

YAESU

FT-450

FT-450AT

Users Manual

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## Authors Message

When I started this project, I did so thinking that the Yaesu Manual was too confusing and hard to learn from. Besides, writing a User's Manual is a great way to learn any system.

Well, I have to say, I was wrong about the first item. It turns out the Yaesu Manual is very good. It is just that the FT-450 is a very complex machine. I continued with the effort because my second reason is still valid. And I wanted a shorter reference manual, structured closer to the way I think, to provide myself with a slightly different perspective of this impressive machine.

You will find that this is structured to my machine. I do not have the enhanced microphone, a linear amplifier to boost up the power, and as yet I do not have the software in my computer to drive RTTY , packet, or slow scan video.

Where Yaesu's version of the manual gives explicit instructions on an entire task, I have tried to break it down to functional procedures and presume that the reader will learn these basic procedures so that I do not have to spell out the specifics of every keystroke over and over again.

The only area covered by this document that was not clear in the Yaesu manual is found in section 5.2 where I discuss the interaction between M-TUNE, VFO-A, and VFO-B.

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## 1 General

The Yaesu FT-450 HF/50 MHz Transceiver is designed for Amateur Radio use. It provides a general-purpose receiver covering 30 KHz through 56 MHz. The Transceiver range is broken into 10 Amateur Radio Bands and 1 general purpose band to cover the remaining high frequency spectrum. The variable frequency oscillator (VFO) setup for each band is remembered individually as you switch bands. The details of what makes up a VFO setup will be described when we get into the section on memory. The transceiver allows communication in using side band, continuous wave, amplitude modulation, frequency modulation, and (when computer driven) a number of data modes.

## 2 Controls

The FT-450 front panel contains 24 push buttons, 3 analog rotary dials, 2 rotary digital dials, a lighted display, and three jacks. The small rotary digital dial (“DSP/SEL”) has 24 steps per revolution and also functions as a push button. The large rotary digital dial has 100 steps per revolution. A number of push buttons behave differently if held down for one second (adaptable).

Since there are literally hundreds of settings possible on the FT-450, a button, knob, or dial may be used to control more than one function. The less often changed values are set by a sequence of buttons and/or dials. For example, if you press the “F■” button (2<sup>nd</sup> from right mid height button), the letter F will illuminate on the display. The upper right six buttons have two names on each. If the F is illuminated, the button performs the function of the upper name and the F is extinguished. Otherwise those buttons perform the function of the lower name.

Definitions:

f-press = press a button preceded by the “F■” button

t-press = press a button and hold for 1 second (adaptable 0.5, 1.0, 1.5, or 2.0 seconds)



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CONTROL	ACT	STATE	FUNCTION	
ON/OFF	T-PRESS	-	Toggle system ON/OFF	
DSP	PRESS	-	Step DSP contour, notch, digital noise reduc, width, OFF	
ATT/IPO	PRESS	-	Step through combinations of ATT and IPO off and on	
	T-PRESS	CW	Voice tone to compare with CW tone to spot the frequency	
NB	PRESS	-	Toggles noise blanker	
AGC	PRESS	-	Step automatic gain control through auto, fast, slow	
	T-PRESS	-	Turn off automatic gain control	
BAND▼	PRESS	-	Steps forward through enabled bands	
		menu	Steps forward through bands to enable/disable	
BAND▲	PRESS	-	Steps backward through enabled bands	
		menu	Steps backward through bands to enable/disable	
TUNE	PRESS	-	Toggle enable/disable of automatic antenna tuner	
	T-PRESS	-	Start tuning to antenna process	
F	PRESS	-	Enter the "F■" (function) state	
		menu cwtrain	Generates the next group of 5 practice CW characters	
	T-PRESS	-	Enter or leave the "menu" state (see section 6 adaptation)	
		power off	Reset adaptation to factory default when turn power on	
METER/DIM	PRESS	-	Step through power, ALC, standing wave ratio meter	
	T-PRESS	-	Start brightness adjustment via DSP/SQL(end with press)	
MODE▼	PRESS	-	Steps forward through enabled modes	
		-menu	Steps forward through modes to enable/disable	
	T-PRESS	CW	Toggles between USB and LSB reception	
		power off	Display software version (194) when turn power on	
MODE▲	PRESS	-	Steps forward through enabled modes	
		-menu	Steps backward through modes to enable/disable	
	T-PRESS	CW	Toggles between USB and LSB reception	
A=B	PRESS	-	Copy the current VFO settings into the secondary VFO	
A/B	PRESS	-	Swap the current and secondary VFO settings	
KEYER	PRESS	-	Toggle CW keyer on/off (manual vs space assisted keying)	
CLAR	PRESS	-	Allow offset of receive frequency with "MAIN" dial	
FAST	PRESS	-	Toggle increase in frequency steps for both dials	
LOCK	PRESS	-	Lock frequency (see details) to avoid accidental change	
SHIFT	PRESS	-	Shift the intermediate frequency (IF) pass band	
DSP/SEL	TURN	-	Small kHz steps in frequency (see Table 5)	
		-	100 KHx steps in frequency (may be adapted to set CW side tone, CW speed, 1 mHz steps, mic gain, or rf power)	
		MEMORY	-	single channel steps
			-	single groups steps
		DSP	-	Step values for selected filter (shown by ">")
		MENU	-	Step through list of adaptable items
		MENU blink	-	Step through allowed values fore individual items
	PRESS	-	Toggle between small and large steps in frequency	
		MEMORY	-	Toggle between groups and individual memory numbers
		DSP	-	Toggle type of filter on/off, sense, magnitude (see writeup)
		MENU	-	select menu item (blink menu display) for setting
MAIN DIAL	TURN	-	Fine setting of frequency (end memory mode)	

CONTROL	ACT	STATE	FUNCTION
SQL/RF GAIN	TURN	not squelch	Analog setting of radio frequency gain
		squelch	Analog setting of squelch level
AF GAIN	TURN	-	Analog setting of audio frequency gain
VOICE/C.S	PRESS	F	Announce the frequency and mode in voice to operator,
		-	Customer adapted function ( see Tables 9, 10, 11, 12)
MW/V/M	PRESS	F	Memory write VFO setup to selected channel (1 out of 508)
		-	Copy memorized VFO setup into current VFO
	T-PRESS	power off	Clear memory channels when power turned on
HOME/RCL	PRESS	F	Copy preferred (quick) VFO setup into current VFO
		-	Copy quick VFO setup into current VFO
		F MW	Copy current VFO setup into home channel
		menu - blink	In most cases, the menu item restored to factory default
	T-PRESS	power on	Reset adapt, clear memory channels when turn power on
VOX/STO	PRESS	F	Activate or deactivate voice activated transmission
		-	Copy current VFO setup into (preferred (quick) memory
STEP/SPLIT	PRESS	F	Toggle setting frequency step with DSP/SEL knob
		-	Toggle operation using secondary VFO settings to transmit
	T-PRESS	-	Activate quick SPLIT operation
PMS/SCAN	PRESS	F	Toggle program memory scan between two frequencies
		-	Toggle upward scanning of frequencies or memory channel

Table 1 - Controls

This document was derived from the information in the Yaesu HF/50 MHz Transceiver FT-450 Operation Manual.

## 2.1 Power

To toggle the FT-450 transceiver ON or OFF, t-press the ON/OFF button. Some portion of the display will show when the unit is on. Needless to say, the 12 volts must already be supplied to the unit.



The power switch is also used to reset memory and/or adaptation in the FT-450. Warning: Do not perform any of the first three following steps unless you are prepared to lose information:

1) Turning the power on while holding the “F■” button will restore adaptation to the factory default settings.



2) Turning the power on while holding the “VM/V/M” button will clear all memory channels except QMB.



3) Turning the power on while holding the “HOME/RCL” button will both restore adaptation to the factory default settings and clear all memory channels except QMB.

4) Turning the power on while holding the “MODE▼” button will display the current software version. You must then turn the power off and then on to resume normal operation.

### 3 Receiver

The transceiver provides both a multi-band sensitive receiver and transmitter. Most of the controls have to do with the operation of the receiver section. However, Mode, Band, and VFO apply to the transmitter section as well.

