

**ENOVATION**  
CONTROLS™

**MURPHY**®

## GENERAL CATALOG 2016

MURPHY

ENGINE  
STOP RUN

EICS

PUSH TO CRANK

SPEED CONTROL  
MANUAL AUTO

ENGINE SPEED  
DECREASE INCREASE

CONTROLS & INSTRUMENTATION





# 2016 Catalog

## Controls and Instrumentation

In order to consistently bring you the highest quality, full-featured products, we reserve the right to change our specifications and designs at any time.

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# How To Use The Catalog

The 2016 Murphy Catalog features a style to assist you in finding the right product for your needs. Here are some of the key elements, you will find on most of the bulletins included.

For more information on any product, please visit our website at [www.fwmurphy.com](http://www.fwmurphy.com). If you have questions, please call us at (918) 317-4100.

## Brief Description

Each bulletin has a brief description of the product and its features. For more information on any product, please visit our website.



## Document Number

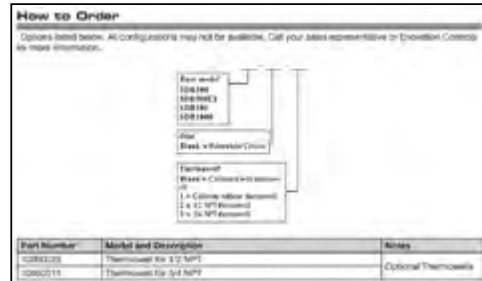
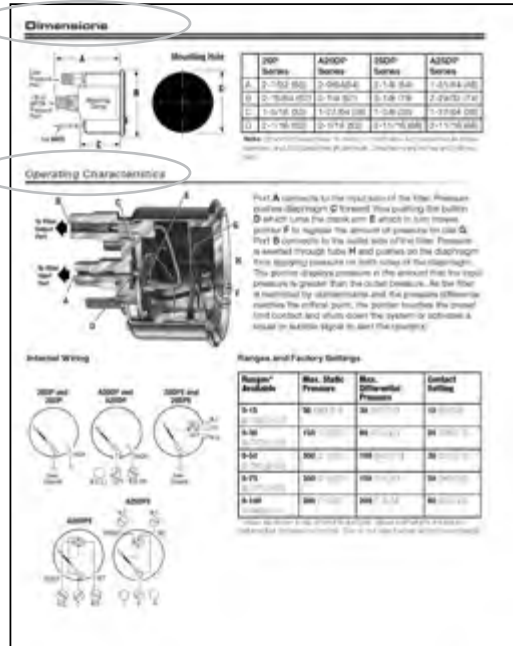
Every bulletin has a document number. This number can be helpful when speaking with a sales representative to ensure you are referring to the same product. Some bulletins reference these numbers to indicate products that can be used in conjunction with other parts.

## Section Sidebar

This convenient bar identifies the section each bulletin is in and allows for quick location of each section.

## Important Features

Quickly find the features pertinent to your job with easy-to-find headers.



## How To Order

Most bulletins will feature a list of product numbers to assist you in ordering. Others may have a matrix to guide you through creating the specific part you require. All combinations may not be available. Please call Enovation Controls for more information and availability.

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# 2 Inch and 2.5 Inch Vacuum Switchgage® 20, 25, A20 and A25 Series

The 20 Series (2 inch/51 mm dial) and the 25 Series (2 1/2 inch/64 mm dial) Switchgage instruments are diaphragm-actuated, vacuum-indicating gages with built-in electrical switches. These switches are used for tripping alarms and/or shut-down devices.

The 20 and 25 series gage mechanism is enclosed in a steel case coated to resist corrosion.

A-Series gages have a polycarbonate case and are sealed from the environment. All gages feature a polycarbonate, break-resistant lens and a polished, stainless steel bezel to help protect these rugged, built-to-last instruments.

The gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have a self-cleaning motion to ensure electrical continuity.

Gage-only models without contacts (Murphygage® instruments) are also available.

A pulsation dampener (PD2160) is included with each Switchgage to help eliminate pointer flutter. When monitoring intake manifold vacuum, the PD2160 is mounted in the manifold. The PD2160 has a 1/8-27 NPT connection.

Commonly used to measure loading of spark-ignition engines through intake manifold vacuum, the gages also can serve as overspeed protection from sudden loss of load on these engines. Use anywhere the vacuum source is compatible with port materials.



25 Series



20 Series



Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Dial:** White on black, dual scale; U.S.A. standard scale is Inches of Hg/kPa

**Case (mounting clamp included):**

20 and 25 Series: Plated steel

A20 and A25 Series: Polycarbonate/glass filled

**Bezel:** Polished stainless steel, standard; others are available (see How to Order)

**Lens:** Polycarbonate, high-impact

**Process Connection:** 1/8-27 NPTM brass

**Sensing Element:** Beryllium copper diaphragm

**Gage Accuracy:** ±2% of scale in operating range (mid 1/3 of scale)

**Adjustable Limit Contacts:**

2-SPST contacts; pilot- duty only, 2 A @ 30 VAC/DC. Contacts are gold flashed silver.

Limit Contact Adjustment: by a 1/16 in. hex wrench

Limit Contact Wire Leads (20 and 25 Series):

18 AWG (1.0 mm2) x 12 in. (305 mm)

Limit Contact Terminals: A20 Series number 4 screw terminals;

A25 Series number 6 screw terminals

**Unit Weight:**

20 Series: 8 oz. (0.23 kg)

25 Series: 11 oz. (0.31 kg)

A20 Series: 6 oz. (0.17 kg)

A25 Series: 10 oz. (0.28 kg)

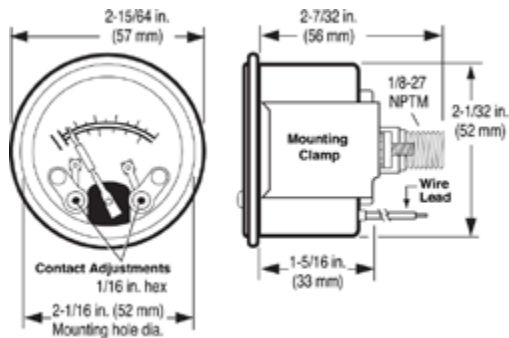
**Unit Dimensions:**

20 and A20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm)

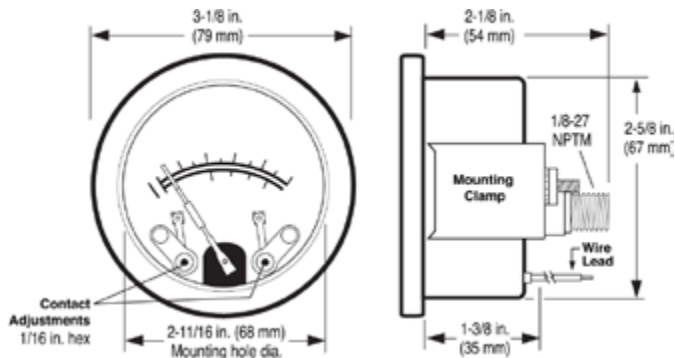
25 and A25 Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

## Dimensions

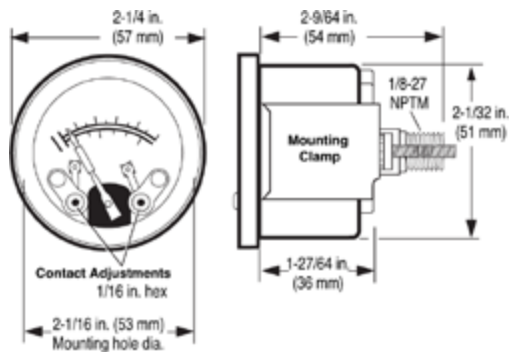
### 20 Series Models



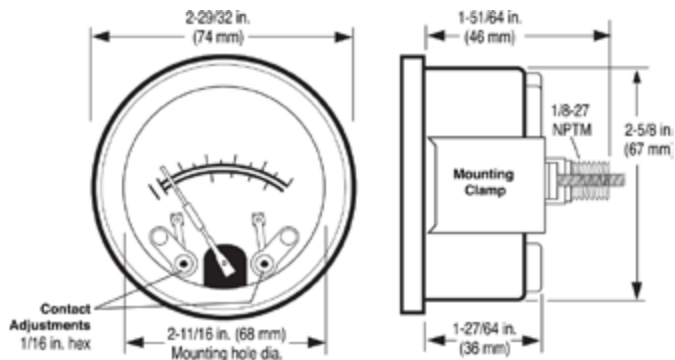
### 25 Series Models



### A20 Series Models



### A25 Series Models



## How to Order

Part Number	Model and Description	Notes
05703194	<b>20V-20:</b> Vacuum Switchgag	20 Series Model
05703195	<b>20V-30:</b> Vacuum Switchgag	20 Series Model
05704227	<b>25V-30:</b> Vacuum Switchgag	25 Series Model
05704330	<b>A20V-30:</b> Vacuum Switchgag	A20 Series Model
05704394	<b>A25V-30:</b> Vacuum Switchgag	A25 Series Model

# 2 Inch and 2.5 Inch Differential Pressure Gage for Filter Restriction

## 20DP, 25DP, A20DP and A25DP Series

The 20DP and A20DP Series (2 inch/51 mm dial) and the 25DP and A25DP Series (2-1/2 inch/64 mm dial) Swichgage instruments are diaphragm-actuated, differential pressure-indicating gages with a built-in electrical switch. This switch is used for tripping alarms and/or shutting down equipment. These gages are intended to monitor and indicate oil, fuel or water filter restriction and can reduce the risk of dangerously high pressure which may rupture the filter, resulting in contaminants entering the system.

The 20DP and 25DP series mechanism is enclosed in a steel case coated to resist corrosion. The A20DP and A25DP series have a polycarbonate case and are sealed from the environment. All feature a polycarbonate, break-resistant lens and a polished, stainless steel bezel to help protect these rugged, built-to-last instruments.

The gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have self-cleaning motion to ensure electrical continuity.

Additional features:

- Constant visual indication of the condition of your filter is shown on the dial.
- Two instruments in one with an accurate indicating gage and adjustable p.s.i.d. limit switch reduces inventory and installation time.
- Adjustable contact lets you set the monitoring range of the gage. The contact is tamper proof and can be set only with a 1/16 Allen-head wrench.
- All gages are made of durable materials allowing them to withstand rugged applications.
- Early filter changes cost you money and increase the risk of contaminants entering the system. A Murphy filter restriction Swichgage instrument will let you know when to change the filter and maintain peak efficiency.

### Base Models

#### 20DP, 25DP, A20DP and A25DP Swichgage instrument

The gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

#### 20DPE, 25DPE, A20DPE and A25DPE Swichgage instrument

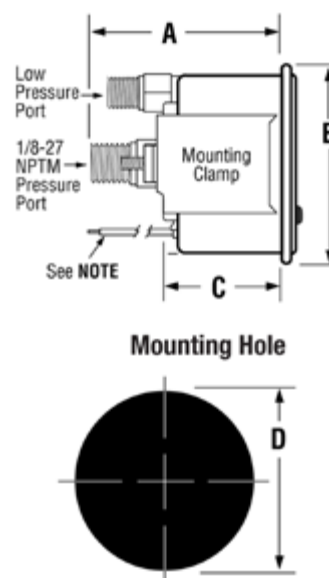
20DPE (was 20DPEO), 25DPE (was 25DPEO), A20DPE (was A20DPEO) and A25DPE (was A25DPEO).

Features an internal snap-acting SPDT switch, instead of the single pole/pointer contacts. When the switch closes on rising pressure, it becomes set, as pressure falls the switch resets. 20DPG, 25DPG, A20DPG and A25DPG Murphygage instrument gage without contact(s).



Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

### Dimensions



	20P Series	A20DP Series	25DP Series	A25DP Series
A	2-7/32 (56)	2-9/64(54)	2-1/8 (54)	1-51/64 (46)
B	2-15/64 (57)	2-1/4 (57)	3-1/8 (79)	2-29/32 (74)
C	1-5/16 (33)	1-27/64 (36)	1-3/8 (35)	1-27/64 (36)
D	2-1/16 (53)	2-1/16 (53)	2-11/16 (68)	2-11/16 (68)

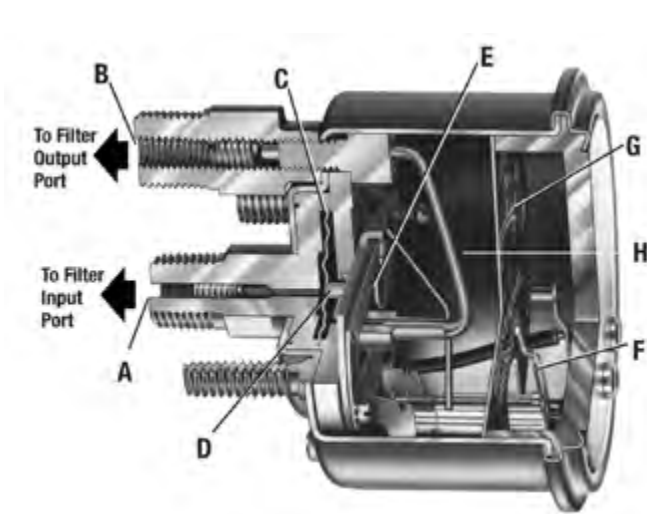
**Note:** 20 and 25 Series have 18 AWG (1.0 mm<sup>2</sup>) wire. A20 Series has #4 screw terminals, and A25 Series has #6 terminals. Dimensions are inches and (millimeters).

Specifications

**Dial:** White on black, dual scale; U.S.A. standard scale is psi/kPa. Other scales available  
**Case:** 20DP and 25DP Series: plated steel. A20DP and A25DP Series: polycarbonate  
**Bezel:** Polished stainless steel, standard; others are available.  
**Lens:** Polycarbonate, high-impact  
**Temperature Range:**  
Ambient: -40° to 150° F (-40° to 66° C)  
Process: -40° to 250° F (-40° to 121° C)  
**Process Connection:** 1/8-27 NPTM brass  
**Sensing Element:** Beryllium copper diaphragm  
**Gage Accuracy:** ±3% maximum across scale  
**Snap-Switch Rating (DPE models):** SPDT, 3 A @ 30 VDC inductive; 4 A @ 125 VAC inductive

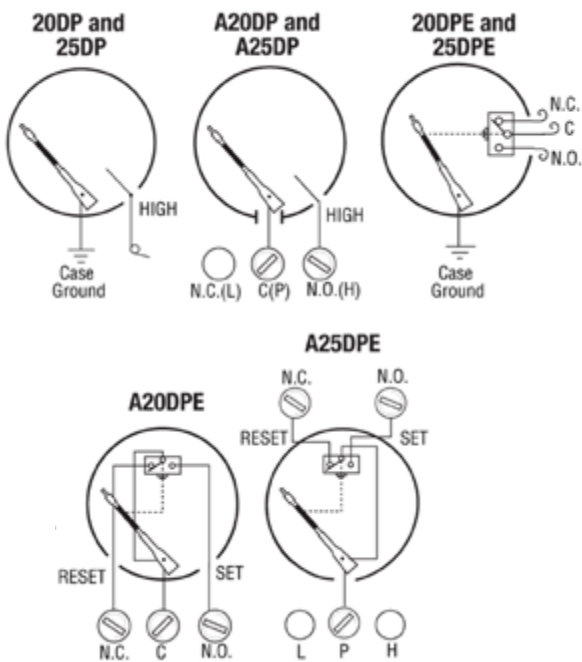
**Adjustable Limit Contact:** SPST contact; pilot duty only, 2 A @ 30 VAC/DC; closed when the low limit is met, open when pointer is in normal operating range. Contacts are gold flashed silver.  
Limit Contact Adjustment: by 1/16 in. hex wrench through 100% of scale.  
Limit Contact Wire Leads (20DP and 25DP Series): 18 AWG (1.0 mm2) x 12 in. (305 mm)  
Limit Contact Terminals: A20DP Series #4 screw terminals. A25DP Series #6 screw terminals  
**Unit Weight:** 20DP and A20DP Series: 9 oz. (0.25 kg); 25DP and A25DP Series: 11 oz. (0.29 kg)  
**Unit Dimensions:** 20DP and A20DP Series: 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm). 25DP and A25DP Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

Operating Characteristics



Port **A** connects to the input side of the filter. Pressure pushes diaphragm **C** forward thus pushing the button **D** which turns the crank arm **E** which in turn moves pointer **F** to register the amount of pressure on dial **G**. Port **B** connects to the outlet side of the filter. Pressure is exerted through tube **H** and pushes on the diaphragm thus applying pressure on both sides of the diaphragm. The pointer displays pressure in the amount that the input pressure is greater than the outlet pressure. As the filter is restricted by contaminants and the pressure difference reaches the critical point, the pointer touches the preset limit contact and shuts down the system or activates a visual or audible signal to alert the operator.

Internal Wiring



Ranges and Factory Settings

Ranges* Available	Max. Static Pressure	Max. Differential Pressure	Contact Setting
0-15 (0-103) [0-1.0]	50 (345) [3.4]	30 (207) [2.0]	10 (69) [0.8]
0-30 (0-207) [0-2.0]	150 (1.0) [10]	60 (414) [4.0]	20 (138) [1.0]
0-50 (0-345) [0-3.5]	300 (2.1) [20]	100 (690) [7.0]	30 (207) [2.0]
0-75 (0-517) [0-5.0]	300 (2.1) [20]	150 (1.0) [10]	50 (345) [3.5]
0-100 (0-690) [0-7.0]	300 (2.1) [20]	200 (1.4) [14]	60 (414) [4.0]

\* Values are shown in psi, (kPa/MPa) and [bar]. Values in kPa/MPa and bar are mathematical conversions from psi. They do not reflect actual second scale change.

## How to Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

<b>Base Model</b> <b>20DP      25DP</b> <b>A20DP    A25DP</b> <b>20DPE    A25DPE</b> <b>20DPG    25DPG</b> <b>            A25DPG</b>		<b>Range<sup>††</sup></b> <b>15 = 0-15</b> <b>30 = 0-30</b> <b>50 = 0-50</b> <b>75 = 0-75</b> <b>100 = 0-100</b> <sup>††</sup> Select scale so your normal operating pressure is in the middle half of the scale.
<b>Options<sup>‡</sup></b>		
<b>B1 = Black bezel</b> <b>B2 = Bezel 05051857 (was "HP")</b> <b>B3 = Bezel 05051836 (was "HBB")</b>		<b>EX = Explosion-proof</b> <b>K = Knob adjusting face contact</b>
<sup>‡</sup> Options not available on all models or configurations.		

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# 2 Inch and 2.5 Inch Pressure Switchgauge® 20 and 25 Series

The 20 Series (2 inch/51 mm dial) and the 25 Series (2-1/2 inch/64 mm dial) Switchgauge models are diaphragm-actuated, pressure-indicating gages with built-in electrical switches. These switches exceed SAE standards and are used for tripping alarms and/or shut-down devices.

Ranges are available from 0-15 psi (103 kPa) [1.0 bar] through 0-400 psi (2.8 MPa) [28 bar].

The gage mechanism is enclosed in a steel case coated to resist corrosion. A polycarbonate, break-resistant lens and a polished, stainless steel bezel help protect this rugged, built-to-last instrument. Accuracy and protection from moderate overpressure is assured by a unique, unitized diaphragm chamber. A built-in pulsation dampener helps eliminate pointer flutter and is removable for cleaning. For models 20P and 25P, the gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts are grounded through the case and have self-cleaning motion to ensure electrical continuity.

Models 20PE and 25PE have internal snap-acting SPDT switches.

Gage-only models without the switches (Murphygage®) are also available.

The Switchgauge was specifically designed to protect engines/equipment in oil field, marine, irrigation, construction and trucking applications to monitor engine lube pressure, water pump pressure, hydraulic pressure, air pressure, etc.

## Base Models

### 20P and 25P Series Switchgauge

The gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

### 20PE and 25PE Switchgauge

20PE (was 20EO) and 25PE (was 25EO)

Features internal snap-acting SPDT switches, instead of the single pole/pointer contacts. When the switch closes on falling pressure, it becomes set, as pressure rises the switch resets.

### 20PABS and 25PABS Switchgauge

Same as 20P and 25P with internal SPDT snap-switch for pre-alarm.

### 20P7 and 25P7 Lockout Switchgauge

Same as 20P and 25P Series. They also include a front, semi-automatic lockout for startup override. This built-in device holds the pointer away from the contact on startup. When pressure exceeds the set point, the lockout is automatically disengaged (see following pages for details).

### 20PG and 25PG Murphygage

Gage without contact(s)



Products covered in this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Dial:** White on black, dual scale; U.S.A. standard scale is psi/kPa; U.K. standard scale is psi/bar; others available (see How to Order).

**Case:** Plated steel; mounting clamp included (except for direct mount models)

**Bezel:** Polished stainless steel, standard; others are available.

**Lens:** Polycarbonate, high-impact

**Oil:** Silicon Oil

### Temperature Range:

Ambient: -40° to 150° F (-40° to 66° C)

Process: -40° to 250° F (-40° to 121° C)

**Process Connection:** 1/8-27 NPTM brass

**Sensing Element:** Beryllium copper diaphragm

### Gage Accuracy (% of Full Scale):

Range	Lower 1/4	Middle 1/2	Upper 1/4
≤300 psi (20 Bar)	±3%	±2%	±3%
400psi (28 Bar)	±3%	±3%	±5%

**Maximum Pressure:** See Pressure Ranges and Factory Settings table next page

**Adjustable Limit Contact (20P and 25P):** SPST contact; pilot-duty only, 2 A @ 30 VAC/DC; Normally Close (NC) when the low limit is met. Normally Open (NO) when pointer is in normal operating range. Contacts are gold flashed silver.

**Limit Contact Adjustment:** By a 1/16 in. hex wrench through 100% of the scale

**Limit Contact Wire Leads:** 18 AWG (1.0 mm2) x 12 in. (305 mm)

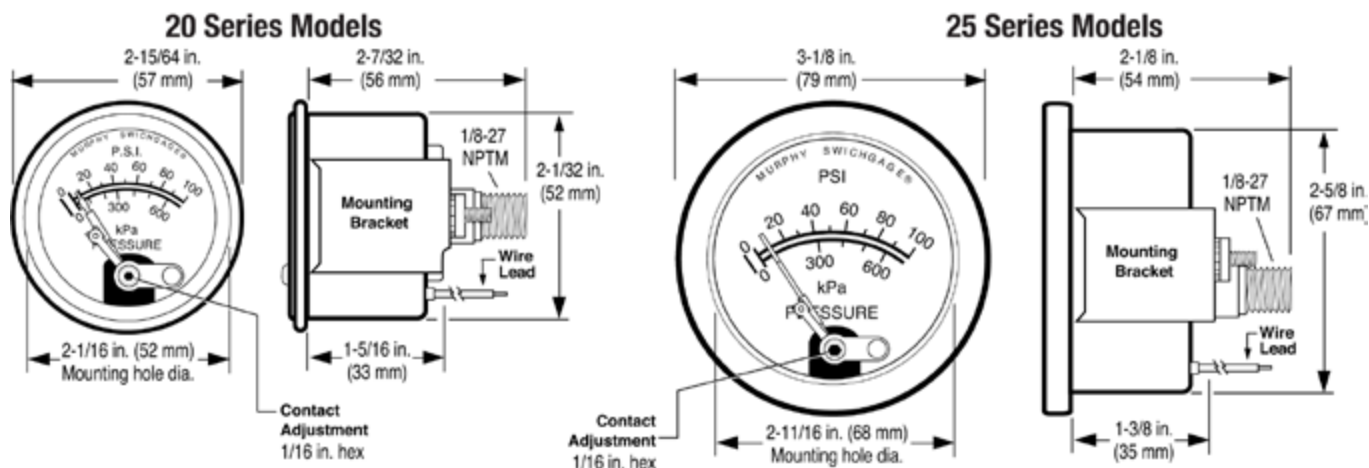
**Snap-Switch Rating (20PE and 25PE):** SPDT, 3 A@ 30 VDC inductive; 4 A @ 125 VAC inductive

**Snap-Switch Wire Leads:** 20 AWG (0.75 mm2) x 12 in. (305 mm)

**Unit Weight:** 20 Series: 8 oz. (0.23 kg); 25 Series Models: 11 oz. (0.31 kg)

**Unit Dimensions:** 20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm); 25 Series Models: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

## Dimensions

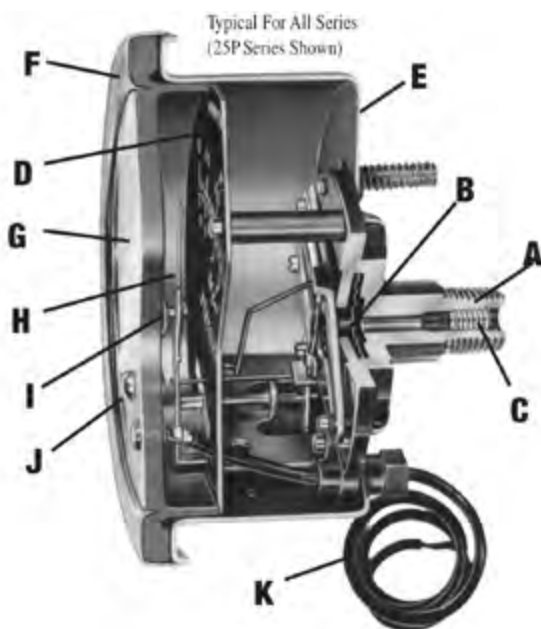


## Pressure Ranges and Factory Settings

Ranges Available psi (kPa) [bar]	Maximum Pressure	Standard Settings			High Settings			20PABS and 25PABS Settings Low			Alarm		
		psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]
0-15 (103) [1.0]	2 x scale	3	(21)	[0.2]	12	(83)	[0.8]	3	(21)	[0.2]	6	(41)	[0.3]
0-30 (103) [1.0]	2 x scale	7	(48)	[0.4]	24	(165)	[1.6]	7	(48)	[0.4]	10	(69)	[0.6]
0-50 (345) [3.5]	2 x scale	10	(69)	[0.8]	40	(276)	[2.8]	10	(69)	[0.8]	13	(90)	[1.0]
0-75 (517) [5.0]	2 x scale	15	(103)	[1.0]	60	(414)	[4.0]	15	(103)	[1.0]	18	(124)	[1.5]
0-100 (690) [7.0]	2 x scale	20	(138)	[1.5]	80	(552)	[5.5]	20	(138)	[1.0]	23	(159)	[1.5]
0-150 (1.0 MPa) [10]	2 x scale	30	(207)	[2.0]	120	(827)	[8.0]	30	(207)	[1.5]	33	(228)	[2.0]
0-200 (1.4 MPa) [14]	2 x scale	50	(345)	[3.0]	150	(1 MPa)	[10]	50	(345)	[3.0]	53	(365)	[4.0]
0-300 (2.1 MPa) [20]	1-2/3 x scale	75	(517)	[5.0]	225	(1.6 MPa)	[15]	75	(517)	[5.0]	78	(538)	[5.0]
0-400 (2.8 MPa) [28]	1-1/4 x scale	150	(1.0 MPa)	[7.0]	300	(2.1 MPa)	[20]	75	(517)	[5.0]	150	(1 MPa)	[10]

## Features

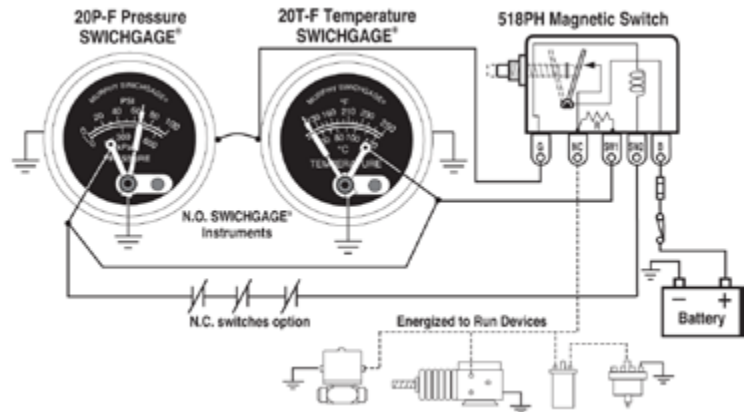
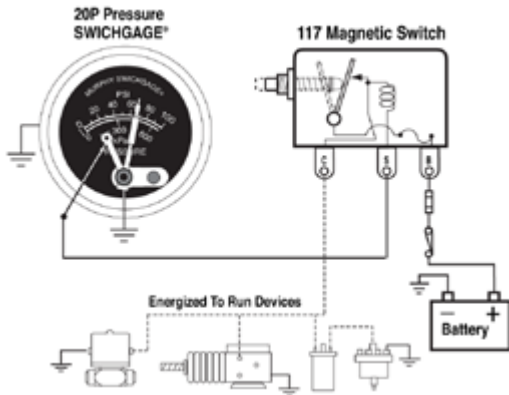
- A. Process Connection and Port:** Machined from brass bar stock; together with the diaphragm forms the diaphragm chamber.
- B. Diaphragm:** Beryllium copper; material is die formed and heat treated to very close physical and metallurgical specifications.
- C. Pulsation Dampener:** Designed to minimize undesirable pointer chatter. It is removable for cleaning.
- D. Dial:** White letters on a black background, dual scale (psi & kPa) standard; others available on request (see How to Order).
- E. Case:** Steel with zinc and iridite; mounting clamp included (except for direct mount models).
- F. Bezel:** Polished stainless steel standard, black bezel also available
- G. Lens:** Made of polycarbonate glass, high-impact treated
- H. Pointer:** Tempered nickel silver for continuity and corrosion resistance. It is mounted on a machined brass post.
- I. Limit Contact:** SPST contact; N.C. when low limit is met. N.O. when pointer operates above limit.
- J. Limit Contact Adjustment:** By 1/16 in. hex type wrench through 100% of the scale. Easy adjustment knob available.
- K. Wire Leads:** 12 in. (305 mm) long, 18 AWG (1.0 mm<sup>2</sup>) for face-adjustable contacts. 20 AWG (0.75 mm<sup>2</sup>) for snap-switches models.



**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

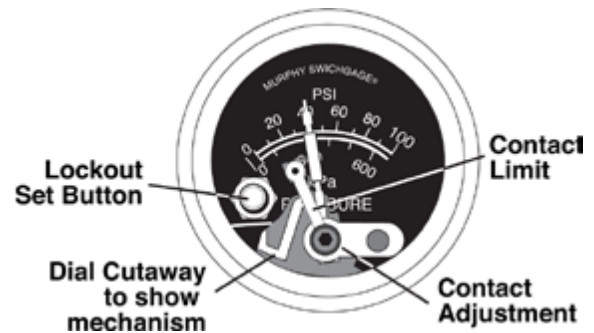
## Magnetic Switch

**INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH.** The Switchgag contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the light-duty Switchgag limit contacts. Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown.



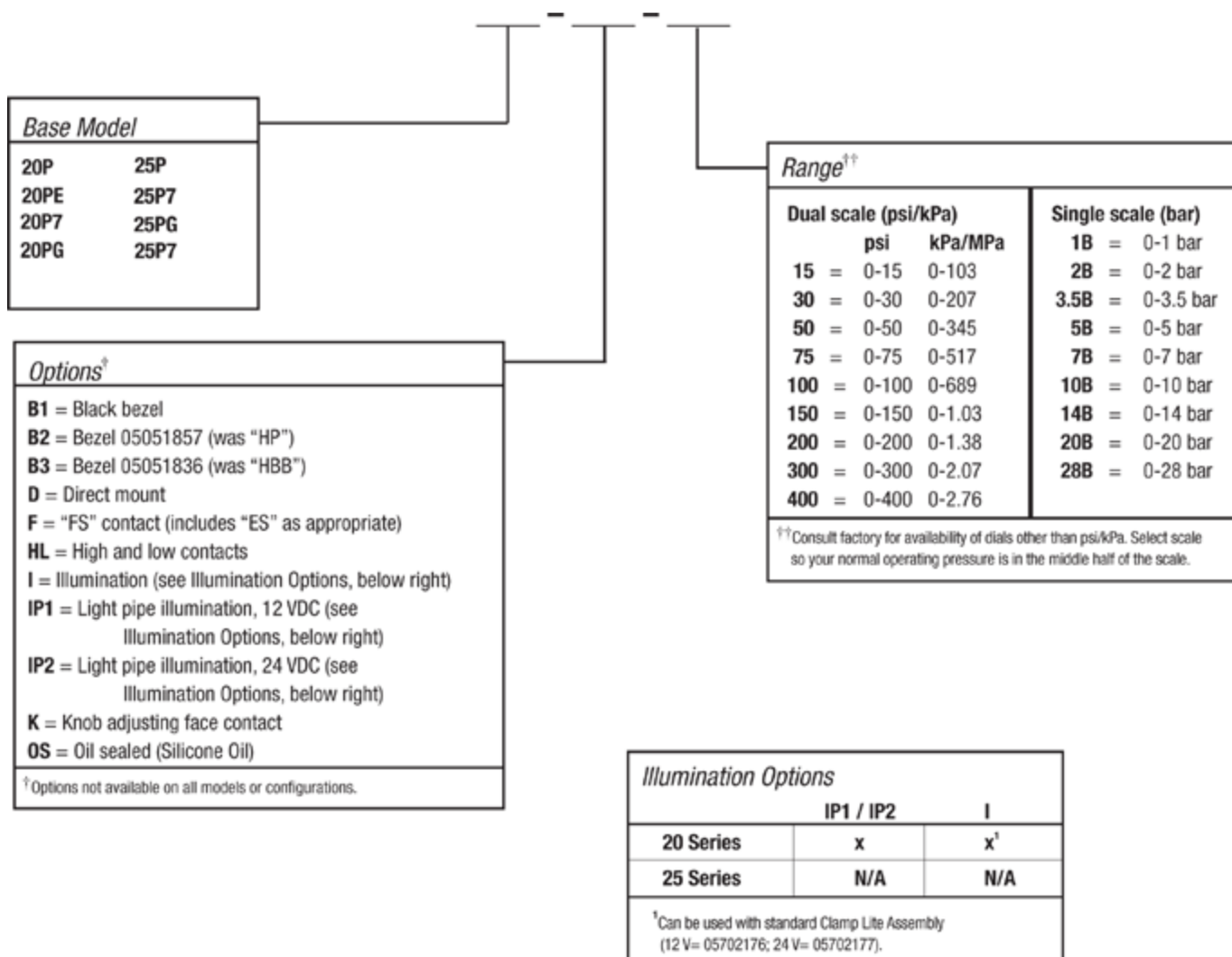
## Start-Up Lockout (P7 Versions)

The Switchgag low limit contact can be bypassed on start-up by pushing this optional lockout button. It holds the pointer away from the shut-down contact while the engine starts. The lockout will disengage automatically on rising pressure.



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



# Pressure Switchgauge® Instrument A20 and A25 Series

The A20 Series (2 inch/51 mm dial) and the A25 Series (2-1/2 inch/64 mm dial) Switchgauge instruments are diaphragm-actuated, pressure-indicating gages with built-in electrical switches for tripping alarms and/or shut-down devices.

Ranges are available from 0-15 psi (103 kPa) [1.0 bar] through 0-400 psi (2.8 MPa) [28 bar].

These rugged, built-to-last instruments are face sealed from the environment by the unique combination of a polycarbonate case and lens, a polished stainless steel bezel and O-ring seals. Ranges above 30 psi (207 kPa) [2 bar] are sealed from the external environment (except PE Series). Ranges of 30 psi and lower have a small weep hole in the bottom of the case. Accuracy and protection from moderate overpressure is assured by a unique, unitized diaphragm chamber. A built-in pulsation dampener helps eliminate pointer flutter and is removable for cleaning.

For series A20P and A25P, the gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have self-cleaning motion to ensure electrical continuity.

Models A20PE and A25PE have internal snap-acting SPDT switches for three wire control and can be wired to make or to break a circuit.

Gage-only models without switches (Murphygage instrument) are also available.

A20/A25 Series applications include: engines/equipment in oil field, marine, irrigation, construction and trucking for lube oil pressure, water pump pressure, hydraulic pressure, air pressure, etc.

## Base Models

### A20P and A25P Series Switchgauge

The gage pointer makes with an adjustable contact to complete a pilot duty circuit.

### A20PE and A25PE Switchgauge

A20PE (was A20EO) and A25PE (was A25EO). Features internal snap-acting SPDT switches, instead of the single pole/pointer contacts. When the switch closes on falling pressure, it becomes set, as pressure rises the switch resets (refer to wiring diagram).

Model A25PE is CSA listed for non-hazardous areas.

Model A25PE-EX is CSA listed for Class I, Division 1, Groups C and D hazardous areas.

### A20PABS and A25PABS Switchgauge instrument

Same as A20P and A25P with internal SPDT snap-switch for pre-alarm

### A20PG and A25PG Murphygage instrument

Gage without contact(s)



A20 Series



A25 Series



Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Dial:** White on black, dual scale; U.S.A. standard scale is psi/kPa; U.K. standard scale is psi/bar.

**Case:** Polycarbonate/glass filled, corrosion-resistant; steel mounting clamp included

**Bezel:** Polished stainless steel, standard; others are available.

**Pointer:** Tempered nickel silver; Red tip

**Lens:** Polycarbonate, high-impact

**Oil:** Silicone Oil

### Temperature Range:

Ambient: -40° to 150°F (-40° to 66°C)

Process: -40° to 250°F (-40° to 121°C)

**Process Connection:** 1/8-27 NPTM brass

**Sensing Element:** Beryllium copper diaphragm

**Gage Accuracy (% of Full Scale):**

Range	Lower 1/4	Middle 1/2	Upper 1/4
≤ 300psi (20 Bar)	±3%	±2%	±3%
400psi (28 Bar)	±3%	±3%	±5%

**Maximum Pressure:** See Pressure Ranges and Factory Settings table.

**Adjustable Limit Contact (A20P and A25P):** SPST contact; pilot-duty only, 2A@30 VAC/DC; Closed when the low limit is met. Open when pointer is in normal operating range. Contacts are gold flashed silver. Limit Contact Adjustment: by a 1/16 in. hex wrench through 100% of the scale.

**Wiring:** A20P: Number 4 screw terminals; A25P: Number 6 screw terminals

**Snap-Switch Rating (A20PE and A25PE):** SPDT, 3 A@ 30 VDC inductive; 4 A @ 125 VAC inductive

**Wiring:** A20PE: Number 4 screw terminals; A25PE: Number 6 screw terminals.

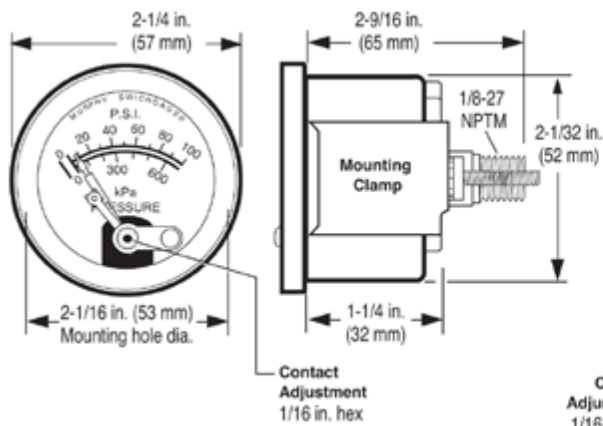
**Unit Weight:** A20 Series: 8 oz. (0.23 kg); A25 Series Models: 11 oz. (0.31 kg).

**Unit Dimensions:** A20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm); A25 Series Models: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

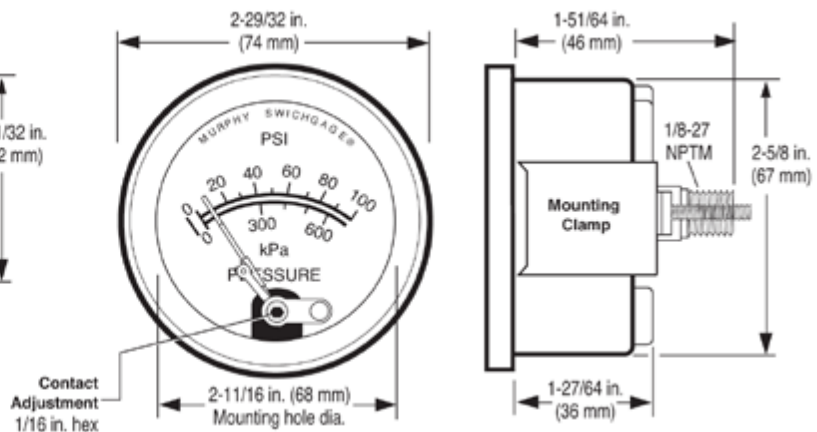


## Dimensions

### A20 Series Models



### A25 Series Models



## Pressure Ranges and Factory Settings

### NOTES

• Values in ( ) are mathematical conversions from psi to kPa/MPa — they do not reflect actual second scale range. U.S.A. standard scale is psi/kPa; U.K. standard scale is psi/bar — exact setpoint shown. Consult factory for other scales.

• For models A20PE and A25PE, the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential. Only certain models are adjustable.

• For adjustable switch models, the trip point is adjustable only over the lower half of the scale.

Ranges Available psi (kPa) [bar]	Maximum Pressure	Standard Settings			High Settings			20PABS and 25PABS Settings Low			Alarm		
		psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]
0-15 (103) [1.0]	30 psi (207)	3	(21)	[0.2]	12	(83)	[0.8]	3	(21)	[0.2]	6	(41)	[0.3]
0-30 (207) [2.0]	60 psi (413)	7	(48)	[0.4]	24	(165)	[1.6]	7	(48)	[0.4]	10	(69)	[0.6]
0-50 (345) [3.5]	100 psi (690)	10	(69)	[0.8]	40	(276)	[2.8]	10	(69)	[0.8]	13	(90)	[1.0]
0-75 (517) [5.0]	150 psi (1.0 MPa)	15	(103)	[1.0]	60	(414)	[4.0]	15	(103)	[1.0]	18	(124)	[1.5]
0-100 (690) [7.0]	200 psi (1.4 MPa)	20	(138)	[1.5]	80	(552)	[5.5]	20	(138)	[1.0]	23	(159)	[1.5]
0-150 (1.0 MPa) [10]	300 psi (2.1 MPa)	30	(207)	[2.0]	120	(827)	[8.0]	30	(207)	[1.5]	33	(228)	[2.0]
0-200 (1.4 MPa) [14]	400 psi (2.8 MPa)	50	(345)	[3.0]	150	(1 MPa)	[10]	50	(345)	[3.0]	53	(365)	[4.0]
0-300 (2.1 MPa) [20]	500 psi (3.4 MPa)	75	(517)	[5.0]	225	(1.6 MPa)	[15]	75	(517)	[5.0]	78	(538)	[5.0]
0-400 (2.8 MPa) [28]	500 psi (3.4 MPa)	150	(1.0 MPa)	[7.0]	300	(2.1 MPa)	[20]	75	(517)	[5.0]	150	(1 MPa)	[10]

## Features

**A. Process Connection and Port:** Machined from brass bar stock. Together with the diaphragm forms the diaphragm chamber.

**B. Diaphragm (not shown):** Beryllium copper die formed and heat treated to very close physical and metallurgical specifications.

**C. Pulsation Dampener:** Designed to minimize undesirable pointer chatter. It is removable for cleaning.

**D. Dial:** White letters on a black background, dual scale; others available on request.

**E. Case:** Polycarbonate/glass filled, corrosion resistant; mounting clamp included.

**F. Bezel:** Polished stainless steel standard, black bezel also available.

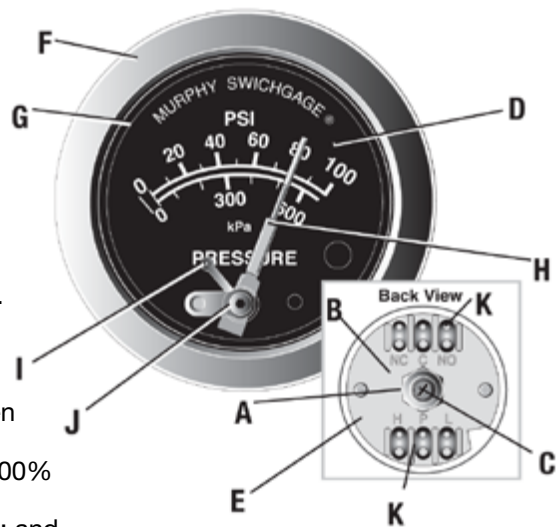
**G. Lens:** Made of high-impact resistant treated polycarbonate.

**H. Pointer:** Tempered nickel silver for continuity and corrosion resistance—mounted on a machined brass post. Red tip.

**I. Limit Contact:** SPST contact; N.C. when low limit is met. N.O. when pointer operates above limit.

**J. Limit Contact Adjustment:** by 1/16 in. hex type wrench through 100% of the scale. Easy adjustment knob available.

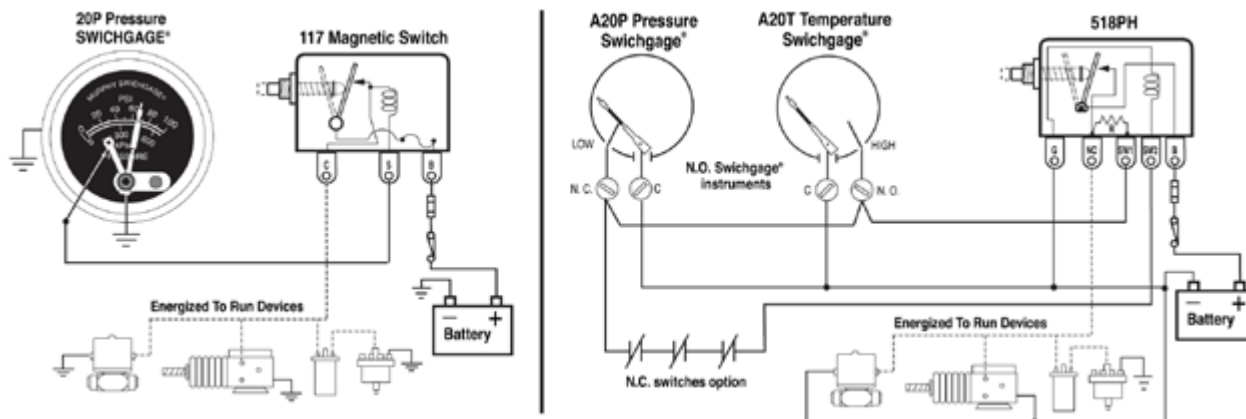
**K. Electrical Connections:** Number 4 screw terminals for A20 Series; and number 6 screw terminals for A25 Series models.



## Magnetic Switch

**INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH.** The Switchgag contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the pilot-duty Switchgag limit contacts.

Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown below.

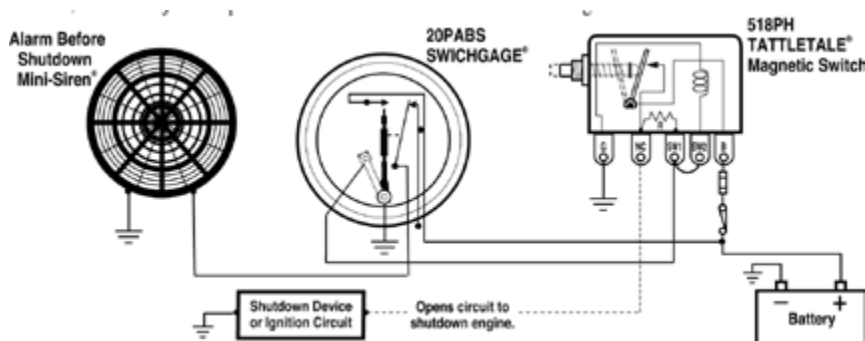


## Pre-Alarm Using A20/A25PABS

The A20PABS and A25PABS feature a standard limit contact for equipment shutdown on low pressure. They also have an internal SPDT snap-switch to signal an alarm before shutting down. When the snap-switch trips (preset point) on falling pressure, the switch completes a circuit to activate an alarm. If the pressure continues to fall, the face-adjustable pointer contact will make and

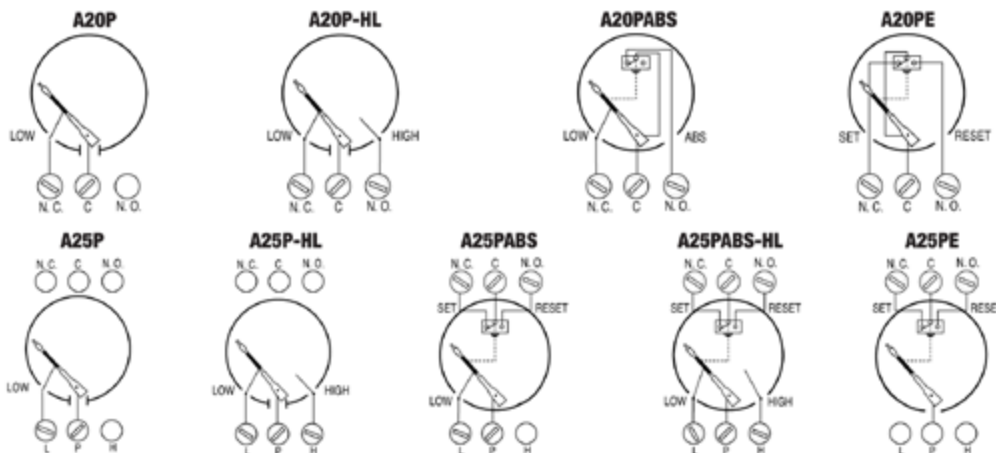
the shut-down circuit will be completed (see the typical diagram below for reference).

The front contact shut-down limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to Pressure Ranges and Factory Settings table. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



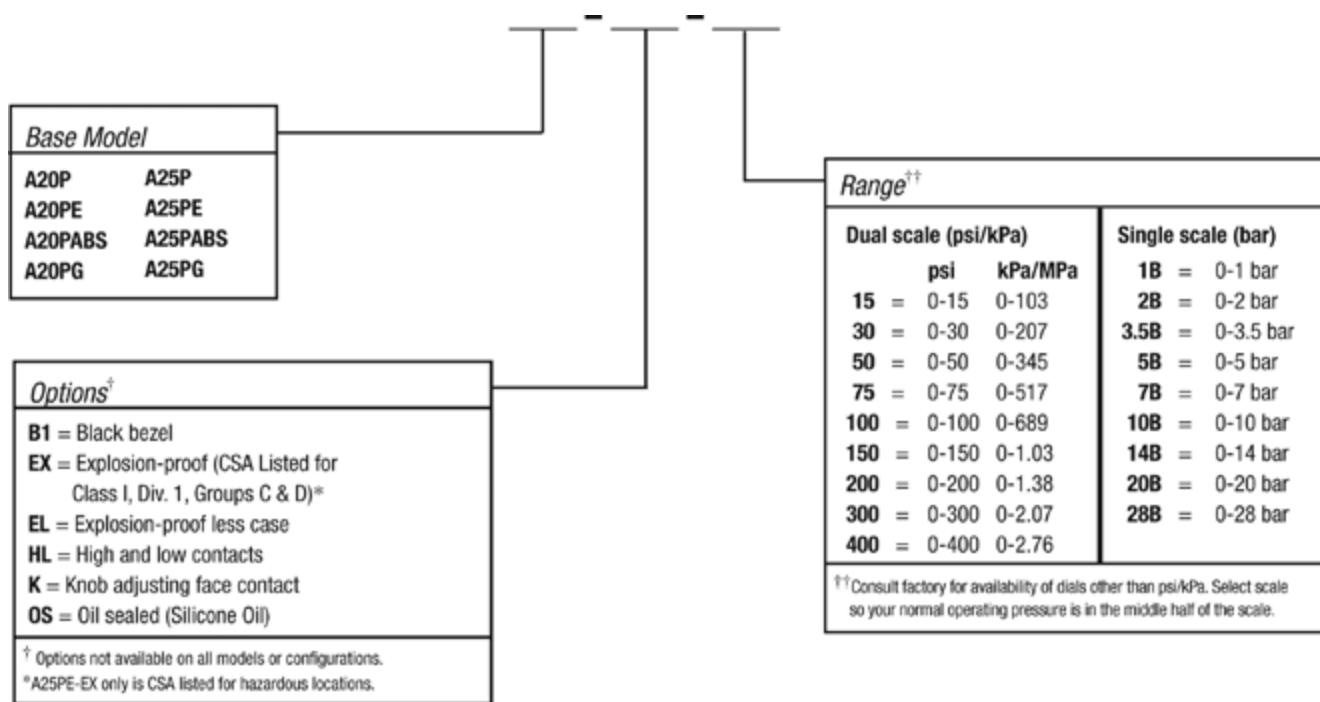
## Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot-duty 2 A @ 30 VAC/VDC resistive. Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
05702176	A20 Series Clamp Lite Assembly; 12V	Illumination — Order Separately
05702177	A20 Series Clamp Lite Assembly; 24V	
N/A	A25 Series	



# B-Series Murphygage® Instrument

The B-Series Murphygage® instrument is a high-quality, diaphragm-actuated indicating gage. Built by Enovation Controls with the same heavy-duty design as the standard 20 series and 25 series Switchgage® instrument, the B-gage is more compact and is the optimum instrument for gage-only applications. It has a high impact polycarbonate lens, sturdy steel case and a polished, low-profile stainless steel bezel. Accuracy and protection from moderate over-pressure/over-temperature are assured by a unique, unitized diaphragm chamber, superior quality materials and the design of the gage movement.

## Pressure Murphygage instrument

Pressure changes at the diaphragm convert to accurate mechanical movements that are indicated on an easy-to-read analog dial. A pulsation dampener in the pressure port helps eliminate pointer flutter. It can be removed for cleaning to maintain the gage's response and accuracy.

## Vacuum Murphygage instrument

Available in 0 to 20 or 0 to 30 in. Hg. (0 to -68 or 0 to -102 kPa) vacuum.

## Temperature Murphygage instrument

As temperature rises, the fluid in the sensing bulb vaporizes to apply pressure on the diaphragm. The movement translates this vapor pressure to a calibrated reading of temperature on the dial. The standard capillary is copper with a PVC armor. Optional armor covering is galvanized steel or 316 stainless steel (specify). Optional bulb types, adaptor nuts and thermowells are available.

The B-Series can be utilized in industrial engines and equipment in the oil field, marine, irrigation, construction and trucking industries as well as monitoring engine coolant, crankcase oil and transmission oil.



Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Dial:** White on black; U.S.A. standard scale is dual scale; others available.

### Gage Accuracy:

Pressure/Vacuum (% of Full Scale):

Range	Lower 1/4	Middle 1/2	Upper 1/4
≤ 300 psi (24 bar)	±3%	±2%	±3%
400 psi (28 bar)	±3%	±3%	±5%

**Temperature:** See chart.

### Temperature Range:

Pressure/Vacuum:

Ambient: -40° to 150° F (-40° to 66° C)

Process: -40° to 250° F (-40° to 121° C)

**Temperature:** See chart on reverse side.

**Maximum Panel Thickness:** 1/4 in. (6 mm)

**Port:** Brass

**Case:** Plated steel; mounting clamp included (except for direct mount models)

**Bezel:** Polished stainless steel, standard; optional bezels are available.

**Pointer:** White (black dial); black (white dial)

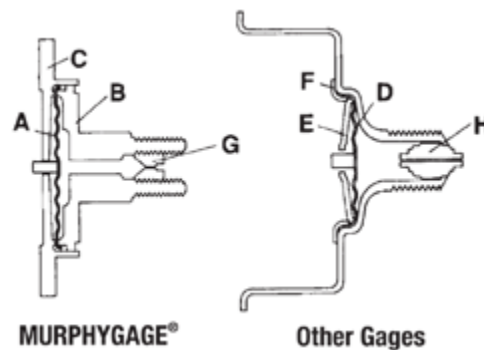
**Lens:** Polycarbonate, high-impact

**Sensing Element:** Beryllium copper diaphragm

## Comparison of Murphy Gages to Most Other Gages

The basic difference between the Murphygage instrument and most other gages is the internal design. The Murphygage instrument does not rely on the gage case to serve as part of the sensing chamber. The diaphragm **(A)** which must expand and contract consistently with changing pressures and temperatures, is held firmly in place by the back plate **(B)** and the mounting plate **(C)**. In most other gages, the diaphragm **(D)** and an expansion retarding plate **(E)** are soldered directly into the case port and held in place by a locator ring **(F)**. Should the case receive any damage in this area the diaphragm operation could be affected. However, in the Murphygage instrument, the diaphragm is protected and securely locked in position.

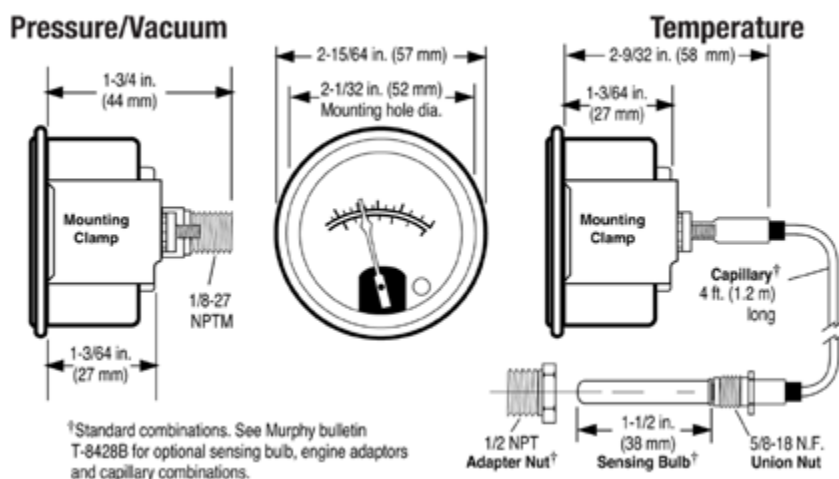
Another feature of the Murphygage instrument is the removable pulsation dampener (pressure instruments only) **(G)** which provides for periodic cleaning when



being used with liquids which might cause clogging. Other gages are usually equipped with a non-removable dampener (H).

NOTE: For optional temperature capillary lengths, engine adaptors, sensing bulbs and range combinations, see Murphy bulletin T-8428B.

## Dimensions



## Temperature Accuracy/Range Chart

Celsius measurements are shown in parentheses.

Range	Lower 1/3 Scale	Middle 1/3	Upper 1/3
32-120 (0-49)	±12° (±6°)	±5° (±2.4°)	±6° (±3°)
32-160 (0-71)	±20° (±10°)	±8° (±4.4°)	±7° (±4°)
130-220 (54-104)	±6° (±3°)	±3° (±1.6°)	±4° (±2°)
130-250 (54-121)	±9° (±5°)	±5° (±2.4°)	±4° (±2°)
140-300 (60-149)	±10° (±5.2°)	±6° (±3°)	±5° (±2.4°)
160-320 (71-160)	±10° (±5.2°)	±5° (±2.4°)	±5° (±2.4°)
180-350 (82-177)	±12° (±6°)	±5° (±2.4°)	±5° (±2.4°)
300-440 (149-227)	±9° (±5°)	±5° (±2.4°)	±4° (±2°)

Range	Maximum Process Temperature
≤250° (120°)	120 % of Full Scale
300° (140°)	350° (198°)
≤320° (160°)	120% of Full Scale

## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

<b>Base Model</b> <b>20BPG</b> = Pressure <b>20BVG</b> = Vacuum <b>20BTG</b> = Temperature	<b>Options*</b> <b>B1</b> = Black bezel <b>B2</b> = Bezel 05051857 (was "HP") <b>B3</b> = Bezel 05051836 (was "HBB") <b>D</b> = Direct mount <b>IP1</b> = Light pipe illumination, 12 VDC <b>IP2</b> = Light pipe illumination, 24 VDC <small>*Options not available on all models or configurations.</small>	<b>Adapter Nuts<sup>††</sup></b> <b>1/8</b> = 1/8-27 NPT <b>1/4</b> = 1/4-18 NPT <b>3/8</b> = 3/8-18 NPT <b>3/8B</b> = 3/8-19 BSPT <b>3/8K</b> = 3/8 NPSF <b>-</b> = 1/2-14 NPT <sup>†††</sup> <b>1/2B</b> = 1/2-BSPT <b>1/2K</b> = 1/2 NPSF <b>5/8</b> = 5/8-18 UNF <b>3/4</b> = 3/4-14 NPT <b>3/4U</b> = 3/4-16 UNF <b>7/8</b> = 7/8-9 UNC <b>Metric</b> <b>M10</b> = 10 mm x 1.5 <b>M12</b> = 12 mm x 1.5 <b>M14</b> = 14 mm x 1.5 <b>M16</b> = 16 mm x 1.5 <b>M18</b> = 18 mm x 1.5 <b>M20</b> = 20 mm x 1.5 <b>M22</b> = 22 mm x 1.5 <b>M24</b> = 24 mm x 1.5 <small>††Specific adapter nut must match the sensing bulb. †††Standard.</small>																																																																																																														
<b>Temperature Capillary Armor Type and Length</b> <b>Capillary Armor Type</b> <b>Blank</b> = PVC armor, copper capillary <b>S</b> = Stainless steel armor, copper capillary <b>Capillary Length (specify after capillary type; example: "S4")</b> <b>4</b> = 4 ft. (1.2 m) <b>Specify other length</b> = Available in 2 ft. increments thru 20 ft.; 5 ft. increments above 20 ft. (0.5 metre increments from 1.5–10 metres; 2 metre increments thru 34 metres. <b>Specify "M"</b> following length, i.e. 1.5M.)																																																																																																																
<b>Range<sup>††</sup></b> <table border="1"> <thead> <tr> <th colspan="2">Pressure (20BPG) Dual scale (psi/kPa)</th> <th colspan="2">Pressure (20BPG) Single scale (bar)</th> <th colspan="2">Vacuum (20BVG) Dual scale (in. Hg/kPa)</th> <th colspan="2">Temperature (20BTG) Dual scale (°F/°C)</th> <th colspan="2">Temperature (20BTG) Single scale (°C)</th> </tr> <tr> <th>psi</th> <th>kPa/MPa</th> <th></th> <th></th> <th>in. Hg</th> <th>kPa</th> <th>°F</th> <th>°C</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>15 = 0-15</td> <td>0-103</td> <td>1B = 0-1 bar</td> <td></td> <td>30 = 0 to 30</td> <td>0 to -102</td> <td>120 = 32-120</td> <td>0-49</td> <td>70C = 0-70°C</td> <td></td> </tr> <tr> <td>30 = 0-30</td> <td>0-207</td> <td>2B = 0-2 bar</td> <td></td> <td></td> <td></td> <td>160 = 32-160</td> <td>0-71</td> <td>100C = 45-100°C</td> <td></td> </tr> <tr> <td>50 = 0-50</td> <td>0-345</td> <td>3.5B = 0-3.5 bar</td> <td></td> <td></td> <td></td> <td>220 = 130-220</td> <td>54-104</td> <td>120C = 50-120°C</td> <td></td> </tr> <tr> <td>75 = 0-75</td> <td>0-517</td> <td>5B = 0-5 bar</td> <td></td> <td></td> <td></td> <td>250 = 130-250</td> <td>60-121</td> <td>140C = 60-140°C</td> <td></td> </tr> <tr> <td>100 = 0-100</td> <td>0-689</td> <td>7B = 0-7 bar</td> <td></td> <td></td> <td></td> <td>300 = 140-300</td> <td>60-149</td> <td>160C = 70-160°C</td> <td></td> </tr> <tr> <td>150 = 0-150</td> <td>0-1.03</td> <td>10B = 0-10 bar</td> <td></td> <td></td> <td></td> <td>320 = 160-320</td> <td>71-160</td> <td></td> <td></td> </tr> <tr> <td>200 = 0-200</td> <td>0-1.38</td> <td>14B = 0-14 bar</td> <td></td> <td></td> <td></td> <td>350 = 180-350</td> <td>71-160</td> <td></td> <td></td> </tr> <tr> <td>300 = 0-300</td> <td>0-2.07</td> <td>20B = 0-20 bar</td> <td></td> <td></td> <td></td> <td>440 = 300-440</td> <td>149-227</td> <td></td> <td></td> </tr> <tr> <td>400 = 0-400</td> <td>0-2.76</td> <td>28B = 0-28 bar</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <small>††Consult factory for availability of dials other than psi/kPa or °F/°C. Select scale so your normal operating value is in the middle half of the scale.</small>			Pressure (20BPG) Dual scale (psi/kPa)		Pressure (20BPG) Single scale (bar)		Vacuum (20BVG) Dual scale (in. Hg/kPa)		Temperature (20BTG) Dual scale (°F/°C)		Temperature (20BTG) Single scale (°C)		psi	kPa/MPa			in. Hg	kPa	°F	°C			15 = 0-15	0-103	1B = 0-1 bar		30 = 0 to 30	0 to -102	120 = 32-120	0-49	70C = 0-70°C		30 = 0-30	0-207	2B = 0-2 bar				160 = 32-160	0-71	100C = 45-100°C		50 = 0-50	0-345	3.5B = 0-3.5 bar				220 = 130-220	54-104	120C = 50-120°C		75 = 0-75	0-517	5B = 0-5 bar				250 = 130-250	60-121	140C = 60-140°C		100 = 0-100	0-689	7B = 0-7 bar				300 = 140-300	60-149	160C = 70-160°C		150 = 0-150	0-1.03	10B = 0-10 bar				320 = 160-320	71-160			200 = 0-200	0-1.38	14B = 0-14 bar				350 = 180-350	71-160			300 = 0-300	0-2.07	20B = 0-20 bar				440 = 300-440	149-227			400 = 0-400	0-2.76	28B = 0-28 bar							
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# Direct Mount Pressure Switch

## Model PSB

The PSB switch is a direct-mount switch for critical pressure points. It has one limit contact that can be used to activate an alarm, actuate indicator lights or shut down equipment.

The construction of this instrument is the same as Murphy's time-proven Switchgag® instrument. A precision machined brass mounting plate and port captures a high-quality, stamped beryllium copper diaphragm. The single-pole, double-throw (SPDT) snap-switch is operated directly from the diaphragm for quick acting and positive switching. Trip point is factory preset according to your specifications.

Housing is weather sealed to prevent entry of moisture, dust, etc. A glass-filled nylon terminal block with screw terminal connections gives the PSB switch a real advantage in industrial engine applications. The PSB is ideal when reading is not desired, but pressure is critical to operational efficiency. Intended for use in general purpose non-classified areas.

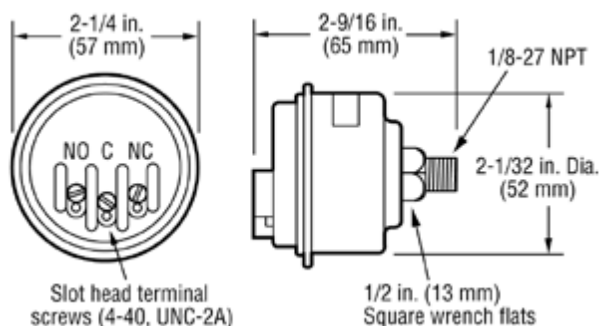
Applications include:

- |                             |                        |
|-----------------------------|------------------------|
| Engine lubrication          | Water pumps            |
| Compressors                 | Oil field systems      |
| Irrigation systems          | Construction equipment |
| Marine engines              | Generators             |
| Light-duty mobile equipment |                        |

Features include:

- Fits all engine applications
- SPDT snap-switch
- Activates indicator lights, alarms or shuts down equipment
- Time-proven Switchgag® construction
- Easy wiring terminal block
- Steel housing specially coated to resist corrosion
- Factory preset to your specifications

## Dimensions



\* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Housing:** Plated steel

**Pressure Connection:** 1/8-27 NPT, brass

**Diaphragm:** Formed beryllium copper (heat treated)

**Pulsation Dampener:** Brass (removable for cleaning)

**Terminal Block:** Three #4-40 screws

**Accuracy:** Trip point:  $\pm 3\%$  of full scale

**Switch reset differential:**  $\pm 7\%$  of full scale

Repeatability:  $\pm 1\%$  of full scale

**Contact Rating:** SPDT 3 A @ 30 VDC inductive

**Maximum Pressure:** See Trip Point Chart

**Temperature Range:**

Ambient=  $-40^{\circ}$  to  $150^{\circ}$  F ( $-40^{\circ}$  to  $66^{\circ}$  C)

Process=  $-40^{\circ}$  to  $250^{\circ}$  F ( $-40^{\circ}$  to  $121^{\circ}$  C)

**Factory Trip Point Setting:** See Trip Point Chart

**Pressure Range:** Specify from 15-400 psi (0.21 kPa- 2.76 MPa) [1.03-27.58 bar]. See Trip Point Chart

**Contact:** Operates on rising or falling pressure (specify)

**Shipping Weight:** 8 oz. (0.25 kgs)

**Shipping Dimensions:** 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm)

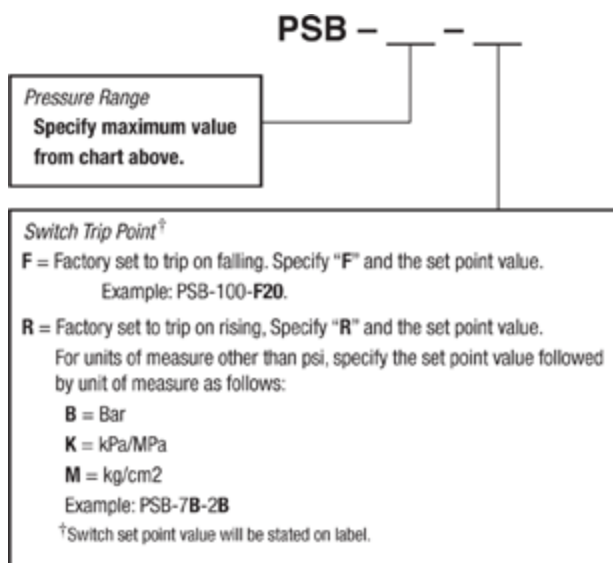
**NOTE:** No customer replacement parts

## Base Model

Ranges available			Factory setting			Maximum pressure		
psi	(kPa/MPa)	[bar]	psi	(kPa/MPa)	[bar] Falling	psi	(kPa/MPa)	[bar]
0-15	(0-103)	[0-1.03]	3	(21)	[.21]	30	(207)	[2.07]
0-30	(0-207)	[0-2.07]	7	(48)	[.48]	60	(414)	[4.14]
0-50	(0-345)	[0-3.45]	10	(69)	[.69]	100	(0-689)	[0-6.89]
0-75	(0-517)	[0-5.17]	15	(103)	[1.03]	150	(0-1.03)	[0-10.34]
0-100	(0-689)	[0-6.89]	20	(138)	[1.38]	200	(0-1.38)	[0-13.79]
0-150	(0-1.03)	[0-10.34]	30	(207)	[2.07]	300	(0-2.07)	[0-20.70]
0-200	(0-1.38)	[0-13.79]	50	(345)	[3.45]	400	(0-2.76)	[0-27.60]
0-300	(0-2.07)	[0-20.70]	75	(517)	[5.17]	500	(3.45)	[34.50]
0-400	(0-2.76)	[0-27.60]	150	(1.03)	[10.34]	500	(3.45)	[34.50]

## How to Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



# Pressure Gage and Swichgage® Instruments

## OPL Series 4-1/2 in. (114mm) Diameter Dial

The OPL-series pressure Swichgage instruments are combination pressure indicating gages with adjustable low and high limit switches. Limit switches can be wired directly to electric pilot circuits to operate alarms, shutdown or the start/stop of engines and electric motors. Surface mount or panel mount enclosure is available for most versions. All versions feature a 4-1/2 in. (114 mm) dial for easy viewing. Adjustable limit switches are accessible from the front of the Swichgage instrument. Limit contacts have self-cleaning motion to enhance electrical continuity.

Other versions available (details on next page):

- Gage only without contacts (Murphygage instrument);
- Swichgage instrument with built-in latching relay for start-stop operations.

### Specifications

**Case:** Die cast aluminum; weatherproof

**Contacts:** See details in the Electrical section, for contact ratings.

**Dial:** 4-1/2 in. (114 mm) white on black, dual scaled psi /kPa

**Other dial configurations available. Consult factory**

**Gage Accuracy:** ±2% for the first and last quarters of the scale, the middle half is ±1%.

**Geared Movement:** 302 and 304 stainless steel

**Lens:** Optically clear polycarbonate

**Pointer:** High visibility with a pointer calibration hub

**Process Connection:** Available in 1/4 NPT and 1/2 NPT. See Table B.

**Sensing Element:** Select from bronze or 316 stainless steel bourdon tube. See **Table B** for bourdon tube/socket combinations.



1 Selected configurations are third-party listed. Consult factory for details.

2 Options not available on all models or configurations.

3 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.



### Product Selection Information

**WARNING:** Selection of the proper gage/Swichgage instrument should include consideration for the service application, the medium being measured, electrical ratings, hazardous area requirements and general operating conditions. Improper selection and/or application may be detrimental to the gage/Swichgage instrument and could cause failure in the operating system and possibly personal injury or property damage. If in doubt, consult our sales/engineering staff.



## Base Models

---



### OPLC, OPLCE and OPLG

The **OPLC** is a surface mount, indicating pressure gage and switch. Adjustable high and low limit, ungrounded contacts are used to operate alarm, shutdown or start-stop circuits. Pointer closure against either of the adjustable contacts completes the pilot-duty circuit. An SPST toggle switch is provided to override the low limit contact for equipment startup. Suitable for engines or electric motors with appropriate Murphy magnetic switch or transformer relay assembly.

The **OPLCE** features a panel mount square case. It has all the features of the OPLC except the low limit contact lockout.

The **OPLG** is an indicating-only pressure Murphygage instrument. Same as the OPLC except without switch (limit) contacts.



### OPLFC and OPLFG

The **OPLFC** is a panel mounting version of the OPLC. It has all of the features of the OPLC except the low limit contact lockout. The lockout must be done externally through the control circuit. The OPLFC is typically used in control panels for compressors, pumps, etc. This version can be environmentally sealed with either the ES or OS options. Contact lead termination is by pigtail wires.

The **OPLFG** is an indicating only pressure Murphygage instrument. Same as the OPLFC except without switch (limit) contacts.



### OPLBP and OPLBPE

The **OPLBP** is a specialized version of the OPL series designed for start-stop operation of engines and electric motors. The pilot-duty limit switches are connected to an internal latching control relay for ON/OFF automation. Available for various voltages.

The **OPLBPE** is the same as the OPLBP except it has a panel mount square case.



1 Selected configurations are third-party listed. Consult factory for details.

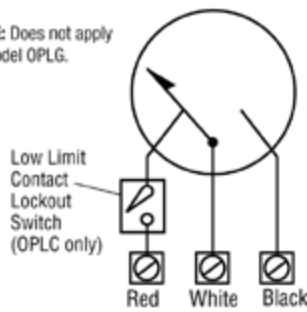
2 Options not available on all models or configurations.

3 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.



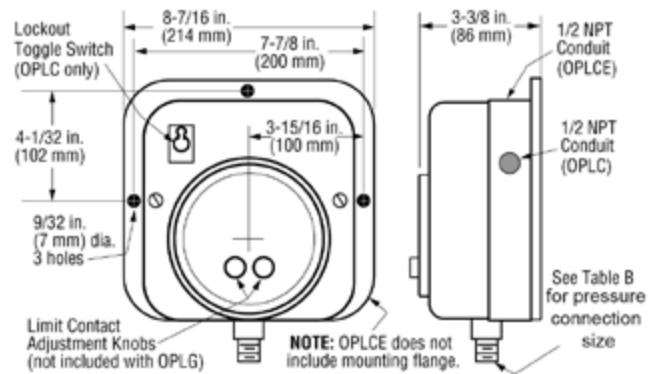
### OPLC and OPLCE

**NOTE:** Does not apply to model OPLG.



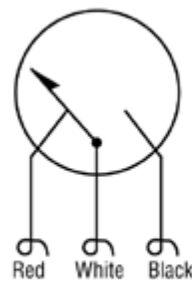
**Contact Rating:** 1 SPDT; Center off; 2 A, 30 VDC, 1 A, 125 VAC pilot duty

### OPLC, OPLCE and OPLG



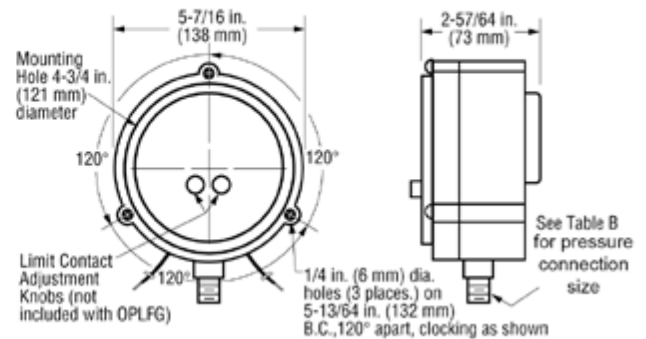
### OPLFC

**NOTE:** Does not apply to model OPLFG.

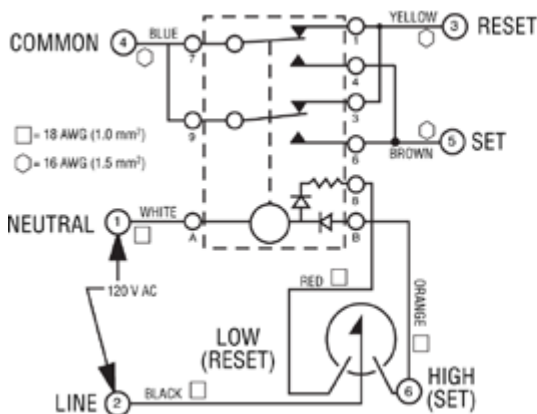


**Contact Rating:** 1 SPDT; Center off; 2 A, 30 VDC, 1 A, 125 VAC pilot duty

### OPLFC and OPLFG

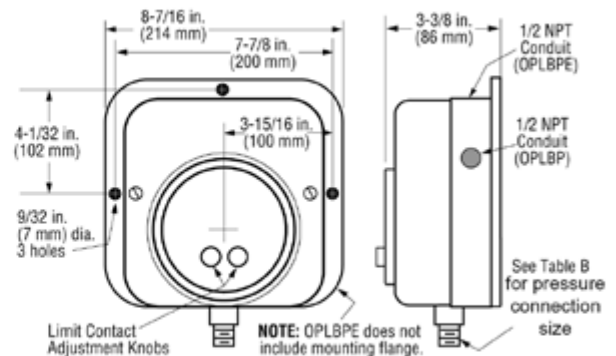


### OPLBP and OPLBPE



**Contact Rating:** SPDT dry relay contacts; 10 A, 125 VAC.

### OPLBP and OPLBPE



## Options and Accessories

### P4 and P6 Options

The **P4 (was PT147)** option provides a remote seal mechanism to protect the Switchgauge instrument sensing element from line pressures of highly viscous and mildly corrosive fluids. Ranges are 100 through 5,000 psi (689 kPa through 34.5 MPa) [6.9 through 344.7 bar]. A sealed stainless steel capillary tube with stainless steel armor transmits the pressure from the diaphragm seal to the Switchgauge instrument. Standard capillary length is 5 ft. (1.5 m). Optional lengths to 50 ft. (15 m) in 5 ft. (1.5 m) increments are available. Oil well lead lines and pumps with highly viscous liquids are typical applications. If required, customer should provide a pulsation dampener.

The **P6 (was PT167)** option is a diaphragm sealed to a 2 NPT housing which attaches directly to the pressure gage connection. The gage sensing element and the diaphragm chamber are filled with a silicone fluid so that pressure against the diaphragm causes the gage to respond. The diaphragm housing is plated machined steel. Typical application is for oil well lead lines. Ranges are 100 through 1,000 psi (689 kPa through 6.8 MPa) [6.89 through 68.9 bar]. The P4 and P6 can be ordered as optional features to the Switchgauge or indicating-only Murphygage instrument. See *How to Order*.

#### NOTE:

P4 option not available for scales below 100 psi.

P6 option available for scales 100 psi thru 1,000 psi only.



OPLFC-A-600-OS-P6



OPLFC-A-1000-OS-P4L

### Tamper-proof Contact Accessory



### Pulsation Dampener

- Eliminate pointer contact flutter on pressure Switchgauge and Murphygage instruments which are subject to pulsating pressure from reciprocating pumps or compressors.
- Allow close high-low contact settings for more accurate pressure indication and equipment control.
- Decrease wear on internal geared movement and increase the life of your instrument by eliminating excessive strain and unnecessary pointer movement.
- Available in brass, carbon steel and stainless steel.
- **Must be ordered separately.**



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### Selecting a Model:

**OPLBP - S - 2 - 1000 -**

1. Select a Base Part Number from Table A \_\_\_\_\_
2. Select Bourdon Tube and Socket code from Table B \_\_\_\_\_
3. Select BP Relay Voltage code (applies to BP models only) from Table C \_\_\_\_\_
4. Select Range code from Table D<sup>1</sup> \_\_\_\_\_
5. Select Options from Table E<sup>2</sup> \_\_\_\_\_

1 - For metric only dials specify scale and unit of measure; example: kPa or bar.

2 - List options in alphabetical order (A to Z) followed by numeric in ascending order. Place a dash (-) between each option. See example above.

**Table A: Base Models**

Model	Description
OPLC	Swichgage, surface mount, with low limit lockout switch
OPLCE	Swichgage, panel mount square case
OPLFC	Swichgage, panel mount
OPLBP*	Swichgage, surface mount, with latching control relay
OPLBPE*	Swichgage, panel mount square case, with latching control relay
OPLG	Murphygage, surface mount
OPLFG	Murphygage, panel mount

\*This version not covered by the CE mark.

**Table C: BP Relay Voltage**

Code	Voltage
Blank <sup>3</sup>	120 VAC
2	12 VDC
4	24 VDC

NOTE: Relay Voltage applies to BP models only.  
3: No code is required for 120 VAC voltage.

**Table B: Bourdon Tube and Socket**

Code	Process Connection	Tube Type	Range Selection Limits psi (MPa) [bar]	Bourdon Tube and Tip Material (all joints TIG welded except A)	Socket Material
A <sup>4</sup>	1/4 NPT	Drawn C-Tube	Through 1,000 psi (6.89 MPa) [68.95 bar]	Grade A Phosphor Bronze Tube (Brass Tip, Silver Brazed)	Brass
S <sup>5,6</sup>	1/4 NPT	Drawn C-Tube	Through 1,000 psi (6.89 MPa) [68.95 bar]	316 Stainless Steel	316 Stainless Steel
	1/2 NPT	Drawn Helical	1,500/10,000 psi (10.3/68.9 MPa) [103.42/700 bar]		

<sup>4</sup>Standard through 1,000 psi (6.89 MPa) [68.95 bar]  
<sup>5</sup>Standard 1,500 psi (10.3 MPa) [103.42 bar] through 10,000 psi (68.9 MPa) [700 bar]  
<sup>6</sup>Optional all ranges

Table D: Ranges				
Code	Vacuum/psi	kPa/MPa	bar	<b>Dials</b> All dials are dual scaled psi and kPa/MPa. Single scale dials and custom dials available. Additional charges may apply.  <b>Gages</b> All 4-1/2 inch (114 mm) Switchgauge instruments are available for Class I, Division 1, Groups C & D hazardous applications.  Division 2 locations can also be covered by our Non-Incendive or Intrinsically Safe systems. Contact any Enovation Controls representative for complete details.
30HV60H	30" Hg/Vac-60" Hg/Press.	-101 kPa-203 kPa	-1.01-2.03	
30V	30" vac-0 psi	-101 kPa-0 kPa	-1.01-0	
30V15	30" vac-15 psi	-101 kPa-103 kPa	-1.01-1.03	
30V30	30" vac-30 psi	-101 kPa-207 kPa	-1.01-2.07	
30V100	30" vac-100 psi	-101 kPa-689 kPa	-1.01-6.89	
30V200	30" vac-200 psi	-101 kPa-1.38 MPa	-1.01-13.79	
30V300	30" vac-300 psi	-101 kPa-2.07 MPa	-1.01-20.68	
15	0-15 psi	0-103 kPa	0-1.03	
30	0-30 psi	0-207 kPa	0-2.06	
60	0-60 psi	0-414 kPa	0-4.13	
100	0-100 psi	0-689 kPa	0-6.89	
160	0-160 psi	0-1.10 MPa	0-11	
200	0-200 psi	0-1.38 MPa	0-14	
300	0-300 psi	0-2.07 MPa	0-20	
400	0-400 psi	0-2.76 MPa	0-28	
600	0-600 psi	0-4.14 MPa	0-40	
1000	0-1000 psi	0-6.89 MPa	0-70	
1500	0-1500 psi	0-10.34 MPa	0-100	
2000	0-2000 psi	0-13.79 MPa	0-140	
3000	0-3000 psi	0-20.68 MPa	0-200	
5000	0-5000 psi	0-34.48 MPa	0-350	
10000	0-10,000 psi	0-68.95 MPa	0-700	

Table E: Options <sup>7</sup>			
Option	Description	Option	Description
BC	Back connected bourdon tube	P6	(PT167) PT167 pressure transmitter, direct mounting
ES	Environmentally sealed	TA	(TCA) Tickler contact
EX	Explosion-proof: Switchgauge® enclosed within explosion-proof case; Class I, Div. 1, Groups C & D		
EL	(EXLC) Explosion-proof less case		
LC	Less case		
OS	Oil sealed case		
P4L	(PT147) Pressure transmitter with 5 ft. (1.5m) capillary* (Pulsation dampener no longer supplied.) *For capillary greater than 5 ft., specify in 5 ft increments following designator; example: P4L15		

<sup>7</sup> Options not available on all models or configurations.

## Shipping Information\*

### Shipping Weights:

OPLC: 5 lbs 9 oz (2.5 kg)  
OPLG: 5 lbs 6 oz (2.4 kg)  
OPLFC and OPLCE: 3 lbs 4 oz (1.5 kg)  
OPLFG: 3 lbs 4 oz (1.5 kg)  
OPLBP and OPLBPE: 5 lbs 11 oz (2.6 kg)

### Shipping Dimensions:

OPLC, OPLG and OPLFG:  
9-1/2 x 9-1/4 x 5-3/4 in. (241 x 235 x 146 mm)  
OPLFC and OPLCE:  
9-1/4 x 8-1/4 x 5-1/2 in. (235 x 210 x 140 mm)  
OPLBP and OPLBPE:  
9-1/4 x 8-1/4 x 5-1/2 in. (235 x 210 x 140 mm)

\* Some options could alter shipping weights and dimensions. Consult factory.

# Pressure Switchgag<sup>®</sup> 45APE Series

The 45APE Series Switchgag instrument is a mechanical gage for pressure indication. It includes two adjustable SPDT switches. These snap-acting switches can be used for start and stop, to trip alarms and to shut down equipment. Ranges are available from 30" VAC (-100 kPa) [-1 bar] thru 10,000 psi (138 MPa) [1379 bar].

The 45APE Series utilizes a bourdon tube sensing unit with a stainless steel dual-sector geared movement. Each of the sectors drives separate pointers when pressure is applied to the bourdon tube. The indicating pointer (visible pointer) shows actual pressure reading, including below and beyond the low and high trip points. The low and high trip points are adjustable independently on the gage front lens. The switch operator pointer (behind the dial) is calibrated to follow the indicating pointer. The low and high trip point indicators arrest the switch operator pointer. As pressure decreases or increases through the principal of lost motion, the respective snap-switch is tripped.

The 45APE Series models are widely used in applications requiring pressure indication and Form C low and high pressure switches.

## Specifications

**Dial:** White on black, dual scale, psi and kPa standard, 4-1/2 in. (114 mm) diameter

**Case:** Die cast aluminum, surface or panel mount

**Overrange:** Do not exceed 10% FS above full range

**Process Connection:** 1/4 NPTM thru 1000 psi; 1/2 NPTM 1500 - 10,000 psi; back connection optional

**Sensing Element:** Bronze or 316 stainless steel bourdon tube

**Gage Accuracy:** Indicating pointer within switch points with hysteresis of <1%: ±2% for first and last quarters of scale; middle half of scale is ±1%. Indicating pointer above or below trip point:

Range	Accuracy (+/-) above & below to trip point only
< 100 (except 15 psi)	10
15	15
100-300	4
400-1500	2
2000	12
3000-5000	8

Reading based on testing performed with switch point at mid scale which represents worst case. Switch accuracy ±1.5%.

**Pressure Relief Disc:** Back of case (except EX models)

**Switch Reset Deadband:** Approximately 10% FS



Certain models listed for non-hazardous locations. Pending for hazardous location.

## Basic Models

**45APE Series Switchgag instrument**  
Surface mount (square case) version

**45APEF Series Switchgag instrument**  
Panel mount (round case) version

## 45APEBP Latching Control Relay Series

These models have a latching control relay for automatic ON/OFF control. They are designed to start and stop electric motor driven equipment.

## 45APEE and 45APEBPE

These models (square case) have the same features as the 45APE/45APEBP but are suitable for panel mounting.

**Snap-Acting Switches:** 2-SPDT; 2 A @ 250 VAC

**Dry Relay Contact (BP Models):** 10 A @ 28 VDC or 10 A @ 120 VAC

**Wire Connections (Surface Mount):** 1/2 NPTF conduit/ terminal block

**Wire Connections (Panel Mount):** Wire leads, 18 AWG (1.0 mm<sup>2</sup>) x 9 in. (229 mm) long

**Wire Connections (-ES, -OS):** 1/2 NPTM conduit and wire leads, 24 AWG (0.22 mm<sup>2</sup>) x 30 in. (762 mm) long

**Weight:** 5 lbs 6 oz (2.4 kg) approximately

**Explosion-proof models:** 21 lb. (9.5 kg) approx.

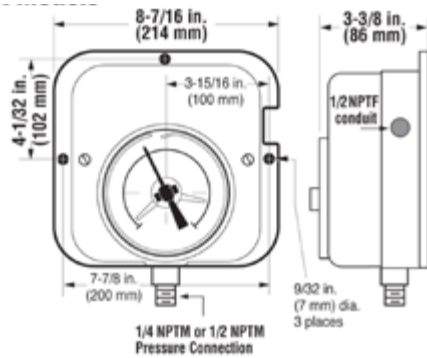
**Dimensions:** 10 x 9 x 6 in. (254 x 229 x 152 mm) approximately

**Explosion-proof models:** 12 x 12 x 9 in (305 x 305 x 229 mm) approximately

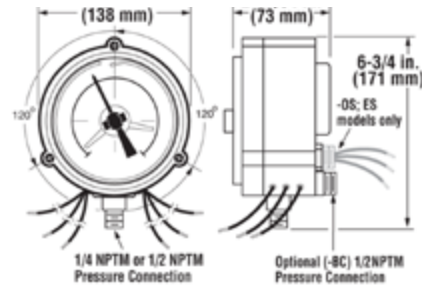
**CSA Certified Models:** 45APE Series models with pressure range thru 5000 psig (34.4 MPa) [344 bar] are CSA approved for non-hazardous locations, except options BC, ES, LC and OS. Explosion-proof EX models with pressure range thru 5000 psig (34.4 MPa) [344 bar] are CSA approved for Hazardous locations Class I, Groups, C & D. 45APEBP and 45APEBPE models are not CSA certified.

## Dimensions

### Surface Mount Models



### Panel Mount Models



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

#### Base Model

45APE 45APEE  
45APEF 45APEBPE\*  
45APEBP\*

\* Not covered by CSA.

#### Voltage (BP models only, feature NOT covered by CSA)

Blank= 120 VAC  
2= 12 VDC  
4= 24 VDC

#### Bourdon Tube/Socket

A = Bronze/Brass std. < 1,000 psi  
S = 316 Stainless Steel/ 316 Stainless Steel

45APEBP - 4 - S - 100 - EX

#### Options (NOTE: Not all options available for every model.)

BC = Back Connected Bourdon Tube  
ES = Environmentally Sealed (45APEF models only)  
EX = Explosion-proof (approved for hazardous areas Class I, Groups C & D to < 5000 psig)  
EL = (EXLC) Explosion-Proof Less Case  
LC = Less Case  
OS = Oil Sealed (45APEF models only)  
P4L = (PT147) PT147 pressure transmitter w/5 ft. capillary<sup>(1)</sup>  
(Pulsation dampener no longer provided)  
P6 = (PT167) PT167 Pressure transmitter direct mount<sup>(2)</sup>  
(1) For capillary greater than 5 ft., specify in 5 ft. increment following designator, example: P4L15 (option P4 with 15 ft. capillary).  
(2) Available for ranges ≥100-1000 psi only.

NOTE: for detail on P4L, P6 options see FWMurphy sales bulletin OPL-96001B in section 05 of your catalog.

#### Range

Code	Vacuum/psi	kPa/MPa	bar
30HV60H	30" Hg/Vac - 60" Hg/Press.	-101 kPa-203 kPa	-1.01-2.03
30V	30" vac - 0 psi	-101 kPa - 0 kPa	-1.01 - 0
30V15	30" vac - 15 psi	-101 kPa - 103 kPa	-1.01 - 1.03
30V30	30" vac - 30 psi	-101 kPa - 207 kPa	-1.01 - 2.07
30V100	30" vac - 100 psi	-101 kPa - 689 kPa	-1.01 - 6.89
30V200	30" vac - 200 psi	-101 kPa - 1.38 MPa	-1.01 - 13.79
30V300	30" vac - 300 psi	-101 kPa - 2.03 MPa	-1.01 - 20.68
15	15 psi	0 - 103 kPa	0 - 1.03
30	0 - 30 psi	0 - 207 kPa	0 - 2.06
60	0 - 60 psi	0 - 414 kPa	0 - 4.13
100	0 - 100 psi	0 - 689 kPa	0 - 6.89
160	0 - 160 psi	0 - 1.10 MPa	0 - 11.03
200	0 - 200 psi	0 - 1.38 MPa	0 - 13.78
300	0 - 300 psi	0 - 2.07 MPa	0 - 20.68
400	0 - 400 psi	0 - 2.76 MPa	0 - 27.57
600	0 - 600 psi	0 - 4.14 MPa	0 - 41.36
1000	0 - 1000 psi	0 - 6.89 MPa	0 - 68.95
1500	0 - 1500 psi	0 - 10.34 MPa	0 - 103.42
2000	0 - 2000 psi	0 - 13.79 MPa	0 - 137.89
3000	0 - 3000 psi	0 - 20.68 MPa	0 - 206.84
5000	0 - 5000 psi	0 - 34.48 MPa	0 - 344.73
10000	0 - 10,000 psi	0 - 68.95 MPa	0 - 689.47



# Lead Line Pressure Switchgauge® Instrument Model PT167EX 4-1/2 in. (114 mm) Diameter Dial

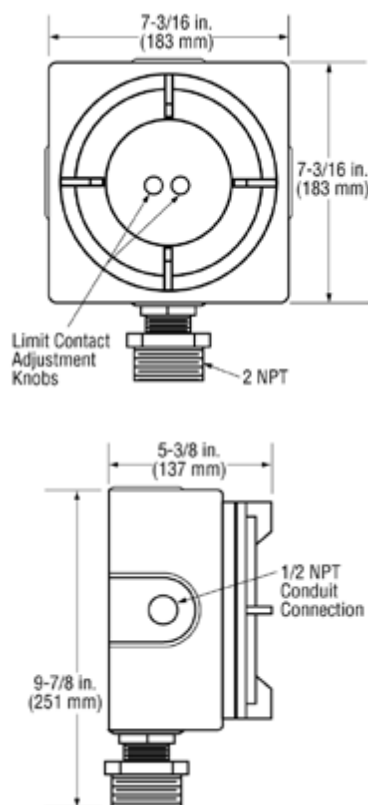
The Murphy PT167EX is a pressure Switchgauge instrument connected to a threaded pressure diaphragm housing. The Switchgauge instrument is enclosed in an explosion-proof case and is CSA rated for Class I, Division 1, Groups C and D.

A Switchgauge instrument is a pressure-indicating gage with adjustable low and high pressure limit switches. When the gage pointer touches the low or high limit switches, an electrical circuit is completed which can operate alarms and/or shut down equipment.

The 2 NPT, sealed diaphragm housing is attached directly to the Switchgauge connection. The diaphragm housing is filled with a silicone fluid so that pressure against the diaphragm causes the Switchgauge instrument to respond. The housing seals the Switchgauge sensing element from the medium being measured.

Applications include highly viscous liquids such as crude oil on lead line applications. Other applications have included asphalt, sludge, abrasive materials, etc.

## Dimensions



\* The PT167EX is CSA listed for ranges 100 to 5000 psi (689 kPa to 34.5 MPa) [6.89 to 344.74 bar].

† Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

## Specifications

**Case:** Explosion-proof, sand cast aluminum. Lens is removable.  
CSA Listed for Class I, Division 1, Groups C and D.

**Contact Rating:** 1 A, 125 VAC

**Dial:** 4-1/2 in. (114 mm) white on black, dual scaled psi/kPa. Other dial configurations available. Consult factory.

**Ranges:** See How to Order

**Gage Accuracy:** ±3% full scale

**Process Connection:** 2 NPT

**Maximum Pressure:** 30% overpressure

**Diaphragm Housing:** Plated steel, Ni-Span®; silicon filled

**Diaphragm Fluid:** Silicone 200

**Shipping Weight:** 16.5 lb (7.5 kg)

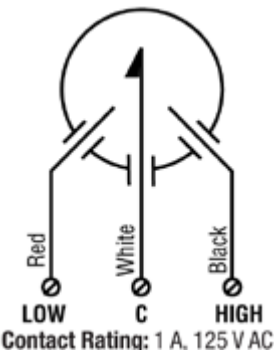
**Shipping Dimensions:** 12 x 12 x 9 in. (305 x 305 x 229 mm)

Typical Installation

This photo shows the PT167EX installed in a lead line. For optimum effectiveness, the PT167EX should be installed ahead of all other devices or valves. By positioning it immediately adjacent to the well outlet, the Swichgage instrument monitors the entire lead line, sensing any blockage whether build up of sludge in the line or an accidental closed valve. The pressure transmitter threads into a 2 NPT T on the lead line.



Internal Wiring



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Bourdon Tube Socket-Material/Size			
Specify	Tube/Socket Material	Tube Type	Range Selection Limits psi (MPa) [bar]
A	Grade A Phosphor Bronze (Tube) Brass (Socket)	C-Tube	Thru 1,000 psi (6.89 MPa) [68.95 bar]
S	316 Stainless Steel (Tube and Socket)	C-Tube	Thru 1,000 psi (6.89 MPa) [68.95 bar]

Ranges			
Specify	vacuum/psi	kPa/MPa	bar
100	0 - 100 psi	0 - 689 kPa	0 - 6.89
160	0 - 160 psi	0 - 1.10 MPa	0 - 11.03
200	0 - 200 psi	0 - 1.38 MPa	0 - 13.78
300	0 - 300 psi	0 - 2.07 MPa	0 - 20.68
400	0 - 400 psi	0 - 2.76 MPa	0 - 27.57
600	0 - 600 psi	0 - 4.14 MPa	0 - 41.36
1000	0 - 1000 psi	0 - 6.89 MPa	0 - 68.95

If specifying range in bar, kPa/MPa or kg/cm<sup>2</sup>, specify appropriate designator after value.  
Example: 20B = 20 bar.  
B = Bar  
K = kPa/MPa  
M = kg/cm<sup>2</sup>

Part Number	Description	Notes
05000610	Tamper-proof Contact Accessory	



# Pressure Transmitters

## PXT-K Series

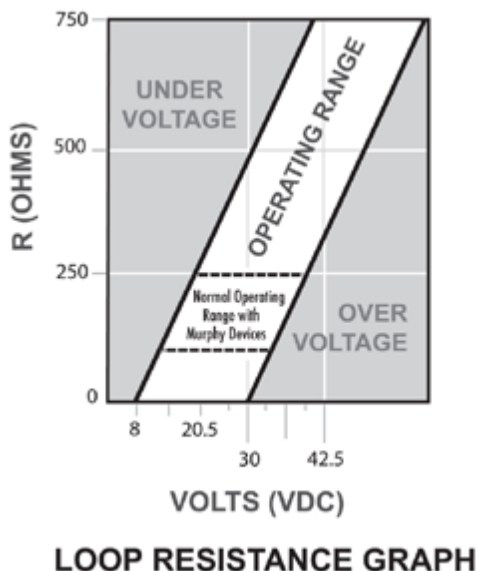
The PXT-K Series pressure transmitters are state-of-the-art instruments providing 4-20 mA output. Each Piezoresistive Pressure Transmitter contains a transducer comprised of a piezoresistive silicon chip mounted on a glass-metal feed-through header welded into a stainless steel housing and filled with silicone oil. The very thin laser-welded stainless steel isolation-diaphragm completes the front side. Media pressure is transferred from the stainless steel isolation-diaphragm via the oil inside the cell to the silicon measuring chip. This construction, combined with the advanced internal signal conditioning circuitry, results in a rugged instrument with extremely small temperature error and class-leading EMI/RFI resistance.

The enclosure and all wetted parts are made of 316L stainless steel to comply with NACE MR0175.

PXT-K Series Pressure Transmitters can be used in applications such as compressors, engines, process control, liquid level and pumps.

### Operating Range

Supply voltage for the PXT-K must be within range of 8-30 VDC. The graph below shows the minimum supply voltage (VDC) required for a given load resistance (R).



### Specifications

**Operating Pressure Range:** See How to Order under the PXT-K Series Model Number Matrix.

**Operating Temperature:** -40 to 180° F (-40 to 82° C)

**Compensated Temp Range:** -20 to 160° F (-29 to 71° C)

**Physical Characteristics**

**Process Connection:** 1/4 NPT female with 7/8" Hex nut

**Electrical Connection (PXT-K-XXX):** 1/2" NPT male conduit connection with 60" long cable, vented

**Enclosure:** NEMA 4/IP65 or better

**Body:** 316L stainless steel. Complies with NACE MR0175

**Wetted Parts:** 316L stainless steel

**Environmental Effect (Humidity):** No effect for 0-95%, non-condensing

**Mounting:** Transmitter can be installed in any axis. Transmitter position has negligible effect on performance as long as it is perpendicular to the flow being monitored.

**Shock Resistance:** 1000g per IEC 60068-2-6 (Mechanical Shock)

**Vibration Resistance:** 20G per IEC 60068-2-6 (Vibration under resonance)

**Wiring Protection:** Protected against reverse polarity and short circuit, 48 VDC Maximum

**Supply Voltage:** 8 - 30 VDC (Typically 24 VDC)

**Transmitter Output:** 4-20 mA, two wire configurations with load characteristics

**Insulation:** Greater than 10 MΩ @ 300 VDC

**Electromagnetic Compatibility (EMC):** Standards; EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61326-2-3:2006

**Voltage Surge/Spike Protection:** Protection against a 600 volt spike per IEC 60-2

**Shipping Weight:** 6.5 ounces

**Applicable Standards**

**NACE MR0175** Compliant with the requirements

**CSA (c/us):** Class I / II / III, Div 1, Groups A-F T4

Class I / II / III, Div 2, Groups A-D,F,G T4

**ATEX:** IBExU 10 ATEX 1124 X

II 1G Ex ia IIC T6-T4

II 3G Ex nA IIC T6



Specifications (continued)

<b>Accuracy:</b>	
<b>% of Span (BFSL)</b>	+/- 0.25% of span*
<b>Zero/Span Setting Tolerance</b>	+/- 2.5% of full scale* max. (30V30WC only)
	+/- 0.25% of span* typical,
	+/-0.5% of span* max (all other ranges)
<b>Operating Temperature</b>	+/- 2.5% of span T.E.B.
<b>Compensated Temperature</b>	+/- 1.7% of span T.E.B.
<b>Response Time</b>	<5mS

\* Accuracy Tolerance to be applied at 25° C.

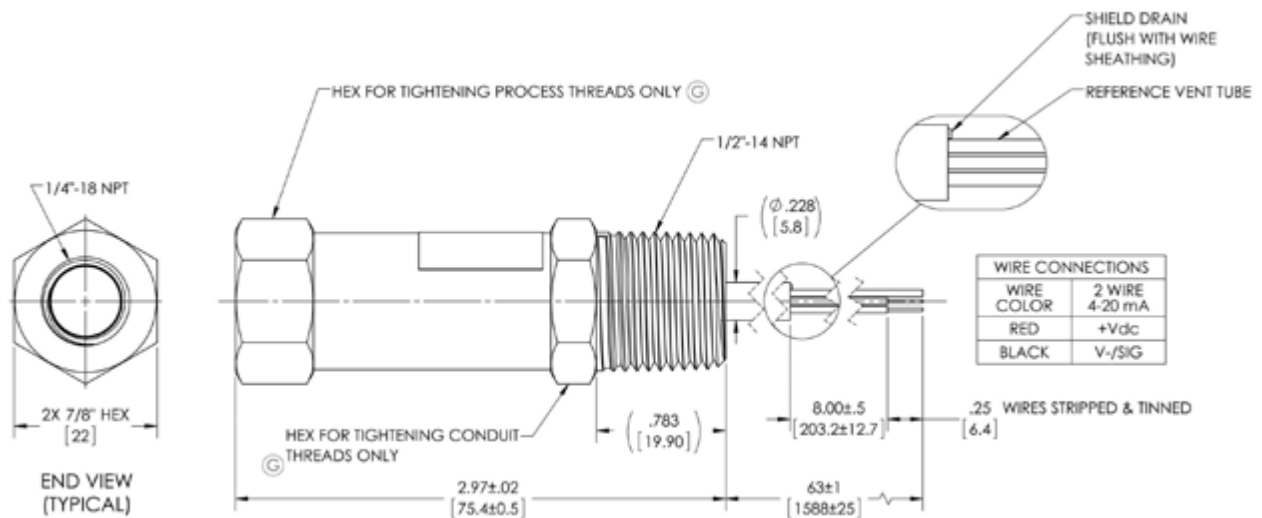
PXT and PXT-K Series Transmitter Cabling Identification

The PXT Series Pressure Transmitters have been changed. Previous pressure transmitters in this series were identified as **PXT Pressure Transmitters**. The newest version is the **PXT-K Series Pressure Transmitters**. Identification of electrical cable color is NOT interchangeable between the two series of pressure transmitters. This section contains information to assist you in identifying the pressure transmitter unit you have and the correct electrical cable colors to avoid wiring mistakes.

PXT Series		PXT-K Series	
			
<b>Cable Color</b>	<b>Connection</b>	<b>Cable Color</b>	<b>Connection</b>
RED	POWER	RED	POWER
BLUE	SIGNAL	BLUE	N/A
BLACK	CASE GROUND	BLACK	SIGNAL
ORANGE, YELLOW, WHITE	N/A	ORANGE, YELLOW, WHITE	N/A
Installation Instructions	00020475	Installation Manual	00020840
Installation Diagram	05-08-0754	Installation Diagram	05-08-0763

Shield drain wire is isolated from case.

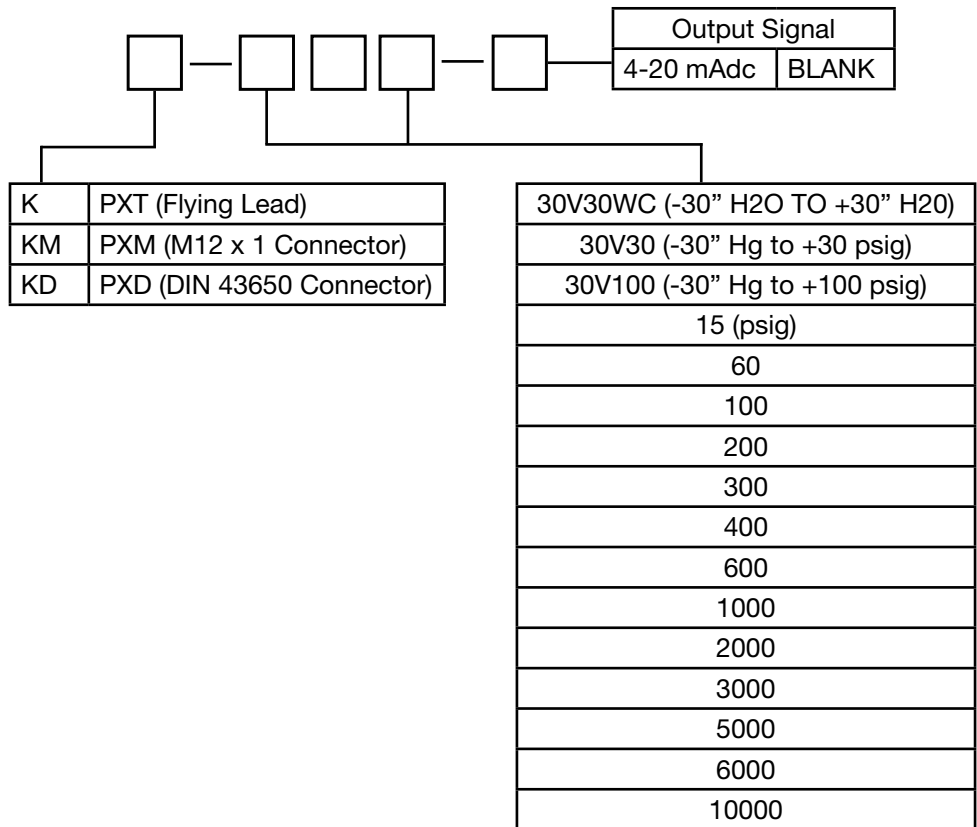
Shield drain wire is common to case.



How to Order

Options listed a right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Murphy two wire Pressure Transmitter with Flying Lead Connection, 0-600psig range, 4-20 mAdc output. If no digit follows the pressure range, it is automatically a 4-20mAdc output signal.



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## Section 10 Temperature

	<b>2" and 2.5" Swichgage® and Murphygage® Instruments</b>	
95026	Temperature Swichgage® — A20 and A25 Series . . . . .	39
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0910430	Air Temperature Sensor — Model 12. . . . .	71

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# Temperature Switchgauge® A20 and A25 Series

The A20 Series (2 inch/51 mm dial) and the A25 Series (2-1/2 inch/64 mm dial) Switchgauge models are diaphragm-actuated, temperature-indicating gages, with built-in electrical switches for tripping alarms and/or shutdown devices.

Ranges are available from 32°-120°F (0°-45°C) through 300°-440°F (160°-220°C).

All models of these rugged, built-to-last instruments are fully sealed from the environment by the unique combination of a polycarbonate case and lens, a polished stainless steel bezel and O-ring seals.

These vapor/pressure actuated gages feature a sealed capillary tube and a sensing bulb. When subjected to heat, the liquid in the sensing bulb changes to vapor creating pressure against a diaphragm mechanism. The diaphragm translates this vapor pressure into a mechanical gage reading.

For series A20T and A25T, the gage pointer acts as a temperature indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contact(s) are isolated from ground. They have a self-cleaning motion to enhance electrical continuity.

Models A20TE and A25TE have internal snap-acting SPDT switches.

Gage-only models, without contacts (Murphygage®) are also available.

Applications for A20 and A25 Series temperature Switchgauge instruments include: engines and equipment in the oil field, marine, irrigation, construction and trucking industries, monitoring engine coolant temperature, crankcase oil, transmission oil.

## Base Model

### Coolant or Oil Temperature

**A20T and A25T Series Switchgauge:** For these models the gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

**A20TL and A25TL Switchgauge:** For use on Ford Worldwide engines. Supplied with special sensing bulb.

**A20TE and A25TE Switchgauge:** A20TE (was A20ESR) and A25TE (was A25ESR). Models with internal SPDT snap-switches, instead of the single pole/pointer contact(s). When the switch closes on rising temperature, it becomes set. As temperature decreases the switch resets.

Model A25TE is CSA listed for non-hazardous areas.

Model A25TE-EX is CSA listed for Class I, Division 1, Groups C & D hazardous areas.

**A20TABS and A25TABS Switchgauge:** Same as A20 and A25T with internal SPDT snap-switch for pre-alarm.

### Cylinder Head Temperature

**A20TH and A25TH Switchgauge:** A20TH (was A20TL8133) and A25TH (was A25TL8133). For use on air-cooled engines.

### Gage-Only Models

**A20TG and A25TG Murphygage:** Gage without contact(s).



CE

Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Dial:** White on black; U.S.A. standard scale is dual scale °F/°C; others available

**Case:** Glass filled/Polycarbonate, corrosion-resistant; steel mounting clamp included

**Bezel:** Polished stainless steel, standard; others are available.

**Pointer:** Tempered nickel silver; red tip

**Lens:** Polycarbonate, high-impact

**Sensing Element:** Beryllium copper diaphragm

**Capillary:** PVC armored copper; 4 ft. (1.2 m). \* Stainless steel armor optional

**Sensing Bulb:** Copper\*

**Gage Accuracy:** See accuracy chart

**Maximum Temperature:**

See Temperature Ranges and Factory Settings table

**Maximum Ambient Temperature:**

-40°F (-40°C) through 150°F (66°C)

**Adjustable Limit Contact (A20T and A25T):** SPST contact; pilot-duty only, 2 A @ 30 VAC/VDC; isolated from case ground Closed when the high limit is met. Normally Open when pointer is in normal operating range. Contacts are gold flashed silver. Limit Contact Adjustment: by a 1/16 in. hex wrench through 100% of the scale.

Wiring: A20T: Number 4 screw terminals; A25T: Number 6 screw terminals.

**Snap-Switch Rating (A20TE and A25TE):** SPDT, 3 A @ 30 VDC inductive; 4 A @ 125 VAC inductive

Wiring: A20TE: Number 4 screw terminals; A25TE: Number 6 screw terminals

**Unit Weight:** A20 Series: 11.9 oz. (0.370 kg); A25 Series Models: 13.3 oz. (0.413 kg)

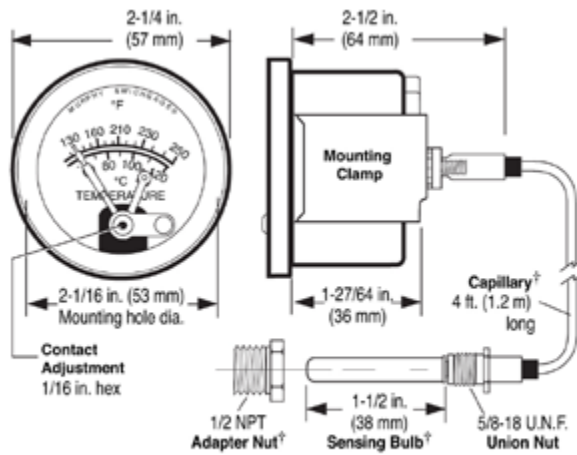
**Unit Dimensions:** A20 Series: 4-3/4 x 4-3/4 x 3 in. (121 x 121 x 76 mm); A25 Series Models: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

\*For optional capillary lengths, engine adapters, sensing bulbs and range combinations, see Murphy bulletin 8428.

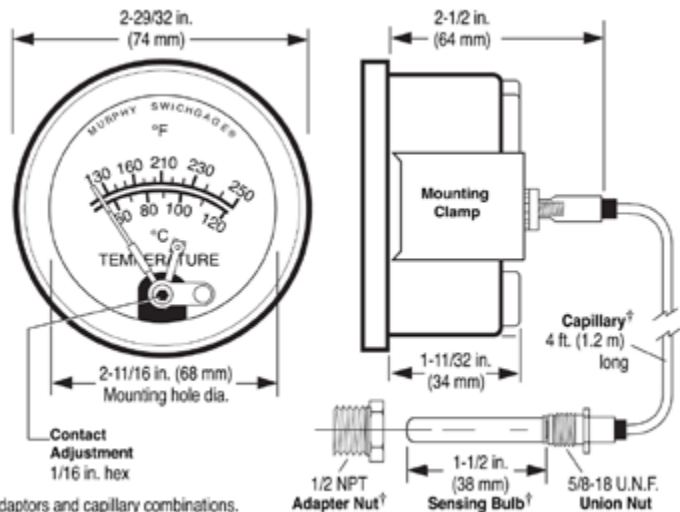


## Dimensions

**A20 Series Models (typical)**



**A25 Series Models (typical)**



†Standard combinations. See Murphy bulletin 8428 for optional sensing bulb, engine adaptors and capillary combinations.

## Temperature Ranges and Factory Settings

### NOTES

1. Values in ( ) are mathematical conversions from °F to °C — they do not reflect actual second scale range. U.S.A. standard scale is °F/°C.
2. For models A20TE and A25TE; the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential. Only certain models are adjustable.
3. For adjustable switch models, the trip point is adjustable only over the upper half of the scale.

Ranges Available		Max Temp.	Std. Settings*			Hi/Lo Settings		20TABS and 25TABS Settings			
Dual Scale Dial °F (°C)	Single Scale °C only					Low	High	Alarm†		Shutdown	
		°F (°C)	°F (°C)	°C only		°F (°C)	°F (°C)	°F (°C)	°C only	°F (°C)	°C only
32-120 (0-49)	----	185 (85)	110 (43)	----		32 (0)	110 (43)	100 (38)	----	110 (43)	----
32-160 (0-71)	0-70	215 (102)	150 (66)	66		32 (0)	150 (66)	140 (60)	60	150 (66)	66
130-220 (54-104)	45-100	260 (127)	210 (99)	85		160 (71)	210 (99)	200 (93)	80	210 (99)	85
130-220 (54-121)	50-120	310 (154)	210 (99)	97		160 (71)	210 (99)	200 (93)	95	210 (99)	100
140-300 (60-149)	60-140	340 (173)	275 (135)	130		200 (93)	275 (135)	265 (129)	125	275 (135)	130
160-320 (71-160)	70-160	370 (192)	300 (149)	150		200 (93)	300 (149)	290 (143)	145	300 (149)	150
180-350 (82-177)	----	400 (209)	330 (166)	----		240 (116)	330 (166)	320 (160)	----	330 (166)	----
300-440 (149-227)	----	500 (260)	400 (204)	----		300 (149)	400 (204)	390 (199)	----	400 (204)	----

\* Standard setting for A20T, A25T, A20TE and A25TE models.

†SPDT snap-switch is the alarm switch.

## Temperature Accuracy Chart

Temperature Range	Lower 1/3 of Scale	Middle 1/3 of Scale	Upper 1/3 of Scale
32° - 120°F (0° - 49°C)	±12°F (±6°C)	±5°F (±2.4°C)	±6°F (±3°C)
32° - 160°F (0° - 71°C)	±20°F (±10°C)	±8°F (±4.4°C)	±7°F (±4°C)
130° - 220°F (54° - 104°C)	±6°F (±3°C)	±3°F (±1.6°C)	±4°F (±2°C)
130° - 250°F (54° - 121°C)	±9°F (±5°C)	±5°F (±2.4°C)	±4°F (±2°C)
140° - 300°F (60° - 149°C)	±10°F (±5.2°C)	±6°F (±3°C)	±5°F (±2.4°C)
160° - 320°F (71° - 160°C)	±10°F (±5.2°C)	±5°F (±2.4°C)	±5°F (±2.4°C)
180° - 350°F (82° - 177°C)	±12°F (±6°C)	±5°F (±2.4°C)	±5°F (±2.4°C)
300° - 440°F (149° - 227°C)	±9°F (±5°C)	±5°F (±2.4°C)	±4°F (±2°C)

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product.

