FT-847

OPERATING MANUAL

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General Description

HF + V·UHF ALL MODE TRANSCEIVER
FT-847

The exciting new Yaesu FT-847 Earth Station is a revolutionary multimode transceiver providing coverage of all nine HF Amateur bands, plus VHF/UHF coverage of the 50, 144, and 430 MHz bands.

The FT-847 Earth Station provides 100 Watts of power output on 160 through 6 meters, and 50 Watts output on 144 MHz and 430 MHz. General-coverage HF receive capability is provided, along with VHF/UHF reception at 37~76 MHz, 108~174 MHz, and 420~512 MHz. Independent antenna ports are provided: one each for HF, 50 MHz, 144 MHz, and 430 MHz.

The front panel's multi-function blue display includes dual frequency registers, digital metering, and a wide variety of status displays. The FT-847's compact size makes it ideal either for base station, field day, vacation, or VHF/UHF "rover" expeditions.

Important features of the FT-847 Earth Station include: crossband full duplex capability with normal/inverted tracking for satellite work; built-in low-noise preamplifiers; DSP Noise Reduction, Notch, and Bandpass Filters; AFSK I/O port for teletype, HF packet, AMTOR, or high-speed CW work; 1200/9600 bps packet jack for VHF/UHF; two tuning knobs plus **Shuttle-Jog™** dial for easy frequency navigation; direct keyboard frequency entry; Digital Speech Processor; adjustable CW pitch/sidetone; alpha-numeric label tags for labeling satellite memories; built-in CW electronic keyer with weight control; built-in CTCSS/DCS encode-decode operation for FM; and a high-speed (up to 57600 bps) **CAT** port for external computer control. Available options include Collins® Mechanical IF Filters for SSB and CW, and the **FVS-1A** Voice Synthesizer for visually impaired operators.

Thank you for your investment in the FT-847 Earth Station. 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 - 36.99 MHz
		37 - 76 MHz
		108 - 174 MHz
		420 - 512 MHz
	<u>Transmit</u>	160 - 6 Meters
		2 Meters
		70 Centimeters
		(Amateur bands only)
		5.1675 MHz (Alaska Emergency Channel)

Emission Modes: USB, LSB, CW, AM, FM, F1 (9600 bps Packet), F2 (1200 bps Packet), AFSK

Synthesizer Steps (Min.): 0.1 Hz (CW/SSB)
10 Hz (AM/FM)

Antenna Impedance: 50Ω, Unbalanced

Operating Temp. Range: −10ºC to +50ºC (14ºF to 122ºF)

Frequency Stability: Better than ±2 ppm (0ºC to +40ºC) SSB/CW/AM/AFSK
Better than ±5 ppm (−10ºC to +50ºC) SSB/CW/AM/AFSK
Better than ±{1 kHz ±5 ppm} FM

Power Requirements: DC 13.8V ⎓ ±10%, Negative Ground

Current Consumption: Receive (Squelched): 1.5A
Receive (Max. Audio): 2.0A
Transmit: 22A (@ 100W RF output)

Case Size: 260(W) x 86(H) x 270(D) mm (10.24" x 3.39" x 10.63")

Weight: Approximately 7 kg (14.4 lbs.)

TRANSMITTER

Power Output: 160 - 6m: 100 Watts (25 Watts AM carrier)
2m/70cm: 50 Watts (12.5 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 40 dB

3rd-Order IMD: At least 31 dB down (14 MHz, 100W PEP output)

SSB Frequency Response: 400 Hz - 2600 Hz (−6 dB)

Microphone Impedance: 200Ω - 10kΩ (Supplied microphone: 600Ω)

Specifications

RECEIVER

Sensitivity:

	SSB/CW	AM-N	FM
500 kHz - 1.8 MHz:	–	20 µV	–
1.8 - 28 MHz:	0.25 µV	2 µV	–
28 - 30 MHz:	0.25 µV	2 µV	0.5 µV
50 - 54 MHz:	0.20 µV	1 µV	0.25 µV
144/430 MHz:	0.125 µV	–	0.2 µV

(Above specifications are worst-case. SSB/CW/AM-N figures are for 10 dB S/N, 12 dB SINAD on FM)

Squelch Sensitivity:

	SSB/CW/AM	FM
500 kHz - 1.8 MHz:	20 µV	–
1.8 - 28 MHz:	2 µV	–
28 - 30 MHz:	2 µV	0.25 µV
50 - 54 MHz:	1 µV	0.20 µV
144/430 MHz:	0.5 µV	0.16 µV

Image Rejection: Better than 60 dB
IF Rejection: Better than 60 dB
Selectivity (−6/−60 dB):

SSB/CW:	2.2 kHz/4.5 kHz
CW-N:	0.5 kHz/2.0 kHz (Optional YF-115C installed)
AM:	9 kHz/20 kHz
AM-N:	2.2 kHz/4.5 kHz
FM:	15 kHz /30 kHz
FM-N:	9 kHz/20 kHz

Audio Output: At least 1.5W into 8Ω @ 10% THD
Audio output impedance: 4Ω - 16Ω

Specifications are subject to change, in the interest of improvement, without notice or obligation. Specifications are guaranteed only within Amateur bands.

Accessories & Options
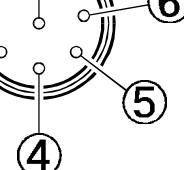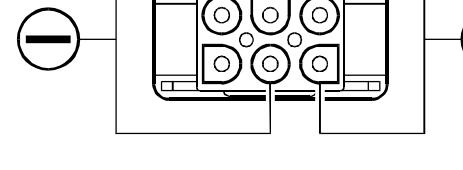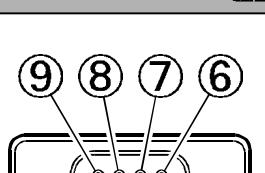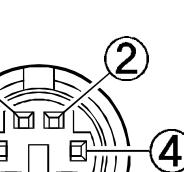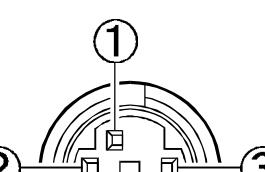
SUPPLIED ACCESSORIES

Item	Quantity
MH-31B8 Hand Microphone	1
DC Cable fused for 25 Amps (T9019925)	1
Spare 25 Amp Fuse (Q0000074)	1

AVAILABLE OPTIONS

MH-36D8	DTMF Microphone
MD-100A8X	Desk-Top Microphone
YF-115S-02	SSB Filter (Collins® Mechanical Filter)
YF-115C	CW Filter (Collins® Mechanical Filter)
FC-20	Automatic Antenna Tuner
ATAS-100	Active-Tuning Antenna System
FVS-1A	Voice Synthesizer Unit
MMB-66	Mobile Mounting Bracket
FP-1030A	AC Power Supply, Linear Type (25A)
FP-1023	AC Power Supply, Switching Regulator Type (23A) (U.S.A. only)
CT-39	Packet Cable
CT-61	STBY Cable
RCA Connector	(P/N P0090544)
5-pin Mini DIN Plug	(P/N P0090976)
3-pin Phone Plug	(P/N P0090008)
2-pin Miniature Plug	(P/N P0090034)

MIC

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

(as viewed from front panel)

13.8VDC

(as viewed from rear panel)

TUNER

① +13V
② TX GND
③ GND
④ DATA IN
⑤ DATA OUT
⑥ TUNER SENSE
⑦ RESET
⑧ TX INH

(as viewed from rear panel)

CAT

① NC
② SERIAL IN
③ SERIAL OUT
④ N/A
⑤ GND
⑥ N/A
⑦ N/A
⑧ N/A
⑨ NC

(as viewed from rear panel)

PKT

① DATA IN
② GND
③ PTT
④ DATA OUT
  (9600bps)
⑤ DATA OUT
  (1200bps)
⑥ SQL

(as viewed from rear panel)

STBY

① GND
② STBY 430MHz
③ STBY HF
④ STBY 144MHz
⑤ STBY 50MHz

Pins ②~⑤ close to ground on TX on the respective bands.

(as viewed from rear panel)

KEY

Internal Keyer

DOT   DASH   COMMON

Straight Key

KEY   COMMON

⚠ Do not use 2-conductor type plug

PHONE

SIGNAL

SIGNAL   GND

EXT SPKR

GND

SIGNAL

DATA IN/OUT

DATA OUT (RX)

DATA IN (TX)   GND

RCA PLUG

GND or (−)

SIGNAL or (+)

Installation

POWER CONNECTIONS

The DC power connector for the FT-847 must only be connected to a DC source providing 13.8 Volts DC (±10%), and capable of at least 22 Amperes of current. Always observe proper polarity when making DC connections:
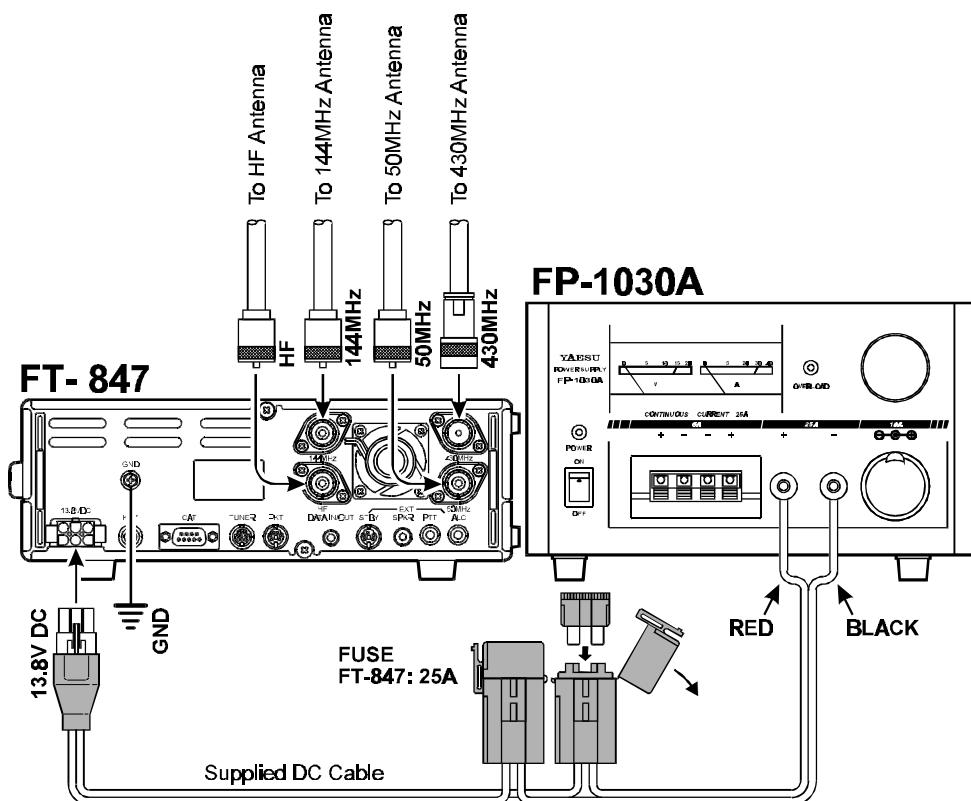
The RED DC power lead connects to the POSITIVE (+) DC terminal; and

The BLACK DC power lead connects to the NEGATIVE (-) DC terminal.

For base station installations, Yaesu recommends the use of the FP-1025 or FP-1030A AC power supplies. Other models of power supplies may be used with the FT-847, 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-847 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.

POWER CONNECTIONS
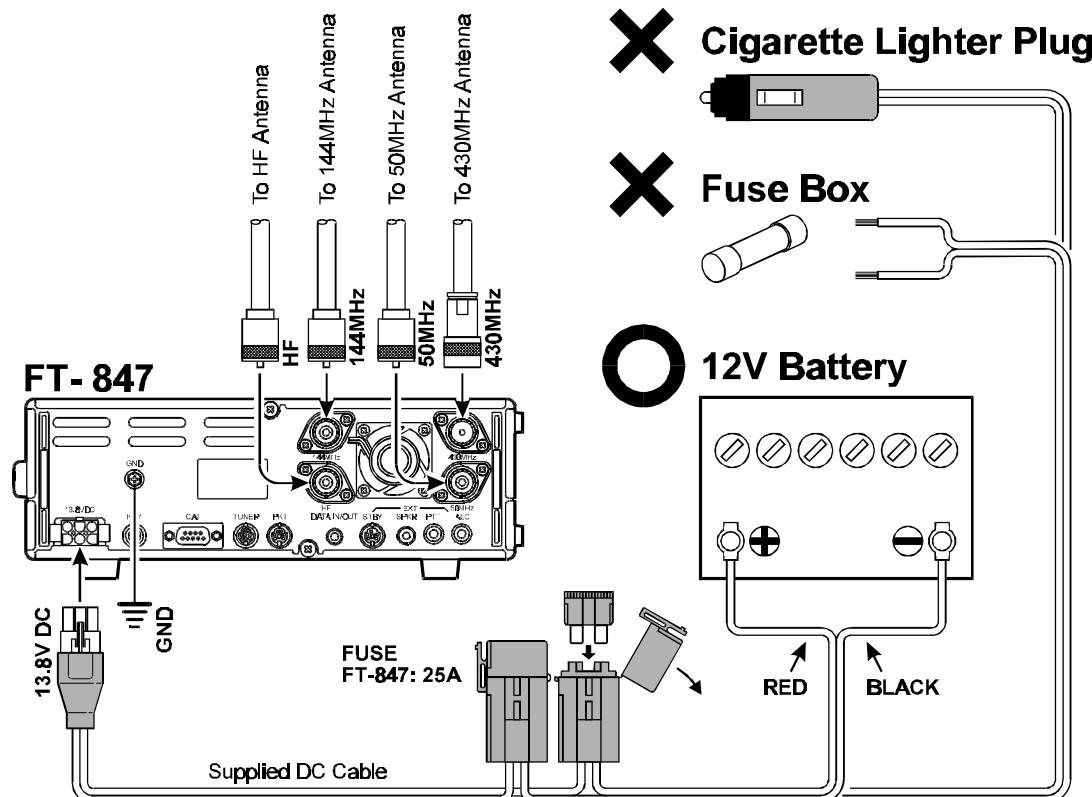
Tips for Successful Mobile Installations:

❒ 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, and cut off any excess cable (from the *battery end*) to minimize voltage drop.

❒ 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).

❒ Be sure that the **POWER** switch on the FT-847 is *OFF* when connecting the DC cable's connector to the rear panel **13.8VDC** jack.

❒ Be sure that the **POWER** switch on the FT-847 is *OFF* when starting your car. There initially may be no voltage regulation, which may cause erratic operation of your transceiver's microprocessor.

❒ Check the battery terminal connections frequently to be sure they are tight and not corroded.
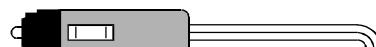
Caution

Permanent damage can result if improper supply voltage, or reverse-polarity voltage, is applied to the FT-847. 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 ±10%.

When replacing fuses, be certain to use a fuse of the proper rating. The FT-847 requires a 25A fast-blow fuse.
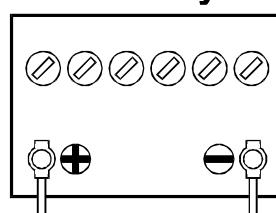
Installation

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.

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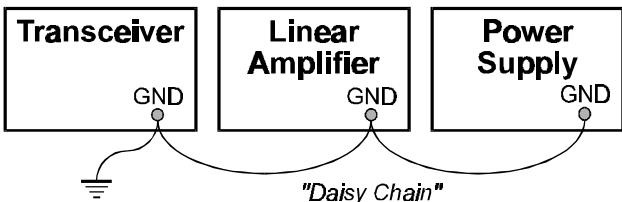
Do not use gas line pipes in an attempt to provide a ground connection! To do so creates a serious risk of explosion!!

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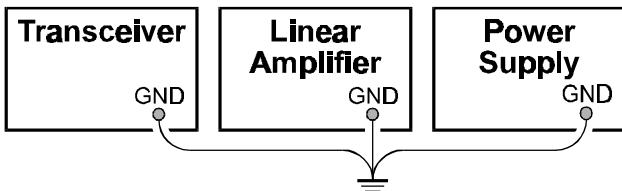
Do not make ground connections from one electrical device to another, and thence to the ground bus. This so-called "Daisy Chain" grounding technique may nullify any attempt at effective radio frequency grounding. See the drawings below for examples of proper and improper ground connections.

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

Improper Ground Connection

Proper Ground Connection

GROUNDING

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*. 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 of 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-847 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-847 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.

Installation
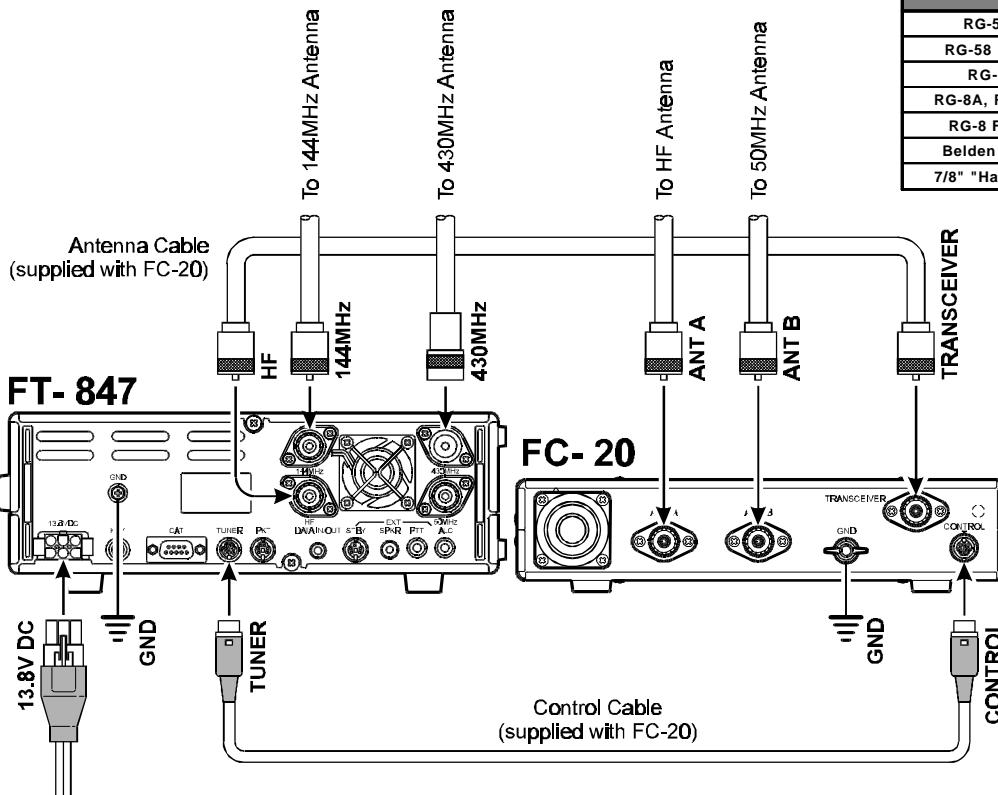
The antenna systems connected to your FT-847 transceiver are, of course, critically important in ensuring successful communications. The FT-847 is designed for use with any antenna system providing a 50Ω resistive impedance at the desired operating frequency. While minor excursions from the 50Ω specification 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 **S**tanding **W**ave **R**atio (SWR) of 1.5:1).

Four antenna jacks are provided on the rear panel of the FT-847, using two different types of connectors. Three of these jacks are "Type M" (SO-239) jacks; these are the **HF**, **50 MHz**, and **144 MHz** jacks. The other jack is a "Type N" jack, which is the **430 MHz** jack.

The center pins of these two jack types are of very different diameters, and damage (not covered by your transceiver's Limited Warranty) will be caused if you attempt to connect a Type M (PL-259) plug to the **430 MHz** Type N jack. It is best to confirm *visually* that you are connecting your coaxial cables to the correct jacks.

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

Base Station Antenna Installations

When installing a "balanced" antenna such as a Yagi or dipole, remember that the FT-847 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-847 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 50W Coaxial Cables**
(Assumes 50Ω Input/Output Terminations)

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
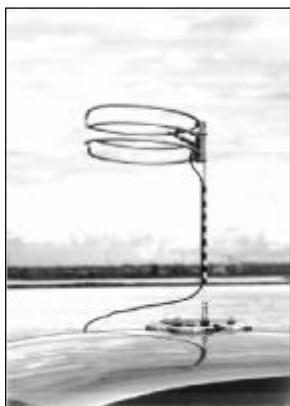
Loss figures are approximate; consult cable manufacturers' catalogs for complete specifications.

ANTENNA CONSIDERATIONS
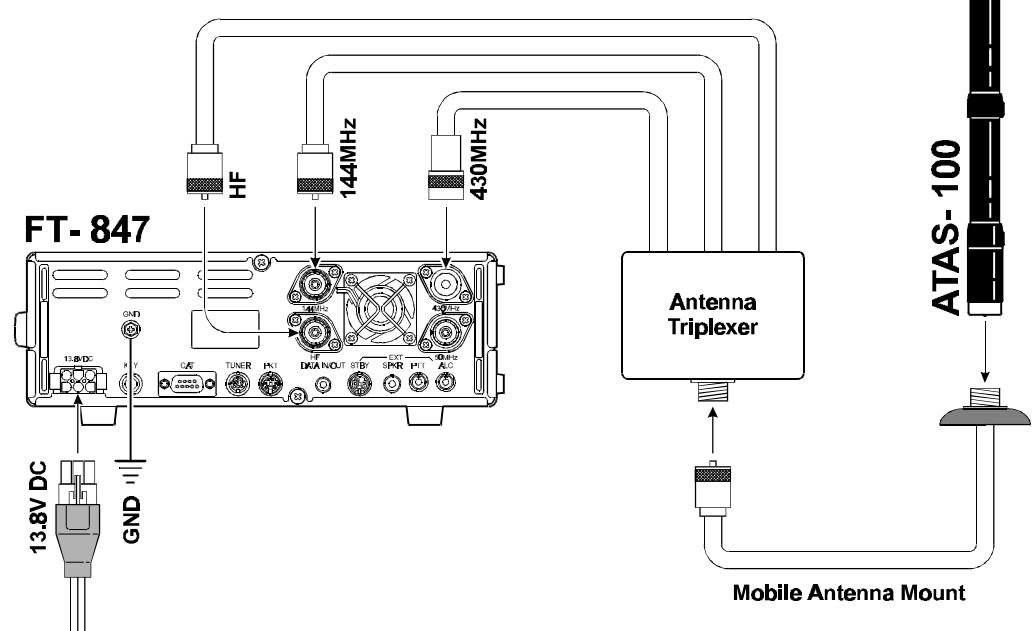
Always locate antennas such that they can *never* come in contact with outdoor power lines in the event of a catastrophic support or power-pole structural failure. Ground your antennas' support structure(s) adequately, so as to dissipate energy absorbed during a lightning strike. Install appropriate 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-847 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.

Photo
Horizontal Loop
for SSB/CW Operation

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 antenna 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-847. 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.

FT-847

HF

144MHz

430MHz

Antenna Triplexer

ATAS-100

13.8V DC

GND

Mobile Antenna Mount

Installation

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-847 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 50 Watt power output supplied by the FT-847, 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 **R**adio **F**requency **I**nterference (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-847 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.

Installation
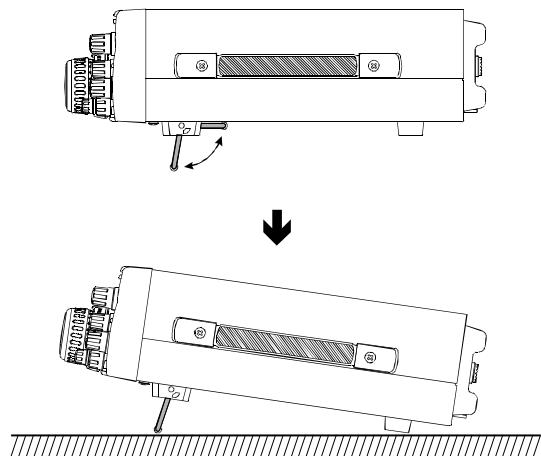
HEAT AND VENTILATION

To ensure long life of the components, be certain to provide adequate ventilation around the cabinet of the FT-847. 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.
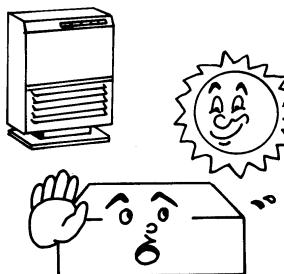
Do not install the transceiver on top of another heat-generating device (such as a linear amplifier), and do not place equipment, books, or papers on top of the transceiver. Place the transceiver on a hard, flat, stable surface. Avoid heating vents and window locations that could expose the transceiver to excessive direct sunlight, especially in hot climates.

BASE STATION WIRE STAND
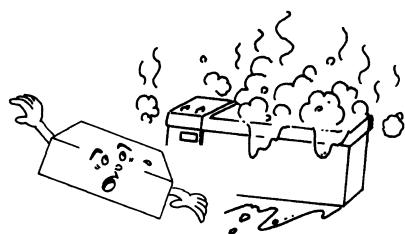
The heavy wire stand on the bottom of the transceiver allows the transceiver to be tilted upward for better viewing. Simply fold the stand forward to raise the front of the transceiver, and fold it back against the bottom case to lower the front of the FT-847.
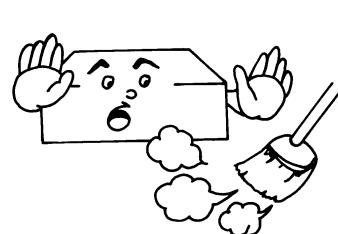
Note: Do not use the wire stand as a carrying handle, as it could slip out of its mount, causing the transceiver to be dropped! Use the carrying handle on the side of the FT-847 for transport purposes.
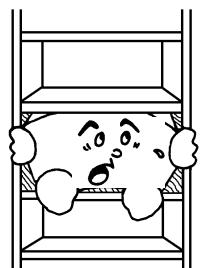
Heat   Water & Moisture   Dust   Ventilation

Installation

The FT-847 may be connected to a wide variety of accessories in your amateur station. Wherever possible (e.g. **PTT**, **ALC**, **KEY**, **SPKR**, **PKT**, **DATA**, **CAT**, **ANTENNA**) commonly-accepted standard connectors have been used for accessory interfacing so as to minimize the need for "custom" cabling.
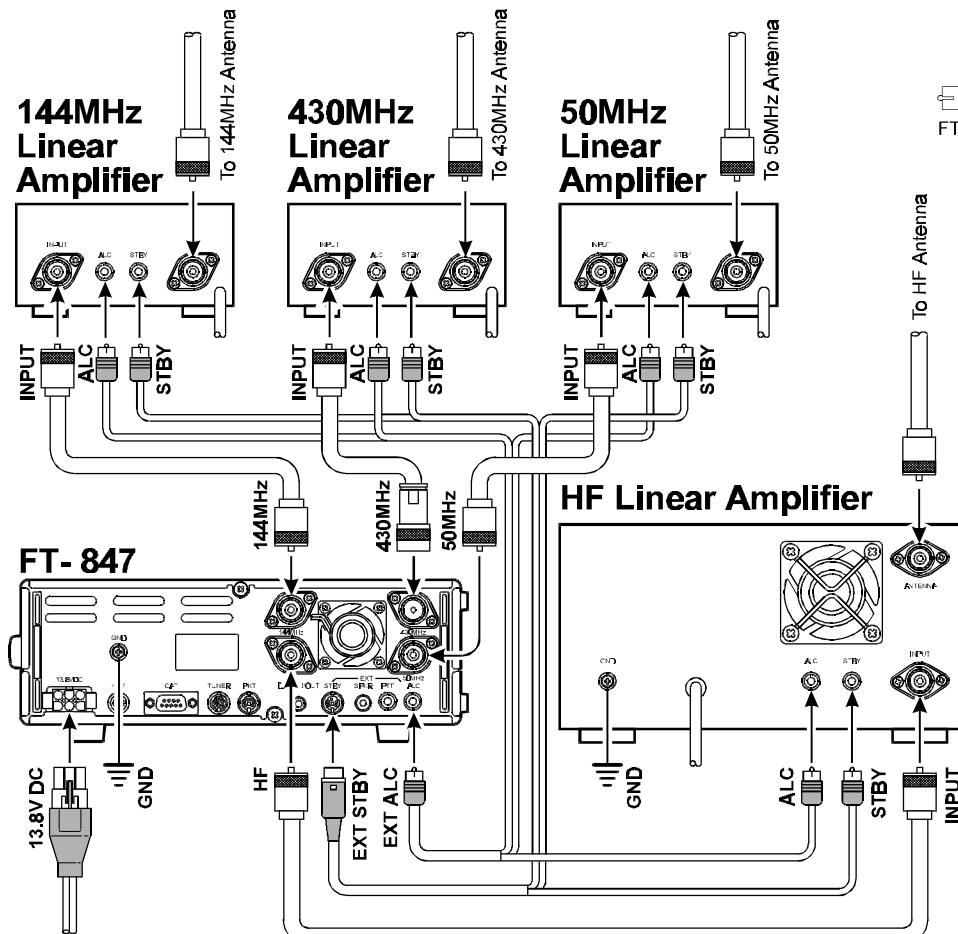
Linear Amplifier Interfacing

The FT-847 provides the switching and control lines required for easy interfacing to most all commonly-available amplifiers used today.

These include:

- Separate RF output jacks for HF, 50 MHz, 144 MHz, and 430 MHz;
- Separate T/R control lines (open-circuit on RX, closure to ground on TX); and
- A negative-going ALC jack (control voltage range: 0 to –4V DC).

The T/R control lines are transistor "open collector" circuits, capable of handling *positive* amplifier relay coil voltage of up to +24V DC and current of up to 100 mA.
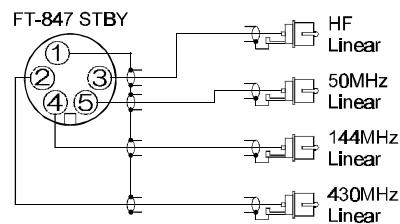
Important Note!

Do not exceed the maximum voltage or current ratings for the **STBY** jack. This jack is not compatible with negative DC voltages, nor AC voltages of any magnitude.
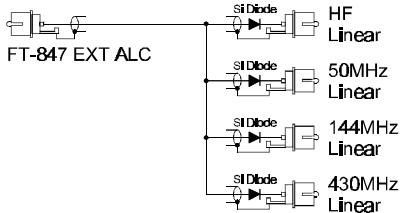
Most amplifier control relay coils require much lower voltage/current switching capability (typically, +12V DC at 25-75 mA), and the switching transistors in the FT-847 will easily accommodate such amplifiers.

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-847.

STBY Cable

ALC Cable

ACCESSORY INTERFACING

VHF/UHF Preamplifiers

For maximum improvement of system noise figure, VHF and (especially) UHF preamplifiers should be located as close to the antenna feedpoint as possible. This puts the preamplifier's low-noise-figure gain *ahead* of the loss in the coaxial cable feedline.

The FT-847 provides the capability to deliver +12V DC at up to 300 mA via the 144 MHz and/or 430 MHz antenna jacks, for those preamplifiers equipped to receive DC power via the coaxial cable. Menu items #29 and #30 provide the following operational settings:

- In the "INT" mode, the *internal* preamplifier of the FT-847 is used, and no DC power is delivered to the rear panel antenna jack(s).
- In the "ANT" mode, the internal preamplifier is bypassed, and +12V DC is delivered to the antenna jack(s).

Menu #29 controls the setting for the 144 MHz antenna jack, while Menu #30 controls the setting for the 430 MHz antenna jack. These settings are totally independent, so each antenna port may be set for the configuration you desire on that particular band.

If you wish to use *both* the internal preamplifier *and* a very-low-noise tower-mounted preamp, set Menu #29 and/or #30 to "INT" and supply DC power to your preamp(s) via a separate DC cable.

Caution!

Check your antenna system switching carefully before activating the "ANT" setting of Menu #29 or #30. If there are any antennas in your system which present a DC Ground when checked with an Ohmmeter, you should be certain that there is no way that such an antenna can be connected directly to the FT-847 (without the intervening preamplifier). Direct connection of a DC short to ground will instantly destroy the transistor passing the +12V DC to the antenna jack.

This trouble may be avoided by putting your antenna switch(es) in a remote position on the *antenna side* of the preamplifier, so that *all* antennas are isolated from the FT-847 by the preamp(s).

The Limited Warranty for the FT-847 does not cover damage caused by improper installation. Check your antennas before connecting them to be sure!

Note: the default selection for both Menu #29 and #30 is set to "INT" at the factory to avoid accidental damage to your transceiver.

Installation

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

The FT-847 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 utilizing either USB or LSB.

Audio Frequency-Shifted Keying (AFSK) operation for HF Baudot, AMTOR, 300 bps Packet, etc. is provided via the rear-panel **DATA IN/OUT** terminal.

The tip connector of this jack accepts "TX Audio" from the TNC; the optimum level is 20 mV at 10 kΩ impedance. The ring connector provides "RX Audio" from the FT-847's receiver. This is fixed-level audio 200 mV at 10 kΩ, not affected by the setting of the front panel's **AF** control.

The other connection required for AFSK operation is PTT control of the transceiver's transmit/receive status. Use the illustration below to connect the TNC's PTT line to the **DATA IN/OUT** terminal.
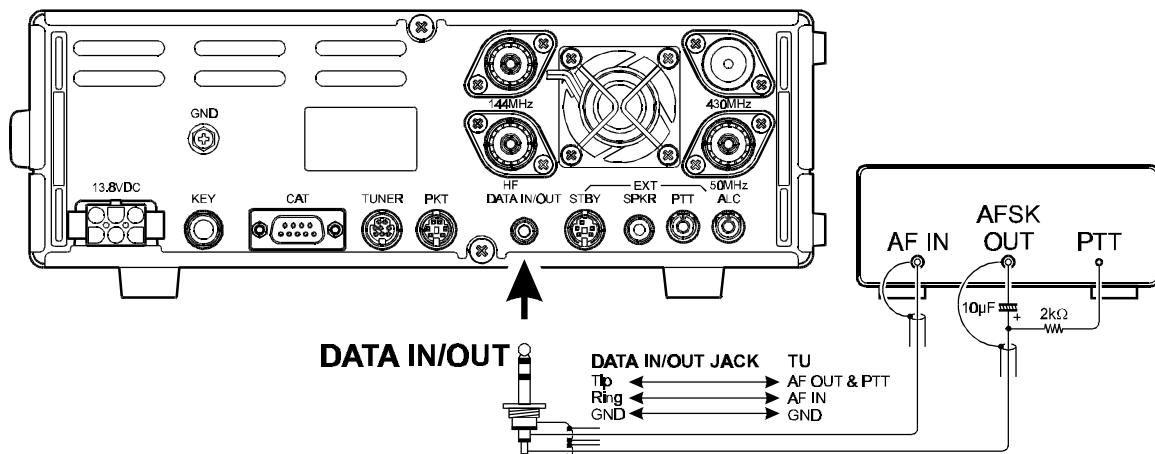
Note: If you use the rear-panel's "PTT" jack for AFSK operation, the transceiver will operate in the "SSB" mode, with the microphone connected. Activating PTT via the **DATA IN/OUT** *jack disconnects the microphone.*

┌─────────── **Caution!** ───────────┐

Some digital modes, such as RTTY (Radio TeleType), require continuous key-down transmission. While the internal fan is designed to protect your transceiver from excessive heat, full key-down output for long periods is not recommended. Especially during hot or humid weather, we recommend minimizing continuous full-power transmit time to ensure long life of the transceiver components, with a three-minute maximum being recommended (with a five minute "rest" period thereafter).

If possible, adjust the transmit audio input level to restrict the power output to 50 Watts or less on HF, 25 Watts or less on 144/430 MHz, if longer transmissions (and/or shorter "rest" periods) are required.

└──────────────────────────────────┘

Typical connection information is presented below.

ACCESSORY INTERFACING

FM Packet TNC Interfacing

The FT-847 provides a convenient rear-panel **PKT** jack for easy connections to your TNC. The connections to this jack are in accordance with a standard adopted by many amateur-product manufacturers. However, we recommend that you verify the connections to any cable you already own by comparison to the pictorial below.

Only the "Main" band may be used for packet operation, as there are no connections to the "Sub" band via the **PKT** jack.

The FT-847's **PKT** jack connections are optimized for the data transmission and reception speed in use. In accordance with 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, by connecting the TNC "Radio 1" port to the 1200 bps lines on the FT-847, and the "Radio 2" port to the 9600 bps lines.
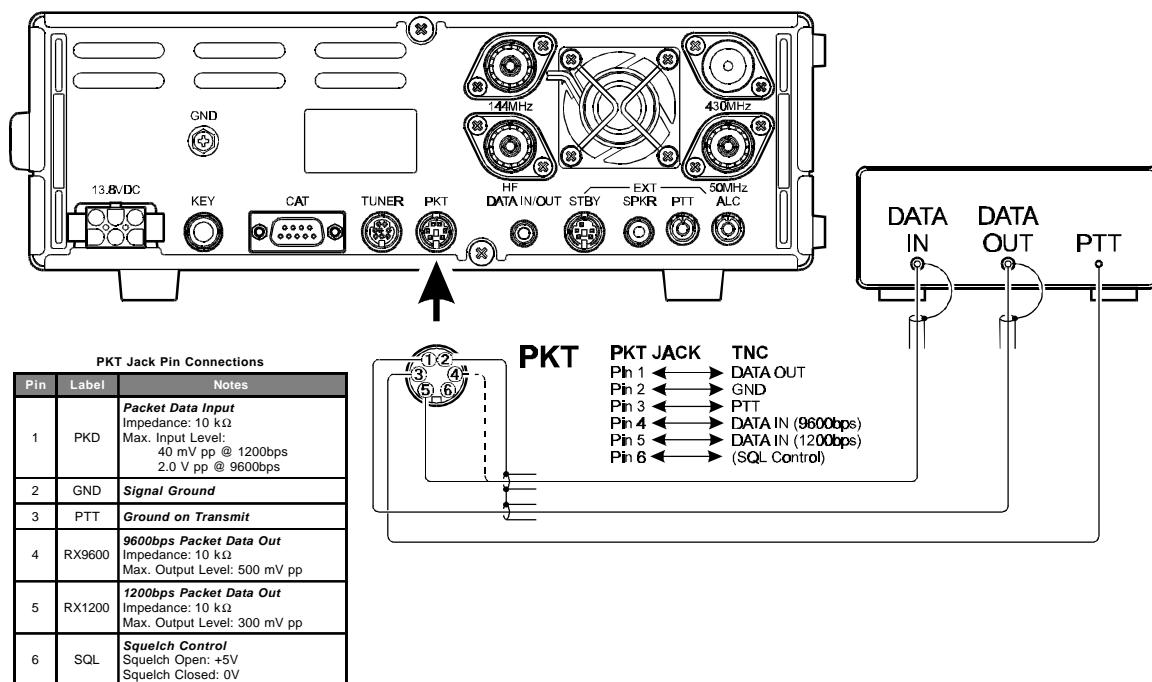
For ease in making connections to your TNC, the optional CT-39 Packet Cable for the FT-847 is available from your Yaesu dealer. With reference to the "**PKT Jack Pin Connections**" chart and data jack pinout pictorial on this page, you may connect your TNC in minutes using the color code information 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 **PKT** 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 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 (±2.5 ~ ±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-36$_{D8}$** DTMF Microphone, set your TNC's tone output to be about the same level as that of the DTMF tones produced by the **MH-36$_{D8}$**.

The "RX 1200" and "RX 9600" lines are fixed-level audio outputs, not affected by the setting of the **AF** (GAIN) control. Selection of the Packet Baud Rate to be used is performed via Menu #23. See the section on "**FM PACKET OPERATION**" on page 56 for details.

PKT Jack Pin Connections

Pin	Label	Notes
1	PKD	*Packet Data Input* Impedance: 10 kΩ 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 kΩ Max. Output Level: 500 mV pp
5	RX1200	*1200bps Packet Data Out* Impedance: 10 kΩ Max. Output Level: 300 mV pp
6	SQL	*Squelch Control* Squelch Open: +5V Squelch Closed: 0V

PKT

PKT JACK	TNC
Pin 1	DATA OUT
Pin 2	GND
Pin 3	PTT
Pin 4	DATA IN (9600bps)
Pin 5	DATA IN (1200bps)
Pin 6	(SQL Control)

Installation

CW Accessory Interfacing

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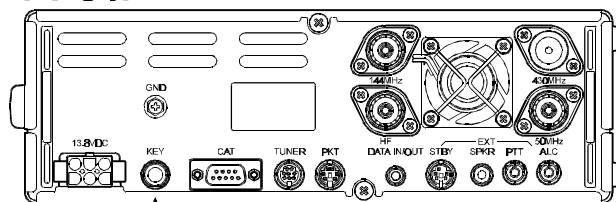
Note: Even when using a straight key, you must use a three-conductor ("stereo") plug. If a two-conductor plug is used, the key line will be constantly shorted to ground.

