RM-452TB
DIGITAL PANEL METERS

INSTRUCTIONS

INTRODUCTION.

The Model RM-452TB is a four and one-half-digit, fixed-range, digital panel meter for making DC voltage measurements. DC 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 volts F.S.

Modification from any one range to another is easily accomplished by changing one or two resistors. 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.

An active filter at the signal input provides 60 db of normal-mode rejection at 50 Hz.

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

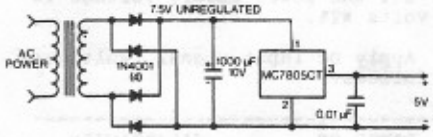

Figure 1. Power Supply Schematic

SPECIFICATIONS.

RANGE: .0000 to ±1.9999 VDC
or 0.000 to ±19.999 VDC
or 00.00 to ±199.99 VDC
or 000.0 to ±999.9 VDC

ACCURACY: ±0.02% Full Scale

SPEED: 3 Rdg/Sec, nominal

OPERATING TEMP: 0°C to +50°C

POWER: +5 VDC ±5% @ 140 mA, max

DISPLAY: LED, red, 0.5" high

TURN-ON TIME: 10 seconds to ±0.05% accuracy

TEMPERATURE COEFFICIENT: ±(0.01% Rdg + 0.001% F.S.)/°C

INPUT Z: 2V range, 1000 megohms; 20V range, 1 megohm; 200V and 1000V ranges, 10 megohms

SETTLING TIME: 2 seconds, including polarity change

COMMON-MODE COMPLIANCE: SIGNAL LO may be anywhere in the range from -0.1 volt to +1 volt with respect to power supply common. Note that if the power for the meter is supplied from an isolated power supply, the effective common-mode compliance is the isolation voltage rating of the power supply.

COMMON-MODE REJECTION: 80 db, minimum

NORMAL-MODE REJECTION: 60 db typical, 40 db minimum @ 50-60 Hz

INPUT CURRENT: 250 pA

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

INPUT VOLTAGE PROTECTION: ±100 VDC or peak VAC, 2V range; ±350 VDC or peak VAC, 20V range; ±1000 VDC or peak VAC, 200V and 1000V ranges.

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

SIZE: See figure 2

WEIGHT: Approximately 6 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.

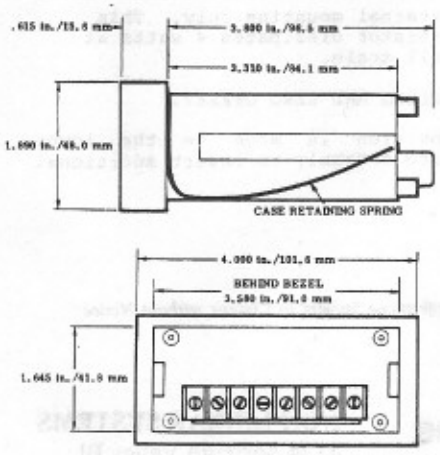

Figure 2. Outline Drawing

OPERATION.

POWER AND SIGNAL CONNECTIONS

1. Connect power supply common to terminal 5 of the terminal block.

2. Connect +5V power to terminal 6.

3. Connect SIGNAL LO of the source being measured to terminal 2.

4. Connect SIGNAL HI to terminal 1.

NOTE

In an electrically noisy environment it may be desirable to use a shielded lead for this connection. If a shielded lead is used, connect the shield to SIGNAL LO of the source.

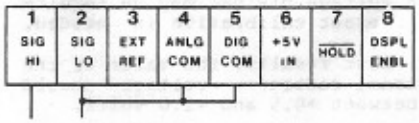

Figure 3. Connection Information

DECIMAL POINT. The position of the decimal point is determined by the position of an internal jumper on the P.C. 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 assembly, 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) 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 blanked internally.

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

EXTERNAL REFERENCE. Connecting an external reference between terminals 3 and 4 of the 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 P.C. board as described under Disassembly, and removing R24 and R26. This will increase the reference input resistance to 1000 megohms.

RANGE MODIFICATION.

1. Perform steps 1 thru 4 under Disassembly.

2. Observe resistor values for R17 and R18 and compare to figure 4 and table I below. Install resistors of values specified in table I 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.

CURRENT MEASUREMENT.

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 II. 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.

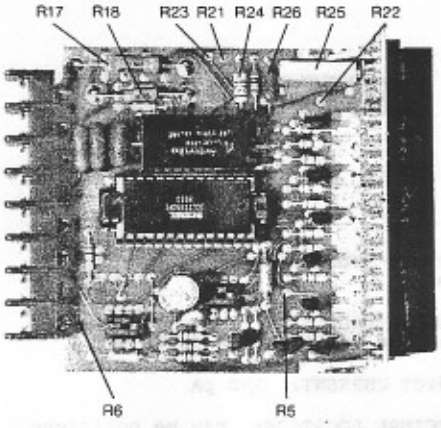

Figure 4. Component Location

Table I. Resistor Values in Range Modification

RANGE	R17	R18
2V	JUMPER	OMIT
20V	909 kOhms 1%	100 kOhms 1%
200V	10 MOhms 1%	100 kOhms 1%
1000V	10 MOhms 1%	10 kOhms 1%

Table II. 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. This 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.

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 DC input signal voltages as follows:

RANGE OF INSTRUMENT	CALIBRATION VOLTAGE
2 V	+1.9990 V
20 V	+19.990 V
200 V	+199.90 V
1000 V	+999.0 V

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

LITHO IN USA

Non-Linear Systems
Originator of the digital voltmeter.

NON-LINEAR SYSTEMS
4174 Sorrento Valley Bl.
San Diego, CA 92121

PHONE: 858.535.2161
FAX: 858.535.2169
sales@nonlinearsystems.com
www.nonlinearsystems.com