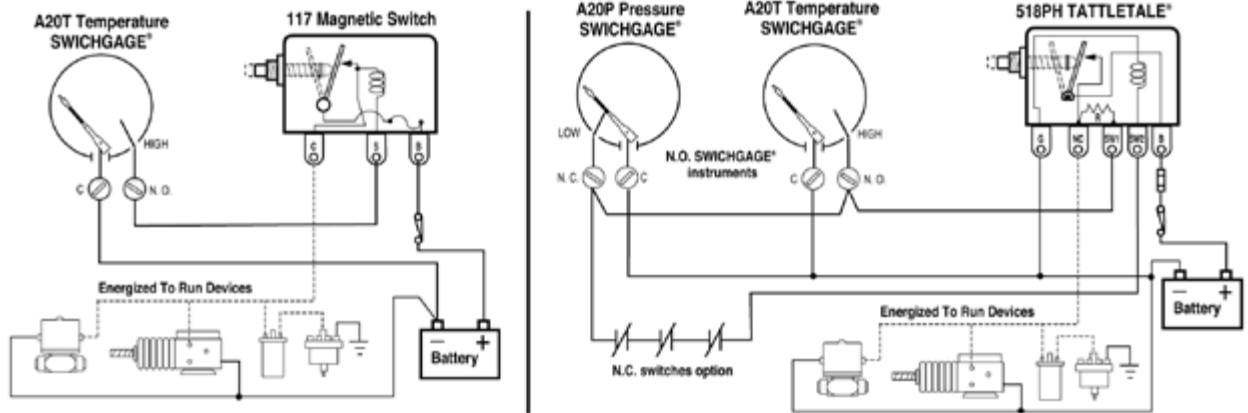
A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)



## Magnetic Switch

INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH. The Switchgauge contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the pilot-duty Switchgauge limit contacts.

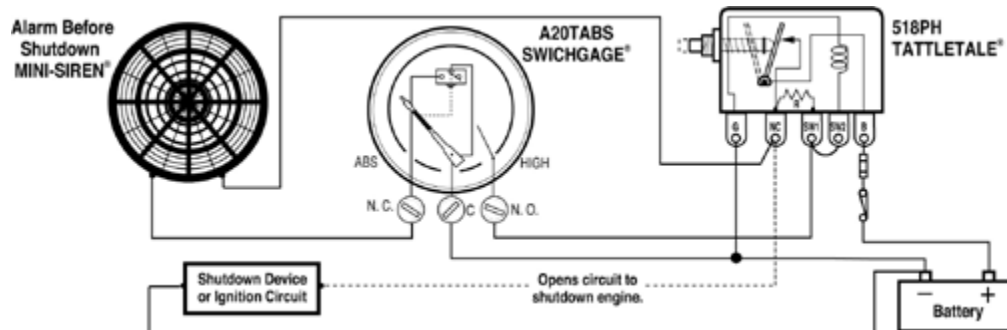
Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown.



## Pre-Alarm using A20/A25TABS

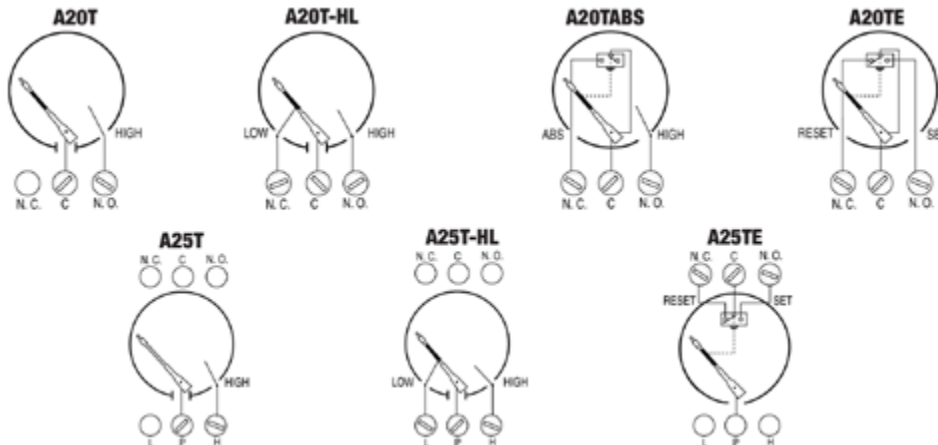
The A20TABS and A25TABS feature a standard limit contact for equipment shutdown on high temperature and an internal SPDT snap-switch to signal an alarm before shutting down. When the snap-switch trips (preset point) on rising temperature, the switch completes a circuit to activate an alarm.

If the temperature continues to increase, the face-adjustable pointer contact will make and the shutdown circuit will be completed (see the typical diagram). The front contact shutdown limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to Temperature Ranges and Factory Settings table for settings. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



## Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot-duty 2 A @ 30 VAC/VDC resistive. Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.




## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

<b>Base Model</b> <table style="width: 100%;"> <tr> <td>A20T</td> <td>A20TG</td> </tr> <tr> <td>A20TE</td> <td>A25T</td> </tr> <tr> <td>A20TABS</td> <td>A25TE</td> </tr> <tr> <td></td> <td>A25TG</td> </tr> </table>	A20T	A20TG	A20TE	A25T	A20TABS	A25TE		A25TG	<table style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;"><b>Adapter Nuts<sup>††</sup></b></td> </tr> <tr> <td style="width: 50%; vertical-align: top;"> <b>1/8</b> = 1/8-27 NPT  <b>1/4</b> = 1/4-18 NPT  <b>3/8</b> = 3/8-18 NPT  <b>3/8B</b> = 3/8-19 BSPT  <b>3/8K</b> = 3/8 NPSF  <b>-</b> = 1/2-14 NPT<sup>††††</sup>  <b>1/2B</b> = 1/2-BSPT  <b>1/2K</b> = 1/2 NPSF  <b>5/8</b> = 5/8-18 UNF  <b>3/4</b> = 3/4-14 NPT  <b>3/4U</b> = 3/4-16 UNF  <b>7/8</b> = 7/8-9 UNC             </td> <td style="width: 50%; vertical-align: top;"> <b>Metric</b>  <b>M10</b> = 10 mm x 1.5  <b>M12</b> = 12 mm x 1.5  <b>M14</b> = 14 mm x 1.5  <b>M16</b> = 16 mm x 1.5  <b>M18</b> = 18 mm x 1.5  <b>M20</b> = 20 mm x 1.5  <b>M22</b> = 22 mm x 1.5  <b>M24</b> = 24 mm x 1.5    <small>††† Specific adapter nut must match the sensing bulb.                  †††† Standard.</small> </td> </tr> </table> <table style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;"><b>Temperature Capillary Armor Type and Length</b></td> </tr> <tr> <td colspan="2"> <b>Capillary Armor Type</b>  <b>Blank</b> = PVC armor, copper capillary  <b>S</b> = Stainless steel armor, copper capillary             </td> </tr> <tr> <td colspan="2"> <b>Capillary Length (specify after capillary type; example: "S4")</b>  <b>4</b> = 4 ft. 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<b>Options<sup>†</sup></b>	
<b>B1</b> = Black bezel <b>EX</b> = Explosion-proof (CSA Listed for Class I, Div. 1, Groups C & D)* <b>EL</b> = Explosion-proof less case <b>HL</b> = High and low contacts <b>K</b> = Knob adjusting face contact <b>OS</b> = Oil sealed (Silicone Oil) <b>UA</b> = Temperature bulb style "A" (10-05-0166) <b>UB</b> = Temperature bulb style "B" (10-01-0061) <b>UC</b> = Temperature bulb style "C" (10-01-0060) <b>UD</b> = Temperature bulb style "D" (10-00-0286) <b>UE</b> = Temperature bulb style "E" (10-01-0084) <b>UF</b> = Temperature bulb style "F" (10-00-0577) <b>UG</b> = Temperature bulb style "G" (10-00-0578) <b>UH</b> = Temperature bulb style "H" (10-00-2466) <b>UJ</b> = Temperature bulb style J (10051153) <b>UK</b> = Temperature bulb style K (10054886)  <small>† Options not available on all models or configurations.                  *A25TE-EX only is CSA listed for hazardous locations.</small>	

Part Number	Model and Description	Notes
05702176	A20 Series Clamp Lite Assembly; 12V	
05702177	A20 Series Clamp Lite Assembly; 24V	
N/A	A25 Series	

# 20 and 25 Series Temperature Switchgauge® 2 and 2 1/2 in. (51 and 64 mm) Dial

The 20 Series (2 inch/51 mm dial) and the 25 Series (2-1/2 inch/64 mm dial) Switchgauge models are diaphragm-actuated, temperature-indicating gages with built-in electrical switches for tripping alarms and/or shut-down devices.

Ranges are available from 32°-120°F (0°-45°C) through 300°-440°F (160°-220°C).

The gage mechanism is enclosed in a steel case coated to resist corrosion. A polycarbonate, break-resistant lens and a polished, stainless steel bezel help protect this rugged, built-to-last instrument.

These vapor-actuated gages feature a sealed capillary tube and a sensing bulb. When subjected to heat, the liquid in the sensing bulb changes to vapor creating pressure against the diaphragm mechanism. The diaphragm translates this vapor pressure into a mechanical gage reading.

For series 20T and 25T, the gage pointer acts as a temperature indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contact(s) are grounded through the Switchgauge case. They have a self-cleaning motion to enhance electrical continuity.

Models 20TE and 25TE have internal snap-acting SPDT switches. Gage-only models without contacts (Murphygage® instrument) are also available.

These instruments are used on industrial engines and equipment in oil field, marine, irrigation, construction and trucking industries and for monitoring engine coolant, crankcase oil and transmission oil.



1 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

2 Model 25TE is CSA listed for non-hazardous areas. Model 25TE-EX is CSA listed for Class I, Division 1, Groups C & D hazardous areas.

## Base Models

### Coolant or Oil Temperature

#### 20T and 25T Series Switchgauge

For these models the gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

#### 20TL and 25TL Switchgauge instrument

For use on Ford Worldwide engines. Supplied with special sensing bulb.

#### 20TE and 25TE Switchgauge instrument internal snap-switch

20TE (was 20ESR) and 25TE (was 25ESR)  
Models with internal SPDT snap-switches, instead of the single pole/pointer contact(s). When the switch closes on rising temperature, it becomes set. As temperature decreases, the switch resets.

#### 20TABS and 25TABS Switchgauge instrument

Same as 20/25T with internal SPDT snap-switch for pre-alarm.

### Cylinder Head Temperature

#### 20TH and 25TH Switchgauge instrument

20TH (was 20TL8133) and 25TH (was 25TL8133). For use on air-cooled engines.

#### Direct Mount Models

##### 20TD Switchgauge instrument

Same as 20T. Available ranges: 220°F (104°C) or 250°F (121°C). Includes 1/4 x 4 in. (6 x 102 mm) sensing bulb.

##### 20SD Switchgauge instrument

Same as 20T. Available ranges: 220°F (104°C) or 250°F (121°C). Includes 11/32 x 1-1/2 in. (9 x 38 mm) sensing bulb.

#### Gage-Only Models

##### 20TG and 25TG Murphygage

Gages without contact(s).

## Specifications

**Dial:** White on black; U.S.A. standard scale is dual scale °F/°C; others available (see How to Order)

**Case:** Plated steel; mounting clamp included (except direct mount models)

**Bezel:** Polished stainless steel, standard; others available (see How to Order)

**Pointer:** Tempered nickel silver

**Lens:** Polycarbonate, high-impact

**Sensing Element:** Beryllium copper diaphragm

**Capillary:** PVC armored copper; 4 ft. (1.2 m). Stainless steel armor optional

**Sensing Bulb:** Copper\*

**Gage Accuracy:** See Temperature Accuracy Chart

**Maximum Temperature:**

See Temperature Ranges and Factory Settings Table

**Maximum Ambient Temperature:**

-40°F (-40°C) through 150°F (66°C)

**Adjustable Limit Contact (20T and 25T):** SPST contact; pilot duty only, 2 A @ 30 VAC/ VDC; Ground path through encasement. Normally Closed (NC) when the high limit is met. Normally Open (NO) when pointer is in normal operating range. Contacts are gold flashed silver.

**Limit Contact Adjustment:** By a 1/16 in. hex wrench through 100% of the scale

**Limit Contact Wire Leads:** 18 AWG (1.0 mm) 2 x 12 in. (305 mm)

**Snap-Switch Rating (20TE and 25TE):**

SPDT, 3 A @ 30 VDC inductive; 4 A @ 125 VAC inductive

**Snap-Switch Wire Leads:** 20 AWG (0.75 mm<sup>2</sup>) x 12 in. (305 mm)

**Unit Weight:** 20 Series: 12.7 oz. (0.39 kg); 25 Series Models: 13.8 oz. (0.43 kg)

**Unit Dimensions:**

20 Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

25 Series Models: 4-3/4 x 4-3/4 x 3 in. (121 x 121 x 76 mm)

\* For optional capillary lengths, engine adaptors, sensing bulbs and range combinations, visit [www.fwmurphy.com](http://www.fwmurphy.com).

## Temperature Ranges and Factory Settings

### NOTES

- Values in ( ) are mathematical conversions from °F to °C – they do not reflect actual second scale range. U.S.A. standard scale is °F/°C.
- For models 20TE and 25TE, the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential. Only certain models are adjustable.
- For adjustable switch models, the trip point is adjustable only over the upper half of the scale.

Ranges Available			Max. Temp.	Std. Settings*		Hi/Lo Settings		20TABS and 25TABS Settings			
Dual Scale Dial		Single Scale				Low	High	Alarm+		Shutdown	
°Fahrenheit	(°Celsius)	°Celsius only	°F (°C)	°F (°C)	°C only	°F (°C)	°F (°C)	°F (°C)	°C only	°F (°C)	°C only
32 – 120	(0 – 49)	—	185 (85)	110 (43)	—	32 (0)	110 (43)	100 (38)	—	110 (43)	—
32 – 160	(0 – 71)	0 – 70	215 (102)	150 (66)	66	32 (0)	150 (66)	140 (60)	60	150 (66)	66
130 – 220	(54 – 104)	45 – 100	260 (127)	210 (99)	85	160 (71)	210 (99)	200 (93)	80	210 (99)	85
130 – 250	(54 – 121)	50 – 120	310 (154)	210 (99)	97	160 (71)	210 (99)	200 (93)	95	210 (99)	100
140 – 300	(60 – 149)	60 – 140	340 (172)	275 (135)	130	200 (93)	275 (135)	265 (129)	125	275 (135)	130
160 – 320	(71 – 160)	70 – 160	370 (192)	300 (149)	150	200 (93)	300 (149)	290 (143)	145	300 (149)	150
180 – 350	(82 – 177)	—	400 (209)	330 (166)	—	240 (116)	330 (166)	320 (160)	—	330 (166)	—
300 – 440	(149 – 227)	—	500 (260)	400 (204)	—	300 (149)	400 (204)	390 (199)	—	400 (204)	—

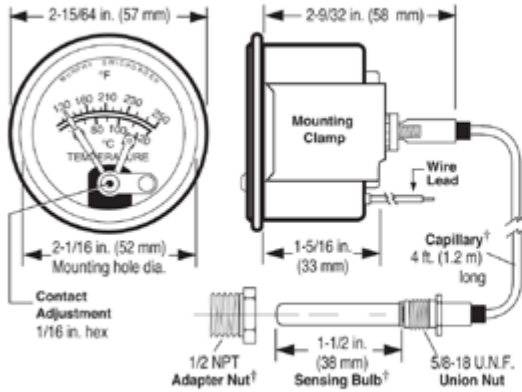
\* Standard setting for 20T, 25T, 20TE and 25TE models.

+ SPDT snap-switch is the alarm switch.

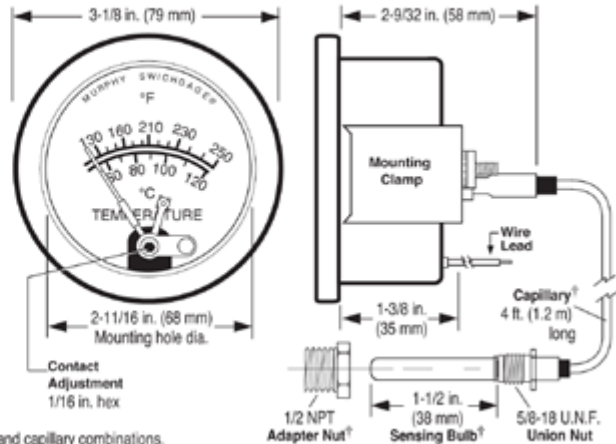
## Temperature Accuracy Chart

Temperature Range	Lower 1/3 of Scale	Middle 1/3 of Scale	Upper 1/3 of Scale
32 to 120°F (0 to 49°C)	± 12°F (± 6°C)	± 5°F (± 2.4°C)	± 6°F (± 3°C)
32 to 160°F (0 to 71°C)	± 20°F (± 10°C)	± 8°F (± 4.4°C)	± 7°F (± 4°C)
130 to 220°F (54 to 104°C)	± 6°F (± 3°C)	± 3°F (± 1.6°C)	± 4°F (± 2°C)
130 to 250°F (54 to 121°C)	± 9°F (± 5°C)	± 5°F (± 2.4°C)	± 4°F (± 2°C)
140 to 300°F (60 to 149°C)	± 10°F (± 5.2°C)	± 6°F (± 3°C)	± 5°F (± 2.4°C)
160 to 320°F (71 to 160°C)	± 10°F (± 5.2°C)	± 5°F (± 2.4°C)	± 5°F (± 2.4°C)
180 to 350°F (82 to 177°C)	± 12°F (± 6°C)	± 5°F (± 2.4°C)	± 5°F (± 2.4°C)
300 to 440°F (149 to 227°C)	± 9°F (± 5°C)	± 5°F (± 2.4°C)	± 4°F (± 2°C)

20 Series Models (typical)



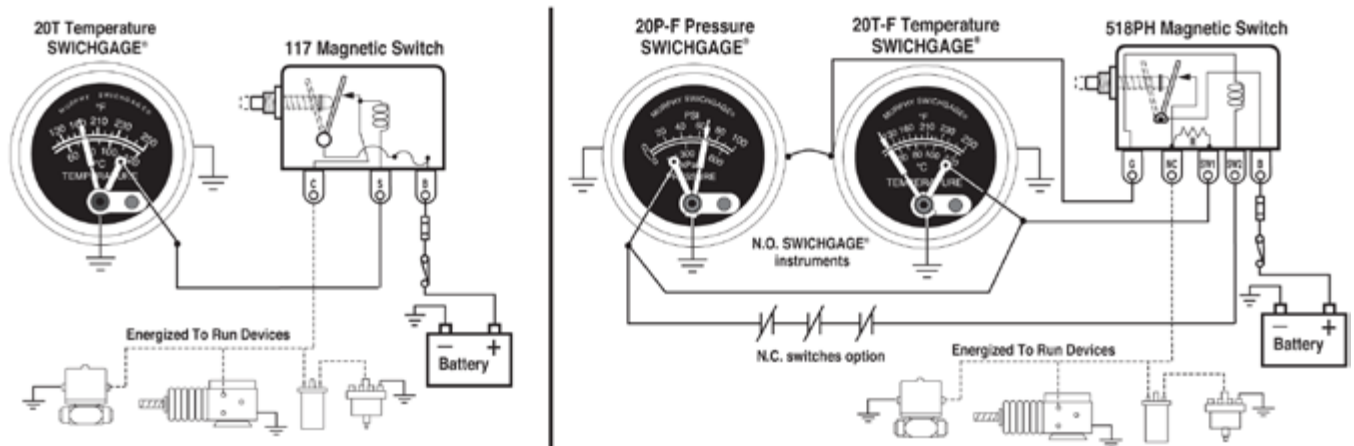
25 Series Models (typical)



\*Standard combinations. See Murphy bulletin . 8428 for optional sensing bulb, engine adaptors and capillary combinations.

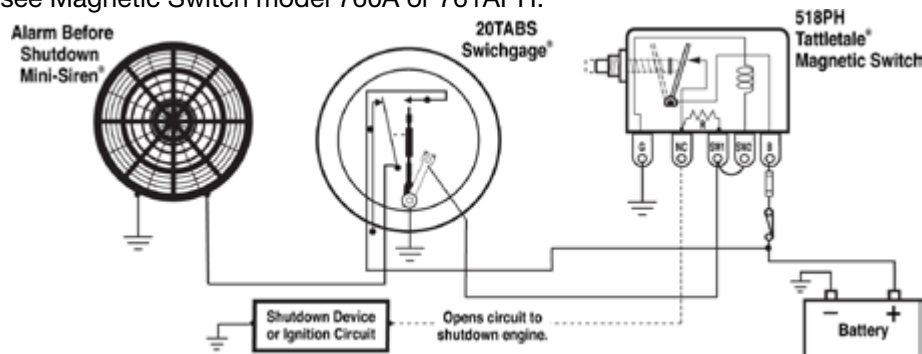
## Magnetic Switch

INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH. The Switchgauge contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the light-duty Switchgauge limit contacts. Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown below.



## Pre-Alarm using 20/25TABS

The 20TABS and 25TABS feature a standard limit contact for high temperature equipment shutdown and an internal SPDT snap-switch to signal an alarm before shutting down. When the low side of the snap-switch trips (preset point), on rising temperature, the switch completes a circuit to activate an alarm. If the temperature continues to increase, the face-adjustable pointer contact will make, and the shutdown circuit will be completed (see the typical diagram below for reference). The front contact shutdown limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to Temperature Ranges and Factory Settings table for settings. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



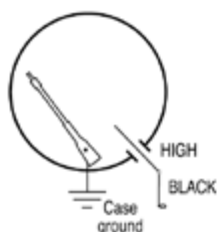


## Typical Internal Wiring Diagrams

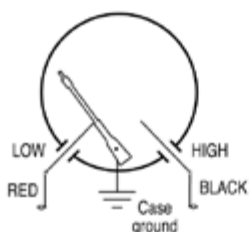
Pointer shown in the shelf position. Pointer type contact rating: pilot duty 2 A @ 30 VAC/VDC.

Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.

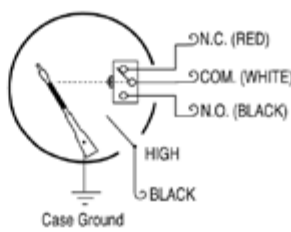
**Pointer Type Contact**



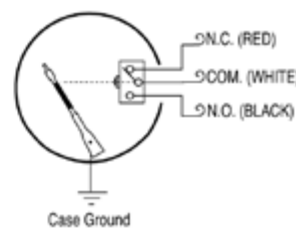
**"HL" Hi-Lo Option**



**ABS Models**



**TE Models**



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### Base Model

20T	20TH	25T
20TL	20TD	25TG
20TE	20SD	
20TABS	20TG	

### Options<sup>†</sup>

A = AGF (Argon filled)  
 B1 = Black bezel  
 B2 = Bezel 05051857 (was "HP")  
 B3 = Bezel 05051836 (was "HBB")  
 EX = EX proof (explosion proofed)  
 EL = EX less case (explosion proofed less case)  
 F = "FS" contact (includes "ES" as appropriate)  
 HL = High and low contacts  
 I = Illumination (for options, see chart below)  
 IP1 = Light pipe illumination, 12 VDC  
 IP2 = Light pipe illumination, 24 VDC  
 K = Knob adjusting face contact  
 OS = Oil sealed (Silicone Oil)  
 UA = Temperature bulb style A (10050166)\*  
 UB = Temperature bulb style B (10010061)\*  
 UC = Temperature bulb style C (10010060)\*  
 UD = Temperature bulb style D (10000286)\*  
 UE = Temperature bulb style E (10010084)\*  
 UF = Temperature bulb style F (10000577)\*  
 UG = Temperature bulb style G (10000578)\*  
 UH = Temperature bulb style H (10002466)\*  
 UK = Temperature bulb style K (10054886)\*

<sup>†</sup> Options not available on all models or configurations.  
 \* Specify optional bulb **ONLY** when not included as standard for temperature **Base Model**, scale/range or capillary length.

### Illumination Options

	IP1 / IP2	I
20 Series	x	x <sup>†</sup>
25 Series	N/A	N/A

<sup>†</sup> Can be used with standard Clamp Lite Assembly (12 V= 05702176; 24 V= 05702177).

### Adapter Nuts<sup>†††</sup>

	Metric
1/8 = 1/8-27 NPT	M10 = 10 mm x 1.5
1/4 = 1/4-18 NPT	M12 = 12 mm x 1.5
3/8 = 3/8-18 NPT	M14 = 14 mm x 1.5
3/8B = 3/8-19 BSPT	M16 = 16 mm x 1.5
3/8K = 3/8 NPSF	M18 = 18 mm x 1.5
- = 1/2-14 NPT <sup>†††</sup>	M20 = 20 mm x 1.5
1/2B = 1/2-BSPT	M22 = 22 mm x 1.5
1/2K = 1/2 NPSF	M24 = 24 mm x 1.5
5/8 = 5/8-18 UNF	
3/4 = 3/4-14 NPT	
3/4U = 3/4-16 UNF	
7/8 = 7/8-9 UNC	

<sup>†††</sup> Specific adapter nut must match the sensing bulb.  
<sup>†††</sup> Standard.

### Temperature Capillary Armor Type and Length

#### Capillary Armor Type

Blank = PVC armor, copper capillary  
 S = Stainless steel armor, copper capillary

#### Capillary Length (specify after capillary type; example: "S4")

4 = 4 ft. (1.2 m)  
 Specify other length = Available in 2 ft. increments thru 20 ft.; 5 ft. increments above 20 ft. (0.5 metres increments from 1.5-10 metres; 2 metre increments thru 34 metres. Specify "M" following length, i.e. 1.5M.)

### Range<sup>††</sup>

Dual scale (°F/°C)	Single scale (°C)
120 = 32-120 °F 0-49 °C	70C = 0-70°C
160 = 32-160 °F 0-71 °C	100C = 45-100°C
220 = 130-220 °F 54-104 °C	120C = 50-120°C
250 = 130-250 °F 60-121 °C	140C = 60-140°C
300 = 140-300 °F 60-149 °C	160C = 70-160°C
320 = 160-320 °F 71-160 °C	
350 = 180-350 °F 82-177 °C	
440 = 300-440 °F 149-227 °C	

<sup>††</sup> Consult factory for availability of dials other than °F/°C. Select scale so your normal operating temperature is in the upper half of the scale.

# Direct Mount Temperature Switch

## Model TSB

The TSB switch is a direct-mount switch for temperature sensing. It has one limit contact that can be used to activate an alarm, actuate indicator lights or shut down equipment.

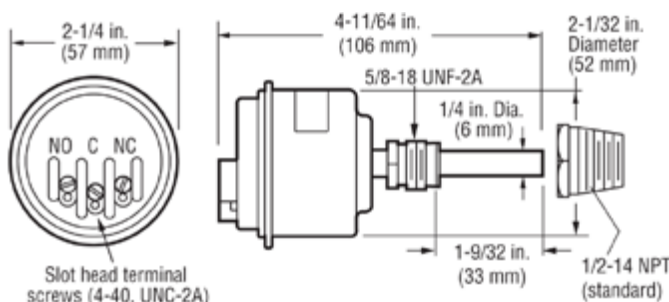
The construction of this instrument is the same as our time-proven Switchgauge®. A precision machined brass mounting plate and port captures a high quality stamped beryllium copper diaphragm. The single-pole, double-throw (SPDT) snap-switch is operated directly from the diaphragm, for quick acting and positive switching. Trip point is factory preset according to your specifications.

Housing is weather sealed to prevent entry of moisture, dust, etc. A glass-filled nylon terminal block with quick-screw terminal connections gives the TSB switch a real advantage in industrial engine applications. The TSB is ideal when reading is not desired but temperature is critical to operational efficiency.

Intended for use in general purpose non-classified areas. Applications include:

- Engine coolant
- Compressors
- Engine lubrication
- Mobile equipment
- Generators
- Irrigation systems
- Oil field systems
- Construction equipment
- Marine engines
- Electric motors

## Dimensions



\*Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Specifications

**Housing:** Plated steel

**Connections:** Popular NPT and metric (specify)

**Diaphragm:** Formed beryllium copper (heat treated)

**Sensing Bulb:** Copper

**Terminal Block:** Three # 4-40 screws

Accuracy	Switch Trip Point Range 150°-295°F (66°-146°C)
Trip Point	±3°F (1.7°C)
Switch Reset Differential	±15°F (9°C)
Repeatability	±3°F (1.7°C)

**Contact Rating:** SPDT 3 A @ 30 VDC inductive

**Maximum Temperature:** See chart

**Factory Trip Point Setting:** 210°F (99°C) Rising. Other trip point setting must be specified at time of order.

**Contact:** Operates on rising or falling temperature (specify)

**Approximate Shipping Weight:** 10 oz. (0.31 kg)

**Approximate Shipping Dimensions:** 4-3/4 x 4-3/4 x 2-5/8 in. (121 x 121 x 67 mm)

**NOTE:** No customer replacement parts

## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### TSB – R230 – 3/8

Standard Switch Trip Point		Connection Size	
Specify trip point value. Example: TSB-R200			
Standard Switch Trip Point		<b>Blank</b> = 1/2-14 NPT** 10-05-0131**	
Values (rising)*	Accuracy	<b>3/8</b> = 3/8-18 NPT 10-05-0069	
R165 = 165°F (74°C)	165–210°F ±5°F (±2.7°C) Water/glycol 10% used for setpoint	<b>M14</b> = 14 mm x 1.5 † 10-05-0104 †	
R180 = 180°F (82°C)			
R200 = 200°F (93°C)			
R205 = 205°F (96°C)			
R210 = 210°F (99°C)			
R220 = 220°F (104°C)	215–230°F ±7°F (±3.8°C) 240–250°F ±10°F (±6.5°C) Heat transfer fluid used for setpoint (276 viscosity @ 100°F)		
R225 = 225°F (107°C)			
R230 = 230°F (110°C)			
R240 = 240°F (116°C)			
R250 = 250°F (121°C)			
* Non standard trip points require a minimum quantity order. Trip point must be in 5°F increments between 165–250°F (74–121°C).			
Switch Reset Differential	±15°F (±8.3°C)		
Switch Repeatability	±3°F (1.7°C)		

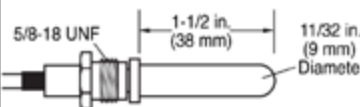
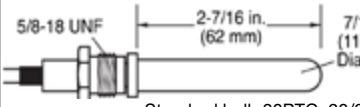

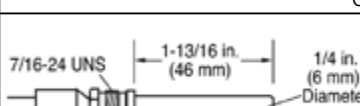
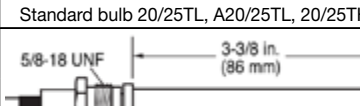
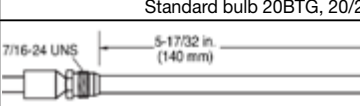
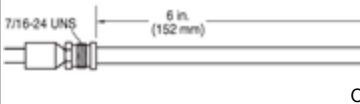


# Sensing Bulb/Scale/Capillary Length Combinations for 20, 25, A20 and A25 Series Temperature Swichgage® and Murphygage® Instruments

**APPLICATION NOTE:** Murphy vapor pressure actuated temperature Swichgage and Murphygage instruments indicate the temperature as measured at the sensing bulb. If the sensing bulb is not fully immersed in the medium being measured, an inaccurate reading will occur. This is particularly important when applying bulb types C, F and H since the attaching nut can be positioned at various depths along the length of the sensing bulb. For best results, be sure that the sensing bulb is fully immersed. For further important details see appropriate installation sheet for Murphy temperature devices or contact a representative.

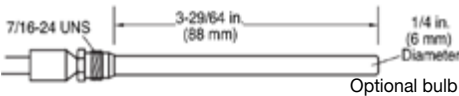
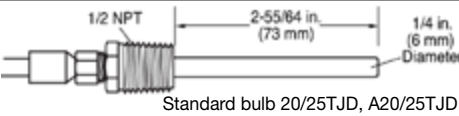
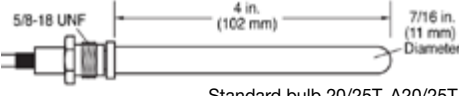
## NOTES:

- Bulb Type A, B, E & K are provided as standard on T & TE series based on scale and capillary length.
- Bulb Type D is provided as standard on TL & TH series based on scale and capillary length.
- Any bulb used where it is not standard must be specified in the model number.

Bulb Type	Bulb Dimensions	Part Number	Adaptor Nut Group	Thermowell Group	Capillary Tube Length	Temperature Ranges	
						°F	°C
<b>A</b>	 <p>Standard bulb 20BTG, 20/25T, A20/25T</p>	10050166	1	I	2-30 feet (0.61-9.14 meters)	130-220, 130-250, 140-300, 160-320, 180-350, 300-440	54-104, 54-121, 60-149, 71-160, 82-177, 149-227
					2-7 feet (0.61-2.13 meters)	32-120, 32-160	0-49, 0-71
<b>B</b>	 <p>Standard bulb 20BTG, 20/25T, A20/25T</p>	10010061	2	II	31-80 feet (9.45-24.39 meters)	130-220, 130-250, 140-300, 160-320, 180-350, 300-440	54-104, 54-121, 60-149, 71-160, 82-177, 149-227
					8-23 feet (2.43-7.01 meters)	32-120, 32-160	0-49, 0-71
<b>C</b>	 <p>Optional bulb</p>	10010060	3	—	2-25 feet (0.61-1.21 meters)	130-220, 130-250, 140-300, 160-320, 180-350	54-104, 54-121, 60-149, 71-160, 82-177
					2-4 feet (0.61-1.21 meters)	300-440	149-227
<b>D¹</b>	 <p>Standard bulb 20/25TL, A20/25TL, 20/25TH, A20/25TH</p>	10000286	4	IV	2-16 feet (0.61-4.88 meters)	130-220, 130-250, 140-300, 160-320, 180-350	54-104, 54-121, 60-149, 71-160, 82-177
					2-4 feet (0.61-1.21 meters)	300-440	149-227
<b>E</b>	 <p>Standard bulb 20BTG, 20/25T, A20/25T</p>	10010084	2	III	24-35 feet (7.32-10.67 meters)	32-120, 32-160	0-49, 0-71
					81-110 feet (24.69-33.53 meters)	130-220, 130-250, 140-300, 160-320, 180-350, 300-440	54-104, 54-121, 60-149, 71-160, 82-177, 149-227
<b>F</b>	 <p>Optional bulb</p>	10000577	3	—	16-25 feet (4.88-7.62 meters)	130-220, 130-250, 140-300, 160-320	54-104, 54-121, 60-149, 71-160
<b>G</b>	 <p>Optional Bulb</p>	10002466	4	—	17-25 feet (5.18-7.62 meters)	130-220, 130-250, 140-300, 160-320	54-104, 54-121, 60-149, 71-160

1 Standard bulb for air-cooled engine models (example 20TH) and Ford worldwide engines (example 20TL)

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product.  
A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

Bulb Type	Bulb Dimensions	Part Number	Adaptor Nut Group	Thermowell Group	Capillary Tube Length	Temperature Ranges	
						°F	°C
<b>H</b>		10002466	3	IV	2-25 feet (0.61-7.62 meters)	130-220, 130-250, 140-300, 160-320, 180-350	54-104, 54-121, 60-149, 71-160, 82-177
					2-4 feet (0.61-1.21 meters)	300-440	149-227
<b>J</b>		10051153	3 and part number 85030447	—	2-12 feet (0.61-3.66 meters)	130-250	54-121
<b>K</b>		10004886	2	—	36-50 feet (10.97-15.24 meters)	32-120 32-160	0-49 0-71

Part Number	Description	Notes
10050167	1/4-18 NPT	Optional Adapter Group 1
10050069	3/8-18 NPT	
10050284	3/8-19 BSPT	
10050131	1/2-14 NPT	
10050330	1/2-14 BSPT	
10050068	5/8-18 UNF	
10050105	3/4-14 NPT	
10050093	7/8-9 UNC	
10002442	14 mm x 1.5	
10002444	16 mm x 1.5	
10002443	18 mm x 1.5	
10002446	20 mm x 1.5	
10002445	22 mm x 1.5	
10002449	24 mm x 1.5	
10050103	3/8-18 NPT	Optional Adapter Group 2
10050107	1/2-14 NPT	
10050827	3/4-14 NPT	
10050695	7/8-9 UNF	
10002447	22 mm x 1.5	Optional Adapter Group 3
10010052	1/8-27 NPT	
10010051	10 mm x 1.5	Optional Adapter Group 4
10005235	10 mm x 1.0	
10050912	1/8-27 NPT	Optional Thermowells Group I
10002450	10 mm x 1.5	
10002451	12 mm x 1.5	Optional Thermowells Group II
10010009	1/2-14 NPT, Carbon Steel, Nickel Plate	
10050128	1/2-14 NPT, 304 Stainless Steel	Optional Thermowells Group III
10050899	1/2-14 NPT, Carbon Steel, Nickel Plate	
10000425	7/8-9 UNC, Carbon Steel, Nickel Plate	Optional Thermowells Group III
10050169	1/2-14 NPT, 304 Stainless Steel	
10050900	1/2-14 NPT, Carbon Steel, Nickel Plate	Optional Thermowells Group III
10050901	1/2-14 NPT, 304 Stainless Steel	

Consult factory for non-listed options and combinations.

# Exhaust Pyrometers for Diesel Engines

## Models 10705146 and 10705147

Excessive exhaust temperature is a major damaging factor to all engines. The best way to monitor this temperature is with the use of a pyrometer. Excessive exhaust temperature is caused by an upset fuel/air ratio or more fuel in the engine than there is air to support it. This condition can occur as a result of over throttling, a dirty air cleaner, different fuels, a malfunctioning fuel system, change of altitude, an out-of-tune engine and many other causes. But whatever the cause, a pyrometer indicates this condition before serious damage occurs.

The Single 10705147 and Dual 10705146 Port Pyrometers monitor exhaust temperatures in all types of engines. The Dual Port Pyrometer can monitor each bank of a V-type engine allowing you to compare readings at all times. Both pyrometers feature an easy-to-read illuminated dial with scales in both Fahrenheit and Celsius. They require no outside power (except for dial lighting). Spring-loaded jewels and alloy pivots increase durability. Murphy offers pyrometer accessories such as thermocouples and wire lead assembly suitable for stationary or mobile engines, power units, agricultural and construction equipment, as well as marine and trucking.



### Features

- Large sweep scales for maximum legibility
- Internal illumination for night use
- Accuracy: 2% full scale
- Sealed housing
- Ambient temperature compensation
- Calibrated permanently at 2/3 scale
- Flush type mounting on any plane

### Benefits of Using a Pyrometer

- Longer engine life
- Better fuel economy
- Less lubrication oil dilution
- Lubrication oil stays clean much longer
- Exhaust emissions drop to a minimum
- Malfunctions indicated before excessive damage occurs

### Specifications

#### Dial Scale

Single: 300° to 1300°F (150° to 700°C)  
Dual: 300° to 1200°F (150° to 649°C)\*

**Dial Sweep (both models):** 100°

**Accuracy:** Full scale 2%

**Illumination:** Internal 12 or 24 VDC

**Bezel:** Polished stainless steel\*

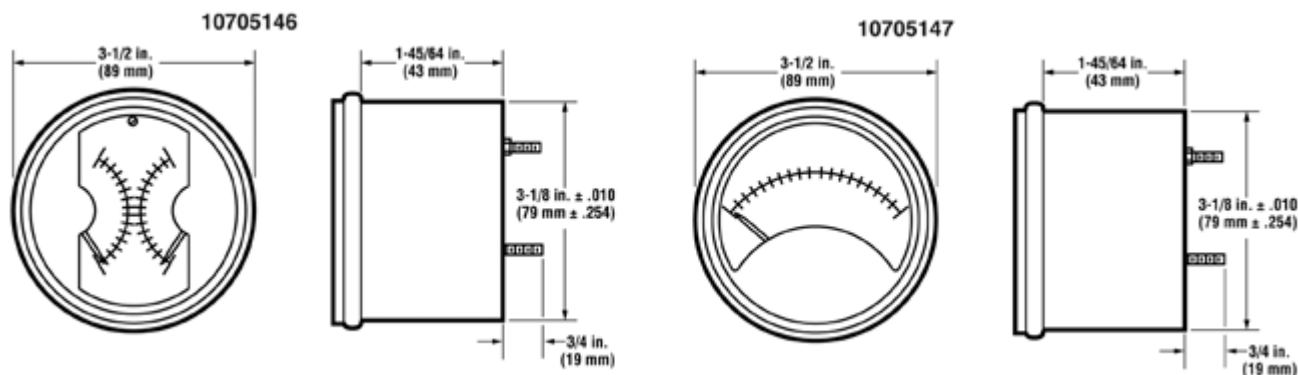
**Case:** PVC

**Pointer(s):** Fire Orange

\* Celsius only dials available

\* Black Bezel available. See special order.

## Dimensions



## Accessories

Type K thermocouples can mount in the engine manifold or in 2 to 3-1/2 in. (51 to 89 mm) diameter exhaust ports. In turbocharged engines, a thermocouple mounts between the engine and the turbo. Thermocouple 00000818 is a grounded, type K (Chromel Alumel). Thermocouple 00003488 is ungrounded type K (Chromel Alumel).

### Thermocouple Specifications

Element K: type (NiCr/Ni) solid wire  
 Hot Junction: fusion welded  
 Protecting Tube: inconel for no carbon absorption, end closed by heliarc melt down  
 Wire Insulation: Q-glass with stainless steel overbraid

Wire Lead Assembly 00000817 is a 14 ft. (4.27 m) extension with mating plug connections for the 00000818 and 00003488 thermocouples. The wire is PVC covered, non-shielded, 18 AWG (1.0 mm<sup>2</sup>), with heat shrinkable sleeve provided for insulating terminals after installation. Extension up to 100 ft. (30.48 m) can be made with 18 AWG (1.0 mm<sup>2</sup>) or larger copper wire at the gage head.



## How to Order

Part Number	Model and Description	Notes
00000819	10705146 Dual Pyrometer	
00000956	10705147 Single Pyrometer	
00000817	14 ft. (4.27m) Wire Lead Assembly	Accessories
00000818	Thermocouple, grounded, Type K, 3/8 NPT *	
00003488	Thermocouple, ungrounded, Type K, 1/4 NPT *	
00003578	3/8 NPT Adaptor	
00003577	1/8 NPT Adaptor	
00003450	1/4 NPT Adaptor	
00003579	1/2 NPT Adaptor	

\*1/8 NPT, 1/4 NPT and 1/2 NPT adaptors available.

# Direct Mount Temperature Switchgauge®

## SDB Series (For Gas Compressor Cylinder Discharge Temperatures)

The SDB Series are direct-mounting temperature Switchgauge devices. They provide an accurate direct-reading gage with an adjustable limit switch to activate alarms and/or shutdown. A knob on front of the Switchgauge instrument allows you to adjust the limit switch trip point. Pointer movement is actuated by a bi-metallic sensing element.

Models SDB500, SDB501 and SDB500EX have a temperature range of 100° to 500°F (40° to 260°C). SDB500EX enclosure is explosion-proof and CSA listed for Class I, Group C and D hazardous locations.

The SDB1000 has a temperature range of 200° to 1000°F (100° to 500°C).

The most common use of the SDB Series is to monitor gas compressor temperatures. Engine exhaust temperature can also be monitored to indicate overloading or lean fuel mixtures, or use the SDB to help coordinate loads on twin-engine installations.

### Specifications

#### Temperature Ranges:

SDB500, SDB500EX and SDB501: 100° to 500°F (40° to 260°C)  
SDB1000: 200° to 1000°F (100° to 500°C)

**Sensing Bulb Material and Size:** 304 stainless steel; 1/2 in. dia. x 4 in. insertion depth (13 x 102 mm)

**Maximum Bulb Pressure:** 285 psi (1.97 MPa) [19.7 bar] at 625°F (329°C) **NOTE:** Use of a thermowell is recommended.

**Process Connection:** 1/2 NPTF; 3/4 NPT adapter available

**Sensing Element:** High torque bi-metal element in heliarc welded stainless steel bulb

**Contact Rating:** SDB500, SDB501 and SDB1000: 2 A @ 30 VAC  
SDB500EX: 2 A @ 120 VAC

**Limit Contact Adjustment:** By knob through full range

#### Maximum Unit Temperature:

SDB500, SDB500EX, SDB501: 625°F (329°C)  
SDB1000: 1250°F (677°C)

**Case Material:** SDB501: Die-cast aluminum; SDB500, SDB1000, SDB500EX: Sand-cast aluminum

**Switchgauge Accuracy:** ± 3% of full scale; **NOTE:** All models are calibrated for use with a thermowell. Specify when a thermowell is NOT to be used when ordering.

**Wire:** 18 AWG (1.0 mm²). See Dimensions for lengths.

**Dial:** Black print on stainless steel. Dials are scaled in degrees Fahrenheit and Celsius.

#### Approximate Shipping Weight:

SDB501: 1 lb. 4 oz. (0.57 kg)  
SDB500 and SDB1000: 2 lb. (1.0 kg)  
SDB500EX: 2 lb. 5 oz. (1.05 kg)

#### Approximate Shipping Dimensions:

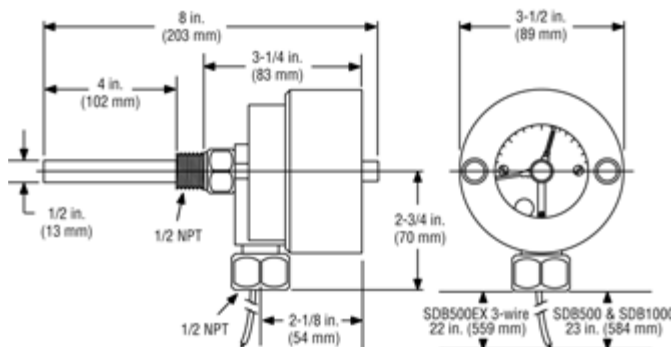
SDB501: 8-1/4 x 4-1/4 x 4-1/2 in. (210 x 108 x 114 mm)  
SDB500 and SDB1000: 8-1/4 x 4-1/4 x 4-1/2 in. (210 x 108 x 114 mm)  
SDB500EX: 9 x 5-1/2 x 6 in. (229 x 140 x 152 mm)



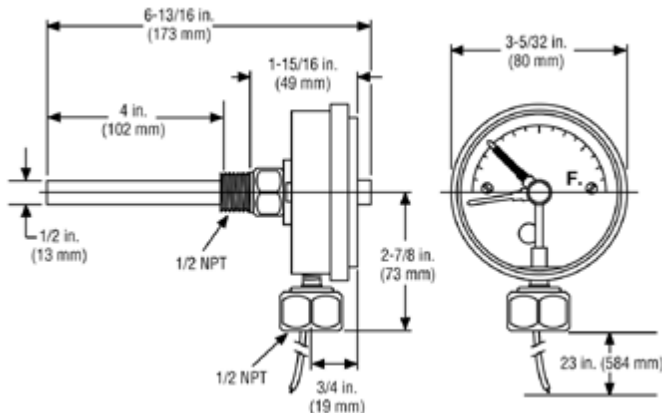
\* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

### Dimensions

#### SDB500, SDB500EX and SDB1000



#### SDB501



**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

Basic Operation

**SDB500, SDB501 and SDB1000:** When the indicating pointer on the SDB touches the adjustable contact, a one-wire-to-ground circuit is completed to shut down the equipment and/or actuate audible or visual alarms. Proper relays or Tattletale® annunciators (magnetic switches) must be incorporated into the system.

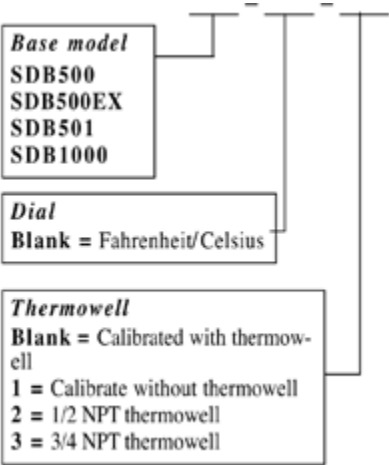
**SDB500EX:** When the temperature rises to the preset trip point, the pointer engages an internal SPDT snap-switch to close/open circuits.

Optional Thermowells

Thermowells (separable sockets) are available to facilitate maintenance of a temperature Swichgag instrument and to protect the temperature sensing bulb from extreme amounts of system pressure. For system pressures exceeding 285 psi (1.97 MPa) [19.7 bar] at 625°F (329°C) an optional thermowell is recommended for use with the SDB series. The thermowell protects the SDB bulb from system pressures up to 3000 psi (20.68 MPa) [206.8 bar] at 300°F (149°C). Two thermowell options are available: 1/2 NPT and 3/4 NPT. Thermowells can be ordered with the SDB Series Swichgag instrument or ordered separately. See How to Order.

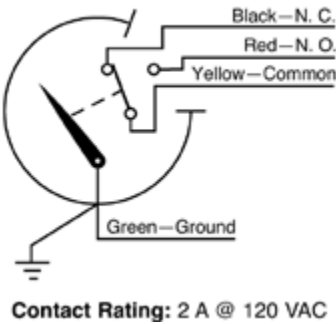
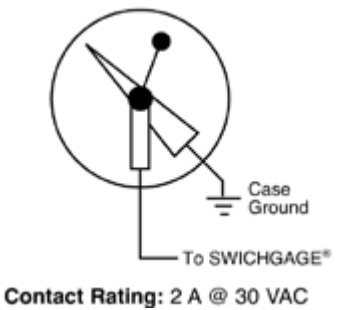
How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Model and Description	Notes
10050025	Thermowell for 1/2 NPT	Optional Thermowells
10050311	Thermowell for 3/4 NPT	

Wiring Diagrams





# 4.5" (114 mm) Dial Temperature Switchgauge® SPL and 45TE Series

The 4-1/2" (114 mm) size dial Switchgauge is a mechanical gage for temperature indication. It is a combination indicating gage and critical temperature limit switches. High and low temperature limit contacts are visible.

It includes adjustable, electrical contacts that can be used for start and stop, to trip alarms and to shut down equipment.

Panel and wall-mount versions are available as well as latching control relay versions.

Ranges are available from 15° to 250°F (9° to 121°C) through 260° to 450°F (127° to 232°C).

Typical applications include:

- Gas compressors      • Engine coolant temperature
- Heaters and coolers   • Process temperature
- Water pump temperature

## Specifications

**Dial:** White on black, dual scale, °F and °C standard, 4-1/2 in. (114 mm) diameter

**Case:** Die-cast aluminum, surface or panel mount

**Capillary:** PVC-armored copper tube, 5 ft. long (1.5 m) standard – see options

**Sensing Bulb:** Copper bulb: 1/2 in. (13 mm) OD  
Length: 7 in. (178 mm)

Minimum bulb insertion – see corresponding chart

Pressure Rating: 600 psi (4.1 MPa) [41 bar]. Connection: 1/2 NPT compression fitting

**Overrange:** Do not exceed 10% above full range

**Limit Contacts (SPLC and SPLFC):** 1-SPDT, Center off; pilot-duty; 2 A @ 30 V; 1 A @ 125 VAC. Contacts are gold-plated silver.

**Snap-Acting Switches (45TE and 45TEF):** 2-SPDT; 2 A @ 250 VAC

**Dry Relay Contact (BP Models):** 10 A @ 28 VDC or 10 A @ 120 VAC

### Wire Connections:

Surface-mount models: 1/2 NPT conduit and terminal block

Panel mount models: Wire leads, 18 AWG (1.0 mm<sup>2</sup>) x 9 in. (229 mm) long

OS models: 1/2 NPT conduit and wire leads, 18 AWG (1.0 mm<sup>2</sup>) x 9 in. (229 mm) long

**Item Weight:** 8 lb. (3.6 kg) approximately; Explosion-proof models: 22 lb. (10 kg) approx.

**Item Dimensions:** 16 x 11 x 5-1/2 in. (406 x 279 x 140 mm); Explosion-proof models: 12 x 12 x 9 in. (305 x 305 x 229 mm)



45TE Model

1 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

2 Selected configurations are third-party listed. Call Enovation Controls for details.

## Basic Models

**SPLC Series Switchgauge:** Surface-mount version of the Switchgauge. For these models the gage pointer makes with two adjustable contacts to complete a pilot-duty circuit.

**SPLFC Series Switchgauge:** Panel-mounting (round case) version of the SPLC.

**SPLBP Latching Control Relay Switchgauge:** This version of the SPLC Series is designed to start and stop electric motor driven equipment. The pilot-duty contacts of the SPLBP are connected to a latching control relay for automatic ON/OFF control, either directly or through a motor starter.

**45TE Series Snap-Acting Switchgauge:** Surface-mount version of the Switchgauge. These models offer internal snap-acting SPDT switches, instead of the single pole contacts.

**45TEF Series Switchgauge:** This is the panel-mounting (round case) version of the 45TE series.

**45TEBP Snap-Acting and Latching Control Relay Switchgauge:** Same as 45TE – includes an internal latching control relay for automatic ON/OFF control either directly or through a motor starter.

Enovation Controls offers square case configurations altered to fit round panel openings, see Dimensions.

## Basic Operation

This vapor-actuated gage features a sealed capillary tube and sensing bulb. When subjected to heat, the liquid in the sensing bulb expands to vapor creating pressure against a bourdon tube mechanism. The bourdon tube translates this vapor pressure into a mechanical gage reading.

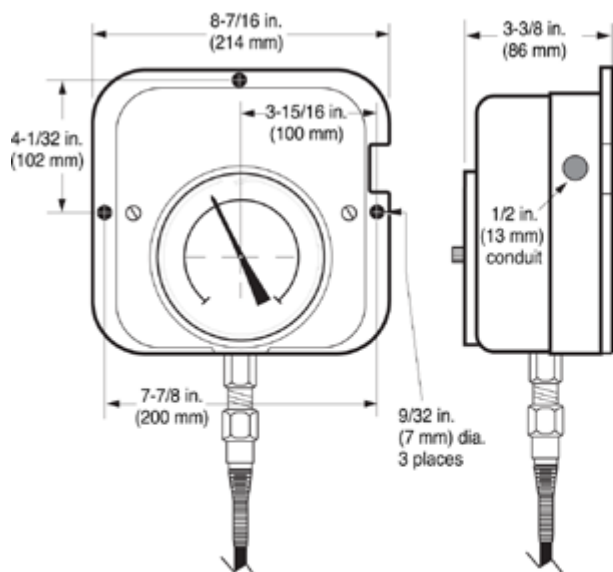
For models SPLC and SPLFC, the gage pointer acts as a pressure indicator and as one switch pole, which

completes a circuit when it touches the adjustable limit contacts. Contacts have self-cleaning motion to ensure electrical continuity. A toggle switch is provided on SPLC models to override the low contact for equipment start-up.

Models 45TE and 45TEF have internal snap-acting SPDT switches.

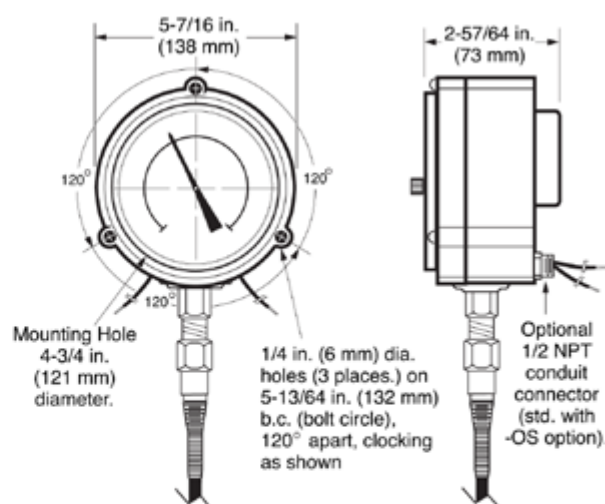
## Dimensions

### Surface-Mount Models

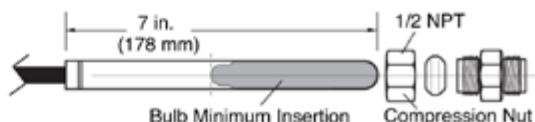


Surface-mount models SPLCE, SPLBPE, 45TEE and 45TEBPE feature square case but altered to fit standard round panel mounting-not pictured.

### Panel-Mount Models



### Sensing Bulb



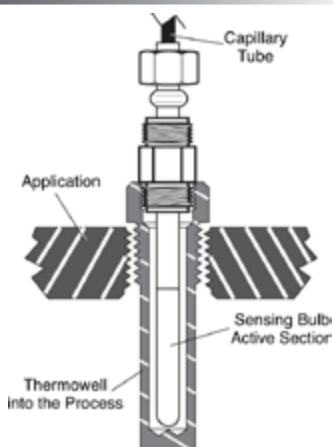
## Ranges and Accuracy – Sensing Bulb Insertion

Temperature Ranges Available (dual scale dials)		Accuracy (SPL and 45 Series Models)			Minimum Sensing Bulb Insertion into Process
Fahrenheit	Celsius	First 1/3	Middle 1/3	Upper 1/3	
15° to 250°	9° to 121°	±8°F/±4°C	±2°F/±1°C	±2°F/±1°C	5 in. (127 mm)
130° to 350°	54° to 177°	±8°F/±4°C	±2°F/±1°C	±3°F/±1.5°C	2-1/2 in. (64 mm)
260° to 450°	127° to 232°	±8°F/±4°C	±2°F/±1°C	±3°F/±1.5°C	2-1/2 in. (64 mm)

## Using a Thermowell

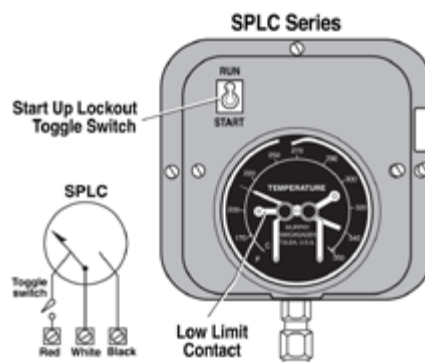
Installing a thermowell is recommended for high pressure applications or corrosive environments.

It also allows sensing bulbs to be changed or adjusted without opening the connection to process. Enovation Controls offers thermowells for a variety of applications.



## Start-Up Lockout

The SPLC Switchgauge low limit contact can be bypassed for equipment start up. A toggle switch is provided for this purpose. The toggle switch must be manually reset when temperature rises above the low limit.

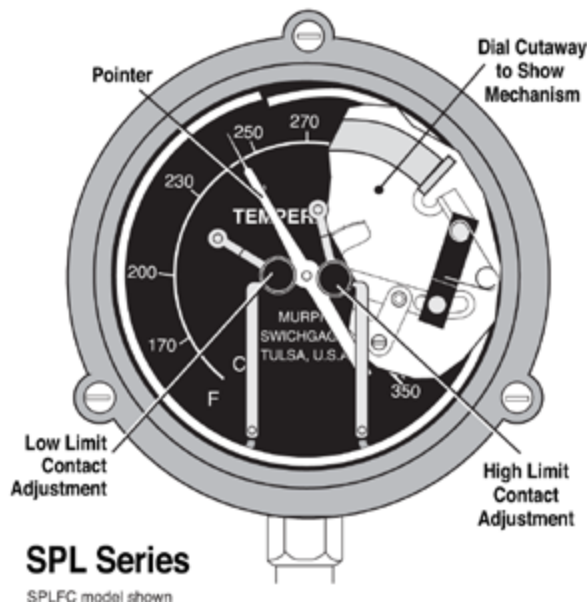




## How the SPL Works

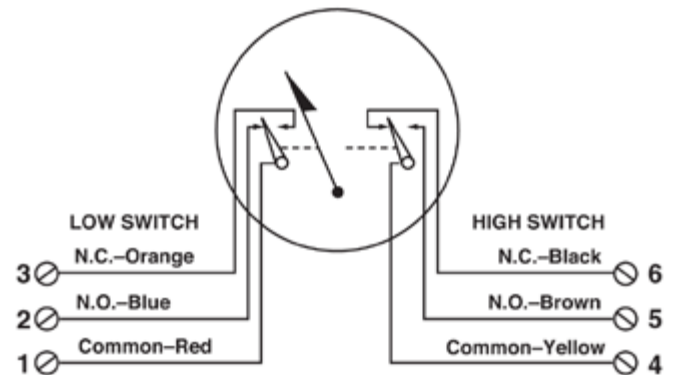
SPLC and SPLFC Switchgauge temperature indicator gages include two pilot-duty, pointer-type limit contacts (one for high and one for low) that can be used for alarm and/or shutdown. The SPLC and SPLFC models will complete a circuit when the gage pointer and either limit contact meet. This provides an electrical signal to alert the operator of critical temperature conditions or when required, to shut down the equipment.

Both limit contacts (high and low) are field adjustable by simply turning the fingertip-type knob to the desired point on the scale dial. This graphic shows details of a typical SPLFC Switchgauge model.



## How the 45TE Works

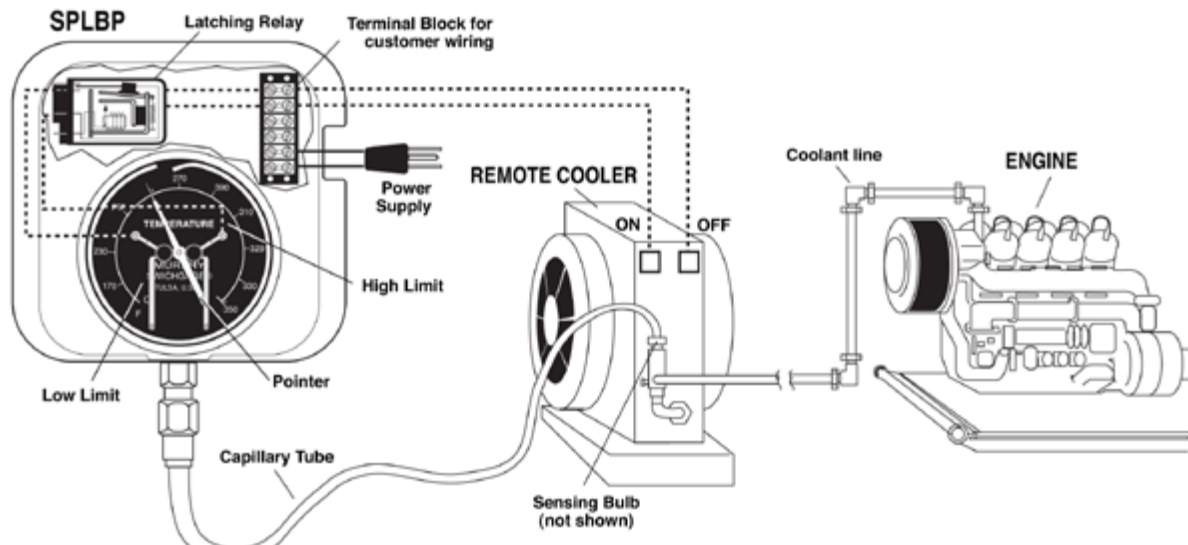
The 45TE Series Switchgauge incorporates two SPDT snap-switches instead of the pointer-type contacts of the SPL. Unlike the SPL that completes an electrical circuit as soon as the pointer touches the contact, the 45TE trip point indicators will stop the pointer movement slightly before the switches operate. As temperature continues to increase (reaching high set point) or to decrease (reaching low set point), the electrical circuit is then made. It provides the ability to set the trip point exactly with the indicator needle — no guessing or equipment calibration is needed as on blind switches. The 45TE trip points (high and low) can be easily set using its stacked-knob adjustment. See the schematic below for details.



## (BP) Latch Relay Contact Models

Primarily designed to maintain a specific temperature range by turning ON or OFF heaters or coolers having 125 VAC circuitry, the SPLBP and 45TEBP Switchgauge models are applicable to a variety of situations where variable temperatures are controlling factors. As the pointer touches a preset high or low limit contact/snap-switch, the

magnetic latching relay sets or resets to latch a heater or cooler ON or OFF. The relay unlatches (resets), when the opposite contact operates. Pictured is a typical application. For applications with higher voltages, a Murphy TR assembly can be used in conjunction with any 4-1/2 in. (114 mm) dial Switchgauge.



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

**SPLBP - 4 - 350 G 10 - EX**

Base Model	
SPLC	45TE
SPLCE	45TEE
SPLFC	45TEF
SPLBP*	45TEBP*
SPLBPE*	45TEBPE*

\*This version not covered by CE mark.


Latching Control Relay Voltage (applies to "BP" models only)	
Blank	= 120 VAC
2	= 12 VDC
4	= 24 VDC

Range	
250	= 15 to 250°F
350	= 130 to 350°F
450	= 260 to 450°F

Armor / Capillary / Bulb	
P	= PVC / Copper / Copper
S	= Stainless steel / Stainless steel / Stainless steel

Capillary Length	
Specify in feet:	Specify in metres:
05 = 5 feet	1.5M = 1-1/2 metres
10 = 10 feet	2M = 2 metres
Etc.	Etc.
5 ft. increments available to 30 ft., thereafter 10 ft. increments only. Some ranges are not available over 50 ft.	

Options	
NOTE: Verify option availability. Not all options can be provided for every model.	
BC	= Capillary tubing exits from back of case
ES	= Environmentally sealed for isolation from the elements
EX	= Explosion-proof; SWICHGAGE® enclosed within explosion proof case; Class I, Division 1, Groups C & D
EL	= (EXLC) Explosion-proof less case; internal gage mechanism only—without case
LC	= Less case; SWICHGAGE® mechanism and hardware connections—without case
OS	= Liquid filled case for resistance against corrosion, environment, vibration and electrical arc
TA	= (TCA) Tickler contact; includes 1 auxiliary contact (tickler) and 2 limit contacts (all-face-adjustable-SPL series)

Part Number	Model and Description	Notes
05000610	Tamper-proof Contact Accessory	

# Dual Temperature Switchgage® Model Series MDTM89

Murphy's model MDTM89 is an electronic, dual-temperature monitor. It monitors two thermocouples, displays the temperature of the thermocouple selected and has adjustable trip points for each input. A toggle switch provides for selection of the thermocouple to be displayed and/or the temperature trip point to be checked/adjusted. If either trip point is reached, the associated output turns on and can be used as a control signal or to initiate alarms and/or shutdown. A Push to Read button, located below the selector switch, allows the operator to check the trip point and to see its value as adjustments are made. Two potentiometers, one on each side of the thermocouple selector switch, are provided for field adjustment of the trip points.

There are four basic models. Two of the models are powered by capacitor discharge ignition and have either an FET or an SCR output. One model operates from 12- or 24-VDC and has an FET output. Standard display is in degrees Fahrenheit; degrees Celsius is optional.

## Applications

Applications include the following:

- Compressor suction/discharge temperature
- Engine/compressor jacket water temperature
- Engine exhaust temperature
- Compressor cylinder temperature
- After cooler temperature
- Bearing temperature

## Thermocouple Type

Either J or K type UNGROUNDED THERMOCOUPLE is accepted. Specify type in part number for each MDTM89 unit (see How to Order). Order thermocouples as a separate item.

## Continuous & Trip Point Display

The selector switch is used to choose the thermocouple or trip point temperature to be displayed. The selected temperature is continuously displayed during normal operation. Depressing the Push to Read push button displays the trip point temperature of the selected thermocouple.



1 When used with approved ignition or 12-24 VDC. Contact Enovation Controls for details.

2 Approved for CD ignition, 80-250 VDC

## Open Thermocouple Input

An open thermocouple input forces the monitor into upscale overrange. The monitor indicates an overrange by displaying the numeral 1 in the left most digit of the display. An overrange will turn on the high trip point output.

## Trip Point Operation

Monitored trip points are independent of the thermocouple selector switch. Both set points are always active.

When the thermocouple temperature reaches the trip point temperature, the MDTM89 is triggered. After approximately 0.5 seconds the trip point output turns on.

Trip points are set by depressing the Push to Read push button while rotating a trip point potentiometer until the desired trip point temperature is displayed.

## Automatic Cold Junction

Cold junction reference point compensation is an integral feature of the monitor. The compensator circuit monitors case temperature and automatically compensates for changes in ambient temperatures. Compensation will allow maximum of 2 degrees change in the temperature reading from 32° to 122°F (0° to 50°C).

## Specifications

### Power Requirements (Operating Voltages):

**MDTM89-A:** 100 to 350\* VDC, CD ignition, negative ground (FET outputs)

**MDTM89-E:** 100 to 350\*, CD ignition, negative ground (FET outputs)

**MDTM89-B:** 100 to 350\* VDC, CD ignition, negative or positive ground (SCR outputs)

**MDTM89-C:** 12 to 24\* VDC, negative ground, 15 milliwatts (FET outputs)

**Power Consumption:** CD ignition: 350  $\mu$ A @ 100V; 120 VAC: 0.6 watts; 24 VDC: 0.5 watts

### Outputs:

**Model B:** output turns on above trip point; output turns off when power is switched off; two (2) isolated SCR outputs, 0.5 amp @ 250 VDC

**Models A, C and D:** output turns on above trip point; output turns off below trip point; two (2) isolated FET outputs, 0.5 amp @ 250 VDC

**Model E:** output one turns on above trip point, output turns off below trip point; output 2 turns on below trip point, output turns off above trip point; two (2) isolated FET outputs, 0.5 amp @ 250 VDC

**Ambient Cold Junction Compensation Range:** 32° to 122°F (1°C from 0° to 50°C)

**Operating Temperature:** -4° to 158°F (-20° to 70°C)

**Storage Temperature:** -40° to 300°F (-40° to 150°C)

**Case:** Die cast aluminum

**Reset Differential:** FET models: Decreases 3° (°F or °C). SCR model: turn input power off to reset.

**Measurement Range:** Monitor Range 0°-1999°F or °C (specify F or C in part number)

**Accuracy:** With J-type thermocouple: from 150°-1200°F (66°-649°C)  $\pm 1.5\%$  of reading. With K-type thermocouple: from 400°-2000°F (204°-1076°C)  $\pm 1.5\%$  of reading. At calibration temperature.

**Laboratory Approvals:** CSA† and Factory Mutual\* approved for Class I, Division 2, Group D, hazardous locations).

**Thermocouple Lead Length:** 150 ohm lead resistance affects monitor accuracy less than 1°

**Trip Point Accuracy:**  $\pm 3^\circ\text{F}$  ( $\pm 2^\circ\text{C}$ ) of reading

**Trip Point Adjustment Range:** 0-1999 Degrees

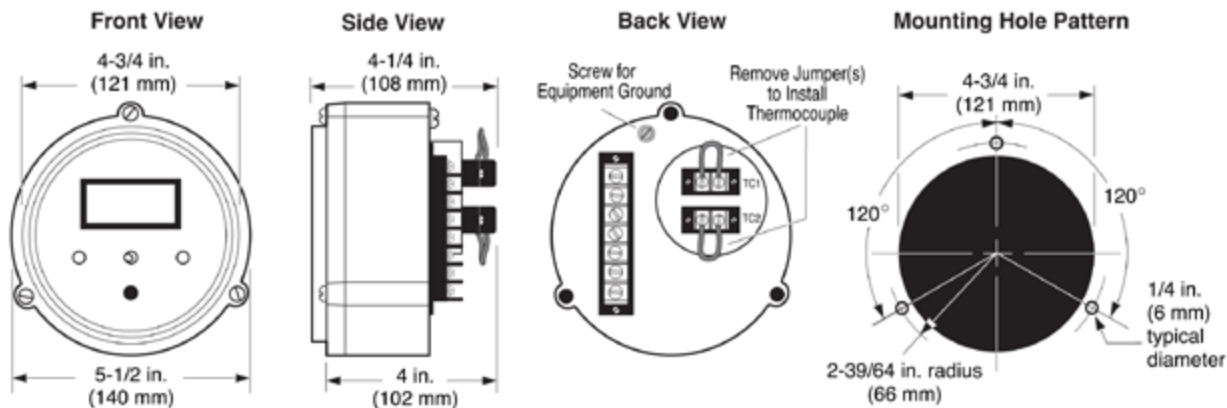
**Shipping Weight:** 48 oz. (1.4 kg)

**Shipping Dimensions:** 10 x 9-1/2 x 6 in. (254 x 241 x 152 mm)

\* Approved for CD ignition, 80-250 VDC.

† When used with approved ignitions or 12-24 VDC. Contact Enovation Controls for details.

## Dimensions

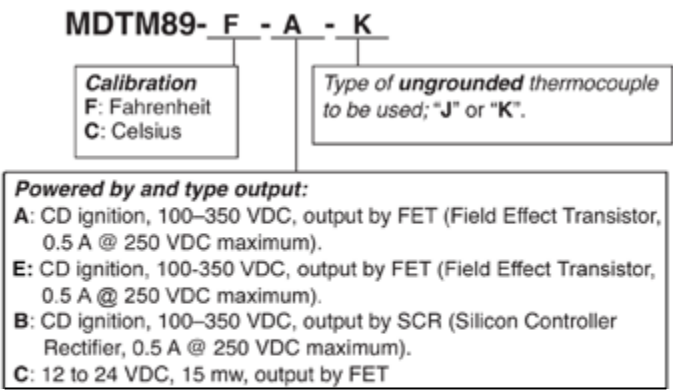


## MDTM89 Interface Capabilities

Model	Power Source	Rating
LCDT	CD Ign., 120 VAC, 12/24 VDC	Cl.I, Div. 1, Gr. D, Haz areas*
S1501	120 VAC or 12/24 VDC	Cl.I, Div. 1, Gr. D, Haz areas*
TTD	CD Ign., 12/24 VDC	Cl.I, Div. 2, Gr. D, Haz areas**
TATTLETALE®	CD Ign., 120 VAC, 12/24 VDC	Non-Hazardous areas
PLCs, various Non-Murphy annunciators - contact Enovation Controls.		
* An isolation barrier is needed between the <b>MDTM89</b> and an <b>Annunciator</b> rated for Class I, Division 1, Group D, Hazardous areas.		
** When used with approved ignition. Contact Enovation Controls for details.		

# How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



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# Temperature Switchgage® Scanner/Pyrometer Model TDX6

The TDX6 is an advanced design six-point temperature scanner and pyrometer. It continually scans up to six thermocouples and sequentially displays the thermocouple number and its reading. Each sensor input has a field settable trip point for alarm, shutdown or control. A read/scan selector allows the operator to set and view each trip point. With the selector in the scan mode, a thermocouple read push button provides a means to manually toggle through the six channels and to lock in on a specific channel. Normal scanning will resume approximately three seconds after releasing the push button. All trip points are continually armed and active during the scanning process.

Type J or K, grounded\* or ungrounded thermocouples are accommodated. Other types are available upon request.

The TDX6 can interface with other Murphy Selectronic® Tattletale® annunciators and microcontrollers. It is rated for Class I, Division 2, Group D, hazardous areas\* and is available for operation from CD ignition, 120 VAC or 24 VDC.

NOTE: Using grounded thermocouples introduces the risk of odd currents or voltages being imposed on the thermocouple signal which can affect the accuracy of the reading. This is an inherent problem of grounded thermocouples and the reason why we prefer ungrounded thermocouples.

## Applications

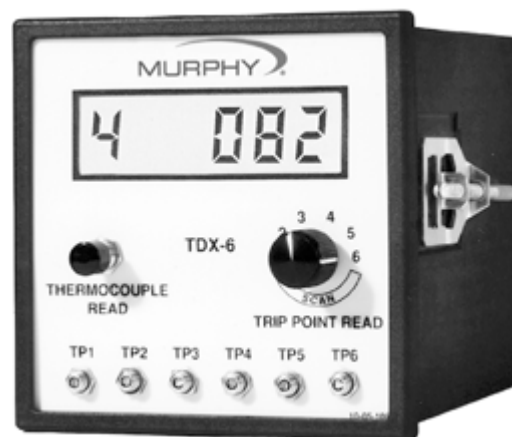
- Gas Compressor Suction/Discharge Temperature
- Engine/Compressor Jacket Water Temperature
- Process Temperatures
- Generators
- Pumps
- Engine Exhaust Temperature

## TDX Interface Capabilities

Models	Power Source	Ratings
LCDT	CD Ign., 120 VAC, 12/24-VDC C	Cl.I, Div.1, Gr.D, Haz. areas*
S1501	120 VAC or 12/24-VDC	Cl.I, Div.1, Gr.D, Haz. areas *
TTD	CD Ignition (neg. grnd), 12/24-VDC	Cl.I, Div.2, Gr.D, Haz. areas †
Tattletale®	CD Ign., 120 VAC, 12/24-VDC	Non-Hazardous areas

An isolation barrier is needed between the TDX6 and an Annunciator rated for Class I, Division 1, Group D, Hazardous Areas.

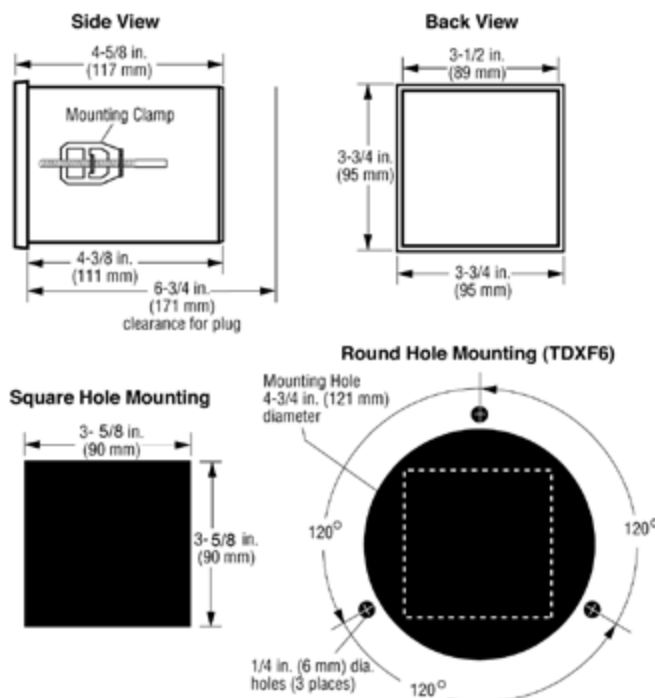
PLCs, various non-Murphy annunciators—contact factory.



1 When used with power requirements described below.

2 When used with approved ignition. Contact Enovation Controls for details.

## Dimensions





## Specifications

### Power Requirements (Operating Voltages):

120 VAC or 80-250 VDC, CD ignition or 24 VDC

### Outputs:

**Models TDX6-A and TDX6-C:** Six isolated Silicon Controlled Rectifier (S.C.R.) outputs; 0.5 A @ 250 VDC; switches on (applies ground) above trip point and switches off (removes ground) when power is switched off.

**Models TDX6-B and TDX6-D:** Six isolated Field-Effect Transistor (F.E.T.) outputs; 0.1 A @ 250 VDC; switches on (applies ground) above trip point and switches off (removes ground) below trip point.

**Operating Temperature:** -4° to 158° F (-20° to 70° C)

**Storage Temperature:** -40° to 300° F (-40° to 150° C)

**Case:** ABS 1/4 DIN (90 x 90 mm)

**Scanning Speed:** Complete scan in 30 seconds

### Reset Differential:

**F.E.T. models:** Decreases 3 Degrees (° F or ° C)

**S.C.R. models:** Turn input power off to reset

**Display Update Time:** Updates temperature every 0.3 seconds

**Start-up Time Delay:** Unit is locked out for 10 seconds after ignition voltage is sensed.

### Ambient Cold Junction Compensation Range:

2° F from 32° F to 122° F (1° C from 0° C to 50° C)

### Measurement Range:

Monitor Range 0-1999° F or ° C (specify ° F or ° C in part number)

### Accuracy:

#### With J-type thermocouple:

from 50°-150° F (10°-66° C) +3° F(+2° C)

from 150°-1200° F (66°-649° C) ±1.0% of reading

#### With K-type thermocouple:

from 400°-2000° F (204°-1076° C) ±1.0% of reading

**Trip Point Accuracy:** ±3° F (±2° C) of reading

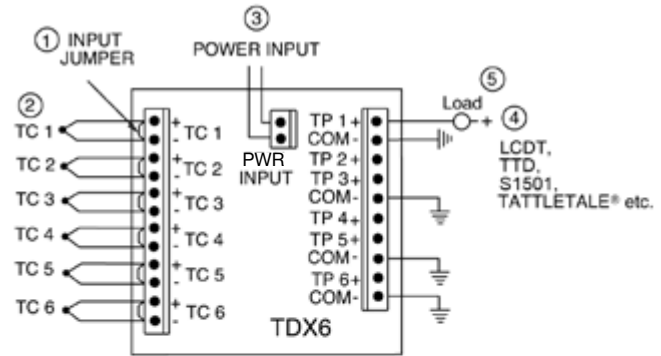
**Trip Point Adjustment Range:** 0-1999 Degrees

**Open Thermocouple Input:** A number 1 appears in the display to the right of the channel number and the trip point operates.

**Shipping Weight:** 2 lb. (0.91 kg)

**Shipping Dimensions:** 5-1/2 x 9 x 6 in. (140 x 229 x 152 mm)

## Typical Wiring Diagram

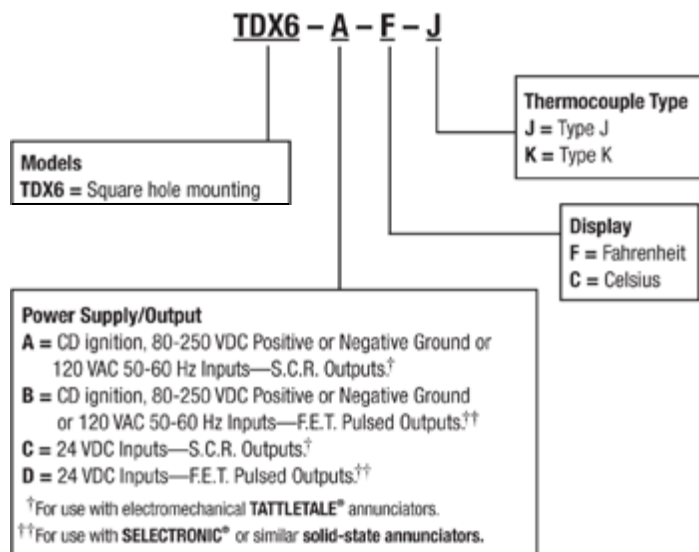


### NOTES:

- ① Remove input jumper when the thermocouple is connected to input.
- ② Thermocouple Input
- ③ Power input 120 VAC, 80-250 VDC, CD ignition or 24 VDC, positive or negative ground.
- ④ Interfaced components must meet area classification requirements.
- ⑤ When using the TDX6 with inductive loads, we recommend installing a suppression diode across all coils.

## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



# Temperature Scanner/Pyrometer TDXM Model

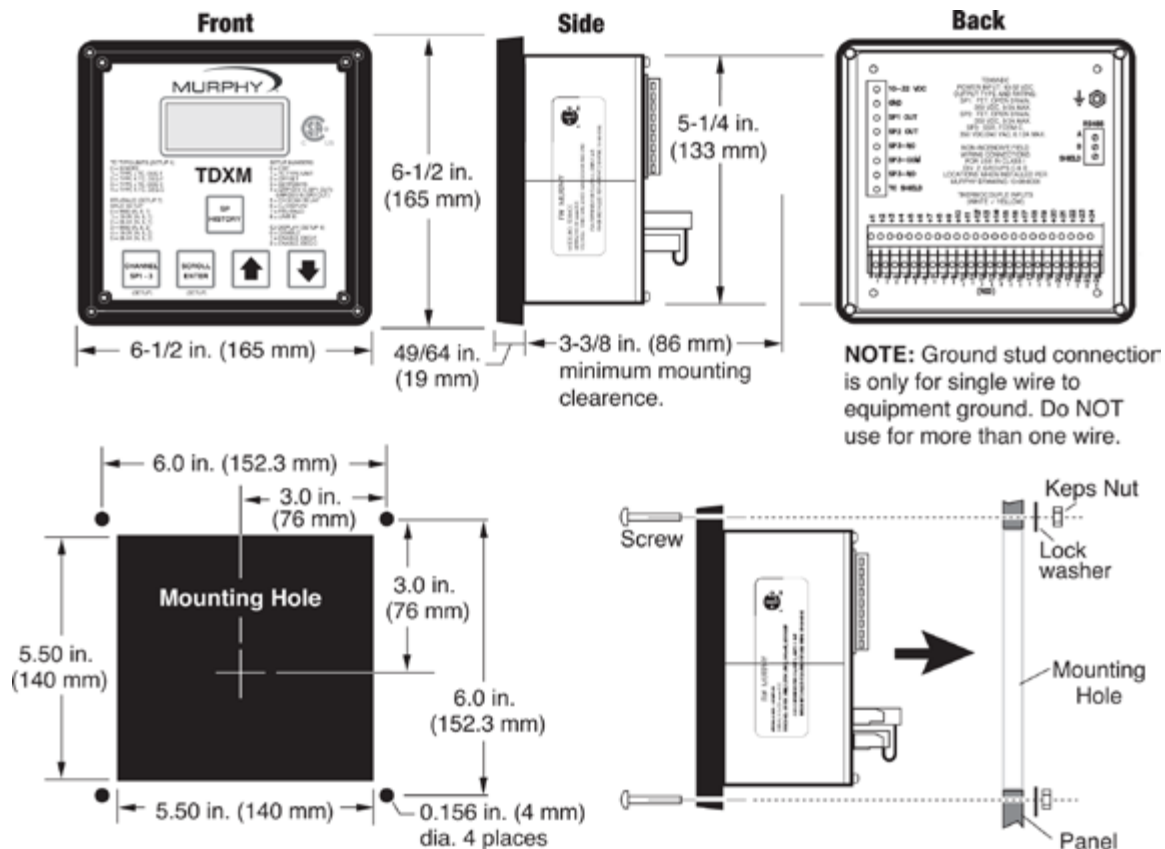
The TDXM now gives you a unique configurable temperature scanner/pyrometer with a built-in power supply. A new design features a 7-character, 7-segment Liquid Crystal Display window with 1/2 inch (13 mm), easy-to-read characters. Also located on the faceplate are membrane keys for easy configuring. Highly reliable and versatile, the TDXM accepts up to 24 type J or K grounded or ungrounded thermocouples. Each channel has three adjustable set points SP1, SP2 and SP3. The SP1, SP2 and SP3 set points correspond to the SP1, SP2 and SP3 outputs. Additionally it has the selectable feature to monitor and alarm or shut down on deviation from an average for up to two groups of temperatures (GRP/DEV; deviation from average). One group could be exhaust temperatures, and another group could be bearing temperatures.

The TDXM is capable of communicating with controllers, PLCs, computers or SCADA (Supervisory Control & Data Acquisition) systems by a built-in RS485 serial communications port.

The TDXM-DC is available for 10 - 32 VDC systems.



## Dimensions



**Important:** For outdoor use, the TDXM should be mounted in a weatherproof enclosure.

## Features

### User Interface (Faceplate)

The User Interface includes a numeric LCD and a five-button membrane keypad for readout and channel configuration. Thermocouple types can be selected and set points entered through a series of setup menus.

### Thermocouple Types

Each of the 24 channels on the TDXM can be configured as either J or K type thermocouples and temperature units can be selected as °F or °C readout for each channel. Unused channels can be set to Ignore and will not be seen in the display and will not cause fault trips.

### Control Options

Each TDXM model features three outputs: two Field Effect Transistor (FET) outputs and one Form-C Relay output. Each channel has three set points; one for each output. This allows for greater system flexibility by grouping sets of channels through one output.

### Set Point History

The TDXM stores the last set point trip for each output in non-volatile memory. For instance, if SP1 of channel 1 was the last SP1 tripped, the LCD display will read: SP1 1 when the set point History is accessed for SP1.

### Sensor Inputs and Terminals

The TDXM accepts up to 24 either J or K type grounded or ungrounded\* thermocouples using 24 pairs of screw type connections. Each pair has a jumper from the factory. Any tripped set point is detected within two seconds after the set point is exceeded.

### RS485 Serial Port

The RS485 serial port (MODBUS RTU slave) on the back of the module is provided for communicating with micro-controllers, PCs, PLCs and SCADA systems. It is recommended that a termination resistor (customer supplied) be used when the TDXM is the last device connected in a daisy-chain configuration. The Baud rate, number of stop bits and slave node number can be set using the keypad. Communication is half-duplex. MODBUS RTU function codes 3 and 6 are supported.

\* We recommend the use of ungrounded thermocouples. Errors in readings with grounded thermocouples can be the result of differences in grounding between different devices.

## Specifications

**Power Input (Operating Voltages):** 10- 32VDC, 750 mW max

### Sensor Inputs:

Up to 24 type J or K grounded or ungrounded<sup>‡</sup> thermocouples

### Outputs:

Two (2) Output .5 A, 350 VDC, FET-sink to ground to trip

One (1) Form C Solid State Relay Output 0.125 A, 350 VDC/240 VAC

**NOTE:** The form C relay output is de-energized for a trip condition. The NC terminal is closed, and the NO terminal is open for trip

**Communications:** RS485 Serial Port, MODBUS RTU slave

### Operating, Storage and Display Temperature:

-40° to 185°F (-40° to 85°C)

**Sensor Scan Rate:** Scans all channels in 2 seconds

### Range:

**Type K:** 0° - 1999°F (0° - 1093°C)

**Type J:** 0° - 1538°F (0° - 837°C)

**Display Type:** Custom 7-segment, 7-character, backlit type with temperature units indication and set point trip indication

### Accuracy:

**Cold junction:** Better than ± 1.0°F (0.5°C)

**Type J or K:** ± 2°F (1°C); 100° - 1999°F (38° - 1093°C)

**Cold Junction Compensation:** -40° to 185°F (-40° to 85°C)

**Open Thermocouple Detection:** Drives channel reading high

**Shipping Weight (all Models):** 3 lb. (1.36 kg) approximately

### Shipping Dimensions (all Models):

5-1/2 x 9 x 9-1/2 in. (140 x 229 x 241 mm) approximately

<sup>‡</sup> We recommend the use of ungrounded thermocouples. Errors in readings with grounded thermocouples can be the result of differences in grounding between different devices.

## How to Order

Part Number	Model and Description	Notes
10702748	TDXM-DC: 24-channel model, 10-32 VDC powered	Head/Module
10702996	TDXM-DC W/SP3 Latch: TDXM-DC with SP3 latch feature	
Call for part number	MConfig: TDXM configuration software available	Software
10007848	Plug, kit, TDXM: Terminal Plug replacement kit	Replacement Parts

# Thermocouple, RTD and RTD Transmitter With Thermowell – TC, RTD and RTDT Series

Enovation Controls offers a variety of highly reliable thermocouple and RTD (Resistance Temperature Detector) assemblies and 4-20 mA DC output RTD transmitters.

Their innovative features include a 304 stainless steel thermowell that provides protection to the spring-loaded element.

The cast aluminum connecting head meets NEMA 4 requirements and includes an RTD transmitter or a thermocouple/ RTD terminal block mounted on ceramic Steatite and rated NEC Class 2.

The complete assemblies are offered in 2-1/2, 4-1/2 or 7-1/2 in. (63, 114 or 191 mm) thermowell insertion lengths.

## Specifications

**Thermowell:** 304 SS; 7000 psi (48.2 MPa) [482 bar] max. @ 70°F

**Connecting Head:** Cast Aluminum; 400°F (204°C) max. operating temp

**Thermocouple:** Ungrounded, Magnesium Oxide (MgO) insulated 96% purity; element sheath of 304 SS (stainless steel)

**Type J operating temp.:** 900°F (482°C) max

**Type K operating temp.:** 1800°F (982°C) max

**RTD:** 100 ohm @ 0°C Platinum element; 3-wire; 400 °F maximum; 0.00385 temperature coefficient; 316L stainless steel element sheath

**RTD Transmitter:** 100 ohms Platinum RTD; 400°F maximum; Ranges: 0° to 400°F and -60° to 140°F. Linearized 4-20 mA DC output. Loop powered typically 24 VDC, when using the Loop Resistance Graph, 13-40 VDC. For use with 100 ohms Platinum RTD elements, 0.00385 temp. coefficient

**Thermocouple Accuracy (J/K):** 0.5%

**RTD Accuracy:** ±0.12%

**RTD Transmitter Accuracy:** ±0.1%

**Terminal block:** Ceramic Steatite; thermocouples have: 4 terminals; RTDs: 6 terminals. 28 to 14 AWG wire size, (8-32 SS screws)

**Shipping Weights (listed by insertion length):**

**2-1/2 in. (63 mm) model:** 2 lb. (0.907 kg)

**4-1/2 in. (114 mm) model:** 2 lb. 8oz. (1.24 kg)

**7-1/2 in. (191 mm) model:** 3 lb. 6oz. (1.67 kg)

**Shipping Dimensions (listed by insertion length):**

**2-1/2 and 4-1/2 in (63 and 114 mm) models:**

12 x 7 x 5-1/2 in. (305 x 178 x 140 mm)

**7-1/2 in. (191 mm) models:**

16 x 11 x 5-1/2 in. (406 x 280 x 144 mm)

**Optional Thermocouple Extension Wire:**

(Sold separately—see How to Order section)

**Individual Conductor Insulation:** Extruded PFA

**Duplex Conductor Insulation:** Twisted; Extruded PFA Overall

**Temperature Rating:** Continuous -450° to 500°F (-267° to 260°C)

**Abrasion Resistance:** Good

**Moisture Resistance:** Excellent

**Shielding:** Metallic Shield

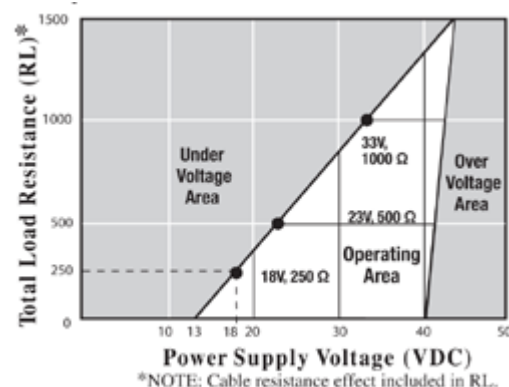
**Gage:** 20 AWG (0.5 mm<sup>2</sup>)

Ohms per Double Foot Type J: 0.357

Ohms per Double Foot Type K: 0.586



## Loop Resistance Graph



Supply voltage for RTDT must be within 13-40 VDC. The graph shows the minimum supply voltage (VDC) required for a given load resistance (RL).

### Thermocouple Assemblies with Thermowell

Available in types J or K, the thermocouple assemblies have ungrounded elements in a 304 stainless steel spring-loaded sheath. For product compatibility see next page (replacement parts and thermocouple extension wire are available).

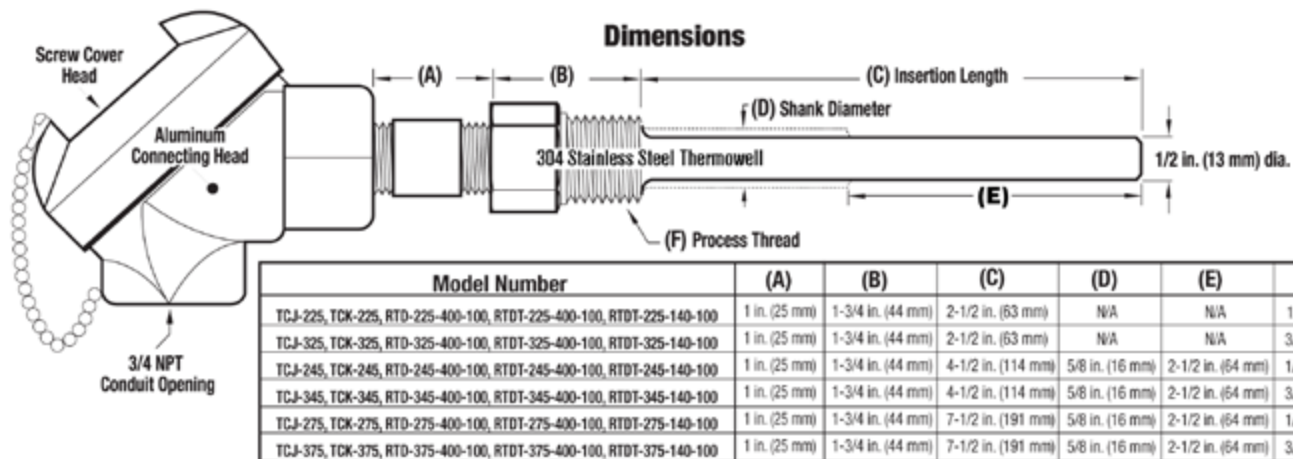
### RTD Assemblies with Thermowell

Resistance temperature detector (RTD) assemblies are available with a 100 ohm platinum element, 3-wire leads and spring-loaded 316L stainless steel element sheath.

### RTD Transmitter Assemblies with Thermowell

RTDT assemblies transmit process variable temperatures. Available as part of the temperature sensor assemblies or as a separate units, the RTDTs accept 2- or 3-wire, 100 ohm RTDs. The RTD transmitters are loop powered. They feature linearized 4-20 mA DC outputs and have reversed polarity protection.

## Dimensions



## How to Order

Model Number	Model and Description	Notes
Thermocouple Assemblies (thermowell included)		
TCJ-225	J Type underground thermocouple, 1/2 NPT	2-1/2 in. (63 mm) insertion length
TCK-225	K Type underground thermocouple, 1/2 NPT	
TCJ-325	J Type underground thermocouple, 3/4 NPT	
TCK-325	K Type underground thermocouple, 3/4 NPT	4-1/2 in. (114 mm) insertion length
TCJ-245	J Type underground thermocouple, 1/2 NPT	
TCK-245	K Type underground thermocouple, 1/2 NPT	
TCJ-345	J Type underground thermocouple, 3/4 NPT	
TCK-345	K Type underground thermocouple, 3/4 NPT	7-1/2 in. (191 mm) insertion length
TCJ-275	J Type underground thermocouple, 1/2 NPT	
TCK-275	K Type underground thermocouple, 1/2 NPT	
TCJ-375	J Type underground thermocouple, 3/4 NPT	
TCK-375	K Type underground thermocouple, 3/4 NPT	
RTD Assemblies (thermowell included)		
RTD-225-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	2-1/2 in. (63 mm) insertion length
RTD-325-400-100	100 ohm Pt RTD 400°F (204°C) max., 3/4 NPT	
RTD-245-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	4-1/2 in. (114 mm) insertion length
RTD-345-400-100	100 ohm Pt RTD 400°F (204°C) max., 3/4 NPT	
RTD-275-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	7-1/2 in. (191 mm) insertion length
RTD-375-400-100	100 ohm Pt RTD 400°F (204°C) max., 3/4 NPT	
RTD Transmitter Assemblies (thermowell included)		
RTDT-225-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	2-1/2 in. (63 mm) insertion length
RTDT-225-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, -60-140°F (-51.1-60°C)	
RTDT-325-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	
RTDT-325-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, -60-140°F (-51.1-60°C)	4-1/2 in. (114 mm) insertion length
RTDT-245-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	
RTDT-245-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, -60-140°F (-51.1-60°C)	
RTDT-345-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	
RTDT-345-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, -60-140°F (-51.1-60°C)	7-1/2 in. (191 mm) insertion length
RTDT-275-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	
RTDT-275-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, -60-140°F (-51.1-60°C)	
RTDT-375-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	
RTDT-375-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, -60-140°F (-51.1-60°C)	

Model Number	Model and Description	Notes
Replacement Parts (order separately)		
TCHA	Cast aluminum head with terminal blocks for thermocouples	all elements are spring loaded
TCJE-25	Type J elements only for 2-1/2 in wells*	
TCKE-25	Type K elements only for 2-1/2 in wells*	
TCJE-45	Type J elements only for 4-1/2 in wells*	
TCKE-45	Type K elements only for 4-1/2 in wells*	
TCJE-75	Type J elements only for 7-1/2 in wells*	
TCKE-75	Type K elements only for 7-1/2 in wells*	
PTW-225	1/2 NTP x 2-1/2 in. thermowell	
PTW-325	3/4 NTP x 2-1/2 in. thermowell	
PTW-245	1/2 NTP x 4-1/2 in. thermowell	
PTW-345	3/4 NTP x 4-1/2 in. thermowell	
PTW-275	1/2 NTP x 7-1/2 in. thermowell	
PTW-375	3/4 NTP x 7-1/2 in. thermowell	
RTDE-25	100 ohm Pt RTD element only for 2-1/2 in. wells	
RTDE-45	100 ohm Pt RTD element only for 4-1/2 in. wells	
RTDE-75	100 ohm Pt RTD element only for 7-1/2 in. wells	
RTDTX-400-100	100 ohm Pt RTD Transmitter only 0-400°F (-17.8-204°C)	all elements are spring loaded
RTDTX-140-100	100 ohm Pt RTD Transmitter only -60-140°F (-51.1-60°C)	
Thermocouple Extension Wire		
00003271	Type J 100 ft. roll	
00003272	Type K 100 ft. roll	

Product Compatibility		
Model	Power Source	Temp Sensor
MDTM89	CD Ign. 12/24 VDC, 120 VAC	JK ungrounded thermocouples
TDX6	CD Ign. 12/24 VDC, 120 VAC	JK grounded/ungrounded tc.
TDXM	12/24 VDC	JK grounded/ungrounded tc.



# Thermocouple, Stainless Steel Tube Type 1/4 Inch Diameter

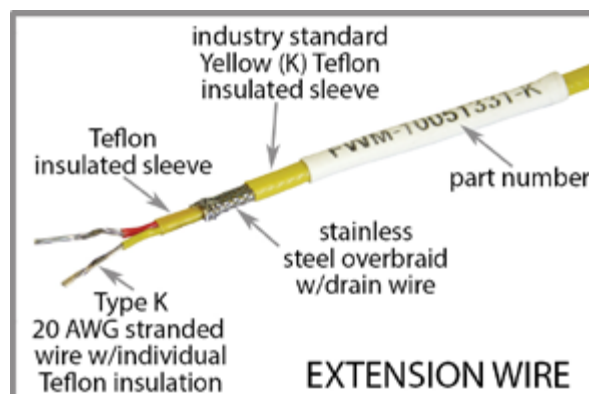
The thermocouples are encased in a 1/4 inch diameter 316 stainless steel tubing sheath with stainless steel Bell Spring for strain relief. The initial offerings are K type thermocouples with 6-inch and 10-inch long 1/4-inch diameter probes. The thermocouples are shipped straight but can be bent with standard tubing benders anywhere along its length to a 90° angle to minimize clearance required and help prevent damage due to personnel working on the unit. The thermocouple is tip sensitive to minimize ambient temperature influence and should be inserted between 25% and 75% of the piping inside diameter or enough to minimize any skin temperature affect on the tip of the probe when installed in vessels.



## Features

- Stainless steel transition sealing gland with a stainless steel Bell Spring for strain relief.
- Standard bore through stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth.
- Can be inserted directly into a low-pressure application process through a standard 1/4-inch stainless steel bore through tubing compression fitting.
- Enables a run from the point of measurement to the nearest conduit entry, junction box or all the way to the panel housing the readout and monitoring instrument. Can also be installed in a cable tray.
- The thermowell assembly comes with a stainless steel bore through compression fitting and ferrule saving installation time and money.

## Extension Wire



The Type K, 20 AWG stranded extension wire encased in a rugged cable meets demanding environments. The industry standard yellow Teflon allows easy identification of K type thermocouple wires so they can be separated from high voltage wires following good installation practices.

## Thermowell

Thermowells are available in 2-inch, 4-1/2 inch or 7-1/2 inch lengths for insertion depth and have a 1/2-inch NPT process connection. They are supplied with a standard stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth. In low pressure applications the thermocouple can be inserted directly into the process through a standard 1/4-inch SS tubing compression fitting.



## How to Order

Part Number	Description	Notes
10051331	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/5 ft. Thermocouple Extension Wire
10051325	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/15 ft. Thermocouple Extension Wire
10051326	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/30 ft. Thermocouple Extension Wire
10051327	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/50 ft. Thermocouple Extension Wire
10051328	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/100 ft. Thermocouple Extension Wire
10051332	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/5 ft. Thermocouple Extension Wire
10051323	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/15 ft. Thermocouple Extension Wire
10051317	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/30 ft. Thermocouple Extension Wire
10051322	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/50 ft. Thermocouple Extension Wire
10051321	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/100 ft. Thermocouple Extension Wire
10707436	Thermowell, 1/2 in. NPT, 1/4 in. T, 2.0 in. L	Assembly 304SS
10707437	Thermowell, 1/2 in. NPT, 1/4 in. T, 4.5 in. L	Assembly 304SS
10707438	Thermowell, 1/2 in. NPT, 1/4 in. T, 7.5 in. L	Assembly 304SS



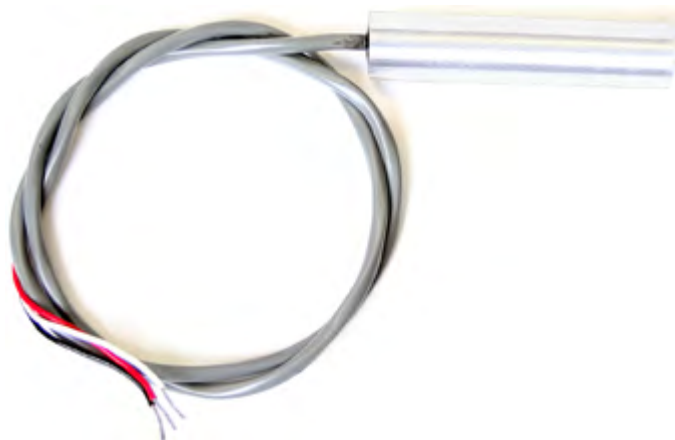
# Air Temperature Sensor Model 12

The Model 12 Air Temperature Sensor is intended for use in applications that monitor slowly changing temperature.

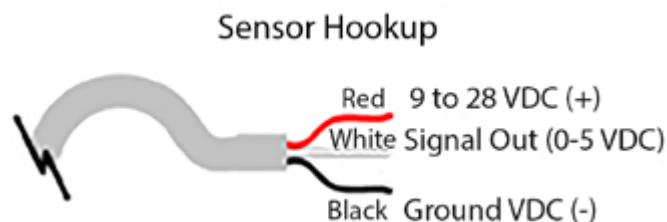
The unit gives approximately .5 °F (.25 °C) resolution when used with an 8-bit analog input.

## Temperature Sensing Range

VDC Out	°C	°F
0.00	-18	0
0.25	-14.5	5.8
0.50	-11.4	11.5
0.75	-8.2	17.3
1.00	-5	23.0
1.25	-1.8	28.8
1.50	1.4	34.5
1.75	4.6	40.3
2.00	7.8	46.0
2.25	11	51.8
2.50	14.2	57.5
2.75	17.4	63.3
3.00	20.6	69.0
3.25	23.8	74.8
3.50	27	80.5
3.75	30.2	86.3
4.00	33.3	92.0
4.25	36.6	97.8



## Wire Diagram



## Specifications

### Temperature Capability

**Useful Operating Temperature Range:** 0°F to 115°F (-18°C to 46°C)

**Component Temperature Range:** -85°F to 300°F (-65°C to 150°C)

**Accuracy:** 2% of full scale with software offset correction.

### Voltage

**Power Input Voltage:** 9 to 28 VDC

**Current Draw:** 1mA

**Cable:** 2 foot length, 22 AWG, stranded

**Clamp:** 1/2" ID, provided (P/N 00-03-0392)

## How to Order

Part Number	Model and Description	Notes
10707483	Model 12: Air Temperature Sensor	

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## Section 15 Fluid Level

	<b>Level Switch System - Bilge</b>	
95107	Bilge Level Switch System — BLSK1 Series . . . . .	75
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6572	Lube Level Swichgage® Instrument — L129 . . . . .	93
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7229	Crankcase Level Switch — L971 Series . . . . .	95
	<b>Level Switches - Scrubber</b>	
1010629	Liquid Level Switches — MLS Series . . . . .	97
0600009	Liquid Level Switches — LS200 Series . . . . .	99
	<b>Level Valves - Scrubber</b>	
01069	Dump Valves — DVU Series . . . . .	103
	<b>Level Swichgage® Instruments - Tank Level</b>	
94122	4-1/2 in. (114 mm) Dial Level Swichgage® — OPLH/OPLHACS Series. . . . .	105

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# Bilge Level Switch System

## BLSK1 Series

The BLSK1 Bilge Level Switch System operates bilge pumps or alarms. The kit includes all items and fittings necessary to install in your bilge. You order only the parts you want, and you provide brackets, tubing and mounting hardware.

Using the proven Air Cell actuating system, all moving parts and switching are remote from bilge liquids and are not affected by corrosion, rust, etc. All wetted parts are of non-corrosive materials.

As bilge level rises, a column of air is captured in the MAC1 Air Volume Cell. The rising bilge level compresses the column of air creating pressure against the large diaphragm in the BLS1 Bilge Level Switch and the switch trips. Switch set point is adjustable.

The switch resets as the bilge is pumped out and the air cell recharges itself during normal operation.

The BLS1 is constructed of materials not affected by marine atmospheres: aluminum or bronze body and cover, Buna-N diaphragm.

## Specifications

### BLS1 Bilge Level Switch Snap-Switch SPDT (standard)

5 A @ 125, 250, or 480 VAC

1/2 A @ 125 VDC, 1/4 A @ 250 VDC

**NOTE:** A pilot relay may be used for higher contact ratings (see Typical Wiring Diagram)

**Case/Lid:** Aluminum (std)

**Bottom Plate:** Glass-filled nylon

**Process Connection:** 1/4 NPTF

**Max. Pressure:** 25 psi (172 kPa) [1.72 bar]

**Conduit Connection (electrical):** 1/2 NPT

**BLS1 Weight:** 3 lb. (1.4 kg)

**BLS1 Dimensions:** 6-1/4 x 6-1/4 x 6-1/4 in. (159 x 159 x 159 mm)

**15050737 Optional mounting bracket:** 16 ga., 304 stainless steel (see Dimensions)

### MACT1 Tube Kit (fittings included):

4 ft. (1.21 m) flexible non-corrosive tubing, 1/4 in. (6 mm) dia. (cut to fit)

**MACT1 Weight:** 0.5 lb. (0.23 kg)

**MACT1 Dimensions:** 6 x 6 x 6 in. (152 x 152 x 152 mm)

### MAC1 Air Cell (Volume Cell):

Made of non-corrosive materials

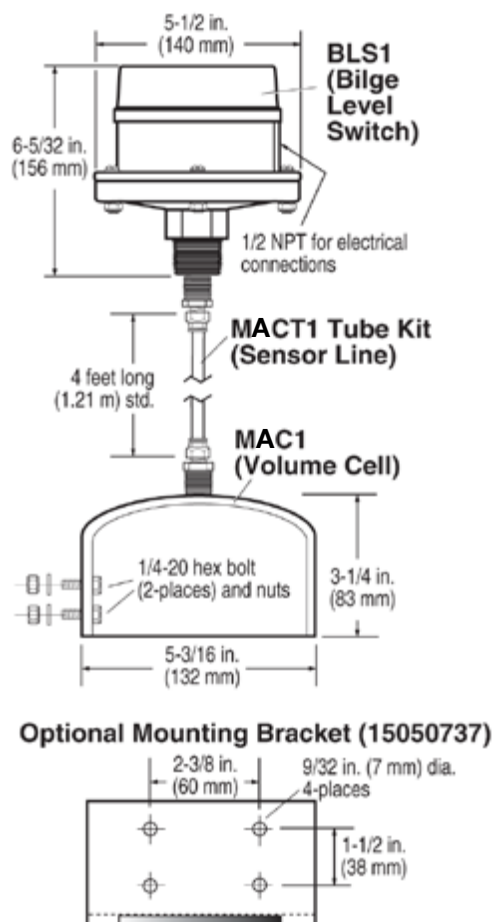
(2) 1/4-20 stainless steel hex bolts and nuts

**MAC1 Weight:** 2 lb. (1 kg)

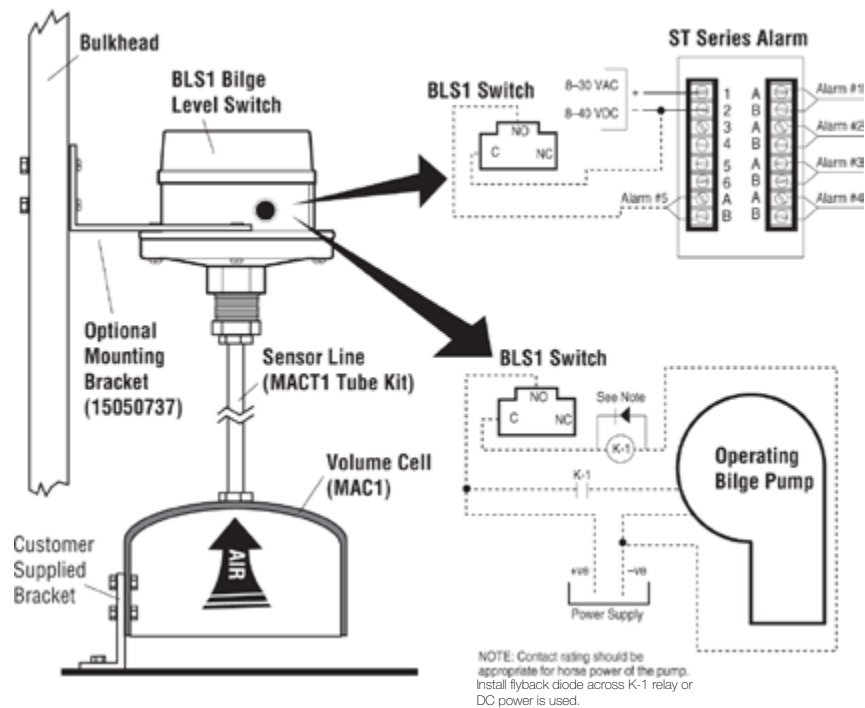
**MAC1 Dimensions:** 6 x 6 x 6 in. (152 x 152 x 152 mm)



## Dimensions



# Typical Installation and Wiring



## How to Order

Part Number	Model and Description	Notes
15000587	BLS1: Bilge level switch	SPDT, 5A Switch, aluminum case and lid
15700193	BLSK1: Bilge level switch kit includes BLS1, MACT1 tubing kit and MAC1 air cell	Kit
15050737	BLS1 mounting bracket	Accessories and replacement parts
15010205	5 A snap-switch and movement assembly	
15000123	Diaphragm assembly	
15050823	Piston	
15050824	Knob for limit adjustment	
15700200	MACT1	
15000590	MAC1	

# Hydrostatic Head Level Switches

## DF Series

The DF series are diaphragm-operated hydrostatic head pressure level switches. A pressure sensitive diaphragm operates a snap-switch that can be wired directly to electric pilot circuits to control pumps at predetermined levels. Typical application is to start and stop electric driven pump(s) to maintain tank levels. It is also applicable to engine-driven pumps.

The nitrile sensing diaphragm is impervious to most liquids and is sensitive enough to control levels with 1/4 in. (6 mm) repeatability. See model descriptions for limits of switch trip point adjustability. Materials include aluminum body, glass-filled nylon bottom plate and a special alloy leaf snap switch as standard.

This simple level switch is highly reliable and can be worked into almost any new or existing system without major modification or special tools.

DF755 and DF757 are suitable for atmospheric tanks in a non-hazardous area. The SPDT snap-switch for the DF755 is preset for a 4 in. (102 mm) differential in liquid level. The DF757 trip point is adjustable over a 108 in. (2743 mm) differential.

## Specifications

### Snap Switch Ratings

#### SPDT

15 A @ 125, 250 VAC

**Case/Lid:** Aluminum

**Bottom Plate:** Glass-filled Nylon

**Process Connection:** 1 NPT

**Maximum Pressure Rating:** 25 psi (172 kPa [1.72 Bar])

**Conduit Connection (electrical):** 1/2 NPT

### Shipping Weights:

DF755: 3 lb. (1.4 kg)

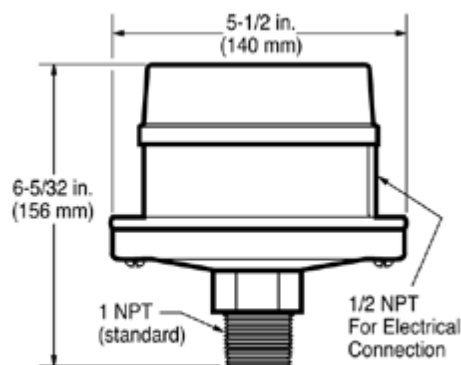
DF757: 3 lb. (1.4 kg)

### Shipping Dimensions:

6-1/4 x 6-1/4 x 6-1/4 in. (159 x 159 x 159 mm)



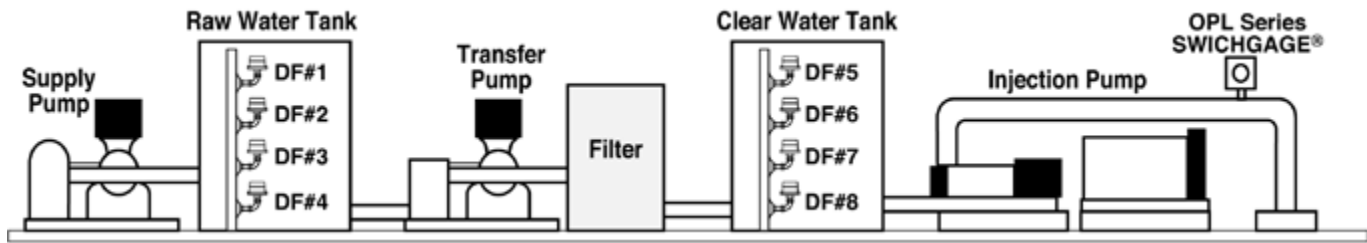
## Dimensions





## Applications

- Saltwater Disposal Systems
- Cooling Towers
- Crude Oil Tanks
- Waterflood Systems
- Diesel Day Tanks
- Sumps



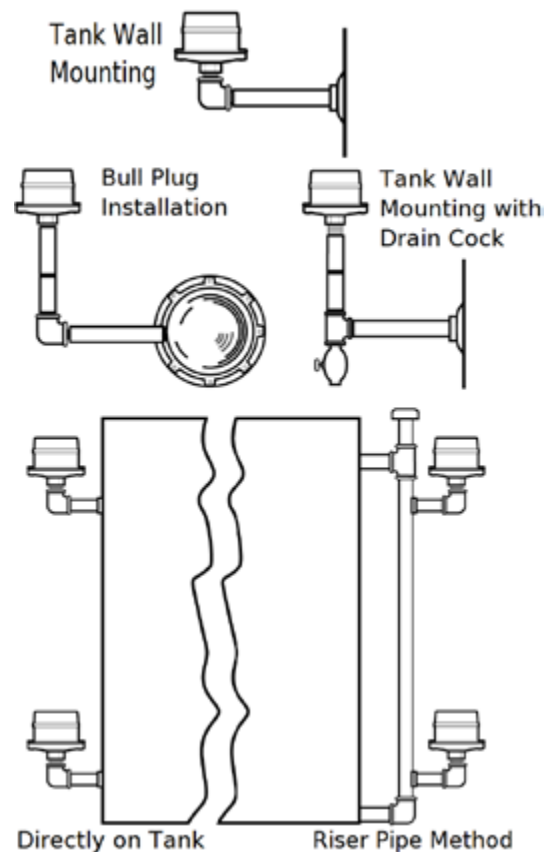
### Typical Water Flood Control System

The diagram above displays eight DF Series switches installed on a Raw Water tank and a Clear Water tank. When raw water rises to predetermined level, DF#1 stops the supply pump. As the tank level falls below the predetermined level, DF#2 starts the supply pump. If the tank level continues to fall, DF#3 initiates shutdown of the supply pump. DF#4 stops the transfer pump before the raw water tank is completely pumped out.

When clear water reaches the predetermined level, DF#5 stops the transfer pump. As the tank level falls to a predetermined low level, DF#6 starts the transfer pump. If the tank level continues to fall due to the failure of the filters section, DF#7 initiates shutdown of the transfer pump. (DF755 located at this level will also operate backwash equipment). DF#8 stops the injection pump before the tank pumps completely out.