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-847 is +5V, and the "key-down" current is only about 2 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, as shown below. Check with the documentation accompanying your keyer and your contest/DX software for any cautions which need to be observed.
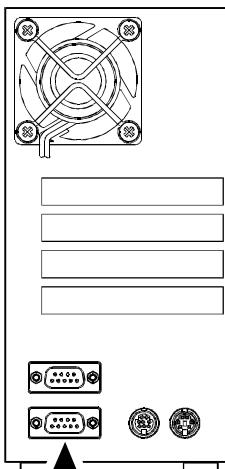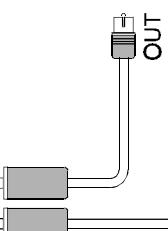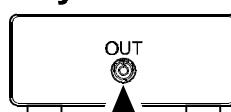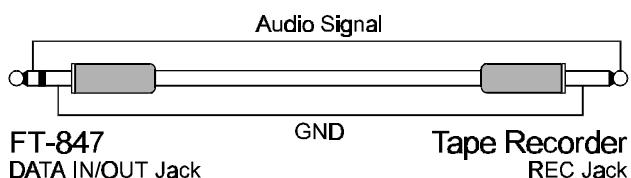
Receiver Accessories

(TAPE RECORDER, WEATHERFAX DEMODULATOR, etc.)

For weak-signal VHF work, including meteor scatter and EME (Moonbounce), it often is desirable to record your contacts for future reference. During high-speed CW meteor-scatter schedules, tape recording (or feed of RX Audio to a computer) is required for decoding of the incoming signal bursts.

Connection of a tape recorder, WeatherFax demodulator, or other receiver accessory is easily accomplished using the **DATA IN/OUT** jack's *Ring* connector, as shown in the illustration below. The audio output level is fixed at 20 mV with an impedance of 10 kΩ.
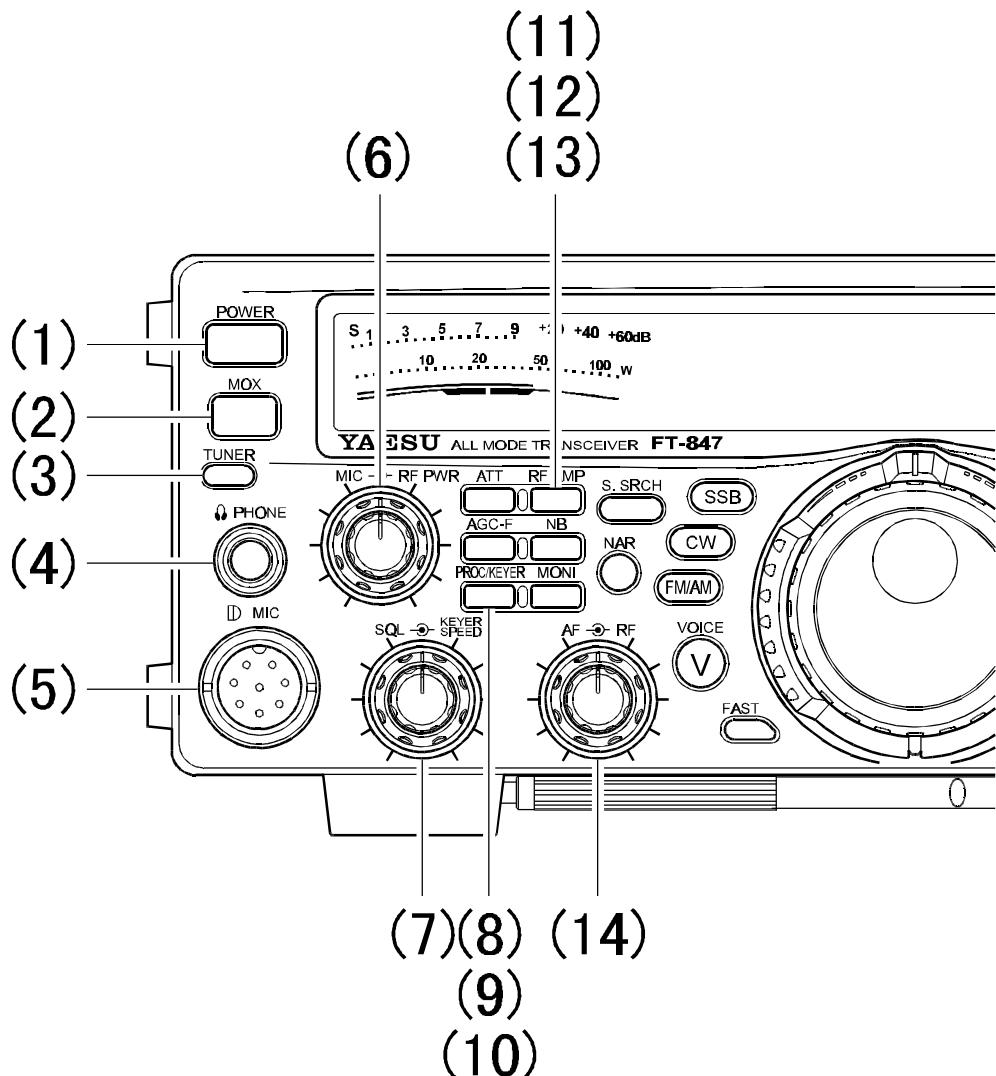
Front Panel Controls & Switches

(1) POWER Switch

This latching-type switch turns the transceiver on and off. Push the switch in to turn the transceiver on, and push it again to turn the power off.

(2) MOX Switch

This latching-type switch is used to switch the transceiver manually into the transmit mode (it thereby duplicates the action of the microphone Push-To-Talk [**PTT**] switch). Press it in to activate the transmit mode, and press it again to release the transceiver back into the receive mode.

CAUTION: *Be sure to have an antenna or dummy load connected to the appropriate antenna jack when this switch is pushed. Failure to do so may cause damage to the transceiver's final amplifier stage.*

(3) TUNER Switch

This switch activates the optional (external) **FC-20** Automatic Antenna Tuner of the optional **ATAS-100** Active-Tuning Antenna System. A momentary touch of this switch places the Antenna Tuner in line (reception is not affected). Pressing and holding this switch in for ½ second activates the Automatic Matching Mode, in which a carrier is generated and the tuner or antenna's microprocessor makes adjustments so as to present a 50Ω impedance to the transmitter's antenna port.

CAUTION: *Be certain to have an antenna or dummy load connected to the appropriate antenna jack before initiating Automatic Antenna Tuner matching procedures.*

(4) PHONE Jack

This ¼" 3-pin ("stereo") jack is used for connection to your headphones. When a plug is inserted into this jack, the internal (or external) speaker will be cut off. This jack's impedance is optimized for use with 16Ω to 32Ω headphone types.

(5) MIC Jack

This 8-pin connector accepts microphone input, as well as providing PTT, ground, and scanning control access. Optimum microphone impedance is 500Ω ~ 600Ω.

(6) MIC/RF PWR Controls

The inner **MIC** control adjusts the microphone input level in the SSB, AM, and FM modes (see Menu #25 on page 86 regarding FM operation). Clockwise rotation increases the microphone gain level.

The outer **RF PWR** control adjusts the transmitter's power output, and adjustment is available in all modes. Clockwise rotation increases the power output.

(7) SQL/KEYER SPEED Controls

The inner **SQL** control sets the signal threshold at which receiver audio is muted (in all modes). Most frequently used during FM operation, this control must be rotated fully counter-clockwise for most SSB, CW, or AM operation.

The outer **KEYER SPEED** control sets the sending speed for the built-in Electronic Keyer. Clockwise rotation increases the sending speed.

(8) ATT Switch

This switch may be used to insert a 10 dB attenuator in the receiver front end to minimize the potential for overload. The "ATT" icon will appear on the display when the attenuator is on. Best receiver sensitivity will, of course, occur when no attenuation is used.

(9) AGC-F Switch

Pressing this switch activates "Fast" recovery time for the receiver's Automatic Gain Control system. The "AGC-F" selection is generally preferred for CW operation and, on SSB, during rapid-fading conditions.

(10) PROC/KEYER Switch

This is a dual-function switch, the effect of which depends on the operating mode:
- In the SSB mode, pressing this switch activates the RF Speech Processor, which provides enhanced "talk power" for use under difficult conditions. When activated, the "PROC" icon will appear on the display panel.
- In the CW mode, pressing this switch activates the built-in Electronic Keyer circuit. When activated, the "KEYER" icon will appear on the display panel.

(11) RF AMP Switch

This switch turns the receiver RF preamplifiers on and off. When this switch is pressed, the "RF AMP" icon will appear on the display panel, signifying that the receiver input preamplifier is activated. When this switch is pressed again, "RF AMP" will disappear, and the preamp will be bypassed. Best receiver sensitivity occurs when the RF preamplifier is on; however, in a noisy location (or on the HF bands below about 10 MHz) the RF preamplifier may not be necessary.

(12) NB Switch

Pressing this switch activates the IF **N**oise **B**lanker, which may help reduce many different types of man-made impulse noise (but not atmospherics). When the Noise Blanker is activated, the "NB" icon will appear on the display panel.

(13) MONI Switch

Pressing this switch activates the SSB voice monitor, which allows the operator to monitor voice characteristics during adjustment of, for example, the Speech Processor. In the CW mode, pressing this switch activates the CW sidetone monitor. In either mode, the "MONI" icon will appear when the monitor is activated. The MONITOR feature does not, however, function in the SSB mode during Satellite operation, as it would interfere with your ability to monitor your own downlink signal.
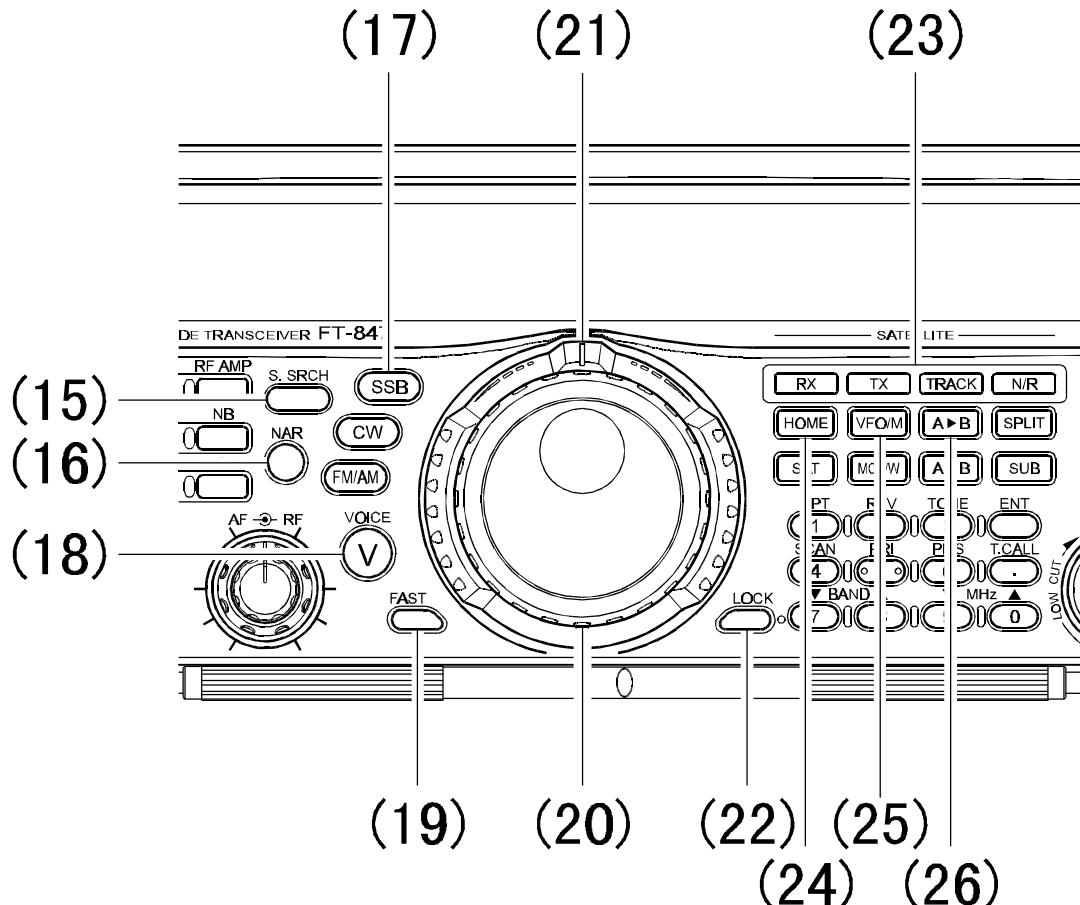
(14) AF/RF Controls

The inner **AF** control adjusts the receiver volume level presented to the speaker or headphones (but not the rear panel **PKT** or **DATA IN/OUT** jacks). Clockwise rotation increases the volume level.

The outer **RF** control adjusts the gain of the receiver's RF and IF stages. Clockwise rotation increases the RF Gain level for best sensitivity, and the normal operating position for this control is fully clockwise.

Note: Counter-clockwise rotation of the **RF** *(GAIN) control, besides lowering the receiver gain level, will cause the S-meter to deflect upward, as though a strong signal were present. This is quite normal.*

Front Panel Controls & Switches

(15) S.SRCH Switch

Pressing this switch momentarily recalls the "SMART SEARCH™" memories. Pressing and holding in this switch for ½ second initiates SMART SEARCH™ scanning. With SMART SEARCH™ engaged, the transceiver quickly searches above and below the *Main VFO* frequency, storing those frequencies on which activity is detected (without stopping on them even momentarily).

(16) NAR Switch

This switch is used to activate the "Narrow" filter mode in the CW (optional **YF-115C** required), AM, and FM modes, for improved interference rejection. On FM, it also selects the low-deviation mode required for HF FM operation on 29 MHz. Press this switch to select the Narrow mode; the "**NAR**" icon will appear on the display panel.

(17) MODE Switches

Pressing one of these switches selects the operating mode. Per the chart below, repeated presses of a particular switch will cause the precise mode to be selected from within a mode group (for example, repeatedly pressing [**SSB**] toggles the mode between USB and LSB).

MODE Switch	Available Modes
SSB	LSB ⇔ USB
CW	CW(USB) ⇔ CW(LSB)
FM/AM	FM ⇔ AM

(18) VOICE Switch

Pressing this switch activates the optional **FVS-1A**, which provides announcement of the operating frequency (with resolution to the displayed 100 Hz digit) for operators with vision impairments.

(19) FAST Switch

Pressing this switch toggles the transceiver between "high speed" and "slow speed" tuning rates for the **MAIN VFO** Tuning Dial, the **SUB-TUNE** knob, the **MEM/VFO CH** knob, and the **UP/DOWN** switches. The "FAST" icon will appear on the display panel when the fast-tuning mode has been selected.

(20) MAIN VFO Tuning Dial

This large knob is the main tuning dial for the transceiver, controlling the frequency of the Main VFO. Clockwise rotation of the dial increases the frequency, while counter-clockwise rotation of the dial decreases the frequency.

The tuning steps may be changed via the Menu system. The default tuning steps are shown below:

Mode	Available Steps		Default Step
	NORMAL	FAST	
SSB/CW	0.1, 1, 10 Hz	1, 10, 100 Hz	1 Hz/10 Hz
AM/FM	10 Hz	100 Hz	10 Hz/100 Hz

(21) SHUTTLE JOG™ Control

The outer "SHUTTLE JOG™" control is concentric to and slightly behind the **MAIN VFO** Tuning Dial. The **SHUTTLE JOG**™ allows fine or rapid frequency excursions with just a slight turn of your hand. Rotating this control slightly to the left or right initiates slow tuning in a downward or upward direction, respectively. The more you rotate this spring-loaded control, the faster the Main VFO frequency will be changed.

(22) LOCK Switch

This switch locks the settings of the **MAIN VFO** Tuning Dial, **SHUTTLE JOG**™ ring, and the **SUB-TUNE** knob. Other front panel switches may also be locked out, using Menu #27 (see page 87).

(23) SATELLITE Mode Indicators

These indicators provide satellite operating mode information, and they become illuminated based on mode selections made via the switches immediately below the indicators (see sections **(24)** ~ **(27)** below for details).

[**RX**] (**HOME**)

   In this mode, the **MAIN VFO** Tuning Dial is used to control the *downlink* (receive) frequency during satellite operation.

[**TX**] (**VFO/M**)

   In this mode, the **MAIN VFO** Tuning Dial is used to control the *uplink* (transmit) frequency during satellite operation.

[**TRACK**] (**A ▶ B**)

   In this mode, the Main and Sub VFOs are "slaved" so that they change frequency *together* when the **MAIN VFO** Tuning Dial is rotated. In the "TRACK" mode, either "normal" or "inverted" transponders may be utilized, depending on the selection made by the [**N/R**] switch (see below).

[**N/R**] (**SPLIT**)

   This switch selects the transponder operating mode during satellite operation. In the "**N**" (Normal) mode, increasing the Main VFO frequency also causes an identical increase in the Sub VFO frequency.

   In the "**R**" (Reverse) mode, increasing the Main VFO frequency causes an identical *decrease* in the Sub VFO frequency.

(24) HOME [RX] Switch

This switch is used to recall the "HOME" memory channel on each band.

In the SATELLITE mode, pressing this switch causes the Main VFO to be designated as the *Receive* (downlink) VFO; in this case, the Transmit (uplink) frequency will be controlled by the **SUB-TUNE** knob.

(25) VFO/M [TX] Switch

Pressing this switch changes frequency control between the Main VFO and the Memory systems. Repeatedly pressing this switch causes frequency control to toggle between these two systems.
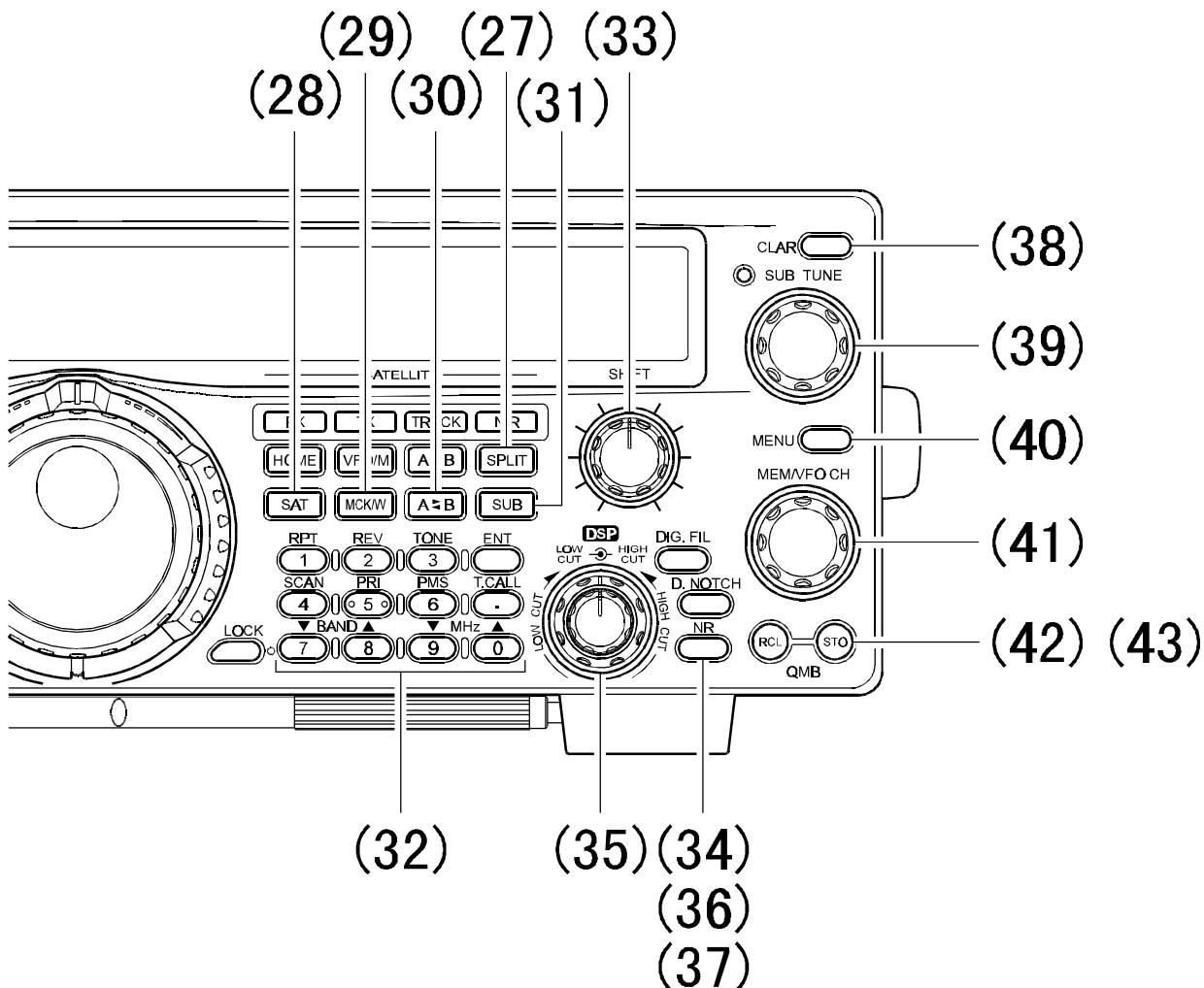
In the SATELLITE mode, pressing this switch causes the Main VFO to be designated as the *Transmit* (uplink) VFO; in this case, the Receive (downlink) frequency will be controlled by the **SUB-TUNE** knob.

(26) A▶B [TRACK] Switch

Pressing and holding in this switch for ½ second causes the contents of the Main VFO to be copied into the Sub VFO, so that the two VFOs' contents will be identical.

In the SATELLITE mode, pressing this switch activates the "VFO Tracking" mode, whereby the Main VFO and Sub VFO are "slaved" under control by the **MAIN VFO** Tuning Dial.

(27) SPLIT [N/R] Switch

Pressing this switch activates split-frequency opera-
tion between the main display (either the Main VFO
or a Memory Channel), used for transmission, and the
Sub VFO, used for reception. The "Split" mode is *not*
used for full-duplex satellite operation. When the SPLIT
mode is activated, the "**SPLIT**" icon will appear on the
display panel.

In the SATELLITE mode, pressing this key toggles the
VFO Tracking feature between the "Normal" and "Re-
verse" (inverted) tracking modes.

(28) SAT Switch

Pressing this switch activates the full-duplex SATEL-
LITE mode of operation, in which the Main and Sub
VFOs are used for crossband satellite operation. The
"<sat icon>" icon will appear on the display panel during
satellite operation.

(29) MCK/W Switch

Pressing this switch momentarily checks the contents
of the current memory channel *without switching the
transceiver out of the VFO mode*. The **MEM/VFO CH**
knob may then be rotated to select, for example, an
unused channel (to be used for memory storage).

Pressing and holding in this switch for ½ second trans-
fers the Main VFO frequency into the current memory
channel register. A double-beep will confirm memory
storage.

(30) A⇄B Switch

Pressing this switch momentarily causes the contents
of the Main VFO and the Sub VFO to be swapped.

(31) SUB Switch

Pressing this switch momentarily allows direct key-
board frequency entry and/or mode change to be per-
formed on the Sub VFO register.

(32) Keypad

The keypad is used for direct frequency entry during VFO operation. Secondary functions allow control of certain repeater, scanning, and frequency navigation functions.

(33) SHIFT Control

This control is used to adjust the receiver's IF SHIFT feature, which tunes the 455 kHz IF relative to the center frequency of the selected IF filter (in all modes except FM). The default position of this control is 12 o'clock, and an adjustment range of about ±1.2 kHz is provided (the pitch of the incoming signals will not change, however).

(34) DIG. FIL Switch

Pressing this switch activates the receiver's DSP filters. When the DSP is activated, the "DIG.FIL" icon will appear on the display panel.

(35) DIGITAL FIL (LOW CUT/HIGH CUT Controls)

These controls adjust the passband cutoff frequencies of the receiver's **HIGH CUT** and **LOW CUT** DSP filters in the SSB, AM, and FM modes. The inner control adjusts the LOW-CUT characteristics, while the outer control adjusts the HIGH-CUT characteristics.

(36) NOTCH Switch

This is the ON/OFF switch for the beat-canceling DSP NOTCH filter.

(37) NR Switch

This is the ON/OFF switch for the DSP NOISE REDUCTION filter. The level of DSP Noise Reduction is set via Menu #11 (see page 85).

(38) CLAR Switch

Pressing this switch activates the RX CLARIFIER ("RIT"), which provides offset tuning from the Main VFO frequency. When this feature is enabled, the "CLAR" icon will appear on the display panel. The **SUB-TUNE** knob is used for Clarifier adjustment, and the available offset range is ±9.99 kHz.

(39) SUB-TUNE Knob

This knob is the tuning dial which controls the frequency of the Sub VFO. Clockwise rotation of the dial increases the frequency, while counter-clockwise rotation decreases the frequency.

The tuning steps are defined by the setting of Menu #2, which also sets the steps for the Main Tuning Dial. The default tuning steps are shown below:

Mode	Available Steps		Default Step
	NORMAL	FAST	
SSB/CW	0.1, 1, 10 Hz	1, 10, 100 Hz	1 Hz/10 Hz
AM/FM	10 Hz	100 Hz	10 Hz/100 Hz

(40) MENU Switch

Pressing this switch momentarily activates the "MENU" mode, which allows customization of many aspects of transceiver configuration.

(41) MEM/VFO CH Knob

When the VFO mode is active, this detented knob becomes a "channelized" tuning control, which allows quick navigation up and down the band.

This knob selects the Memory Channel when the Memory mode is active.

The tuning steps for the **MEM/VFO CH** knob (when operating in the "VFO" mode) may be set via the Menu system. The default steps are:

Operating Mode	HF Bands	VHF Bands	UHF Bands
SSB/CW	2.5 kHz	2.5 kHz	2.5 kHz
AM	5 kHz	5 kHz	5 kHz
FM	5 kHz	✳	✳

✳: Depends on transceiver version (USA, European, etc.)

These steps may be set individually for the HF, 50 MHz, 144 MHz, and 430 MHz bands; see page 34 for details.

(42) QMB RCL Switch

This switch is used for one-touch recall of the Quick Memory Bank memory.

(43) QMB STO Switch

This switch is used for storing a Main VFO frequency into the QMB memory register.

Display Indicators and Icons

Operational Command Icons:
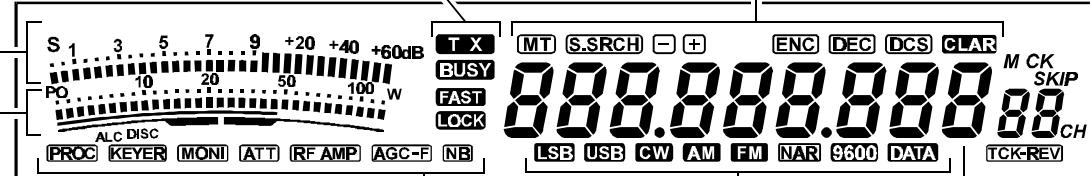
`T X` : Transmitter is active.

`BUSY` : Receiver Squelch is open.

`FAST` : "Fast" tuning is active.

`LOCK` : Frequency or switch LOCK feature is engaged.

Main Band Operating Icons:

`MT` : Memory Tune mode is active.

`S.SRCH` : SMART SEARCH™ mode is active.

`−` `+` : Repeater Shift indicators.

`ENC` : CTCSS Encoder is active.

`DEC` : CTCSS Decoder is active.

`DCS` : Digital Code Squelch Encoder/Decoder is active.

`CLAR` : Receiver "CLARIFIER" is active.

Receiver S-Meter Scale

Reflected Power Meter Scale when the **ATAS-100** is activated.

Satellite Mode	
OFF	**ON**
TX **Default Setting:** **PO** (Power Output) **Alternate Setting:** **ALC** (via Menu # 24) ☞ Page 86	**Default Setting:** **PO** (Power Output) **Alternate Setting:** **ALC** **DICS** (RX Discriminator Center Meter) (via Menu # 33) ☞ Page 88
RX FM Mode: **DISC** (Discriminator Center Meter)	

Main Band Frequency Display Field

Main Band Operating Mode Icons:

`LSB` : Lower Sideband

`USB` : Upper Sideband

`CW` : CW

`AM` : AM

`FM` : FM

`NAR` : Narrow Filter is engaged.

`9600` : FM Packet Baud Rate: 9600 bps

`DATA` : FM Packet or SSB DATA Transmission is active.
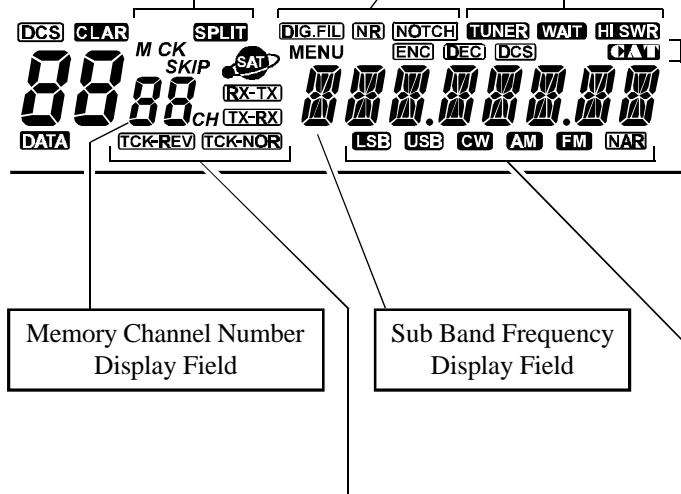
Accessory Feature Icons:

`PROC` : RF Speech Processor is engaged.

`KEYER` : CW Electronic Keyer is engaged.

`MONI` : MONITOR is engaged.

`ATT` : Receiver Input ATTENUATOR is engaged.

`RF AMP` : Receive Preamplifier is in line.

`AGC-F` : Fast AGC is engaged.

`NB` : IF Noise Blanker is engaged.

Display Indicators and Icons

SPLIT : Split Frequency Operation is engaged.

M CK : Memory Channel "Check" mode is active.

SKIP : The current Memory Channel is flagged to be skipped during scanning.

Digital Signal Processing Mode Indicators:

DIG.FIL : Digital Passband Filter (Voice Modes) is engaged.

NR : Noise Reduction Filter is engaged.

NOTCH : DSP Auto-Notch Filter is engaged.

FC-20 Automatic Antenna Tuner/**ATAS-100** Antenna Status:

TUNER : **FC-20** or **ATAS-100** is engaged.

WAIT : **FC-20** or **ATAS-100** Tuning is in progress.

HI SWR : Antenna system SWR is too high.

MENU: Menu mode has been activated.

Sub-Band Tone Icons:

ENC : CTCSS Encoder is active.

DEC : CTCSS Decoder is active.

DCS : Digital Code Squelch Encoder/Decoder is active.

Memory Channel Number Display Field

Sub Band Frequency Display Field

CAT : CAT System data is being transferred.
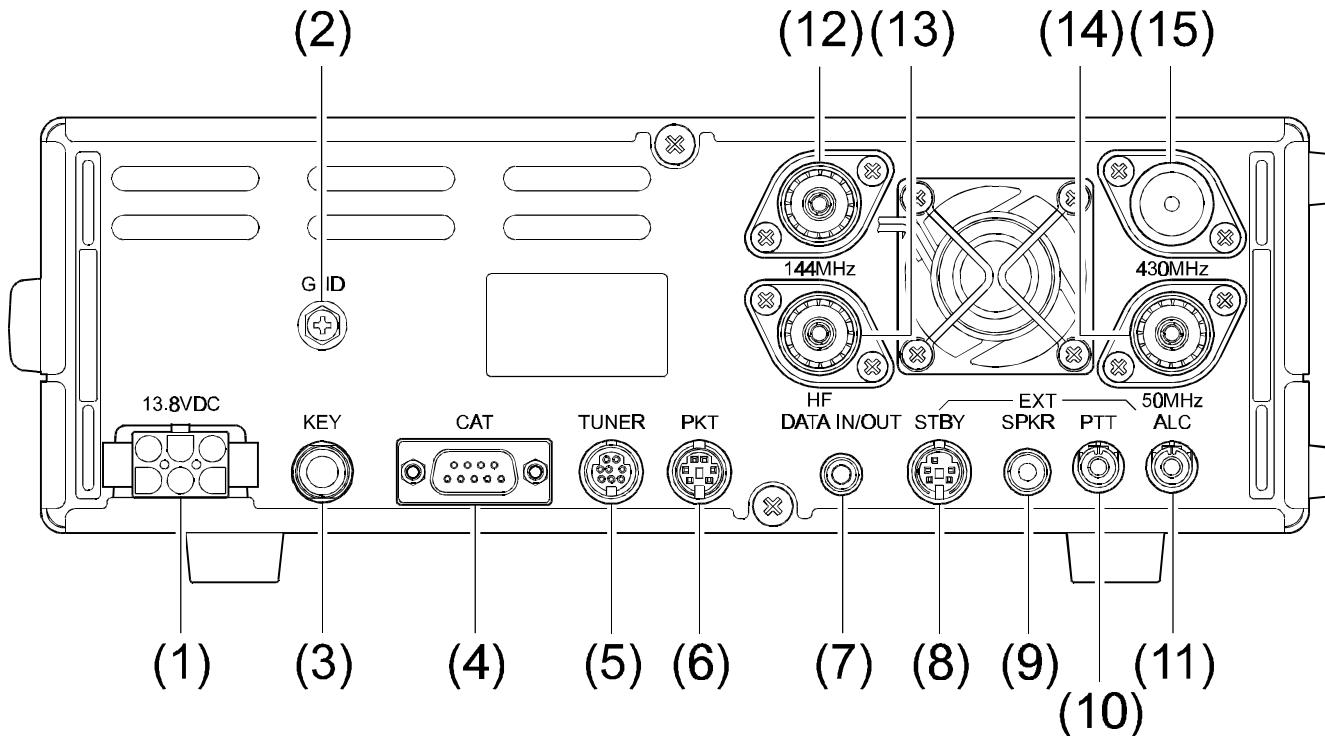
Satellite Mode Frequency Relationship Indicators

SAT : Satellite mode (Full-Duplex) is engaged.

RX-TX : Main Band is used for Receive, Sub Band is used for Transmit.

TX-RX : Main Band is used for Transmit, Sub Band is used for Receive.

TCK-REV : Inverted "Reverse" Frequency Tracking is engaged.

TCK-NOR : Linear "Normal" Frequency Tracking is engaged.

Sub Band Operating Mode Icons:

LSB : Lower Sideband

USB : Upper Sideband

CW : CW

AM : AM

FM : FM

NAR : Narrow Filter is engaged.

Rear Panel Connectors

(1) 13.8V DC Jack

This is the main DC input jack for the transceiver. The specified voltage is 13.8V DC, negative ground (±10%), and maximum current draw is 22 Amperes.

(2) GND Lug

For best performance and safety, this Ground lug should be connected to a good earth ground using a short, heavy, braided cable.

(3) KEY Jack

This 3-pin ¼" ("stereo") jack may be used for connection to a straight key, an external electronic keyer, or a keyer paddle. When connecting to an external electronic keyer or computer-driven keying interface, be sure that the external device is set up for "positive" voltage keying. The key-up voltage is +5 V DC, and the key-down current is 2 mA.

(4) CAT Port

This DB-9 connector is used for interconnection to a personal computer's serial port to enable computer-assisted operation. Use a "null modem" (not "straight") RS-232C serial data cable; no "level converter" or other hardware interface should be required.

(5) TUNER Connector

This 8-pin mini-DIN connector is used for connection to the optional **FC-20** External Automatic Antenna Tuner.

(6) PKT Connector

This 6-pin mini-DIN connector accepts AFSK input from a Terminal Node Controller (TNC). It also provides fixed-level receiver audio output, PTT, and Ground lines. See the section on "**FM PACKET TNC INTERFACING**" for details of the correct levels and impedances required for proper operation.

(7) DATA IN/OUT Jack

This 3.5 mm, 3-pin miniature phone jack provides constant-level receiver audio output on the *ring* contact, and accepts transmit audio input and PTT on the *tip* contact, for AFSK use with a TNC for RTTY or other digital operating modes. See the section on "**AFSK TNC CONNECTIONS**" for details of the correct levels and impedances required for proper operation.

(8) STBY Jack

This 5-pin mini-DIN connector provides "closure-to-ground" switching lines for T/R control of external amplifiers. One connection is provided for HF operation, and one each for the 50, 144, and 430 MHz bands. The maximum ratings for these connections are +24V DC at 100 mA (only positive DC voltages are acceptable).

(9) SP Jack

This 3.5 mm, 2-pin miniature phone jack provides receiver audio output for an external speaker. The audio output impedance is $4\Omega \sim 16\Omega$, and the level varies according to the setting of the front panel's **AF** (GAIN) control.

(10) EXT PTT Jack

This "RCA" female connector is used for connection to a footswitch or other external switch for Tx/Rx command control of the transceiver. This jack is wired in parallel with the front panel's **MOX** switch; shorting this jack to ground causes the transceiver to be placed in the Transmit mode, while opening the connection to this jack returns the transceiver to the Receive mode. Open-circuit voltage is +5V DC, and closed-circuit current is 1 mA.

*Note: This jack is designed to be used for external PTT input only. Do not attempt to use the **PTT** jack for switching of amplifiers or other external devices (use the **STBY** jack for controlling such devices).*

(11) EXT ALC Jack

This "RCA" female connector may be used to a linear amplifier's ALC (Automatic Level Control) connector, to prevent over-drive by the transceiver. The specified control voltage range is 0V ~ –4V DC, with –4V corresponding to the maximum degree of power reduction being applied to the transceiver.

(12) 144 MHz Coaxial Jack

This Type "M" (SO-239) jack is for connection of your antenna for the 144 MHz band.

(13) HF Coaxial Jack

This Type "M" (SO-239) jack is for connection of your antenna for the 1.8 ~ 29.7 MHz bands.

(14) 50 MHz Coaxial Jack

This Type "M" (SO-239) jack is for connection of your antenna for the 50 MHz band.

(15) 430 MHz Coaxial Jack

This Type "N" jack is for connection of your antenna for the 430 MHz band. Do not, under any circumstances, attempt to connect a Type "M" (PL-259) plug to this jack!

OPERATION

INITIAL SETUP

Before plugging in the transceiver for the first time:
- ☑ Make sure your power supply voltage is correct.
- ☑ Ensure that a proper ground connection has been made.
- ☑ Ensure that all antennas have been securely connected to the correct rear-panel jack.

