

MAS-CAL

CALIBRATION PROCEDURE MANUAL



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GENERAL

Please read these instructions carefully to prevent any possible injury or equipment damage.

INTRODUCTION

PLC-Multipoint's MAS-CAL is a field calibration unit for MAS Series sensors. The MAS-CAL communicates with a sensor remotely over the MAS Sensor's 2 wires up to a distance of 4,000ft. The MAS-CAL can indicate the current configuration of the sensor as well as select an MAS Sensor's Light Range and Response Time.

The MAS-CAL can be operated in two ways:

1. With an MAS Sensor connected to the SENSOR inputs; enabling the user to see the status or select the pre-programmed Light Range and Response Time.
2. With an MAS Sensor and a user supplied Digital Multimeter, set on its DC milli-amp (mA) setting. This allows the user to see the MAS sensor's status or select the pre-programmed Light Range or Response Time and view the actual milli-amp reading from the sensor. In this manual, this second method will be used.

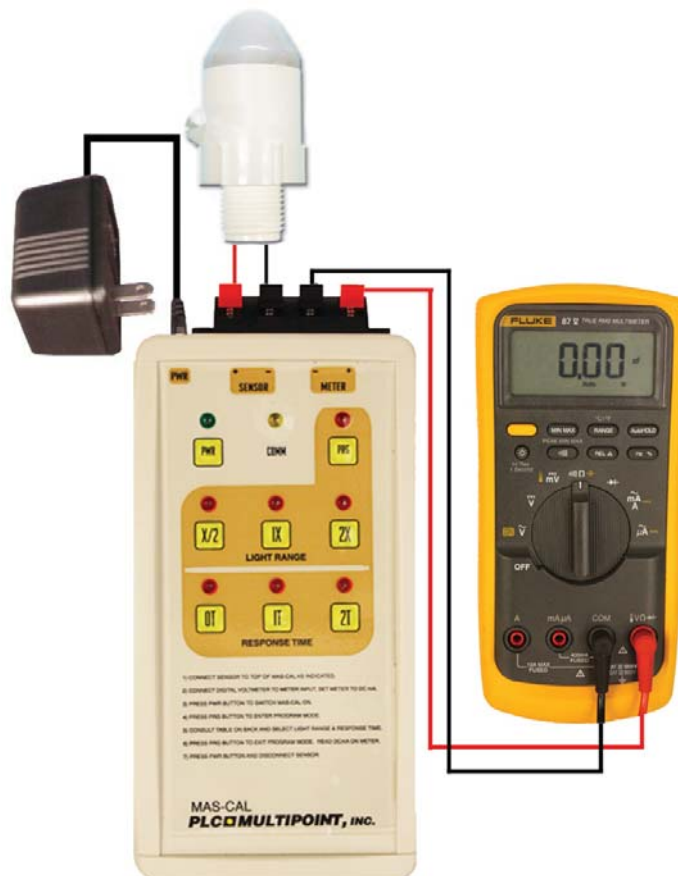


FIGURE 1: CONNECTION DRAWING

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POWER

*The MAS-CAL is powered by an internal 9V battery, or an external 24VAC power supply. The battery compartment is located at the bottom of the back side of the MAS-CAL. The 24VAC transformer can be used if the battery power is low. It plugs into the **PWR** connector at the top left corner of the MAS-CAL.*

SENSOR CONNECTION

The MAS-CAL connects directly into the spring clamp terminal in the top middle of the MAS-CAL. The MAS Sensor RED wire goes into the MAS CAL's + terminal. The MAS Sensor BLACK wire goes into the MAS-CAL's - terminal.

MILLI-AMP MEASUREMENT

The user supplied Digital Multimeter must be set to the DC milli-amp (mA) setting. The Digital Multimeter's probes are directly inserted into the spring clamp terminal, on the top right of the MAS-CAL. The meter's COM (Black) lead goes into the MAS-CAL's - terminal. The meter's mA (Red) lead goes into the MAS-CAL's + terminal.



