The MFJ-451 Morse Keyboard sends Morse code from a keyboard. The MFJ-451 has two 100 character message memories and a 200 character type ahead buffer. This unit can repeat messages continuously, insert timed pauses within messages, and insert an auto-incrementing serial number. The speed, tone, and weight of the code are keyboard adjustable. The MFJ-451 has a internal sidetone speaker with a volume control on the front panel of the unit. The MFJ-451 has a paddle jack and a connection for an external speaker.

MFJ-451 Morse Keyboard

FEATURES

Memories:
Two independent 100 character message memories.

Type Ahead Buffer:
The MFJ-451 has a 200 character type ahead buffer with audible buffer full warning.

Built-In Iambic Keyer
Using the paddle jack makes the MFJ-451 a keyboard controlled iambic keyer.

Embedded commands:
Auto-incrementing serial numbers, Timed pauses up to 99 minutes 99 seconds, Message loop.

Adjustable Parameters:
Code speed is variable from 5 to 100 WPM, weight varies from 5 to 95 %.

Sidetone Speaker:
Internal sidetone speaker with adjustable volume and frequency.

Output Tune Mode:
Constant key to tune tuners or antennas

Key Output Disable:
Enable and disable key output to practice operation

Handkey Mode:
Use the space bar or iambic paddle as a straight key.

INSTALLATION

The MFJ-451 is supplied with an IBM-AT compatible keyboard. The unit is guaranteed to support the supplied keyboard but may be used with other standard 101 key AT style keyboards. ***Using an XT style keyboard or turning a switchable keyboard to "X" mode may damage both the keyboard and the MFJ-451.*** After checking the A-X switch on the back of the keyboard, plug the keyboard into the 5 pin DIN connector marked KYBRD IN on the MFJ-451.

The MFJ-451 Morse Keyboard requires a 12 VDC 250 milliamp power supply. The power jack accepts a 2.1mm coaxial plug with the center conductor positive and shield ground. An optional DC supply, the MFJ-1312B, is available from MFJ Enterprises. Connect your MFJ-1312B Power Adapter or compatible DC supply into the jack marked **POWER** on the MFJ-451 back panel.

This unit supports both positive and negative keyed radios. Connect a standard shielded RCA cable between your radio key input and to the MFJ-451's key output. The MFJ-451 is set up for a **Direct** or positive keyed radio(most solid state radios). The unit can be set up for **Grid Block** or negative (most radios with tube finals) by changing the internal jumper to the left most pair of pins on JMP1. JMP1 is located, with the POWER switch toward you, to the right rear of the PC board.

A paddle connects to the 3.5mm stereo phone jack with a shielded cable through the back of the unit. Connect the dot wire of the paddle to the ring on the plug and the dash wire to the center conductor. The shield on the plug should be attached to paddle ground.

An external speaker can be connected to the external speaker output on the rear or the unit by using a 3.5mm plug.

KEYBOARD OPERATION

The Morse Keyboard is simple to operate. After turning the unit on, it will send the characters "ON" in Morse code over the sidetone speaker and turn on the **POWER** LED. This tells you the MFJ-451 is ready for operation. Now the memories can be set along with the speed, tone and weight of the Morse code. If the volume is too low or too loud, adjust the volume control on the front of the unit.

After a key is pressed, a character will be sent to the key output and the speaker. If your typing speed is faster than the code speed, characters will fill the type ahead buffer. Pressing the backspace key will remove a character from the type ahead buffer before it is played. As the buffer is filled to 180 characters the sidetone frequency lowers. When the buffer is full, an error tone will sound for every key that is pressed. Any characters typed over 200 will be lost. As the code is played the buffer will empty.

While your type ahead buffer is emptying you may clear it by pressing **Esc**. The buffer will clear, all text in it will be lost, and the keyer will stop playing code. Now you may enter new text or play a message.
If you press **Pause** while your type ahead buffer is playing your message will stop playing. You can now insert text with the paddle. Press **Esc** and your type ahead buffer will continue playing where it stopped.

ADJUSTING CODE PARAMETERS

NOTE: *While changing parameters or loading memories, the MFJ-451 disables the output key so that erroneous code is not sent over the air.*

Sidetone Frequency (F2)
To adjust sidetone frequency, press **F2.** The unit will sound the present tone setting. Use the up and down arrow keys to increase or decrease the sidetone setting. Note that the tone will not affect your transmitted signal, only the sidetone speaker frequency changes. When you have found a tone setting that you like, press either **Esc** or **Enter** to exit the tone change mode.