Preset the controls as follows:
POWER & **MOX** switches: Off (■)
RF PWR & **RF** (GAIN): Fully clockwise (maximum)
MIC & **AF** (GAIN): 10 o'clock
SQL & **KEYER SPEED**: Fully counter-clockwise (minimum)
LOW CUT: Fully counter-clockwise
HIGH CUT: Fully clockwise
SHIFT: 12 o'clock
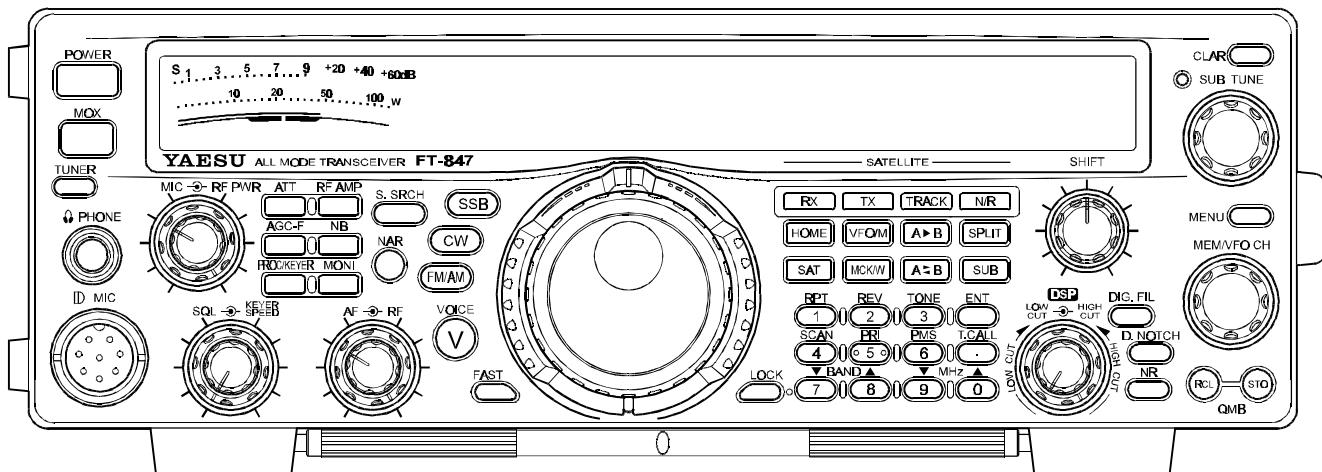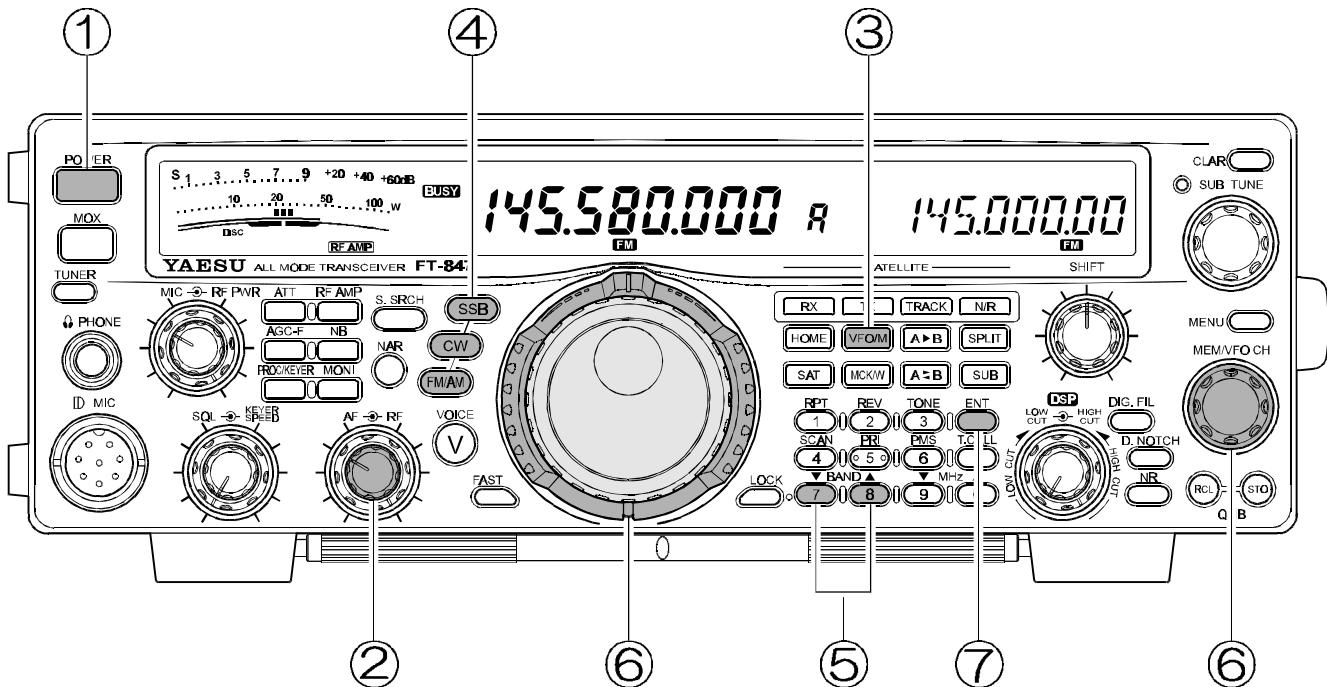
Connect your microphone and/or CW key or paddle,
connect the DC cable to the rear panel **13.8VDC** jack.
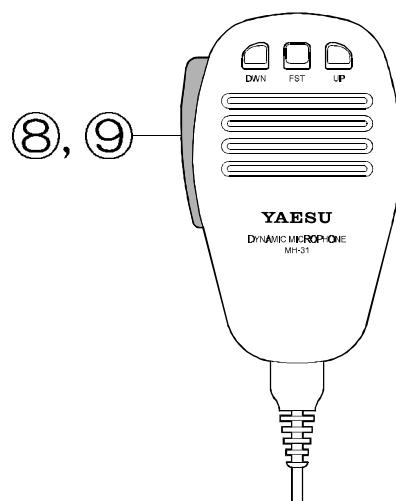
OPERATION QUICK START

① Push in the [**POWER**] switch. The display should become illuminated, and operation may now commence.

② Rotate the **AF** (GAIN) control to set the receiver volume level.

③ Press the [**VFO-M**] switch, if necessary, to select the *VFO* mode of frequency control (either "**A**" or "**b**" will appear to the right of the Main Frequency Display field).

④ Press the appropriate Mode switch ([**SSB**], [**CW**], or [**FM/AM**]) to select the desired operating mode. Press a particular Mode switch repeatedly to toggle between the selections available for that mode:

    [**SSB**]:   LSB ⇔ USB
    [**CW**]:   CW/USB ⇔ CW/LSB
    [**FM/AM**]: FM ⇔ AM

⑤ Press the [**BAND**] [▲] or [▼] keys, as necessary, to set the desired operating band.

⑥ Rotate the **MAIN VFO** Tuning Dial or **MEM/VFO CH** knob to select the desired frequency. The **SHUTTLE JOG™** ring may also be turned to the left or right to change frequency.

⑦ To set a frequency directly from the keyboard, press [**ENT**], followed by the frequency (enter the decimal point after the "MHz" portion of the frequency), then push [**ENT**] to finish your entry.

⑧ To transmit, press the microphone's [**PTT**] switch, and speak into the microphone in a normal voice level.

⑨ To receive, release the [**PTT**] switch.

OPERATION

Frequency Navigation

Several methods of frequency setting and/or adjustment are provided on the FT-847:

- The **MAIN VFO** Tuning Dial (for "Main VFO" frequencies);
- The **SUB-TUNE** Dial (for "Sub VFO" frequencies);
- The **SHUTTLE JOG**™ Ring (for "Main VFO" frequencies);
- The **MEM/VFO CH** knob (for "Main VFO" frequencies);
- The **UP** and **DWN** scanning keys on the microphone;
- The ▼**BAND**▲ and ▼**MHz**▲ keys (for both VFOs); and
- The 12-key Keypad (for both VFOs).
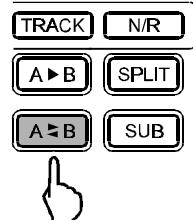
VFO Operation

The VFO (Variable Frequency Oscillator) system in the FT-847 is the primary method of frequency navigation. Separate VFOs are provided for the Main (left) and Sub (right) display areas; these VFOs will be described, throughout this manual, as the "Main" and "Sub" VFOs, respectively.

The VFO registers are designed to minimize the amount of operator intervention required when changing bands. Therefore, when changing bands using the ▼**BAND**▲ keys, you will observe that the VFO registers do not just retain frequency information; they also store *Mode*, *Bandwidth, RF Amp, Clarifier, (FM) Repeater Shift (if any), and (FM) Tone* status information independently on each VFO. When you return to a particular band after operation elsewhere, the FT-847 will "remember" how you were set up on that band, so you will be ready for operation without delay.

For satellite operation, the Main VFO is generally the one used for reception, while the Sub VFO is the one used for transmission. When this is the case, the "RX-TX" icon will appear on the display. If you press the [**TX** (**VFO/M**)] key, the Main VFO will now control the Transmit (TX) frequency, and the "TX-RX" icon will become illuminated.

Pressing the [**A**⇄**B**] key swaps the contents of the Main and Sub VFOs. In the Satellite mode, this does not change the "RX-TX" or "TX-RX" configuration; it just reverses the contents of the Main and Sub VFOs.

Main VFO Tuning Dial

Rotate the **MAIN VFO** Tuning Dial clockwise to increase the operating frequency, and rotate it counterclockwise to decrease the operating frequency.

The tuning rate may be increased by pressing the front panel [**FAST**] key. The available "steps" for tuning of the **MAIN VFO** Tuning Dial and **SUB-TUNE** knob are shown in the chart below:

Mode	Available Steps		Default Step
	Normal	Fast	
SSB/CW	0.1, 1, 10 Hz	1, 10, 100 Hz	1 Hz
AM/FM	10 Hz	100 Hz	10 Hz

In the SSB and CW modes, the choice of tuning steps may be accomplished using Menu #2, as described on page 84. Note that you may set different steps on different operating bands (HF/50 MHz/144 MHz/430 MHz); when making changes via Menu #2, the band on which you are currently receiving will be the only band on which the change in frequency steps is executed.

Rotate the **MAIN VFO** Tuning Dial to increase the operating frequency, and rotate it clockwise to decrease the operating frequency.

Sub-Tune Knob

The **SUB-TUNE** knob is most often used to adjust the uplink (transmit) frequency during satellite operation. The same frequency steps selected for the **MAIN VFO** Tuning Dial will be applied to the **SUB-TUNE** knob.

As with the **MAIN VFO** Tuning Dial, clockwise rotation of the **SUB-TUNE** knob increases the operating frequency.

Note: If you have selected very fine (0.1 Hz or 1 Hz) steps via Menu #2, the **SUB-TUNE** control will appear to tune very slowly. If you are using the **SUB-TUNE** control often, we recommend that you use the [**FAST**] key, or set Menu #2 to 10 Hz steps, to make frequency change via the **SUB-TUNE** control more *efficient*.

RECEIVER OPERATION

Locking the Front Panel Controls & Switches

Press the [**LOCK**] key to lock out certain of the front panel controls and switches so as to prevent accidental frequency or band change. Press the [**LOCK**] key once more to disable the "LOCK" feature, and return to normal operation.

It is possible to have the front panel [**LOCK**] switch perform different degrees of "lock-down" of the front panel controls and switches. The selection is made via Menu #27, per the following procedure:
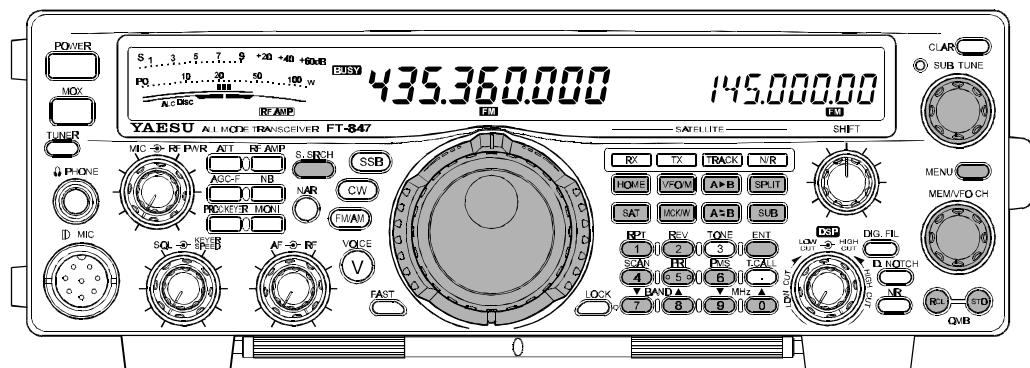
① Press the [**MENU**] key to enter the Menu mode.
② Rotate the **SUB-TUNE** knob to select Menu #27 "LOCK" on the display.
③ Rotate the **MEM/VFO CH** knob to select from the available options:
   diAL: This selection locks out only the **MAIN VFO** Tuning Dial and **SUB-TUNE** knob, plus the **SHUTTLE JOG™** ring.
   FrE: This selection locks out the knobs and switches in the shaded areas of the illustration below.
④ Press the [**MENU**] key again when you are satisfied with your selection. This causes you to exit from the Menu mode.

SHUTTLE JOG™ RING

The **SHUTTLE JOG™** is an efficient way to achieve large frequency excursions, avoiding the need to spin the **MAIN VFO** Tuning Dial to move quickly from one frequency to another.

The **SHUTTLE JOG™** is a spring-loaded ring used for frequency change. Rotating the **SHUTTLE JOG™** ring away from its center detent in either direction will initiate tuning. The farther the **SHUTTLE JOG™** ring is moved from the center, the larger and faster the amount of frequency change which results.

The **SHUTTLE JOG™** is active in the VFO mode. When you are operating in the Memory mode, the **SHUTTLE JOG™** acts identically to the **MAIN VFO** Tuning Dial: activation of the **SHUTTLE JOG™** places the transceiver in the "Memory Tune" mode, allowing you to tune away from a pre-stored memory frequency.

OPERATION

RECEIVER OPERATION

MEM/VFO CH KNOB

The **MEM/VFO CH** knob on the front panel serves a dual function. In the VFO mode, it allows "channelized" frequency stepping, for rapid and convenient excursions around the band. In the Memory mode, this knob is used to select the desired memory channel.

Menu Items #3, #4, and #5 allow you to select the "Channelized VFO" steps you wish to use in the SSB/CW, AM, and FM modes, respectively.

Menu #	Mode(s)	Available Steps	Default Steps
3	SSB/CW	1/2.5/5 kHz	2.5 kHz
4	AM	2.5/5/9/10/12.5/25 kHz	5 kHz
5	FM	5/6.25/10/12.5/15/20/25kHz	HF: 5 kHz 50 MHz: 5 kHz 144 MHz: 5 or 25 kHz* 430 MHz: 25 kHz

* USA version: 5 kHz

As with the settings of the frequency synthesizer steps for the Main and Sub Tuning Dials, the steps for the SSB/CW modes (Menu #3) and AM mode (Menu #4) may be set independently for the HF, 50 MHz, 144 MHz, and 430 MHz bands. The band on which you are currently receiving will be the only band on which the change in frequency steps is executed.

Clockwise rotation of the **MEM/VFO CH** knob increases the operating frequency. The **MEM/VFO CH** control only affects the Main VFO. When you first rotate the **MEM/VFO CH** control in the VFO mode, the frequency will "round off" to the nearest step appropriate for the steps in use.

*Note: In the Satellite mode, the **MEM/VFO CH** control is used to select the various "Satellite Memories," and no "VFO" channelized operation is possible.*


Operating Tip
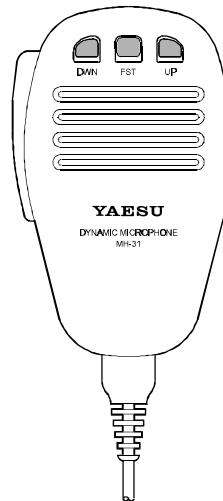
If the steps of the **MEM/VFO CH** knob appear to be twice what you set via Menu Items #3 ~ #5, it is because the "Fast" mode has been activated (this *doubles* the step size). Just press the [**FAST**] key to return to the originally-programmed steps (the "FAST" icon will disapper from the LCD).

UP AND DWN SCANNING KEYS (MICROPHONES)

The **UP** and **DWN** switches on the microphones, when pressed momentarily, cause the frequency to be moved upward or downward, respectively, by one step. Holding the **UP** or **DWN** switches in will cause scanning to occur, in the direction selected, until the switch is released. If the squelch is closed, the scanning will continue automatically (even if the **UP** or **DWN** switch is released) until a signal is encountered. See page 76 for more details about scanning.

MH-31B8 Hand Mic UP/DWN/FST Switches

Pushing the **MH-31B8**'s [**UP**] or [**DWN**] switch will initiate tuning in an upward or downward direction, in frequency steps set in accordance with the selection made previously for the **MAIN VFO** Tuning Dial. Pushing the [**FST**] key will switch tuning into the "Fast" mode, as though the front panel [**FAST**] switch had been pressed.

MD-100A8X Desk Microphone Rotary Scanning Switch

The (optional) **MD-100A8X** Desk Microphone features a Rotary Scanning Switch at the base of the microphone support stand. Rotating this switch to the left causes the frequency to scan lower, and rotating the switch to the right causes the frequency to scan higher. Rotating this switch *fully* to the left or right causes the scanning speed to switch to the "Fast" mode, as though you had pushed the [**FST**] switch on the **MH-31B8**.

Important Note!

When connecting the **MD-100A8X** to the FT-847, be certain that the **coiled** cord from the microphone base is connected to the transceiver! If the short "straight" cable is connected to the transceiver instead, scanning will not be possible (the "straight" cable does not include scanning lines, as it is intended only to pass microphone and PTT signals from the microphone shaft).

OPERATION

RECEIVER OPERATION

▼BAND▲ AND ▼MHz▲ KEYS

The [**BAND**] keys may be used, in the VFO mode, to jump to the next Amateur band above (▲) or below (▼) the current operating band. When moving to a new band, the FT-847 will move you to the last frequency and mode on which you were operating on that band.

If the [**FAST**] key has activated the "FAST" mode, pressing the ▼BAND▲ keys will cause the transceiver to toggle between HF (the last band/frequency on which you were operating), 50 MHz, 144 MHz, and 430 MHz; all the HF bands other than the last one on which you were operating will be bypassed.

The [**MHz**] keys, similarly, are used in the VFO mode to move up (▲) or down (▼) in frequency by 1 MHz. If the [**FAST**] key has been pressed, the frequency jump will be 10 MHz, instead of 1 MHz.

If you wish to execute either a band change or a 1 MHz frequency change on the Sub VFO, press the [**SUB**] key first, *then* either a [▼BAND▲] key or a [▼MHz▲] key, then press [**SUB**] again.

Can't Change HF Ham Bands?

If you find that you are "stuck" on one HF Amateur band, and cannot change to another HF band using the [▼BAND▲] key(s), it likely is because you have the "Fast" tuning mode activated (look for the "FAST" icon on the display. In this mode, pressing the [▼BAND▲] keys toggles band change from **HF** to **50 MHz** to **144 MHz** to **430 MHz**.
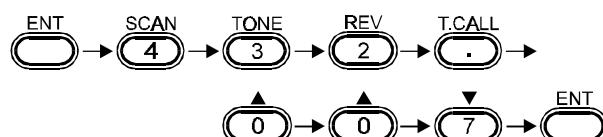
Press the [**FAST**] key to recover the ability to toggle among the various HF bands (the "FAST" icon will disappear).

DIRECT FREQUENCY ENTRY VIA 12-KEY KEYPAD

The 12-key Keypad provides a simple, efficient way to enter a starting frequency for operation on a band. The procedure for entering a frequency is simple:
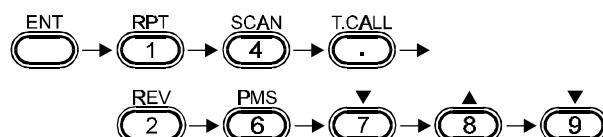
- Press the [**ENT**] key to begin the entry process.
- Enter the "MHz" portion of the frequency on which you wish to operate.
- Now enter the decimal point [●] in the frequency (this key is shared with the "**T. CALL**" function, and is located just to the right of the [**6**] key).
- Enter any desired remaining digits of the frequency.
- Press [**ENT**] to complete the frequency entry procedure.

Example: Enter 432.007 MHz onto the Main VFO

- If you complete the frequency entry down to the 10 Hz digit, it is not necessary to key in the final "[**ENT**]" keystroke, as the transceiver will recognize a complete frequency entry.
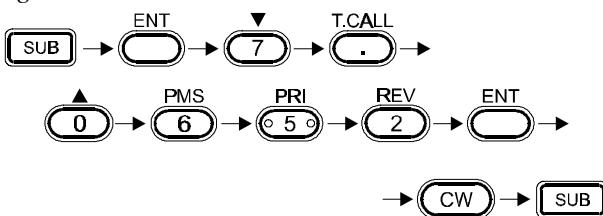
Example: Enter 14.267.890 MHz

Note: Do not enter the second decimal point in the frequency; doing so returns the entry process to the first digit after the decimal point which follows the "MHz" digits.

- The Keypad may also be used to enter frequencies into the Sub VFO register. To do this, press [**SUB**] before pressing [**ENT**] in the frequency entry process.

Example: Enter 7.065.2 MHz CW into the Sub VFO Register
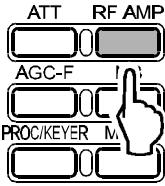
Note: You do not need to enter any leading zeroes prior to entry of the "MHz" digits.

OPERATION

RECEIVER FEATURES

RF PREAMPLIFIERS (INTERNAL)

For weak-signal work, it is essential to secure the best system Noise Figure possible. The receiver's input preamplifiers provide low Noise Figure for best sensitivity in weak-signal situations. Individually-optimized preamplifiers are provided for HF, 50 MHz, 144 MHz, and 430 MHz. In noisy locations or when very strong signals are present, the input preamplifiers may be switched off, thereby reducing the receiver system gain and minimizing the chances of degraded reception due to overload or intermodulation distortion.

① To activate the receiver preamplifiers, push the [**RF AMP**] key. The "RF AMP" icon will become illuminated on the display. You should also hear an increase in the incoming signal strength with the preamplifier on.

② To switch the preamplifier off, press the [**RF AMP**] key once more; the "RF AMP" icon will disappear from the display.

RF PREAMPLIFIERS (EXTERNAL)

The function of the [**RF AMP**] switch can be modified to allow the use of external tower-mounted preamplifiers on the 144 MHz and 430 MHz bands, by supplying +12V DC via the **ANT** jack for each respective band. If you own a preamplifier capable of accepting its DC power via the coaxial line, you may wish to exercise this option so as to place the preamplifier in the line right at the antenna, where the gain and low Noise Figure of the preamp can be used to overcome the insertion loss of your coaxial cable feedline.

Menu #29 controls the selection for the 144 MHz band, while Menu #30 controls the selection for the 430 MHz band. The available choices are:
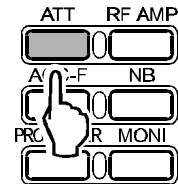
● **INT**: The preamplifier internal to the FT-847 will be selected.
● **EXT**: The internal preamplifier will be bypassed, and +12V DC will instead be sent up the coaxial line for powering an external preamp.

These selections are not provided on the HF and 50 MHz antenna jacks, as there is little chance that the system Noise Figure can be significantly improved by mounting a preamplifier at the tower. If you wish to use an external preamp on 50 MHz, you must supply the necessary DC voltage via a separate power cable; just remember not to activate the internal preamp, as the system total gain will probably be much too high, leading to increased probability of receiver overload and intermodulation.

RECEIVER INPUT ATTENUATOR

For situations where extremely high signal levels are present, the receiver's input ATTENUATOR may be activated, to reduce the sensitivity and total gain of the receiver system.

① To activate the receiver ATTENUATOR, push the [**ATT**] key. The "ATT" icon will become illuminated on the display. You should also hear a decrease in the incoming signal strength (and background noise) with the ATTENUATOR on.

② To switch the ATTENUATOR off, press the [**ATT**] key once more; the "ATT" icon will disappear from the display.

AGC (AUTOMATIC GAIN CONTROL)

The AGC system limits the audio output produced by incoming signals, so as to prevent damage to your ears and overload of the receiver components. The AGC system works instantaneously when an incoming signal is detected, while the receiver recovery time may be adjusted from the front panel.

When tuning around the band (looking for signals), it usually is best to have "FAST" AGC recovery time selected (the [**AGC-F**] switch should be pressed momentarily so that the "AGC-F" icon appears at the bottom right-hand corner of the LCD's meter area).

In this mode, the receiver gain recovers quickly after you tune past strong signals. Once you have a signal tuned in, unless it is very weak, you may find reception more comfortable with "SLOW" AGC selected (press the [**AGC-F**] key once more to turn off the "AGC-F" icon).
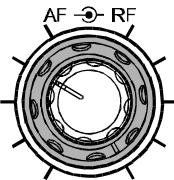
NOTE

The maximum allowable current drain for powering external preamplifiers is 300 mA. Check your preamp's specifications to ensure that this specification is not exceeded.

RECEIVER FEATURES

RF GAIN CONTROL

The RF GAIN control provides a *manual* way to control the gain of the receiver's RF and IF amplifier stages.

For most operation, this control should be left in the fully *clockwise* position, which provides maximum gain and best sensitivity. However, under particularly noisy conditions, net Signal-to-Noise Ratio may be improved by rotating the **RF** (GAIN) control counter-clockwise so that the S-Meter reading holds a steady position slightly higher than the (variable) S-Meter reading of the noise itself. Signals weaker than this fixed S-Meter reading may still be plainly audible, but they will no longer be affecting the AGC system.
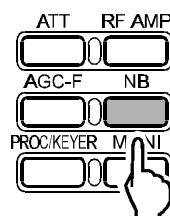
By doing this, you have ① eliminated annoying noise which does not contribute to effective reception, and ② created a new threshold for the onset of AGC action, perhaps allowing even more effective action by the DSP's NOISE REDUCTION, NOTCH, and/or the HIGH CUT/LOW CUT features (see pages 38, 40, 41).

When the noisy conditions have subsided, return the **RF** (GAIN) control to its fully clockwise position.

IF NOISE BLANKER

For reduction of impulse noise, such as that produced by automotive ignition systems, the NOISE BLANKER feature may prove helpful. To activate the IF NOISE BLANKER:

① Turn the Noise Blanker on by pressing the [**NB**] switch. The "NB" icon will appear on the display, and you should observe a reduction in the ignition noise.
② To turn the Noise Blanker off, press the [**NB**] switch again; the "NB" icon will disappear from the display.

Note that the IF NOISE BLANKER may, under crowded band conditions with extremely strong signals, cause a slight degradation in overload immunity, or it may create the sound usually associated with "splatter" on a nearby signal (if that station is very strong). Try switching off the NOISE BLANKER if you observe these conditions.

CLARIFIER (RECEIVER INCREMENTAL TUNING)

The CLARIFIER provides a means of separating the receiver and transmitter frequencies by up to ±9.99 kHz. This may be required for a number of situations:

● If the station you are receiving should start to drift, the CLARIFIER allows you to follow the drifting signal without requiring you to move your transmit frequency.
● In DX pile-up situations, the CLARIFIER offset capability may be sufficient to cover many "Split" calling situations.
● For VHF/UHF EME ("Moonbounce") work, the CLARIFIER allows you to set up a frequency difference corresponding to the predicted Doppler Shift for the EME path. See "**Appendix**" beginning on page 98 for more details regarding EME operation.

To utilize the CLARIFIER feature:

① Press the [**CLAR**] switch; the "CLAR" icon will appear on the display.
② Rotate the **SUB-TUNE** control to set the desired frequency offset for the receiver relative to the transmit frequency.
③ To switch the CLARIFIER off, press the [**CLAR**] switch once more.
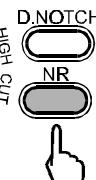
Note: *If you switch the CLARIFIER Off and do not touch the **MAIN VFO** Tuning Dial, the contents of the CLARIFIER's register will be preserved. However, if you change frequencies via the **MAIN VFO** tuning Dial after turning the CLARIFIER Off, the CLARIFIER's register will be "cleared" to a zero offset.*

OPERATION

DSP NOISE REDUCTION
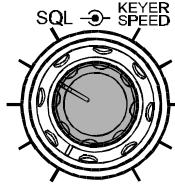
The Digital Signal Processing (DSP) circuitry includes a highly-effective NOISE REDUCTION feature, which may be used alone or in conjunction with the IF NOISE BLANKER. The DSP NOISE REDUCTION circuit can be effective against a wide variety of noise types; it is not limited to the "impulse" noise such as ignition noise. However, because the NOISE REDUCTION is effected in the audio stage, the operator may have to work around the effects of the AGC circuitry. Here's how to use the DSP NOISE REDUCTION feature:

① To turn the NOISE REDUCTION feature on, press the [**NR**] switch. The "NR" icon will appear on the display. You should notice a significant reduction in the background noise.

② If the noise is strong enough to be moving the S-Meter (thereby indicating that AGC voltage is being produced by the strong noise level), you may find the DSP NOISE REDUCTION to be more effective if you take one of the following steps:
  ● Switch off the RF PREAMPLIFIER;
  ● Engage the RF ATTENUATOR; or
  ● Rotate the **RF** (GAIN) control counter-clockwise until the S-meter reading "hangs" at the peak S-Meter reading on the noise.

③ The level of noise reduction applied by the DSP may be adjusted via Menu #11. The default setting, on an arbitrary scale of **0** (minimum noise reduction) to **15** (maximum noise reduction) is **7**. A higher setting will provide more noise quieting, with slightly degraded fidelity; a setting lower than **7** will improve received signal quality, but with slightly less-effective noise reduction.

④ To turn the DSP NOISE REDUCTION feature off, press the [**NR**] switch again. The "NR" icon will disappear from the display.

SQUELCH (RECEIVER MUTING)

The SQUELCH circuit allows muting of the receiver's audio circuits during operating sessions where you wish to quiet the receiver except when a signal is present.

To set the proper sensitivity threshold for the SQUELCH circuit, rotate the **SQL** control clockwise until the background noise just disappears. This threshold point provides the best sensitivity to weak signals, while ensuring proper quieting during quiescent periods.

When a signal is received which exceeds the threshold set by the **SQL** control, the muting function will be disabled and normal receiver audio will flow. When the signal disappears, the receiver will again be muted.

To disable the SQUELCH system's muting action, rotate the **SQL** control fully counter-clockwise.

The SQUELCH circuitry is most often used during FM operation, but the FT-847's SQUELCH system is operational in all modes. There are additional muting functions associated with FM operation (CTCSS and DCS), and these are described on page 53.

VOICE SYNTHESIZER

The FT-847 includes the capability for the use of the (optional) **FVS-1A** VOICE SYNTHESIZER, which provides an audible announcement of the current operating frequency (receive frequency).

To confirm the current frequency, press the [**VOICE**] key, located between the **MAIN VFO** Tuning Dial and the **AF/RF** (GAIN) controls. Frequency resolution to the displayed 100 Hz digit is provided. For example, if the frequency is 145.910.0 MHz, the **FVS-1A** will announce: "*One-Four-Five-Point-Nine-One-Zero-Zero*."

Note: *The VOICE SYNTHESIZER announces the receive frequency; in "Split" operation, the receive frequency is displayed on the SUB VFO frequency display field.*
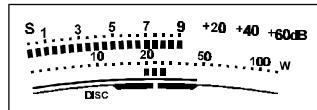
RECEIVER FEATURES

METERING
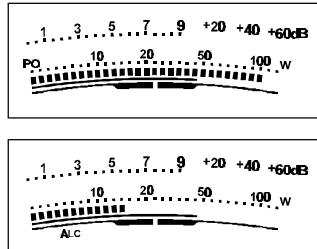
The FT-847 includes dual meter functions, useful in many operating situations.

NON-SATELLITE MODE

On receive, the Meter displays incoming signal strength ("S" Meter). Additionally, in the FM mode, the lower scale of the Meter is a Discriminator Center meter.
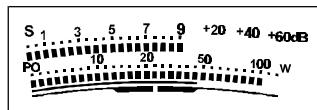
On transmit, the Meter indicates Power Output ("**PO**") in Watts. However, via Menu #24, transmit metering may be changed to indicate **ALC** voltage (internal ALC plus any external ALC from a linear amplifier). See page 86.

SATELLITE MODE

The Satellite mode utilizes simultaneous transmission and reception. Accordingly, simultaneous Tx and Rx metering functions are provided.

The S-Meter provides signal strength monitoring on the downlink signal from the satellite. On transmit, the default meter function is **PO**; however, Menu #34 may be used to select ALC metering instead. Menu #34 also provides the option to disable transmitter monitoring, and select Discriminator Center metering (FM mode) in addition to the S-Meter function. See page 88.

Dealing with Interference

The FT-847 includes a wealth of features designed to facilitate single-signal reception during conditions of heavy interference. These features are described below.

NARROW IF FILTERS (CW/AM/FM MODES)

If you have installed the optional **YF-115C** 500 Hz CW filter, pressing the [**NAR**] key while in the CW mode will place this filter in line, leading to a dramatic reduction in adjacent-frequency interference, as well as greater sensitivity to weak signals (due to the reduced bandwidth).

In the AM mode, pressing the [**NAR**] key causes the bandwidth to be narrowed to 2.4 kHz (the same bandwidth as used on SSB). Although the fidelity will not be particularly good, this bandwidth may enable you to copy weak AM stations under very difficult, crowded conditions. Rotating the DSP **LOW CUT** control slightly clockwise (see next page) will reduce the bass response, which may make the incoming signal sound more pleasant.
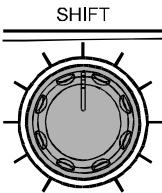
In the FM mode, the "Narrow" selection reduces the receiver bandwidth and the transmitter deviation, so as to comply with international regulations governing FM operation below 30 MHz. The "Narrow" mode may, however, be utilized in the VHF/UHF bands in areas of extreme channel congestion.

OPERATION
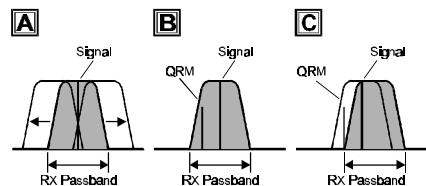
RECEIVER FEATURES

IF SHIFT
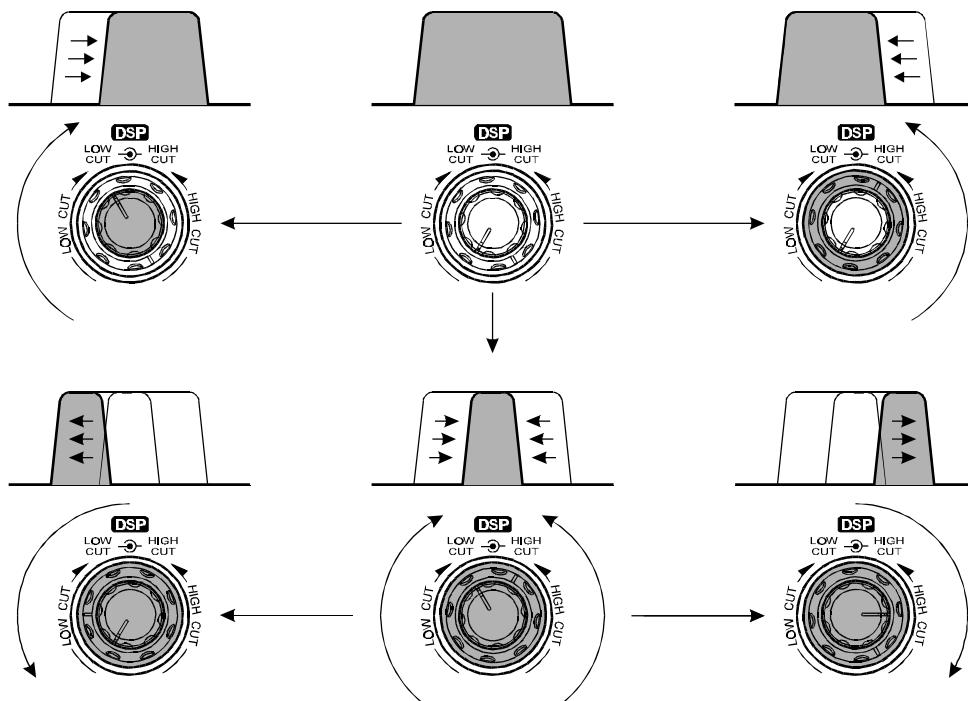
The front panel's **SHIFT** control tunes the position of the IF passband relative to the frequency of the incoming signal. This allows the operator, in effect, to sweep the current IF filter back and forth across the desired signal, eliminating interference from *undesired* signals in the process, without changing the pitch of the incoming signal.

The **SHIFT** control's 12 o'clock (center) position represents the "normal" passband center frequency. Rotate the **SHIFT** control to the left or right to eliminate interference. Careful adjustment of the **SHIFT** control may also be useful in improving the recovered audio on excessively bassy SSB signals. Return the **SHIFT** control to the center position to return to the normal default passband setting.
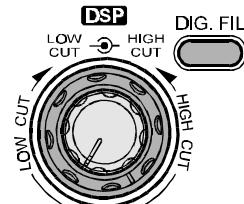
This feature is operational in all modes except FM, although the effect in the AM mode may not be dramatic due to the wider bandwidth used during AM operation. The **SHIFT** control's function is dedicated to the receive mode, and does not affect your transmitted signal characteristics; such adjustment of the transmitted signal is, however, provided via Menu items #92 and 93, as described on page 90.

HIGH CUT/LOW CUT CONTROLS (DSP)

The DSP system's chief interference-fighting circuitry is the passband tuning feature, adjusted via the **HIGH CUT** and **LOW CUT** controls. These controls may be used to optimize the audio bandwidth so as to reduce interference and noise, thus maximizing Signal-to-Noise Ratio. The **HIGH CUT** and **LOW CUT** controls are active on the SSB, AM, and FM modes.

To activate the DSP passband filter, press the [**DIG. FIL**] switch; the "DIG. FIL" icon will appear on the display when the DSP is on. Now rotate the **HIGH CUT** and **LOW CUT** controls to roll off interference and/or noise, as needed, or to enhance the audio response. Press the [**DIG. FIL**] switch again to turn the DSP passband filter off.
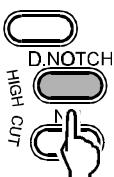
In the CW mode, these controls are disabled, and the DSP bandwidth is set via Menu #10, while the center frequency of the DSP passband filter is determined by the setting of the "PITCH" command (Menu #6).

RECEIVER FEATURES

NOTCH FILTER (DSP)

Unwanted beat notes within the receiver's IF filter passband can be effectively removed by utilization of the DSP NOTCH function. The DSP system will detect the incoming carrier, then automatically center a sharp notch filter to eliminate the beat note. If multiple beat notes are present, the DSP will create multiple notch filters to eliminate them.

To activate the DSP NOTCH filter, press the [**D. NOTCH**] switch; the "NOTCH" icon will appear on the display. To turn this filter off, press the [**D. NOTCH**] switch again.
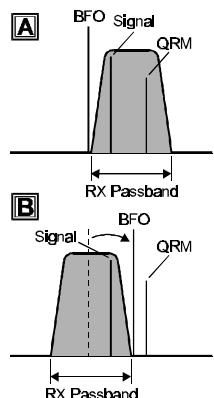
Note: *The DSP NOTCH filter should not be used in the CW mode! The DSP system will interpret a CW carrier as being "interference," and will notch out the incoming signal. Therefore, as you tune the CW portion of the band with the NOTCH filter on, CW signals will appear for a moment, then disappear as they are notched out.*

CW REVERSE

While operating on CW, occasionally you may encounter interference situations which cannot be resolved by switching to a narrower filter or by adjustment of the IF SHIFT control. And there sometimes are operating situations requiring a mode change from, for example, LSB to CW; if the wrong "sideband" is utilized in the CW mode, the other station may not be easy to find.

The FT-847 can be quickly configured, so as to avoid these problems, to utilize either "USB" or "LSB" carrier injection in the CW mode. To do this, while in the CW mode, just press the [**CW**] switch momentarily. The "CW" icon glows steadily for USB-side injection, while the "LSB" icon will appear to the left of the "CW" icon for LSB injection. This system allows instantaneous recognition of the current injection mode selected for CW use.

Referring to example **A**, note the presence of both a desired signal and interfering signal. By switching sidebands (example **B**), note how the interfering signal has been avoided through selection of the opposite sideband.

Note: *When sidebands are switched, all aspects of CW operation are switched at once, including the transmitted CW carrier and the displayed frequency. This avoids the necessity of making multiple adjustments so as to align the receiver and transmitter sections for proper operation.*

NOTE

TRANSMITTING

Now that you are familiar with basic receiver operation, we shall explore the FT-847's capabilities in the transmit mode.

The transmitter can be activated within any of the 500-kHz segments (detailed below) which contain the HF amateur bands, as well as 50-54 MHz, 144-146 (or 144-148) MHz, and 430-440 (or 450) MHz. When tuned to any other frequency, the transmitter will be disabled. Within the 500 kHz HF transmitting segments, you (the control operator) are responsible for restricting your transmissions to those frequency sub-bands on which you are authorized to operate. Attempting to transmit outside an amateur band segment will cause the "ERROR" diagnostic message to appear on the display.

Important Note!

Whenever you transmit, be certain to have a suitable antenna or 50Ω dummy load connected to the antenna jack in use. Although the final amplifier stage of this transceiver includes protection circuitry which will immediately reduce power if no load is present, there still is a slight chance of damage to your equipment in the (unlikely) event of a catastrophic protection-circuitry failure.
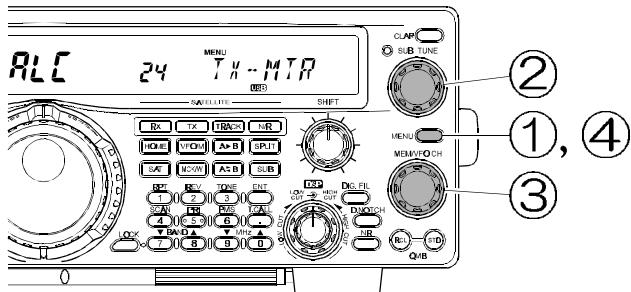
Remember that there are four antenna jacks on the rear panel of the FT-847, and each should be connected to an antenna or dummy load in the interest of long-term safety and reliability.

POWER OUTPUT/ALC LEVEL MONITORING

During transmission, you have the option of monitoring RF power output ("PO" on the Meter) or relative ALC voltage ("ALC" on the Meter). The default setting for the Meter is **PO**, and the selection may be switched to **ALC** via Menu #24. For initial setup, we recommend that you make this change now, then return the setting to **PO**, if you like, once initial adjustments have been completed.

