INSTRUCTIONS

RM-452TB/AC
DIGITAL PANEL METER

INTRODUCTION.

The Model RM-452TB/AC is a four and one-half-digit, fixed-range, digital panel meter for making AC voltage measurements. AC current may also be measured using internal or external shunt resistors. The instrument is available in any one of four ranges: ±1.9999 volts F.S., ±19.999 volts F.S., ±199.99 volts F.S. or ±1000.0 volts F.S.

Modification from any 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 instrument.

The value of the measured voltage (or current) is displayed in one-half-inch high light-emitting diode numerals.

For operation, an external +5 VDC ±5% power supply is required. See figure 1 for a typical power supply circuit.

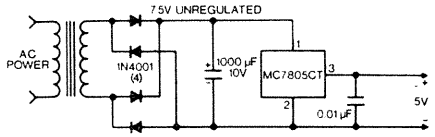

Figure 1. Power Supply Schematic

SPECIFICATIONS.

RANGE	RESOLUTION	INPUT IMPEDANCE	MAXIMUM INPUT VOLTAGE
1.9999 VAC	0.1 mV	1 MΩ/20 pF	100 VAC
19.999 VAC	1 mV	1 MΩ/20 pF	400 VAC
199.99 VAC	10 mV	10 MΩ/20 pF	1000 VAC
1000.0 VAC	100 mV	10 MΩ/20 pF	1000 VAC

ACCURACY: ±0.05% Rdg. ±0.05% F.S.

OPERATING TEMP: 0°C to +50°C

POWER: +5 VDC ±5% @ 180 mA, max

DISPLAY: LED, red, 0.5" high

DECIMAL LOCATION: May be positioned by internal jumper to any of four locations, X.X.X.X.X

OVERLOAD INDICATION: On all ranges except the 1000V range, an input exceeding full scale is displayed as four flashing zeros.

AC CONVERTER RESPONSE: Average reading, calibrated to display RMS value of sine wave.

SIZE: See figure 2

WEIGHT: Approximately 9 ounces

MOUNTING DATA.

A rectangular panel cutout is recommended for mounting the meters. The recommended dimensions are:

92 millimeters +1, -0 mm (3.622 inches +0.040, -0 in.)

43 millimeters +1, -0 mm (1.693 inches +0.040, -0 in.)

The meters will also fit the DIN/NEMA standard cutout, 92 mm x 45 mm (3.622 x 1.772 in.) and the widely used 99.7 mm x 42.72 mm (3.925 in. x 1.682 in.) cutout.

Any panel thickness from 1.524 mm (0.060 in.) to 4.57 mm (0.18 in.) may be used.

To mount the meter, remove the retaining spring from its holes in the sides of the meter at the rear. Insert the meter from the front of the panel cutout. Replace the retaining spring 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.

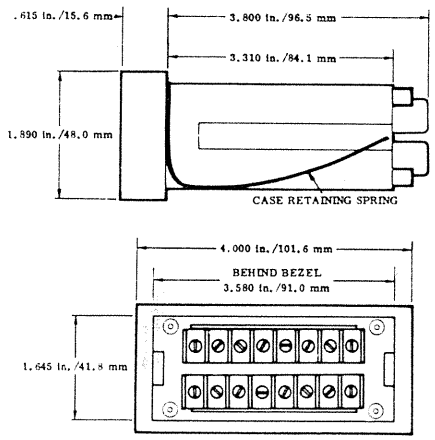

Figure 2. Outline Drawing

OPERATION.

POWER AND SIGNAL CONNECTIONS

1. Make connections between upper and lower terminal blocks as shown in figure 3.

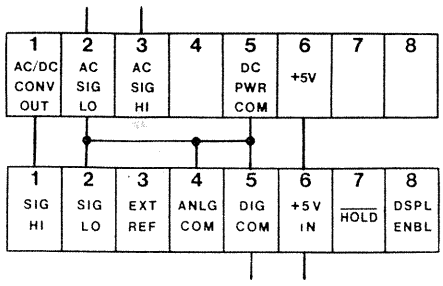

Figure 3. Connection Information

2. Connect the +5 VDC power to terminals 5 and 6 on the lower terminal block; the negative side to terminal 5 and the positive side to terminal 6.