#### 3.1 Communications Mode

The FT-450 transceiver is designed to communicate using Lower Side Band (LSB), Upper Side Band (USB), Continuous Wave (CW, i.e. Morse code), Data (DATA), Amplitude Modulation (AM), or Frequency Modulation (FM). Pressing either the “MODE▼” or “MODE▲” will step through the available modes in the forward or reverse direction respectively. These buttons are found to the right of the “DSP/SEL” knob. Any unwanted modes may be turned off in adaptation using the MENU functions described later.



Most user's will not need all of the communication modes shown in Table 2. When you get to the section on adaptation, you will find that you can configure the system to skip any modes that are not needed.

MODE	DESCRIPTION
USB	Upper side band
LSB	Lower side band
CW	Continuous Wave
AM	Amplitude Modulation
FM	Frequency Modulation
DATA	Radio teletype, Packet

Table 2 – Communication Modes

#### 3.2 Band

Step through the bands using ”BAND▲” and “BAND▼” buttons on either side of the “MAIN” dial. Only those bands enabled (via the menu command) will be selected. The available bands are shown in Table 1 above. Any unwanted bands may be turned off in adaptation using the MENU functions described later.



BAND	RANGE	AMATEUR RADIO BAND
GEN	30 KHz ~ 33 MHz	none (stores non-ham fqys )
1.8 MHz	30 KHz ~ 33 MHz	1.8 MHz ~ 2.0 MHz
3.5 MHz	30 KHz ~ 33 MHz	3.5 MHz ~ 4.0 MHz
7.0 MHz	30 KHz ~ 33 MHz	7.0 MHz ~ 7.3 MHz
10 MHz	30 KHz ~ 33 MHz	10.1 MHz ~ 10.15 MHz
14 MHz	30 KHz ~ 33 MHz	14 MHz ~ 14.35 MHz

BAND	RANGE	AMATEUR RADIO BAND
18 MHz	30 KHz ~ 33 MHz	18.068 MHz ~ 18.168 MHz
21 MHz	30 KHz ~ 33 MHz	21 MHz ~ 21.45 MHz
24 MHz	30 KHz ~ 33 MHz	24.89 MHz ~ 24.99 MHz
28 MHz	30 KHz ~ 33 MHz	28 MHz ~ 29.7 MHz
50 MHz	33 MHz ~ 56 MHz	50 MHz ~ 54 MHz

Table 3 – Transceiver Bands

### 3.3 VFO (Variable Frequency Oscillator)

The display shows the current frequency in 10 Hz increments (left field is MHz, mid field is KHz). The desired frequency is selected by rotating the “DSP/SEL” knob (24 steps per revolution). Table 5 shows the incremental step size. Factory defaults are highlighted.



Press the “DSP/SEL” knob to blink the left 3 digits of the frequency display and the “DSP/SEL” knob now moves in 100 kHz increments changing only those digits. Pressing the “DSP/SEL” knob again (or pressing any button or moving the “MAIN” dial) stops the blinking and the “DSP/SEL” knob action returns to the smaller increment size.



The “MAIN” (large unlabeled) dial (100 steps per revolution) allows fine-tuning of the frequency. The “MAIN” dial is, by default, disabled in AM or FM modes, but may be enabled by adaptation.

MODE(S)	“DSP/SEL” KNOB	“MAIN” DIAL
CW, LSB, USB, DATA	1.0, <b>2.5</b> , 5.0 kHz	1, <b>10</b> , 20 Hz
AM	2.5, <b>5.0</b> , 9.0, 10, 12.5, 25 kHz	<b>100</b> , 200 Hz *
FM	<b>5.0</b> , 6.25, 10, 12.5, 15, 20, 25, 50 kHz	<b>100</b> , 200 Hz *

Table 5 – Base frequency step size for controls

\*Note: By default, “MAIN” dial is inoperative for AM and FM modes unless enabled by adaptation.

To change the frequency step size of the “DSP/SEL” knob, f-press the “STEP/SPLIT” (just above “F■”). The current step size will show on the bottom right of the display. Change the step size value by rotating the “DSP/SEL” knob. When the correct value is displayed, press the “STEP/SPLIT” button to exit that state.

Press the “FAST” button (to the left bottom of “MAIN” dial) to increase the speed of frequency selection. The word FAST will be highlighted on the display, the “DSP/SEL” increments will be doubled and the “MAIN” dial increments will be increased by a factor of 10. Pressing “FAST” again to extinguish the FAST highlight and returns both knobs to their set increments.

The current frequency may be locked to avoid inadvertently changing it. To toggle the lock function, press the “LOCK” button to the right of the “MAIN” dial. When locked, the word LOCK will appear

above the right end of the frequency display. The frequency lock may be released by pressing "LOCK" again.

In addition to the display, the FT-450 is able to announce the current frequency through the speaker or headset. To hear the frequency, f-press the "VOICE" button (2<sup>nd</sup> upper button from the right).

Note: Small changes in the receive frequency (under 10 kHz) may also be achieved by use of the clarifier. See section 4.1.1 of transmission for details.



### 3.3.1 Clarifier

The receive frequency can be set up to +/-9.99 kHz different from the transmit frequency. This is toggled on and off by pressing the "CLAR" button located near the bottom middle of the front panel. When activated, the word CLAR shows on the right side of the display with the offset shown below it (replacing the M-TUNE, VFO-A, or VFO-B on the display). The offset value may be changed with the "MAIN" dial. Note that the offset control may be re-assigned to the "DSP/SEL" knob in adaptation using the MENU functions as described later.



The system will remember the offset value, even when CLAR is turned off. To zero the offset, t-press the "CLAR" button while the clarifier is turned on. The offset will also be set to zero if the "MAIN" dial is inadvertently turned when the CLAR is turned off.

### 3.3.2 Split Frequency Operation

The FT-450 Transceiver is capable of operating on two frequencies; one for transmission and another for reception. Moreover, there is no restriction that the two VFOs operate on the same band or even in the same mode.

To toggle split frequency operation, press the "STEP/SPLIT" button. The word SPLIT is highlighted in the display. The current receive VFO setup appears on the display. If you want to keep it, press either the "A = B" or "A / B" button to either put that setup in the transmit VFO or swap setups with the current transmit VFO. Then enter the transmit frequency and any other parameters associated with it and press the "A / B" button to swap it with the receive VFO setup.



You are now ready to communicate. Whenever the Transceiver is transmitting, the frequency display will show the transmit frequency. Otherwise it will show the receive frequency.

There is also a quick split feature in the system. If you t-press the "STEP/SPLIT" button, the system will automatically copy the receive VFO into the transmit VFO and add 5 kHz to the transmit frequency. You may now communicate as before.

Note: see section 5 for a better understanding of the contents of a VFO setup and section 5.5 a more complete description of the "A = B" or "A / B" button action.

### 3.4 Extracting the Signal from the Noise

Every stage of the FT-450 Transceiver contributes to the effort to improve the signal to noise ratio. In order to deal with the wide dynamic range of input signals, the operator may optionally insert 20 db of attenuation or disable the radio frequency (RF) amplifier in what is called intercept point optimization (IPO). The RF amplifier gain is controlled by the automatic gain control (AGC) circuitry.

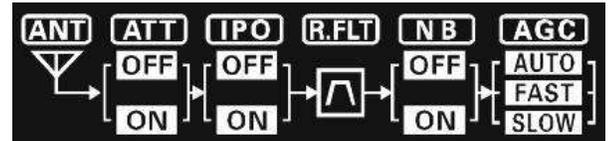
The signal is then mixed with the first local oscillator to produce an intermediate frequency of 67.899 mHz, passed through a 10 kHz wide roofing filter and then passed through the first intermediate frequency (IF) amplifier. The gain of the IF amplifier is also controlled by the AGC circuitry.

The amplified IF signal is mixed to produce a 24 kHz second IF. The second IF signal is then converted through an analog to digital converter (ADC). Further filtering is then performed by the digital signal processor (DSP). The DSP then detects (DET) the signal and provides the AGC control. The detected signal then passes through a digital to analog converter (DAC) to drive the speaker circuitry

The operator has direct control of ATT, IPO, noise blanker (NB), several DSP filter properties, AGC speed, IF gain (or squelch), and audio frequency (AF) gain.

