

MFJ-828 Digital SWR/Wattmeter

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The MFJ-828 SWR/wattmeter covers 1.8 to 50 MHz and measures peak or average power up to 1,500 W. The unit includes an adjustable SWR alarm and can be set to interrupt an amplifier key line if SWR exceeds a preset limit. The meter requires a 12 V dc power supply, and we used the optional MFJ-1312D wall transformer. The MFJ-828 does not come with a printed manual, but a PDF file with comprehensive instructions and color illustrations is available for download from MFJ's website. Schematic diagrams are available as well.

Displays

The MFJ-828 has three ranges — 25, 250, and 1,500 W. By default it is autoranging (the meter picks the correct range based on input power), but you can set it to any of the three ranges from a menu.

The analog cross-needle meter on the left side of the front panel is illuminated and easy to read. Full-scale readings are 3,000/300/30 W forward and 600/60/6 W reflected, depending on the range selected. SWR is read where the needles cross. The analog meter is especially useful for adjusting an antenna tuner or power amplifier.

In addition to the cross-needle display, there's a two-line LCD digital display. As shown in Figure 5, by default,

Bottom Line

The MFJ-828 offers a nice mix of features. The digital display can be configured to show a variety of information, while the analog cross-needle display shows forward and reflected power at a glance and is handy for adjusting antenna tuners or power amplifiers.



the LCD shows frequency with 1 kHz resolution and SWR on the top line, and forward and reflected power on the bottom line. Power readings on the digital readout and the analog meter seem to match closely.

Although the analog meter goes to 3,000 W full scale, the MFJ-828's upper limit is the legal power limit of 1,500 W. If you transmit with more than 1,500 W for more than a second or two, the LCD displays an error message (see Figure 6). The internal speaker sounds QRP in Morse code,

and the analog meter needles fluctuate between zero and full scale.

Pressing the **MODE** switch cycles through several bar graph display options, where the bottom line shows bars for forward and reflected power or SWR with a numerical indication of forward power. A fourth mode changes the top line to an SWR bar and numerical SWR indicator, and the bottom line to forward and reflected bars and numerical forward power indicator.

Table 3
MFJ-828, serial number n/a, firmware v.1012

Manufacturer's Specifications		Measured in the ARRL Lab			
RF power range: 25, 250, or 1,500 W.		As specified.			
Frequency range: 1.8 to 54 MHz.		As specified.			
Frequency counter accuracy: ±1 kHz.		As specified; see text.			
Insertion loss: Not specified.		1.8 MHz, 0.01 dB; 14 MHz, 0.02 dB; 28 MHz, 0.03 dB; 50 MHz, 0.06 dB.			
Power requirements: 12 – 15 V dc at 250 mA maximum.		At 13.8 V dc: 164 mA (average mode), 171 mA (peak mode).			
Size (height, width, depth): 3.8 × 7.5 × 6.8 inches, incl. protrusions. Weight, 1.9 lbs.					
Actual Forward Power		Indicated Power			
Frequency (MHz)	1.8	14	28	50	
5 W CW	4.0	4.3	4.0	3.6	
100 W CW	97	101	104	89	
1,000 W CW	1,010	1,030	1,100	780	
100 W Voice	101	101	110	100	
1,000 W Voice	1,100	1,130	1,200	1,000	



Figure 5 — By default, the LCD shows frequency and SWR on the top line, and forward and reflected power on the bottom line. The 1 next to the frequency indicates the 1-second peak-hold mode.



Figure 6 — If you exceed 1,500 W output for more than a second or two, the MFJ-828 alerts you in several ways as described in the text. (Yes, this test was done using a dummy load.)

The **PEAK** button selects the average power measurement mode or one of several peak-hold measurement modes. In peak-hold mode, the analog meter will hold the highest power reading for 1, 2, or 3 seconds before dropping back to zero. A small **A**, **1**, **2**, or **3** on the LCD indicates the **PEAK** mode selected.

According to the instructions, if a bar graph display is selected in a peak-hold mode, the highest displayed bar segment will also freeze for 1, 2, or 3 seconds. That wasn't the case with the review meter — the bar graph display worked the same with average or any of the peak-hold modes.

The built-in frequency counter is accurate. As noted in the instructions, while using SSB or fast CW, the counter usually will not lock and hold the frequency on each dit or syllable. The display jumps around. It's fine with a steady carrier or slow CW.

Connections

The rear panel (see Figure 7) has SO-239 connectors for **ANTENNA** and **TRANSMITTER**. The RS-232 jack is used for updating firmware, which is available for download from MFJ's



Figure 7 — The MFJ-828's rear panel.

website. The review unit had the latest version, so I did not try this feature.

The MFJ-828 includes an SWR alarm feature. If the measured SWR exceeds a preset level (menu-selectable from 1.5:1 to 3:1), the front-panel **ALM** LED will light. The rear-panel **RLY** miniature stereo phone jack is connected to a relay that is also controlled by the alarm feature. Normally open and normally closed contacts are available, and they can be used to trigger an external alarm or control a separate device.

The **AMP ENABLE IN** and **OUT** phono jacks are for an amplifier key line. If the SWR alarm feature triggers, the amplifier key line is disabled. This is useful to protect station equipment if you select the wrong antenna or something in your antenna system fails.

Lab Tests

Table 3 shows the results of testing in the ARRL Lab. Average power readings were close to the expected levels, with accuracy falling off a bit at the high end of the spectrum (10 and 6 meters). That's not surprising, as the MFJ-828 is calibrated at one frequency. (More sophisticated — and much more expensive — SWR/power

meters are calibrated at a number of points throughout the spectrum.)

Initial SWR readings were off by quite a bit. For example, with a 50 Ω resistive load, at 100 W and 1,000 W, the indicated SWR was between 1.3:1 and 2:1, depending on frequency. SWR is calculated from forward and reflected power, and the reflected power measurements were off.

The manual includes instructions for calibrating SWR measurements using another meter of known accuracy and a 50 Ω load. The procedure involves removing the cover, entering the calibration mode, transmitting through the meter with a known power level, and adjusting potentiometers on the PC board to set the forward power in each of the three measurement ranges. Then the **TRANSMITTER** and **ANTENNA** connections are swapped to use the same procedure to set the reflected power. After calibration, the SWR measurements were very close to expected over most of the frequency range, with accuracy falling off slightly at 10 and 6 meters.

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