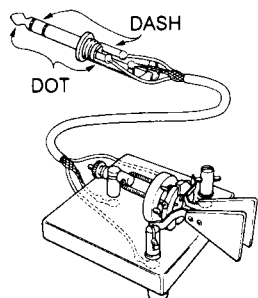
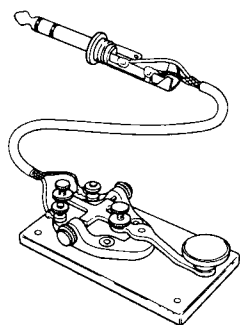
All commonly-available keyer paddles should work perfectly with the built-in Electronic Keyer. The wiring configuration for the paddle is shown below.

For straight-key operation, only the tip and shaft connections are used.

Note: Even when using a straight key, you must use a three-conductor ("stereo") plug. If a two-conductor plug is used, the key line will be constantly shorted to ground.

When using an external electronic keyer, be absolutely certain that it is configured for "positive" keying, not "negative" or "grid block" keying. The "key-up" voltage of the FT-100 is +5V, and the "key-down" current is only about 1 mA.

For CW automated keying using a personal computer, with an external memory keyer providing for manual sending, it usually is possible to connect the keyed lines together via a "Y" connector. Check with the documentation accompanying your keyer and your contest/DX software for any cautions which need to be observed.



ACCESSORY INTERFACING

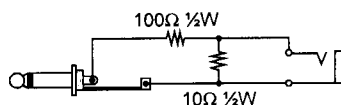
Receiver Accessories (Tape Recorder, WeatherFax Demodulator, etc.)

Connection of a tape recorder, WeatherFax demodulator, or other such receiver accessory is easily accomplished by using the **DATA** jack's **DATA OUT** (1200 bps) terminal (Pin 5) and Ground (Pin 2). The audio output is fixed at 100 mV, with an impedance of 600 Ω .

CONNECTION OF HEADPHONES

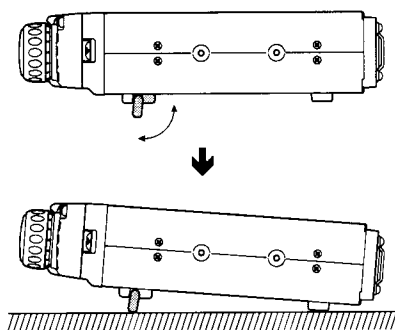
The FT-100's extremely compact size does not permit inclusion of a headphone jack. Direct connection of 4 Ω or 8 Ω headphones to the Speaker jack, however, could cause hearing damage, due to the high level of audio output available at that jack.

To connect headphones to the Speaker jack, build a small attenuator circuit into a small adapter box. Connect a 100 Ω $\frac{1}{2}$ W resistor in series with the headphone line, and a 10 Ω $\frac{1}{2}$ W resistor shunt to the shield (ground).

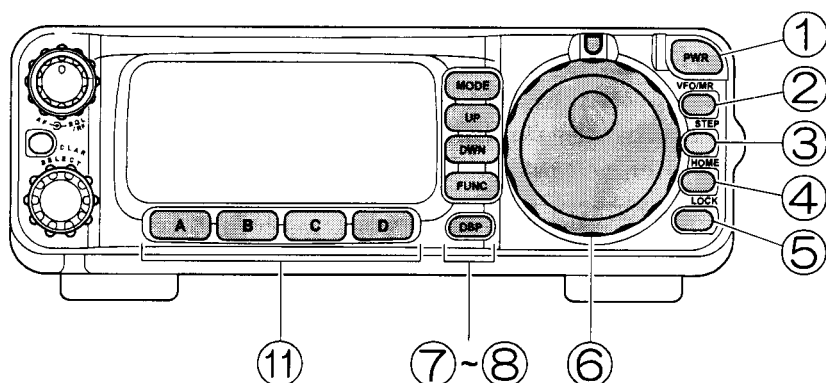


ADJUSTING THE FRONT FEET

The two front feet of the transceiver allow the transceiver to be tilted upward for better viewing. Simply fold both feet forward to raise the front of the transceiver, and fold them back against the bottom case to lower the front of the FT-100.



Front Panel Controls and Switches



① **PWR** Switch

Press and hold in the **PWR** switch for ½ second to turn the transceiver on or off.

② **VFO/MR** Key

Pressing this key switches frequency control between the VFO and Memory Systems.

③ **STEP** Key

Press this key momentarily to change the tuning steps of the **MAIN DIAL** and the **SELECT** knob. The **STEP** key toggles the tuning steps through the following Selections:

MAIN DIAL

SSB/CW: 1.25 → 2.5 → 5 → 10 → 25 → 50 → 100 → 1.25 ... (Hz)

AM/FM: 100 Hz (fixed)

W-FM: 1 kHz (fixed)

SELECT Knob

SSB/CW: 10 kHz (fixed)

AM: 1k → 5k → 9k → 10k → 12.5k → 25k → 1k ... (Hz)

FM: 5k → 10k → 12.5k → 15k → 20k → 25k → 50k → 5k ... (Hz)

W-FM: 50k → 100k → 50k (Hz)

In the SSB/CW mode, press and hold the **STEP** key for ½ second to change the tuning steps of the **SELECT** knob to 1 kHz.

④ **HOME** Key

Pressing this key momentarily recalls a favorite “HOME” frequency memory.

Press and hold this key to activate the 1750 Hz Burst Tone used (primarily in Europe) for repeater access.

Front Panel Controls and Switches

⑤ **LOCK** Key

Pressing this key locks the **MAIN DIAL**, so as to prevent accidental frequency change.

⑥ **MAIN DIAL**

This is the main tuning dial for the transceiver. It is used both for frequency tuning as well as “MENU” setting in the FT-100.

⑦ **FUNC** Key

The “**Function**” key is used to select one of the nine operations available on each of the **[A]**, **[B]**, **[C]**, or **[D]** keys. These keys are located below the LCD (display).

⑧ **MODE** Key

Pressing this key repeatedly allows selection of the operating mode. The selections available are:

SSB (LSB or USB) → CW → AM → FM → SSB (LSB or USB) ...

Pressing *and holding in* this key for ½ second allows toggling of modes within a mode group (**LSB ⇄ USB**, **CW ⇄ CW-R** [Reverse], **AM ⇄ DIG**, and **FM ⇄ W**[Wide]-**FM**).

⑨ **UP/DWN** Keys

Pressing one of these keys momentarily will cause the frequency to be moved up or down by one Amateur band.

⑩ **DSP** Key

Pressing this key momentarily provides instant access to Operating Function Row 9, which contains the command keys for the receiver’s **Digital Signal Processing** system. The available functions will appear as the functions displayed above the **[A]** ~ **[D]** keys, described below.

⑪ **FUNC** Key

These four keys select many of the most important operating features of the FT-100. Above each of the **[A]** ~ **[D]** keys (along the bottom of the LCD) is a label describing the current function of that key; pressing the **FUNC** key repeatedly scrolls the display through nine rows of functions available for use via the **[A]** ~ **[D]** keys.

The available features are shown in the chart below.

