

## Introduction

The MFJ-441 *SlimLine*<sup>™</sup> Econo Keyer with Memory is a microprocessor controlled keyer that provides iambic key operation and dot-and-dash memory to make sending perfect code easier. It has tunable code speed, code weight, and sidetone frequency; it supports both direct and grid-block keying outputs. You also get to choose between Iambic Type "A" and Type "B" keying. It even has a volatile memory to record and play a message of your choice.

## Control Functions

1. The **Power** button turns the unit ON and OFF. The power is ON when the button is locked in the "in" position and OFF in the "out" position.
2. The **Semi-Auto/Auto** button allows semi-automatic "bug" and manual operations. The keyer generates dots automatically when a squeeze or single lever key is used. Dashes are manually made. The keyer is completely manual when a straight key is used. Semi-Auto is active when the switch is in the "in" position and Auto when in the "out" position.
3. The **Message** button lets you record and play a message from the volatile memory. It is a momentary push-button that is time sensitive.
4. The **Speed** control varies the code speed. The speed range is configured with an internal jumper (JMP9) for 5 to 65 WPM or 10 to 40 WPM. Turn the control clockwise to increase speed and counter-clockwise to decrease speed. The unit is factory set to 5 to 65 WPM. To make the speed adjustment less sensitive, change the speed range to the narrower range of 10 to 40 WPM. To change the speed range the power must be off, then remove the cover by removing the two screws (one on each side) that secure it. Locate jumper JMP9 and set it to the "H" position.

*Note: Power must be off when changing the jumper settings.*

5. The **Weight** control varies the code weight from approximately 25% to 75%, with the standard dot defined as 50% weight. The standard dot-dash-space ratio is 1:3:1 (trimpot at mid-range). Turn the control clockwise to increase dot and dash lengths and counter-clockwise to decrease dot and dash lengths. This control is located internally. When looking at the unit's front panel, it is accessible through the small hole on the left side, closest to the *rear* and may be adjusted by inserting a small, flat-headed screwdriver.
6. The **Tone** control sets the desired sidetone pitch from approximately 300 to 1200 Hz. Turn the control clockwise to raise the pitch and counter-

clockwise to lower the pitch. This control is located internally. When looking at the unit's front panel, it is accessible through the small hole on the left side, closest to the *front* and may be adjusted by inserting a small, flat-headed screwdriver.

7. The **Volume** control adjusts the sidetone level of the internal speaker. Turn the control clockwise to increase the volume and counter-clockwise to decrease the volume.
8. The **Direct/Grid-Block Output** keying circuit allows keying of grid-block and solid state transmitters. The MFJ-441 can only key one type of transmitter at a time. This is an internal jumper selected option. The unit is factory set to direct keying. To change to grid-block keying the power must be off, then remove the cover by removing the two screws (one on each side) that secure it. Locate JMP1 and JMP2. JMP2 is directly behind the RCA jack and JMP1 is approximately one inch in front of JMP2. Set *both* jumpers JMP1 and JMP2 to the "G" position. To key a solid state transmitter, set both jumpers to the "D" position.

*Note: Power must be off when changing the jumper settings.*

9. The **Iambic Type A/B** mode is also set inside the unit with a jumper. The unit is factory set for Type "A" Iambic. If you prefer Type "B" Iambic, remove the cover by removing the two screws (one on each side) that secure it. Locate jumper JMP3 and set it to the "B" position. For Type "A" Iambic, set the jumper to the "A" position.

*Note: Power must be off when changing the jumper settings.*

When a squeeze is released during an element (dot or dash), type "B" adds the opposite element. Type "A" just finishes the element in progress and does *not* produce a following alternate element. For example, in Type "A" Iambic, a squeeze release during the "dah" in the letter A will produce "di-dah" (A). In Type "B" Iambic, a squeeze release during the "dah" in the letter A will produce "di-dah-dit" (R).

