

MAS-CAL INSTALLATION AND  
MAINTENANCE MANUAL (IMM)

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**PLC  MULTIPPOINT, INC.**

3101 111th ST SW #F Everett Washington 98204

**Telephone:** 425-353-7552 **Fax:** 425-353-3353

# MAS-CAL INSTALLATION AND MAINTENANCE MANUAL (IMM)

## GENERAL

1. Please read these instructions carefully to prevent any possible injury or equipment damage.
2. Installer must be a qualified and experienced service technician.
3. Verify the product ratings to confirm that this product will satisfy your requirements and application.

## INTRODUCTION

PLC-Multipoint's MAS-CAL is a field calibrator for MAS Series 4-20mA sensors. The MAS-CAL communicates with a sensor remotely over the MAS Sensors 2 wires up to a distance of 4,000ft. The MAS-CAL can view the current configuration of the sensor as well as program an MAS Sensor's Light Range and Response Time.

The MAS-CAL can be operated in two ways:

1) With an MAS Sensor hooked up to the SENSOR inputs - enabling the user to see the status or program the pre-selected Light Range and Response Time.

2) With an MAS Sensor and an a user supplied Digital Multimeter- set on its milli-amp (mA) setting. This allows the user to see the MAS sensor status or program the pre-selected 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:  
MAS-CAL HOOK-UP DIAGRAM**

## **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 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 HOOK-UP**

The MAS Sensor plugs 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.



**FIGURE 2:**

## **MILLI-AMP MEASUREMENT**

The user supplied Digital Multimeter must be set to the 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 3:**

## PWR 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 battery has a warning indicator and 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 when there is a short circuit in the sensor hookup.

## COMM LED

The **COMM** LED will be solidly lit when the MAS-CAL is properly hooked up to the MAS Sensor. The **COMM** LED blinks slowly when there is no sensor or an intermittently hooked up 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 sends a signal from 4mA to 20mA. The MAS sensor will respond using its stored light range and full scale response time. Wait 15 seconds for signal to stabilize after toggling **PRG** button.

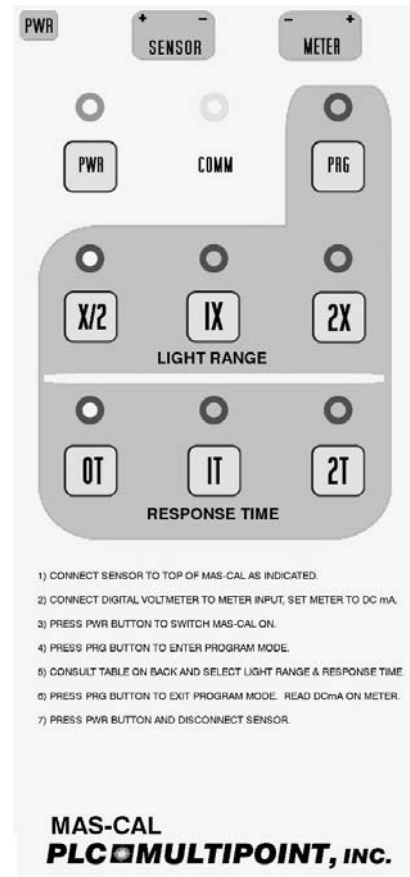


FIGURE 4:




FIGURE 5:

Pressing the **PRG** pushbutton will solidly light the **PRG** LED and send a status inquiry to the MAS Sensor, which should respond with its currently configured Light Range and Response time. The sensor is now in Program mode.

**While in the 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 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 MINUTE
MAS-S Sky-light	2,500 FC	5,000 FC	10,000 FC	1T	10 MINUTES
MAS-A Atrium	500 FC	1,000 FC	2,000 FC	2T	20 MINUTES
MAS-O Outdoor	125 FC	250 FC	500 FC		
MAS-I Indoor	50 FC	100 FC	200 FC		

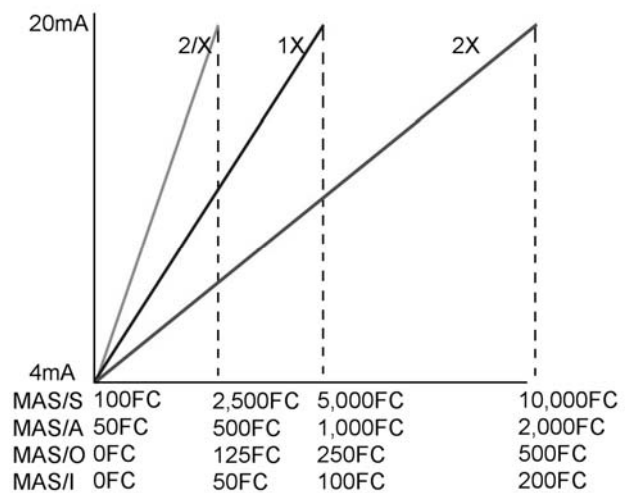
**FIGURE 6:**

### 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.



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 go out of program 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:**

## 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 go out of program and observe the new milliamp reading.

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

**1X** output = 10 mA

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

The effective range of the sensor is now doubled.



**FIGURE 9:**

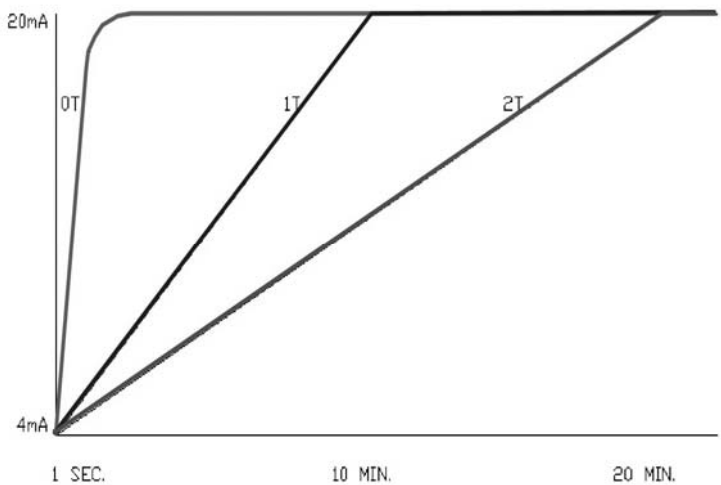
## RESPONSE TIME OVERVIEW

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.



**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 go out of program 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 go out of program and observe the new doubled response time.



**FIGURE 11:**

**PLC MULTIPOINT, INC.**  
 3101-111th ST SW #F Everett, WA 98204  
 www.plcmultipoint.com  
 Toll Free 866-998-5483