Code WPM Speed (F3)
Code speed is set using the **F3** key. After you press **F3**, the MFJ-451 sends a series of dot-dashes over the sidetone speaker to indicate the current speed. There is only one method to change code speed. The up and down arrow keys can be used to vary the speed gradually.

Weight (F4)
Weight is set with **F4**. After pressing **F4**, a series of dot-dashes is played from the sidetone speaker. Pressing the up arrow key lengthens the on time of a dot or dash and shortens the off time. The down arrow key shortens the dot or dash length. To exit press either **Esc** or **Enter**. This feature lets you personalize your code and can help to avoid clipping if your radio or amplifier has a send delay. It can also increase your power out by increasing on time.

Parameter Save
All code parameters and message memories are saved in nonvolatile memory. Memory life is rated greater than 20 years.

Message Memories

The MFJ-451 has two 100 character message memories. Memory #1 is stored by pressing **F5** and memory #2 by pressing **F7**. The MFJ-451 tells you to "GO" in Morse Code and you may begin typing in your message. The keyer plays the message as you type it in. If you type past 90 characters, the playback frequency will become lower to indicate you are approaching the memory end. As you get to 100, an error tone will sound for every character you press. All characters over 100 are lost. You may then edit your message back to below 100 characters by using **Backspace** and then inserting shorter text.

At the end of your message hit **Enter**. An end of message character will sound to tell you the message has been programmed. After your message has been programmed it can be played by pressing **F6** for memory #1 or **F8** for memory #2**.**

Clearing the Memories

To erase memory, you save nothing in the memory location by simply pressing the F5 key for memory #1 and "Enter" or F7 key for memory #2 and "Enter".

Embedded Commands

While in the save message mode you may use embedded commands for special features. To use an embedded command simply enter the embedded command code within your message.

***To use* Ctrl *press and hold* Ctrl*, press and release the other key, release* Ctrl**

Ctrl-L To create a repeating message, press **Ctrl-L** at the end of the message and then hit **Enter**. As the MFJ-451 plays your message it comes to the **Ctrl-L** and repeats.
ex: AA5MT BEACON 5 W **Ctrl-L Enter**
This will repeat the message until you press **Esc**.

Ctrl-P The MFJ-451 also allows you to insert a timed pause within a message. By pressing **Ctrl-P** and then four numbers in a xxxx format you can pause the keyer from 00min 01sec to 99min 99sec. **Esc** exits.
ex: CQ CQ CQ DE KB5JOB **Ctrl-P**0045 **Ctrl-L Enter**
This will repeat the message every 45 seconds or until you hit **Esc**.

Ctrl-S Another memory feature is serial numbering. Type in a message and hit **Ctrl-S**. As the message plays, it will hit the **Ctrl-S** character and play the serial number. The serial number will then auto increment up to 9999. The serial number function sends an "N" character for nine and a "T" for zero. To store a new serial number press **F10** followed by four numbers and the **Enter**.
Pressing **F11** will decrement the serial number. The keyer will echo a "D" for every decrement.
ex: YOU ARE CONTACT NR**Ctrl-S** FOR THE BEAR BRYANT MEMORIAL WD4DAT **Enter**

Message Pause

While playing a message you may insert text of any length with the paddle. First load and play a message. While it is playing hit **Pause**. The keyer will stop and allow you to enter text with the paddle. When you are ready to resume the message press **Esc** once. The message will begin playing where it stopped.

KEYBOARD COMMANDS

Tune Mode
By pressing **F1** a constant key is sent to the radio to allow tuning of your station. **Esc** exits.

Key Output Disable
To disable the Output Key press **F9**. This enables you to practice without actually sending code to the transmitter. When you are ready to resume normal operation, press **F9** again. While changing parameters or loading memories, this toggle is off so that erroneous code is not sent over the air.

Handkey
By pressing **F12**, the space bar and the paddle, if one is attached, become a straight key. Normal keyboard operation is suspended until you press **Esc.**

Pause
By hitting **Pause,** you can stop sending the message buffer to the radio temporarily. By pressing **Esc,** sending resumes where the keyer stopped.