Front Panel Controls and Switches

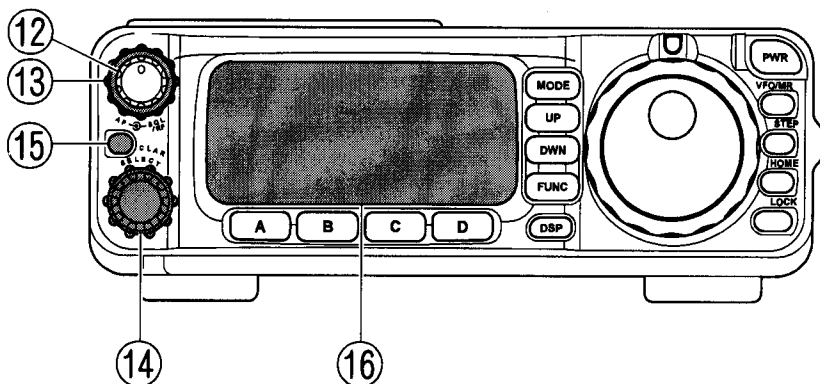
Func	[A] Key	[B] Key	[C] Key	[D] Key
1	A/B Press the [A] key to switch between VFO-A and VFO-B on the display.	A=B Press and hold the [B] key for ½ second to copy the contents of VFO-A into the VFO-B register, so that the two VFOs' contents will be identical.	SPL Press the [C] key momentarily to activate SPLIT frequency operation between VFO-A and VFO-B.	QMB Pressing the [D] key repeatedly recalls the QMB Memories sequentially. Pressing the [VFO/MR] key and <i>holding it in</i> for ½ second will store the VFO frequency into the next-available QMB Memory register.
2	V>M Press and hold the [A] key for ½ second to transfer the contents of the VFO into a Memory register.	M>V Press and hold the [B] key for ½ second to transfer the contents of the currently-selected Memory channel into the VFO.	RPT Pressing the [C] key while operating on FM causes the default repeater shift to be applied to the operating frequency when you transmit.	REV Pressing the [D] key during repeater operation causes the uplink and downlink frequencies to be reversed.
3	TON Press the [A] key to activate the CTCSS system.	DCS Press the [B] key to activate the DCS system.	ART Press the [C] key to initiate the Auto-Range Transponder mode.	- No function.
4	SKP Pressing the [A] key designates the current Memory channel to be "skipped" during scanning.	SCN Press and hold the [B] key for ½ second to initiate scanning (in the direction of <i>higher</i> frequencies).	DW Press the [C] key to activate the Dual Watch system.	SCH Press the [D] key to activate Smart Search™ operation.
5	IPO Press the [A] key to bypass the receiver preamplifier, thereby causing Intercept Point Optimization for improved strong-signal characteristics. IPO does not function on 144/430 MHz.	ATT Press the [B] key to engage the receiver front-end attenuator, which will reduce all signals and noise by 12 dB. The ATT does not function on 144/430 MHz.	AGC Press the [C] key to select the recovery time (Fast , Slow , or Auto) for the receiver's AGC system.	NB Press the [D] key to activate the receiver's IF Noise Blanker. Press and hold the [D] key for ½ second to recall MENU #60 (for setting of the NB Level).
6	6.0 Press the [A] key to select the 6.0 kHz IF filter.	2.4 Press the [B] key to select the 2.4 kHz IF filter.	500 Press the [C] key to select the 500 Hz IF filter.	300 Press the [D] key to select the 300 Hz IF filter.

Front Panel Controls and Switches

Func	[A] Key	[B] Key	[C] Key	[D] Key
7	MTR Press the [A] key to select the display function of the Meter in the transmit mode (ALC or SWR indication).	TUN Press the [B] key to activate the optional FC-20 Automatic Antenna Tuner or ATAS-100 Active-Tuning Antenna System. Press and hold the [B] key for ½ second to initiate tuner or antenna retuning.	PRO Press the [C] key to activate the Speech Processor (SSB/AM modes only). Press and hold the [C] key for ½ second to recall MENU #27 (for setting the compression level).	VOX Press the [D] key to enable the VOX (voice-operated transmitter switching) system in the SSB, AM, and FM modes. Press and hold the [D] key for ½ second to recall MENU #54 (to set the VOX Gain level).
8	WRI Press and hold the [A] key for ½ second to enable the storage of a CW message (50 characters maximum length).	PLY Press the [B] key to send the message recorded via the [A] key.	BK Press the [C] key to activate CW Break-in operation. Press and hold the [C] key for ½ second to recall MENU #51 (for selecting Full- or Semi-Break-In CW).	KYR Press the [D] key to activate the built-in Electronic Keyer. Press and hold the [D] key for ½ second to recall MENU #46 (for setting the Electronic Keyer mode).
9	DNR Press the [A] key to activate the DSP Noise Reduction system. Press and hold the [A] key for ½ second to recall MENU #17 (to select one of the four available Noise Reduction settings).	DNF Press the [B] key to activate the DSP's Auto Notch filter.	DBP Press the [C] key to activate the DSP's receiver Bandpass Filter. In the SSB, AM, FM and AFSK modes, press and hold the [C] key for ½ second to recall MENU #18 to adjust the high-frequency cutoff of the DSP Bandpass Filter via the SELECT knob. In the CW mode, press and hold the [C] key for ½ second to recall MENU #20 (for setting the CW Bandwidth).	- No function.

* The Operating Function number in this column does not appear on the LCD.

Front Panel Controls and Switches



⑫ **AF Knob**

The (inner) **AF** Gain control adjusts the receiver audio volume level presented to the speaker or external speaker. Clockwise rotation increases the volume level.

⑬ **SQL/RF Knob**

In its default setting, this (outer) knob functions as a **SQUELCH** control, which may be used to silence background noise when no signal is present. Using **MENU #56**, this control may be changed to function as an **RF GAIN** control, to adjust the gain of the receiver's RF and IF stages.

⑭ **SELECT Knob**

This 30-position detented rotary switch is used for many tuning, Memory selection, and Function setting operations on the FT-100D.

⑮ **CLAR/IF SHIFT Key**

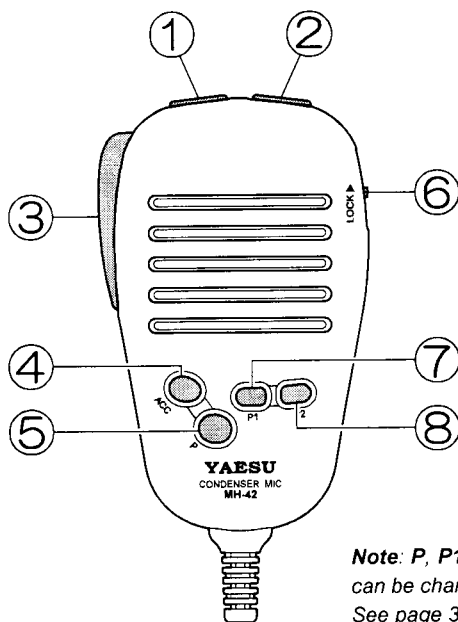
Pressing this key activates the Receive **CLARIFIER** feature. When this feature is activated, the **SELECT** knob is used to set a tuning offset of up to ± 9.99 kHz.

Press and hold this key for $\frac{1}{2}$ second to activate the **IF SHIFT** feature, which allows you to use the **SELECT** knob to adjust the center frequency of the IF filter's passband response.

⑯ **Liquid Crystal Display**

The Liquid Crystal Display (LCD) provides indication of the operating frequency and other aspects of transceiver status.

Microphone Switches



Note: *P, P1, and P2 button functions can be changed via the MENU system. See page 37.*

① **DWN** Button

Press this button to tune downward in the current step increment, hold this button in to start scanning toward a lower frequency.

② **UP** Button

Press this button to tune upward in the current step increment, hold this button in to start scanning toward a higher frequency.

③ **PTT** Switch

Press this switch to transmit, and release it to receive.

④ **ACC** Button (HOME)

Pressing button key recalls a favorite "HOME" frequency memory.