3. Connect AC signal HI to terminal 3 of the upper terminal block. A shielded lead may be needed if the signal source has a high impedance.

4. Connect AC signal LO to terminals 2 and 5 of the upper terminal block. It will usually be better to do this with separate wires from signal LO to terminals 2 and 5 rather than have a jumper across terminals 2 and 5 at the terminal block. This will eliminate error due to current flow through the signal LO connection to terminal 2.

DECIMAL POINT. The position of the decimal point is determined by the position of an internal jumper on the lower board assembly. Jumper between terminal pad E12 and terminal pads E8, E9, E10 or E11 depending upon which decimal point is to be illuminated. See below.

DEC. LOCATION	+ 1	.0	.0	.0	.0
TERMINAL PAD		E8	E9	E10	E11

If a decimal point is not desired, omit the jumper.

DISASSEMBLY

To gain access to the P.C. board assemblies, proceed as follows:

1. Remove all sources of power and signal from the meter.

2. Using a knife or a small screwdriver blade, carefully pry off front panel.

3. Remove the two screws and the two retaining brackets behind front panel.

4. Slide meter out of case.

HOLD. Connecting terminal 7 (hold) to terminal 5 (ground) on lower terminal block will cause the meter to stop making measurements, and to continue to display the result of the measurement in progress when the meter was placed on hold. Removing the connection to ground will permit the meter to continue making measurements. Logic levels (0 to +5V) may be used on terminal 7 instead of the connection to ground.

DISPLAY DIMMING AND BLANKING. The number display, including decimal points, may be dimmed or blanked internally or externally. The polarity display may only be dimmed or blanked internally.

Increasing the value of R6, dims the number display. See figure 4 for component location. As shipped from the factory, R6 is a jumper. Removing the jumper blanks the number display.

Increasing the value of R5 dims the polarity display. As shipped from the factory, R5 is a jumper. Removing the jumper blanks the polarity.

To control dimming and blanking of the number display externally, first remove R6. If there is a jumper in the R6 position, remove it. The brightness of the display will then depend upon the amount of resistance between terminals 6 and

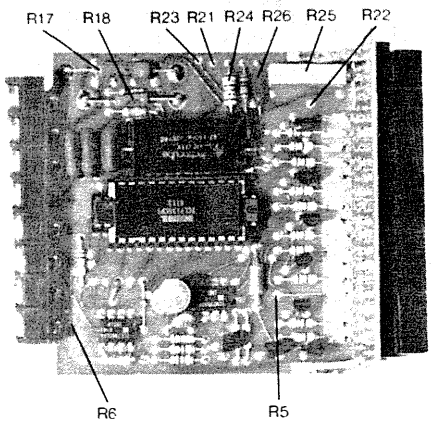

Figure 4. Component Location
Lower Board Assembly

8 on the lower terminal block. A jumper between these terminals will produce maximum brightness.

EXTERNAL REFERENCE. Connecting an external reference between terminals 3 and 4 of the lower terminal block (+ to 3 and - to 4) overrides the internal reference. Under these conditions, the ratio of the input signal to the external reference is displayed. Since the internal calibration potentiometer has no effect in this mode, an external adjustable voltage divider may be required if exact calibration is needed.

For best results, the value of the external reference voltage should be between +0.5 and +2.0 volts.

The input resistance between terminals 3 and 4 is 59 kilohms, minimum. This resistance may be increased by gaining access to the lower P.C. board as described under Disassembly, and removing R24 and R26. This will increase the reference input resistance to 1000 megohms.

CURRENT MEASUREMENT (See figure 4).

DC current measurements can be made using an internally or externally mounted shunt resistor. For internal mounting, replace R18 with the shunt resistor, and replace R17 with a jumper. For external mounting, use meter in the two-volt range and connect shunt resistor between terminals 1 and 2 of the terminal block. If the current being measured enters terminal 1 and exits from terminal 2 the polarity displayed will be positive.

The value of the shunt resistor should be chosen as set forth in table I. Note that at full scale, the voltage drop across the shunt resistor is 1.9999 volts. The measuring circuit should be carefully examined to insure that this voltage drop does not introduce excessive error into the measurement.