PROSIGNS

The following prosigns are assigned to keyboard characters: $\overline{\text{AAA}}$, $\overline{\text{MIM}}$, $\overline{\text{KR}}$, $\overline{\text{OS}}$, $\overline{\text{WG}}$, $\overline{\text{AF}}$, $\overline{\text{DN}}$, $\overline{\text{IMI}}$, $\overline{\text{DU}}$, $\overline{\text{IQ}}$, $\overline{\text{BT}}$, $\overline{\text{AR}}$, $\overline{\text{SN}}$, $\overline{\text{HH}}$, $\overline{\text{AL}}$, $\overline{\text{SX}}$, $\overline{\text{KA}}$, K, $\overline{\text{AS}}$, $\overline{\text{SK}}$, $\overline{\text{KN}}$, $\overline{\text{KK}}$, and $\overline{\text{AL}}$. See Page 5 for a complete chart showing keyboard assignments. To create prosigns not included on the keyboard, use the **Alt** key. The MFJ-451 produces prosigns by removing the intercharacter spaces from characters of keys while the **Alt** key is pressed.
ex: To produce the prosign $\overline{\text{AAA}}$ (.-.-.-) hold the **Alt** key down, press **A** three times, then release **Alt**

PADDLE OPERATION

The paddle input allows iambic keyer operation. The speed, weight, and tone for the paddle are the same as that for the keyboard. All iambic paddle parameters are controlled by the keyboard.

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 **601-323-0549** or the *MFJ Factory* at **601-323-5869**. 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 FAX to 601-323-6551; through Compuserve at 76206,1763; or by email to 76206.1763@Compuserve.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.

Keyboard Character to Morse Code Table

Keyboard key	Morse character		Keyboard key	Morse character			
A	A	.-	5	5	.....		
B	B	-...	6	6	-....		
C	C	-.-.	7	7	--...		
D	D	-..	8	8	---..		
E	E	.	9	9	----.		
F	F	..-.	0	0	-----		
G	G	--.	.	.	.-.-.-	$\overline{\text{AAA}}$	
H	H	....	,	,	--..--	$\overline{\text{MIM}}$	
I	I	..	;	;	-.-.-.	$\overline{\text{KR}}$	
J	J	.---	:	:	---...	$\overline{\text{OS}}$	
K	K	-.-	'	'	.----.	$\overline{\text{WG}}$	
L	L	.-..	"	"	.-..-.	$\overline{\text{AF}}$	
M	M	--	/	/	-..-.	$\overline{\text{DN}}$	
N	N	-.	?	?	..--..	$\overline{\text{IMI}}$	
O	O	---	-	-	-....-	$\overline{\text{DU}}$	
P	P	.--.	_	_	..--.-	$\overline{\text{IQ}}$	
Q	Q	--.-	=	=	-...-	$\overline{\text{BT}}$	
R	R	.-.	+	+	.-.-.	$\overline{\text{AR}}$	(1)
S	S	...	!	!	...-.	$\overline{\text{SN}}$	(2)
T	T	-	@	Error	.....	☐	
U	U	..-	#	Paragraph	.-.-..	$\overline{\text{AL}}$	
V	V	...-	$	$	...-..-	$\overline{\text{SX}}$	
W	W	.--	%	%	-.-.-	$\overline{\text{KA}}$	(3)
X	X	-..-	^	K	-.-	K	(4)
Y	Y	-.--	&	&	.-...	$\overline{\text{AS}}$	(5)
Z	Z	--..	*	*	...-.-	$\overline{\text{SK}}$	(6)
1	1	.----	(	(	-.--.	$\overline{\text{KN}}$	
2	2	..---	)	)	-.--.-	$\overline{\text{KK}}$	
3	3	...--	tab	Paragraph	.-.-..	$\overline{\text{AL}}$	
4	4	....-					

Notes: (1) Also 'End of Message'
(2) Also 'Understood'
(3) Also 'Start Signal'
(4) Also 'Invitation to Transmit'
(5) Also 'Wait'
(6) Also 'End of Work'

