

# **BINMASTER**

*Taking Control . . . To A Higher Level*

## **PRO AUTO-CAL CAPACITANCE PROBE**



## **OPERATING INSTRUCTIONS PLEASE READ CAREFULLY**

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## GENERAL SPECIFICATIONS

SUPPLY	120VAC +10% -15%, 50/60 Hz, 5VA (230VAC option)
AMBIENT TEMPERATURE (Electronics)	-40°F to +160°F (-40°C to +70°C)
SENSITIVITY	Less than 1 picofarad
ENCLOSURE	Type 4X, 5, 12
RELAY OUTPUT	DPDT contacts; 10 Amp 250 VAC rating
FAIL-SAFE	Switch selectable "High" or "Low" level
CALIBRATION	Automatic calibration, manually activated OR Through cover activation with magnetic wand. Five selectable sensitivity offset values
STATUS INDICATORS	Internal LED indicates material in contact with probe: ON = Probe covered External LED, includes the time delay setting: Slowly Flashing = Probe uncovered ON Steady = Probe covered OFF Steady = Power failure Quick Flashes with Pause = Calibration fault
OUTPUT RELAY TIME DELAY	Continuously adjustable up to 10 seconds
TEST FEATURES	Through cover tests with magnetic wand: Simulate Covered Probe Simulate Uncovered Probe
PROBE SHEILD	Automatically compensates for material buildup on the probe
CONDUIT ENTRY	3/4" NPT

## **1.0 INTRODUCTION**

The Bin-Master PRO AUTO-CAL is a point level control used to detect the presence or absence of solids or liquids. The PRO AUTO-CAL operates on the capacitance principle and incorporates an embedded microprocessor which controls the automatic calibrate feature. The PRO AUTO-CAL includes switch selectable Fail-Safe relay output contacts, adjustable time delay of relay operation, "Probe Shield" technology for ignoring material build-up, and through the cover full operational testing. An external LED provides visual monitoring of probe covered, uncovered, auto-calibration, or power failure conditions.

Upon installation, the PRO AUTO-CAL is calibrated with the probe uncovered. The automatic calibrate feature allows push button or through the cover calibration of the unit. Five internal selectable sensitivity offsets permit reliable detection of a wide range of materials.

## **2.0 APPLICATIONS**

For applications in pressurized vessels up to 1500 PSI, the PRO AUTO-CAL should be mounted with the 3/4" stainless steel coupling.

Application temperatures for the various probes are:

- |                                    |       |
|------------------------------------|-------|
| 1. Delrin Sleeved Stainless Steel: | 250°F |
| 2. Teflon Sleeved Stainless Steel: | 500°F |
| 3. Flush Mount (Polyethylene):     | 180°F |
| 4. Flush Mount (Teflon):           | 450°F |
| 5. Bare Stainless Steel:           | 250°F |
| 6. Flexible Extension:             | 250°F |

The Delrin and Teflon sleeved stainless steel probe should be used for most applications. A bare metal stainless steel probe can be used in certain granular or liquid materials that are not electrically conductive. For electrically conductive material, a coated (insulated) probe must be used. Conductive material, which completely coats the probe, will render the unit inoperative. This is true for any capacitance probe.

**NOTE:** The temperature of the electronics within the enclosure must not exceed 160°F. Use of high temperature probes may require lagging the electronics away from the heat source.