To do this:

① Press the [**MENU**] switch momentarily to activate the Menu mode.
② Now rotate the **SUB-TUNE** control until Menu #24 ("TX MTR") appears.
③ If the current value is shown to be "PO," rotate the **MEM/VFO CH** control so that "ALC" appears on the display.
④ Now press the [**MENU**] switch once more to lock in your new setting and exit the Menu mode. Now proceed to the "**SSB TRANSMISSION**" section on the next page.
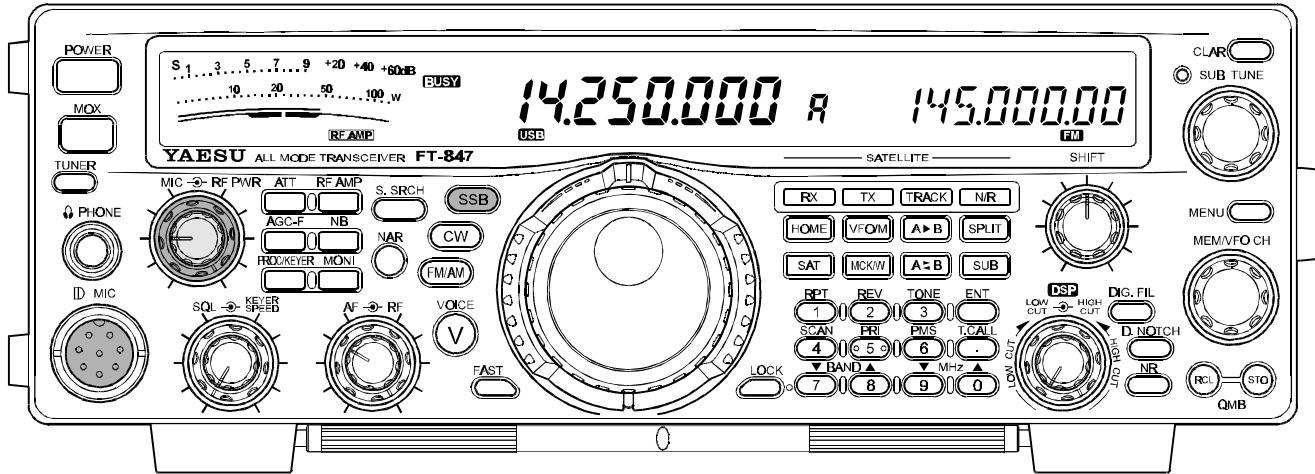
See page 82 for a complete description of Menu operation.

OPERATION

SSB Transmission

① Connect your microphone to the front panel **MIC** jack.

② Preset the front panel controls as follows:
    MODE: **USB** or **LSB** (depending on band; use USB on 14 MHz and above)
    MIC (GAIN): 9 o'clock position
    RF PWR: Fully clockwise

③ Press the microphone's **PTT** switch, and speak into the microphone in a normal voice level. The "TX" indicator on the display will become illuminated, and the ALC meter will deflect according to the peaks in your speech level. Adjust the **MIC** (GAIN) control so that the ALC meter peak reading is along (but not beyond) the right edge of the ALC range on the meter.

④ Release the **PTT** switch to return to the receive mode. You may wish to reset the TX Multimeter back to "P0" via Menu #24 at this time (see previous discussion).

⑤ For operation at lower power levels, rotate the **RF PWR** control counter-clockwise while watching the PO (Power Output) scale on the meter, so as to set the desired power level.

    Note: Counter-clockwise rotation of the **RF PWR** control, or operation using an antenna with an impedance greatly different from 50Ω, may result in an abnormally-high reading on the ALC meter. Therefore, it is helpful to make initial adjustment of the **MIC** (GAIN) control while using a 50Ω dummy load connected to the antenna jack in use; be certain that the **RF PWR** control is fully clockwise during such adjustments.

⑥ For hands-free operation when using a desk microphone, such as Yaesu's model **MD-100A8X**, a footswitch (which shorts two contacts together) may be connected to the rear panel's **PTT** jack.

SSB TRANSMISSION
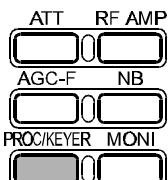
RF SPEECH PROCESSOR OPERATION

The RF SPEECH PROCESSOR provides a significant increase in your transmitter's *average* power output.

To activate the RF SPEECH PROCESSOR, press the [**PROC/KEYER**] switch. The "PROC" icon will appear on the display.

To deactivate the RF SPEECH PROCESSOR, press the [**PROC/KEYER**] switch again.
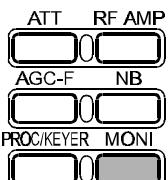
*Note: The RF SPEECH PROCESSOR is disabled during **Satellite** operation.*

VOICE MONITOR

For monitoring your own voice during SSB transmission, the VOICE MONITOR feature may be used.

To activate the VOICE MONITOR, press the [**MONI**] switch. The "MONI" icon will appear on the display. Press the [**MONI**] key once more to disable the VOICE MONITOR.

The monitoring level may be adjusted via Menu #20 if the monitoring level is too loud or too soft for your operating needs. To do this, use the following procedure:

① Press the [**MENU**] button to activate the Menu mode.
② Rotate the **SUB-TUNE** knob to select Menu #20 ("MONI-VOL").
③ Rotate the **MEM/VFO CH** knob to set a higher or lower MONITOR volume level; you cannot transmit while in the Menu mode, so you will need to pick an arbitrary value at first.
④ Press the [**MENU**] button to exit the Menu mode.
⑤ Now transmit to check the MONITOR volume level. If it still is not set to the correct level, repeat the above procedure.

*Note: The MONITOR feature is disabled on SSB during **Satellite** operation, as it would make reception of your own downlink signal difficult. The MONITOR is, however, available during CW Satellite operation, to eliminate coordination problems in sending caused by the propagation delay to and from the satellite.*

SSB TX FREQUENCY RESPONSE ("CARRIER POINT") ADJUSTMENT

Although your FT-847 is carefully aligned at the factory for the best average frequency response for most human voices, it is possible that your voice (or your microphone) may have particular characteristics (excessive treble or bass) which may warrant minor adjustments to the TX CARRIER POINT. This feature, provided via Menu #92 (USB) and #93 (LSB), is analogous to the receiver's IF SHIFT feature, but it is applied to your own voice in the transmit mode.

Utilization of Menu items #92 and 93 requires that you first activate the "Extended Menu" function via Menu #42. Press the [**MENU**] key to enter the Menu mode. Next, rotate the **SUB-TUNE** control until Menu #42 ("EXTEND") appears. Rotate the **MEM/VFO CH** control until the display changes from "OFF" to "ON." The Extended Menu is now active; press [**MENU**] again to return to normal operation.

To adjust the USB CARRIER POINT:

① First select the USB mode, then connect a dummy load to the current antenna jack.
② Switch on the VOICE Monitor, and press the microphone's **PTT** switch.
③ Listen to your voice, making careful observations as to the treble and bass characteristics.
④ Now enter the Menu mode by pressing the [**MENU**] key. Rotate the **SUB-TUNE** control until Menu #92 ("USB-CAR") is selected.
⑤ Rotate the **MEM/VFO CH** control to change the transmit passband characteristics: rotating in the *positive* direction increases the treble response, while selecting a *negative* number will increase the bass response.
⑥ The CARRIER POINT scale is in increments of 10 Hz, so a setting of "3" represents a passband shift of +30 Hz.
⑦ Exit the Menu mode by pressing the [**MENU**] key.
⑧ Now transmit again, listening to your voice characteristics. If the response is acceptable, the procedure is complete. If further adjustments must be made, repeat the above process.

This adjustment may also be performed for LSB via Menu #93. The two settings need not be identical; for example, if you use 75 and 40 meters (bands where LSB is used) primarily for local work, you may desire a slightly lower frequency response for a more "mellow" sound, while setting a slightly higher frequency response for DX work on 20 meters and higher frequency bands on the USB mode.
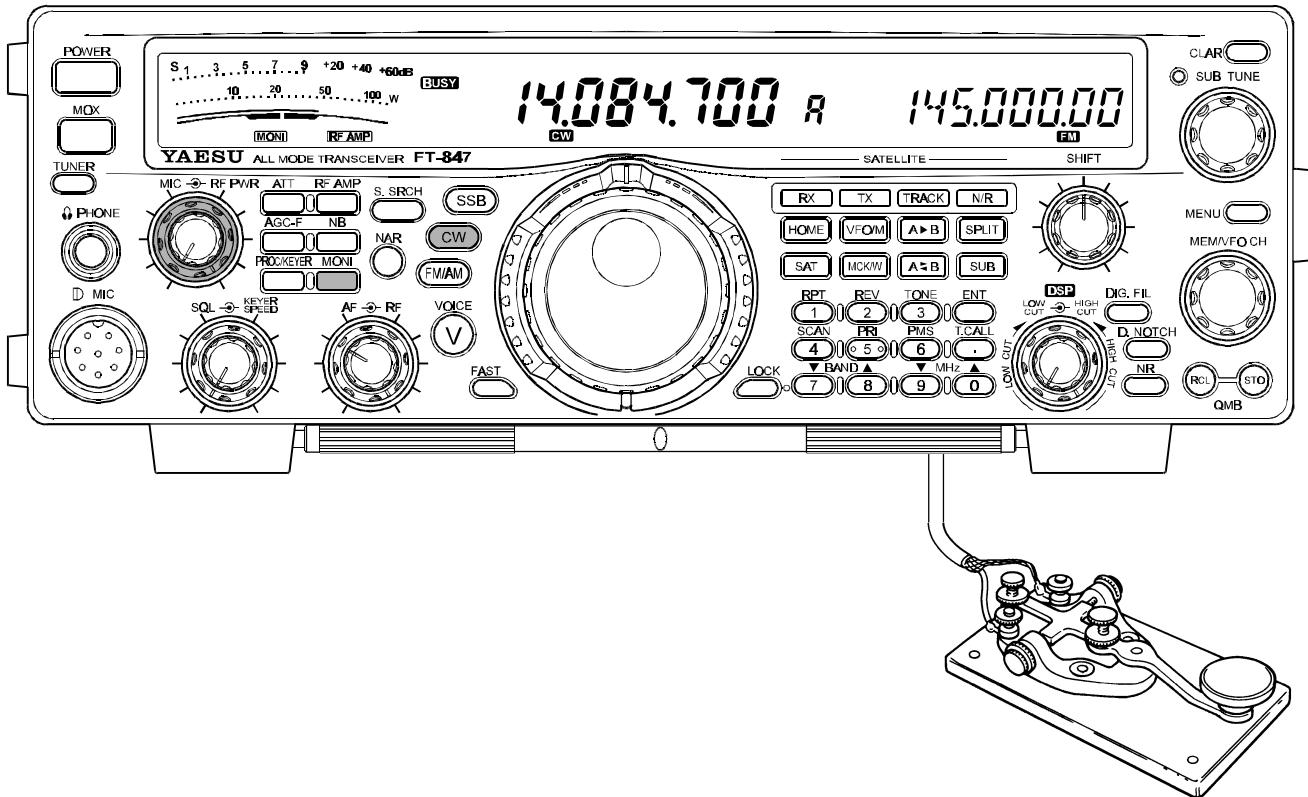
OPERATION

CW TRANSMISSION

The FT-847's versatile design is engineered to provide the operating flexibility required for contest, DX, or weak-signal VHF/UHF operation.

STRAIGHT KEY/EXTERNAL KEYING DEVICE OPERATION

This section describes the operating procedure using a manual "straight key." This section also pertains to operation using the output from an external electronic keyer, or from a CW keying interface utilized with a personal computer (using contest software, etc.).

① Insert your key's ¼" three-conductor ("stereo") plug into the **KEY** jack on the rear panel of the transceiver. Remember that the Tip of this plug is the "hot" key lead, while the main shaft is Ground; the Ring is not used.

② Set the applicable controls as follows:

MODE:	**CW**
PPOC/KEYER:	**Off** (No icon in this regard should be present on the LCD)
RF PWR:	Fully Clockwise
MONI:	**On**

③ To transmit, simply press the straight key (or start sending on your external keyer/computer). The transmitter will automatically be activated, and the CW sidetone will be heard as you send. When you stop sending, the transceiver will return to the receive mode. Use the **RF PWR** control to set the desired power output level during transmission.

④ You can adjust the CW sidetone volume level via Menu #8.
To adjust the sidetone volume level:
● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #8 ("SIDETONE").
● Rotate the **MEM/VFO CH** knob to select a new level; on the arbitrary scale of 0 ~ 63, the default value is 32, and you may wish to set a value of about "10" if you are using headphones (to make the level more comfortable).
● Press the [**MENU**] key to exit the Menu mode.

CW TRANSMISSION

⑤ You also can adjust the sidetone pitch using Menu #6. This adjustment also controls the BFO offset (the actual pitch of your transmitted signal relative to your current receive frequency).
To adjust the CW pitch:
● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #6 ("CW-PITCH").
● Rotate the **MEM/VFO CH** knob to select a new pitch tone/BFO offset.
● The available offset range is 400 ~ 1100 Hz.
● Press the [**MENU**] key to exit the Menu mode.
The setting of Menu #6 also affects the "CW SPOT" function. See the "**CW SPOT FEATURE**" discussion below for details.

⑥ You may also adjust the receiver recovery time of the pseudo-VOX system which automatically activates the transmitter when you close the key. The default value for this feature is 100 ms.
To adjust the "hang time" for CW operation:
● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #9 ("CW-DELAY").
● Rotate the **MEM/VFO CH** knob to select a new delay time. The available range of adjustment is 10 ~ 300 ms.
● Press the [**MENU**] key to exit the Menu mode.
Although the FT-847 was not designed for "full QSK" operation, the minimum setting of Menu #9 (10 ms) will be very close to full break-in performance.
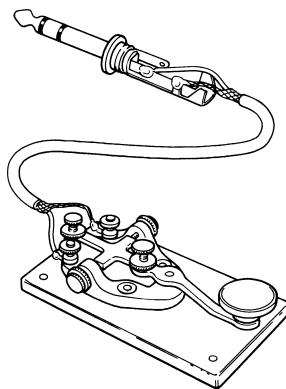
⑦ If you are using an external electronic keyer, and it provides a "PTT" line for transceiver Tx/Rx control, this line may be connected to the rear-panel **PTT** jack.

Note
Regarding CW Frequency Display

The FT-847's frequency display is specifically designed to provide you with precise indication as to the zero beat frequency of your CW carrier, so you always know where your signal is relative to the band edges.

Accordingly, the displayed frequency on CW will be different from that displayed on the corresponding SSB mode by an amount equal to the setting of the **PITCH** command (Menu #6). For example, if Menu #06 is set to 700 Hz, and you are operating on 144.200 MHz USB, if you switch to CW (USB side) the display will now indicate **144.200.700** MHz, but the pitch of incoming signals will not change. Conversely, if you are operating on 3.790 MHz LSB, and switch to CW (LSB side), the display will now indicate **3.789.300** MHz, but signals received will be on the same pitch as they were on the (voice) LSB mode.
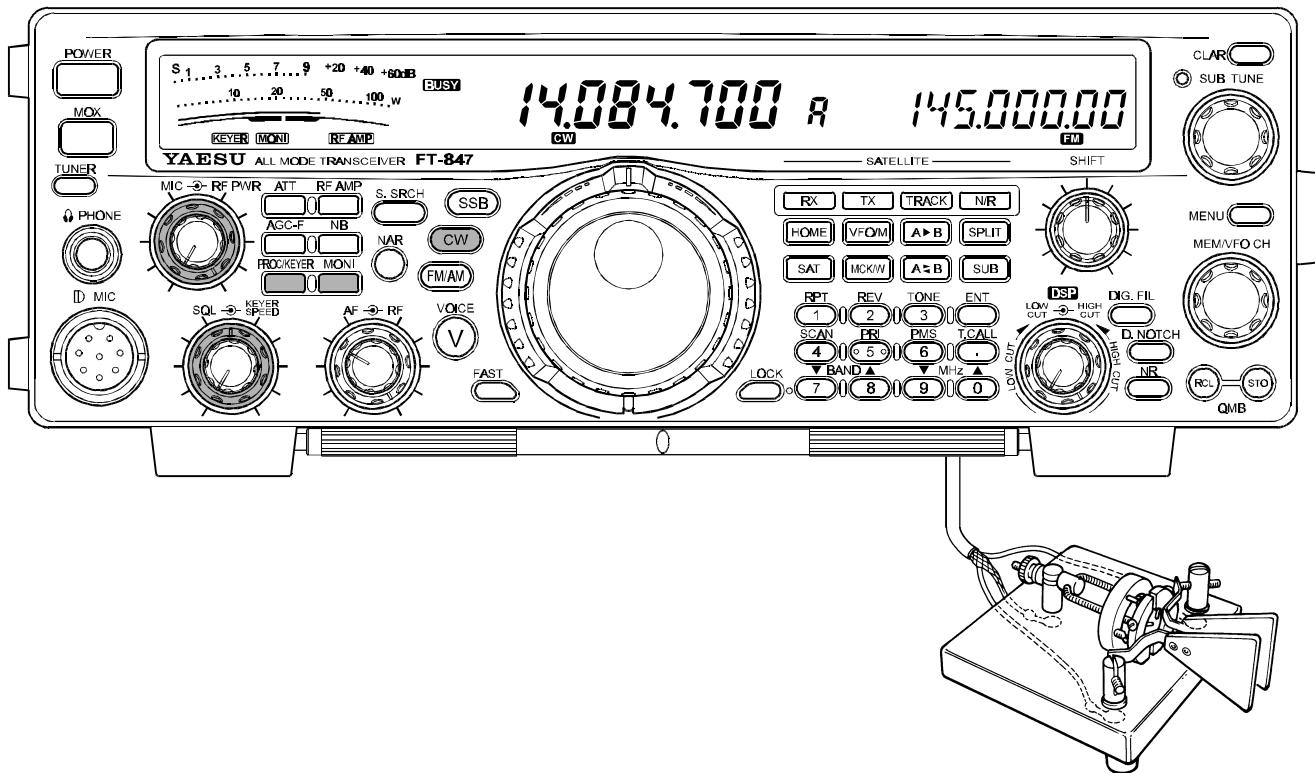
OPERATION

CW TRANSMISSION

ELECTRONIC KEYER OPERATION

The FT-847's built-in electronic keyer is flexible, yet easy to use.

① Insert your key's ¼" three-conductor ("stereo") plug into the **KEY** jack on the rear panel of the transceiver. Remember that the Tip of this plug is the "Dot" key lead, the Ring connector is the "Dash" lead, and the main shaft is Ground.

② Set the applicable controls as follows:
MODE:	**CW**
PROC/KEYER:	**On** (the "KEYER" icon should appear on the LCD)
KEYER SPEED:	12 o'clock position
RF PWR:	Fully Clockwise
MONI:	**On**

③ When you press your thumb against your keyer paddle, a string of Dots will be generated by the KEYER. Rotate the **KEYER SPEED** control to set the desired sending speed.
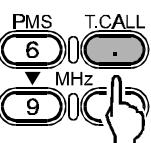
④ You may adjust the sidetone pitch, sidetone volume, and receiver recovery time as described in the previous section.

⑤ The KEYER's Weighting (Dash:Dot ratio) may be adjusted via Menu #7, although the default 3:1 ratio should normally be used. See page 84 if you need to make this adjustment.

CW SPOT FEATURE

During CW operation, it is useful to be able to zero in precisely to the other station's frequency. The CW SPOT feature of the FT-847 makes this task simple.

During CW operation, press the [**T.CALL** (●)] key; you will hear a solid tone in the speaker. The pitch of this tone corresponds to the pitch of your signal as heard by another station relative to your current operating frequency (i.e. it is the tone at which you are transmitting). The pitch of this tone (and the BFO offset for the receiver, etc.) may be aligned via Menu #06 (see page 84).
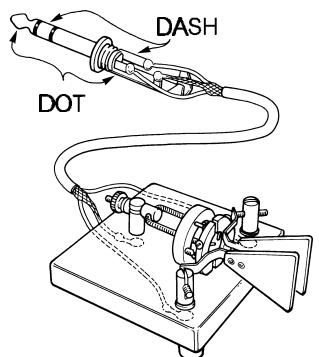
If you align the pitch produced by the SPOT function to be exactly the same as the pitch of an incoming CW signal, you will precisely zero-beat to the other station.

Note that the BFO offset is compensated for by the microprocessor when you switch between CW (USB injection) and CW (LSB injection). So unless you have the IF SHIFT control grossly mis-aligned, you can never find yourself "spotted" on the "wrong" sideband.

CW Transmission

OPERATION

FM Transmission

FM operation is permitted on the bands above 29 MHz, and the FT-847 provides a wealth of features for AM simplex and repeater operation. Several of these features may be customized for each band via the Menu system.

Use the "Narrow" mode for operation on 29 MHz, as the permitted deviation below 30 MHz is one-half of that permitted on VHF or UHF. To do this, press the [**NAR**] key while operating in the FM mode.

Please be certain to respect other amateurs by observing the operating bandplans in your country, and do not use the FM mode in the sub-bands recognized as being reserved for SSB/CW "weak-signal" work. These sub-bands typically may include the frequency ranges 50.0 ~ 50.5 or 51.0 ~ 51.125 MHz, 144.0 ~ 144.5 MHz, and 432.0 ~ 432.6 MHz, but may be slightly different in your country. Satellite sub-bands to avoid are 29.3 ~ 29.5 MHz, 145.8 ~ 146.0 MHz, and 435.0 ~ 438.0 MHz. The communications effectiveness of the amateur service requires the cooperation of all licensees, and operating bandplans have evolved so as to minimize interference among operators using incompatible emission modes such as FM and SSB.

"Channelized" Frequency Navigation

You may find that the **MAIN VFO** Tuning Dial is somewhat inconvenient for FM operation, since most all stations operating in the FM mode use a "channelized" frequency, which is generally a multiple of either 5 kHz or 6.25 kHz. Therefore, we recommend the use of the **MEM/VFO CH** knob for FM frequency tuning.

The steps utilized by the **MEM/VFO CH** knob in the FM mode may be set independently for HF and for each VHF and UHF band. Therefore, if you live in an area where 10 kHz steps are used on 29 MHz and 50 MHz FM, and 5 kHz steps are used on 144 MHz, and 25 kHz steps are used on 430 MHz, you may wish to set these (or steps appropriate for your area) using Menu #5:

● Set the operating frequency to anywhere in the HF range (160 ~ 10m).
● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #05 ("FM-CH").
● Rotate the **MEM/VFO CH** knob to select a new frequency step. The available steps are 5/6.25/10/12.5/15/20/25 kHz.
● Press the [**MENU**] key to exit the Menu mode.
● Now set a frequency anywhere in the 50 MHz band.
Press the [**MENU**] button to activate the Menu mode, and repeat the above process to select the desired steps on 6 meters. Most likely, you will want to choose either 5 kHz or 10 kHz steps, depending on where you live.
● Repeat this procedure for the other bands by setting a frequency on 144 MHz, then selecting the desired step. Press [**MENU**] to exit the Menu mode, move to 430 MHz, then re-enter the Menu and set the desired step on the 70 cm band.
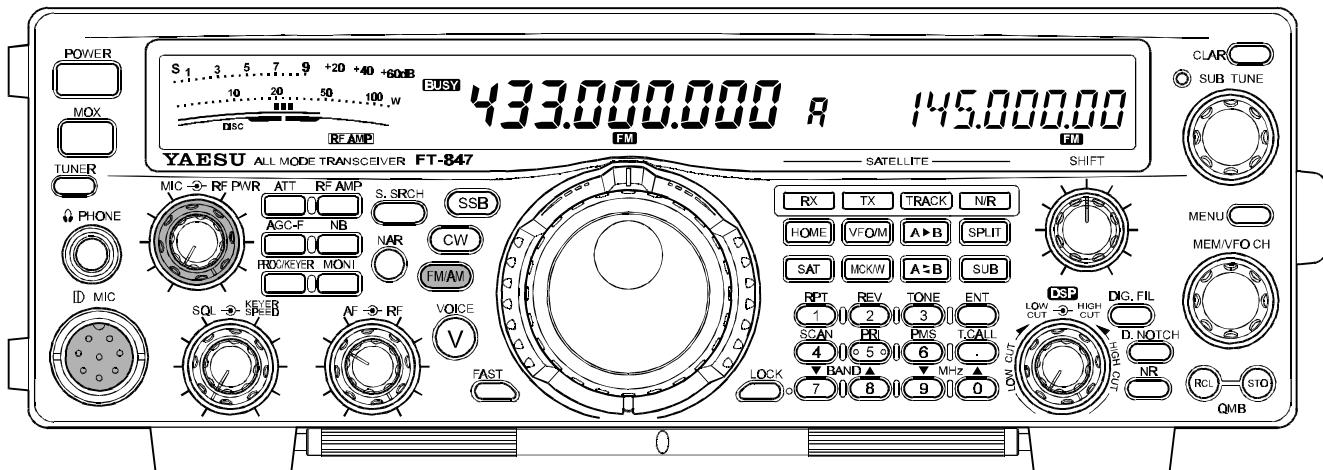
FM TRANSMISSION

SIMPLEX (NON-REPEATER) OPERATION

① Connect the microphone to the **MIC** jack, and press the [**FM/AM**] key, as necessary, to select the "**FM**" operating mode. Set the **RF PWR** control fully clockwise.

② Close the microphone's **PTT** switch to activate the transmitter, and speak into the microphone in a normal voice level. Release the **PTT** switch when you wish to return to the receive mode.

③ The microphone gain is set to a fixed value at the factory. However, the Menu system includes provision for adjusting the microphone gain, if needed. To adjust the microphone gain:

● Press the [**MENU**] button to activate the Menu mode of operation.

● Rotate the **SUB-TUNE** knob to select Menu #25 ("**FM-PSET**").

● Rotate the **MEM/VFO CH** knob to adjust the mic gain. You may select from the default value ("**32**") or a value on an arbitrary scale of **0 ~ 63**. The "**OFF**" selection transfers control of the FM mic gain to the front panel's **MIC** (GAIN) control.

● Press the [**MENU**] key to exit the Menu mode.

● Close the microphone's **PTT** switch, and speak into the microphone to check the mic gain level. If further adjustment is required, repeat the above procedure.

Note: Because of international regulations, the permissible deviation on 29 MHz is about one-half of that typically used on 50 MHz and higher. Therefore, it is normal for 29 MHz FM signals not to have as much audio "punch" as do FM signals on, for example, 2 meters.

OPERATION

FM TRANSMISSION

REPEATER OPERATION

FM "repeater" stations are usually located on top of tall mountains or hills, allowing mobile, portable, and otherwise low-power stations to extend their communication range significantly. The flexible operating features of the FT-847 make repeater work simple and enjoyable.

Automatic Repeater Shift
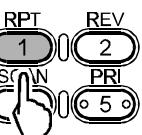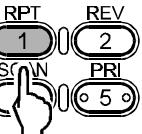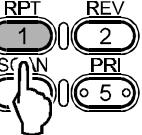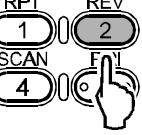
The ARS (Automatic Repeater Shift) feature, active on the 144 and 430 MHz bands, automatically activates and sets the direction (upward or downward) of the repeater shift function.

The ARS feature may be activated or de-activated independently on the 144 MHz and 430 MHz bands, using Menu items #14 (144 MHz) and #15 (430 MHz). The default condition for the ARS is "ON" for both bands. See page 85 for details on disabling the ARS, if desired.

*Note: With the ARS turned On, the repeater shift icon will not initially appear when you enter a frequency directly from the keypad. However, if you move the Main tuning Dial or **MEM/VFO CH** knob, or initiate scanning in either direction, the ARS feature will be activated, and the appropriate repeater shift will be applied.*

Manual Repeater Shift

For repeater operation on 29 or 50 MHz, or on the 144/430 MHz bands when ARS is disabled, it is easy to activate or change the repeater shift manually.

① While operating in the FM mode (see previous section), press the keypad's [**1**(**RPT**)] key. The "−" icon will appear on the display, indicating a *downward* repeater shift.

② Press the [**1**(**RPT**)] key once more to change the direction of the repeater shift to the *upward* direction. The "−" icon will change to "+" on the display.

③ Press the [**1**(**RPT**)] key once more to disable the shift and CTCSS encoder, and return to *simplex* operation. The "+" icon will disappear from the display.

④ During operation, you may wish to check the input frequency to the repeater, to see if the other station is strong enough to be worked on simplex. To do this, press the [**2**(**REV**)] key on the keypad; the uplink and downlink frequencies will be reversed.

Setting the Repeater Shift
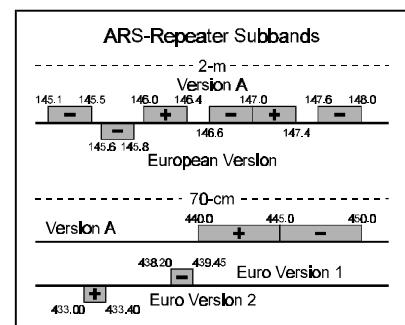
The repeater shift has been set, at the Yaesu factory, to the value most likely to be correct for your location. However, you may have the need to change the repeater shift especially on a band like 50 MHz, where several shifts may be popular even within the same country (e.g. 500 kHz, 1 MHz, and 1.7 MHz in the United States). Check with your local repeater coordinator or a repeater guide for confirmation of the appropriate shift in your area.

The default repeater shift may be changed independently on each of the four FT-847 bands on which repeater operation is authorized. The setting of the repeater shift is accomplished using Menu items #16 through #19 for the 29 MHz through 430 MHz bands, respectively. Here is an example of how to change the repeater shift to 1.70 MHz on the 50 MHz band:

● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #17 ("**50M-RPT**").
● Rotate the **MEM/VFO CH** knob to set the value to 1.70 MHz. The available range of repeater shifts is 0 ~ 99.99 MHz.
● Press the [**MENU**] key to exit the Menu mode.

An identical procedure is used to set the shifts on the other repeater bands. Remember that this procedure only sets the *amount* of the repeater offset; the *direction* of the repeater shift ("+" or "−") is set using the [**1**(**RPT**)] key.

Note: If you wish to access a single repeater which uses a shift different from the default shift, it is not necessary to follow the above procedure (which will make operation on other repeaters inconvenient). For the one repeater using a nonstandard split, use the "Split Memory" capability of the memory system. See page 72 for details.

ARS-Repeater Subbands

FM TRANSMISSION
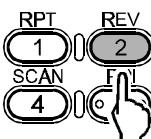
REPEATER OPERATION

Repeater Shift Reversal Feature

While operating on a repeater, you may wish to reverse your receive and transmit frequencies, so as to listen for the other station's *direct* signal.

This allows you to determine if communication is possible with the other station without using the repeater (i.e. "simplex").
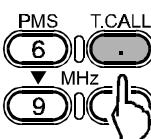
To do this, press the [**2**(**REV**)] key. To return to normal repeater operation, press the [**2**(**REV**)] key once more.

1750 Hz Tone Call Repeater Access

Particularly in the European market, repeater access may require that you send a brief transmission containing a 1750 Hz tone superimposed on the carrier.

To do this, press the [**T. CALL**] key. The transmitter will automatically be activated, and the 1750 Hz tone will be sent out, to access the repeater.
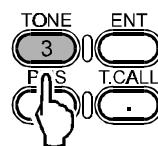
Release the [**T. CALL**] key after the prescribed time, then press the microphone's [**PTT**] switch to begin your conversation.

CTCSS Operation

The subaudible CTCSS (Continuous Tone Coded Squelch System) circuitry includes the following components, hereafter called Tone Modes:

❐ The Encoder circuit, which superimposes a subaudible tone onto your voice signal, for repeater access or selective calling of other stations. When the Encoder is activated, the "ENC" will appear on the display.
❐ The Decoder circuit, which will mute your transceiver's receiver audio unless an incoming signal containing a matching CTCSS signal is received. When the Decoder is activated, both the "ENC" and "DEC" icons will appear.

To activate the Encoder, press the [**3**(**TONE**)] key once. To activate the Decoder, press the [**3**(**TONE**)] key again. A third press of this key activates the DCS system (see next page).

In addition to the Tone Mode, one must be aware of the need to set the correct CTCSS Tone Frequency, as highly-selective audio filters at a repeater site will cause the repeater not to respond to your call if you are using the wrong Tone Frequency. A total of 39 internationally-recognized CTCSS tones are provided on the FT-847.

The CTCSS Tone Frequency is set using Menu #12. For example, to set a CTCSS Tone Frequency of 103.5 Hz, use the following procedure:

● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #12 ("TONE-FRQ").
● Rotate the **MEM/VFO CH** knob to set the value to 103.5 Hz.
● Press the [**MENU**] key to exit the Menu mode.

To summarize:

● First set the Tone Mode, using the [**3**(**TONE**)] key.
● Next set the Tone Frequency, using Menu #12.

After completing these steps, and setting the repeater shift, if applicable, you will probably want to store this data into a memory register. See page 71 for details on how to do this.

CTCSS TONE FREQUENCY (Hz)							
67.0	69.3	71.9	74.4	77.0	79.7	82.5	85.4
88.5	91.5	94.8	97.4	100.0	103.5	107.2	110.9
114.8	118.8	123.0	127.3	131.8	136.5	141.3	146.2
151.4	156.7	162.2	167.9	173.8	179.9	186.2	192.8
203.5	210.7	218.1	225.7	233.6	241.8	250.3	-

OPERATION

FM TRANSMISSION

DCS (DIGITAL CODED SQUELCH) OPERATION

Similar to CTCSS, the DCS system is another form of selective calling. An advantage of DCS is that it is less susceptible to false opening of the squelch by unwanted signals.

As with CTCSS operation, the proper setup of DCS involves two basic steps:

● Activating the DCS system, using the [**3**(**TONE**)] key; and
● Selecting the proper DCS Code (analogous to the CTCSS Tone Frequency).

To activate the DCS system, press the [**3**(**TONE**)] key three times (if you currently have no tone system activated). The first two presses of this key activate the CTCSS Encoder and Decoder, respectively, while the third press deactivates the CTCSS and activates the DCS. The DCS system is an Encode-Decode system only.

To select the desired DCS Code, use Menu #13:

● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #13 ("**DCS-CODE**").
● Rotate the **MEM/VFO CH** knob to set the desired Code #.
● Press the [**MENU**] key to exit the Menu mode.

DCS CODE												
023	025	026	031	032	036	043	047	051	053	054	065	071
072	073	074	114	115	116	122	125	131	132	134	143	145
152	155	156	162	165	172	174	205	212	223	225	226	243
244	245	246	251	252	255	261	263	265	266	271	274	306
311	315	325	331	332	343	346	351	356	364	365	371	411
412	413	423	431	432	445	446	452	454	455	462	464	465
466	503	506	516	523	526	532	546	565	606	612	624	627
631	632	654	662	664	703	712	723	731	732	734	743	754
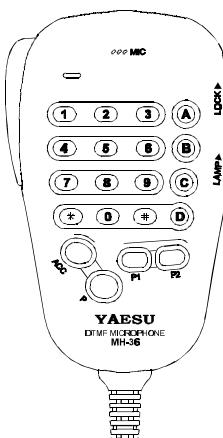
DTMF (AUTOPATCH) OPERATION

The optional **MH-36D8** DTMF Microphone includes a 16-key DTMF pad, which may be used for autopatch and/or control purposes. These keys are [**0**] ~ [**9**], plus [**A**], [**B**], [**C**], and [**D**].

To send DTMF tones, first press the microphone's [**PTT**] switch. While holding in the [**PTT**] switch, press the required DTMF keys in the order required. You may then release the [**PTT**] switch, if you need to listen for "Dial" tone or some other reply from the repeater. Otherwise, you may continue with the transmission.

The [**A**], [**B**], [**C**], and [**D**] keys are *generally* used only for repeater control by a Control Operator; consult your repeater's autopatch administrator for command code information.

For nighttime use, the **MH-36D8** includes a back-lighting feature which may be activated by turning the microphone's [**LAMP**] key on.

Important Notes

Regarding CTCSS and DCS Decoder Operation

Because your FT-847's receiver will be silent during CTCSS or DCS Decoder operation, you must be certain that the current operating frequency is not occupied before you transmit.

The display's "BUSY" icon responds to the presence of a carrier, and ignores any tones present. So if you do not hear any speech audio in your speaker, but see the "BUSY" icon on the display, this indicates that a station using a different CTCSS Tone or DCS Code is currently using the frequency. Wait until the other station's transmission is completed (the "BUSY" icon will disappear) before making your transmission. If the "BUSY" icon does not disappear within a reasonable time period, disable the Decoder in use to be certain that the front panel's **SQL** control is properly silencing background noise.

FM TRANSMISSION

CROSS-BAND REPEATER OPERATION

The FT-847 can be set up to operate as a one-way "range extender," using the Menu system. This feature is useful for emergency portable work in a remote area to extend the range of a dual-band hand-held transceiver. However, please remember these points before using the cross-band repeater function:

● Check the amateur radio rules and regulations for your country, to ensure that this type of operation is permitted.
● Pick your frequency pair carefully, so as not to cause harmful interference to other users. The use of cross-band repeaters has the potential to cause serious disruption of communications circuits, and the creation of harmful interference is inconsiderate and may be illegal! If you are not sure of active repeater frequencies in your area, a safe rule is to stay off of the repeater sub-bands and use the FM simplex portion of each band. ***Contact your area's frequency coordinator for guidance.***
● Remember that the transmit duty cycle will be much higher during repeater service, so we recommend that the transmit power level be set to 25 Watts or lower, to ensure cooler operation.
● Transceiver CTCSS or DCS Encode/Decode settings may, of course, be activated, allowing selective calling for your cross-band repeater. However, keep in mind that, if the channels you use are so busy as to motivate you toward CTCSS/DCS decoding, you may not have chosen a good frequency pair on which to operate, as the potential for interference to other users is high.
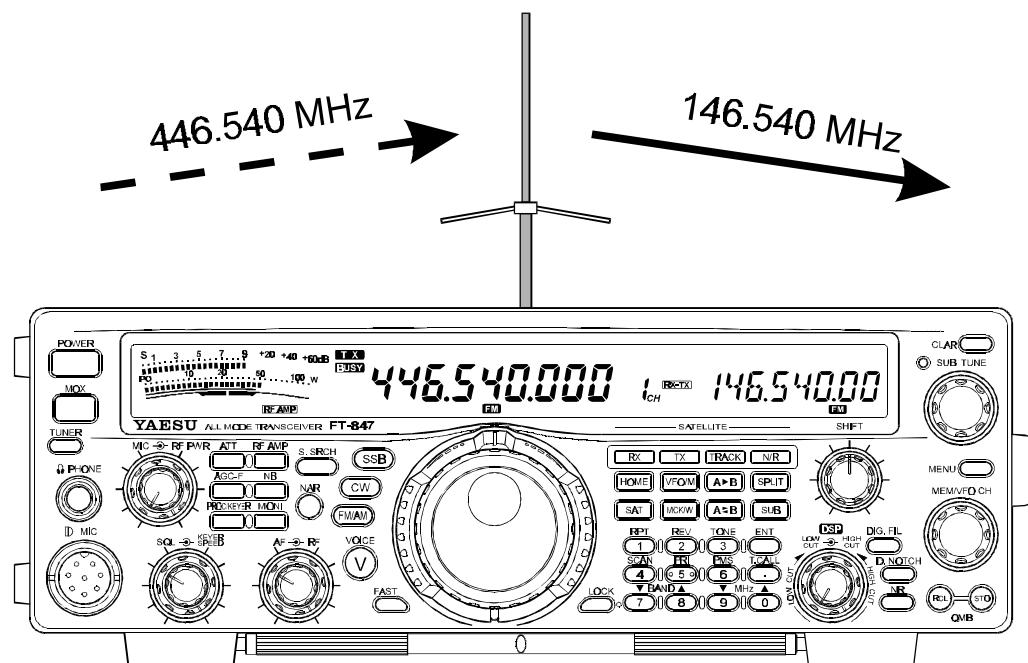
Here is the procedure for setting up cross-band repeater operation:

① Press the [**SAT**] switch to activate "Satellite" operation.
② Set the desired transmit frequency into the Sub VFO, and the desired receive frequency into the Main VFO.
③ Rotate the **SQL** control such that the background noise is silenced.
④ Press the [**MENU**] switch to enter the Menu mode.
⑤ Rotate the **SUB-TUNE** knob to select Menu #41 ("X RPT").
⑥ Rotate the **MEM/VFO CH** knob to set this feature to "ON."
⑦ Press the [**MENU**] key to exit the Menu mode.

During cross-band repeater operation, the [**RX**(**HOME**)], [**TX**(**VFO/M**)], and [**A⊵B**] keys are all functional, for control of the uplink and downlink frequency relationships.

