

# MFJ

## *Digital SWR/Wattmeter*

*Model MFJ-826B*



### INSTRUCTION MANUAL

CAUTION: Read All Instructions Before Operating Equipment

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# The Basics

## Introduction

The MFJ-826B digital SWR/Wattmeter/Frequency Counter measures up to 1500 watts. It has three high-resolution ranges with accuracy in each range from 1.8 to 54 MHz. True peak or average forward and reflected watts, SWR and frequency can be simultaneously displayed.

There are also auto-ranging bar meter modes to display forward and reflected power, SWR and power twin bar meters, or SWR only bar meter; SWR and forward power are also displayed numerically. *PeakHold*<sup>™</sup> feature freezes the highest forward power displayed bar segment for one, two or three seconds. These digital-analog displays make it visually easy to tune antenna tuners, amplifiers and transmitters.

There are three high-resolution forward/reflected power ranges that are automatically selected: a QRP range (25 watts full scale), a mid-range (250 watts full scale) and a high-range (1500 watts full scale). *TrueActive*<sup>™</sup> peak reading circuit gives *true* peak or average power on all modes.

Built-in frequency counter gives any transmitter digital frequency readout in continuous carrier mode. Perfect for older and QRP rigs such as MFJ-9420 travel radios and MFJ-9340 *QRPCubs*<sup>™</sup>.

The MFJ-826B enters a “sleep” mode when idle and when no transmit signal is present, turning off the microprocessor clock to avoid the generation of spurious signals.

## Features

- Power range of 25, 250 or 1500 watts
- 1.8 to 54 MHz continuous frequency coverage
- Adjustable alarm SWR from 1.5 to 3.0
- Multifunction backlit LCD display with contrast control
- Numeric readings for frequency, SWR, forward and reflected power
- Bar meters for SWR, forward and reflected power with auto-ranging
- Peak or average power mode
- Built-in frequency counter
- Built-in bootloader for field upgradeable firmware

## Specifications

- RF power range : 25, 250 or 1500 watts
- Frequency range : 1.8 to 54 MHz continuous coverage
- Frequency counter accuracy :  $\pm 1$  kHz
- A/D conversion resolution : 10-bit
- Forward power display resolution : 0.1 for  $< 100$  watts and 1 for  $\geq 100$  watts
- Reflected power display resolution : 0.1 for  $< 10$  watts and 1 for  $\geq 10$  watts
- SWR display resolution : 0.01 for  $< 10:1$  and 0.1 for  $\geq 10:1$
- Power bar meters resolution : 60 segments

- SWR bar meter resolution : 56 segments
- Memory endurance : 1 million erase/write cycles typical
- Memory data retention : 100 years typical
- Power supply requirement : 12 - 15 volts DC
- Current consumption : 250 milliamps or less
- Dimensions (projections included) : 6 ½ × 2 ¾ × 6 ¾ in; 165 × 70 × 171 mm (w × h × d)
- Display : 2-line × 16-character backlight LCD
- TRANSMITTER connector : SO-239
- ANTENNA connector : SO-239
- POWER connector : 2.1 × 5.5 mm coaxial plug, center pin positive
- RS-232 connector : D-sub 9-pin

† Specifications and design are subject to change without notice or obligation.