⑤ **P** Button (VFO/MR)

Pressing this button switches frequency control between the VFO and Memory Systems.

⑥ **LOCK** Switch

Slide this switch upward to lock (disable) the microphone buttons.

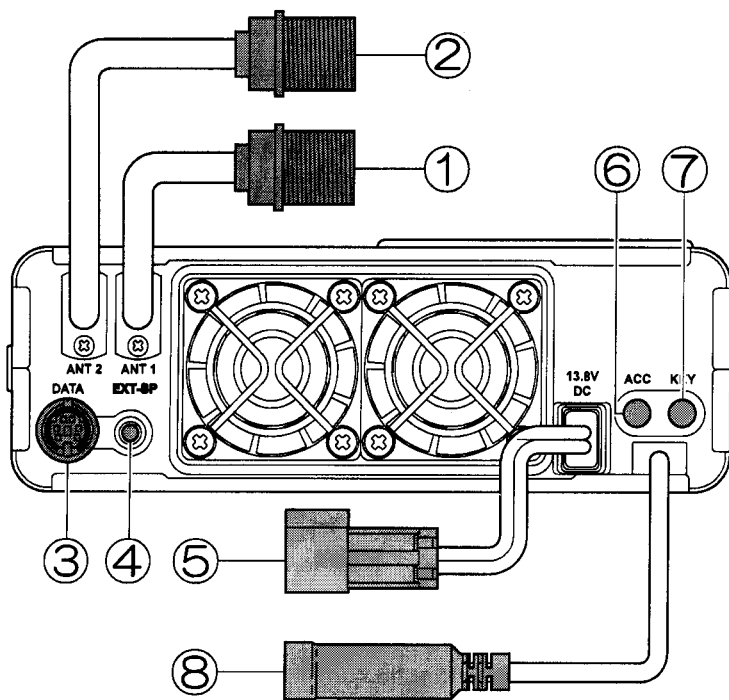
⑦ **P1** Button (BAND Down)

Pressing this button will cause the frequency to be switched to the next-lowest band.

⑧ **P2** Button (BAND UP)

Pressing this button will cause the frequency to be switched to the next-highest band.

Rear Panel Connectors



① ANTENNA 1 Cable

Connect your HF and/or 50 MHz antenna's 50 Ω coaxial cable to this M-type ("SO-239") connector.

② ANTENNA 2 Cable

Connect your 144 and/or 430 MHz antenna's 50 Ω coaxial cable to this connector.

③ DATA Jack

This six-pin mini-DIN jack accepts AFSK or FSK input from a Terminal Node Controller (TNC) or Terminal Unit (TU); it also provides fixed-level Receiver Audio Output, Push-To-Talk (PTT), and Ground lines.

④ EXT SP 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 Ω ~ 16 Ω , and the level varies according to the setting of the front panel's **AF** control.

Rear Panel Connectors

⑤ 13.8 VDC Cable Pigtail

This is the DC power supply connection for the transceiver. Use the supplied DC cable to connect this pigtail to the car battery or base station DC power supply, which must be capable of supplying at least 25 Amperes (continuous duty). Make certain that the **RED** lead connects to the **Positive** side of the power source, and that the **BLACK** lead connects to the **Negative** side of the power source.

⑥ ACC Jack

This 3.5-mm 3-pin jack accepts external ALC (Automatic Level Control) voltage from a linear amplifier on the tip connection, and provides TX/RX control to a linear amplifier (closure to ground on transmit) on the ring connection. The main shaft is the ground return.

⑦ KEY Jack

This 3.5-mm 3-pin jack is used for connection to a CW keyer paddle or a straight key. Use only a 3.5-mm *stereo* plug for these connections.

⑧ BAND DATA Cable Pigtail

This 8-pin mini-DIN jack is used for connection to the **FC-20** External Automatic Antenna Tuner or **ATAS-100** Active-Tuning Antenna System. It is also used for interfacing to a personal computer for control of the FT-100 using the **CAT** System, and for interconnection to the **VL-1000** Linear Amplifier.

Basic Operation



Hi! I'm R. F. Radio, and I'll be helping you along as you learn the many features of the FT-100. I know you're anxious to get on the air, but I encourage you to read the "Operation" section of this manual as thoroughly as possible, so you'll get the most out of this fantastic new transceiver. Now ... let's get operating!

BEFORE YOU START

1. Be certain that power supply connections have been securely made, and that the proper polarity has been observed.
 2. Be certain that your antennas have been connected to the correct cable pigtails on the rear of the transceiver.
-

OPERATION QUICK START

The basic steps required to begin operation are:

1. Turn the transceiver on.
 2. Set the band on which you wish to operate.
 3. Set the operating mode on which you wish to operate.
 4. Adjust the audio volume level.
 5. Adjust the operating frequency using the **MAIN DIAL**.
-

TURNING THE TRANSCEIVER ON AND OFF

1. To turn the FT-100 on, press and hold in the **PWR** switch for ½ second.
 2. To turn the transceiver off, again press and hold in the **PWR** switch for ½ second.
-



*By making you press the **PWR** switch for ½ second, the FT-100 makes it more difficult for you accidentally to cut power by just bumping the switch with your finger.*

AMATEUR BAND SELECTION

Press either the [UP] or [DWN] key to move to the next higher or lower Amateur band, respectively.

As you do this, you may observe the operating mode changing. This is normal; default "startup" modes are pre-programmed for each band, for your convenience. These modes may be changed, of course, per the next section.

MODE SELECTION

1. Press the **[MODE]** key repeatedly to toggle among the four “Macro” settings for the operating mode:

SSB (LSB or USB) → CW → AM → FM → SSB (LSB or USB) ...

When operating on frequencies *below 10 MHz*, the default SSB mode is **LSB**; *above 10 MHz*, the default SSB mode is **USB**.

2. To reverse SSB modes, press and hold in the **[MODE]** key for ½ second to toggle between **LSB ⇌ USB**.
3. Similarly, pressing and holding in the **[MODE]** key while in the **CW** mode allows selection of either the **CW ⇌ CW-R** (Reverse) mode.
4. Pressing and holding in the **[MODE]** key for ½ second while in the **AM** mode allows selection of either **AM ⇌ DIG** (Digital).
5. Pressing and holding in the **[MODE]** key while on **FM** allows selection of either **FM** or **W-FM** (Wide FM).



The operating mode will be preserved on each band's VFO, so that when you return to a particular band, you will return to the mode you were using the last time you operated on that band.

SETTING THE AUDIO VOLUME LEVEL

1. Rotate the **AF** control to set a comfortable listening level.
2. When operating in the “DIG” mode, you may set the **AF** control to any comfortable setting, or even all the way off, because the output from the **DATA** jack is a fixed-level audio signal.



Start with the AF control set fully counter-clockwise, especially when using FM (the background noise on FM can be surprisingly loud)!

SETTING THE OPERATING FREQUENCY

1. Rotate the **MAIN DIAL** to set the frequency. Clockwise rotation of the **MAIN DIAL** increases the operating frequency.
2. You may also use the **SELECT** knob to adjust the operating frequency. In the VFO mode, the **SELECT** knob functions as a “channelized” tuning dial, allowing quick excursions around the band.



*Both the synthesizer's tuning steps and the tuning rate (the number of steps per rotation of the **MAIN DIAL**) can be adjusted. See page 35 for details.*

Receiver Operation

The FT-100 includes a wide variety of features which may be used to enhance reception.

Before you explore these features, it is important to understand the proper utilization of the **OPERATING FUNCTION SELECTOR** key ([**FUNC**]) and the [**A**], [**B**], [**C**], and [**D**] keys, which often are used to activate or change various features of the FT-100 in everyday operation.

