

## MFJ-835 RF Ammeter

### Introduction

Congratulations on purchasing the MFJ-835 Balanced Line RF Ammeter. The MFJ-835 is designed for measuring balanced RF feedline current on 1.8-30 MHz while having low interaction on the primary lines. Connect the Balanced Line RF Ammeter between your antenna and tuner/ transmitter/amplifier and feedline currents are *simultaneously* displayed on separate calibrated scales in three calibrated ranges: 0.3 Amperes, 1 Ampere, and 3 Amperes. Balance is clearly revealed on MFJ's exclusive *BalancedBar*. When currents are balanced, the dual needles cross in the center. If the needles cross within the vertical *BalancedBar*, the balance is within 10%.

### Uses

Equal currents in the feeder wires minimize feedline radiation and reduce pattern distortion, RFI, TVI and wasted power. You could lose up to 10% of your power. Imbalance is due to feedline not being perpendicular to antenna, if one side runs close to metal or is shorter or closer to ground. The MFJ-836 helps you solve all your unbalanced problems.

- Use it for *tuning* your antenna tuner/transmitter/amplifier for maximum radiated power, for *determining* antenna feedpoint impedance, for *comparing* antennas and tuners, for *troubleshooting* and for *checking* for changes.
- Minimum SWR *does not* always mean maximum radiated power. Your tuner or lossy coax may be dissipating power and you may not get peak output power even if your tuner or amplifier is properly tuned.
- Use the MFJ-835 Balanced Line RF Ammeter to determine best antenna tuner settings and to compare various tuners. Calculate your antenna feedpoint impedance by dividing your applied power by the square of the feedpoint current.
- Your antenna can change when you apply power. Insulators break down, traps heat up, capacitors leak and your feedpoint impedance may be drastically different from your SWR Analyzer measurements.

#### **IMPORTANT:**

**Please read entire manual before attempting to operate this equipment. This unit does not provide a dc or low frequency earth ground. A separate wire should be connected from the station ground bus to an electric ground. Do not place any non-coaxial feed wires near metallic or RF sensitive devices.**

## Installation

1. Connect your transmitter to the Heavy-duty 5-way binding posts on the back of the unit labeled TRANSMITTER and your antenna to the Heavy-duty 5-way binding posts labeled ANTENNA. It is important that you use good quality feedline and properly installed connectors.
2. An internal lamp backlights the RF Ammeter scale. The lamp circuit requires 12 VDC. The rear panel accepts a 2.1 mm coaxial plug with the center conductor positive (+) and the sleeve negative (-). The negative lead is grounded inside the meter.
3. To measure the power output capability of a transmitter/amplifier you should connect a quality 50-ohm dummy load to the ANTENNA connector of the MFJ-835.

## Operation

1. The Balanced Line RF Ammeter measures RF current in three calibrated ranges: 0.3 Amperes, 1 Ampere, and 3 Amperes. Simply turn the Current Range knob to the desired range.
2. The meter is scaled from 0 to 100. On the 1-A range, move the decimal point 2 places to the left (100 = 1.00 A). To convert meter readings made on the .3A and 3A ranges, multiply accordingly. For example, a reading of 85 on the 300-mA range equals 300 x .85, or 255 mA. See *Table 1* below to estimate readings quickly.
3. The *BalancedBar* easily displays when currents are balanced by using the dual needles. When the needles cross within the vertical *BalancedBar*, the balance is within 10%.
4. To prevent meter pegging, begin checks on a high range and work down. To estimate unknown current levels, use the formula below (I = Unknown Current in Amps, P = Applied Power in Watts, and R = Load Resistance in Ohms).

$$I = \sqrt{\frac{P}{R}}$$

**Table 1: Actual Current Value**

Meter	Range		
	300 mA	1 A	3 A
10	30	0.1	0.3
20	60	0.2	0.6
30	90	0.3	0.9
40	120	0.4	1.2
50	150	0.5	1.5
60	180	0.6	1.8
70	210	0.7	2.1
80	240	0.8	2.4
90	270	0.9	2.7
100	300	1.0	3.0

**RF Hazard--Important Warnings:**

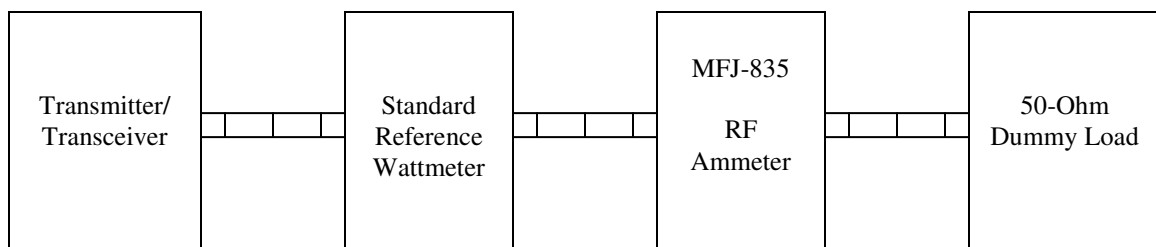
1. RF-current measurements must be conducted with extreme caution. Physical contact with conductors carrying even moderate RF-energy levels can result in severe RF burns, or injury.
2. Avoid measuring RF currents on conductors where high RF voltages may be present (>500 Volts). Damage to your meter may result.