## Front Panel

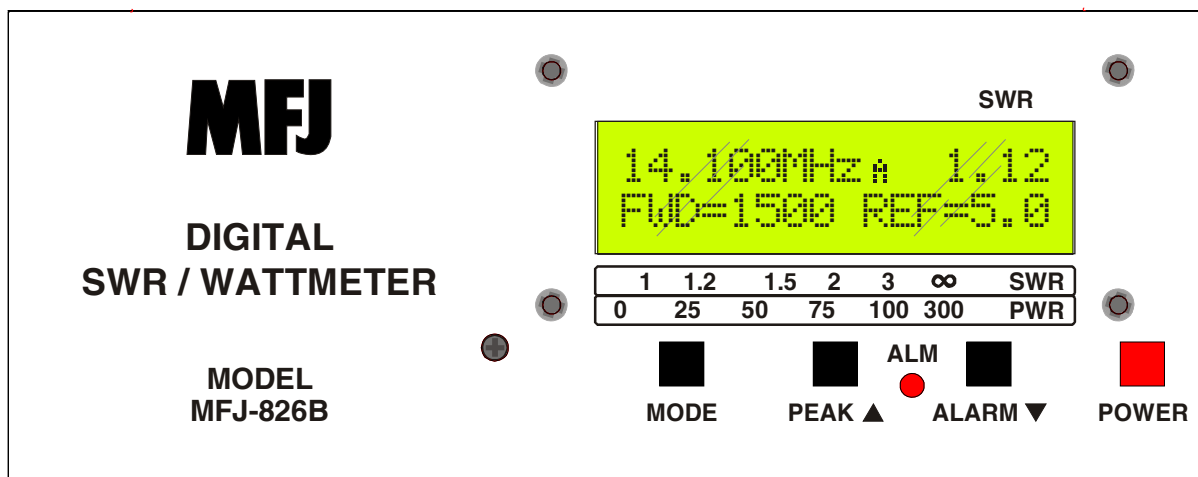


Figure 1. MFJ-826B Front Panel.

- **LCD Display:** A 2-line by 16-character alphanumeric display with backlight. It displays the unit's various menus and status. The display contrast can be adjusted by the LCD contrast control on the front panel. Below the display are the SWR and power bar meter scales. Refer to Figure 7 for descriptions of the various displayed information.
- **LCD Contrast Control:** A trimpot control that adjusts the contrast of the LCD display. Use a small flat blade screwdriver, insert into the small hole to the left of the display, and turn clockwise to increase contrast.
- **MODE Button:** Time-sensitive and used to navigate through the various main menus and to enter or exit the setup menus.
- **PEAK Button:** Used to select peak or average power mode. Peak envelope power (PEP) is measured by selecting a peak mode with selectable peak hold time. A small "A" appears on the display to indicate average mode. A small "1", "2" or "3" appears to indicate peak mode is ON and the number represents the peak hold time in second.

- **ALM LED:** Illuminates when the SWR is greater than the selectable alarm SWR.
- **ALARM Button:** Used to toggle the alarm feature on and off. When enabled, the ALM LED will light and the buzzer will sound when the SWR is greater than the selectable alarm SWR.
- **POWER Button:** Used to turn the unit on and off. Press to turn power on; press again to turn power off.

**WARNING:** Do not turn the power on and off rapidly, otherwise the unit's setting memory can be corrupted and the unit will have to be reset to factory defaults.

## Back Panel

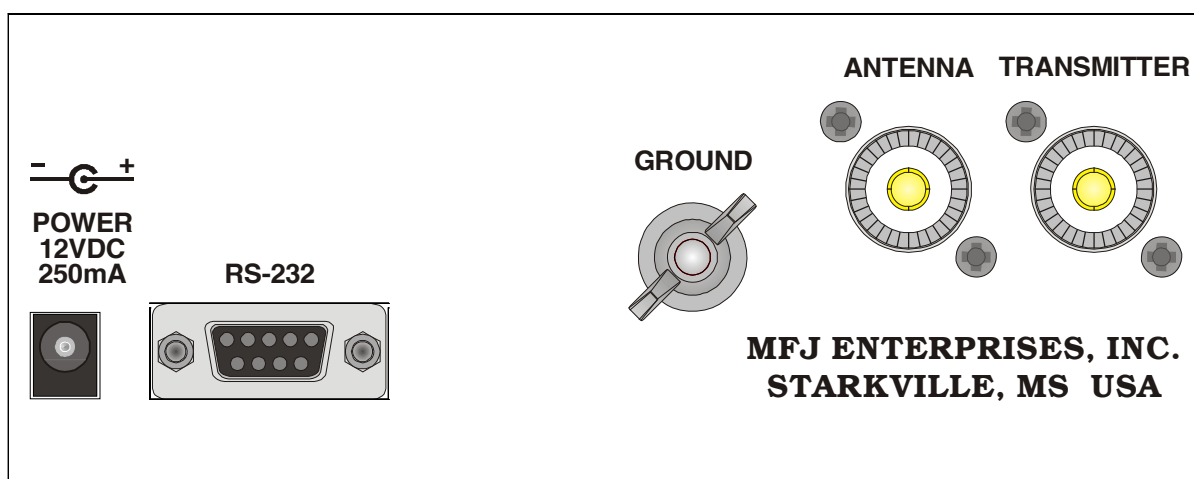


Figure 2. MFJ-826B Back Panel.