An OPL Series Pressure Switchgag<sup>®</sup> stops injection pump when pressure reaches predetermined high or low pressure

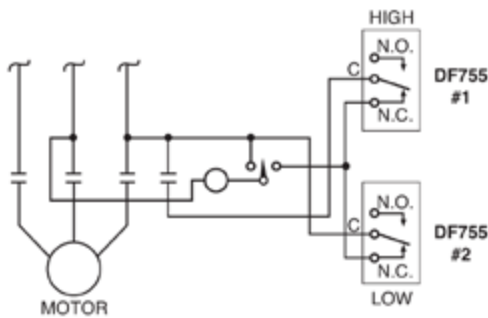
### Typical Tank Mounting Methods (DF755)



## Typical Wiring

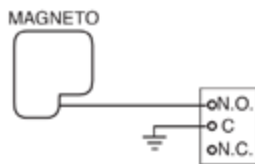
### Starts at Low Level, Stops at High

Start motor when predetermined low level is reached and stops when high level is reached. Keeps tank level within selected limits. Motor starter equipped with H.O.A.



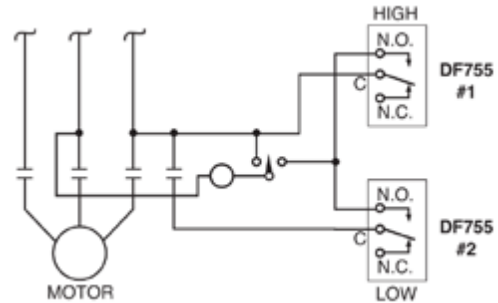
### Single Magneto Shutdown

Shut down single ignition engine when fluid reaches low level. Simple wiring of magneto to N.O. switch terminal will shut down engine at predetermined high level.



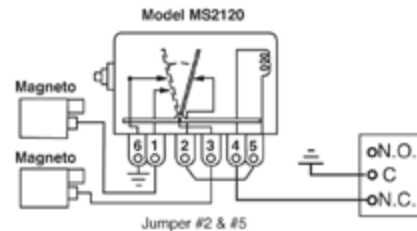
### Starts at High Level, Stops at Low

Start motor when predetermined high level is reached and stops when low level is reached. Motor starter equipped with H.O.A.



### Dual Magneto Shutdown

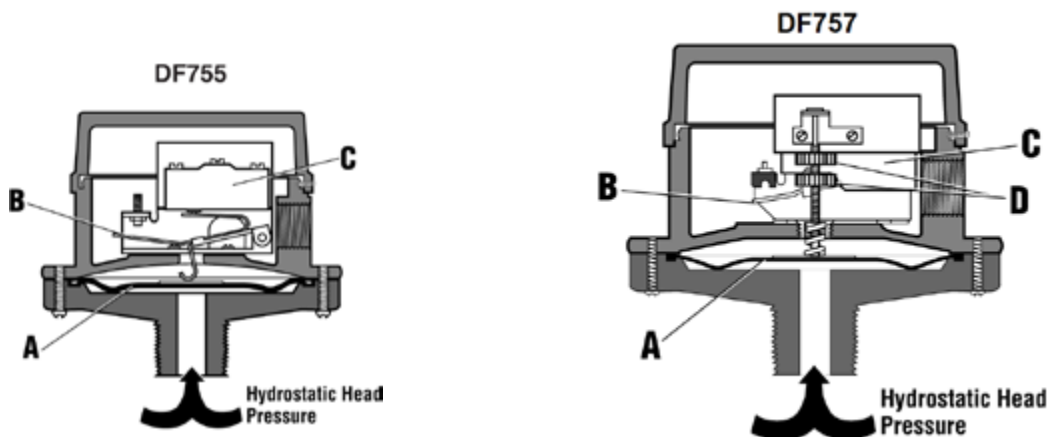
Shut down dual magneto engines using Murphy MS2120 Magnetic Switch. Diagram shows hookup for low level shutdown. Simple wiring changes and mounting locations are necessary for high level shutdowns.



## Basic Operation

As the liquid level rises, hydrostatic head pressure is applied to the diaphragm **A**. The diaphragm is forced upward forcing the actuator arm **B** to activate the snap switch **C**.

Model DF755 is factory set and operates at approximately 2 in. (51 mm) and 6 in. (152 mm) above the level at which the diaphragm is mounted. The trip point(s) for Model DF757 are adjustable between 2 in. (51 mm) and 110 in. (2794 mm) for high and low (make/break) operation by knobs, **D**.



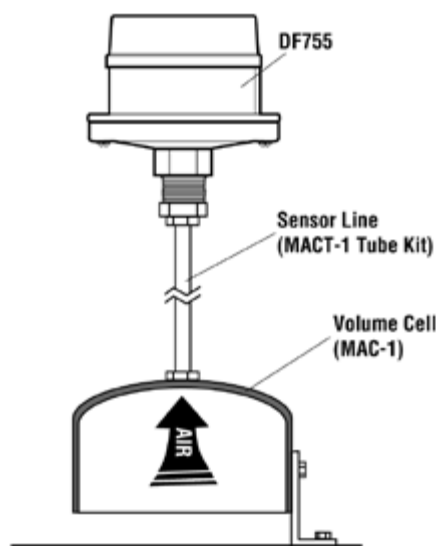
## Accessories

Enovation Controls offers the MAC-1 Volume Air Cell that can be attached to the DF755 to monitor water levels on a sump. It activates alarms or starts a pump directly. The MAC-1 Volume Air Cell is non-corrosive and provides 1/4-20 stainless steel mounting studs.

The MACT-1 Tubing Kit provides 4 ft. (1.2 m) flexible, non-corrosive 1/4 in. (6 mm) tubing (cut to fit). The kit includes necessary fittings to attach tubing.

### Volume Cell Operation

As liquid rises around the volume cell, it compresses air inside the cell and forces it up in the sensor line. As air pressure increases due to the water level continuing to rise, sufficient pressure will be applied to activate the internal snap-switch, which in turn starts the pump. As the liquid level is pumped down, pressure decreases and the above procedure is reversed. The pump is stopped and held in a standby condition. An air purge may be required in the sensor line. Consult factory.



## How to Order

Part Number	Model and Description	Notes
15700001	<b>DF755:</b> Hydrostatic head level switch, SPDT snap-switch	DF Series switch
15700007	<b>DF757:</b> Hydrostatic head level switch, adjustable trip point	
15000123	Diaphragm Repair Kit	DF Series service part
15000121	Snap switch and insulator assembly	DF755 Series service part
15000122	Snap switch, insulator and movement assembly	
15000174	Snap switch and bracket assembly	DF757 Series service part

Accessories and service parts are sold separately and are available from Enovation Controls.

Accessories available:

MAC-1: air volume cell

MACT-1: air volume cell tube kit

# Level Switchgag<sup>®</sup> for Engine Liquids

## L150 and EL150K1 Series

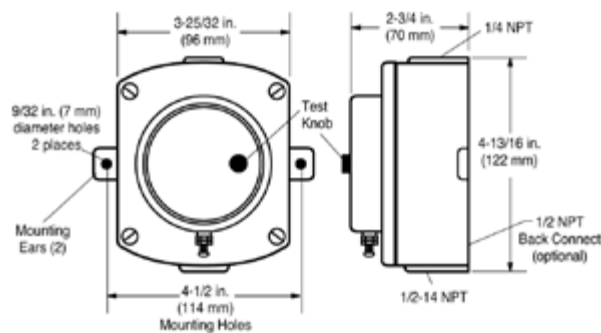
The L150 Series Level Switchgag instrument is a combination liquid level gage and low-limit switch; each unit includes (1) a chamber with pivotal float, (2) an indicating dial with pointer and (3) a low-level contact. When properly installed and maintained, the float operates the pointer which, in turn, both indicates level during normal operation and closes a switching circuit if the level falls to the low-limit set point.

### Applications

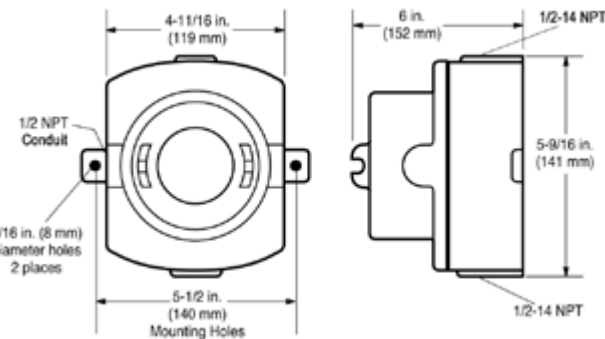
The primary use of the L150/EL150K1 is for engine cooling systems, surge or expansion tanks, condenser radiator or vapor phase systems, pressurized or atmospheric systems. The Level Switchgag instrument can also be used to monitor lube oil, hydraulic fluid or diesel fuel reservoirs and activates alarms and/or shut down at a predetermined minimum level. These instruments are built for low pressure systems with a maximum of 25 psi (172 kPa) [1.72 bar].

### Dimensions

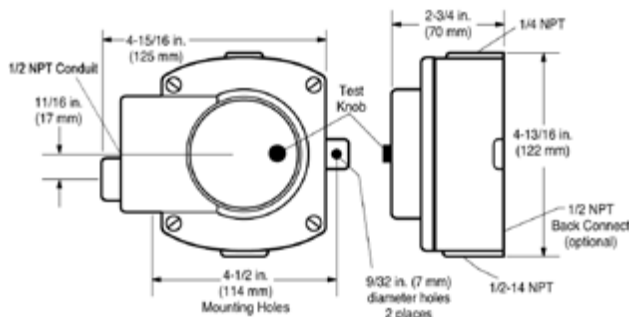
#### L150



#### EL150EX

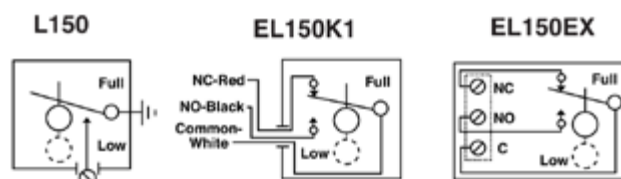


#### EL150K1



### Standard Electrical Diagrams

**WARNING:** This typical wiring diagram is shown for clarity only. It is not intended for use as installation instructions.



## Specifications

### L150

**Case:** Die cast aluminum, polyurethane coated; approximate dimensions; 4-1/2 x 4-3/4 x 2-3/4 in. (114 x 121 x 70 mm)  
**Mounting Holes:** (2) 9/32 in. (7 mm) diameter at 4-1/2 in. (114 mm) on center  
**Float:** Brass  
**Lens:** Polycarbonate  
**O-rings:** Saturated Nitrile, are suitable for coolant or hydrocarbons  
**Maximum temperature:** 250°F (121°C)  
**Gasket:** Nitrile  
**Vent Tube:** 1/4 x 5 in. (6 x 127 mm) copper cane with 1/4 NPT x 1/4 in. (6 mm) tube fitting  
**Contact Rating:** 2 A @ 30 VAC/DC. Wire: (1) 16 AWG x 26 in. (1.5 mm 2 x 660 mm) with terminals  
**Shipping Weight:** 29 oz. (0.82 kg.)  
**Shipping Dimensions:** 5-1/4 x 5-1/4 x 5-1/2 in. (133 x 133 x 140 mm)

### EL150K1

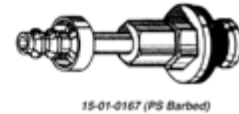
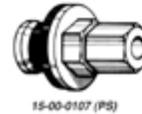
**Case:** Die cast aluminum, polyurethane coated; approximate dimensions; 5 x 4-3/4 x 2-3/4 in. (127 x 121 x 70 mm)  
**Enclosure Rating:** IP35  
**Mounting Holes:** (2) 9/32 in. (7 mm) diameter at 4-1/2 in. (114 mm) on center  
**Float:** Brass  
**Lens:** Polycarbonate  
**O-rings:** Saturated Nitrile, are suitable for coolant or hydrocarbons  
**Maximum temperature:** 250°F (121°C)  
**Gasket:** Nitrile  
**Vent Tube:** 1/4 x 5 in. (6 x 127 mm) copper cane with 1/4 NPT x 1/4 in. (6 mm) tube fitting  
**Snap-Switch:** SPDT rated 10 A @ 125 VAC; 0.5 A @ 125 VDC; 10 A 30 VDC  
**Wire:** (3) 18 AWG x 14 in. (1 mm2 x 356 mm)  
**Shipping Weight:** 42 oz. (1.2 kg.)  
**Shipping Dimensions:** 5-1/4 x 5-1/4 x 5-1/2 in. (133 x 133 x 140 mm)

### EL150EX

**Case:** Sand cast aluminum, painted; approximate dimensions; 6-1/2 x 5-3/4 x 5-1/4 in. (165 x 146 x 133 mm)  
**Mounting Holes:** (2) 5/16 in. (8 mm) diameter at 5-1/2 in. (140 mm) on center  
**Float:** 304 Stainless steel  
**Lens:** Tempered glass  
**O-rings:** Saturated Nitrile, suitable for coolant or hydrocarbons  
**Maximum temperature:** 250°F (121°C)  
**Gasket:** Nitrile  
**Vent Tube:** 1/4 x 5 in. (6 x 127 mm) copper cane with 1/4 NPT x 1/4 in. (6 mm) tube fitting and 1/2 NPT to 1/4 NPT reducer fitting  
**Snap-Switch:** SPDT rated 10 A @ 125 VAC; 0.5 A @ 125 VDC; 10 A 30 VDC  
**Wire:** Wired to terminal block  
**Laboratory Approvals:** CSA Listed for Hazardous Locations Class I, Division 1, Groups C & D  
**Shipping Weight:** 5 lbs. (2.26 kg.)  
**Shipping Dimensions:** 6-1/2 x 6-3/4 x 6-3/8 in. (165 x 171 x 162 mm)

## Radiator Fittings

Murphy PS, PS Barbed and PS-D fittings allow the installation of the L150 / EL150K1 to the radiator when a fitting is not available.



## How to Order

Part Number	Model and Description	Notes
15000138	All parts except case and body	L150 Repair Kits
15000101	Case/body assembly	
15000139	All parts except case and body	EL150K1 Repair Kits
15000101	Case/body assembly	
15000100	Lens/switch assembly	
15000110	Cover and float assembly	EL150EX Repair Kits
15000108	Lid assembly	
15000109	Switch/terminal assembly	
15000107	Radiator fitting (PS), thin wall, 1/4 in. (6 mm) tube fitting	Accessories
15010202	Radiator fitting (PS-D), for diesel or oil, thick wall (to 1/4 in. [6 mm]), accepts 1/2 in. (13 mm) I.D. hose or 1/4 in. (6 mm) O.D. tubing	
15010167	Radiator fitting (PS Barbed), thin wall, 1/4 in. (6 mm) tubing or hose	
15700854	Visor Kit, EL150K1 (knob guard)	

# Lube Level Maintainer LM500/LM500-TF

The LM500 maintains oil level on any size engine. It also supports installations that require a three-wire, snap-action switch. The form C (three-wire) contact allows a controller/annunciator to be wired as a closed-loop system, resulting in a reliable fault-sensitive circuit. Refer to LM500 Series Flow Rate Chart for application data.

The Murphy LM500-TF Oil Level Maintainer includes a test feature that confirms both the float and switch are operating correctly with a single press of the test button. The LM500 series maintains the crankcase oil level of an engine, pump or compressor. Adjusted to the correct running oil level, it will replenish oil as it is used. The low-level switch will alarm and/or shut-down the equipment, if supply oil is lost and the equipment continues to use oil.

As crankcase oil level drops, the LM500 float also drops and opens the Thumb-Valve™. This allows oil to flow from the supply tank through the LM500 and into the crankcase. When proper level is achieved in the crankcase, the LM500 float rises causing the Thumb-Valve to close off further oil flow.

The simple and unique Thumb-Valve is non-clogging and provides a positive, leak-free seal.

If the clean oil supply is depleted and oil level continues to fall, the low-level switch will operate an alarm or equipment shutdown.

## Specifications

**Crankcase Balance Vent Connection:** 1/2 NPTF (top)

**Inlet Connection:** 1/2 NPTF removable screen (side)

**Outlet Connection:**

2 x 3/4 NPTF (side)

1 x 3/4 NPTF (bottom)

**Thumb-Valve™ Material:** Viton

**Snap-switch:** SPDT rating 10 A, 125 VAC; 0.5 A, 125 VDC; 10 A, 30 VDC

**Wire leads:** 18 AWG x 14 in. ± 2 in. (355 mm) length

**Conduit Connection:** 1/2 inch conduit (female, top)

**Case:** Die cast aluminum

**Lens:** Clear Frog Eye non-staining, high-impact, high temperature polycarbonate; UV and heat stabilized

**Dial:** High visibility white background with solid green band for normal level indication

**Maximum Inlet Pressure:** 9.50 psi/25 ft. oil (head pressure)

**Maximum Case Pressure:** 15 psi (103 kPa)

**Maximum Differential:** 2 in. (51 mm) between running and stopped

**Maximum Ambient Temperature:** 250°F (121°C)

**Float:** 304 Stainless Steel

**Flow Rates:** Refer to LM500 Series Flow Rates chart for application data

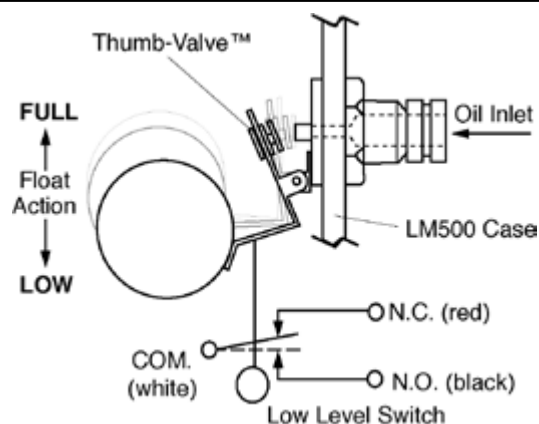
**Dimensions:** Overall 6-9/16 in. (H) x 6-3/16 in. (W) x 3-1/2 in. (D)

**LM500/LM500-TF Shipping Dimensions:** 9.5 (W) x 7.5 (D) x 11 in. (H) (241.3 (W) x 190 (D) x 279.4 mm (H))

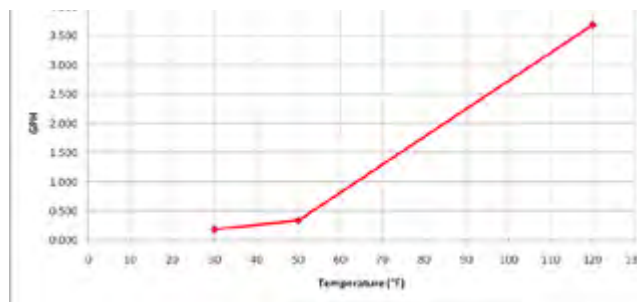
**LM500/LM500-TF Shipping Weight:** 3 lbs. 13.44 oz (1.74 kg)



## Thumb-Valve Operation



## LM500 Series Flow Rates



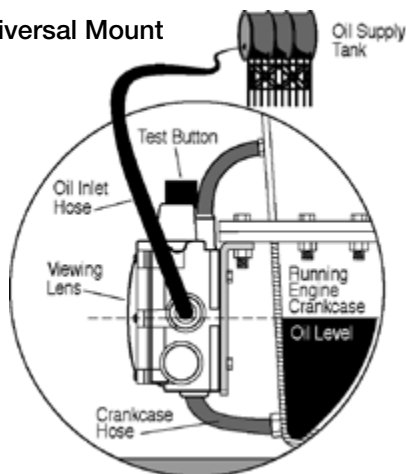
## Mounting Brackets with Hardware

In addition to the direct mounting option, Enovation Controls offers two mounting brackets for the LM500. The pipe bracket fits a 7/8 in. (22 mm) diameter pipe (see typical installation). The Universal Flange Kit allows various mounting methods. For exact dimensions, visit <http://www.fwmurphy.com>.

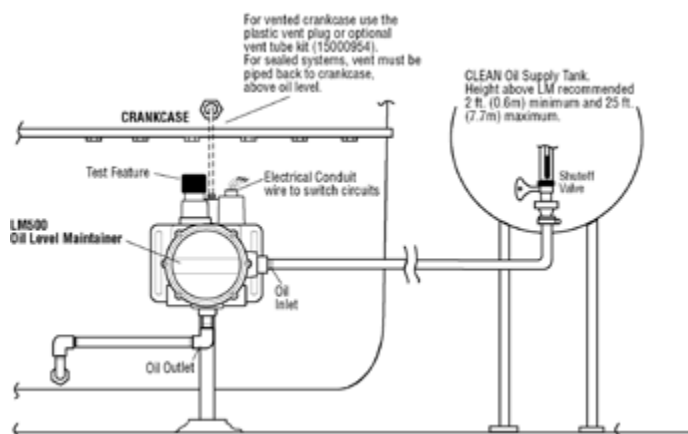


## Typical Installations

Universal Mount

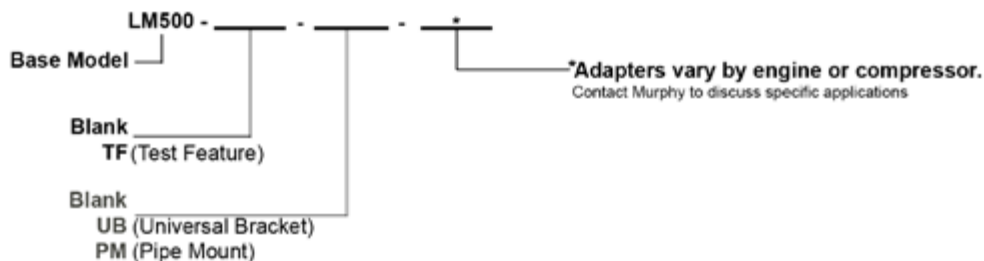


Pipe Mount



## How to Order

Options listed at right.  
All configurations may  
not be available. Call your  
sales representative or  
Enovation Controls for  
more information.



Part Number	Description	Notes
15000954	Vent Fittings Kit	one tubing vent, one 1/4 x 1/2 NPT connector
15000355	Hose Kit	one - 1/2 in. (13 mm) I.D. x 3 ft. (914 mm) hose one - 1 in. (25 mm) I.D. x 3 ft. (914 mm) hose two - 1/2 in. (13 mm) worm gear clamp two - 1 in. (25 mm) worm gear clamp two - 1/2 NPT x 1/2 in. (13 mm) barbed fitting two - 3/4 NPT x 1 in. (25 mm) barbed fitting
89080801	1/2 NPT x 1/2 in. Hose Barbed Fitting	
89081001	3/4 NPT x 1 in. Hose Barbed Fitting	
15000518	Pipe Bracket Kit	
15000519	Universal Flange Kit	
15000532	Bubble Lens Kit	
15000943	Fittings Kit	one tubing vent; one hose barb, 1/2 NPT to 1/2 Hose; one hose barb, 1" ID hose x 3/4 NPT; one connector, 1/4 x 1/2 NPT



# Level Maintainer LM300 Series

The LM300 Series Level Maintainer automatically adds oil to the crankcase as needed to keep the lube level normal. Most models have built-in switches that will alarm and/or shut-down the equipment, if the makeup supply is depleted and engine oil level falls or if overfill conditions exist. LM300 series explosion-proof models are CSA certified for Class I, Division 1 Hazardous areas.

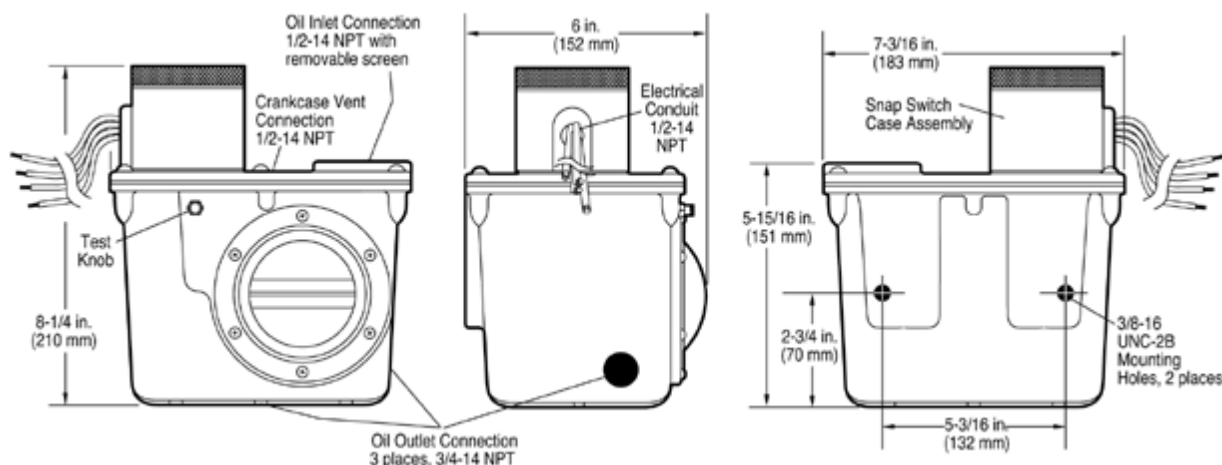
The LM300 can be used in engines, compressors, pumps and coolers.



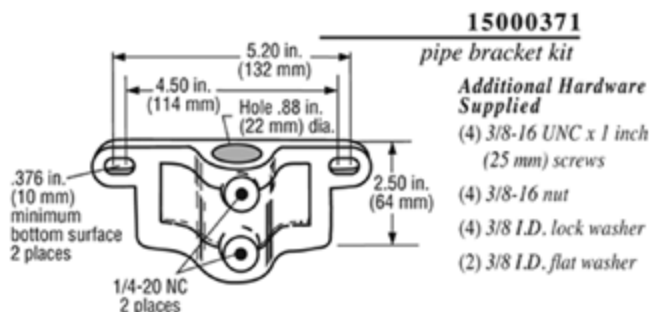
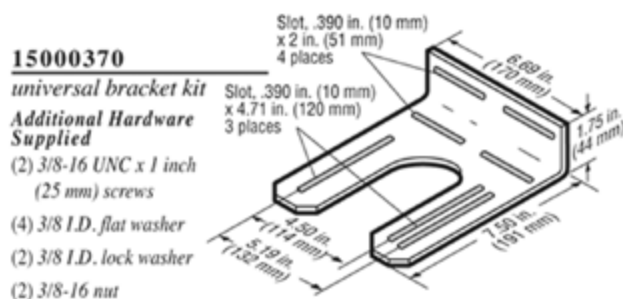
\*Products covered by this bulletin comply with Directive: 2004/108/EC (European Electromagnetic Compatibility). European Harmonised standard: EN 61000-6-3:2007 (Emissions). EN 61000-6-1:2005 (Immunity)

## Dimensions

The dimensions below are for the optional EX model enclosure. The standard model enclosure dimensions are the same except the height and width which are: 7 in. (178 mm) H, 7-7/8 in. (200 mm) W.



## Mounting Brackets with Hardware



## Specifications

**Case/Cover:** Die cast aluminum

**Switch Housing:** Aluminum

**Approval Rating:** LM301 through LM305: CSA certified\* for non hazardous locations. Enclosure Type 4 certified

LM301-EX through LM305-EX: CSA certified for Class I, Groups C and D; Class II, Groups F and G hazardous locations. Enclosure Type 4 certified.

**Float:** Rigid polyurethane foam; Polyurethane coated

**Max. Ambient Temperature:** 250°F (121°C)

**Oil Inlet Connection:** Top entry 1/2-14 NPT with built-in filter screen (removable for cleaning)

**Inlet Orifices:** 1/4 in. (6 mm) standard; 1/8 in. (3 mm) available

**Wire (switch models):** 18 AWG x 13 in. (1.0 mm<sup>2</sup> x 330 mm)

**Max. Inlet Pressure (MIP):** 30 psi (207 kPa) [2.07 bar] with 1/8 in. (3 mm) orifice

15 ft oil (4.6 m oil) with 1/4 in. (6 mm) orifice

**Max. Differential:** 2 in. (51 mm) between running and stationary oil level

**Max. Case Pressure (MCP):** 15 psi (103 kPa) [1.03 bar]

**Orifice Seal†:** Buna-N Thumb-Valve

**Switch Contact:** Silver, SPDT snap-acting, rated at 10 A @ 125, 250 VAC; 10 A @ 30 VDC (1 only for low level; 2 only for high and low; or 2 only for low level with alarm before shutdown)

**Flow Rate Test:** Using SAE 30 @ 32°F (0°C)

Orifice Diameter	Pressure	Flow Rates
1/4 in. (6 mm) *	4 ft. oil – 15 ft. oil (1.2 m oil – 4.6 m oil)	4.7 GPH - 31.0 GPH (17.8 LPH - 117.3 LPH)
1/8 in. (3 mm)	10 psig – 30 psig (68.9 kPa – 207 kPa) [.69 – 2.07 bar]	16.9 GPH - 32.1 GPH (63.7 LPH - 121.5 LPH)

\* Standard

**NOTE:** Friction losses due to piping not considered

**Outlet Connection:** 3/4-14 NPT left side, right side and bottom

**Crankcase Balance Vent Fitting:** 1/2-14 NPT

**Mounting:** Accepts Murphy pipe mounting bracket or universal mounting bracket

**Lens:** Clear Frog Eye non-staining, high-impact, high-temperature nylon; UV and heat stabilized

**Dial:** High visibility white background with green and white index lines for normal level indication

**Test Knob:** Rotate to test switch operation. Turn clockwise for low level test and turn counterclockwise for high level test.

## Base Models

LM300: Level Maintainer only (no switches).

LM301: Low switch contacts for low-level shutdown or alarm. Four wires, SPDT.

LM302: Two switches for low-and high-level shutdown or alarm. Four wires, DPST, wired N.O. in normal operating ranges.

LM303: Two switches for low-and high-level shutdown or alarm. Four wires, DPST, wired N.C. in normal operating ranges.

LM304: Two switches. Alarm before shutdown on low level and shutdown on low-low level. Four wires, DPST, wired N.O. in normal operating ranges.

LM305: Two switches. Alarm before shutdown on low level and shutdown on low-low level. Four wires, DPST, wired N.C. in normal operating ranges.

## How to Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Part Number	Description
15000355	Optional Hose Kit 1 1/2 in. (13 mm) I.D. x 3 ft. (914 mm) long hose 1 1 in. (25 mm) I.D. x 3 ft. (914 mm) long hose 2 1/2 in. (13 mm) worm gear clamp 2 1 in. (25 mm) worm gear clamp 2 1/2 NPT x 1/2 in. (13 mm) barbed fitting 2 3/4 NPT x 1 in. (25 mm) barbed fitting

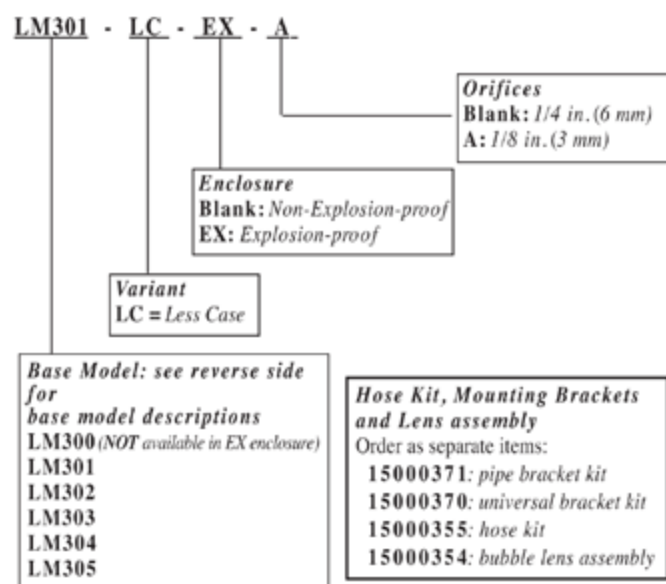
### Shipping Weights:

LM300 Series non-EX models: 6 lbs. 6 oz. (2.89 kg)

LM300 Series EX models: 6 lbs. 12 oz. (3.06 kg)

### Shipping Dimensions (all LM300 Series models):

10-5/8 x 8-7/8 x 6-3/4 in. (270 x 225 x 171 mm)



# Oil Level Regulators for Lubricators

## LR500 Series

The LR500 Series Level Regulators automatically add oil to a lubricator to maintain the factory-recommended level. This function eliminates the work time necessary for manual checks and refills.

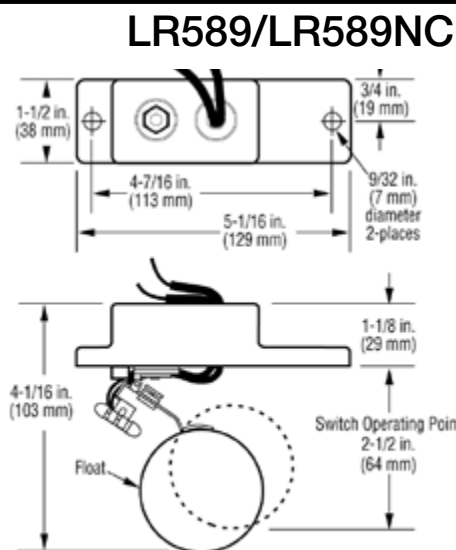
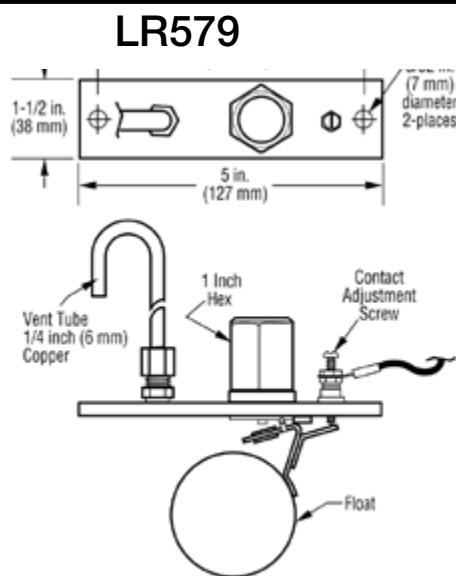
Each model has a low-level shut-down switch to protect equipment when oil supply is lost. If the lubricator oil level drops below the minimum operations level, the low-level switch will operate an alarm and/or shut down the equipment.

Model LR579 is for Lincoln lubricators. It features an adjustable low-level shut-down contact.

LR589 is for Lincoln lubricators, and the LR589NC is the normally closed-wired version of the LR589.



### Dimensions



### Shipping Weight and Dimensions

Shipping Weight: 13 oz. (368 g)  
Shipping Dimensions: 4-3/4 x 4-3/4 x 3-1/4 in.  
(121 x 121 x 83 mm)

Shipping Weight: 12 oz. (340 g)  
Shipping Dimensions: 4-3/4 x 4-3/4 x 2-3/4 in.  
(121 x 121 x 70 mm)

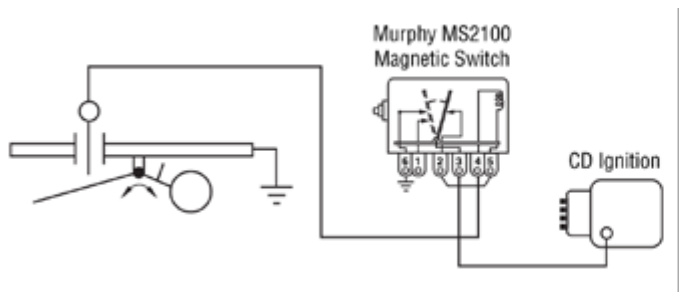
# Installation



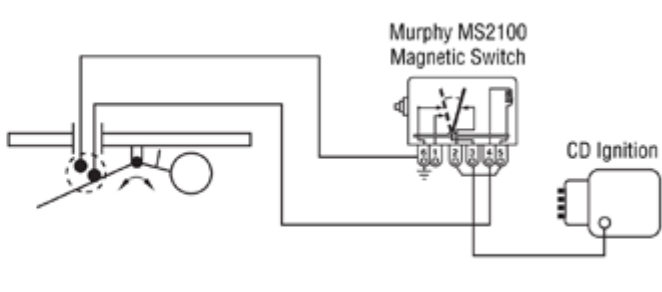
- WARNING!**  
Before beginning installation of this Murphy product:
- Disconnect ALL electrical power to the machine.
  - Make sure the machine **CANNOT** operate during installation.
  - Follow all safety warnings of the machine manufacturer.
  - Read and follow all installation instructions.

1. Remove the cover on a vacant cell of the lubricator (DO NOT install in bays next to crank arm).
2. Bolt the level regulator in place using the bolts that held the cover.
3. Connect the flex hose from the oil reservoir to the oil inlet at the level regulator. Oil reservoir must be at least two feet (0.61 meters) above the level regulator.
4. Wire switch for alarm and/or shutdown. One switch can be used to shut down all equipment supplied by a common oil reservoir.

**Typical Wiring for LR579**



**Typical Wiring for LR589**



## How to Order

Part Number	Model and Description	Notes
Specify Model When Ordering	LR579	
	LR589	
	LR589NC	

# Maintain Lube Level

## Model LR857

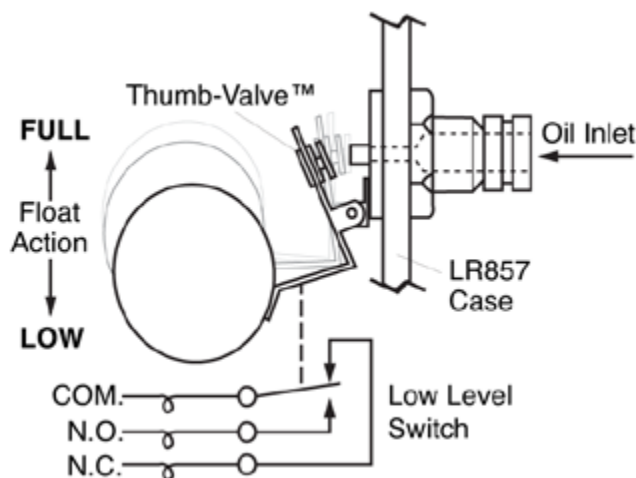
Murphy LR857 Lube Level Regulator maintains the crankcase oil level of an engine, pump or compressor. Adjusted to the correct running oil level, the LR857 will replenish oil as it is used. An integral, low-level switch will alarm and/or shut down the equipment, if supply oil is lost and the equipment continues to use oil.

The LR857 maintains oil level on any size engine but is recommended for small- to medium-volume applications and installations that require a three-wire, snap-action switch.

As crankcase oil level drops, the LR857 float also drops and opens the Thumb-Valve™. This allows oil to flow from the supply tank through the LR857 and into the crankcase. When proper level is attained in the crankcase, the LR857 float rises causing the Thumb-Valve to close off further oil flow.

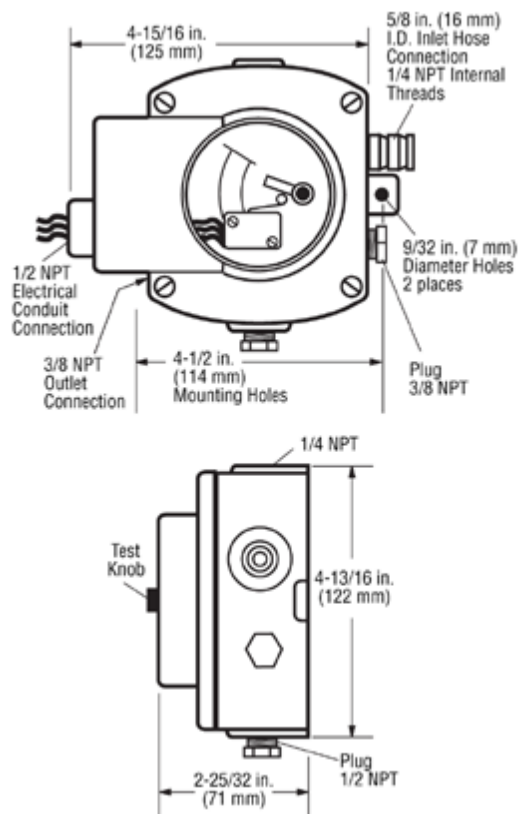
The simple and unique Thumb-Valve is non-clogging and provides a positive, leak-free seal. Flow rate through the 1/8 inch (3 mm) orifice is significant to allow crankcase refill through the LR857.

### Thumb-Valve Operation



\* Products covered by this bulletin comply with EMC Council directive 89/336/EMC regarding electromagnetic compatibility except as noted.

### Dimensions



## Mounting Brackets with Hardware

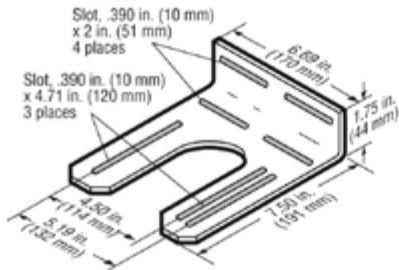
Enovation Controls offers two mounting brackets for the LR857. The 15000238 Pipe Bracket Kit fits a 7/8 in. (22 mm) diameter pipe (see typical installation). The 15010224 universal Flange Kit allows various mounting methods.

### 15010224

#### Universal Flange Kit

##### Additional Hardware Supplied

- (2) 1/4-20 x 1-1/4 inch (32 mm) bolts
- (4) 1/4 dia. flat washer
- (2) 1/4-20 hex nuts
- (2) 5/16-18 x 1-1/4 inch (32 mm) bolts
- (4) 5/16 dia. flat washer
- (2) 5/16-18 hex nuts

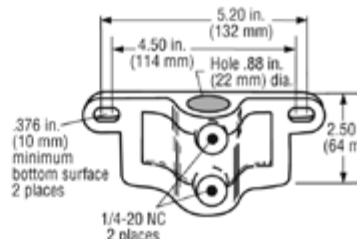


### 15000238

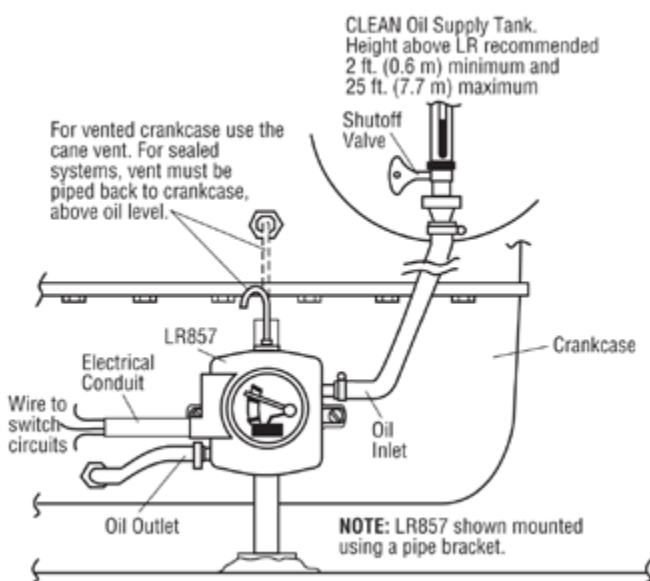
#### Pipe Bracket Kit

##### Additional Hardware Supplied

- (2) 1/4-20 x 7/8 inch (22 mm) screws
- (2) 1/4-20 x 1 inch (25 mm) screws
- (4) 1/4-20 hex nuts
- (4) 1/4 inch (6 mm) dia. split washer



## LR857 Typical Installation



### LR857 Shipping Dimensions:

9 x 5-1/2 x 6 in. (229 x 140 x 152 mm)

### LR857 Shipping Weight:

3 lbs. 6 oz. (1.5 kg)

## Specifications

**Inlet Connection:** 5/8 in. (16 mm) I.D. hose

**Outlet Connection:** 3/8 NPT

**Snap-switch:** SPDT rating 10 A @ 125 VAC; 0.5 A @ 125 VDC; 10 A @ 30 VDC

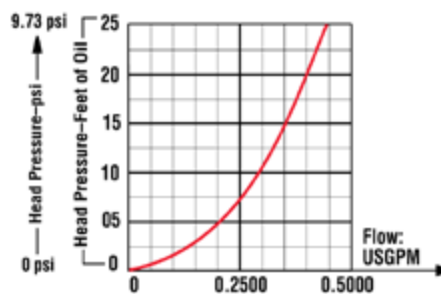
**Conduit Connection:** 1/2 NPT

**Case:** Die cast aluminum

**Lens:** Polycarbonate

**Float:** Brass

**Flow Rates (see chart below):** Oil with 0.9 specific gravity @ 70°F (21°C)



### Fittings Kit: 15000420

The 15000420 kit is sold separately. It includes the following items:

Quantity Description

- 1 1/4 in. (6 mm) O.D copper cane tube (vent connection)
- 1 1/4 in. (6 mm) tube x 1/4 male pipe fitting
- 1 1/2 in. (13 mm) I.D. hose fitting (outlet connection)

## How to Order

Part Number	Model and Description	Notes
Specify Model No.	LR857	
15000420	Fittings Kit	Accessories
15000238	Pipe Bracket Kit	
15010224	Universal Flange Kit	
15000159	Inlet Valve Assembly	Replacement Parts
15000100	Glass and Switch Assembly	
15000161	Lid Assembly	
15000941	Float Assembly (Brass-std)	



# Float Actuated Oil Level Switchgage® For Small Engines and Pumps

The Float Actuated Oil Level Switchgage instruments are a combination oil level sight gage and adjustable, low and/or high limit switch. The limit switches are normally open during operation — yet closed if the level drops (or rises) to where the float contacts the limit screw. The contact completes a circuit to ground a magneto or trip a Murphy magnetic switch. The magnetic switch can be used to activate alarms and/or shut down. Models are also available without limit switches.

The level instruments can be used on a variety of crankcases, pump gearcases or oil reservoirs — primarily on small engines and pumps. Installation is simple, and these instruments save on reduced downtime and repair costs.

The following list displays the model and its typical application:

**L100†:** Small engines and pumps with non-vented crankcase

**L100W†:** Small engines and pumps with vented crankcase

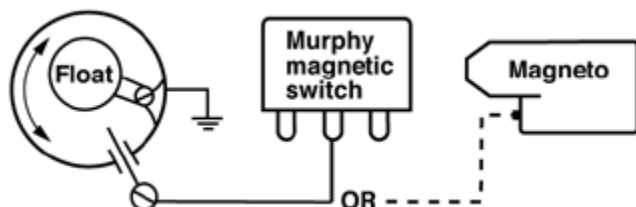
**L120:** Machined surface on crankcase such as Witte, National-Oilwell/Garland

**L127:** Machined surface on crankcase, specifically, Fairbanks-Morse ZC Series and Bell Engines

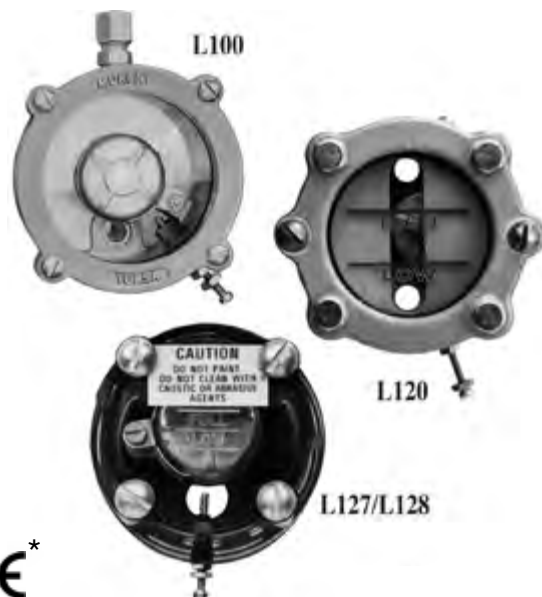
**L128:** Machined surface on crankcase, specifically, Arrow and Continental Emsco/Climax

## Typical Wiring

Below is a typical wiring diagram for a level Switchgage instrument. A Switchgage instrument can be connected to a Murphy magnetic switch or magneto. Switch Contact Rating is 2 A @ 30 VAC/DC resistive.



† Models available with high and low options.



\* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

## Specifications

### Maximum Pressure Rating (all models):

30 psi (207 kPa) [2.07 bar]

### L100 and L100W

**Case:** Die cast aluminum

**Float:** Brass

**Rating:** 2 A @ 30 VAC/DC

**Vent Fitting:** 1/4 in. (6 mm) tube x 1/8 NPT

**Inlet Fitting:** Hex Nipple 1/4 NPT

### Hardware (shipped loose)

#### L100:

**Copper Tubing:** 1/4 x 48 in. dia. (6 mm x 1.2 m)

**Reducer Bushing:** 1/2 NPT x 1/4 NPT

**Close Nipple:** 1/2 NPT

**Tee:** 1/2 NPT, black pipe

**Wire:** 16 AWG x 24 in. (1.5 mm<sup>2</sup> x 610 mm)

#### L100W:

**Vent Tube:** 1/4 x 3-3/8 in. (6 x 86 mm)

**Reducer Bushing:** 3/4 NPT x 1/4 NPT

**Close Nipple:** 3/4 NPT

**Tee:** 3/4 NPT, black pipe

**Wire:** 16 AWG x 24 in. (1.5 mm<sup>2</sup> x 610 mm)

#### L120

**Case:** Cast Aluminum

**Float:** Brass

**Rating:** 2 A @ 30 VAC/DC

**Mounting Bolts:** 1/4-20 UNC-2A (4 required)

#### L127 and L128

**Case:** TROGAMID Nylon

**Float:** Brass

**Rating:** 2 A @ 30 VAC/DC

**Wire:** 16 AWG x 48 in. (1.5 mm<sup>2</sup> x 1.2 m)

### Mounting Bolts:

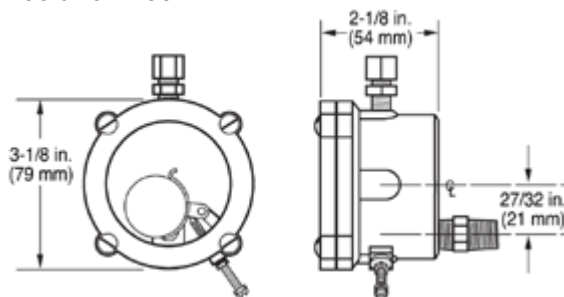
**L127:** 1/4-20 NC x 2 in. (4 required)

**L128:** 3/8-16 NC x 3/4 in. (2 required)

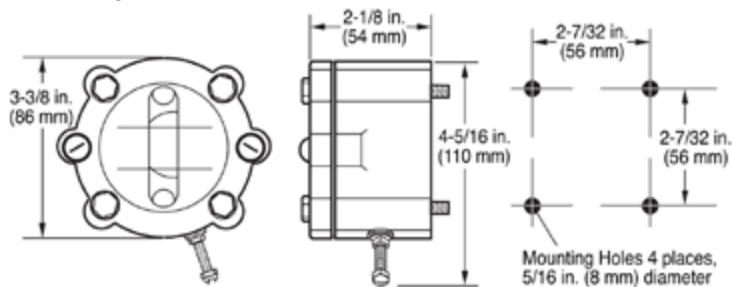


## Dimensions

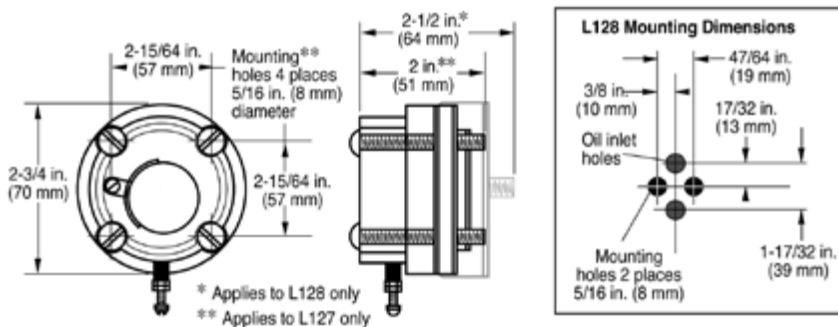
### L100 and L100W



### L120

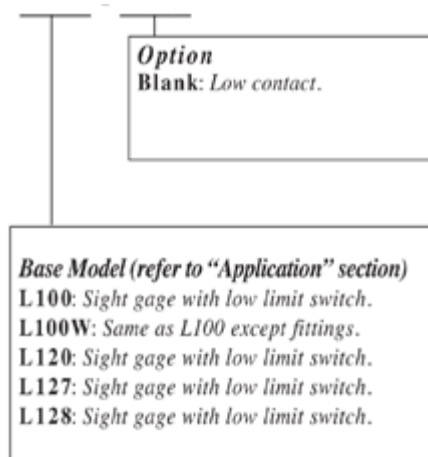


### L127 and L128



## How to Order

Options listed at right.  
All configurations may not be available. Call your sales representative or Enovation Controls for more information.



#### Shipping Weight:

**L100:** 2 lbs. (0.91 kg)  
**L100W:** 2 lbs. (0.91 kg)  
**L120:** 1 lb. 8 oz. (0.68 kg)  
**L127:** 8 oz. (0.23 kg)  
**L128:** 10 oz. (0.36 kg)

#### Shipping Dimensions:

**L100:** 5-1/4 x 5-1/4 x 5-1/2 in. (133 x 133 x 140 mm)  
**L100W:** 4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)  
**L120:** 4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)  
**L127 and L128:** 4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

# Lube Level Swichgag<sup>®</sup> Instrument L129 Series

The L129 Series Lube Level Swichgag instrument is a combination lube level indicating gage and adjustable low and high limit switches. It provides protection against low oil level or high level caused by overfill or fuel or water seepage into the crankcase.

A 6-3/4 inch (171 mm) deep sight gage allows you to check the condition and level of your oil without shutting down the equipment.

Fingertip adjustable limit contacts, through 4-7/8 inch (122 mm) range, make it simple to set high and low limit contacts. If the float touches the high or low limit contact, a normally open circuit will be completed which can activate alarms and/or shut down the equipment.

There are two models in the L129 Series: L129 and L129CK1. The L129 model is designed for grounded, low voltage electrical systems. It features a one-wire-to-ground electrical circuit. The L129CK1 was designed for applications requiring a three-wire, above ground electrical circuit. It features ungrounded contacts and a conduit hub to protect electrical wiring. Options are available for both models.

A flow restrictor plug is available that restricts oil flow from the crankcase to the L129 Series switch and vice versa. It is typically used on applications where the engine is not stationary such as marine and mobile equipment.

When properly installed and maintained, the L129 Series Lube Level Swichgag can monitor and protect engines and pumps from improper lubrication level, which can result in extensive damage.

The L129 Series is recommended for engines and pumps with larger crankcase capacity. Although designed primarily for stationary engines, the L129 Series is often used in mobile applications such as marine, rail and some large off-highway trucks.

## Specifications

**Case:** Die-cast aluminum

**Lens:** Tempered glass

**Maximum Working Pressure:** 10 psi (68.9 kPa)

**Process Connection:** 1/2 NPT

**Float Material:** Brass

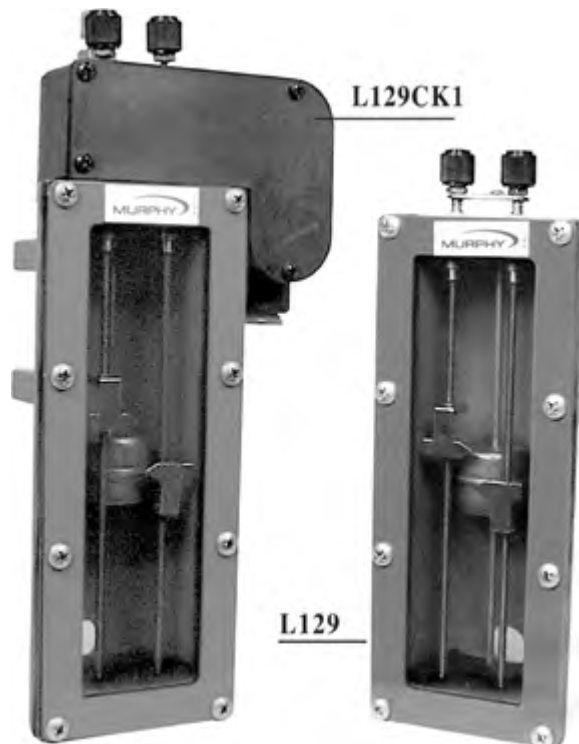
**Contact Rating:** 2 A @ 30 VAC/DC, pilot duty

**Shipping Weight:**

L129: 3 lb. (1.4 kg)

L129CK1: 3 lb. 9 oz. (1.6 kg)

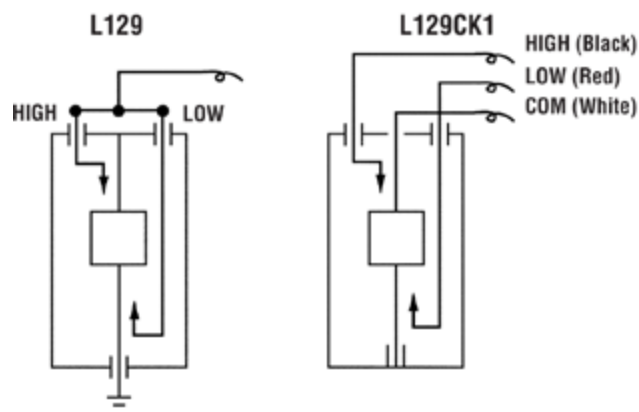
**Shipping Dimensions (both models):** 12 x 4-1/2 x 4-3/4 in.  
(305 x 114 x 121 mm)



\* Products covered by this bulletin comply with EMC Council directive 89/336/EMC regarding electromagnetic compatibility except as noted.

## Wiring

These diagrams are shown with the float in the full position.

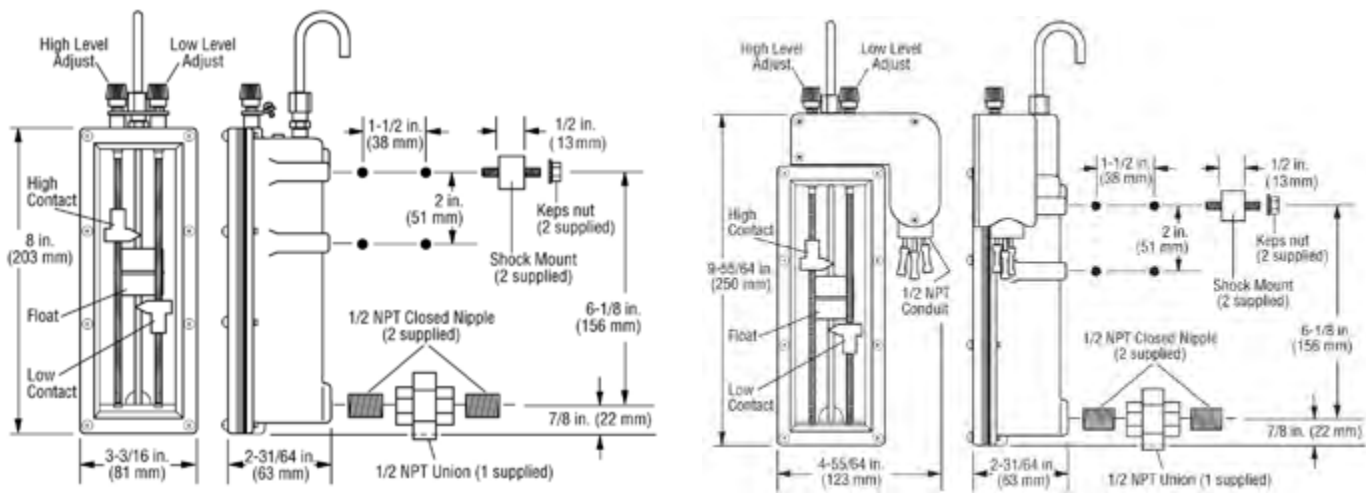


Contact Rating: 2 A @ 30 VAC/DC, pilot duty

Dimensions

L129

L129CK1



How to Order

Part Number	Description	Notes
15000888	Full repair kit (less castings and glass assembly) for date code T2 and later	For L129
15000480	Bezel, glass and gasket set for date code W7 and later	
15000485	Glass and gasket set for all date codes	
15050241	Restrictor plug for all date codes	

# Crankcase Level Switch

## L971 Series

The Murphy L971 Series Level Switch detects low oil level in a compressor's crankcase. As oil level in the crankcase depletes, the float on the L971 switch falls, and when reaching the predetermined limit, it will trip the internal snap-switch sounding an alarm or initiating shutdown.

The L971 is designed for Ingersoll-Rand Type 30, Type 40 and ESH compressors, yet it can be adapted to fit other compressors that have an inspection plate extending below normal operating oil level. It installs with minimal downtime and has a two-year limited warranty.

The L971 has a 1/2 NPT process connection and features an explosion-proof enclosure, durable SPDT snap-switch and rigid polyurethane foam float. A 304 stainless steel float is available on certain configurations.

### Specifications

**Operating Temperature Range:** -15 to 275°F (-26 to 135°C)

**Maximum Working Pressure:** 30 psi (206 kPa) [2.06 bar]

**Switch Rating:** 4 A @ 250 VAC

**Case:** Aluminum (explosion-proof)

**Mounting Adaptor:** Brass

**Floats:** Rigid polyurethane. 304 stainless steel available on L971-C only

**Other Wetted Parts:** 303, 304, and 316 stainless steel

**O-Ring Seals:** Viton and Buna

**Process Connection:** 1/2 NPT

**Hazardous Location Rating:** UL and CSA listed for Class I, Groups C & D; Class II, Groups F & G.

**Enclosure Type / Ingress Protection Rating:** IP66 per IEC 60529.

**Conduit Connection:** 1/2 NPT

**Wire:** 18 AWG (0.75 mm<sup>2</sup>)

**Shipping Weight:** 1 lb. 10 oz. (0.7 kg)

**Shipping Dimensions:** 8-1/4 x 4-1/4 x 4-1/2 in. (210 x 108 x 114 mm)

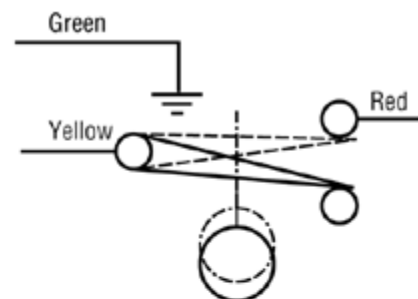


\* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

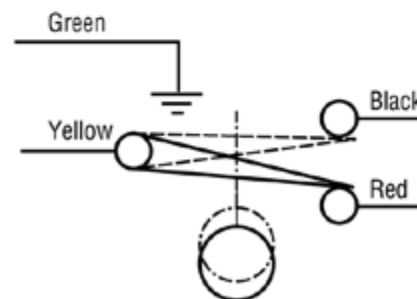
### Wiring

Diagrams are shown in the shelf position with no force acting upon float.

#### L971-A



#### All Other Models

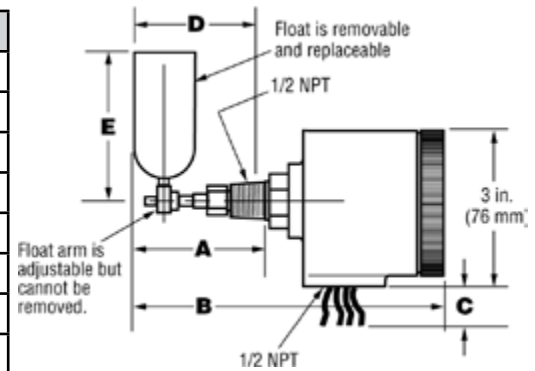


**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

## Dimensions

Dimensions are inches (millimeters).

Model	A	B	C	D	E
L971	2-5/8 (67)	5-7/8 (149)	30 (762)	2-1/2 (64)	2-27/32 (72)
L971-A	2-5/8 (67)	5-7/8 (149)	30 (762)	2-1/2 (64)	2-27/32 (72)
L971-B	4-13/16 (122)	8-1/16 (205)	30 (762)	4-5/8 (117)	2-27/32 (72)
L971-C	2-13/16 (71)	6-1/16 (154)	30 (762)	2-7/8 (73)	3-1/8 (79)
L971-D	3-7/8 (98)	7-1/8 (181)	30 (762)	3-3/4 (95)	2-27/32 (72)
L971-E	4-13/16 (122)	8-1/16 (205)	30 (762)	5-1/8 (130)	2-27/32 (72)
L971-F	2-5/8 (67)	5-7/8 (149)	40 (1016)	2-1/2 (64)	2-27/32 (72)
L971-G	2-5/8 (67)	5-7/8 (149)	40 (1016)	2-1/2 (64)	2-27/32 (72)



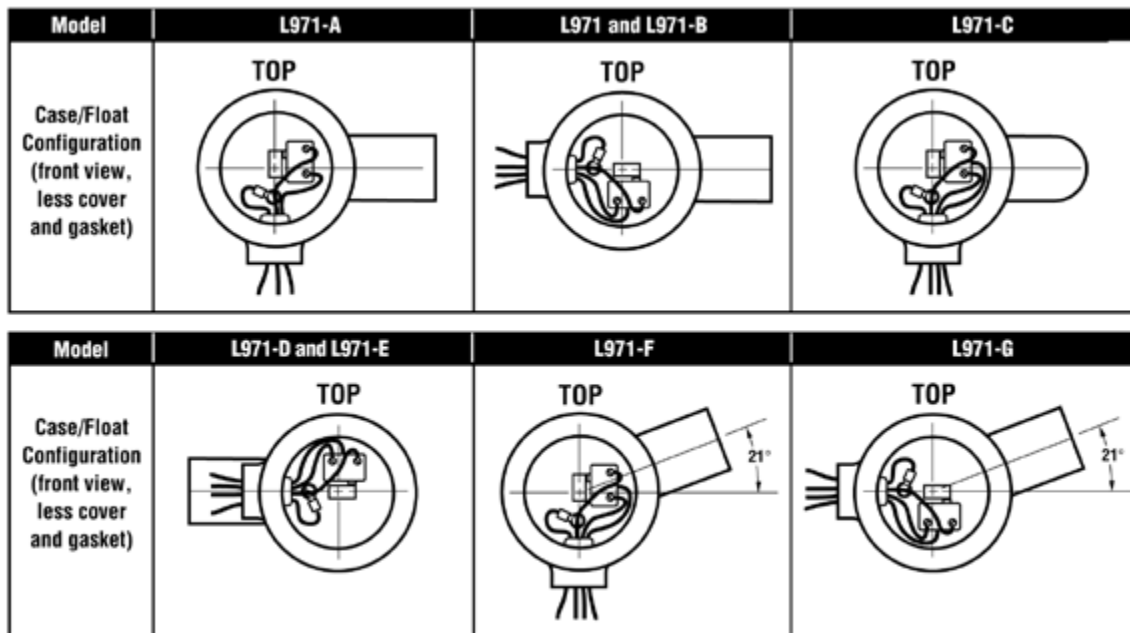
## How to Order

Options listed at right.  
All configurations may not be available. Call your sales representative or Enovation Controls for more information.

L971 -

Case/Float Configuration (see chart below)	
Blank = Standard configuration	D = Configuration D
A = Configuration A	E = Configuration E
B = Configuration B	F = Configuration F
C = Configuration C	G = Configuration G

To order the L971 Series Level Switch to fit your application, use this diagram.



NOTE: Switches shown tripped on falling level.

Part Number	Description	Notes
15000449	Float kit for L971	Accessory

# Liquid Level Switches

## MLS Series

MLS Series Liquid Level Switches are float activated to operate an electrical SPDT reed switch for annunciation/pilot signal for indication of high level to an annunciator, controller or PLC. The MLS connects directly into the gas scrubber wall and can be used with a Murphy weld collar or Murphy external float chamber. The MLS Series is available in both 1 1/2 and 2 in. NPT models.

Features of the MLS Series includes:

- Clean magnet design virtually eliminates iron filing accumulation on the magnet
- Seal-free construction
- ANSI/ISA 12.27.01 compliant (Single Seal)
- Operates in 0.50 specific gravity or heavier fluids
- Designed for harsh gas compressor scrubber applications
- 304 cast equivalent SS body and 304 SS float
- Rated for 2000 psi (13.8 MPa) [138 bar] working pressure
- Trip on rising and falling without need to rotate body
- Electric model only available
- All models screw directly into the scrubber or can be mounted via a Murphy External Float Chamber
- CSA C/US Class I, Div. 1, Grp. B, C & D locations
- Canadian registered



## Specifications

**Process Connection:** 2" NPT (MLS-020); 1-1/2" NPT (MLS-015)

**Fluid Density (SG):**

0.50 MIN (no extension)

0.65 MIN (1 inch extension)

**Pressure Rating:** 2000 psig (13.8 MPa) [138 bar]

**Body:** ASTM A351 CF8 (304 SS)

**Cover:** ASTM A351 CF8 (304 SS)

**Other Wetted Parts:** 303, 304 and 316 SS

**Process Temperature:** -20° to 300° F (-29° to 149° C)

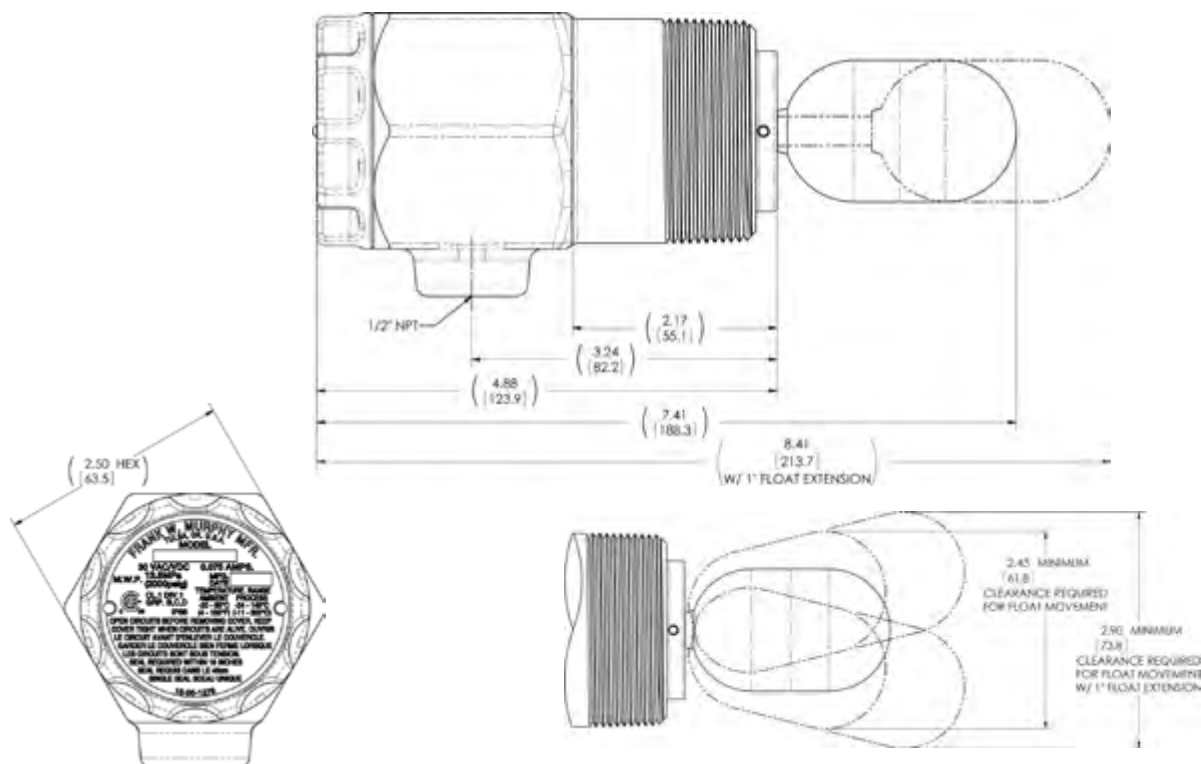
**Electrical:** 30VAC/VDC 75mA Form C SPDT

**Conductor cross section AWG/kcmil min.:** 26

**Conductor cross section AWG/kcmil max.:** 16

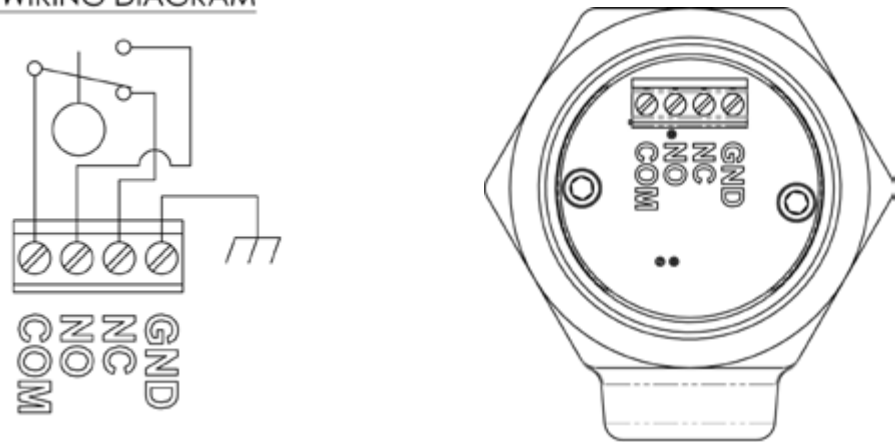
**Canadian Registration Number:** OF12013.2 C (all provinces and territories)

## Dimensions





STD WIRING DIAGRAM



How to Order

Part Number	Description	Notes
15700840	MLS-015	1-1/2 in. NPT
15700839	MLS-020	2 in. NPT
15700799	External Float Chamber	Operating Pressure: 2000psi (13.8MPa) [138 bar] Operating Temperature: 400°F (204°C)
15050375	Weld Collar	
15000892	1-inch Float Extension Kit	

Approximate Shipping Weight:

- MLS-015: 5 lbs. (2.27 kg)
- MLS-020: 5.5 lbs. (2.49 kg)
- External Float Chamber: 18 lbs. (8.2 kg)
- Weld Collar: 6 lbs. (2.7 kg)

Approximate Shipping Dimensions:

- MLS-015 and MLS-020: 14 x 5 x 3.5 in. (356 x 127 x 89 mm)

Refer to MLS installation and operation manuals for additional information.



# Liquid Level Switches

## LS200 Series

Designed for harsh gas compressor scrubber applications, the LS200 Series Liquid Level Switches feature a robust design that trips on rising liquid level only. With both electric and pneumatic models available, the instruments screw directly into the vessel or can be mounted via an external float chamber. The nickel-plated body provides enhanced corrosion protection while the 304 stainless steel float operates in 0.55 specific gravity and heavier fluids. Additional features include:

- Rated for 2000 psi (13.8 MPa) [138 bar] working pressure
- Listed for Class I, Div. 1, Grp. C & D locations
- Canadian registered
- Stainless steel models available for corrosive atmospheres

The LS200 Series replaces the Murphy Series L1200 Liquid Level Switches. The MSLS (Scrubber Level System) replaces the LS200 high-level shut-down switch with the MLS-020 magnetic level switch.

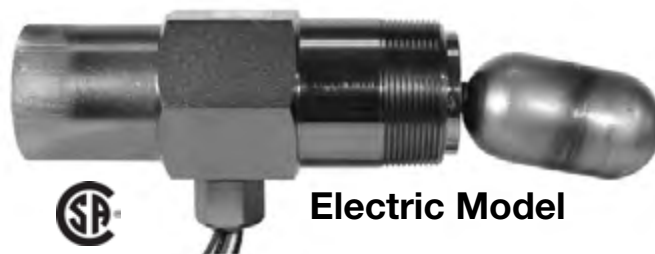
### Models

**LS200** Liquid Level Switches with 2 in. NPT mounting are float activated to operate an electrical SPDT snap-switch (optional DPDT on some models) for alarm or shutdown of an engine or electric motor. The LS200 connects directly into the vessel wall and can be used with a Murphy weld collar or Murphy external float chamber.

**LS200NDVOR** is a float-activated, pneumatic-vent level device used to operate DVU Series dump valves or similar devices. It provides a 2 in. NPT mounting with a pneumatic output for interfacing with pneumatic devices such as the Murphy pneumatic dump valve or other pneumatic instrumentation.

**LS200NDVO** is the Dump Valve Operator (DVO) without the pressure regulator for those applications where the system provides a filter regulator for instrument-quality air or gas as the control medium.

**LS200N** is the pneumatic level switch without the DVO or filter regulator. Please note: pneumatic media devices require clean, dry, instrument-quality air or gas.



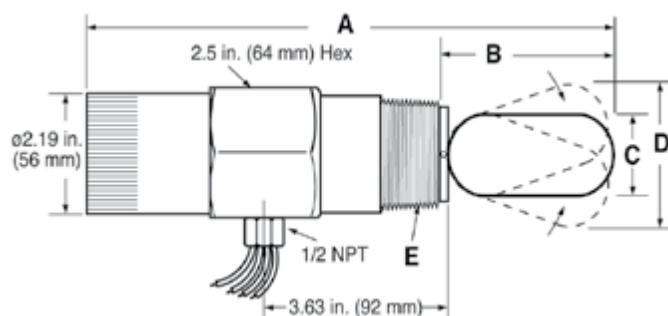
**Electric Model**



**Pneumatic Model**

### Dimensions

#### LS200, L1100



	LS200	L1100*
<b>A</b>	10.16 in (258 mm)	11 in. (279 mm)
<b>B</b>	3.44 in. (87 mm)	3.50 in. (189 mm)
<b>C</b>	1.75 in. (44 mm)	1.56 in. (40 mm)
<b>D</b>	2.80 in. (71 mm)	3.4 in. (71 mm)
<b>E</b>	2 NPT	1-1/2 NPT

\* The L1100 has been discontinued and remains in the table for reference purposes only.

## Application Data

Pipe Data				
Nom. Size (inches)	O.D. (inches)	Schedule Number	Wall Thickness (inches)	Inside Diameter (inches)
3	3.5	40ST	0.216	3.068
3	3.5	80XS	0.3	2.9
4	4.5	40ST	0.237	4.026
4	4.5	80XS	0.337	3.826

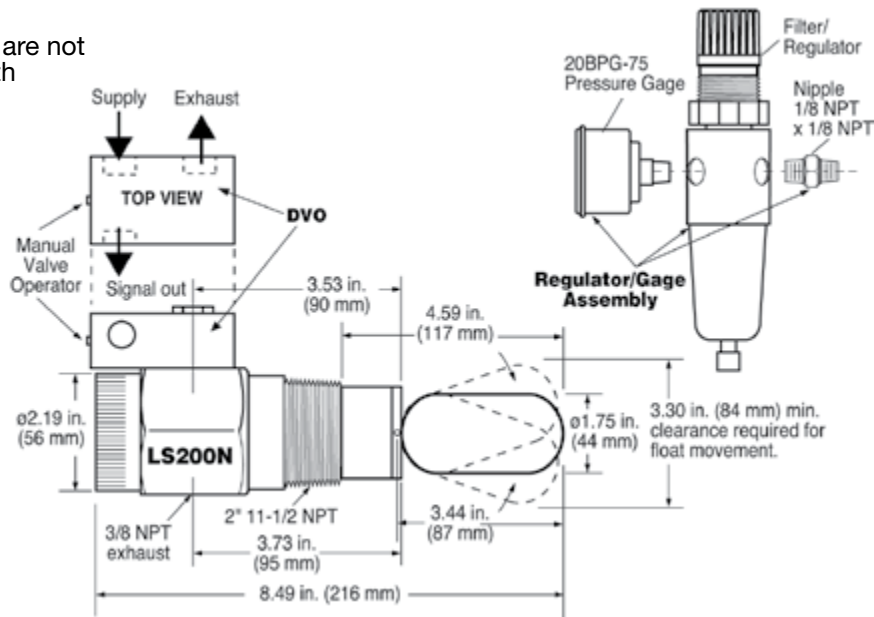
Minimum Clearance				
Product	Insertion Depth (inches)		Vertical Clearance (inches)	
	Std.	w/ 1" Extension	Std.	w/ 1" Extension
LS200	4.6	5.6	2.8	3.15
LS200N	5.43	6.4	3.3	3.9
L1200	4.65	5.7	3.9	4.55
L1200N	5.6	6.7	5.3	6.9
L1100	4.4	5.4	3.4	4.05

Models L1200, L1200N and L1100 are discontinued and remain in the table for reference purposes only.

### LS200N, LS200NDVO and LS200NDVOR with Dump Valve Operator, Pressure Regulator and Gage

#### CAUTION:

LS200 Series parts are not interchangeable with the L1200 Series.



## Accessories

Refer to LS200 installation and operation manual for additional information.

#### External Float Chamber

Operating Pressure: 2000 psi (13.8 MPa) [138 bar]

Operating Temperature: 400° F (204° C)

#### Weld Collar

Operating Pressure: 2000 psi (13.8 MPa) [138 bar]

Operating Temperature: 400° F (204° C)

#### Float Shaft Extension

LS200 Series: 1 in.

LS200 Minimum Allowable Specific Gravity			
Model	Float Extension Length (inches)	Pressure (psi)	Specific Gravity
LS200	0	2000	0.55
	1		0.7
LS200NDVO	0	2000	0.63
	1		0.73

Note: The minimum allowable SG will decrease with a decrease in operating pressure.

# Specifications

## All Models

**Body:** Nickel-plated; optional 316 stainless steel

**Float:** 304 stainless steel

**Pressure Rating:** 2000psig (13.8 MPa) [138 bar]

**Canadian Registration Numbers (issued by ABSA):**

LS200: 0F01476.2

L1200, L1200N and L1100 Series: 0F01476.0

## LS200

**O-ring:** Viton

**Process Connection:** 2" NPT

**Temperature Rating:** -20° to 300°F (-29° to 149°C)

**Electrical:** SPDT std.

**Wiring:** 18 AWG x 36 in. (1.0 mm<sup>2</sup> x 916 mm)

## LS200NDVOR

**Process Connection:** 2" NPT

**DVO Valve:** 3-way N.C. w/manual operator, all connections 1/8" NPT (minimum 30 psig required)

**Filter/Pressure Regulator Set:**

**Regulator:** 0 to 75 psig (0 to 517 kPa) [0 to 5.17 bar] range

**Maximum Input Pressure:** 300 psig (2.07 MPa) [20.7 bar]

## LS200NDVO

**Process Connection:** 2" NPT

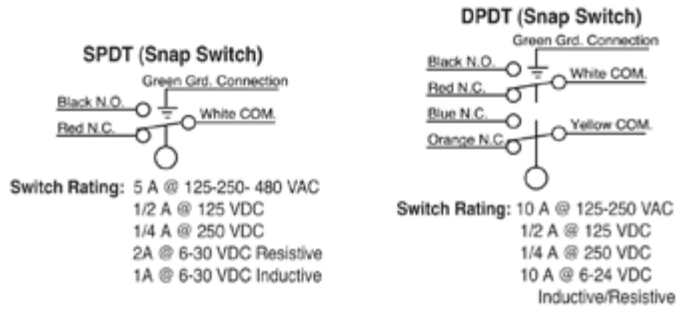
**DVO Valve:** 3-way N.C. w/manual operator, all connections 1/8" NPT

## LS200N

**Process Connection:** 2" NPT

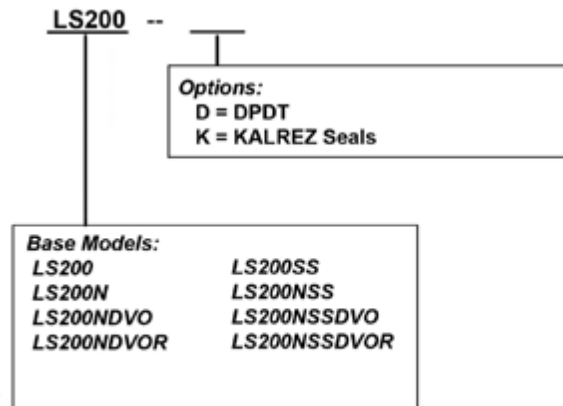
**Vent Valve:** 2-way N.C. w/ 1/16 in. (2 mm) orifice and Viton seat;  
**Inlet:** 1/8" NPT; **Outlet:** 3/8" NPT

## Electrical



# How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
15700799	External Float Chamber	
15050375	Weld Collar	Shipping Weight: 6 lb. (2.7 kg)
15000478	1 in. Float Shaft Extension	LS200 Series
15000892	1 in. Float Shaft Extension	L1100 Series

Note: Refer to 00020671 for replacement parts.

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# Dump Valves

## DVU Series

The DVU Series features pneumatically controlled dump valves. The valves open and close automatically by pneumatic control from a Murphy level controller and dump valve operator. Diaphragm actuated, the DVU series dump valves operate at 30–70 psi (207–483 kPa) [2.07–4.83 bar] and up to 2000 psi (13.8 MPa) [138 bar] vessel pressure (depending on the model).

A key benefit of this design is a hex union that provides the ability to replace the seat without removing the valve from piping.

The DVU Series is compatible with Murphy level controllers. They feature a soft seat valve and manual valve operator.

Designed for gas compressor scrubbers, the DVU Series can be used to dump any liquids compatible with its materials of construction.

## Specifications

**Operating Temperature:** -30° to 250°F (-34.4° to +121°C)

**Valve Operating Pressure:** See How to Order

**Maximum Working Pressure:**

**DVU150/175 (STD & SS):** 1800 psi (12.4 MPa) [124 bar]

**DVU2105:** 500 psi (3.44 MPa) [34 bar]

**DVU2115:** 1500 psi (10.3 MPa) [103 bar]

**DVU2120:** 2000 psi (13.8 MPa) [138 bar]

**Shipping Weights:**

**DVU150 and DVU175:** 9 lbs. (4 kg)

**DVU150SS and DVU175SS:** 9 lbs. (4 kg)

**DVU2105, DVU2115, DVU2120:** 14 lbs. (6.4 kg)

**Shipping Dimensions:** 8 x 8 x 12 in. (203 x 203 x 305 mm)

**Wetted Parts**

**Standard Models:**

**Body/Union Nut:** 12L14 carbon steel, electroless nickel-plated

**Stem:** ANSI 303 SS

**Stuffing Box:** ANSI 303 SS

**Seat:** ANSI 303 SS

**Plug/Seal:** ANSI 303 SS / 95 durometer urethane

**Stainless Steel Models:**

**Body/Union Nut:** ANSI 316 SS

**Stem:** ANSI 316 SS

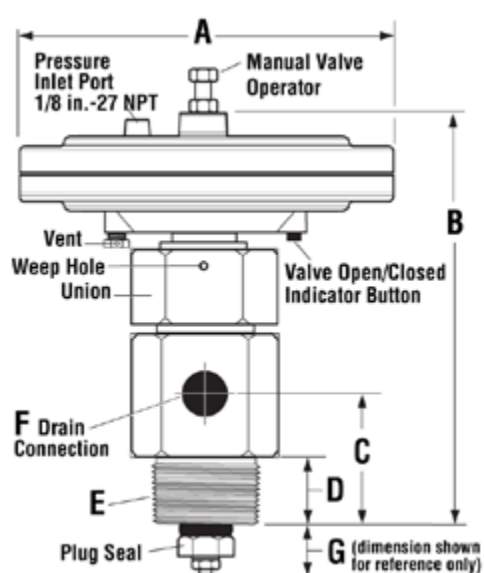
**Stuffing Box:** ANSI 316 SS

**Seat:** ANSI 316 SS

**Plug/Seal:** ANSI 316 SS / 95 durometer urethane



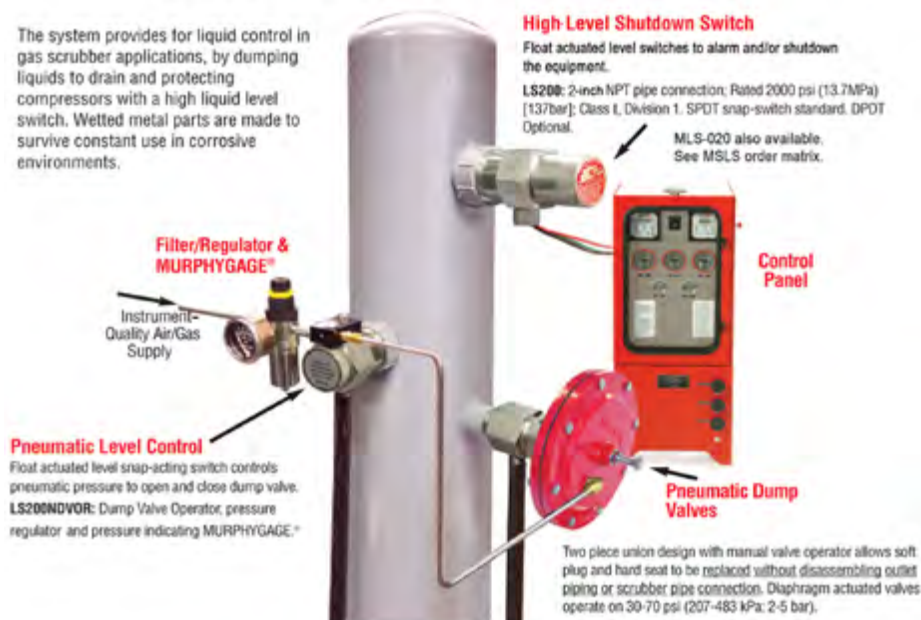
## Dimensions



in. (mm)	DVU2120	DVU2115	DVU2105	DVU175	DVU150
<b>A</b>	7.50 (191)	7.50 (191)	7.50 (191)	7.50 (191)	7.50 (191)
<b>B</b>	8.0 (203)	8.0 (203)	8.0 (203)	6.75 (171)	6.75 (171)
<b>C</b>	2.75 (70)	2.75 (70)	2.75 (70)	2.0 (51)	2.0 (51)
<b>D</b>	1.0 (25)	1.0 (25)	1.0 (25)	1.0 (25)	1.0 (25)
<b>E</b>	2-11.5 NPT	2-11.5 NPT	2-11.5 NPT	1-11.5 NPT	1-11.5 NPT
<b>F</b>	1-11.5 NPT	1-11.5 NPT	1-11.5 NPT	3/4"-14 NPT	1/2"-14 NPT
<b>G</b>	.81 (20.57)	.81 (20.57)	.81 (20.57)	0.73 (19)	0.73 (19)

## The Murphy Gas Compressor Scrubber Level System (SLS)

The system provides for liquid control in gas scrubber applications, by dumping liquids to drain and protecting compressors with a high liquid level switch. Wetted metal parts are made to survive constant use in corrosive environments.



(Includes LS200, LS200NDVOR and DVU valve)

**SLS2120:** Includes DVU2120 valve

**SLS2115:** Includes DVU2115 valve

**SLS2105:** Includes DVU2105 valve

**SLS175:** Includes DVU175 valve

**SLS150:** Includes DVU150 valve

-LR: Less regulator option

(Includes MLS-020, LS200NDVOR and DVU valve)

**MSLS2120:** Includes DVU2120 valve

**MSLS175:** Includes DVU175 valve

**MSLS150:** Includes DVU150 valve

-LR: Less regulator option

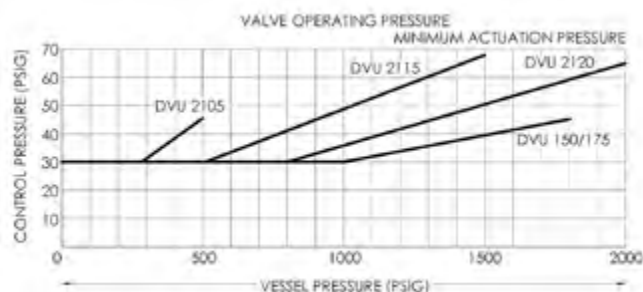
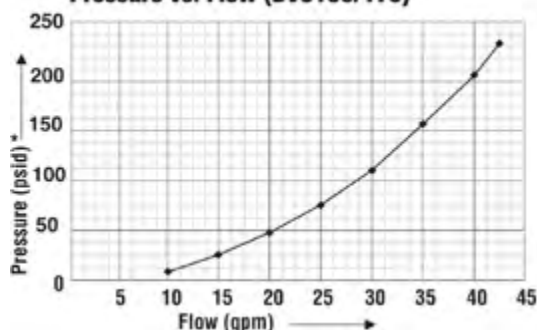
## How to Order

Part Number	Model and Description	Notes
Use Model Number	DVU2120	
	DVU2115	
	DVU2105	
	DVU175	
	DVU175SS	
	DVU150	
	DVU150SS	
55000272	DVU2120 Seal Kit	Service Parts
55000273	DVU2120 Diaphragm Kit	
55000271	DVU2115 Seal Kit	
55000273	DVU2115 Diaphragm Kit	
55000270	DVU2105 Seal Kit	
55000273	DVU2105 Diaphragm Kit	
55000230	DVU150/175 Seal Kit	
55000231	DVU150/175 Diaphragm Kit	
55000255	DVU150/175 End Seal Kit	
55000262	DVU150SS/175SS Seal Kit	
55000231	DVU150SS/175SS Diaphragm Kit	
55000263	DVU150ss/175SS End Seal Kit	

## Models

Model	Inlet	Outlet	Trim Size inches (mm)	Working Max. Press.
DVU2120	2 NPT	1 NPT	0.500 (12.7)	2000 psi
DVU2115	2 NPT	1 NPT	0.571 (14.5)	1500 psi
DVU2105	2 NPT	1 NPT	0.791 (20.09)	500 psi
DVU175	1 NPT	3/4 NPT	0.359 (9)	1800 psi
DVU175SS	1 NPT	3/4 NPT	0.359 (9)	1800 psi
DVU150	1 NPT	1/2 NPT	0.359 (9)	1800 psi
DVU150SS	1 NPT	1/2 NPT	0.359 (9)	1800 psi

Pressure vs. Flow (DVU150/175)





# 4-1/2 in. (114 mm) Dial Level Switchgage® OPLH/OPLHACS Series

The OPLHC/OPLHACS Series Level Switchgage instruments are combination level-indicating gages with adjustable low- and high-limit switches. Limit switches can be wired directly to electric pilot circuits to operate alarms, shut down or start/stop pumps to maintain predetermined levels.

Surface-mount or panel-mount enclosures are available for both model series. All models feature a 4-1/2 in. (114 mm) dial for easy viewing. Adjustable limit switches are accessible from the front of the Switchgage instrument.

Specialized models are available for specific applications involving engines or electric motors.

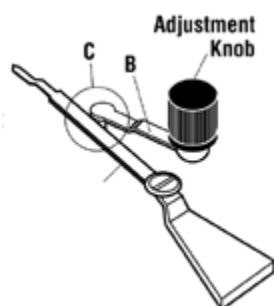
**OPLHC/OPLHACS** Series Switchgage instruments include two adjustable, pilot duty, pointer type contacts. Contacts have self-cleaning motion to enhance electrical continuity. Models are available with a rugged bourdon tube or a 316 stainless steel bellows sensing element for greater accuracy and sensitivity in lower ranges.

**OPLHBP/OPLHABPS** Internal latching control relays are available to provide ON/OFF automation for electric motor applications.

OPLHC and OPLHACS series are available in indication only Murphygage models (OPLHAGS). See the following pages to determine the model for your application.

## Basic Operation

The OPLHC/OPLHACS Series operates from static head pressure. Pressure is transmitted to the process connection of the Switchgage instrument. From here, the pressure flexes the bourdon tube or operates the 316 stainless steel bellows (depending on which model you have). The bourdon tube/bellows operates the stainless steel rotary geared movement, which in turn operates the indicating pointer on the face of the dial. When the pointer (A)



closes with the limit contact (B), a control circuit (C) is completed and signals an alarm and/or shutdown or starts/stops a pump.



Selected configurations are third-party listed. Consult Enovation Controls for details.

## Applications

- Saltwater Disposal Systems
- Waterflood Systems
- Diesel Day Tanks
- Oil Storage Tanks

## Internal Wiring

**OPLHC, OPLHACS and OPLHAFP Series**

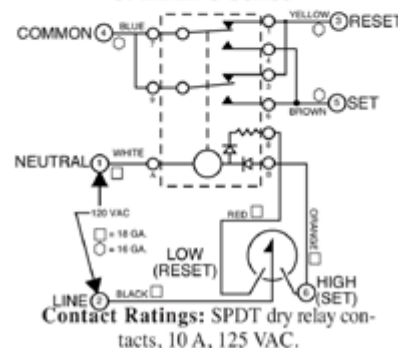


**OPLHCE, OPLHFC, OPLHACES and OPLHAFCS Series**



**Contact Ratings:** SPDT center off;  
2 A, 30 VDC, 1 A, 125 VAC pilot duty.

**OPLHBP and OPLHABPS Series**

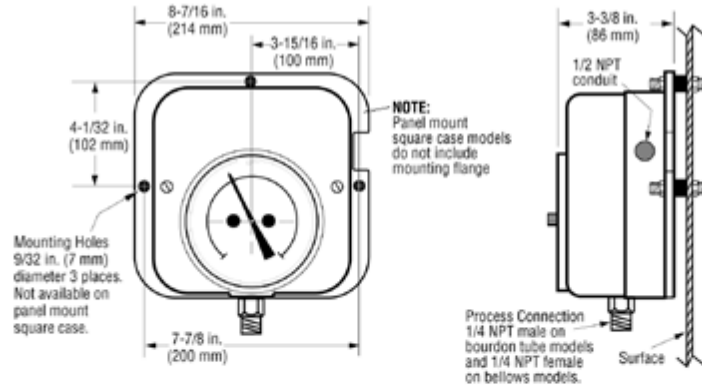


**Contact Ratings:** SPDT dry relay contacts, 10 A, 125 VAC.

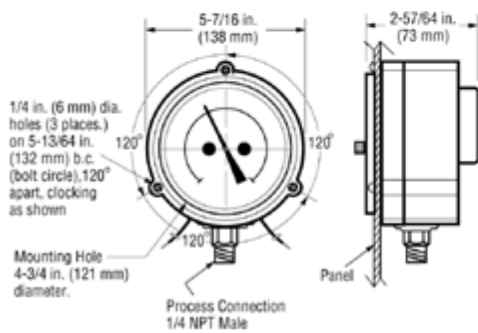


## Dimensions

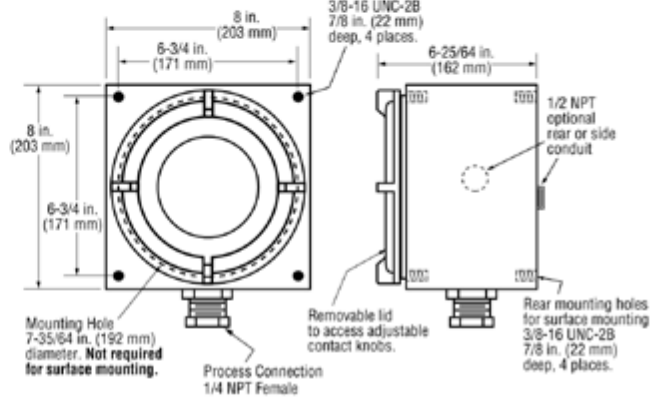
### Surface / Panel Mount Enclosure (Square Case)



### Panel Mount Enclosure (Round Case)

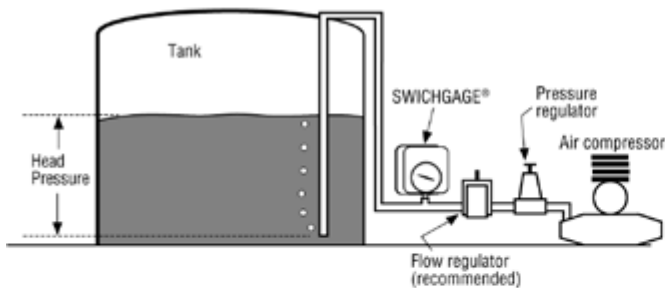


### Explosion-proof Enclosure ("EX" Option)

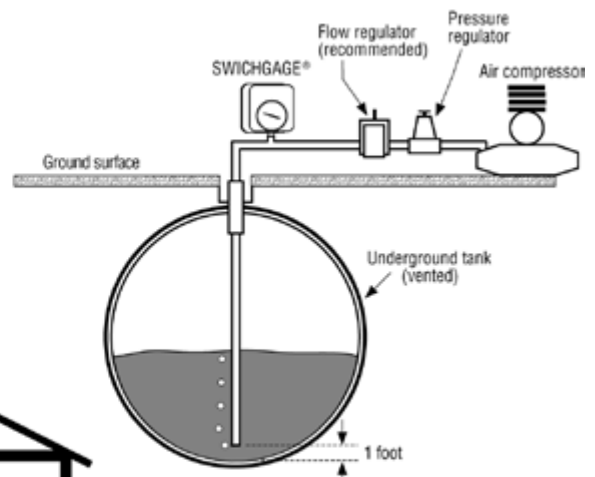


## Typical Applications

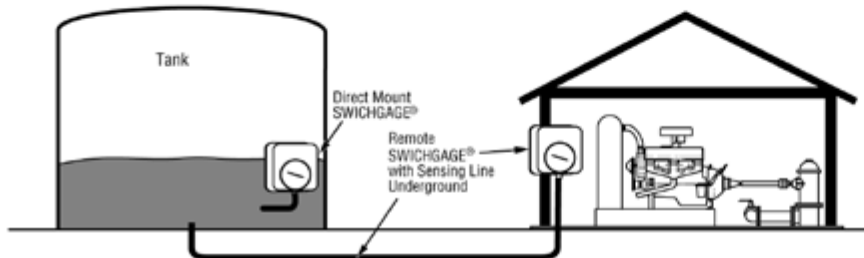
### Above Ground Tank



### Below Ground Tank



### Direct and Remote Tank



	OPLH / OPLHA Series													
	OPLHC*	OPLHFC	OPLHCE	OPLHACS	OPLHACES	OPLHRP	OPLHABPS	OPLHBPE	OPLHABPES	OPLHIG	OPLHFG	OPLHAGS	OPLHAFCS	OPLHAFGS
Enclosure Type (die cast aluminum)														
• Surface mount, square case	•			•		•	•		•		•			
• Panel mount, round case		•							•				•	•
• Panel mount, square case			•		•			•	•			•		
Limit Switch Ratings														
• Pointer Contacts: SPDT center off; 2 A, 30 VDC, 1 A, 125 VAC.	•	•	•	•		•	•	•	•	•			•	
Latching Control Relay														
• SPDT, 10 A @ 120 VAC (standard)						•	•	•	•					
• DPDT, 12 VDC (Optional)						•	•	•	•					
• DPDT, 24 VAC (Optional)						•	•	•	•					
• DPDT, 24 VDC (Optional)						•	•	•	•					
Sensing Element														
• Bourdon Tube, Bronze/Brass (standard)	•	•	•			•		•		•	•			
• Bellows, 316 Stainless Steel (standard)				•		•		•			•	•	•	•
Process Connections														
• 1/4 NPT Male	•	•	•			•		•		•	•			
• 1/4 NPT Female				•		•		•			•	•	•	•
• 2 NPT Male														
Geared Movement: 300 series stainless steel.	•	•	•	•		•	•	•	•	•	•	•	•	•
Accuracy (standard calibration is for water)														
• ±2% first/last quarters of scale, 1% middle half scale. <sup>(1)</sup>	•	•	•	•		•	•	•	•	•	•	•	•	•
OPTIONS AVAILABLE (specify when ordering)														
• Environment sealed for isolation from the elements (ES). <sup>(2)</sup>		•							•				•	•
• Explosion-proof case; Class I, Div. 2, Groups C & D (EX)	•			•		•	•							
• Explosion-proof less case; internal gage mechanism without case (EL)	•			•		•	•							
• Less case; internal gage mechanism without case (LC)	•	•	•	•		•	•	•	•	•	•	•	•	•
• Tickler contact (TA)				•									•	
RANGES AVAILABLE (specify when ordering)														
• 0–5 ft. (0–1.5 m) dual scale dial				•		•		•			•	•	•	•
• 0–10 ft. (0–3 m) dual scale dial				•		•		•			•	•	•	•
• 0–20 ft. (0–6 m) dual scale dial	•	•	•	•		•	•	•	•	•	•	•	•	•
• 0–30 ft. (0–9 m) dual scale dial	•	•	•	•		•	•	•	•	•	•	•	•	•
• 0–60 ft. (0–18 m) dual scale dial	•	•	•			•		•	•					
• 0–120 ft. single scale dial	•	•	•			•		•	•					
• 0–3.6 metres single scale dial				•		•		•			•	•	•	•
• 0–4 metres single scale dial				•		•		•			•	•	•	•
• 0–6 metres single scale dial				•		•		•			•	•	•	•
• 0–9 metres single scale dial	•	•	•	•		•	•	•	•	•	•	•	•	•

<sup>(1)</sup> Bourdon tube (OPLHC) models in the 20 ft. (6 m) range have an accuracy of 3% full scale. \* Bourdon tube, 316 SS optional

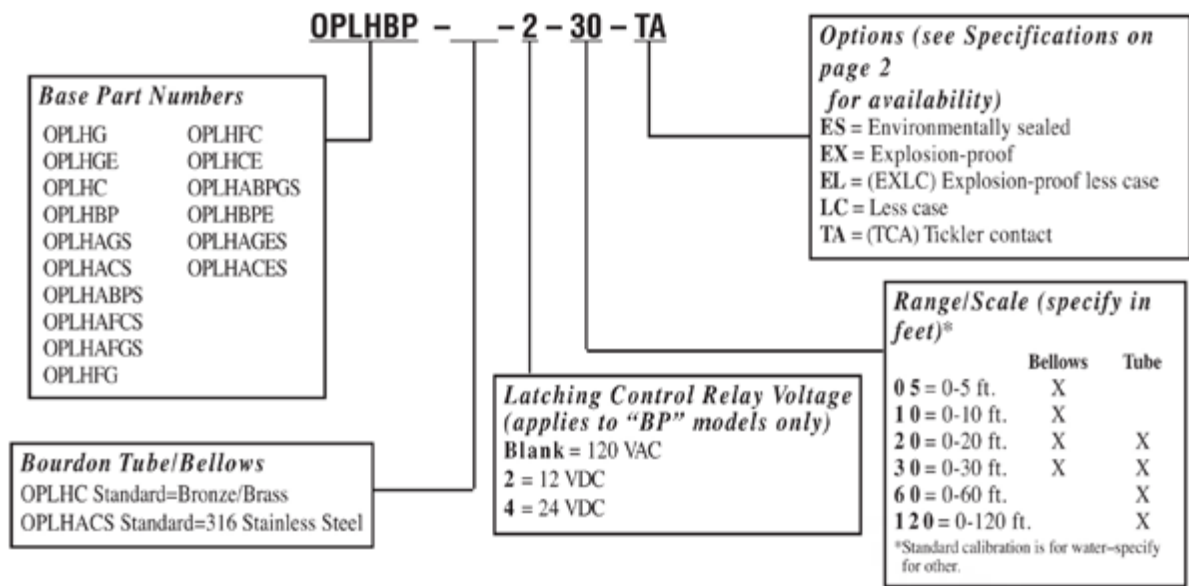
<sup>(2)</sup> ES option available for the 20 ft. (6 m) range models and above.


**NOTES:**

- Options may not be available in combination. Consult factory.
- Over range is not to exceed 10% FS above full range.
- Calibration is for water. Specify for other liquids.
- Add **TOTAL** height of liquid above the pressure connection to determine correct range (dial scale).  
For elevated tanks subtract the tank elevation from gage reading to determine actual tank level.

# How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Model and Description	Notes
05000610	Tamper-proof Contact Accessory	<div>Order 05000610</div> 

**Shipping Dimensions:**  
16 x 11 x 5-1/2 in. (406 x 279 x 140 mm)  
Explosion-proof models: 12 x 12 x 9 in. (305 x 305 x 229 mm)

**Shipping Weights:**  
Item Weight: 8 lb. (3.6 kg) approximately  
Explosion-proof models: 22 lb. (10 kg) approximately

## Section 20 Vibration, Time and Overspeed

	<b>Tachometers - Digital</b>	
9004	Selectronic® Digital Tachometer — MT90 Model. . . . .	111
96115	Digital Tachometer and Hourmeter with Adjustable Overspeed Set Point — MTH6. . . .	113
97050	Digital Tachometer/Hourmeter with Adjustable Overspeed Trip Point SHD30 and SHD30-45 Models . . . . .	115
	<b>Speed Switches</b>	
97118	Electronic Speed Switches — HD9063 Series, OS77D Series and SS300 Series . . . .	117
	<b>Hourmeters - Electromechanical</b>	
97030	Hourmeters — TM Series. . . . .	121
	<b>Timers - Mechanical</b>	
96095	Time Switches — Models 5T, 15T, 12T and 24T . . . . .	123
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96013	Shock and Vibration Switch — VS2 Series . . . . .	125
94092	Shock and Vibration Switch — VS94 Model . . . . .	129

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# Selectronic® Digital Tachometer

## MT90 Model

The Murphy Selectronic MT90 digital tachometer offers high accuracy and dependability resulting from use of a quartz crystal time-base and digital, solid-state electronics.

Tachometer power is supplied by either a Murphy magnetic pickup mounted at the flywheel ring-gear of an engine or by a 12-, 24- or 32-volt DC battery system.

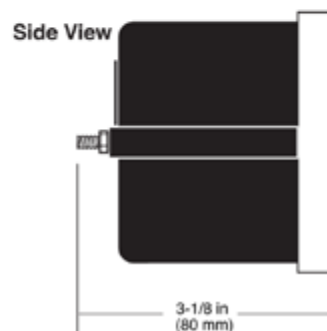
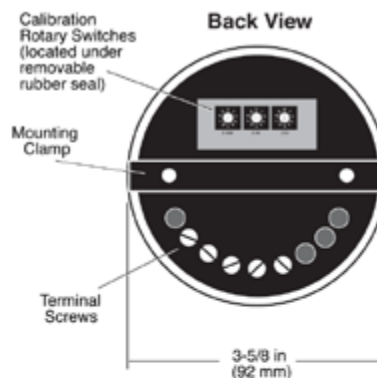
RPM data is supplied by either a Murphy magnetic pickup or by the alternator in your battery charging circuit. The MT90 tachometer also has backlighting for easy readings in low-lit areas. This lighting requires a battery power source.

The MT90 is calibrated to engine RPM by setting a series of calibration rotary switches on the back of the tachometer. The proper switch sequence for the engine is determined by (1) the number of ring gear teeth for the magnetic pickup or (2) by the ratio of alternator to engine pulley diameter and the number of poles of the alternator.

Typical applications include: generators, compressors, industrial engines, oil field equipment, marine vessels, vehicles, farm equipment and construction equipment.



### Dimensions



### Specifications

**Signal Input Voltage:** 4 to 35 Vrms from a magnetic pickup or alternator\*

**Pulses per Revolution:** 3 to 999

**Power Requirements**

**Pickup Power:** 4-35Vrms\*

**Battery Power:** 8-40 VDC (12, 24, 32 volt)

**Current:**

Tach backlight Off, 4mA @ 40 VDC

Tach backlight On, 25 mA @ 40 VDC

**Case:** 1018 polycarbonate/polyester blend

**Lens:** Polycarbonate

**Bezel:** #430 Stainless Steel

**Display:** LCD, 4-digit, seven segment

**Operating Temperature:** -4° to 158°F (-20° to 70°C)

**Storage Temperature:** -13° to 185°F (-25° to 85°C)

**Mounting Hole:** 3-7/16 in. (87 mm)

**Shipping Weight:** 14 oz. (0.4 kg)

**Shipping Dimensions:** 5-1/2 x 5-1/2 x 5-1/2 in. (140 x 140 x 140 mm)



# Magnetic Pickups



Pickup Models	Total Length	Threaded Length	Thread Size
MP3298*	3 in. (76 mm)	3 in. (76 mm)	5/8-18 UNF
MP7906+	3 in. (76 mm)	3 in. (76 mm)	3/4-16 UNF
MP7905±	4-1/2 in. (114 mm)	4-1/2 in. (114 mm)	3/4-16 UNF

\* Replaces 20-01-0080 and MP100. Lead wire hookup (12 in. [305 mm])  
+ Replaces 20-01-0081. Lead wire hookup (12 in. [305 mm])  
± Replaces 20-01-0082. Lead wire hookup (12 in. [305 mm])

## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



# MTH6 - Digital Tachometer and Hourmeter With Adjustable Overspeed Set Point

This microprocessor-based digital tachometer and hourmeter with a built-in overspeed switch is highly accurate and dependable. It measures speed and running hours and can give an alarm or shut down the engine on overspeed.

The MTH6 case is polycarbonate, and its dial measures 3-1/2 in. (89 mm) in diameter.

RPM data for the tachometer and overspeed switch is supplied by a magnetic pickup or battery charging alternator. The magnetic pickup is installed into the flywheel housing of an internal combustion engine. The starter ring gear acts upon the magnetic pickup to generate a voltage pulse each time a gear tooth passes the end of the sensor.

During normal operation, the MTH6 displays RPM. Its five-digit, liquid crystal display is updated every second. When the MTH6 is displaying hours and a speed signal is present, the far left digit and decimal point will flash indicating the hourmeter is operating.

The overspeed set point and running hours can be viewed by manipulating three membrane switches located on the MTH6 front panel. When the overspeed set point is met, an LED located on the front panel lights.

## Specifications

**Power Requirements:** 8-40 VDC (12, 24 or 32 VDC systems)

**Maximum Current:**

12 VDC: 0.011 A, backlight Off; 0.025 A, backlight On

24 VDC: 0.008 A, backlight Off; 0.015 A, backlight On

32 VDC: 0.007 A, backlight Off; 0.010 A, backlight On

**Operating Temperature:** -4° to 158°F (-20° to 70°C)

**Storage Temperature:** -40° to 185°F (-40° to 85°C)

**Case:** 1018 Polycarbonate/Polyester blend

**Mounting Hole Dimensions:** 3-3/8 in. (86 mm) Dia

**Speed Input:** 4.5 Vrms minimum

**Overspeed Switch Rating:** 2 A, 50 VDC

**Overspeed Range:** 0 to 9000 RPM

**Pulses per Revolution:** 4 to 255

**Tachometer Range:** 0 to 65,535 RPM

**Tachometer Accuracy:** ±1% of the display reading or -2 RPM whichever is greater

**Input Frequency Range:** 25 Hz to 20 kHz

**Hourmeter Range:** 0 to 99999 hrs

**Hourmeter Resolution:** ±0.1 Hour up to 9999.9; ±1 hour 10,000 and up

**Reset Hourmeter:** Apply temporary ground to terminal #5 to reset hours to zero

**Shipping Weight:** 14 oz. (435 g)

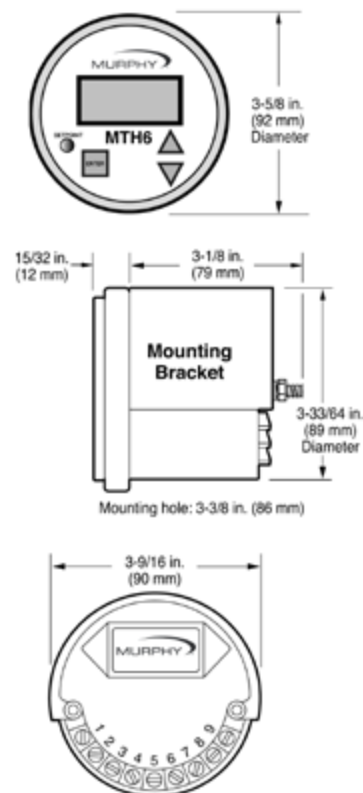
**Shipping Dimensions:** 5-1/2 x 5-1/2 x 5-1/2 in. (140 x 140 x 140 mm)



## Applications

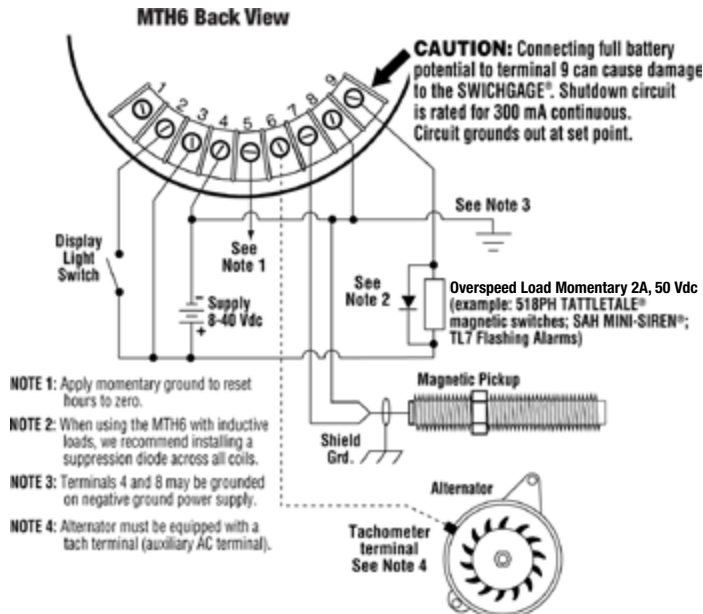
- Industrial Engines
- Generators
- Compressors
- Oil Field Equipment
- Marine Engines
- Vehicles
- Farm Equipment
- Construction Equipment

## Dimensions

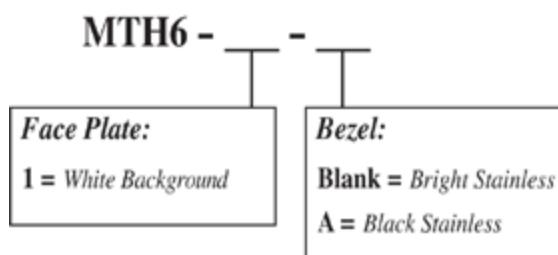


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# Digital Tach/Hourmeter w/Adjustable Overspeed Trip Point SHD30 and SHD30-45 Models

The SHD30 and SHD30-45 are microprocessor-based tachometers with hourmeter and an overspeed trip point. The trip point can be connected as either a form C relay output or as a normally open SCR output for alarm or shutdown on overspeed.

The SHD30 features a panel-mounting design, plastic enclosure that is 5-1/16 (129 mm) long and 4-1/4 in. (108 mm) high.

The SHD30-45 has the same enclosure, but it also has a backplate with studs to mount like an OPLFC.

The SHD30 models power and RPM data are supplied by either a magnetic pickup or a capacitor discharge (CD) ignition. The hourmeter is adjustable to a preset time and resettable to zero. Should power be lost, on-board batteries maintain the run hours display and allow for resetting the overspeed relay output.

When a tach signal is present the SHD30 models display RPM. When a tach signal is not present, the display is blank unless the Read Hours membrane key on the faceplate is pressed and held.

The five-digit, liquid crystal display is updated every second. The run hours, overspeed set point and current pulses per engine revolution can be displayed by manipulating the membrane switches. Run hours can be displayed even after power is lost. The run hours display can be configured to alternate with the RPM display.

## Ease of Calibration

The SHD30 models calibration is accomplished by entering the number of pulses per engine revolution using the Pulses per Revolution and Overspeed Set point membrane keys on the faceplate. The number of pulses is determined by the number of cylinders, cycles and ignition features. It is also determined by the number of ring gear teeth of the engine's flywheel on a magnetic pickup system.

Presetting and resetting running hours is done from the back and front of the SHD30 models.