Note: The cross-band repeat function (Menu #41) can only be initiated while the "Satellite" mode is activated. If the "Satellite" mode is not activated, the Menu system will not allow Menu #41 (X RPT) to be set to the "ON" position.
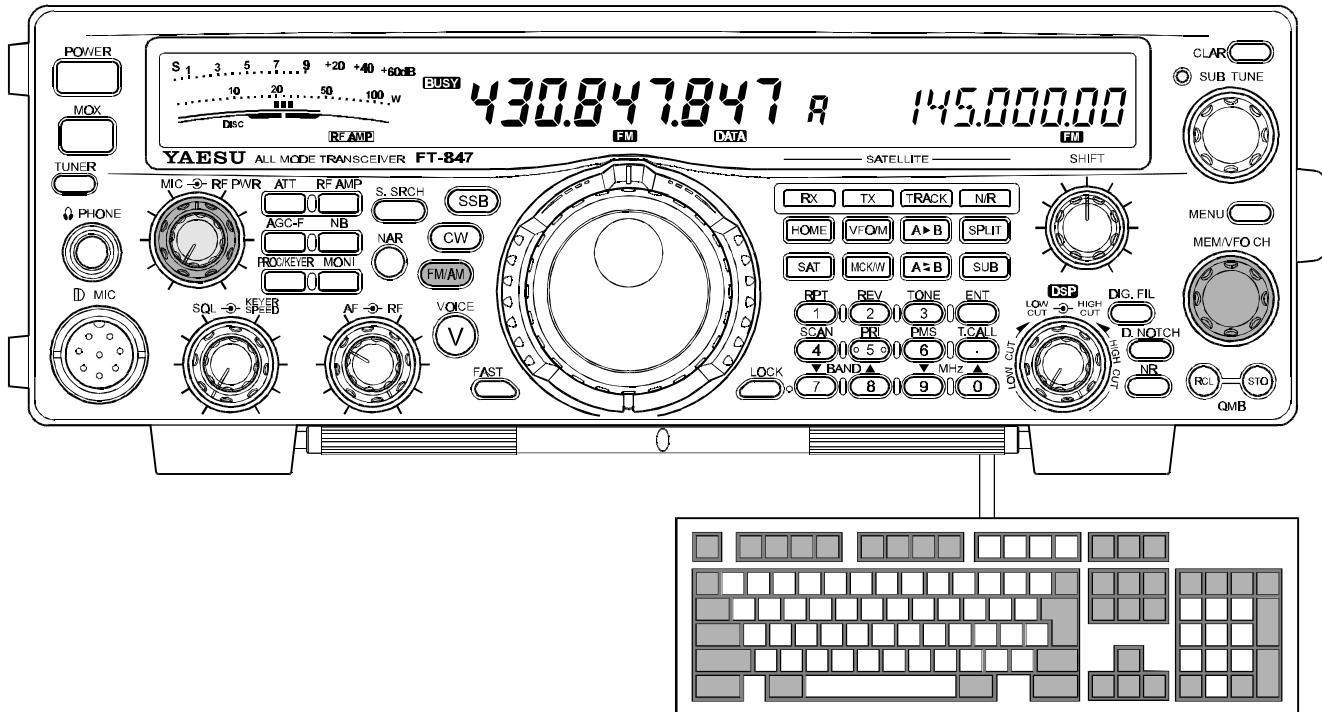
To exit the cross-band repeater mode, press [**SAT**] swicth momentarily, or re-enter the Menu, and set Menu #41 to "OFF."

OPERATION

FM PACKET OPERATION

The FT-847 may easily be configured for 1200 or 9600 bps packet operation.

① Refer to page 17, and connect your TNC (Terminal Node Controller) to the rear panel's **PKT** jack, per the instructions on that page.

② Set the FT-847 to the desired band, and press the [**FM/AM**] mode key, as necessary, to select the "**FM**" operating mode. Note that there is no "Packet" mode activated via the front panel; *the "Packet" mode is recognized when the microprocessor detects PTT control commands sent via the* **PKT** *jack.*

③ Select the desired baud rate for your packet operating session. To do this:
- Press the [**MENU**] button to activate the Menu mode of operation.
- Rotate the **SUB-TUNE** knob to select Menu #23 ("**PKT-RATE**").
- Rotate the **MEM/VFO CH** knob to select either "**1200**" or "**9600**" bps.
- Press the [**MENU**] key to exit the Menu mode.

If 9600 bps has been selected, the "**9600**" icon will appear along the bottom edge of the LCD.

Note: For 2400 bps operation, you may have to experiment with this Menu selection, as different TNCs may work better with one setting or the other.

④ Set the transceiver to the desired operating frequency. You may find it more convenient to use the **MEM/VFO CH** knob to set the frequency in the FM mode, because of the channelized nature of most packet systems. Be sure to disable any repeater shifts, if they have been manually activated by you.

⑤ Set the **MIC** (GAIN) control fully counter-clockwise.

⑥ Set the **RF PWR** control to the 12 o'clock position.

⑦ Using the keyboard of the computer connected to your TNC, you may now issue the "Connect" command, and begin operation. When you transmit via the **PKT** jack, the "**DATA**" icon will appear on the display.

⑧ Adjust the setting of the **RF PWR** control to the minimum setting which will allow reliable communication with the packet network on which you are operating. Because of the high duty cycle which may be associated with active packet networks, we recommend that the **RF PWR** control be set so that the power output is between15 and 25 Watts (144/430 MHz) or between 35 and 50 Watts (50 MHz).

Note: The baud rate setting may be independently set on each band and on each VFO. That is, you may set the baud rate on VFO-A's 430 MHz band to 9600 bps, while setting VFO-B's 430 MHz band to 1200 bps. The baud rate setting will be preserved if the frequency is stored into a memory channel register.

OPERATION

AFSK RTTY/DATA OPERATION

A wide variety of SSB-based data modes may be utilized via the rear panel's **DATA IN/OUT** jack.
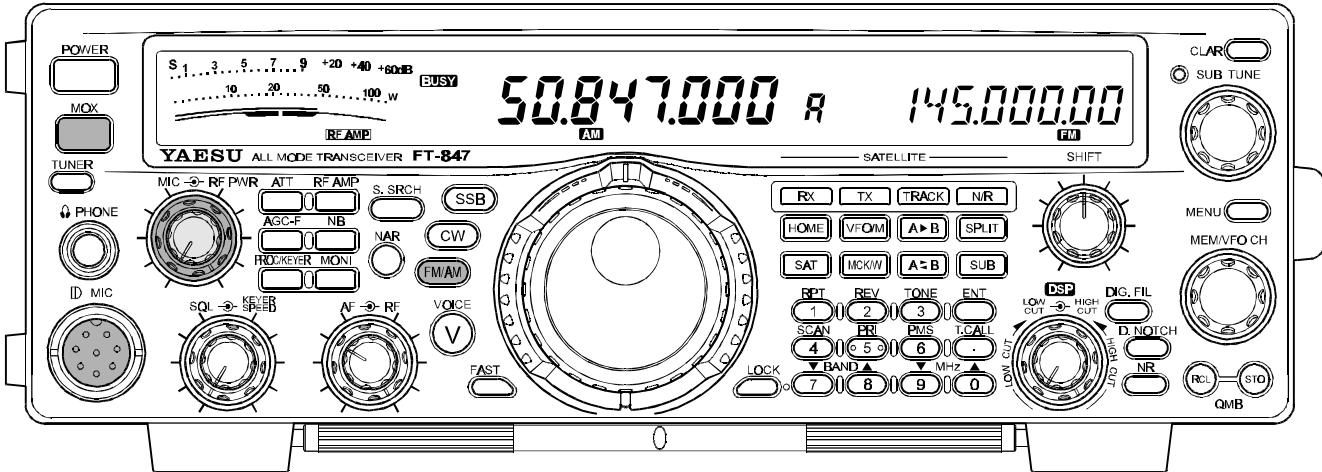
① Refer to page 16, and connect your TNC or Terminal Unit to the rear panel's **DATA IN/OUT** jack per the instructions on that page. Note that the "Transmit Data" connection must be to an "AFSK" (Audio Tone Generator) line, not an "FSK" line (closure to ground).

② Press the [**SSB**] mode key, as necessary, to set the desired mode. For Baudot RTTY operation on the HF bands, use the LSB mode. *The microphone will not be active during AFSK operation, so long as you have connected the TNC's PTT line via the **DATA IN/OUT** jack per the diagram on page 16.*

③ Set the **RF PWR** control to the 12 o'clock position.

④ Using the keyboard of the computer connected to your TNC, you may now issue the "Connect" command, and begin operation. When you transmit via the **DATA IN/OUT** jack, the "DATA" icon will appear on the display.

⑤ Adjust the setting of the **RF PWR** control to the minimum setting which will allow reliable communication with other digital stations. Because of the high duty cycle which especially is encountered during RTTY operation, we recommend that the **RF PWR** control be set so that the power output is between 15 and 25 Watts (144/430 MHz) or between 35 and 50 Watts (50 MHz). AMTOR operation, on the other hand, should not exceed a 50% duty cycle, so full power may be used in this mode, if required.
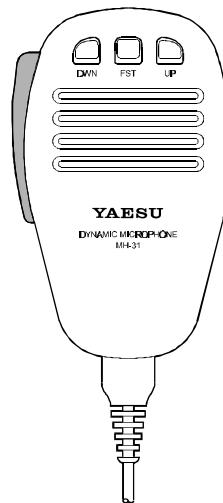
OPERATION

AM TRANSMISSION

The FT-847 includes provision for AM transmission using an early-stage modulator.

① Connect your microphone to the front panel **MIC** jack. Preset the **MIC** (GAIN) control fully counter-clockwise.

② Press the **FM/AM** mode key, as necessary, to select the "**AM**" operating mode.

③ Rotate the **MAIN VFO** Tuning Dial to set the operating frequency.

④ Close the microphone's **PTT** switch, and adjust the **RF PWR** control so that the power output is 33% of the rated maximum output for the band in use (i.e. 33 Watts on 1.8 ~ 54 MHz, or 16.5 Watts on 144/430 MHz). This is the setting of the carrier level which ensures adequate power for the modulation sidebands. To activate transmission, you may also use the front panel's **MOX** switch, if you prefer.

⑤ Advance the **MIC** (GAIN) control clockwise while speaking, at a normal voice level, into the microphone. Advance the gain to the point where a slight upward deflection in the power output reading is observed on voice peaks. This is the point where approximately 100% modulation is achieved.

⑥ Release the **PTT** (or **MOX**) switch to return to the receive mode.

Operation on Alaska Emergency Frequency: 5167.5 kHz
(U.S.A version only)

Section 97.401(d) of the regulations governing amateur radio in the United States permit emergency amateur communications on the spot frequency of 5167.5 kHz by stations in (or within 92.6 km of) the state of Alaska. This frequency is *only* to be used when the *immediate safety of human life and/or property* are threatened, and is *never* to be used for routine communications.

The FT-847 includes the capability for transmission and reception on 5167.5 kHz under such emergency conditions via the Menu system. To activate this feature:

① Press the [**MENU**] button to activate the Menu mode of operation.
② Rotate the **SUB-TUNE** knob to select Menu #40 ("**5167KHZ**").
③ Rotate the **MEM/VFO CH** knob to select "**ON**" for this frequency.
④ Press the [**MENU**] key to exit the Menu mode.

Emergency communication on this spot frequency is now possible:

*Press the [**BAND**] keys, as necessary, to locate the Emergency Channel, which will be located between the 3.5 MHz and 7 MHz bands.*

Note that the receive-mode CLARIFIER functions normally while using this frequency, but variation of the transmit frequency is not possible. Activation of Menu #40 does not enable any other out-of-amateur-band capability on the transceiver. The full specifications of the FT-847 are not necessarily guaranteed on this frequency, but power output and receiver sensitivity should be fully satisfactory for the purpose of emergency communication.

To return to normal transceiver operation, repeat the procedure detailed above, but set Menu #40 to "**OFF**" in step ③ of the procedure.

In an emergency, note that a half-wave dipole cut for this frequency should be approximately 45'3" on each leg (90'6" total length).

Emergency operation on 5167.5 kHz is shared with the Alaska-Fixed Service. This transceiver is *not* authorized for operation, under the FCC's Part 87, for aeronautical communications.
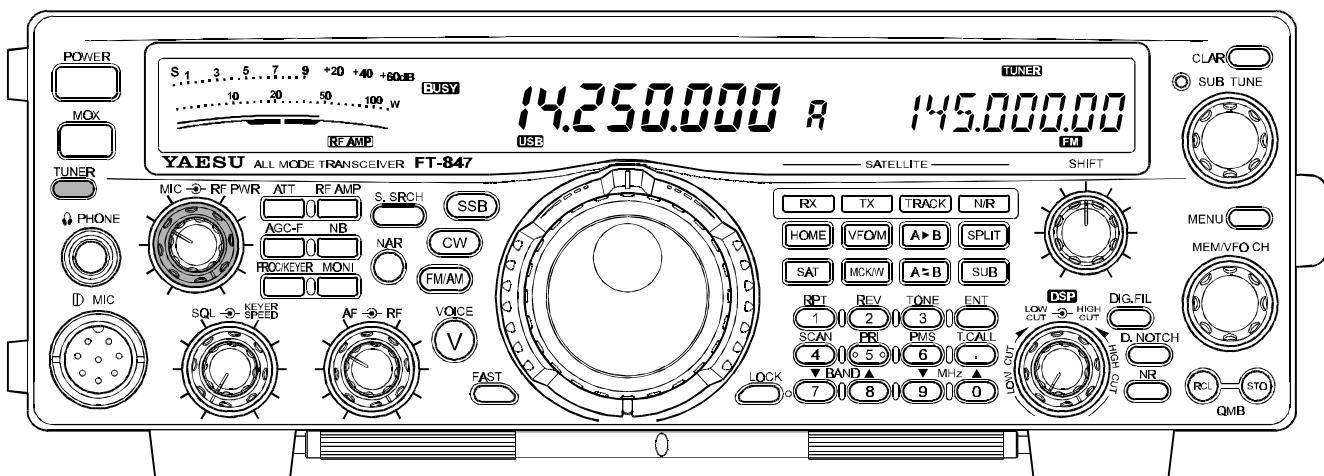
OPERATION

ANTENNA TUNER (FC-20) OPERATION

The optional **FC-20** (external) Automatic Antenna Tuner may be helpful, in some installations, in maintaining a satisfactory impedance match between your coaxial feedline and the FT-847's final amplifier stage. The **FC-20** operates on the 160 through 6 meter bands, and is capable of achieving an impedance match in the presence of up to 3:1 SWR (impedance range: 16.5Ω ~ 150Ω) on HF, and 2:1 SWR on 50 MHz (25Ω ~ 100Ω). On the 144 and 430 MHz bands, high SWR causes losses in your coaxial cable to escalate rapidly, so impedance problems should be resolved by adjustments at the antenna feedpoint.

The **FC-20** is not designed to accommodate the widely varying impedance presented by "random-length" or "long wire" antennas.

OPERATING PROCEDURE

① Connect the **FC-20** between the FT-847 and your antenna system as shown on page 10.
② Determine if you need to use the **FC-20** on the 50 MHz band. If so, using Menu #28, route the power output on 50 MHz via the HF antenna jack (see page 87).
③ Set the **RF PWR** control fully clockwise.
④ Press the front panel's [**TUNER**] switch momentarily; this will turn the **FC-20** On.
⑤ Press the front panel's [**TUNER**] switch for ½ second to initiate antenna tuning. The "WAIT" icon will appear on the display during tuning, and will disappear when a match has been achieved. If a satisfactory match cannot be achieved by the tuner, the "HI SWR" icon will appear on the display, and you should make adjustments or repairs to your antenna system to resolve the problem.
⑥ If you wish to turn off the antenna tuner's matching circuitry, press the [**TUNER**] key momentarily.

Note: *The power level used during tuning depends on the setting of the **RF PWR** control. We recommend that this control be set for a power output of about 50 Watts maximum for antenna tuning purposes. Antenna tuning is accomplished using a "CW" carrier, although the mode indication will not change to "CW" (if you are operating on another mode) during antenna tuning.*

ANTENNA TUNER (FC-20) OPERATION

ANTENNA TUNER MEMORY SYSTEM

The **FC-20**, working in concert with the FT-847, can store impedance matching data in its micro-computer memory, so as to provide instant adjustment as you transmit in different areas of a particular band. A total of 100 memories are provided: 11 of these are "general" memories apportioned one per band, while the remaining 89 are allocated for specific frequency data within the various bands, with the capability to resolve new tuning data every 10 kHz. A few guidelines should be noted regarding the **FC-20**'s memory system:

1. Tuning data is stored when you make an active effort to store it by pressing and holding in the [**TUNER**] key for ½ second. Although the tuner will automatically activate itself if it encounters more than 1.5:1 SWR, this memory will *not* be stored unless you have pressed the [**TUNER**] key for ½ second. This allows you to store your favorite operating frequency areas into tuner memory without tying up memory space with matching data on seldom-used frequencies.

2. If the **FC-20** cannot resolve a satisfactory match because the SWR is above 3:1 (2:1 on the 50 MHz band), the tuning process will stop, and no memory data will be stored. However, you may wish to move frequency a few kHz, then press the [**TUNER**] key again for ½ second, as slight changes in the reactance may allow a match to be obtained. Then go back to the original frequency and try again.

3. Another technique which may allow matching in some situations is to add a few feet or meters of coaxial cable on the "antenna side" of the **FC-20**. This will change the impedance transformation taking place in the coaxial cable, possibly moving the impedance presented to the **FC-20** into an acceptable range. Note that this is not changing the actual antenna SWR, but only the impedance "seen" by the **FC-20**'s matching circuits.

4. If your antenna system presents an SWR of less than 1.5:1, you may wish to turn off the antenna tuner, as full transmitter power will be delivered to the antenna system without intervention by the **FC-20**.

5. If the impedance encountered by the **FC-20** exceeds 3:1, and the "HI SWR" icon is illuminated, the microprocessor will *not* retain the tuning data for that frequency, as the **FC-20** presumes that you will want to adjust or repair your antenna system so as to correct the high SWR condition.
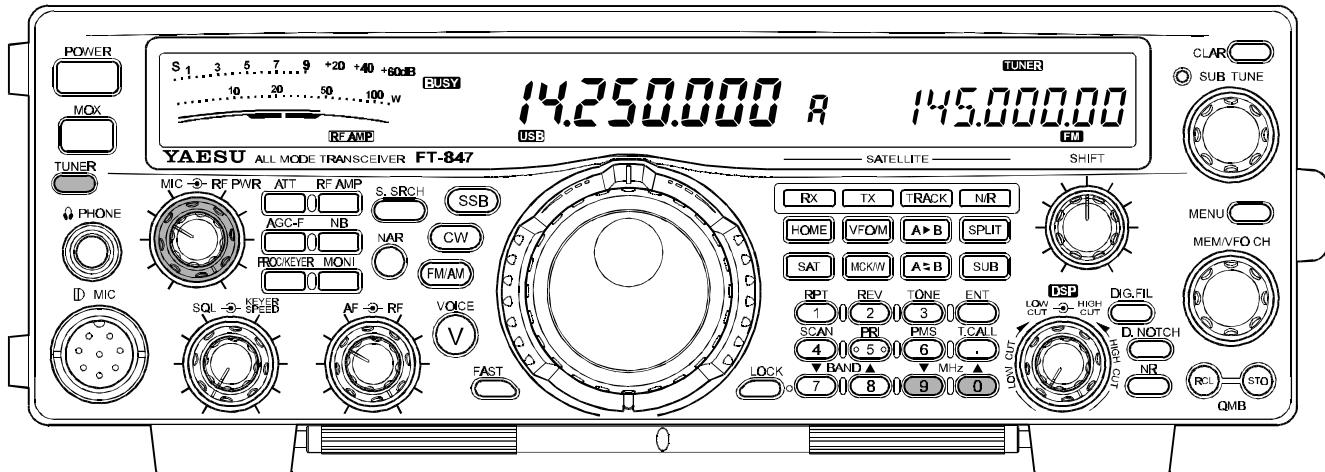
OPERATION

ACTIVE-TUNING ANTENNA SYSTEM (ATAS-100) OPERATION

The optional **ATAS-100** Active-Tuning Antenna System provides operation on the 7, 14, 21, 28, 50, 144, and 430 MHz bands.

Full instructions for its use are found in the documentation accompanying the **ATAS-100**.

To activate automatic tuning of the **ATAS-100**, Menu #31 must be changed from its default "TUNER" setting to "ANT." See page 88 for details.

AUTOMATIC TUNING

① Press the [**TUNER**] switch momentarily to "turn on" the **ATAS-100**. The "TUNER" icon will appear on the LCD.

② Now press and hold in the [**TUNER**] switch for ½ second to initiate the tuning procedure. The FT-847 will automatically transmit a carrier, and you will observe the **ATAS-100** extending itself beyond its fully-nested position. During tuning, the S-Meter becomes a relative SWR indicator, and successful matching will be indicated by a sudden "dip" in the reading on the meter.

③ When tuning is successfully completed, the FT-847 will return to the receive mode.

④ When changing bands, once a match has been obtained via step ② above, just press and hold in the [**TUNER**] switch for ½ second to initiate re-tuning of the **ATAS-100** for operation on the new band. Although there is no "memory" of antenna position, the **ATAS-100** will raise or lower itself in the "correct" direction if it has successfully achieved an impedance match on one band.

⑤ For operation on 144 and 430 MHz, the loading coil assembly must be fully "nested" at its minimum length. If it is not in this position, touch the [**TUNER**] switch momentarily; the **ATAS-100** will retract itself fully, and will turn itself off at the nested position. Operation on the 144 MHz or 430 MHz bands may then commence.

MANUAL TUNING

In some instances, the SWR may be slightly improved by manual adjustment of the antenna position. This may be needed for operation on bands like 17 meters, where the "Q" of the **ATAS-100** is high, causing a narrow resonance range.

To tune the **ATAS-100** manually, press the **MOX** switch (or press and hold in the microphone **PTT** switch). With the transceiver in the "TRANSMIT" mode, press and hold in the [**MHz ▲**] key (to raise the antenna) or the [**MHz ▼**] key (to lower the antenna). While you hold in one of these keys, the FT-847 will generate a carrier, and you may watch the top scale of the FT-847's meter, looking for the meter indication to reach its minimum value. When this is reached, release the [**MHz**] key, then press **MOX** (or release the **PTT** key to return to the "RECEIVE" mode.

ACTIVE-TUNING ANTENNA SYSTEM (ATAS-100) OPERATION

Notes:

❍ Once automatic matching has been successfully accomplished, you must change frequency by at least 10 kHz before attempting automatic matching again. Within a window of ±10 kHz from a match point, the transceiver's microprocessor will ignore any command to attempt automatic matching.

❍ Antenna tuning is accomplished using a "CW" carrier, although the mode indication will not change to "CW" (if you are operating on another mode) during antenna tuning.

❍ If you see a "HI SWR" indication on the LCD, it may mean that there is a problem in your coaxial cable (bad connection, etc.) which is preventing

successful tuning. Replace the cable, or try adding a few feet/meters of cable (to eliminate the possibility of adverse "transformer action" in the 50Ω cable during the tuning process).

❍ If you are able to achieve an SWR of less than 2:1 via manual tuning, the FT-847 will "accept" the manual setting, and you may then re-tune automatically when changing bands.

❍ If, however, you stop manual tuning at a non-optimum setting (SWR >2:1), the FT-847 will not permit further automatic tuning. To refresh the setting of the **ATAS-100**, press the [**MHz ▼**] key until the **ATAS-100** will fully retract. You may then restart automatic tuning per the procedures described earlier.

ATAS-100 Operating Tips

The information below will help you derive the best performance possible from your new **ATAS-100** Active-Tuning Antenna System.

GROUNDING

It is critically important that you establish a good mechanical and RF ground connection for your **ATAS-100** (as with all vertical antennas). Mobile mounts which are bolted through the vehicle's roof, or otherwise mechanically affixed, will usually be satisfactory. However, magnetic mounts do not provide the RF grounding necessary for good performance, and are not recommended for use with this antenna.

TUNING PROCEDURE

The feedpoint impedance of the **ATAS-100** (resistance and reactance) will necessarily vary over a wide range when you change bands. Occasionally, the transceiver's microprocessor will not *initially* be able to determine the proper direction for the **ATAS-100** to travel (inward or outward) for best SWR.

To resolve this situation, the transceiver will then command the **ATAS-100** to retract fully to its minimum height, and thence restart the tuning process. In this instance, the "WAIT" icon will appear on the display after you press the [**TUNER**] button. If this happens, do not press the [**TUNER**] button repeatedly. The transceiver will remain in the receive mode as it retracts (this may take up to one minute). Thereafter, the transmitter will be engaged, and the **ATAS-100** will be automatically adjusted for best SWR. The "WAIT" icon will then disappear from the LCD, and you will be ready for operation.

The command which retracts the **ATAS-100** to its minimum height utilizes a fixed timer. If the **ATAS-100** reaches its minimum height before the timer has expired, you may observe the antenna's motor continuing to rotate; this is normal, as the **ATAS-100**'s retraction mechanism includes a clutch assembly to prevent damage to the antenna or motor.

EXTERNAL WATTMETERS

If you wish to use an external wattmeter in conjunction with the transceiver and your **ATAS-100**, please check the wattmeter with an Ohmmeter prior to installation. Be sure there is a direct connection between the "IN" and "OUT" jacks of the wattmeter (zero resistance), and also ensure that there is a completely open circuit between the center pin and shield of the wattmeter's output jack. Some wattmeters use a coil or other device which shorts the center pin to ground at DC, and this type of internal wattmeter circuitry will not allow the tuning function of the **ATAS-100** to operate.

OPERATION ON 30/17/12 METERS
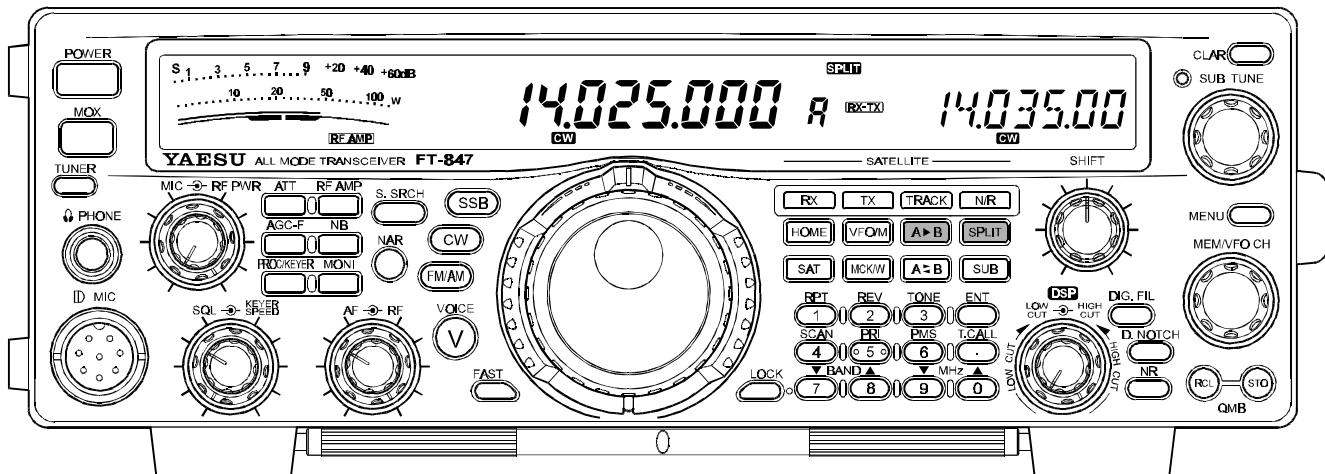
Although the **ATAS-100** is not specified for operation on the above bands, and optimum operation is therefore not guaranteed, the **ATAS-100** generally can be tuned successfully on these bands (some manual adjustment may be required). Operation of the **ATAS-100** on these bands will not damage the antenna's components; please feel free to experiment on these bands, if you like.

OPERATION

SPLIT FREQUENCY OPERATION (NON-SATELLITE)

The FT-847 provides convenient split-frequency operation, using the Main and Sub VFOs, for DX working and other operating situations requiring unique split frequency pairs. For repeater operation using the default shifts provided, see page 52. Split operation per this section is not a "full-duplex" configuration as needed for satellite operation; see page 66 for details regarding satellite full-duplex operation.

The example below will describe a split-frequency DX situation on the 20-meter band, with a DX station transmitting on 14.025 MHz, listening 10 kHz higher in the band.

① With the Main VFO set to 14.025.00 MHz CW, press the [A▶B] key to transfer the contents of the Main VFO into the Sub VFO.

② Press the [**SPLIT**] key momentarily. The FT-847 will now transmit using the Sub VFO frequency, and will receive using the Main VFO frequency. The "**SPLIT**" icon will appear on the display.

③ Rotate the **SUB-TUNE** knob to set 14.035.00 MHz on the Sub VFO display.

④ To listen to the pile-up calling the DX station (so as to align your frequency more closely to that of the station being worked by the DX), press the [A⇌B] key. The Main VFO will now be tuning in the vicinity of 14.035 MHz, and you can zero in on the DX station's listening frequency by tuning in on the station in QSO with the DX. Press [A⇌B] again to return the receiver to the DX station's transmitting frequency.

⑤ Press the [**SPLIT**] key once more to cancel split operation. Transmit/receive control will revert to the Main VFO, and the "**SPLIT**" icon will disappear from the display.

OPERATION

SATELLITE OPERATION

The FT-847 is an outstanding performer on amateur satellites, providing "turn-key" operation on Voice/CW "analog" satellites, and easy interface for digital mode operation.

The chief features of the FT-847 for satellite operation include:

- Full duplex crossband capability, pioneered on the Yaesu FT-726R;
- Uplink/downlink "tracking" of the VFOs, introduced on the Yaesu FT-736R;
- Dual frequency displays, showing both uplink and downlink frequencies;
- The **SUB-TUNE** control, which allows manual adjustment of the uplink frequency;
- The dedicated Satellite "Memory" VFO system, which includes alpha-numeric labeling of the memories and independent operating mode storage on the uplink and downlink registers; and
- The frequency entry keyboard (including the [**SUB**] key), which makes loading of uplink and downlink frequencies simple.

Satellite operation involves transmission on one band *while simultaneously receiving* on another band (sometimes on another operating mode, as well). This is different from "Split" operation, where transmission and reception are not occurring simultaneously; the [**SPLIT**] key should not be used during satellite operation.

"Analog" Satellite Transponder Information

SATELLITE NAME	ORBIT TYPE[1]	UPLINK	DOWNLINK	NOTES
AO-10	Molniya	435.030 ~ 435.180 MHz CW & LSB	145.975 ~ 145.825 MHz CW & USB	Semi-operational. Inverted Transponder.
AO-27	LEO	145.850 MHz FM	436.972 MHz FM	Single Channel
FO-20	LEO	145.900 ~ 146.000 MHz CW & LSB	435.900 ~ 435.800 MHz CW & USB	Inverted Transponder.
FO-29	LEO	145.900 ~ 146.000 MHz CW & LSB	435.900 ~ 435.800 MHz CW & USB	Inverted Transponder. Operation schedule varies, shared with Digital modes[2]
RS-13	LEO	21.260 ~ 21.300 *and* 145.960 ~ 146.000 MHz CW & USB	29.460 ~ 29.500 MHz CW & USB	Use either uplink band for transponder access.
RS-15	LEO	145.858 ~ 145.898 MHz CW & USB	29.354 ~ 29.394 MHz CW & USB	Communication range greater than RS-13 due to higer orbit.
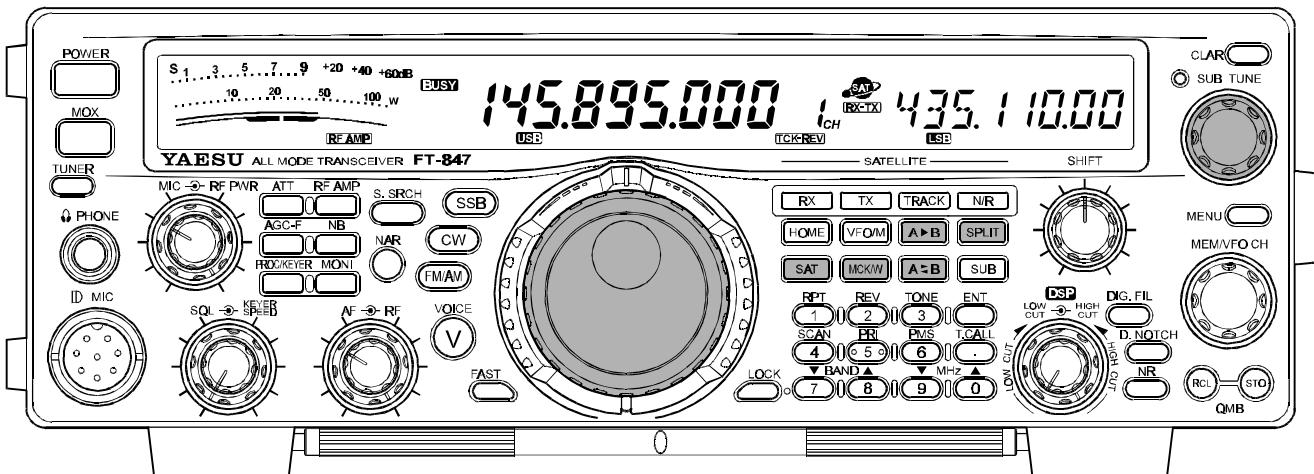
Notes: (1) Orbit Types: Molniya - Elliptical orbit, Apogee $\cong$ 36,000 km, Perigee $\cong$ 4,000 km
LEO - "Low Earth Orbit," Apogee/Perigee $\leq$ 2,000 km.
(2) The FO-29 operating schedule, and that of other satellites, may be viewed at AMSAT's Web site: <http://www.amsat.org/amsat/news/ans.html>

SATELLITE OPERATION

Here is an example of satellite operation setup for a typical "analog" voice satellite, AO-10, operating in "Mode B" on SSB:

① Press the [**SAT**] switch to activate the "Satellite" mode of operation. The "𝄞" icon will appear on the LCD.

② Press the [**A⇄B**] key, if necessary, to set the 144 MHz band on the Main Display and the 430 MHz band on the Sub Display. For Mode B operation, your radio's transmit frequency (the "uplink") will be on 435 MHz LSB, while your listening ("downlink") frequency band will be 145 MHz USB.

③ Using the keypad, set a starting downlink frequency (for example, 145.895 MHz) on USB.

④ Refer to an appropriate frequency conversion chart, and use the keypad to enter the uplink frequency which corresponds to 145.895 MHz (in this case, 435.110 MHz); this is done by pressing [**SUB**] ⇨ [**ENT**] ⇨ (frequency digits) ⇨ [**ENT**] ⇨ [**SSB**] (to select LSB) ⇨ [**SUB**].

⑤ Press the [**TRACK(A▶B)**] key; this activates the "Tracking" feature required for operation on many satellite transponders. An icon (either "**TCK-REV**" or "**TCK-NOR**") will appear on the LCD, indicating the type of tracking selected ("REVERSE" or "NORMAL").

⑥ For satellite AO-10, "REVERSE" tracking is required (whereby *upward* frequency change on the Main VFO causes *downward* frequency change on the Sub VFO). If "**TCK-REV**" does not appear, press the [**N/R**] key once to change the Tracking mode.

⑦ Press and hold in the [**MCK/W**] key *momentarily*; a single "beep" will be heard. The "**MCK**" icon on the LCD will blink. Now press and hold in the [**MCK/W**] key for ½ second until a *double* "beep" is heard; this will lock the current frequency pair into "Satellite Memory" register #1.

⑧ Now rotate the **MAIN VFO** Tuning Dial to find a clear frequency. As you do this, observe that the Sub Display frequency is changing in the opposite direction from that of the Main Display.

⑨ If the satellite is above the horizon, adjust the position of your antennas so as to point them at the satellite.

⑩ When the frequency is clear, press the microphone's [**PTT**] switch, and give a short whistle into the microphone. If you have set the uplink/downlink frequency relationship approximately correctly, you should hear yourself (after a short delay) coming back from the satellite. Now rotate the **SUB-TUNE** knob so as to make your voice sound natural as you speak into the microphone (you may find it easier to match the tones of your whistling).

You may now tune the satellite sub-band, using the **MAIN VFO** Tuning Dial, as though you were operating on any HF or VHF band. As you tune, the uplink frequency will automatically be adjusted by the Tracking feature. Periodically, you may have to make very slight adjustments to the uplink frequency, using the **SUB-TUNE** control, as Doppler Shift is of different magnitude on UHF (the 435 MHz Doppler Shift is about three times the shift on 145 MHz).

Note: Operation on satellite Mode "K" is not possible with the FT-847, as both the uplink (21 MHz) and downlink (29 MHz) frequencies fall on the "HF" antenna jack.

OPERATION

SATELLITE OPERATION

SATELLITE "MEMORY" REGISTERS

The FT-847 provides twelve Satellite "Memory" registers which function as independent VFO pairs; these allow the FT-847 to be configured for a number of different satellites, each with its own frequency and tracking specifications.

In the discussion above, a "Mode B" frequency pair (435 MHz uplink, 145 MHz downlink) was loaded into Satellite Memory register #1. Now you will learn how to load a "Mode A" frequency pair (145 MHz uplink, 29 MHz downlink) with "Normal" tracking into Satellite Memory register #2. This discussion picks up after step ⑩ above.

① Using the keyboard, set the Main VFO to 29.480 MHz USB (the center of the Mode A downlink passband for satellite RS-13).
② Using the keyboard, set the Sub VFO to 145.980 MHz USB (the center of RS-13's Mode A uplink passband).
③ Press the [**N/R** (**SPLIT**)] key to change the Tracking mode from "Reverse" ("TCK-REV") to "Normal" ("TCK-NOR").
④ Press and hold in the [**MCK/W**] key momentarily; a single "beep" will be heard. The "MCK" icon on the LCD will blink.
⑤ Rotate the **MEM/VFO CH** knob to select "2" as the new Satellite Memory register number. If you wish to store this frequency data into a different register number, you may select any number between 1 and 12.
⑥ Now press the [**MCK/W**] key for ½ second until a *double* "beep" is heard.
⑦ Now rotate the **MEM/VFO CH** control. You will observe that the display switches back and forth between the Mode A frequency pair just programmed and the Mode B frequency pair entered in the earlier discussion. Note that the frequency, uplink mode, and Tracking mode are all changing.

Additional Satellite Memory registers may be loaded with different satellite transponder frequency pairs, so as to accommodate Mode A, Mode B, Mode J, Mode T, and various uplink and downlink combinations on different satellites (for example, satellites RS-13 and RS-15 were both designed for Mode A, but use slightly different uplinks and downlinks on the same frequency bands: 145 MHz uplink, 29 MHz downlink).

SATELLITE METERING OPTIONS

During transmission, the lower meter scale may be set, via Menu #34, to indicate one of three possible conditions:

A. On FM, the meter may serve as a Discriminator Center Meter, for precise adjustment of the downlink signal while compensating for Doppler Shift.
B. The meter may also serve as a "PO" (Power Output) meter.
C. Alternatively, the meter may monitor your transmitter's ALC level.

The top meter area always serves as a received signal strength ("S") meter, thus allowing the operator to monitor the status of both the transmit and receive sides of the satellite link. To change the (lower) meter's function:

● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #34 ("SAT-MTR").
● Rotate the **MEM/VFO CH** knob to select the desired function (DISC, PO, or ALC).
● Press the [**MENU**] key to exit the Menu mode.

Operating Reminder

Direct Frequency Entry on Main and Sub VFOs

To Enter a Frequency into the Main VFO
(example: 145.895 MHz USB)

① Press [**ENT**].
② Press [**1**] ⇨ [**4**] ⇨ [**5**] ⇨ [**●**] ⇨ [**8**] ⇨ [**9**] ⇨ [**5**] ⇨ [**ENT**].
③ If the display does not indicate "USB" below the Main Frequency Display field, press [**SSB**] once or twice, as need, to make "USB" appear.

To Enter a Frequency into the Sub VFO
(example: 435.110 MHz LSB)

① Press [**SUB**].
② Press [**ENT**].
③ Press [**4**] ⇨ [**3**] ⇨ [**5**] ⇨ [**●**] ⇨ [**1**] ⇨ [**1**] ⇨ [**ENT**] ⇨ [**SSB**] ⇨ [**SUB**].

(In the above step, pressing [**SSB**] is required if "LSB" is not displayed below the Sub VFO Frequency Display field).

SATELLITE OPERATION

SATELLITE MEMORY LABELING

When storing satellite memories, a special feature of these memory channels is the alpha-numeric labeling ("Tag") which can be appended to each memory. This can be particularly useful if you wish to preset a number of satellite memories as starting points for operation on a number of satellites. You may then label each memory with the satellite's designator number and the operating mode.

For example, you might wish to label an appropriate memory as being configured for the satellite known as "FO-29" (**F**uji-**O**scar **29**) in Mode JD. When the Satellite Memory is selected via the **MEM/VFO CH** knob, the Tag will be displayed for two seconds, after which the frequency display for that Satellite Memory register will appear.

