



# Non-Linear Systems

## RM-350TB/AC/120 or RM-350TB/AC/240 Digital Panel Meters



### INSTRUCTIONS

The model RM-350TB/AC/120, and RM-350TB/AC/240 are 3½ digit fixed-range, line powered, digital panel meters for making AC voltage measurements. The TB indicates Terminal Block connection. The last three digits of the model number indicate the line input voltage power. AC current may also be measured by connecting a shunt resistor across the AC signal input terminals.

The meters are available in any one of four ranges: 2 Volts, 20 Volts, 200 Volts, or 1000 Volts.

Modification from one range to another is easily accomplished by changing one to three resistors and one capacitor. Calibration is readily accomplished by the adjustment of one potentiometer accessible at the front of the meter.

The value of the measured AC voltage (or current) is displayed in 0.56" LED numerals, a decimal point. Also, an 0.8" LED option is available.

### SPECIFICATIONS

**Accuracy:** ± 0.7% Reading, ±2 digits

**AC Converter Response:** Average responding, calibrated to display RMS value of sine wave.

**Decimal Location:** may be positioned by a jumper on the connector to any of the three locations, -X.X.X.X

**Display:** 0.56" LED or 0.8" large LED option

**Frequency Range:** 50 to 400 Hz

**Input Z:** 2V range, 1000MΩ; 20V range, 1MΩ; 200V and 1000V ranges, 10MΩ.

**Overload Indication:** Left-most digit is the numeral 1; remaining digits are blank.

**Power:**

RM-350TB/AC/120 105 to 125 VAC  
50/60 Hz

RM-350TB/AC/240 210 to 250 VAC  
50/60 Hz

**Operating Temp.:** 0°C to +50°C

**Ranges:** 0 to 2Volts  
0 to 20Volts  
0 to 200Volts  
0 to 1000Volts

**Settling Time:** 2 seconds

**Update Rate:** 3 readings/sec, nominal

**Warm-up Time:** 10 seconds

**Weight: Approx.:** 13 ounces (368 g)

### CONSTRUCTION

The RM Series AC reading, AC powered panel meters contain two printed circuit board assemblies, mounted one above the other. The lower assembly is the display/main board assembly, and the upper assembly is the AC/DC converter assembly. All interconnections between the upper and lower assemblies are made via the terminal blocks.

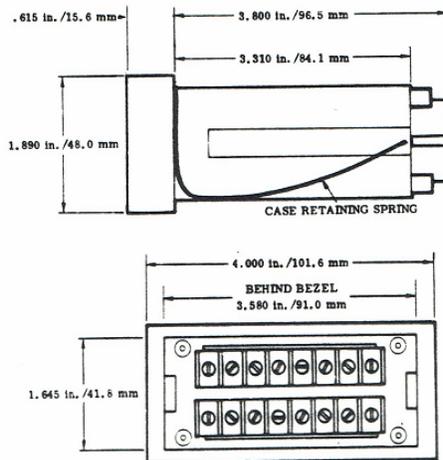


Figure 1.

### MOUNTING DATA

A rectangular panel cutout is recommended for mounting the instrument. Recommended dimensions are:

92 mm +1, -0 mm (3.622 in +0.04, -0 in) x  
43 mm +1, -0 mm (1.693 in +0.04, -0 in)

The meter will also fit the DIN/NEMA 1/8 standard cutout, 92 mm by 45 mm (3.6 in. x 1.8 in.) and the widely used, 99.7 mm by 42.72 mm (3.9 in. x 1.7 in.).

Any panel thickness from 1.52 mm (0.06 in.) to 4.57 mm (0.18 in.) may be used.

To mount the meter, insert the meter from the front side of the panel cutout. Place the retaining spring in the rear holes in the sides of the meter and slide it behind the mounting panel to fasten the meter in place. It does not matter whether the retaining spring swings from above or below the meter.

### OPERATION

**1. Signal:** Connect the AC signal to be measured to terminals 2 and 3 of the upper terminal block (Signal HI to 3 and Signal LO to 2). Figure 2 provides wiring information for the terminal blocks. Connect terminals 1, 2, 5 and 6 of the upper terminal block to the corresponding terminals on the lower terminal block. Jumper terminals 2 and 5 on the lower terminal block.

**2. Decimal point:** Jumper between terminals 3 (dec com) and terminals 4, 7, or 8 on the lower terminal block, depending upon which decimal point is to be displayed.

**Dec. Location** X • X • X • X  
**Terminal** 8 7 4

If decimal point is not desired, omit jumper.