## Applications

- Gas Compressors
- Oil Field Equipment
- Industrial Engines
- Generators



\* When installed per Murphy drawing 20-08-0258

## Specifications

### Power input:

#### CD ignition:

- 90 to 350 VDC
- 150  $\mu$ A typical @ 90 VDC
- 300  $\mu$ A @ 350 VDC

#### Magnetic Pickup:

- 5 to 120 Vrms
- 325  $\mu$ A typical @ 5 Vrms, 100 Hz
- 450  $\mu$ A typical @ 5 Vrms, 1 kHz
- 1 mA typical @ 5 Vrms, 5 kHz
- 2 mA typical @ 5 Vrms, 10 kHz
- 15 mW max. @ 5 Vrms, 10 kHz
- 2.8 W max. @ 120 Vrms, 10 kHz

**Backup Batteries:** 2 replaceable, long-life Lithium batteries, Panasonic CR2032 or equivalent, 3 V, 220 mAh power. Shelf life expectancy 10 years

**Operating Temperature:** -4° to 158°F (-20° to 70°C)

**Storage Temperature:** -40° to 300°F (-40° to 150°C)

**Case Material:** Plastic

**Ignition Frequency Range:** 3 to 666 Hz

**Magnetic Pickup Frequency Range:** 1 to 10 kHz

### Overspeed Output:

Connected to S.C.R. (Silicon Controlled Rectifier) terminals:

0.5 A, 350 VDC continuous

Connected to Form C Relay terminals:

Relay Contact, 0.5 A, 30 VDC, 125 VAC resistive

**Tachometer Accuracy:**  $\pm 0.5\%$  of the display reading or  $\pm 1$  RPM whichever is greater

**Hourmeter Range:** 0 to 65535 hrs

**Hourmeter Accuracy:**  $\pm 15$  minutes per year

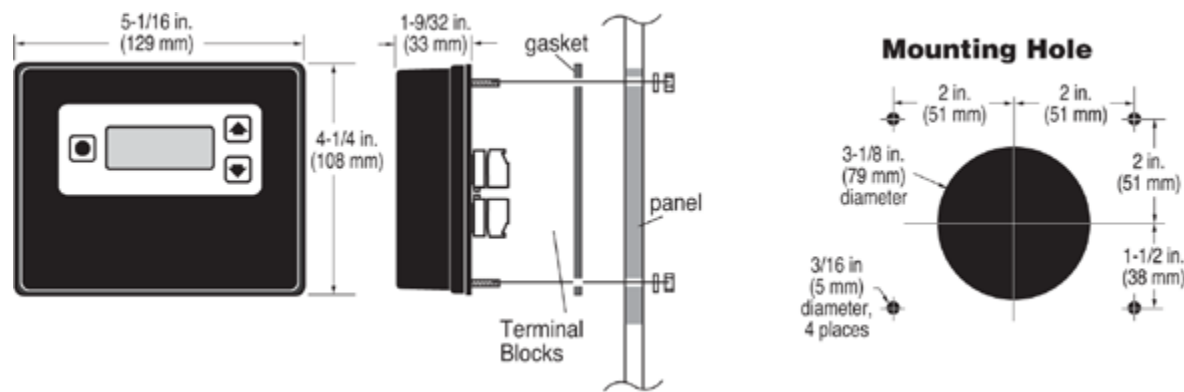
**Laboratory Approvals:** CSA (Canadian Standards Association) approved for Class I, Division 2, Groups C & D hazardous areas

**Shipping Weight:** 1 lb (0.5 kg)

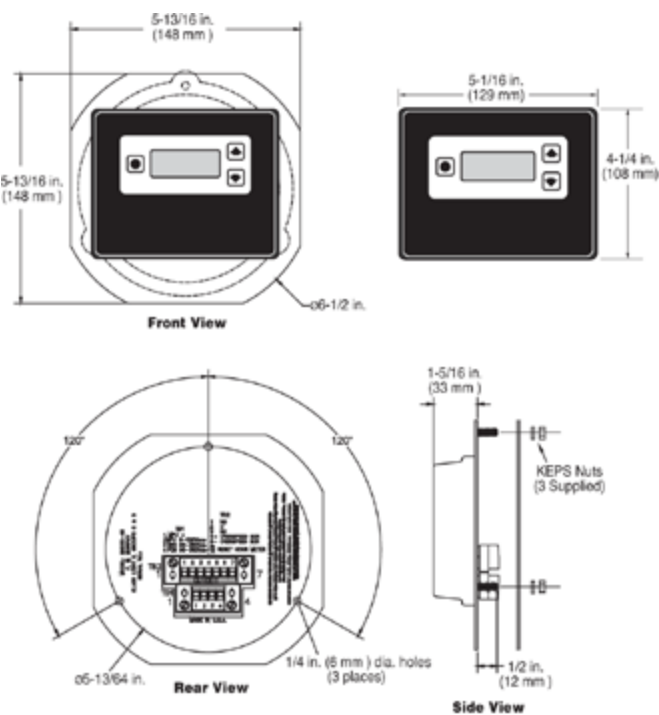
**Shipping Dimensions:** 9-1/4 x 8-1/4 x 5-1/4 in. (235 x 210 x 133 mm)

Dimensions

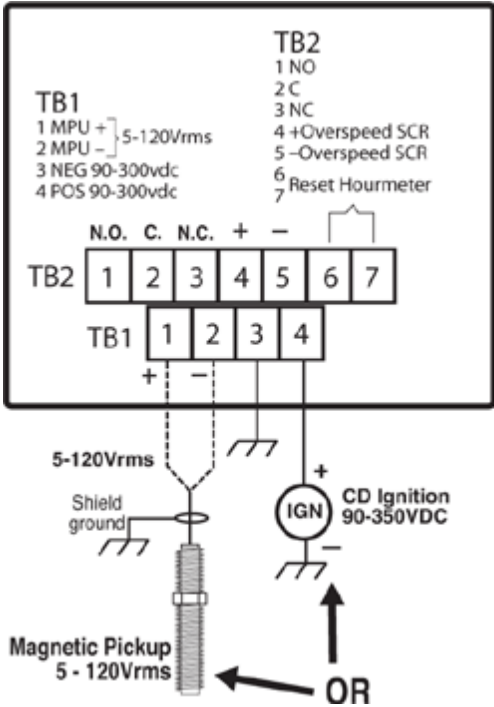
SHD30



SHD30-45



Typical Wiring Diagram



**WARNING:** In hazardous areas the overspeed relay contact is certified for use ONLY with Murphy non-incendive or intrinsically safe products. In non-hazardous areas overspeed relay contact may be used to switch electromechanical Tattletale® or Magnetic Switches that do not exceed the relay contact rating: 1 A, 30 VDC; 0.3 A, 110 VDC; 0.5 A, 125 VAC. However, the preferred output to switch electromechanical Tattletale® or Magnetic Switches is the N.O. SCR.

How to Order

Part Number	Model and Description	Notes
Specify Model Number	SHD30 Tach/Hourmeter with Overspeed	
	SHD30-45 Tach/Hourmeter with Overspeed to mount like SHD45 or OPLFC	
00009389	Panasonic CR2032 or equivalent backup battery (2 required)	

# Electronic Speed Switches

## HD9063, OS77D and SS300 Series

Murphy Electronic Speed Switches are available in various configurations to cover a wide variety of applications. These compact devices receive their input signal from various sources depending upon the particular speed switch model and application. They are available in single or dual switch point models, and the switch point(s) are field adjustable.

Models are available in self-contained enclosures and as PC-board design for inclusion in your control cabinet. All Murphy speed switches are designed to operate in harsh environments and have high electrical noise immunity.



### Series Models Available

**SS300 Series:** Single set point speed switch with SPDT relay dry contact output.

**OS77D Series:** Single set point speed sensing module with a transistor output.

**HD9063 Series:** Dual set point speed switch in a PC board configuration and relay outputs.

### Applications

Murphy speed switches applications include operating alarms and equipment shutdown. They are ideal for disconnecting starter cranking on auto start systems or overspeed switching:

- |                      |                  |
|----------------------|------------------|
| • Generators         | • Pumps          |
| • Compressors        | • Vehicles       |
| • Industrial Engines | • Farm Equipment |

### Selecting a Speed Switch

In selecting the best Speed Switch for your application, the following factors should be considered:

- **Number of Switch Points**  
How many switch points are needed to perform the speed switching function you require?
- **Available Signal Sources**  
The signal source must provide a minimum frequency and a minimum, but less than maximum, voltage as required by the selected speed switch.
- **What Is the Frequency Output of the Signal Source?**  
The following signal sources can be used with most Murphy Electronic Speed Switches.  
Note: they may additionally provide the signal and/or power source for some Murphy Tachometer/Tachswitch™ instruments.

**Magnetic Sensor:** The sensor is usually mounted through the flywheel housing so that the sensor tip is in close proximity to the ring gear teeth. Output voltage is dependent upon the amount of the gap between the sensor tip and the gear tooth.

$$\text{Set Point Frequency in Hz} = \frac{\text{No. Gear Teeth} \times \text{RPM Set Point}}{60}$$

**Alternator Output:** Most industrial engine alternators have an auxiliary or tachometer tap. This tap can provide the signal source for speed switches and tachometers.

$$\text{Set Point Frequency in Hz} = \frac{\text{Pulley Ratio} \times \text{No. of Alternator Poles} \times \text{RPM Set Point}}{120}$$

**Ignition Output:** This battery ignition signal is commonly used on gasoline and natural gas fueled type engines. The tap is usually located either on the distributor or on the ignition coil. The ignition can be breaker point type or all electronic.

$$\text{For 2 Cycle: Set Point Frequency in Hz} = \frac{\text{No. of Cylinders} \times \text{RPM Set Point}}{60}$$

$$\text{For 4 Cycle: Set Point Frequency in Hz} = \frac{\text{No. of Cylinders} \times \text{RPM Set Point}}{120}$$

**Signal Generators:** Add-on signal generators produce a voltage and frequency output. Match this output to the requirements of the speed switch selected.



## SS300 Series

The SS300 Series are single set point speed switches with SPDT relay dry contact output. The trip point is set by a potentiometer. An LED indicates when the signal source is present. A second LED turns on when the trip point is reached. See Table 1 for available models and requirements. An optional time delay is on board to delay operation of the relay for 2-6 seconds after the set point has been reached.

The SS300 Series speed switch is intended for installation within a weatherproof enclosure to protect it from rain, dust, etc.

### Application

**Overspeed shutdown.** Shuts down the engine if RPM exceeds the preset limit.

**Speed sensitive pull-in/drop-out.** Engage or disengage PTOs, four-wheel drives, other switch points, etc. according to the engine speed being monitored.

**Engine and transmission alarms/shutdowns.** Oil pressure in some engines and transmissions varies widely between running and idle speeds. The SS300 Series can select between two pressure switch set points according to speed of the engine or transmission and thus give maximum protection to the equipment while at operating RPM and eliminate nuisance alarms when at idle.

**Adjustable differential model.** The AD can be adjusted to change the speed range over which the pull-in and drop-out differential of the relay will operate. A typical application is to ensure that engine speed is above a minimum RPM before applying a load but allows a drop in speed of several hundred RPM without disconnecting the load.

Table 1: Models Available and Input Signal

Model No.	Distributor Ignition	Magnetic Pickup	Alternator	Voltage	
				12	24
SS300 (std. model)		X		X	X
SS300-LF (low frequency)	X		X	X	X
SS300-AD (adjustable differential)		X		X	X
SS300-AD-LF (low frq. & Adjst. diff.)	X		X	X	X

## Specifications

### Power Requirements:

12 VDC (9-16 VDC)

24 VDC (18-30 VDC)

### Frequency Signal:

#### Voltage (all models):

Minimum Input Voltage Signal: 4.5 Vrms

Maximum Input Voltage Signal: 50 Vrms

Maximum Current	12V	24V
Pull In	46 mA	46 mA
Pickup Only	10.5 mA	16 mA

Frequency Range in Hz	Model Number
25-2000	SS300-LF, SS300-AD-LF
625-9000	SS300-AD, SS300

### Reset Differential Magnetic Pickup Signal Models:

Standard Models: 2 Hz Differential

AD Models (Adjustable Differential): 650-8900 Hz Adjustable

### Reset Differential Alternator Models:

LF Models (Low Frequency): 2 Hz Differential

AD-LF Models (Adjustable Differential Low Frequency): 50-1900 Hz Adjustable

**Output:** Relay contact, SPDT, resistive load, 6 A, 30 VDC

**Time Delay:** When terminal 7 is grounded, the relay operation is delayed for 2-6 seconds after RPM set point is reached.

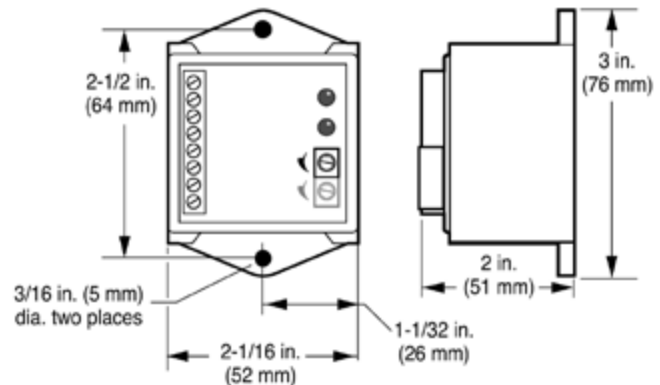
**Adjustment:** 20-turn potentiometer(s)

**Temperature Range:** -4° to 185°F (-20° to 85°C)

**Relative Humidity:** 0 to 95% Non-condensing

**Case:** Black, ABS plastic

## Dimensions





## HD9063 Series

The HD9063 Series is a unitized two set point speed switch with SPDT relay outputs. HD9063 is a PC-board configuration with standoffs for mounting in a control panel or cabinet.

The HD9063 provides crank disconnect and overspeed functions. Trip points can be field adjusted on all models. LEDs next to the set point potentiometers indicate that the trip point has been reached and the relay(s) have operated. An overspeed test circuit is built-in. It will actuate the output relay at a point 10 percent below the actual overspeed set point.

### Application

Crank disconnect/overspeed are functions where the HD9063 is used to disconnect the starter on automatic start engine applications and to shut down the engine if an overspeed situation occurs. Re-engagement of the starter is inhibited until RPM returns virtually to zero. Typical applications include: standby generator sets, pumps and compressors.

## Specifications

**Power Supply:** Voltage: 8-30 VDC

**Maximum Current:** 150 mA

**Frequency Signal: (Voltage, Magnetic Pickup Signal Models):**

Minimum: 0.35 Vrms

Maximum: 60 Vrms

**Maximum Signal:** 4.8  $\mu$ A

**Adjustment Range:**

Crank Disconnect: 250-6,000 Hz

Overspeed: 1,100-10,000 Hz

**Reset Differential, Magnetic Pickup Signal Models**

Crank Disconnect: Dropout 160 Hz  $\pm$  5%

Overspeed: 200 Hz Differential

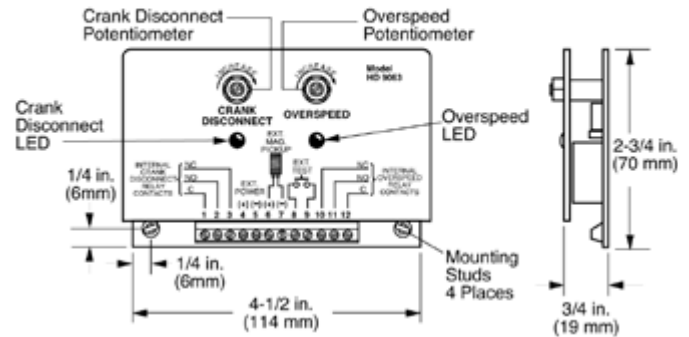
**Output:** Relay Contact, SPDT, Resistive Load: (2) 5 A 30 VDC

**Adjustment:** (2) 270°-turn potentiometer

**Temperature Range:** 14° to 158°F (-10° to 70°C)

## Mounting Dimensions / Wiring

HD9063



## OS77D Series

The OS77D Series single set point speed switch is a compact all-electronic speed sensing module. It can be panel mounted via its trip set point potentiometer. It is field adjustable and gives a transistor output when tripped. Relay models available.

Models are available with Normally Open or Normally Closed circuit and with or without re-crank feature, which inhibits starter re-engagement until the engine speed is near zero RPM.

### Application

Overspeed shutdown. Activates engine shut-down circuit on engine overspeed.

Operate PTOs or drive circuits. Engage or disengage engine PTO, four-wheel drives or other control circuits according to RPM monitored.

Disconnect engine cranking when engine starts.



OS77D

## Specifications

**Power Supply:** Voltage: 7-28 VDC

**Maximum Current:** 100 mA

**Frequency Signal:**

**Voltage, Magnetic Pickup Signal Models**

Minimum: 1.2 Vrms

Maximum: 30 Vrms

**Voltage, Distributor Ignition Models**

Minimum: 6 Vrms

Maximum: 30 Vrms

**Maximum Signal Current, Magnetic Pickup Signal Models:**

0.12 mA

**Maximum Signal Current, Distributor Ignition Models:** 0.12 mA

**Adjustment Range, Magnetic Pickup Signal Models:**

1000-10,000 Hz

**Adjustment Range, Distributor Ignition Models:** 40-400 Hz

**Reset Differential, Magnetic Pickup Signal Models**

Non-recrank model: 10 Hz Differential

Recrank model: dropout 54 Hz

**Reset Differential, Distributor Ignition Models**

Non-recrank model: 10 Hz Differential

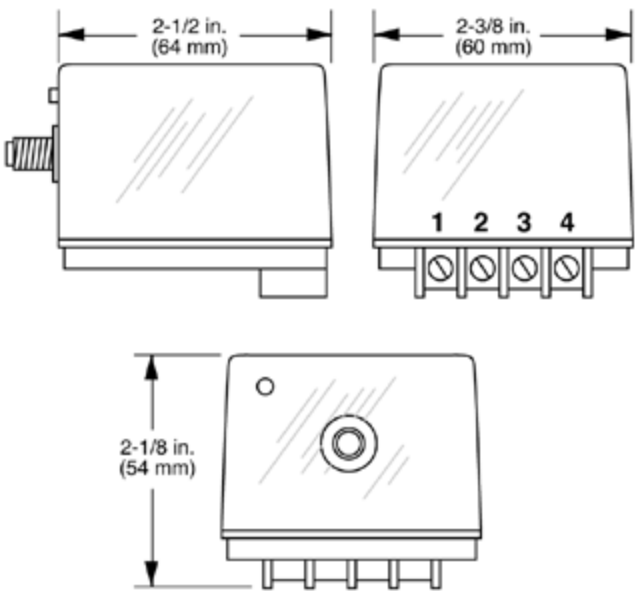
Recrank model: Dropout 2.4 Hz

**Output:** Transistor Sink to Ground Resistive Load: 2 A, 28 VDC

**Adjustment:** 270°-turn potentiometer

**Temperature Range:** -13° to 185°F (-25° to 85°C)

## Dimensions



## How to Order

Part Number	Model and Description	Notes
Specify Model Number and Voltage	SS300 Series	See Table 1
Specify Model Number	HD9063 Series	Two set points, PC board mounting, crank disconnect and overspeed
	OS77D-900NTO	Normally Open; 1000- 10,000 Hz, magnetic sensor input
	OS771-040NTO	Normally Open; 40-400 Hz, distributor ignition input
	OS77D-900NTC	Normally Closed; 1000-10,000 Hz, magnetic sensor input
	OS77D-900RTC	Normally Closed; 1000-10,000 Hz, max. with recrank feature

# Hourmeters TM Series

The TM Series hourmeters record the operating time of vehicles or powered equipment. They are electromechanical and have a quartz base time counter that ensures accuracy (better than  $\pm 0.02\%$  over the entire range). They can record up to 99,999.9 hours (9,999.9 for TM612/624) and include an automatic recycle to zero hours feature. The TM Series models have a shock-proof and tamper-proof, totally sealed case made of an engineered plastic. These small, lightweight time meters are rugged and durable. They are the answer to applications requiring a low DC power and reliable hourmeter. The TM612/624 model includes a three-hole mounting shock ring for extreme shock protection.

These hourmeters can be used on any engine where operating time needs to be recorded. All it requires is a DC power source (refer to Specifications).

## Outstanding Features

- Solid-State Electronic Drive Circuit
- Quartz-Crystal for Accurate Timing
- Quiet Operation – Permanently Lubricated
- High-Impact, Tamper-proof Plastic Case
- Sealed Against Moisture and Dirt
- Indicates Operating Time in Hours and Tenths
- No Battery Back Up Required
- Made in the U.S.A.

## Specifications

**Power Input:** 12 to 24 VDC

**Power Consumption:** Less than 0.03 W @ 12 VDC; 0.4 W @ 24 VDC

**Accuracy:**  $\pm 0.02\%$  over entire range

**Temperature Range:**  $-40^{\circ}$  to  $185^{\circ}\text{F}$  ( $-40^{\circ}$  to  $+85^{\circ}\text{C}$ )

**Dial (Face Plate):** White numerals (over black background)

**Time Scale:**

TM4592-95 models: 6-digits 99,999.9 hours

TM612/624 models: 5-digits 9,999.9 hours

Automatic recycle to zero

**Vibration Resistance:** Withstands 10 to 75 Hz @ 1 to 8 Gs

**Case Material:** Plastic

**Bezel:** Stainless Steel

**Terminations:** 1/4 in. (6 mm) male blade terminals

**TM4592/4595 Shipping Weight:** 5 oz. (140 g)

**Shipping Dimensions:** 3-1/8 x 3 x 3 in. (79 x 76 x 76 mm) approximately

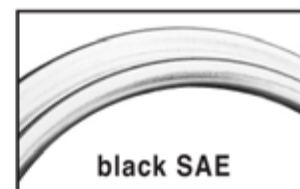
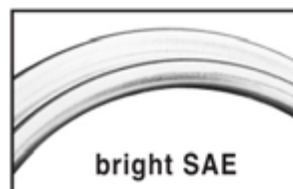
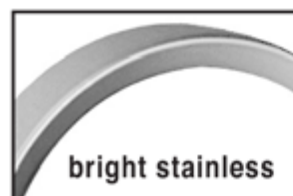
**TM612/624 Shipping Weight:** 8 oz. (230 g)

**TM612/624 Shipping Dimensions:** 5 x 5 x 3-1/4 in. (127 x 127 x 83 mm) approximately



\* Products covered by this bulletin conform with European Council electro-magnetic compatibility directive 89/336/EEC, except as noted.  
The CE mark does not apply to the TM612 and TM624 models

## Available Bezels



## Basic Models

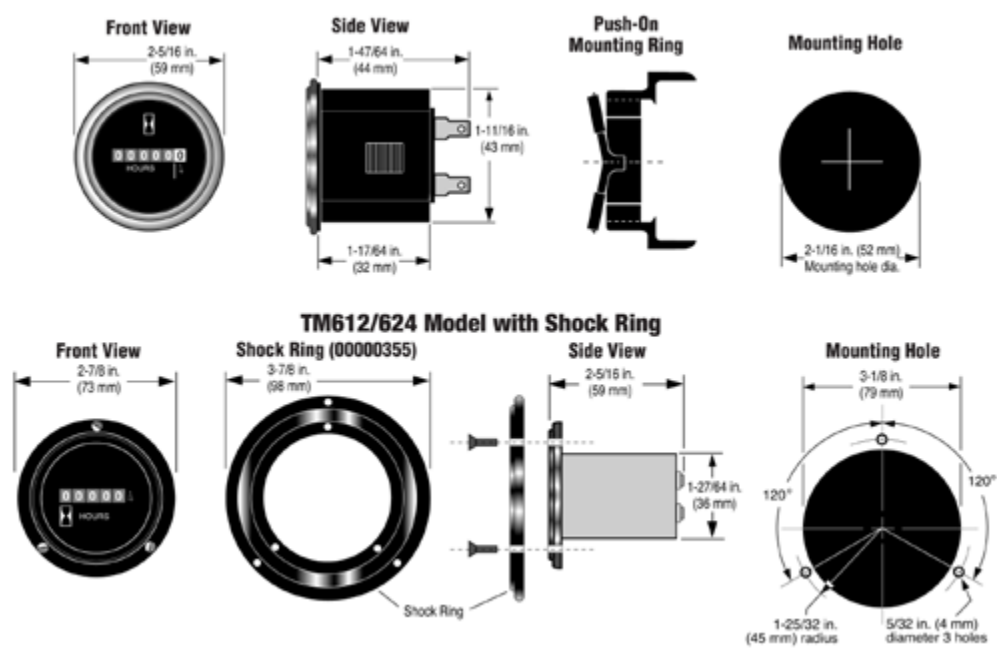
### 6-Digits Hourmeters

Model	Bezel Type
TM4592	Bright Stainless Steel Bezel
TM4593	Black Stainless Steel Bezel
TM4594	SAE Bright Stainless Steel Bezel
TM4595	SAE Stainless Steel Black Bezel

### 5-Digits Hourmeter with Shock Ring Mounting

TM612/624	3-Hole Mount, Black Bezel
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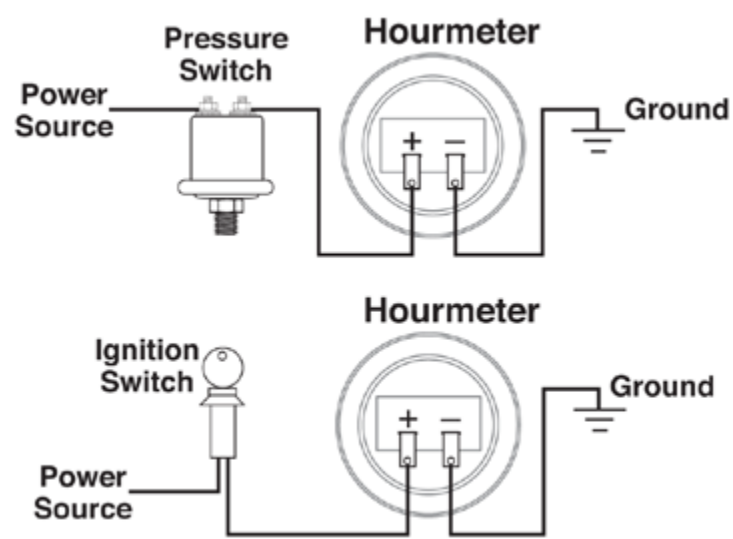
Dimensions



Typical Wiring Diagram



**WARNING:**  
Turn the power  
source OFF before  
wiring.



How to Order

Part Number	Model and Description	Notes
20700192	TM4592 6 digits w/Bright Stainless Steel Bezel	Bezel
20700193	TM4593 6 digits w/Black Stainless Steel Bezel	
20700194	TM4594 6 digits w/SAE Bright Stainless Steel Bezel	
20700195	TM4595 6 digits w/SAE Stainless Steel Black Bezel	
20700144	TM612/624 5 digits w/Shock Ring Mount Black Bezel	
00000355	Shock Ring only for TM612/624	Shock Ring

# Time Switches

## Models 5T, 15T, 12T and 24T

Murphy Time Switches can automatically start or stop engines or electrical motors after a predetermined time. These time switches can be wired for an open or closed circuit when time expires. They require no electrical current to operate and have an SPDT contact arrangement. These switches feature a precision movement that gives years of reliable service. The switches' precision movement can be set to zero anytime, and a built-in stop prevents overwinding.

Two versions are available: an hour switch for setting run time and shutdown of equipment; and a minute switch for short interruption of Swichgag® circuits on test or start up.

The **12T (12 hour)** and **24T (24 hour)** time switches are enclosed in a NEMA 4 weatherproof enclosure. A hinged, gasketed cover and 1/2 NPT conduit connection allow for a dust-tight installation. The enclosure includes a clasp and eye for a padlock to prevent unauthorized operation. Instructions for popular engine applications are secured inside of the lid.

The **5T (5 minute)** and **15T (15 minute)** timers mount directly in control panels for short range timing with manual reset.

These switches are perfect for disconnecting shutdown circuits while equipment is being started.

Murphy Time Switches are designed for use in the oil field, irrigation systems or anywhere equipment must operate or be controlled for a predetermined time. Mounted on a post or in a panel away from vibration and shock, these time switches give accurate, long-term service.



## Specifications

### Range:

**12T:** 0-12 hours in 15 minute intervals

**24T:** 0-24 hours in 30 minute intervals

**5T:** 0-5 minutes

**15T:** 0-15 minutes

**Operating Temperature Range:** 32° to 185°F (0° to 85°C)

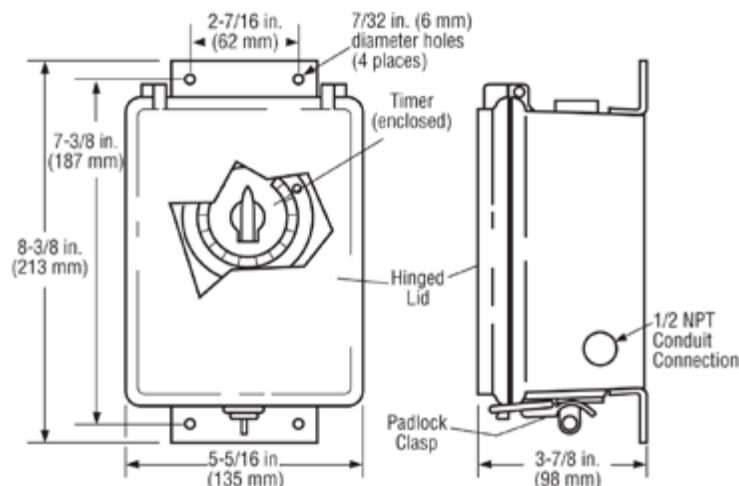
**Contact (all models):** SPDT, rated 5 A @ 480 VAC; 10 A @ 250 VAC; 15 A @ 48 VDC

**Shipping Weight:** 12T, 24T: 4 lbs. 12 oz. (2.15 kg); 5T and 15T: 6 oz. (11.66 g)

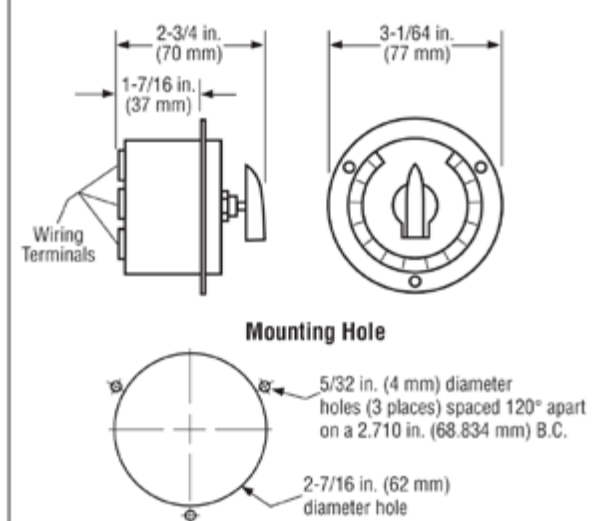
**Shipping Dimensions:** 12T, 24T: 9-1/4 x 8-1/4 x 5-1/2 in. (235 x 210 x 140 mm); 5T and 15T: 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm)

## Dimensions

### 12T and 24T 5TWP and 15TWP



### 5T and 15T



## Typical Wiring

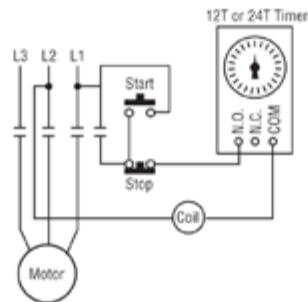


### WARNING

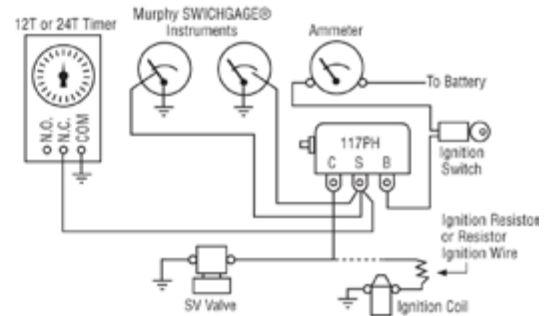
Before beginning installation of this Murphy product:

- ✓ Disconnect all electrical power to the machine.
- ✓ Make sure the machine cannot operate during installation.
- ✓ Follow all safety warnings of the machine manufacturer.
- ✓ Read and follow all installation instructions.

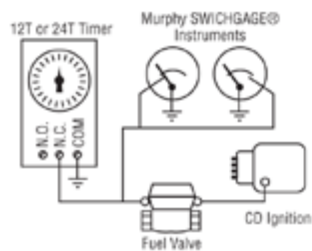
### Electric Motor



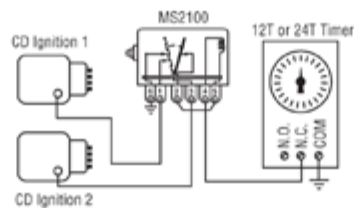
### Diesel Engine



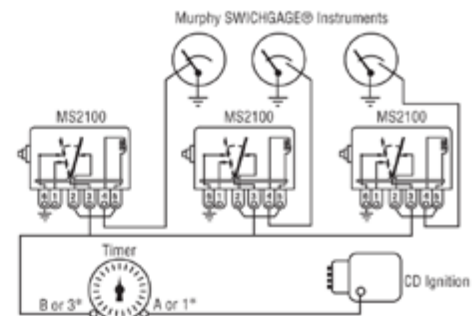
### Fuel Valve and CD Ignition



### Dual CD Ignition



### SWICHGAGE® Circuit Disconnect (5T and 15T)



\*Refer to Electrical diagrams on reverse side.

## How to Order

Part Number	Model and Description	Notes
20700155	<b>5T:</b> 5 minute timer	Time switch
20700154	<b>15T:</b> 15 minute timer	
20700031	<b>12T:</b> 12 hour timer	
20700037	<b>24T:</b> 24 hour timer	
20000033	12T & 24T Repair Kit, case and lid assembly	Service



# Shock and Vibration Switch VS2 Series

The VS2 Series switches are shock-sensitive mechanisms for shutdown of engine or electric motor powered equipment. It is designed to detect shock/vibration in three planes of motion.

These fully adjustable switches use a magnetic latch to ensure reliable operation. Explosion-proof EX models for hazardous locations are available.

Ideal for use on engines, pumps, compressors, heat exchangers and pumping units, the VS2 Series can be used where shut-down protection from damaging shock/vibration is desired. Switches are field adjustable to the sensitivity required in each application.

## Specifications

**Normal Operating Temperature:** -40° to 185°F (-40° to 85°C); For UL and CSA applications, applicable temperature specification is de-rated to -40° to 140°F (-40° to 60°C)

### VS2 and VS2C

**Case:** Environmental Protection: Ingress protected to IP54 (when mounted on a horizontal surface with drain holes down). Suitable for non-hazardous areas. VS2C: C-clamp mount, includes 45 ft. (13.7 m) 2-conductor cable and 5 cable clamps

**Contacts:** SPDT-double make leaf contacts, 3A @ 240 VAC; 10A @120 VAC; 10A @ 32 VDC

**Shipping Weight:** VS2: 2 lb. 8 oz. (1.1 kg); VS2C: 7 lb (3.2 kg)

**Shipping Dimensions:** VS2: 8-1/4 x 9-1/4 x 5 in. (210 x 235 x 127 mm); VS2C: 12 x 7 x 5-1/2 in. (305 x 178 x 140 mm)

### VS2EX

**Case:** Base mount, explosion-proof aluminum alloy housing; meets IP54 specifications; Class I, Division 1, Groups C & D; UL and CSA listed

**Certification:** CSA, UL

**Snap switches:** 2-SPDT snap switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC

**Shipping Weight:** 4 lb. 8 oz. (2 kg)

**Shipping Dimensions:** 8-1/4 x 9-1/4 x 5 in. (210 x 235 x 127 mm)

### VS2EXR

**Case:** Same as VS2EX

**Certification:** CSA, UL

**Snap switch:** 1-SPDT snap switch and reset coil; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC

**Remote Reset:** 115 VAC or 24 VDC (specify)

**Shipping Weight:** 5 lb. 8 oz. (2.2 kg)

**Shipping Dimensions:** 8-1/4 x 9-1/4 x 5 in. (210 x 235 x 127 mm)

### VS2EXRB

**Case:** Explosion-proof aluminum alloy housing; designed to meet Class I, Division 1, Group B hazardous areas

**Certification:** No third-party certification

**Snap switch:** 1-SPDT snap switch with reset coil (option available for 2-SPDT switches); 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC

**Remote Reset:** 115 VAC or 24 VDC (specify)

**Shipping Weight:** 17 lb. 8 oz. (7.9 kg)

**Shipping Dimensions:** 12 x 12 x 10 in. (305 x 305 x 254 mm)



\* Selected configurations are third-party listed.

## Basic Operation

Pushing the reset button moves the tripping latch into a magnetically held position. A shock/vibration will move the magnet beyond this holding position, thus freeing the spring loaded tripping latch to transfer the contacts and shut down the machinery (see dimensional diagrams or visual representation of parts).

## Remote Reset Operation (VS2EXR and VS2EXRB)

The remote reset option includes a built-in electric solenoid which allows reset of tripped unit from a remote location. Available for 115 VAC or 24 VDC.

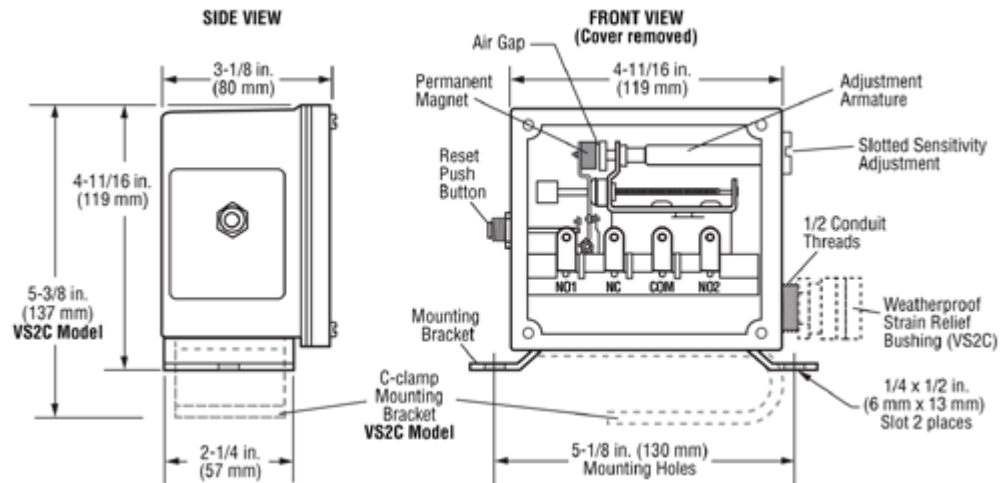
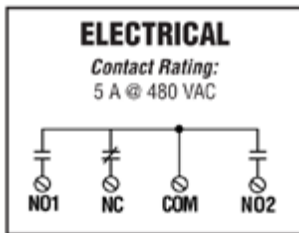


## Dimensions

Environmental Protection: Ingress protected to IP54 (when mounted on a horizontal surface with drain holes down).

### VS2 and VS2C

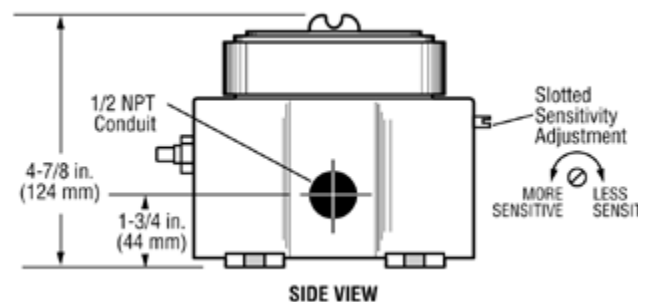
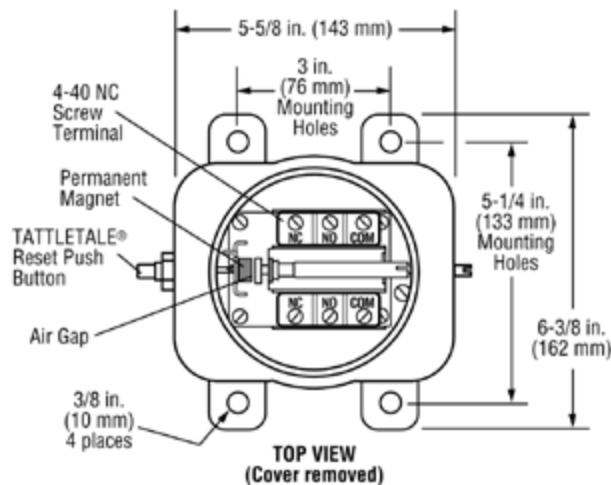
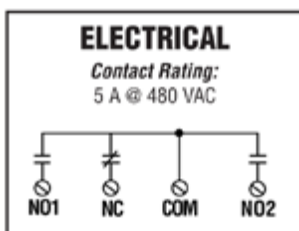
The VS2 and VS2C are designed for use in non-hazardous locations. They have leaf type SPDT, double make contacts that can be used for shutdown and/or alarm. They have a slotted sensitivity adjustment located on the side of the case (see drawing).



### VS2EX

- IP54 Specifications
- Snap switch Contacts
- Tattletale® Reset Button

Model VS2EX is housed in an explosion-proof enclosure with threaded cover. This enclosure is CSA and UL listed for Class I, Division 1, Groups C & D hazardous locations. In place of the leaf type contacts, 2-SPDT snap-switches are used in this model. Sensitivity is externally adjustable, and when tripped, the VS2EX gives a Tattletale indication on the reset button. It is constructed to meet IP54 specifications.



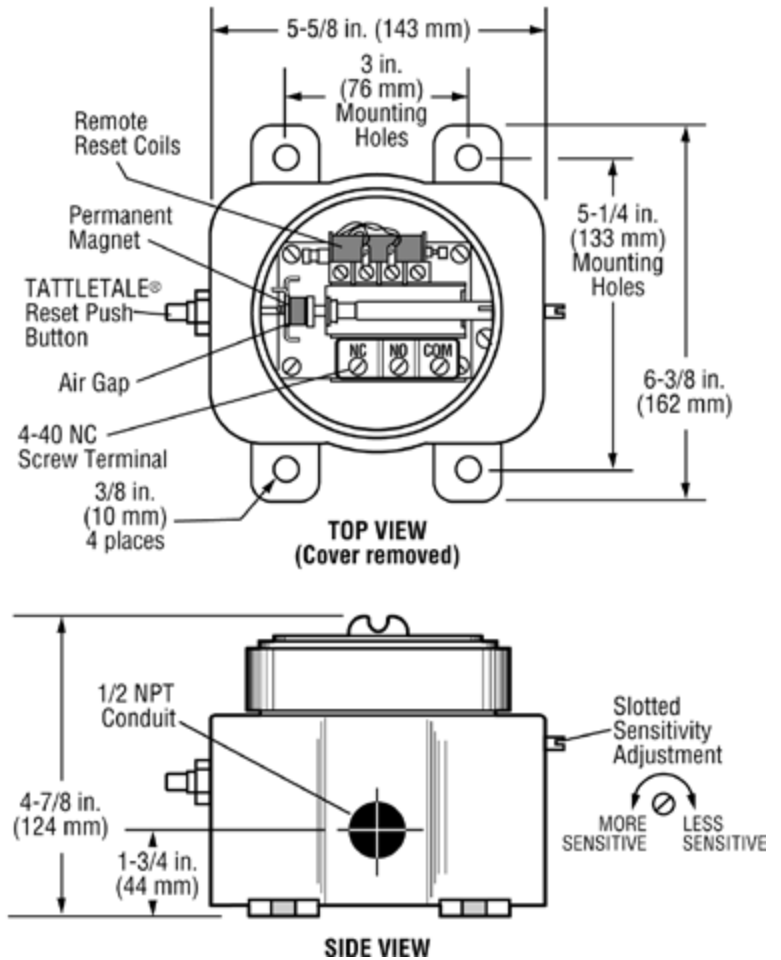
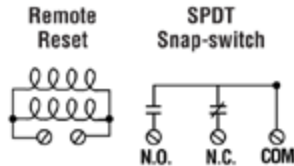
## VS2EXR

- Remote Reset Feature
- IP54 Specifications
- Snap-switch Contacts
- Tattletale® Reset Button

Model VS2EXR features an electric remote reset feature in addition to the Tattletale reset button. The VS2EXR uses only one SPDT snap-switch and is CSA and UL listed for Class I, Division 1, Groups C & D hazardous locations. It is constructed to meet IP54 specifications.



ELECTRICAL	
<b>Contact Rating:</b>	
5 A @ 125-480 VAC	
1/2 A @ 125 VDC	
1/4 A @ 250 VDC	
2 A Resistive 30 VDC	
1 A Inductive 30 VDC	
<b>Remote Reset Rating:</b>	
115 VAC or 24 VDC (Specify)	
350 mA AC/DC	

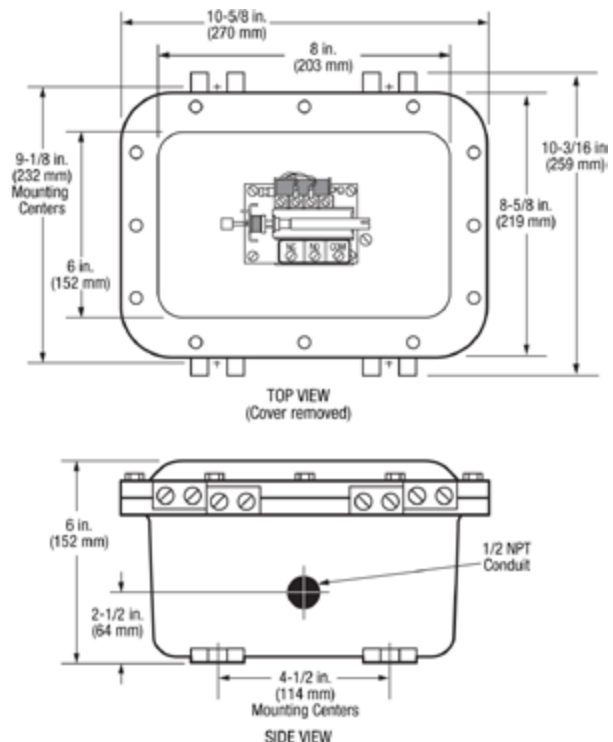
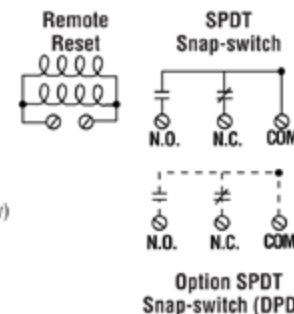


## VS2EXRB

- For Group B Locations (not certified)
- Snap-switch Contacts
- DPDT Feature Optional

Model VS2EXRB is constructed for use in Class I, Division 1, Group B, hazardous locations. It has as standard a SPDT snap-switch and an electric remote reset. Option is available for DPDT snap-switch

ELECTRICAL	
<b>Contact Rating:</b>	
5 A @ 125-480 VAC	
1/2 A @ 125 VDC	
1/4 A @ 250 VDC	
2 A Resistive 30 VDC	
1 A Inductive 30 VDC	
<b>Remote Reset Rating:</b>	
115 VAC or 24 VDC (Specify)	
350 mA AC/DC	



## How to Order

Options listed at right.  
All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### Base Model

**VS2**  
**VS2C**  
**VS2EX**  
**VS2EXR**  
**VS2EXRB**

**NOTE:** Order C-clamp mounting kit as a separate line item for VS2EX and VS2EXR.

### Options

**24** = 24 VDC reset coil on VS2EXR or VS2EXRB  
**15** = 115 VAC reset coil on VS2EXR or VS2EXRB  
**D** = DPDT switch on VS2EXRB only  
**LC** = Less case  
**LCC** = Less cable and clamps on VS2C

Service Part Number	Description	Notes
20000030	Movement assembly	VS2 and VS2C
20000031	Glass and gasket assembly	
20000032	Reset push button assembly	
20050021	Mounting clamp	VS2C
20000261	Cable clamp assembly (1 each)	
20050465	2-Conductor electrical cable, 45 feet (13.7 meters)	
20000137	5 clamps and 45 feet (13.7 meters) of cable	
20010091	Movement assembly	VS2EX
20050087	Cover	
00000309	Cover gasket	
20010090	Snap-switch and insulator kit (1 switch per kit) prior to Sept. 1, 1995.*	
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured after Sept. 1, 1995.*	
20000289	C-clamp conversion mounting kit	VS2EXR
20000262	Movement assembly	
20050087	Cover	
00000309	Cover gasket	
20010090	Snap-switch and insulator kit (1 switch per kit) prior to Sept. 1, 1995.*	
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured after Sept. 1, 1995.*	
20000049	Reset solenoid assembly (115 VAC)	
20000234	Reset solenoid assembly (24 VDC)	VS2EXRB
20000289	C-clamp conversion mounting kit	
20010090	Snap-switch and insulator kit (1 switch per kit) prior to Sept. 1, 1995.*	
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured after Sept. 1, 1995.*	
20000057	Inside snap-switch and insulator kit (1 switch per kit) for model VS2EXRB-D prior to Sept. 1, 1995.*	

\*Models with date 0895 and before use old switch. Dated 0995 and after, use straight snap-switch arm, no rollers.

# Shock and Vibration Switch VS94 Model

VS94 Series is an electro-mechanical device designed to protect equipment from damaging shock or vibration. This sensitive mechanism can detect excessive shock or vibration and shut down the equipment before further damage occurs. A set of contacts is held in a latched position through a magnetic latch mechanism. As the level of shock or vibration increases, an inertia mass exerts force against the latch arm and forces it away from the magnetic latch causing the latch arm to separate and to operate the contacts. Sensitivity is obtained by adjusting the amount of air gap between the magnet and latch arm plate.

The VS94 Series is housed in a NEMA 4/4X glass-filled polyester enclosure and has a base mount. It is for applications in non-hazardous locations.

VS94 models are rated up to 480 VAC. (See How to Order for models and options available.)

Applications for the VS94 include all stationary types of machinery or equipment where excessive shock/vibration can be damaging or poses a threat to normal operations in:

- Cooling fans
- Engines
- Pump jacks
- Compressors
- Pumps
- Rotating and Reciprocating Machinery

## Specifications

**Case:** Polyester fiberglass reinforced; NEMA type 4X; IP66; CSA types 4 and 12

**Conduit Fitting:** 3/4 NPT conduit fitting connection

**Normal Operating Ambient Temperature:** 0° to 140°F (-18° to 60°C)

**Snap-switches:** 2-SPDT snap acting switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC

**Range adjustment:** 0 - 7 Gs; 0 - 100 Hz /0.100 in. displacement

**Space Heater (optional):**

Option	Operating Current
H15	.023 A @ 115 VAC
H24	.12 A @ 24 VDC

**Remote Reset (optional):**

Option	Operating Current
R15	.17 A @ 115 VAC
R24	.36 A @ 24 VDC

**Time Delay (optional):**

Option	Operating Current	Standby Current
T15	.360 A @ 115 VAC	.01 A @ 115 VAC
T24	1.15 A @ 24 VDC	.01 A @ 24 VDC

**Time Delay/Remote Reset:** Adjustable 20-turn potentiometer from 5 seconds to 6-1/2 minutes (15 seconds per turn approximately)

**Shipping Weight:** 4.35 lb. (2 kg)

**Shipping Dimensions:** 9 x 8 x 4-11/16 in. (229 x 203 x 119 mm)



## Features

- Electromechanical Design
- Detects Shock or Vibration in Three Planes of Motion
- NEMA 4/4X (CSA types 4 and 12) Weatherproof Enclosure
- Reliable Magnetic Latch Feature
- Micro Fine, Easy-to-Adjust Sensitivity Adjustment
- Manual Reset (Standard)
- Remote Reset (Optional)
- Adjustable Start-up Time Delay (Optional)
- Space Heater Circuit to Prevent Housing Moisture Condensation (Optional)
- Two versatile SPDT snap-switches rated up to 480 VAC

## Options

### Remote Reset

This option of the VS94 includes a built-in electric solenoid which allows reset of tripped unit from a remote location. Available for 115 VAC or 24 VDC.

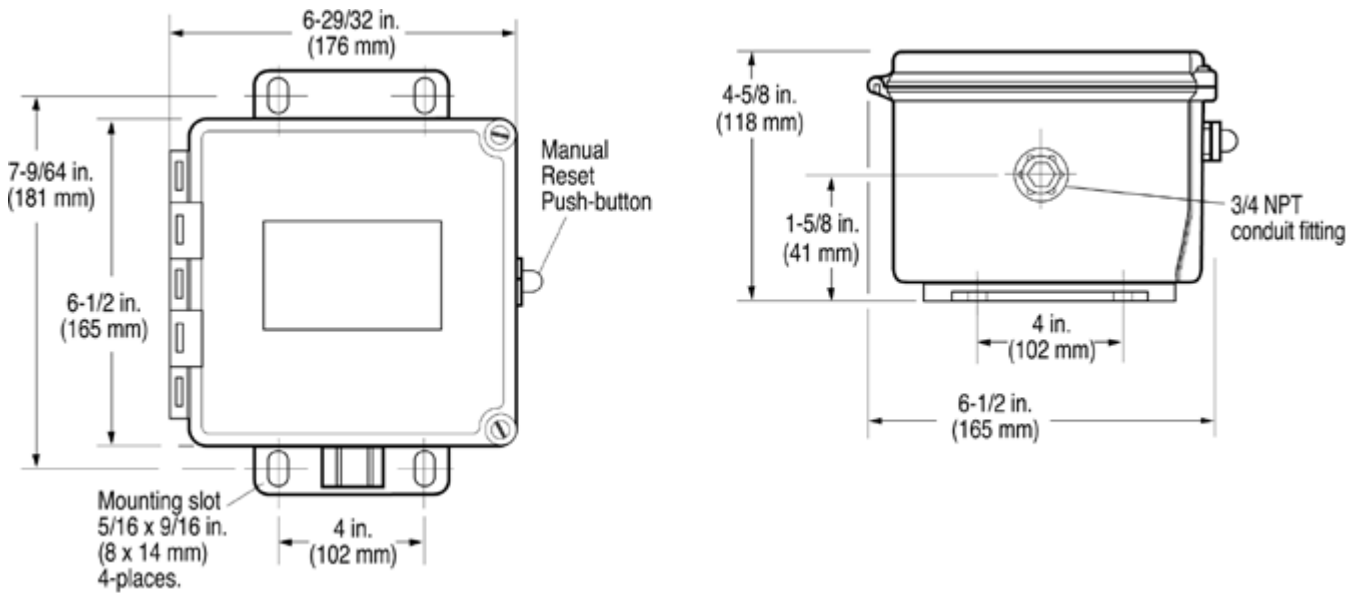
### Time Delay

Overrides trip operation on start-up. The time delay option is field-adjustable from 5 seconds up to 100 seconds with an easy-to-adjust 20-turn potentiometer. Available for 115 VAC or 24 VDC.

### Space Heater

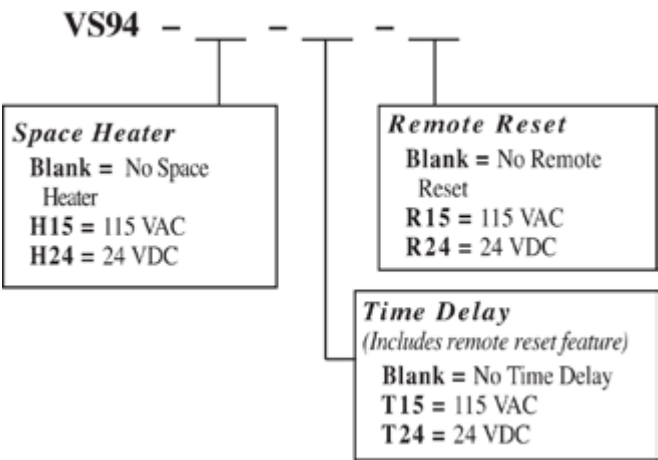
This optional circuit prevents moisture condensation inside the VS94 housing.

Dimensions



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



## Section 25    Magnetic Switches & Annunciators

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	<b>Remote Alarm / Annunciators</b>	
95046	Selectronic® Tattletale® Remote Alarm Annunciators — ST Series . . . . .	133
	<b>Magnetic Switches</b>	
78793	Tattletale® Annunciators and Magnetic Switches . . . . .	139



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# Selectronic® Tattletale® Remote Alarm Annunciators

The ST Series Selectronic Tattletale annunciators are a simple and inexpensive answer to your remote alarm annunciator needs. These compact Tattletale annunciators announce by a flashing LED which variable malfunctioned. It may feature a pulsating Mini-Siren® to audibly alert to the malfunction, which is silenced by depressing the alarm silence button. The visual signal remains in operation until the fault is corrected and the contacts are cleared. When an alarm sensor trips, the LED flashes, and if equipped, the Mini-Siren sounds. At the same time, an output circuit will activate which allows you to connect an external relay to operate a general alarm, operate a shutdown device, etc.

A test push button tests all alarm LEDs.

Basic models accept 8-32 VAC or 8-40 VDC input voltage. Others are available for either 12-VDC or 24-VDC input.

Preprinted peel and stick nameplates for common faults are supplied with each unit. Most of the Selectronic Tattletale annunciators accept either



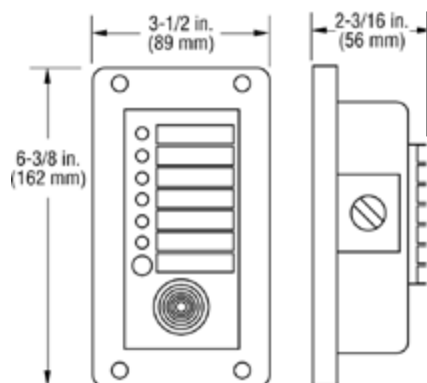
normally open (N.O.) or normally closed (N.C.) contacts. You can mix N.O. and N.C. contacts on the same unit.

Two mounting styles are offered: a recessed panel mounting flange and a freestanding gimbal mounting. (Model STA16 is available only in flange mount).

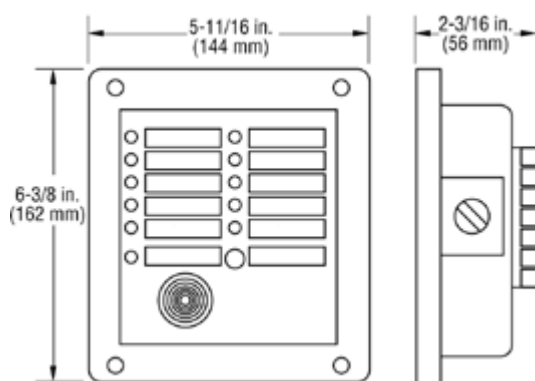
All models except STA16 have a time delay available to lock out the audible alarm on startup. These unique alarm panels have wide ranging applications and can be grouped in many configurations.

## Dimensions

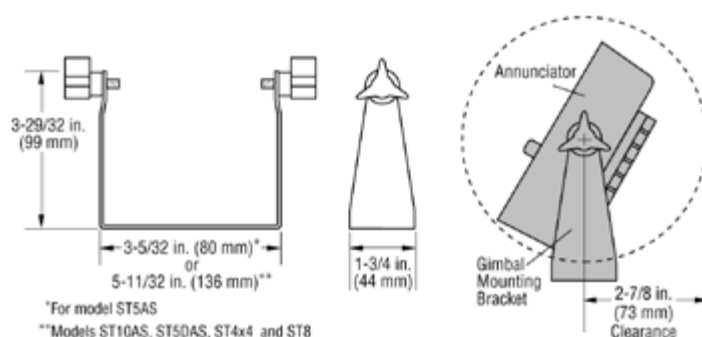
### ST5ASF



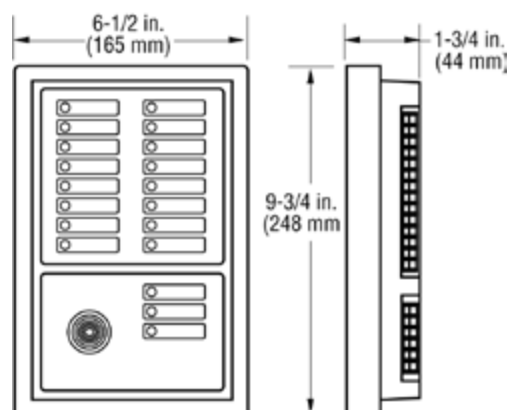
### ST8F and ST10ASF



### Gimbal Mounting (G Option)



### STA16



## BASIC: ST5AS, ST10AS and ST5DAS Series

Murphy Basic ST-Series Selectronic Tattletale annunciators are used wherever a remote alarm and annunciation is required. Typical applications are in marine pilot houses to alert the crew of problems developing in engine, gear, bilge, auxiliary power plants, etc. Repeater panels can be added for additional locations such as flybridge, on deck, galley or engineer's quarters. Each repeater panel can be acknowledged individually, or alternate wiring allows for one master control to silence all repeater panels.

Other applications include power plant control rooms, building maintenance, remote drilling rigs, construction sites, agricultural and construction equipment.

When a fault occurs, the contact operation causes the appropriate LED to flash and the audible Mini-Siren to pulse. At the same time, an output signal is generated, which allows an external relay to be wired to operate a general alarm such as a bell or horn. Pressing the Alarm Silent button quiets the local audible alarm and disconnects the output for the remote alarm. The flashing LED remains in operation until the fault is corrected and the contacts reset. An Alarm Silence/Test button allows you to test all LEDs.

Preprinted peel and stick nameplates for common faults are supplied with each unit.

### 5-Points

- **ST5ASF** (flange mount) and **ST5ASG** (gimbal mount)
- Provides 5 alarm points and output for remote alarm relay
- Accepts N.O. and/or N.C. contacts
- Use individually or gang for multiple applications
- Input voltage 8-32 VAC or 8-40 VDC



### 10-Points

- **ST10ASF** (flange mount) and **ST10ASG** (gimbal mount)
- Provides 10 alarm points and output for remote alarm relay
- Accepts N.O. and/or N.C. contacts
- Use individually or gang for multiple applications
- Input voltage 8-32 VAC or 8-40 VDC



### Dual 5-Points

- **ST5DASF** (flange mount) and **ST5DASG** (gimbal mount)
- Provides two separate sets of 5 alarm points in one package. Each set of 5 points is powered separately from the other but share the same negative of the power source.
- Primary application is on twin engine boats. Because each set of alarm points is powered separately, if only one engine is running there is no alarm on the engine not running.
- Accepts N.O. and/or N.C. contacts
- Input voltage 8-32 VAC or 8-40 VDC



**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [fwmurphy.com/support/warranty.htm](http://fwmurphy.com/support/warranty.htm)

## FIRST OUT FAULTS: ST8 Series

First Out Fault Tattletale tells you which monitored variable malfunctioned first. The fault is annunciated and locked in until reset by the operator. Applications include process monitoring such as compressors, pumps, generators, etc. Preprinted peel and stick nameplates for common faults are supplied with each unit.

### 8 First Out

- **ST8F** (flange mount) and **ST8G** (gimbal mount)
- Provides 8-point first out cause of shutdown Tattletale. A flashing LED indicates the cause of shutdown identified by the nameplate.
- Accepts N.O. and/or N.C. contacts
- Includes SPDT dry contact output rated 2 A @ 28 VDC
- Selectable sensor lockout for delay on start up
- Input voltage 8-32 VAC or 8-40 VDC



## GENERATORS: STA16 Series

The STA16 is a multifunctional visual and audible 16-point alarm typically applied as a remote alarm. Its picture frame bezel allows for flush mounting into a control panel or customer supplied wall mounted pull box. Preprinted peel and stick nameplates for all common engine and generator functions allow for generic applications or for NFPA-110 Requirements.

### 16-Points

- **STA16** is a 16-point annunciator for generator sets.
- Provides 16 points of visual and audible alarms including built-in sensing for low battery voltage and battery charger malfunction
- Accepts N.O. switch inputs
- Negative switch input



## Specifications

	Models				
	ST5AS	ST10AS	ST5DAS	ST8	STA16
<b>Number of Alarm Points</b>					
• 5 Visual	•				
• 10 Visual		•	•		
• 8 First Out Visual				•	
• 16 Visual					•
<b>Audible Alarm</b>					
• 1 local; common to all inputs	•	•	•		•
<b>Alarm Silence:</b> Silences audible only	•	•	•		•
<b>Test Push Button:</b> Tests all LED	•	•	•		•
<b>Alarm Output:</b> Customer supplied relay same voltage as input; coil not to exceed 500 mA	•	•	•		•
<b>Input Voltage</b>					
• 8-32 VAC / 8-40VDC	•	•	•	•	
• 12 or 24 VDC (specify)					•
<b>Startup Time Delay:</b> Customer selectable: 25-35 seconds	•	•	•	•	
<b>Sensor Input</b>					
• Accepts N.O. positive or negative					•
• Accepts N.O. and/or N.C.	•	•	•	•	
<b>Mounting Options</b>					
• Less Mounting kit	•	•	•	•	
• Flange Mounting kit	•	•	•	•	
• Gimbal Mounting kit	•	•	•	•	
<b>First Out Shutdown:</b> Amber-No; Red-Yes				•	
<b>Shutdown Relay Output:</b> SPDT dry contacts; 2 A @ 28 VDC				•	
<b>Shutdown Reset:</b> Repair fault; contacts open; push reset button; remove power				•	
<b>Battery Charger Malfunction:</b> Built-in sensing; visual alarm only					•
<b>Shipping Weights</b>					
• 1.25 lbs (567 g)	•				
• 1.50 lbs (680 g)		•	•	•	
• 2 lbs (907 g)					•
<b>Shipping Dimensions</b>					
• 6-1/4 x 6-1/4 x 6-1/4 in. (159 x 159 x 159 mm)	•	•	•	•	
• 12 x 7-1/2 x 5-1/2 in. (305 x 191 x 140 mm)					•

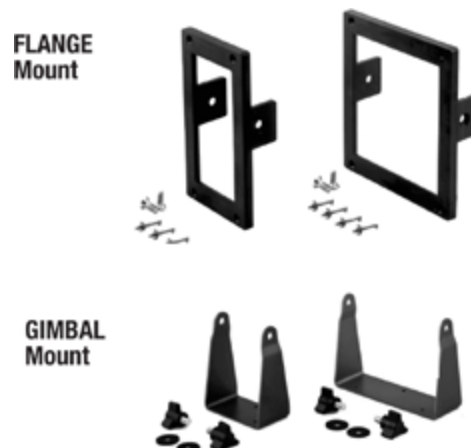
## Accessories and Options

### TDST3-5 and TDST8-10

TDST3-5 and TD8-10 single point time delays inhibit sensor input to ST Series annunciators for 3 to 5 or 8 to 10 seconds. Compensates for momentary contact operation due to vessel movement, etc.

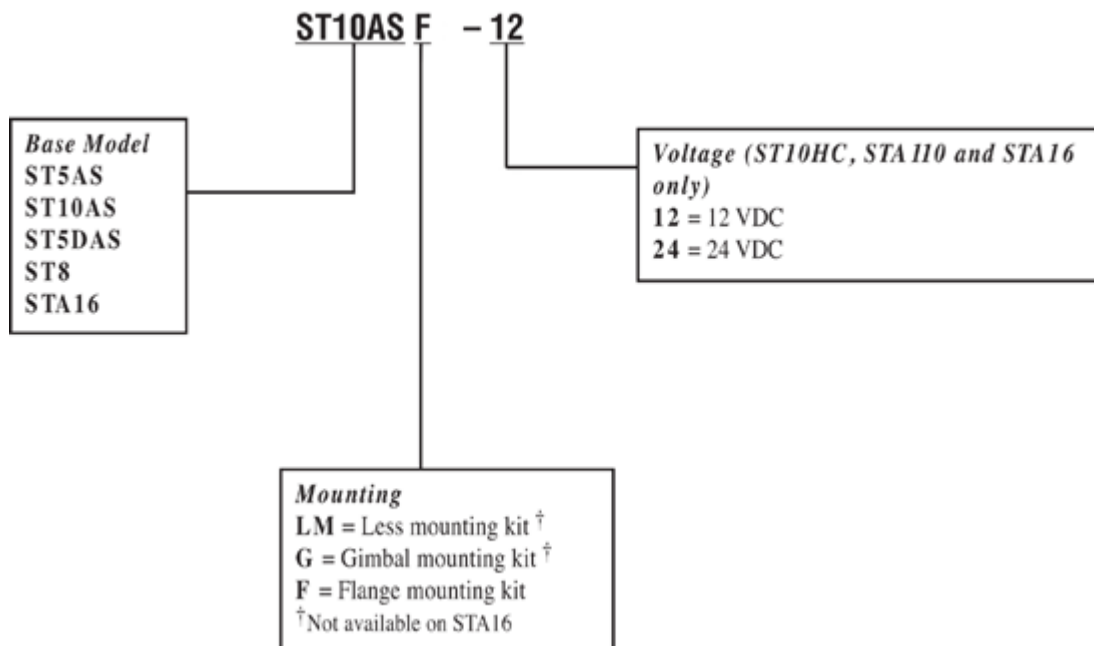
### Gimbal and Flange Mounting Kits

These kits are available for change-over mounting and as service parts. They fit all LM (less mounting) configurations.



## How To Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



### Accessories and Options

Part Number	Description	Notes
TDST3-5	3-5 second time delay	
TDST8-10	8-10 second time delay	
25700007	Gimbal mount kit	Fits ST5ASLM
25700008	Flange mount kit	
25700034	Gimbal mount kit	Fits ST10ASLM, ST5DASLM and ST8LM
25700371	Flange mount kit	



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# Tattletale®

## Annunciators and Magnetic Switches

Tattletale annunciators and magnetic switches are the nerve centers that translate Switchgauge contact operations into decisions and operate the alarm or shutdown device. These switches are the electrical load carrying devices for the alarm or shutdown device. Tattletale annunciators indicate which monitored function failed leading to the alarm or shutdown; magnetic switches do not. Magnetic switches operate basically as a latching relay.

### Application

Magnetic switches and Tattletale annunciators are available for use with engines or electric motors. Various circuits, time delays and contact configurations are available to match the power source and mode of operation required for alarm only, alarm before shutdown or shutdown only.

For distributor ignition engines, the magnetic switch opens the distributor coil circuit to cause shutdown. For magneto or CD ignitions the magnetic switch grounds the ignition output. Some models can also trip fuel valves instead of or in addition to grounding the ignition. Diesel engines are shut down by either closing off the fuel or air supply. Magnetic switches and Tattletale annunciators can make or break circuits for these engines.

For electric motor application, various magnetic switches are available to operate the motor starter, holding coil directly or in conjunction with appropriate Murphy Transformer-Relay assembly.

### Features

Magnetic switches and Tattletale annunciators described in this bulletin are electrically tripped relay type devices. Models are available to operate from battery power, 120 VAC, conventional magnetos and

capacitor discharge type ignitions.

Energized to run models allow Closed Loop circuitry. Others draw momentary power to trip. Configurations are available for contact make or contact break to cause shutdown. Some models have both make and break contacts.

All models have a weather-resistant case with screw terminals for ease of customer hookup. Manually reset models have a face mounted reset push button which also serves as a fault indicator in the Tattletale version. In this application, one or more Tattletale/magnetic switches are used to advise operating personnel which monitored function caused shutdown.

Only the Tattletale connected to that function sensor trips causing the reset push button to pop out.

Electrically reset models perform the same functions as the manually reset models and are reset by cycling the power supply off and then on.

Time delay models use reliable solid state time circuits to lockout operated switch contacts for start-up and/or to allow operation of alarms before shutdown occurs. Specific models allow application of power to a shutdown circuit and automatic disconnect of power after a given time delay.



## Specifications

	117	117PH	MS2100	MS2110	MS2111	MS2120	518PH	518APH	518E	520APH	521PH	760A ‡	761APH	822PH	M4254-1	R129A
<b>Coil Voltage</b>																
12 volt							•	•	•	•	•	•				•
24 volt							•	•		•	•	•				•
12/24 volt*	•	•		•	•									•		
120 VAC			•													
Magneto ignition					•										•	
CD ignition			•											•		
<b>Coil</b> (see Note 6 below)	2	2	6	2	4	1	7	7	7	8	7	5	2	3		5
<b>Contacts</b> (see Note 2 below)																
NCH	•	•	A	A	A		•	•	•	•	•	•	•			
NOH			A	A	A		•	•	•		•	•	•			
NCG						B									B	B
NOG						B				•				B	B	B
<b>Latch Type</b>																
Energize to trip	•	•	•	•	•	•					•	•	•	•		•
Energize to latch							•	•	•	•						
<b>Reset Type</b>																
Manual indicating		•	•	•	•	•	•	•	•	•	•	•	•	•		
Manual non-indicating	•															
Electric non-indicating											•					•
<b>Time Delay</b>																
Before shutdown										•		•	•			
Start only											•	•				
After shutdown																

\* Multi-voltage AC or DC systems. See circuit descriptions below and on next page.

A: Dry contacts normally wired in hot circuit.

B: Dry contacts normally wired in ground circuit.

‡ Does not latch after shutdown signal clears, automatically resets.

### NOTES

This chart indicates features/configurations available for each model.

**1. Coil Voltage** — Coils are specific voltage rated or multiple voltage rates.

**2. Contacts** — This is the control circuit output. In the latched position, the NCH contact has a hot output. In the tripped position, the NOH contact has a hot output. In the latched position, the NCG has a grounded output. In the tripped position, the NOG has a grounded output.

**3. Latch Type** — Refers to whether the magnetic coil is momentarily energized to trip or requires continuous power in the operating mode and de-energizes to trip.

**4. Reset Type** — Refers to manual or electric reset; manual indicating type is a Tattletale.

**5. Time Delay** — Indicates operation of the time delay.

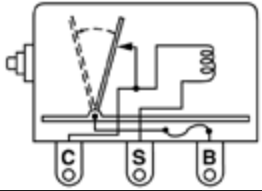
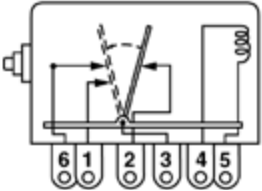
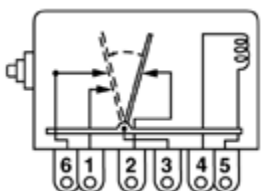
**6. Coil Resistances** — In OHMS or coil and resistor

1.) 0.5 2.)18 3.)30 4.)72 5.)90/190

for 12/24 6.)288 7.)339/678 for 12/24

8.)339/618 for 12/24

## Models

Model	Description	Illustration
117/117PH	Use to shutdown 12V through 32V distributor ignition or diesel engines. Breaks circuit when tripped. Opens distributor coil circuit or power circuit to diesel run device. Automatically disconnects from battery after trip. Contacts 10 amps 32 VDC. 14 amp fuse.	
MS2100	Multipurpose Tattletale with dry contacts that can be used to make two circuits and break another when tripped. Operates from 120 VAC or capacitor discharge ignition. The operating coil is intermittent duty and must be disconnected by an external circuit when tripped. The MS2100 is a replacement for 100PH, 307CD, 307PHCD and 224CD.	
MS2110	Multipurpose Tattletale with dry contacts that can be used to make two circuits and break another when tripped. Operates from 12 or 24 VDC or 24 VAC. The operating coil is intermittent duty and must be disconnected by an external circuit when tripped. The MS2110 is a replacement for 221PH, 169PH, 274 and 274PH.	

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [fwmurphy.com/support/warranty.htm](http://fwmurphy.com/support/warranty.htm)

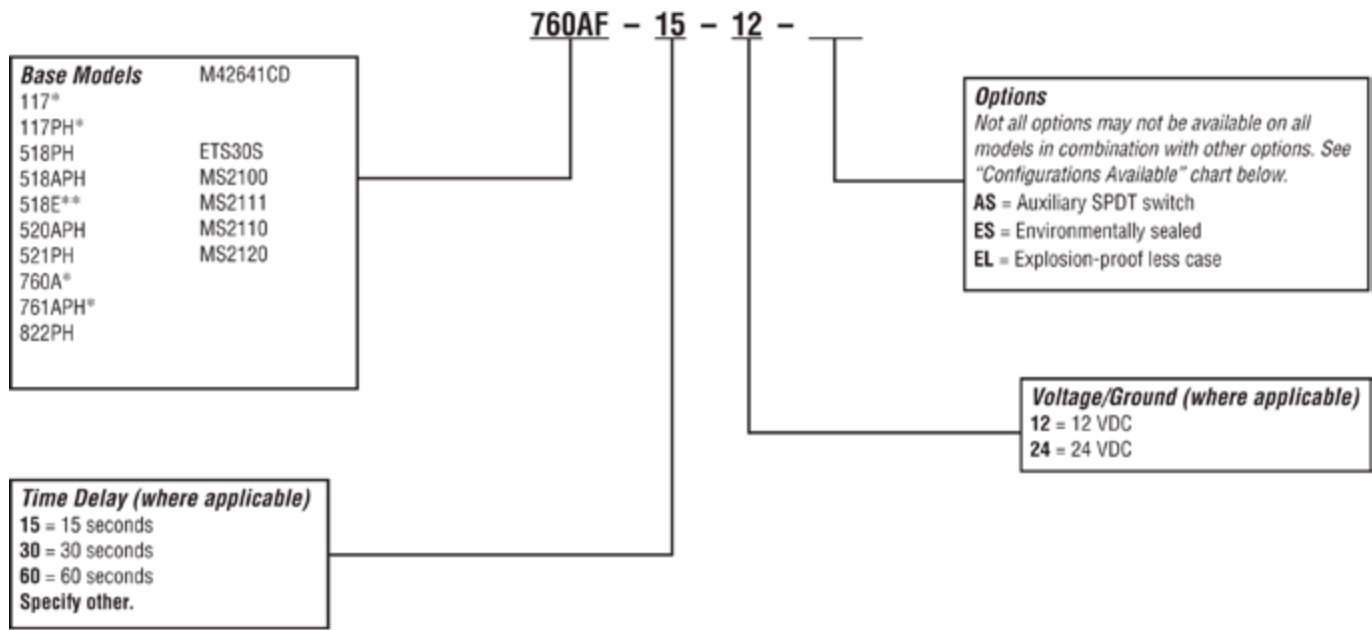
Model	Description	Illustration
MS2120	Multipurpose Tattletale with dry contacts that can be used to make two circuits and break another when tripped. Operates from magneto ignition. The operating coil is intermittent duty and must be disconnected by an external circuit when tripped. The MS2120 is a replacement for 307, 307PH and 224.	
518PH	Allows for Switchgag and/or N.C. contacts to be wired closed loop (in series). Any contact open or Switchgag contact close in the circuit shunt trips the 518PH. Specify 12 or 24 VDC. Contacts 10 amps 24V. 14 amp fuse.	
518APH	Allows for Switchgag and/or N.C. contacts to be wired closed loop (in series).Any contact open or Switchgag contact close in the circuit trips the 518APH. Specify 12 or 24 VDC. Contacts 10 amps 24V. 14 amp fuse.	
518E	Same as 518APH but recommended for high vibration application where nuisance shutdowns typically occur due to higher than normal vibrations (i.e. wood chippers). 12 Volt only.	
520APH	Same as 518PH except with 30 second time delay before trip on one Switchgag contact input but immediate trip on the second Switchgag contact input. Typical use is for immediate stop of engine from oil pressure or coolant temperature but delayed shutdown from alignment switches on center pivot irrigation system. Specify 12 or 24 VDC and length of time delay. Time delays are available from 5 to 120 seconds. Contacts 10 amps 24 V. 14 amp fuse.	
521PH	Use with N.C. Switchgag or switches to ground magneto or CD ignition when tripped. Trip coil energized to shutdown when N.C. contacts open. Specify 12 or 24 VDC. Contacts 10 amps 24V.	
MS2111	Replaces 221PH with 72 ohm coil. Used with NICS-78 non-incendive control system. Service part only.	

Model	Description	Illustration
760A/ 760AF/ 761APH	<p>Use for distributor ignition or diesel. Time delay lockout of Switchgag contacts on start up only. Customer wired for delay or immediate trip on shutdown. Breaks and makes circuits when tripped. 760A resets automatically when the shutdown signal is removed or power is removed. 761APH has manual reset. 760AF is 760A with in-line fuse. Must specify 12 or 24 VDC and length of time delay. Option time delays: 15, 30 (standard) or 60 seconds. Contacts 10 amps 24 V. 14 amp fuse. Models 760A and 761APH carry the CE mark.</p> <p><i>Note: The 760A cannot be adequately protected by a circuit breaker in a dead short condition with a battery as the power source. The circuit breaker will take a finite amount of time to react, during which time the circuit board of the 760A will be damaged beyond repair. Fuses are the optimal method for protecting 760A.</i></p>	
822PH	<p>Used in Murphy TR assemblies as master disconnect. 24VAC coil energizes when Switchgag contact closes to ground; breaks and makes circuit when tripped. Manual reset</p>	
M4264 Series	<p>Detects loss of magneto/CD ignition output and transfers contacts for customer use. Contacts 10 amps; 48 VAC/VDC. M42641CS transfers SPDT dry contacts when tripped.</p>	
R129A	<p>A SPDT relay with 10 amp dry contacts. Specify 12 or 24 VDC. Contacts 10 amps 24 VDC. 14 amp fuse.</p>	

Always provide proper circuit protection with fuses or circuit breakers.

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



\* Add the letter F to the base model to indicate an in-line fuse instead of a base-mounted fuse.  
\*\* 12 Volt negative ground version only

Configurations Available

	117	MS2110	MS2110	MS2120	MS2111	517/517A	518/518A/518E	520A	521	760A	760AF	761A	822	M4264-1
Non-PH	1,2									1	1			1
PH	1,2	1,2	1,2	1,2	1,2	1	1	1	1			1	1	
PH-ES	1	1	1	1	1	1								

1= Offered  
2= Auxiliary snap-switch

Part Number	Description	Notes
25050016	Weather cap	Accessories
25050547	Clear, flexible dust boot for push button	
30050323	Single unit mounting plate	
65010026	In-line fuse holder with 14 amp fuse	

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## Section 30 Engine Panels

	<b>Engine Panel Accessories</b>	
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94032	Swichgage® Shutdown Panels for Mobile Equipment of All Kinds — WAI Series. . . . .	149
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03061	Swichgage® Shutdown Panels with Open Back for Diesel Engines — WD300 Series . .	155
04001	Electric Gage Shutdown WDU Series Panels for Deutz 1011/2011, 912/913 and 914 Engines . . . . .	157
03062	WHB Series Swichgage® Shutdown Panels for High Plains and Other Irrigation Engines . . . . .	163
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# Selectronic® Flasher Alarm and Mini-Siren TL7 and SAH Series

The Model TL7 is a panel-mounted flashing alarm light and audible alarm driver. The TL7 helps protect the Murphy Switchgate contacts from the very high inrush current of the lamp. It is available in 12- or 24-VDC for negative ground systems. The SAH Mini-siren provides an audible alarm when fault conditions are detected by a Switchgate instrument. It can be panel mounted and operates on 6–28 VDC.

## Application

The TL7 Flasher/Light is used as a warning device on various types of industrial and mobile equipment. The Mini-siren will give an audible warning when the TL7 operates, or it can be wired directly to the Switchgate contacts for audible only alarm.

## Features

- Red polycarbonate lens
- 12 VDC or 24 VDC negative ground
- Tin-plated male push-on type terminals
- SAH terminal designed to drive piezo electric audible alarm rated 20 mA @ 28 VDC such as Murphy SAH Series Mini-siren

## Specifications

### TL7

#### Power Requirements:

**Voltage:** 12 or 24 VDC, negative ground (specify voltage)

#### Current:

- Sensor switch < 60 mA
- 12 VDC, 360 mA with lamp on
- 24 VDC, 200 mA with lamp on
- 12 or 24VDC, 5 mA standby, lamp off

#### Outputs (see replacement lamps):

**Lamp output:** 120 mA @ 14.4 VDC

**SAH terminal:** 20 mA @ 28 VDC resistive

**Enclosure:** Red polycarbonate lens with aluminum retaining nut

**Temperature Range:** -40° to 165°F (-40° to 74°C)

**Terminal Connections:** Four tin plated 1/32 x 1/4 in. (0.8 x 6 mm) male push-on type terminal

**Mounting Hole:** 1-1/8 in. (29 mm) diameter

**Maximum Panel Thickness:** 1/4 in. (6 mm)

### SAH

**Type:** PIEZO electric transducer

**Operating Voltage:** 6–8 VDC

**Output Level:** at 28 VDC 1 meter, 90± 5 dB

**Current Drain:** at 28 VDC, 20 mA MAX

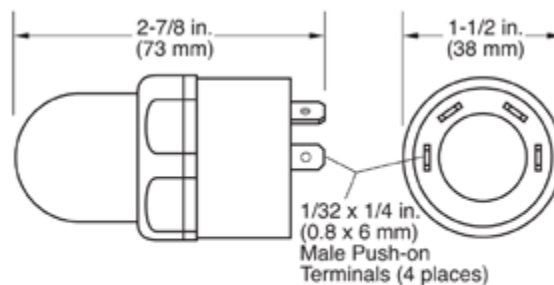
**Mounting Hole:** 1-1/8 in. (29 mm) diameter

**Maximum Panel Thickness:** 1/8 in. (3 mm)



## Dimensions

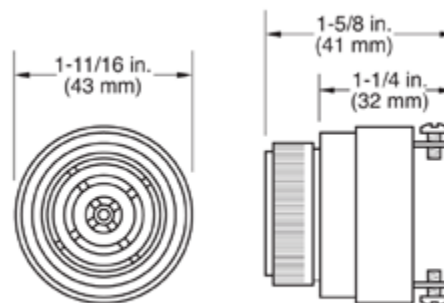
### TL7



**Mounting Hole:** 1-1/8 in. (29 mm) diameter

**Maximum Panel Thickness:** 1/4 in. (6 mm)

### SAH



**Mounting Hole:** 1-1/8 in. (29 mm) diameter

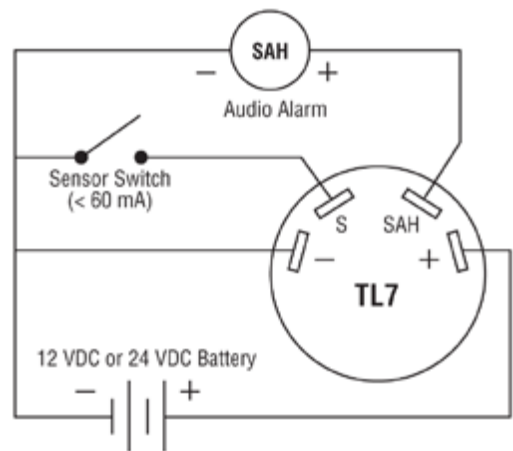
**Maximum Panel Thickness:** 1/8 in. (3 mm)

# Typical Wiring Diagram



- WARNING** Before beginning installation of this Murphy product:
- Disconnect ALL electrical power to the machine.
  - Make sure the machine CANNOT operate during installation.
  - Follow all safety warnings of the machine manufacturer.
  - Read and follow all installation instructions.

Below is a typical circuit diagram for the TL7 Flasher/Light and SAH Mini-siren. When the switch closes, the lamp will flash and the optional Mini-siren will pulse at the same frequency.



**NOTE:** Typical wiring with negative ground. Although designed to be used with Murphy Switchgaze, the TL7 can be used with any dry contact type switch. Always provide proper circuit protection with fuses or circuit breakers.

## How to Order

Part Number	Model and Description	Notes
65700045	TL7-12N: 12 VDC, negative ground	Alarm light and audible alarm
65700047	TL7-24N: 24 VDC, negative ground	
65700257	SAH: Mini siren steady tone	Audible alarm
65700258	SAH-A: Mini siren pulse tone	

# Swichgage® Shutdown Panels for Mobile Equipment of All Kinds

## WAI Series

WAI Series Murphy panels offer engine protection for on- and off-road mobile equipment.

The panels provide accurate engine readings and time-delayed automatic shutdowns. Flashing light and mini-siren signal a warning before a shutdown. Alarm-only panels (without shut-down capabilities) are also available.

WAI panels are easy to install and function test without the need for expensive auxiliary equipment. Each is a cost-competitive and effective system for engine protection.

The WAI Series Panels are complete diagnostic, engine-protection systems. Any vehicle or engine can be monitored, and in case of potentially damaging conditions, an alarm will operate before the engine is shut down. WAI Panels feature direct reading, mechanical Swichgage instruments



(gauge and limit switch in one) and Selectronic relays and alarms. Swichgage instruments are internally lighted for night illumination. Applications include: trucks, buses,

fork lifts, loaders, earth-movers — any engine-powered mobile unit, such as delivery vans, farm and construction equipment and street sweepers.

## Models

**WAI-2:** Completely enclosed and convenient under-dash mounting provides Swichgage instruments for low oil pressure and high coolant temperature; visual and audible alarms before automatic shutdown. Includes a 270° pivoting, mounting bracket.

**WAI-3:** Same as WAI-2 panel with a third Swichgage instrument for block coolant pressure (0-15 psi)

**WAI-4:** Same as WAI-2 panel with a third Swichgage instrument for transmission temperature (140°- 300°F / 60°- 148°C)

**WAI-7:** Open style panel same as WAI-2

**WAI-8:** Open style panel provides Swichgage instruments for low oil pressure, coolant pressure and high coolant temperature; visual and audible alarms before automatic shutdown

**WAI-9:** Open style panel same as WAI-8 with transmission temperature Swichgage instrument instead of coolant pressure

**WAI-271:** Open style panel similar to WAI-7 but for alarm-only

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

## WAI-2

---

- Enclosed Panel
- Oil Pressure Switchgauge instrument
- Coolant Temperature\* Switchgauge instrument
- Mini-siren
- FL3/TL2 flasher and light
- 760AF Magnetic Switch with 30-second time delay for alarm before shutdown; 12-VDC, (optional 24-V)



## WAI-3 / WAI-4

---

- Enclosed Panels
- Oil Pressure Switchgauge instrument
- Coolant Temperature\* Switchgauge instrument
- Block Coolant Pressure\* Switchgauge instrument (WAI-3 only 0-15psi)
- Transmission Temp.\* Switchgauge instrument (WAI-4 only 140°-300°F / 60°- 148°C)
- Mini-siren
- FL3/TL2 flasher and light
- 760AF Magnetic Switch with 30 second time delay for alarm before shutdown; 12-VDC, (optional 24-V)



## WAI-7

---

- Open Style Panel
- Oil Pressure Switchgauge instrument
- Coolant Temperature\* Switchgauge instrument
- Mini-siren
- TL7 Flasher Alarm Light
- 760AF Magnetic Switch with 30 second time delay for alarm before shutdown; 12-VDC, (optional 24-V)



## WAI-8 / WAI-9

---

- Open Style Panel
- Oil Pressure Switchgauge instrument
- Coolant Pressure\* Switchgauge instrument (WAI-8 only 0-15psi)
- Transmission Temp.\* Switchgauge instrument (WAI-9 only 140°-300°F / 60°- 148°C)
- Coolant Temperature\* Switchgauge instrument
- Mini-siren
- TL7 Flasher Alarm Light
- 760AF Magnetic Switch with 30 second time delay for alarm before shutdown; 12-VDC, (optional 24-V)



## WAI-271

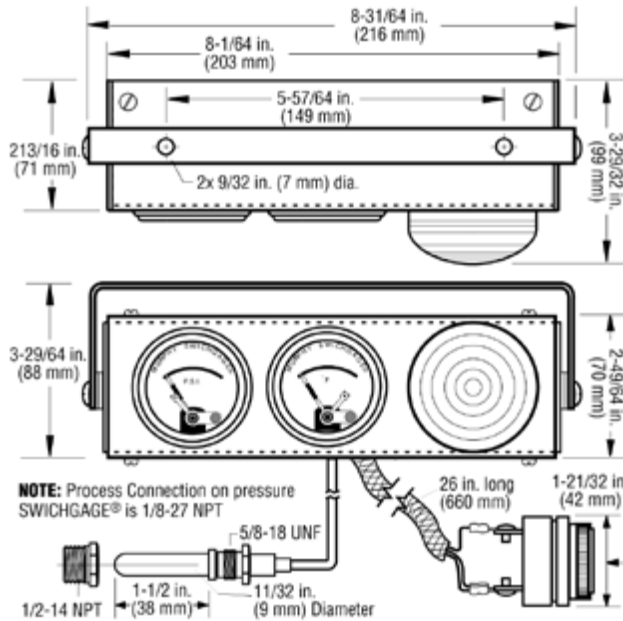
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- Alarm-Only, Open Style Panel
- Oil Pressure Switchgauge instrument
- Coolant Temperature\* Switchgauge instrument
- Mini-siren
- TL7 Flasher Alarm Light
- Available for 12-VDC or 24-VDC

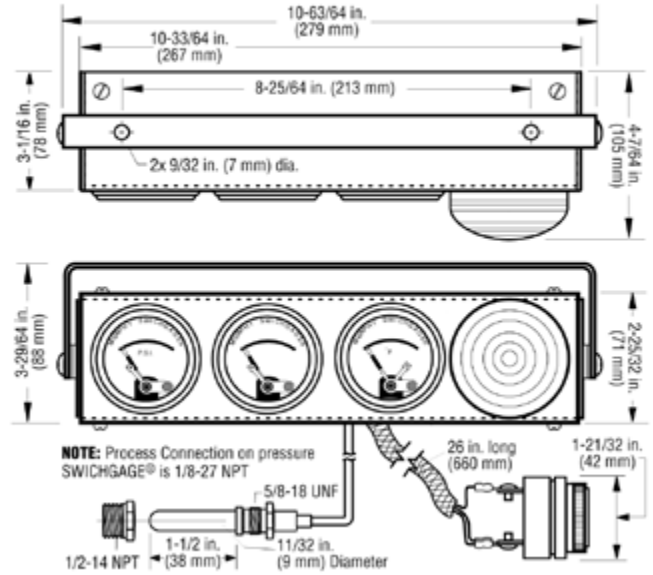


\* Temperature capillary length is standard 6 ft. (1.8 m). Specify longer lengths.

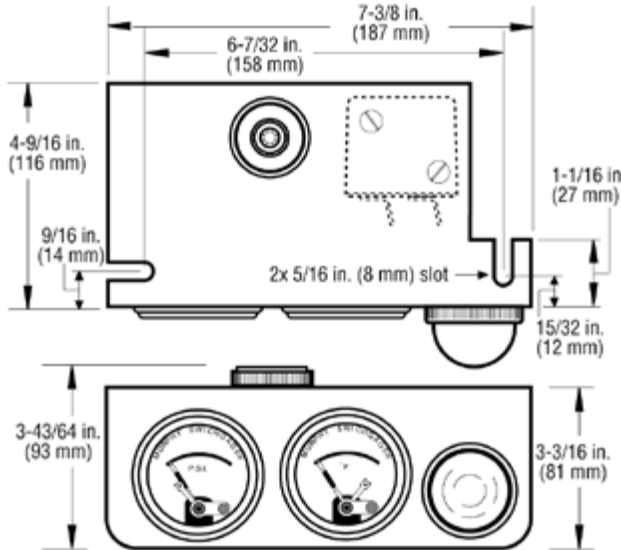
## WAI-2



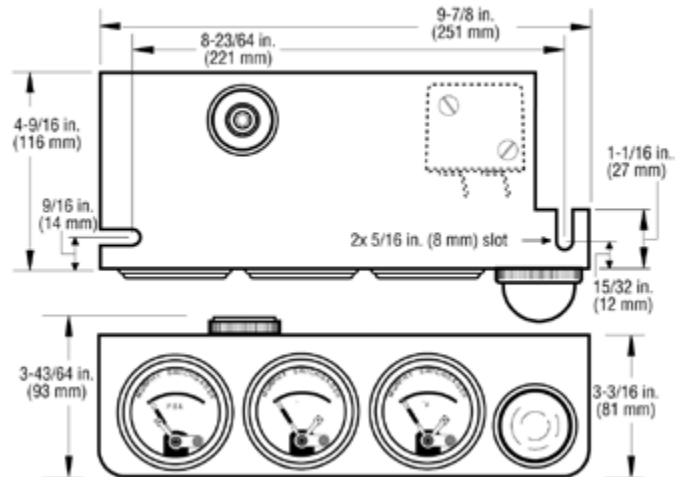
## WAI-3 / WAI-4



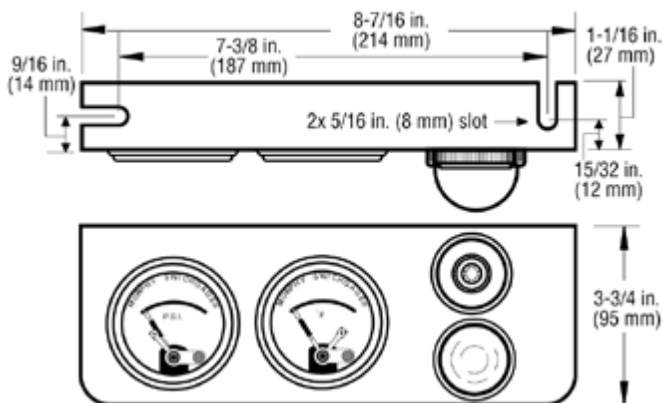
## WAI-7



## WAI-8 / WAI-9



## WAI-271





## Standard Panel Assemblies and Kits Reference Guide

Options like 24 VDC, special capillary length, delay time, etc. can be specified.

	WAI2	WAI3	WAI4	WAI7	WAI8	WAI9
Enclosed, easy-mount panel	✓	✓	✓			
Open, easy-mount panel				✓	✓	✓
201P-1-75 Engine oil pressure SWICHGAGE®	✓	✓	✓	✓	✓	✓
202T-1-220 Engine coolant temperature SWICHGAGE® (6 ft. [1.83 m] capillary)	✓	✓	✓	✓	✓	✓
202P-1-15 Engine coolant pressure SWICHGAGE®		✓			✓	
203T-1-300 Transmission temperature SWICHGAGE® (6 ft. [1.83 m]) warning-only			✓			✓
760AF SELECTRONIC® relay (30 second time delay, 12V)	✓	✓	✓	✓	✓	✓
TL7 SELECTRONIC® flashing alarm (12V, negative ground)				✓	✓	✓
TL2 and FL3 alarm light	✓	✓	✓			
SAH MINI-SIREN®	✓	✓	✓	✓	✓	✓
Diode 65010098, isolates transmission temperature for warning-only			✓			✓

## How to Order

Part Number	Model Number	Notes
Use Model Number for Ordering	WAI-2	
	WAI-3	
	WAI-4	
	WAI -7	
	WAI-8	
	WAI-9	
	WAI-271	

# Swichgauge® Kits for Engines

## WD100 Series

The WD100 Series Swichgauge kits provide engine monitoring that shuts down farm, construction or other engine-powered equipment when dangerous pressures or temperatures occur. The control center for each of these kits is the compact and adjustable Universal Mounting Panel. This panel holds two Swichgages and a Tattletale® magnetic switch as well as a shut-down device where appropriate.

### Specifications

- Murphy Swichgauge products are two-instruments-in-one: (1) an accurate indicating gage with (2) a built-in, adjustable limit switch.
- 518PH Tattletale magnetic switch is designed to shut down engines by operating as a circuit breaker to interrupt the ignition circuit to a distributor or to close a solenoid fuel valve on diesels.
- Temperature capillary tubes are 6 ft. (1.8 m) standard but can be ordered in any length.
- Standard Swichgauge ranges\*:  
**Pressure:** 0-100 psi (0-689 kPa) [0-6.89 bar]  
**Temperature:** 100° to 250°F (37° to 121°C)  
 \*Other ranges available on request.

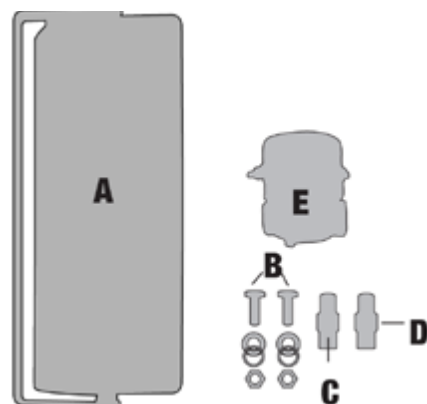


### WD100 Series Kits

Depending upon the kit selected, the following components are supplied:

- A.** Universal Mounting Panel which consists of:
  - 20P oil pressure Swichgauge instrument
  - 20T temperature Swichgauge instrument with 6 ft. (1.8 m) capillary, or 20TH temperature Swichgauge instrument for WD175 kit
  - 518PH Tattletale magnetic switch
- B.** Bracket mounting bolts, washers and nuts
- C.** CKV2336 fuel reverse flow/check valve
- D.** PRV50 fuel pressure relief valve
- E.** SV Series fuel shut-off solenoid valve (1/4 NPT X 1/4 NPT) Specify 12-VDC or 24-VDC

### Kit Combinations



These kits are available for virtually any engine application, any engine type or can be custom ordered to meet a specific use.

**Kit WD100 includes: A and B**  
 Suitable for use on distributor ignition engines or on diesels having a shut-down solenoid in the fuel pump  
**Approximate Shipping Weight:** 4.75 lbs. (2.2 kg)  
**Approximate Shipping Dimensions:** 9-3/4 x 9-1/4 x 5-3/4 in. (248 x 235 x 146 mm)

**Kit WD150 includes: A, B, C and E**  
 Suitable for most liquid cooled diesel engines  
**Approximate Shipping Weight:** 6.15 lbs. (2.8 kg)  
**Approximate Shipping Dimensions:** 9-3/4 x 9-1/4 x 5-3/4 in. (248 x 235 x 146 mm)

**Kit WD175 includes: A, B, C and E**  
 Suitable for air-cooled diesel engines; 10 mm 1.5 adaptor and special head temperature bulb. Includes SV Series fuel valve  
**Approximate Shipping Weight:** 6.15 lbs. (2.8 kg)  
**Approximate Shipping Dimensions:** 9-3/4 x 9-1/4 x 5-3/4 in. (248 x 235 x 146 mm)

**Kit WD185 includes: A, B, C, D and E**  
 Suitable for engines with gear-driven transfer pump. (SV Series is not required on engines with built-in shutdown in the injector pump.)  
**Approximate Shipping Weight:** 6.20 lbs. (2.8 kg)  
**Approximate Shipping Dimensions:** 9-3/4 x 9-1/4 x 5-3/4 in. (248 x 235 x 146 mm)

## Typical Wiring to Diesel Engine

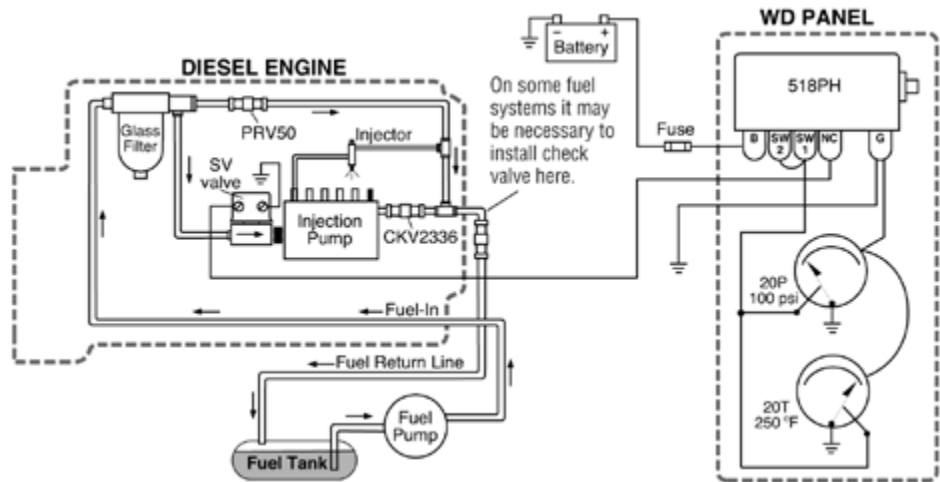
### Special Notes:

- Murphy Pressure Relief Valve (model PRV50) is factory set to start opening at 25 psi (172 kPa) [1.72 bar]. This is done to protect the fuel filter canister from bursting due to high pressure.

- Install the Murphy Check Relief Valve (model CKV2336) as close as possible to the injection pump. When the CKV2336 is installed properly, it should prevent the injection pump from siphoning fuel which halts operation after the SV valve closes.

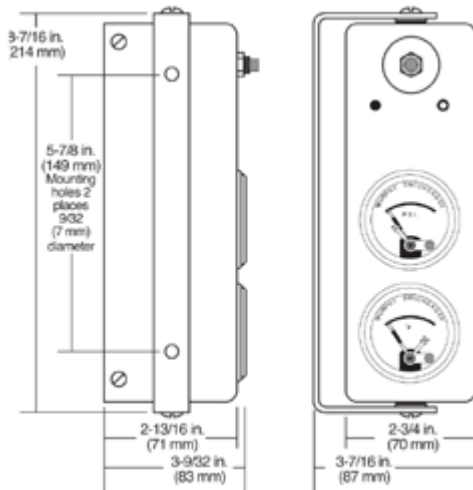
- Install the SV Series fuel valve as close as possible to the injection pump inlet port.

- **All fittings must be air tight.**



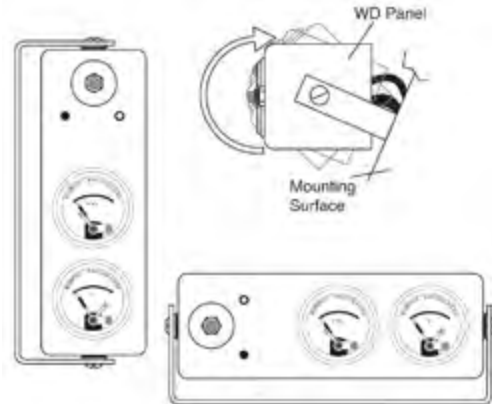
\* Always provide proper circuit protection with fuses or circuit breakers.

## Dimensions



## Rotating/Tilting Panel

This panel may mount in many different positions (Switchgauge instruments can be rotated and the panel tilted) that allows for instrument visibility without a difficult installation or interference with other engine equipment.



## How to Order

To determine the kit that will suit your application, refer to descriptions. When you have selected a kit, the model number and voltage must be specified when ordering.

Order oil line assembly separately.

# Swichgauge® Shutdown Panels with Open Back for Diesel Engines

## WD300 Series

### WD300 Series

The universally applicable WD300 Series panels are the ideal control solution for a wide variety of diesel engines without shut-down solenoid in the injection pump.

The standard WD300 Series panel includes basic engine protection for low oil pressure and high coolant temperature. It also includes Murphy's SV Series solenoid fuel shut-off valve, (see bulletin SV-99026B).

### WD300LV Models

For engines that have the fuel shutoff solenoid built into the injection pump. This model is also applicable to battery ignition engines.

Panel Kits Include:

- Low lube oil pressure Swichgauge instrument
- High coolant/temperature Swichgauge instrument
- 117PH magnetic switch
- SV Series solenoid fuel shutoff valve
- PB128S emergency stop push button



WD300-LV

## Specifications

### Low Lube Oil Pressure Swichgauge:

- 0-100 psi (0-689 kPa) [0-6.89 bar]
- 1/8 NPT process connection

### High Coolant Swichgauge:

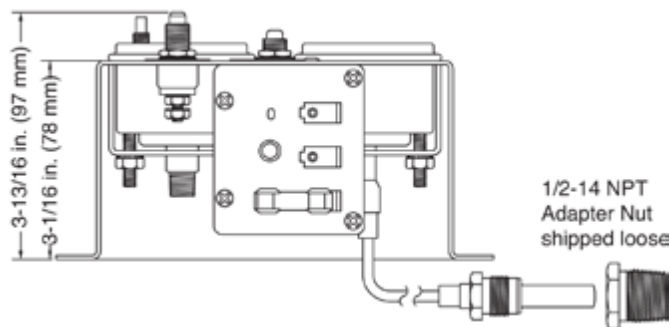
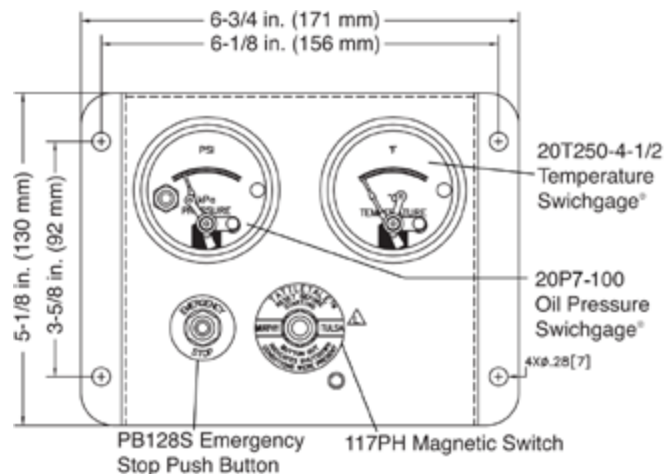
- 130-250°F (54-121°C)
- 48 in. (1.2 m) capillary
- 1/2 NPT process connection

**117PH Magnetic Switch SV Series Solenoid Fuel Shutoff Valve:** 12 or 24 volt (specify)

**Approximate Shipping Weight:** 8 lbs. 8 oz. (3.9 kg)

**Approximate Shipping Dimensions:** 8.5 x 5.25 x 5.5 in. (216 x 133 x 140 mm)

## Dimensions



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### Notes:

\* = Standard Component or Range and is not required for ordering. See section notes if section has two parts to specify.

- **WD300LV**: Does not include an SV Fuel Valve.
- **WD300**: Includes an SV Fuel Valve. (WD300-12 = 12-volt valve and WD300-24 = 24-volt valve)

If requirements are outside of the matrix, order panel with free-formed text and use the product number of the base model.

<b>WD300LV</b> <b>WD300-12</b> <b>WD300-24</b>																												
<b>PRESSURE RANGES</b> A = 75psi <b>*B = 100psi</b> C = 150psi																												
<b>TEMPERATURE RANGES</b> <table border="1"> <thead> <tr> <th colspan="2">RANGES</th> <th colspan="2">CAPILLARY</th> </tr> </thead> <tbody> <tr> <td>D = 220°</td> <td>*4 = 4ft.</td> <td>10 = 10ft.</td> <td>16 = 16ft.</td> </tr> <tr> <td>*E = 250°</td> <td>6 = 6ft.</td> <td>12 = 12ft.</td> <td>18 = 18ft.</td> </tr> <tr> <td>F = 300°</td> <td>8 = 8ft.</td> <td>14 = 14ft.</td> <td>20 = 20ft.</td> </tr> <tr> <td>G = 20TH-320°</td> <td colspan="3"> <b>NOTE: 20TH ONLY, M10 adapter (std.)</b>            Maximum capillary length 16 ft.         </td> </tr> </tbody> </table> <p><b>NOTE:</b> specify capillary length with range no dash. Both parts must be standard to leave blank, otherwise specify both parts. <b>EXAMPLE: E6</b></p>					RANGES		CAPILLARY		D = 220°	*4 = 4ft.	10 = 10ft.	16 = 16ft.	*E = 250°	6 = 6ft.	12 = 12ft.	18 = 18ft.	F = 300°	8 = 8ft.	14 = 14ft.	20 = 20ft.	G = 20TH-320°	<b>NOTE: 20TH ONLY, M10 adapter (std.)</b> Maximum capillary length 16 ft.						
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<b>ADAPTER NUTS</b> <table border="1"> <tbody> <tr> <td>1/8 = 1/8-27 NPT</td> <td>M10 = 10mm x 1.5</td> </tr> <tr> <td>1/4 = 1/4-18 NPT</td> <td>M12 = 12mm x 1.5</td> </tr> <tr> <td>3/8 = 3/8-18 NPT</td> <td>M14 = 14mm x 1.5</td> </tr> <tr> <td>3/8B = 3/8-19 BSPT</td> <td>M16 = 16mm x 1.5</td> </tr> <tr> <td>3/8K = 3/8 NPSF</td> <td>M18 = 18mm x 1.5</td> </tr> <tr> <td><b>*1/2 = 1/2-14 NPT</b></td> <td>M20 = 20mm x 1.5</td> </tr> <tr> <td>1/2B = 1/2 BSPT</td> <td>M22 = 22mm x 1.5</td> </tr> <tr> <td>1/2K = 1/2 NPSF</td> <td>M24 = 24mm x 1.5</td> </tr> <tr> <td>5/8 = 5/8-18 UNF</td> <td></td> </tr> <tr> <td>3/4 = 3/4-14 NPT</td> <td></td> </tr> <tr> <td>3/4U = 3/4-16 UNF</td> <td></td> </tr> <tr> <td>7/8 = 7/8-9 UNC</td> <td></td> </tr> </tbody> </table>					1/8 = 1/8-27 NPT	M10 = 10mm x 1.5	1/4 = 1/4-18 NPT	M12 = 12mm x 1.5	3/8 = 3/8-18 NPT	M14 = 14mm x 1.5	3/8B = 3/8-19 BSPT	M16 = 16mm x 1.5	3/8K = 3/8 NPSF	M18 = 18mm x 1.5	<b>*1/2 = 1/2-14 NPT</b>	M20 = 20mm x 1.5	1/2B = 1/2 BSPT	M22 = 22mm x 1.5	1/2K = 1/2 NPSF	M24 = 24mm x 1.5	5/8 = 5/8-18 UNF		3/4 = 3/4-14 NPT		3/4U = 3/4-16 UNF		7/8 = 7/8-9 UNC	
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1/2K = 1/2 NPSF	M24 = 24mm x 1.5																											
5/8 = 5/8-18 UNF																												
3/4 = 3/4-14 NPT																												
3/4U = 3/4-16 UNF																												
7/8 = 7/8-9 UNC																												
<b>MAGNETIC SWITCHES</b> <b>*H = 117PH</b> J=518PH-12 K=518PH-24 L=518APH-12 M=518APH-24																												

# Electric Gage Shutdown WDU Series Panels for Deutz 1011/2011, 912/913 and 914 Engines

Deutz engines that come factory equipped with electric-switched oil pressure and temperature senders can now be outfitted with a standard line of electric gage plug-and-go panels that take the work and time out of the installation process. Two bolts mount the panel to the engine's bell housing, and the included wiring allows for fast plug-and-go assembly. Simply remove two screws and the front hinged panel drops down allowing access to all the internal components. These panels are offered in three versions to accommodate all wiring and mounting requirements for DEUTZ 1011/2011, 912/913 and 914 Engines.

The panels are designed to compliment Deutz engines supplied with pre-installed factory-set electric switched senders. Protection against low oil pressure and high engine temperature is achieved with the Murphy 760A Time Delayed Magnetic Switch. A panel mounted 10 amp fuse protects the sensitive instrumentation from any over-current situation and stops the engine if blown. The Deutz pre-installed electric switched senders supply all shut-down signals directly to the Murphy 760A providing reliable and proven engine protection in harsh environments.

Critical engine information is provided with Murphy's environmentally sealed, LED illuminated EG Series electric gages. Known for their reliable performance and constructed of corrosion resistive materials, these rugged gages exceed SAE J1810 standards for use in tough off-road and industrial power unit applications. A unique spin-on gage clamp keeps the gages tight even in high vibration applications. Murphy's alternator driven ATHA 4000 RPM tachometer provides accurate display of engine speed with its back-lit dial, while the digital hour meter records the elapsed engine run time. The heavy-duty key switch constructed of corrosion resistant materials and heavy gage wiring exceeds the current requirements of the starter and engine pre-heat circuit. A red lamp mounted on the front panel indicates when the pre-heat circuit is active.

All components are assembled into a robust black powder-coated enclosure with text indicating key position. The plug-and-go external wire harness connects to the rear of the panel and has all the engine side connections pre-wired. The panel mounting bracket comes pre-assembled to the enclosure with three vibration isolators, making installation fast and simple.