Function Key Quick Reference

Key	Usage
F1	Enter output tune-up mode. Press **Esc** to exit.
F2	Enter set sidetone frequency mode. Use the up and down arrows to vary frequency. Press **Esc** to exit.
F3	Enter set speed (WPM) mode. Use up and down arrows to vary speed. Press **Esc** to exit.
F4	Enter set weight mode. Use up and down arrows to vary weight. Press **Esc** to exit.
F5	Enter memory 1 store mode. Type in message then press **Enter** when finished.
F6	Enter memory 1 playback.
F7	Enter memory 2 store mode. Type in message then press **Enter** when finished.
F8	Enter memory 2 playback.
F9	Toggles between Output Key enable and disable.
F10	Serial Number Store
F11	Serial Number Decrement
F12	Hand Key Mode
Alt	Used for making prosigns by removing the intercharacter spacing of keys pressed while the **Alt** key is also pressed. For example, to produce the prosign $\overline{\text{AAA}}$ (.-.-.-) hold the **Alt** key down, press **A** three times, then release **Alt**.
Alt-Print Screen	Plays the EPROM code version number of your unit
Backspace	Allows the user to delete the last character entered into message memory or the last character entered into the type-ahead buffer if that character has not already been transmitted.
Esc	Exit any mode.
Pause	Enter pause mode. The keyer will stop the current message being played and will resume when **Esc** is pressed.
Enter	Store a stop character at the end of message memory.
Shift	Enable upper case characters if applicable. If the upper case character does not have a Morse translation then the keyboard simply repeats the lower case character. For example **Shift-A** is the same as **A** but **Shift - ;** produces **:**.
Spacebar	Insert a word break space into the message in normal operation. While the MFJ-451 is in handkey mode the spacebar is a straight key.

MFJ-451 Parts List

Part Designator	Part Description	MFJ Part Number
R1,R2,R4,R5,R8	Resistor, 1/4 Watt, 5%, Film, 10K ohm	100-4100
R3	Resistor, 1/4 Watt, 5%, Film, 130 ohm	100-2130
R6,R12,R13	Resistor, 1/4 Watt, 5%, Film, 33K ohm	100-4330
R7	Resistor, 1/4 Watt, 5%, Film, 1K ohm	100-3100
R9	Resistor, 1/2 Watt, 5%, Film, 30 ohm	101-1300
R10	Resistor, Pot.17mm, PCB, Linear, 500 ohm	155-2500-1
R11	Resistor, 1/4 Watt, 5%, Film, 82 ohm	100-1820
C1,C2	Capacitor, Multilayer Cer., NPO, 5%, 50 V, 33pF	205-0033
C3,C4,C11,C12	Capacitor, Multilayer, Cer., X7R, 10%, 50V, .01uF	205-1110
C7,C8,C9,C10,C14,C18	Capacitor, Multilayer, Cer., .1, Z5U, 20%, 50V, .1uF	205-1210
C5	Capacitor, Electrolytic, Radial, 35V, 47uF	203-0007
C6	Capacitor, Electrolytic, Radial, 50V, 1uF	203-0006
C13,C15,C16,C17	Capacitor, Multilayer, .1, 50V, 10%, X7R, .001uF	205-1010
D1,D2,D3	Diode, Rectifier, DO-41, 1 A, 50 PIV, 1N4001	300-1004
CR1	LED, 5mm Round, Red, MV5753	320-0001
L1,L2	Inductor, Molded, .3", 10%, BRN-BLK-BRN, 100uH	401-0030
Q1	Transistor, TO-92, NPN, MOT 2N3904	305-0018
Q2	Transistor, 300V, PNP, MPS-A92	305-2006
Q3	Transistor, VN10KM	305-6005
Q4	Transistor, NPN, MPS-A13	305-2007
Y1	Crystal, HC 18/U, 10MHz	405-0065
U1	IC, CPU, 40, 8-BIT, INTEL, P80C32-1	313-08032
U2	IC, HC, 20, Tri-State Octal Latch, 74HC573	310-3753
U3	EPROM, 32K, 450nS, 24 Pin, 2732-45	312-2052
U4	IC, Serial EPROM, CMOS, 512 X 8, 24C04A/P	312-32404
U5	Voltage Regulator +5 VDC, 7805T	307-1011
FOR U1	Socket, Low Profile, 40 PIN	312-0040
FOR U2	Socket, Low Profile, 20 PIN	312-0020
FOR U3	Socket, Low Profile, 28 PIN	312-0028
FOR U4	Socket, Low Profile, 8 PIN	312-0008
SW1	Switch, Push-Button PC, .5 A, 125 VAC, 2P2P	504-0022
For SW1	Knob, Plastic, Push-Button, .350" DIA, Red	760-2140
J1	Connector, DIN, PCB, Rt. Ang., F, 5 Pin	611-1005
J2,J5	Jack, 3,5mm, PCB, Stereo, Closed	601-5005
J3	Jack, RCA Phono, PCB, Single	600-0011
J4	Jack, 2.1mm, PCB, DC, Coaxial Jack	601-6021
JMP1	Connector, Header, .1, .375", 3 Pos	612-0103
FOR JMP1	Connector, Jumper, Shorting, .1, 2 Pos	612-4001
SPK1	LLT, Speaker, Round, 8 ohm	410-0024

MFJ-451 Schematic Diagram