FIGURE 2: SENSOR CONNECTION



FIGURE 3: MILLI-AMP MEASUREMENT

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POWER LED AND PUSHBUTTON

The **PWR** pushbutton switches the power to the MAS-CAL on and off. Its Green LED will be solidly lit when sufficient voltage is available from the battery or the transformer. The Green Power LED will blink slowly when the battery is nearing its minimum usable voltage. The **PWR** LED will blink rapidly and not allow the user to proceed if the battery power is too low and the battery must be replaced. MAS-CAL will turn off after 10 minutes of inactivity. The **PWR** LED will repeat a pattern of three rapid blinks if there is a short-circuit in the sensor connection.

COMM LED

The Yellow **COMM** LED will be solidly lit when the MAS-CAL is properly connected to the MAS Sensor. The **COMM** LED blinks slowly when there is no sensor or an intermittently connected sensor. The **COMM** LED will flicker as communication occurs between the MAS-CAL and the MAS Sensor.

PRG LED and PUSHBUTTON

When the **PRG** pushbutton is NOT pressed and **PRG** LED is NOT lit, the Digital Multimeter will display the milli-amp current reading from the MAS Sensor. The MAS Sensor transmits to a 4-20mA signal. The MAS Sensor's signal will be conditioned by its stored light range and full scale response time setting.

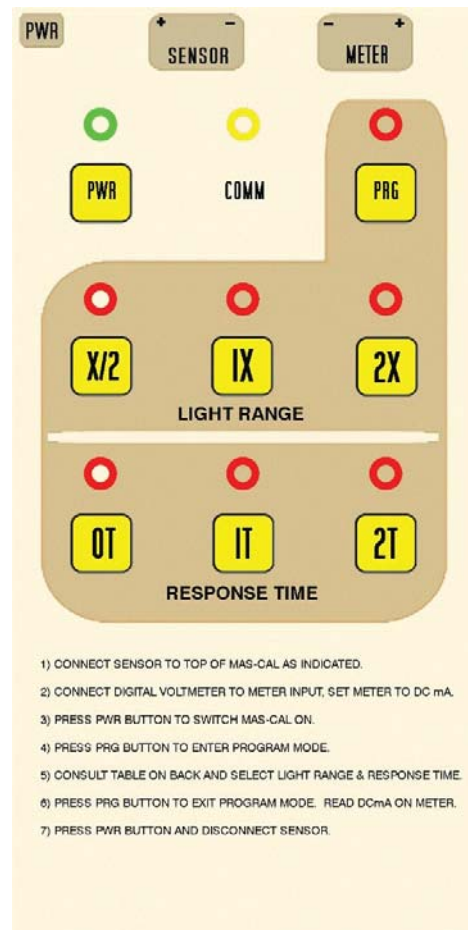


FIGURE 4

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Pressing the **PRG** pushbutton will solidly light the Red **PRG** LED and transmit status inquiry to the MAS Sensor. The sensor will respond with its currently configured Light Range and Response time. The sensor is now in Program Mode. **While in Program mode, disregard milli-amp readings displayed on the Digital Multimeter.** After a new setting has been loaded into the MAS Sensor, (See following sections on Light Range and Response Time configurations), pressing the PRG pushbutton will take the MAS sensor out of Program Mode and display the actual reading on the Digital Multimeter.

LIGHT RANGE AND RESPONSE TIME OVERVIEW

Each MAS Sensor comes configured from the factory with a standard light range and response time. These are indicated as the **1X** light range (One times the factory preset light range) and **1T** (One times the factory preset response time. Each MAS product has an individual light range based upon the application of the sensor: This is the maximum value that that the sensor will detect at 20mA and is calibrated at the factory.

LIGHT RANGE IN FOOTCANDLES				RESPONSE TIME	
	X/2	1X	2X	OT	1/60 MIN-UTE
MAS-S Sky-light	2,500 FC	5,000 FC	10,000 FC	1T	10 MIN-UTES
MAS-A Atrium	500 FC	1,000 FC	2,000 FC	2T	20 MIN-UTES
MAS-O Outdoor	125 FC	250 FC	500 FC		
MAS-I Indoor	50 FC	100 FC	200 FC		