- **Power:** This jack accepts a standard  $2.1 \times 5.5$  mm coaxial plug with positive center and negative sleeve. The unit requires 12 volts DC at up to 250 milliamps. The use of a regulated supply is not mandatory but is recommended for best performance. An optional 12 volts DC 500 milliamp power supply, the MFJ-1312D, is available from MFJ Enterprises, Inc.

**WARNING:** Do not apply voltages greater than 18 volts to this unit, or permanent damage to the unit may result.

- **RS-232:** DB-9 female connector for connecting to the computer's RS-232 serial port to update firmware. Check <http://www.mfjenterprises.com> for the latest version of the firmware.
- **Ground:** Wing-nut terminal for RF ground wire connection.
- **Antenna:** SO-239 connector for coax cable from antenna or dummy load.
- **Transmitter:** SO-239 connector for coax cable from transmitter or transceiver.

## Installation

1. Place the wattmeter in a convenient location at the operating position.
2. Install the wattmeter between the transmitter and the desired antenna. Use good quality coaxial cable (such as RG-8/U) to connect the transmitter (or amplifier) to the rear panel connector marked TRANSMITTER.
3. Connect the antenna to the rear panel connector marked ANTENNA.
4. A GROUND post is provided for an RF ground connection.
5. Connect a 12 to 15 VDC power source capable of 250 milliamps to the rear panel jack marked POWER.

# The Menus

## Main Mode Menu

The main mode menus show various wattmeter settings and status. There are four main mode menus arranged in a “wrap-around” structure. When powered on, wattmeter operation starts with the main menu that was last used. Within each main menu, press the [MODE] button briefly to view the next main menu. Press and hold the [MODE] button for two seconds to enter the setup mode (see below). Refer to Figure 7 for details on the displayed information.

**Note:** *In sideband mode, the frequency readout on the wattmeter display jumps around to different frequencies while transmitting and stops on another frequency when un-keyed. This is normal and is a characteristic of sideband mode, because sideband signals jump around in frequency and power.*

## Digital Wattmeter Menu

Shows the frequency, SWR, and forward and reflected power in watts.

## Power Bar Meter Menu

Shows the frequency, SWR, forward power, and bar meters for forward and reflected power. The top bar meter is the forward power and the bottom bar meter is the reflected power. The numeric reading of forward power appears at the end of the bar meters. A power scale is printed just below the display on the front panel. Each power bar meter consists of 60 bar segments. When in the high power range, multiply the readings on the printed power scale by ten, and each vertical bar segment consists of four dots. Below 1000 watts, each bar segment represents 20 watts; above 1000 watts, each bar segment represents 200 watts. The forward bar meter has a “peak hold” feature. The peak meter hold function freezes the highest displayed bar segment of the forward power for approximately one, two or three seconds, so that you can more easily read the meter. This function can be turned ON and OFF with the PEAK button.

When in the mid power range (250 watts scale), each vertical bar segment consists of three dots. Below 100 watts, each bar segment represents two watts; above 100 watts, each bar segment represents 20 watts.

For low-power, meter range of 25 watts is available. When in the low power range, divide the readings on the printed power scale by ten, and each vertical bar segment consists of two dots. Below 10 watts, each bar segment represents 0.2 watts; above 10 watts, each bar segment represents two watts.



The power meter default condition is auto ranging. Auto range automatically sets the meter scale according to the input RF power to the wattmeter. Forward power greater than 250 watts automatically sets the meter to the high power range. Forward power less than 25 watts automatically set the meter to the low power range.



Figure 3. Power Bar Meter (High Range).

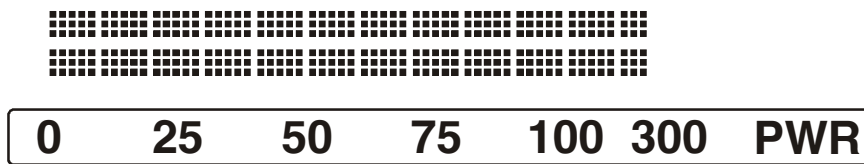


Figure 4. Power Bar Meter (Mid Range).