#### 3.4.1 RF Attenuation and Intercept Point Optimization (IPO)

Filtering is done first by the "ATT/IPO" button. To reduce strong signals, apply these filters. Each time the "ATT/IPO" button is pressed it advances through the sequence:



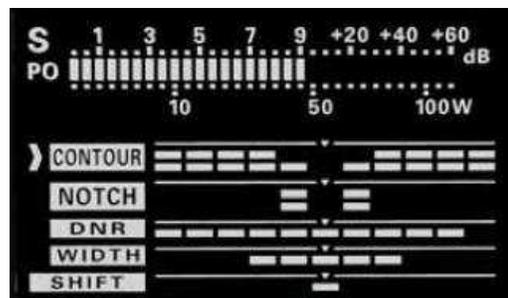
ATT off, IPO off	no attenuation, input preprocessor active
ATT on, IPO off	20 db attenuation, input preprocessor active
ATT off, IPO on	no attenuation, input processor off
ATT on, IPO on	20 db attenuation, input processor off

#### 3.4.2 Noise Blanking

Interference rejection within the bass band follows the IF filtering. This is used to filter noise from automobiles or any other electrical sparks. It is toggled on and off by the "NB" button and the display will show the status of the NB on the second figure top right on the display.

#### 3.4.3 Digital Signal Processor

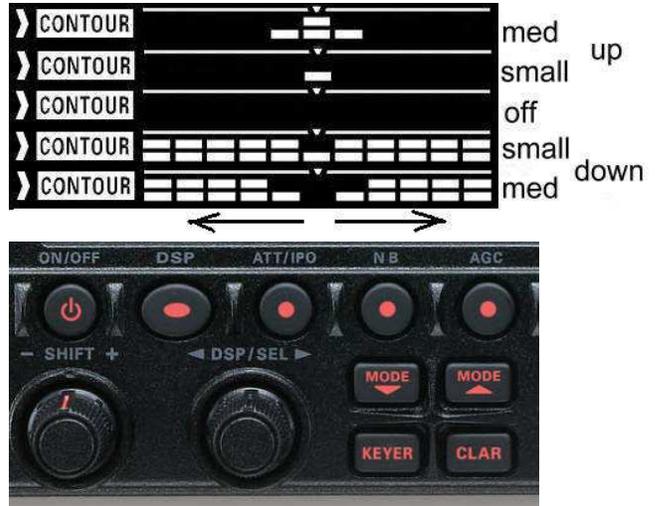
Pressing the "DSP" button will cause a ">" sign to appear in front of the CONTOUR signal processing



graph on the left side of the display. Repeated press of the “DSP” button will move the “>” sign down to the NOTCH graph, then to the DNR graph, then to the WIDTH, and finally to remove the “>” sign. While the “>” sign is displayed and if M-TUNE, VFO-A, or VFO-B shows on the bottom right of the screen, the “DSP/SEL” knob is used to adjust the digital signal processor parameters.

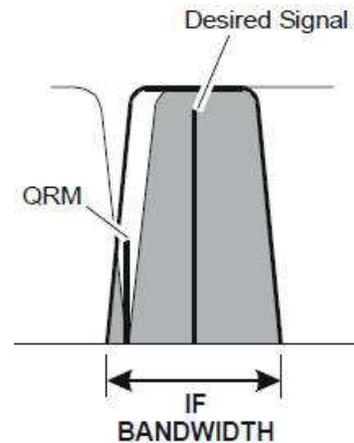
### 3.4.3.1 Contour

The shape of the band pass may be rounded up or down over a small or medium width of the band pass. That bulge may be moved over the width of the band pass. The first press of the “DSP” button causes the “>” sign to be positioned next to the CONTOUR graph. Pressing the “DSP/SEL” knob steps the filter from none to narrow to medium with bulge. T-press the “DSP/SEL” knob to flip between and upward or downward bulge. Turn the “DSP/SEL” knob to position the bulge over the different parts of the band pass.



### 3.4.3.2 Notch

Introducing a sharp notch in the band pass is achieved by the second press of the “DSP” button that causes the “>” sign to be positioned next to the NOTCH graph. Press the “DSP/SEL” knob to toggle the filter off or on. Turn the “DSP/SEL” knob to position the bulge over the different parts of the band pass. Note that the knob must be moved several steps before the notch will move noticeably.

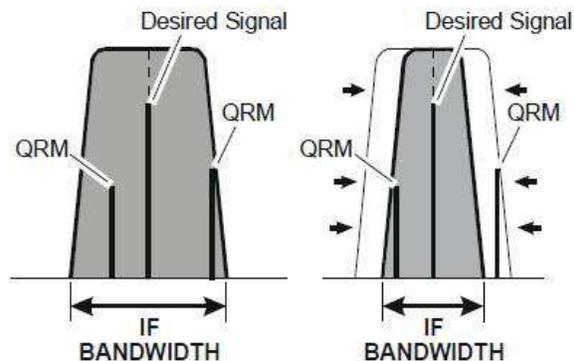


### 3.4.3.3 Digital Noise Reduction (DNR)

Application of one of 11 different digital Noise Reduction (DNR) filters in the band pass is achieved by the third press of the “DSP” button that causes the “>” sign to be positioned next to the DNR indicator. Press the “DSP/SEL” knob to toggle the DNR off or on. Rotate the “DSP/SEL” to select one of the filters which are indicated in the number of segments lighted by listening to which sounds best.

### 3.4.3.4 Band Pass Width

Without any other filtering, the band pass is relatively flat for its band pass value with relatively steep drop-off above and below that band. The fourth push of the “DSP” button causes the “>” sign to be positioned next to the WIDTH graph on the display. Turning the “DSP/SEL” knob steps the filter from narrow (left), nominal (mid), to wide (right). The actual band width



depends on the communications mode as shown in Table 6.

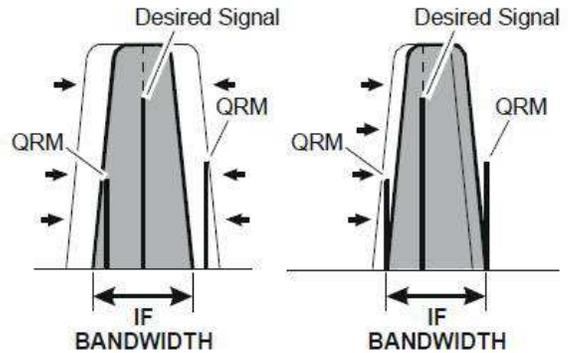
MODE	NARROW	NOMINAL	WIDE
CW, DATA	500 Hz	1.8 kHz	2.4 kHz
USB, LSB	1.8 kHz	2.4 kHz	3.0 kHz
AM	3.0 kHz	6.0 kHz	9.0 kHz
FM	2.5 kHz	5.0 kHz	-----

Table 6 – Band Width Filter Settings

### 3.4.3.5 Filter Shift

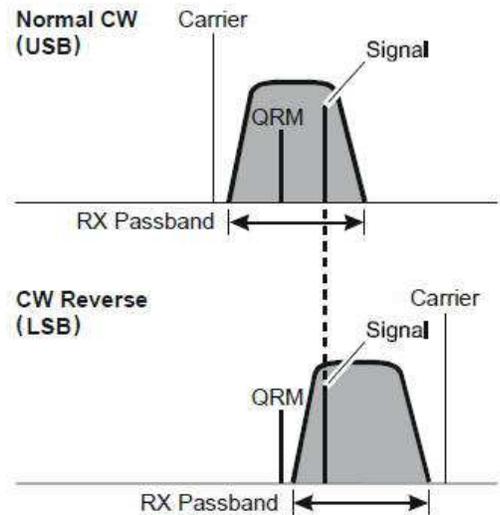
The digital signal processor center frequency can always be shifted with the “SHIFT” knob. The position of that center frequency is shown on the lower left of the display.

Note: The shift value is not saved as part of the VFO setup.



### 3.4.4 CW Reverse

The default CW reception injects the beat frequency in the upper sideband of the CW carrier. In some cases, a near signal may be filtered out by switching to the lower sideband of the CW carrier. The sideband for CW reception can be toggled by a t-press of either “MODE▼” or “MODE▲”.



### 3.4.4.6 CW Spotting

When fine tuning a CW signal, it is sometimes helpful to zero beat with your own signal. T-press the “ATT/IPO” button to sound your signal on top of the received signal.

### 3.4.5 Radio Frequency Gain

#### 3.4.5.7 Automatic Gain Control

The FT-450 attempts to maintain a constant audio level (assuming the signal is strong enough). In general, we want the Automatic Gain Control (AGC) to respond quickly during CW or DATA transmissions. However, when speech is involved we want the system to react more slowly so that voice inflections can be heard. Status of the AGC control is shown on the upper right of the display.