To store Satellite Tags, use the following procedure:

● Press the [**MENU**] button to activate the Menu mode of operation.
● Rotate the **SUB-TUNE** knob to select Menu #35 ("**SAT TAG**").
● Press the [**MCK/W**] key.
● Rotate the **MEM/VFO CH** knob to select the Satellite Memory to which an alpha-numeric Tag is to be appended.
● Rotate the **SUB-TUNE** knob to select the first position in the Tag to be programmed. The current character will be blinking.
● Rotate the **MEM/VFO CH** knob to select the letter or number to be set into the current slot. In this case, select "**F**" as the first letter.
● Repeat the last two steps so as to select "FO29JD" as the complete label.
● Press the [**MCK/W**] key to complete entry of this Tag. Repeat this process for as many Satellite Memory registers as you wish.
● Press the [**MENU**] key to exit the Menu mode.

This procedure may be repeated for each Satellite memory register, for easy identification of the satellite name, operating frequencies, and mode of operation (the "D" represents "Digital" operation in the above example).

Note
Regarding Satellite Memory Registers

If you reset the microprocessor (via Menu #38 or 39), the contents of the Satellite Memory registers will also be cleared out.

If this happens, please re-load the Satellite Memory registers in accordance with the instructions in this chapter.

Be certain that Menu #36 ("**AUTO-MEM**") is set to "**ON**" before commencing satellite operation. See page 88 for details regarding Menu #36.

The wide variety of amateur satellites provides many opportunities to utilize the flexibility of the FT-847. For example, some digital satellites may require an uplink signal to be sent on FM, while downlinking on SSB. Full details on satellite frequencies, operating modes, and operating procedures may be found in books available from your dealer, or from the Web site of AMSAT-NA (Amateur Satellite Corporation) at <http://www.amsat.org>, which provides many links to other national satellite organizations, such as AMSAT-DL, AMSAT-UK, AMSAT-Australia, etc.
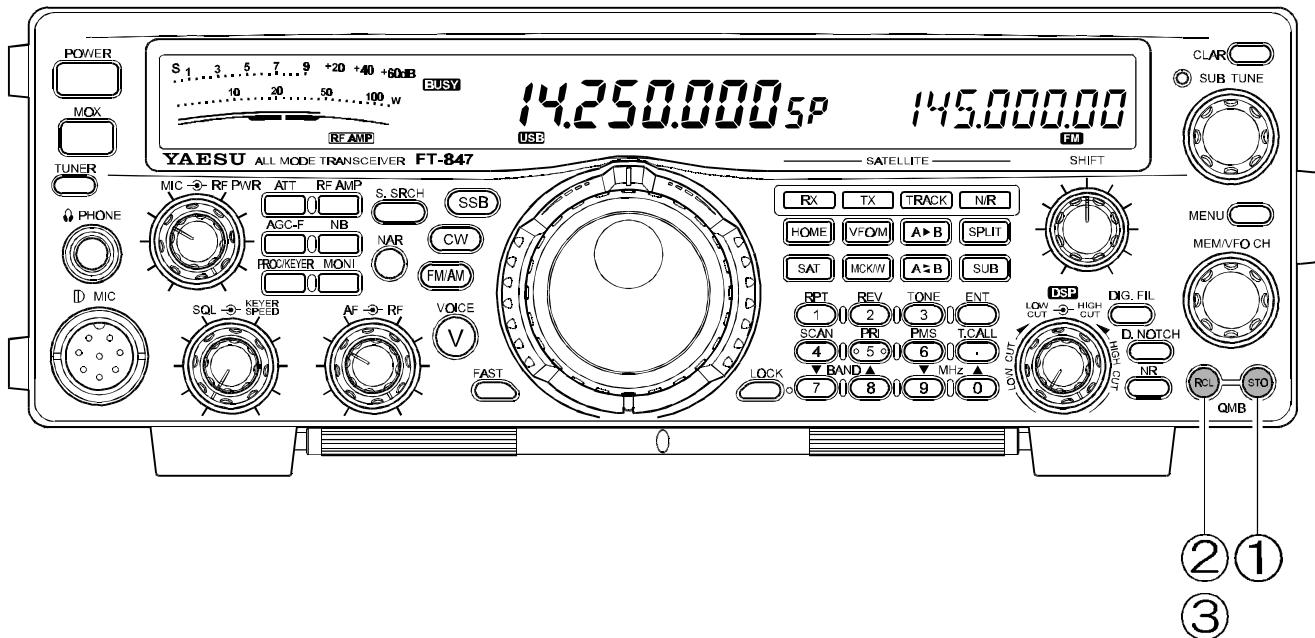
MEMORY OPERATION

The FT-847's Memory System provides a wide variety of facilities which enhance operating efficiency and convenience. The Memory System stores frequency, operating mode, bandwidth, repeater offset and tone data, and CLARIFIER information, to minimize the need to reset controls each time a memory channel is recalled. The features of the Memory System are described on the pages to follow.

QMB (QUICK MEMORY BANK)

A convenient QMB channel is available, providing instantaneous storage and recall of an urgently-needed frequency (for example, a DX station which is not currently listening for your call area).

QMB MEMORY STORAGE/RECALL

① While operating in the VFO mode, press the [**QMB STO**] key momentarily to store the frequency.
   Note: The QMB system is capable of memorizing:
   - Operating frequency
   - Operating mode
   - Receiver filter (Wide/Narrow)
   - Clarifier information (direction and magnitude)
   - Repeater shift information (direction and magnitude)
   - Packet baud rate

② Press the [**QMB RCL**] key momentarily to recall the current QMB channel. The "SP" ("**SP**ecial Memory") designator will appear in the Memory Channel window.

③ Press the [**QMB RCL**] key once more to return to the previous frequency (either a VFO frequency or a Memory channel).

Note: If you move the **MAIN VFO** Tuning Dial or the **VFO/MEM CH** knob while in the QMB Memory mode, you can change frequencies as if you were in a "VFO" mode. When this is done, the "MT" (Memory Tune) icon will appear on the display. Press the [**QMB RCL**] key once more to return to the originally-stored QMB frequency.
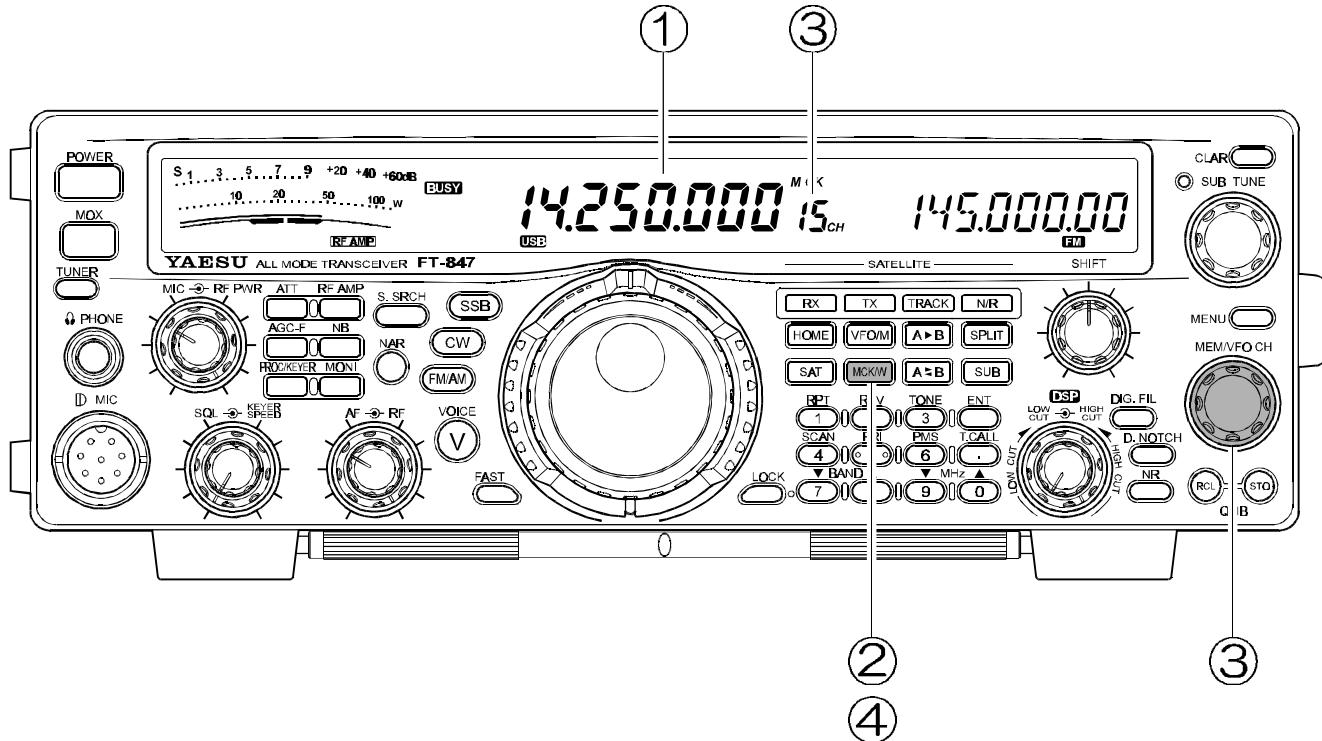
MEMORY OPERATION

MAIN MEMORY SYSTEM

The Main Memory System of the FT-847 consists of memory channels 1 through 78, which provide the user with a huge bank of memories for every operating need.

NORMAL ("SIMPLEX") MEMORY STORAGE

Use this procedure for storage of most frequencies, when not operating either in the "Split" nor "Satellite" mode.

① Set the Main VFO to the frequency which you wish to store in memory. Be sure that all mode, bandwidth, and other conditions are set the way you want them.

② Press the [MCK/W] key *momentarily*. The "MCK" icon will blink at the top right-hand corner of the Main Frequency Display field.

③ Rotate the **MEM/VFO CH** knob to select an unused channel (one where no frequency display is found). In the above illustration, this is channel 15.

④ Press the [MCK/W] ("Memory Check and/or Write") key for ½ second. A double "beep" will be heard, and the Main Frequency Display field will revert to the VFO frequency. The double "beep" confirms that the frequency data was stored. You will still be operating in the "VFO" mode, so that you can store additional frequencies into other memory registers.

Notes: The Main Memory system is capable of memorizing:
- Operating frequency
- Operating mode
- Receiver filter (Wide/Narrow)
- Clarifier information (direction and magnitude)
- Repeater shift information (direction and magnitude)
- CTCSS Tone information (CTCSS Encode, Decode On/Off; Tone Frequency)
- DCS information (DCS On/Off, DCS Code)
- Packet baud rate
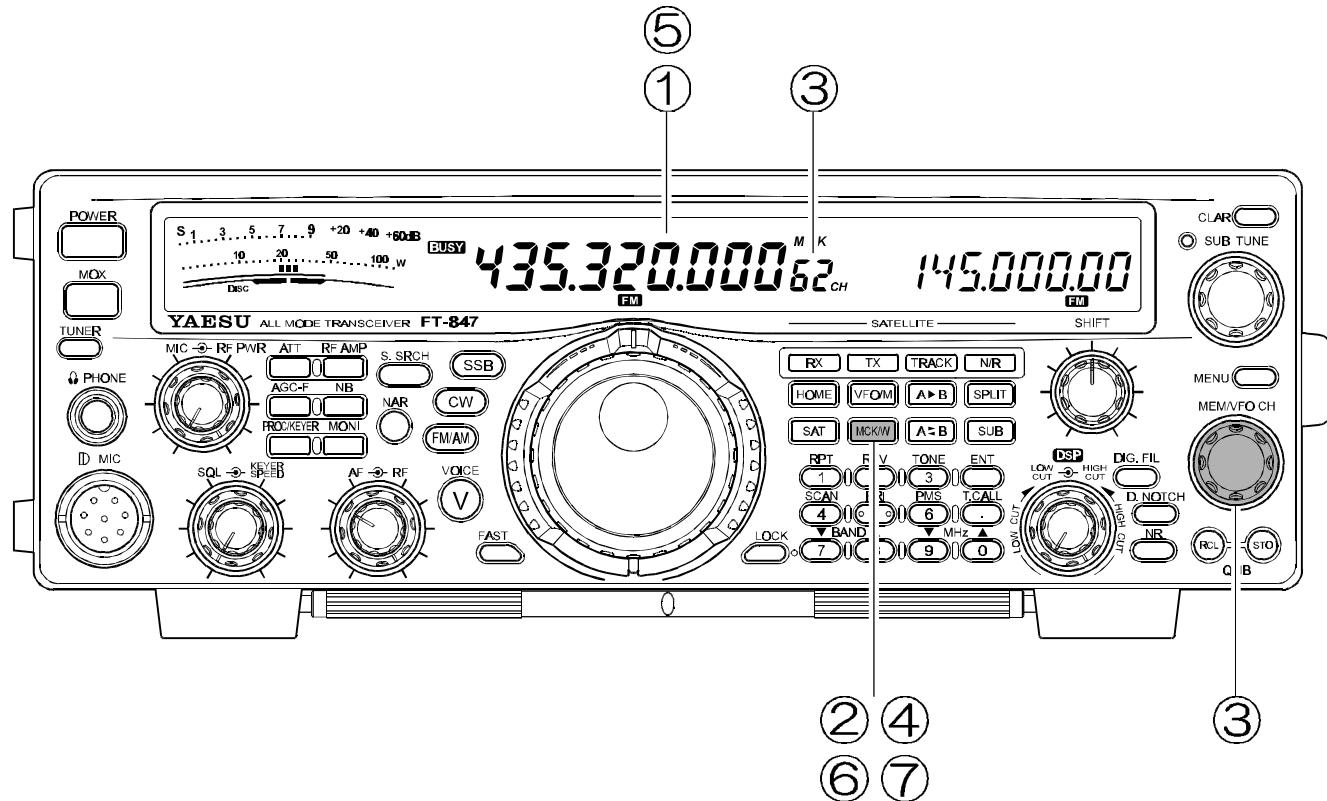
Channels "L" and "U" are used as band limits for the Programmable Memory Scan feature. See page 78 for details.

MEMORY OPERATION
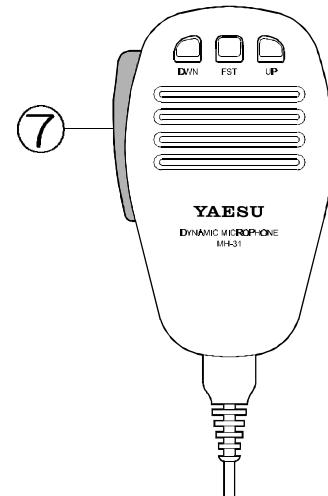
MAIN MEMORY SYSTEM

SPLIT-FREQUENCY MEMORY STORAGE

You can also store "Split" frequencies, such as when operating on a repeater system not utilizing a "standard" offset. This procedure may also be used for DX work on 7 MHz SSB, etc.

① In the VFO mode, set the Main VFO to the desired *Receive* frequency and mode.

② Press the [**MCK/W**] key momentarily. A single "beep" will be heard, and the "*M CK*" icon at the top right-hand corner of the Main Frequency Display field will blink.

③ Rotate the **MEM/VFO CH** knob to select the channel into which you wish to store the current frequency data (in the above illustration, channel 62).

④ Press the [**MCK/W**] key once more for ½ second; a double "beep" will again be heard, confirming that the *Receive* frequency data is now stored.

⑤ Now set the Main VFO to the desired *Transmit* frequency.

⑥ Press the [**MCK/W**] key for ½ second (you will hear the double "beep"); *do not* rotate the **MEM/VFO CH** knob!

⑦ While the "62" (channel number) indication is blinking, press and hold in the microphone's **PTT** switch; while holding in the **PTT** switch, again press the [**MCK/W**] key for ½ second. The double "beep" will confirm that independent *Transmit* frequency data is now stored. You may now release the [**PTT**] switch.
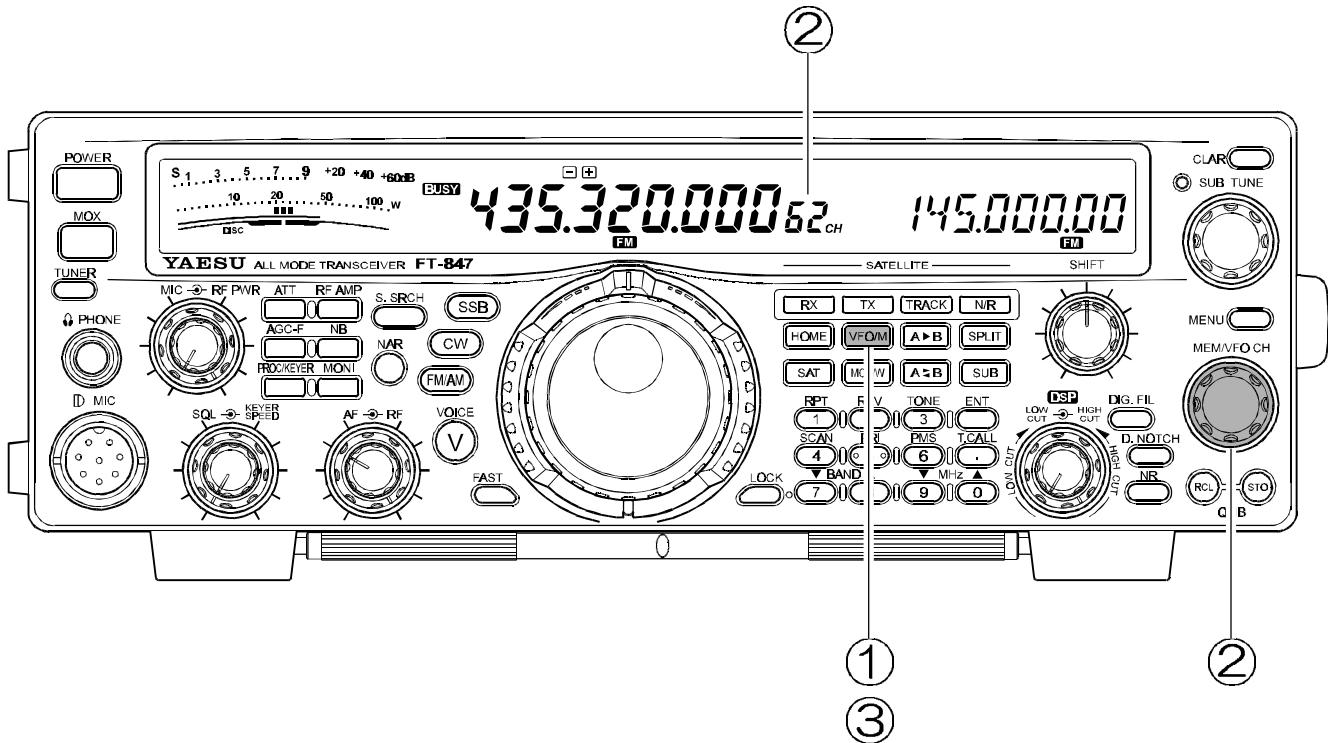
Note: In step ⑦ above, pressing the **PTT** switch does *not* activate the transmitter. It simply sends a signal to the microprocessor that an independent *Transmit* frequency is being stored on the same channel as a previously-stored *Receive* frequency.

MEMORY OPERATION

MAIN MEMORY SYSTEM

MEMORY CHANNEL RECALL

① While operating in the VFO mode, press the [**VFO/M**] switch momentarily. The transceiver will switch into the "Memory" mode.

② Rotate the **MEM/VFO CH** knob to select the desired Memory channel. Both the channel number and frequency will appear on the display.

③ To return to VFO operation, press the [**VFO/M**] key once more.

> *Note: When "Split" memories are programmed, the Transmit frequency does not appear on the display until the transmitter is activated. The frequency appearing on the Sub VFO Display field is **not** the "Transmit" frequency during "Split" memory operation.*

Note: If you move the **MAIN VFO** Tuning Dial or the **SHUTTLE JOG™** ring while in the Memory mode, you can change frequencies as if you were in a "VFO" mode. When this is done, the "**MT**" (Memory Tune) icon will appear on the display. Press the [**VFO/M**] key once more to return to the originally-stored Memory frequency.

While operating in the "**MT**" mode, if you want to store a newly-tuned frequency, just follow the procedures described previously for memory storage (as though the "**MT**" mode were the VFO mode). Just remember to select an unused memory channel for storing the new frequency data.
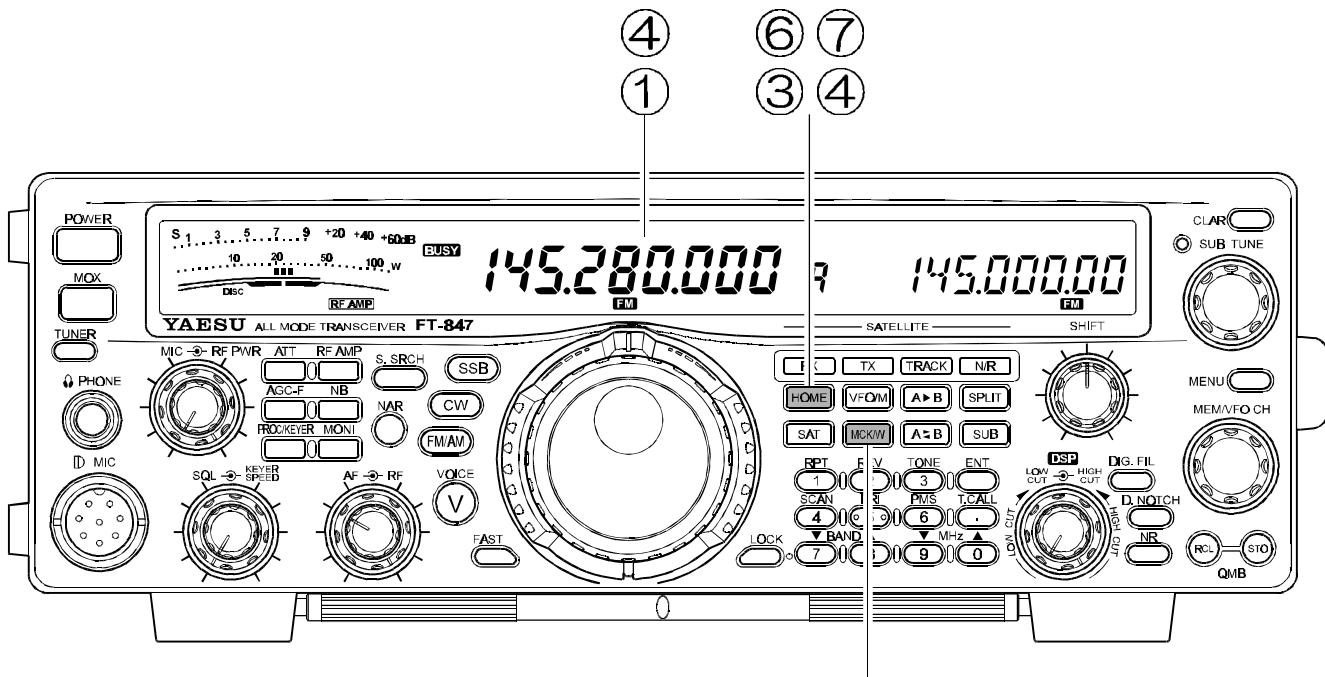
When operating on a "Split" frequency memory (see previous page), the "**+**, **–**" indication will appear on the display.

MEMORY OPERATION
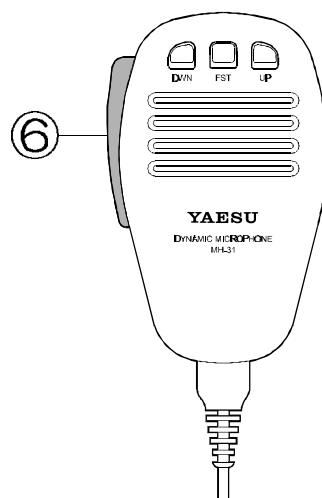
MAIN MEMORY SYSTEM

"HOME" CHANNEL MEMORY

Four special one-touch HOME channels are available, for special frequencies you use often. Either "simplex" or "split" frequency/mode data may be stored in the HOME channel locations. Separate HOME channels are available for HF (any frequency between 1.8 and 29.7 MHz), 50 MHz, 144 MHz, and 430 MHz.

① Set the Main VFO to the frequency which you wish to store into the HOME memory. Be sure that all mode, bandwidth, and other conditions are set the way you want them.

② Press the [**MCK/W**] key for ½ second.

③ Now press the [**HOME**] key for ½ second. This stores the frequency data into the HOME channel location.

④ If you wish to store a "Split" frequency pair into the HOME channel, store the *Receive* frequency in steps ① ~ ③ above. Now set the Main VFO to the desired *Transmit* frequency.

⑤ Once more, press the [**MCK/W**] key for ½ second.

⑥ Press and hold in the microphone's [**PTT**] switch; while holding in the [**PTT**] switch, again press the [**HOME**] key for ½ second. This stores the *Transmit* frequency data into the HOME channel location.

⑦ To recall the HOME channel, just press the [**HOME**] key momentarily (while operating either in the VFO or Memory mode). The "**H**" indication will appear in the memory channel number field to the right of the main frequency display area. Press the [**HOME**] key once more to return to the previous frequency (either a VFO frequency or a memory channel).

MAIN MEMORY SYSTEM

Notes: The HOME channel memory system is capable of memorizing:
- Operating frequency
- Operating mode
- Receiver filter (Wide/Narrow)
- Clarifier information (direction and magnitude)
- Repeater shift information (direction and magnitude)
- CTCSS Tone information (CTCSS Encode, Decode On/Off; Tone Frequency)
- DCS information (DCS On/Off, DCS Code)
- Packet baud rate

If you move the **MAIN VFO** Tuning Dial or the **MEM/VFO CH** knob while in the HOME channel mode, you can change frequencies as if you were in the "MT" mode. Press the [**HOME**] key once more to return to the originally-stored Memory frequency.

While operating in the "pseudo-MT" mode, if you want to store a newly-tuned frequency, just follow the procedures described previously for memory storage (as though the "pseudo-MT" mode were the VFO mode). Just remember to select an unused memory channel for storing the new frequency data.

When operating on a "Split" frequency HOME memory (see previous texts, the "+, −" indication will appear on the display.

Note

Regarding Recall of Home Channels

The HOME channel that will be recalled will depend on the last-used frequency band of operation. That is, if you are presently using a 144 MHz memory channel, pressing the [**HOME**] key to switch to VFO operation on, for example, 14 MHz, pressing the [**HOME**] key will cause the "HF Band" HOME channel to be recalled.

ERASING INDIVIDUAL MEMORIES

You may wish to clear the contents of a single memory channel. The procedure to clear a memory of its data is:

① Press the [**MCK/W**] key momentarily.
② Rotate the **MEM/VFO CH** knob to select the memory channel to be erased.
③ Press the [**REV**] key. This will erase the data.
④ If you need to erase other channels, repeat steps ② and ③ above.
⑤ Press the [**MCK/W**] key once more to exit to normal operation.

ERASING ALL MEMORIES

If you wish to erase all memories (including all Satellite Memory registers), and set the Main and Sub VFOs to their default frequencies, use the following procedure:
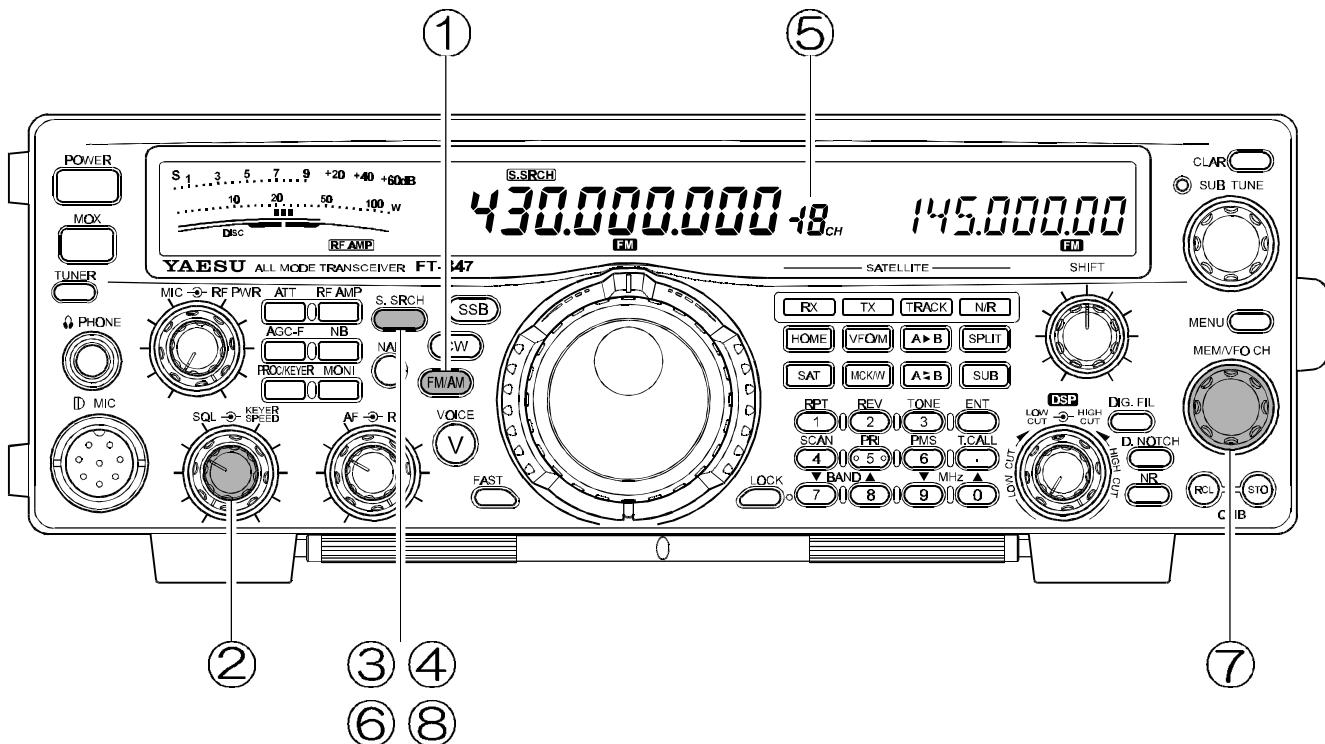
① Press the [**MENU**] button to activate the Menu mode of operation.
② Rotate the **SUB-TUNE** knob to select Menu #38 ("MEM CLR").
③ Press the [**MCK/W**] key.
④ Press the [**MENU**] key to exit the Menu mode.

Note: This procedure does not reset the Menu System to its factory defaults. See page 95 regarding microprocessor reset procedures.

Smart Search™

The **SMART SEARCH™** feature automatically loads active channels into special memory locations, without the need for you to go through the memory loading process manually, channel-by-channel. This may be particularly useful when traveling to a new city, where local repeater frequencies are not known.

The **SMART SEARCH™** feature is functional in the FM mode only.

① Set the operating mode to **FM**.
② Adjust the **SQL** (Squelch) control so that the background noise is just silenced.
③ Press the [**S.SRCH**] key *momentarily* to enter the **SMART SEARCH™** mode. The "S.SRCH" icon will appear on the LCD.
④ Press the [**S.SRCH**] key for ½ second to initiate **SMART SEARCH™** scanning.
⑤ The **SMART SEARCH™** process will now cause the FT-847 to scan upward in frequency on the current band, loading channels on which it encounters a signal strong enough to open the squelch. When 10 channels are loaded, the scanner will return to the original frequency, then scan *downward* in frequency, loading another 10 channels. When all 20 **SMART SEARCH™** channels are loaded, scanning will stop, and the transceiver will return to the original operating frequency.
⑥ To interrupt **SMART SEARCH™** scanning at any time, press the [**S.SRCH**] key momentarily.

⑦ To recall **SMART SEARCH™** memories just stored, rotate the **MEM/VFO CH** knob (you must be in the **SMART SEARCH™** mode, with the "S.SRCH" icon displayed, to recall **SMART SEARCH™** memories).
⑧ To enter the **SMART SEARCH™** mode from either the VFO or Memory mode, or to exit the **SMART SEARCH™** mode, press the [**S.SRCH**] key momentarily.
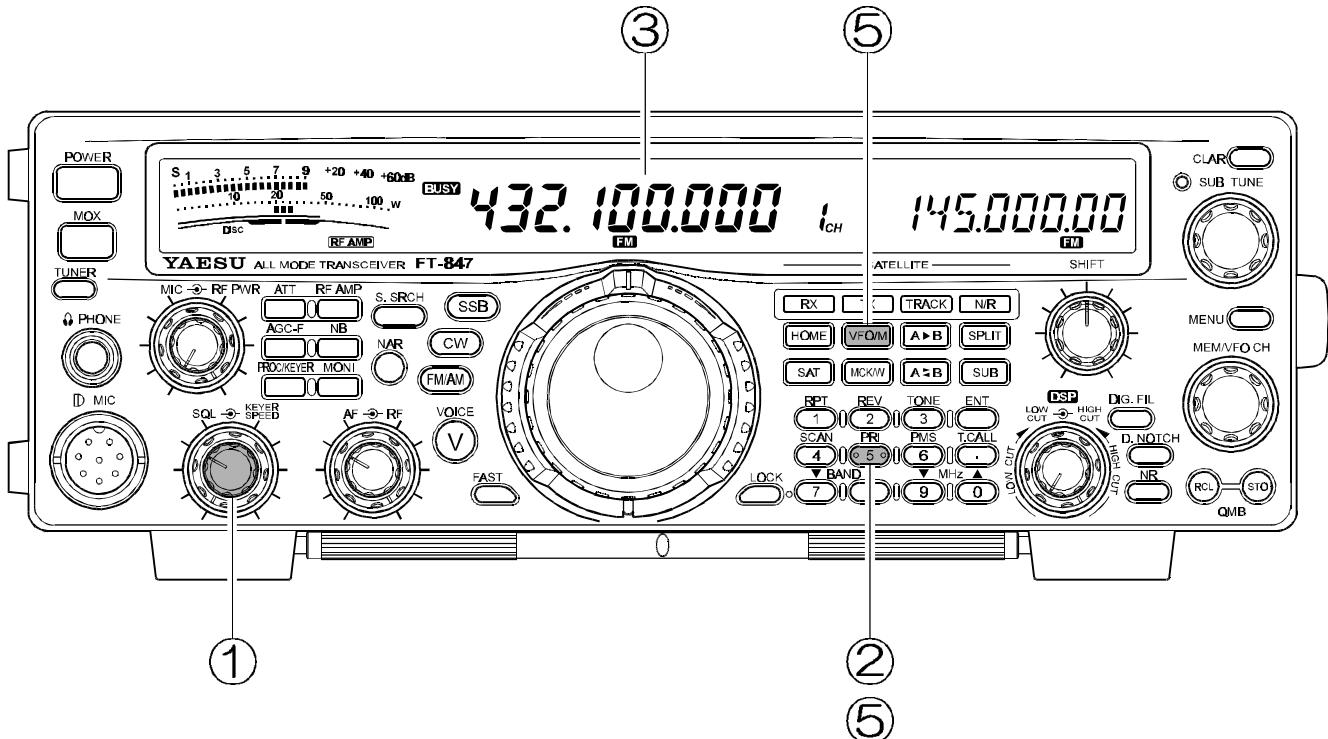
Note: **SMART SEARCH™** memories for frequencies above the original operating frequency are numbered "1" ~ "10" in the memory channel display area. **SMART SEARCH™** memories for frequencies below the original operating frequency are numbered "–1" ~ "–10" in the memory channel display area.

During the **SMART SEARCH™** scanning process, the scanner only "notes" which channels are active; scanning does not stop until the **SMART SEARCH™** channels are filled (unless you manually stop the scan, as in step ⑤ above).
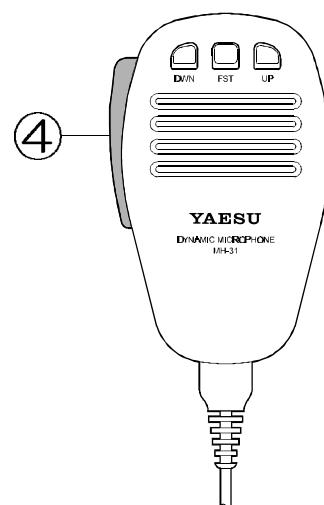
Priority Channel Operation

The "Priority Channel" feature initiates a two-frequency scanning process, whereby Memory Channel #**1** is checked every five seconds to see if there is activity. This feature is helpful if you wish to operate on one FM repeater while checking for a call on another, and it is also useful for watching two VHF/UHF "Calling Frequencies" for activity (e.g. 144.200 MHz and 432.100 MHz in North America). The Priority feature is available in all operating modes (not just FM or AM).

When loading memories, remember to reserve Channel #1 for Priority use.
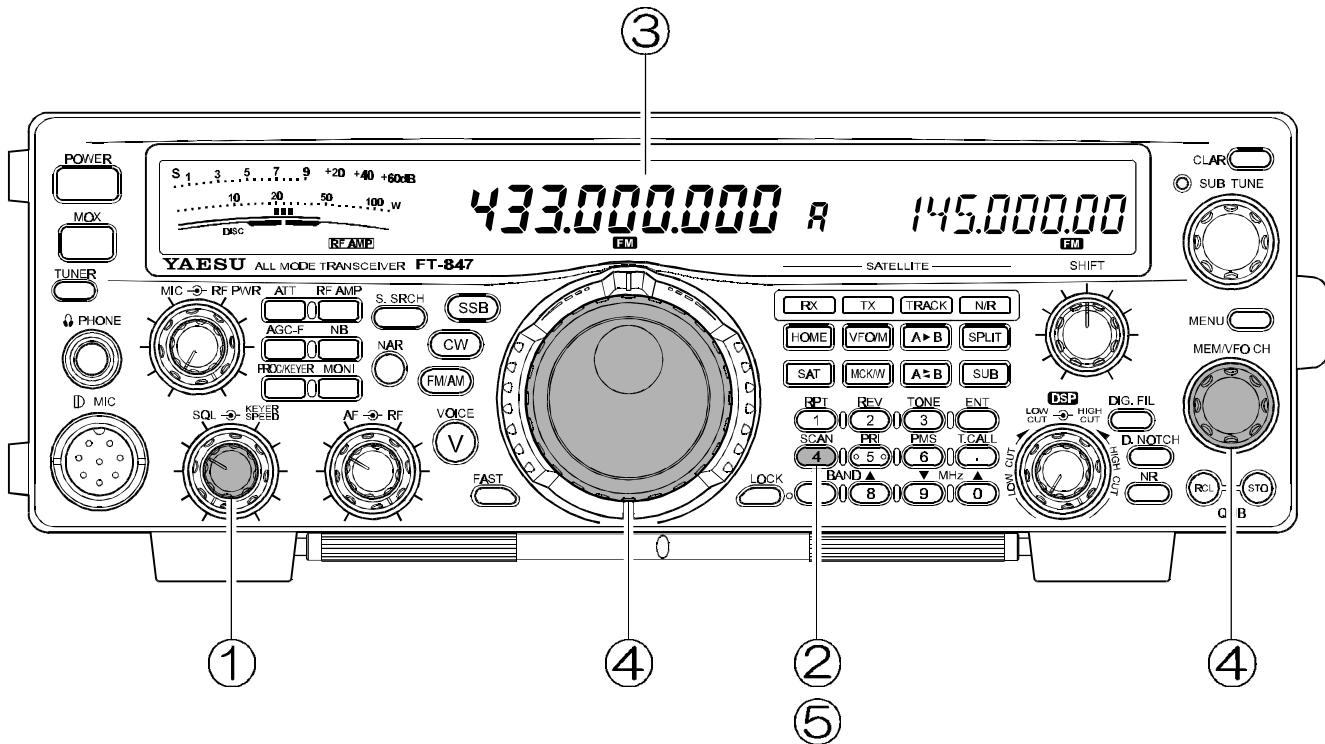
① Adjust the **SQL** (Squelch) control so that the background noise is just silenced.

② Press the keypad's [**5**(**PRI**)] key momentarily to initiate the Priority mode. The FT-847 will continue to operate normally on the current frequency, but every five seconds will switch briefly to Memory Channel #1, looking for activity. If no activity is found, operation will resume on the current frequency.

③ If activity is found on the Priority Channel (Memory #1), the transceiver will lock on the Priority Channel for a time interval set via Menu #26 (see page 86).

④ If you press the microphone's [**PTT**] switch while "pausing" on the Priority Channel (Memory #1), operation will be locked on the Priority Channel frequency.

⑤ Press the [**VFO/M**] or [**5**(**PRI**)] key to exit the Priority mode. Operation will then revert either to the VFO or Memory mode, whichever was most recently in use before Priority operation was initiated.

Scanning Operation

The FT-847's Scanning capability allows you to monitor a large number of Memory Channels, or to sweep a band (or band segment), looking for activity. For scanning just a band segment, see page 80 for operating instructions for the "**PROGRAMMABLE MEMORY SCAN**" mode of scanning.

① Adjust the **SQL** (Squelch) control so that the background noise is just silenced.