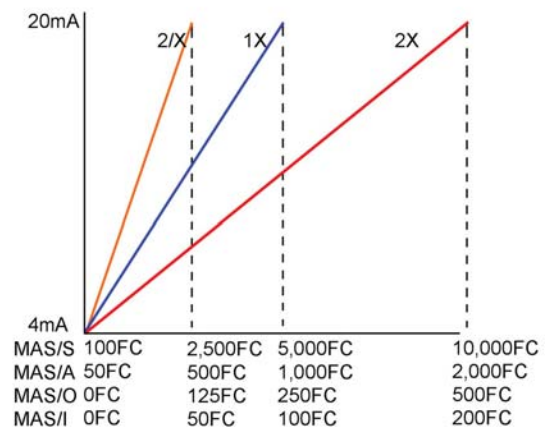
FIGURE 6

LIGHT RANGE SETTINGS

Each MAS sensor has a different **1X** or factory preset range. The vast majority of sensor installations can use the **1X** setting without change.

However, if the sensor doesn't detect enough light to obtain the desired signal level, by pressing the **X/2** pushbutton, the sensor will recalculate the output so that the 20mA signal will be obtained at half of the light level of the factory preset.

If the sensor is saturated with light early during the day, then the sensor range can be doubled using the **2X** setting. Both the **X/2** and the **2X** settings are only recalculations of the original factory calibration, which is always available to return to if desired.



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In the example shown, the **1X** standard range has a current reading of 10.04 milliamps, which shall be approximated to 10mA for the calculations below.



FIGURE 7

X/2 SETTING CHANGE

To change the light range to the **X/2** setting. Press the **PRG** key, (Disregard the Digital Multimeter reading). Press the **X/2** key. The LED should light above the **X/2** key. Press the **PRG** key to leave Program Mode and observe the new milliamp reading. The sensor recalculates the signal for the same detected illuminance level.

1X output = 10 mA

X/2 output = 10 mA + (10mA-4mA) = 16mA

The effective light range detection of the MAS sensor is now halved.



FIGURE 8

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2X SETTING CHANGE

To change the light range to the **2X** setting. Press the **PRG** key, (Disregard the Digital Multimeter reading). Press the **2X** key. The LED should light above the **2X** key. Press the **PRG** key to leave Program Mode and observe the new milliamp reading.

The sensor recalculates the signal for the same detected illuminance level.

1X output = 10 mA

2X output = 10 mA – $\frac{1}{2} * (10\text{mA} - 4\text{mA}) = 7\text{mA}$

The effective range of the sensor is now doubled.



FIGURE 8

RESPONSE TIME OVERVIEW

All MAS series sensors have the same response time selections. Three settings are available on the MAS-CAL.

0T = Instantaneous response -useful in dimming systems and commissioning, where the sensor needs to immediately follow light changes.

1T = Factory setting of the full scale response time - derived from the time the MAS sensor takes to go from 10% of the range to 90% of the range.

2T = Twice the factory setting. -recalculates the response time so that it is twice as long as the factory 1T setting.

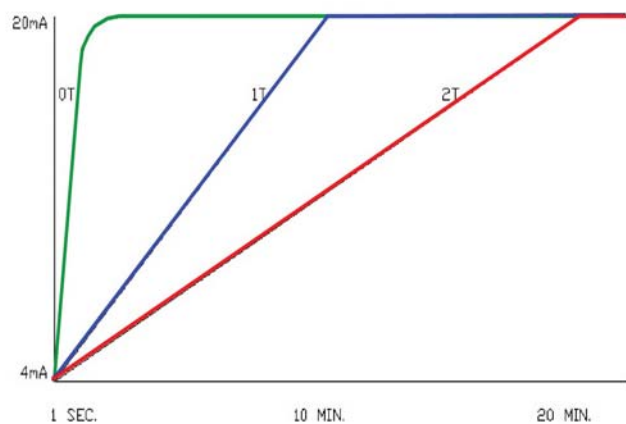


FIGURE 9

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0T RESPONSE TIME CHANGE

To change the response time to the **0T** setting. Press the **PRG** key, (Disregard the Digital Multimeter reading). Press the **0T** key. The LED should light above the **0T** key. Press the **PRG** key to leave Program Mode and observe the new instantaneous response time.



FIGURE 10

2T RESPONSE TIME CHANGE

To change the response time to the **2T** setting. Press the **PRG** key, (Disregard the Digital Multimeter reading). Press the **2T** key. The LED should light above the **2T** key. Press the **PRG** key to leave Program Mode and observe the new doubled response time.



FIGURE 11

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