## **3.0 INSTALLATION**

### **3.1 Location and Mounting**

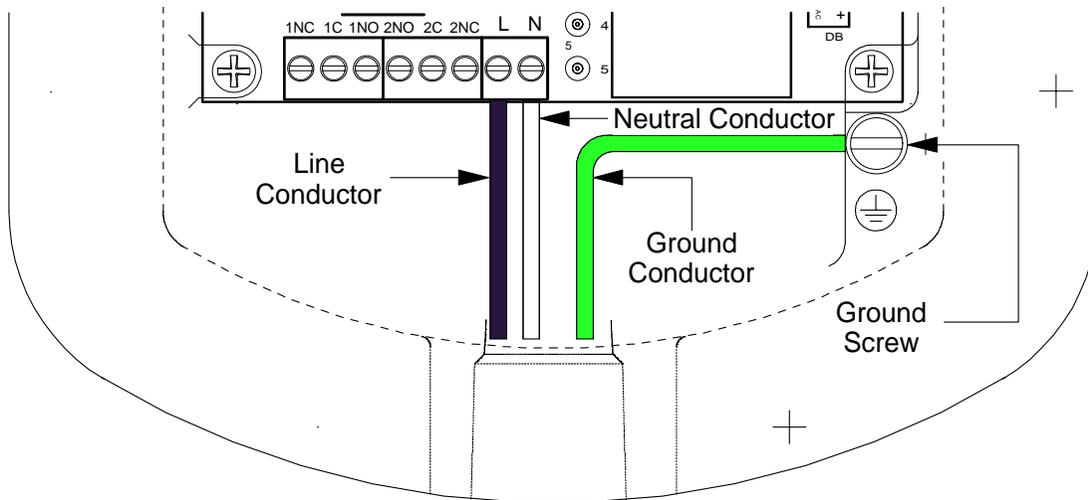
The probe should be located out of the direct flow of material. The PRO AUTO-CAL is designed to mount utilizing either a standard 3/4" NPT coupling or optional 1 1/4" NPT coupling. When the PRO AUTO-CAL is used with the flush mount probe, the flush mount probe mounts directly to the vessel wall using a 7" diameter bolt circle. Refer to Figures 1.1 through 1.4 for illustrations on installation, mounting options, and different probe combinations.

When the PRO AUTO-CAL is used with a probe that does not have a guard shield, care should be taken if mounted in a stand pipe or through a thick vessel wall. Close proximity between the standpipe or vessel walls and the probe rod can produce an ambient capacitance that is high enough to exceed the calibration range of the PRO ATUO-CAL. If you have any questions about the installation consult your BinMaster representative or the Bin-Master factory.

### 3.2 Input Power and Field Wiring

The PRO AUTO-CAL is be powered from a 115 VAC supply (see diagram below). Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation. A 230 VAC model is available on request.

#### POWER SUPPLY WIRING CONNECTIONS



### 3.3 Grounding

An equipment grounding connection (earth ground) **must** be supplied to the unit for safety and to insure proper operation of the unit. This unit uses earth ground as a reference for calibration and detecting a covered or uncovered condition. Therefore, the vessel in which the PRO AUTO-CAL is mounted must be made of metal, or a suitable metal ground plate must be installed where the PRO AUTO-CAL is mounted.

## 4.0 FAIL-SAFE SELECTION

### 4.1 Description

A Fail-Safe condition means that the output relay contact positions are set up so that in the event of a power failure, which causes the relay to de-energize, the contacts will indicate a condition that is deemed safe for the application. (Refer to FIGURE 2.1 for the location of the Fail-Safe selection switch.)

**4.2 Fail-Safe High**  
 Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is covered whether it is or not.

### 4.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when to indicate that the probe is covered. In this mode, a power line failure will cause the relay contacts to indicate that the probe is covered whether it is or not.

#### FAIL SAFE "HIGH" RELAY CONTACT POSITION



### 4.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the probe is uncovered and will energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is uncovered whether it is or not.

#### FAIL SAFE "LOW" RELAY CONTACT POSITION



## 5.0 CALIBRATION

The automatic calibrate feature can be activated with the enclosure cover removed by use of an internal push button, or with the cover in place, by use of a magnetic wand. Before activating the automatic calibration cycle, the desired **sensitivity** offset must be selected internally. There are 5 sensitivity offset values, selectable with a 3 pole DIP switch, refer to paragraph 5.3.

**IMPORTANT:** The desired Sensitivity setting must be selected using the internal 3 pole SENSITIVITY switch **before** the Automatic Calibration cycle is activated. To program in a new sensitivity setting, the Automatic Calibration cycle must be activated **each time** a new setting is set on the SENSITIVITY switches

**NOTE:** Accurate calibration requires that the appropriate probe be attached to the PRO AUTO-CAL and the unit is installed in the vessel. The probe must be UNCOVERED with material well below it

### 5.1 Calibration Verification

Following calibration, verify that the sensitivity setting you have selected is correct for your application. Material should be brought up to the probe level to confirm that the PRO AUTO-CAL senses a covered condition.

