

# **METER CALIBRATOR**

## **MODEL MC-10**

### **Revision C**

## **OPERATING MANUAL**

734A1037

Revision C

**General Component Design, Inc.**

*Electronic Design & Manufacture*

**Minneapolis, MN. 55316**

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with the operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the user's purposes, the matter should be referred to General Component Design, Inc. Any applicable Federal, State or local regulations or company safety or operating rules must take precedence over any instructions given in this manual.

**METER CALIBRATOR**  
**MODEL MC-10**  
Table Of Contents

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
Table Of Contents	2
Specifications	3
Calibrator Description	4
Receiving, Handling And Storage	5
Functional Descriptions	6
AC POWER cord, Section 1	
OUTPUT cord, Section 2	6
POWER ON switch, Section 3	6
RANGE switch, Section 4	6
POLARITY switch, Section 5	6
STANDBY push-button, Section 6	6
TEST push-button, Section 7	7
VOLTAGE CONTROL, Section 8	7
POWER ON lamp, Section 9	7
BATTERY CHARGE lamp, Section 10	7
FLOAT CHARGE lamp, Section 11	7
BATTERY LOW lamp, Section 12	7
OUTPUT TRIP lamp, Section 13	7
OUTPUT ENABLED lamp, Section 14	7
VOLTS, digital meter, Section 15	8
General Testing Procedure	9
Load Meter Table, EMD Millivolts	10
Load Meter Table, GE Millivolts	11
Load Meter Table, EMD Volts	12
Warranty & Service	13

# METER CALIBRATOR

## MODEL MC-10

### Specifications

- Accuracy: 0.10% of reading  $\pm$  1 count @ 25° Celsius.
- Temperature Coefficient: 0.008% of reading per degree Celsius
- Operating Temperature: 0 to +55° Celsius for rated accuracy
- Storage Temperature: -40° to +85° Celsius
- Warm-up Time: 1 Minute to rated accuracy
- Display: 7-Segment L.E.D., 14.2 MM
- Meter Overrange: 3 LSD's (least significant digits) blank
- Humidity: 0 - 95% R.H. @ 0 to 40° C, non-condensing
- Voltage, Low Range: 0 to 0.120 Volts Nominal, open-circuit.
- Voltage, High Range: 0 to 10.4 Volts Nominal, open-circuit.
- Voltage Source: Constant to 10.5 Volts Nominal.
- Measurement method: Kelvin method, 4-wire test probe.
- Current, over: 0.040 Amperes maximum limited.
- AC Power Cord: 6' Long, 2-Conductor with ground.
- Output Cord: 6' Long, 4-Conductor.
- Battery Type: Lead-Acid, sealed Gel cell.
- Battery Capacity: 12-Volt, 2.3 Ampere-Hour. Qty. 1.
- Battery Charge Time: 18 Hours from a full discharge.
- Battery Cycle Life: >7 Hours nominal with constant full output.
- Battery Charger: Dual-slope, constant-voltage.
- Battery Charger full current: 0.18 amperes.
- Battery Charger float current: 0.08 amperes.
- Battery Charging Power: 110 to 130 Volts (nominal) AC, 60 Hertz.
- Weight: 9.7 Lbs.
- Size: 7" x 11" x 8.5"

**METER CALIBRATOR**  
**MODEL MC-10**  
Calibrator Description

**Warning!**

*During normal battery operation, there are no hazardous voltages available inside or outside of this Meter Calibrator unit with respect to personal safety.*

**Personal Safety Instructions**

Only qualified personnel should work on or around this equipment. To ensure the highest degree of personal safety, all who use this equipment are required to become thoroughly familiar with all safety instructions contained in this document. Successful and safe operation of this equipment depends upon proper handling, operation, maintenance and application of local company procedures.

This instruction manual covers the specifications and operation of the General Component Design, Inc. load meter calibrator. Hereafter referred to as calibrator.

This calibrator is a second-generation load meter calibrator. It is a battery-operated device and is completely self-contained which affords good portability. It is built to withstand a reasonable rough handling environment. It is capable of testing and calibrating and certifying locomotive load meters of the millivolt and volt ranges as found on E.M.D. (General Motors) and General Electric locomotives.

Various features have been improved in this newer version. The wear factor of the front panel text has been greatly improved with the use of a durable G.E. Lexan® material with sub-surface printed text. This virtually eliminates the possibility of panel text wearing out after continued use. The internal battery supply has changed from two cells to one whereby reducing the overall calibrator weight and maintenance costs. A dual-slope battery charger is used to maximize the battery cycle time and battery life. A ten-turn operator potentiometer has been used to increase resolution. Bright LED lamps annunciate battery modes and operation modes. Overall weight has been decreased by over two pounds.