Pressing the “AGC” button (to the left of the “BAND▼” button) will step from AUTO to FAST or from FAST to SLOW or from SLOW to AUTO. If you t-press the “AGC” button, the system will disable (or enable) the AGC. For most uses, simply leave the AGC set to AUTO and the FT-450 will set the AGC speed according to the current receive MODE (see next section).



### 3.4.5.8 Radio Frequency Volume Control

In most cases, the gain (or squelch) is turned full on by rotating the “SQL/RF GAIN” knob fully to the right. The signal strength meter readings are only accurate in the full on position. The “SQL/RF GAIN” knob may also be adapted to act as a squelch, muting the sound when the signal is below a set level and/or pausing a scan operation when sufficient signal is present.

### 3.4.6 Audio Volume Control

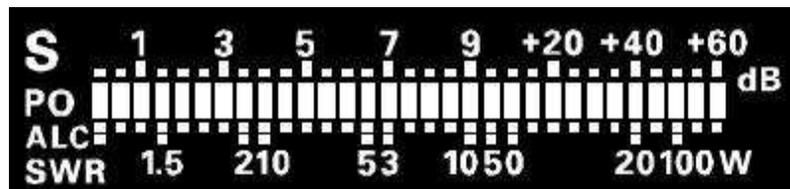
No surprises here. Adjusting the audio for the most comfortable sound by rotation of the “AF GAIN” knob sets the volume. Turning to the right makes most sound louder.

The system beep volume, BEEPVOL, alerting the user of system warnings as well as CW side tone volume, CWSTONE, is set in adaptation. Either, may be set to a fixed volume or linked to the “AF GAIN” with a user selected offset in volume.



### 3.4.7 Signal meter

When not transmitting, the meter in the upper left corner of the display shows the signal strength of the received signal. Note that the value is only accurate when the “SQL/RF GAIN” knob is turned full on (all the way to the right).



## 4 Transmitter

The transmitter makes use of the mode, band, and frequency settings shown in 3.1, 3.2, and 3.3.

The current mode of transmission, LSB, USB, CW, AM, FM, or DATA is lighted in the display. In



addition, if CW mode, the display also shows whether the injected beat frequency is LSB or USB.

When the automatic antenna tuner is engaged, the TUNER indicator is lighted. As long as the system is receiving (or squelch is open) the BUSY indicator is lighted.

#### 4.1 Transmission

When the system is transmitting, the TX is lighted and the BUSY is not lighted. If an attempt is made to transmit outside of the amateur radio bands, the status area of the display (lower right hand corner will show TX ERR and the TX indicator will not be lighted.

##### 4.1.1 Microphone Button

The system will transmit whenever the side button on the microphone is pressed.

##### 4.1.2 Voice Activated Transmitter Switching (VOX)

F-press the “VOX/STO” button to toggle the VOX (voice-actuated transmitter switching) system on or off when in USB, LSB, AM, or FM modes. When the VOX is active, the VOX indicator will show on the display. When VOX is active, speaking into the microphone will cause the Transceiver to transmit. (Note: MH-67 microphone not operative when button released)

##### 4.1.3 CW Break-In

F-press the “VOX/STO” button to toggle the break-in (key-actuated transmitter switching) system on or off when in CW mode. When the break-in is active, theBK-IN indicator will show on the display. Break-in should be on for CW transmission. Turning off break-in is useful for code practice.



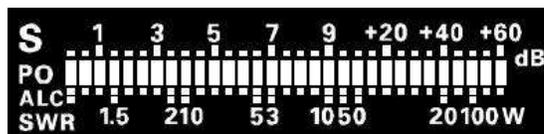
##### 4.1.4 Data

An external computer or device may command the transceiver to transmit rtty, packet, or other data.

#### 4.2 Meter

During transmission, one of the three parameters is monitored (only one of PO, ALC, or SWR titles will show on the display). The parameters may be stepped through by pressing the

“METER/DIM III” button just above the “AF GAIN” knob. They are PO (Power Out), ALC (Automatic Level Control), and SWR (Standing Wave Ratio) respectively.



### 4.3 Automatic Antenna Tuner

The built in automatic antenna tuner will match the output through a 50 ohm line if the SWR of the antenna without the tuner is 3:1 or less. The antenna tuner is toggled on or off by pressing the “TUNE” button located just below the right edge of the display. When the tuner is on, the word TUNER is displayed just above the start of the frequency display.



To operate the automatic antenna tuner, t-press the “TUNE” button for one second. The TX will light up during the operation and you might hear the tuner operation for a couple of second. If the operation fails (usually because of excessive SWR), the antenna symbol at the start of the diagram on the display will flash until the tuner is either turned off or run successfully.



## 5 Channel Memories

The FT-450 contains 508 memory channels as well as M-TUNE, VFO-A, VFO-B, QUICK, and HOME. The memory channels may be addressed one of two ways per Table 7 according to the setting in adaptation.

Group Memory “OFF”	Group Memory “ON”
MEM-001 ~ MEM-050	M-01-01 ~ M-01-50
MEM-051 ~ MEM-100	M-01-01 ~ M-01-50
MEM-101 ~ MEM-150	M-01-01 ~ M-01-50
MEM-151 ~ MEM-200	M-01-01 ~ M-01-50
MEM-201 ~ MEM-250	M-01-01 ~ M-01-50
MEM-251 ~ MEM-300	M-01-01 ~ M-01-50
MEM-301 ~ MEM-350	M-01-01 ~ M-01-50
MEM-351 ~ MEM-400	M-01-01 ~ M-01-50
MEM-401 ~ MEM-450	M-01-01 ~ M-01-50
MEM-451 ~ MEM-500	M-01-01 ~ M-01-50
MEM-P1L ~ MEM-P2U	M-11-1L ~ M-11-2U
MEM-EMG	M-12-EM
US5-001 ~ US5-005	M-13-01 ~ M-13-05

Table 7 – Memory Channel Number

### 5.1 Memory Content

All of the configuration data specific to a single channel is known as the VFO setup data. Absent from this data are the current functional status such as transmit or the transceiver state such as menu. The contents are described in Table 8.

The state of the clarifier (CLAR) is also maintained between working and band memories, but not in the channel memories. A VFO setup does not include the position of any knobs. In addition it does not include the state of TUNER, BUSY, TX, KEYS, VOX, BK-IN, P.BACK, FAST, LOCK, MENU, SPLIT, and F.

Operating Mode
Operating Frequency
Attenuation Status
IPO (preamplifier) Status
CONTOUR setting
DSP Notch filter (NOTCH) setting
DSP Noise Reduction (DNR) setting
DNR Reduction algorithm setting
Bandwidth setting
Repeater Shift setting
CTCSS Tone Frequency

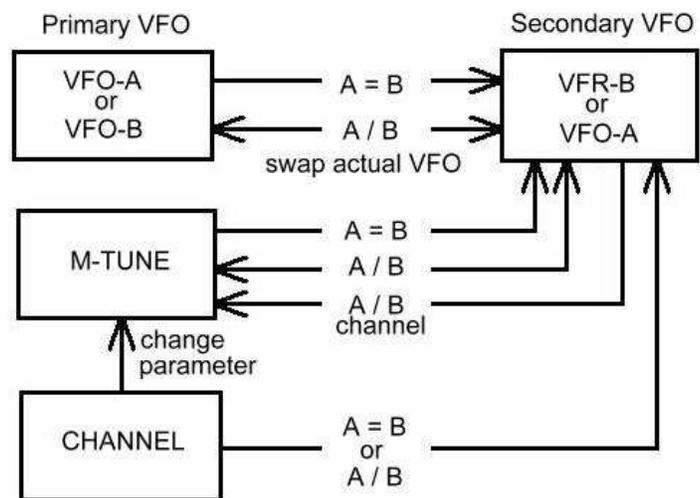
Table 8 – Contents of Each Memory Channel

### 5.2 Tuning of the VFO Setup Memory

The FT-450 Transceiver maintains three active VFO setups; M-TUNE, VFO-A and VFO-B. One of these three setups, known as the primary VFO, is indicated on the bottom right hand corner of the display. The operator has the ability to directly change parameters in the primary VFO setup.