## Installation

1. A 9-volt battery (not included) may be installed. Remove the cover by removing the two screws (one on each side) that secure it.. A battery holder, located inside the enclosure, is provided for installing a 9-volt battery.
2. A 12 Vdc power supply may also be used to power the MFJ-441. A 2.1mm coaxial plug with a positive center and a negative sleeve should be used to power this unit. The MFJ-1312B, an optional 12 volts adapter, is available from MFJ Enterprises, Inc. The battery is automatically disconnected when external power is used.
3. A squeeze or single lever key can be used. Squeeze key allows Iambic operation. A 1/4-inch stereo phono plug and a two-conductor shielded cable should be used. If separate shielded cables are used, the two shields should be tied together and connected to ground. The dot wire should be connected to the tip of the plug and the dash wire to the ring. The MFJ-441 becomes a manual keyer when a straight key is used. The unit will safely key your transmitter and eliminate the shock hazard of high voltage being present on the straight key.

*Note: To use a straight key, first switch the keyer to the Semi-Auto mode (button in). Again a 1/4-inch stereo phono plug should be used because a mono plug will not work on a straight key in Semi-Auto mode. Connect one wire to the ring of the plug and another wire to ground. The tip of the plug should not used.*

4. Output keying circuit allows keying of grid-block and solid state transmitters. Remember this is internally jumper selected (refer to page 2). The keying output connection is made with a RCA phono plug.

*Note: Consult the transmitter's instruction manual to determine which output to use. When in doubt, try both jumper positions. The transmitter will key continuously when the jumpers are connected to the wrong positions.*

## Keyer Operation

1. A 9-volt battery or an optional dc adapter may be used to supply power to the keyer.

2. The key paddle should be connected to the **Key** jack on the rear panel of the unit. A dual paddle squeeze key or a single lever key can be used.
3. Next, the keyer should be turned on with the **Power** switch.
4. The **Semi-Auto/Auto** switch should be in the "out" position for automatic operation.
5. The user should now start sending with the paddle and adjust volume, tone, weight, and speed to his or her preference.
6. The dot and dash memories make sending easier. The memories allow the user to key a dot before the completion of a dash and vice versa. This feature can be checked by setting the keyer to the lowest speed and tapping first the dash lever and then the dot lever before the completion of the dash. The keyer will provide both the dash and the dot. The dash memory can be checked in a similar manner. The dot insertion feature allows the user to insert a dot by tapping the dot lever while holding the dash lever in. The dash insertion feature allows the user to insert a dash while holding the dot lever in. The Iambic operation allows sending of alternate dots and dashes when using squeeze key and with both paddles squeezed. The first paddle contacted will determine whether a dot or dash occurs first.
7. The user may select either **Iambic A** or **B** according to his preference.

### Message Memory

The **Message** button is used to record and play your message. To record the message, press and hold the **Message** button until the keyer plays "GO" (dah-dah-dit dah-dah-dah) in Morse code and the LED flashes. You may now key in the message of your choice. As you pause after every word, the keyer will play a "W" (di-dah-dah) over the sidetone speaker to show that it is inserting a word break (uses one unit of memory). If you make a mistake entering a word, you can back up over it by briefly pressing and releasing the **Message** button. The keyer will erase the last word, then play the word before it (if any) to let you know where you stopped. If deleting the first word of the message, the keyer will play "GO" instead. At the end of your message, press and hold the **Message** button until the keyer sends an end of message character "+" (di-dah-di-dah-dit) and the LED stops flashing. When there are ten or less units of memory remaining, the LED will flash faster to let you know the memory is running low. If you try to save more characters than you have memory, the keyer will automatically end your message and send you an end of message character. The

speed, weight and tone *cannot* be changed during message recording. Also, the output keying circuit is disabled during recording.

**Note:** A straight or manual key cannot be used to record the message.

To play the recorded message, momentarily press the **Message** button. On-going message can be stopped by tapping either paddle or pressing the **Message** button.