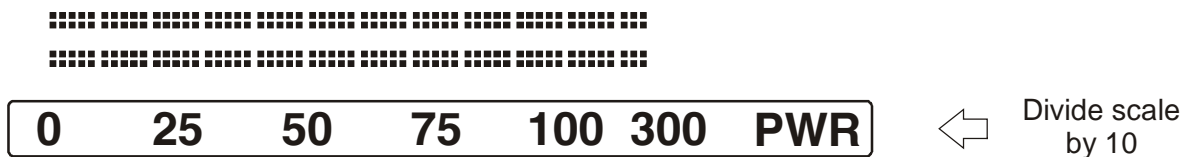


Figure 5. Power Bar Meter (Low Range).

### SWR Bar Meter Menu

Shows the frequency, SWR, forward power, and SWR bar meter. A SWR scale is printed just below the display on the front panel. The 12-block (56-segment) SWR bar meter indicates SWR of 1.00, 1.01-1.10, 1.11-1.20, 1.21-1.30, 1.31-1.40, 1.41-1.50, 1.51-1.70, 1.71-2.00, 2.01-2.50, 2.51-3.00, 3.01-5.00, 5.01-10.0 and infinity. The numeric reading of forward power appears at the end of the bar meter.

$$SWR = \frac{1 + \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}{1 - \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}$$



Figure 6. SWR Bar Meter.

### SWR/Power Bar Meters Menu

Shows the SWR bar meter on the top line and the power bar meters on the bottom line of the display. The numeric readings of SWR and forward power appear at the end of the bar meters.