**METER CALIBRATOR**  
**MODEL MC-10**  
Receiving, Handling and Storage

Immediately upon receipt, examine this equipment for any damage that might have been sustained in transit. If damage or rough handling is evident, please contact the General Component Design company. This calibrator was built to withstand rough handling, but reasonable care should be exercised when handling or transporting this equipment as with all electronic equipment. Store in cool dry place when not using.

**METER CALIBRATOR**  
**MODEL MC-10**  
Functional Descriptions

**1. AC POWER cord:**

**Warning!** AC power is used by this instrument for battery charging purposes only. There are no exposed voltage points available. This cord plugs directly into a source of 115 Volts (nominal) Alternating Current, 60 Hertz for battery charging operation only and is not intended for the primary operation of the calibrator unit. The internal battery charger is a dual-slope type whereby upon first power application, a full charge current (limited) is applied to the battery. After a pre-determined battery condition, the charger switches to a “Float Charge” or lower charge rate. This lower charge rate protects the battery from overcharging if inadvertently left plugged in for unusually long periods of time. The time difference between the when charger is plugged and when the float lamp will illuminate will vary greatly depending upon the balance of charge left in the battery.

**2. OUTPUT cord:**

**Warning!** There are NO hazardous voltages available at the output terminals of this calibrator. Output test leads are color-coded for polarity Red for positive and Black for negative. The output terminals are capable of producing 0 to 0.150 volts and 0 to 10.5 volts nominal direct current. The Kelvin measurement method is employed for elimination of IR losses and optimum accuracy with high burden load meters.

**3. POWER ON Switch:**

Rocker switch is labeled with International standard symbols 0 or 1 meaning power off and power on respectively. This switch applies the main control power to the calibrator unit and illuminates the digital meter. Upon power up, the digital meter displays “1.888” reading for three seconds nominally as a display test. The MC-10 unit defaults in the standby mode with the “Power On” and “Output Trip” lamps illuminated.

**4. RANGE Switch:**

Rocker switch is labeled with International standard symbols 0 or 1 meaning Millivolt and Volt range respectively. It switches the output operating range from the Millivolts range to the Volts range. In the Millivolt position, the output has a range from 0 to 150 Millivolts. Likewise, when the switch is in the Volts position, the operating range is extended from 0 to 10.5 Volts nominal. Notice: When switching from the Millivolt range to the Volt range, the output is automatically disabled to prevent inadvertent higher range voltages to the meter under test. Conversely, when switching from the Volts range to the Millivolts range, the output will not shut down but will continue to operate.

**5. POLARITY Switch:**

Rocker switch is labeled with International standard symbols 0 or 1 meaning Normal and Reverse output polarities respectively. It switches the output polarity. In the Normal position, the red colored test probe is positive with respect to the black. In the Reverse position, just the opposite is true.

**6. STANDBY Push-Button:**

This unguarded push-button switch will disable the output signal. This means depressing this switch will shut off the output and the annunciator lamps will switch likewise.

**METER CALIBRATOR**  
**MODEL MC-10**  
Functional Descriptions

**7. TEST Push-Button:**

This guarded push-button switch will enable the output signal. This means depressing this switch will activate the output circuit but only when the voltage potentiometer is turned fully CCW.

**8. VOLTAGE CONTROL:**

This control directly adjusts the available output voltage. The scale markings represent a range from 0 to 100% in a 10-turn manner giving the operator very fine resolution as needed. As previously stated, this operator control must be returned full counterclockwise to enable the unit from a standby mode to an operate mode. The methodology for requiring a zero-start is to protect a meter-under-test from stress or damage by inadvertent over-voltage operation.

**9. POWER ON lamp:**

Illuminated when main control “power on” switch is depressed.

**10. BATTERY CHARGE lamp:**

Illuminated only when the power cord is plugged into an acceptable AC power source and indicates the battery charger mode is active. This lamp operation is independent of the operation of the main unit.

**11. FLOAT CHARGE lamp:**

This lamp is a secondary operation of the battery charge lamp as described above. It is illuminated only after the battery charge lamp is illuminated. When pre-determined battery conditions have been met, the battery charger circuitries will switch and lock into a second mode considered a trickle or float charge. The battery charge and float charge lamps are operational only when the AC Power, power cord are plugged in and are independent of main unit operation.

**12. BATTERY LOW lamp:**

This lamp is a secondary operation of the battery monitoring circuitries. It is illuminated when the battery level drops to a pre-determined level. It is operational only when the unit is powered up but not when the battery charging mode is used. When this level has been met, the lamp will illuminate and lock on. A shut-down level has been selected while still preserving approximately 15% to 20% (at 25° Celsius) of the battery capacity remaining. This was done to ensure a full output can be achieved with the Calibrator.

**13. OUTPUT TRIP lamp:**

Indicates the output status of the main control unit. Upon power up of the MC-10, this lamp illuminates indicating the output is off or in the standby mode. This is the power-up sequence default mode. When an output current of forty milliamperes (nominal) is exceeded, the output will be tripped and this trip lamp will be illuminated.