The memory is set up for *only one* message and it is volatile; that is, when power is removed the message is erased. There are 85 units of memory, which can record up to 85 characters (nine elements maximum per character--an element is a dot or a dash). Each normal character uses one unit of memory; only the rarely used 7-, 8- and 9-element characters require two units of memory.

#### **Embedded Commands:**

While in the message recording mode you may use embedded commands for special features. To use an embedded command simply store the multi-character embedded command code within your message.

**/D** Decrement--decrements the serial number. Serial number 0001 will decrement to 9999, skipping 0000 since it is not used. This feature allows a serial number to be sent twice in a message.

Example: UR RST 559 559 SN /N /D SN /N

**/G#** Gap--inserts a gap of # standard intra-character spaces into the message, where # is a digit in the range of 1 to 9 (0 can be used but not practical). Invalid numeral code will automatically default to zero. This command is used to exaggerate inter-character and word spacing.

**/L** Loop--creates a message loop (message repeat). Note that any character recorded after "/L" will not be sent.

Example: BEACON AA5CS 5 W /L

**/N** Number--inserts a contest serial number, in the range of 001 to 9999, into the message. Jumpers JMP4 to JMP8 controls the way zeroes and nines in the serial number are sent. Only three digits are sent for numbers less than 1000--use leading zeros when appropriate. The serial number is automatically post-incremented each time it is sent. Serial number 9999 will wrap-around to 0001, skipping 0000 since it is

not used. The serial number reset to 0001 when power on. If a different serial number is desired, it must be programmed during power up. To initialize the serial number, press and hold the **Message** button while turning the power on until the keyer plays "GO" (dah-dah-dit dah-dah-dah) and the LED flashes. You must then enter *four* numbers in Morse code for a valid serial number, most-significant digit first (invalid numeral code will automatically convert to zero). All numbers must be in the proper Morse code format. For example, the number "1" must be "di-dah-dah-dah-dah" and the number "0" must be "dah-dah-dah-dah-dah". When four numbers are entered, the keyer will automatically send an end of message character "+" (di-dah-di-dah-dit). The keyer then resumes with normal operation when the LED stops flashing. The serial number can be set from 0000 to 9999 (0000 will automatically convert to 0001).

Example: YOU ARE CONTACT NR /N

*/Pmmss* Pause—inserts a timed pause of *mm* minutes and *ss* seconds into the message. Four numbers must follow */P*". Invalid numeral code will automatically default to zero.

Example: TIMEOUT 1 HOUR /P6000 TIMEOUT 1.5 MIN /P0090 TIMEOUT 1 HR 40 MIN 39 SEC /P9999

*/R* Resume—suspends message playback to allow insertion of paddle entry. Once paddle sending is finished, press the **Message** button again to continue the message.

*/S* Space—inserts an extra standard word space into the message. This command yields the same result as */G7*" but uses one less unit of memory.

*//* Slash character—stores the slash character */*" into the message.

**Jumper Settings**

JMP1	JMP2								Keying Mode
D	D								Direct *
D	G								Invalid
G	D								Invalid
G	G								Grid Block
		JMP3							lambic Mode
		A							A *
		B							B
		JMP4	JMP5						Leading Zeroes
		L	L						none
		L	H						0
		H	L						0 *
		H	H						T
		JMP6	JMP7						Other Zeroes
		L	L						0 *
		L	H						0
		H	L						0
		H	H						T
		JMP8							Nines
		L							9 *
		H							N
		JMP9							Speed Range
		L							5 - 65 WPM *
		H							10 - 40 WPM

\* Factory defaults.

## Self Test

A self test is included to perform testing of the paddle, the buttons, the controls, and the audio circuitry. At any time, turn off the power to stop the self test.