**3. Power Supply:** Connect the AC power to terminals 7 and 8 of the upper terminal block. The "hot" side of the AC line should be connected to terminal 8 since it is this terminal which is connected to the internal fuse.

Terminal Numbers 1 thru 8 read from left to right when facing rear of meter			
Lower Board		Upper Board	
DC SIG HI	1	1	+DC CONV OUT
DC SIG LO	2	2	AC SIG LO —
DEC PT COM	3	3	AC SIG HI —
10° DEC PT	4	4	N/C
DC PWR COM	5	5	DC PWR COM
+5V IN	6	6	+5V OUT
10 <sup>1</sup> DEC PT	7	7	AC NEUT —
10 <sup>2</sup> DEC PT	8	8	AC PWR —

Figure 2.  
Terminal Block Wiring Information

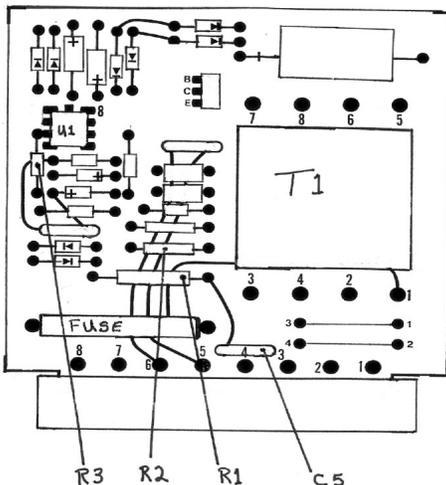
## RANGE MODIFICATION.

1. Remove all sources of power and signal from the meter.
2. Using a knife or a small screwdriver blade, carefully pry off the front panel
3. Remove the two screws and brackets behind the front panel.
4. Slide the meter out of the case.
5. Install the resistors specified in **Table I** to obtain desired range. See **Figure 3** for component locations.
6. Reassemble the meter.
7. Calibrate the meter.
8. If a decimal indication is required, refer to the applicable paragraphs on wiring terminal blocks.

**Table 1**

Resistor Values for Range Modification				
Range	R1	R2	R3	C5
2V	Jumper	1M $\Omega$	100K	0.1 $\mu$ F
20V	909K	100K	Jumper	0.1 $\mu$ F
200V	10M $\Omega$	100K	Jumper	0.1 $\mu$ F
1000V	10M $\Omega$	10K	Jumper	.01 $\mu$ F

**Figure 3: Component Location**



## CURRENT MEASUREMENT

The meter should be a 2 Volt range meter or be so modified. A shunt resistor may be placed between AC signal HI and AC signal LO in the upper board to permit current measurement. Also, an external shunt resistor may be connected between Signal HI and Signal LO.

Select the value of the shunt resistor in **Table II** below. One percent metal-film or wire-wound resistors are recommended.

**Table II**

Shunt Resistor Values	
Full Scale Current Range	Shunt Resistor w/2V Range Meter
2mA	1000 $\Omega$
20mA	100 $\Omega$
200mA	10 $\Omega$
2A	1 $\Omega$ *

\* External shunt or transformer

## CALIBRATION

1. Use a knife or small screwdriver blade, carefully pry off the front panel to gain access to the calibration potentiometer.
2. Verify that the line voltage is correct
3. Allow the meter to warm up for five min.
4. Apply AC input signal voltages as follows:

Range of Instrument	Calibration Voltage
2 VAC	1.900 VAC
20 VAC	19.00 VAC
200 VAC	190.0 VAC
1000 VAC	700 VAC

5. Adjust the potentiometer at lower right of the display panel until the display agrees with input.
6. Disconnect the calibration voltage and power supply input.
7. Replace the front panel.

## MAINTENANCE

To facilitate maintenance, all six integrated circuits on the lower board assembly are plug-in components. They can be easily removed and installed without soldering. They include the four LED displays, the ICL7107CPL Integrated Circuit and the CD4049BE Integrated Circuit.

The **fuse** is located in fuse clips on the upper board assembly.

The **RM-350TB/AC/120** meters are protected with a 3AG, 1/8 ampere, "Slo-Blo" fuse.

The **RM-350TB/AC/240** meters are protected with a 3AG, 1/16 ampere, "Slo-Blo" fuse.

*Specifications Subject to Change without Notice*

Thank you for choosing Non-Linear Systems. Should you have any questions Please contact us.

## Non-Linear Systems

*Originator of the digital voltmeter*

San Diego, CA  
**(619) 535-2161**  
**sales@nonlinearsystems.com**