② Press the keypad's [**4**(**SCAN**)] key momentarily to initiate scanning in an upward direction (during VFO scanning, towards a higher frequency; in Memory scan, toward a higher channel number).

③ If the scanner encounters a signal strong enough to open the squelch, *In the FM/AM modes*, the scanner will halt and pause on that channel in accordance with the "hold" time set via Menu #26 (see page 86), *In the SSB/CW modes*, the scanner will slow down (but doesn't stop).

④ To reverse the direction of the scan, turn either the **MAIN VFO** Tuning Dial or the **MEM/VFO CH** knob to the left (while scanning upward) or to the right (while scanning downward).

⑤ To exit the Scanning mode, press the [**4**(**SCAN**)] key once more.

Notes: In the VFO mode, the scanning range will be the entire HF spectrum of 100 Hz through 30 MHz. In the Memory mode, all channels not "skipped" (see next page) will be scanned.

To stop the scan manually, press the microphone's [**PTT**] switch (or the keypad's [**VFO/M**] key).

The time period on which the scanner will pause on an active channel may be adjusted via Menu #26. See page 86 for details.
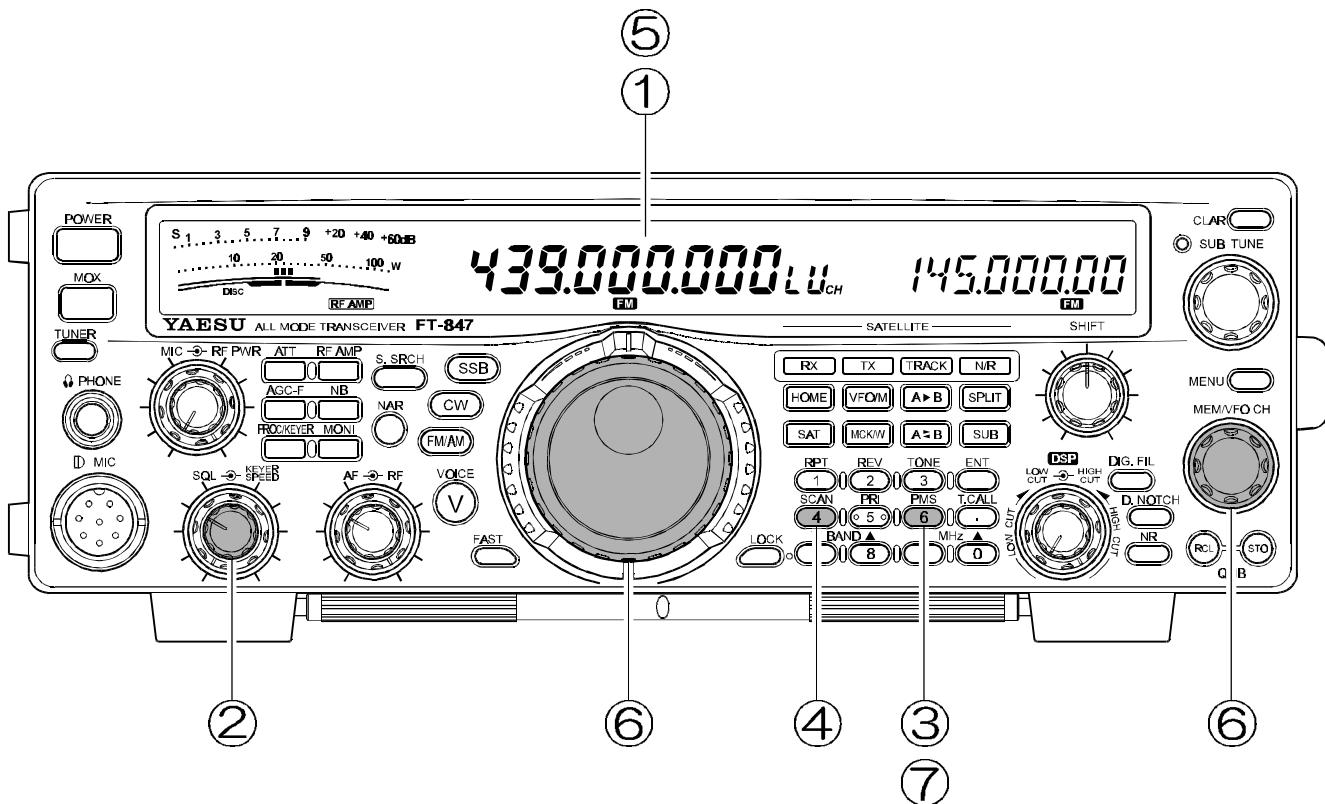
MEMORY CHANNEL "SKIP" FEATURE

There may be certain always-busy channels (such as a weather forecast beacon station) which you may wish to "skip" during scanning. Channels to be ignored by the scanner will have "*SKIP*" appear above the channel number.

① While operating in the Memory mode, press the [**MCK/W**] key momentarily.
② Rotate the **MEM/VFO CH** knob to select the channel number to be skipped.
③ When the correct channel number is shown in the memory channel field, press the [**4**(**SCAN**)] key momentarily. The "*SKIP*" icon will appear above the channel number on the display.
④ Repeat steps ② and ③ if you want to skip other channels.
⑤ Press the [**MCK/W**] key once more to exit to normal operation.

Programmable Memory Scan

The Programmable Memory Scan utilizes the "U" and "L" memories to provide sub-bands within scanning can take place. For example, on the 2-meter band, you may wish to limit FM scanning to 144.5 ~ 148 MHz, to avoid encroachment on the SSB/CW sub-band between 144.0 and 144.5 MHz.

① Program the lower frequency limit of the sub-band to be scanned into the "L" memory location, and the upper sub-band limit into the "U" memory location.
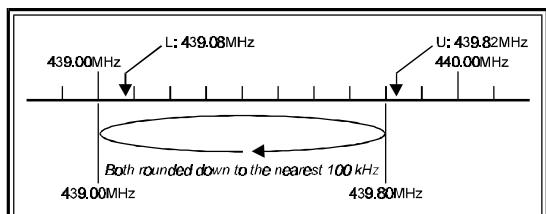
   For example, load 439.000 MHz into "L" and 449.900 MHz into "U" per the procedures described on page 70 for "Main Memory System" programming.

② Adjust the **SQL** (Squelch) control so that the background noise is just silenced.

③ Press the [**6**(**PMS**)] key to enter the Programmable Memory Scan mode.

④ Now press the [**4**(**SCAN**)] key to initiate PMS scanning. The scanner will begin scanning in an upward direction, as though you were performing VFO scanning; however, scanning will be restricted to the frequency range established by the "L" and "U" memories. The transceiver will "beep" when a sub-band limit is reached.

⑤ If the scanner encounters a signal strong enough to open the squelch, the scanner will slow down (SSB/CW modes) or halt and pause on that channel in accordance with the "hold" time set via Menu #26 (FM/AM modes, see page 86).

⑥ To reverse the direction of the scan, turn either the **MAIN VFO** Tuning Dial or the **MEM/VFO CH** knob to the left (while scanning upward) or to the right (while scanning downward).

⑦ To exit the PMS mode, press the [**6**(**PMS**)] key once more.

Notes: *The PMS system rounds off the "L" and "U" memory frequencies to the the next-lowest 100 kHz multiple for the purposes of establishing a band edge. Therefore, if Memory "U" is set to 439.820 MHz, the Upper PMS band limit will be 449.800 MHz. If the "L" memory is set to 439.080, the Lower PMS band limit will be 439.000 MHz.*

For the purposes of PMS scanning, the operating mode and synthesizer steps programmed into the frequency associated with the "L" memory slot will be utilized.

WeatherFax Monitoring

Monitoring of HF WeatherFax broadcasts is easily accomplished using the FT-847.
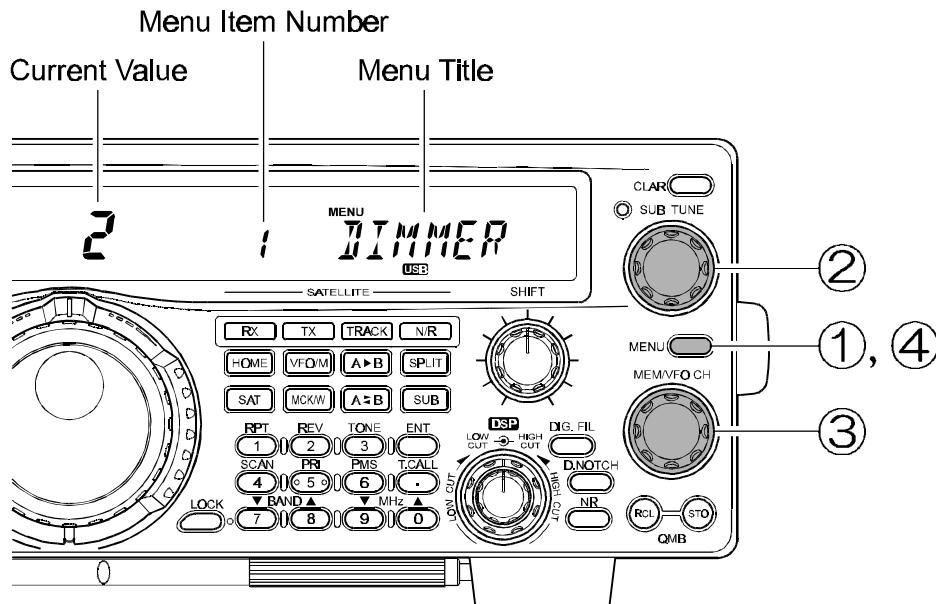
① Before proceeding, be certain that the WeatherFax demodulator is properly connected to the rear panel **DATA IN/OUT** jack (only the "RX" *ring* and *ground* contacts are required; the tip connector is not used).

② Set the operating mode to USB by pushing the [**SSB**] key, as needed.

③ Set the transceiver to the VFO mode (unless a WeatherFax channel has been programmed into a Memory channel). Now, using the keypad (or Main Dial, in the Memory mode), select the operating frequency of the station transmitting the WeatherFax broadcast. Note that, in the USB mode, the frequency you should program onto the display is typically 1.90 kHz *below* the station's "assigned" frequency. Thus, for a WeatherFax station assigned to 8.682.0 MHz, tune to 8.680.1 MHz.

④ When the WeatherFax broadcast begins, no further operator intervention should be needed from the transceiver standpoint. The audio level from the **DATA IN/OUT** jack on the rear of the transceiver is fixed, and cannot be adjusted. Fine adjustments in the gray-scale and the frame alignment are accomplished using the computer and software connected to your WeatherFax demodulator.

Menu System

The FT-847's Menu system allows customization of many aspects of transceiver performance by the owner. The parameters adjusted via the Menu system are performance characteristics which do not require adjustment in "real time" by the operators, but rather are "set-and-forget" parameters which optimize the transceiver's setup configuration for the way *you* like to operate.

ACTIVATION OF MENU SYSTEM AND PARAMETER SETTING

The Menu system is easy to activate and set. Use the following procedure:

① Press the [**MENU**] key momentarily.
② Rotate the **SUB-TUNE** control to select the Menu item # to be adjusted.
③ Rotate the **MEM/VFO CH** control to adjust or select the parameter to be changed on the Menu item selected in step ② above.
④ After completing your selection and adjustment, press the [**MENU**] key once more to exit the Menu mode and return to normal operation.

Note: If you need to adjust more than one Menu item, return to step ② after completing step ③ above, and repeat this process until you have adjusted all desired Menu items. Then go to step ④ to exit the Menu mode.

Menu System Selection Chart

MENU #	MENU ITEM DESCRIPTION	SELECTIONS	DEFAULT VALUE
1	Display Dimmer Level	0 (bright) ~ 7 (dim)	0
2	VFO Dial Step Size	0.1/1/10 Hz	1 Hz
3	VFO/Mem Ch Step Size (SSB/CW)	1/2.5/5 kHz	2.5 kHz
4	VFO/Mem Ch Step Size (AM)	2.5/5/9/10/12.5/25 kHz	5 kHz
5	VFO/Mem Ch Step Size (FM)	5/6.25/10/12.5/15/20/25 kHz	HF: 5 kHz, V/UHF: Depends on transceiver version
6	CW Sidetone/BFO Pitch	400 ~ 1100 Hz	700 Hz
7	CW Keyer Weight (Dash:Dot ratio)	3.0:1 ~ 4.4:1	3.0:1
8	CW Sidetone Level	0 ~ 63	32
9	CW Delay Time (Rx Recovery Time)	10 ~ 300 ms.	100 ms.
10	DSP CW Filter Bandwidth	25/100/200/400 Hz	200 Hz
11	DSP Noise Reduction Level	0 (min.) ~ 15 (max.)	7
12	CTCSS Tone Frequency	39 Tones Available	88.5 Hz
13	DCS Code #	104 DCS Codes	023
14	Auto Rptr Shift (144 MHz)	On/Off	On
15	Auto Rptr Shift (430 MHz)	On/Off	On
16	Rptr Shift Magnitude (29 MHz)	0 ~ 99.99 MHz	0.1 MHz (100 kHz)
17	Rptr Shift Magnitude (50 MHz)	0 ~ 99.99 MHz	1 MHz
18	Rptr Shift Magnitude (144 MHz)	0 ~ 99.99 MHz	600 kHz
19	Rptr Shift Magnitude (430 MHz)	0 ~ 99.99 MHz	5 MHz
20	SSB Monitor Audio Level	0 ~ 63	16
21	"Beep" Tone Pitch	440/880 Hz	880 Hz
22	"Beep" Tone Audio Level	0 ~ 63	32
23	FM Packet Baud Rate	1200/9600 bps	1200 bps
24	Tx Mode Multimeter Readout	PO/ALC	PO
25	FM Mode Mic Gain	Off/0 ~ 63	32
26	Scan-Resume Pause Time	Off/3/5/10 Sec.	5 Sec.
27	[Lock] Switch Mode	Dial-Lock/Freq.-Lock	Dial-Lock
28	50 MHz Antenna Port Selection	Sep/HF	Sep
29	Rx Preamp Selection (144 MHz)	Int/Ant	Int
30	RX Preamp Selection (430 MHz)	Int/Ant	Int
31	[Tuner] Switch Control Function	Tuner/ATAS-100	Tuner
32	Mic. Up/Dwn Sw. Control Function	(AutoScan) On/Off	On
33	CW Filter Activation	On/Off	Off
34	Satellite Mode TX Meter Function	Disc/PO/ALC	PO
35	Satellite Memory Alpha Labels	-	-
36	Satellite Auto-Memory Function	On/Off	Off
37	CAT Data-Transfer Baud Rate	4800/9600/57600 bps	4800 bps
38	Clear All Memories	-	-
39	Microprocessor Full Reset	-	-
40	Alaska Emergency Channel (5167 kHz) (U.S.A. version only)	On/Off	Off
41	One-Way Cross-Band Repeater Mode	On/Off	Off
42	Menu Expansion (To #90 ~ 96)	On/Off	Off
90	TX DCS Code Inversion	Nor/Inv	Nor
91	RX DCS Code Inversion	Nor/Inv	Nor
92	TX Carrier Injection Point (USB)	- 100 ~ +150 Hz	0 Hz
93	Rx Carrier Injection Point (LSB)	- 100 ~ +150 Hz	0 Hz
94	Cloning Data Transfer Baud Rate	9600/57600 bps	9600 bps
95	Clone Mode "SEND"	-	-
96	Clone Mode "RECEIVE"	-	-

Note: Default setting may vary in different countries.

Menu System

MENU SELECTION DETAILS

1 [DIMMER]
Function: Setting of the front panel display's illumination level.
Available Values: 0 (Bright) ~ 7 (Dim)
Default Setting: 0 (Brightest setting)

2 [MIN-FREQ]
Function: Setting of the minimum synthesizer step size for the **MAIN VFO** Tuning Dial.
Available Values: 0.1/1/10 Hz
Default Setting: 1 Hz

3 [SSB-CH]
Function: Setting of the synthesizer steps in the SSB mode when using the **MEM/VFO CH** knob.
Available Values: 1.0/2.5/5.0 kHz
Default Setting: 2.5 kHz
The **MEM/VFO CH** knob is extremely useful for making quick frequency excursions. The 5 kHz setting may be useful for situations when you ask a station to move "5 kHz UP" for a contact, while the 1 kHz setting is useful for precise tuning of SSB signals. This setting may be performed *individually* on HF, 50 MHz, 144 MHz, and 430 MHz.

4 [AM-CH]
Function: Setting of the synthesizer steps in the AM mode when using the **MEM/VFO CH** knob.
Available Values: 2.5/5.0/9.0/10.0/12.5/25.0 kHz
Default Setting: 5.0 kHz
The 9.0 kHz setting may be useful for channel-by-channel tuning of AM broadcast stations. This setting may be performed *individually* on HF, 50 MHz, 144 MHz, and 430 MHz.

5 [FM-CH]
Function: Setting of the synthesizer steps in the FM mode when using the **MEM/VFO CH** knob.
Available Values: 5/6.25/10/12.5/15/20/25 kHz
Default Setting: HF: 5 kHz
VHF/UHF: Depends on transceiver version (U.S.A., European, etc.)
This setting may be performed *individually* on HF, 50 MHz, 144 MHz, and 430 MHz.

6 [CW-PITCH]
Function: Setting of the pitch of the CW sidetone, CW Spot, BFO offset, and IF/DSP CW filter center frequencies.
Available Values: 400 ~ 1100 Hz
Default Setting: 700 Hz
The CW sidetone frequency corresponds to the tone of your signal as heard by another station. Align the other station's tone pitch to be the same as your CW sidetone pitch, using the "SPOT" feature, to "zero-beat" to the other station. The CW Pitch alignment may be performed in 50 Hz increments.
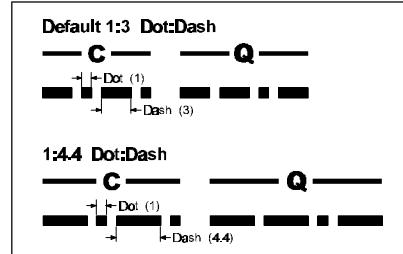
7 [WEIGHT]
Function: Setting of the radio between CW Dashes and Dots for the internal electronic keyer.
Available Values: (Dot:Dash Ratio) 3.0:1 ~ 4.4:1
Default Setting: 3.0:1

8 [SIDETONE]
Function: Setting the volume of the CW Sidetone.
Available Values: 0 ~ 63 (arbitrary scale)
Default Setting: 32
This CW Sidetone Level adjustment is fixed via this Menu item, and does not depend on the setting of the **AF** (GAIN) control.

9 [CW-DELAY]
Function: Setting the receiver recovery time during pseudo-"VOX" CW semi-break-in operation.
Available Values: 10 ~ 300 ms.
Default Setting: 100 ms.
The recovery time may be adjusted in steps of 10 ms. A longer delay may be preferable if you pause frequently while sending.

Menu System

MENU SELECTION DETAILS

10 [CW-BPF]

Function: Setting the bandwidth for the DSP CW audio filter.

Available Values: 25/100/200/400 Hz

Default Setting: 200 Hz

This selection determines the bandwidth of the DSP CW Peaking Filter. The most narrow setting is highly useful for very-weak-signal VHF/UHF CW work, such as EME (see Appendix, page 102). Use 200 Hz or 400 Hz for everyday operation.

11 [DSP-NR]

Function: Setting the degree of DSP Noise Reduction.

Available Values: 0 ~ 15 (arbitrary scale)

Default Setting: 7

A higher setting provides more noise reduction, with a slight loss of fidelity on the incoming signal.

12 [TONE-FRQ]

Function: Setting the CTCSS Tone Frequency.

Available Values: 39 standard CTCSS Tones (see chart below)

Default Setting: 88.5 Hz

The available tones are shown in the chart below.

CTCSS TONE FREQUENCY (Hz)							
67.0	69.3	71.9	74.4	77.0	79.7	82.5	85.4
88.5	91.5	94.8	97.4	100.0	103.5	107.2	110.9
114.8	118.8	123.0	127.3	131.8	136.5	141.3	146.2
151.4	156.7	162.2	167.9	173.8	179.9	186.2	192.8
203.5	210.7	218.1	225.7	233.6	241.8	250.3	-

13 [DCS-CODE]

Function: Setting the DCS Code.

Available Values: 104 standard DCS Codes (see chart below)

Default Setting: DCS Code #023

The available DCS codes are shown in the chart below.

DCS CODE												
023	025	026	031	032	036	043	047	051	053	054	065	071
072	073	074	114	115	116	122	125	131	132	134	143	145
152	155	156	162	165	172	174	205	212	223	225	226	243
244	245	246	251	252	255	261	263	265	266	271	274	306
311	315	325	331	332	343	346	351	356	364	365	371	411
412	413	423	431	432	445	446	452	454	455	462	464	465
466	503	506	516	523	526	532	546	565	606	612	624	627
631	632	654	662	664	703	712	723	731	732	734	743	754

14 [VHF-ARS]

Function: Activate/deactivate the **A**utomatic **R**epeater **S**hift when operating on the 144 MHz band.

Available Values: ON/OFF

Default Setting: ON

The ARS feature is operational when using the **MAIN VFO** Tuning Dial, **MEM/VFO CH** knob, or the scanning switches on the microphone; it does not function when tuning via the **SUB-TUNE** knob.

15 [UHF-ARS]

Function: Activate/deactivate the **A**utomatic **R**epeater **S**hift when operating on the 430 MHz band.

Available Values: ON/OFF

Default Setting: ON

The ARS feature is operational when using the **MAIN VFO** Tuning Dial, **MEM/VFO CH** knob, or the scanning switches on the microphone; it does not function when tuning via the **SUB-TUNE** knob.

16 [28M-RPT]

Function: Set the magnitude of the Repeater Shift to be utilized when operating on the 28 MHz band.

Available Values: 0.00 ~ 99.99 MHz

Default Setting: 0.10 MHz (100 kHz)

Any attempt to set a shift greater than 1.7 MHz will result in an "*ERROR*" message when you transmit, as the resulting transmit frequency would be outside the amateur band.

17 [50M-RPT]

Function: Set the magnitude of the Repeater Shift to be utilized when operating on the 50 MHz band.

Available Values: 0.00 ~ 99.99 MHz

Default Setting: 1.00 MHz

Any attempt to set a shift greater than 4 MHz will result in an "*ERROR*" message when you transmit, as the resulting transmit frequency would be outside the amateur band.

Menu System

18 [VHF-RPT]

Function: Set the magnitude of the Repeater Shift to be utilized when operating on the 144 MHz band.
Available Values: 0.00 ~ 99.99 MHz
Default Setting: 0.60 MHz (600 kHz)
Any attempt to set a shift greater than 4 MHz will result in an "*ERROR*" message when you transmit, as the resulting transmit frequency would be outside the amateur band.

19 [UHF-RPT]

Function: Set the magnitude of the Repeater Shift to be utilized when operating on the 430 MHz band.
Available Values: 0.00 ~ 99.99 MHz
Default Setting: 5.00 MHz
Any attempt to set a shift greater than 20 MHz will result in an "*ERROR*" message when you transmit, as the resulting transmit frequency would be outside the amateur band.

20 [MONI-VOL]

Function: Set the audio level for the SSB Monitor.
Available Values: 0 ~ 63 (arbitrary scale)
Default Setting: 16
The Monitor Level setting is established via this Menu item, and does not depend on the setting of the **AF** (GAIN) control.

21 [BEEP-FRQ]

Function: Set the frequency of the "Beep" tone which sounds when a front panel key is pressed.
Available Values: 440/880 Hz
Default Setting: 880 Hz

22 [BEEP-VOL]

Function: Set the audio level of the "Beep" tone which sounds when a front panel key is pressed.
Available Values: 0 ~ 63 (arbitrary scale)
Default Setting: 32
The Beep Level setting is fixed via this Menu item, and does not depend on the setting of the **AF** (GAIN) control.

23 [PKT RATE]

Function: Set the transceiver's circuitry for the Packet baud rate to be used.
Available Values: 1200/9600 bps
Default Setting: 1200 bps
The rear-panel **PKT** jack's connections are optimized for the different bandwidth, level, and impedance values typically utilized on 1200 bps and 9600 bps. This Menu selection instructs the microprocessor as to which connections to utilize.

24 [TX-MTR]

Function: Set the function for the transmit-mode meter indication.
Available Values: Po: Indication of **P**ower **O**utput
ALC: Indication of **ALC** voltage
Default Setting: Po
The ALC meter indication includes the transceiver's ALC plus any external ALC voltage which may be fed to the FT-847 from an external linear amplifier.

25 [FM P-SET]

Function: Set the Mic Gain level for the FM mode.
Available Values: OFF or 0 ~ 63 (arbitrary scale)
Default Setting: 32
The OFF setting selects control of the FM Microphone Gain via the front-panel **MIC** (GAIN) control. Manual adjustment is also possible via the 0 ~ 63 arbitrary scale; use a Deviation Meter to establish the proper level.

26 [RESUME]

Function: Set the Scan-Resume mode and time delay.
Available Values: OFF/3/5/10 seconds
Default Setting: 5 seconds
In the OFF position, scanning will resume after the other station stops transmitting (carrier drops). In the other settings, the scanner will resume scanning after a fixed interval set through this Menu item, whether or not the other station is still transmitting.

Menu System

MENU SELECTION DETAILS

27 [LOCK]

Function: Set the [**LOCK**] key's lockdown coverage on the front panel.

Available Values: DIAL: The **MAIN VFO** Tuning Dial, **SUB-TUNE** knob and the **SHUTTLE JOG™** ring are locked out

FRE: The controls shown below are locked out.

Default Setting: DIAL

28 [50M-ANT]

Function: Set the routing of Tx/Rx signals when operating on the 50 MHz band.

Available Values: SEP: 50 MHz RF is routed to the **50 MHz** Antenna port

HF: 50 MHz RF is routed to the **HF** Antenna port

Default Setting: SEP

When using the optional **ATAS-100** Antenna, the optional **FC-20** Automatic Antenna Tuner, or an antenna providing both HF and 50 MHz coverage, the "HF" selection should be utilized. Otherwise, for completely separate 50 MHz antenna use, the (default) "SEP" selection should be used.

29 [VHF-AMP]

Function: Select the preamplifier to be used when operating on 144 MHz.

Available Values: INT: The internal RF preamplifier will be used, with ON/OFF control provided via the front panel's [**RF AMP**] switch.

ANT: The internal RF preamplifier is disabled, and 12 VDC at 300 mA (maximum) will be sent via the **144 MHz** Antenna port for powering an external preamplifier.

Default Setting: INT

If you desire to use both the internal preamplifier and a tower-mounted preamplifier, select the "INT" setting, then provide power to your tower-mounted preamplifier via a separate power cable.

30 [UHF-AMP]
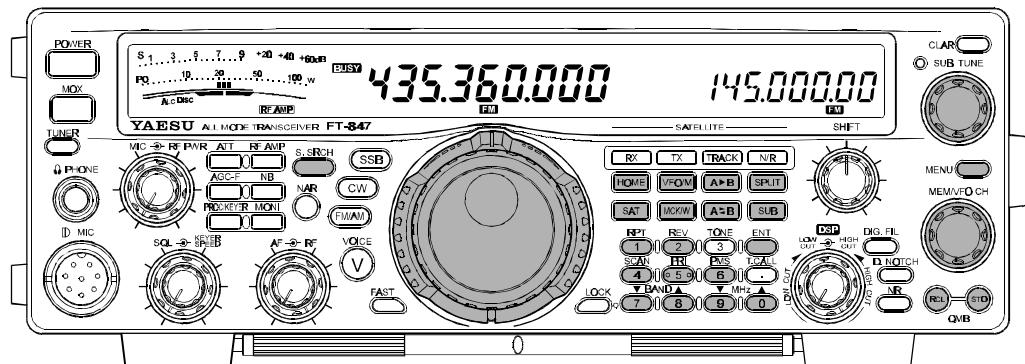
Function: Select the preamplifier to be used when operating on 430 MHz.

Available Values: INT: The internal RF preamplifier will be used, with ON/OFF control provided via the front panel's [**RF AMP**] switch.

ANT: The internal RF preamplifier is disabled, and 12 VDC at 300 mA (maximum) will be sent via the **430 MHz** Antenna port for powering an external preamplifier.

Default Setting: INT

If you desire to use both the internal preamplifier and a tower-mounted preamplifier, select the "INT" setting, then provide power to your tower-mounted preamplifier via a separate power cable.

Menu System

## 31 [TUNER]

Function: Select the device (**FC-20** or **ATAS-100**) to be controlled via the front panel's [**TUNER**] switch.

Available Values: TUNER: The [**TUNER**] key will activate the optional **FC-20**.

ATAS-100: The [**TUNER**] key will activate the optional **ATAS-100** Active-Tuning Antenna System.

Default Setting: TUNER

32 [MIC SCAN]

Function: Activate/deactivate the AutoScan function of the microphone.

Available Values: ON: Pressing and holding in the microphone's [**UP**] or [**DWN**] key for ½ second will cause automatic scanning to begin.

OFF: The scanner will scan only while [**UP**] or [**DWN**] key is held down (the scanner will halt if you release the key).

Default Setting: ON

33 [CW-N FIL]

Function: Enable the CW signal path via the optional **YF-115C** slot.

Available Values: ON/OFF

Default Setting: OFF

When the optional **YF-115C** CW Collins® Mechanical Filter is installed, the microprocessor must be instructed to route the signal path via the **YF-115C**, instead of via the SSB filter. Use this Menu selection to do so. If the **YF-115C** is *not* installed, but Menu #33 is set to On, no signals will be heard when the [**NAR**] key is pressed in the CW mode! Conversely, if the **YF-115C** is installed, but Menu #33 is set to Off, the [**NAR**] key will not respond when you push it.

34 [SAT-MTR]

Function: Set mode of the meter's lower scale (below S-meter) during Satellite operation.

Available Values: DISC: Display of **Disc**riminator centering (of incoming signal) for frequency adjustment purposes.

PO: Display of transmitter **P**ower **O**utput.

ALC: Display of transmitter ALC voltage.

Default Setting: PO

The DISC setting is helpful in making frequency adjustments (due to Doppler Shift, etc.) when the downlink signal from a satellite utilizes the FM mode.

35 [SAT TAG]

Function: Store Alpha-Numeric "Tags" for the Satellite Memories.

Up to 8 characters may be stored, for the purpose of labeling the Satellite Memories for easier transponder-mode identification. The storage procedure is shown next page.

36 [AUTO-MEM]

Function: Activate/deactivate the Satellite Automatic Memory feature.

Available Values: ON/OFF

Default Setting: OFF

This selection ensures that Satellite-mode frequency data is preserved when using that mode for the first time (before "memorizing" any data), or immediately following a microprocessor reset procedure.

37 [CAT RATE]

Function: Set the data transfer rate during **CAT** (Computer Aided Transceiver) control operation.

Available Values: 4800/9600/57600 bps

Default Setting: 4800 bps

38 [MEM CLR]

Function: Clear all memories.

While in this Menu selection, pressing the [**MCK/W**] key causes all Memories to be cleared, but any custom Menu settings you have programmed will not be affected.

MENU SELECTION DETAILS

39 [ALL INIT]
Function: Reset microprocessor, restoring all factory defaults.

While in this Menu selection, pressing the [**MCK/W**] key causes all Memories and Menu selections to be returned to their default factory settings.

40 [5167KHZ] (U.S.A. version only)
Function: Enable Tx/Rx operation on the Alaska Emergency Channel, 5167.5 kHz.

Available Values: ON/OFF
Default Setting: OFF

When this Menu selection is set to ON, the spot frequency of 5167.5 kHz will be enabled. To get to this frequency, use the [**7(▼) BAND**] or [**8(▲) BAND**] keys to navigate; the Alaska Emergency Channel will be found between the 3.5 MHz and 7 MHz bands as you press the above-mentioned [**BAND**] keys. See page 59 for details.

Note: Use of this frequency is restricted to amateurs operating in (or within 92.6 km of) the U.S. State of Alaska, and it is to be used for emergency communications only (involving the immediate protection of life or property).

41 [X RPT]
Function: Activate/Deactivate Cross-Band Repeat mode.

Available Values: ON/OFF
Default Setting: OFF

Be certain that the desired transmit and receive frequencies have been set, and that the Squelch is closed ("BUSY" should not be visible on the LCD), before initiating the Cross-Band Repeat mode.

90 [DCS-DEC]
Function: Select "Normal" or "Inverted" DCS coding on Receive (Decoder).

Available Values: NOR/IN
Default Setting: NOR

Keep this selection set to "NOR" unless you are certain that the other station(s) will be using "Inverted" DCS coding.
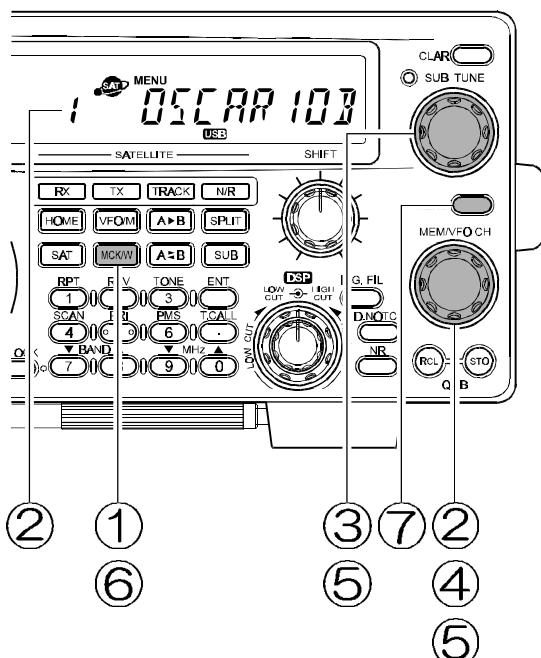
91 [DCS-ENC]
Function: Select "Normal" or "Inverted" DCS coding on Transmit (Encoder).

Available Values: NOR/IN
Default Setting: NOR

Keep this selection set to "NOR" unless you are certain that the other station(s) will be using "Inverted" DCS coding.

Satellite Memory Alpha-Numeric Tag Programming

① After selecting Menu #35, press the [**MCK-W**] key momentarily.
② Rotate the **MEM/VFO CH** knob to select the Satellite Memory to which an Alpha-Numeric Tag is to be appended.
③ Rotate the **SUB-TUNE** knob to select the first character of the Tag.
④ Rotate the **MEM/VFO CH** knob clockwise one click to select the next letter/number position.
⑤ Repeat steps ② and ③ as needed to fill out the Alpha-Numeric Tag contents. In the above example, the Tag shows "OSCAR10B" for "Oscar 10, Mode B."
⑥ Press the [**MCK-W**] key momentarily when entry of the Alpha Tag is completed.
⑦ Press the [**MENU**] key to exit the Menu mode.

Menu System

MENU SELECTION DETAILS

92 [USB-CAR]

Function: Adjust Tx USB carrier injection point.

Available Values: −10 ~ 15 (x 10) Hz
(i.e. −100 ~ 150 Hz)

Default Setting: 0 Hz

Analogous to "IF Shift" on receive, the TX Carrier Point adjustment allows you to shift the IF passband so as to roll off excessive bass or treble frequencies, depending on your voice pattern, microphone frequency response, etc. The TX Carrier Point may be adjusted in steps of 10 Hz.

93 [*LSB-CAR*]

Function: Adjust Tx LSB carrier injection point.

Available Values: −10 ~ 15 (x 10) Hz
(i.e. −100 ~ 150 Hz)

Default Setting: 0 Hz

Analogous to "IF Shift" on receive, the TX Carrier Point adjustment allows you to shift the IF passband so as to roll off excessive bass or treble frequencies, depending on your voice pattern, microphone frequency response, etc. The TX Carrier Point may be adjusted in steps of 10 Hz.

94 [CLN RATE]

Function: Set the data transfer rate to be used during cloning.

Available Values: 9600/57600 bps

Default Setting: 9600 bps

Both radios used in the cloning process must be set to the same baud rate.

95 [SEND CLN]

Function: Transmit cloning data to another FT-847.

When this Menu selection is active, pressing the [**MCK/W**] key causes cloning data to be sent to another FT-847.

96 [RCV CLN]

Function: Receive cloning data from another FT-847.

When this Menu selection is active, pressing the [**MCK/W**] key places the FT-847 in the "Clone Data Receive" mode, ready to accept the transfer of cloning data from another FT-847.

CAT (COMPUTER AIDED TRANSCEIVER) SYSTEM PROGRAMMING

The FT-847's **CAT** System allows the transceiver to be controlled by a personal computer. This allows multiple control operations to be fully automated as a single mouse click, or it allows a third-party software package (such as contest logging software) to communicate with the FT-847 without (redundant) operator intervention.

The FT-847 has a built-in level converter, allowing direct connection from the rear panel **CAT** jack to the serial port of your computer, without the need for an external RS-232C level converter box.

You will need a serial cable for connection to the (RS-232C) COM port of your computer. Purchase or construct a "null modem" type serial cable (not a "straight" type), ensuring it has the correct gender and number of pins for connection to your system. Note that this cable is different from the type utilized on earlier Yaesu **CAT** System transceivers.
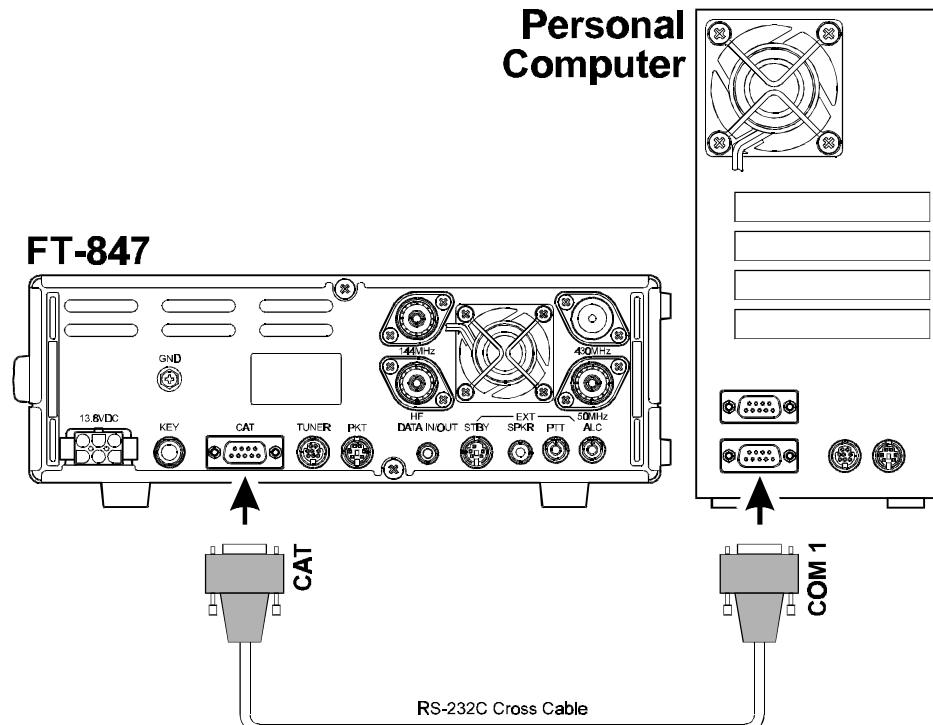
Yaesu Musen does not produce **CAT** System operating software, due to the wide variety of personal computers, operating systems, and applications in use today. However, the FT-847 (and other Yaesu products) are widely supported by third-party software packages, and we recommend that you contact your dealer for advice, or check advertisements in amateur radio journals. Most software vendors also have Home Pages on the World Wide Web which contain a wealth of information on the features and radio support for their software packages.

The information presented in this section will allow the programmer to understand the command structure and opcodes used in the FT-847's **CAT** System.

Important Notice!

It is not possible to engage the **CAT** System when the **FC-20** Automatic Antenna Tuner is in use.
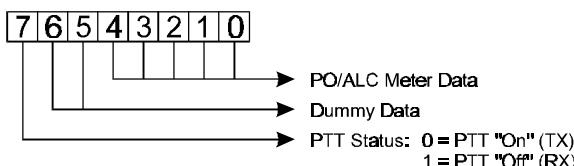
Please disconnect the **FC-20** Control Cable from the **TUNER** jack on the rear panel of the FT-847 prior to commencing **CAT** System control of the FT-847.