OPERATING FUNCTION SELECTOR ([**FUNC**] KEY)

Full access to the many full range of features provided on the FT-100 would require many more controls and switches than could possibly fit on the tiny front panel of the transceiver. Therefore, the FT-100 utilizes a flexible **OPERATING FUNCTION SELECTOR** key, labeled [**FUNC**], to provide access to these many features via the [**A**], [**B**], [**C**], and [**D**] keys.

The [**FUNC**] key must be pressed correctly, as there are two modes of [**FUNC**] key operation which are often used.

- Pressing the [**FUNC**] key *momentarily* causes this key to serve as the **OPERATING FUNCTION SELECTOR**.
- Pressing *and holding* in the [**FUNC**] key for ½ second activates the “MENU” mode, used to customize many aspects of the transceiver’s configuration. The MENU mode is detailed in the chapter beginning on page 82.

Basic Operation of the [**FUNC**] Key

1. Press the [**FUNC**] key momentarily. Note that the labels on the LCD just above the [**A**] ~ [**D**] keys will change. Repeatedly pressing the [**FUNC**] key will scroll the LCD through the *nine* rows of features provided via the **OPERATING FUNCTION SELECTOR**.
2. Once the row containing the desired feature is located, press the [**A**], [**B**], [**C**], or [**D**] key to select the desired function within that row.
3. Next, depending on the feature being utilized, you may be instructed to press the same key again to toggle the current setting to a new state (e.g. from OFF to ON).



*If you don't see the operating functions appear on the LCD, you may have held the [**FUNC**] key in too long – putting you in the “MENU” mode. Press [**FUNC**] again to escape and start over.*

ICON DISPLAY

The left side of the FT-100’s LCD includes a handy Icon display field, which alerts you to many aspects of the transceiver’s current operating status.

BANDWIDTH SELECTION (SSB/CW/AM/DIG MODES)

1. Press the **[FUNC]** key, as necessary, until Operating Function Row 6 [6.0, 2.4, 500, 300] appears on the display.
2. Now press the **[A]**(6.0) key to select 6.0 kHz, the **[B]**(2.4) key to select 2.4 kHz, the **[C]**(500) key to select 500 Hz, or the **[D]**(300) key to select 300 Hz bandwidth. These bandwidth selection options are displayed immediately above the **[A]**, **[B]**, **[C]**, and **[D]** keys along the bottom edge of the display. Note that the **[B]** bandwidth (2.4 kHz) is installed at the factory, while the other bandwidths require the installation of optional filters.



Only the 6.0 kHz and 2.4 kHz modes are usable for AM reception, as the 500 Hz and 300 Hz bandwidths are much too narrow to pass AM signals.

FREQUENCY SYNTHESIZER STEPS

The FT-100 uses a “frequency synthesizer” tuning system, which is capable of both coarse and ultra-fine steps. A wide variety of synthesizer steps is available, so allow you the flexibility to cope with different operating situations.

The tuning steps will change as you change operating modes. This capability provides greater convenience during frequency adjustments, as the need for tuning precision is very different when operating on CW or DIG(AFSK) as compared to FM.

Press the **[STEP]** key momentarily to change the tuning steps of the **MAIN DIAL** and/or the **SELECT** knob.

In the case of the **MAIN DIAL**, the **[STEP]** key toggles only the tuning steps utilized in the SSB, CW, and DIG(AFSK) modes:

1.25 → 2.5 → 5 → 10 → 25 → 50 → 100 → 1.25 ... (Hz)

(The AM/FM steps are fixed at 100 Hz/step in AM/FM, 1 kHz/step in W-FM)

In the SSB/CW mode, press and hold the **[STEP]** key for ½ second to change the tuning steps of the **MAIN DIAL** is fixed at 1 kHz/step.

In the case of the **SELECT** knob, the **[STEP]** key toggles only the tuning steps in the AM and FM modes, with SSB/CW/DIG being fixed at 10 kHz per step:

AM: 1k → 5k → 9k → 10k → 12.5k → 25k → 1k ... (Hz)

FM: 5k → 10k → 12.5k → 15k → 20k → 25k → 50k → 5 k ... (Hz)

FM-W: 50k → 100k → 50k ... (Hz)

Finally, some preset values for the operation of the **SELECT** knob are also available. These are especially useful for quick frequency change.

Receiver Operation

TUNING SPEED SELECTION

The rate at which the **MAIN DIAL** causes frequency change is determined, in part, by the number of “steps” per revolution of the dial. The stepping rate may be doubled (or cut in half) via the following procedure:

1. Press and hold in the [**FUNC**] key for ½ second to activate the “Menu” command mode.
2. Rotate the **SELECT** knob until MENU #01 is found.
3. Rotate the **MAIN DIAL** to choose the desired tuning speed. The default value is “200,” and selecting “100” will cut the tuning rate in half.
4. Press the [**FUNC**] key momentarily to save your new setting and exit to normal operation.



*The section just described allows you to change the number of “steps” per revolution of the **MAIN DIAL**. If you want to choose larger or smaller steps, go back to the section before this one, entitled “Frequency Synthesizer Steps.”*

GENERAL COVERAGE 1 MHz FREQUENCY STEPS

1. Press the **SELECT** knob momentarily, then rotate the **SELECT** knob to change frequency in 1 MHz increments.
2. To return to normal steps, again press the **SELECT** knob momentarily.

GENERAL COVERAGE 10 MHz FREQUENCY STEPS

Especially when navigating over the VHF and UHF bands, you may find it more efficient to move in 10 MHz steps, so as to get to the desired frequency more quickly.

1. Press and hold the **SELECT** knob for ½ second, then rotate the **SELECT** knob to change Frequency in 10 MHz increments.
2. To return to normal steps, again press and hold in the **SELECT** knob for ½ second.



To help you remember the procedure for large frequency excursions:

- *press the **SELECT** knob a short time for a “short” step (1 MHz);*
- *press the **SELECT** knob a longer time for a “longer” step (10 MHz).*

Receiver Operation

STACKED VFO SYSTEM

1. Press the **[FUNC]** key, as needed, until Operating function Row 1 [A/B, A=B, SPL, GMB] appears on the display.
2. Now press the **[A](A/B)** key (the A/B function) to toggle between the “A” and “B” VFO on the band on which you are currently operating. There are two such VFOs provided on each Amateur band, so you may set **VFO-A** to the CW sub-band, and **VFO-B** to the SSB sub-band, if you like. The operating mode will be preserved, along with the frequency information, on each VFO.

MICROPHONE: PROGRAMMABLE FUNCTION BUTTONS

The **MH-36B6JS** and **MH-42B6JS** microphones include three programmable buttons, labeled **P**, **P1**, and **P2**. These buttons may be used for quick access to frequency control commands of the FT-100. In the default configuration, the **P** button controls **VFO/MR** (Memory Recall); **P1** controls **Band Down**, while **P2** controls **Band Up**.

The configuration of these buttons can be changed via the MENU system:

1. Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
2. Rotate the **SELECT** knob to recall MENU #59 (MIC SW SET).
3. Rotate the **MAIN DIAL** to choose from the following configuration options:
4. When you have made your selection, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.

Option	P Button	P1 Button	P2 Button
1	VFO/MR	BAND DOWN	BAND UP
2	VFO/MR	SEARCH	MODE
2	STEP	BAND DOWN	BAND UP
4	STEP	SEARCH	MODE

Receiver Operation

LOCKING FRONT PANEL CONTROLS

The front panel [LOCK] button allows you to disable the **MAIN DIAL** and/or the front panel controls.