If a memory channel is selected to control the primary VFO, its name shows on the bottom right hand corner of the display. Should the operator decide to change one of the parameters (see Table 8 above), the entire VFO setup of that channel is copied into the M-TUNE memory and the change applied to the M-TUNE memory. M-TUNE is now the primary channel. Neither the memory channel nor VFO-A nor VFO-B have been changed at this point.

If either VFO-A or VFO-B is selected to control the primary VFO, any changes in the parameters of Table 8 above are made directly to VFO-A or VFO-B respectively. When either of these VFOs is associated with the primary channel, the other acts as the secondary channel. The primary channel provides all the settings for reception as well as those for direct transmission. The secondary channel provides parameters for transmission during SPLIT transmission.



There are two buttons available to change the contents of the secondary channel in the FT-450.

- 1) If you press the "A = B" button, the contents of the primary VFO are copied to the secondary VFO.

2) If the primary VFO is M-TUNE and you press the “A / B” button, the contents of the primary VFO are swapped with the contents of the secondary VFO.

3) If the primary VFO is one of the memory channels, then the contents of the secondary VFO are copied into M-TUNE, the contents of the memory channel is copied into the secondary VFO, and M-TUNE becomes the primary VFO.

4) If the primary VFO is either VFO-A or VFO-B and you press the “A / B” button, the roles of VFO-A and VFO-B are swapped so the primary VFO becomes the secondary VFO and the secondary VFO becomes the primary VFO..



One final note on this subject: If you wish to make VFO-A or VFO-B your primary channel, press “MW/V/M” twice. If you get the wrong one as the primary channel, apply item 4) above and press the “A / B” button to swap VFO roles.

### 5.3 Band VFO Setup Memory

Each band also maintains a VFO setup channel. When you change bands, the system identifies the band to which the receiver data now belongs to (based on the receiver frequency) and updates the current data in that memory. If the receiver frequency is outside of any amateur band, then the GEN band memory will be updated. As you step through the different bands, the VFO setup in the tuning VFO will be updated to reflect the data that last controlled that band.

### 5.4 Home Memory

There is a preferred VFO setup for the bands in the range from 300 kHz through 33 MHz and another for the bands in the range of 33 MHz through 54 MHz. To store VFO-A into one of these home positions, f-press the “MW/V/M” button and then press the “HOME/RCL” button within 10 seconds.

To select the home storage VFO setup in the current band range (either HF or 6 meter) to act as VFO-A, f-press the “HOME/RCL” button.



### 5.5 Quick Memory

There is one channel set aside for quick storage and retrieval. To save the current primary VFO data in quick storage, press the “VOX/STO” button.

To select the quick storage VFO setup to act as VFO-A, press the “HOME/RCL” button



## 5.6 Channels Memories

See Table 7 for channel designation.

### 5.6.1 Recall

Simply press the “MW/V/M” button and then select the desired active channel with the “DSP/SEL” knob. If memory groups is adapted ON, pressing the “DSP/SEL” knob highlights the group number and the DSP/SEL knob now steps one active group at a time. Pressing the “DSP/SEL” knob again returns the function of the knob to select from the active channels within the current group.



Note that if the “MAIN” dial is turned in memory mode, the system immediately copies the data into the working VFO setup and modifies that copy as VFO-A. The channel memory has not been changed and you can return to that channel by simply pressing the “MW/V/M” button again.

### 5.6.2 Storage

Set up the frequency, mode, filters, etc that you desire for that channel. Then f-press the “MW/V/M” button. Turn the “DSP/SEL” knob to select the desired memory channel. Note that even if channels are in groups, all 50 memory channel of each group are accessed followed by the next group, and so on. Pressing the “DSP/SEL” knob has no effect. When you reach the desired channel, press the V/M button to store the information in that channel. Warning: The process will be aborted if no action is taken for a 10 seconds period. A beep will sound to confirm that the process was accepted.



### 5.6.3 Removal

To remove a channel, press the “MW/V/M” button (if the system is not already in memory mode). Select the memory channel that you wish to remove as done in memory channel restore above and f-press the “MW/V/M” button. Press “CLAR” to remove the data. Confirm with the “MW/V/M” button. The channel selection will revert to the first of that group (or first channel if memory groups turned off).



Note: If you make a mistake, after the channel has been turned off, the information is still there. To restore the channel, f-press “MW/V/M” button, select the channel with the “DSP/SEL” knob, press “CLAR”, and press the “MW/V/M” button to confirm.

### 5.6.4 Labeling

Channels may have been adapted with an alphanumeric label (up to 7 characters long) to remind the operator what the channel was for. If the channel label has been enabled in adaptation, when the channel is selected, you see the original channel number for 2 seconds before it is replaced with the label. See section 7.1 in adaptation for MEM\_TAG input.

## 5.7 VFO Memory Scanning

SCAN Initiates upward scanning of VFO frequencies or memory chan

## 5.8 Programmable Memory scanning

## 6 System Controls

### 6.1 Display Brightness

The display brightness may be set to one of 5 levels, 0 through 4. F-press the “METER/DIM III” button to step through these levels. The current level shows on the lower right of the display (unless it is 0, in which case the display is blank). Rotating the “DSP/SEL” knob will then change the level. Press the “METER/DIM III” button to save the new value and resume operation.



Warning: It is recommended that the display remain at full (4) brightness. People have reported a hum on the transmitted audio when the value is set lower.

### 6.2 Semi-automatic Keyer

The FT-450 contains a semi-automatic keyer for CW transmission. It has the advantage (and to some, disadvantage) of making the code stream more uniform. The relative size of dots, dashes and spaces a standard size for a given code speed. Press the “KEYER” button to toggle the keyer on or off. Input to the keyer can be adapted for either a straight key or paddles. See adaptation for parameters associated with CW.

### 6.3 Custom Switch

The manual says that the C.S button will act as a shortcut to one of 52 functions. However, there are only 20 unique functions that are not duplicates of either press, f-press, or t-press of existing buttons or knobs. The unique functions are shown in Table 9.

NAME	FUNCTION
MONI	Pipe audio signal through speaker or headset
P/B	Activates the Monitor function
PLAY1	Send CW beacon text 1
PLAY2	Send CW beacon text 2
PLAY3	Send CW beacon text 3
QSPL	Activate quick SPLIT operation
SPOT	Generate a CW spot tone (only in CW mode)
SQLOFF	Opens the squelch
SWR	Transmits a 10 W CW carrier to check the standing wave ratio
TXW	Monitor the transmit (rather than receive) frequency when in SPLIT mode
VCC	Display the power supply voltage
VOICE2	Same as VOICE except adds S meter reading
VM1MONI	Play back message in voice memory 1

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VM1REC	Store the voice message in voice memory 1
VM1TX	Transmit the voice message in voice memory 1
VM2MONI	Play back message in voice memory 2
VM2REC	Store the voice message in voice memory 2
VM2TX	Transmit the voice message in voice memory 2

Table 9 – 20 Unique Assignable Button Functions

The other assignable functions may not be as useless as they seem. If you happen to have the optional MH-31 or MD-100 microphones, it might be useful to assign redundant functions to the microphone buttons. Each of the custom switch functions may also be assigned to any of those three buttons through adaptation.

NAME	BUTTON	FUNCTION
VOICE	VOICE	Announce the current frequency and mode
MW	MW	Copies operating VFO data into current memory channel
VOX	VOX	Activate the VOX (voice-actuated transmitter switching) sys
STEP	STEP	Enable setting freq step used by DSP/SEL knob
PMS	PMS	Engage programmable memory scan
MENU	F held for 1 second	Open the adaptation menu
DIMMER	METER/DIM	Enable setting of display brightness by DSP/SEL knob
HOME	HOME	Recall the home (favorite) memory