## Features

- Pressure Gage: 0-80 PSI (0-500 kPa)
- Engine Temperature Gage: 140°-300°F (60°-150°C)
- Volt Meter (8-18 VDC)
- Tachometer/Hourmeter (0-4000 RPM)
- Key Switch (Heavy-Duty)
- Engine Preheat with Red Indicator Lamp
- Murphy 760A Safety Shutdown (Automatic Time Delayed for Start-up)
- Panel Mount Fuse
- Recessed and Protected Front Panel
- Durable Powder-Coat Finished Enclosure and Mounting Bracket

## Labor Saving Install Features

- Pre-wired External Harness (Includes all connectors and terminals)
- Mating connectors match Deutz Engine wiring for fast plug-and-go connection
- Pre-assembled: Enclosure, Rubber Isolation Mounts and Mounting Bracket
- Simple Bolt-on/Plug-in Installation



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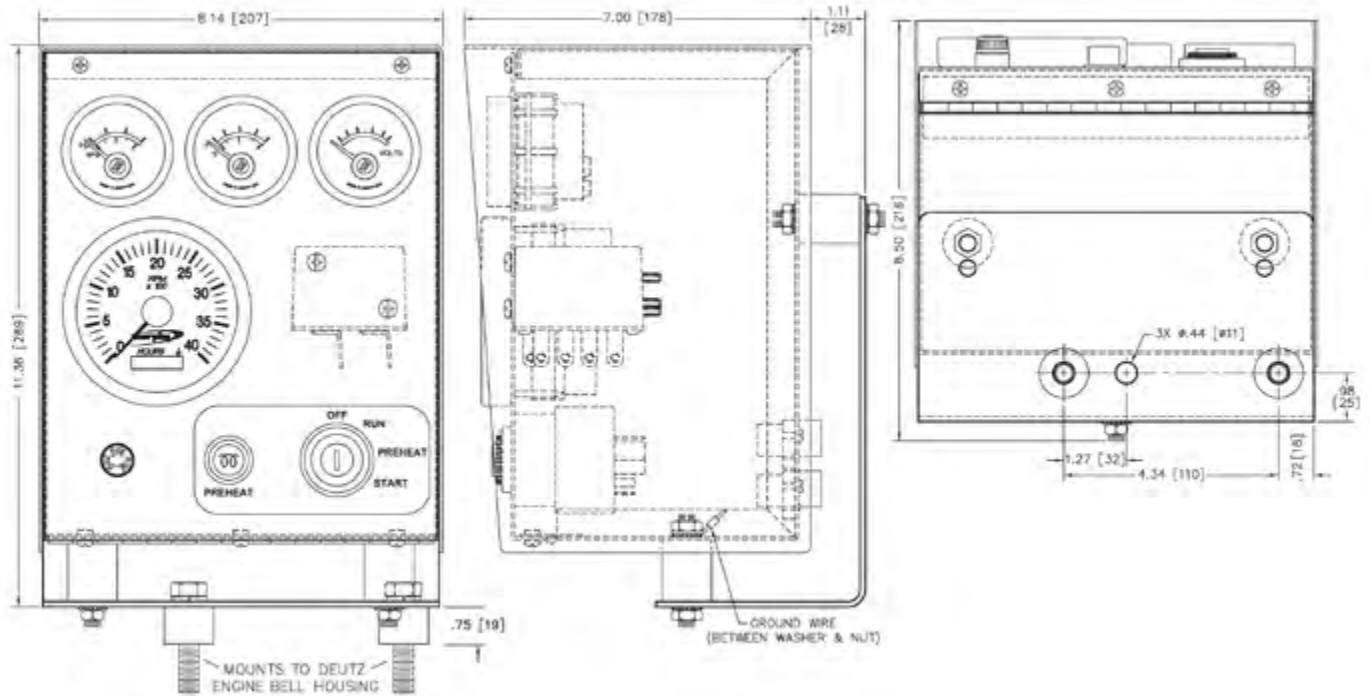


## Wiring

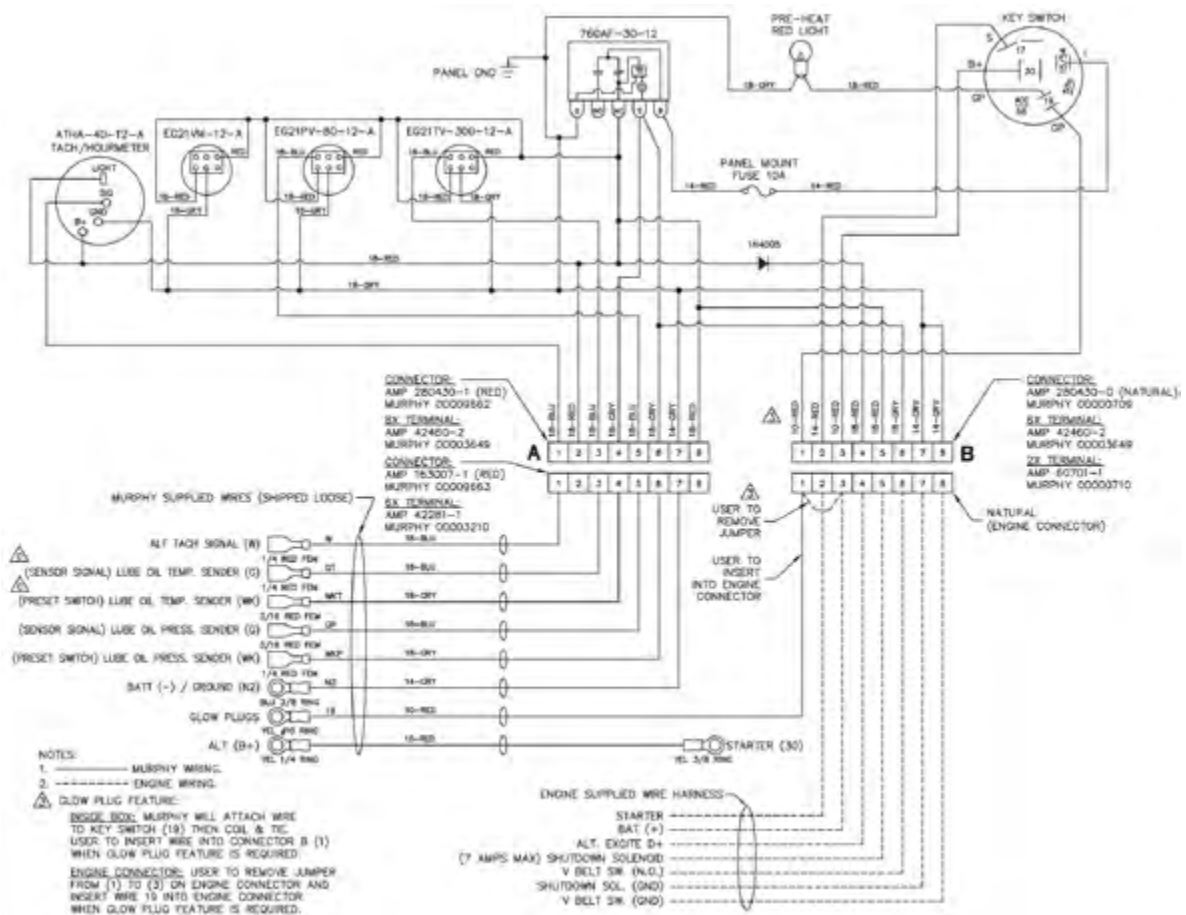




## WDU0815 Dimensions (includes Enclosure, Mounting Bracket and Shock Mounts)

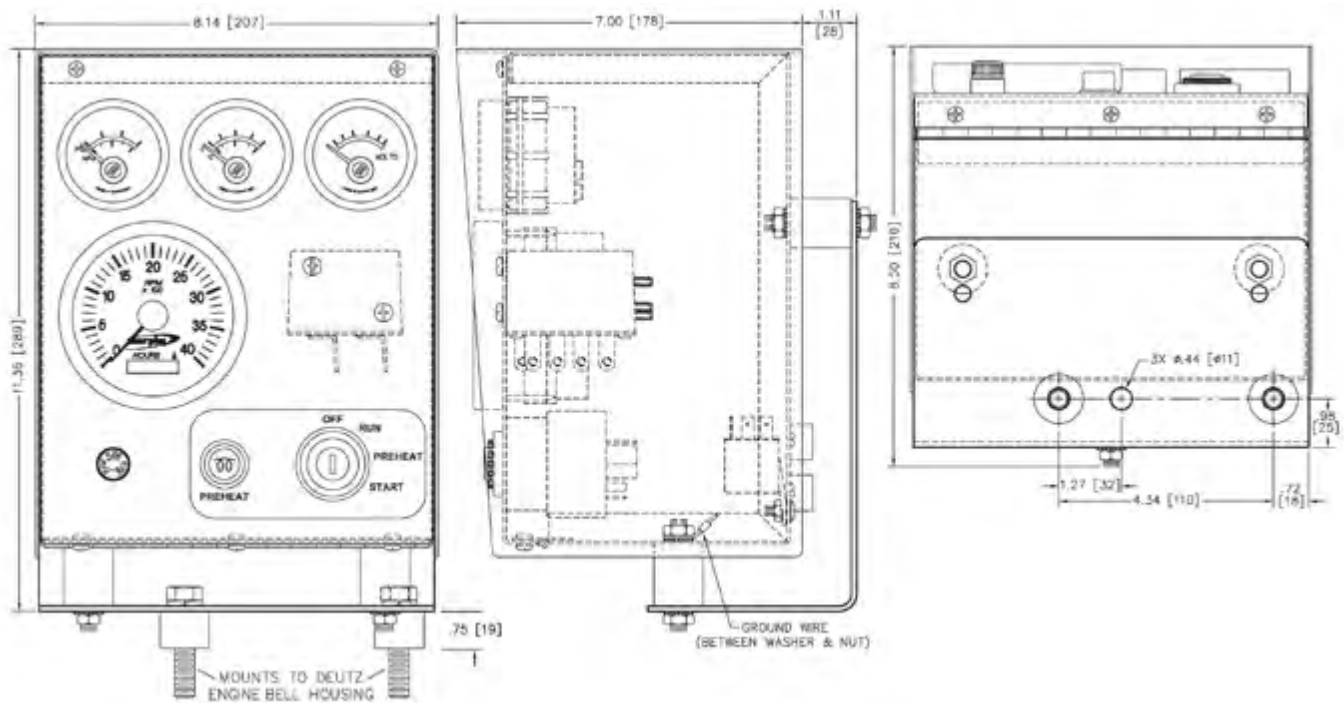


## WDU0815 Wiring

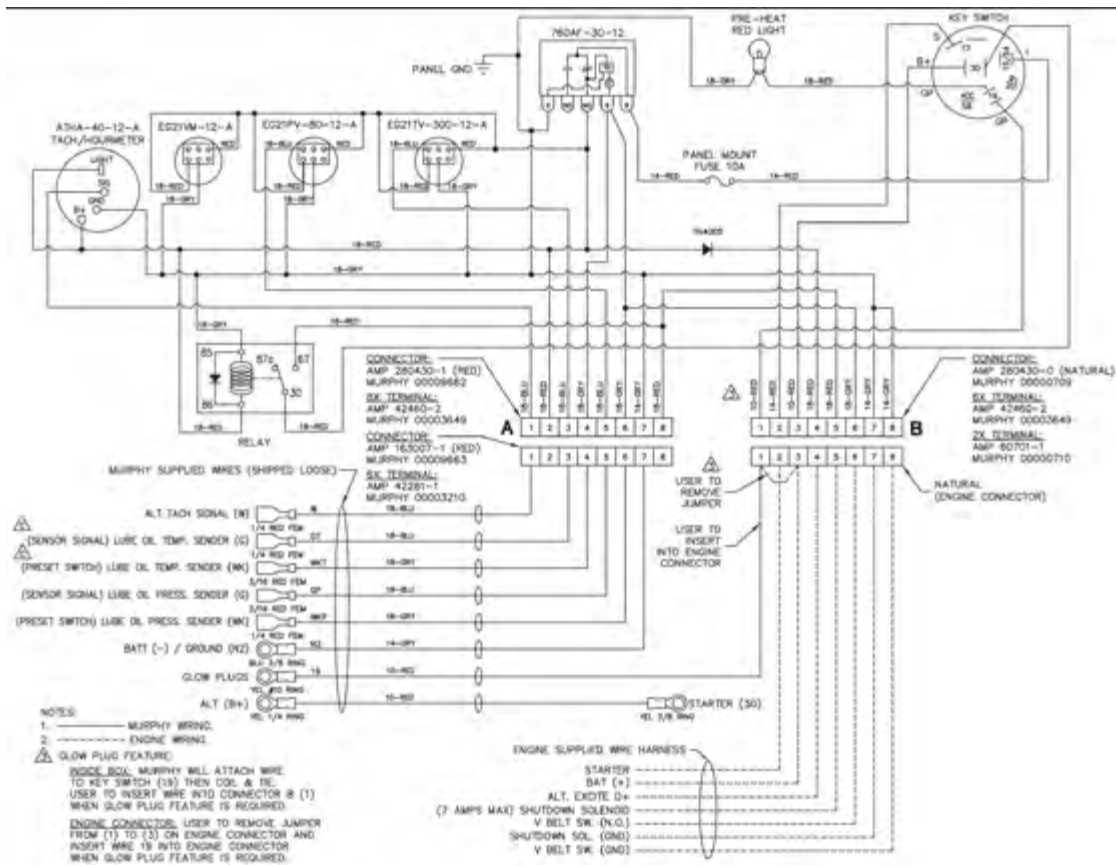


Always provide proper circuit protection with fuses or circuit breakers.

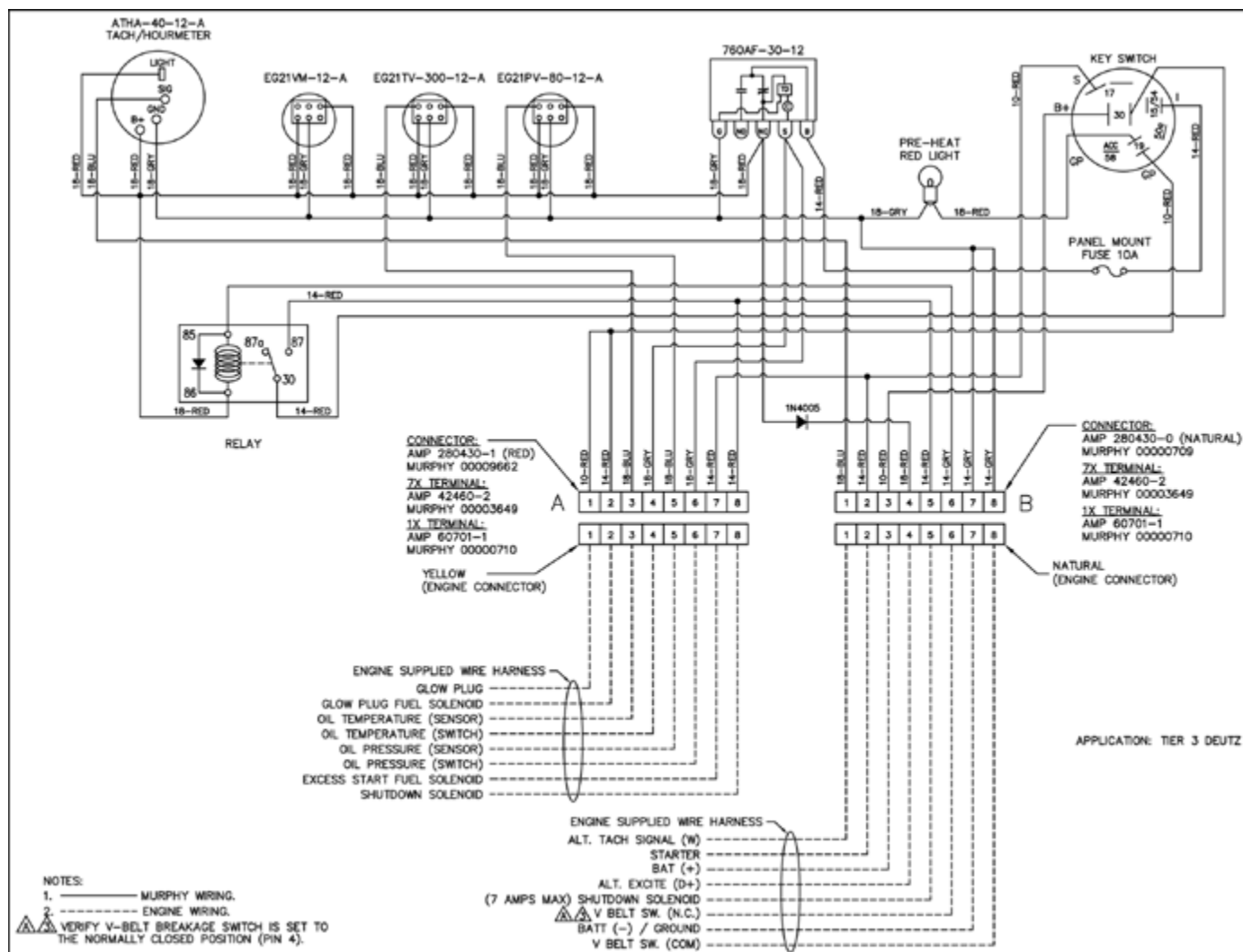
## WDU0816 Dimensions (includes Enclosure, Mounting Bracket and Shock Mounts)



## WDU0816 Wiring



Always provide proper circuit protection with fuses or circuit breakers.



Always provide proper circuit protection with fuses or circuit breakers.

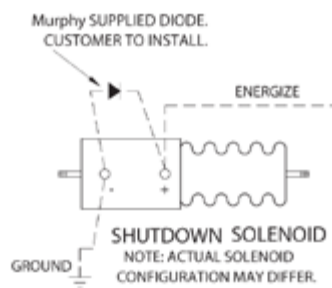
## Specifications

**Voltage:** 12 VDC

**Shipping Weight:** 16 lb. (7.3 kg)

**Shipping Dimensions:** 14 x 15-3/4 x 9-1/2in. (356 x 400 x 242 mm)

WARNING: FLYBACK DIODE REQUIRED ACROSS ALL INDUCTIVE LOADS TO REDUCE THE POTENTIAL OF VOLTAGE SPIKES DAMAGING SOLID STATE COMPONENTS.



## How to Order

Part Number	Model and Description	Notes
30700814	WDU0814 Panel Number used on DEUTZ 1011/2011 Engine	Includes Attached Wire Harness Pigtail with engine connector, battery (+), starter, pre-heat and ground wires. Mounting bracket has an additional plate to accommodate specific engine mount location.
30700815	WDU0815 Panel Number used on DEUTZ 912/913 Engine	Includes Loose External Wire Harness that plugs into back of panel, starter and pre-heat wires. Deutz-supplied engine harness also plugs into back of panel.
30700816	WDU0816 Panel Number used on DEUTZ 914 Engine	Includes a relay housed internal to the panel for the fuel solenoid. Includes Loose External Wire Harness that plugs into back of panel, starter and pre-heat wires. Deutz-supplied engine harness also plugs into back of panel.
30700865	WDU865 Panel Number used on Deutz 914 TIER 3 engines	Includes a relay housed internal to the panel for the fuel solenoid. Includes Loose External Wire Harness that plugs into back of panel, starter and pre-heat wires. Deutz-supplied engine harness also plugs into back of panel.

# WHB Series Swichgag® Shutdown Panels for High Plains and Other Irrigation Engines

The WHB Series open type panels are the industry standard for High Plains irrigation engines. These panels bolt directly to the engine flywheel housing. They include Switchgauge protection for low engine oil pressure and high coolant or high oil temperature and have provision to add additional Switchgauge instruments, such as a pump discharge pressure, voltage regulator, throttle cable and start button or switch.

For diesel engines without shut-down solenoid in the injection pump, add a Murphy SV Series solenoid fuel shut-off valve or RP2300 series rack puller solenoid (for details visit [www.fwmurphy.com](http://www.fwmurphy.com)).

Swichgage products are two instruments in one: (1) an accurate indicating gage with (2) a built-in, adjustable limit switch.

Panel Kits include:

- Low Lube Oil Pressure Switchgauge instrument
- High Coolant/ Temperature Switchgauge instrument
- 117PH Magnetic Switch
- PB128S Emergency Stop Push Button
- Ammeter 60-0-60



## Specifications

### Low Lube Oil Pressure Swichgage instrument:

0-100 psi (0-689 kPa) [0-6.89 bar]  
1/8 NPT process connection

**High Coolant/Oil Temperature Switchgauge instrument:**

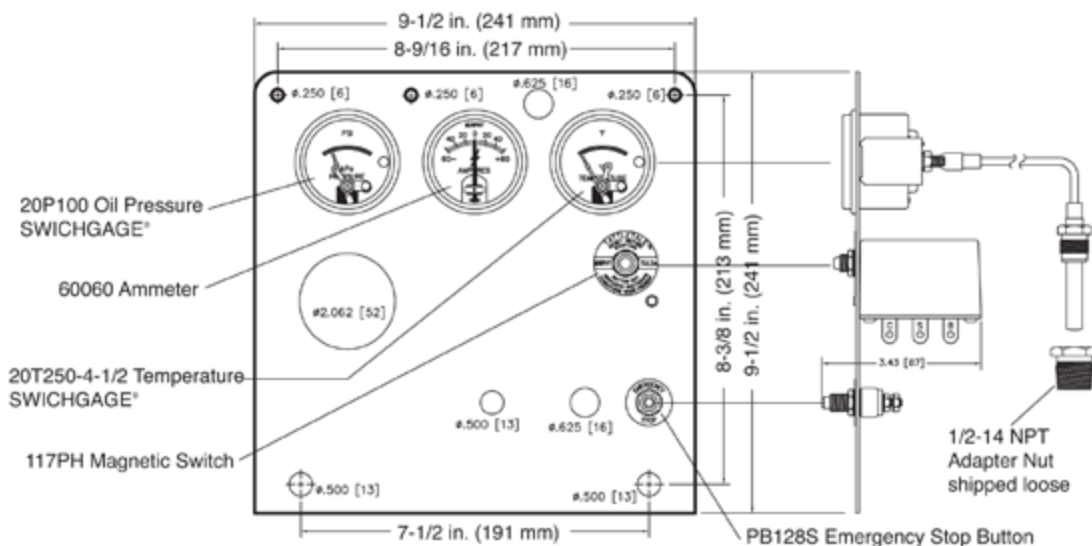
130°-250°F (54°-121°C)  
48 in. (1.2 m) capillary  
1/2 NPT process connection

**117PH Ammeter:** 60-0-60

**Shipping Weight:** 8 lbs. 8 oz. (3.9 kg)

**Shipping Dimensions:** 9.5 x 9 x 5 in. (241 x 229 x 127 mm)

## Dimensions



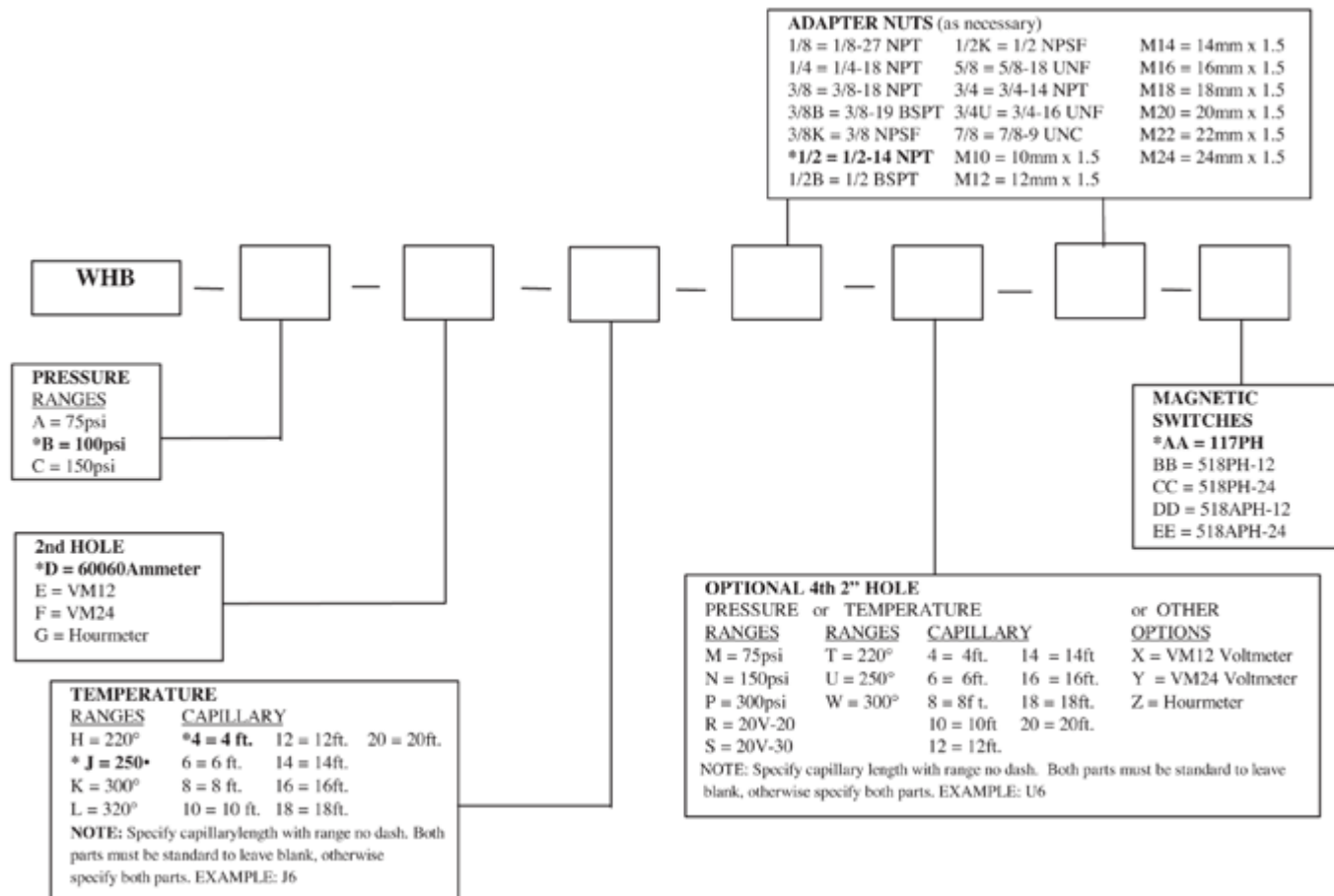
## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Notes:

\* = Standard Component or Range and is not required for ordering. See section notes if section has two parts to specify.

If requirements are outside of the matrix, order panel with free-formed text and use the 3050xxxx product number of the base model.





# Shutdown Panel Kits for Deutz and Other Engines W0156 and W0169 Series

The W0156 and W0169 panel kits were developed specifically for air-cooled and liquid-cooled engines where a weatherproof engine panel is required. Both kits feature Swichgage® protection for low engine oil pressure and high cylinder head or high oil temperature. Shock-mounted panel bolts directly to the flywheel housing or bracket of your design.

These kits were originally designed for Deutz FL912 and FL913 Series engines but can be used on a variety of engines. Internal wiring mates with a standard Deutz circuit.

Panel kits include:

- Low Lube Oil Pressure Swichgage instrument
- Cylinder Head/Oil Temperature Swichgage instrument
- 518PH Magnetic Switch
- Alternator failure light
- Ignition key switch
- Provisions for additional Swichgage instruments such as irrigation pump pressure or voltmeter/ammeter etc.
- Provisions for tachometer

Swichgage products are two instruments in one: (1) an accurate indicating gage with (2) a built-in, adjustable limit switch.

A 518PH Magnetic Switch provides a closed-loop circuit to ensure proper operation at all times. The 518PH allows the system to be sensitive to open circuits, broken wires, false grounds, corrosion, loss of power and other factors which could otherwise prevent the protective controls from operating.

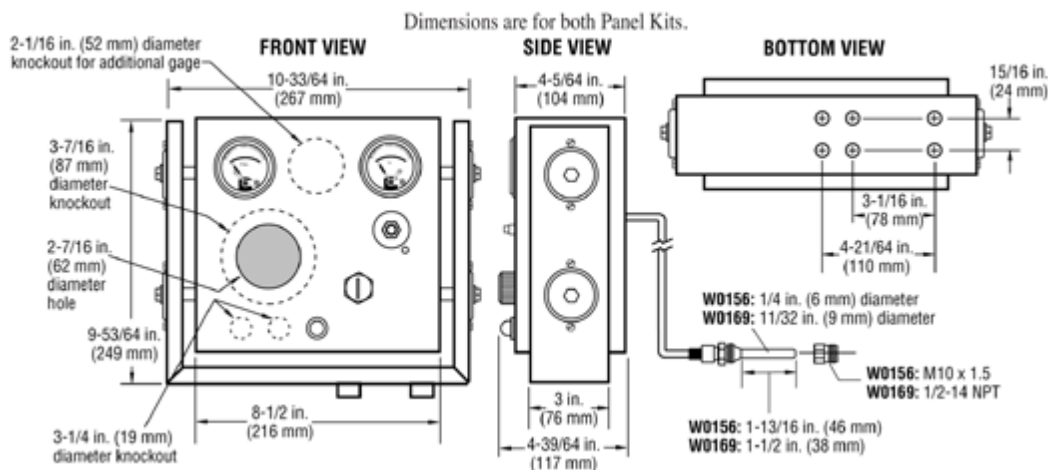
The mounting panel is enclosed. Panel Kits are pre-wired, ready to install and are available for 12- or 24-VDC systems.\*



**CAUTION:** Certain danger to human and to equipment such as applied in a mobile or marine application may occur if some equipment is stopped without pre-warning. It is therefore, recommended that monitored functions be limited to alarm only or to alarm before shutdown in such applications.

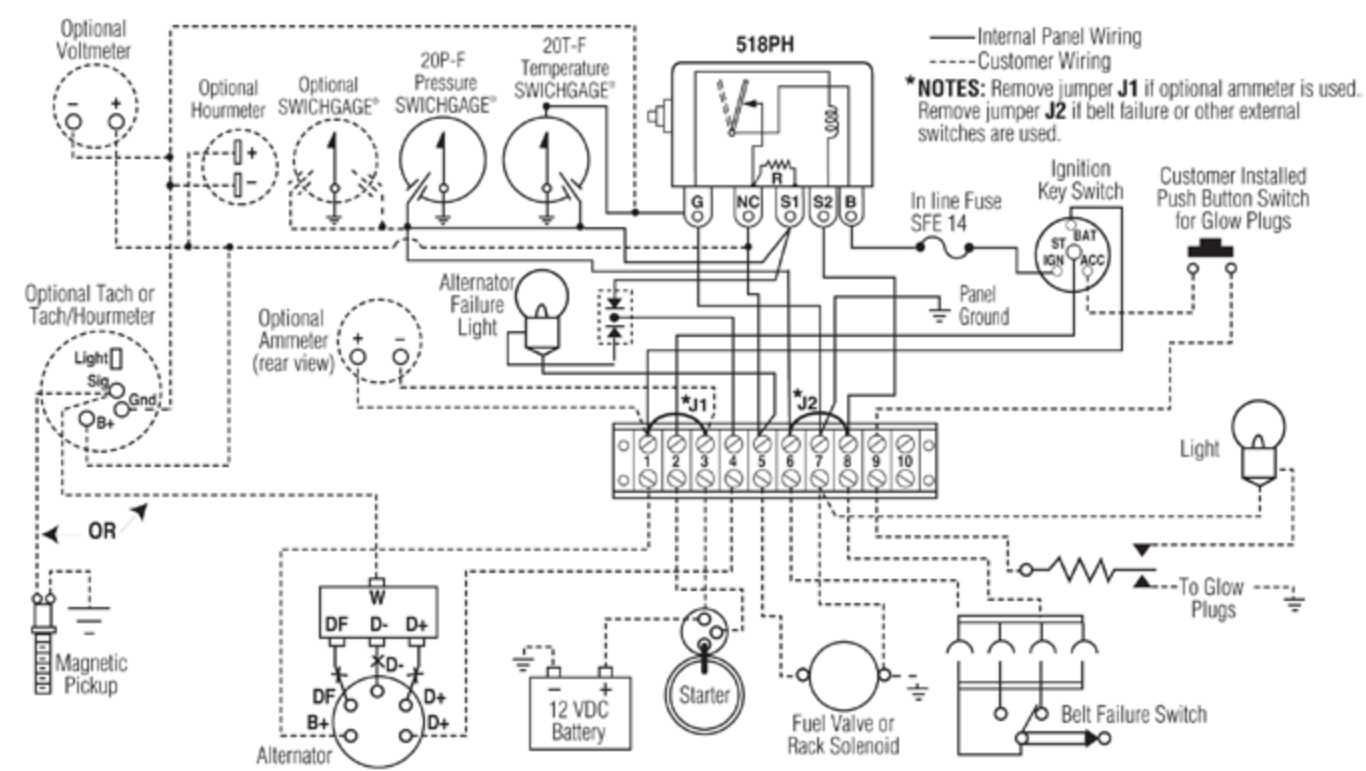
\* NOTE: 12-volt kit is standard. If you require a 24-volt kit, specify when ordering.

## Dimensions (dimensions are for both panel kits)





# Typical Wiring Diagram for Deutz



Always provide proper circuit protection with fuses or circuit breakers.

## Specifications

### Low Lube Pressure Switchgauge:

0-100 psi (0-689 kPa) [0-6.89 bar]  
1/8 NPT process connection

**518PH Magnetic Switch:** 12 or 24 volt (specify)

**Shipping Weight:** 14 lbs. (6.4 kg)

**Shipping Dimensions:** 14-7/8 x 14-7/8 x 6-3/4 in. (378 x 378 x 171 mm)

### Temperature Switchgauge:

**Cylinder Head Temperature (W0156):** 160°-320°F (71°-160°C), M10 x 1.5 process connection

**Oil Temperature (W0169):** 130°-250°F (54°-121°C), 1/2NPT process connection (see Murphy General Catalog for optional sizes)

**48 in. (1.2 m) capillary**

## How to Order

Part Number	Model and Description	Notes
Specify Model Number	W0156 For air-cooled engines	
	W0169 For liquid-cooled engines	

# Swichgag<sup>®</sup> Shutdown Panel Kit

## Models WO168 and WO241

The WO168 and WO241 panel kits are universal-fit instrument panels for most industrial engines. They include Swichgag protection for low engine oil pressure and high coolant or high oil temperature. These Panel Kits are similar – the WO168 has a start/stop key switch and the WO241 has a start push button.

The Swichgag product is two instruments in one: (1) an accurate indicating gage with (2) a built-in, adjustable limit switch.

A 518PH Magnetic Switch provides a closed-loop circuit to ensure proper operation at all times. The 518PH allows the system to be sensitive to open circuits, broken wires, false grounds, corrosion, loss of power and other factors which could otherwise prevent the protective controls from operating.

The universal mounting panel is enclosed on all four sides with an open back. An optional back cover is available for both kits. Panel Kits are pre-wired and ready to install and are available for 12- or 24-VDC systems.



WO168

### Dimensions

### Features

- Low Lube Oil Pressure Swichgag instrument
- High Coolant/Oil Temperature Swichgag
- 518PH Magnetic Switch
- Emergency stop push button
- Ignition key switch for start/stop (WO168)
- Push button for start (WO241)
- Ammeter 60-0-60
- Provisions for additional Swichgag controls, such as irrigation pump pressure or engine oil temperature
- Provisions for tachometer and throttle cable

### Specifications

#### Low Lube Oil Pressure Swichgag Instrument:

0-100 psi (0-689 kPa) [0-6.89 bar]  
1/8 NPT process connection

#### High Coolant/Oil Temperature Swichgag Instrument:

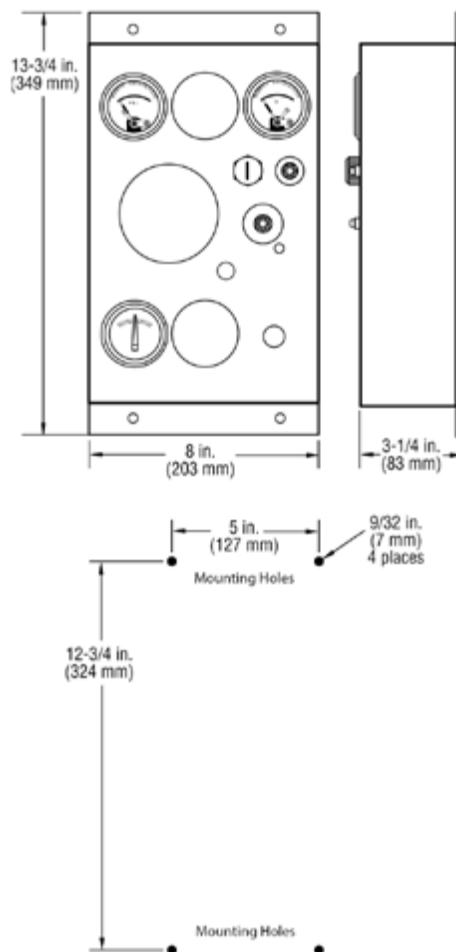
130°-250°F (54°-121°C)  
48 in. (1.2 m) capillary  
1/2 NPT process connection

**518PH Magnetic Switch:** 12 or 24 volt (specify)

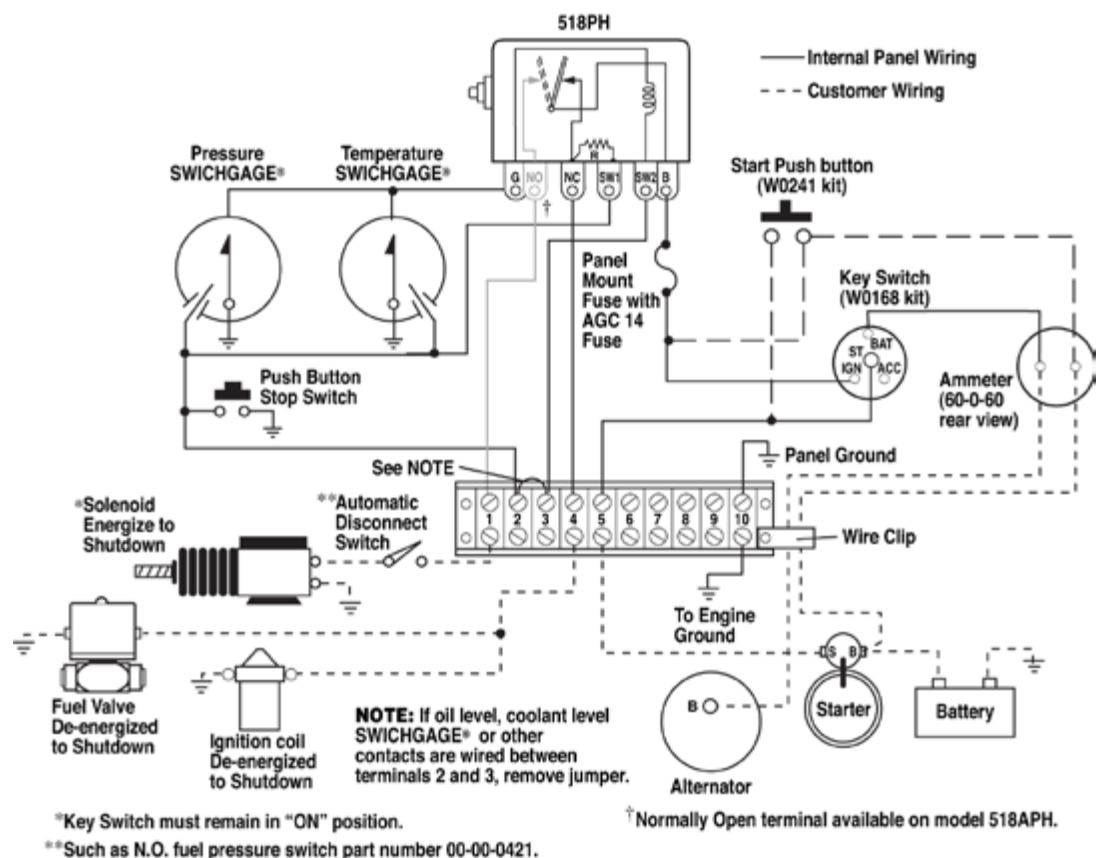
**Ammeter:** 60-0-60

**Shipping Weight:** 8 lbs. 8 oz. (3.9 kg.)

**Shipping Dimensions:** 16 x 11 x 5-1/2 in. (406 x 279 x 140 mm)



# Typical Wiring Diagram



Always provide proper circuit protection with fuses or circuit breakers.

## How to Order

Part Number	Model and Description	Notes
Specify Model Number	W0168: Panel Kit, start/stop key switch	12-volt kit is standard. If you require 24-volt kit - specify when ordering
	W0168B: Panel Kit with back cover, start/stop key switch	
	W0241: Panel Kit, start push button	

# Swichgag<sup>®</sup> Shutdown Panel Kit Model WO270

The WO270 is a compact, low-profile Swichgag shutdown panel kit. It is designed to fit the following power units:

- Caterpillar 3054 and 3056
- Perkins 1004 and 1006
- Detroit Diesel 1000 Series.

A universal shock-mounted bracket allows mounting on either side of the engine or on top for your power unit configurations. The kit is ready for quick, easy installation with provision for installing customer supplied ignition/start key switch. All wiring is included in the panel.

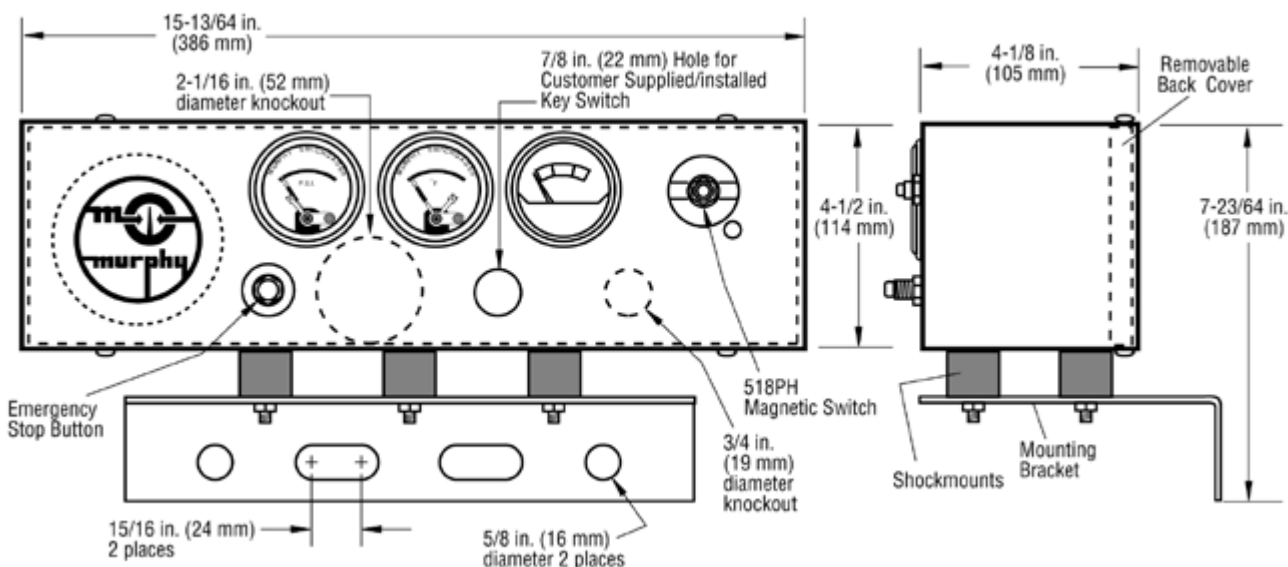
This panel kit is ideal for all types of power unit applications – irrigation pumps, grain dryers, compressors, generators, etc.



## Features

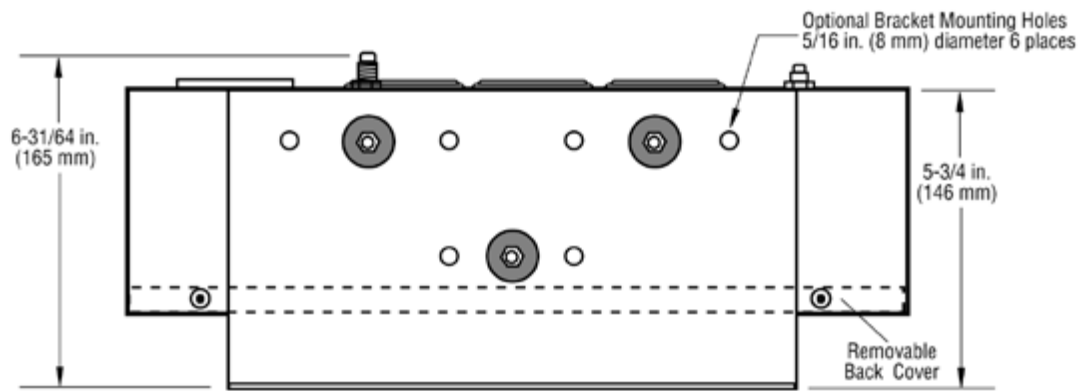
- Engine oil pressure monitoring Swichgag instrument (20P-F)
- Coolant temperature monitoring Swichgag instrument (20T-F)
- Voltmeter (VM12/VM24)
- Closed-loop 518PH Magnetic Switch
- Emergency stop button (PB128S)
- Provision for throttle cable
- Provision for customer supplied key switch (loom is pre-wired – mount and plug-in)
- Provision for optional tachometer or hourmeter (loom is pre-wired)
- Provision for one additional Swichgag instrument such as irrigation pump discharge pressure monitoring
- All items pre-wired including tachometer or hourmeter
- Complete external wiring harness including wiring for pre-heat and shutdown solenoid

## Dimensions



**Dimensions — continued**

Bottom View



**How to Order**

Part Number	Model and Description	Notes
Specify Model Number	WO270: Panel Kit	
Order oil line assembly separately		

# ML25 Panels

## MurphyLink® Series

The MurphyLink Series ML25 Panels feature the PowerView™ PV25, an engine and diagnostic display in an economical and compact package. This J1939-compliant device provides electronic engine parameter data, is simple to install and matches the PowerView line of rugged displays. The PV25 can be powered by 12- or 24-volt systems.

The PV25 is equipped with two push buttons to quickly access a convenient menu. In addition, a back lit graphic display and two LEDs indicate Active-fault Alarm or Shutdown status.

Active and Stored Fault messages display the SPN (Suspect Parameter Number), FMI (Failure Mode Indicator) and the OC (Occurrence Count) using the SAE J1939 protocol.

### Features

- Tier 4/Stage IIIB/IV Compliant/Ready
- Compact J1939-compliant device for electronically controlled engines
- Displays up to 20 standard J1939 parameters
- Active and stored diagnostic trouble codes
- Provides enhanced visual alarm indication using bright alarm and shutdown LEDs

### Specifications

#### Operating Voltage:

12/24 VDC (6.5-32VDC Minimum and Maximum Voltage)

#### Operating Current:

850mA MAX

#### Mounting:

4-.75" Rubber Isolated Shockmounts

#### Starting Method:

KeySwitch

#### Stopping Method:

KeySwitch

#### Display:

PowerView Model 25

#### Indication Lamps:

One red, One Amber via PV25 Display

#### Enclosure Material:

Powder-Coated Cold Rolled Steel

#### Wiring Interface:

1-Deutsch HDP 21pin Connector

#### Throttle Method:

Rocker Switch (Digital Inputs to ECU)

#### Tier 4 Regeneration:

CAN Enabled (via PV25) or Rocker Switch (via Digital Input to ECU)

#### Operational Temperature:

-40° to +158°F (-40° to +70°C)

#### Storage Temperature:

-67° to +185°F (-55° to +85°C)

#### Box Dimensions:

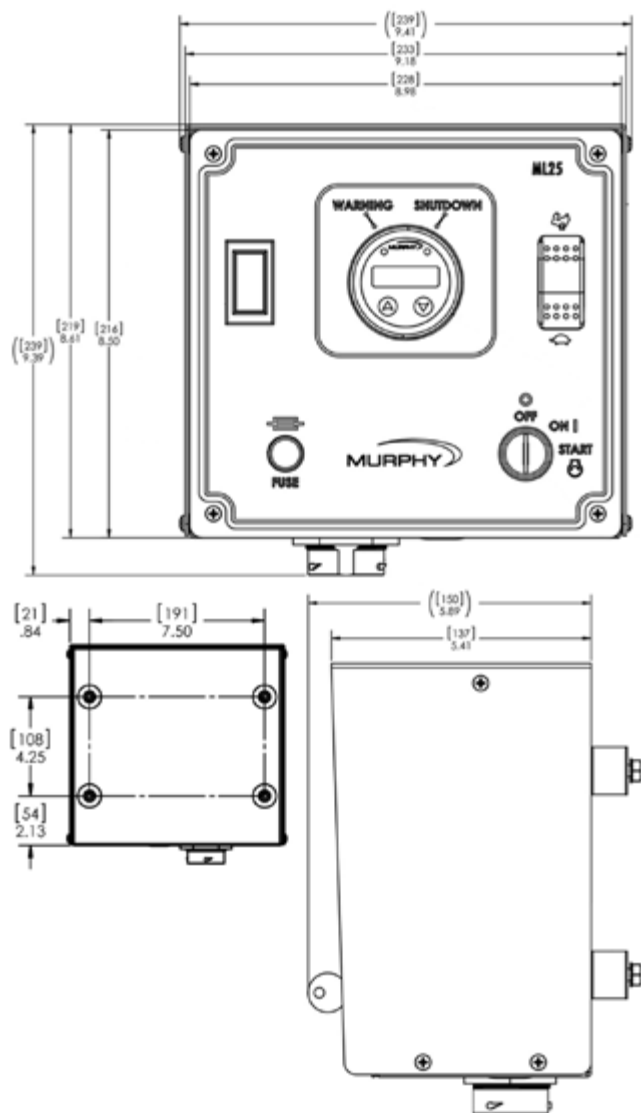
15.4 X 13.4 X 8.5 (340.6 mm X 215.9 mm)

#### Shipping Weight:

9.5 lbs (4.3 kg)



### Dimensions



## How to Order

Part Number	Model and Description	Notes
32700190	<b>ML25-FP:</b> PV25 flat only, PTO Ramp throttle method, 12/24 VDC	Flat panel
32700191	<b>ML25:</b> PV25 enclosed, PTO Ramp throttle method, 12/24 VDC	Enclosed panel
32700192	<b>ML25-T4-FP:</b> PV25 flat only w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Flat panel
32700193	<b>ML25-T4:</b> PV25 enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Enclosed panel



# ML50 Panels

## MurphyLink® Series

The MurphyLink Series ML50 Panels feature PVCAN gages and the PowerView™ PV25, an engine and diagnostic display in an economical and compact package. This J1939-compliant device provides electronic engine parameter data, is simple to install and matches the PowerView line of rugged displays. The PV25 can be powered by 12 or 24 volt systems.

The PV25 is equipped with two push buttons to quickly access a convenient menu. In addition, a back lit graphic display and two LEDs indicate Active-fault Alarm or Shutdown status.

Active and Stored Fault messages display the SPN (Suspect Parameter Number), FMI (Failure Mode Indicator) and the OC (Occurrence Count) using the SAE J1939 protocol.

### Features

- Tier 4/Stage IIIB/IV Compliant/Ready
- Compact J1939-compliant device for electronically controlled engines
- Displays up to 20 standard J1939 parameters
- Active and stored diagnostic trouble codes
- Analog gages
- Provides enhanced visual alarm indication using bright alarm and shutdown LEDs

### Specifications

#### Operating Voltage:

12/24 VDC (6.5-32VDC Minimum and Maximum Voltage) Operating

**Current:** 1.2A MAX

**Mounting:** 4-.75 in. Rubber Isolated Shockmounts

**Starting Method:** KeySwitch

**Stopping Method:** KeySwitch

**Display:** PowerView Model 25 Indication Gages

- 1) Engine Temperature
- 2) Engine Oil Pressure
- 3) Engine Speed (Analog Tachometer)

**Indication Lamps:** One red, One Amber via PV25 Display

**Enclosure Material:** Powder-Coated Cold Rolled Steel

**Wiring Interface:** 1-Deutsch HDP 21pin Connector

**Throttle Method:** Rocker Switch (Digital Inputs to ECU)

**Tier 4 Regeneration:** CAN Enabled (via PV25) or Rocker Switch (via Digital Input to ECU)

**Operational Temperature:** -40° to +158°F (-40° to +70°C)

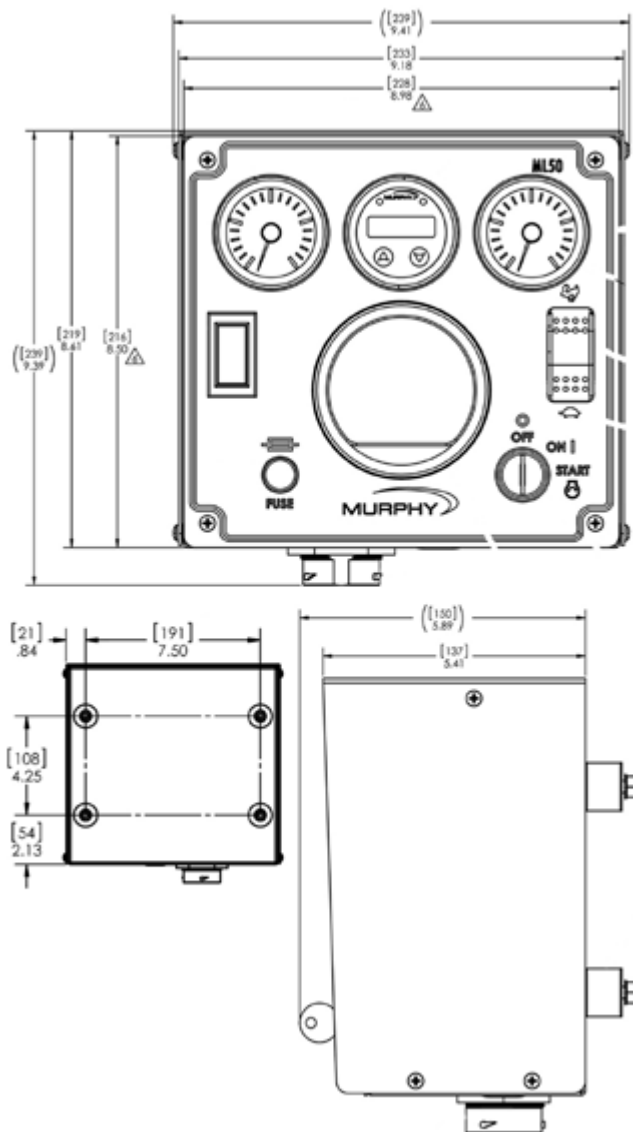
**Storage Temperature:** -55° to +185°F (-67° to +85°C)

**Box Dimensions:** 15.4 X 13.4 X 8.5 (391 X 340.4 X 216 mm)

**Shipping Weight:** 10.5 lbs (4.8 kg)



### Dimensions



## How to Order

Part Number	Model and Description	Notes
32700212	ML50-FP: PV25 with gages flat only, PTO Ramp throttle method, 12/24 VDC	Flat panel
32700213	ML50: PV25 with gages enclosed, PTO Ramp throttle method, 12/24 VDC	Enclosed panel
32700214	ML50-T4-FP: PV25 with gages flat only w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Flat panel
32700215	ML50-T4: PV25 with gages enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Enclosed panel

# ML100 Panels

## MurphyLink® Series

The MurphyLink® Series ML100 Panel features the PV101-C display, which was developed to meet the needs for instrumentation and control on electronically controlled engines communicating using the SAE J1939 Controller Area Network (CAN).

This basic panel contains a key switch, increment/decrement throttle and the PowerView. This standard panel can be ordered with or without an enclosure, because all of the components are assembled to a stand-alone flat panel. Optional mounting kits are offered for the enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications. Panel designs are offered to meet the needs of specific engine models. In addition, Murphy offers standard wiring harnesses for quick plug-and-go operation that interface with all the second-generation MurphyLink PowerView panels.

The PV101 Display is a multifunction tool that enables equipment operators to view many different engine or transmission parameters and service codes. The PowerView includes a graphical, backlit LCD screen. It has excellent contrast and viewing from all angles. The display can show either a single parameter or a quadrant display for viewing four parameters simultaneously. Diagnostic capabilities include fault codes with text translation for the most common fault conditions.

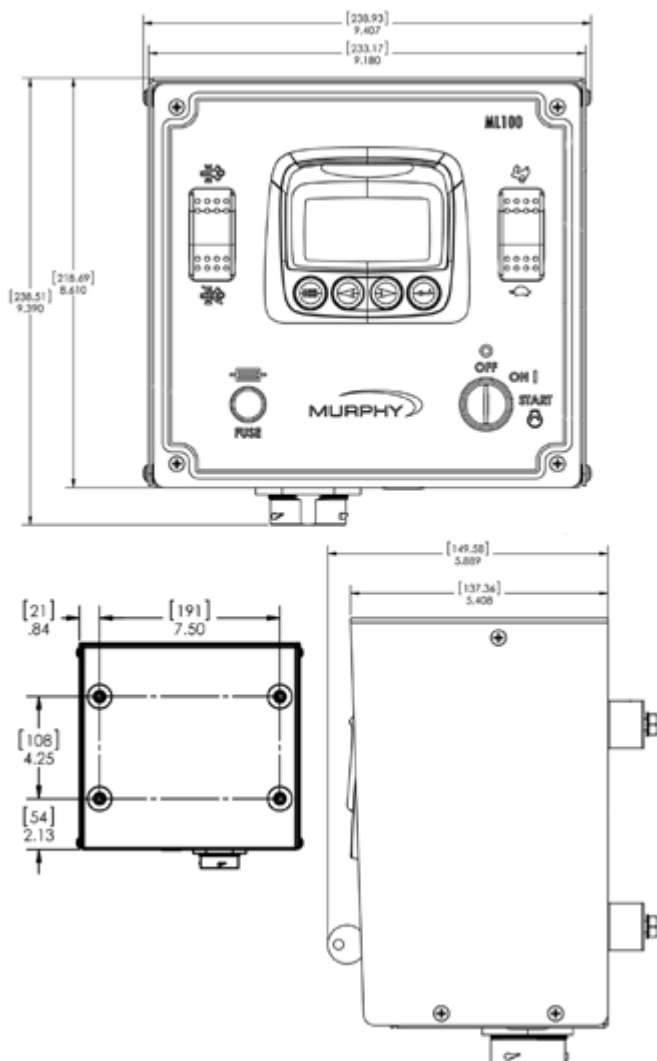
The PowerView has four buttons using touch-sensitive technology, which eliminates the concern for push button wear and failure. In addition, operators can navigate the display with ease. Enhanced alarm indication uses ultra bright alarm and shutdown LEDs (amber and red). The PowerView has a wide operating temperature range of -40° to 185°F (-40° to +85°C), display viewing -20° to 185°F (-29° to +85°C) and environmental sealing to +/- 5 PSI.

### Features

- Tier 4/Stage IIIB/IV Compliant/Ready
- Standard Panel Designed for Modern Electronic Engines and Equipment Applications Using SAE J1939 Controller Area Network (CAN)
- PowerView Model 101 Displays More Than 50 Standard SAE J1939 Parameters Broadcast by Major Engine and Transmission Manufacturers ECUs
- Display Active Faults and ECU-Stored Faults with Text Description on Most Common Faults for Diagnosing Equipment Malfunctions
- Standard Harnesses Available for Most Major Engine Manufacturers ECUs
- Enclosed Design or Flat Panel Option



### Dimensions



## Specifications

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**Operating Voltage:**

12/24 VDC (6.5-32VDC Minimum and Maximum Voltage)

**Operating Current:** 1A MAX**Mounting:** 4-.75" Rubber Isolated Shockmounts**Starting Method:** KeySwitch**Stopping Method:** KeySwitch**Display:** PowerView Model 101-C**Indication Lamps:** One red, One Amber via PV101-C Display**Enclosure Material:** Powder-Coated Cold Rolled Steel**Wiring Interface:** 1-Deutsch HDP 21pin Connector**Throttle Method:**

Rocker Switch (Digital Inputs to ECU)

TSC1 CAN Throttling (via PV101)

**Tier 4 Regeneration:**

CAN Enabled (via PV101) or Rocker Switch (via Digital Input to ECU)

**Operational Temperature:** -40° to +185°F (-40° to +85°C)**Viewable Temperature:** -20° to +185°F (-29° to +85°C)**Storage Temperature:** -40° to +185°F (-40° to +85°C)**Box Dimensions:** 15.4 X 13.4 X 8.5 (391 X 340.4 X 216 mm)**Shipping Weight:** 9.5 lbs (4.3 kg)

## How to Order

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Part Number	Model and Description	Notes
32700198	ML100-FP: PV101 Flat only, PTO Ramp throttle	Flat panel
32700199	ML100: PV101 Enclosed, PTO Ramp throttle	Enclosed panel
32700200	ML100-T4-FP: PV101 Flat only w/ T4 switch, PTO Ramp T4 Rocker throttle	Flat panel
32700201	ML100-T4: PV101 Enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle	Enclosed panel

# ML150 Panels

## MurphyLink® Series

The MurphyLink® Series ML150 Panels include the PowerView™ PV101-C display and the M-Link™ PowerView Analog gages. They are part of the J1939 MurphyLink Family developed to meet the needs for instrumentation and control on electronically controlled engines communicating using the SAE J1939 Controller Area Network (CAN).

The PV101 display is a multifunction tool that enables equipment operators to view many different engine or transmission parameters and service codes. The panels provide a window into modern electronic engines. The PowerView includes a graphical backlit LCD screen. It has excellent contrast and viewing from all angles. The display can show either a single parameter or a quadrant display for viewing four parameters simultaneously. Diagnostic capabilities include fault codes with text translation for the most common fault conditions.

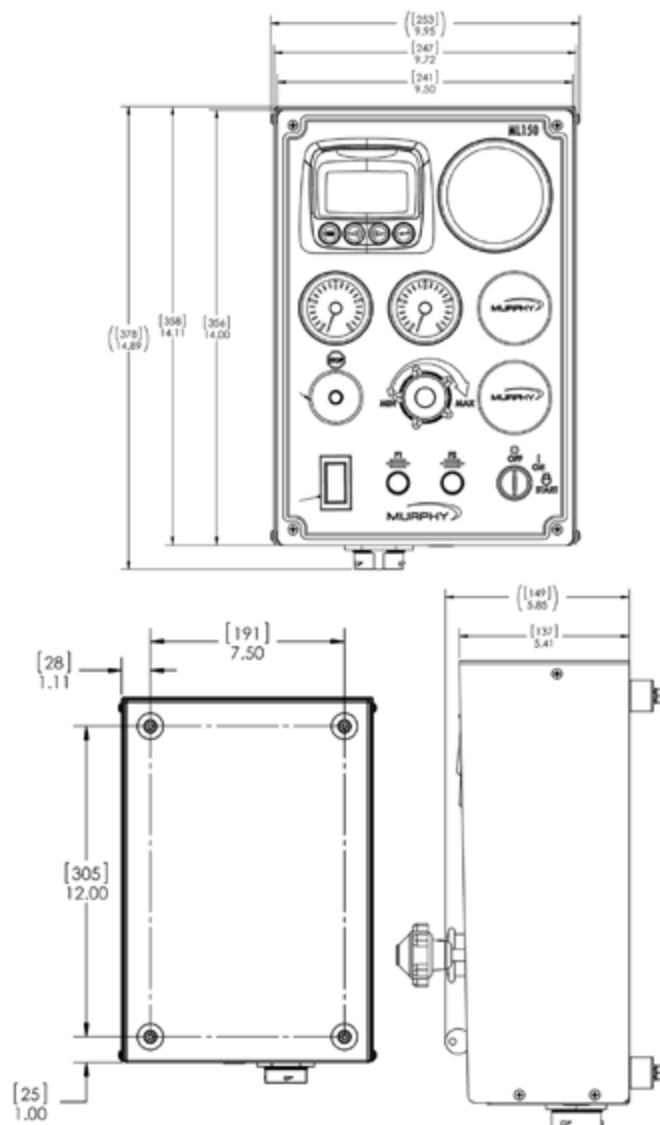
Other components in the panels are microprocessor-based M-Link PowerView Analog Gages for displaying critical engine data broadcast by an electronic engine: engine RPM, oil pressure and coolant temperature. The ML150 Series panels are available in an enclosure or stand-alone flat panel option that can be dropped into a dash or console. This standard panel can be ordered with or without an enclosure. Optional mounting kits are offered for the enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications.

### Features

- Standard Panel Designed for Modern Electronic Engines and Equipment Applications Using SAE J1939 Controller Area Network (CAN)
- PowerView Model 101 Displays More Than 30 Standard SAE J1939 Parameters Broadcast by Major Engine and Transmission Manufacturers' ECUs
- Display Active Faults and ECU-Stored Faults with Text Description on Most Common Faults for Diagnosing Equipment Malfunctions
- Standard Harnesses Available for Most Major Engine Manufacturers ECUs
- Enclosed Design or Flat Panel Option



### Dimensions



## Specifications

### Operating Voltage:

12/24 VDC (8-32VDC Minimum and Maximum Voltage)

**Operating Current:** 1.4A MAX

**Mounting:** 4-.75" Rubber Isolated Shockmounts

**Starting Method:** KeySwitch

**Stopping Method:** KeySwitch

**Display:** PowerView Model PV101-C

**Indication Lamps:** One red, One Amber via PV101-C Display

**Enclosure Material:** Powder-Coated Cold Rolled Steel

**Wiring Interface:** 1-Deutsch HDP 21pin Connector

### Throttle Method:

Rocker Switch (Digital Inputs to ECU) or Hand Throttle (PWM or 0-5V)  
TSC1 CAN Throttling (via PV101)

### Tier 4 Regeneration:

CAN Enabled (via PV101) or Rocker Switch (via Digital Input to ECU)

**Operational Temperature:** -40° to +185°F (-40° to +85°C)

**Viewable Temperature:** -29° to +185°F (-20° to +85°C)

**Storage Temperature:** -40° to +185°F (-40° to +85°C)

**Box Dimensions:** 21.5 X 13.5 X 8.5 (546 X 343 X 216 mm)

**Shipping Weight:** 16.0 lbs (7.3 kg)

## How to Order

Part Number	Model and Description	Notes
32700202	<b>ML150-FP:</b> PV101 Flat only, PTO Ramp throttle	Flat panel
32700203	<b>ML150:</b> PV101 Enclosed, PTO Ramp throttle	Enclosed panel
32700204	<b>ML150-T4-FP:</b> PV101 Flat only w/ T4 switch, PTO Ramp T4 Rocker throttle	Flat panel
32700205	<b>ML150-T4:</b> PV101 Enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle	Enclosed panel
32700216	<b>ML150-ES-MT5V-FP:</b> PV101 Flat only Stop Button, Morse 5V, PWM Morse & E-Stop throttle	Flat panel
32700217	<b>ML150-ES-MT5V:</b> PV101 Enclosed Stop Button, Morse 5V, PWM Morse & E-Stop throttle	Enclosed panel
32700206	<b>ML150-T4-ES-MT5V-FP:</b> PV101 Flat only Stop Button, Morse 5V w/ T4 switch, PWM Morse & E-Stop throttle	Flat panel
32700207	<b>ML150-T4-ES-MT5V:</b> PV101 Enclosed Stop Button, Morse 5V w/ T4 switch, PWM Morse & E-Stop throttle	Enclosed panel
32700218	<b>ML150-ES-MTPWM-FP:</b> PV101 Flat only Stop Button, Morse PWM, 0-5V Morse & E-Stop throttle	Flat panel
32700219	<b>ML150-ES-MTPWM:</b> PV101 Enclosed Stop Button, Morse PWM, 0-5V Morse & E-Stop throttle	Enclosed panel
32700208	<b>ML150-T4-ES-MTPWM-FP:</b> PV101 Flat only Stop Button, Morse PWM w/ T4 switch, 0-5V Morse & E-Stop throttle	Flat panel
32700209	<b>ML150-T4-ES-MTPWM:</b> PV101 Enclosed Stop Button, Morse PWM w/ T4 switch, 0-5V Morse & E-Stop throttle	Enclosed panel



# ML300 Panels

## MurphyLink® Series

The MurphyLink® Series ML300 Panels include the new PowerView™ PV300, a robust, multifunction control panel that provides advanced monitoring of electronic engines designed to meet Tier 4/Euro Stage IV emissions requirements. The model PV300-P monitors multiple engine and machine parameters on an easy-to-read 3.8-inch (97 mm) QVGA monochrome LCD.

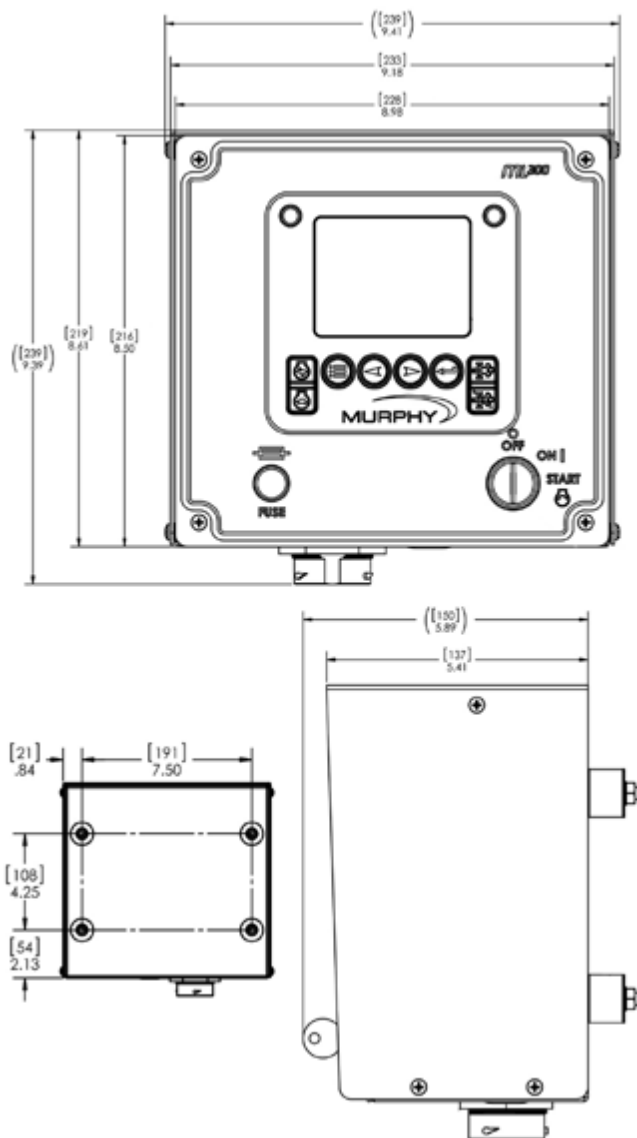
The panel is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown with integrated throttle control. The PV300 provides monitoring of Tier 4/Euro Stage 4 compliant electronic engines, monitors multiple J1939 parameters and provides basic engine alarm/shutdown with integrated throttle control. Throttling communicates through TSC1 on the J1939 CAN network. The regeneration commands for inhibit and forced-regeneration communicate through J1939 CAN protocol.

### Features

- Tier 4/Euro Stage IV ready
- Superior Display Visibility Even in Bright Sunlight
- Back-Mounted Display for Seamless Panel Integration
- Integrated CAN Communication Using SAE J1939
- Rugged Enclosure Using Industry Standard Deutsch Connectors
- Circuit Protection and Diagnostics



### Dimensions





# Specifications

- Operating Voltage:**  
12/24 VDC (9-32VDC Minimum and Maximum Voltage)

**Operating Current:** 1.2A MAX

**Mounting:** 4 - .75" Rubber Isolated Shockmounts

**Starting Method:** KeySwitch

**Stopping Method:** KeySwitch

**Display:** PowerView Model 300

**Indication Lamps:** One red, One Amber via PV300 Display

**Enclosure Material:** Powder Coated Cold Rolled Steel

**Wiring Interface:** 1-Deutsch HDP 21pin Connector
- Throttle Method:** TSC1 CAN Throttling (via PV300 Tactile Rocker)

  - Increment/Decrement
  - Idle/Run
  - Idle, Run 1, Run 2

**Tier 4 Regeneration:** CAN Enabled (via PV300 Tactile Rocker)

**Operational Temperature:** -40° to +185°F (-40° to +85°C)

**Storage Temperature:** -40° to +185°F (-40° to +85°C)

**Box Dimensions:** 15.4 X 13.4 X 8.5 (391 X 340.4 X 216 mm)

**Shipping Weight:** 10.0 lbs (4.5 kg)

# How to Order

Part Number	Model and Description	Notes
32700210	ML300: 12/24-Volt	Enclosed panel

# MLC380 Panel

## MurphyLink® Series

The MurphyLink Series MLC380 Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering that includes the powerful, yet simple-to-configure PV380<sup>1</sup> display. This display is part of the Murphy PowerView family and provides monitoring of Tier 4/Euro Stage 4 compliant electronic engines. The PV380 monitors multiple J1939 parameters and provides basic engine alarm/shut-down information.

The MLC380 panel has the ability for the software to be fully configured from the front user interface. If the default parameters set by Enovation Controls are not the desired set points, the packager or operator has the ability to change these settings. The configuration tool also allows for the splash screen to incorporate a company logo when powered on.

The flexibility of the MLC380 allows for the same panel to be used across many applications. This provides the operator familiarity with the display and panel in any application. The panel utilizes industry standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully



electronic Tier 4 engines, when used with the correct Murphy Industrial Harness<sup>2</sup> or John Deere OEM engine harnessing.

This panel is available in a rugged powder-coated cold rolled steel enclosure that can be mounted on or near the engine.

<sup>1</sup>Please see [fwmurphy.com/PV380](http://fwmurphy.com/PV380) for additional information regarding this display model.

<sup>2</sup>Please see [fwmurphy.com/MIH](http://fwmurphy.com/MIH) for additional information regarding harnessing.

## Specifications

### **PV380 Display**

Operating Voltage: 6-36 VDC; reverse polarity protected (display only)

Operating Temperature: -40° to +85°C (-40° to 185°F)

Storage Temperature: -40° to +85°C (-40° to 185°F)

**Total Current Consumption:** 10W Max (display only)

**Viewing Area:** 3.8" (97mm) QVGA (320 x 240 pixels); mono-chrome transreflective LCD with white LED backlight and heater

**Viewing Angle:** ±55° horizontally; +45° / -60° vertically

**Enclosure:** Powder-coated cold rolled steel

**Alarms:** Red and amber warning LEDs; Set point triggered output for external piezo buzzer or shut-down relay

### **Mating Connectors:**

21 Position, Deutsch HDP26-24-21SE

31 Position, Deutsch HDP26-24-31SE

**Sealing:** IP66 and 67 (Display only)

**Vibration and Shock:** 7.86g random vibe (5-2000Hz) and ±50g shock in 3 axes (Display only)

**Communications:** CAN (SAE J1939) and RS-485 Modbus

**Languages:** English

### **Outputs (2):**

(1) 500 mA; switched low-side

(1) 5V supply (70mA); protected

### **Inputs (8):**

(4) Resistive Analog

(2) 4-20mA

(1) Digital Input Ground

(1) Frequency (2Hz - 10KHz, 3.6VAC-120VAC)

**EMC/EMI:** 2004/108/EC and 2006/95/EC directives

EN61000-6-4:2001 (emission)

EN61000-6-2:2001 (immunity)

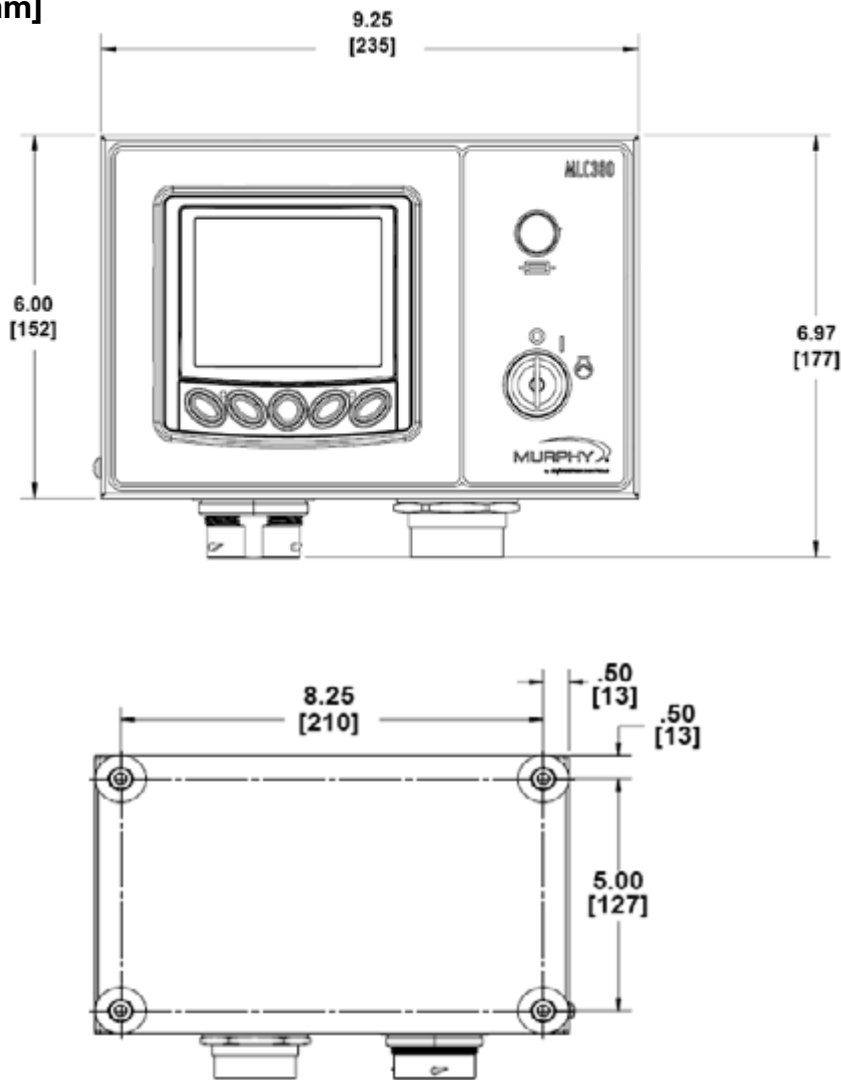
EN50121-3-2 and EN12895

**SAE J1113/2, 4, 11, 12, 21, 24, 26 and 41**

Product and Mounting Dimensions

MLC380 Panel

inches  
[mm]



SIDE VIEW

How to Order

Part Number	Model and Description	Notes
32700221	MLC380-12V	12 Volt
32700223	MLC380-24V	24 Volt
65000457	Mechanical Sender Kit*	Optional

\*Mechanical Sender Kit includes:  
05701858 ES2P-100 Pressure Sender  
10702013 ES2T-250/300-1/2 Temperature Sender  
20700162 MP3298 Magnetic Speed Sensor  
05705669 ES2F Fuel Level Sender

# ML1000-4X Panel

## MurphyLink® Series

The MurphyLink Series ML1000-4X Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering which includes the powerful, yet simple-to-configure MPC-10 Controller. The MPC-10 is a general, all-purpose manual/auto start and manual/auto throttling engine controller designed with rental applications in mind. The controller is purposed primarily for applications where a wide array of inputs and outputs are not required. The MPC-10 supports J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety shutdowns.

The MPC-10 follows a standard operating sequence of 22 machine states that happen in a predetermined order. Machine states can be set to zero if not needed or adjusted to fit the application. The menu structure is incredibly versatile, with the ability to change many parameters and settings from the face without the need of a PC tool, if desired.

The flexibility of the MPC-10 controller allows for the same control panel to be used across many applications. This provides the operator familiarity with the controller and control panel in any application.

### Specifications

#### MPC-10 Controller

Operating Voltage: 8-32VDC, reverse polarity, load dump protection

Operating Temperature: -40° to +85° C (-40° to 185° F)

Storage Temperature: -40° to +85° C (-40° to 185° F)

#### Total Current Consumption:

Power on in stopped state; 117 mA at 12 VDC. Power on in standby mode; 52 mA at 12 VDC.

**Enclosure:** Polycarbonate NEMA 4X

#### Mating Connectors:

21 Position, Deutsch HDP26-24-21SE,

31 Position, Deutsch HDP26-24-31SE

#### Communications:

(1) CAN J1939

(1) RS485, Modbus RTU

### How to Order



The Control Panel utilizes industry-standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness<sup>1</sup> (MIH) or John Deere OEM engine harnessing.

A free-of-charge PC Configuration tool is available to allow customers to change default settings and provide three levels of passcode protection.

The ML1000-4X panel can be mounted directly to the engine or engine/application cover. The enclosure has a clear door for protection from foreign debris contacting the face of the controller when desired.

<sup>1</sup>Please contact Industrial Panel Sales for application specifics and MIH harnessing.

(1) USB 2.0B for Programming

#### Outputs (13):

(3) Relays: 10A, SPDT, Form C (30 VDC @ 10A max.), 30 A max aggregate @ 85C

(2) Low-side (1A)

(2) High-side (1A)

(1) Dedicated Alternator Excite (provides Charge Fail Fault if unable to excite alternator)

#### Inputs (15):

(5) Digital, configurable (high/low)

(3) Analog, configurable (4-20 mA, 0-5 V, resistive)

(1) Frequency, supporting Magnetic pickup (30 Hz - 10 kHz, 2.0 VAC-120 VAC) and Engine Alternator (30 Hz - 10 kHz, 4.5 VRMS - 90 VRMS)

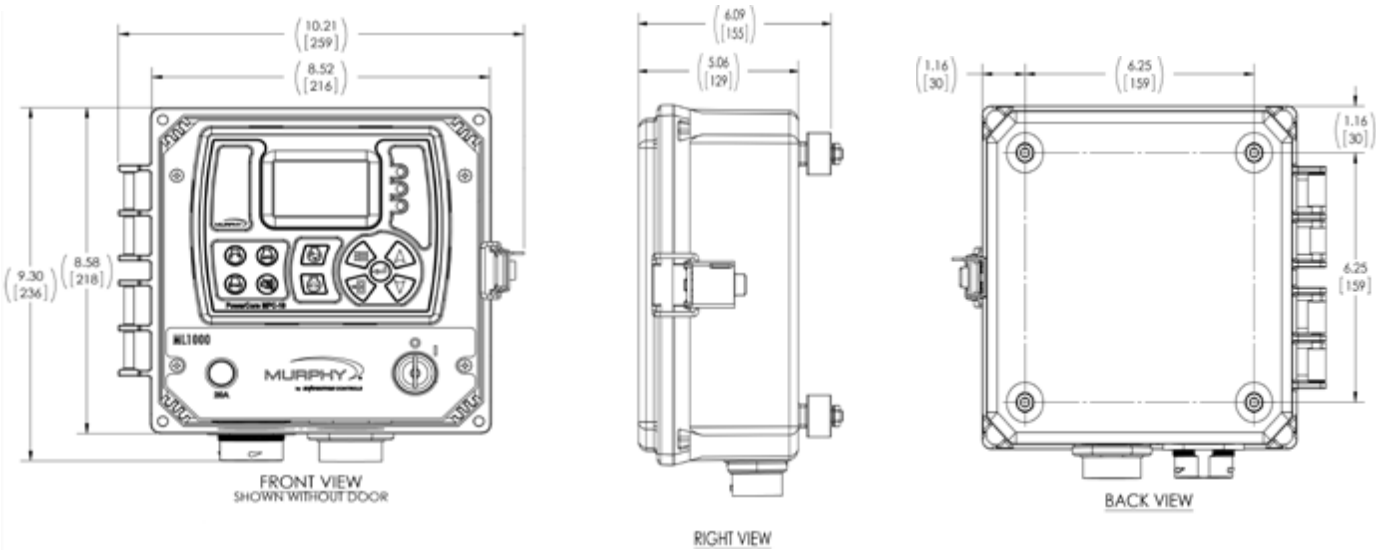
**Languages:** English, Spanish, German, French, Italian

**Dimensions:** 10.21 x 9.30 x 6.09 in. (259 x 236 x 155mm) (WxHxD)

Part Number	Model and Description	Notes
40700503	ML1000-4X, Polycarbonate, NEMA 4X Control Panel	
40000602	Engine Harness, 21 Position Connector 10' Whip Harness (3m approx.)	
40000603	I/O Harness, 31 Position Connector 10' Whip Harness (3m approx.)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	
78000668	USB Programming Harness	

Product and Mounting Dimensions

ML1000-4x



Connectors

Deutsch 21 pin Connector Engine		Deutsch 31 pin Connector I/O	
PIN	Function	PIN	Function
A		1	Ignition Signal
B	Battery +	2	
C		3	
D	Starter Solenoid	4	
E	Battery -	5	
F		6	
G	Fuel/ECU	7	
H		8	
J	Alternator Excite	9	Analog Input 3
K		10	
L		11	
M		12	
N		13	Not in Auto
P		14	Float Stop (Digital Input 3)
R	Throttle Decrement	15	
S	Throttle Increase	16	
T	Frequency Input	17	Relay 3 (Common)
U	J1939 CAN LO	18	Relay 3 (NC)
V	J1939 CAN HI	19	Relay 3 (NO)
W	Temperature Sender	20	Oil Level (Digital Input 5)
X	Pressure Sender	21	Digital Input 1
		22	
		23	Float Start (Digital Input 2)
		24	Engine Running Signal
		25	
		26	Aux battery negative
		27	
		28	
		29	Coolant Level (Digital Input 4)
		30	RS485+
		31	RS485-

# ML2000 Panel

## MurphyLink® Series

The MurphyLink Series ML2000 Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering which includes the powerful, yet simple-to-configure MPC-20 Controller. This controller is part of the Murphy PowerCore family and was developed to meet the need of manual or automatic control whether it's starting/stopping, throttling or both. This controller also has the flexibility to be used on either mechanically or electronically governed engines supporting SAE J1939 CAN communications.

The ML2000 panel has the ability for the software to be fully configured from the front user interface or PC configuration tool. If the default parameters set by Enovation Controls are not the desired set points for a factory default reset, the packager or operator has the ability to change these settings with the PC configuration tool then load with a USB thumb drive<sup>1</sup> and USB programming harness<sup>1</sup>. The configuration tool also allows for the splash screen to incorporate a company logo when powered on.

The flexibility of the MPC-20 controller allows for the same control panel to be used across many applications. This provides the operator familiarity with the controller and control panel in any application. The Control Panel utilizes industry standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness<sup>2</sup> (MIH) or John Deere OEM engine harnessing.

The ML2000 Series panels are available in two rugged enclosures or a stand-alone flat panel option that can be dropped into an existing panel or engine surround/dog house. The enclosure types to choose from are powder-coated cold rolled steel or polycarbonate NEMA 4X. Optional mounting kits are offered for the sheet-metal enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications.

<sup>1</sup>USB thumb drive and programming harness sold separately from the control panel.

<sup>2</sup>Please contact Industrial Panel Sales for application specifics and MIH harnessing.



## Specifications

### **MPC-20 Controller**

Operating Voltage: 8-32VD

Operating Temperature: -40° to +85°C (-40° to 185°F)

Storage Temperature: -40° to +85°C (-40° to 185°F)

### **Total Current Consumption:**

18W Max without 2 2A High-sides active,

146W Max with 2 2A High-sides active

**Enclosure:** Powder-coated cold rolled steel or polycarbonate

### **Mating Connectors:**

21 Position, Deutsch HDP26-24-21SE,

31 Position, Deutsch HDP26-24-31SE

### **Shipping Weights:**

ML2000: 13 lbs (5.9kg)

ML2000-FP: 7 lbs (3.17kg)

ML2000-4X: 11 lbs (4.99kg)

**Communications:** CAN (SAE J1939) and RS-485 Modbus

### **Outputs (13):**

(2) 1A Max Low-side

(2) 2A Max High-side

(2) 200mA Max 5VDC

(1) 0-5VDC Analog

(6) 10A Max Form C Relays

### **Inputs (15):**

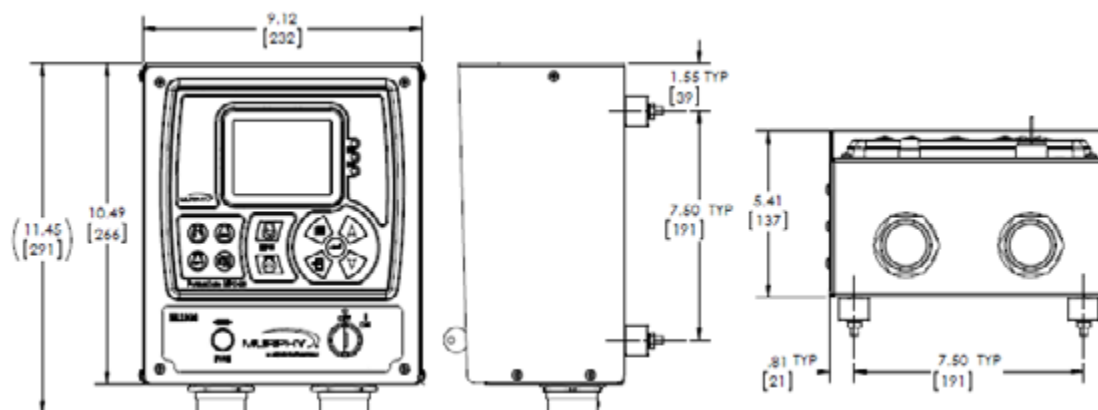
(8) Analog, configurable as Resistive, 0-5VDC or 4-20mA

(6) Digital, Configurable as Battery or Ground

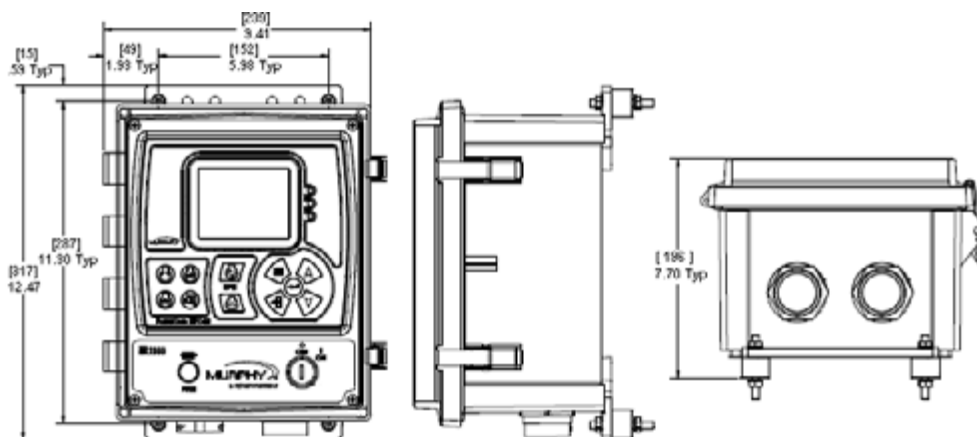
(1) Frequency, (2Hz - 10KHz, 3.6VAC-120VAC)

## Product and Mounting Dimensions

### ML2000



### ML2000-4X



## How to Order

Part Number	Model and Description	Notes
40700491	ML2000, Metal Control Panel	English
40700492	ML2000-4X, Polycarbonate, NEMA 4X Control Panel	
40700497	ML2000-FP, Flat Control Panel	
40700499	ML2000, Metal Control Panel (Spanish)	Spanish
40700501	ML2000-4X, Polycarbonate, NEMA 4X Control Panel (Spanish)	
40700502	ML2000-FP, Flat Control Panel (Spanish)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	
40000553	Harness, ML2000, Mechanical, 10' Blunt, 21 Pos, 10' Mechanical Engine Whip Harness	
40000565	Harness, ML2000, I/O, 10' Blunt, 31 Pos, 10' I/O Whip Harness	
40000566	ML2000 USB Programming Harness, 6PIN to USB Programming Harness	



# Murphy Industrial Harnesses

## MurphyLink® Series

The MurphyLink Series ML Panels are universal to all engines. The adaptation to the engines will be through the MIH Harness, which is built to the specifications of each engine manufacturer and customer. When requesting the MIH Harness, specific information will be obtained so that the correct harness may be built for your engine.

### Features

- Connect any MurphyLink Panel to Major Engine Manufacturers' Engines
- Customizable Per Specific Customer Application and Requirement
- Standard 21-Pin Deutsch Connector Interface
- Manufactured in the USA
- Built to Strict Quality Standards for Long-Term Reliability



### How to Order

Part Number	Model and Description	Engine MFG
32000137	<b>MIH-CA-40P-T2-ADEM3-6:</b> CAT W/PTO	Caterpillar
32000138	<b>MIH-CA-64P-T3-A4E2-6:</b> Works with C4.4 & 6.6	
32000160	<b>MIH-CA-70P-IT4-A4E4-6:</b> Works with CAT C18-32	
32000148	<b>MIH-CA-70P-IT4-A4E4-6-12VDC:</b> Works with IT4 C9.3, C13, C15, C18 (<750 hp)	
32000150	<b>MIH-CA-70P-IT4-A4E4-6-24VDC:</b> Works with IT4 C9.3, C13, C15, C18 (<750 hp)	
32000159	<b>MIH-CA-70P-IT4-C4.4-12VDC:</b> Works with only IT4 C4.4	
32000151	<b>MIH-CA-70P-IT4-C7.1-6-12VDC:</b> Works with only IT4 C7.1	
32000171	<b>MIH-CA-70P-T3-A4-6:</b> Works with C series tier 3 except 4.4 and 6.6	
32000155	<b>MIH-CA-86P-T4-C4.4-6:</b> Works with FT4 C4.4 only	
32000188	<b>MIH-CA-70P-FT4-C7.1-6:</b> Works with FT4 C7.1 only	
32000167	<b>MIH-CA-70P-T4-C9.3-C18:</b> Works with FT4 C9.3-18 only	Cummins
32000149	<b>MIH-CU-50P-T2-CM570-12:</b> Works with QSM/QSX	
32000134	<b>MIH-CU-50P-T2-CM570-6:</b> Works with QSM/QSX	
32000147	<b>MIH-CU-50P-T3-CM850-12:</b> Works with QSB, QSC, QSL	
32000152	<b>MIH-CU-60P-IT4-CM2250-6:</b> Works with QSB6.7, QSL9, QSL11.9, QSL15	Detroit Diesel
32000168	<b>MIH-DD-30P-T3-DDECIII/DDECIV-6:</b> Works with DDEC III/IV ECM	
32000139	<b>MIH-DD-68P-T3-DDECV-6:</b> Works with 50/60 Series, DDEC V ECM	JCB
32000154	<b>MIH-JCB-62P-T4-DCM3.3-6:</b> Works with iT4 and FT4	
32000166	<b>MIH-SCANIA-8P/6P-DC-13-24V:</b> Works with iT4	Scania
32000132	<b>MIH-SCANIA-8P-FT4-EMS-XPI-6:</b> Works with FT4	

Table continued on next page

## How to Order, cont.

Part Number	Model and Description	Engine MFG
32000137	<b>MIH-CA-40P-T2-ADEM3-6:</b> Works with CAT w/PTO	Perkins-854
32000138	<b>MIH-CA-64P-T3-A4E2-6:</b> Works with C4.4 & 6.6	
32000160	<b>MIH-CA-70P-IT4-A4E4-6:</b> Works with CAT C18-32	
32000148	<b>MIH-CA-70P-IT4-A4E4-6-12VDC:</b> Works with IT4 C9.3, C13, C15, C18 (<750 hp)	
32000150	<b>MIH-CA-70P-IT4-A4E4-6-24VDC:</b> Works with IT4 C9.3, C13, C15, C18 (<750 hp)	
32000159	<b>MIH-CA-70P-IT4-C4.4-12VDC:</b> Works with IT4 C4.4 only	
32000151	<b>MIH-CA-70P-IT4-C7.1-6-12VDC:</b> Works with IT4 C7.1 only	
32000171	<b>MIH-CA-70P-T3-A4-6:</b> Works with C Series Tier 3 except 4.4 and 6.6	
32000155	<b>MIH-CA-86P-T4-C4.4-6:</b> Works with FT4 C4.4 only	
32000188	<b>MIH-CA-70P-FT4-C7.1-6:</b> Works with FT4 C7.1 only	
32000167	<b>MIH-CA-70P-T4-C9.3-C18:</b> Works with FT4 C9.3-18 only	
32000170	<b>MIH-PK-94P-IT4/T4-C3.4/P854F-:</b> Works with IOPU and ML Panel Connection	
32000190	<b>MIH TO IOPU JUMPER HARNESS:</b> Jumper Harness	IOPU Harnesses
32000191	<b>MIH-IOPU-CA-70P-FT4-C7.1:</b> Not yet released	
32000192	<b>MIH-IOPU-CA-86P-FT4-C4.4:</b> Not yet released	
32000170	<b>MIH-PK-94P-IT4/T4-C3.4/P854F-:</b> Works with IOPU and ML Panel Connection	
78001035	MIH, extension harness, 6 feet long	Extension Harnesses
78000294	MIH, extension harness, 12 feet long	
78000293	MIH, extension harness, 20 feet long	
78000933	MIH, extension harness, 40 feet long	

# Marine Engine Panel Series

## Local and Remote

Maximize the monitoring and alarm capabilities for your mechanical engine with Murphy's panel solutions designed specifically for commercial marine applications. The 100 Series and 300 Series provide the durability, reliability and functionality essential for your engine and offer a broad range of features from which to choose.

- Designed Specifically for Commercial Marine, Mechanical Engine Applications
- Full and Broad Compliment of Features and Functionality
- High-Quality Construction and Components Designed to Withstand the Rigors of Marine Life
- Local and Remote Panel Options

### MLP100

#### Indication Gages:

Water Temperature (Engine Coolant Temperature)  
Oil Pressure (Engine Oil Pressure)  
Voltage (Voltmeter)  
Engine Speed (Analog Tachometer/ Digital Hour Meter)

#### Inputs:

Battery (+)  
Battery (-)  
Magnetic Pickup  
Engine Oil Pressure  
Engine Temperature

#### Outputs:

Engine Crank  
Engine Stop Signal

#### Mounting:

Shock Mounts

**Panel Material:** Polycarbonate

**Style:** Enclosed

**Voltage:** 12-V or 24-V

**Max Current Draw:** 13 Amps

**Starting Method:** Key Switch

**Stopping Method:**

Key Switch or Engine Stop Button

**Wiring Interface:**

1-Deutsch HDP 21 pin

& 1 Deutsch HDP 31 pin Connectors

**Remote/ Local Switch:** Toggle Switch

for Switching Between Local and Remote Modes of Operation



### MRP100

#### Indication Lamps:

5-First Out Fault Indication Lamps Utilizing Murphy's ST5 Annun-  
ciator  
1-Power On Lamp Utilizing Murphy's ST5 Annunciator

#### Indication Gages:

Engine Speed (Analog Tachometer/ Digital Hour Meter)

#### Inputs:

Battery (+)  
Battery (-)  
Magnetic Pickup  
Remote Stop Signal Line In  
Warning Oil Pressure  
Warning Coolant Temperature

#### Outputs:

Remote Start  
Remote Stop Signal

**Mounting:** Countersunk Screw

Holes (size 6 to 8 screws)

**Panel Material:** Polycarbonate

**Style:** Flat Panel

**Voltage:** 12-V or 24-V

**Max Current Draw:** 13 Amps

**Starting Method:** Key Switch

**Stopping Method:**

Key Switch or Engine Stop Button

**Wiring Interface:** 1-Terminal Block 16 Position



## MLP300

### Indication Lamps:

System Power Green Incandescent Lamp  
Water Temperature High Red Incandescent Lamp  
Overspeed Red Incandescent Lamp  
Oil Pressure Low Red Incandescent Lamp  
Warning Red Incandescent Lamp

### Indication Gages:

Water Temperature (Engine Coolant Temperature)  
Oil Pressure (Engine Oil Pressure)  
Voltage (Voltmeter)  
Engine Speed (Analog Tachometer/ Digital Hour Meter)  
Gear Oil Pressure  
Exhaust (Pyrometer)  
Crankcase Pressure (Water Column Pressure)

### Inputs:

Battery (+)  
Battery (-)  
Magnetic Pickup  
Engine Temperature

### Outputs:

Engine Crank  
Engine Stop Signal

### Mounting:

**Panel Material:** Polycarbonate

**Style:** Enclosed

**Voltage:** 12-V or 24-V

**Max Current Draw:** 13 Amps

**Starting Method:** Key Switch

**Stopping Method:**

Engine Stop Push Button

**Wiring Interface:**

1-Deutsch HDP 21 pin

& 1 Deutsch HDP 31 pin Connectors

**Remote/ Local Switch:** Toggle Switch for Switching Between Local and Remote Modes of Operation



## MRP300

### Indication Lamps:

10-First Out Fault Indication Lamps Utilizing Murphy's ST10 Annunciator  
1-Power On Lamp Utilizing Murphy's ST10 Annunciator  
1-Engine Warning Red Incandescent Lamp

### Indication Gages:

Water Temperature (Engine Coolant Temperature)  
Oil Pressure (Engine Oil Pressure)  
Engine Speed (Digital Tachometer)  
Gear Oil Pressure + D14

### Inputs:

Battery (+)  
Battery (-)  
Magnetic Pickup  
Remote Stop Signal Line In  
Warning Oil Pressure  
Warning Coolant Temperature  
Warning Gear Oil Pressure  
Warning Crankcase Pressure  
Warning Overspeed

Engine Oil Pressure  
Engine Coolant Temperature  
Gear Oil Pressure

### Outputs:

Remote Start  
Remote Stop Signal

**Mounting:** Countersunk Screw

Holes (size 6 to 8 screws)

**Panel Material:** Polycarbonate

**Style:** Flat Panel

**Voltage:** 12-V or 24-V

**Max Current Draw:** 13 Amps

**Starting Method:** Key Switch

**Stopping Method:** Engine Stop Push Button

**Dimmer:** Local Dimmer knob (Adjustment to Gage Backlights)

**Wiring Interface:** 1- Terminal Block 16 Position



## How to Order

Part Number	Model and Description	Notes
30090496	MLP100: Marine Local Panel	12-V
30090497	MRP100: Marine Remote Panel	12- or 24-V
30090489	MLP300: Marine Local Panel	12-V
30090488	MRP300: Marine Remote Panel	12-V
30090510	MLP100-24V: Marine Local Panel	24-V
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# Keystart 9620 Series Engine/Generator Controls

Keystart 9620 and 9621 control modules provide manual start/stop and automatic fault protection for generators, pumps and other engine-driven applications. Outputs allow control of engine fuel (energized to run), starter motor and preheat. The Keystart also has an alarm output for remote or audible warning of faults.

Six LEDs and icons indicate engine status and faults. Four switch inputs (closing to negative on fault) enable automatic shutdown on engine low oil pressure, high coolant temperature and auxiliary faults. Model 9621 has a fully adjustable engine overspeed shut-down feature, configurable for either generator AC or magnetic pickup speed signals. Charge alternator excitation and a charge fail warning LED are standard.

Electrical connection is by quick-connect, spring-clamp terminal blocks. A universal 7 to 30VDC power supply permits operation with 12 or 24VDC engine batteries, with standard engine crank-dip voltage protection.

Keystarts are mounted in the front through a standard cutout and secured at the rear with quick-fit clips. Epoxy resin case encapsulation gives superior vibration/shock resistance and environmental protection.

## Specifications

### Power Supply

**Operating voltage, steady state:** 7 to 30VDC

**Operating voltage, brown out/cranking:** 5VDC minimum

**Current consumption:** <100mA

### Inputs

**Fault switch inputs:** close to negative DC during fault

**Generator AC input (model 9621 only):**

70 - 270 VAC rms, <50 to >60 Hz nominal

**Magnetic pickup input (model 9621 only):**

3.5 - 21 VAC rms, <2000 to >6500 Hz nominal

### Outputs (all ratings non-reactive)

**Run (fuel):** positive DC, NO relay contacts, 10A max @ 24VDC

**Start (crank):** positive DC, keyswitch contacts, 10A max @ 24VDC

**Alarm:** negative DC (open collector transistor), 300 mA max

**Speed calibration:** to suit 0-1mA, 75 Ohm meter, output=0.75mA at rated engine speed.

### Adjustable settings

**Preheat timer:** 0 or 10 secs, default = 0 secs

**Fault override timer:** 2 to 20 secs (VR1), default = 10 secs

**Overspeed trip level (model 9621 only):** 100 to 130% (VR3) of nominal calibrated speed, default = 110% (of 50 or 60 Hz)

### Physical

**Case material:** polycarbonate / polyester

**Overall dimensions:** (w x h x d): 3.8 x 3.8 x 3.7 in.  
(96 x 96 x 95 mm)

**Panel cut-out size:** DIN 3.6 x 3.6 in. (92 x 92 mm)

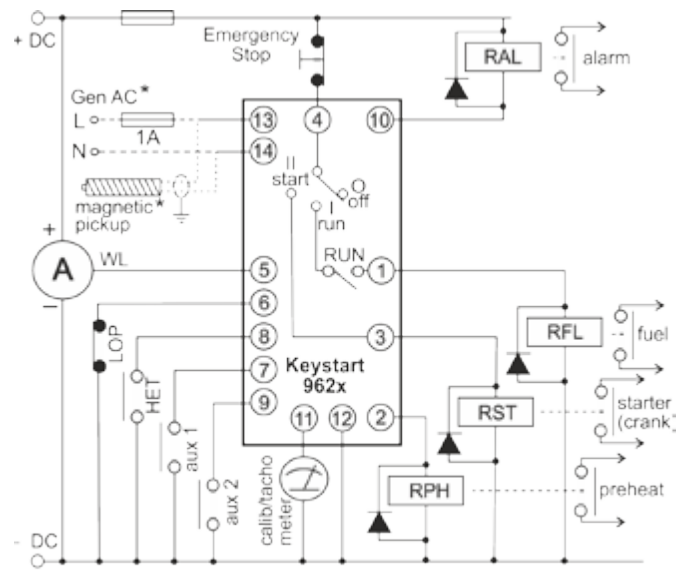
**Weight:** approx 0.7 lb. / 300g

**Operating temperature:** -31° to 131°F / -35° to 55°C

**Electromagnetic compatibility:** EN55022, class B



## Typical Connections



Notes:

\* Overspeed models 9621 only. Select generator AC or magnetic pickup speed sensing using configuration links (see rear view diagram). Factory default setting is for generator AC sensing.





# CANstart™ 9630 Series Engine/Generator Controls

CANstart™ 9631 and 9632 modules provide operator start/stop control, panel gage driving, fault indication, and auxiliary shut-down protection for ECU-controlled, CAN bus SAE J1939 compatible engines. These compact controllers can be used with generators, pumps and other engine-driven applications.

Operator control is through a four-position keyswitch. The key is common to all CANstarts and is removable only in the stop/reset position. Six LEDs and icons indicate engine/ECU status and faults. Two of these LEDs (with associated inputs) provide for auxiliary fault shutdown and charge alternator fail excitation.

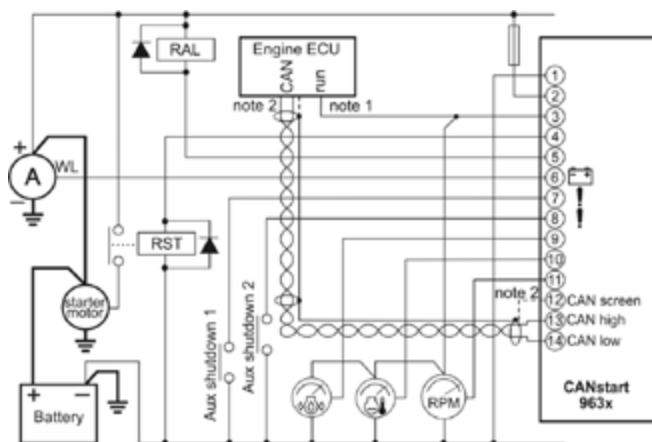
CANstart has two protected (positive DC) FET outputs for the control of ECU engine run and starter motor. Three additional outputs drive analog panel gages (Murphy, VDO or Datcon) based on ECU-transmitted data for engine speed, oil pressure or coolant temperature.

All units include adjustable engine overspeed protection: model 9631 provides automatic overspeed shutdown for variable speed applications; model 9632 is configured for fixed-speed 1500/1800 RPM genset use.

DIP switches at the rear allow set up of control and gage output options. Electrical connection is by spring-clamp terminals, including a universal 8-32VDC power supply for operation with 12 or 24VDC engine batteries. Engine cranking supply brownout protection is standard.

CANstart is panel-front mounted through a standard cutout and secured at the rear with quick-fit clips. Epoxy resin case gives superior vibration/shock resistance and environmental protection.

## Typical Connection



Notes:-

1. Wiring shown for ECU with close to positive to run input. An additional interposing fuse or relay may be required between pin 3 and ECU; check engine documentation for ECU 'run' input requirements.
2. ECU CANbus screen is typically earthed/grounded at one end only. Check engine & ECU documentation for details



## Specifications

### Power Supply

**Operating Voltage, steady state:** 8 to 32 VDC

**Operating Voltage, brownout / cranking:** 5 VDC minimum

**Current consumption:** < 100 mA

### Inputs

**CAN bus:** SAE J1939 protocol, switchable 120 Ohm terminating resistor

**Auxiliary Shutdown (x2):** close to negative DC during fault  
**Outputs (all ratings non-reactive)**

**Run (ECU), start (crank):** positive DC (protected FET), 6A max @ 32 VDC

**Alarm:** negative DC (open collector transistor), 250mA max @ 32 VDC

**Oil pressure gage:** suitable for Murphy, VDO 5 or 10 Bar, Datcon 7 or 10 Bar.

**Engine temperature gage:** suitable for Murphy, VDO or Datcon  
**Tachometer:** for use with charge alternator driven tachometers

### Adjustable Settings

**Model 9631 (variable speed engines)**

**Overspeed level:** 1250 - 2800 RPM (50 RPM increments) or off

**Model 9632 (fixed speed engines/gensets)**

**Nominal speed:** 1500 or 1800 RPM

**Overspeed level:** 1 - 15% of nominal speed (1% increments) or off

### Physical

**Electromagnetic capability:** 2004/108/EC

**Case Material:** polycarbonate / polyester

**Overall dimensions (w x h x d):** 3.8 x 3.8 x 5.2 in. (96 x 96 x 131mm)

**Panel cutout size:** DIN 3.6 x 3.6 in. (92 x 92 mm)

**Weight:** approx. 0.6 lb / 240g

**Operating Temperature:** -4° to 167°F / -2° to 75°C

# Operation, Connections and Settings

## Front View and Operation

LED indication	
flashing	constant
Green, ECU status:	
CAN inactive	CAN active.
Red. Oil pressure fault:	
warning	shutdown.
Red. Coolant temperature fault:	
warning	shutdown.
Red. Engine speed fault:	
overspeed	shutdown.
Red. Charge fail warning.	
Red. ECU/auxiliary fault:	
ECU shutdown fault.	
(50/50 on/off) ECU warning fault.	
(1 on pulse) aux. 1 shutdown.	
(2 on pulses) aux. 2 shutdown.	



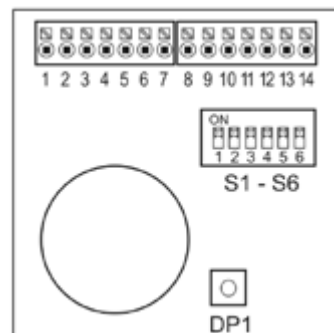
### 4 Position Keyswitch

	Off/Reset. Removes power, stops the engine and resets any latched shutdown fault.
	Run. Activates the run output and (if enabled) the timed preheat output. Once the engine is fully running, and after the override time, Keystart immediately shuts down the engine on detection of a fault.
	Start/crank. Maintains the run output and activates the start (crank) output. Shutdown fault inputs are disabled and the fault override timer is reset. This position spring-returns to I (run) on release.
	Auxiliary. Keyswitch auxiliary output, positive DC

## Rear View, Connection & Settings

### Connection

1	-DC power supply
2	+DC power supply
3	run (ECU) output, +DC, 6A max
4	start (crank) output, +DC, 6A max
5	alarm output, -DC, 250 mA max
6	charge fail (alternator WL)
7	aux 1 input, -DC to activate
8	aux 2 input, -DC to activate
9	oil pressure gage output
10	coolant temp gage output
11	tachometer output
12	CAN screen
13	CAN high
14	CAN low



### S1 - S5 DIP Switch Settings

**Note:** switch S6 reserved for future use.

switch position	on (up)	off (down)	options (* default settings)
S1	▲	▼	
S2	▲	▼	
S3	▲	▼	
S4	▲	▼	
S5	▲	▼	
			Murphy temp. and pressure gauges *
			Datcon temp. and 0 – 7 bar pressure gauges
			Datcon temp. and 0 – 10 bar pressure
			VDO temp. and 0 – 5 bar pressure gauges
			VDO temp. and 0 – 10 bar pressure gauges
			CAN 120 Ohm terminating resistor in circuit *
			CAN 120 Ohm terminating resistor removed
			Sets speed nominal or range for DP1 below: see installation instructions for full details.

**DP1 digital potentiometer setting** (with S5 above)

Overspeed shutdown set point: see installation instructions for details.

## How to Order

Part Number	Model and Description	Notes
41700147	CST9631: Keyswitch K2 (Type 2, rubberized) Default overspeed setting is 1250 RPM. (For variable speed engines, overspeed setting range 1250 - 2800 RPM.)	Non-standard (NS) settings/options are available to order.
CST9632 K2	CST9632: Keyswitch K2 (Type 2, rubberized) Default overspeed setting is 110% of 1500 or 1800 RPM (please specify). (For fixed speed engines/gensets, overspeed setting range 100-115% of 1500/1800 RPM.)	Only available from the UK office. Non-standard (NS) settings/options are available to order.
41700157	Spare mounting clips (pack of 4)	Accessories and spare parts
65700256	Spare keyswitch (K2 type), incl. key	
00003235	Spare key (K2 type)	

# Cascade Controller Auto-Start/Stop

The Cascade controller offers automatic start and stop control with easy configuration for a broad number of applications.

This auto-start controller is designed to fit any engine-driven application requiring a simple and robust automatic start and stop sequence. Pumps, compressors, grinders, power units and generators are just a few of the industrial applications for the controller.

The Cascade controller is fully compatible with all major engine types. Whether you are running mechanical or J1939 engines, the controller will work with your application.

Murphy offers unique features at a competitive price with the Cascade controller.

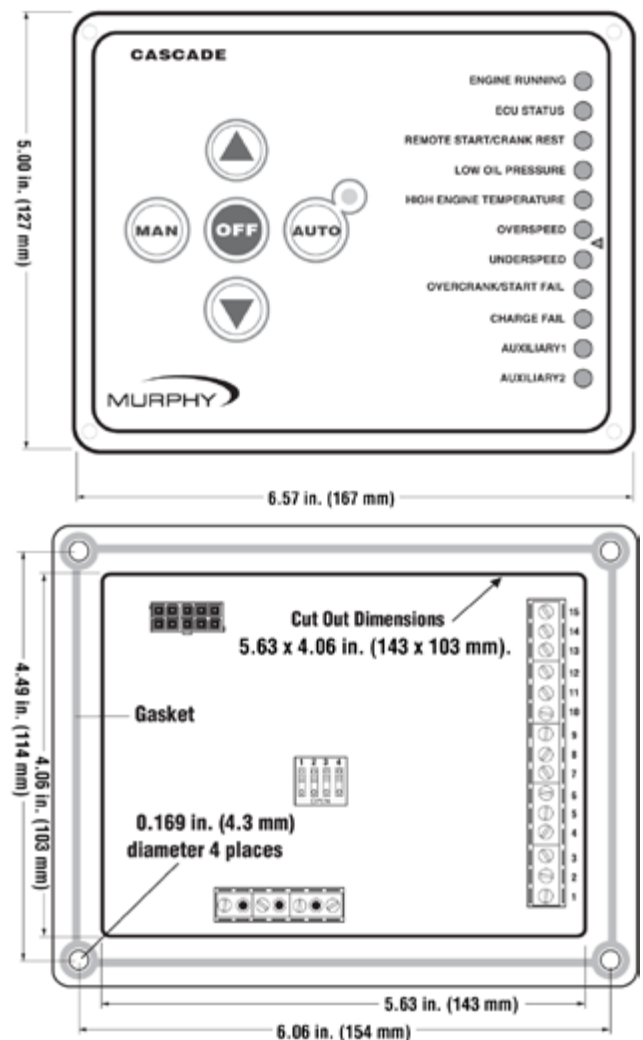
## Features

- **Durability:** Encapsulated to protect it against dirt, water and dust, along with a compression gasket to fully seal it to the panel. Cascade is rated NEMA4 and IP65.
- **Low Battery Blackouts:** Operates in total blackout for a minimum of two seconds.
- **Compatibility:** Accepts MPU, AC Frequency and ECU speed signals and can operate with standard and J1939 engines.
- **Inputs and Outputs:** The Cascade Inputs and Outputs are ruggedly protected and fault tolerant.
- **J1939 Ready:** Works directly with Murphy's J1939-ready PowerView gages, just plug and go. No sender is required.
- **CD101 Cascade Configuration Tool:** Allows quick setup and loading of parameters into a Murphy standard Cascade via a PC software tool.



CL1 DIV 2  
GRP A, B, C, D  
HAZARDOUS  
LOCATIONS

## Dimensions





## Specifications

**Power input:** 9-35VDC continuous - operates during total black out for 2 seconds minimum.

**Power consumption:** Sleep Mode (Manual): 1mA typical; Sleep mode (Automatic): 4mA typical. Running mode (manual): 20mA typical; Running mode (Automatic): 24mA typical.

**Operating/Storage temperature:** -40 to 185°F (-40 to 85°C)

**Humidity:** 0-100%, non-condensing

**Housing:** UV stabilized black polycarbonate and epoxy encapsulation. Weather tight and includes sealing gasket to keep moisture and debris out of enclosure. Properly mounted controller will maintain NEMA4 / IP65 rating of enclosure.

**Vibration:** Rated to 6G

**Impact:** Rated to 10G

**Inputs:** Dedicated digital inputs for low oil pressure, high engine temperature, remote start, DC charge fail/alternator fail. Two auxiliary inputs are configurable for multiple functions.

**Outputs:** 7 – 4 auxiliary, configurable (1A DC protected). 3 dedicated outputs for crank, fuel/ECU, alternator excitation

**Crank attempts:** 3, 5, 10, Continuous

**Crank Rest:** 5-60 seconds, adjustable

**Shutdown lockout time delay:** 5, 10, 15, 20, 25, 30 seconds

**Crank disconnect speed setting:** Field settable 0-9999 RPM (16-60Hz AC freq input).

**Overspeed/underspeed trip point setting:** ±5 to 50% of nominal.

**Speed sensing inputs:** Magnetic pickup (5-120VAC RMS / 0-10 kHz) and AC frequency (30-600VAC RMS / 16-80 Hz)

**CAN bus interface:** Directly reads engine speed and engine status data from SAE-J1939 enabled engines

**MODBUS interface:** In J1939 applications, drives PVA series analog gages

**Shipping Weight:** 1 lb. (453 g) approximately

**Shipping Dimensions:** 5.1 x 6.7 x 1.6 inch (130 x 10 x 41 mm) approximately

## How to Order

Part Number	Model and Description	Notes
40700259	CD101 Cascade Controller	Controller
40090045	CD101 Cascade Configuration Kit	Accessories

# Automatic Engine Controller Model AEC101

The AEC101 Automatic Engine Controller provides simple, yet sophisticated engine automation. It features basic automatic start/stop capabilities plus other features found on more advanced and expensive controllers, all in an easy-to-install panel.

The AEC101 operates from 12- or 24-volt systems. It includes crank and rest cycles, sensing circuits for crank disconnect and overspeed, overcrank and re-crank on false starts. The top LED for engine running indicates when crank disconnect occurs. Four of the up to six shut-down LEDs are dedicated for low oil pressure, high engine temperature, overspeed and underspeed. Two remaining LEDs can be established for first-out shut-down indication through auxiliary inputs 1 and 2.

The built-in oil pressure and water temperature Switchgag® instruments provide visual indication and can be set to initiate shutdown.

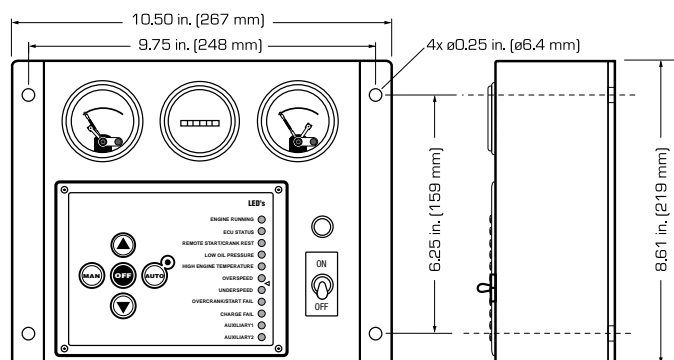
The electromechanical quartz-based hourmeter can record up to 9,999.9 hours. It is housed in a shock-proof case and built to be rugged and durable for a long life.

The Cascade controller allows manual or automatic selection of the operation sequence.

Additional features of the AEC101 are an adjustable shutdown lockout delay, engine running indication LED, advanced microprocessor technology and a convenient hat bracket design for simple engine mounting.



## Dimensions



## Specifications

**Operating Voltage:** 9-35VDC – operates during total blackout for 2 seconds minimum

### Environmental

**Operating Temperature:** -40 to 85°C (-40 to 185°F)

**Storage Temperature:** -40 to 85°C (-40 to 185°F)

**Humidity:** 0-100%, non-condensing

**Inputs:** dedicated digital inputs for low oil pressure, high engine temperature, remote call to run, DC charge fail/Alternator fail. Two auxiliary inputs are configurable for multiple functions.

**Outputs:** (7 total): Four configurable auxiliary sinking outputs (1A DC protected), three dedicated outputs for crank, fuel, alternator excitation.

**Crank Attempts:** 3, 5, 10, Continuous

**Crank Rest:** 5-60 seconds, Adjustable

**Shutdown lockout time delay:** 5, 10, 15, 20, 25, 30 sec.

**Speed sensing input:**

Magnetic pickup (5-120VAC RMS / 0-10 kHz)

AC frequency (30-600VAC RMS / 16-80 Hz)

**Crank disconnect speed setting:** Field programmable 0-9999 RPM (16-60 Hz AC freq input)

**Housing:** Powder-coated 14 gage cold rolled steel

**Shipping Weights:** 7 lb. (3175 g) approximately

**Shipping Dimensions:** 12 x 12 x 5.5 in. (305 x 305 x 140 mm) approximately

## How to Order

Part Number	Model	Notes
30700861	AEC101	

## Sequence of Operation

The following sequence is pre-programmed into the AEC101:

### Operation sequence with panel in Auto:

When the AEC101 receives an automatic start signal, the engine will begin to crank and the Shutdown Lockout time delay will begin. The Shutdown Lockout Delay has two functions: 1) it allows the AEC101 to disregard signals from the low oil pressure and high temperature Switchgag<sup>®</sup> at engine start-up, and 2) if the engine false starts, the recrank will be delayed to allow the engine to stop moving before engaging the starter. If the engine fails to start after the set number of crank and rest attempts, the AEC101 will indicate an Overcrank LED. The engine will be locked out from any further start attempts.

**NOTE: All shutdown conditions can be reset by pressing the OFF button followed by pressing the Auto button to initiate auto sequence.**

Once Crank disconnect speed is reached the Engine Running LED will turn on steady. The engine will also run at full governed speed while in operation. If the speed exceeds the Overspeed set point, the AEC101 will initiate an engine shutdown, and the Overspeed LED will turn on. The engine will be locked out from any further start attempts.

If low oil pressure or high temperature conditions occur while the engine is running, the AEC101 will shutdown the engine, and the appropriate LED will turn on. The engine will be locked out from any further start attempts.

**NOTE: The Shutdown Lockout Delay must have expired to get a shutdown on low oil pressure or high engine temperature.**

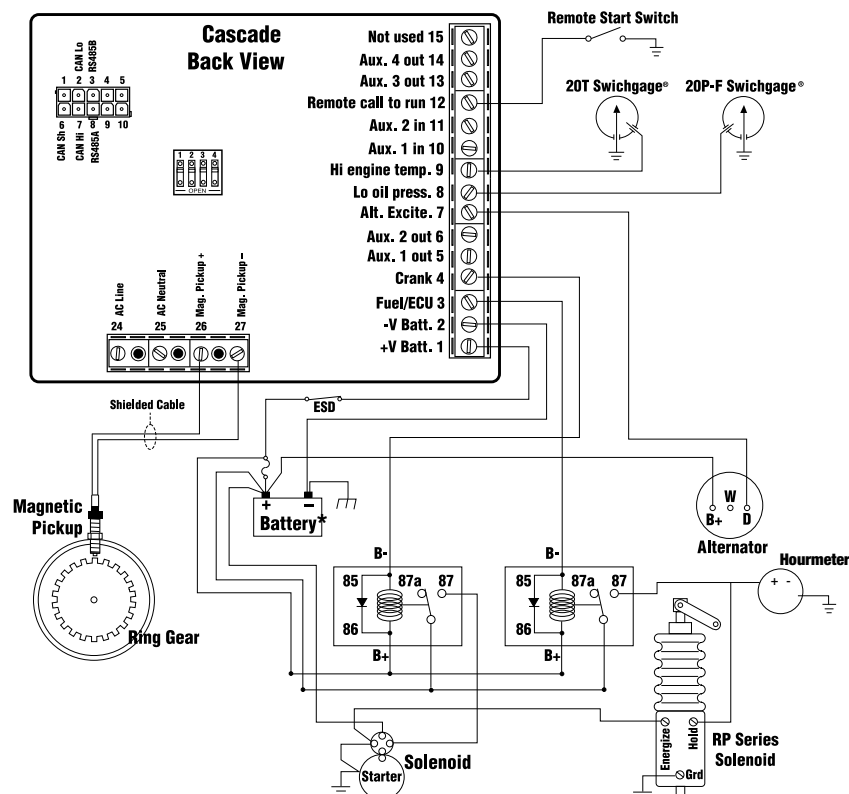
### Operation sequence with panel in Manual:

When the Manual button on the Cascade controller is pressed, an automatic start signal is simulated. Therefore, the controller will operate the same as it does in Auto. However, it will continue to run as long as there are no signals from monitored conditions or until the Off or Auto buttons are pushed. Keep in mind, it will still shutdown the engine if a monitored condition occurs such as low oil pressure, high engine temperature or loss of speed signal.