To perform this test:

1. Turn off the power and remove the power plug.
2. Push all buttons so they are in the out position.
3. Turn all knobs to full clockwise position, except the Volume control. Set volume to a comfortable listening level.
4. Remove the box cover (2 screws).
5. Remove jumpers JMP4 to JMP7. Set jumper JMP3 to the "B" position. Set jumpers JMP8 and JMP9 to the "H" position.
6. Reconnect power.
7. Squeeze the paddle while turning the power on. The self test starts by sending the copyright message "COPYRIGHT 1996-199X MFJ ENTERPRISES, INC. VERSION X.XX" confirming the audio circuitry is working properly. Release the paddle before the message is finished. For the entire test, the LED should blink once after each operation. If the LED blinks continuously the unit fails the test and a Morse code message is sent to indicate the nature of the failure.
8. The paddle, the **Message** button, and jumpers JMP3 to JMP9 are automatically tested for shorts to ground. The LED should be off at this point.
9. Press and release the dot level; press and release the dash level.
10. Press and release the **Message** button.
11. Lock in the **Semi-Auto/Auto** button, then press and release the dash level.
12. Test the **Speed** control by turning it to full counter-clockwise then to full clockwise. The LED should blink once at each end.
13. Test the **Weight** and **Tone** controls in the same way. The LED should blink once at each end.
14. Test the jumper connections by placing the plug-in jumpers on the "A" position of JMP3 and then the "L" positions of JMP4 to JMP9 in ascending order. The LED should blink once for each jumper.
15. When all is okay, a repetitive message "PASS" is sent to the speaker. A repetitive message such as "SP FAIL" indicates that you did not follow the correct order or the unit failed the test.
16. Turn off the power after confirming the audio has good quality and remove the power plug.
17. Replace all jumpers to their original positions.
18. Replace the cover and secure it with the two (2) screws.
19. Reconnect power and resume with normal operation.

### Failure Message Meanings:



- DH FAIL Dash level is shorted or improperly connected.
- DT FAIL Dot level is shorted or improperly connected.
- J3 FAIL Jumper JMP3 is shorted or improperly connected.
- J4 FAIL Jumper JMP4 is shorted or improperly connected.
- J5 FAIL Jumper JMP5 is shorted or improperly connected.
- J6 FAIL Jumper JMP6 is shorted or improperly connected.
- J7 FAIL Jumper JMP7 is shorted or improperly connected.
- J8 FAIL Jumper JMP8 is shorted or improperly connected.
- J9 FAIL Jumper JMP9 is shorted or improperly connected.
- MG FAIL Message button is shorted or improperly connected.
- SA FAIL Semi-Auto/Auto button is shorted or improperly connected.
- SP FAIL Speed control is bad.
- TN FAIL Tone control is bad.
- WT FAIL Weight control is bad.