Table 10 – 8 Assignable shortcuts for f-press of existing buttons

NAME	BUTTON	FUNCTION
FAST	FAST	Toggle increase in frequency steps for both dials
DSP	DSP	Step DSP contour, notch, digital noise reduc, width, OFF
ATT/IPO	ATT/IPO	Step through combinations of ATT and IPO off and on T-PRESS – CW Voice tone to compare with CW tone to spot
NB	NB	Toggles noise blanker
AGC	AGC	Step automatic gain control through auto, fast, slow T-PRESS - Turn off automatic gain control
MODEDN	MODE▼	Steps forward through enabled modes T-PRESS – CW Toggles between USB and LSB reception
MODEUP	MODE▲	Steps forward through enabled modes T-PRESS – CW Toggles between USB and LSB reception
DSP/SEL	DSP/SEL	Toggle between small and large steps in frequency
KEYER	KEYER	Toggle CW keyer on/off (manual vs space assisted keying)
CLAR	CLAR	Allow offset of receive frequency with “MAIN” dial
BANDDN	BAND▼	Steps forward through enabled bands
BANDUP	BAND▲	Steps backward through enabled bands
A=B	A=B	Copy the current VFO settings into the secondary VFO
A/B	A/B	Swap the current and secondary VFO settings
LOCK	LOCK	Lock frequency (see details) to avoid accidental change
TUNE	TUNE	Toggle enable/disable of automatic antenna tuner
V/M	V/M	Toggles frequency control between VFO and memory system
STO	STO	Copies operating data into quick memory bank (QMB) memory
SPLIT	SPLIT	Activate split frequency operation between VFO-A and VFO-B T-PRESS - Activate quick SPLIT operation
SCAN	SCAN	Initiates upward scanning of VFO frequencies or mem0ry chan

NAME	BUTTON	FUNCTION
MTR	MTR/DIM	Change the meter function in the transmit mode
RCL	RCL	Recall the quick memory bank memory

Table 11 – 22 Duplicate Button Functions

NAME	DIAL	FUNCTION
DOWN	DSP/SEL to left	Decreases the VFO frequency or memory selection by 1 step
UP	DSP/SEL to right	Increases the VFO frequency or memory selection by 1 step
N/A	-	No function – disables the button
USER	-	For future expansion – do not select

Table 12 – Miscellaneous redundant or useless function

## 7 Adaptation (Menu)

If you t-press the “F■” button, the display will show the word MENU to the right of the frequency readout. Below the word MENU is the name of one of 62 adaptable parameters. You may then sequence through the parameter names by turning the “DSP/SEL” knob. When you find the desired parameter, press the “DSP SEL” knob. The word MENU will then blink and the lower right now shows the current value of the parameter. With most parameters, you then turn the “DSP SEL” until the desired value is displayed. In most cases, pressing the “HOME/RCL” button will restore the factory default. Then press the “DSP SEL” button again to stop the MENU blinking. When you are done changing parameters, t-press the “F■” button to exit MENU operations.

There are 7 exceptions to the above procedure. The exceptions are BCN TXT, BEEP VOL, CWSPEED, CWSTONE, MEMTAG, MY BAND, and MY MODE. The procedures for those exceptions will be discussed later in this section

EXT MENU - When EXT MENU is turned off, only the 16 most used parameters are presented. The parameter names are in alphabetical order (except EXT MENU) in a continuous loop to expedite finding the right parameter. Since you may have to extend the menu to all 62 parameters, EXT MENU is placed before the alphabet and a beep sounds when it is selected.

ID	NAME	FUNCTION	DEFAULT	VALUES
001*	EXT MNU	Extension menu	OFF	ON / OFF
002	A&F DIAL	AM & FM dial	DISABLE	DISABLE / ENABLE
003	APO	APO time	OFF	OFF / 1~12 h
004	BCN TIM	Beacon time	OFF	OFF / 1~255 sec
005	BCN TXT	Beacon text	-	-
006	BEEPTON	Beep tone	880 Hz	440 / 880 / 1760 Hz
007*	BEEPVOL	Beep volume	000~100 (FIX ), or	101~201 (LNK -50 ~ +50)
008	CAT RTS	Comp Aided Trans	ENABLE	DISABLE / ENABLE
009	CAT TOT	CAT time out time	10	10, 100, 1000, 3000 ms

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ID	NAME	FUNCTION	DEFAULT	VALUES
010	CATRATE	CAT baud rate	4800	4.8, 9.6, 19.2, 38.4 KHz
011	CLAR	Clear DIAL/SEL	DIAL	DIAL / SEL
012	CLK SFT	Clock shift	OFF	ON / OFF
013*	CONT	Disp contrast	24	1 ~ 24
014	CW AUTO	CW auto mode	OFF	ON / OFF
015	CW BFO	CW BFO	USB	USB / LSB / AUTO
016	CW DLY	CW delay	250	FULL / 30 ~ 3000 msec
017	CW KEY	CW key reverse	NOR	NOR / REV
018	CW QSK	CW break in delay	15	15, 20, 25, 30 msec
019	CWPADDL	CW paddle	KEY	KEY / MIC
020*	CWPITCH	CW pitch	700	400,500,600,700,800 Hz
021*	CWSPEED	CW speed	12	4 ~ 60 wpm
022*	CWSTONE	CW side tone	FIX 10 or LNK 8	
023*	CWTRAIN	CW training	Numeric	N num, A alp, M mixed
024	CWWEIGT	CW weight	1/3.0	25 ~ 45 (2.5 ~ 4.5)
025	D DISP	Data display		
026	D TYPE	Data mode	RTTY	RTTY,USER-L,USER-U
029*	DIALSTP	Dial step size	SBB 10, FM 100	SSB 1,10,20 FM 100, 200
030	DIG VOX	VOX switch level	OFF	OFF, 1~100
031	EMERGEN	Emergency	OFF	ON / OFF
032	KEYHOLD	hold time for t-press	1.0	0.5, 1.0, 1.5, 2.0 sec
033	LOCKMOD	Lock mode	FREQ	FREQ, PANEL, ALL
034	M-TUNE		ON	ON / OFF
035	MEM GRP	Memory group	OFF	ON / OFF
036	MEM-TAG	Alpha tags for chan	TAG-OFF	TAG-OFF / TAGNAME
037*	MIC EQ	MIC equalizer	0	0 ~ 9
038*	MICGAIN	MIC gain	NOR	LOW, NOR, HIGH
039	MICSCAN	MIC auto scan	ON	ON / OFF
040	MY BAND	Hide unused bands	ON	see text above ON / OFF
041	MY MODE	Hide unused modes	ON	see text above ON / OFF
042	P M-DWN	MIC down sw prog	DWN	see Tables 9, 10, 11, 12
043	P M-FST	MIC fast sw prog	N/A	see Tables 9, 10, 11, 12
044	P-M-UP	MIC up sw prog	UP	see Tables 9, 10, 11, 12
045	PEAKHLD	Meter peak hold	ON	ON / OFF
046*	PNL-C.S	Panel custom switch	DWN	see Tables 9, 10, 11, 12
047	QSPL-F	Quick split frequency	+5	-20 ~ +20
048*	RFPOWER	RF power	100	5 ~ 100 watts
049	RPT	Repeater shift direction	SIMPLEX	-Shift, SIMPLEX, +Shift
050	RPT SFT	Repeater shift offset	HF 0.1 / 50M 1.0	0 ~ 9.99
051	RTY SFT	RTTY shift	170	170, 200, 425, 850
052	RTY TON	RTTY tone	2125 Hz	1275, 2125 Hz
053	RTYRPOL	RTTY RX polarity	NOR	NOR / REV
054	RTYTPOL	RTTY TX polarity	NOR	NOR / REV
055	SCN RES	Scan resume	TIME 5	BUSY, TIME 1 ~ 10 sec
056	SELDIAL	Select dial mode	100 kHz	see note 2
057*	SQL TYP	SQL type	OFF	OFF, ENC, END DEC
058	SQL/RFG	SQL/RF gain	RF GAIN	SQL, RF GAIN

ID	NAME	FUNCTION	DEFAULT	VALUES
059	STBY BP	Standby beep	OFF	ON / OFF
060	TONE F	Tone freq	88.5 Hz	see Table 14 ( 67 ~ 254.1 Hz)
061	TOT	Turn off time	OFF	OFF, 1 ~ 20 minutes
062*	TUNER	Tuner / ATAS	INT ATU	ATAS. ext ATU, int ATU
063	VOX DLY	VOX delay	500 msec	100 ~ 3000
064*	VOXGAIN	VOX gain	50	1 ~ 100

Table 13 – Adaptable Parameters

Note 2 : 0=CWS sidetone,1=CW keyer spd,2=100KHz step,3=1MHz step,4=MIC gain,5=RF pwr

## 7.1 Transceiver function operational parameters

APO – default OFF out of 1 ~ 12 hours

Selects the automatic power off time if no action taken.