## Typical Wiring Diagram

**Cascade – Basic Mechanical Engine MPU Sensing Speed**

NOTE: This diagram represents a typical wiring scenario and is not the schematic to the panel. Everything shown except Cascade module, 20T, 20P and Hourmeter are customer supplied.



\*Always provide proper circuit protection with fuses or circuit breakers.



# PowerCore™ MPC-10

The Murphy PowerCore MPC-10 Controller is a general, all-purpose manual/auto start and manual/auto throttling engine controller designed with rental applications in mind. The controller is purposed primarily for applications where a wide array of inputs and outputs are not required. This is a powerful and rugged controller that supports J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety shutdowns.

While reprogrammable, the MPC-10 follows a standard operating sequence. This operating sequence is a set of 22 machine states that happen in a predetermined order. Machine states can be set to zero if not needed or adjusted to fit the application. The menu structure is incredibly versatile, with the ability to change many parameters and settings from the face without the need of a PC tool, if desired.

The MPC-10 is flexible in many aspects, with the ability to:

- use the same controller on 12VDC or 24VDC systems;
- assign multiple levels of passcode protection to the menu using the free of charge PC Configuration Tool;
- change the input sensor type for the analog inputs;
- use analog inputs as digital ground inputs;
- be mounted in all-weather environments;
- be customer mounted in panel of choice.

## Specifications

**Power Input:** 8-32 VDC, reverse polarity and load dump protection

**Cranking Power Holdup:** 0 VDC up to 50 mS (also good for brownout/blackout instances)

**Total Current Consumption:** Power on in stopped state; 117 mA at 12 VDC. Power on in standby mode; 52 mA at 12 VDC.

**Display:** 2.7" WQVGA Monochrome HR-TFT 400 x 240

**Keypad:** 11 Tactile Feedback Buttons

**LEDs:** (1) Red, Shutdown, (1) Amber, Warning, (1) Green, Auto Mode or Running Loaded State

### Outputs:

- (3) Relays: 10 A, SPDT, Form C (30 VDC @ 10 A max.), 30 A max aggregate @ 85C
- (2) Low-side (1A)
- (2) High-side (1A)
- (1) Dedicated Alternator Excite (provides Charge Fail Fault if unable to excite alternator)

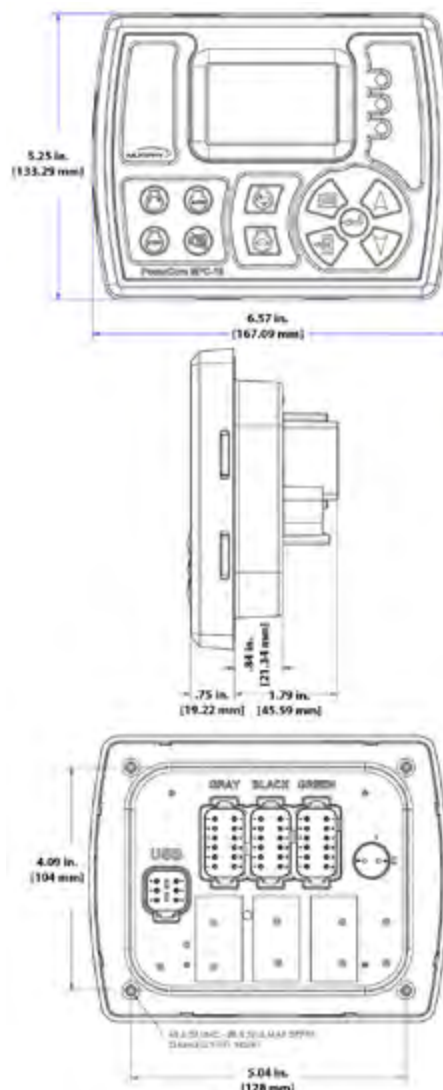
### Inputs:

- (5) Digital, configurable (high/low)
- (3) Analog, configurable (4-20 mA, 0-5 V, resistive)
- (1) Frequency, supporting Magnetic pickup (30 Hz - 10 kHz, 2.0 VAC-120 VAC) and Engine Alternator (30 Hz - 10 kHz, 4.5 VRMS - 90 VRMS)



\*Approved by CSA for non-hazardous locations (Group Safety Publication IEC 61010-1 Third Edition.  
Products covered in this document comply with European Union electromagnetic compatibility directive 2004/108/EC and electrical safety directive 2006/95/EC.

## Dimensions



## Specifications (continued)

### Communications:

- (1) CAN J1939
- (1) RS485, MODBUS RTU
- (1) USB 2.0B for Programming

### Dimensions:

Width: 6.57 in. (167.09 mm)  
 Height: 5.24 in. (133.29 mm)  
 Depth: 2.55 in. (64.81 mm)

**Mass:** 1lb. 1oz. (0.5 kg)

**Operating Temperature:** -40° F to 185° F (-40° C to 85° C)

**Storage Temperature:** -40° F to 185° F (-40° F to 85° C)

**EMI/EMC:** SAE J1113

**Shock:** ± 50G in 3 axes

**Vibration:** Random, 7.86 Grms (5-2000 Hz), 3 axes

**Sealing:** IP67 front and back, IP66 Panel Seal with Gasket

**Case:** Polycarbonate/ABS

**Mating Connector:** Deutsch Wedge Lock W12S-P012:

Gray DT06-12SA-P012  
 Black DT06-12SB-P012  
 Green DT06-12SC-P012  
 USB 6 pin

**Shipping Weight:** 2lbs. 7.1 oz. (1.11 kg)

**Shipping Dimensions:**

8 x 8 x 5-11/16 in. (204 x 204 x 127mm) (WxHxD)

**Languages:** English, Spanish, German, French, Italian

## Connectors

Deutsch 12 pin Connector Gray		Deutsch 12 pin Connector Black		Deutsch 12 pin Connector Green		Deutsch 6 pin Connector USB	
PIN	Function	PIN	Function	PIN	Function	PIN	Function
1	Battery (+)	1	Battery (+)	1	Battery (-)	1	USB1_VBUS
2	RS485 (H)	2	Not Used	2	Battery (+)	2	USB_DP_OUT
3	RS485 (L)	3	Digital Out 2 HS 1A	3	Battery (+) Switched	3	USB_DM_OUT
4	Relay 3 NC	4	Digital Out 1 HS 1A	4	Alt Excite	4	USB_ID_OUT
5	Relay 3 COM	5	Digital Out 2 LS 1A	5	CAN (H)	5	USB_SHLD
6	Relay 3 NO	6	Digital Out 1 LS 1A	6	CAN (L)	6	USB_GND
7	Analog In 3	7	Analog In 1	7	Relay 1 NO		
8	Digital In 3	8	Analog In 2	8	Relay 1 COM		
9	Digital In 4	9	Digital In 1	9	Relay 1 NC		
10	Digital In 5	10	Digital In 2	10	Relay 2 NO		
11	Not Used	11	Frequency In	11	Relay 2 COM		
12	Battery (-)	12	Battery (-)	12	Relay 2 NC		

## How to Order

Part Number	Model/Description
40700494	MPC-10 Controller
40051142	Panel Gasket, IP66, MPC-10
40700506	PowerCore 3X12 Position Connector Kit
40000598	PowerCore 3X12 Position 3' Conn Whip Harness (1m approx.)
78000668	USB Programming Harness

# ML1000-4X Panel

## MurphyLink® Series

The MurphyLink Series ML1000-4X Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering which includes the powerful, yet simple-to-configure MPC-10 Controller. The MPC-10 is a general, all-purpose manual/auto start and manual/auto throttling engine controller designed with rental applications in mind. The controller is purposed primarily for applications where a wide array of inputs and outputs are not required. The MPC-10 supports J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety shutdowns.

The MPC-10 follows a standard operating sequence of 22 machine states that happen in a predetermined order. Machine states can be set to zero if not needed or adjusted to fit the application. The menu structure is incredibly versatile, with the ability to change many parameters and settings from the face without the need of a PC tool, if desired.

The flexibility of the MPC-10 controller allows for the same control panel to be used across many applications. This provides the operator familiarity with the controller and control panel in any application.

### Specifications

#### MPC-10 Controller

Operating Voltage: 8-32 VDC, reverse polarity and load dump protected

Operating Temperature: -40° to +85° C (-40° to 185° F)

Storage Temperature: -40° to +85° C (-40° to 185° F)

#### Total Current Consumption:

Power on in stopped state; 117 mA at 12 VDC. Power on in standby mode; 52 mA at 12 VDC.

**Enclosure:** Polycarbonate NEMA 4X

#### Mating Connectors:

21 Position, Deutsch HDP26-24-21SE,

31 Position, Deutsch HDP26-24-31SE

#### Communications:

(1) CAN J1939

(1) RS485, Modbus RTU

### How to Order



The Control Panel utilizes industry-standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness<sup>1</sup> (MIH) or John Deere OEM engine harnessing.

A free-of-charge PC Configuration tool is available to allow customers to change default settings and provide three levels of passcode protection.

The ML1000-4X panel can be mounted directly to the engine or engine/application cover. The enclosure has a clear door for protection from foreign debris contacting the face of the controller when desired.

<sup>1</sup>Please contact Industrial Panel Sales for application specifics and MIH harnessing.

(1) USB 2.0B for Programming

#### Outputs (13):

(3) Relays: 10A, SPDT, Form C (30 VDC @ 10A max.), 30A max aggregate @ 85C

(2) Low-side (1A)

(2) High-side (1A)

(1) Dedicated Alternator Excite (provides Charge Fail Fault if unable to excite alternator)

#### Inputs (15):

(5) Digital, configurable (high/low)

(3) Analog, configurable (4-20 mA, 0-5V, resistive)

(1) Frequency, supporting Magnetic pickup (30 Hz - 10 kHz, 2.0 VAC-120 VAC) and Engine Alternator (30 Hz - 10 kHz, 4.5 VRMS - 90 VRMS)

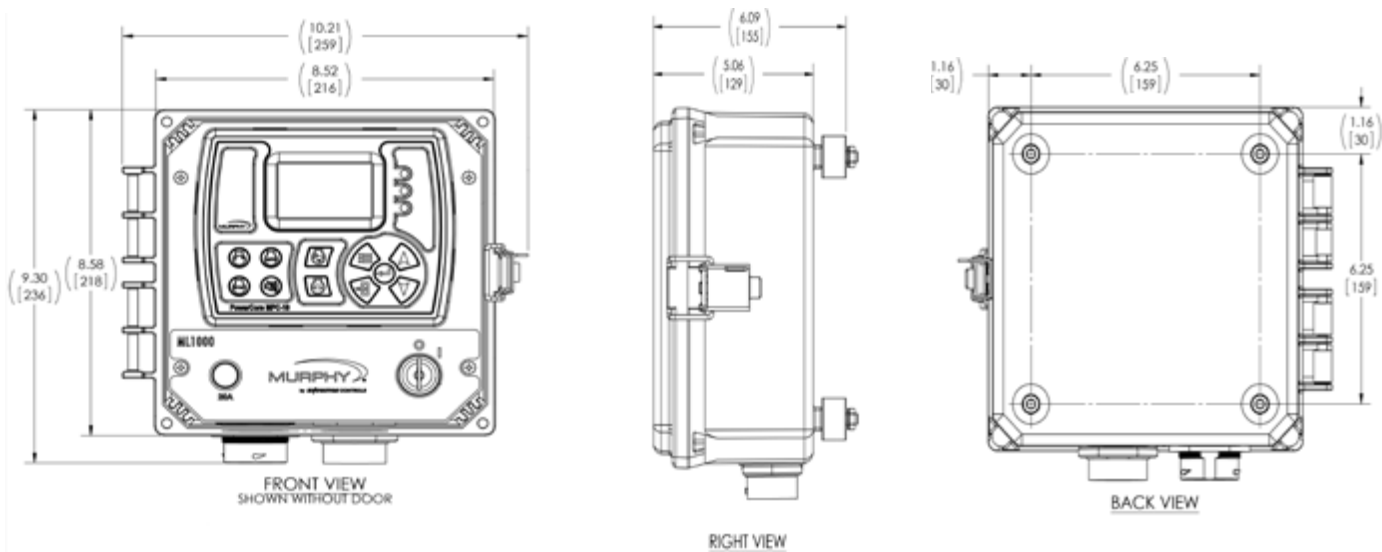
**Languages:** English, Spanish, German, French, Italian

**Dimensions:** 10.21 x 9.30 x 6.09 in. (259 x 236 x 155mm)  
(WxHxD)

Part Number	Model and Description	Notes
40700503	ML1000-4X, Polycarbonate, NEMA 4X Control Panel	
40000602	Engine Harness, 21 Position Connector 10' Whip Harness (3m approx.)	
40000603	I/O Harness, 31 Position Connector 10' Whip Harness (3m approx.)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	
78000668	USB Programming Harness	

# Product and Mounting Dimensions

## ML1000-4x



## Connectors

Deutsch 21 pin Connector Engine		Deutsch 31 pin Connector I/O	
PIN	Function	PIN	Function
A		1	Ignition Signal
B	Battery +	2	
C		3	
D	Starter Solenoid	4	
E	Battery -	5	
F		6	
G	Fuel/ECU	7	
H		8	
J	Alternator Excite	9	Analog Input 3
K		10	
L		11	
M		12	
N		13	Not in Auto
P		14	Float Stop (Digital Input 3)
R	Throttle Decrement	15	
S	Throttle Increase	16	
T	Frequency Input	17	Relay 3 (Common)
U	J1939 CAN LO	18	Relay 3 (NC)
V	J1939 CAN HI	19	Relay 3 (NO)
W	Temperature Sender	20	Oil Level (Digital Input 5)
X	Pressure Sender	21	Digital Input 1
		22	
		23	Float Start (Digital Input 2)
		24	Engine Running Signal
		25	
		26	Aux battery negative
		27	
		28	
		29	Coolant Level (Digital Input 4)
		30	RS485+
		31	RS485-

# PowerCore™ MPC-20

Murphy's PowerCore MPC-20 is an all-purpose industrial controller that stands up to some of the harshest environments. This powerful controller is targeted for engine-driven pumps and irrigation, with the versatility to work in most engine-driven applications. The controller can be mounted in a sealed control box but is entirely sealed to meet and/or exceed an IP67 rating.

Easily viewable in full-sun conditions, the MPC-20 has a large 3.8-inch monochrome transfective LCD. Interim and Final Tier 4 ISO symbols appear with engine and application information without the appearance of a cluttered screen.

The MPC-20 is configurable by the user to meet the most versatile applications. The ease of initial setup of the I/O does not leave the user feeling paralyzed when an input is needed for a specific function. This allows for quicker uptime and less headache while on the manufacturing floor or in the field.

Although a configuration tool is not required, it provides the ability to configure the controller's set points on the PC and save them in a file for future loading. A standard set point configuration tool is included as a free download to allow customized default settings for building application- or customer-specific configurations.

The MPC-20's design has been proven through internal and external testing including HALT (Highly Accelerated Life Testing) and third-party approvals.

## Specifications

**Display:** 3.8" Monochrome LCD, Transfective, 320 x 240 QVGA with White Backlight

**Keypad:** 11 Tactile Feedback Buttons

**LEDs:** (1) Red, Shutdown, (1) Amber, Warning, (1) Green, Auto Mode

**Outputs:**

- (2) 1A Max Low-side
- (2) 2A Max High-side
- (2) 200mA Max 5 VDC
- (1) 0-5 VDC Analog
- (6) 10 A Max Form C Relays

**Inputs:**

- (8) Analog, Configurable as Resistive, 0-5VDC, 4-20mA or Digital Ground
- (6) Digital, Configurable as Battery or Ground
- (1) Frequency, (2 Hz - 10 K Hz, 3.6 VAC-120 VAC)

**Communications:**

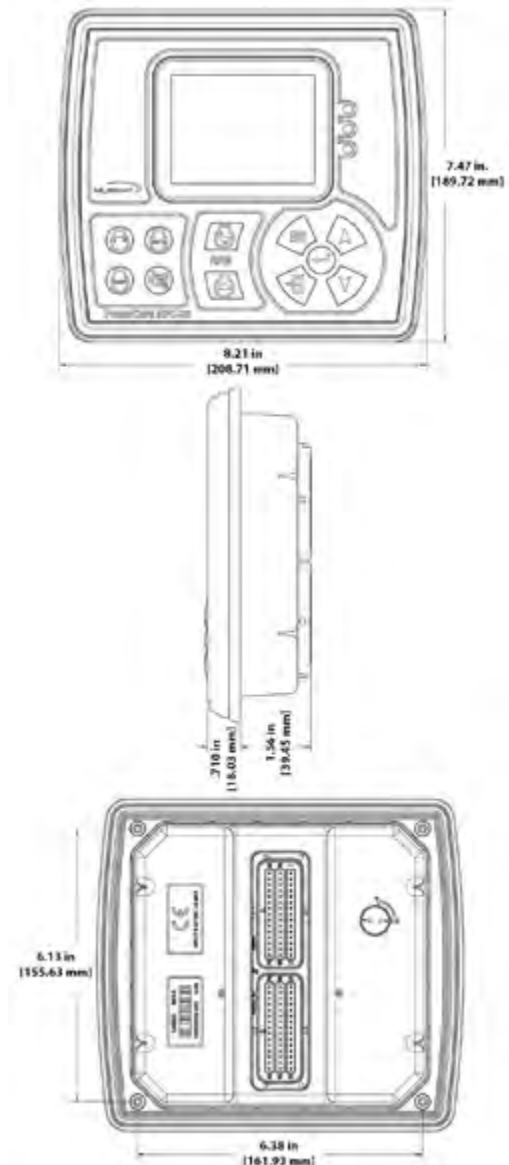
- (1) CAN 2.0B, 250 kbps, J1939
- (1) RS485, MODBUS RTU
- (1) USB, Programming

**Power Input:** 8-32 VDC, Reverse Polarity & Load Dump Protection



\*Approved by CSA for non-hazardous locations (Group Safety Publication IEC 61010-1 Third Edition).  
Products covered in this document comply with European Council electromagnetic compatibility directive 2004/108/EC and electrical safety directive 2006/95/EC.

## Dimensions





## Specifications (continued)

### Total Current Consumption:

18W Max without 2 2A High-sides active

146W Max with 2 2A High-sides active

### Dimensions:

Width: 8.2 in. (208.7 mm)

Height: 7.5 in. (189.7 mm)

Depth: 2.3 in. (57.5 mm)

**Mass:** 0.9 kg (2.0 lb)

**Operating Temperature:** -40°F to 185°F (-40°C to 85°C)

**Storage Temperature:** -40°F to 185°F (-40°C to 85°C)

**EMI/RFI:** SAE J1113

**Shock:** 50G in X, Y, Z Axes

**Vibration:** Random, 7.86 Grms (5-2000Hz), 3 Axes

**Sealing:** IP67 Complete Controller, IP66 Panel Mount with Gasket (Minimum 14 Ga Metal Plate)

**Case:** Polycarbonate

**Mating Connector:** Delphi, SICMA 90 Position

**Shipping Weight:** 2lbs. 7.1 oz (1.11 kg)

**Shipping Dimensions:** 9.5 x 9 x 5 in. (241 x 229 x 127 mm)

## How to Order

Part Number	Model/Description
40700490	MPC-20 Controller
40700500	MPC-20 Controller, Spanish version
40051031	Panel Gasket, IP66, MPC-20
40700496	PowerCore 90 Position Connector Kit
40000554	PowerCore 90 Position 3 ft. Conn Whip Harness
40000567	Hand Crimper for PowerCore 90 Position Connector

## Connectors

Delphi SICMA 90 Way Connector 1-30	
PIN	Function
1	Switched Power (+)
2	Ground (-)
3	Analog Input 1 (Resistive,0-5V,4-20mA)
4	Analog Input 2 (Resistive,0-5V,4-20mA)
5	Analog Input 3 (Resistive,0-5V,4-20mA)
6	Analog Input 4 (Resistive,0-5V,4-20mA)
7	Analog Input 5 (Resistive,0-5V,4-20mA)
8	Analog Input 6 (Resistive,0-5V,4-20mA)
9	Analog Input 7 (Resistive,0-5V,4-20mA)
10	Analog Input 8 (Resistive,0-5V,4-20mA)
11	Reserved
12	RS485 Low
13	RS485 High
14	Reserved
15	Reserved
16	USB D+
17	USB Ground
18	Relay 4 Normally Closed
19	Relay 4 Common
20	Relay 4 Normally Open
21	Reserved
22	Relay 5 Normally Closed
23	Relay 5 Common
24	Relay 5 Normally Open
25	Reserved
26	Relay 6 Normally Closed
27	Relay 6 Common
28	Relay 6 Normally Open
29	Low-side FET 1 (1A Max)
30	Low-side FET 2 (1A Max)

Delphi SICMA 90 Way Connector 31-60	
PIN	Function
31	Power (+)
32	Ground (-)
33	Digital Input 1 (Power or Ground)
34	Digital Input 3 (Power or Ground)
35	Digital Input 5 (Power or Ground)
36	Reserved
37	Reserved
38	Reserved
39	Reserved
40	Analog Output
41	Reserved
42	Reserved
43	Reserved
44	Reserved
45	Reserved
46	USB D-
47	USB Shield
48	Reserved
49	Reserved
50	Reserved
51	Reserved
52	Reserved
53	Reserved
54	Reserved
55	Reserved
56	Reserved
57	Reserved
58	Reserved
59	Reserved
60	Reserved

Delphi SICMA 90 Way Connector 61-90	
PIN	Function
61	Power (+)
62	Ground (-)
63	Digital Input 2 (Power or Ground)
64	Digital Input 4 (Power or Ground)
65	Digital Input 6 (Power or Ground)
66	High-side FET 1 (2A Max)
67	High-side FET 2 (2A Max)
68	Reserved
69	Frequency Input
70	Ground (-)
71	Reserved
72	CAN Low
73	CAN High
74	Reserved
75	Reserved
76	USB VBUS
77	USB ID
78	Relay 1 Normally Closed
79	Relay 1 Common
80	Relay 1 Normally Open
81	Reserved
82	Relay 2 Normally Closed
83	Relay 2 Common
84	Relay 2 Normally Open
85	Reserved
86	Relay 3 Normally Closed
87	Relay 3 Common
88	Relay 3 Normally Open
89	5VDC Output 1 (200mA Max)
90	5VDC Output 2 (200mA Max)



# ML2000 Panel

## MurphyLink® Series

The MurphyLink Series ML2000 Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering which includes the powerful, yet simple-to-configure MPC-20 Controller. This controller is part of the Murphy PowerCore family and was developed to meet the need of manual or automatic control whether it's starting/stopping, throttling or both. This controller also has the flexibility to be used on either mechanically or electronically governed engines supporting SAE J1939 CAN communications.

The ML2000 panel has the ability for the software to be fully configured from the front user interface or PC configuration tool. If the default parameters set by Enovation Controls are not the desired set points for a factory default reset, the packager or operator has the ability to change these settings with the PC configuration tool then load with a USB thumb drive<sup>1</sup> and USB programming harness<sup>1</sup>. The configuration tool also allows for the splash screen to incorporate a company logo when powered on.

The flexibility of the MPC-20 controller allows for the same control panel to be used across many applications. This provides the operator familiarity with the controller and control panel in any application. The Control Panel utilizes industry standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness<sup>2</sup> (MIH) or John Deere OEM engine harnessing.

The ML2000 Series panels are available in two rugged enclosures or a stand-alone flat panel option that can be dropped into an existing panel or engine surround/dog house. The enclosure types to choose from are powder-coated cold rolled steel or polycarbonate NEMA 4X. Optional mounting kits are offered for the sheet-metal enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications.

<sup>1</sup>USB thumb drive and programming harness sold separately from the control panel.

<sup>2</sup>Please contact Industrial Panel Sales for application specifics and MIH harnessing.



## Specifications

### **MPC-20 Controller**

Operating Voltage: 8-32VD

Operating Temperature: -40° to +85°C (-40° to 185°F)

Storage Temperature: -40° to +85°C (-40° to 185°F)

### **Total Current Consumption:**

18W Max without 2 2A High-sides active,

146W Max with 2 2A High-sides active

**Enclosure:** Powder-coated cold rolled steel or polycarbonate

### **Mating Connectors:**

21 Position, Deutsch HDP26-24-21SE,

31 Position, Deutsch HDP26-24-31SE

### **Shipping Weights:**

ML2000: 13 lbs (5.9kg)

ML2000-FP: 7 lbs (3.17kg)

ML2000-4X: 11 lbs (4.99kg)

**Communications:** CAN (SAE J1939) and RS-485 Modbus

### **Outputs (13):**

(2) 1A Max Low-side

(2) 2A Max High-side

(2) 200mA Max 5VDC

(1) 0-5VDC Analog

(6) 10A Max Form C Relays

### **Inputs (15):**

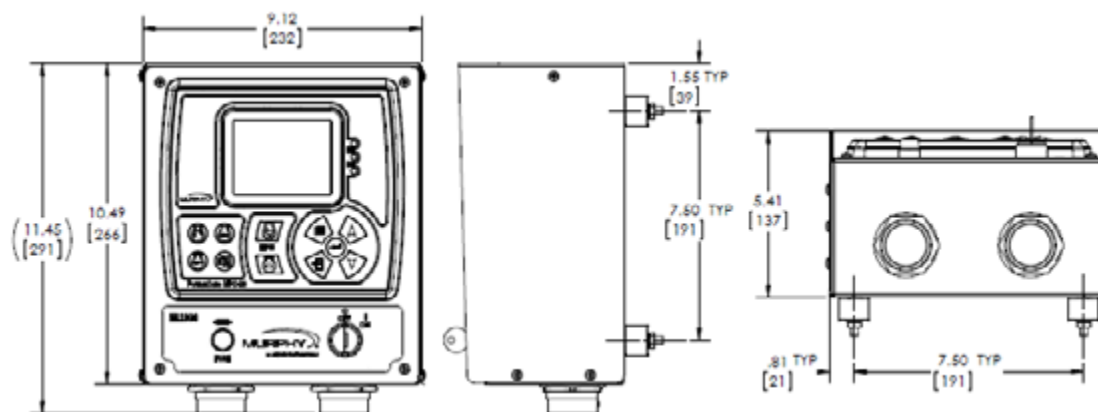
(8) Analog, configurable as Resistive, 0-5VDC or 4-20mA

(6) Digital, Configurable as Battery or Ground

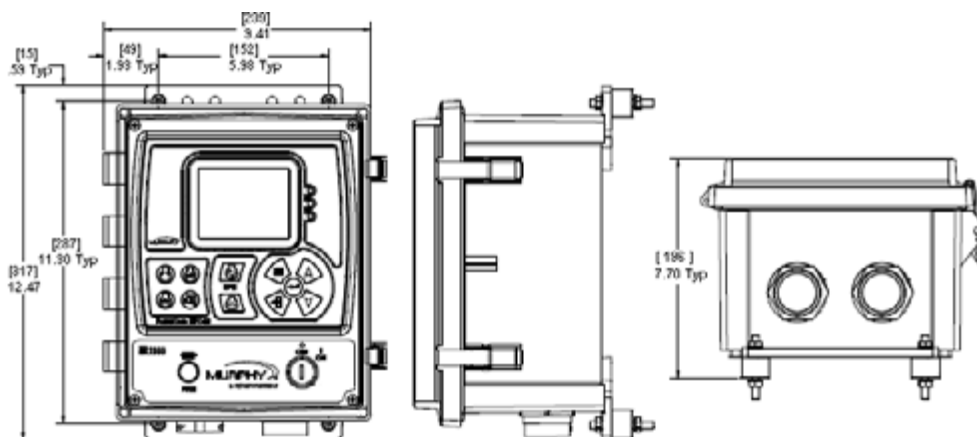
(1) Frequency, (2Hz - 10KHz, 3.6VAC-120VAC)

## Product and Mounting Dimensions

### ML2000



### ML2000-4X



## How to Order

Part Number	Model and Description	Notes
40700491	ML2000, Metal Control Panel	English
40700492	ML2000-4X, Polycarbonate, NEMA 4X Control Panel	
40700497	ML2000-FP, Flat Control Panel	
40700499	ML2000, Metal Control Panel (Spanish)	Spanish
40700501	ML2000-4X, Polycarbonate, NEMA 4X Control Panel (Spanish)	
40700502	ML2000-FP, Flat Control Panel (Spanish)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	
40000553	Harness, ML2000, Mechanical, 10' Blunt, 21 Pos, 10' Mechanical Engine Whip Harness	
40000565	Harness, ML2000, I/O, 10' Blunt, 31 Pos, 10' I/O Whip Harness	
40000566	ML2000 USB Programming Harness, 6PIN to USB Programming Harness	

# EMS Pro

## Engine Monitoring System Controller

The EMS PRO is a flexible all-in-one customizable unit that meets the needs of engine-driven pumping equipment applications.

The EMS PRO is a dedicated microprocessor-based, single-engine controller. It offers field-adjustable operating parameters that can be changed without the need for a computer. It is also able to support both mechanical and J1939 electronic engines.

The EMS PRO has selectable auto start/stop features with several throttling options. The auto start/stop options (single contact, floats, momentary, transducer and clock) are available at the touch of a button. The transducer start/stop option includes three settings: pressure, level and temperature. In addition, there are many performance-enhancing features, all of which are available through an operator interface that is easy to learn and use. The EMS PRO is ideal for use with a remote modem or in a SCADA system offering MODBUS RTU protocol on either the RS232 or RS485 port.

The EMS PRO has the ability to withstand a wide ambient temperature range, comes standard in a NEMA 4 rated enclosure and is secured by four rubber shock mounts. Inside is a backlit graphical display that is visible day or night in all conditions.

Additional features include:

- Shut-down history file
- First-out shutdowns and/or alarm indicating LEDs
- Supports TSC1 throttle messaging
- Wide operating temperature range
- IP66 rated
- Internet ready utilizing MODBUS RTU with auxiliary equipment
- Real-time clock in 24-hour format
- NEMA 4 enclosure with optional clear door

## Communications

The EMS PRO has RS485, RS232 and J1939 CAN communication ports. The standard unit uses RS485 or RS232 for MODBUS RTU. At the same time, the CAN port allows J1939 communication with the engine ECU to display engine parameters and control the throttle via TSC1, if supported by the engine.

Shown  
with optional  
clear door.



\*Approved by CSA for Non-hazardous locations (Group Safety Publication IEC 61010-1)

## Specifications

**Operating Voltage (12 and 24 systems):** 8 VDC minimum to 32 VDC maximum

### Environmental

**Operating Temperature:** -40° to 176°F (-40° to 80°C)

**NOTE:** Care should be taken when selecting the clear door option when used in applications involving sunlight exposure. Direct sunlight can cause premature component failure by allowing the sealed enclosure temperature to exceed the rated 80°C/175°F.

**Storage Temperature:** -40° to 176°F (-40° to 80°C)

**Environmental Sealing:** IP66

**NOTE:** Meets IP66 when the door is closed and latched.

**Relative Humidity:** 95%RH @ 60°C

**Standby Current:**

(@ 12VDC) 220mA

(@ 24VDC) 255mA

**CAN bus:** SAE J1939 compliant

**Enclosure:** Polycarbonate NEMA 4 (UL Certified)

### Inputs

**Analog Inputs:** (12) designated via program; sender/ground digital, 4 -20mA, 0-5 VDC.

**Digital Inputs:** (8) high/low

**Frequency:** 1 optically-isolated input for speed reference, magnetic pick-up. (2VAC-50VAC RMS)

**Fuel Sender Input:** 33 Ohm full, 240 Ohm empty

### Outputs

**Digital Outputs:** (3) FET B+ (rated at 1A)

**Relays:** 1 SPDT and 8 SPST 5 Amp pilot relays (maximum relay ground current limited to 23 amps).

**User Interface:** (8) button membrane switch

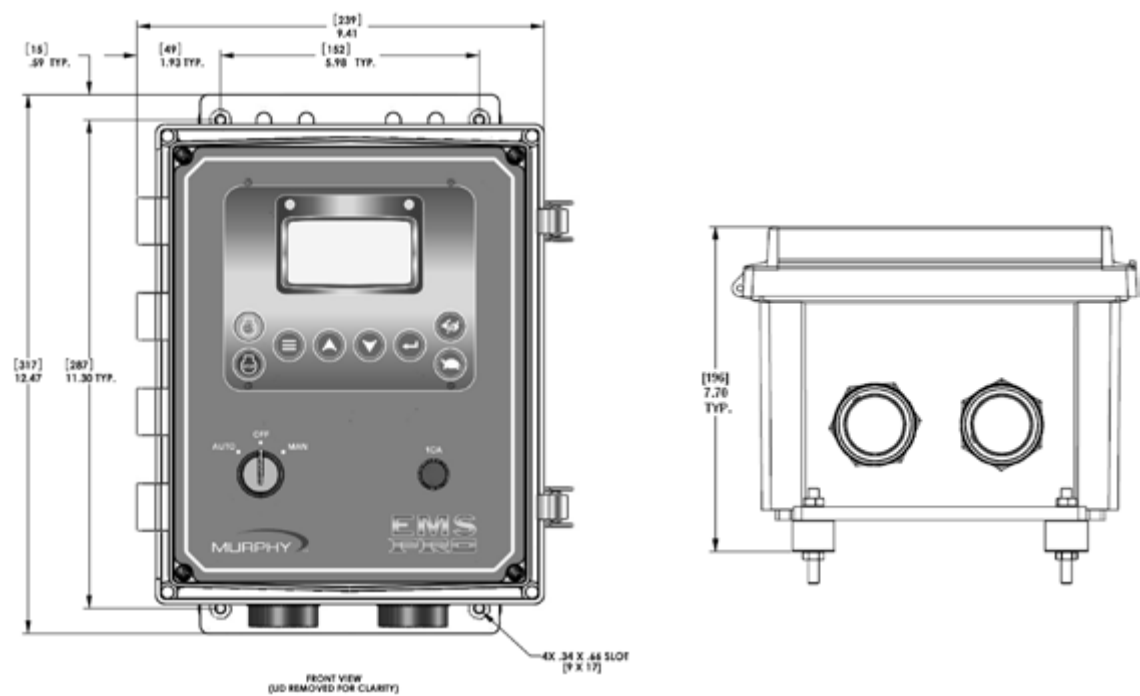
**Connectors:** 21 pin and 31 pin Deutsch HDP20 Series

**Mounting:** 4 isolated .75 inch rubber shock mounts

**Shipping Weight:** 11 lb. (5 kg.)

**Shipping Dimensions (all models):** 15 x 15 x 11 in. (381 x 381 x 279.4 mm)

## Dimensions



## How to Order

Part Number	Description	Notes
40700301	EMS Pro	
40700302	EMS Pro with optional clear door*	
40000479	21-pin and 31-pin connector kit	Accessories
40000480	Deutsch HDP 10' 21-pin and 31-pin harness kit	
40000481	10' 31-pin I/O harness	
Contact Industrial Panel Sales	MIH	
	MIH harness	

\* Care should be taken when selecting the optional clear door when used in applications involving direct sunlight exposure. Direct sunlight can cause premature component failure by allowing the sealed enclosure temperature to exceed the rated 175°F/80°C.

# EMS Pro Lite

## Engine Monitoring System Controller

The EMS Pro Lite is a customizable pump controller designed specifically for dewatering and irrigation applications. This versatile unit supports both mechanical and J1939 electronic engines, thus eliminating the need to stock multiple controllers. A step ahead, the EMS Pro Lite is Tier 4 and Stage IIIB/IV ready. This includes displaying the current urea level % on the LCD.

The operator interface is a responsive eight-button membrane keypad and backlit graphical display mounted directly to the front of a rugged NEMA 4 enclosure.

A microprocessor-based controller, the EMS Pro Lite's operating parameters are field adjustable without the need for a computer. However, the EMS Pro Lite can be modified for use with a remote modem or in a SCADA system with MODBUS<sup>®</sup> RTU protocols on either an RS232 or RS485 port.

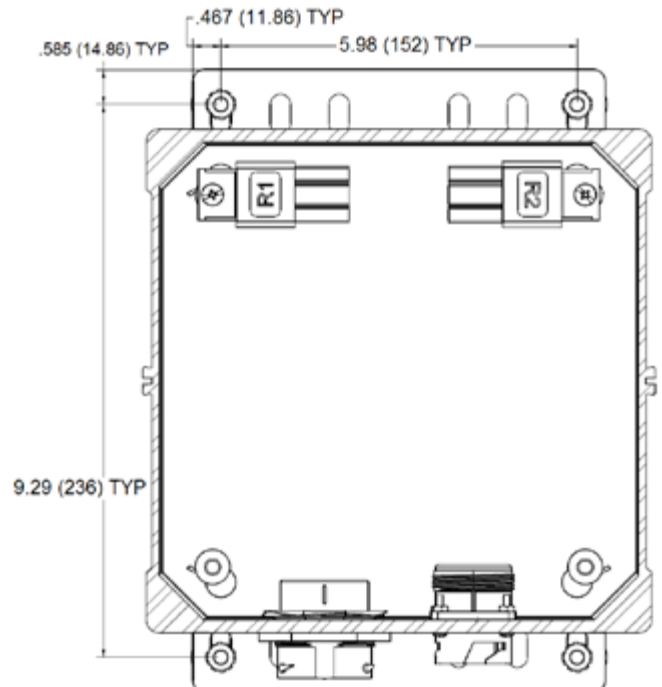
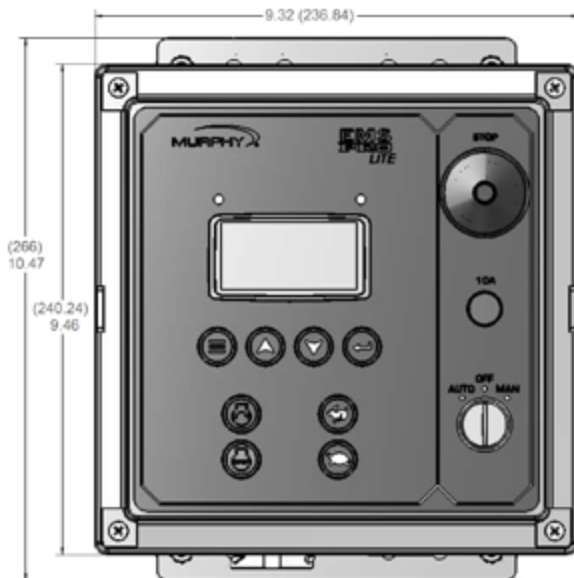
EMS Pro Lite offers Auto Start/Stop with 2-Float, Transducer settings (pressure and level) or Clock start/stop using the internal real-time clock. Throttle to Level, Pressure or Maximum RPM (desired RPM) is offered.

The robust EMS Pro Lite is engineered for 12 VDC systems (8 VDC minimum to 14.4 VDC maximum) and a wide operating temperature.



\*MODBUS is a registered trademark of its respective owner and is not affiliated with Enovation Controls.

### Dimensions



## Communications

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The EMS Pro Lite has RS485, RS232 and J1939 CAN communication ports. The standard unit uses RS485 or RS232 for MODBUS RTU. At the same time, the CAN port allows J1939 communication with the engine ECU to display engine parameters and control the throttle via TSC1, if supported by the engine.

## Specifications

---

**Operating Voltage:** 8 VDC minimum to 14.4 VDC maximum

**Relative Humidity:** 95% RH @ 60°F (15.5°C)

**Enclosure:** Polycarbonate NEMA 4 (UL/cUL listed)

**Shipping Weight:** 7 lb. (3.2 hg)

**Analog Inputs:** 6 analog inputs designed via program; sender/ground digital 4-20mA, 0-5 VDC

**Digital Inputs:** 4 digital inputs High/Low (2 inputs dedicated for auto and manual states of key switch)

**Frequency:** 1 optically isolated input for speed reference, magnetic pick-up, (2 VAC - 50 VAC RMS, 30-10kHz)

**Fuel Sender Input:** 33 Ohm full, 240 Ohm empty. This input can also be configured for an external auxiliary shutdown.

**Analog Output:** 4-20mA or 0.4 to 4.2 VDC (used for 0.4 – 4.2V throttling)

**Digital Outputs:** 6 digital outputs; 3 FET B+ (rated at 1A), 3 Open Collector sink-to-ground 100 mA (one of these is used to pilot a relay)

**Communications:** RS485, RS232, CAN J1939, CAN 2.0B ports

**Shipping Dimensions:** 12 x 12 x 10 in. (304.8 x 304.8 x 254 mm)

**Operating Temperature:** -40 to 176° F (-40 to 80° C)

**Storage Temperature:** -40 to 176° F (-40 to 80° C)

**Environmental Sealing:** IP65

## How to Order

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Part Number	Description
40700305	EMS Pro Lite
<b>Accessories</b>	
40000521	21-pin and 9-pin, 10 ft (3.048m) Whip Harness Kit for Mechanical Engines
40000522	9-pin, 10 ft (3.048m) Whip Harness for I/O
40000523	9-pin Connector Kit for I/O with terminals
40000524	21-pin and 9-pin Connector Kit with terminals
40000526	21-pin, 10 ft (3.048m) Whip Harness for Mechanical Engines
40000531	21-pin Connector Kit with terminals for engine connector
Murphy Industrial Harness: Please contact Industrial Panel Sales for application-specific harnesses for electronic engines.	



# Murphymatic® TR Series Transformer Relay Assemblies

The Murphy TR Series Transformer Relay Assemblies are electric motor controllers. Models are available for emergency shutdown, start and stop only, start and stop with emergency shutdown and combinations of the above models with time delay.

All TR Series internal control circuits are completely pre-wired and relays are plug-in type to facilitate field servicing.

The NEMA 1 enclosure is standard on all TR Series models. The NEMA 3 weatherproof enclosure and LC Less Case versions are optional.

Murphy Switchgauge® instruments for pressure, temperature, level etc., can be used with the TRs for semiautomatic or totally unattended operation and control of your electric motor powered equipment.

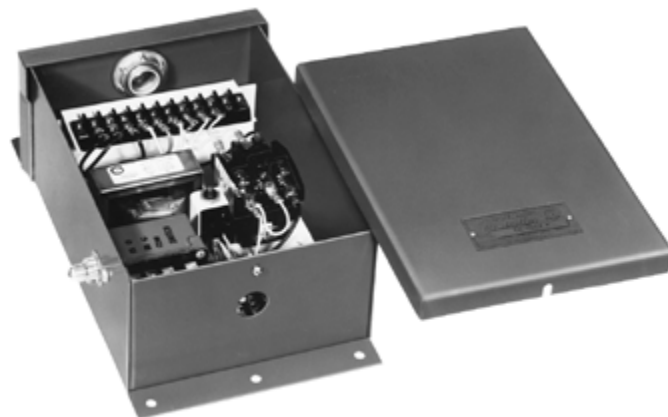
A set of normally open, dry relay contacts controlled by a 24 VAC relay coil controls the magnetic motor starter holding coil up to 480 volts. The high voltage contacts are completely isolated from the low voltage control to help reduce electrical hazards.

## Features

- Heavy-duty transformer with multiple primary taps for easy connection to most any available AC power sources.
- 24 VAC low voltage secondary control circuit with terminals for remote auxiliary switches.
- Plug-in relays have three SPDT silver cadmium oxide contacts providing long life reliability.
- Power relay has extra heavy silver cadmium oxide contacts rated 10 amp, 480 VAC.
- When TR is used with a Murphy Analog Switchgauge, it allows for visual reading of operating conditions and provides an adjustable differential between high and low settings throughout the Switchgauge dial range.

## Applications

The TR Series transformer relay assemblies are ideal for controlling a variety of electric motor driven applications. They are recommended for use on saltwater disposal systems, waterflood systems and many others. Model TR-1762 used in conjunction with model OPLHC Tank Level Controller and an OPLC Series discharge pressure can completely automate a salt water disposal pump.



## Specifications

### Transformer:

Primary (power supply) with triple taps for 120/240/480 VAC  
50/60 Hz

Secondary (control supply) 24 VAC

### Power Rating: 25 VA

### Terminal Blocks:

High Voltage rated at 30 A, 600 V

Low Voltage rated at 20 A, 300 V

### Control Relays: Plug-in, 120 V, 10 A contact rating

### Contacts:

Power (holding): 10 A, 480 VAC, SPST

Control (auxiliary): 480 VAC, 690 VA pilot duty

### Conduit: Top: 3/4 in. hub; Bottom 1/2 in. hole

### Approximated Shipping Dimensions:

NEMA 1; NEMA 3; and "LC" Less Case:

15 x 15 x 7 in. (381 x 381 x 178 mm)

### Approximated Shipping Weight:

NEMA 1: 18 lb. (8.16 kg)

NEMA 3: 22 lb. (10 kg)

"LC" Less Case: 14 lb. (6.35 kg)

## Models and Functions

**TR7207** — Used for emergency shutdown of electric motors driven equipment which are manually started.

Tattletale® indicates shutdown and locks out power until the malfunction is corrected and the Tattletale is reset. A momentary power failure during shutdown will not void the lockout feature. For use with standard, normally open, one-wire to ground Murphy Switchgag instruments.

**TR7208** — Same as TR7207 except used with normally closed, ungrounded Switchgag instruments which open for shutdown.

**TR9193** — Same as TR7207 with adjustable time delay, which locks out shutdown functions for up to 10 minutes, to allow pressures and temperatures to reach normal range after start-up.

**TR1760** — Used with electric motors or driven equipment which is started and stopped from a remote, normally open Switchgag.

**TR1761** — Includes the same features as the TR1760 plus provisions for

operating remote panel lights or audible alarms. Also includes emergency shutdown and lockout from a remote, normally open, one wire to ground Switchgag.

**TR1762** — Same as TR1761 with adjustable time delay lockout of shutdown functions, for up to 10 minutes, during start-up.

**NOTE:** TR1760, TR1761 and TR1762 comply with National Electrical code 1975, Article 430-73.

Some models have been discontinued and replaced by other models:

**Discontinued** **Replacement**

TR-5171 . . . . . TR1760

TR-7159 . . . . . TR1761

TR-9195 . . . . . TR1762

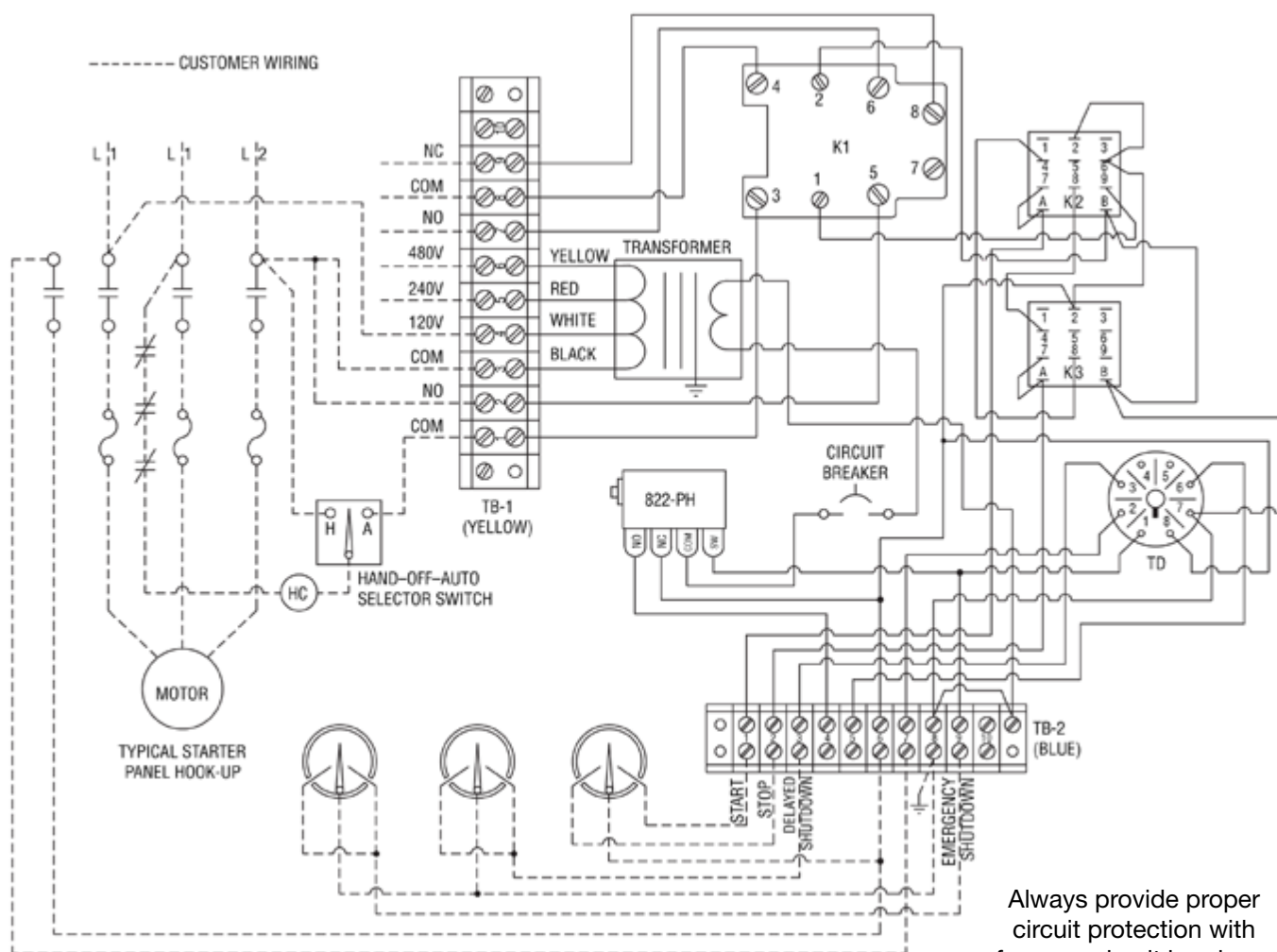
To order TR assemblies use the appropriate model number

**Warning:** Before beginning installation of this Murphy product:

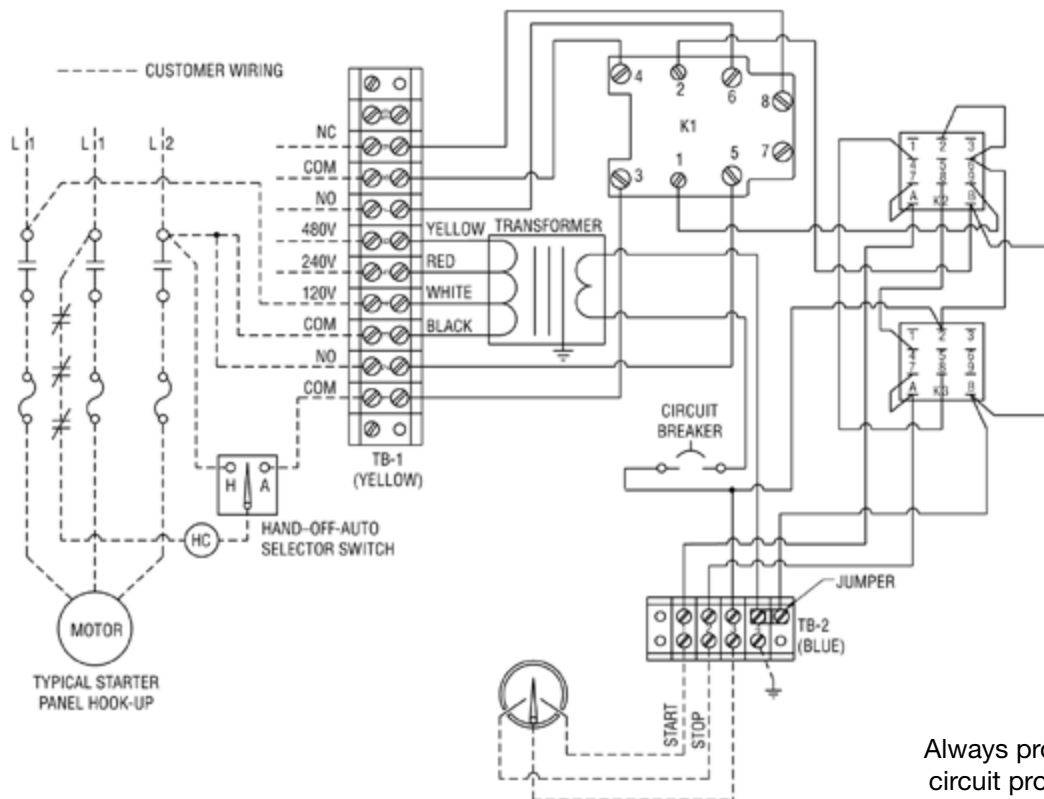
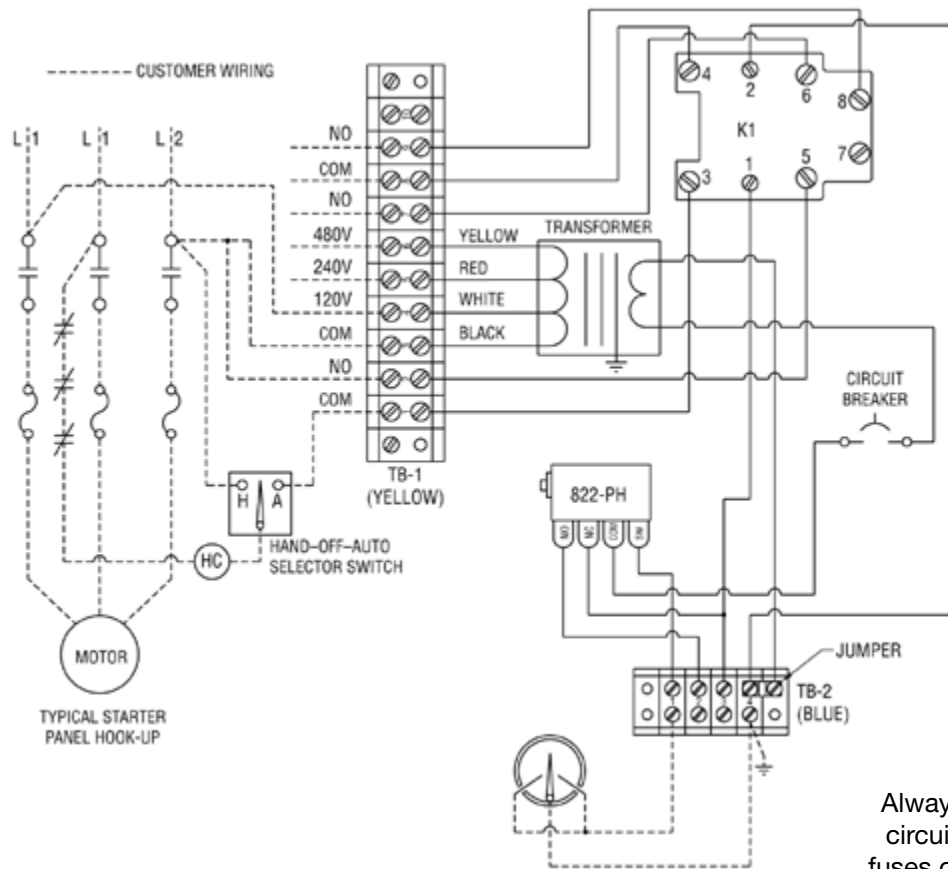


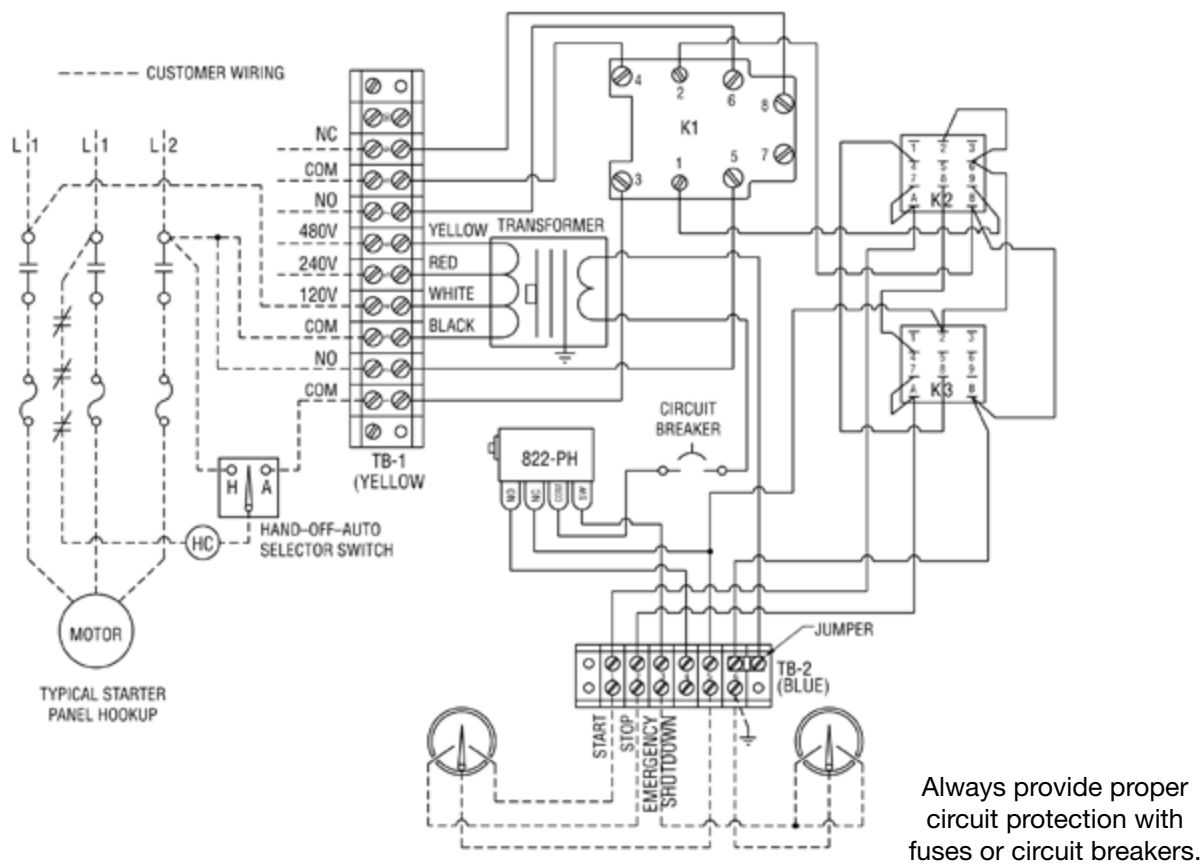
1. Disconnect ALL electrical power to the machine.
2. Make sure the machine CANNOT operate during installation.
3. Follow all safety warnings of the machine manufacturer.

## TR1762



Always provide proper circuit protection with fuses or circuit breakers.





How to Order

Part Number	Model and Description	Notes
Specify Model Number	TR7207	
	TR7208	
	TR9193	
	TR1760	Replaces TR-5171
	TR1761	Replaces TR-7159
	TR1762	Replaces TR-9195

# IntelliSpark®

## Ignition Controller System

The IntelliSpark 32/16/8 series ignition systems are capacitive discharge, low-tension type designs. The system is capable of generating precise spark timing that improves fuel economy, load balance and ignition stability. The controller design incorporates a state-of-the-art 16-bit microcontroller. This technology provides users with a highly flexible solution to meet their ignition needs.

The user can choose from one of five methods of crankshaft sensing for a 4-stroke engine and two methods for a 2-stroke engine.

Murphy's smart ignition coils used with this product incorporate a sense lead connection for real-time spark plug demand voltage measurements by the ignition controller. This allows the controller to:

- Measure demand on each cylinder's plug for diagnostic purposes;
- Automatically control the energy delivered to the smart coils to optimize spark plug life;
- Use the measured demand in the unique camless crank method to determine the compression stroke, eliminating the need for a camshaft sensor.

Several smart coil designs are available to accommodate specific ignition requirements including: remote mount coils and plug-mounted (integral) coils, non-hazardous or CSA Class I, Div. 2 rated versions.

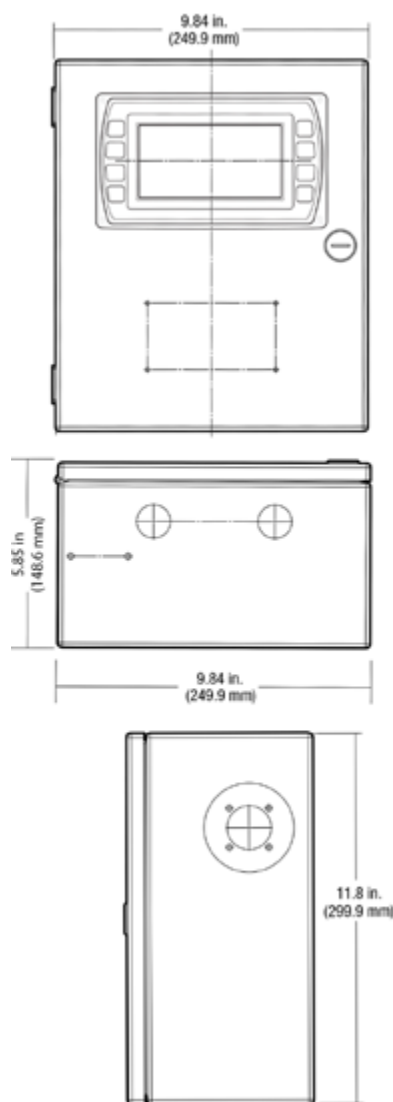
This system also includes the Murphy PV-450 full-color screen display for control functions, monitoring, programming and diagnostic testing. The eight-button display includes comprehensive built-in help files and wiring information for the coil harness and a database of common engines for ease of configuration.

### Features

- Crankshaft-referenced 16-bit microprocessor based system
- Patented Smart Coil technology
- Automatic energy control
- Five timing reference options including camless operation
- Two field-adjustable timing schedules
- Optimized engine combustion and performance
- True primary and secondary diagnostics



### Dimensions



## Specifications

### Power Requirements:

**IS-16/8:** 10-30 VDC (12/24 VDC nominal) 3.0 Amps max

**IS-32:** 10-30 VDC, 6.0 Amps max

**Note:** The input current is dependent on firing rate

### Environment:

**Temperature Operating Range:** -4° to +158° F  
(-20° to +70° C)

**Enclosure Rating:** IP66 with display mounted in the enclosure box;  
Type 4 without display mounted in the enclosure box

### Third Party Approvals:

CSA Certified for Class I, Div 2, Groups B, C, D

**IS-8:** Fires 8 outputs

**IS-16:** Fires 16 outputs

**IS-32:** Fires 32 outputs, 2 outputs can fire simultaneously

### Energy Storage:

**IS-32/16/8:** 180 mJ max, per tank capacitor

### Communications:

**IS-32/16/8:** An auxiliary comm port is available, RS-485 interface,  
MODBUS protocol

**Note:** This port has a user programmable slave ID, runs at  
9600 baud or 19.2K.

All parameters available can be modified in parallel using the main  
front panel display.

### Output Electrical Specifications:

**IS-8:** Single tank capacitor

**IS-16:** Dual, alternately fired tank capacitors

**IS-32:** Quad, alternately fired pairs of tank capacitors

Ignition Outputs are High-side firing referenced to the T pin  
on the output harness

**Note:** These outputs are not ground referenced unless the T lead is  
grounded. Recommend careful adherence to installation instructions.

**Maximum Output Current Pulse Rating:** 40 Amps

**Note:** Current pulse amplitude is dependent on the coils in use  
and the tank capacitor voltage.

**IT-230 Series coils:** 7 Amp pulse @ 230Volts

**IT-150 Series coils:** 35 Amps @ 150 Volts

**IT-250 series coils:** 20 Amps @ 250 Volts

### 4/20 mA Inputs:

**4/20mA A:** This input retards timing (if programmed) when  
schedule A is active.

**4/20mA B:** This input retards the timing (if programmed) when  
schedule B is active.

## How to Order

Part Number	Model and Description	Notes
72700256	IS-8,Ignition Module, 8 Outputs, Without Display	IntelliSpark Ignition Module
72700252	IS-8D,Ignition Module, 8 Outputs, With Display	
72700257	IS-16,Ignition Module, 16 Outputs, Without Display	
72700253	IS-16D,Ignition Module, 16 Outputs, With Display	
72700258	IS-32,Ignition Module, 32 Outputs, Without Display	
72700254	IS-32D,Ignition Module, 32 Outputs, With Display	
72700249	Display Module, PV450NV-03-CSA-IS	Remote Display Unit
78001106	Cable, Remote Power 50 ft., PVW-450-PWR-50 ft.	
78001107	Cable, Remote Communication 50 ft., PVW-450-RS485-50 ft.	
<b>NOTE:</b> Either choose an ignition module that comes with the display built into the enclosure or order loose display and cables for remote mount.		

Please contact your local Murphy Sales Representative for a complete IntelliSpark Ignition System and Murphy products from Enovation Controls.

A local distributor can be found at [www.fwmurphy.com/wheretobuy/us-sales-distributors](http://www.fwmurphy.com/wheretobuy/us-sales-distributors).



# 601 CD Ignition System

## Ignition Control

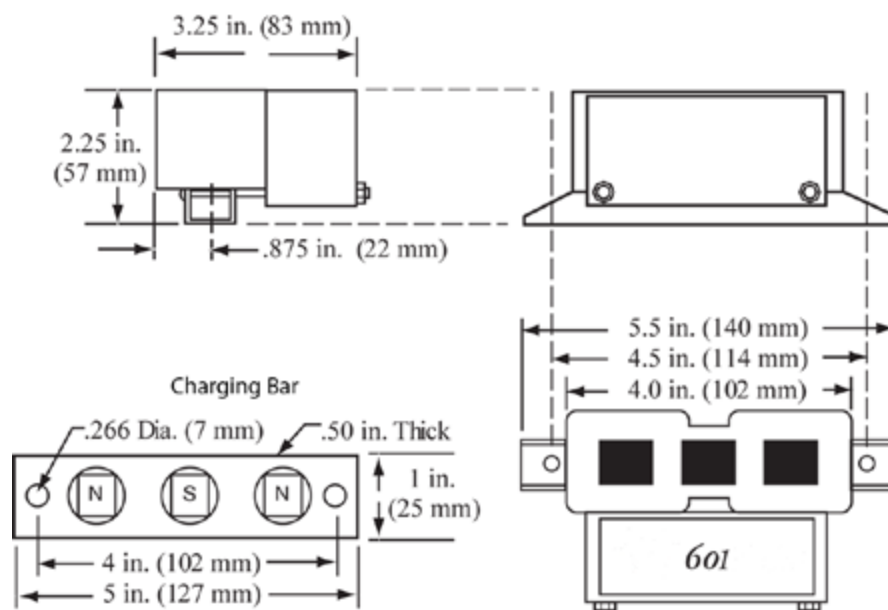
The 601 is a self-powered Capacitor Discharge (CD) Ignition System which can be installed on any large flywheel, spark-ignited engine. With electronics engine-mounted in close proximity to the flywheel, the unit is powered by magnetic charging circuitry.

### Features and Benefits

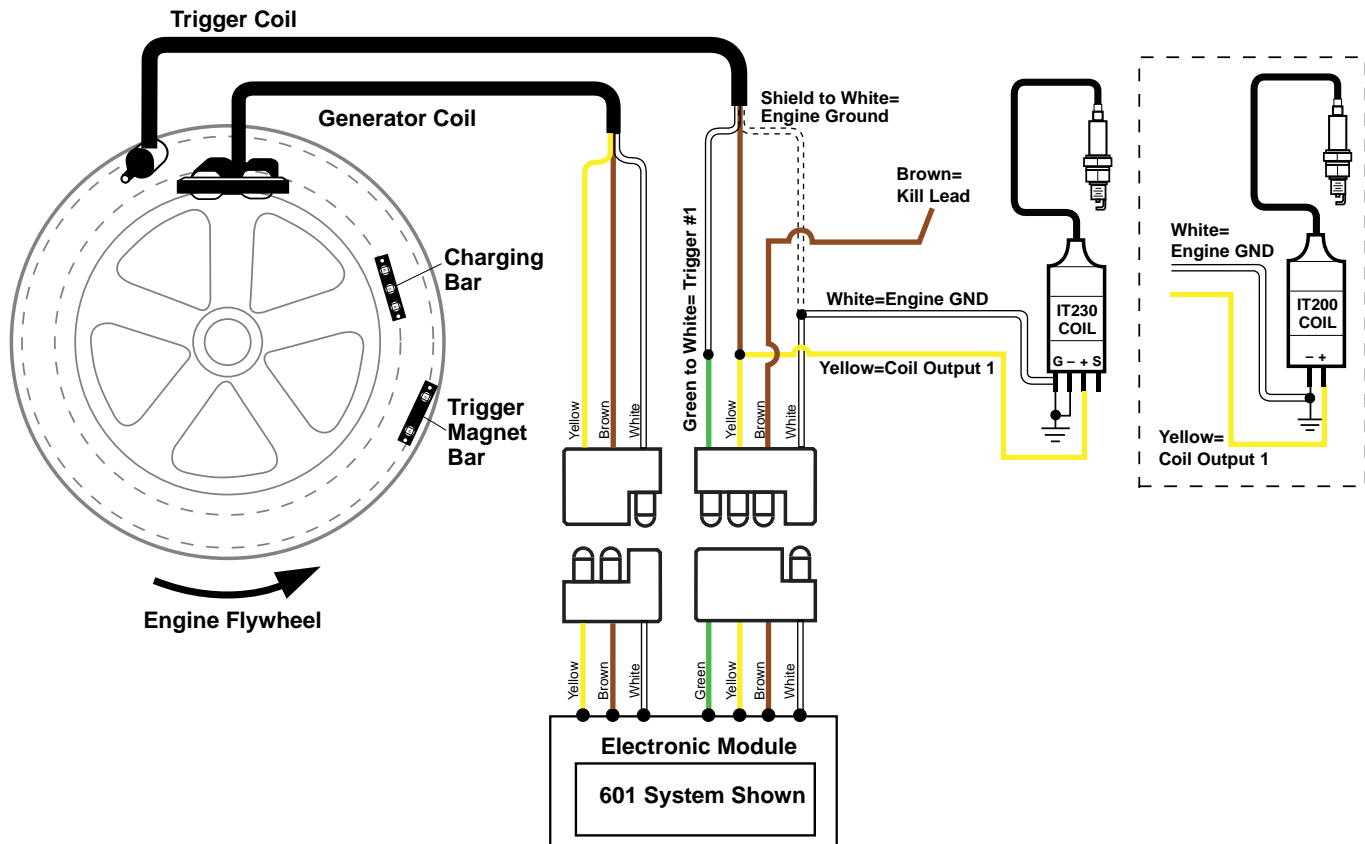
- Reliable capacitor discharge circuitry
- High-output, self-powered electromagnetic system
- 30,000 volt output at low rpm
- Crankshaft-referenced timing
- Dual trigger timing
- One-cylinder applications
- Control circuitry is sealed module
- Self-powered, no external power required
- Two-year warranty
- Inexpensive, proven design
- No moving parts to wear out
- More timing accuracy with flywheel mounting
- Compatible with most large flywheel spark-ignited engines
- Provides power for ignition-powered panels



### Dimensions



## Connection Diagram



### Installation Brief

1. A trigger magnet bar is fastened to the flywheel with the run magnet (deeper recessed) at the timing angle chosen for normal running.
2. A trigger coil is installed to sense the magnets and trigger ignition circuitry.
3. The ignition unit is installed on brackets in close proximity to the flywheel, at a 30 degrees more advanced than the position of the trigger magnet bar.

NOTE: Detailed instructions are provided with every unit.

### How to Order

To order, please contact your local Murphy Sales Representative for a complete 601 Series CD Ignition Control System for your specific engine type.

A local distributor can be found at [www.fwmurphy.com/wheretobuy/us-sales-distributors](http://www.fwmurphy.com/wheretobuy/us-sales-distributors).

# Detonation Sensing Interface System

## Model DSI - G3500 Series Caterpillar Engine

The Murphy Detonation Sensing Interface System utilizes a pair of highly sensitive accelerometers to detect detonation. In the event of detonation, the DSI signals the Murphy IntelliSpark™ System, via 4/20 mA control signal, which responds by immediately retarding the timing thus eliminating the potentially harmful effects of continuous detonation.

### Features

- Utilizes advanced piezoelectric accelerometer sensors to provide real-time analog signal
- Signal is proportional in amplitude to the levels of vibration detected
- Sensors respond over wide range of frequencies up to 10 K Hz
- Retards timing to reduce vibration intensity or eliminate it entirely
- Sensor range - 0 - 500 g's
- Detect any source of vibration

### Benefits

- Easy-to-use controller interface
- Detects detonation tendencies at low levels before they reach greater intensity and cause engine damage
- Flexible controls and useful information for operators
- Wide bandwidth allows detection of most mechanical vibration sources including detonation
- Complete installation kits, wiring guidelines and sensor kits provided

### Specifications

**Power Requirements:** 18-30 VDC 300mA max  
**Controller Operating Temp:** -40°F to 158°F (-40°C to 70°C)  
**Sensor Operating Temp:** -40°F to 248°F (-40°C to 120°C)  
**Sensor Frequency:** 20 - 500 Hz  
**Sensor Sensitivity:** 10mV/g 500g F. S.



## ***Control Inputs***

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The 1/REV signal must be provided. Two interfaces are available for customer convenience.

Option 1. MPI\_ISO\_1/REV-MPI\_ISO\_RTN: This input connects back to the IntelliSpark Isolated\_ 1/REV output pair.

Option 2. 1/REV\_In: This interface is designed to be used directly by a mag pick sensor. It can be wired in parallel to the MPI 1/REV mag pick up. It can also be connected in parallel to a Hall-Effect sensor if in use.

Control Output: Vanalog\_Out: This is a 1-5 volt open-circuit output level that when terminated externally by 250 ohm becomes a 4-20 mA current signal. Note: The Murphy IntelliSpark ignition system already has an internal 250 ohm resistor across this input.

Shutdown Output: This is an Open-Drain type interface.

Maximum current when activated: 1.0 amps.

Maximum externally applied voltage when de-activated: 100V.

## ***Panel Controls and Indicators***

---

Power On Switch. Applies 24 VDC to the electronics and sensors.

The knock sensor cable should never be removed or installed with power on.

Power On Indicator provides verification that power is applied.

Sensor 1(2) Low Level lights: These indicators will come on when the engine is running over 400 rpm and the sensor output is below minimum level. Its an indication that the sensor is not sensing vibration levels during normal running operations. This may be due to the sensor becoming loose or the cable is removed or the engine is running at idle or unloaded when very low levels of vibration are generated.

SHUTDOWN: This indicator will come on if the system detects three heavy detonation events present for three successive revolutions. The Shutdown output will activate and it can be tied into a panel or directly to a Murphy IntelliSpark Ignition system to kill ignition.

SHUTDOWN RESET: After a shutdown occurs this push-button clears the shutdown indicator and de-activates the shutdown output for subsequent start-up.

Internal indicators: Flashing amber led indicates firmware is operating normally

Applications: Any Caterpillar 3500 series engine.

## **How to Order**

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Please contact your local Murphy Sales Representative for a complete System and Murphy products from Enovation Controls.

A local distributor can be found at [www.fwmurphy.com/wheretobuy/us-sales-distributors](http://www.fwmurphy.com/wheretobuy/us-sales-distributors).

# Ignition Coils

## Ignition Control Systems

The ignition coil is one of the most critical components of any ignition system. When properly matched to the ignition controller's output, the ignition coil ensures optimum performance and reliability.

Murphy Smart Coils are patented and are used with IntelliSpark Control Technology to provide real-time diagnostics and prognostics. Also offered are coils for direct replacement of Altronic coils. All Murphy coils are manufactured with the highest quality of construction for long life durability.

A variety of coils are offered to meet specific application requirements as listed below.

IT-250FM  
72700240  
Smart Coil™  
Flange Mount Coil  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: 400-500 uS @ 10 kV



IT-250  
72700237  
Smart Coil™  
Open Coil, Non-Hazardous  
Duration: 400-500 uS @ 10 kV



IT-230FM  
72700231  
Smart Coil™  
Flange Mount Coil  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: 500-700 uS @ 10 kV



IT-230  
72700230  
Smart Coil™  
Open Coil, Non-Hazardous  
Duration: 500-700 uS @10 kV



ITX-230RM  
72700232  
Smart Coil™  
Remote Mount Coil  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: 500-700 uS @ 10 kV



ITX-150-6; -12  
6" Length 72700233  
12" Length 72700234  
Smart Coil™  
6 in. Integral Coil  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: 200-300 uS @ 10 kV



ITX-250-6; -12  
72700245  
Smart Coil™  
Integral Coils  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: 400-500 uS @10 kV



ITX-250RM  
72700246  
SmartCoil™  
Integral Coil  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: 400-500 uS @ 10 kV



## Murphy Ignition Coils Direct Replacement to Altronic Coils



ITX-200RM  
72700241  
Remote Mount Coil  
(direct replacement to \*Altronic 501061-S)  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: Standard



ITX-170-6; -10; -12  
6" length 72700242 (replaces \*Altronic 501011A)  
10" length 72700243 (replaces \*Altronic 501011B)  
12" length 72700244 (replaces \*Altronic 501011C)  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: Standard



IT-200FM  
72700238  
Flanged Coil  
(replaces \*Altronic 501018)  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: Standard



IT-200 Blue  
72700235  
Unshielded Epoxy Coil  
(replaces \*Altronic 501061)  
Duration: Standard



IT-200LFM  
72700239  
Flanged Coil  
(replaces \*Altronic 501012)  
CSA Approved - Cl. I, Gr. D, Div. 2  
Duration: Long



IT-200L Red  
72700236  
Unshielded Epoxy Coil  
(replaces \*Altronic 501010)  
Duration: Long

\*Altronic is registered trademark of Altronic Inc.

## How to Order

Part Number	Model	Notes
72700240	IT-250FM	Smart Coil
72700237	IT-250	
72700231	IT-230FM	
72700230	IT-230	
72700232	ITX-230RM	
72700233	ITX-150-6, 6 inch length	
72700234	ITX-150-12, 12 inch length	
72700245	ITX-250-12, 12 inch length	
72700246	ITX-250RM	Direct replacement of Altronic coil
72700241	ITX-200RM	
72700242	ITX-170-6, 6 inch length	
72700243	ITX-170-10, 10 inch length	
72700244	ITX-170-12, 12 inch length	
72700238	IT-200FM	
72700235	IT-200 Blue	
72700239	IT-200LFM	
72700236	IT-200L Red	



# Murphy Brushless Alternators

## Power Supply

Murphy Ignition Systems are optimized with power supplies utilizing Murphy high-quality brushless alternators. Designed for long-lasting durability with no moving electrical components these devices are ideal for all industrial applications and are certified for hazardous duty locations and field proven.

### Features

- No brushes, no brush springs
- One moving part, no moving electrical parts
- One-piece bearing housing, 4.5 or 9.5 inch brackets available
- Permanent bearing alignment
- Oversize lubrication reservoir
- Glass Filled TFE Fluorocarbon Seal (Teflon)
- Air-cooled 7.3" diameter advanced design

### Benefits

- Strong, compact reliable power
- Exceptional bearing life
- Simple inspection and maintenance procedures
- 24-VDC, rated to 80 amp, 5,000 rpm CSA approval rated to 60 amp, 3,600 rpm
- Bi-directional rotation

### Specifications

**Rated Amperes:** 80

**RPM @ Rated Amperes:** 5000

**Preset Volt Range:** 25.5-30

**Full Load Voltage @ 28.0 Preset:** 27.5

**Field Amperes:** 4.5 Typical

**Rotation:** Bi-Directional

**Shaft Diameter (Pulley):** 7/8 inch nominal

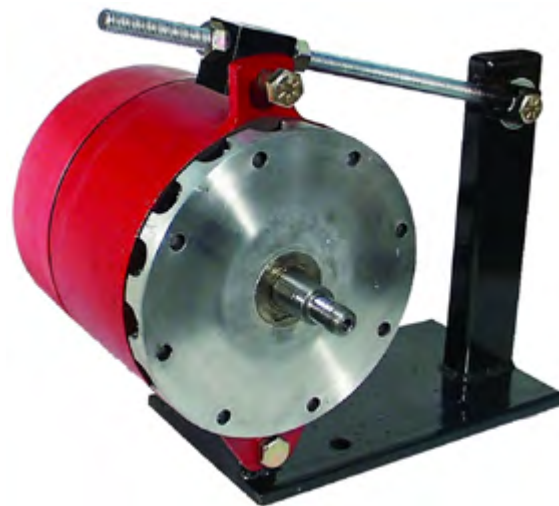
**Voltage Regulator:** Integral - Adjustable - Self Exciting

**Wiring Connections:** B+, B-, Ground

**Rectifier Diode Construction:** Individually Replaceable

**Rectifier, Rated Capacity:** 225 Amperes

\*CSA International Certification 60 Amperes @ 3600 RPM

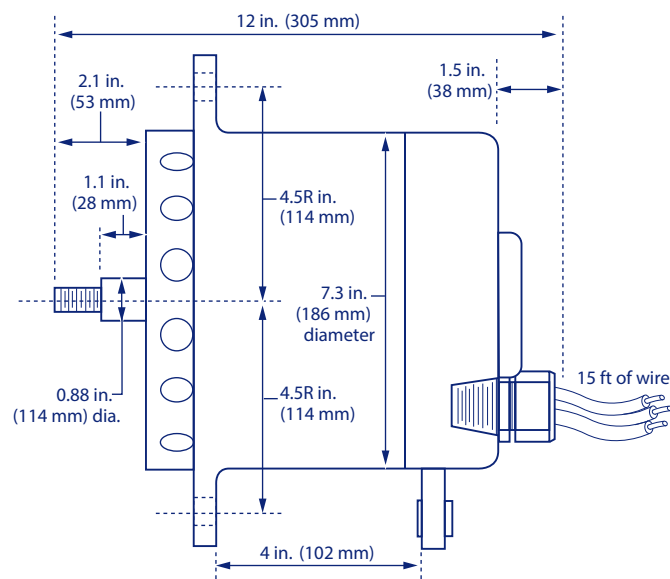


Shown with optional bracket

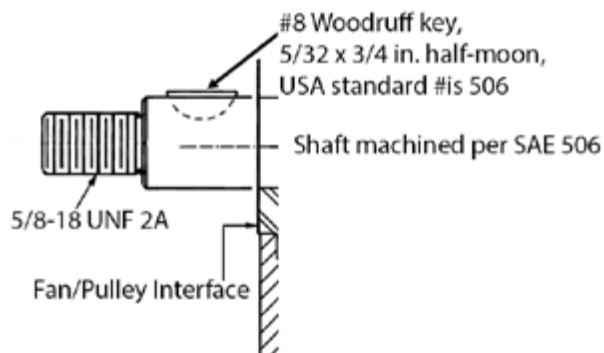


### Dimensions

#### 7.3 inch Diameter Model 102499-HZ24



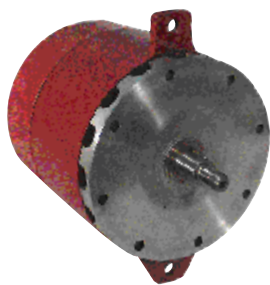
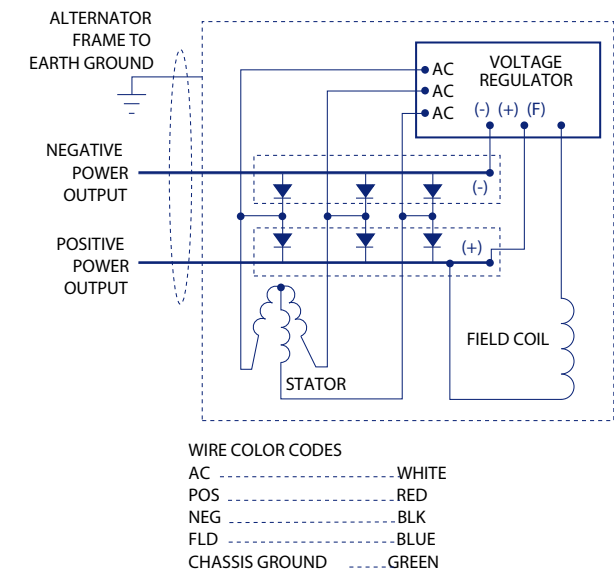
#### Alternator Shaft and Woodruff Key



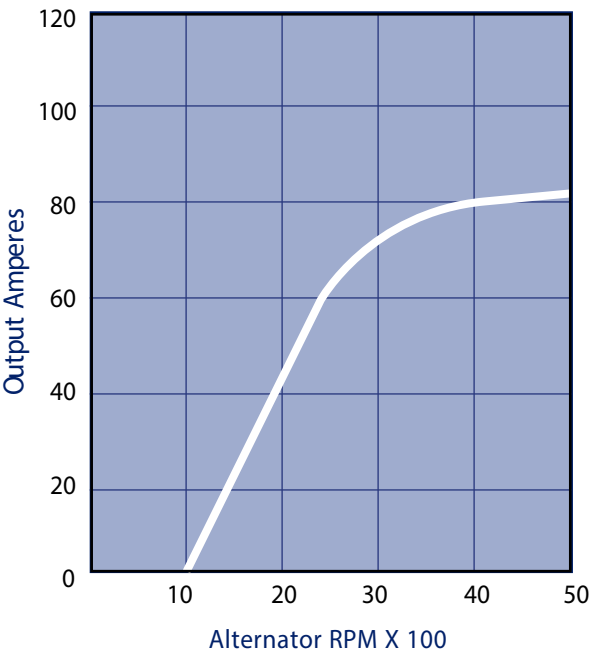
# Brushless Alternators

## Wiring Diagram

For 7.3 inch diameter, single ended, 80 amp alternator to self-excited voltage regulator, all voltages.  
For use in Class I, Div. 2, Hazardous Areas.



## Output Amperes at RPM Ranges



## How to Order

Part Number	Model and Description	Notes
72700161	102499-HZ24, 7.3 inch diameter, air-cooled, belt or direct driven	24 Volt
72700092	Alternator bracket, 4 1/2 in. universal mounting	
72700093	Alternator bracket, 9 1/2 in. universal mounting	

# AFR-1R

## Rich-Burn Air/Fuel Ratio Control System

The AFR-1R is the simplest to use rich-burn engine, single set point air/fuel ratio control system available. The system is designed to maximize the efficiency of a 3-way catalyst by maintaining the proper air/fuel ratio.

Maintaining the correct air/fuel ratio to enhance the performance of your catalytic converter shouldn't be that hard, and it's not if you choose the right equipment.

The Murphy AFR-1R features a single pre-catalyst set point target to optimize the catalysts performance. And when activating the optional post-catalyst set point target, the AFR-1R monitors the catalyst performance and adjusts the air/fuel ratio to maintain and prolong the catalyst performance.

The system includes the Murphy PV450 full-color graphical user interface for control functions, monitoring, programming and diagnostic displays. The eight-button display includes comprehensive built-in help files for added operator convenience.

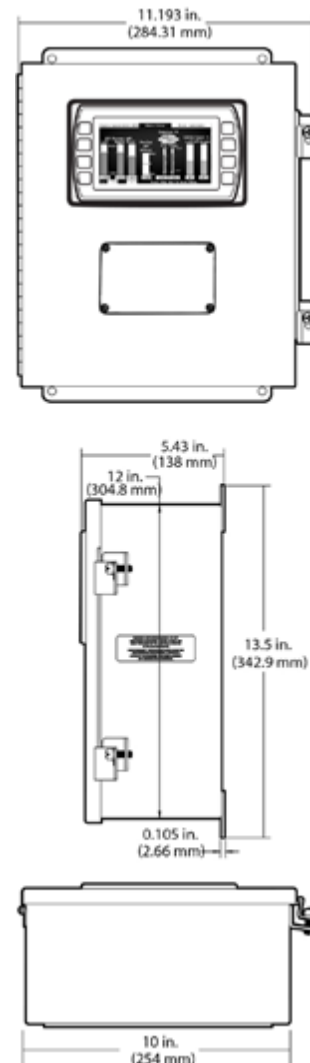
The Enovation Controls AFR-1R air/fuel ratio controller represents cutting-edge technology in many areas: hardware, microprocessor power, control system software, operator interface options, adaptability to variable engine conditions and control requirements, software upgrade capability, in addition to comprehensive on-board diagnostics system (OBD).

### Technical Features

- Designed for low horsepower gas fueled, carbureted rich-burn industrial engines.
- Microprocessor-based controller with a single set point.
- Set point and operation done entirely through the full-color graphic display, enclosure or remote mounted.
- Post catalyst, oxygen sensor input for real-time adaptation to changing catalyst performance (post catalyst sensor is optional).
- Pre and post catalyst thermocouple input for catalyst over temperature protection (ungrounded Type K thermocouples, optional).
- Pre and post catalyst differential temperature displayed.
- Separate alarm and shut-down dry-contact relays for flexibility in setup and operation.
- High-speed full-authority butterfly fuel control valves for quick response time. (available)
- Proportional solenoid fuel control valves for auxiliary fuel control (available)



### Dimensions



Technical Features (continued)

- Heated exhaust gas oxygen sensors for optimum AFR control.
- NEMA 12 enclosure, 10 in. W x 13 in. H x 5 in. D.
- 24 VDC standard with optional 12 VDC configuration.
- CD ignition input for engine speed reference with optional magnetic pickup input.
- Upgradeable to command multi-set point targets and accept additional end devices.

How To Order

Options listed below applies to all Air/Fuel Controllers. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

AFR Model Number Strategy

AFR-PD-R-1R-20-FA50-LC									
HARDWARE		Application			End Devices				
AFR-PD-R		1	R	2	0	FA50	LC		
1	Model	2	3	4	5	6	7		
		# of Target Setpoints	Control Type	# of Banks	Post Cat Sensor	Type of Valve	Kit Type		
AFR-ND-R	AFR, No Display, HEGO Controller	1 Qty. 1	R RICH BURN	1 Single	0 None	TK2	Blank	Standard Kit w/Enclosure	
AFR-WD-R	AFR, With Display, HEGO Cotroller	9 Qty. 9		2 Dual	1 Yes	TK4B	LC	"Less Case", No Enclosure	
AFR-ND-L	AFR, No Display, Wideband Controller	64 Qty. 64		- OR IF LEAN BURN -		TK6B		for Panel Mount	
AFR-WD-L	AFR, With Display, Widband Controller		L LEAN BURN	1 1 Fuel Ctrl Valve	1 1 UEGO Sensor	TK10			
AFR-PD-R	AFR, With Powerview Display, HEGO Cotroller			2 2 Fuel Ctrl Valve	2 2 UEGO Sensor	TK11B			
AFR-PD-L	AFR, With Powerview Display, Widband Controller					FA25 (uses FL-25)			
						FA50 (uses FL-50)			

# AFR-9R

## Rich-Burn Air/Fuel Ratio Control System

The AFR-9R is the right choice when searching for the simplest to use load following air/fuel ratio control system. The system is designed to maximize the efficiency of a three-way catalyst by maintaining the proper air/fuel ratio over varying engine loads, speeds, fuel quality, ambient temperatures and barometric pressure. This is done without operator intervention after the initial program setup.

The AFR-9R features nine set point targets based on a combination of three RPM settings and three manifold pressure settings and includes three valve default position settings. As your engine's load and/or speed change, the AFR-9R anticipates (feed-forward control) and corrects the air/fuel ratio to optimize catalyst performance.

The system includes the Murphy PV-450 full-color graphical user interface for control functions, monitoring, programming and diagnostic displays. The eight-button display includes comprehensive built-in help files for added operator convenience.

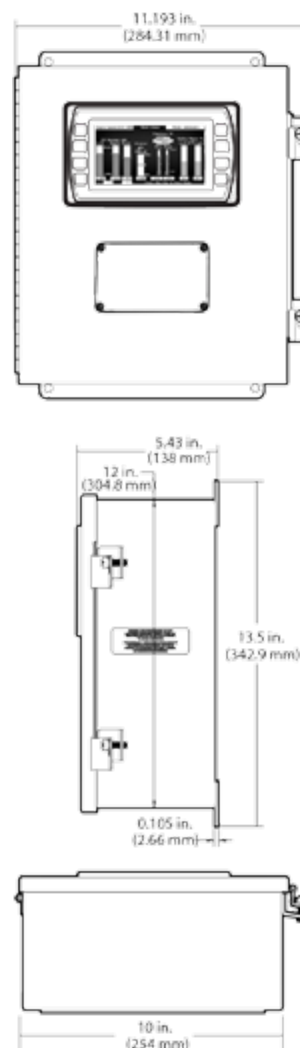
The Murphy AFR-9R air/fuel ratio controller represents cutting-edge technology in many areas: hardware, microprocessor power, control system software, operator interface options, adaptability to variable engine conditions and control requirements, software upgrade capability, in addition to comprehensive on-board diagnostics system (OBD).

### Technical Features

- Set point and operation done entirely through the full-color graphic display, enclosure or remote mounted
- Designed for wide range of horsepower, gas fueled, carbureted rich-burn industrial engines
- Microprocessor-based controller with nine air/fuel set points
- Available with either the non-intrusive fuel enrichment strategy or the in-line fuel authority control strategy
- High-speed full-authority butterfly fuel control valves for quick response time. (available)
- Proportional solenoid fuel control valves for auxiliary fuel control (available)
- Map sensor to measure variances in manifold air pressure



### Dimensions



## Technical Features (continued)

- Post catalyst, oxygen sensor input for real-time adaptation to changing catalyst performance (post catalyst sensor is optional)
- Pre and Post catalyst differential temperature displayed when using an (optional) ungrounded Type K thermocouple
- Separate alarm and shut-down dry-contact relays for flexibility in setup and operation
- Heated exhaust gas oxygen sensors for optimum Air/ Fuel Ratio control
- 12 / 24 VDC
- Magnetic pickup or CD ignition input for engine speed operating reference
- Upgradeable to accept additional end devices

## How To Order

Options listed below applies to all Air/Fuel Controllers. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

AFR-PD-R-9R-20-FA50-LC							
HARDWARE		Application		End Devices			
AFR-PD-R		9	R	2	0	FA50	LC
1	Model	2	3	4	5	6	7
		# of Target Setpoints	Control Type	# of Banks	Post Cat Sensor	Type of Valve	Kit Type
AFR-ND-R	AFR, No Display, HEGO Controller	1 Qty. 1	R RICH BURN	1 Single	0 None	TK2	Blank Standard Kit w/Enclosure
AFR-WD-R	AFR, With Display, HEGO Controller	9 Qty. 9		2 Dual	1 Yes	TK4B	LC "Less Case", No Enclosure, for Panel Mount
AFR-ND-L	AFR, No Display, Wideband Controller	64 Qty. 64		- OR IF LEAN BURN -		TK6B	
AFR-WD-L	AFR, With Display, Wideband Controller		L LEAN BURN	1 1 Fuel Ctrl Valve	1 1 UEGO Sensor	TK10	
AFR-PD-R	AFR, With Powerview Display, HEGO Controller			2 2 Fuel Ctrl Valve	2 2 UEGO Sensor	TK11B	
AFR-PD-L	AFR, With Powerview Display, Wideband Controller					FA25 (uses FL-25) FA50 (uses FL-50)	



# AFR-64R

## Rich Burn Air/Fuel Ratio Control System

A lot of control in a single package: The AFR-64R air/fuel ratio controller monitors ambient changes, reacts with precision and diagnoses potential problems before they become costly.

**Emissions Compliance:** The AFR-64R precisely tracks the air/fuel mix to maintain targeted emissions levels – regardless of variance in load, ambient air temperature or fuel composition.

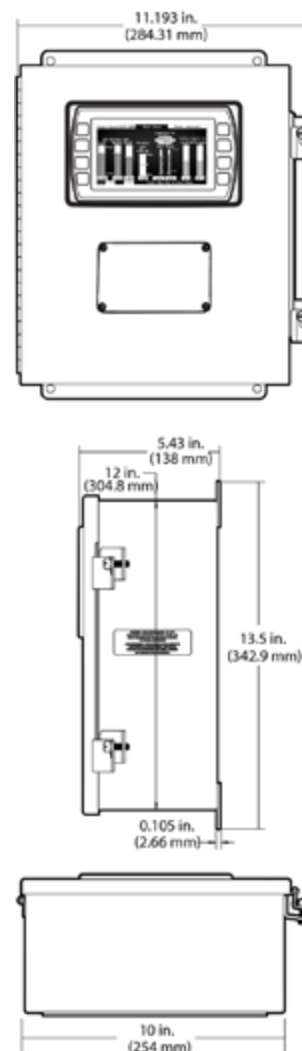
**Flexibility:** The AFR-64R controller stores up to 64 load-specific air/fuel set points and automatically tracks engine load changes based on engine RPM and manifold air pressure.

**Cost Savings:** Pinpoint performance problems as soon as they occur—misfires, engine valve issues and more – to cut the costs of maintenance, downtime, labor and replacement parts.

Whether you need better emissions compliance, engine prognosis/diagnosis and trouble-free equipment life, the AFR-64R helps maximize the efficiency of the engine and its three-way catalytic converter.



### Dimensions



### Technical Features

- Fast, easy, low-cost installation
- Fits virtually any gas-fueled, carbureted, rich-burn industrial engine – with (or without) a catalytic converter
- Windows®-based platform compatible with most computers
- Software can be installed on laptop, PC or network
- Comprehensive 38-fault diagnostics, including continuous oxygen sensor health monitoring
- Data plotting for easy, accurate troubleshooting
- Separate alarm and shut-down dry contact relays
- Pre-catalyst closed loop, exhaust oxygen feedback control
- Post-catalyst exhaust oxygen feedback; cascade control for fast, real-time adaptation to changing catalyst performance
- Variable set-point for pre-catalyst and post-catalyst exhaust oxygen control – for real-time response to varying engine loads
- Up to 64 load-specific air/fuel set points to map your engine
- Catalyst temperature monitoring for catalyst over temperature protection
- Drives up to two control banks for operation on V type engine configurations
- High-speed full-authority butterfly fuel control valves for quick response time.

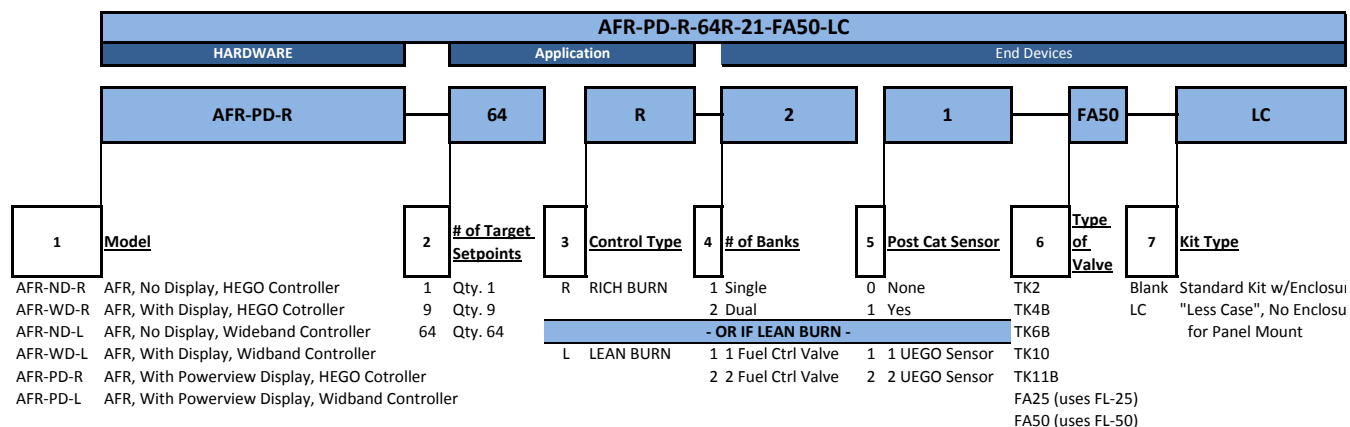
## Technical Features - continued

- Multiple valve control options:
  - Full Authority Valve controls all engine fuel via system- controlled butterfly valve
  - Trim Fuel Valve adds supplemental fuel to the air intake via system-controlled proportional fuel valve
- Full-color Graphic Display - optional, enclosure or remote mounted
- RS-485/MODBUS communications support for high-speed

## How To Order

Options listed below applies to all Air/Fuel Controllers. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### AFR Model Number Strategy



# AFR-64L

## Lean-Burn Air/Fuel Ratio Control System

The AFR-64L air/fuel ratio controller provides state-of-the-art engine control in one simple, easy-to-use product.

**Automatic Operation:** No operator intervention needed – the AFR-64L controller automatically tracks multiple factors, including engine load, tailpipe emissions and more, then precisely adjusts the air/fuel mix to maximize fuel efficiency, minimize engine emissions, improve engine performance and reduce maintenance costs.

**Emissions Compliance:** The AFR-64L controller optimizes the lean-burn air/fuel mix to maintain targeted emissions levels over varying engine loads, speeds, fuel quality and ambient conditions.

**Cost Savings:** Pinpoint performance problems and avoid detonation. The AFR-64L controller's advanced troubleshooting and diagnostics cover 76 critical operating parameters, allowing the operator to cut the costs of maintenance, labor, downtime and replacement parts.

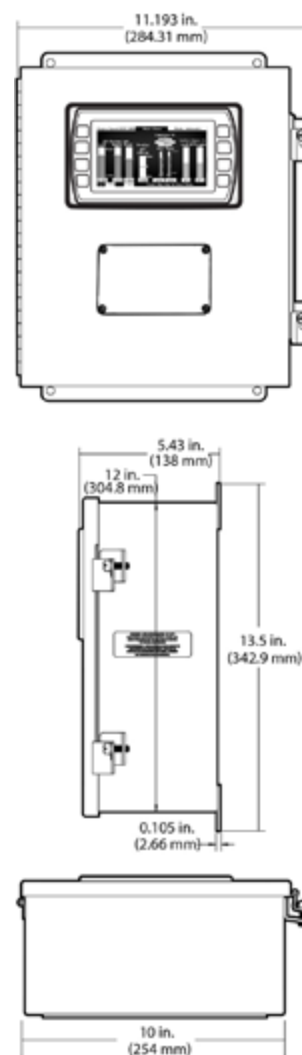
Take control over your engine needs – engine diagnostics, emissions control, fully automatic operation – the AFR-64L does it all for you.

### Technical Features

- Fast, easy, low-cost installation
- Fits virtually any lean-burn, spark-ignited, carbureted natural-gas industrial engine
- Windows-based platform compatible with most computers
- Software, upgrades and documentation available on disk or online
- High-speed full-authority butterfly fuel control valves for quick response time
- Comprehensive 76 fault diagnostics
- Data plotting for easy, accurate troubleshooting
- Separate alarm and shut-down dry contact relays
- Closed loop, exhaust oxygen feedback control
- Variable set point for exhaust oxygen control delivers real-time response to varying engine loads and transients – perfect for generator-sets and other high-variance applications
- Catalyst temperature monitoring to protect the catalyst from engine fueling malfunctions



### Dimensions



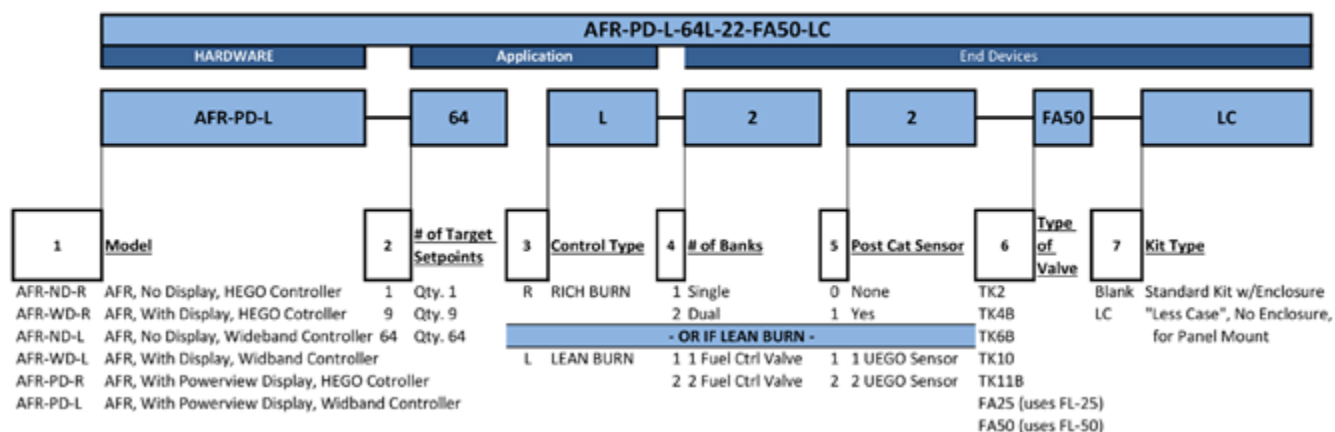
## Technical Features - continued

- Open loop/feed forward control combined with closed loop exhaust gas oxygen sensor feedback and a super fast-acting fuel control valve
- Allows for rapid response to engine load changes
- Vital for generator sets and other applications with severe engine load variations
- Helps maintain compliance even in the event of an oxygen sensor failure
- Drives up to two control banks for operation on V type engine configurations
- Fast-acting Full-Authority Fuel Control Valve controls all fuel delivered to the engine
- Full-color Graphic Display - optional, enclosure or remote mounted
- RS-485/MODBUS communications support for high-speed data transmission

## How To Order

Options listed below applies to all Air/Fuel Controllers. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### AFR Model Number Strategy



# EICS®

## Engine Integrated Control System

Optimizing your engine's performance and maintaining emission compliance is easier than ever with the Murphy Engine Integrated Control System (EICS). It is a complete integration package pre-calibrated specifically for your engine model.

EICS combines key components - ignition system (powered by Murphy's IntelliSpark™ Ignition technology), air/fuel control, speed governing, interface and diagnostics, sensors, harnesses, catalyst and engine control unit (ECU) - in one package, saving you money and man-hours associated with the installation and setup of separate engine components.

The EICS has been pre-configured for your convenience, ensuring your engine will run at optimum performance without the need for manual field adjustments. Its D-EPR valve accommodates wide variations in fuel composition and speed/load ranges, maintaining efficiency with load following technology for even the toughest gas lift applications.

In addition, the EICS eliminates the need for pretest site visits by maintaining emissions - saving you time and money. With EICS you can be certain your site will pass required testing, like Quad J testing, without the need for pretesting to get dialed in.

### Features

- An OEM approach to an after-market application
- Two packages available: performance/efficiency package, optional emissions package (includes catalyst)
- One unit, three integrated functions - CD Ignition, air/fuel control and electronic governing speed control
- Pre-calibrated and dyno tested for specific engine models
- Advanced electronic air-fuel ratio control
- Lightning fast response to engine speed/load variations and fuel quality changes
- Murphy's IntelliSpark™ Ignition Coils for expanded engine diagnostics and dynamic spark adjustment
- Graphical color user interface
- Data sharing via MODBUS RS485
- Data logging



### Benefits

- Integrated system = simplified installation compared to separate components
- The integrated approach makes more advanced diagnostics possible
- No more setup of generic boxes - EICS is engine specific
- No more dialing in - it's pre-calibrated
- Optimization of your engine's performance
- Maintains emissions compliance between testing - no tweaking necessary
- Eliminates magneto failures and premature spark plug changes
- Reduces engine failure diagnostic time
- Reduces costs associated with the engine's operation



## How To Order

### Step 1 - Pick the EICS System based on your engine model

#### An EICS System is Available for Engine Models

Arrow VRG330 and VRG330CF

Caterpillar G3300 Series

Caterpillar G3406

Cummins G5.9

Cummins G8.3

Cummins Engine KTA19GC

Kits are available with magneto conversion for older engines.

Kits are also available with shielded ignition components.

### Step 2 - Determine display variant

Every EICS Engine Kit Requires One Display - Choose One Variant Below

P/N 48700017 - In Panel Mount Display Kit, Display + EICS Pigtail + RS485 Pigtail

P/N 48700021 - Remote Mount Display Panel with Switches, in Enclosure

### Step 3 - Add optional hardware if desired

Add Optional Emissions Package:

Emissions kits are available for each engine. To order, contact your Murphy sales representative.

To Add Optional Suction/Discharge Pressure Based Speed Control:

Order the key below and add a standard Murphy PXT 4-20ma Pressure Sensor to complete

P/N 48700031 - Suction Control/Discharge Control Software Key (requires Murphy PXT sensor)

### Step 4 - Generator controls

The EICS works with generator controls. To check compatibility contact your Murphy sales representative.

Contact your Murphy sales representative:

- To purchase products and systems
- To view a full list of supported engine models
- To let us know which engine models you would like to see mapped next

Contact your Murphy sales representative at [www.fwmurphy.com/EICS-engines](http://www.fwmurphy.com/EICS-engines).

## Diagram of System Overview





# Pull/Push DC Solenoids for Diesel Engines

## RP Series

The Murphy Push/Pull DC Solenoids provide single unit versatility for engine applications, such as shutdown. One solenoid offers pull/push operation. The RP Series has no internal switches, reduces coil burnout and reduces adjustments while boosting reliability. The solenoid offers high force in its small size. It can be used with most engines' start systems.

A choice of two models and two voltages is available. All models come complete with return spring and rubber seal boot.

An SD85 Solenoid Drive Time Delay is also available to greatly reduce possibility of coil burnout and to facilitate low current-piloted operation.



### Basic Models

**Models RP2307B and RP2308B** give a full 1 in. (25 mm) stroke at 11 pounds (49 N) and hold up to 27 pounds (120 N) at full voltage, continuous duty. They will operate at any stroke less than maximum; see chart below.

**Models RP2309B and RP2310B** can pull 17 pounds (75 N) with a 1-1/2 in. (38 mm) stroke. They hold up to 35 pounds (155 N) at full voltage, continuous duty. See chart below for holding force at any stroke less than maximum.

### SD85 Solenoid Drive Time Delay

The SD85 is used when the solenoid is duty cycled for short time periods such as two-position throttle operation. It also provides enhanced operational control for normal on-off applications. Using the SD85 ensures the energize coil is only powered for one to two seconds with each operation. If the plunger does not seat in that time, it is highly unlikely it will seat. The SD85 activates both coils of the solenoid for a short time then de-energizes the Energize coil. The Hold-in coil is energized as long as the signal to the SD85 is active. This ensures long life of the RP solenoid.

Input voltage: 8 to 30 VDC. See chart below for current ratings.

### Watts Power/Cold Force in Pounds at 100% Voltage/Inches Stroke

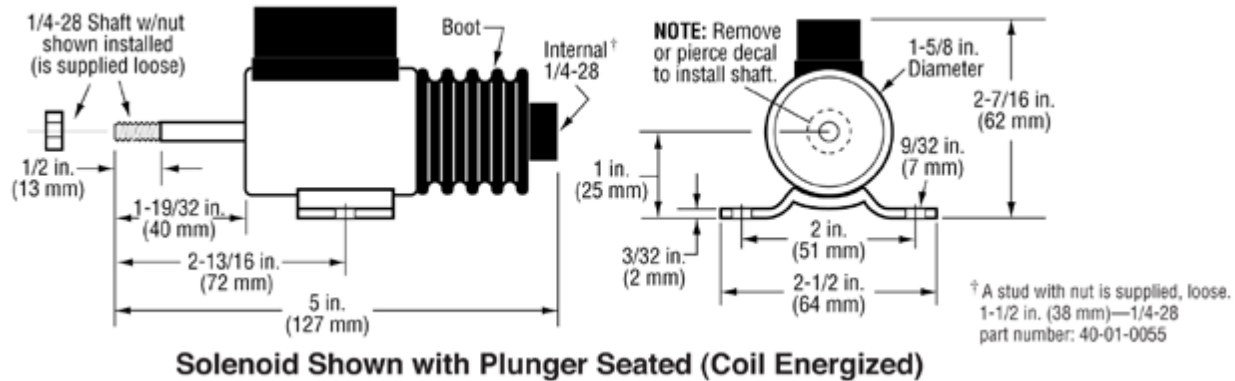
Solenoid Model Number	Max Stroke In. (mm)	Power in Watts		Force* in Pounds [Kilograms] at 100% Voltage† Stroke in Inches (Millimeters)							
		Hold Coil	Energize Coil	Hold Continuous	1/8 (3)	1/4 (6)	1/2 (13)	3/4 (19)	1 (25)	1-1/4 (32)	1-1/2 (38)
RP2307B	1 (25)	18	624	25 [11.34] <13> [5.90]	22 [9.98] <12> [5.44]	21 [9.53] <11> [4.99]	17 [7.71] <10> [4.54]	14 [6.35] <8> [3.63]	10 [4.54] <6> [2.72]	—	—
RP2308B	1 (25)	12	696	27 [12.25] <15> [6.80]	25 [11.34] <14> [6.35]	23 [10.43] <13> [5.90]	19 [8.62] <12> [5.44]	15 [6.80] <9> [4.08]	11 [4.99] <7> [3.18]	—	—
RP2309B	1-1/2 (38)	18	1029	32 [14.52] <19> [8.62]	30 [13.61] <18> [8.16]	27 [12.25] <16> [7.26]	22 [9.98] <14> [6.35]	18 [8.16] <11> [4.99]	13 [5.90] <9> [4.08]	8 [3.63] <6> [2.72]	6 [2.72] <4> [1.81]
RP2310B	1-1/2 (38)	12	960	35 [15.88] <20> [9.07]	34 [15.42] <19> [8.62]	31 [14.06] <17> [7.71]	26 [11.79] <15> [6.80]	22 [9.98] <12> [5.44]	17 [7.71] <9> [4.08]	12 [5.44] <7> [3.18]	7 [3.18] <4> [1.81]

\* Forces shown are without return spring. Forces shown < > are with return spring. Forces shown in [ ] are in kilograms.

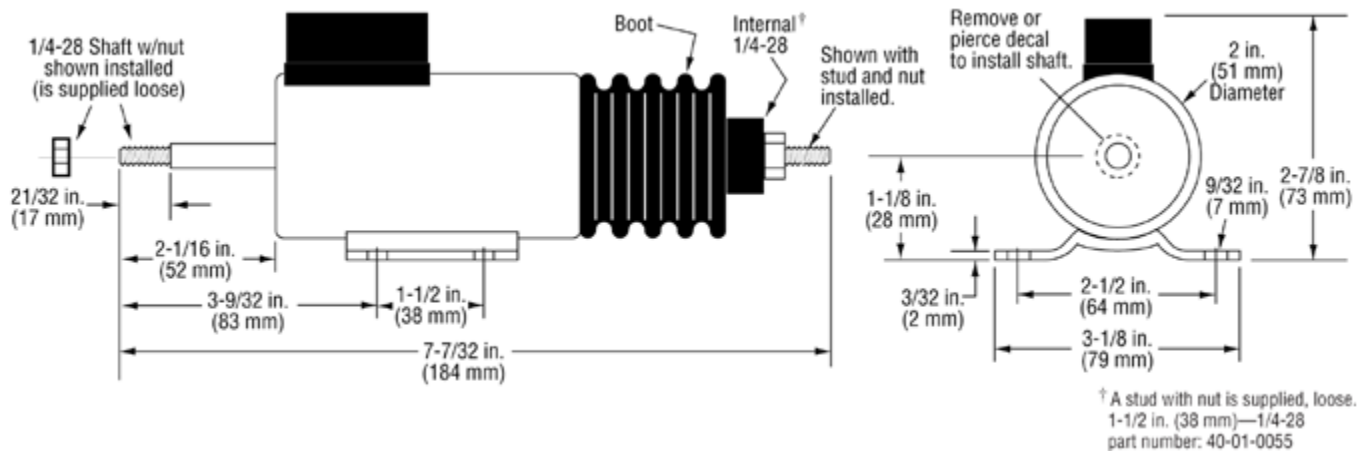
† To determine the operating current, divide the power (watts) indicated in the above table by the applied voltage. Solenoids will operate at any stroke less than maximum.

## Dimensions

### RP2307B & RP2308B



### RP2309B & RP2310B



#### NOTES:

1. Typical operating temperature for single 15 second operation of the energize coil is less than:  
 140° F (60° C) ± 10° F (6° C) for 1 in. (25 mm) Stroke Solenoids (70° F/21° C rise above ambient)  
 120° F (49° C) ± 10° F (6° C) 1-1/2 in. (38 mm) Stroke Solenoids (50° F/10° C rise above ambient)

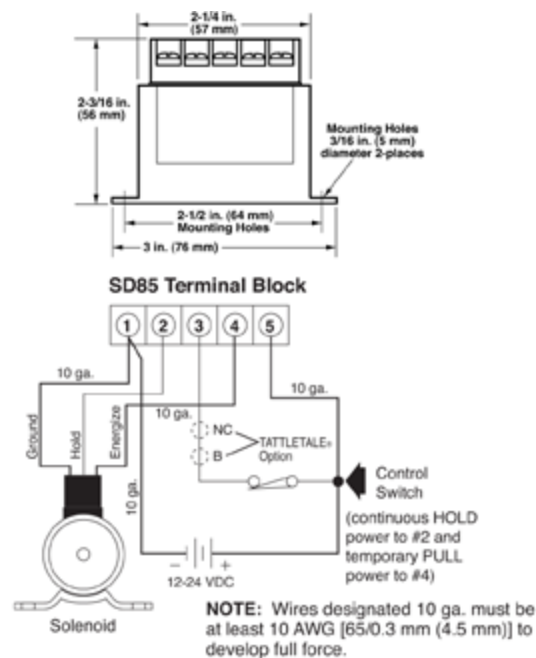
See **CAUTION** statement in Operations section on previous page and note maximum housing temperature is **185° F (85° C)**.

2. The energize coil should not be activated for more than 15 seconds. Longer energize coil activation times will damage the solenoid.

3. Allow minimum 15 minutes for cooling between activations of energize coil to avoid damaging the solenoid. (Depends on length of time energize coil is energized.) Contact Enovation Controls for high cycle rate applications.

4. The energize coil must fully seat the plunger to allow the hold-coil to function properly.

#### SD85



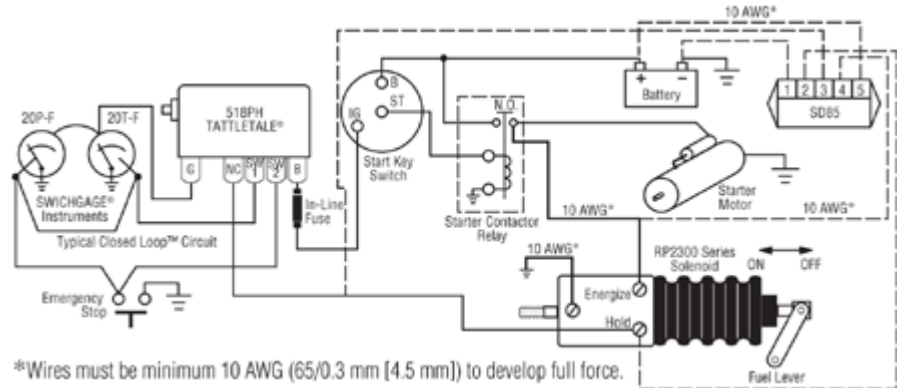
## Typical Wiring Diagrams

**NOTE:** In either application if the starter hangs on starters with integral solenoids, the energize coil remains energized.