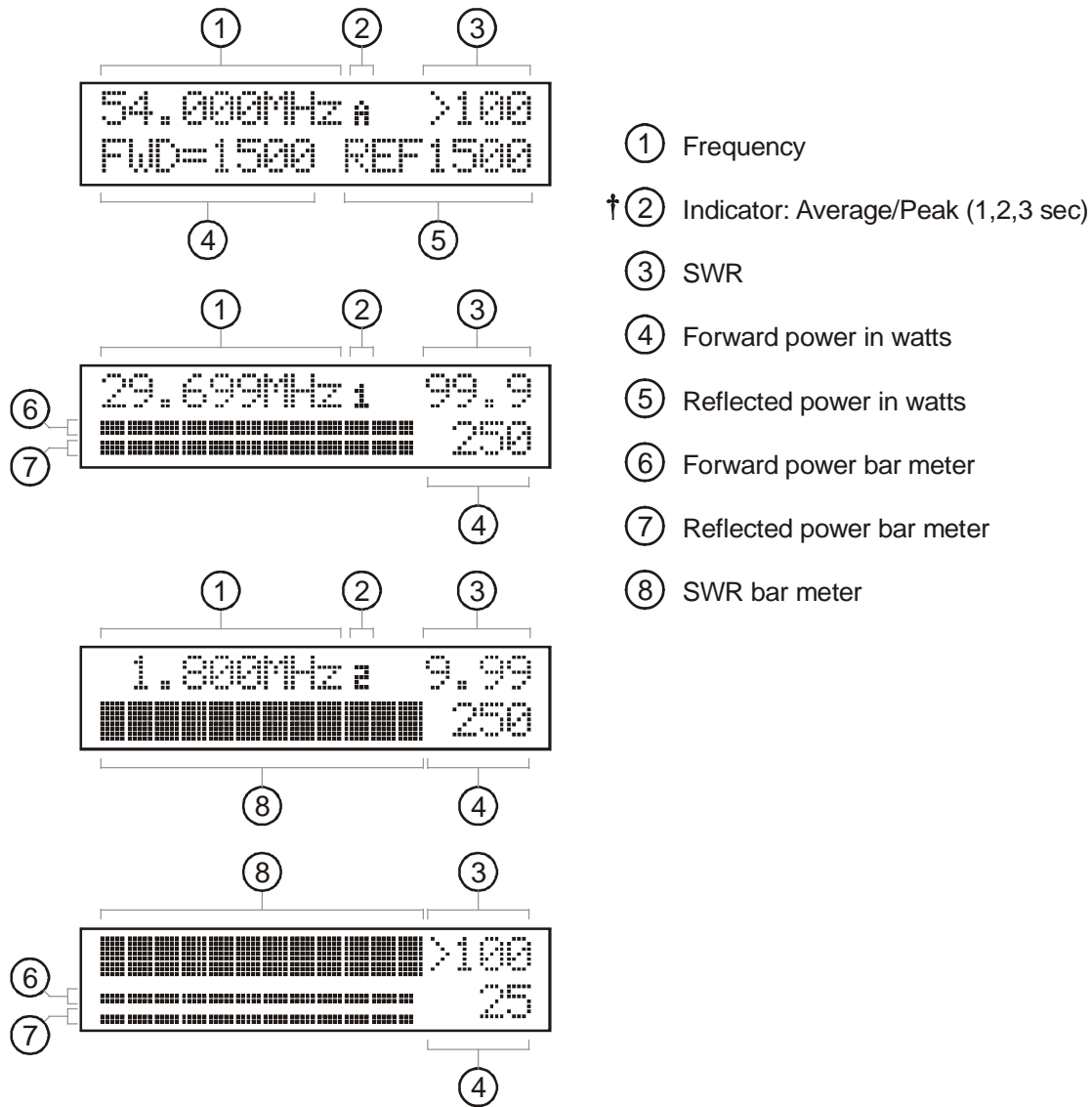


Figure 7. Main Mode Menu Display.

### Setup Mode Menus

The setup mode menus allow you to configure the MFJ-826B for the way you want it to behave. There are two setup mode menus arranged in a “wrap-around” structure. To access these setup menus, press and hold the [MODE] button for two seconds. The setup menu that will display is the one that was last used. When finished, press the [MODE] button for two seconds to go back to the main mode for normal operation. If no button is pressed for more than eight seconds, the unit automatically exits the setup mode and returns to the main mode.

Within each setup menu:

- Press the [MODE] button briefly to cycle through the setup menus. Press and hold the [MODE] button for two seconds to exit the setup mode and go back to the main mode.
- Press the [PEAK] button to increase or turn on the setting for the current setup menu.

- Press the [ALARM] button to decrease or turn off the setting for the current setup menu.

### Alarm SWR Menu

Allows you to set the alarm SWR from 1.5 to 3.0. The ALM LED will light and the buzzer will sound when the SWR is above the alarm SWR. Default is 3.0.

### Beep Menu

Acknowledgement beep sounds each time a parameter is changed to acknowledge it. This also controls the CW notification of “QRP”. If more than 1500 watts is applied to the unit, the unit will flash DECREASE POWER three times and send “QRP” (dah-dah-di-dah di-dah-dit di-dah-dah-dit) on CW. This function can be turned OFF for silent operation. Default is ON.

## Appendices

### Factory Defaults

Each time the wattmeter is powered off, the microprocessor saves all memories and configurations to non-volatile memory ready to be used the next time the unit is turned on. If the unit is not working properly, even on initial power on, try resetting to the factory defaults.

The unit is shipped with the following default settings:

- |              |                   |
|--------------|-------------------|
| • Main Menu  | Digital Wattmeter |
| • Setup Menu | Alarm SWR         |
| • Alarm SWR  | 3.0               |
| • Beep       | On                |
| • Peak Hold  | Off (Average)     |
| • Alarm      | On                |

To reset the unit to these defaults:

1. Turn off the power to the unit.
2. Press and hold *only* the [PEAK] button while turning the power on.
3. Release the buttons when DEFAULTS RESET appears on the display.
4. Resume with normal operation.

**WARNING: If the MFJ-826B is not behaving properly or acting erratic, try resetting the unit to factory defaults.**

## Self Test

A self-test routine will check the functions of the MFJ-826B. This routine checks the display, the front-panel buttons, the internal memory, the audio circuitry, and the power-down circuitry. During the self-test, you may stop the test by turning off the unit; however, this should NOT be done during the memory test or the memory could be corrupted. The self-test can be completed in approximately 30 seconds.