### 5.2 Calibration Procedure

**NOTE:** Material should be at least three (3) feet below the probe when calibrating.

1. Set the sensitivity switch to the desired sensitivity, see para 5.3 below.
2. If the enclosure cover is off, push the CALIBRATE button three times.
3. If the enclosure cover is on, touch the magnetic wand to the CALIBRATE target slowly three times. lift the wand at least 3/4 inch above the cover between each touch.

**NOTE:**

When the automatic calibration cycle is activated, the flashing LED will turn off for approximately 6 seconds to indicate that calibration is taking place. When the calibration is completed, the LED will again flash at a **slow steady rate**. Failure to calibrate gives quick flashes with a pause between, see paragraph 5.4.

### 5.3 Sensitivity Selection

Sensitivity Setting	DIP Switches	Dielectric Constant of Material
HIGH	HIGH switch only ON	1.2 to 2
MED. HIGH	HIGH and MED. switches both ON	2 to 4
MEDIUM	MED. switch only ON	4 or greater
MED. LOW	MED. and LOW switches both ON	10 or greater
LOW	LOW switch only ON	20 or greater

## 5.4 Failed Calibration Indication

Two, three or four quick flashes of the LED followed by a pause indicates that the unit failed to calibrate properly. The PRO AUTO-CAL has built-in diagnostics. If during the automatic calibrate cycle the PRO AUTO-CAL cannot properly achieve calibration, due to a problem with the probe or internal wiring, the LED indicator will not return to slow steady flashing after the 6 second off period. Rather, the LED will give a repeating sequence of short quick flashes followed by an off pause. In such a case, check the probe and its connecting wires for a short. **Do not** rely on the unit for your plant process when it is indicating a failed calibration condition.

## 6.0 TIME DELAY

The PRO AUTO-CAL has an adjustable time delay of 1/2 to 10 seconds for the output relay. This time delay is for the output to change states from either an uncovered to a covered condition or from a covered to an uncovered condition. This time delay affects the relay contacts and the flashing LED only. The internal LED (DS1) always responds immediately to a change in covered or uncovered condition, regardless of the time delay setting.

Minimum time delay is when the DELAY potentiometer is set fully counter-clockwise. (Refer to FIGURE XX for the location of the DELAY potentiometer.) Maximum time delay is with the DELAY potentiometer set fully clockwise.

**CAUTION:** This is a delicate electronic adjustment, do not use excess force, care should be taken so as not to turn the control past its stop when making adjustments.