BEEPTON – default 880 Hz out of 440, 880, 1760 Hz

Sets the tone of the transceiver beep alert to the user. The system uses these tones to signal completion of an action or reaching certain values (as in EXT MENU)

BEEPVOL – default either FIX10 or LNK-8 out of range of FIX0 ~ FIX100 or LNK-50 ~ LNK+50

Sets the volume of the of the transceiver beep alert to the user. This is either a fixed volume or one that is linked to and offset from the audio volume control. To toggle between a fixed volume and a volume linked to the setting of the audio volume control, press the “F■” key.

CLK SFT – default OFF out of ON or OFF

Shifts the CPU clock frequency. Used to move a spurious response “birdie” if it interferes with reception.

EMERGEN – default OFF out of ON or OFF

Set Alaska emergency spot frequency of 5167.5 kHz.

MEM GRP – default OFF out of ON or OFF

Reconfigures the 500 general purpose memory channels into 10 groups of 50 channels.

MEM-TAG –

Replace the memory channel name with your own 7 character tag. When you select a channel, the number will display for two seconds before the tag displays.

PEAKHLD – default ON out of ON or OFF

Hold the S meter on its peak value for 0.5 seconds to make it easier to read.

QSPL-F – default +5 out of -20 ~ +20 kHz in 1 kHz increments

Offset frequency when using the one step Quick Split for transmit.

RFPOWER – default 100 watts out of 5 ~ 100 watts in 1 watt increments

Set the maximum transmit power for the current band.

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SCN RES – default 5 seconds out of 1 ~ 10 seconds in 1 second increments  
Sets the delay time after signal lost before scan resumes.

STBY BP – default OFF out of ON or OFF  
Transmit a beep at end to inform the receiving station that your transmission is complete.

TONE F – default 88.5 Hz out of Table 14 below  
Sets the CTCSS tone frequency

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	159.8	162.2	165.5	167.9
171.3	173.8	177.3	179.9	183.5	186.2	189.9	192.8	196.6	199.5
203.5	206.5	210.7	218.1	225.7	229.1	233.6	241.8	250.3	251.4

Table 14 – CTCSS tone frequencies (Hz)

TOT – default OFF out of OFF, 1~ 20 min  
Selects the time-out-timer if mic switch held too long.

## 7.2 Tranceiver Controls

A&F DIAL – default DISABLE out of ENABLE, DISABLE  
Enables and disables the “MAIN” dial in AM and FM modes

CLAR – default DIAL out of DIAL OR SEL  
Determines whether the “MAIN” dial or “DSP/SEL” knob will adjust the clarifier offset.

CONT – default 10 out of 1 ~ 24  
Adjusts the display contrast.

DIALSTP – default SSB or CW is 10 Hz and AM or FM is 100 Hz from see Table 5  
Sets the “MAIN” dial step size for the current mode

KEYHOLD – default 1.0 second out of 0.5, 1.0, 1.5, 2.0 seconds  
Sets amount of time before button t-press functions take place.

LOCKMOD – default FREQ out of FREQ, PANEL, ALL  
Set the lock mode evoked when the LOCK button is toggled. Those modes are FREQ, PANEL, and ALL.

Regardless of which LOCKMOD is selected, the following functions will be locked when LOCK is engaged: MAIN dial, DSP/SEL knob, FAST, BAND, A=B, A/B, MW, V/M, HOME, RCL, PMS, SCN, SPLIT, and STO.

In addition the following are added:

For FREQ – STEP, the C.S functions QSPL, DWN, FAST, and UP, and the microphone buttons UP, DWN, and FAST.

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For PANEL – DSP, ATT/IPO, NB, AGC, METER, MODE, KEYER, CLAR, and STEP

For ALL – DSP, ATT/IPO, NB, AGC, MODE, KEYER, CLAR, VOX, STEP, the C.S functions MONI, N/A, P/B, PLAY1, PLAY2, PLAY3, SWR, VCC, QSPL, DWN, FAST, and UP, and the microphone buttons UP, DWN, and FAST.

PNL-C.S – default VCC out of Table 9, Table 10, Table 11, or Table 12

One of 53 functions shown in Table 9, Table 10, Table 11, or Table 12 can be assigned to the “VOICE/C.S” key.

SELDIAL – default 100 kHz out of CWSTONE, CWSPEED, 100KHZ, 1MHZ, MICGAIN, RFPOWER  
Sets the secondary function if the “DSP/SEL” knob is pressed.

TUNER – default INT ATU out of ATAS, EXT ATU, INT ATU, INTRATU, F TRANS  
Sets the auto antenna and antenna tune.

M-TUNE – default ON out of ON or OFF  
Allows copy and tuning from memory channel. Does not alter the memorized channel unless you write it back.

SQL/RFG – default RF-GAIN out of SQL or RF-GAIN  
Select the configuration for the panel “SQL/RF” knob.

### 7.3 Computer Aided Transceiver (CAT) Operation

CAT RTS – default ENABLE out of DISABLE or ENABLE  
Enables or disables the request to send (RTS) port of the CAT jack.

CAT TOT – default 10 milliseconds out of 10, 100, 1000, 3000 milliseconds  
CAT time-out-timer for a single message. If a message exceeds this time, the input will be disabled.

CATRATE – default 4800 bits per second out of 4800, 9600, or 38400 bits per second  
CAT baud rate.

SQL TYP – default OFF out of OFF, CTCSS encoder, CTCSS encoder/decoder – tone squelch  
Selects the tone encoder and/or decoder mode.

### 7.4 Adaptation of CW communication

CW AUTO – default OFF out of OFF or ON  
Enable key jack to automatically allow CW operation when USB or LSB selected.

CW BFO – default USB out of USB, LSB, or AUTO  
Select CW carrier injection location. If AUTO is selected, the system will automatically use LSB below 10 mHz or USB above 10 mHz)

CW DLY – default 250 milliseconds out of FULL or 30 ~3000 milliseconds

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Receiver recovery time with semi-break-in operation.

**CW KEY** – default NOR out of NOR or REV

Keyer wiring configuration. In NOR, the plug tip produces dots and the plug ring produces dashes. In REV, the plug tip produces dashes and the plug ring produces dots.

**CW QSK** – default 15 milliseconds out of 15, 20, 25, or 30 milliseconds

Transmit delay when from key to carrier.

**CWPADDLE** – default KEY out of KEY or MIC

Use paddle via KEY jack or use up/down buttons on MH-31 A8J microphone (MIC) as paddle

**CWPITCH** – default 700 out of 400, 500, 600, 700, or 800 Hz

Set the pitch of the CW sidetone, (BFO offset) and the CW filter center frequencies. To hear the tone, press the “METER/DIM” button.

**CWSPEED** – default 12 WPM (60 CPM) out of 4 ~ 60 WPM or 20 ~ 300 CPM

Set the CW speed of the automatic keyer. To toggle between display in words per minute (WPM) and characters per minute (CPM) press the “F■” key. To hear the tone, press the “METER/DIM” button.

**CWSTONE** – default either FIX10 or LNK-8 out of range of FIX0 ~ FIX100 or LNK-50 ~ LNK+50

Set the CW sidetone volume level. To toggle between a fixed volume and a volume linked to the setting of the audio volume control, press the “F■” key. To hear the tone, press the “METER/DIM” button.

**CWTRAIN** – default N out of N, A, or M

Set CW training function. N = Numeric, A = Alpha, and M = Mixed. See section 8.4, CW Training for use of this parameter.

**CWWEIGHT** – default 1/3.0 out of 1/2.5, 1/3.0, 1/3.5, 1/4.0 and 1/4.5

Set the CW weight of dot size / dash size.

**BCN TIM** – default OFF out of OFF, 1 ~ 255 seconds

Selects the time interval between transmission of a CW beacon message.

**BCN\_TXT** – default not applicable

Stores the message for a beacon transmission. This adaptation procedure is more complicated than other parameters. After selecting BCN TXT with the “DSP/SEL” knob, we must add steps using the “MAIN” dial to select the first character 1:1..., the “DSP/SEL” dial to enable storing, the “MAIN” dial to select a character from A-Z, 0-9, /, →, and the space character, the “DSP/SEL” knob to move on to the next character, and so on. If the text string is more than 40 characters but less than 79 characters, set the 40<sup>th</sup> character to →, press the “DSP/SEL” knob twice, turn the “MAIN” dial to select the next character 2:2... and continue on. If the text string is more than 79 characters but less than 118 characters, set the final character of slot 2 to →, press the “DSP/SEL” knob twice, turn the “MAIN” dial to select the next character 3:3... and continue on. Be sure to terminate the text string with the → character.