**Note:** *Performing the self-test will reset the unit to its factory default settings.*

Here is the self-test procedure:

1. Turn off the power to the unit.
2. Press and hold *only* the [MODE] button while turning the power on.
3. The test begins by displaying a copyright message and firmware version numbers, such as  
COPYRIGHT (c) 2008-2011 MFJ ENTERPRISES, INC. VERSION VVVV.BB. This is the test of the display. Release the [MODE] button before the message completes.
4. You will be prompted to press each of the front-panel buttons: [MODE], [PEAK] and [ALARM].
5. The unit then tests its non-volatile memory. Notice this step will reset the unit to its factory default settings.
6. If the unit is okay, the ALM LED will turn on steady, a repetitive message PASS will be displayed and sent as Morse code (di-dah-dah-dit di-dah di-di-dit di-di-dit). If there is a problem, the ALM LED will blink continuously, a failure message will be displayed and sent repetitively.
7. Once you have confirmed that the audio is okay, turn the unit off.
8. Turn the unit on again to test the power-down detection circuitry.
9. If the power-down detection circuitry is okay, the ALM LED will turn on steady, a repetitive message PASS will be displayed and sent as Morse code (di-dah-dah-dit di-dah di-di-dit di-di-dit). If there is a problem, the ALM LED will blink continuously, message PD FAIL will be displayed and sent as Morse code repetitively.
10. Turn the power off.

Failure Message	Indicates
ALARM FAIL	[ALARM] button is shorted or improperly connected.
MEMORY FAIL	Non-volatile memory circuitry is improperly connected.
MODE FAIL	[MODE] button is shorted or improperly connected.
PD FAIL	Power-down circuitry problem.
PEAK FAIL	[PEAK] button is shorted or improperly connected.
WAKEUP FAIL	Microprocessor wakeup circuitry problem.

Table 1. Failure Messages.

## SWR Bridge Calibration

To calibrate the SWR Bridge, you will need a transmitter capable of 100 watts output, a precise calibrated wattmeter, a 50-ohm dummy load, three 50-ohm SO-239 coax cables, a Phillips screwdriver, and a tuning tool or small flat blade screwdriver.

**WARNING: Do not touch anything inside the wattmeter during operation! Serious, painful RF burns can result.**

**WARNING: Never operate the MFJ-826B with its cover removed; dangerous voltages and currents can be present during operation. Never exceed wattmeter specifications.**

1. Turn off the power to the unit and the transmitter.
2. Remove the cover from the unit (4 screws) with a Phillips screwdriver.
3. Connect the 50-ohm dummy load to the ANTENNA connector; connect the calibrated wattmeter between the transmitter and the TRANSMITTER connector on the unit.
4. Turn on the power to the transmitter. Using a frequency in the middle of the HF band, such as 7.253 MHz, for calibration is recommended.
5. Press and hold *both* the [MODE] and [PEAK] buttons while turning the power on.
6. The top line will display F: 0.0 0.0 0.0 to show the forward power and the bottom line will display R: 0.0 0.0 0.0 to show the reflected power. Key the transmitter to output 100 watts and adjust trimmer capacitor VC1 (located in front of the coax connectors) for minimum reflected power.
7. Key the transmitter to 100 watts output and adjust the FWD trimpot VR1 until the left F number shows forward power of 100 watts.
8. Key the transmitter to 100 watts output and adjust the trimpot VR3 until the center F number shows forward power of 100 watts.
9. Key the transmitter to 20 watts output and adjust the trimpot VR5 until the right F number shows forward power of 20 watts.
10. Turn off the transmitter and reverse the ANTENNA and TRANSMITTER connections; that is, connect the 50-ohm dummy load to the TRANSMITTER connector and connect the transmitter/wattmeter to the ANTENNA connector.
11. Turn on the transmitter's power.
12. Key the transmitter to 100 watts output and adjust the REF trimpot VR2 until the left R number shows reflected power of 100 watts.
13. Key the transmitter to 100 watts output and adjust the trimpot VR4 until the center R number shows reflected power of 100 watts.
14. Key the transmitter to 20 watts output and adjust the trimpot VR6 until the right R number shows reflected power of 20 watts.
15. Turn off the power to the unit and the transmitter.
16. Remove the transmitter/wattmeter and the 50-ohm dummy load from the unit.
17. Secure the cover back onto the unit.
18. Connect your transmitter to the TRANSMITTER connector and connect your antenna to the ANTENNA connector on the unit.