**Calibration**

The MFJ-835 RF Ammeter has been calibrated at the factory. If the RF Ammeter should ever need to be recalibrated, then follow this procedure:

**Equipment Needed**

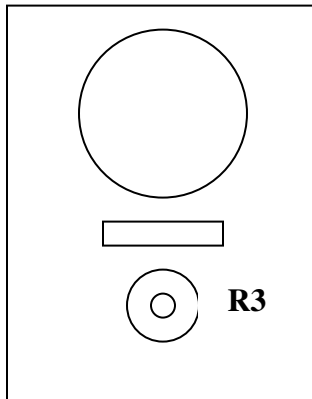
1. Transmitter capable of supplying enough power to obtain  $\frac{1}{2}$  to full-scale reading at 14 or 21 MHz.
2. 50-ohm dummy load that is capable of handling full transmitter output power and has better than a 1.15:1 SWR.
3. Power meter of known accuracy. The calibration will only be as good as the standard reference meter.
4. Ladder line capable of handling the power.



**Figure 1:** RF Ammeter Test Setup

## RF Ammeter Calibration

1. Refer to *Figure 1* for the Test Setup and refer to the PCB layout in *Figure 2* for trim pot location.
2. Remove the top of the MFJ-835.
3. Connect the Test Setup equipment as shown in *Figure 1*. Use a 50-ohm dummy load for the antenna. Set the Transmitter to the 14 MHz in the 20-meter band.
4. Set the Current Range selector to 1A. For meaningful results, *your Wattmeter must be accurate and the 50-ohm load free of significant reactance.*
5. To test, apply a 50-watt CW signal to the 50-ohm dummy load. You should observe a full-scale reading of 1A (100 on the scale) on CURRENT 1. If results vary significantly from this reading, adjust trim pot R3 on the top pc board for the correct indication. Trim pot R3 is located on the top pc board below the sense coil.
6. Reverse the connections of the ladder line and apply a 50-watt CW signal to the 50-ohm dummy load. You should observe a full-scale reading of 1A (100 on the scale) on CURRENT 2. If results vary significantly from this reading, adjust trim pot R3 on the bottom pc board for the correct indication. Trim pot R3 is located on the bottom pc board below the sense coil.



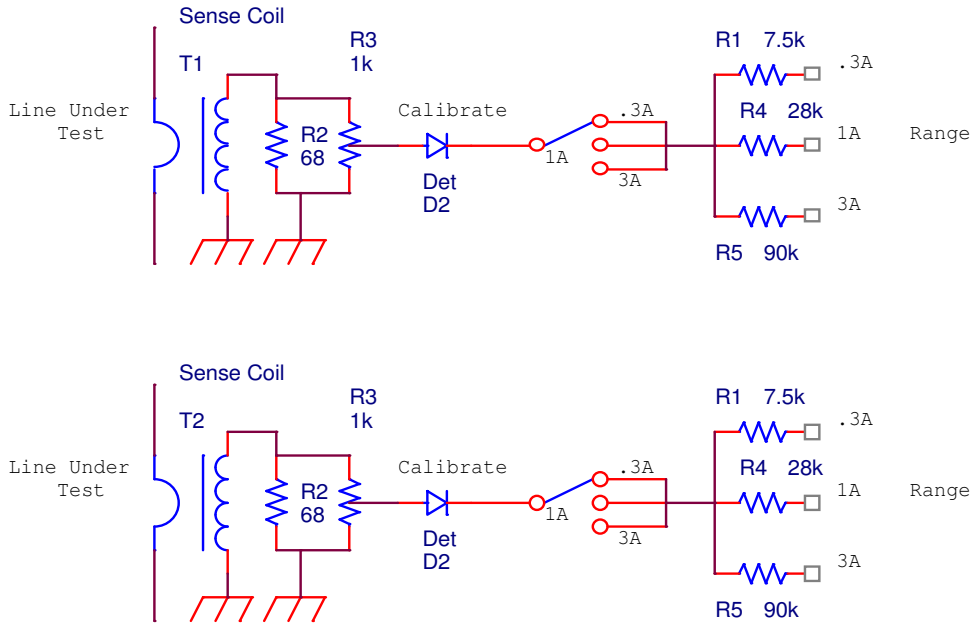
*Figure 2: RF Ammeter PCB Layout and Trim Pot Location*

**IMPORTANT WARNING:** Avoid direct physical contact with this device when making measurements with power sources of over 5 Watts. RF burns or permanent injury may result from contact with high RF voltages.

If your meter is out of calibration and you lack the equipment or skills to perform the calibration procedure, you may return it to the MFJ factory for service.

**Schematic**

**RF Ammeter**



**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 reading the manual does not solve your problem, 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.