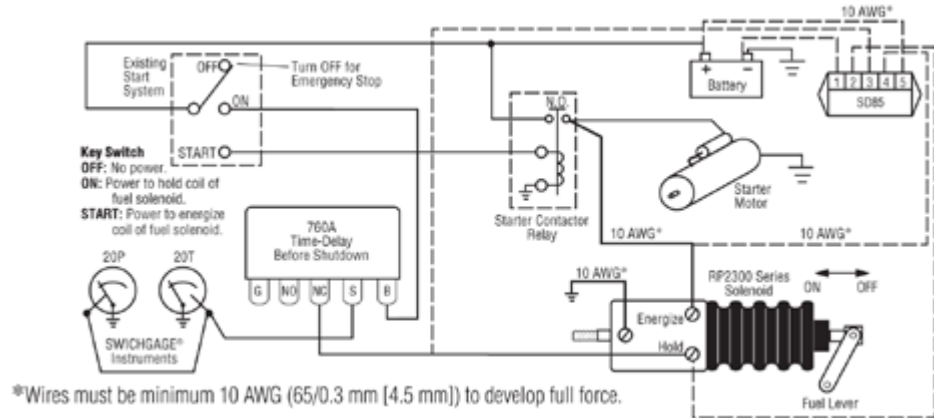


**CAUTION:** On certain starter solenoids/contactor relays, current can feed back through the energize terminal from the hold coil and provide a parallel path to ground through the device connected to the energize terminal.

### Typical time-delayed shutdown using a 518PH magnetic switch (SD85 is optional)



### Typical time-delayed shutdown using a 760A magnetic switch (SD85 is optional)



## Mechanical Installation

1. Bolt the solenoid securely to the mounting bracket.
2. Connect linkage and check for binding. Plunger should move freely throughout the complete stroke and be allowed to bottom at the internal stop of the solenoid.

**DO NOT MOUNT WITH BOOT DOWN. DO NOT APPLY ANY GREASE OR LUBRICATION TO PARTS.**

**IMPORTANT:** If the plunger does not seat, it will release prematurely when shifted to the holding mode of operation. Re-adjust linkage to lengthen the plunger stroke. Adjust the yoke in increments of 1/2 turn until plunger will remain in hold position.

## Electrical Installation

1. Refer to the diagrams above for typical electric wiring.
2. Use minimum 10 AWG [65/0.3 mm (4.5 mm)] wire size, as noted in the wiring diagrams. A smaller wire will reduce the current available and thus the pulling force. Wire length must be kept to a minimum.

## Operation

The solenoid coil is connected to the existing engine starter system or an equivalent circuit. A SD85 is recommended. At starting, both the Energize and Hold-in coils are energized. In the run mode, the Hold-in coil is continuously energized while the Energize coil has to be disconnected, reducing the heating effect and power consumption and avoiding damage to the device.

**NOTE:** Coils that burn out due to improper electrical hookup, misadjustment or improper operation are not covered by Murphy factory warranty.



**CAUTION:** The solenoid housing is hot to the touch. A temperature rise to 185° F (85° C) is permissible.

**NOTE:** A cool down period of 15 minutes minimum should be allowed between energized pull in cycles.

\* Always provide proper circuit protection with fuses or circuit breakers.

## How to Order

Part Number	Model and Description	Notes
40700092	RP2307B — 12VDC, 1 in. (25 mm) stroke, 10 lbf (44 N) pull, 25 lbf (111 N) hold	DC Solenoids
40700093	RP2308B — 24VDC, 1 in. (25 mm) stroke, 11 lbf (49 N) pull, 27 lbf (120 N) hold	
40700094	RP2309B — 12VDC, 1-1/2 in. (38 mm) stroke, 13 lbf (58 N) pull, 32 lbf (151 N) hold	
40700095	RP2310B — 24VDC, 1-1/2 in. (38 mm) stroke, 17 lbf (75 N) pull, 35 lbf (155 N) hold	
40700067	SD85 Solenoid Drive Time Delay	
65010108	Clevis yoke assembly	
65010110	Clevis yoke chain assembly	
40050315	Threaded rod (1-1/2 in.)	
00002457	RPS in-line ball joint	
00002458	RPS 90° ball joint	

### Shipping Weights:

RP2307B: 24oz. (0.7 kg)  
 RP2308B: 24 oz. (0.7 kg)  
 RP2309B: 48 oz. (1.4 kg)  
 RP2310B: 48 oz. (1.4 kg)  
 SD85: 6.4 oz. (0.2 kg)

Clevis yoke: 1 oz. (.03 kg)  
 Clevis yoke chain assembly: 2 oz. (.04kg)  
 Threaded rod (1-1/2 in.): .05 oz. (.001 kg)  
 RPS in-line ball joint: .05 oz. (.001 kg)  
 RPS 90° ball joint: 1 oz. (.03 kg)

# Rack Puller for Diesel Engines

## Model RP75

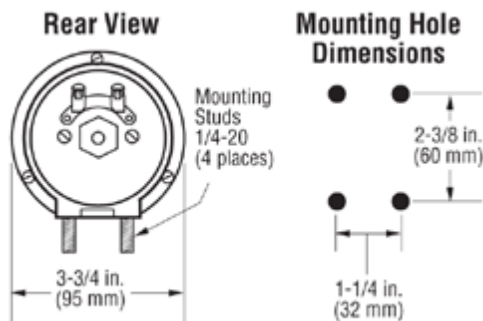
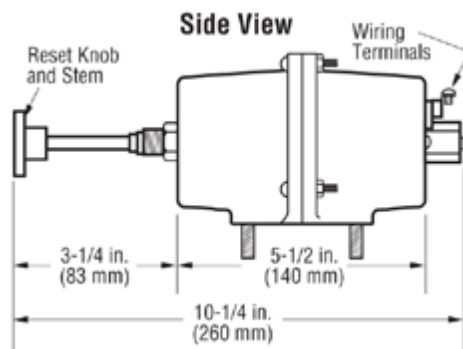
The RP75 Rack Puller is a semiautomatic device that provides a pulling force to initiate shut down of diesel engines and equipment.

The RP75 connects to the injection pump or air intake shut-off lever via a cable (chain optional). A coil spring, within the RP75, is reset manually and is held in place by an electromagnet. When the Switchgauge® detects a malfunction, the electromagnetic circuit is interrupted through a magnetic switch — releasing the coil spring thus pulling the cable/chain to actuate shutdown. When fully compressed, the spring exerts a pull of 30 lbf (133 N).

The RP75 is available for 12- or 24-VDC applications and is compatible with all Switchgauge instruments.



### Dimensions



### Specifications

**Operating Force:** 30 lbf (133 N) maximum, 10 lbf (44 N) minimum

**Coil Voltage:** Specify 12- or 24-VDC

**Coil Resistance:** RP75-12: 32.2 ohms; RP75-24: 129.8 ohms

**Length of Travel:** 1-7/8 in. (48 mm)

#### Control Linkage

- Cable: 4ft. (1.22 m); Optional 8 ft. (2.43 m) or 12 ft. (3.65 m) available.
- Chain (optional): 30 in. (762 mm)

**Shipping Weight:** 5 lbs 3 oz. (2.4 kg)

**Shipping Dimensions:** 9-1/4 x 8-1/4 x 5-1/4 in. (235 x 210 x 133 mm)



## Installation



**WARNING** Before beginning installation of this Murphy product:

- Disconnect ALL electrical power to the machine.
- Make sure the machine CANNOT operate during installation.
- Follow all safety warnings of the machine manufacturer.
- Read and follow all installation instructions.

### Mounting

1. Mount the RP75 using the 40-05-0161 mounting bracket or similar (see Figure 1). If installing the RP75 to an engine compartment firewall, go to Step 2.

2. If installing the RP75 to an engine compartment firewall, drill a 37/64 in. (15 mm) diameter hole in the firewall (see Figure 2).

3. Remove the reset knob on the RP75 by loosening the Allen-head screw on the knob.

4. Remove the mounting nut and insert the RP75 reset stem through the hole from the back of the firewall.

5. Replace the mounting nut and tighten. Reinstall the reset knob.

### Typical Wiring Diagrams

Wire the RP75 appropriately (see Figure 3).

**NOTE:** RP75 is voltage rated; do not apply 24-VDC to 12-VDC model and vice versa. Also, the 117PH Magnetic Switch is rated for both 12- and 24-VDC circuits but voltage must be specified when ordering the 518PH or 761APH Magnetic Switches.

### Installing Cable or Chain

1. To install the control linkage (cable or chain), apply voltage to the RP75. Push in the reset knob. If installing the cable, insert the cable attaching nut into the RP75 and tighten snugly (see Figure 1). DO NOT OVER TIGHTEN or threads may strip. Attach and tighten outer cable securing nut. If installing the chain, attach the S hook to the RP75 (see Figure 1).

2. Attach the other end of the cable or chain to the injection pump or air intake shutoff lever so it moves freely without sharp bends and without binding.

### Operation Test

**NOTE:** Some method must be provided to disconnect (lockout) all normally closed Switchgag® circuits when starting (such as through the appropriate Magnetic Switch).

1. Reset magnetic switch.

2. Push in RP75 reset stem until coil latches the trip mechanism.

3. Start engine and observe that all locked out contacts clear.

4. With engine running, ground Switchgag contact. The Magnetic Switch will trip thus removing voltage to RP75. The engine should shutdown immediately. If the engine does shutdown, adjust control linkage (cable or chain) to ensure that shutoff lever travels the full length in both directions.



**CAUTION:** Shut-off lever should not pull hard against the stop in the OFF position.



**WARNING:** The firewall must be capable of withstanding the push and pull force of the RP75.

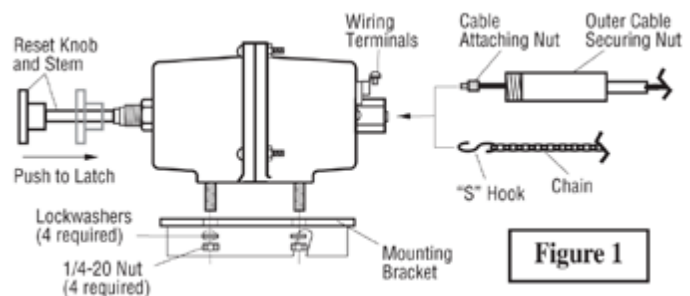


Figure 1

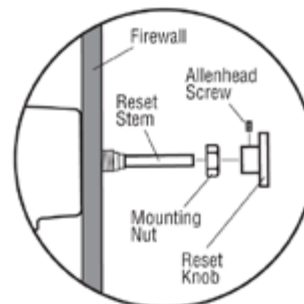


Figure 2

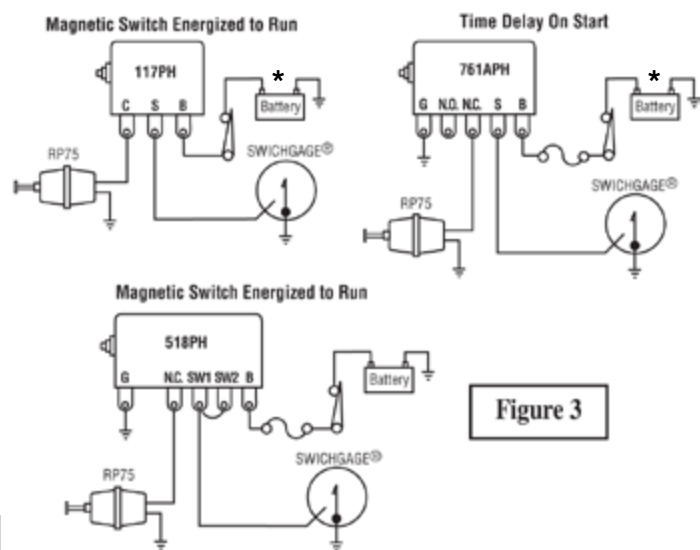


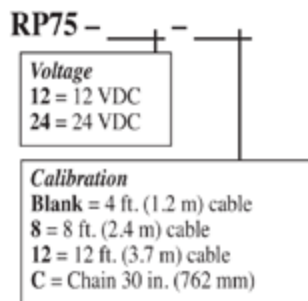
Figure 3

\* Always provide proper circuit protection with fuses or circuit breakers.



## How to Order

Options listed at right.  
All configurations may  
not be available. Call your  
sales representative or  
Enovation Controls for  
more information.



Part Number	Description	Notes
40050161	Mounting Bracket	Mounting bracket is sold separately from RP75.
40000021	12 VDC core assembly	Service parts
40000044	Shaft solenoid assembly	
40010050	Bushing shaft assembly	
40010053	Case repair kit	
40040054	Cocking rod, bushing and knob repair kit	
40050136	Spring, main actuating	
40050149	Spring, cocking rod return	
80041030	2 screw, machined #10-24 x 3/8 pan HD steel CAD II	
40000024	24 VDC core assembly	

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# Murphymatic® Engine Throttle Controller

## Model AT03069

The AT03069 is a completely reliable heavy-duty device developed specifically to automatically control engine speed to meet system demand. Low current, high torque, solid-state switching and an electronic clutch make it ideal for all automatic and semiautomatic engine systems. Used with the appropriate Murphy Switchgag® near constant pressure, level and load can be maintained. Speed changes are made slowly and smoothly. The device saves fuel, engine wear, horsepower and labor. One model can be used with both 12- and 24-VDC systems. Check with our engineers for help with other applications where speed control can improve your system.

Applications include:

### Pressure

- City water systems
- Water flood injection
- Sprinkler lateral changes
- Make-up if a gang pump stops
- Multiple hose-reel irrigation systems

### Level

- Water or oil storage tanks
- Waterflood tanks
- Sewer disposal systems
- Flood control catch basins

### Temperature

- Multi-engine cooling systems
- Air conditioned chilled water systems

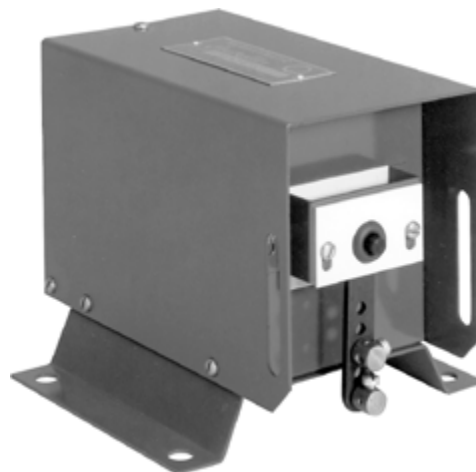
### Engine load

- Empty or fill reservoirs with a lower horsepower engine — fast when head is high — slow when head is low

The AT03069 can enhance features of our Selectronic® Microcontroller units by allowing features such as:

- Warm-up RPM set point
- Minimum RPM set point
- Maximum RPM set point
- Preset operating RPM set point
- Auto throttling to match flows (as needed in flood control applications)
- Maintaining system pressure (as needed in booster station application)
- Adjustable rate of change in RPM (allowing fine tuning of overall system).

For more information, recommendations and quotations contact our engineering department.



## Specifications

**Voltage:** 11-28 VDC negative ground

**Maximum Current:** 500 mA (1/2 amp)

**Standby Current:** Approx. 7 mA

**Increase and Decrease:** Inputs float at approx. 8.4 VDC. Grounding inputs causes 8-18 mA of current to flow from either.

**Torque:** 25 inch pounds

**Sealed limit switches:** Factory adjusted, controls maximum travel

**Linkage adjustment on lever arm—5 holes:** Adjusts travel: 1-3/16 in. (30 mm); 1-11/16 in. (43 mm); 2 in. (51 mm); 2-1/4 in. (57 mm) approximately. Travel Time: 11 to 20 seconds depending on the voltage and force applied.

**Net Weight:** 5 lb. (2.27 kg)

## Operation

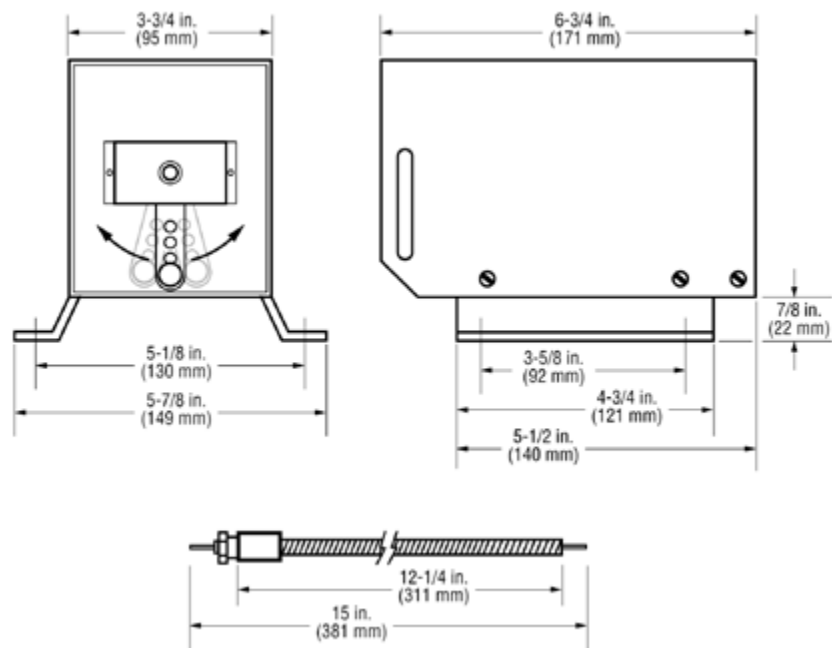
A Murphy Switchgag® constantly monitors pressure, level, temperature or load. Adjustable high and low contacts on Switchgag are set slightly above and below desired

operating point. When demand changes, the pointer touches appropriate high or low contact and signals speed change. The AT03069 controller responds only as long as contact is made. The controller stops immediately when contacts separate. Slow, smooth action prevents hunting or surging on normal applications.

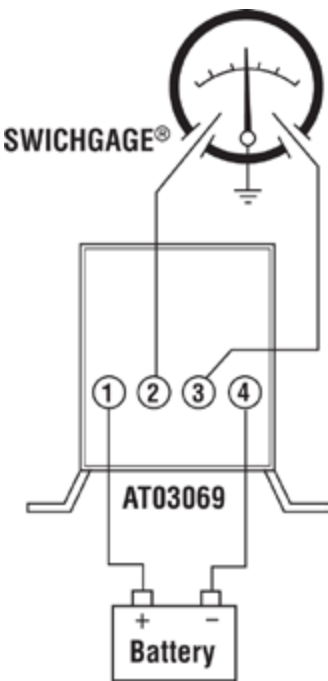
\*Mercury tube or snap-action switches are not suitable for this type of control. For more information, recommendations and quotations, contact our engineering department.



Dimensions



Typical Wiring



How to Order

Part Number	Description	Notes
40700249	AT03069	

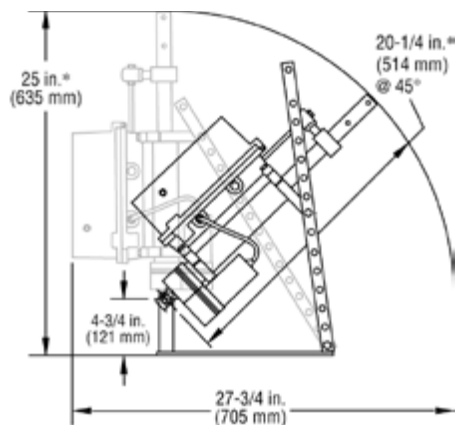
# Electric Motor Driven Clutch Operator for Engine Automation Systems

The CO3 is an electrically controlled and driven actuator for automatic operation of two position, lever action equipment. Primarily designed to engage and disengage over-center clutches on engines, the CO3 has a wide variety of applications such as opening and closing of pipeline valves, engagement and disengagement of pumps, fixture positioning in automated process control, etc. The positive action screw-type actuator is fully adjustable for length of stroke up to 6 inches (152 mm). The CO3 motor is equipped with an overload clutch that slips if overloaded. In addition, the motor is protected with an automatic reset thermal overload. The CO3 is available for 12- or 24-VDC applications and is compatible with Murphymatic® start-stop engine controllers.

Applications include:

- Engine disc clutches
- Butterfly and ball valves
- Brakes
- Two position lever-action equipment

## Dimensions

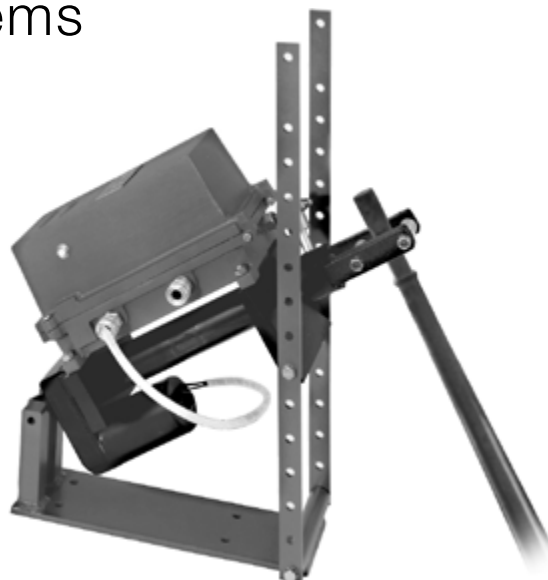


\*These dimensions are given with the CO3 disengaged.  
When CO3 is engaged, add 6 in. (152 mm).

## Basic Operation

When the CO3 receives a signal to engage, the heavy-duty DC motor operates to extend the actuator shaft and yoke a predetermined length. Length of extension is controlled by the adjustable cams in the control housing. When disengaging, the motor reverses and retracts the actuator shaft. At engagement end of the stroke, the actuator backs off from its maximum travel to relieve pressure on the clutch or other device.

Refer to Figure 4.



## Specifications

### Voltage:

CO3-12: 12-VDC, negative ground  
CO3-24: 24-VDC, negative ground

**Travel (adjustable):** 6 in. (152 mm) max

**Case Material:** Cast aluminum

**Built-in Circuit Breaker:** 20 A

### Operating Force:

CO3-12: 250 lb-f (1112N) max  
CO3-24: 500 lb-f (2224N) max

### Duty Cycle @ 77° F (25° C):

CO3-12: 40% max. @ 125 lb-f (556N) to 25% @ 250 lb-f (1112N)  
CO3-24: 100% max. @ 75 lb-f (334N) to 25% @ 500 lb-f (2224N)

### Speed:

CO3-12: 1.2 in./sec. (3 cm/sec.) @ 0 lb-f to 1.00 in./sec. (1 cm/sec.) @ 250 lb-f (1112N)  
CO3-24: 2.4 in./sec. (6 cm/sec.) @ 0 lb-f to 1.35 in./sec. (3 cm/sec.) @ 500 lb-f (2224N)

**Drive:** Self-locking ACME screw

### Current:

CO3-12: 20 amp max  
CO3-24: 14 amp max

**Operating Temperature:** -15 to 150° F (-26 to 66° C)

**Shipping Weight:** 40 lb (18.1 kg)

**Shipping Dimensions:** 25 x 14-1/2 x 12 in. (635 x 368 x 305 mm)

## How to Order

Part Number	Model and Description
Specify Model	CO3-12
	CO3-24

## Installation

1. Disengage clutch lever on the engine.
2. Remove the clutch lever and reposition it approximately 45 degrees from vertical, toward the rear of the clutch (Figure 4).
3. Locate and remove outer roller of the CO3 operating yoke (Figure 1).
4. Place the CO3 in direct line with the clutch lever until the inner roller touches the clutch lever at an approximate 90 degree angle (See detail in Figure 4).

**NOTE: Reposition clutch lever so it does not bind between rollers when actuator is fully extended and fully retracted.**

5. Bolt the CO3 to the stabilizer arm to hold the angle of incidence to the clutch arm (Figure 4).
6. Temporarily attach the CO3 mounting plate to the engine skid or base, or mark its location on the skid or base. (See Figure 2 for dimensions.)
7. Open control housing cover and locate Cam A (Figure 1). Loosen the two set screws on Cam A and slide the cam all the way to Cam B.

**NOTE: Do not disturb setting of Cam B. It is factory adjusted for proper operation.**

8. Temporarily wire Battery Negative to terminal #5, Positive to terminal #4 of the CO3 (Figure 3).
9. Apply a momentary N.O. push button between terminals #1 and #3. When the push button is pressed the CO3 actuator will extend (Figure 3).



**CAUTION: Be ready to release the push button when the clutch arm is fully engaged. Damage to the clutch or the CO3 can occur if the actuator is allowed to continue to push against the clutch arm.**

**NOTE: This is best done by energizing the CO3 for short intervals as the clutch arm approaches full engagement. Disconnect battery and remove push button from terminals #1 and #3.**

10. Firmly affix the CO3 mounting plate to the engine or skid or pad.

11. Move Cam A back toward the front end of the CO3 so that it fully depresses the roller of limit switch SW-2. Re-tighten both set screws.

12. Reconnect battery and the temporary push button across terminal #1 and #3. The actuator should back-off a short distance until clutch lever is between both rollers to insure removal of load from throw out bearings. If minor adjustment is necessary, move SW-2 forward to reduce back-off or aft to increase back-off. Maximum adjustment is 1/2 in. (13 mm). Remove momentary push button.

13. Place a N.O. momentary push button across terminals #2 and #3 (Figure 3). Press push button. Actuator should retract and disengage clutch. Actuator will back-off and stop when clutch is fully disengaged.

**Disconnect battery and remove push button from terminals #2 and #3.**

14. Reconnect battery. The CO3 is now ready for operation. A maintained contact closure across terminals #1 and #3 will engage clutch. A maintained contact closure across terminals #2 and #3 will disengage clutch.

**NOTE: Readjust CO3 after any clutch repair.**

**WARNING Before beginning installation of this Murphy product:**

- Disconnect ALL electrical power to the machine.
- Make sure the machine CANNOT operate during installation.
- Follow all safety warnings of the machine manufacturer.
- Read and follow all installation instructions.

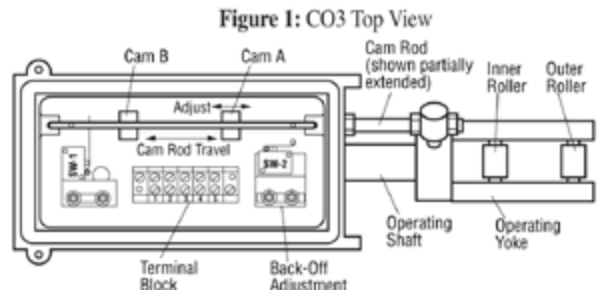


Figure 2: Mounting Plate Dimensions

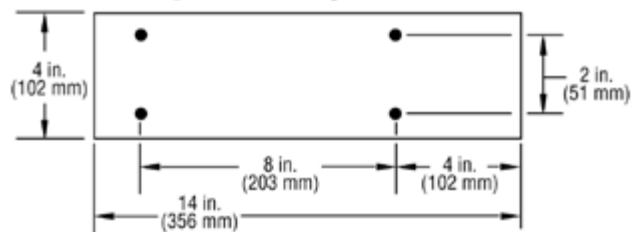


Figure 3: Customer Wiring

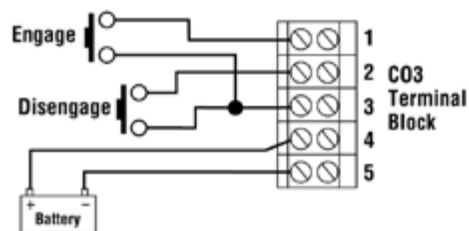
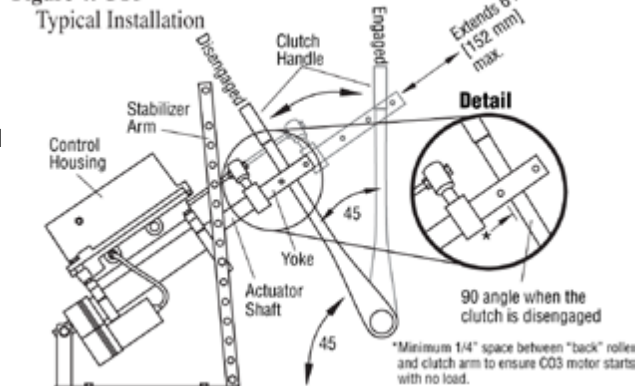


Figure 4: CO3





## Section 50 Compressor Controls and Panels

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# LCDT Selectronic® Tattletale® System

The LCDT Selectronic Tattletale system is a compact fault annunciator with an electronic alarm/shutdown control system. It's designed to protect engine-driven or motor-driven compressors and pumps. The annunciator indicates the sensor, and hence the parameter, that causes an alarm or shutdown. In addition, a means is provided for testing the operation of each sensor without initiating an alarm or shutdown. Employing a liquid crystal display, the LCDT system gives a digital reading of the tripped sensor and the lockout timer countdown.

At the heart of the system, the basic annunciator component has two variations: the Model LCDT-NO, which accommodates normally open sensors; and the Model LCDT-NC, which accommodates normally closed sensors. These units are enclosed in an aluminum box having a brush finish. The LCDT system accommodates 47 NO or 45 NC sensor inputs, 15 of which may be locked out during start up by the start/run timer delay.

A separate power supply is provided with the model LCDT instrument. Power may be supplied by CD ignition, a 120 VAC line or by 12- or 24-VDC battery.

Intended for use with all Swichgage instruments without OS option.

Features include:

- System alarm or shutdown for up to 47 NO or 47 NC sensors
- Timed start up override for up to 15 sensors
- Liquid Crystal Display of tripped sensors and the lockout timer countdown
- Test timer for shutdown override during sensor test
- Intrinsically safe annunciator unit: Class I, Division 1, Group D Hazardous Locations
- Explosion-proof power supply
- Battery power to maintain electronics while engine is not running
- Optional three-second time delay allows a fuel valve to close before grounding the ignition



## Specifications

**Power:** Supplied by CD ignition of an engine, 120 VAC line or by 12- or 24-VDC battery

### Power Inputs (Operating Voltage):

LCDT-PS-CD (R)-P: 90-250 VDC, CD ignition, positive ground  
LCDT-PS-CD-N: 90-250 VDC CD ignition, negative ground  
LCDT-PS-120/24/12: 120 VAC (6 VA), 24 VDC (1 watt), 12 VDC (0.5 watts)

**Sensor Inputs:** Accepts up to 47 sensors (NC version only 45) via a ribbon cable. The LCDT system was designed to be used with sensor switches having normally open or normally closed contacts such as Murphy Swichgage instrument.

**NOTE:** An approved isolation barrier such as a thermocouple type barrier, must be used between sensor switch and input terminals if sensor outputs come from any energy storing device such as a relay or transistor.

### Relay Outputs Ratings:

LCDT-PS-CD (R)-P Contact rating: 4A, 1/20 HP, 125/250 VAC/3A, 30 VDC  
LCDT-PS-120/24/12 Contact Rating: 5A, 28 VDC. 120 VAC (resistive)

**FET Outputs:** LCDT-PS-CD-N rating (for fuel valve and ignition ground): 0.5A @ 250 V

**Alarm Relay Contact Rating:** 4A, 1/20 HP, 125/250 VAC/3A, 30 VDC

**Operating Temperature:** Module (head): -40° to 185°F (-40° to 85°C)

**Power Supply:** 0° to 158°F (-18° to 70°C)

**Storage Temperature:** -40° to 302°F (-40° to 150°C)

**Case:** LCDT-NO/NC (module): anodized aluminum.

**Power Supply (all models):** Explosion-proof aluminum

**Multiplexer Scan Rate:** Scans all 47 sensors in 0.7 sec.

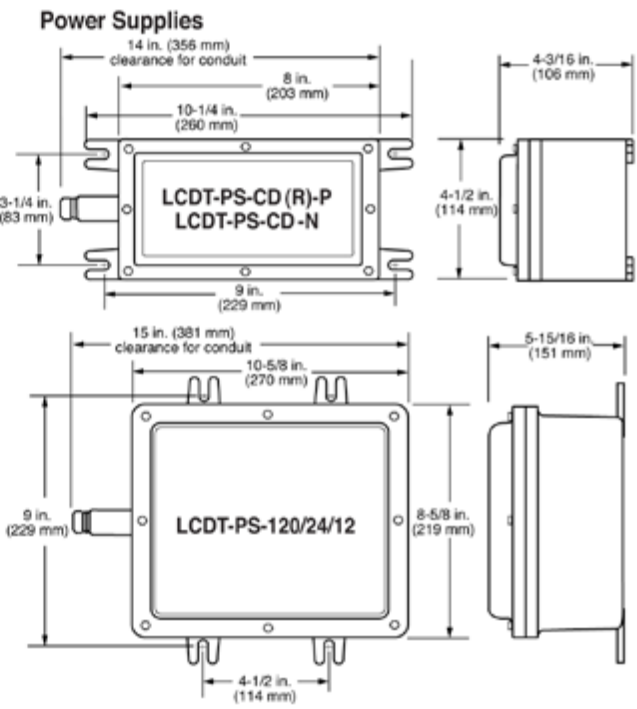
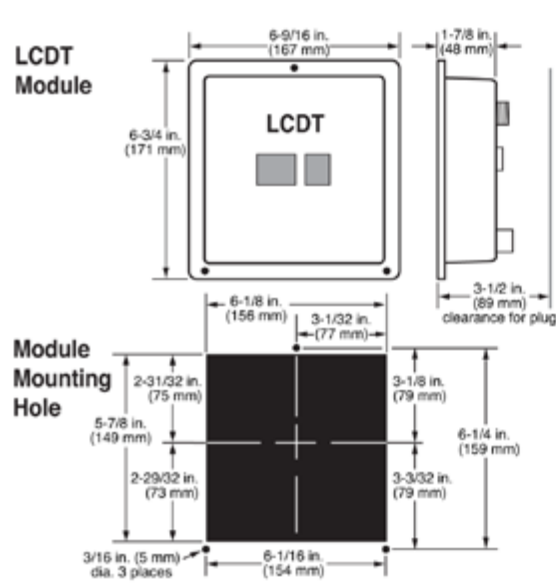
**Start-Run/Test Timer:** Standard 5 minutes, specify other, up to 7 minutes maximum (in 1 minute increments)

**Laboratory Approvals:** CSA\* and Factory Mutual System† Listed for Class I, Division 1, Group D, Hazardous Locations

\* When used with approved ignition A. Contact Enovation Controls for details.

† When installed per Murphy drawings HC-9450-A (50-08-0021) or HC-9450-AA (50-08-0019).

Dimensions



LCDT System

The basic LCDT system consists of the LCDT module, the terminal strip and cable assembly and the power supply.

Terminal Strip and Cable Assembly

The plug-in type Terminal Strip has 50 screw-type connections for normally open sensors and 100 connections for normally closed sensors. The terminal strip can be connected to the LCDT module with the 36 in. (914 mm) flat ribbon cable.

Power Supply

You have a choice of input power supplies: LCDT-PS-CD (R)-P and LCDT-PS-CD-N for CD ignition or LCDT-PS-120/24/12 for 120 VAC or 12 or 24 VDC. Each power supply includes control Inputs/Outputs and an intrinsically safe barrier. They were designed for Class I, Divisions 1 and 2, Group D Hazardous Locations. FM and CSA listed.

How to Order

Part Number	Model and Description	Notes
Specify Model Number	LCDT-NO, LCDT Normally Open	LCDT Module
	LCDT-NC, LCDT Normally Closed	
	LCDT-50CA-36, Normally Open	Terminal Strip and Cable Assembly
	LCDT-100CA-36, Normally Closed	
	LCDT-PS-CD (R)-P, CD Ignition Positive Ground	Power Supply
	LCDT-PS-CD-N, CD one or two ignitions negative ground	
	LCDT-PS-120/24/12, Voltage: 120 AC, 12/24DC	

Shipping Dimensions:

LCDT-NO/NC module: 8-1/2 x 9-1/2 x 5-1/2 in. (216 x 241 x 140 mm)  
LCDT-PS-CD-N and LCDT-PS-CD (R)-P: 4-1/2 x 15-1/2 x 5-1/2 in. (114 x 394 x 140 mm)  
LCDT-PS-120/24/12: 11-1/2 x 18-1/4 x 13-1/2 in. (291 x 464 x 343 mm)  
LCDT-50CA-36 or 100CA-36: 7-1/4 x 12 x 5-1/2 in. (184 x 305 x 140 mm)

Shipping Weights:

LCDT-NO/NC Head: 5 lbs. (2.2 kg)  
LCDT-PS-CD (R)-P: 9 lbs. (4.08 kg)  
LCDT-PS-120/24/12: 21 lbs. (9.5 kg)  
LCDT-50CA-36 or 100CA-36: 3 lbs. (1.3 kg)

# TTD Series

## Configurable Fault Annunciator

The TTD product is a solid-state fault annunciator and shut-down control system designed to protect engines, pumps, compressors and associated equipment. The TTD model accepts 48 sensor inputs from normally open and/or normally closed sensors. Each of the 48 inputs can be configured for shutdown or alarm only. Any input can be locked out by one of the two start-run timers or configured as Class C, ESD or ignore. The annunciator provides for both closing of a fuel valve and grounding of an ignition after a time delay.

Incorporated in the TTD non-volatile memory:

- Run Hours/Elapsed Time Meter (hours roll over at 99,999)
- Last 10 shutdowns with associated run hours
- Last four alarms with associated run hours
- Selectable Modbus RTU slave RS232/RS485 serial communications
- Selectable baud rates

Optional Features:

- Pre/Post lube timed functionality
- Tachometer w/ overspeed and underspeed setpoints and running hours.
- Lubricator no-flow detection for up to four proximity switches

With the TTD series, the display head is common to all configurations allowing fewer spare parts required to be maintained in the field. Its user-selectable templates provide ease of retrofit by selecting configuration of existing annunciators via display keypad or download from a computer with Windows-based MConfig® installed.



## Components

### Display Head

The display head shows operational and configuration data. Configuration parameters are entered via keypad or downloaded from MConfig software.

The display head will accept digital inputs directly on the back of the unit. Power is provided to the display head via a direct Phoenix connector. The display head contains the microprocessor, LCD, membrane keys for configuring the sensors inputs and the sensor input terminal blocks.

The TTD LCD annunciates any fault from the sensor inputs, displays engine speed and run hours/elapsed time meter. Other features for the TTD are: built-in test mode function to check the sensor circuits without causing a fault shutdown, pre-lubrication and post-lubrication timers and onboard backup battery to retain the fault display after shutdown on ignition powered units.

### Power Supply

The power input and control output terminals are mounted on the plug-in power supply (PSU-2). Power supplies also include an RS485/RS232 serial communication port (MODBUS RTU slave) to interface with microcontrollers, PCs, PLCs and/or communication and control systems. The serial communication provides read and write register capability and selectable baud rate up to 38,400.

All power supply models are reverse polarity protected and can be powered by 10-32vdc or 90-400vdc negative ground CD ignition. The TTD annunciator is fully operable with the internal battery. The external DC power enables communications support (MODBUS slave) and turns on the display backlight.

## Specifications

### Power Requirements:

**PSU-2:** 10-32VDC, 10W (max); 90-400VDC CD Ignition, 750uA @ 100VDC (max)

**On-Board Backup Power:** Lithium battery, 6 VDC, 1300 mAh.

**Digital Inputs:** 48 (aka channels)

**Sensor Types:** Discrete input, N.O./N.C., non-incendive

**Magnetic Pickup Input:**

**One Magnetic Pickup Sensor Input:** 3.6 - 120 VAC, 2-10 kHz.

### Outputs:

**IGN:** 0.4A @ 400VDC\* for 5 seconds

0.15A @ 400VDC(\*) cont. duty

**RLY:** 0.5A @ 48VDC cont. duty

**FV- :** 0.5A @ 400VDC(\*) cont. duty

**ALR:** 0.5A @ 48VDC cont. duty

**AUX:** 0.5A @ 48VDC cont. duty

### Operator Interface:

**Display Type:** LCD, Static, 80 segment, custom text with LED backlight

**Display Viewable Area:** ~ 2.79 x 1 in. (71.04mm x 25.4mm)

**Display Contrast:** Automatic

**Display Backlight:** Yellow (Normal Operation); Red (Shutdown)  
(Backlight will only be available when unit is powered by DC)

**Voltage Level Monitor:** Monitor and display voltage level of DC supply, CD ignition and internal battery

**Keypad:** 6 switches: Ridge Embossed, Metal Dome, Tactile 14 Oz. Trip Force

**Enclosure Cutout:** 5.50 x 5.50 in. (133 mm)

**Operating Temperature:** -40° to 85°C

**Viewable Temperature:** -40° to 85°C

**Storage Temperature:** -40° to 85°C

**Tachometer Accuracy:** ±0.5% of the display reading or ±1 RPM, whichever is greater

**Resettable Hourmeter Range:** 0 to 99999 hrs.

**Non-Resettable Hourmeter Range:** 0 to 99999 hrs.

**Hourmeter Accuracy:** ±1 hour per year

### Communication Ports: 1

A single bi-color (green/red) LED is provided to give visual indication of active transmit and receive traffic. Only one connection will be active at any time.

**Interface:** Factory configured for RS485; field-selectable for 3-wire RS232 or RS485

**Baud/Stop Bit Selections:** 9600, 19.2K, 38.4K<sup>†</sup>; N,8,1; N,8,2

**Protocol:** MODBUS RTU

**Connection:** There are two screw terminal connectors for RS485.

There are two screw terminal connectors for RS232. There is one screw terminal common for both ports labeled as GND.

### Third-Party Approvals:

TTD-H, PSU-2: CSA Class I, Division 2, Groups B, C and D

TTD-H: IEC 60529 - IP66 (NEMA 4 & 4X equivalent)

**Intuitive Display Icons:** Display status and assist in setup and operation. The appropriate icon will turn on to indicate unit status or navigation through the setup features.

**RUN** – Run mode

**RPM** – Screen Value

**HOURS** – Screen Value

**TYPE** – Channel Type Configuration

**LOW BATT** – Low Battery Warning (displayed when condition exists)

**HISTORY** – Shutdown History

**TEST** – Test Mode

**LUBE** – Pre-lubrication Timer

**POSTLUBE** – Post-lubrication Timer

**SHUTDOWN** – Stop Mode

**ALARM** – Alarm(s) Warning (displayed when condition exists)

**SETPOINT** – Edit Set-point Value

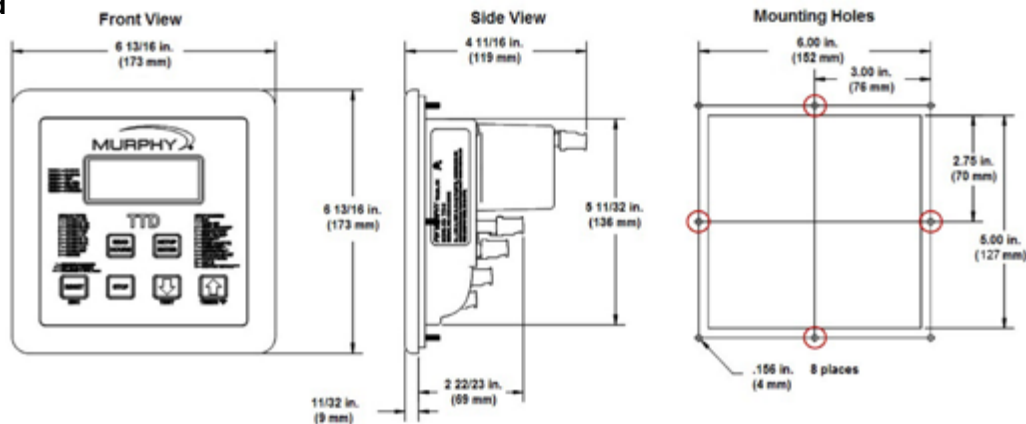
**SETUP** – Setup Menu(s)

\* CSA approved for 250VDC maximum

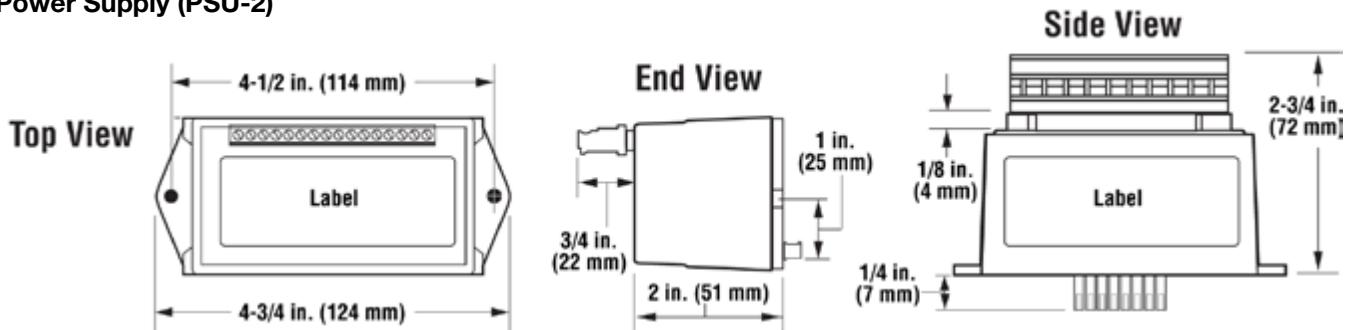
<sup>†</sup> 38.4K baud will not be available when IGN input is selected as the source for RPM calculations. When MPU is selected, this feature is available for selection.

## Dimensions

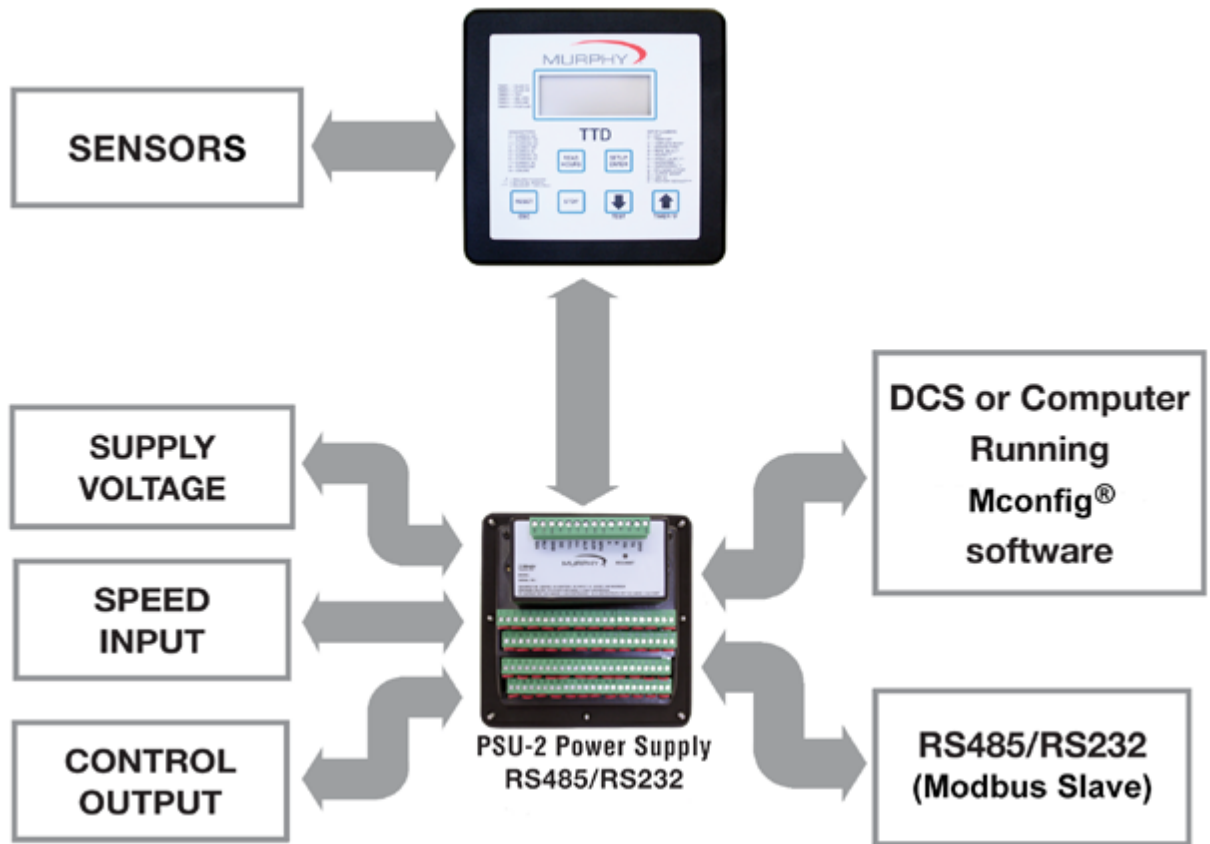
### Display Head



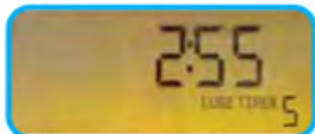
### Power Supply (PSU-2)







### TTD-H Display Head



Normal Operation Display  
(yellow background\*)



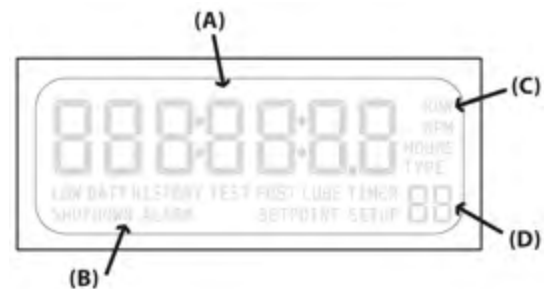
Shutdown/Warning Display  
(red background\*)



Back View w/PSU-2

### TTD Intuitive Display Icons

The TTD system features a static LCD display (A) with backlight (external DC is required). The applicable icon and number (B, C and D) will be displayed to clarify the display readings or alert the operator to an operating condition.



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Specify model number (see chart below). List your power supply options by placing a dash (-) between each option.

Base Model: **PSU-2 - X - X - X**

**2** (Div 2 Direct Mount)

**N** (No-flow detection functionality)

**Blank** (without No-flow detection)

**L** (Auxiliary Pre/Post Lube functionality)

**Blank** (without Auxiliary Lube control)

**T** (with Tachometer)

**Blank** (without Tachometer)

MODEL NUMBER (X indicates components and features included in Model)	PSU-2 (Class 1 Grps. B.C.&D. Div 2 Power Supply, Direct Mounted)	Tachometer w/ Overspeed functionality	Auxiliary Pre/Post Lube functionality	No-flow detection functionality
PSU-2	X			
PSU-2-T	X	X		
PSU-2-L-N	X		X	X
PSU-2-T-L-N	X	X	X	X

Part Number	Description	Notes
50700597	TTD-H Display Head	Replacement Parts and Assemblies
50700596	PSU-2 Div 2 Power Supply	
50700594	PSU-2-T Div 2 Power Supply w/ Tach	
50700944	PSU-2-L-N Div 2 Power Supply w/Pre/Post Lube and No-Flow	
50700942	PSU-2-T-L-N Div 2 Power Supply w/ Tach, Pre/Post Lube and No-Flow	
00005125	Backup Lithium Battery, 6VCD, 1200mAh	
50000774	Ignition Choke Filter	
00009741	TTD-H Plug Kit, Printed Replacement Terminal Plugs for TTD-H Sensor Inputs	
00009768	PSU-2-Plug, Printed Replacement Plug for PSU-2 Power Connector	

# Series S1501 Selectronic® Microcontroller/Annunciator

The S1501 instrument is a microprocessor-based alarm, shutdown and control system with tachometer/hourmeter function. It annunciates in alphanumeric characters the protective device that has signaled an alarm or caused equipment shutdown. Information is called up and adjustments are made on a six-button keypad on the face of the unit. Configurations such as alarm or shut-down nomenclature, preset timers and tachometer calibration can be made in the field.

The Murphy S1501 system has seven SPDT relays. On the standard model, the relays are assigned to the following functions: lube, crank, ignition/motor, fuel valve/cooler, load, alarm and shutdown.

The complete S1501 system consists of a head, sensor input terminal strip (two needed for 64 sensor models), 36-inch (914 mm) flat ribbon cable(s) for connecting the terminal block to the head and a Class I, Div. 1, explosion-proof power supply.

The S1501 system is powered from 120 VAC or 12 or 24 VDC. The head is rated intrinsically safe and includes a communication port, jumper selectable for either RS232 or RS485, operating as a MODBUS RTU slave. This port allows for remote control functions such as start/stop, load/unload, etc., and for read access to S1501 holding registers.

The S1501 system can be configured to monitor applications such as air and natural gas compressors, natural gas refueling and other industrial operations. For a list of applications and our cataloged programs contact a Murphy sales representative.

Custom programming is available at additional charge.

MConfig can be used to download to or upload from the S1501 and to save configurations.



## Specifications

### Power Consumption:

- 120 VAC (7.5 VA)
- 12 VDC (3.5 watts)
- 24 VDC (3.5 watts)

**Sensor Inputs:** 32 or 64 N.O. and/or N.C. inputs such as Murphy Switchage® instruments. Field selectable as a Class A, B1, B2, C, P or ESD for shutdown, alarm or control function.

*NOTE: Sensor inputs 27 through 32 reserved for control functions.*

**Outputs:** 7-SPDT relay outputs, 5 A, 1/16 HP, 125/250 VAC/ 1 A, 30 VDC

*NOTE: For hazardous areas an approved isolation barrier must be used between sensor switch and input terminals if the sensor output comes from any energy storing device such as a relay or transistor.*

### Adjustable Time Delays:

- Permissive
- Run
- Ignition Ground
- Prelube
- Class B1 Lockout
- Postlube
- Purge
- Class B2 Lockout
- Cooler
- Fuel
- Process Lockout
- Crank
- Idle/Cool down

**Sensor Inputs Terminal Block:** Rail mount DIN type; 32 terminals, screw type

**Opto-Isolated Tach/Run Input:** Magnetic pickup, 4.5 to 120 Vrms, 0-10 kHz. CD ignition, positive or negative ground, 100 to 300 VDC, 3-666 Hz. 12 to 125 VDC or 120 Vrms, 50/60 Hz may be used for run signals.

**Operating Temperatures:** 32 to 122°F (0 to 50°C)

**Storage Temperatures:** -4 to 158°F (-20 to 70°C)

**Case :** ABS plastic, 1/4 DIN (90 x 90 mm)

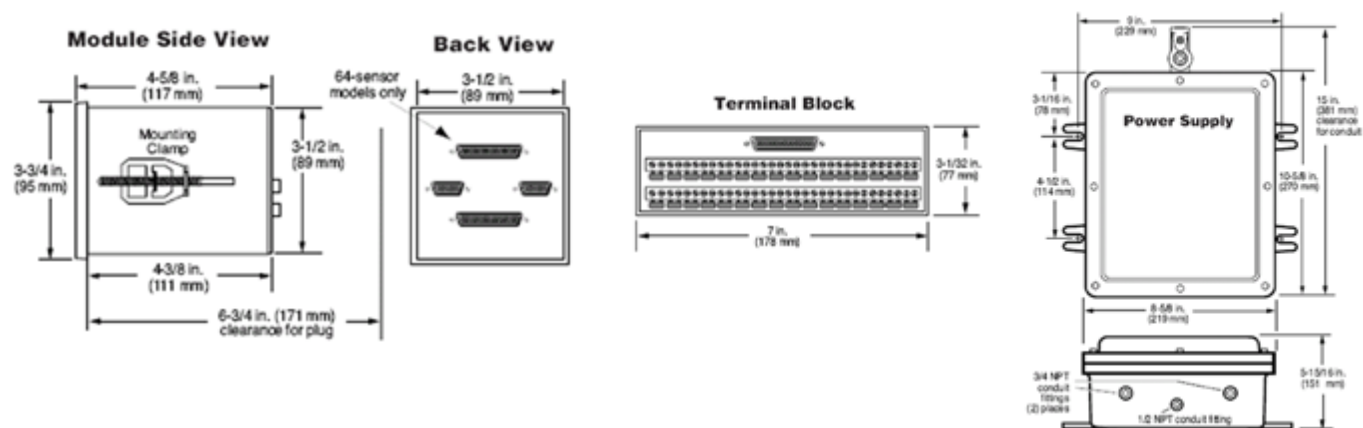
**Interface Output:** Factory configured for RS232; field-selectable for RS485.

**Alphanumeric Display:** 2 lines, each line with 16 characters (32 characters total)

**Power Supply Enclosure:** Explosion-proof, Class I, Division 1. Intrinsically safe barrier built into the power supply, with 7 form C relay outputs for the following functions (with standard S1501):

- Lube
- Fuel/Cooler
- Shutdown
- Crank
- Load
- Ignition/Motor
- Alarm

## Dimensions



## How to Order

Part Number	Model and Description	Notes
Specify Model Number	S1501H-32-2	Head with RS232/RS485 port for 32 sensors
	S1501H-64-2	Head with RS232/RS485 port for 64 sensors
	S1501CH-32-2	Head with custom* program, RS232/RS485 port, 63 sensors
	S1501CH-64-2	Head with custom* program, RS232/RS485 port, 64 sensors
	S1500TB32	Terminal Block only**
	S1500CA36	Ribbon Cable Assembly**
	S1501PS-120	120 VAC, 12 or 24 VDC Power Supply
	S1501PS-120-E	Power Supply with 90° Conduit Elbow Fitting
	S1501PS-120-LC-AMOT Kit	
	S1501PCA72 - Power and Control Cable Assembly, 72 in. (1.8 m) long	Accessories
	S1501PS-120-LC - Power Supply less case	

\*Specify program number or contact Enovation Controls for available programs listings.

\*\* Two required for 64 sensor models.

### Approximate Shipping Weights /Dimensions

#### S1501 complete system:

28 lb. (12.7 kg) / 20x14x12.5 in. (508x356x218mm)

#### S1501H-32-2; S1501H-64-2; S1501CH-32-2;

#### S1501CH-64-2:

2 lb. (0.907 kg) / 6x6x6 in. (152x152x152mm)

#### S1500TB32:

2 lb. (0.907 kg) / 12x7x4 in. (305x178x102mm)

#### S1500CA36; S1501PCA72:

2 lb. (0.907 kg) / 6x6x6 in. (152x152x152mm)

#### S1501PS-120-LC:

3 lb. (1.36 kg) / 12x7x4 in. (305x178x102mm)

#### S1501PS-120 and S1501PS-120-E:

22 lb. (9.98 kg) / 17x10x9.75 in. (431x254x248mm)

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [fwmurphy.com/support/warranty.htm](http://fwmurphy.com/support/warranty.htm)

# Centurion™ Configurable Controller

The Centurion Configurable Controller is a control and monitoring system. Primarily designed for engine/electric motor driven compressors, the Centurion is well suited for many control applications using standard configurations to save money and reduce training. Additionally, Enovation Controls can custom design a control package to meet exact specifications for a variety of applications.

The Centurion continuously monitors input signals and set points and commands outputs to maintain proper operation. When an out-of-limits event occurs, the controller will stop, shut-down or control equipment to change conditions. The auto-start capabilities of the Centurion allow for start/stop based on parameters such as pressure set points or by digital signals.

The Centurion provides real-time data via communication ports to a connected display and/or supervisory system. This advanced system offers multiple options for remote communications and operation including HMIs, PLCs, PCs and SCADA systems. The industry standard MODBUS\* RTU protocol means greater support for a wide variety of communication equipment including radio and satellite communications systems.



## Features of the Centurion include:

- Fully configurable control and monitoring system. Applications include reciprocating/screw compressors and pump systems.
- Expandable system to meet most three-stage compressor applications.
- User configurability with Windows-based software allows the operator to point and click to implement standard processes. All I/O points can be custom configured.
- No programming experience required.
- Local and remote communications, MODBUS RTU via RS485/232.
- USB 1.1 support for laptops without a serial port.

- Upload/download capabilities for configurations and set points.
- Approved certification for Class I, Division 2, Groups B, C & D areas.
- Shut-down history list (Last 20 events)
- Event history list (Last 32 events)
- Active alarm list
- 10 maintenance timers
- Run hourmeter
- Support for no-flow totalization
- Number of starts per hour (electric motor)
- Six PID loops with override (up to three each)
- Configuration templates provided for simple use
- Configurations stored in non-volatile flash memory
- Set points stored in non-volatile EEPROM memory

## Basic Components

The Centurion consists of a display module, a main I/O module and optional expansion I/O module. No special cables are required. The Centurion is designed for use within a weatherproof enclosure only.

**Display Module (Head):** Choose from  
Standard MV-3-C LCD with graphic display  
Standard full-color VGA 6 in. or 10 in. touchscreen

**Main I/O Module:** C4-1-A: 32 DI, 10 DO, 12 AI, 8 TC, 2 AO, 1 MPU

**Expansion Module:** MX4: 18 TC (Type J or K). MX5-A: 6 DO, 8 AI, 4 AO, 1 MPU

DI=Digital Input; DO=Digital Output; AI=Analog Input; AO=Analog Output; TC=Thermocouple Input; MPU=Magnetic Pick Up Input; RTD=Resistive Temperature Device

## Controller General Specifications

**Power Input:** 10 -32 VDC

**Operating Temp:**  
-40° to 185° F (-40° to 85° C)

**Configuration:**  
PC-based Centurion Configuration Software



## MV-3-C Display Module with Graphical LCD

- Operating temperature: -40° to 185° F (-40° to 85° C)
- 320 x 240 pixels, LCD display with backlight
- 12-key keypad for user interface for set point entry, alarm acknowledgment, start, stop, reset, etc.
- Communications
  - RS232/RS485-1 (MODBUS master)
  - RS485-2 (reserved)
  - USB 1.1 compliant ports
  - Type A (reserved)
  - Type B (firmware updates)
  - CAN 1/2 (reserved)
- Customizable process screens (up to nine)
  - Line by line
  - Gage
  - Control loop
  - Generic register



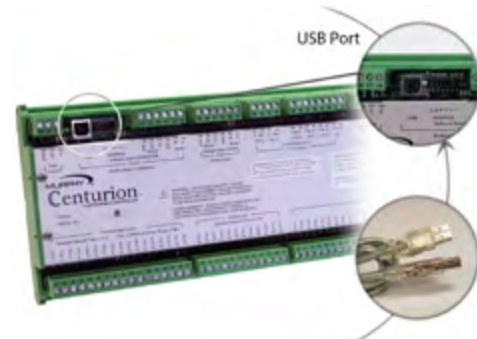
## Full-Color VGA Touch Screen

- Operating temperature: 32 to 122° F (0 to 50° C)
- Full-color VGA touch screen (resistive analog)
- 6" standard offering, 10" upgrade
- Data logging - 1 GB memory card
- Data log transfer on the fly
- Communications
  - Serial RS232 - 2
  - Serial RS485 - 1
  - USB 1.1 - 1
  - Ethernet (several protocols supported including, but not limited to MODBUS TCP, TCP/IP Internet Web server)
- Five-button keypad for on screen menus (6")
- Eight-button keypad for on-screen menus (10")
- Standard screen offerings
- Front panel power LED
- 24 VDC powered



## C4-1-A Main I/O Module

- All I/O options individually software selectable. No jumpers required
- 32 optically isolated DC digital inputs: NO or NC, (active high/active low), non-incendive
  - LED indicators
  - Approved for use with general purpose switches in hazardous areas
- 12 analog inputs: 0-24mA or 0-5VDC , 10 bit hardware
- Eight thermocouples
  - Open thermocouple
  - Cold junction compensation
- One magnetic pickup input/AC run signal: 30 to 10kHz, 4.5VAC rms min, 120VAC rms max.
- 10 digital outputs:
  - LED indicators
  - 4 relay outputs, form C, dry contacts
  - 4 FET outputs (source)
  - 2 FET outputs (sink)
- Two analog outputs
  - 4-20mA, 16 bit hardware
- 3 Communication Ports:
  - Port 1 (SERIAL):
    - Interface: RS232 or RS485
    - Protocol: MODBUS RTU (slave)
  - Port 2 (SERIAL):



- Interface: RS232 or RS485
- Protocol: MODBUS RTU (slave), proprietary (configuration transfer)
- Port 2 (USB): Interface: USB 1.1 compliant port emulating RS232 communications via PC driver
  - Protocol/Services: MODBUS RTU (slave), proprietary (configuration transfer)
  - Connection: USB Type B connector
  - Automatic selection of USB when a signal is detected on the USB Type B connector
- Port 3: Interface: CAN bus
  - Protocol/Services: Proprietary communications for expansion I/O module support



### MX4 Expansion I/O Module

- All I/O options individually software selectable. No jumpers required.
- 18 thermocouple inputs: Type J or K, 12 bit hardware
- Open thermocouple detection: Drives channel reading high (max of scale)
- Cold junction compensation
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz



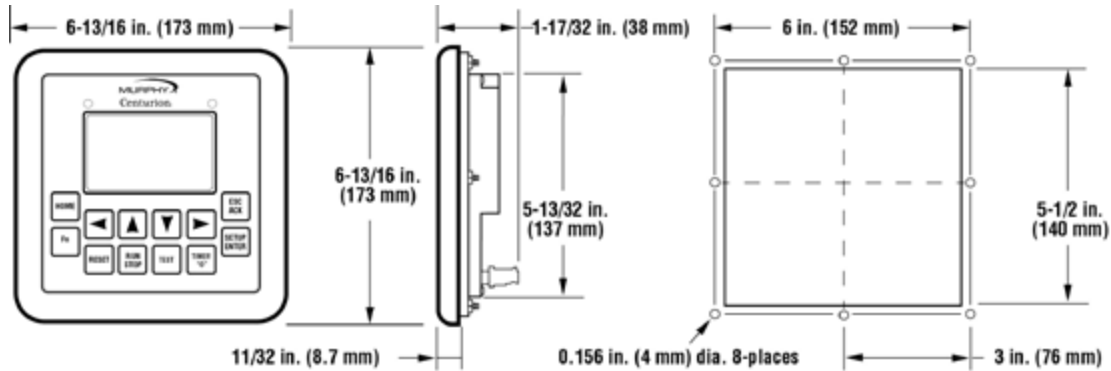
### MX5-A Expansion I/O Module

- Eight analog inputs: 0-24mA or 0-5VDC, 10 bit hardware
- Six digital outputs: open collector transistor, 150mA (sink)
- Four analog outputs: 4-20mA, 16 bit hardware
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

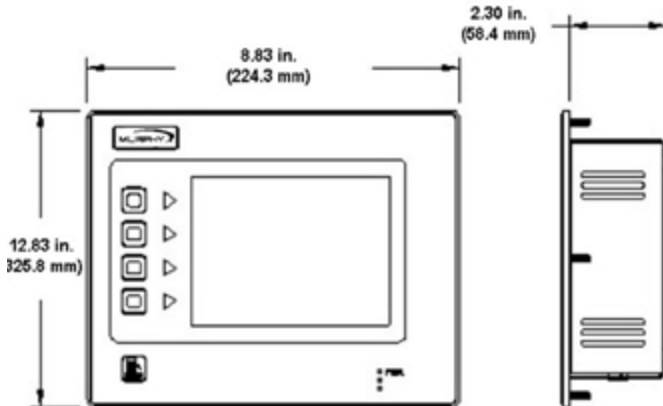


## Dimensions

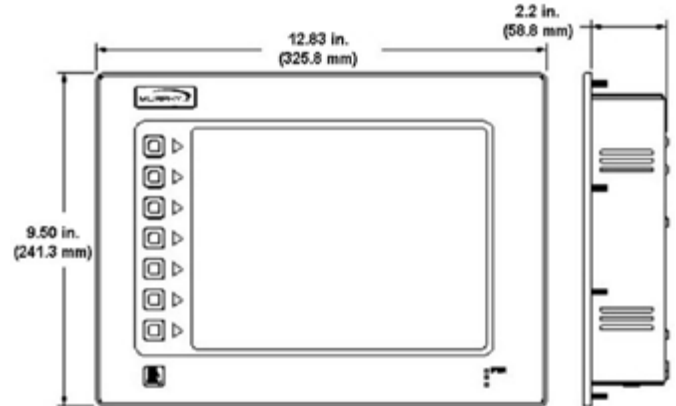
### MV-3-C



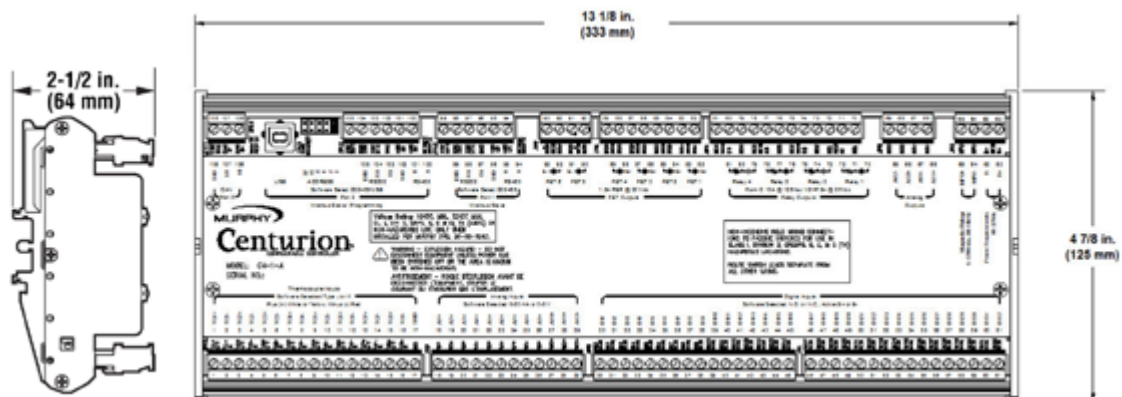
### 6-Inch VGA Touch Screen



### 10-Inch VGA Touch Screen



### C4-1-A



## How to Order

Select a Centurion Configurable Controller  
C4-1-A

Specify One (optional) Expansion I/O Module  
MX4 or MX5-A

Specify One Display  
MV-3-C LCD

6-inch VGA Touch Screen  
10-inch VGA Touch Screen

The minimum system requirements:  
C4-1-A Main I/O Module  
Display capable of MODBUS communications

The Murphy MV-3-C Display Module is a highly integrated HMI for use with the Centurion system and is recommended for most customers.

Some systems may require additional I/O which is available on the MX4 or MX5-A expansion I/O modules.

Part Number	Description	Notes
Specify Model	C4-1-A, Centurion Controller	
	MV-3-C, Monochrome display	Standard with auto sync
	6-inch VGA touch screen	Requires additional software
	10-inch VGA touch screen	Requires additional software
	MX4 expansion I/O module	
	MX5-A expansion I/O module	
50000774	Ignition noise (choke) filter	
00000504	C4-1-A Plug kit	Printed replacement terminal plugs for main I/O module
00030867	MX4 Plug kit	Printed replacement terminal plugs for MX4 expansion I/O module
00030868	MX5 Plug kit	Printed replacement terminal plugs for MX5 expansion I/O module
50702313	Centurion configuration tool for user application setup	MurphyNET Configuration Suite is software for modifying sequence of operation, set points, timers, faults and displays for Centurion. Includes file transfer utilities for configuration and upgrades.

# Centurion™ PLUS Full-Featured Controller

The Centurion PLUS Full-Featured Controller is a control and monitoring system. Primarily designed for engine/electric motor driven compressors, the Centurion is well suited for many control applications using standard configurations to save money and reduce training. Additionally, Enovation Controls can custom design a control package to meet exact specifications for a variety of applications.

The Centurion PLUS continuously monitors input signals and set points and commands outputs to maintain proper operation. When an out-of-limits event occurs, the controller will stop, shut down or control equipment to change conditions. The auto-start capabilities of the Centurion allow for start/stop based on parameters such as pressure set points or by digital signals.

The Centurion PLUS provides real-time data via communication ports to a connected display and/or supervisory system. This advanced system offers multiple options for remote communications and operation including HMIs, PLCs, PCs and SCADA systems. The industry standard MODBUS® RTU protocol means greater support for a wide variety of communication equipment including radio and satellite communications systems.

Features of the Centurion include:

- Custom programmed to meet exact application requirements
- Communications via 2 RS485/RS232 ports



- USB 1.1 support for laptops without a serial port
- Upload/download capabilities for set point edits
- Shut-down and alarm history, maintenance timers
- Complex valve logic and sequencing support
- PID Loops w/ overrides (multiple control loop possibilities)
- Expand I/O up to three expansion modules, any combination
- Firmware stored in non-volatile flash memory
- Set points stored in non-volatile eeprom memory
- Approved Certification for Class 1, Division 2, Groups B, C & D areas

## Expanded calculation abilities

- Custom rod load equations
- Look up table support
- Temperature channel deviation

## Expanded communication abilities

- Modem dial in/dial out using terminal interfaces, MODBUS RTU protocols
- Remote monitoring and control via Ethernet (several protocols supported including but not limited to MODBUS TCP, TCP/IP Internet web server)
- Event driven email, SMS text messaging possible
- Protocol conversion (many industry protocols supported)
- Web page hosting

## Data logging

- Using common compact flash card memory, 1 GB of storage
- Trends data as well as capture of readings at time of fault
- Security file logs all set point changes
- Importable to CSV files
- Multi-language support

## Basic Components

The Centurion consists of a display module, a main I/O module and optional expansion I/O module. No special cables are required. The Centurion is designed for use within a weatherproof enclosure only.

**Display Module (Head):** Choose from

- Standard MV-3-C LCD with graphic display
- Standard full-color VGA 6 in. or 10 in. touchscreen

**Main I/O Module:** CPC4-1-A: 32 DI, 10 DO, 12 AI, 8 TC, 2 AO, 1 MPU

**Expansion Module:** MX4: 18 TC (Type J or K). MX5: 24 DI, 8 DO, 10 AI, 1 MPU. MX5-A: 6 DO, 8 AI, 4 AO, 1 MPU. MX5-D: Same I/O as MX5, additional 8 digital outputs.

DI=Digital Input; DO=Digital Output; AI=Analog Input; AO=Analog Output; TC=Thermocouple Input; MPU=Magnetic Pick Up Input; RTD=Resistive Temperature Device

## Controller General Specifications

**Power Input:** 10 -32 VDC

**Operating Temp:** -40° to 185° F (-40° to 85° C)

**Configuration:** PC-based Centurion Configuration Software

## MV-3-C Display Module with Graphical LCD

- Operating temperature: -40° to 185° F (-40° to 85° C)
- 320x240 pixels, LCD display with backlight
- 12-key keypad for user interface for set point entry, alarm acknowledgment, start, stop, reset, etc.
- Communications
  - RS232/RS485-1 (MODBUS master)
  - RS485-2 (reserved)
  - USB 1.1 compliant ports
  - Type A (reserved)
  - Type B (firmware updates)
  - CAN 1/2 (reserved)
- Customizable process screens (up to nine)
  - Line by line
  - Gauge
  - Control loop
  - Generic register



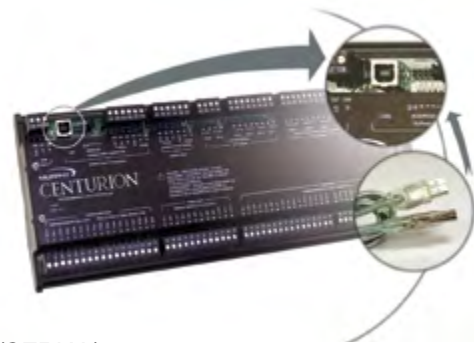
## Full-Color VGA Touch Screen

- Operating temperature: 32 to 122° F (0 to 50° C)
- Full-color VGA touch screen (resistive analog)
- 6" standard offering, 10" upgrade
- Data logging - 1 GB memory card
- Data log transfer on the fly
- Communications
  - Serial RS232 - 2
  - Serial RS485 - 1
  - USB 1.1 - 1
  - Ethernet (several protocols supported including, but not limited to MODBUS TCP, TCP/IP Internet Web server)
- Five-button keypad for on screen menus (6")
- Eight-button keypad for on-screen menus (10")
- Standard screen offerings
- Front panel power LED
- 24 VDC powered



## CPC4-1-A Main I/O Module

- Application Firmware: Programming proprietary C Language; PC-based upload/download set point editor
- All I/O options individually software selectable. No jumpers required
- 32 optically isolated DC digital inputs: NO or NC, (active high/active low), non-incendive
  - LED indicators
  - Approved for use with general purpose switches in hazardous areas
- 12 analog inputs: 0-24mA or 0-5VDC , 10 bit hardware
- Eight thermocouples
  - Open thermocouple
  - Cold junction compensation
- One magnetic pickup input/AC run signal: 30 to 10kHz, 4.5VAC rms min, 120VAC rms max.
- 10 digital outputs:
  - LED indicators
  - 4 relay outputs, form C, dry contacts
  - 4 FET outputs (source)
  - 2 FET outputs (sink)
- Two analog outputs
  - 4-20mA, 16 bit hardware
- 3 Communication Ports:
  - Port 1 (SERIAL):
    - Interface: RS232 or RS485
    - Protocol: MODBUS RTU (slave)



### Port 2 (SERIAL):

- Interface: RS232 or RS485
- Protocol: MODBUS RTU (slave), proprietary (configuration transfer)
- Port 2 (USB): Interface: USB 1.1 compliant port emulating RS232 communications via PC driver
- Protocol/Services: MODBUS RTU (slave), proprietary (configuration transfer)
- Connection: USB Type B connector
- Automatic selection of USB when a signal is detected on the USB Type B connector
- Port 3: Interface: CAN bus
- Protocol/Services: Proprietary communications for expansion I/O module support



### MX4 Expansion I/O Module

- All I/O options individually software selectable. No jumpers required.
- 18 thermocouple inputs: Type J or K, 12 bit hardware
- Open thermocouple detection: Drives channel reading high (max of scale)
- Cold junction compensation
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

### MX5 Expansion I/O Module

- 24 Digital Inputs: Optically-isolated DC digital inputs, (active high/active low), non-incendive
- 10 analog inputs: 4–20mA or 0–5VDC, 10 bit hardware
- Eight digital outputs: open collector transistor. 150mA (sink)
- One magnetic pickup input: 4.5VAC–120VAC, 30–10kHz

### MX5-A Expansion I/O Module

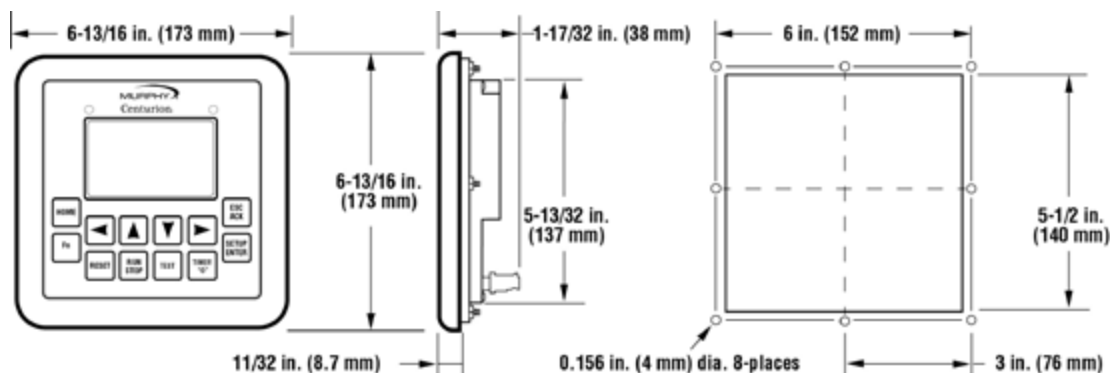
- Eight analog inputs: 0–24mA or 0–5VDC, 10 bit hardware
- Six digital outputs: open collector transistor, 150mA (sink)
- Four analog outputs: 4–20mA, 16 bit hardware
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

### MX5-D Expansion I/O Module – Analog Output Option

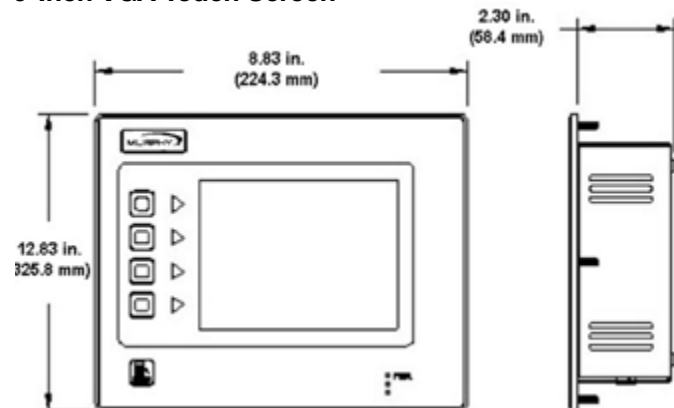
- 24 digital inputs: optically isolated DC digital inputs, (active high/active low) non-incendive
- 10 analog inputs: 4–20mA or 0–5VDC, 10 bit hardware
- 16 digital outputs: open collector transistor. 150mA (sink)
- One magnetic pickup input: 4.5VAC–120VAC, 30–10kHz

## Dimensions

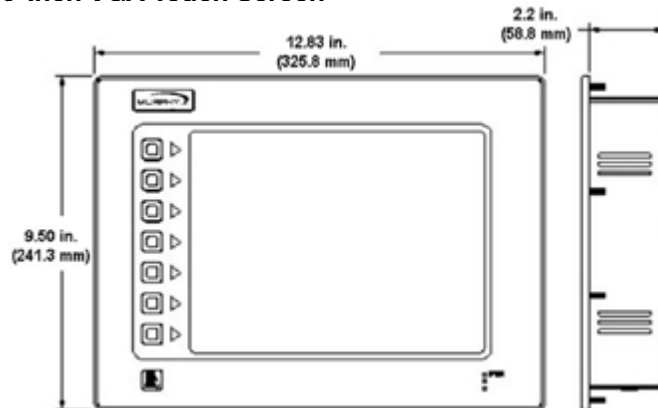
### MV-3-C



### 6-Inch VGA Touch Screen

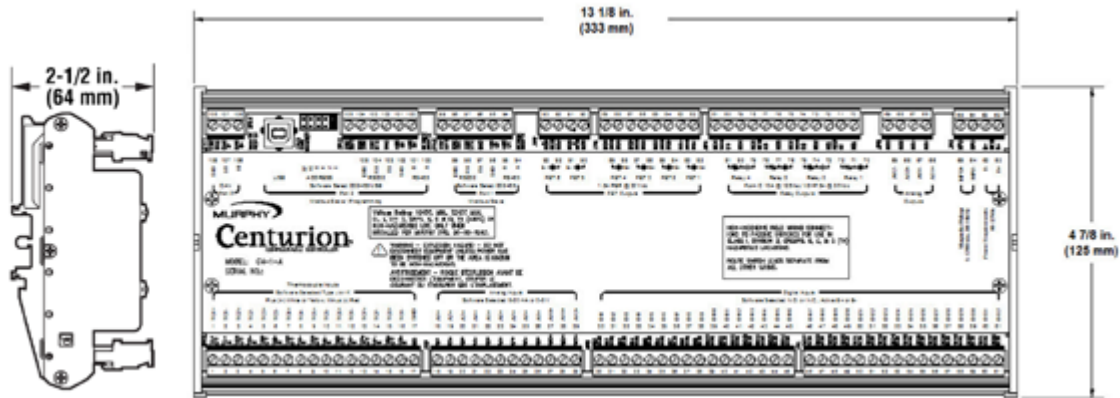


### 10-Inch VGA Touch Screen



## Dimensions - continued

### CPC4-1-A



## How to Order

Select a Centurion Configurable Controller  
CPC4-1-A

Specify any combination up to three Expansion I/O  
Modules

MX4 MX5-A MX5-A and/or MX5-D

Specify One Display  
MV-3-C LCD

6-inch VGA Touch Screen  
10-inch VGA Touch Screen

The minimum system requirements:  
CPC4-1-A Main I/O Module  
Display capable of MODBUS communications

The Murphy MV-3-C Display Module is a highly integrated HMI for use with the Centurion system and is recommended for most customers.

Some systems may require additional I/O which is available on the MX4 or MX5-A expansion I/O modules.

Part Number	Description	Notes
Specify Model	CPC4-1-A, Centurion Controller	
	MV-3-C, Monochrome display	
	6-inch VGA touch screen	
	10-inch VGA touch screen	
	MX4 expansion I/O module	
	MX5-A expansion I/O module	
50000774	Ignition noise (choke) filter	
00030866	CPC4-1-A Plug kit	Printed replacement terminal plugs for main I/O module
00030867	MX4 Plug kit	Printed replacement terminal plugs for MX4 expansion I/O module
00030868	MX5 Plug kit	Printed replacement terminal plugs for MX5 expansion I/O module
50702313	Centurion configuration tool for user application setup	MurphyNET Configuration Suite is software for modifying sequence of operation, set points, timers, faults and displays for Centurion. Includes file transfer utilities for configuration and upgrades.



# TTD Annunciator Panel

The TTD is a fully configurable fault annunciator and shut-down control system designed to protect engines, compressors and associated equipment.

This easy-to-operate panel features a simple interface. One display head is common to all configurations which requires fewer spare parts. The optional tachometer may use CD ignition or MPU input. The panel offers optional pre-lube or post-lube functionality as well as optional no-flow detection. It can monitor 48 user-configurable sensors.



TTD-H, PSU-2 approved for hazardous locations Class 1, Division 2, Groups B, C and D.

## Specifications

### Power Requirements:

**PSU-2:** 10-32VDC, 10W (max); 90-400VDC CD Ignition, 750uA @ 100VDC (max)

**On-Board Backup Power:** Lithium battery, 6 VDC, 1300 mAh

**Digital Inputs:** 48 (aka channels)

**Sensor Types:** Discrete input, N.O./N.C., intrinsically safe or non-incendive

**Magnetic Pickup Input:** 3.6 - 120 VAC, 2-10 kHz.

### Outputs:

**IGN:** 0.4A @ 400VDC\* for 5 seconds

0.15A @ 400VDC(\*) cont. duty

**FV- :** 0.5A @ 400VDC(\*) for 5 seconds

**ALR:** 0.5A @ 48VDC

**AUX:** 0.5A @ 48VDC

### Operator Interface:

**Display Type:** LCD, Static, 80 segment, custom text with LED backlight

**Display Viewable Area:** ~ 2.79 x 1 in. (71.04mm x 25.4mm)

**Display Contrast:** Automatic

**Display Backlight:** Yellow (Normal Operation); Red (Shutdown) (Backlight will only be available when unit is powered by DC.

**Voltage Level Monitor:** Monitor and display voltage level of DC supply, CD ignition and internal battery.

**Keypad:** 6 switches: Ridge Embossed, Metal Dome, Tactile 14 Oz. Trip Force

**Enclosure Cutout:** 5.25 x 5.25 in. (133 mm)

**Operating Temperature:** -40° to 85°C

**Viewable Temperature:** -40° to 85°C

**Storage Temperature:** -40° to 85°C

**Tachometer Accuracy:** ±0.5% of the display reading or ±1 RPM, whichever is greater

**Resettable Hourmeter Range:** 0 to 99999 hrs.

**Non-Resettable Hourmeter Range:** 0 to 99999 hrs.

**Hourmeter Accuracy:** ±1 hour per year.

### Communication Ports: 1

A single bi-color (green/red) LED is provided to give visual indication of active transmit and receive traffic. Only one connection will be active at any time.

**Interface:** Factory configured for RS232; field-selectable for RS232 or RS485

**Baud/Configuration:** 9600, 19.2K, 38.4K†;N,8,1;N,8,2

**Protocol:** MODBUS (Slave)

**Connection:** There are two screw terminal connectors for RS485. There are two screw terminal connectors for RS232. There is one screw terminal common for both ports labeled as GND.

### Third Party Approvals:

TTD-H, PSU-2: CSA Class I, Division 2, Groups B, C and D

**Intuitive Display Icons:** Display status and assist in setup and operation resulting in greater ease of operation and interface. The appropriate icon will turn on to indicate unit status or navigation through the setup features.

**RUN** – Run mode

**RPM** – Screen Value

**HOURS** – Screen Value

**TYPE** – Channel Type Configuration

**LOW BATT** – Low Battery Warning (displayed when condition exists)

**HISTORY** – Shutdown History

**TEST** – Test Mode

**LUBE** – Pre-lubrication Timer

**POSTLUBE** – Post-lubrication Timer

**SHUTDOWN** – Stop Mode

**ALARM** – Alarm(s) Warning (displayed when condition exists)

**SETPOINT** – Edit Set-point Value

**SETUP** – Setup Menu(s)

\* CSA approved for 250VDC maximum

† 38.4K Baud will not be available when IGN input is selected as the source for RPM calculations. When MPU is selected, this feature is available for selection.

**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

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# Centurion™

## Configurable Control Panel

The Centurion Configurable Control Panel (C4) is a hybrid of an annunciator and compressor controller. The C4 combines the monitoring and shut-down features of an annunciator, with auto-start and basic engine controls that help prevent shutdowns.

The panel is PC configurable and USB compatible. No programming experience is required for this panel.

### Specifications

**Power Input:** 10 -32 VDC

**Operating Temp:** -40° to 185° F (-40° to 85° C)

**Configuration:** PC-based Centurion Configuration Software

**Display Module (Head):** Choose from

Standard MV-3-C LCD with graphic display

Standard full-color VGA 6 in. or 10 in. touchscreen

**Main I/O Module:** C4-1-A: 32 DI, 10 DO, 12 AI, 8 TC, 2 AO, 1 MPU

**Expansion Module:** MX4: 18 TC (Type J or K). MX5-A: 6 DO, 8 AI, 4 AO, 1 MPU

DI=Digital Input; DO=Digital Output; AI=Analog Input; AO=Analog Output; TC=Thermocouple Input; MPU=Magnetic Pick Up Input; RTD=Resistive Temperature Device

### C4-1-A Main I/O Module

- All I/O options individually software selectable. No jumpers required
- 32 optically isolated DC digital inputs: NO or NC, (active high/active low), non-incendive
  - LED indicators
  - Approved for use with general purpose switches in hazardous areas
- 12 analog inputs: 0-24mA or 0-5VDC , 10 bit hardware
- Eight thermocouples
  - Open thermocouple
  - Cold junction compensation
- One magnetic pickup input/AC run signal: 30 to 10kHz, 4.5VAC rms min, 120VAC rms max.
- 10 digital outputs:
  - LED indicators
  - 4 relay outputs, form C, dry contacts
  - 4 FET outputs (source)
  - 2 FET outputs (sink)
- Two analog outputs
  - 4-20mA, 16 bit hardware
- 3 Communication Ports:

Port 1 (SERIAL):

- Interface: RS232 or RS485
- Protocol: MODBUS RTU (slave)

Port 2 (SERIAL):

- Interface: RS232 or RS485
- Protocol: MODBUS RTU (slave), proprietary (configuration transfer)

Port 2 (USB): Interface: USB 1.1 compliant port emulating RS232 communications via PC driver

- Protocol/Services: MODBUS RTU (slave), proprietary (configuration transfer)

- Connection: USB Type B connector
- Automatic selection of USB when a signal is detected on the USB Type B connector

Port 3: Interface: CAN bus

- Protocol/Services: Proprietary communications for expansion I/O module support



**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product.

A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

## MV-3-C Display Module with Graphical LCD

- Operating temperature: -40° to 185° F (-40° to 85° C)
- 320x240 pixels, LCD display with backlight
- 12-key keypad for user interface for set point entry, alarm acknowledgment, start, stop, reset, etc.
- Communications
  - RS232/RS485-1 (MODBUS master)
  - RS485-2 (reserved)
  - USB 1.1 compliant ports
    - Type A (reserved)
    - Type B (firmware updates)
  - CAN 1/2 (reserved)
- Customizable process screens (up to nine)
  - Line by line
  - Gage
  - Control loop
  - Generic register



## Full-Color VGA Touch Screen

- Operating temperature: 32 to 122° F (0 to 50° C)
- Full-color VGA touch screen (resistive analog)
- 6" standard offering, 10" upgrade
- Data logging - 1 GB memory card
- Data log transfer on the fly
- Communications
  - Serial RS232 - 2
  - Serial RS485 - 1
  - USB 1.1 - 1
  - Ethernet (several protocols supported including, but not limited to MODBUS TCP, TCP/IP Internet Web server)
- Five-button keypad for on screen menus (6")
- Eight-button keypad for on-screen menus (10")
- Standard screen offerings
- Front panel power LED
- 24 VDC powered



## Expansion I/O Modules

### MX4 Expansion I/O Module

- All I/O options individually software selectable. No jumpers required.
- 18 thermocouple inputs: Type J or K, 12 bit hardware
  - Open thermocouple detection: Drives channel reading high (max of scale)
  - Cold junction compensation
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

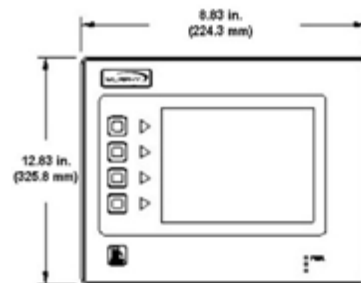
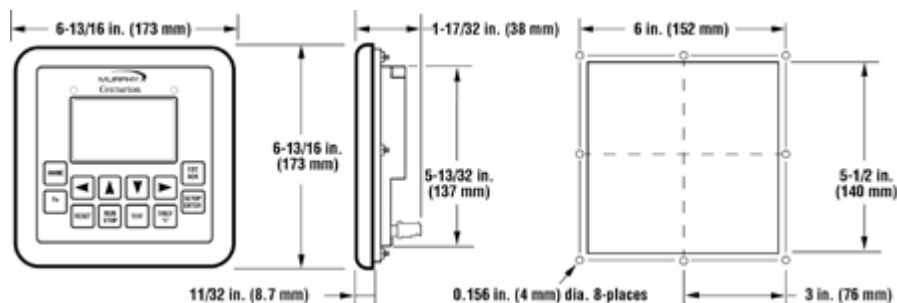
### MX5-A Expansion I/O Module

- Eight analog inputs: 0-24mA or 0-5VDC, 10 bit hardware
- Six digital outputs: open collector transistor, 150mA (sink)
- Four analog outputs: 4-20mA, 16 bit hardware
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

## Dimensions

### MV-3-C

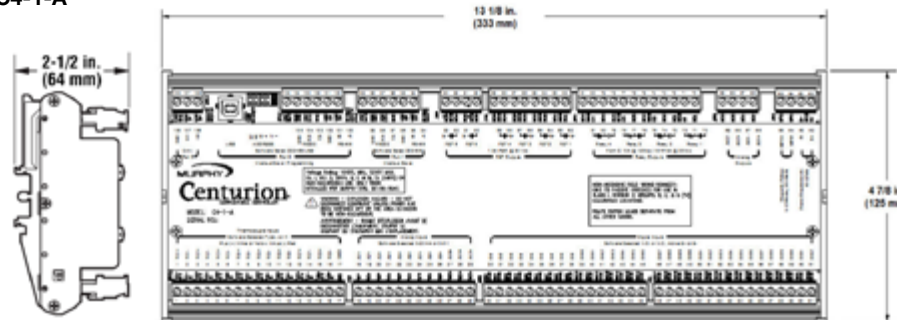
### 6-Inch VGA Touch Screen



Unit is 2.3 in. (58.4 mm) deep.

### C4-1-A

### 10-Inch VGA Touch Screen



Unit is 2.2 in. (56.8 mm) deep.

## How to Order

Select a Centurion Configurable Controller  
C4-1-A

Specify any combination up to three Expansion I/O  
Modules

MX4 MX5-A

Specify One Display  
MV-3-C LCD

6-inch VGA Touch Screen

10-inch VGA Touch Screen

The minimum system requirements:  
C4-1-A Main I/O Module  
Display capable of MODBUS communications

The Murphy MV-3-C Display Module is a highly integrated HMI for use with the Centurion system and is recommended for most customers.

Some systems may require additional I/O which is available on the MX4 or MX5-A expansion I/O modules.

Part Number	Model and Description	Notes
Specify Model	C4-1-A, Centurion Controller	
	MV-3-C, Monochrome display	Standard with auto sync
	6-inch VGA touch screen	Requires additional software
	10-inch VGA touch screen	Requires additional software
	MX4 expansion I/O module	
	MX5-A expansion I/O module	
50000774	Ignition noise (choke) filter	
00000504	C4-1-A Plug kit	Printed replacement terminal plugs for main I/O module
00030867	MX4 Plug kit	Printed replacement terminal plugs for MX4 expansion I/O module
00030868	MX5 Plug kit	Printed replacement terminal plugs for MX5 expansion I/O module

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# Centurion™ PLUS Control Panel

The Centurion PLUS Configurable Control Panel (C4) is the latest evolution in Murphy's controller technology. This full-featured controller provides the stability of proven technology combined with the latest HMI touch screen for greater expandability and user interface.

The Centurion Plus panel features custom application programming as well as full-time date logging and expandable communication capabilities.

## Specifications

**Power Input:** 10 -32 VDC

**Operating Temp:** -40° to 185° F (-40° to 85° C)

**Operating Temp (touch screen):** 32° to 122° F (0° to 50° C)

**Display Module (Head):** Choose from

Standard MV-3-C LCD with graphic display

Standard full-color VGA 6 in. or 10 in. touchscreen

**Main I/O Module:** CPC4-1-A: 32 DI, 10 DO, 12 AI, 8 TC, 2 AO, 1 MPU

**Expansion Module:** MX4: 18 TC (Type J or K). MX5-A: 6 DO, 8 AI, 4 AO, 1 MPU

DI=Digital Input; DO=Digital Output; AI=Analog Input; AO=Analog Output; TC=Thermocouple Input; MPU=Magnetic Pick Up Input; RTD=Resistive Temperature Device

**Application Firmware:** Programming Proprietary C language - PC-based upload/download set point editor

## CPC4-1-A Main I/O Module

- All I/O options individually software selectable. No jumpers required
- 32 optically isolated DC digital inputs: NO or NC, (active high/active low), non-incendive
  - LED indicators
  - Approved for use with general purpose switches in hazardous areas
- 12 analog inputs: 0-24mA or 0-5VDC , 10 bit hardware
- Eight thermocouples
  - Open thermocouple
  - Cold junction compensation
- One magnetic pickup input/AC run signal: 30 to 10kHz, 4.5VAC rms min, 120VAC rms max.
- 10 digital outputs:
  - LED indicators
  - 4 relay outputs, form C, dry contacts
  - 4 FET outputs (source)
  - 2 FET outputs (sink)
- Two analog outputs
  - 4-20mA, 16 bit hardware
- 3 Communication Ports:

Port 1 (SERIAL):

- Interface: RS232 or RS485
- Protocol: MODBUS RTU (slave)

Port 2 (SERIAL):

- Interface: RS232 or RS485
- Protocol: MODBUS RTU (slave), proprietary (configuration transfer)

Port 2 (USB): Interface: USB 1.1 compliant port emulating RS232 communications via PC driver

- Protocol/Services: MODBUS RTU (slave), proprietary (configuration transfer)

- Connection: USB Type B connector
- Automatic selection of USB when a signal is detected on the USB Type B connector

Port 3: Interface: CAN bus

- Protocol/Services: Proprietary communications for expansion I/O module support



**Warranty** — A limited warranty on materials and workmanship is given with this Murphy product. A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

## MV-3-C Display Module with Graphical LCD

- Operating temperature: -40° to 185° F (-40° to 85° C)
- 320x240 pixels, LCD display with backlight
- 12-key keypad for user interface for set point entry, alarm acknowledgment, start, stop, reset, etc.
- Communications
  - RS232/RS485-1 (MODBUS master)
  - RS485-2 (reserved)
  - USB 1.1 compliant ports
    - Type A (reserved)
    - Type B (firmware updates)
  - CAN 1/2 (reserved)
- Customizable process screens (up to nine)
  - Line by line
  - Gage
  - Control loop
  - Generic register



## Full-Color VGA Touch Screen

- Operating temperature: 32 to 122° F (0 to 50° C)
- Full-color VGA touch screen (resistive analog)
- 6" standard offering, 10" upgrade
- Data logging - 1 GB memory card
- Data log transfer on the fly
- Communications
  - Serial RS232 - 2
  - Serial RS485 - 1
  - USB 1.1 - 1
  - Ethernet (several protocols supported including, but not limited to MODBUS TCP, TCP/IP Internet Web server)
- Five-button keypad for on screen menus (6")
- Eight-button keypad for on-screen menus (10")
- Standard screen offerings
- Front panel power LED
- 24 VDC powered



## Expansion I/O Modules

### MX4 Expansion I/O Module

- All I/O options individually software selectable. No jumpers required.
- 18 thermocouple inputs: Type J or K, 12 bit hardware
  - Open thermocouple detection: Drives channel reading high (max of scale)
  - Cold junction compensation
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

### MX5 Expansion I/O Module

- 24 Digital Inputs: Optically-isolated DC digital inputs, (active high/active low), non-incendive
- 10 analog inputs: 4–20mA or 0–5VDC, 10 bit hardware
- Eight digital outputs: open collector transistor. 150mA (sink)
- One magnetic pickup input: 4.5VAC–120VAC, 30–10kHz

### MX5-A Expansion I/O Module

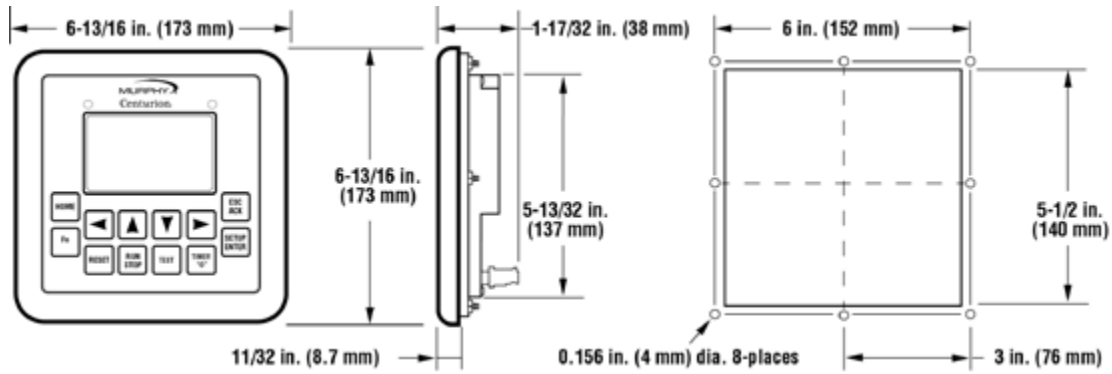
- Eight analog inputs: 0–24mA or 0–5VDC, 10 bit hardware
- Six digital outputs: open collector transistor, 150mA (sink)
- Four analog outputs: 4–20mA, 16 bit hardware
- One magnetic pickup input: 4.5VAC – 120 VAC, 30 – 10kHz

### MX5-D Expansion I/O Module – Analog Output Option

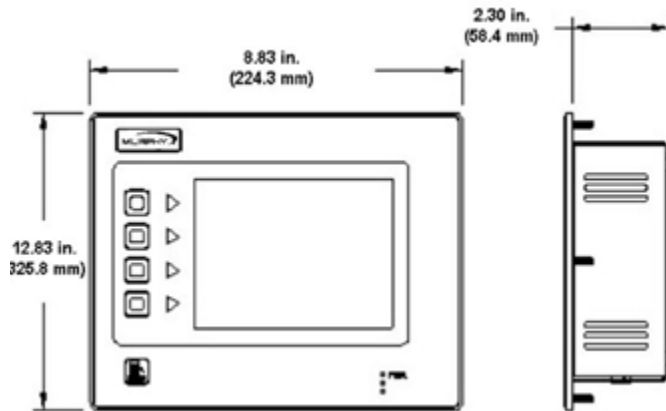
- 24 digital inputs: optically isolated DC digital inputs, (active high/active low) non-incendive
- 10 analog inputs: 4–20mA or 0–5VDC, 10 bit hardware
- 16 digital outputs: open collector transistor. 150mA (sink)
- One magnetic pickup input: 4.5VAC–120VAC, 30–10kHz

# Dimensions

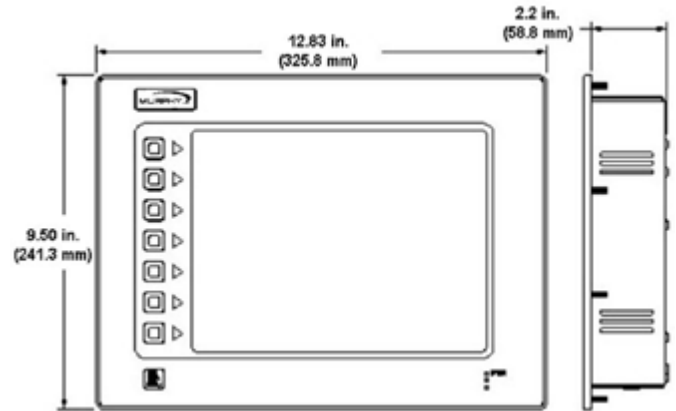
## MV-3-C



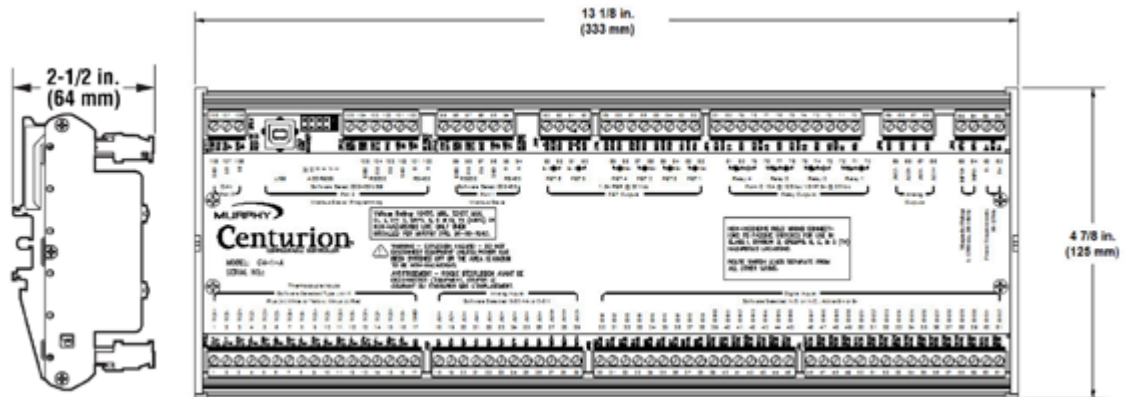
## 6-Inch VGA Touch Screen



## 10-Inch VGA Touch Screen



## CPC4-1-A



## How to Order

Select a Centurion Configurable Controller  
CPC4-1-A

Specify any combination up to three Expansion I/O  
Modules

MX4 MX5-A MX5-A and/or MX5-D

Specify One Display

MV-3-C LCD

6-inch VGA Touch Screen

10-inch VGA Touch Screen

The minimum system requirements:  
CPC4-1-A Main I/O Module  
Display capable of MODBUS communications

The Murphy MV-3-C Display Module is a highly integrated HMI for use with the Centurion system and is recommended for most customers.

Some systems may require additional I/O which is available on the MX4 or MX5-A expansion I/O modules.

Part Number	Model and Description	Notes
Specify Model	CPC4-1-A, Centurion Controller	
	MV-3-C, Monochrome display	
	6-inch VGA touch screen	
	10-inch VGA touch screen	
	MX4 expansion I/O module	
	MX5-A expansion I/O module	
50000774	Ignition noise (choke) filter	
00030866	CPC4-1-A Plug kit	Printed replacement terminal plugs for main I/O module
00030867	MX4 Plug kit	Printed replacement terminal plugs for MX4 expansion I/O module
00030868	MX5 Plug kit	Printed replacement terminal plugs for MX5 expansion I/O module

# Control Systems & Services

With more than 75 years of history, Murphy's Control Systems & Services division has the experience to provide the correct solution for any control system need. We work with clients to quickly identify critical needs and cost-effective solutions in a wide variety of control systems applications, from basic annunciator shut-down panels to complex PLC-based systems.

CS&S takes any project from conception to completion and beyond with 24-hour technical support.

Services include:

- Project Management
- Design and Engineering
- Testing
- Training
- Technical Support



## Project Management: Dedicated to the Details

Our employees have the proven ability to take your project from concept to design to fabrication and field support. We begin the process with the end in mind, utilizing a consultative approach to get a clear picture of your desired end result.

## Design and Engineering: Built Right, Every Time

Consistent design maintains similar look and feel across many different PLC panels. This concept allows production, support staff, customer staff and end users to be familiar with the controls panels even before they see it for the first time.

## Start-Up Assistance: Money Saved, Not Spent

In the oil and gas industry, start ups are critical. Having the right personnel on site can save downtime and money by reducing lost production time. Downtime is expensive and can be minimized by having a PLC Service Engineer provide the technical expertise needed for advanced troubleshooting and on-site control philosophy modifications.

## Troubleshooting: Extensive Knowledge When & Where You Need It

Equipment malfunctions can happen any time, day or night. So we provide 24-hour technical support to help get your equipment back up and running. Our support team is available by phone to answer your questions and assist with troubleshooting.

## Training: Helping Your Team

Our dedicated team of PLC Engineers help your operators feel more comfortable with the systems by spending time with them to go through the PLC as well as basic troubleshooting tips.



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## Section 55 Valves

	<b>Check/Relief Valves — Diesel Fuel</b>	
7867	Diesel Fuel Check Valves — CKV and PRV Series . . . . .	281
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99026	Diesel Fuel Shutoff Valves — SV Series . . . . .	283
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# Diesel Fuel Check Valves

## CKV and PRV Series

Murphy offers two types of diesel fuel line valves: check valves and pressure relief valves.

The **CKV series** check valves are in-line, one-way valves that prevent fuel from being siphoned back into an injector or injection pump which could delay a shutdown.

There are two types of check valves: CKV2336 and CKV1WPS. The CKV2336 has a 1/4 NPT threaded male connection on each end for connecting to fuel line fittings or hoses. The CKV1WPS check valve is typically mounted in the fuel bypass line of the last fuel injector. The CKV1WPS features a hollow bolt connection and a barbed 1/8 NPT connection for flex hose or fitting.

The **PRV series** pressure relief valves relieve overpressure in a fuel system usually caused by closing of a solenoid fuel valve. The PRV50 and PRV70 have a 1/4 NPT threaded connection on each end for connecting to fuel line fittings or hoses.



## Specifications

### Materials

	Body	Seal	Spring
CKV2336	Brass	Poppet	SS
CKV1WPS	Brass	SS	SS
PRV50/PRV70	Brass	SS	SS

**Note:** SS=Stainless steel

### Opening Pressure

CKV2336	4 psi (27)
CKV1WPS	2 psi (14)
PRV50	25 psi (172)
PRV70	70 psi (483)

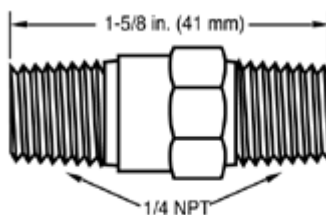
**Note:** metric (kPa) equivalents in parentheses

**Static Pressure (all):** 150 psi (1.03 MPa) maximum

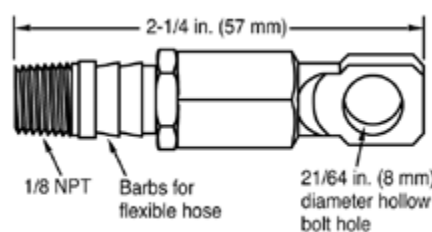
**Weight (all):** 1.3 oz. (40.5 g)

## Dimensions

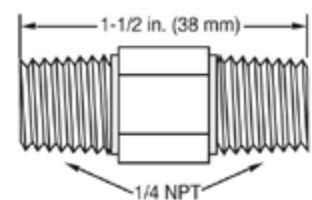
### CKV2336



### CKV1WPS



### PRV50 and PRV70



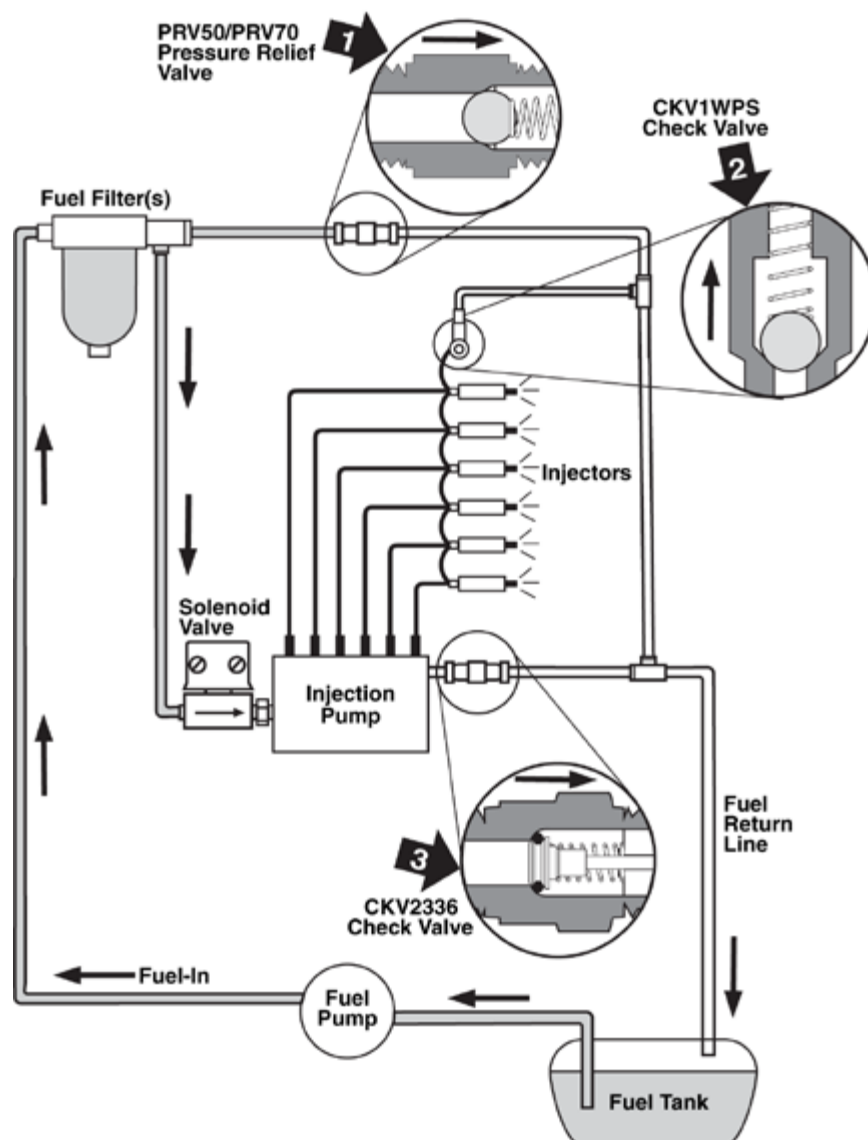
## Basic Operation

Murphy Check Valves and Pressure Relief Valves enhance the operation of diesel engine shut-down valves by reducing the time required for complete engine shutdown after the solenoid valve closes. The diagram at right shows a typical installation using CKV check valves and PRV pressure relief valves.

### All valves are shown closed.

Check Valves close off the fuel return line(s) to prevent fuel or air from re-entering the injection system through the bypass line(s). Models **CKV2336 (3)** is an in-line valve. Model **CKV1WPS (2)** has a 21/64 in. (8 mm) banjo fitting that attaches to the return line of the final injector. All check valves allow fuel to flow away from the injectors but close to prevent fuel from flowing in the reverse direction.

The **PRV50** and **PRV70 (1)** relieve pressure buildup in the fuel system that can cause fuel filter canisters to burst. When the solenoid valve closes to stop the engine, the fuel transfer pump will continue to produce pressure as the engine slows down to stop. This pressure buildup, if not relieved, can cause fuel filter canisters or gaskets to leak. PRVs are installed in the bypass line from the fuel filter(s) to the fuel return line.



## How To Order

Part Number	Description	Notes
Specify Model Number	CKV2336	Valves
	CKV1WPS	
	PRV50	
	PRV70	

**Note:** There are no replacement parts.

# Diesel Fuel Shutoff Valve SV Series

The SV series valve, which is solenoid operated, is a normally closed valve that opens when current is supplied from the battery through a magnetic switch. Temperature, level or pressure Swichgage® instruments installed on the diesel engine and pump or compressor trip the magnetic switch breaking the circuit from the battery which closes the valve and stops the engine.

The SV-12 valve operates on 12-VDC, has a 1/4 NPT inlet and outlet and a full 3/16 in. (5 mm) orifice. A 24-VDC (SV-24) is optional. The SV valves open against 30 psi. (207 kPa) [2.07 bar] inlet pressure.

For a greater flow rate valve, we offer the special series SV valve with a 1/4 in. (6 mm) orifice which opens against maximum pressure of 15 psi (103 kPa) [1.03 bar]. This valve is recommended where greater flow is required and only static head or low transfer pump pressures are encountered.

The Murphy SV-HP series valves open against diesel fuel transfer pump pressure up to 60 psi (414 kPa) [4.14 bar]. Models are available for 12- or 24-volt DC systems. The orifice is 1/4 in. (6 mm) using the same inlet/outlet and options as standard SV.

The SV Series fuel shutoff valve is for use with diesel engines with externally accessible fuel injection pumps. The volume of fuel required for the engine to operate must be able to pass through the 3/16 in. (5 mm) or 1/4 in. (6 mm) orifice of the valve. You must be able to attach the fuel valve directly onto or in close proximity to the fuel injection pump in order to close off fuel flow to the pump.

The SV series is **NOT** intended for use with engines having unit injectors or distributor type injection pumps. Use only with diesel.

## Specifications

**Electrical Rating:** 12- or 24-VDC, 10 watts

**Orifice:** 3/16 in. (5 mm) diameter (optional 1/4 in. [6 mm] diameter). See chart below.

**Body Connections:** 1/4 NPT inlet/outlet

**Maximum Opening Pressure:**

3/16 in. (5 mm) orifice: 30 psi (207 kPa) [2.07 bar]

1/4 in. (6 mm) orifice: 15 psi (103 kPa) [1.03 bar]

**Shipping Weight:** 1 lb. 6 oz. (0.68 kg)

**Shipping Dimension:** 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm)

### SV-HP (High Pressure model)

**Orifice:** 1/4 in. (6 mm) diameter. See chart below.

**Maximum Opening Pressure:** 60 psi (414 kPa) [4.14 bar].

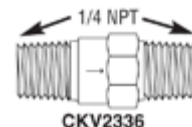
Differential Pressure	3/16 Orifice						1/4 Orifice				
	1	2	5	10	20	30	1	2	5	10	15
Gallons per Minute	.48	.68	1.1	1.5	2.2	2.6	.72	1.05	1.65	2.35	2.70
Liters per Minute	2.01	2.85	4.62	6.3	9.24	10.92	3.02	4.41	6.93	9.87	11.34



## Auxiliary Fuel Valves

### Fuel Return Line Check Valve

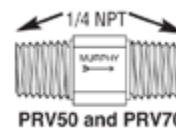
The CKV series is an in-line, one-way valve for the prevention of fuel siphoning from the diesel return line by an injection pump. In engine shutdown



systems using a Murphy SV valve, the CKV is necessary to ensure a rapid shutdown of the engine by fuel starvation of the injection system. For details see bulletin 7867.