## 7.5 Adaptation to exclude bands and modes

MY BAND, MY MODE - defaults ON (all bands and modes) out of OFF or ON

To enable or disable the 10 bands shown in Table 3 (GEN stays on) or the 6 modes shown in table 2, we insert a step in standard adaptation procedure. After selecting MY BAND or MY MODE we must pressg the “BAND▼” and “BAND▲” or “MODE▼” and “MODE▲” buttons to select the appropriate band or mode respectively before rotating the “DSP/SEL” knob to set each band or mode to OFF or ON.

Hint: I rarely use the 6 meter band and chose to disable it. I then found that I could not access the 33 mHz through 60 mHz portion of the spectrum without first changing the adaptation after which I would change it back. I solved the problem by setting up one memory channel in the upper portion of the spectrum. By selecting that channel, I can now access anywhere in that portion of the spectrum without changing adaptation.

## 7.6 Adaptation for microphone

MIC EQ – default 0 out of 0 ~ 9

Set one of the DSP microphone equalizer values

MICGAIN – default NOR out of LOW, NOR, or HIGH

Set the microphone gain. Note: in LOW setting the speech processor is turned off automatically. Otherwise it is turn on automatically.

MICSCAN – default ON out of ON or OFF

Default scanning on DWN/FST/UP microphones. May be replaced by PM\_DWN, PM-UP below. When off, the frequency will scan DWN or UP as long as the button is held down and stop when the button is released. If this parameter is set to ON, if the DWN or UP button is held down for more than 1 second, scanning will continue even after the button is released.

P M-DWN – default DOWN out of Table 9, Table 10, Table 11, or Table 12

Adaptable button on some microphones. One of 53 functions shown in Table 9, Table 10, Table 11, or Table 12 can be assigned to the DWN button.

P M-FST – default N/A out of Table 9, Table 10, Table 11, or Table 12

Adaptable button on some microphones. One of 53 functions shown in Table 9, Table 10, Table 11, or Table 12 can be assigned to the FST button.

P-M-UP – default UP out of Table 9, Table 10, Table 11, or Table 12

Adaptable button on some microphones. One of 53 functions shown in Table 9, Table 10, Table 11, or Table 12 can be assigned to the UP button.

## 7.7 Adaptation of repeater communication

RPT – default SIMPLEX out of -SHIFT, SIMPLEX, or +SHIFT

Set repeater shift direction.

RPT SFT – default 100 kHz for HF, 1 mHz for 6 meter out of 0.00 ~ 99.99 mHz

Set magnitude of the repeater shift on the 28 or 50 mHz bands.

## 7.8 Adaptation of Data communication

D DISP – default 0 Hz out of -3000 ~ +3000 Hz  
DATA mode operation display offset for USER-L or USER-U.

D TYPE – default RTTY out of RTTY, USER-L, or USER-U  
Define DATA mode.

DIG VOX – default OFF out of OFF and 1 ~ 100  
Set the VOX input level for DATA mode.

## 7.9 Adaptation of RTTY communication

RTY SFT – default 170 Hz out of 170, 200, 425, 850 Hz  
Set the frequency shift for FSK RTTY operation.

RTY TON – default 2125 Hz out of 1275 Hz and 2125 Hz  
Set the mark tone for RTTY operation.

RTYRPOL – default NOR out of NOR and REV  
Set the mark or space polarity for RTTY reception. NOR = normal and REV = reverse.

RTYTPOL – default NOR out of NOR and REV  
Set the mark or space polarity for RTTY transmission. NOR = normal and REV = reverse.

## 7.10 Adaptation of VOX Operation

VOX DLY – default 500 milliseconds out of 100 ~ 3000 milliseconds in 100 msec increments  
Set the “hang time” for the VOX circuitry.

VOXGAIN – default 50 out of 1 ~ 100  
Set the gain of the VOX circuit. This may be done while transmitting.

## 8 Procedural Uses

I have included some operational notes to show how I currently use the system. It is best to start with the shift centered, ATT off, IPO off, the RF gain full on (unless you are doing scanning) and the AF gain so the noise is not too high.

### 8.1 CW Setup

No, I am not going to repeat the whole manual here. There are too many permutations and combinations. I am assuming you have adapted the CW parameters the way you want them. The first time, for straightforward communication:

- 1) Set the shift, ATT, IPO, RF gain and AF gain as shown in section 8,
- 2) Select the band,
- 3) Set the mode as CW,
- 4) turn the keyer on,
- 5) Turn BK-IN on,
- 6) Set the DSP parameters the way you think you want them, and
- 7) Select a good starting frequency.
- 8) Save this setting in the channel memory and remember where you put it.

You are now ready to go. Either dial in the frequency you want to initiate communications or dial to look for someone calling.

Then next time you want to start up on the same band:

- 1) Set the shift, ATT, IPO, RF gain and AF gain as shown in section 8,
- 2) Restore the memory channel for this setting

If you plan to change frequency, nudge the MAIN dial to enter M\_TUNE. Either dial in the frequency you want to initiate communications or dial to look for someone calling.

## **8.2 SSB Setup**

The first time, for straightforward communication:

- 1) Set the shift, ATT, IPO, RF gain and AF gain as shown in section 8,
- 2) Select the band,
- 3) Set the mode to USB above 10 mHz or LSB below 10 mHz,
- 4) turn the VOX on,
- 7) Set the DSP parameters the way you think you want them, and
- 8) Select a good starting frequency.

- 9) Save this setting in the channel memory and remember where you put it.

You are now ready to go. Either dial in the frequency you want to initiate communications or dial to look for someone calling.

Then next time you want to start up on the same band:

- 1) Set the shift, ATT, IPO, RF gain and AF gain as shown in section 8,
- 2) Restore the memory channel for this setting

If you plan to change frequency, nudge the MAIN dial to enter M\_TUNE. Either dial in the frequency you want to initiate communications or dial to look for someone calling.

### 8.3 Antenna Testing

It is very convenient to test the standing wave ratio of the antenna as seen by the transceiver right from the transceiver itself. Adapt the C.S function to SWR. Turn off the antenna tuner. Select the desired frequency. Then simply press the "VOICE/C.S" button and read the SWR on the meter. The transceiver will drive the antenna with about 10 watts and automatically switches the meter to SWR. If the reading is 3.0 or less, then the antenna system is adequate for use with the built in antenna tuner.

Hint: I found it convenient to set up a channel group with frequencies near the lower and upper ends of the bands I am interested in. I can then test my multi-band antenna(s) quickly selecting frequencies from that group.

### 8.4 CW Training

To practice sending, simply set up for CW operation. F-press "VOX/STO" to disable the BK-IN function. Any code sent with the key will now be audible through the speaker or headphones, but no transmission will take place. When you are done, be sure to restore the BK-IN function.

For CW reception training, the FT-450 has a built in CW Training feature, which sends random Morse Code five-character groups via the sidetone (heard in the speaker). The groups may be numeric, alpha or a mixture of both alpha and numeric characters. This feature is a little strange as it is only available in MENU mode. Simply enter MENU mode as you normally would for changing adaptation and select the CWTRAIN parameter. If you followed the procedure in section 7, Adaptation, you should now see the letter A, N, or M for alpha, numeric, or mixed respectively. You can change that adaptation at any time with the "DSP/SEL" knob.

While still in that mode (menu blinking) press the "F■" button. The random 5 code group will be heard through the speaker or earphones followed by a display of the 5 characters so you can check your work. Repeatedly press of the "F■" button for new groups as long as you wish. When you are done, be sure to exit the selection and MENU mode in the normal way.

## 9 Acronym Glossary

AGC	Automatic gain control
AF	Audio frequency
AM	Amplitude modulation
ATT	Attenuation
CAT	Computer aided transceiver
CPU	Computer processor unit
CTCSS	Continuous tone-coded squelch system
CW	Continuous Wave
DNR	Digital noise reduction
DSP	Digital signal processor
FM	Frequency modulation
FSK	Frequency shift keying
HF	High frequency
IF	Intermediate frequency
IPO	Intercept point optimization
LCD	Liquid crystal display
LSB	Lower side band
MIC	Microphone
QMB	Quick memory buffer
RTS	Request to send
RTTY	Radioteletype
SNR	Signal to noise ratio
SQL	Squelch
SWR	Standing wave ratio
TX	Transmit
USB	Upper side band
VFO	Variable frequency oscillator
VOX	Voice operated transmission