In the transceiver's default configuration, pressing the [LOCK] key disables just the **MAIN DIAL**, while the other keys and switches are unaffected. To lock out the remainder of the controls and the **SELECT** knob, use MENU #57 (LOCK KEY):

1. Press and hold in the [FUNC] key for ½ second to enter the MENU mode.
2. Rotate the **SELECT** knob so as to recall MENU #57 (LOCK KEY).
3. Rotate the **MAIN DIAL** to change the setting from "dIAL" (lockout of **MAIN DIAL** only) to "PAnEL" (lockout of all controls except the [LOCK] key).
4. When you have made your selection, press the [FUNC] key momentarily to save the new setting and exit to normal operation.

When the controls are locked out, press the [LOCK] key once more to release them to normal operation.



*If MENU #58 (AM&FM CLICK) is set to the "on" position, the **MAIN DIAL** will be disabled during AM and FM operation. In these modes, if you attempt to rotate the **MAIN DIAL**, the "LOCK" icon will appear as a reminder that the **SELECT** knob must be used for frequency selection.*

SETTING THE DISPLAY BRIGHTNESS

The illumination of the display is preset at the factory for satisfactory brightness in most environments. The illumination level may, however, be too intense for nighttime operation. You may change the brightness level by using the MENU system, as follows:

1. Press and hold in the [FUNC] key for ½ second to activate the MENU mode.
2. Rotate the **SELECT** knob to recall MENU #13 (DIMMER SET).
3. Rotate the **MAIN DIAL** to set a new brightness level. The available values range from 1 (Bright) to 63 (Dim), plus "Off" (Brightest).
4. When you have made your selection, press the [FUNC] momentarily to save the new setting and return to normal operation.

Receiver Accessories

CLARIFIER (RECEIVER INCREMENTAL TUNING)

The Clarifier (RIT) allows you to set an offset of up to ± 9.99 kHz of the receive frequency relative to your transmit frequency. To achieve wider offsets, you may use the “Split” operating mode, described on page 58.

1. Press the [**CLAR**] key momentarily to activate the Clarifier function. The [**CLAR**] key glows green when the Clarifier is on.
2. Turn the **SELECT** knob, which allows the *receive* frequency to be varied over a range of ± 9.99 kHz.
3. To turn the Clarifier off, press the [**CLAR**] key once more.
4. To reset the Clarifier offset to zero, turn the Clarifier off, then turn the **MAIN DIAL** by any amount. The Clarifier will reset to zero after the first “step” of the **MAIN DIAL**.

CW SPOT

The audio pitch of the CW Sidetone corresponds to the pitch of your CW signal when you are transmitting. Therefore, if you tune the receiver so that the incoming signal’s pitch is the same as that of your radio’s CW Sidetone, your signal will be exactly “zero beat” with that of the other station.



The CW Sidetone pitch may be used for CW spotting only when the CLARIFIER is off (or set to zero). When the CLARIFIER is on, the FT-100’s transmit and receive frequencies will not be the same when the CLARIFIER is set to a non-zero value.

AGC (Automatic Gain Control)

The receiver recovery time constant may be modified to match your operating needs.

1. Press the [**FUNC**] key, as needed, to select Operating Function Row 5 [IPO, ATT, AGC, NB] on the display.
2. Press the [**C**](AGC) key to toggle the AGC recovery time constant among the following selections:

AGC/(FST) → AGC/(SLO) → AGC/(AUT) → AGC/(FST) ...

where “AGC AUTO” represents “FAST” on CW and DIG(AFSK), and “SLOW” on the voice modes. If you select “AGC AUTO”, the “AGC” indicator on the display will become Bold as opposed to its normal appearance.

Receiver Accessories

NOISE BLANKER

The IF Noise Blanker may be useful in reducing or eliminating some types of impulse noise. It may be used alone, or in conjunction with the DSP's Noise Reduction feature.

1. Press the **[FUNC]** key, as needed, to select Operating Function Row 5 [IPO, ATT, AGC, NB] on the display.
2. Press the **[D](NB)** key to activate the Noise Blanker. Note that this feature is not operational in the FM mode, as impulse noise is an amplitude-modulated waveform.
3. To adjust the blanking level, press and hold in the **[D](NB)** key for ½ second. This instantly activates MENU #60, for adjustment of the Noise Blanking level. Rotate the **MAIN DIAL** to set a higher or lower blanking level (on a scale of 1 to 16). Now press the **[FUNC]** key momentarily to save your setting and return to normal operation.
4. Press the **[D](NB)** key again to turn the Noise Blanker off.



As with all IF Noise Blanker circuits, activation of the NB during operating conditions of very strong signals may degrade the overload characteristics of the receiver slightly.

RECEIVER SQUELCH

The **SQL/RF** control's default position (SQUELCH) may be used to mute the receiver background noise when no signal is present.

While no signals are being received, rotate the **SQL/RF** control clockwise until the background noise just disappears. This threshold point is where the best sensitivity to weak signals will be obtained, along with quieting of the background noise.

RF GAIN Control

The alternate use of the **SQL/RF** control is as an **RF GAIN** control, which varies the gain of the receiver's RF and IF stages.

To change the function of the **SQL/RF** control from SQUELCH to RF GAIN, press and hold in the **[FUNC]** key for ½ second (to enter the Menu mode), then rotate the **SELECT** knob to recall MENU #56 (SQL/RF GAIN). Next, rotate the **MAIN DIAL** to select "RF" instead of "SQL" on the Menu. Finally, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.

Under particularly noisy or crowded conditions, counter-clockwise rotation of the **SQL/RF** control may reduce the background noise level, making reception more pleasant. The S-meter will rise with increasing counter-clockwise rotation of the **SQL/RF** control; this is normal, as it indicates the amount of "AGC" which is being applied so as to reduce the gain of the receiver's RF and IF stages.



This technique may be used in conjunction with the DSP filters, so as to minimize AGC-related "pumping" of the receiver output caused by strong adjacent-frequency signals. In the FM and FM-W modes, the SQL/RF control is fixed in the SQL mode, and cannot be set to the RF function.

IPO (INTERCEPT POINT OPTIMIZATION)

The IPO feature bypasses the receiver RF preamplifier, thereby eliminating the preamp's gain (which may not be needed on the HF bands below about 14 MHz).

1. Press the **[FUNC]** key, as needed, to select Operating Function Row 5 [IPO, ATT, AGC, NB] on the display.
2. Press the **[A](IPO)** key to bypass the receiver input preamplifier.
3. Press the **[A](IPO)** key once more to re-activate the preamp.



This feature is not available on the 144 MHz and 430 MHz bands.

Receiver Accessories

ATT (FRONT END ATTENUATOR)

The Attenuator reduces all signals (and noise) by 12 dB, and it may be used to make reception more pleasant under extremely noisy conditions.

1. Press the [**FUNC**] key, as needed, to select Operating Function Row 5 [IPO, ATT, AGC, NB] on the display.
2. Press the [**B**](ATT) key to activate the Attenuator.
3. Press the [**B**](ATT) key once more to switch the Attenuator out of the receiver front end circuit.



This feature is not available on the 144 MHz and 430 MHz bands.

IF SHIFT

The receiver's **IF SHIFT** feature is an effective interference-reduction tool, which allows you to shift the passband response higher or lower without changing the pitch of the incoming signal.

1. Press and hold in the [**CLAR**] key for ½ second to activate the **IF SHIFT** feature. A graphical display of the **IF SHIFT**'s current position will appear on the LCD.
2. Rotate the select knob, as needed, to reduce or eliminate interference.
3. To switch from **IF SHIFT** to **CLARIFIER** operation, again press the [**CLAR**] key for ½ second. The last setting of the **IF SHIFT** control will be retained until you change it again.