## Frequency Counter Calibration

To calibrate the frequency counter, you will need a transmitter, a 50-ohm dummy load, two 50-ohm SO-239 coax cables, a Phillips screwdriver, and a tuning tool or small flat blade screwdriver.

**WARNING: Do not touch anything inside the wattmeter during operation! Serious, painful RF burns can result.**

**WARNING: Never operate the MFJ-826B with its cover removed; dangerous voltages and currents can be present during operation. Never exceed wattmeter specifications.**

1. Turn off the power to the unit and the transmitter.
2. Remove the cover from the unit (4 screws) with a Phillips screwdriver.
3. Connect the 50-ohm dummy load to the ANTENNA connector and connect the transmitter to the TRANSMITTER connector on the unit.
4. Turn on the power to the transmitter. Set and lock the frequency to *exactly* 29.000 MHz.
5. Press and hold *both* the [MODE] and [ALARM] buttons while turning the power on. A message CAL FREQ 29.000 will display.
6. Key the transmitter to output about 10 watts. Adjust trimmer capacitor VC2 (located next to the big integrated circuit) until the unit displays a frequency of 29.000MHz. Nominal tolerance of the frequency counter is  $\pm 1$  kHz.
7. Turn off the power to the unit and the transmitter.
8. Secure the cover back onto the unit.

## In Case of Difficulty

If the LCD screen is blank, check adjustment of the contrast control.

If the wattmeter acts erratic, reset the wattmeter to factory defaults.

## 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 (FAX) 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. Also include the firmware version number of your unit.

## LIMITED 12 MONTH WARRANTY

MFJ Enterprises, Inc. warrants to the original owner of this product, if manufactured by MFJ Enterprises, Inc. and purchased from an authorized dealer or directly from MFJ Enterprises, Inc. to be free from defects in material and workmanship for a period of 12 months from date of purchase provided the following terms of this warranty are satisfied.

1. The purchaser must retain the dated proof-of-purchase (bill of sale, canceled check, credit card or money order receipt, etc.) describing the product to establish the validity of the warranty claim and submit the original or machine reproduction of such proof of purchase to MFJ Enterprises, Inc. at the time of warranty service. MFJ Enterprises, Inc. shall have the discretion to deny warranty without dated proof-of-purchase. Any evidence of alteration, erasure, or forgery shall be cause to void any and all warranty terms immediately.
2. MFJ Enterprises, Inc. agrees to repair or replace at MFJ's option without charge to the original owner any defective product under warrantee provided the product is returned postage prepaid to MFJ Enterprises, Inc. with a personal check, cashiers check, or money order for **\$10.00** covering postage and handling.
3. This warranty is **NOT** void for owners who attempt to repair defective units. Technical consultation is available by calling the Service Department at 662-323-0549 or the MFJ Factory at 662-323-5869.
4. This warranty does not apply to kits sold by or manufactured by MFJ Enterprises, Inc.
5. Wired and tested PC board products are covered by this warranty provided **only the wired and tested PC board product is returned**. Wired and tested PC boards installed in the owner's cabinet or connected to switches, jacks, or cables, etc. sent to MFJ Enterprises, Inc. will be returned at the owner's expense unrepaired.
6. Under no circumstances is MFJ Enterprises, Inc. liable for consequential damages to person or property by the use of any MFJ products.
7. **Out-of-Warranty Service:** MFJ Enterprises, Inc. will repair any out-of-warranty product provided the unit is shipped prepaid. All repaired units will be shipped COD to the owner. Repair charges will be added to the COD fee unless other arrangements are made.
8. This warranty is given in lieu of any other warranty expressed or implied.
9. MFJ Enterprises, Inc. reserves the right to make changes or improvements in design or manufacture without incurring any obligation to install such changes upon any of the products previously manufactured.
10. All MFJ products to be serviced in-warranty or out-of-warranty should be addressed to:

**MFJ Enterprises, Inc.**  
**300 Industrial Park Road**  
**Starkville, Mississippi 39759 USA**

and must be accompanied by a letter describing the problem in detail along with a copy of your dated proof-of-purchase.

11. This warranty gives you specific rights, and you may also have other rights which vary from state to state.



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Starkville, MS 39759

MFJ-826B Manual  
Version 1A  
Printed In U.S.A. 09/2008