**14. OUTPUT ENABLED lamp:**

Indicates the output status of the main control unit. Upon power up of the MC-10, this lamp is not illuminated indicating the output is not enabled or in the standby mode. When the voltage control operator knob is in the full counterclockwise position and the “test” button is depressed, in that order, the output enabled lamp will be illuminated indicating the unit is ready for operation.

**15. VOLTS, digital meter:**

Digital meter capable of displaying in a 3-½ digit format. It is an L.E.D. type, highly visible for use in average to low-light environments.



**METER CALIBRATOR**  
**MODEL MC-10**  
General Testing Procedure

**WARNING!**

*Prior to any testing procedures, ensure all user circuitries are powered down and disconnected for personal safety.*

Procedures described here are to be generic in nature and may not specifically apply to user application.

To test the typical Millivolt loadmeter, perform the following.

1. Disconnect and remove the meter under test from service.
2. Ensure MC-10 meter calibrator is powered down.
3. Connect the MC-10 test leads to the appropriate load meter terminals.
4. Connect the red test lead to the (+) marked terminal on meter back.
5. Connect the black test lead to the (-) marked terminal on meter back.
6. Depress the MC-10 power on switch.
7. Depress the MC-10 range switch to the millivolt position.
8. Rotate the voltage control knob full counterclockwise.
9. Ensure the power on and output trip lamps are illuminated.
10. Ensure the digital volts display reads 0.00 volts nominal.
11. Depress the test push-button switch.
12. Rotate the voltage control knob to the desired value(s) as shown in the sample table below.
13. Measure or record calibration data as necessary.
14. Depress the standby push-button switch when complete.
15. Reverse the test lead polarities for meters which require negative current tests.
16. Depress the power switch to the off position when finished.
17. For exact load meter specifications, please consult the maintenance instruction manual as provided by the locomotive manufacturer.

**METER CALIBRATOR**  
**MODEL MC-10**  
 Load Meter Table, EMD Millivolts

<u>MC-10 Millivolts</u>	<u>Load Meter Optimum</u>	<u>Load Meter Range</u>
5	100	95 to 105
10	200	190 to 210
15	300	285 to 315
20	400	380 to 420
25	500	475 to 525
30	600	570 to 630
35	700	665 to 735
40	800	760 to 840
45	900	855 to 945
50	1000	950 to 1050
55	1100	1045 to 1155
60	1200	1140 to 1260
65	1300	1235 to 1365
70	1400	1330 to 1470
75	1500	1425 to 1575

The above data are typical values for load meters as found on E.M.D. models GP12, GP38, GP38-2, GP39-2, GP40, SD40, SD40-2, SW1500, SW10, MP15 and any engines that have a 75 Millivolt Full Scale Load Meter.

**METER CALIBRATOR**  
**MODEL MC-10**  
Load Meter Table, GE Millivolts

<u>MC-10 Millivolts</u>	<u>Load Meter Optimum</u>	<u>Load Meter Range</u>
10	100	95 to 105
20	200	190 to 210
30	300	285 to 315
40	400	380 to 420
50	500	475 to 525
60	600	570 to 630
70	700	665 to 735
80	800	760 to 840
90	900	855 to 945
100	1000	950 to 1050
110	1100	1045 to 1155

The above data are typical values for load meters as found on GE Dash 8 Locomotives that have a 110-Millivolt Full Scale Load Meter.

**METER CALIBRATOR**  
**MODEL MC-10**

Load Meter Table, EMD Volts

The following data are typical values for load meters as found on E.M.D. models GP40X, GP50, SD50 and SD60 Locomotives that have a 11 Volt Full Scale Load Meter.

<u>MC-10 Volts</u>	<u>Load Meter Optimum</u>	<u>Load Meter Range</u>
1	150	143 to 157
2	300	285 to 315
3	450	428 to 472
4	600	570 to 630
5	750	713 to 787
6	900	855 to 945
7	1050	998 to 1102
8	1200	1140 to 1260
9	1350	1283 to 1417
10	1500	1425 to 1575
11	1650	1568 to 1732

**METER CALIBRATOR**  
**MODEL MC-10**  
Warranty & Service

**Warranty.**

This unit is provided with a one-year warranty for both parts and labor.

**Calibration:**

To ensure the accuracy of calibration, it is recommended to check the performance of this instrument every 12 months.

**Service.**

To obtain service or additional manuals, please contact the following address.

**General Component Design, Inc.**

*Electronic Design & Manufacture*

10909 Independence Ave. North

Champlin, Minnesota. 55316-3113

or e-mail a request to:

[generalcomponentdesign@comcast.net](mailto:generalcomponentdesign@comcast.net)

[www.generalcomponentdesign.com](http://www.generalcomponentdesign.com)