When you turn the IF SHIFT off, the setting of it returns to “zero.”

CW PITCH

The CW Pitch adjustment feature controls several aspects of transceiver CW operation simultaneously:

- It controls the pitch of the CW Sidetone;
- It controls the pitch of your transmitted signal (it is the same pitch as the Sidetone);
- It controls the center frequency of the IF passband, used by the IF filters; and
- It controls the center frequency of the DSP CW Peaking Filter.

The CW Pitch is set to a default value of 700 Hz at the factory. To change the CW Pitch:

1. Press and hold in the **[FUNC]** key for ½ second to activate the MENU mode.
2. Rotate the **SELECT** knob to select Menu #50 (CW PITCH).
3. Rotate the **MAIN DIAL** to choose the desired CW Pitch. The available settings are 400/500/600/700/800 Hz.
4. When you have made your selection, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.



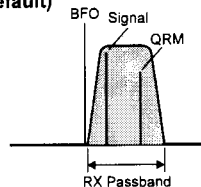
If you set the CW Pitch to a lower value (like 400 Hz), it is slightly easier to “separate” signals in a crowded band, as each synthesizer step is larger (in percentage) at a lower audio frequency.

CW-REVERSE MODE

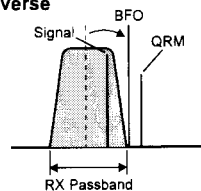
The default injection mode for CW operation is USB. However, in certain operating situations, you may wish to use the “reverse” sideband, LSB. For example, when operating on 40 meters and lower HF bands, LSB is the mode used for SSB voice communications, and if you wish to change modes to CW, tuning is easier if the same sideband is used. Difficult interference situations may sometimes be solved instantly by using the opposite sideband for reception.

From the CW mode, press and hold in the **[MODE]** key for ½ second to toggle to the “CW-R” (Reverse) mode. You may repeat this process to toggle back to “Normal” (USB-side) operation.

CW (Default)



CW-Reverse



Receiver Accessories

DSP BANDPASS FILTER

The receiver's selectivity may be enhanced via the DSP Bandpass Filter. The bandwidth of the DSP filter may be modified per the procedure below.

1. Press the **[DSP]** key, which selects Operating Function Row 9 [DNR, DNF, DBP] on the display.
2. Press the **[C](DBP)** key to activate the DSP Bandpass Filter.
3. To adjust the High-Cut and Low-Cut characteristics of the DSP Bandpass Filter:
 - ① Press and hold in the **[C](DBP)** key for ½ second. This instantly activates MENU #18 (DSP LPF), which allows adjustment of the High-Cut (Low-Pass) filter.
 - ② Turn the **MAIN DIAL**, as desired, to adjust the high-frequency cutoff of the DSP Bandpass Filter.
 - ③ Now rotate the **SELECT** knob one click clockwise to select MENU #19 (DSP HPF), which allows adjustment of the Low-Cut (High-Pass) filter.
 - ④ Turn the **MAIN DIAL**, as desired, to adjust the low-frequency cutoff of the DSP Bandpass Filter.
 - ⑤ When done, press the **[FUNC]** key momentarily to save the new setting(s) and return to normal operation.
4. Press the **[C](DBP)** key once more to disable the DSP Bandpass Filter.

DSP CW PEAKING FILTER

In the CW mode, pressing the **[C](DBP)** key in Operating Function Row 9 [DNR, DNF, DBP] activates a narrow-bandwidth peaking filter, which may be ideal for use under very crowded conditions. The **DSP CW PEAKING FILTER** also is especially helpful under VHF/UHF weak-signal situations.

The *center frequency* of the **DSP CW PEAKING FILTER** is automatically aligned to be centered on the response you have selected via the CW PITCH command (MENU #50). See page 93 for details.

To change the *bandwidth* of the **DSP CW PEAKING FILTER**:

- ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
- ② Rotate the **SELECT** knob so as to select MENU #20 (BPF WIDTH).
- ③ Rotate the **MAIN DIAL** to select the desired bandwidth. The available values are 60 Hz, 120 Hz, and 240 Hz (default value: 240 Hz).
- ④ When you have made your selection, press the **[FUNC]** key momentarily to save the new setting and return to normal operation.

DSP NOISE REDUCTION (NR)

The **NOISE REDUCTION** feature of the DSP system may be used to enhance signal-to-noise ratio on weak signals.

1. Press the **[DSP]** key, which selects Operating Function Row 9 [DNR, DNF, DBP] on the display.
2. Press the **[A](DNR)** key to activate the **DSP NOISE REDUCTION** feature.
3. Now press and hold in the **[A](DNR)** key for ½ second. This instantly activates MENU #17 (DSP NR), which allows adjustment of the **DSP NOISE REDUCTION** level.
4. Rotate the **MAIN DIAL** to find the point where best signal-to-noise ratio is obtained under the current noise conditions.
5. Press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.
6. To turn off the **DSP NOISE REDUCTION** feature, press the **[A](DNR)** key again.



*If noise is present at a level which causes indication on the S-meter, the performance of the Noise Reduction filter may be enhanced by rotating the **SQL/RF (RF GAIN)** control in a counter-clockwise direction so as to set the (fixed) S-meter reading at the same level as the noise peaks. This adjustment raises the AGC threshold of the receiver.*

DSP NOTCH FILTER

The DSP system's Notch Filter may be helpful in removing one or more offending carrier or heterodyne signals from the audio passband.

1. Press the **[DSP]** key, which selects Operating Function Row 9 [DNR, DNF, DBP] on the display.
2. Press the **[B](DNF)** key to activate the Notch Filter. You will notice that the audio level of the carrier signal is being reduced.
3. Press the **[B](DNF)** key once more to turn the Notch Filter off.



Do not activate this filter in the CW mode, as incoming CW signals will be notched out of the audio passband!

Receiver Accessories

AM/FM RECEPTION

In the AM and FM modes, the **MAIN DIAL** is locked out (via a MENU setting) so as to allow “channelized” tuning on these modes. To adjust the operating frequency, rotate the **SELECT** knob to change frequency in steps as set via the **[STEP]** key (see page 35).

If you wish to *enable* the **MAIN DIAL** for tuning in the AM and FM modes, change the setting of MENU #58:

- ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
- ② Rotate the **SELECT** knob to recall MENU #58 (AM&FM CLICK).
- ③ Rotate the **MAIN DIAL** to set this feature (“AM&FM CLICK”) to “Off.”
- ④ Press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.

AUTOMATIC POWER-OFF FEATURE

The FT-100 includes an Automatic Power-Off (APO) feature, which will turn the radio off after a user-defined amount of time. This can prevent your transceiver from draining your car’s battery, for example, if you forget to turn the transceiver off when leaving the car.

To enable and program the APO feature:

- ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
- ② Rotate the **SELECT** knob to recall MENU #29 (APO TIME).
- ③ The default value for the APO feature is “Off.” Rotate the **MAIN DIAL** to select 1 hour, 2 hours, or 3 hours of operation before the radio automatically shuts off.
- ④ Press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.

Once you have programmed a time interval, the APO countdown timer will start whenever some front panel action (tuning, transmission, etc.) ends. If there is no action by you within the time interval programmed, the microprocessor will shut down the radio automatically. Just press and hold in the **[PWR]** switch for ½ second to turn it back on, as usual.

Transmitter Operation



Now that you're familiar with the operation of the receiver, let's turn to transmission on the various operating modes provided in the FT-100!