CAT (COMPUTER AIDED TRANSCEIVER) SYSTEM PROGRAMMING
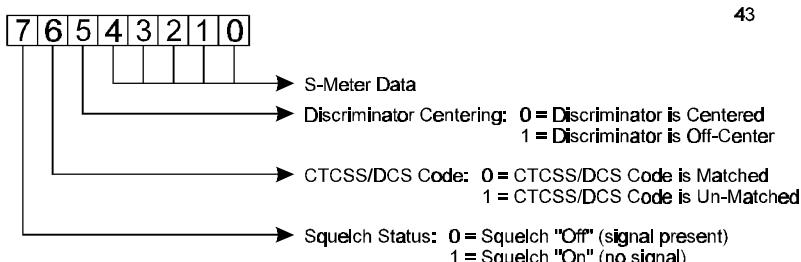
Opcode Command Chart

| Comand Titel	Parameters				Opcode	Comments
CAT On/Off					P1	P1=00: CAT On P1=80: CAT Off
PTT On/Off					P1	P1=08: PTT On (TX) P1=88: PTT Off (RX)
Satellite On/Off					P1	P1=4E: Satellite Mode On P1=8E: Satellite Mode Off
Set Frequency					P1	Frequency Digits: 43, 21, 00, 00 = 432.1000 MHz P1=01: Set to MAIN VFO P1=11: Set to SAT RX VFO P1=21: Set to SAT TX VFO
Operating Mode	D1				P1	D1=00: LSB, D1=01: USB, D1=02: CW, D1=03: CW-R, D1=04: AM, D1=08: FM, D1=82: CW(N), D1=83: CW-R(N), D1=84: AM(N), D1=88: FM(N) P1=07: Set to MAIN VFO P1=17: Set to SAT RX VFO P1=27: Set to SAT TX VFO
CTCSS/DCS Mode	D1				P1	D1=0A: DCS On D1=2A: CTCSS ENC/DEC On D1=4A: CTCSS ENC On D1=8A: CTCSS/DCS Off P1=0A: Set to MAIN VFO P1=1A: Set to SAT RX VFO P1=2A: Set to SAT TX VFO
CTCSS Frequency	D1				P1	D1=00h 3Fh (Tone Frequencies per chart on page ??) P1=0B: Set to MAIN VFO P1=1B: Set to SAT RX VFO P1=2B: Set to SAT TX VFO
DCS Code					P1	, from the DCS Code # (i.e. 07, 54=DCS Code 754) P1=0C: Set to MAIN VFO P1=1C: Set to SAT RX VFO P1=2C: Set to SAT TX VFO
Repeater Shift	D1				09	D1=09: "Minus" Shift D1=49: "Plus" Shift D1=89: Simplex
Repeater Offset					F9	set the Repeater Shift: 00, 50, 00, 00 = 5MHz Shift
Receiver Status					E7	S-Meter, Squelch, etc. (Note 1)
Transmit Status					F7	PO Meter, PTT, etc. (Note 2)
Frequency & Mode Status					P1	P1=03: Read MAIN VFO Frequency & Mode Status P1=13: Read SAT RX VFO Frequency & Mode Status P1=23: Read SAT TX VFO Frequency & Mode Status (Note 3)
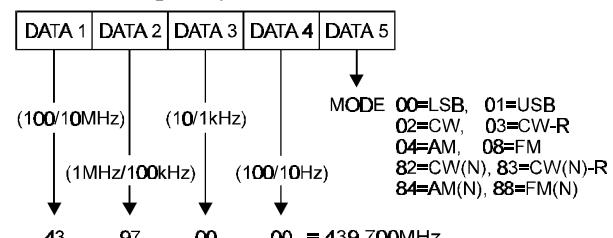
Note 1: Receiver Status

Note 2: Transmit Status

Note 3: Frequency & Mode Status

CAT (Computer Aided Transceiver) System Programming

CAT Data Protocol

Serial data is passed via the **CAT** jack on the rear panel at a transfer rate set via Menu #37 (4800, 9600, or 57600 bps). While data is being transferred, the **CAT** icon on the LCD will appear momentarily, disappearing when the data flow is terminated.

All commands sent from the computer to the transceiver consist of five-byte blocks, with up to 200 ms between each byte. The last byte in each block is the *instruction opcode*, while the first four bytes of each block are arguments (either parameters for that instruction, or dummy values required to pad the block out to five bytes). Each byte consists of 1 start bit, 8 data bits, no parity bit, and two stop bits.

Start Bit	0	1	2	3	4	5	6	7	Stop Bit	Stop Bit

CAT Data Byte Format

Command Data	L.S.D. Parameter 1	Parameter 2	Parameter 3	Parameter 4	M.S.D. Command

CAT 5-Byte Command Structure

There are 25 instruction opcodes for the FT-847, listed in the chart on previous page. Many of these opcodes are On/Off toggle commands for the same action (e.g. "PTT On" and "PTT Off").Most of these commands require some parameter or parameters to be set. Irrespective of the the number of parameters present, every Command Block sent *must* consist of five bytes.

Accordingly, any **CAT** control program must construct the five-byte block by selecting the appropriate instruction opcode, organizing the parameters as needed, and providing unused "dummy" argument bytes to pad the block to its required five-byte length (the dummy bytes can contain any value). The resulting five bytes are then sent, opcode last, from the computer to the FT-847 CPU via the computer's serial port and the transceiver's **CAT** jack.

All **CAT** data values are hexadecimal.

Note that, unlike most other Yaesu transceivers, the FT-847 serial data cable is a "null modem" ("crossed") type, not a "straight" serial data cable.

Constructing and Sending CAT Commands

Example #1:

Set the Main VFO frequency to 439.70 MHz

❏ Per the **CAT** command table, the opcode for "Set Frequency to Main Band" is **01** (set by the "**P1**" command byte). Placing the opcode into the 5th data bit position, we then enter the frequency into the first four data bit positions:

DATA 1	DATA 2	DATA 3	DATA 4	DATA 5
43	97	00	00	01
Parameter				Opcode

Send these five bytes to the transceiver, in the order shown above.

Example #2:

Turn the "Satellite" Mode "On"

❏ Per the CAT command table, the opcode for "Set Satellite Mode On" is **4E** (hex). Placing the opcode into the 5th data bit position, we then enter dummy values into all other parameter locations:

DATA 1	DATA 2	DATA 3	DATA 4	DATA 5
00	00	00	00	4E
Parameter				Opcode

Send these five bytes to the transceiver, in the order shown above.

CTCSS Tone Data

| Freq. (Hz)	D1	Freq. (Hz)	D1	Freq. (Hz)	D1	Freq. (Hz)	D1
67.0	3F	94.8	1D	131.8	09	186.2	04
69.3	39	97.4	3A	136.5	18	192.8	13
71.9	1F	100.0	0D	141.3	08	203.5	03
74.4	3E	103.5	1C	146.2	17	210.7	12
77.0	0F	107.2	0C	151.4	07	218.1	02
79.7	3D	110.9	1B	156.7	16	225.7	11
82.5	1E	114.8	0B	162.2	06	233.6	01
85.4	3C	118.8	1A	167.9	15	241.8	10
88.5	0E	123.0	0A	173.8	05	250.3	00
91.5	3B	127.3	19	179.9	14		

Transceiver-to-Transceiver Cloning
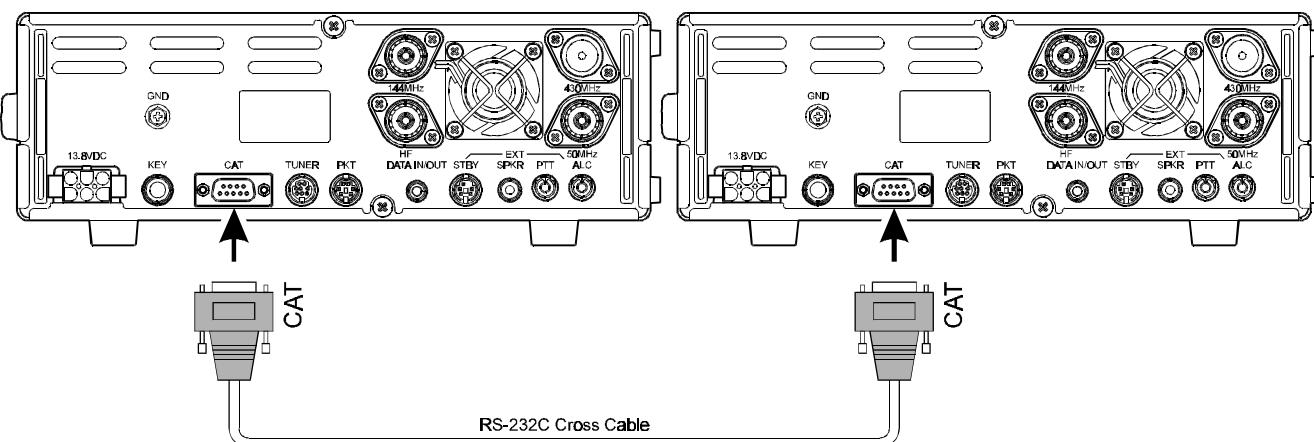
The Menu system provides for cloning of all frequency and memory information from one FT-847 to another. The data format is only compatible with other FT-847 transceivers.

Cloning of frequency and memory data may be helpful when outfitting a group of transceivers for a DX-pedition or a club activity, so as to ensure that all transceivers are configured identically. The Cloning procedure helps minimize the time required to do this.

To Clone frequency and memory data from one FT-847 to another, use the following procedure:

① Connect a "null modem" ("crossed") serial data cable between the **CAT** jacks of the transceivers between which data is to be transferred.

② Use Menu #94 ("**CLN RATE**") to set an *identical* data speed for both transceivers (either 9600 or 57600 bps).

③ On the transceiver which will *receive* the Cloning data, activate Menu #97 ("**RCV CLN**") by pressing the [**MCK/W**] key momentarily after selecting Menu #97.

④ On the transceiver which will *transmit* the Cloning data, activate data transfer by selecting Menu #96 ("**SEND CLN**"), then pressing the [**MCK/W**] key momentarily.

⑤ After data transfer is complete, the displays of both transceivers will appear the same. You may now disconnect the serial data cable and resume normal operation.

⑥ If the diagnostic messages "**RCV ERR**" (receive error) or "**SEND ERR**" (sending error) appear, check to be certain that the serial data cable is of the correct type (see step ① above), check the Cloning Speed setting of Menu #94 (per step ② above), and try again.

RS-232C Cross Cable

Installation of Optional Accessories

INSTALLATION OF OPTIONAL FILTERS YF-112S-02/YF-115C

① Remove the carrying handle and bottom case of the transceiver (see Figure 1). Be sure to remove the screw affixed to the rear panel.

② Refer to Figure 2, and locate the mounting positions for the CW (**YF-115C**) and/or SSB (**YF-112S-02**) filters on the MAIN Unit.

③ Push the optional filter board(s) onto the pins corresponding to the assigned mounting location on the radio. Gently press the board(s) down until the pins are firmly seated in the connectors.

④ Replace the bottom case of the transceiver.

⑤ Turn the transceiver on, and enter the Menu mode. Per the details on page 88, change the setting of Menu #33 to "ON" if installing the **YF-115C** CW filter.
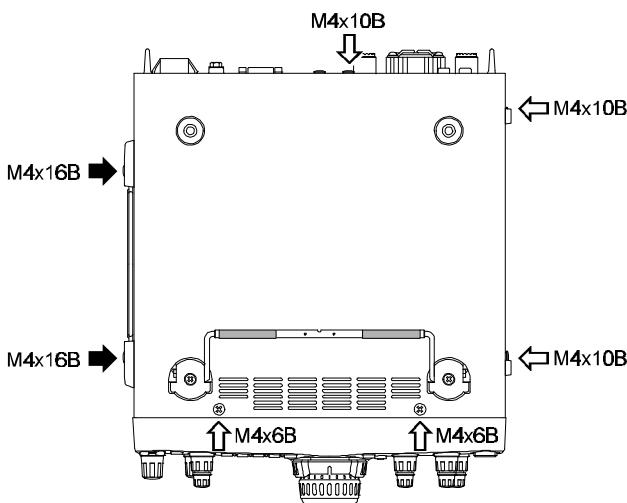

Figure 1
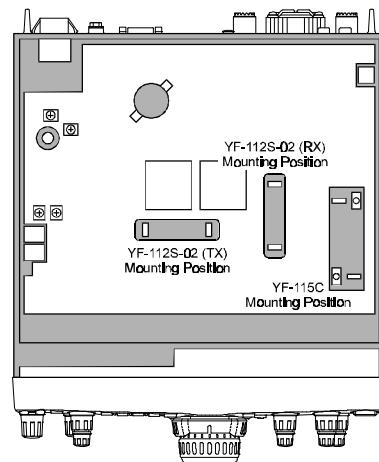
Figure 2

Notes Regarding SSB Filters

Because the FT-847is required to transmit and receive simultaneously during Satellite operation, two optional filter slots are provided for the installation of optional Collins® Mechanical Filters for SSB.

Whether or not you are operating in the Satellite (full duplex) mode, the "RX" filter is always used on Receive, and the "TX" filter is always used on Transmit. As shipped from the factory, compact Ceramic filters are installed in both SSB filter locations.

The information below will describe the benefits gained by optional filter installation in each location:

Installation in "TX"Location
Utilization of a Collins® Mechanical Filter on the Transmit side provides a very flat, natural-sounding frequency response which has negligible ripple. The Collins® Filter will yield very faithful reproduction of your voice's tonal response. For sending of PSK and other data, the low group delay characteristics provide very high through-put.

Installation in "RX" Location
Compared to the stock Ceramic Filter, the Collins® Mechanical Filter provides deeper suppression of annoying interference to the side of your current frequency, *although the bandwidths of the two filters (at -6 dB) are approximately the same.*

Installation of Optional Accessories

INSTALLATION OF OPTIONAL VOICE SYNTHESIZER UNIT FVS-1A

① Remove the two screws in the carrying handle and the six screws affixing the covers (see Figure 3).

② Refer to Figure 4, remove the two front panel mounting screws and loosen the two front panel mounting screws, then fold the front panel down.

③ Inside the front panel, locate the unconnected 10-pin jack, and connect the **FVS-1A** here (see Figure 5).

④ Set the **JA**panese/**EN**glish switch on the **FVS-1A** to the desired position, and then affix the **FVS-1A** board into place using the double-sided adhesive tape on the flat surface of the **FVS-1A** IC.

⑤ Fold the front panel back into place, and replace the covers and carrying handle.
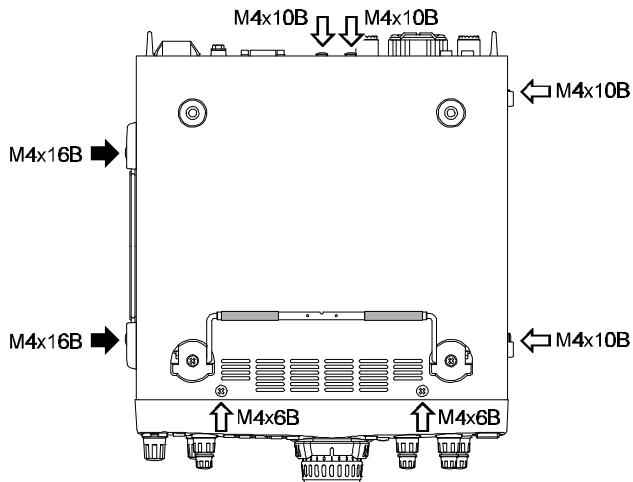
Figure 3
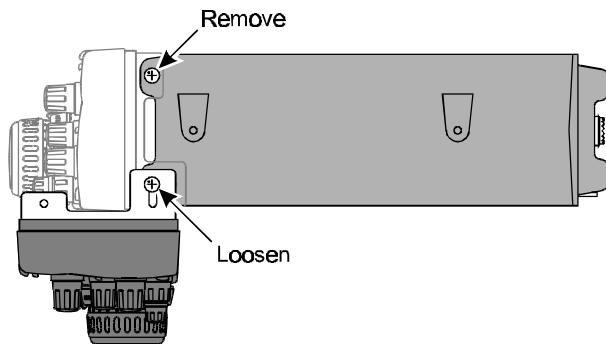
Figure 4
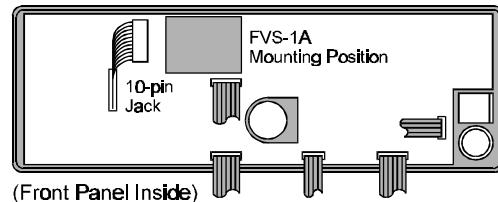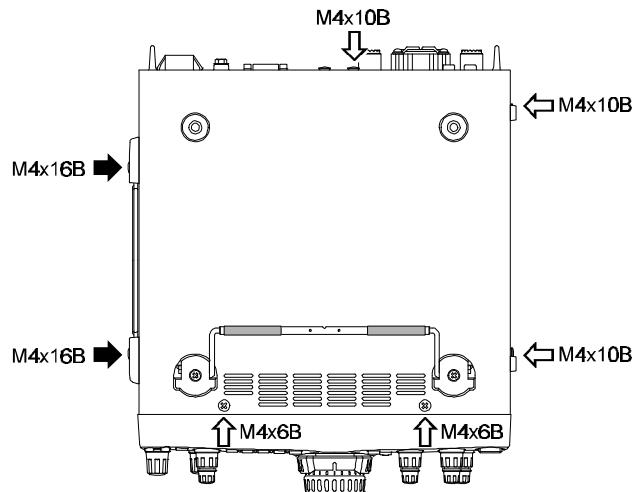
Figure 5

CPU Resetting & Memory Backup

The FT-847's memory data is maintained, even when DC power is turned off, via a lithium backup battery with an estimated lifetime of approximately five years. No data essential to the fundamental operation of the radio is stored in "volatile" memory, so when the battery's voltage ultimately is exhausted the transceiver will not be disabled; you will just observe that your memories have disappeared.

In some cases of erratic operation, it may be advisable to reset the microprocessor to its factory default condition, so as to determine whether or not a part failure has caused improper action, as opposed to some operational error.

This section describes the procedures to be used for these situations.
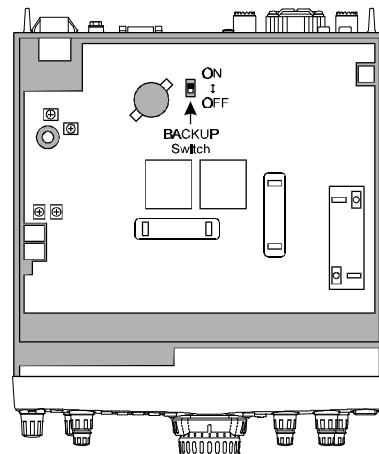
MICROPROCESSOR RESET PROCEDURES

If you wish to reset the FT-847's microprocessor to its original factory default settings (all memories and customized Menu settings will be lost), use the following procedure:

① Press the [**MENU**] button to activate the Menu mode of operation.
② Rotate the **SUB-TUNE** knob to select Menu #39 ("**ALL INIT**").
③ Press the [**MCK/W**] key.
④ Press the [**MENU**] key to exit the Menu mode.

If you only want to clear the Memory registers, use the above procedure, but select Menu #38 ("**MEM CLR**") in step ② above.

In Case of Trouble . . .

The suggestions below may help you recover from commonly-encountered operational difficulties.

TRANSCEIVER WILL NOT TURN ON:
❍ Be sure your power supply is turned on.
❍ If power supply does not turn on, check power supply fuse(s).
❍ Check connections from DC power supply to ensure both ends of cable are securely connected.
❍ Check condition of fuses in DC cable.
❍ Check for poor mechanical connection at fuse holders in DC cable.

NO AUDIO OUTPUT IS BEING HEARD:
❍ Check position of **AF** (GAIN) control to be sure it is not fully counter-clockwise.
❍ Rotate **SQL** (SQUELCH) control fully counter-clockwise to ensure that audio is not being muted by normal SQUELCH operation.
❍ If on FM mode, check to see if the "**DEC**" or "**DCS**" icons are visible on the LCD, indicating that the CTCSS Decoder or DCS are On (thus muting audio). Press [**3** (**TONE**)] repeatedly until these icons disappear.
❍ Check to see if an improper cable is connected to the **PHONE** or **EXT SP** jack.
❍ Check to see if the [**MOX**], microphone [**PTT**], or desk microphone [**TX/STBY**] switch is closed (the "**TX**" icon will be visible on the LCD if this is the case).

SIGNALS APPEAR ON S-METER, BUT POOR/LOW AUDIO:
❍ Check to see if the DSP **LOW CUT** or **HIGH CUT** controls are improperly positioned. Switch DSP Off to confirm.
❍ Check IF Shift control to be sure it is not fully clockwise or counter-clockwise.
❍ Check operating mode, especially during Satellite operation. SSB, CW, and/or FM modes can easily become reversed.
❍ IF FM signals sound distorted, be certain you are not accidentally receiving in the AM mode.
❍ If **YF-115C** CW filter is installed, but bandwidth is too wide, check Menu #33 to ensure that the CW filter's Menu setting is "On."
❍ If operating on CW, be certain that the DSP's Notch filter is Off ([**D. NOTCH**] key).

[NAR] KEY DOES NOT RESPOND (CW MODE):
❍ Set Menu #33 to the "On" position.

CANNOT TRANSMIT:
❍ Check to ensure that coaxial cable is connected to correct **ANTENNA** jack.
❍ On 50 MHz, ensure that coaxial cable is connected to the same jack as set by Menu #28 ("**SEP**" = "50 MHz ANT" jack; "**HF**" = "HF ANT" jack).
❍ Check operating mode, especially during "Split" or Satellite operation. Be sure that the "TX" VFO's operating mode is properly set.
❍ Check to ensure that the operating frequency is within an amateur band (if you see an "*ERROR*" message).
❍ Check to ensure that any FM repeater shift is not causing transceiver to attempt to transmit outside an amateur band (if you see an "*ERROR*" message).

GENERAL TRANSMITTER DIFFICULTIES:
SSB/AM Modes
❍ Check setting of **MIC** (GAIN) control, to be sure it is not fully counter-clockwise.
❍ Check position of **RF PWR** control, to be sure it is not fully counter-clockwise.
❍ Check operation of **MOX** or **PTT** switch to ensure that the "**TX**" icon is appearing. See previous suggestions, if not.
❍ Check settings of Menu #92 (USB) and/or Menu #93 (LSB) if you receive reports of excessively high or low tonal pitch on your voice. Reset to "0" to test.
❍ If using an external computer-generated "Voice Keyer" device, ensure that both "TX Audio" *and* "PTT" cables are connected (because the FT-847 does not have "VOX" circuitry).
❍ If using **MD-100A8X** or **MD-1C8** Desk Microphone, ensure that the *coiled* cord is connected to the transceiver's front panel **MIC** jack, and that the (short) *straight* cable is connected to the microphone tube.

CW Mode
❍ Check setting of **RF PWR** control, to ensure that it is not fully counter-clockwise.
❍ If using external electronic keyer, ensure that keying cable is connected to "Positive" ("+") jack on external device (not "Negative" or "Grid Block").
❍ If continuous "Key-down" tone is present, check to ensure that KEY plug in use is 3-conductor ("Stereo") type, not 2-conductor.
❍ If using computer-driven keying interface, ensure that proper computer port (COM or LPT) and any required "TSR" programs are enabled.
❍ If using a computer-driven keying interface, ensure that keying cable is connected to correct port (COM or LPT).

❍ If using external keyer/computer-driven keying interface and odd characters are being sent, check to ensure that FT-847's *internal* KEYER is not On.

❍ If receiver recovery time is too fast or too slow, adjust setting of Menu #9.

FM Mode

❍ Check setting of FM MIC GAIN per Menu #25.

❍ Check operation of **MOX** or **PTT** switch to ensure that the "TX" icon is appearing. See previous suggestions, if not.

❍ Check setting of **RF PWR** control to ensure that it is not fully counter-clockwise.

❍ If repeater cannot be accessed, ensure that any required CTCSS Encoder Tone or DCS code is properly set. Contact repeater administrator or repeater information directory if tone data is not known.

❍ If you are reported to be slightly "off frequency," check to ensure that frequency is properly set (change synthesizer channel step per page 34 if proper frequency cannot be set using **MEM/VFO CH** knob).

❍ If no repeater shift takes place, check settings of Menu #16 (29 MHz), #17 (50 MHz), #18 (144 MHz), or #19 (430 MHz).

❍ If no Automatic Repeater Shift, check settings of Menu #14 (144 MHz) or #15 (430 MHz).

DATA Modes

❍ Check setting of **RF PWR** control to ensure that it is not fully counter-clockwise.

❍ On RTTY, ensure that you do *not* have TNC's "FSK" keying output (closure to ground to shift) connected to FT-847's (AFSK) "DATA IN" input pin (Tip of **DATA IN/OUT** jack).

❍ Ensure that PTT line is properly connected to FT-847 rear-panel **DATA IN/OUT** or **PKT** jack (as appropriate).

❍ Ensure that "TX AUDIO" output level from TNC is properly set.

❍ On FM Packet, ensure that the Baud Rate is properly set via Menu #23.

❍ On multiple-tone (SSB) Data modes, ensure that all tones fall within IF passband. Adjust Menu #92 (USB) or #93 (LSB) if not.

CANNOT SCAN:

❍ Be certain that Squelch is closed ("BUSY" icon must not be present on LCD).

❍ If using **MD-1C8** or **MD-100A8X** Desk Microphones, be certain that *coiled* cord from microphone base is connected to the transceiver (*not* the short, straight cable).

MEMORY CHANNELS CANNOT BE RECALLED:

❍ Check position of **BACKUP** switch (see page 95) to ensure it is On.

❍ Check condition of Backup Battery. Voltage should be over 3V DC.

BLANK DISPLAY OR
ERRATIC MICROPROCESSOR FUNCTION:

❍ Reset microprocessor using Menu #39 (see page 89).

❍ If front panel switches do not respond, ensure that [**LOCK**] switch has not been pushed.

CAT DATA TRANSFER PROBLEMS:

❍ Ensure that the serial data cable is a "null modem" type, not a "straight" serial cable.

❍ Ensure that the software and computer COM port settings are the same as the setting of Menu #37 (**CAT** System baud Rate): 4800, 9600, or 57600 bps.

❍ Ensure that any contest or logging software used supports the FT-847, and that the "Radio Control" protocol is enabled on the software.

TOO MANY QSL CARDS ARE
BEING RECEIVED:

❍ Condition normal. Thank you for choosing the FT-847!

Appendix

EME (EARTH-MOON-EARTH) OPERATION

Perhaps the ultimate challenge in amateur radio is communication achieved by bouncing signals off our planet's moon. Moonbounce or "EME" communication was, for many years, an activity pursued only by a few dedicated engineers. Today, however, the very large antenna arrays used by some EME specialists throughout the world have made it possible for amateur operators with very modest antennas – one or two Yagis on 144 MHz, two or four Yagis on 432 MHz – to complete EME contacts while running small "brick" solid state amplifiers in the 100W ~ 300W range. More power and (especially) more antennas will improve your results, of course, but two 13~17 element 144 MHz Yagis and 150 Watts *will* provide enough system performance to allow you to work the biggest stations via the moon under favorable conditions.

EME operation shares certain characteristics of both terrestrial weak signal work and satellite work (the moon is, of course, a "passive" satellite of earth). These characteristics are:

❍ As with long-distance tropospheric DX, signals will be weak, so it may be advantageous to utilize a mast-mounted preamplifier, so as to optimize system Noise Figure (by placing the low-noise preamplifier gain ahead of the losses in your coaxial cable).
❍ As with "active satellite" work, the operator must account for Doppler shift of the operating frequency.
❍ The position of the moon is constantly (though slowly) changing, so the ability to rotate your antennas in azimuth *and* elevate them above the horizon is important. Above about 15º elevation, terrestrial noise (especially on 144 MHz) is significantly reduced, making it easier to hear weak EME signals. See your Yaesu Dealer for details regarding Yaesu's **G-5500** Azimuth-Elevation Rotator.

EME activity tends to concentrate on weekends near moon perigee (the point of closest approach of the moon to earth, usually around "full moon"). Details regarding EME operation can be found in monthly amateur magazines, as well as in books on VHF communication which are available from your dealer. There are also many sources of EME information and advice available via The Internet.

OPERATING TUTORIAL

The operational steps for your first EME contacts using the FT-847 are shown below.

① Connect the FT-847 to your antennas and amplifier/preamp as shown on page 15. As a general rule, for 2 meter EME one needs (as a minimum system) a pair of Yagi antennas at least 5 meters (16.4') long (two side-by-side vertically polarized Yagis otherwise used for FM work may be satisfactory) and at least 150 watts of power.
② Set the FT-847 to the **CW** mode, and activate the DSP Bandpass Filter (and NR filter, if you like). Set the DSP Bandpass Filter to its minimum bandwidth setting (25 Hz). If the optional **YF-115C** is installed in your transceiver, press the [**NAR**] switch to activate the narrow IF filter.
③ Set Menu #02 ("MIN FREQ") to the 0.1 Hz selection. This will provide very fine tuning steps, which are helpful when using the ultra-narrow DSP bandwidth of 25 Hz.
④ Press the [**CLAR**] switch to activate the CLARIFIER feature, so as to compensate for Doppler shift. If you have software which provides Doppler shift prediction, use the software to determine the current Doppler shift expected. If you do not have such software, the following guidelines (for a mid-latitude station operating on 2 meters) will get you started:
   ● As the moon rises in the eastern sky, signals will be heard *higher* in frequency compared to the original transmit frequency. As the moon recedes toward the west, signals appear lower in frequency compared to the original transmit frequency.
   ● At moonrise in the east, 144 MHz Doppler will be on the order of +500 Hz; your **CLAR** control should therefore be set to +500 Hz offset, so that your transmit frequency is 500 Hz below your listening frequency.
   ● As the moon reaches its highest point in the sky, the Doppler shift will be reduced to zero (as the moon is no longer "approaching" your location). Therefore, as the rising moon reaches 45 degrees elevation, the Doppler shift may only be about +250 Hz; adjust the **CLAR** control appropriately.

Appendix

EME (Earth-Moon-Earth) Operation

- As the moon sets, the 144 MHz Doppler shift will approach -500 Hz, so you should adjust the **CLAR** control for a *negative* setting once the moon passes to the west of your location. At 45º elevation to the west, set the Clarifier for about -250 Hz offset to compensate for the Doppler shift on the signal reflected from the receding moon.
- Doppler shift varies with frequency, so the 50 MHz predicted Doppler shift will be roughly 1/3 of that on 2 meters, while the 432 MHz Doppler shift will be about 3 times the shift on 2 meters.

⑤ Now tune slowly around the low end of the "CW" sub-band. On 2 meters, most activity is concentrated between 144.005 MHz and 144.035 MHz, with the heaviest activity between about 144.008 MHz and 144.030 MHz. On 432 MHz, the heaviest activity is between 432.005 and 432.030 MHz. Signals will be weak (only a few dB above the noise, with small antennas), so tune slowly.

⑥ If you hear a station calling "CQ" you will probably observe that the call lasts for one to two minutes, followed by an identical-length listening period. You should reply by sending the other station's call once or twice, followed by your call for the remainder of the sending period (one minute, unless you know the other station called for two minutes). Try to match your sending speed to that of the other station, and be sure your station's clock is aligned to WWV, JJY, CHU, VNG, ZUO, or some other international time standard. On 432 MHz, 2½-minute calls are sometimes used, especially during schedules; be sure to match the calling pattern of the other station.

⑦ EME contacts follow a signal report protocol rather different from that used on HF. The chief components of the QSO exchange are:
- "O" means that both callsigns have been received.
- "RO" means that the 2nd station has heard both callsigns (the "O" part), and furthermore that receipt of the other station's "O" is being acknowledged (the "R" part).
- "R" signifies that all the above information has been received.
- "73" signifies that the other station's "R" has been received, and that the contact has now been completed.

A typical 144 MHz EME QSO, therefore, might go something like this, following W1DXC's one-minute "CQ" call:

(Minute 1)
"W1DXC W1DXC W6DXC W6DXC W6DXC W6DXC W6DXC ...... KKK"
(Minute 2)
"W6DXC W1DXC W6DXC W1DXC OOOOOOO ...... W6DXC W1DXC KKK"
(Minute 3)
"W1DXC W6DXC RO RO RO RO RO RO .... W1DXC W6DXC KKK"
(Minute 4)
"W6DXC W1DXC RRR RRR RRR RRR .... W6DXC W1DXC KKK"
(Minute 5)
"W1DXC W6DXC 73 73 73 73 73 73 73 .... W1DXC W6DXC SK SK SK"

If the other station repeats a previous transmission (for example, "OOO"), it means your most recent transmission was not received. Repeat the information again (in this case, your "RO" transmission) until the other station acknowledges your information (by sending "RRR RRR" in this case).

EME operation is today within the reach of many more amateurs than ever before. Good ears, patience, and commonly-available hardware may be used in conjunction with your FT-847 to let you experience "The Ultimate DX."

Appendix

HIGH-SPEED CW METEOR SCATTER (HSCW MS) OPERATION

Configuration of the FT-847 for High-Speed CW Meteor Scatter (HSCW MS) operation at CW sending speeds at 1000 lpm (letters per minute) or more is easily accomplished, using the connectors and controls provided on the transceiver; no modification should be required for successful operation.

Although *worldwide* standards and conventions are not firmly established for such aspects of HSCW operation as the setting of the frequency dial, the flexibility of the FT-847 is such that you can easily set up the transceiver to comply with the standards used in your country.

The proper connection and operating procedures for HSCW are outlined below.
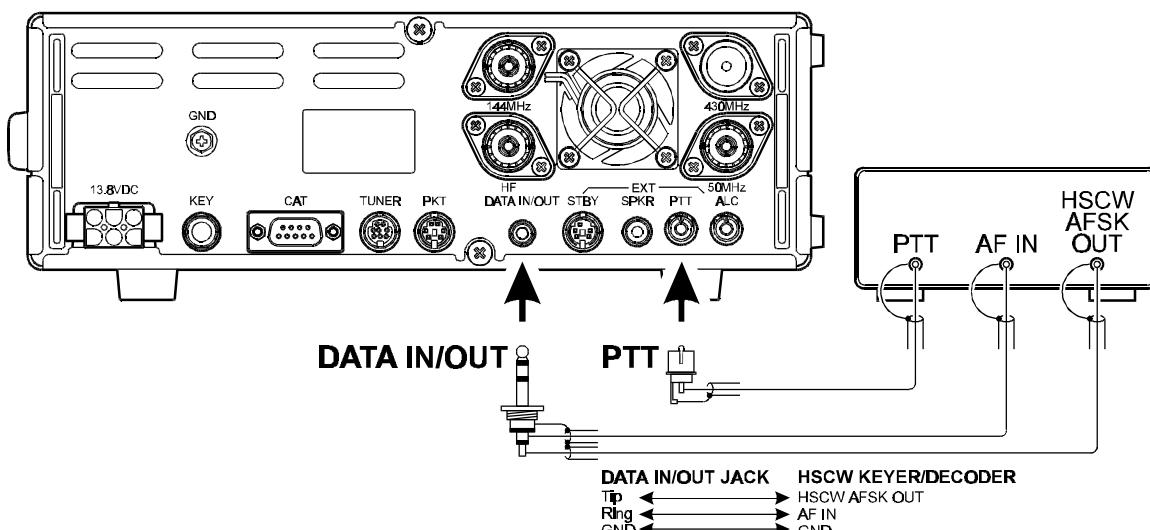
CONNECTIONS TO HSCW KEYING AND DECODING DEVICES

We recommend that you operate HSCW in an AFSK environment, so as to simplify the potential for confusion about the operating frequency. Accordingly, connect your keying and decoding devices in a manner similar to that recommended for HF Packet and other AFSK Data operation:

Remember that the AFSK output level from the **DATA IN/OUT** jack is fixed, so you may monitor the receiving frequency, adjusting the **AF** (GAIN) control for a comfortable listening level, without affecting the decoding of the incoming CW during a meteor burst. The output level from the ring connection of the **DATA IN/OUT** jack is 30 mV at an impedance of 600 Ω, while the optimum AFSK input level to the tip connector is 40 mV at 10 kΩ. When connected to the **DATA IN/OUT** jack, either the internal speaker, an external speaker, or headphones may be used to listen to the receive frequency, without affecting the data flow to the CW decoder.

Disconnect your microphone when using the rear panel's **PTT** jack for T/R control.

Some keying/decoding devices may require a higher or variable receive audio level. In this case, connect the AFSK input line to the decoder to the **EXT SPKR** jack on the rear of the FT-847; in this case, audio from the internal speaker will be cut off.

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HIGH-SPEED CW METEOR SCATTER (HSCW MS) OPERATION

SETTING THE CONTROLS AND SWITCHES FOR HSCW

Set the front panel controls and switches as follows. It is assumed, in this example, that you are injecting a 2000 Hz AFSK keying tone for transmission, and that the "standard" for defining a frequency is the *zero beat frequency of your transmitter*.

MODE:	**USB**
CLAR (Switch):	Off
PROC/KEYER:	Off
AGC:	Fast
NB:	Off
NR:	Off
DIG. FIL:	On
DSP:	Controls fully open at maximum bandwidth
D. NOTCH:	Off
SHIFT:	12 O'clock
SQL:	Fully Counter-clockwise
SPLIT:	On

Set the Main and Sub VFOs to the same frequency, which should be *2000 Hz (2.00 kHz) lower than the "schedule" or "operating" frequency*. This will make the *zero beat* frequency of your 2000 Hz transmitted CW correspond to the "schedule" frequency. If you are sending a 1500 Hz tone, instead, set the VFOs to a frequency *1500 Hz* below the "schedule" frequency, etc.

During your first transmission, adjust the **MIC** (GAIN) control to the position just before the point where the power output no longer increases. Then adjust the **RF PWR** control for about 25 Watts output on 144 or 432 MHz (50 Watts on 50 MHz). The duty cycle during HSCW is much higher than with slower-speed CW or SSB, and reducing the power output from the FT-847 to about 50% of its rated maximum is therefore recommended.

You may wish to experiment with the use of the DSP bandpass filter to optimize the signal-to-noise ratio. Most improvement will be realized by rotating the **LOW CUT** control clockwise to some degree, as counter-clockwise rotation of the **HIGH CUT** control will attenuate the incoming audio tones. The use of the DSP **NR** feature and the IF Noise Blanker generally is not recommended, because at high sending speeds these circuits may interpret the (desired) CW signal as being "noise," leading to the *elimination* of the incoming signal from the receiver section! However, you may wish to experiment with the use of the **NB** and **NR** features, as you may find them to be usable at your sending speed.

OPERATING TUTORIAL

Because operating practices for HSCW meteor scatter are somewhat different throughout the world, only general guidelines will be presented here. Consult with your local VHF/UHF weak-signal society for specific operating information; your Dealer may also have an extensive selection of books on this subject, and a wide variety of resources are available on the Internet.

Calling CQ

During non-meteor-shower conditions, you may wish to call CQ on an established calling frequency such as 144.100 MHz (remember, if you use a 2000 Hz audio tone, set your VFOs to 144.098.0 MHz). When listening for replies, use the **SUB-TUNE** knob, which tunes your receive frequency.

If there is a lot of activity on the calling frequency, you may wish to specify a listening frequency, and operate in a truly "split" environment. The convention is to add a letter (A, B, C, . . .) following the "CQ" call, indicating how many kHz up from the TX frequency you are listening. According to this system, "CQA" means you will listen "Up 1 kHz" while "CQB" means "Up 2 kHz," "CQE" means "Up 5 kHz," and "CQZ" means "Up 26 kHz." If you are calling "CQE" and hear a response to your call 5 kHz up, you then press the [**A▶B**] key to QSY to the "E" frequency, where the QSO is completed.

Completing a QSO

As with EME operation, there are commonly-accepted standards for operating procedures.

Usually, one-minute sending and receiving sequences are used. In North America, it is customary for the westernmost station to transmit during the "even" minutes of the hour, (e.g. 1900~1901, 1902~1903, etc.), while the easterly station transmits on the "odd" minutes (e.g. 1901~1902, 1903~1904, etc.). In Europe, the opposite convention applies (the easternmost station transmits on the "even" minutes). If both stations are approximately at the same longitude, then the more *southerly* station transmits on the "even" minutes, as above. Be certain to clarify the sending sequencing with the other station, so that you both are not transmitting at the same time!

As with EME, when you have received both your call and the other station's call, you send calls and a report (see below). If you get both calls and a report, you send a report and "R." If you get a report and "R," you send "R" in reply, and if you get just an "R" you send 73" to signify completion of the contact.

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HIGH-SPEED CW METEOR SCATTER (HSCW MS) OPERATION

The "report" format generally consists of any of the following:

- A 2-digit burst-length and signal-strength report (e.g. "26");
- A burst-length "S" report (e.g. "S2," the historical report format); or
- Your Grid Square (used in contests).

In principle, any of these reports may be used, because the intent is to exchange information not known in advance to the other party.

If you are missing some piece of information, the following format is used to request a repeat:

BBB: Both callsigns are needed
MMM: My callsign is needed
(your call was received OK)
YYY: Your callsign is needed
(my call was received OK)
SSS: Your "Report" is needed
UUU: Your keying is not readable
(technical problem)

Sending Speed
Unless otherwise stipulated, a sending speed of 1000 lpm (200 wpm) should be satisfactory for calling CQ and random meteor scatter work. Higher speeds are often used on schedules.

YAESU

.... leading the way.[SM]

E 1 1 7 9 1 0 0 5