**Morse Code Character Set<sup>1</sup>**

A	di-dah	•—	N	dah-dit	—•
B	dah-di-di-dit	—•••	O	dah-dah-dah	— — —
C	dah-di-dah-dit	—•—•	P	di-dah-dah-dit	•—••
D	dah-di-dit	—••	Q	dah-dah-di-dah	—•—•
E	dit	•	R	di-dah-dit	•—•
F	di-di-dah-dit	••—•	S	di-di-dit	••••
G	dah-dah-dit	—••	T	dah	—
H	di-di-di-dit	••••	U	di-di-dah	••—
I	di-dit	••	V	di-di-di-dah	•••—
J	di-dah-dah-dah	•— — —	W	di-dah-dah	•— —
K	dah-di-dah	—•—	X	dah-di-di-dah	—••—
L	di-dah-di-dit	•—••	Y	dah-di-dah-dah	—•— —
M	dah-dah	— —	Z	dah-dah-di-dit	—•••
1	di-dah-dah-dah-dah	•— — — —	6	dah-di-di-di-dit	—••••
2	di-di-dah-dah-dah	••— — —	7	dah-dah-di-di-dit	—••••
3	di-di-di-dah-dah	•••— —	8	dah-dah-dah-di-dit	—••••
4	di-di-di-di-dah	••••—	9	dah-dah-dah-dah-dit	—•••••
5	di-di-di-di-dit	•••••	0	dah-dah-dah-dah-dah	— — — — —
Period	[.]	di-dah-di-dah-di-dah	•—•—•—	AAA	
Comma	[,]	dah-dah-di-di-dah-dah	—••— —	MIM	
Question Mark or Request for Repetition	[?]	di-di-dah-dah-di-dit	••—•••	IMI	
Fraction Bar or Slash Bar	[/]	dah-di-di-dah-dit	—••—•	DN	
End of Message, Plus Sign, or Cross	[+]	di-dah-di-dah-dit	•—•—•	AR	
End of Work		di-di-di-dah-di-dah	•••—•	SK	
Double Dash, Equal Sign, Pause, or Break	[=]	dah-di-di-di-dah	—••— —	BT	
Semicolon	[;]	dah-di-dah-di-dah-dit	—•—••	KR	
Colon	[:]	dah-dah-dah-di-di-dit	—••••	OS	
Apostrophe	[']	di-dah-dah-dah-dah-dit	•— — — •	WG	
Quotation Mark	["]	di-dah-di-di-dah-dit	•—•—•	AF	
Hyphen or Dash	[-]	dah-di-di-di-di-dah	—••••—	DU	
Underline	[_]	di-di-dah-dah-di-dah	••—•—	IQ	
Dollar Sign	[\$]	di-di-di-dah-di-di-dah	•••—••	SX	
Left Parenthesis or Go Only	[ ( ]	dah-di-dah-dah-dit	—•—•	KN	
Right Parenthesis	[ ) ]	dah-di-dah-dah-di-dah	—•—•—	KK	
Wait or Stand By		di-dah-di-di-dit	•—•••	AS	
Understood		di-di-di-dah-dit	•••—•	SN	
Starting Signal		dah-di-dah-di-dah	—•—•—	KA	
Error		di-di-di-di-di-di-dit	••••••••	HH	
Paragraph	[¶]	di-dah-di-dah-di-dit	•—•—••	AL	
Invitation to Transmit or Go Ahead	[K]	dah-di-dah	—•—	K	

1. FCC test requirement consists the 26 letters, the 10 numerals, the period, the comma, the question mark,  $\overline{AR}$ ,  $\overline{SK}$ ,  $\overline{BT}$  and fraction bar  $\overline{DN}$ .

**Signals Used In Other Radio Services**

Interrogatory	di-di-dah-di-dah	••—	$\overline{\text{INT}}$
Emergency Silence	di-di-di-di-dah-dah	•••—	$\overline{\text{HM}}$
Executive Follows	di-di-dah-di-di-dah	••••—	$\overline{\text{IX}}$
Break-in Signal	dah-dah-dah-dah-dah	————	$\overline{\text{TTTTT}}$
Emergency Signal	di-di-di-dah-dah-dah-di-di-dit	•••—•••	$\overline{\text{SOS}}$
Relay of Distress	dah-di-di-dah-di-di-dah-di-dit	—••—•••	$\overline{\text{DDD}}$

### Technical Assistance

If you have any problem with this unit first check the appropriate section of this manual. If the manual does not reference your problem or your problem is not solved by reading the manual you may call *MFJ Technical Service* at **662-323-0549** or the *MFJ Factory* at **662-323-5869**. You will be best helped if you have your unit, manual and all information on your station handy so you can answer any questions the technicians may ask.

You can also send questions by mail to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759; by Facsimile to 662-323-6551; or by email to [techinfo@mfjenterprises.com](mailto:techinfo@mfjenterprises.com). Send a complete description of your problem, an explanation of exactly how you are using your unit, and a complete description of your station.

### Notes

**Schematic**