SETTING THE POWER OUTPUT

In the event you wish to set the maximum power output to a particular level (for example, to prevent over-drive of a linear amplifier), the MENU system allows the HF, 50 MHz, 144 MHz, and 430 MHz power levels to be set individually. Moreover, the FT-100 also allows you to set the SSB/CW/FM, and AM power levels individually in each of the above band groupings.

The "0 ~ 100" adjustment scales in each MENU items are shown as a percentage of the maximum allowable power on that band. Therefore, on HF, where the maximum allowable power is 100 watts, a "50%" setting would represent approximately 50 Watts. However, on 144 MHz, where the maximum allowable power is 50 watts, a "50%" setting represents approximately 25 Watts. Minimum power on all bands is approximately 1 Watt.

As an example, let us see how to set the AM carrier output of the HF bands using the MENU:

- ① Press the **[MODE]** key so as to recall the AM mode.
- ② Press and hold in the **[FUNC]** key for ½ second to activate the MENU mode.
- ③ Rotate the **SELECT** knob to recall MENU #21 (HF TX PO).
- ④ Rotate the **MAIN DIAL** to set the desired power level (e.g. 25%).
- ⑤ When you have made your selection, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.



*Use MENU #22 for 50 MHz, #23 for 144 MHz, and #24 for 430 MHz.
Be sure to set the operating mode before making the power adjustment!*

DSP MICROPHONE EQUALIZER

In the SSB, AM, and FM transmission modes, you may use the DSP system to change the frequency response of the audio stage. This will allow you to roll off excessive high- and/ or low-frequency components of your voice's audio characteristics.

To set up the **DSP MICROPHONE EQUALIZER** feature:

- ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
- ② Rotate the **SELECT** knob to recall MENU #16 (DSP MIC EQ).
- ③ Rotate the **MAIN DIAL** to select one of the following equalization choices:
off: Microphone Equalization Off
 - 1: High Cut (lower frequencies are emphasized)
 - 2: Low Cut (higher frequencies are emphasized)
 - 3: High/Low Cut (mid-range frequencies are emphasized)
- ④ When you have made your selection, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.

Transmitter Operation

SSB TRANSMISSION

BASIC SETUP/OPERATION

1. Press the **[MODE]** key so as to recall the SSB(LSB/USB) mode. If you are operating on the 10 MHz or lower bands, the LSB mode will automatically be selected. If you are operating on the 14 MHz or higher bands, the USB mode automatically be selected.
2. Press the **[FUNC]** key, as needed, to recall Operating Function Row 7 **[MTR, TUN, PRO, VOX]**, then press the **[A](MTR)** key to select “ALC” as the meter function (the “MTR” icon becomes faint).
3. Press the microphone’s **PTT** switch, and speak into the microphone in a normal voice while watching the meter. The ideal audio input level to the transmitter from the microphone will cause three to four “dots” of indication on the ALC meter. Release the **PTT** switch to return to receive operation.
4. If the ALC level is too high, or too low, you may need to reset the Microphone Gain:
 - ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
 - ② Rotate the **SELECT** knob to select MENU #25 (**MIC GAIN**).
 - ③ Close the **PTT** switch, and while speaking into the microphone rotate the **MAIN DIAL** until the proper ALC indication (three to four “dots”) is achieved on voice peaks.
 - ④ When done, press the **[FUNC]** key momentarily to save the new setting for the Microphone Gain.



Always make this adjustment while transmitting into a Dummy Load, because reflected power in an antenna system may cause ALC voltage to be generated, throwing off your Mic Gain adjustment.

VOX OPERATION

The VOX system provides automatic transmit/receive switching based on voice input to the microphone. With the VOX system enabled, you do not need to press the **PTT** switch in order to transmit.

1. Press the **[FUNC]** key, as needed, to select Operating Function Row 7 **[MTR, TUN, PRO, VOX]**.
2. Press the **[D](VOX)** key to activate the VOX circuitry. The “VOX” icon will become Bold.
3. Without pressing the **PTT** switch, speak into the microphone in a normal voice level. When you start speaking, the transmitter should be activated automatically. When you finish speaking, the FT-100 should return to the receive mode (after a short delay).
4. To cancel VOX and return to **PTT** operation, again press the **[D](VOX)** key. The “VOX” icon will revert to its normal (non-Bold) state.
5. The VOX Gain may be adjusted, so as to prevent accidental transmitter activation in a noisy environment. To adjust the VOX Gain:

Transmitter Operation

SSB TRANSMISSION

- ① While still in Operating Function Row 7 [MTR, TUN, PRO, VOX], press and hold in the [D](VOX) key for ½ second. This instantly recalls MENU #54 (VOX GAIN).
 - ② While speaking into the microphone, rotate the **MAIN DIAL** to the point where the transmitter is quickly activated by your voice, without causing background noise to activate the transmitter.
 - ③ When you have selected the optimum setting, press the [FUNC] key momentarily to save the new setting and return to normal operation.
6. The “Hang Time” of the VOX system (the transmit-receive delay after the cessation of speech) may also be adjusted via the MENU. The default delay is ½ second. To set a different delay time:
- ① Press and hold in the [FUNC] key for ½ second to activate the MENU mode.
 - ② Rotate the **SELECT** knob to select MENU #55 (VOX DELAY).
 - ③ Rotate the **MAIN DIAL** while saying a brief syllable like “Ah” so as to set the desired delay time.
 - ④ When your adjustment is complete, press the [FUNC] key momentarily to save the new setting and return to normal operation.

AF SPEECH PROCESSOR OPERATION

The AF Speech Processor increases your average power output while operating on SSB and AM modes.

1. Press the [FUNC] key, as necessary, to recall Operating Function Row 7 [MTR, TUN, PRO, VOX].
2. Press the [C](PRC) key to activate the AF Speech Processor. The “PRC” icon will become Bold.
3. Now press the **PTT** key (unless you have VOX enabled), and speak into the microphone in a normal voice level, as usual.
4. To deactivate the AF Speech Processor, again press the [C](PRC) key.
5. The Compression Level may be adjusted via the MENU, as follows:
 - ① While still in Operating Function Row 7 [MTR, TUN, PRO, VOX], press and hold in the [C](PRC) key for ½ second. This instantly recalls MENU #27 (COMP LEVEL).
 - ② Rotate the **MAIN DIAL** to set a new level of Compression (the default value is “50%”).
 - ③ When you have made your selection, press the [FUNC] key momentarily to save your new setting and return to normal operation.
 - ④ Make some on-the-air checks, or use a monitor receiver in your station, to ensure that good voice quality has been obtained via your adjustment.



Excessive advancement of the Compression Level may lead to distortion. Each operator's voice pattern is different, so try several settings to find the one which is best for your voice.

Transmitter Operation

CW TRANSMISSION

OPERATION USING STRAIGHT KEY/EXTERNAL KEYING DEVICE

When using a straight key, an external electronic keyer, or a computer-generated keying device, please follow the instructions in this section.