## 7.0 WARRANTY AND CUSTOMER SERVICE

### 7.1 Limited Warranty

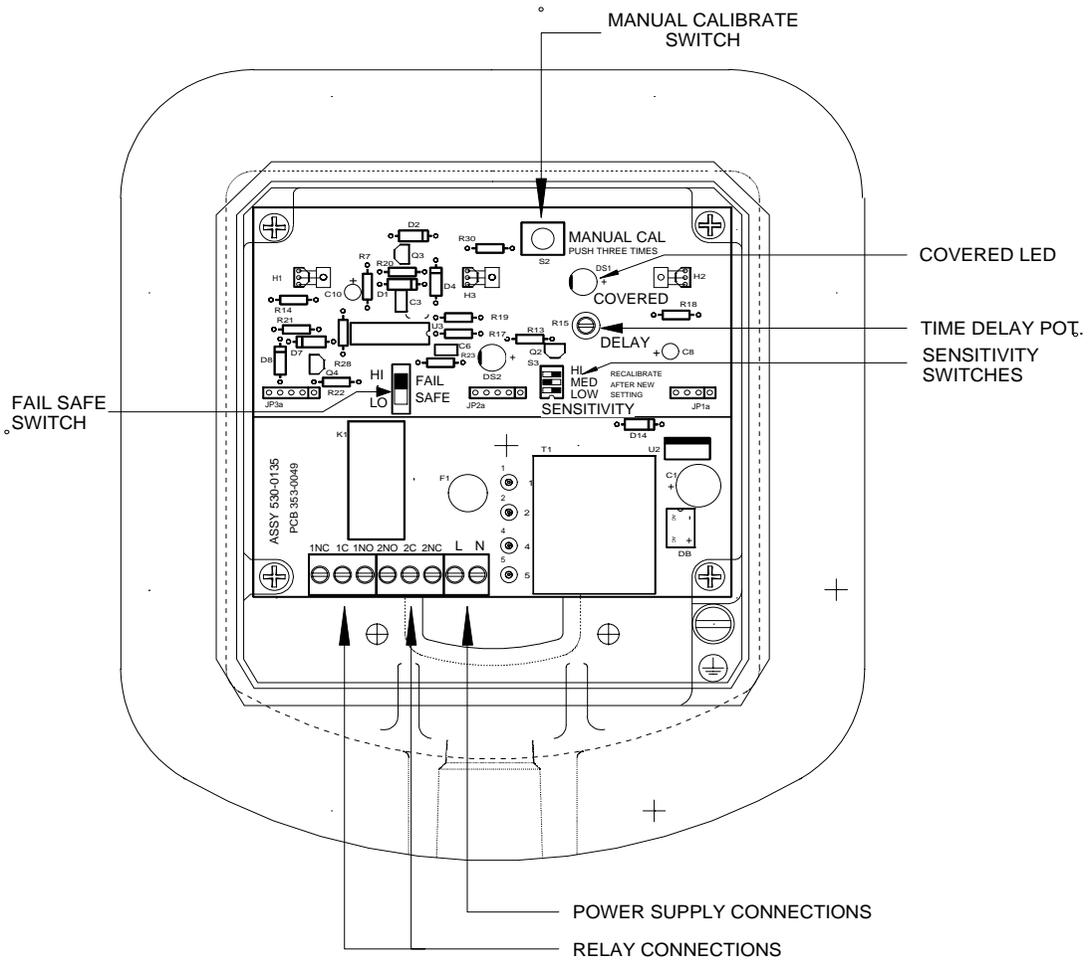
The manufacturer warrants this equipment for 2 years according to the following terms:

- 1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the **Warranty Registration** card to confirm the equipment purchase. Failure to do so may void the warranty.
- 2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.
- 3.) This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.
- 4.) This warranty is in lieu of all other warranties, expressed or implied.

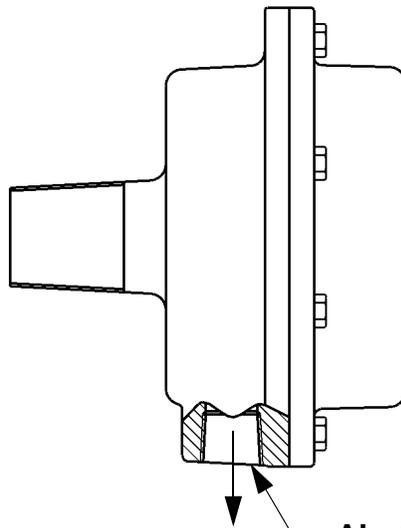
### 7.2 Customer Service

Bin Master offers a toll-free Customer Service phone number **1-800-278-4241**. You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via fax at (402) 434-9133.

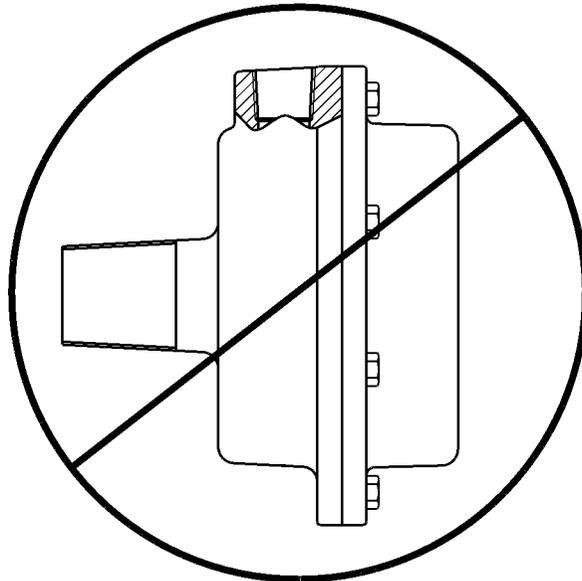
# FIGURE 2.1



# Mounting Instructions



Always Mount Unit with Conduit Opening Down



## CONDUIT SEAL

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure thru the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

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