Table I. Shunt Resistor Values
for Current Measurement

FULL SCALE CURRENT	SHUNT RESISTOR
19.999 μA	100 kOhms
199.99 μA	10 kOhms
1.9999 mA	1 kOhm
19.999 mA	100 Ohms
199.99 mA	10 Ohms
1.9999 A	1 Ohm*

*External mounting only; resistor dissipates 4 watts at full scale.

SCALING AND ZERO OFFSET.

Provision is made on the lower board assembly to insert additional components required for zero offset. This offset capability together with special scaling greatly increases the versatility of the meter so that virtually any engineering unit may be displayed.

The components required for zero offset are R21, R22 and R23. Unless zero offset is specified, these components are not furnished. However, they may be added at any time, either at the factory or in the field. The values of these components depend upon the amount of zero offset required. However, the total resistance, R21+R22+R23, should not be less than 100 kilohms.

In addition to R21, R22 and R23, changes in internal jumpering are necessary to obtain zero offset. The P.C. pads involved with zero offset are numbered E1 through E7. Unless the meter has been ordered with specific zero offset, it will be shipped from the factory with no zero offset. E1 will be connected to E5, and E2 will be connected to E4. E3, E6 and E7 will have no connections.

RANGE MODIFICATION (See figure 5).

1. Perform steps 1 thru 4 under Disassembly.

2. Install resistors and a capacitor of values specified in table II to obtain desired range.

3. If a decimal indicator is desired refer to paragraph headed Decimal Point.

4. Clean all solder joints and adjacent areas on printed circuit board to minimize leakage paths.

5. Reassemble meter.

Table II. Component Values
for Range Modification

RANGE	R1	R2	R3	C5
2V	JUMPER	1 MΩ, 5%	100 kΩ, 5%	0.1 μF, 250 V
20V	909 kΩ, 1%	100 kΩ, 1%	JUMPER	0.1 μF, 250 V
200V	10 MΩ, 1%	100 kΩ, 1%	JUMPER	0.1 μF, 250 V
1000V	10 MΩ, 1%	10 kΩ, 1%	JUMPER	0.01 μF, 1 kV

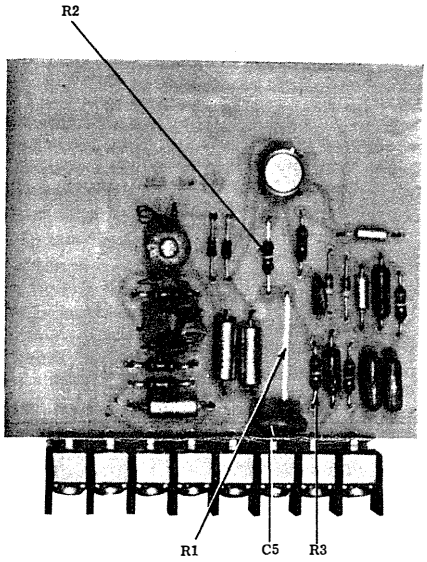

Figure 5. Component Location
Upper Board Assembly

CALIBRATION.

1. Using a knife or a small screwdriver blade, carefully pry off the front panel to gain access to the calibration potentiometer.

2. Allow the meter to warm up for at least five minutes.

3. Set the power supply voltage to +5 volts ±2%.

4. Apply input signal voltages as follows:

RANGE OF INSTRUMENT	CALIBRATION VOLTAGE
2 VAC	+1.9000 VAC
20 VAC	+19.000 VAC
200 VAC	+190.00 VAC
1000 VAC	+900.0 VAC

5. Adjust R25 at lower right of display panel until display agrees with input.

6. Disconnect calibration voltage and power supply input.

7. Replace front panel.

MAINTENANCE.

The three largest integrated circuits and the five LED display modules all have sockets for ease of replacement.

Specifications Subject to Change without Notice

Non-Linear Systems
Originator of the digital voltmeter.

San Diego, CA
P: 619-521-2161
sales@nonlinearsystems.com

6/82

RM-452TB/AC LITHO IN USA