1. Insert your key's (three-conductor) plug into the rear-panel **KEY** jack.
2. Press the **[MODE]** key, as needed, to select the CW mode.
3. Press the **[FUNC]** key, as needed, to recall Operating Function Row 8 [WRI, PLY, BK, KYR].
4. Press the **[C](BK)** key to activate full break-in ("QSK") operation. In this mode, pressing the key will cause instantaneous transmission of your CW carrier signal, and releasing of the key will cause an instantaneous return to receive. The receiver recovery time is fast enough to allow reception between words, as well as dots and dashes within individual letters. When full break-in is active, the "BK" icon will become Bold.
5. For "Semi-Break-In" operation (similar to VOX on SSB/AM), press and hold in the **[C](BK)** key for ½ second. This instantly recalls MENU #51 (CW BREAK-IN). Now rotate the **MAIN DIAL** so as to select "SEMI" instead of "FULL" on the display. Press the **[FUNC]** key momentarily to save the new break-in selection and exit to normal operation.
6. The CW Hang Time (after which the FT-100D returns to the RECEIVE mode after a CW transmission in the "SEMI" mode), can be adjusted using MENU #49 (CW-DELAY).
 - ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
 - ② Rotate the **SELECT** knob to select MENU #49 (CW-DELAY).
 - ③ Rotate the **MAIN DIAL** to select a longer or shorter delay time (default: 0.5 second).
 - ④ When done, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.
7. To practice your CW sending, press the **[C](BK)** key until the "BK" icon becomes faint. Now, pressing the key will cause the CW sidetone to be heard, but your radio will not be transmitting a signal on the air.



*Use the sidetone for CW spotting: if you leave the Function selection in Row 8, press the **[C](BK)** key to disable the transmitter momentarily. Press the key, rotate the **MAIN DIAL** to align the incoming signal pitch to match the sidetone, and you'll be "zero-beat" on the other station. Press **[C](BK)** again to restore transmission capability.*

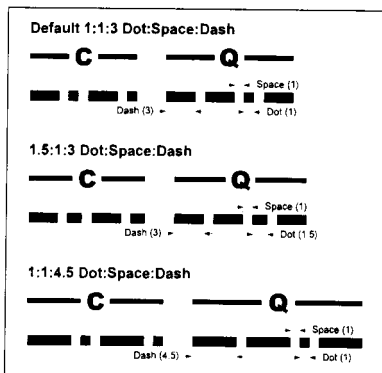
Transmitter Operation

CW TRANSMISSION

OPERATION USING BUILT-IN ELECTRONIC KEYS

The built-in Electronic Keyer provides a convenient method of generating CW. The Electronic Keyer includes weight and speed adjustment, a programmable envelope delay, and a message memory for sending of repetitive messages (like “CQ DX CQ DX DE W6DXC W6DXC $\overline{\text{AR}}$ ”).

1. Connect your keyer paddle's cable to the **KEY** jack on the rear panel of the transceiver.
2. Press the **[MODE]** key, as needed, to select the CW mode.
3. Press the **[FUNC]** key, as needed, to select Operating Function Row 8 [WRI, PLY, BK, KYR] on the display.
4. Press the **[D](KYR)** key to activate the Electronic Keyer (the “KYR” icon will become Bold).
5. The Keyer Speed may be adjusted using MENU #53. To do this:
 - ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
 - ② Rotate the **SELECT** knob to select MENU #52 (KEYER SPEED).
 - ③ Rotate the **MAIN DIAL**, while sending, to set the desired sending speed.
 - ④ When done, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.
6. The “Break-in” mode, Hang Time, and Sidetone Pitch may all be adjusted as described previously.
7. The Dot:Space and Dash:Space ratios may be adjusted (individually) via MENU items #47 and #48, respectively. See page 92 for details. As the default settings are the international standards of 1:1 and 3:1, we generally do not recommend changes be made to these settings.
8. A programmable delay in the keyer's transmission string may be added. This may be helpful when using a linear amplifier, as it can allow the amplifier's relays a few extra milliseconds in order to become properly seated. This delay shifts the entire stream of dots and dashes, without changing the weight or truncating the character(s). To do this, use MENU #53 (QSK DELAY) (see page 93).
9. You may also enable or disable the Automatic Character Space (ACS) feature of the keyer. The default setting for this feature is “enabled.” To change this setting:
 - ① From Operating Function Row 8, press and hold in the **[D](KYR)** key for ½ second. This instantly recalls MENU #46 (KEYER TYPE).
 - ② Rotate the **MAIN DIAL** to change the selection from the following list:



Transmitter Operation

CW TRANSMISSION

EL1 Iambic keyer with ACS disabled.

EL2 Iambic keyer with ACS enabled.

BUG Mechanical “Bug” key emulation. The “dot” paddle produces dots automatically, while the “dash” paddle produces dashes *manually*.

- ③ When you have made your selection, press the **[FUNC]** key momentarily to save the new setting and exit to normal operation.



To store a repetitive message using the Message Memory function (see below), MENU #46 must be set to EL2. You can return to EL1 after message storage, however, if you like.

OPERATION USING MESSAGE MEMORY KEYS

The FT-100 includes an easy-to-use CW Message Memory system, allowing you to store and play back a message of up to 50 characters in length.

Message Memory Storage

1. If you have not done so already, select Operating Function Row 8 [WRI, PLY, BK, KYR].
2. Activate the Electronic Keyer (press **[D](KYR)** in the “EL2” mode, as described previously.
3. Press and hold the **[A](WRI)** key for ½ second, then start sending the message to be stored (e.g. “CQ CQ TEST W7DXC W7DXC K”). When you are done, the storage process will terminate automatically (5 seconds after the last character is sent).

Review of Stored Message (Playback without On-The-Air Transmission)

1. Disable transmission temporarily by pressing the **[C](BK)** key so as to cause the “BK” icon will revert to its normal (non-Bold) state.
2. Press the **[B](PLY)** key to play back the message. You will hear the message in the Sidetone, and you may check it for accuracy during playback.

Transmission of Stored Message (On-The-Air Playback)

1. Re-activate transmission capability by pressing the **[C](BK)** key. The “BK” icon will become Bold.
2. Press the **[B](PLY)** key to transmit the stored message. The transmitter will automatically be activated, and the progress of the message can be monitored via the Sidetone. When the message is complete, the FT-100 will automatically return to the RECEIVE mode.

FM OPERATION

SIMPLEX (NON-REPEATER) OPERATION

1. Press (or press and hold for ½ second) the **[MODE]** key to recall the FM mode (not FM-Wide).
2. Rotate the **SELECT** knob, or press the **[UP]** or **[DOWN]** keys on the microphone, to select the desired operating frequency.
3. Close the microphone's **PTT** switch to activate the transmitter. Speak into the microphone in a normal voice level.
4. Release the **PTT** switch to return to the receive mode.
5. If you get reports that your voice level is too high or too low, you may need to adjust the FM-mode Microphone Gain. The procedure is similar to that used on SSB:
 - ① Press and hold in the **[FUNC]** key for ½ second to enter the MENU mode.
 - ② Rotate the **SELECT** knob to select MENU #26 (FM MIC GAIN).
 - ③ Rotate the **MAIN DIAL** to increase or decrease the Mic Gain setting.
 - ④ When done, press the **[FUNC]** key momentarily to save the new setting for the FM Mic Gain.
6. The VOX feature is operational during FM transmission. From Operating Function Row 7 **[MTR, TUN, PRO, VOX]**, press the **[D](VOX)** key to activate/deactivate VOX.



The FM deviation can be adjust via the Menu Item 33 (FM DEV).

SWR METER

Once you have made the needed setup adjustments to your FT-100D, you may find it more useful to set the display's meter for monitoring of SWR, instead of ALC. This will alert you to sudden changes in your antenna system, so that you can take corrective action promptly.

To activate the SWR meter:

1. Press the **[FUNC]** key, as needed, to recall Operating Function Row 7 **[MTR, TUN, PRO, VOX]**, then press **[A](MTR)** to recall the metering function.
2. If the meter currently shows "**ALC**" as the metering mode, press the **[A](MTR)** key momentarily to activate the SWR meter. The "**MTR**" symbol will become Bold, and the thin line below the "**PO**" bar graph will display relative SWR.