### Fuel Line Pressure Relief Valve

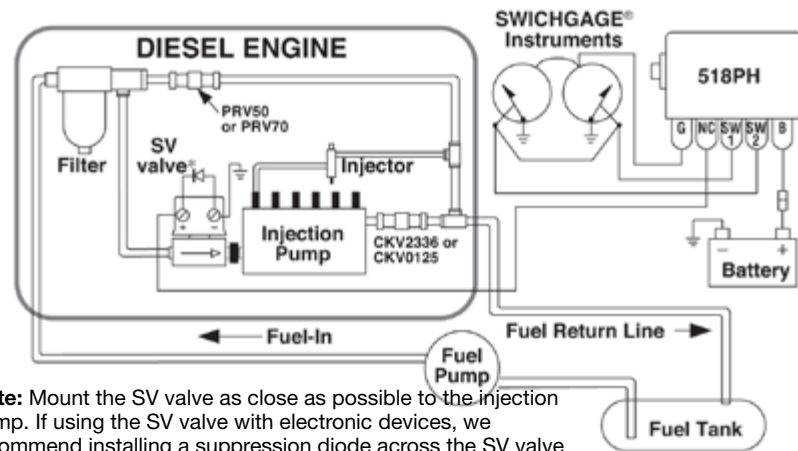
The PRV50 is an in-line, one-way valve for the prevention of overpressure damage to fuel filters and their housings. This pressure relief valve operates in conjunction with a Murphy SV series shutdown valve. After the SV closes, a rapid high pressure build-up caused by the fuel pump can occur. The PRV, mounted in a fuel return line after the filter, will open to relieve pressure buildup.



## Typical SV Valve Installation

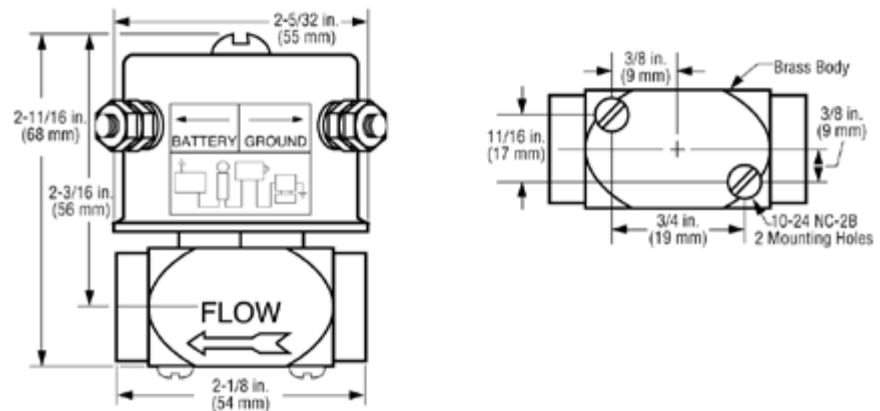
### Installation and Service Suggestions

1. Make sure the valve is the same voltage as the battery. Under continuous duty, the coil will normally be hot; however, incorrect voltage can cause smoking and burned coils.
2. The valve will not operate if the flow arrow on the side of the valve does not indicate the correct direction of flow.
3. Do not apply pipe dope to female valve threads. Dope inside the valve will foul the seat and prevent proper seal.
4. Install the valve as close as possible to the injection pump.



**Note:** Mount the SV valve as close as possible to the injection pump. If using the SV valve with electronic devices, we recommend installing a suppression diode across the SV valve coil.

### Dimensions



### Troubleshooting the SV Series Valves

**Check Control Circuit:** To determine if the electrical system is energizing the solenoid, listen for a metallic click signifying the solenoid is operating. Absence of the click indicates loss of power supply. Check for blown or loose fuses, for an open circuit or a grounded coil, for broken lead wires or open splice connections.

**Coil Burnout:** Check for open-circuit coil. Replace coil if necessary.

**High or Low Voltage:** Check voltage across the coil with a voltmeter. Voltage must be in 85 percent to 110 percent of nameplate rating.

**Incorrect Pressure:** Check fuel line pressure. Pressure on the valve must be within the specific range of the SV in use.

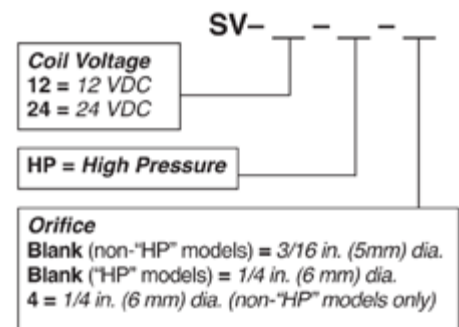
**Fuel Leak Through Valve:** Disassemble the valve and clean parts. Replace any parts that are worn or damaged (see How To Order for repair parts).

**Slow Shutdown:** Due to the internal fuel capacity of some injection pumps, engine shutdown will not occur until that fuel is used up

**Note:** If engine continues to run after the valve closes, install a check valve such as CKV2336 in the return line.

### How To Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
80-04-1412	Screw	Repair Parts
55010141	Coil Replacement 12-volt kit	
55010145	Coil Replacement 24-volt kit	
55010155	Core Repair Kit (Std. model)	
55010156	Core Repair Kit (HP model)	
55050194	Valve Body: 3/16 Orifice 1/4 NPT x 1/4 NPT (std.)	
55050193	Valve Body: 1/4 Orifice 1/4 NPT x 1/4 NPT	



# Electromechanical Fuel Shutoff Valves

## M25 & M50 Series

These fuel shutoff valves are semi-automatic devices for shutdown of natural gas-fueled engines. The valve is opened manually and closes when the electromagnet is energized and trips the latch. The valve can be closed manually by turning the disconnect knob. A normally energized model is available that holds the valve open electrically and closes when the coil is de-energized. A vent in the valve body relieves trapped gas when the valve closes. A pop-out indicator button informs you when the valve is open or closed.

The valve's tripping power is provided by an engine ignition system or battery. Models are available for magneto, CD ignition or 12-/24-V battery.

The **M2582** is a 1-inch (25 mm) valve with one NPT connection. It has one SPDT snap-switch. The valve body is made of sandcast aluminum. It does not include the open/close indicator button.

The **M5081** is a 2-inch (51 mm) valve with two NPT connections. It has two SPDT snap-switches. The valve body is available in sandcast aluminum or cast steel (optional).

The **M5081FS** is the same as the M5081 but has a normally energized circuit. This circuit allows the valve to be held open electrically and close by interruption of the coil's power circuit. A manual trip knob is not available on this model. An optional 2-inch (51 mm) steel flange pipe connection is available for M5081 and M5081FS steel body models (see Dimensions).

### Options & Accessories

#### Diode Package (65010065)

The Murphy 202 V diode package is designed to allow the fuel shutoff valve to be used with dual Magneto Ignition systems. Sold separately (see How to Order).

#### Magnetic Switch Adapter

As ignition systems wear from usage, their power output becomes less and less. Ignition may not have the capacity to reliably trip the fuel valve. Therefore, the use of a Magnetic Switch Adapter for CD ignition systems is recommended. The adapter stores energy from the CD ignition to trip the fuel valve.

Two models are available:

**65700053 (65020126):**

For Negative Ground CD Ignitions up to 240 VDC

**65700055 (65020155):**

For Negative Ground CD Ignitions 240 VDC to 450 VDC



### Specifications

**Valve Body:** Sandcast aluminum, painted red (corrosion resistance). Optional cast steel available for M5081 and M5081FS models only.

**Valve Seat:** Buna-N

**Maximum Pressure Rating:**

- M2582: 80 psig (552 kPa) [5.52 bar]
- M5081: 100 psig (689 kPa) [6.89 bar]
- M5081FS: 100 psig (689 kPa) [6.89 bar]

**Coil Rating:** Intermittent duty; coil type must match power source;

- CD ignition coil resistance: 72  $\Omega$
- CD primary voltage current: 1.38 to 3.8 A

• M5081FS model: Energized to run (continuous-duty coil) coil resistance:

- 12 Volt model: 33  $\Omega$  (0.36 A)
- 24 Volt model: 136  $\Omega$  (0.17 A)

- Magneto ignition coil resistance: 0.5  $\Omega$
- Magneto primary voltage current: 1 to 5 A
- Battery coil resistance: 7  $\Omega$
- 12 or 24 VDC: 1.2 to 2.4 A

**Wiring (See Internal Wiring):**

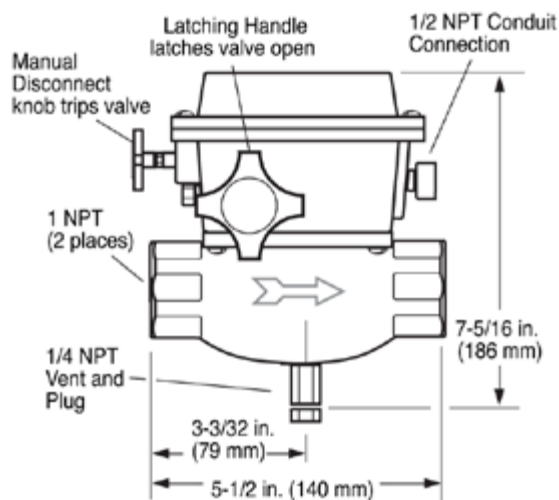
- M2582: Wire leads
- M5081 and M5081FS: Terminal blocks

**Snap-switch Rating:** 5 A @ 480 VAC

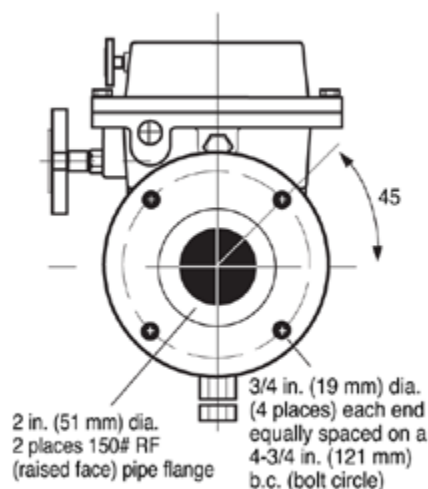
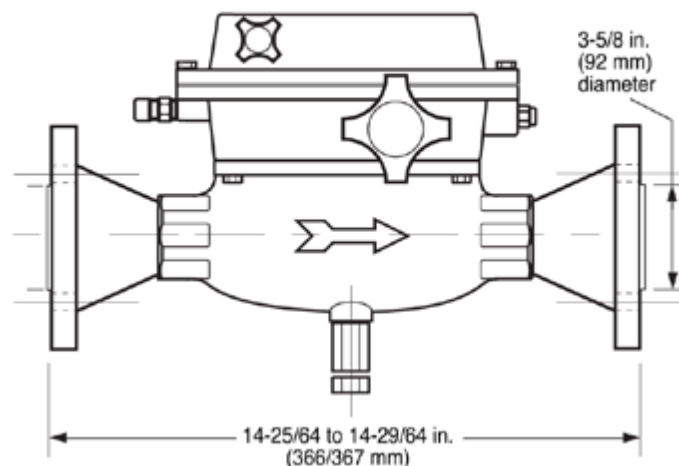
**Laboratory Approval:** CSA listed for Class I, Groups C and D Hazardous Locations. 5 amps maximum; intermittent duty; models M5081 and M5081-CD engine ignition powered and model M5081-B, 12 or 24 VAC or VDC; switch contacts rated 5 A @ 480 VAC maximum

## Dimensions

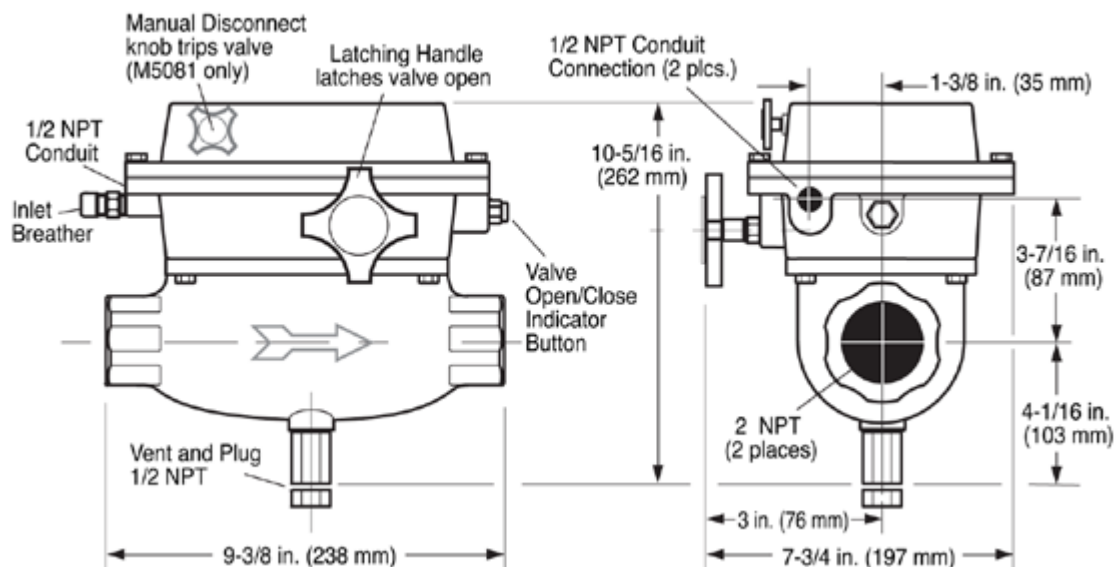
### M2582



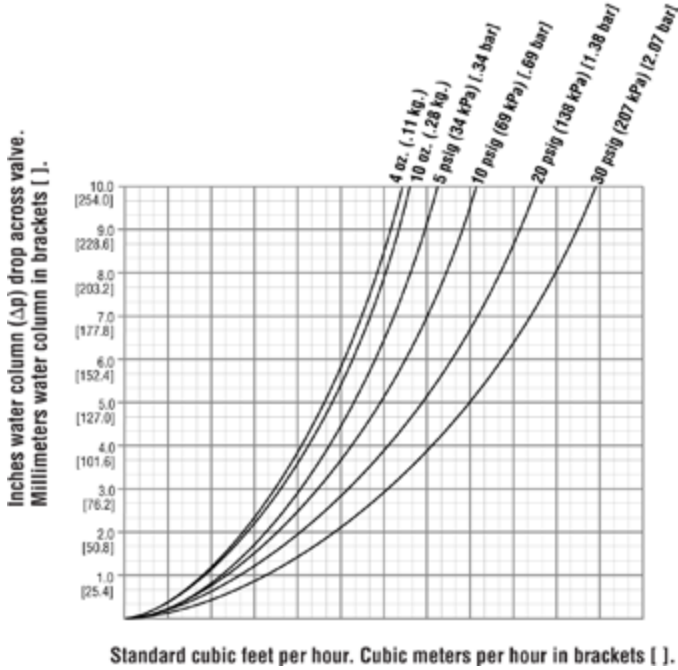
### Steel Flanged Option 3 (available on M5081FS and M5081FS steel body configurations only)



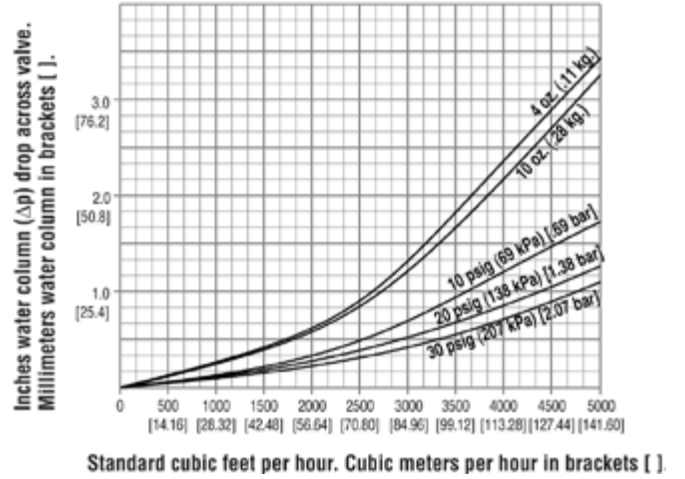
### M5081 & M5081FS



M2582

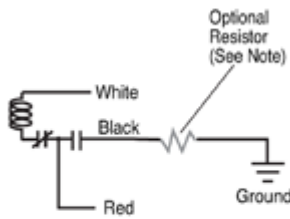


M5081 & M5081FS

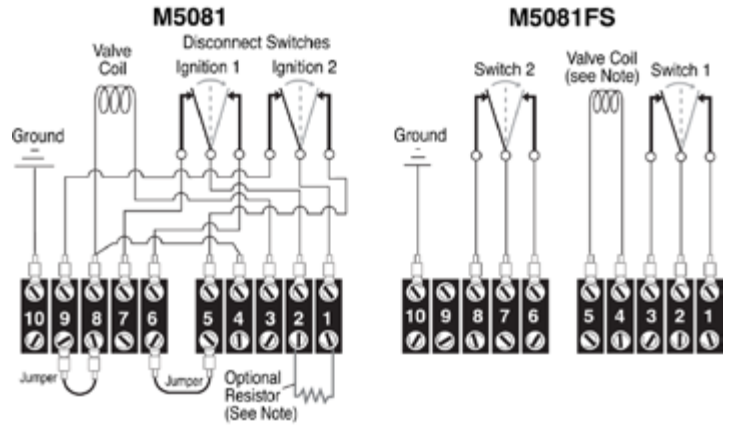


Internal Wiring

M2582



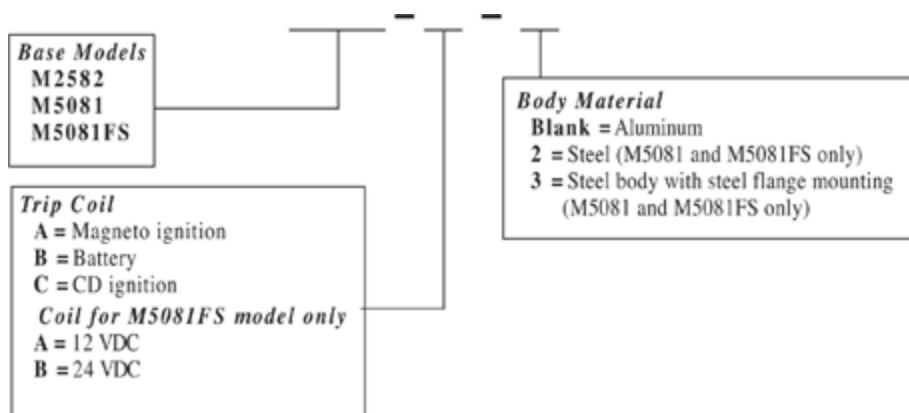
M5081 & M5081FS



» **NOTE:** For grounding the ignition (CD models only) through the fuel valve's internal snap-switch, a Murphy Magnetic Switch adapter (see How To Order) must be used in addition to a 100 ohm, 2 watt resistor.

## How to Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number			Description	Notes
65700053			Magnetic Switch Adapter (for M2582 and M5081)	For Negative Ground CD Ignitions up to 240 VDC
65700055				For Negative Ground CD Ignitions 240 VDC to 450 VDC
M2582	M5081	M5081FS	Service Parts	Notes
55000128	55000126	-----	Battery	Coil Assembly
55000129	55000127	-----	CD Ignition	
55000094	55000080	-----	Magneto Ignition	
-----	-----	55000158	12 VDC	FS Coil Assembly
-----	-----	55000159	24 VDC	
55000095	55000074	-----	Latch Block Assembly	Latch Block Assembly
55000144	-----	-----	Latch Block Switch and Coil Assembly	
-----	55000118	-----	Latch Block Switch and Mounting Bracket Assembly	
-----	55000102	55000102	Handle & Latch Kit	
55000096	-----	-----	Handle Kit	
55000097	55000137	-----	Manual Disconnect Assembly	
55000098	55000072	55000160	Snap-Switch Assembly	
-----	55000138	55000138	Close/Open Indicator Assembly	
55000093	55000075	55000135	Stem & Seat Kit	
55000146	55000131	55000161 (12V) 55000194 (24V)	Top Works Complete Valve Less Body and Vent	
55000143	55000132	55000132	Vent Bushing Assembly	
-----	65010065	-----	Diode Package for Dual Magneto Ignitions	

## Shipping Information

### Shipping Weights:

- M2582: 5 lbs 8 oz. (2.49 kg)
- M5081: 14 lbs 8 oz. (6.58 kg)
- M5081-2: 40 lbs (18.14 kg)
- M5081-3: 56 lbs (25.40 kg)
- M5081FS: 14 lbs 8 oz. (6.58 kg)
- M5081FS-2: 40 lbs (18.14 kg)
- M5081FS-3: 56 lbs (25.40 kg)

### Shipping Dimensions:

- M2582: 8 x 8 x 7 in. (203 x 203 x 178 mm)
- M5081: 12 x 12 x 9-5/16 in. (305 x 305 x 237 mm)
- M5081-2: 12 x 12 x 9-5/16 in. (305 x 305 x 237 mm)
- M5081-3: 18 x 12 x 13-1/2 in. (457 x 305 x 343 mm)
- M5081FS: 12 x 12 x 9-5/16 in. (305 x 305 x 237 mm)
- M5081FS-2: 12 x 12 x 9-5/16 in. (305 x 305 x 237 mm)
- M5081FS-3: 18 x 12 x 13-1/2 in. (457 x 305 x 343 mm)

# Pneumatic Valves for Fuel Gas Shutoff

## Models M2582-P and M5180-P

The MS582-P and M5180-P are pneumatically controlled fuel shutoff valves that open and close automatically or semi-automatically. The pneumatic control pressure can be air, oil or gas. A manual lever aids in opening the valve when control pressure is insufficient. A gas escape vent, when properly vented and maintained, releases trapped gas from the valve after shutoff. Basic operation is:

**Automatic:** As the control pressure/vacuum increase the valve will open. When the control pressure/vacuum decreases, the valve will close.

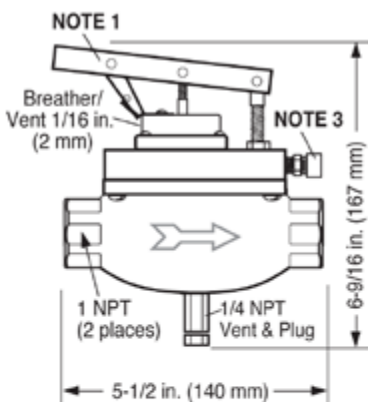
**Semi-Automatic:** If the control pressure/vacuum is too low and the valve does not open automatically, it can be opened manually by lifting the built-in lever arm and setting the latch. The latch resets automatically when control pressure rises enough to release it.

M2582-P is for 1-inch (25 mm) gas lines. It automatically opens at 5 psi (35kPa) [0.34 bar] and fully opens the seat at 15 psi (103 kPa) [1.02 bar]. The valve can be manually opened with the lever and latch against inlet pressure of 80 psi (552 kPa) [5.52 bar]. The latch will release after pilot pressure reaches 11 psi (17kPa) [.17 bar].

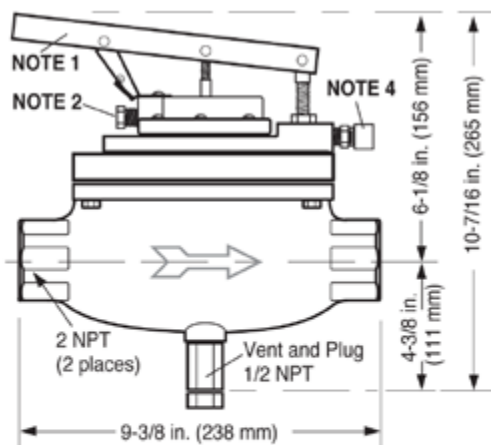
M5180-P is for 2-inch (52 mm) gas lines. It automatically opens at 5 psi (35kPa) [0.34 bar] and fully opens the seat at 15 psi (21 kPa) [.21 bar]. The valve can be manually opened with the lever and latch against inlet pressure of 100 psi (689 kPa) [6.89 bar]. The latch will release after pilot pressure reaches 11 psi (17kPa) [.17 bar].

## Dimensions

**M2582-P**



**M5180-P**



**NOTE 1:** Thumb operated opening latch (2.5 psi [17 kPa] [0.17 bar] required to release cocking latch)

**NOTE 2:** Control pressure fitting and breather vent fitting can be swapped to convert to vacuum control.

**NOTE 3:** 1/4 in. (6 mm) connection; control pressure 15psi (103kPa) [0.21 bar] minimum, 75 psi (517 kPa) [5.17 bar] maximum.

**NOTE 4:** 1/4 in. (6 mm) connection; control pressure 15psi (103kPa) [0.21 bar] minimum, 80 psi (552 kPa) [5.52 bar] maximum (see NOTE 2 to convert to vacuum control).

From	5 PSI	35 kPa	0.34 bar
55020131 (M25)	15 PSI	103 kPa	1.02 bar
55020114 (M50)	11 PSI	76 kPa	0.75 bar



## Specifications

**Valve body:** Sandcast aluminum (alodined for corrosion resistance). Optional steel body available on M5180-P models only.

**Valve seat:** Buna-N

**Valve Inlet Pressure (maximum):**

M2582-P: 80 psi (552 kPa) [5.52 bar]

M5180-P: 100 psi (689 kPa) [6.89 bar]

**Parts exposed to gas line flow:**

M2582-P:

- Aluminum
  - Buna-N
  - 302, 303 and 17-7 PH stainless steel
- M5180P:
- Aluminum (steel optional)
  - Buna-N
  - 302, 303, 304 and 416 stainless steel

**Control diaphragm:** Flexweave polyester fabric and Buna-N elastomer

**Control pressure (maximum):**

M2582-P: 75 psi (517 kPa) [2.55 bar]

M5180-P: 80 psi (552 kPa) [5.52 bar]

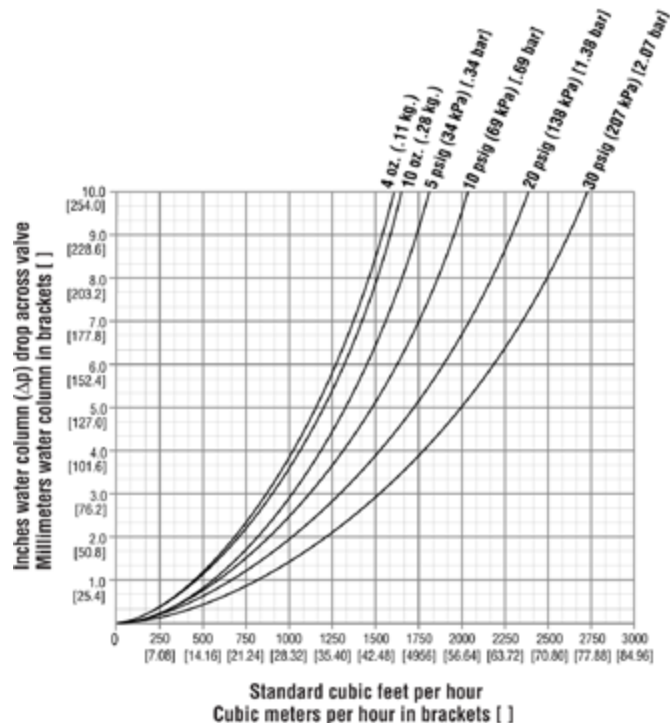
**Shipping Weights:**

M2582-P: 5 lbs 10 oz (2.55 kg)

M5180-P: 14 lbs 9 oz (6.61 kg)

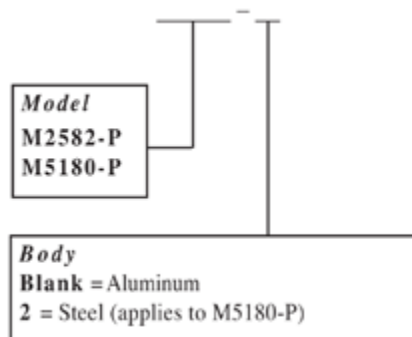
With steel body option: 25 lbs (11.34 kg)





## How To Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
55000148	Handle & Latch Kit	M258-P Service Parts
55000147	Stem & Seat Kit	
55000150	Top Works Complete Valve Less Body & Vent	
55000143	Vent Bushing Assembly	
55000184	Diaphragm Assembly	
0007908	Pilot Diaphragm	M5180-P Service Parts
55000154	Handle & Latch Kit	
55000135	Steam & Seat Kit	
55000155	Top Works Complete Valve Less Body & Vent	
55000132	Vent Bushing Assembly	
55000153	Diaphragm Assembly	
55050420	Pilot Diaphragm	



# Pulsation Dampener

## PD8100 Series

The PD8100 Series eliminates pointer flutter on pressure indicating Swichgage® devices which are subject to pulsating pressure from reciprocating pumps or compressors. It also allows a close setting of high and low contact points providing for more accurate pressure indication and control of equipment.

The PD8100 Series decreases wear on geared movements and increases the life of pressure indicating instruments by eliminating excessive gage strain and unnecessary movement, a necessity which quickly pays for itself by protecting any pressure indicating and control instrument which is subject to pulsation.

**PD8100 SERIES IS NOT FOR USE ON OXYGEN OR LIQUID OXYGEN APPLICATIONS.**

The PD8100 is quality built with a large diameter valve stem wheel for ease of adjustment and features clearly printed operating instructions.

Machined from 1 3/8-inch (35 mm) hex bar stock, a two degree taper on the valve and stem assure positive dampening.

It's available in brass, carbon steel, 303 stainless steel or 316 stainless steel to meet pressure and environmental requirements with either 1/2 NPT or 1/4 NPT inlet connections.

## Specifications

**See How to Order section for available inlet and outlet connections.**

**PD8183:** All wetted parts are brass. Rated to 3000 psi (20.68 MPa) [206.80 bar]

**PD8184:** All wetted parts are carbon steel. Rated to 5000 psi (34.47 MPa) [344.70 bar]

**PD8185:** All wetted parts are 303 stainless steel. Rated to 10000 psi (68.95 MPa) [689.50 bar]

**PD8190:** All wetted parts are 316 stainless steel. Rated to 10000 psi (68.95 MPa) [689.50 bar]. Meets NACE standard MR- 01-75 for direct exposure to H<sub>2</sub>S.

**Operating Temperature:** -15° to 400°F (-26° to 204°C)

**Shipping Weight (all models):** 2 lbs. (0.9 kg)

**Shipping Dimensions (all models):** 4 3/4 x 4 3/4 x 3 1/4 in. (121 x 121 x 83 mm)

## Murphymatic® Compressor Panel

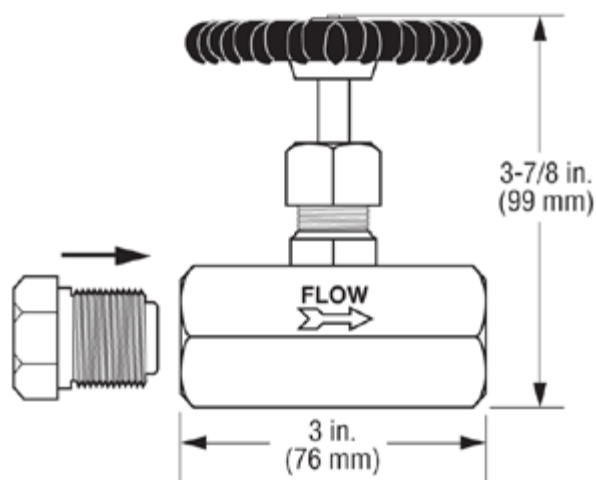
Shown at right is a typical Murphymatic compressor panel featuring three Pulsation Dampeners and Murphy OPLFC gages.

The PDs are recommended for use on piston pumps and compressors to eliminate pointer contact flutter and gage wear.



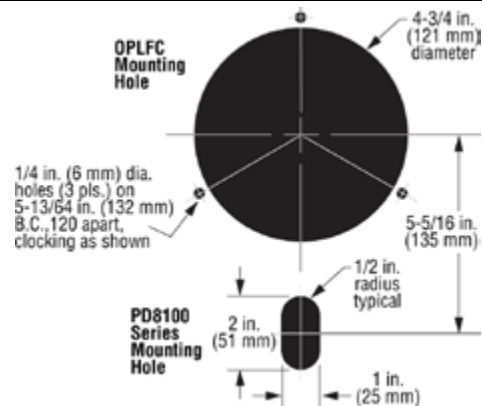
**NOT INTENDED FOR USE AS A SHUTOFF VALVE**

## Dimensions



Mounting

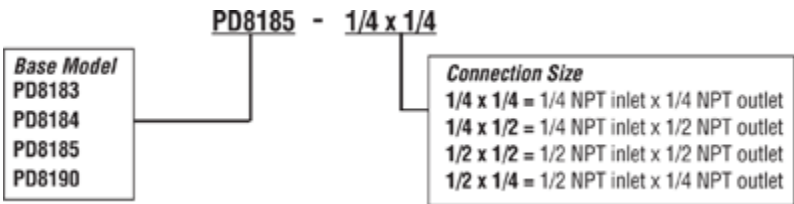
The PD8100 Series Pulsation Dampener is mounted directly below the OPLFS Pressure Switchgauge.



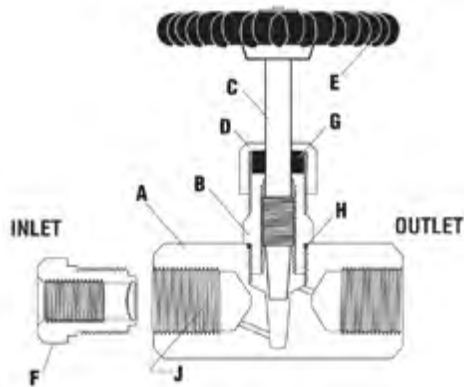
Precautions: Dope or use Teflon tape on connection threads. Do not block the inlet orifice.

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number				Description	Notes
PD8183	PD8184	PD8185	PD8190		
65050104	65050210	65050204	65051136	A. 1/2 NPT inlet x 1/4 NPT outlet*	Service Parts See Drawing Below
65050105	65050212	65050206	65051135	A. 1/2 NPT x 1/2 NPT outlet*	
65050099	65050209	65050203	65051139	B. Bonnet Fitting	
65050175	65050208	65050202	65051140	C. Valve Stem	
65050098	65050211	65050205	65051137	D. Packing Nut	
55000179	55000179	55000179	55000179	E. Hand Wheel (with 10-32 nut)	
55000174	55000173	55000175	55000206	F. Strainer Bushing Assembly†	
00000936	00000936	00000936	00000936	G. Molded Packing Gland	
00000302	00000302	00000302	00000302	H. O Ring Bonnet Seal	
65050214	65050214	65050214	65050214	J. Stainless Mesh Filter**	



\*For 1/4 NPT inlet use with strainer bushing assembly

†Provided only for units with 1/4 NPT inlet

\*\*Provided in units with 1/2 NPT inlet.

## Section 70 Electric Gauges

	<b>Electric Gages</b>	
95090	EG Series — Electric Gage and Swichgage® Instrument. . . . .	295
1411607	Pressure Senders. . . . .	297
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0910469	Four Function Tattletale® Annunciator — EN204 Series . . . . .	305
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# EG Series

## Electric Gage & Swichgage® Instrument

The EGS21 Series Swichgage instrument has all of the features of the EG21 Series Gage plus an adjustable set point Power Hall Effect switch output for operating alarms or equipment shutdown. The trip point is adjustable over 90 percent of the scale and has a set point indicator visible from the gage face. Now you can have both the ease of electric gage installation and the reliable switching of Murphy's famous Swichgage instrument.

Features of the EG Series include:

- EG Air Core Movement design
- Technological improvements in lighting, accuracy in reading and wiring installation
- Environmentally sealed design
- Exceeds the rigid SAE J1810 standard
- Corrosion-resistant materials
- Desirable for marine and other environmentally sensitive applications
- Soft, non-glare dial and pointer illumination by cold light LED

### Specifications

**Power Input:** For Gage, Swichgage instrument and sender, 12 VDC or 24 VDC

**NOTE:** EG21 Series gage and EGS21 Series Swichgage instrument **MOVEMENT** and **ILLUMINATION** require 12 VDC to function. For 24-volt systems, voltage converters are built into the electrical wire/connector assembly and supplied with instrument. Specify voltage when ordering.

**Case:** Polyester (PBT), impact and weather resistant with convenient screw-on mounting clamp

**Bezel:** Polished 316 stainless steel bezel is supplied as standard; Available in black. SAE style optional.

**Lens:** Clear polycarbonate and UV stabilized

**Air Core Movement:** Silicon dampened pointer

**Dial:** Black background and white markings; behind dial lighting (white marking becomes red when illuminated); dual scale with mirror band to reduce parallax reading errors

**Swichgage Instrument Sensor:** Outputs ground signal (sinking output) rated 300 mA continuous (EGS21 Series only). Pressure, fuel, volts set on decreasing scale. Temperature and amps set on increasing scale.

**Output saturation voltage (voltage drop across switch):**

1.3-2.3 Volts @ 77°F (25°C) (May require some conditioning to work with logic inputs)

**Swichgage Instrument Set Point Indicator:** Visible on mirror band (scale); adjustable from the back of the unit (1/16 in. hex type wrench)

**Wiring:** Plug connector with wire leads, 18 AWG (1.0 mm<sup>2</sup>) x 8 in. (203 mm) length

**Operating Temperature:** -40° to 185°F (-40° to 85°C)

**Storage Temperature:** -77° to 185°F (-60° to 85°C)

**Over Voltage (Gage Movement):** Withstands a voltage of 200% of nominal system voltage for 5 minutes. (Meets SAE J1810 standards)

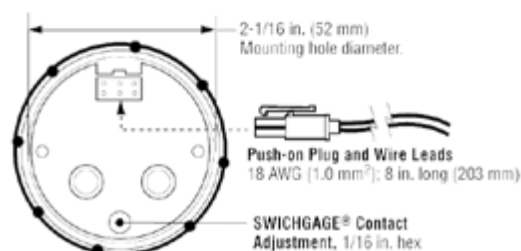
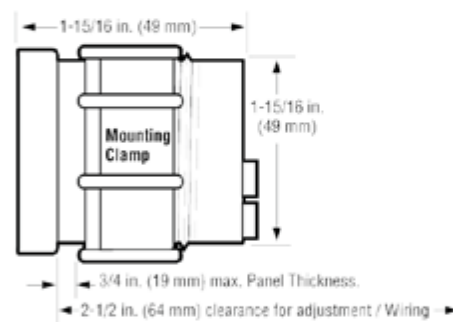
**Reversed Polarity (Gage Movement):** Withstands reversed battery terminal polarity indefinitely within operating temperatures

**Environment and Test:** Meets SAE J1810 standards








### Dimensions

SWICHGAGE® Adjustable Contact Indicator  
Reflective Mirror Band



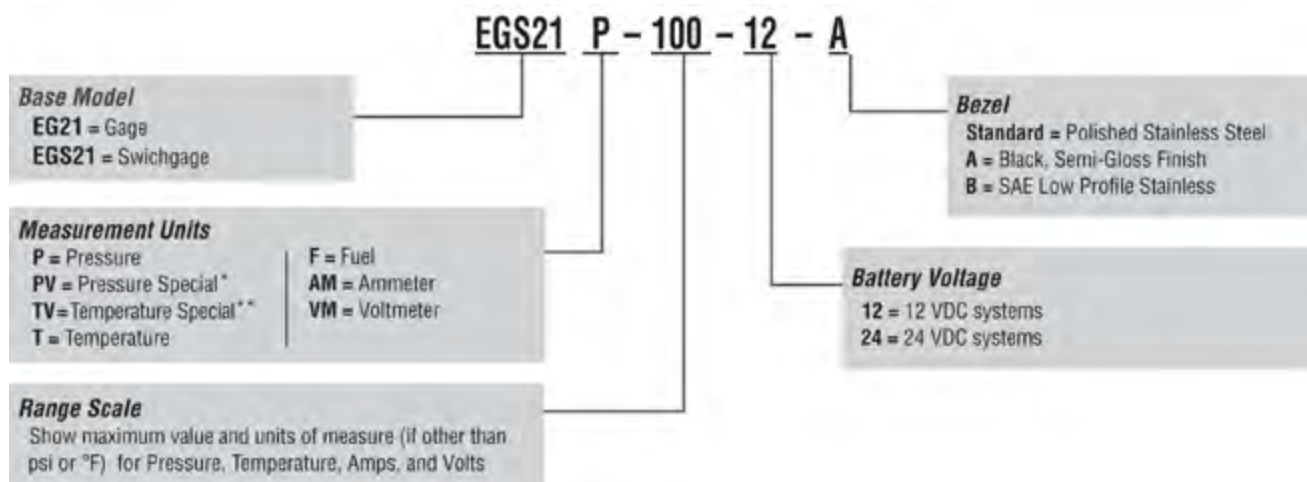
## Gage Ranges

	Pressure	80 psi	552 kPa	5.52 bar
		100 psi	689 kPa	6.89 bar
		200 psi	1.38 MPa	13.80 bar
		300 psi	2.07 MPa	20.70 bar
		400 psi	2.76 MPa	27.60 bar
	Temperature	250° F	121° C	
		300° F	149° C	
	Fuel Level	Empty — 1/4 — 1/2 — 3/4 — Full		
	Ammeter	60 — 0 — 60 amps (internal shunt)		
	Voltmeter	12 VDC: 8-18 Volts		
		24 VDC: 16-36 Volts		

## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

### EG Series Gage and Switchgage Instrument



**NOTE:** EG21 and EGS21 are designed for use with 12-volt systems. For 24-volt systems, voltage reducing resistors are included in the wire/connector assembly. No designator required for Standard configurations.

\* The **EG21PV-80-12** or **24** is designed to read senders with a resistance curve of 9.5 to 182 Ohms, which are commonly supplied as standard senders on Deutz and VW engines.

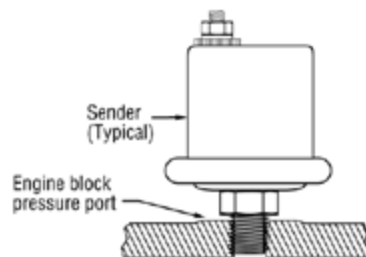
\*\*The **EG21TV-300-12** or **24** is designed to read senders with a resistance of 240 to 18 Ohms, which are commonly supplied as standard senders on Deutz and VW engines.



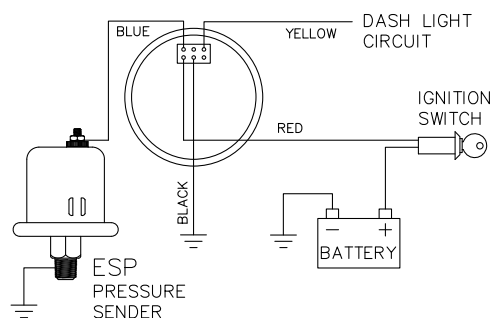
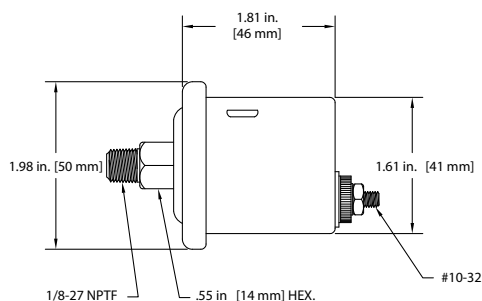
# Pressure Senders

These Gage Pressure Senders are designed to be used in conjunction with our EG Series Switchgauge Instruments as well as CAN I/O modules. See the bulletin 95090 EG Series – Electric Gage and Switchgauge Instrument for more information.

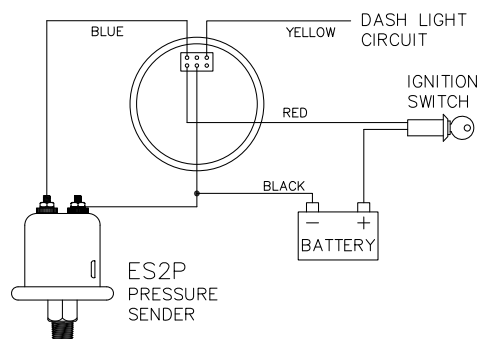
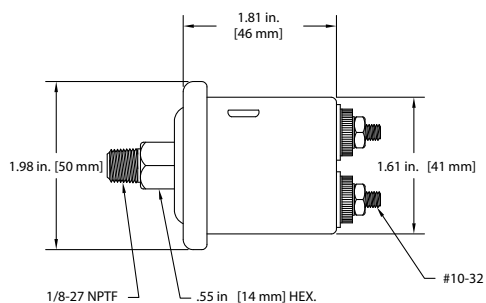
**NOTE:** Always provide proper circuit protection with fuses or circuit breakers.



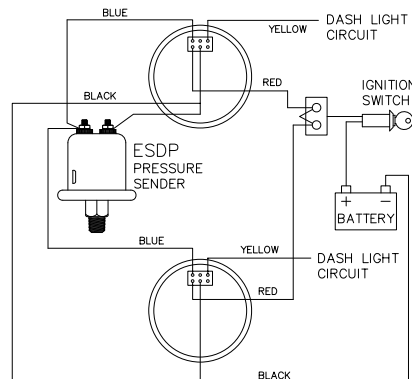
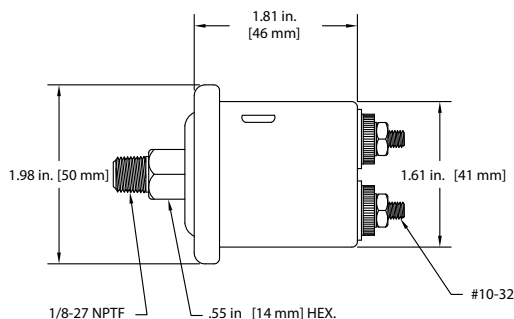
## Model ESP Series



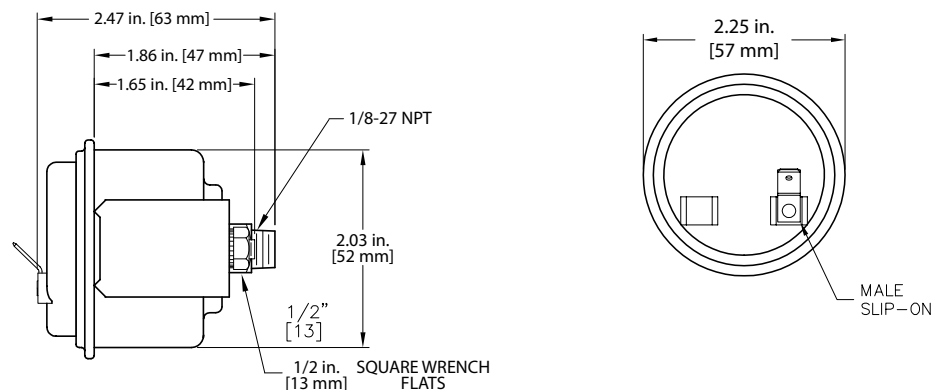
## Model ES2P Series



## Model ESDP Series



## Model ESPM and ESPMK Series



## Resistance Values

### ESP-80, ES2P-80 Senders:

0 PSI = 240 ohms (falling pressure)  
 20 PSI = 153 ohms (falling pressure) (primary calibration point)  
 40 PSI around 100 ohms (falling pressure)  
 60 PSI = 67 ohms (falling pressure) (secondary calibration point)  
 80 PSI = 33 ohms (rising pressure)

### ESP-100, ES2P-100 Senders:

0 PSI = 240 ohms (falling pressure)  
 25 PSI = 153 ohms (falling pressure) (primary calibration point)  
 50 PSI around 100 ohms (falling pressure)  
 75 PSI = 67 ohms (falling pressure) (secondary calibration point)  
 100 PSI = 33 ohms (rising pressure)

### ESPM-200, ES2PM-200 Senders:

0 PSI = 240 ohms (falling pressure)  
 50 PSI = 153 ohms (falling pressure) (primary calibration point)  
 100 PSI around 100 ohms (falling pressure)  
 150 PSI = 67 ohms (falling pressure) (secondary calibration point)  
 200 PSI = 33 ohms (rising pressure)

### ESPM-300, ES2PM-300 Senders:

0 PSI = 240 ohms (falling pressure)  
 75 PSI = 153 ohms (falling pressure) (primary calibration point)  
 150 PSI around 100 ohms (falling pressure)  
 225 PSI = 67 ohms (falling pressure) (secondary calibration point)  
 300 PSI = 33 ohms (rising pressure)

### ESPMK-400, ES2PMK-400 Senders:

0 PSI = 240 ohms (falling pressure)  
 100 PSI = 153 ohms (falling pressure) (primary calibration point)  
 200 PSI around 100 ohms (falling pressure)  
 300 PSI = 67 ohms (falling pressure) (secondary calibration point)  
 400 PSI = 33 ohms (rising pressure)

## Resistance Table for Pressure Sender

The voltage generated when excited by a 10mA DC constant current

PSI	0	10	20	30	40	50	60	70	80	90	100
R(Ohm)	240	205	171	143	123	103	88	74	60	47	33
V (mV)	2.40V	2.05V	1.71V	1.43V	1.23V	1.03V	(880)	(740)	(600)	(470)	(330)

## How to Order

Part Number	Model and Description	Notes: Available Ranges
05701860	ESP-80: 1-wire-to-ground Pressure sender	0-80 psi (0-500 kPa)
05701867	ES2P-80: 2-wire ungrounded Pressure sender	
05701857	ESP-100: 1-wire-to-ground Pressure sender	0-100 psi (0-700 kPa)
05701858	ES2P-100: 2-wire ungrounded Pressure sender	
05701859	ESDP-100: Dual Gage, 2-wire ungrounded Pressure sender	
05701753	ESPM-200: 1-wire-to-ground Pressure sender †	0-200 psi (0-1380 kPa)
05701748	ES2PM-200: 2-wire ungrounded Pressure sender †	
05701751	ESPM-300: 1-wire-to-ground Pressure sender †	0-300 psi (0-2070 kPa)
05701750	ES2PM-300: 2-wire ungrounded Pressure sender †	
05702566	ESPMK-400: 1-wire-to-ground Pressure sender †	0-400 psi (0-2760 kPa)
05702565	ES2PMK-400: 2-wire ungrounded Pressure sender †	

† Mounting off-equipment recommended.

NOTE: The ESPMK-400 & ES2PMK-400 are not recommended for use with digital I/O modules – use PXT-K pressure transmitter.

# Temperature Senders

These Temperature Senders are designed to be used in conjunction with our EG Series Switchgauge Instruments as well as CAN I/O modules. See the bulletin 95090 EG Series – Electric Gage and Switchgauge Instrument for more information.

**NOTE:** Always provide proper circuit protection with fuses or circuit breakers.

## Specifications

**Housing Material:** Brass

**Temperature Range:**

100°-250°F (40°-120°C) or 140°-300°F (60°-150°C)

## Resistance Values

### EST-250/300, ES2T-250/300 Senders:

100 F = 1050 ohms (rising temperature)

150 F = around 330 ohms (rising temperature)

180 F = 174 ohms (rising temperature) (secondary calibration point)

210 F = 100 ohms (rising temperature) (primary calibration point)

250 F = 54 ohms (rising temperature)

### EST-250/300, ES2T-250/300 Senders:

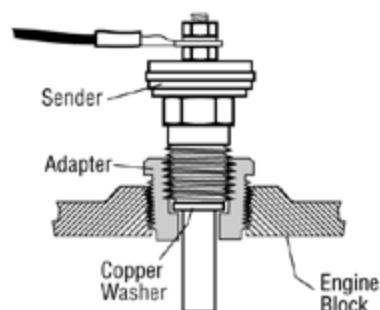
140 F = 410 ohms (rising temperature)

180 F = 176 ohms (rising temperature)

210 F = 100 ohms (rising temperature) (secondary calibration point)

240 F = 63 ohms (rising temperature) (primary calibration point)

300 F = 26 ohms (rising temperature)



## Resistance Table for Temperature Sender

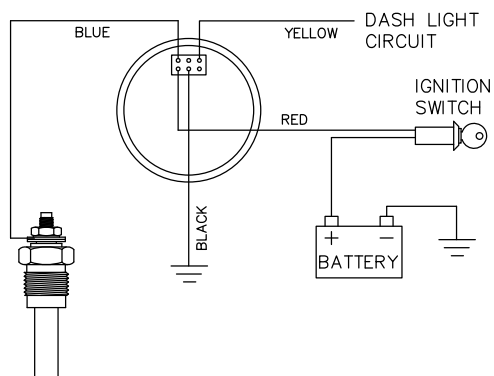
The voltage generated when excited by a 2.5mA DC constant current

°C	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
R(Ohm)	7208	4115	2529	1594	1029	680	460	321	227	164	120	89	74	52	40
V (mV)	18.0V	10.3V	6.32V	3.98V	2.57V	1.70V	1.15V	(0.80)	(0.57)	(0.41)	(300)	(222)	(185)	(130)	(100)

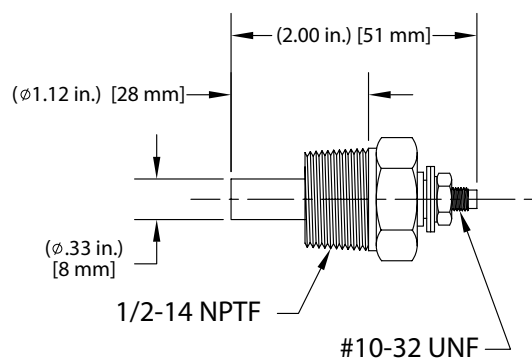
Resistive Range Table (Nominal OHMS)							
100-250°F		40-120°C		140-300°F		60-150°C	
Temp.	OHMS	Temp.	OHMS	Temp.	OHMS	Temp.	OHMS
100	1050	40	1050	140	410	60	410
150	330	60	410	180	176	80	189
180	176	80	193	210	100	100	97
210	103	100	100	240	63	120	55
250	54	120	55	300	26	150	25

## Model EST Series

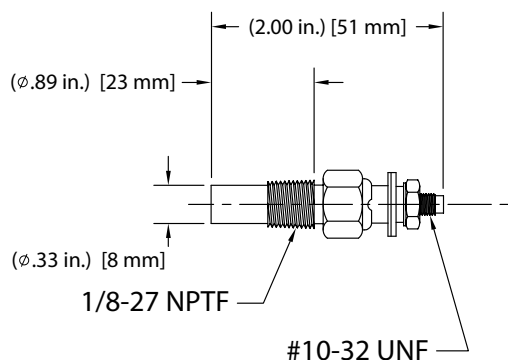
### EST Wiring



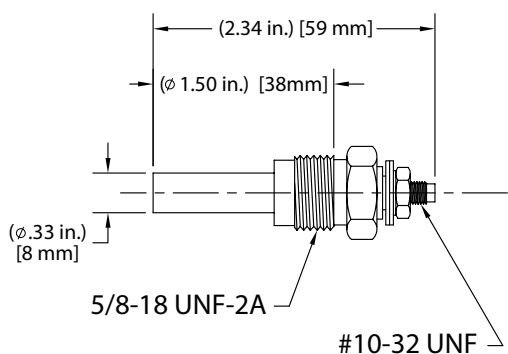
### EST 250/300 1/2-14 NPT



### EST 250/300 1/8-27 NPT

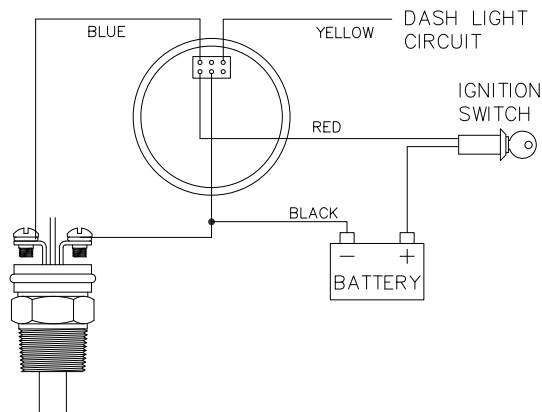


### EST 250/300-X 5/8-18 UNF

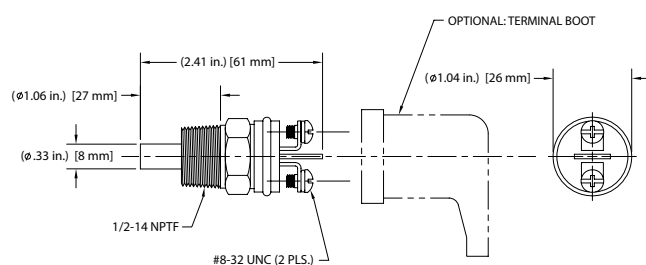


## Model ES2T Series

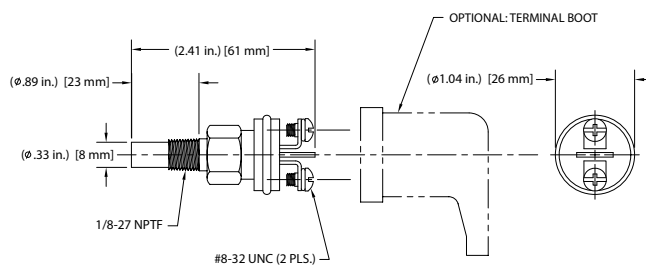
### ES2T Wiring



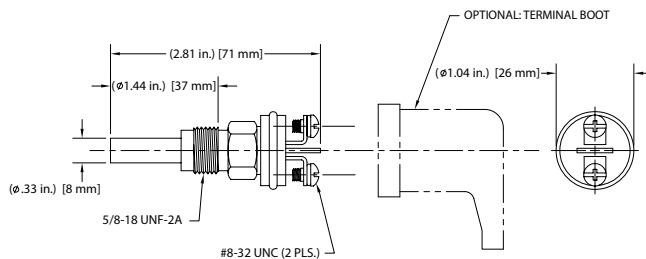
### ES2T 250/300 1/2-14 NPT



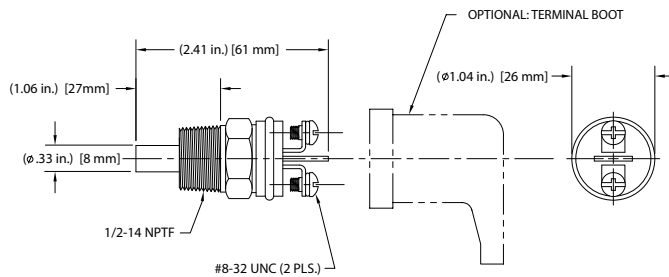
### ES2T 250/300 1/8-27 NPT



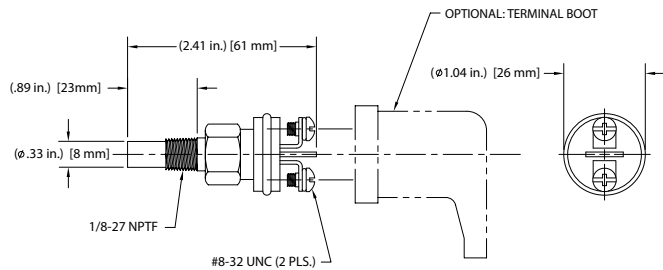
### ES2T 250/300-X 5/8-18 UNF



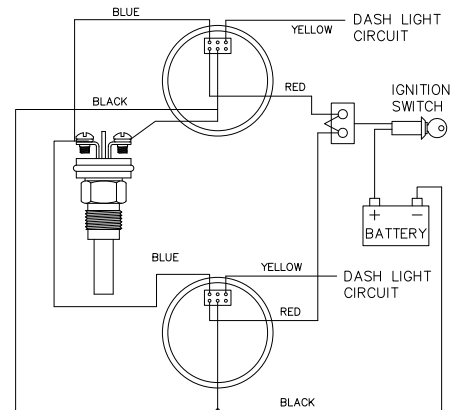
## ESDT 250/300 1/2-14 NPT



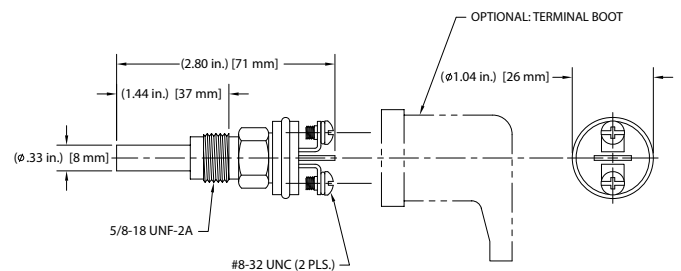
## ESDT 250/300 1/8-27 NPT



## ESDT Wiring



## ESDT 250/300-X 5/8-18 UNF



## How to Order

Part Number	Model and Description	Notes
10702010	EST-250/300-1/8: 1-wire-to-ground Temperature sender	Thread 1/8 - 27 NPT
10702014	ES2T-250/300-1/8: 2-wire ungrounded Temperature sender	
10702017	ESDT-250/300-1/8: 2-wire ungrounded Temperature sender	
10702009	EST-250/300-1/2: 1-wire-to-ground Temperature sender	Thread 1/2 - 14 NPT
10702013	ES2T-250/300-1/2: 2-wire ungrounded Temperature sender	
10702016	ESDT-250/300-1/2: 2-wire ungrounded Temperature sender	
10704691	EST-250/300-X: 1-wire-to-ground Temperature sender	Thread 5/8 - 18 UNF
10706175	ES2T-250/300-X: 2-wire ungrounded Temperature sender	
10704690	ESDT-250/300-X: 2-wire ungrounded Temperature sender	
00003624	EST Boot	Optional

**NOTE:** X = 5/8-18 thread for adaptors.

**NOTE:** See bulletin 8428 for available adaptors (Group 1).

**NOTE:** Always provide proper circuit protection with fuses or circuit breakers.

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# Fuel Senders

These Fuel Senders are designed to be used in conjunction with our EG Series Switchgauge Instruments as well as CAN I/O modules. See the bulletin 95090 EG Series – Electric Gage and Switchgauge Instrument for more information.

## Specifications

**Tank Cutout Hole:** Ø 1.750 in. (44 mm)

**Materials:**

**Float:** Foamed Buna N

**Float Arm:** Stainless Steel

**Resistor Housing:** Glass Filled Polyacetal

**Flange & Shaft:** Steel, Zinc-Plated

**Gaskets:** Buna N, 70 Durometer (48% Acrylonitrile)

**Hardware:** Brass & Phosphor Bronze

**Mounting Hardware:** Zinc-Plated Steel

**Resistance Range:**

**ESF and ES2F Model:** 240 Ohms to 33 Ohms

**ESDF Model:** 120 ohms to 17 ohms

**Operating Temperature:** -40° to 185°F (-40° to 85°C)

**Storage Temperature:** -76° to 185°F (-60° to 85°C)

## Resistance Values

**ESF, ES2F Senders:**

E = 240 ohms (falling level) (primary calibration point)

1/4 = 153 ohms (falling level)

1/2 = around 100 ohms (falling level)

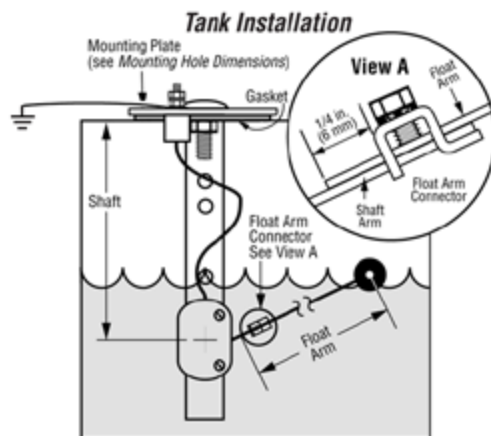
3/4 = 67 ohms (falling level)

F = 33 ohms (rising level) (secondary calibration point)

## Resistance Table for ES2F Fuel Sender

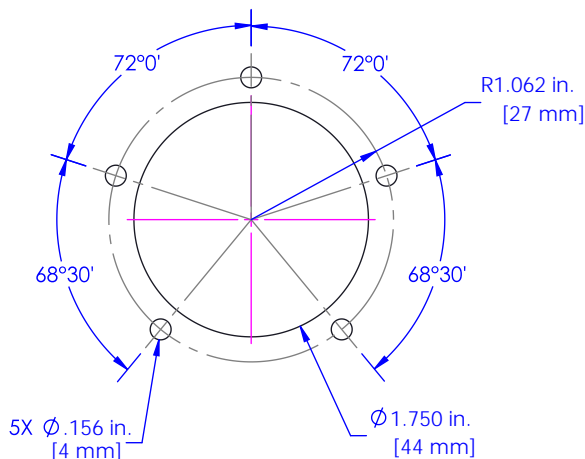
Resistance tables for ES2F Fuel Sender (resistance verses % of scale) Murphy Fuel Sender (0% - 100%)

% of Scale	0	10	20	30	40	50	60	70	80	90	100
R(Ohm)	244	205	171	143	123	103	88	74	60	47	33



## Dimensions

### Mounting and Cutout Layout



\_\_\_\_\_

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\_\_\_\_\_

$$\mathbf{B} = \mathbf{A} + 1.03125$$

$$C = D - .46875$$

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\_\_\_\_\_

	9	7	9 9	
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# Four Function Tattletale® Annunciator EN204 Series

Designed for use with electric Switchgag instruments, the EN204 Series Tattletale Annunciator works with other engine components to clearly indicate critical engine operating conditions. The four bright LEDs on the face of the annunciator indicate the cause of an alarm or shut-down condition.

Two EN204 models are available. Each shows the standard critical engine operating parameters—oil pressure, coolant temperature and battery voltage. Model EN204-S-12 also includes an indicator for low fuel level. Model EN204-SG-12 substitutes the fuel level indicator with a glow plug indicator for those engines that use a glow plug for easier starting.

The EN204 Annunciators are used in conjunction with a Murphy Electric Switchgag instrument or other normally open switches that close to ground when a fault condition occurs. As an example, in a system with a Murphy EGS21P-100 Oil Pressure Switchgag instrument, the Switchgag closes to ground when the oil pressure drops below a predetermined set point. This will energize the oil pressure LED on the EN204 to highlight a low oil pressure failure.

A very important feature of the EN204 is the ability to interface with Murphy 518PH or the 760A Electromagnetic Switches to perform automatic engine shutdown when fault conditions occur. The EN204 can also be used with other Murphy visual and audible alarms (STAS series remote alarm, SAH audible alarm and the TL7 visual alarm) for remote annunciation and equipment shutdown.

## Specifications

**Operating Voltage:** 12 VDC (10 V min. - 16 V max.)

**Current:** 0.020 A to 0.025 A per LED

**Output:** Sink 0.275 A

**Output Saturation Voltage:** .7-1.1 V @ 77°F (25°C)

**Case and Screw-on Mounting Clamp:** Polyester (PBT)

**Bezel:** Bright stainless steel

**Lens:** Clear Polycarbonate, UV stabilized

**Dial:** Black background and white markings with four red LED indicators

**Wiring:** Plug connector with wire leads, 18 AWG (1.0 mm<sup>2</sup>) x 8 in. (203 mm) long

**Operating Temperature:** -40° to 185°F (-40° to 85°C)

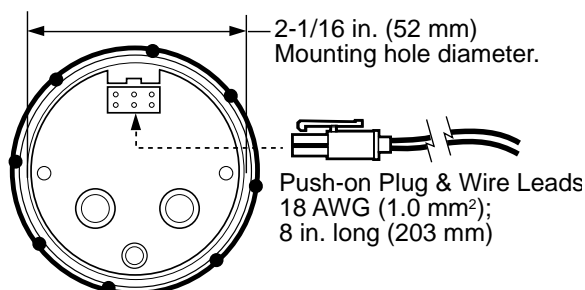
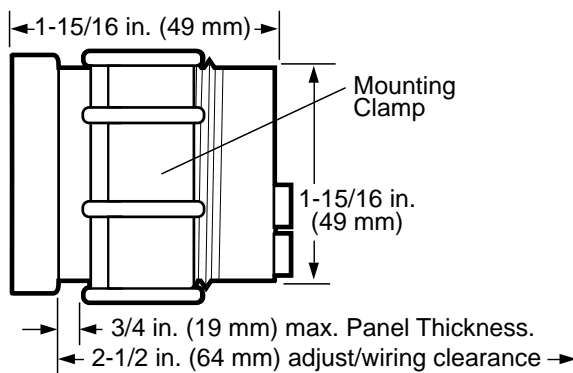
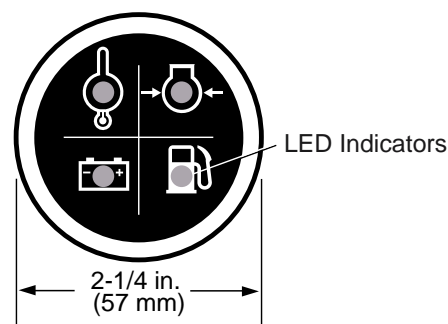
**Storage Temperature:** -76° to 185°F (-60° to 85°C)

**Shipping Weight:** 0.5 lb. (226 g)

**Shipping Dimensions:** 8 x 4 x 4-1/2 in. (203 x 102 x 114 mm)



## Dimensions

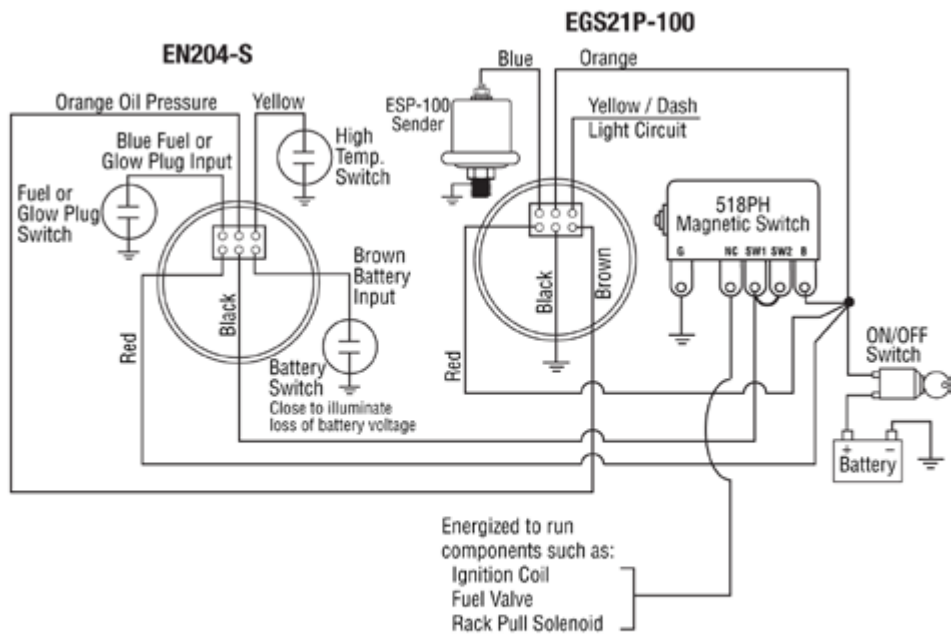


Basic Models

EN204-S-12		EN204-SG-12	
Monitored Functions	Action	Monitored Functions	Action
Oil Pressure	Indicate and Switched	Oil Pressure	Indicate and Switched
Coolant Temperature	Indicate and Switched	Coolant Temperature	Indicate and Switched
Battery Voltage	Indicate	Battery Voltage	Indicate
Fuel Level	Indicate and Switched	Glow Plug Energized	Indicate

The **Switched** functions listed are able to sink a current up to 0.275 amps and may be used to activate the electromechanical control switches or other devices.

EN204-S Typical Wiring Diagram



**Note:** Use of the **black wire** on the **EN204-S** and the **518PH Magnetic Switch** (as shown in the diagram) is required for engine shutdown.  
For LED annunciation only, **black wire** is not used.

How to Order

Part Number	Model and Description	Notes
Specify Model Number	EN204-S and Switch	Four LED Tattletale annunciator including fuel level LED indicator
	EN204-SG-12	Four LED Tattletale annunciator including glow plug LED indicator

# Tachometers and Tach/Hourmeters

## AT and ATH Series

The AT Series tachometers are rugged, transistorized instruments with solid-state circuitry for indication of engine RPM. They are equipped with a bracket for mounting into a standard 3-3/8 in. (86 mm) dash mounting hole. A full 270° sweep of the pointer gives an accurate indication on a large easy-to-read scale, and the dial can be illuminated for night reading. The ATH Series models are also equipped with hourmeter to record the elapsed running time of an engine.

Models are available for alternator, magnetic sensor or ignition signal. These instruments are designed to function from pulses generated by an alternator with 4, 8, 12, 14 or 16 poles on the rotor (3 - 40 PPR). The pulses can also be obtained from the ring gear of an engine by means of an electromagnetic sensor (magnetic pickup). The Murphy magnetic sensor driven models are designed to function with flywheels having anywhere from 50 to 304 teeth. Ignition signal model available for 2 - 10 cylinder, 4 cycle spark-ignited engines. All models are for negative ground, positive ground or isolated electrical systems and are protected against reverse polarity hookup.

All models are powered by a 11-28 VDC battery and are reverse polarity protected.

These tachometers are specially designed for use on truck, marine, industrial or stationary engines.

### Series Models

#### ATS Series Magnetic Sensor Signal Tach

50-304 flywheel teeth 11-28 VDC, 3333 Hz to 20.27 kHz @ 4000 RPM

#### ATHS Series Magnetic Sensor Signal Tachometer/Hourmeter

50-304 flywheel teeth 11-28 VDC, 3333 Hz to 20.27 kHz @ 4000 RPM

#### ATA Series Alternator Signal Tachometer

3-40 pulses/engine revolution 12 VDC, 200 Hz to 2667 Hz @ 4000 RPM

#### ATHA Series Alternator Signal Tachometer/Hourmeter

3-40 pulses/engine revolution 12 VDC, 200 Hz to 2667 Hz @ 4000 RPM

#### ATHI Series Ignition Signal Tachometer/Hourmeter

2 - 10 cylinder, 4 cycle engines, 66.7 Hz to 333.3 Hz @ 4000 RPM



\* Products covered by this bulletin comply with European Council electromagnetic compatibility directive 2004/108/EC, except as noted.

### Specifications

#### Magnetic Sensor Driven Models

**Power Input:** 11-28VDC (70mA - 120mA except lamp load)

**Backlight:** 3.4W T-10 wedge base bulb

**RPM Input Signal Voltage:** 1.5Vrms minimum

#### Accuracy:

Tachometer: +2% full scale

Hourmeter: +0.01% hours, +1 count

**Temperature Range:** -40 to 180°F (-40 to 82°C) (no permanent damage shall occur)

**Dial (Face Plate):** 270° sweep with white numerals (over black background)

**Bezel:** 304 stainless steel for bright and IS 513 E.E.E. CRCA steel for black

**Scale:** 0-4000RPM

**Case Material:** Plastic

**Hourmeter Range:** 99999.9 hours in 0.1 increments.

#### Alternator Driven and Ignition Driven Models

**Power Input:** 11-28VDC (70mA-120mA except lamp load)

**Backlight:** 3.4W T-10 wedge base bulb

**RPM Input Signal Voltage:** V low: 0.5V max, V high: 8.0V min.

#### Accuracy:

Tachometer: +2% full scale

Hourmeter: +0.01% hours, +1 count

**Temperature Range:** -40 to 180°F (-40 to 82°C) (no permanent damage shall occur)

**Dial (Face Plate):** 270° sweep with white numerals (over black background)

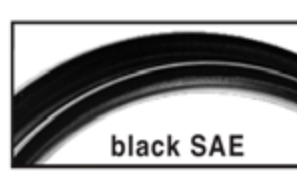
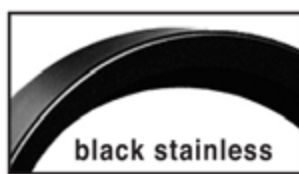
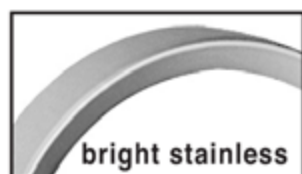
**Bezel:** 304 stainless steel for bright and IS 513 E.E.E. CRCA steel for black

**Scale:** 0-4000RPM

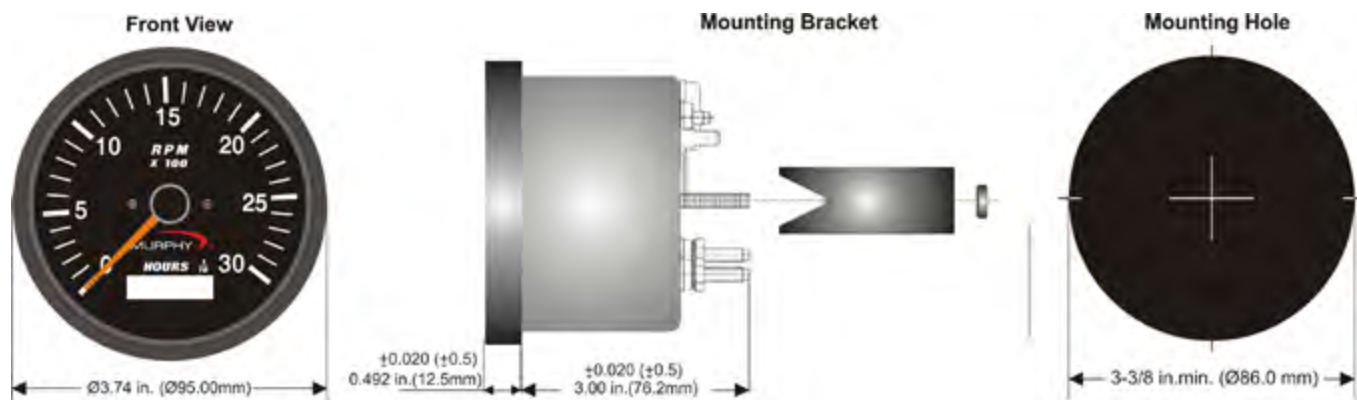
**Case Material:** Plastic

**Hourmeter Range:** 99999.9 hours in 0.1 increments.

## Bezel Styles



## Dimensions



## How to Order

Order the Tachometer or Tachometer/Hourmeter by model number.

Model Number	Description	Notes
<b>Magnetic Sensor Tachometer 4000 RPM; 50 - 304 flywheel teeth 11-28 VDC</b>		
ATS-40	Bright Stainless Steel Bezel	
ATS-40-A	Black Stainless Steel Bezel	
ATS-40-B	SAE Bright Stainless Steel Bezel	
ATS-40-C	SAE Black Stainless Steel Bezel	
<b>Magnetic Sensor Tach/Hourmeter 4000 RPM; 50-304 flywheel teeth 11-28 VDC</b>		
ATHS-40	Bright Stainless Steel Bezel	
ATHS-40-A	Black Stainless Steel Bezel	
ATHS-40-B	SAE Bright Stainless Steel Bezel	
ATHS-40-C	SAE Black Stainless Steel Bezel	
<b>Alternator Signal Tachometer 4000 RPM; 3 - 40 pulses/rev 11-28 VDC</b>		
ATA-40	Bright Stainless Steel Bezel	
ATA-40-A	Black Stainless Steel Bezel	
ATA-40-B	SAE Bright Stainless Steel Bezel	
<b>Alternator Signal Tach/Hourmeter 4000 RPM; 3 - 40 pulses/rev 11-28 VDC</b>		
ATHA-40	Bright Stainless Steel Bezel	
ATHA-40-A	Black Stainless Steel Bezel	
ATHA-40-B	SAE Bright Stainless Steel Bezel	
ATHA-40-C	SAE Black Stainless Steel Bezel	
<b>Ignition Signal Tach/Hourmeter 4000 RPM; 1-5 pulses/engine rev</b>		
ATHI-40-A	Black Stainless Steel Bezel	



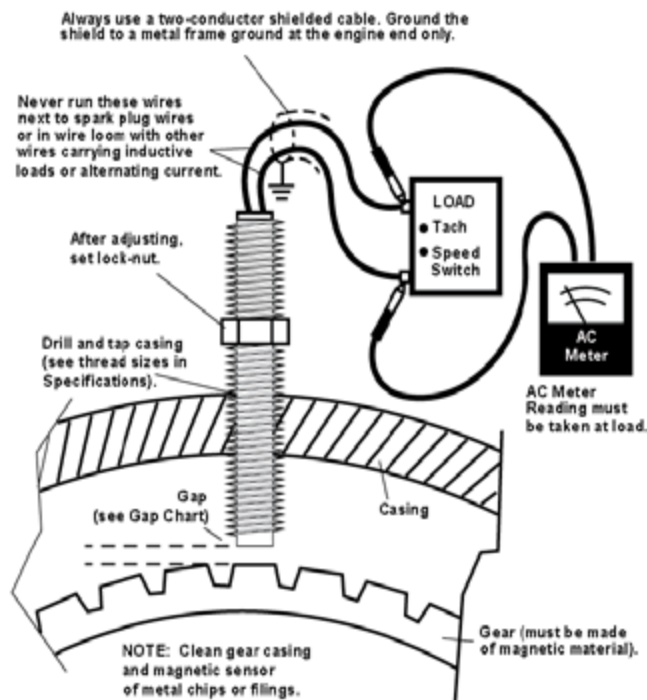
# Magnetic Pickups

## Models MP3298, MP7905 and MP7906

A magnetic pickup is an AC generator. It is normally installed into the flywheel housing of an internal combustion engine. The starter ring gear acts upon it to generate a voltage pulse each time a gear tooth passes the end of the sensor.

### Magnetic Pickup Installation

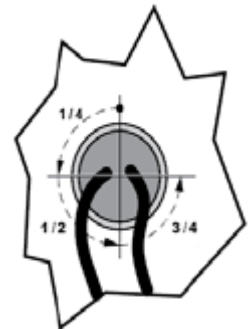
Drill and tap a hole in the flywheel housing (See Specifications for model and thread size). **IMPORTANT:** Drilling too deep may damage ring gear teeth. Blow chips with air hose when drilling and tapping hole.



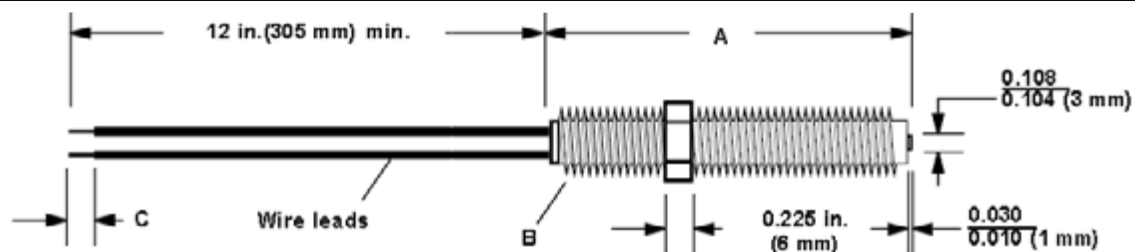
### Gap Adjustment

Insert magnetic pickup and turn until it stops at the face of the gear. Back off the gear by turning the pickup counter clockwise 1/4, 1/2 or 3/4 turn. See Gap Chart to determine gap distance based on the turn. Check gap clearance by rotating the gear completely around.

NOTE: Magnetic pickup gap should be adjusted so that the minimum voltage required is attained at the engine's lowest RPM. The



### Dimensions



- A. MP3298 and MP7906 = 3 in. (76 mm)  
MP7905 = 4.5 in. (114 mm)
- B. MP3298 = 5/8-18 UNF-2A  
MP7905 and MP7906 = 3/4-16 UNF-2A

- C. MP3298 = 0.250 in. (6 mm)  
MP7905 and MP7906 = 0.370 in. (9 mm)
- Polarity: White lead is positive with respect to Black lead upon approach of ferrous metal.

## Specifications

### Housing Material:

MP3298: Type 300 Stainless Steel, Locknut: Type 300 Stainless Steel

MP7905 and MP7906: Type 6061 Aluminum/Anodize Class 1 Locknut: steel nickel plated

**Output Leads (all models):** Two insulated leads, 20AWG, STR/TEF insulated per MIL-W-16878D Type E, 1 White and 1 Black

**Output Voltage (all models):** 200 V.P.P. TYP (tested at 1000 I.P.S. 20 Pitch gear, 0.005 Gap., and 100K OHM Load)

### Coil Resistance:

MP3298: 975 Ohms TYP

MP7905 and MP7906: 2500 Ohms TYP

**Potting (all models):** Internal portion of pickup is filled with epoxy resin, making the magnetic pickup oil- and moist-resistant

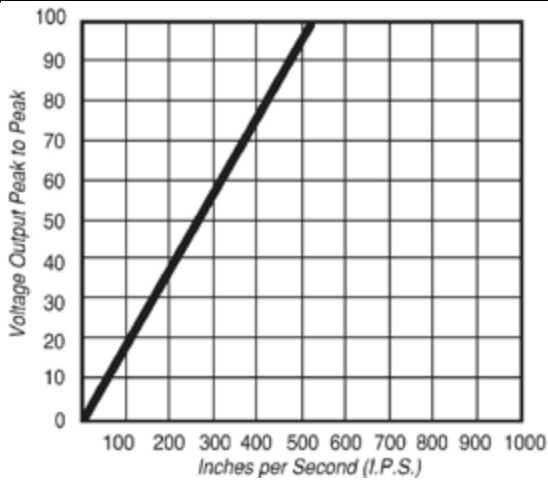
**Temperature (all models):** -65° to +225°F (-54° to 107°C)

### Coil Induction:

MP3298: 800 mH max, @ 1 KHz

MP3298: 400 mH TYP @ 1 KHz

## Output Voltage Operating Chart



Note: Tested at 1000 I.P.S. 20 pitch gear, 0.005 gap and 100K OHM load.

## How to Order

Part Number	Model	Total Length	Threaded Length	Thread Size	Notes
20700162	MP3298	3 in. (76mm)	3 in. (76mm)	5/8-18 UNF	
20700161	MP7906	3 in. (76mm)	3 in. (76mm)	3/4-16 UNF	
20700160	MP7905	4-1/2 in. (114 mm)	4-1/2 in. (114 mm)	3/4-16 UNF	

## Gear Pitch/Voltage Output

Gear Pitch	% Output Std. Volts
6	187
8	172
10	162
12	157
16	118
20	100
24	85
32	23
48	-
64	-
72	-

Note: Dash indicates not recommended.

$$I.P.S. = \frac{R.P.M. \times \text{dia.} \times 3.14}{60}$$

## Gap Chart

TURN	1/4	.013 in. (0.33 mm)	.015 in. (0.38 mm)
	1/2	.028 in. (0.71 mm)	.030 in. (0.76 mm)
	3/4	.035 in. (0.88 mm)	.045 in. (1.14 mm)
	1	.055 in. (1.39 mm)	.062 in. (1.57 mm)
GAP			

## Section 75 Genset Controls

0810288	Keystart 9620 Series — Engine/Generator Controls . . . . .	313
0810330	CANstart™ 9630 Series — Engine/Generator Controls . . . . .	315
05195	Cascade Controller — Auto-Start/Stop . . . . .	317
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	<b>Battery Chargers</b>	
1010704	Sentinel 150 Series — Automatic Battery Charger . . . . .	321
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# Keystart 9620 Series Engine/Generator Controls

Keystart 9620 and 9621 control modules provide manual start/stop and automatic fault protection for generators, pumps and other engine-driven applications. Outputs allow control of engine fuel (energized to run), starter motor and preheat. The Keystart also has an alarm output for remote or audible warning of faults.

Six LEDs and icons indicate engine status and faults. Four switch inputs (closing to negative on fault) enable automatic shutdown on engine low oil pressure, high coolant temperature and auxiliary faults. Model 9621 has a fully adjustable engine overspeed shut-down feature, configurable for either generator AC or magnetic pickup speed signals. Charge alternator excitation and a charge fail warning LED are standard.

Electrical connection is by quick-connect, spring-clamp terminal blocks. A universal 7 to 30VDC power supply permits operation with 12 or 24VDC engine batteries, with standard engine crank-dip voltage protection.

Keystarts are mounted in the front through a standard cutout and secured at the rear with quick-fit clips. Epoxy resin case encapsulation gives superior vibration/shock resistance and environmental protection.

## Specifications

### Power Supply

**Operating voltage, steady state:** 7 to 30VDC

**Operating voltage, brown out/cranking:** 5VDC minimum

**Current consumption:** <100mA

### Inputs

**Fault switch inputs:** close to negative DC during fault

**Generator AC input (model 9621 only):**

70 - 270 VAC rms, <50 to >60 Hz nominal

**Magnetic pickup input (model 9621 only):**

3.5 - 21 VAC rms, <2000 to >6500 Hz nominal

**Outputs (all ratings non-reactive)**

**Run (fuel):** positive DC, NO relay contacts, 10A max @ 24VDC

**Start (crank):** positive DC, keyswitch contacts, 10A max @ 24VDC

**Alarm:** negative DC (open collector transistor), 300 mA max

**Speed calibration:** to suit 0-1mA, 75 Ohm meter, output=0.75mA at rated engine speed.

### Adjustable settings

**Preheat timer:** 0 or 10 secs, default = 0 secs

**Fault override timer:** 2 to 20 secs (VR1), default = 10 secs

**Overspeed trip level (model 9621 only):** 100 to 130% (VR3) of nominal calibrated speed, default = 110% (of 50 or 60 Hz)

### Physical

**Case material:** polycarbonate / polyester

**Overall dimensions:** (w x h x d): 3.8 x 3.8 x 3.7 in.  
(96 x 96 x 95 mm)

**Panel cut-out size:** DIN 3.6 x 3.6 in. (92 x 92 mm)

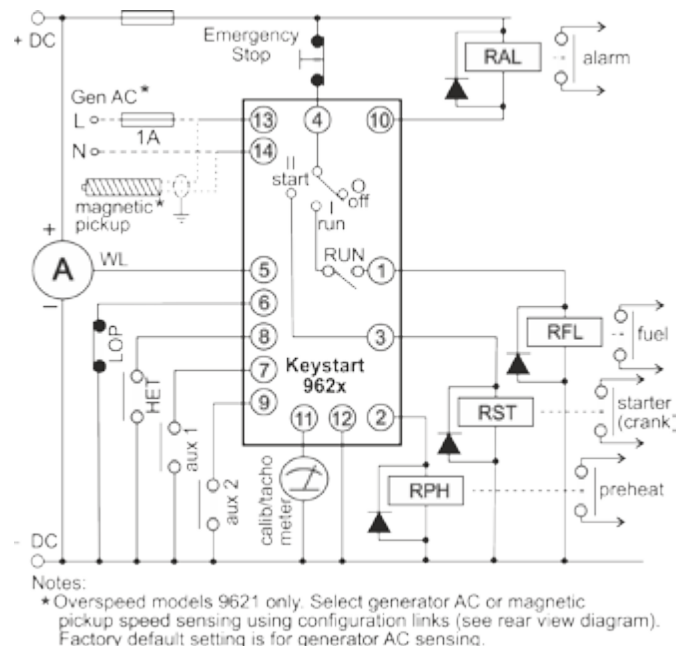
**Weight:** approx 0.7 lb. / 300g

**Operating temperature:** -31° to 131°F / -35° to 55°C

**Electromagnetic compatibility:** EN55022, class B



## Typical Connections







# CANstart™ 9630 Series Engine/Generator Controls

CANstart™ 9631 and 9632 modules provide operator start/stop control, panel gage driving, fault indication, and auxiliary shut-down protection for ECU-controlled, CAN bus SAE J1939 compatible engines. These compact controllers can be used with generators, pumps and other engine-driven applications.

Operator control is through a four-position keyswitch. The key is common to all CANstarts and is removable only in the stop/reset position. Six LEDs and icons indicate engine/ECU status and faults. Two of these LEDs (with associated inputs) provide for auxiliary fault shutdown and charge alternator fail excitation.

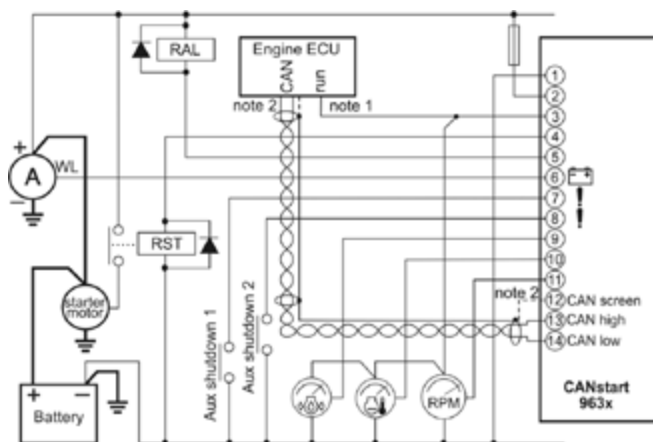
CANstart has two protected (positive DC) FET outputs for the control of ECU engine run and starter motor. Three additional outputs drive analog panel gages (Murphy, VDO or Datcon) based on ECU-transmitted data for engine speed, oil pressure or coolant temperature.

All units include adjustable engine overspeed protection: model 9631 provides automatic overspeed shutdown for variable speed applications; model 9632 is configured for fixed-speed 1500/1800 RPM genset use.

DIP switches at the rear allow set up of control and gage output options. Electrical connection is by spring-clamp terminals, including a universal 8-32VDC power supply for operation with 12 or 24VDC engine batteries. Engine cranking supply brownout protection is standard.

CANstart is panel-front mounted through a standard cutout and secured at the rear with quick-fit clips. Epoxy resin case gives superior vibration/shock resistance and environmental protection.

## Typical Connection



Notes:-

1. Wiring shown for ECU with close to positive to run input. An additional interposing fuse or relay may be required between pin 3 and ECU; check engine documentation for ECU 'run' input requirements.
2. ECU CANbus screen is typically earthed/grounded at one end only. Check engine & ECU documentation for details



## Specifications

### Power Supply

**Operating Voltage, steady state:** 8 to 32 VDC

**Operating Voltage, brownout / cranking:** 5 VDC minimum

**Current consumption:** < 100 mA

### Inputs

**CAN bus:** SAE J1939 protocol, switchable 120 Ohm terminating resistor

**Auxiliary Shutdown (x2):** close to negative DC during fault  
**Outputs (all ratings non-reactive)**

**Run (ECU), start (crank):** positive DC (protected FET), 6A max @ 32 VDC

**Alarm:** negative DC (open collector transistor), 250mA max @ 32 VDC

**Oil pressure gage:** suitable for Murphy, VDO 5 or 10 Bar, Datcon 7 or 10 Bar.

**Engine temperature gage:** suitable for Murphy, VDO or Datcon

**Tachometer:** for use with charge alternator driven tachometers

### Adjustable Settings

**Model 9631 (variable speed engines)**

**Overspeed level:** 1250 - 2800 RPM (50 RPM increments) or off

**Model 9632 (fixed speed engines/gensets)**

**Nominal speed:** 1500 or 1800 RPM

**Overspeed level:** 1 - 15% of nominal speed (1% increments) or off

### Physical

**Electromagnetic capability:** 2004/108/EC

**Case Material:** polycarbonate / polyester

**Overall dimensions (w x h x d):** 3.8 x 3.8 x 5.2 in. (96 x 96 x 131mm)

**Panel cutout size:** DIN 3.6 x 3.6 in. (92 x 92 mm)

**Weight:** approx. 0.6 lb / 240g

**Operating Temperature:** -4° to 167°F / -2° to 75°C

# Operation, Connections and Settings

## Front View and Operation

LED indication	
flashing	constant
Green, ECU status:	
CAN inactive	CAN active.
Red. Oil pressure fault:	
warning	shutdown.
Red. Coolant temperature fault:	
warning	shutdown.
Red. Engine speed fault:	
overspeed	shutdown.
Red. Charge fail warning.	
Red. ECU/auxiliary fault:	
ECU shutdown fault.	
(50/50 on/off) ECU warning fault.	
(1 on pulse) aux. 1 shutdown.	
(2 on pulses) aux. 2 shutdown.	



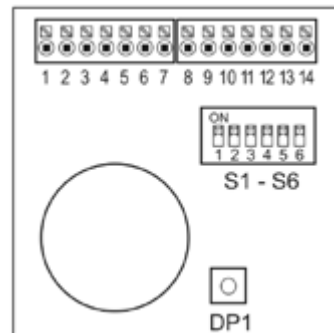
### 4 Position Keyswitch

	Off/Reset. Removes power, stops the engine and resets any latched shutdown fault.
	Run. Activates the run output and (if enabled) the timed preheat output. Once the engine is fully running, and after the override time, Keystart immediately shuts down the engine on detection of a fault.
	Start/crank. Maintains the run output and activates the start (crank) output. Shutdown fault inputs are disabled and the fault override timer is reset. This position spring-returns to I (run) on release.
	Auxiliary. Keyswitch auxiliary output, positive DC

## Rear View, Connection & Settings

### Connection

1	-DC power supply
2	+DC power supply
3	run (ECU) output, +DC, 6A max
4	start (crank) output, +DC, 6A max
5	alarm output, -DC, 250 mA max
6	charge fail (alternator WL)
7	aux 1 input, -DC to activate
8	aux 2 input, -DC to activate
9	oil pressure gage output
10	coolant temp gage output
11	tachometer output
12	CAN screen
13	CAN high
14	CAN low



### S1 - S5 DIP Switch Settings

**Note:** switch S6 reserved for future use.

switch position					on (up) off (down)	options (* default settings)
S1	S2	S3	S4	S5		
▲	▲	▲				Murphy temp. and pressure gauges *
▼	▲	▲				Datcon temp. and 0 – 7 bar pressure gauges
	▲	▼				Datcon temp. and 0 – 10 bar pressure
▲	▼	▲				VDO temp. and 0 – 5 bar pressure gauges
▲	▼	▼				VDO temp. and 0 – 10 bar pressure gauges
			▲			CAN 120 Ohm terminating resistor in circuit *
			▼			CAN 120 Ohm terminating resistor removed
				▲		Sets speed nominal or range for DP1 below: see installation instructions for full details.
				▼		

**DP1 digital potentiometer setting** (with S5 above)

Overspeed shutdown set point: see installation instructions for details.

## How to Order

Part Number	Model and Description	Notes
41700147	CST9631: Keyswitch K2 (Type 2, rubberized) Default overspeed setting is 1250 RPM. (For variable speed engines, overspeed setting range 1250 - 2800 RPM.)	Non-standard (NS) settings/options are available to order.
CST9632 K2	CST9632: Keyswitch K2 (Type 2, rubberized) Default overspeed setting is 110% of 1500 or 1800 RPM (please specify). (For fixed speed engines/gensets, overspeed setting range 100-115% of 1500/1800 RPM.)	Only available from the UK office. Non-standard (NS) settings/options are available to order.
41700157	Spare mounting clips (pack of 4)	Accessories and spare parts
65700256	Spare keyswitch (K2 type), incl. key	
00003235	Spare key (K2 type)	

# Cascade Controller Auto-Start/Stop

The Cascade controller offers automatic start and stop control with easy configuration for a broad number of applications.

This auto-start controller is designed to fit any engine-driven application requiring a simple and robust automatic start and stop sequence. Pumps, compressors, grinders, power units and generators are just a few of the industrial applications for the controller.

The Cascade controller is fully compatible with all major engine types. Whether you are running mechanical or J1939 engines, the controller will work with your application.

Murphy offers unique features at a competitive price with the Cascade controller.

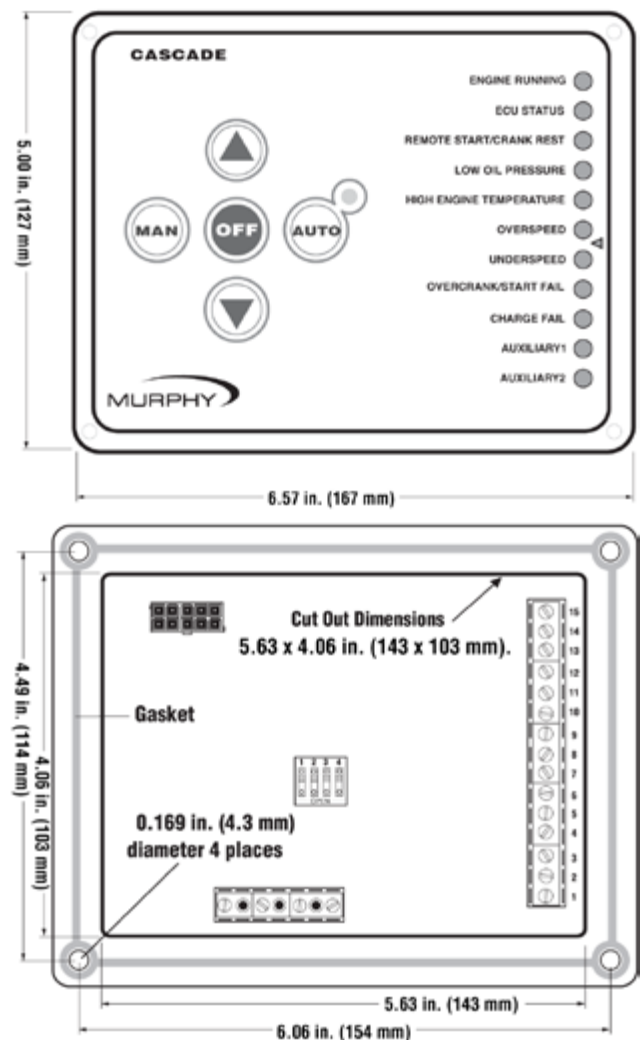
## Features

- **Durability:** Encapsulated to protect it against dirt, water and dust, along with a compression gasket to fully seal it to the panel. Cascade is rated NEMA4 and IP65.
- **Low Battery Blackouts:** Operates in total blackout for a minimum of two seconds.
- **Compatibility:** Accepts MPU, AC Frequency and ECU speed signals and can operate with standard and J1939 engines.
- **Inputs and Outputs:** The Cascade Inputs and Outputs are ruggedly protected and fault tolerant.
- **J1939 Ready:** Works directly with Murphy's J1939-ready PowerView gages, just plug and go. No sender is required.
- **CD101 Cascade Configuration Tool:** Allows quick setup and loading of parameters into a Murphy standard Cascade via a PC software tool.



CL1 DIV 2  
GRP A, B, C, D  
HAZARDOUS  
LOCATIONS

## Dimensions



## Specifications

**Power input:** 9-35VDC continuous - operates during total black out for 2 seconds minimum.

**Power consumption:** Sleep Mode (Manual): 1mA typical; Sleep mode (Automatic): 4mA typical. Running mode (manual): 20mA typical; Running mode (Automatic): 24mA typical.

**Operating/Storage temperature:** -40 to 185°F (-40 to 85°C)

**Humidity:** 0-100%, non-condensing

**Housing:** UV stabilized black polycarbonate and epoxy encapsulation. Weather tight and includes sealing gasket to keep moisture and debris out of enclosure. Properly mounted controller will maintain NEMA4 / IP65 rating of enclosure.

**Vibration:** Rated to 6G

**Impact:** Rated to 10G

**Inputs:** Dedicated digital inputs for low oil pressure, high engine temperature, remote start, DC charge fail/alternator fail. Two auxiliary inputs are configurable for multiple functions.

**Outputs:** 7 – 4 auxiliary, configurable (1A DC protected). 3 dedicated outputs for crank, fuel/ECU, alternator excitation

**Crank attempts:** 3, 5, 10, Continuous

**Crank Rest:** 5-60 seconds, adjustable

**Shutdown lockout time delay:** 5, 10, 15, 20, 25, 30 seconds

**Crank disconnect speed setting:** Field settable 0-9999 RPM (16-60Hz AC freq input).

**Overspeed/underspeed trip point setting:** ±5 to 50% of nominal.

**Speed sensing inputs:** Magnetic pickup (5-120VAC RMS / 0-10 kHz) and AC frequency (30-600VAC RMS / 16-80 Hz)

**CAN bus interface:** Directly reads engine speed and engine status data from SAE-J1939 enabled engines

**MODBUS interface:** In J1939 applications, drives PVA series analog gages

**Shipping Weight:** 1 lb. (453 g) approximately

**Shipping Dimensions:** 5.1 x 6.7 x 1.6 inch (130 x 10 x 41 mm) approximately

## How to Order

Part Number	Model and Description	Notes
40700259	CD101 Cascade Controller	Controller
40090045	CD101 Cascade Configuration Kit	Accessories



# Murphy Generator Control Panels

Our Murphy Generator Control line features standard panels for all levels of use, from basic manual start to full-featured auto-start.

Each standard panel is designed for maximum flexibility, allowing you to customize the instrumentation to fit your specific application. You get plenty of options but with the short delivery time of a pre-engineered panel.

## MGC50



### MANUAL START

- Start method (select one)
  - Key start module with first out annunciation (removes power switch)
  - Key switch & 518 Tattletale
  - Key switch with pre-heat & 518 Tattletale
  - Push button & 518 Tattletale
- Voltmeter
- Hourmeter
- Small enclosure

### OPTIONS

- Relay for alarm outputs
- Note:** Minimal options available due to enclosure space constraints, consult IPD for availability

## MGC100



### AUTO START

- Cascade controller
- Gauges for oil pressure and water temperature (mechanical or electric), compatible with Murphy or VDO senders
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter
- Power on-off switch (toggle)

### MANUAL START

- Start method (select one)
  - Key start module with first out annunciation (removes power switch)
  - Key switch & 518 Tattletale
  - Key switch w/pre-heat & 518 Tattletale
  - Push button & 518 Tattletale
- Gauges for oil pressure and water temperature (mechanical or electric), compatible with Murphy or VDO senders
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter
- Power on-off switch (toggle)

### OPTIONS

- DC voltmeter
- Relays for alarm outputs
- NEMA 4 enclosure
- Electric senders – 100 PSI & 250°F (121°C) 1/2 inch port
- Electric senders – 100 PSI & 320°F (177°C) M14 port (Deutz engines)
- Quick disconnect and wiring harness
- Energized to stop (auto start only)
- E-stop (mushroom style)
- Phase selector switch (single phase applications)
- Current transformers

## MGC150



### AUTO START

- Cascade controller
- Quick disconnect (MEH harness required)
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter
- Power on-off switch (toggle)

### MANUAL START

- Start method (select one)
  - Key switch & 518 Tattletale
  - Key switch w/pre-heat & 518 Tattletale
  - Push button & 518 Tattletale
- PowerView
- Quick disconnect (MEH harness required)
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter

### OPTIONS

- PowerView
- MEH wiring harness
- Relays for alarm outputs
- NEMA 4 enclosure
- E-stop (mushroom style)
- Phase selector switch (single phase applications)
- Current transformers

\* These panels shown with optional equipment installed. All models include fuses, bus, fuses and wiring.

## How to Order

---

Part Number	Model and Description	Notes
Specify Model Number	MGC50: Generator control panel unit	Manual start
	MGC100: Generator control panel unit	Auto and manual start
	MGC150: Generator control panel unit	
	MGC400: Generator control panel unit	Auto start



# Sentinel 150 Series Automatic Battery Chargers

The Sentinel 150 line provides high performance battery charging for continuous float charge and standby power applications. Switch mode technology provides major advances in power supply and battery charger design, giving a compact and lightweight construction, improved power efficiency, low heat dissipation, wide supply voltage tolerance and low output ripple.

The chargers are configured for fast, accurate charging to give optimum battery life and reliability. The very smooth output (<1% ripple) allows charging of sealed or vented batteries – e.g., Nickel Cadmium (NiCd), Lead Acid Sealed (VRLA), vented and Planté cells – or use as a stand-alone power supply. Factory calibration is optimized for each specific battery type.



SNTL150 Open Frame



ESNTL150 Enclosed



\*UL Tested (listed or recognized) to: UL1236 - Battery chargers for charging engine-starting batteries, and CSA22.2 No. 107.2 - Battery chargers. See Specifications for details.

## Features

All models feature an intelligent, multistage charge regime. During charge recovery mode, the Sentinel gives a constant (maximum) current output. As the battery approaches peak charge, the output reverts to float charge mode, maintaining an optimum cell voltage and supplying additional standing load current up to the rated maximum. Output current is always limited to the rated maximum, even during high load (e.g., engine cranking), short-circuit or reverse polarity connection.

### AutoBoost

AutoBoost provides a temporary increase in output voltage, equalizing the charge between cells and maximizing battery life and capacity. AutoBoost is triggered automatically when the battery falls below a preset voltage or can be initiated manually through a momentary switch input. At the end of the Auto-Boost cycle, Sentinel automatically reverts to normal float charge mode, preventing battery over-charge and gassing.

### Alarm Outputs

Sentinel UL150 models include a self-diagnostic circuit for monitoring charge fail fault conditions (AC supply/fuse failure, DC fuse failure or low/no charge current), with a solid-state relay output for driving a remote alarm or fault annunciator. Enclosed NFPA models have NFPA 110 compliant alarms for AC failure, charge fail, high battery volts and low battery volts.

### Temperature Compensation

The optimum charge voltage for lead acid and NiCd batteries varies with ambient temperature. Sentinel can be configured to sense battery temperature from a remote sensor and automatically compensate the output charge voltage.

### Installation and Connection

UL-recognized SNTLUL150 model uses an open frame circuit board and base/heatsink with protected cover, for surface or DIN rail mounting in an existing control panel. UL-listed ESNTLUL150 models use a stainless steel, wall-mounted case.

Electrical connection is by screw terminal blocks. Connection and cable access on ESNTL models is by a hinged front plate and knock-out sections in the enclosure side.

# Specifications

## Power Supply

**Operating Voltage:** 95 to 250 VAC

**Operating Frequency:** 47 - 63 Hz

## DC Charge Output

**Nominal voltage:** 12 or 24 VDC

**Float/boost voltage:** see Output Calibration table

**Maximum current limit:** 5A (12 and 24V models) or 10A (12V models)

**Voltage ripple:** <1%

**Line regulation:** <2%

**Load regulation:** <2%

## Alarm Outputs

**Charge fail, mains AC fail:**

1 x solid-state relay, + DC during normal charge, open circuit during fault

**High and low battery voltage (ESNTLUL1501210xxNFPA only):**

2 x solid-state relays, dry/volt-free contacts, closed on fault

**Current rating (all relay outputs):**

250 mA max @ 30VDC (resistive load), UL class 2

## Physical

**Operating Temperature:** -4 to 140°F (-20 to 60°C)

**Humidity:** 20% to 90% RH

**Electrical Safety:** 2006/95/EC

**Electromagnetic compatibility:**

2004/108/EC (EN 61000-6-2, EN 61000-6-4)

## UL Approvals

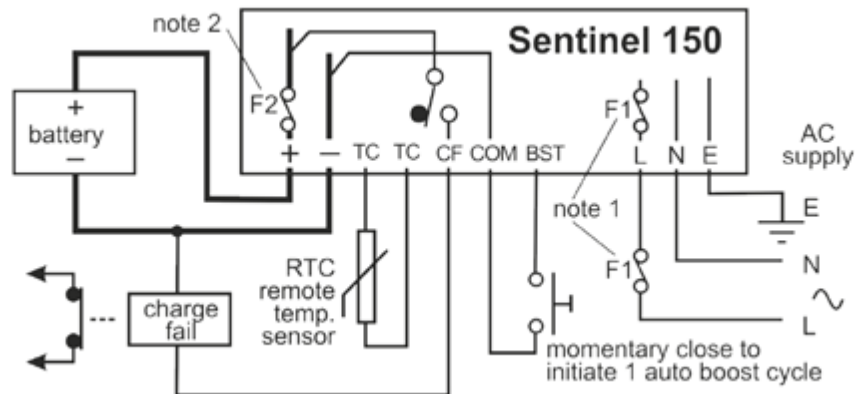
**All (E)SNTLUL150 Models:**

BBGQ: UL1236, CSA22.2 no. 107.2

**ESNTLUL1501210xxNFPA models only:**

BBHH: UL1236 SE

# Electrical Connections



Notes:

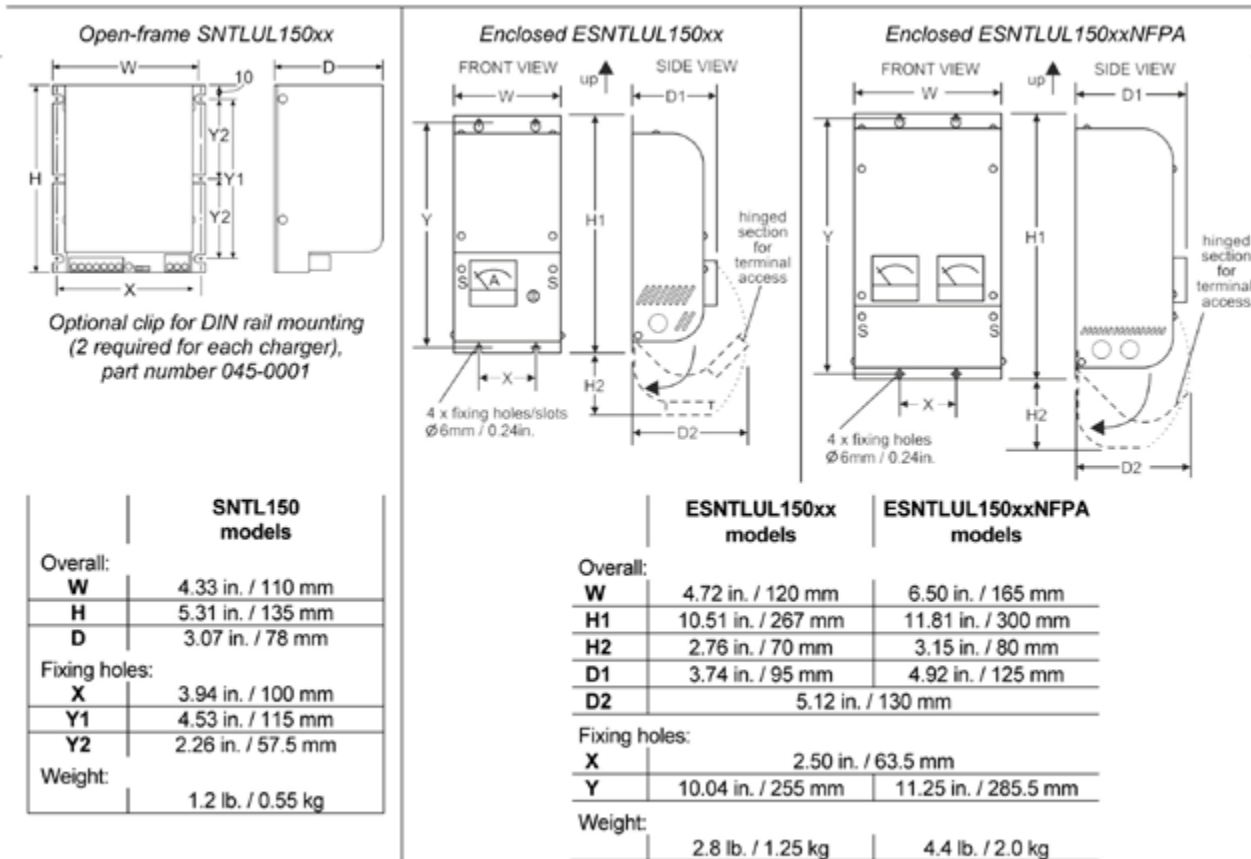
- 1) AC input fusing (F1): All UL-approved 150 models include a replaceable circuit-board mount TR5 fuse package. See charger label for fuse rating.
- 2) DC fusing (F2): all UL 150 models include an internal, electronic (self-resetting) output fuse.
- 3) Battery output is isolated from chassis.
- 4) Charge fail / mains AC fail alarm relay shown in de-energized (powered down) state.
- 5) High and low battery voltage alarm outputs (enclosed NFPA version only) not shown.
- 6) For all UL 150 models, AC supply input ground/earth connection is by M4 chassis stud marked FG (frame ground).

## Output Calibration

Calibration figures shown are at 20°C. If temperature compensation is enabled and remote SNTL-RTC temperature sensor is connected, output voltage automatically varies by 3mV per cell per 1°C deviation from 20°C, within the range -10 to 50°C. Increasing temperatures give decreasing outputs; decreasing temperatures give increasing outputs.




Battery Type		Float Volts (V DC)	Boost Volts (V DC)
12V	Vented lead acid (6 cells)	13.5	14.1
	Calcium - Calcium (6 cells)	13.8	15.6
	VRLA, AGM (6 cells)	13.5	14.4
	VRLA, Gel (6 cells)	13.5	13.8
	NiCd (10 cells)	14.1	14.5
24V	Vented lead acid (12 cells)	27.0	28.2
	Calcium - Calcium (12 cells)	27.6	31.2
	VRLA, AGM (12 cells)	27.0	28.8
	VRLA, Gel (12 cells)	27.0	27.6
	NiCd (18 cells)	25.6	26.1
	NiCd (20 cells)	28.2	29.0

## Dimensions



Dimensions for reference only. Use actual product for mounting template. For safe heat dissipation, mount product in orientation shown, with minimum air-gap clearance of 40mm / 1.5 in. above/below and 25mm / 1.0 in. at each side.

## How to Order

Part Number	Model and Description	Notes
42703600	SNTLUL1501205CDLA: Open-frame (protective cover) Sentinel UL150, 5A/12V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703601	SNTLUL1502405CDLA: Open-frame (protective cover) Sentinel UL150, 5A/24V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703602	SNTLUL1501210CDLA: Open-frame (protective cover) Sentinel UL150, 10A/12V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703603	ESNTLUL1501205CDLA: Enclosed Sentinel UL150, 5A/12V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703604	ESNTLUL1502405CDLA: Enclosed Sentinel UL150, 5A/12V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703605	ESNTLUL1501210CDLA: Enclosed Sentinel UL150, 10A/12V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703650	SNTLUL1501210CDLANFPA: Enclosed Sentinel UL150 (NFPA 110 compliant alarm outputs and metering), 10A/12V vented lead acid output, 110/120/220/240VAC (50Hz/60Hz) input	
42703619	42703619: Remote temperature sensor with 9.8 feet / 3.0 meter lead assembly, for automatic charge output temperature compensation	

For sealed lead-acid (VRLA, AGM, Gel or Calcium) and NiCd batteries, please consult your Enovation Controls' representative.

# Sentinel 300P Series

## Programmable Switch Mode Battery Chargers

Sentinel 300P battery chargers provide new levels of DC power control, monitoring and protection for stationary engine starting and standby battery applications.

Advanced Sentinel charging features included as standard:

- Switch mode charging technology: high power efficiency and low heat dissipation, plus wide supply voltage tolerance, in a compact and lightweight package.
  - Multistage charging: float, bulk, absorption and AutoBoost stages ensure no compromise between rapid charge recovery and long term battery capacity and life.
  - Low output ripple: <1% ripple, beneficial for vented lead acid & NiCd cells, essential for VRLA, and configurable for use as a stand-alone DC power supply.
  - AutoBoost: triggered automatically on low charge levels, or manually by remote switch, AutoBoost temporarily increases the charge voltage before returning to float mode. Equalizing battery cell charge without overcharge and gassing, AutoBoost maximizes cell capacity and life.
  - Temperature compensation: ensures batteries are charged at the optimal voltage, which varies significantly with ambient temperature. Sentinel can measure temperature with a battery-mounted sensor and adjusts output voltage to prevent under or over charging.
- In addition, the Sentinel 300P includes:
- Flexible configuration: microprocessor programmability for automatic or manual configuration of charge output voltages (12 or 24V nominal), cell types/numbers and application – all in one standard model. Programming is by circuit board links or PC-based software configuration and monitoring tool.
  - Inputs & outputs: for remote charger control, and signaling of charge fail, high/low battery volts and mains fail faults. Standard output functions are NFPA 110 compliant. Non-standard input/output functions available to special order.
  - Display, instrumentation and communication: options for backlit LCD readout, analogue metering and CAN 2.0B / SAE J1939 data communication; all models include RS485 communication for configuration and control.

The Sentinel 300P is available either as an open-frame, UL-recognized module for mounting in existing control panels, or as a UL-listed, wall-mounted stainless steel enclosure with LCD and analogue metering options. Electrical connection is by screw terminal blocks. On enclosed models, wiring harness access is by knock-out cable gland holes in the case side.



**NFPA 110  
compliant**

\* Tested and approved by UL to: UL1236 – Battery chargers for charging engine-starting batteries, and CSA22.2 No. 107.2 – Battery chargers

### Specifications

#### Power supply

**Operating voltage:** 95 – 250 V AC

**Operating frequency:** 47 – 63 Hz.

#### DC Charge Output

**Nominal voltage:** programmable 12 or 24 V DC

**Float/boost voltage:** programmable, see 'output calibration' table

**Maximum current limit:** 10 A

**Voltage ripple:** <1%

**Line regulation:** <2%

**Load regulation:** <2%

**Outputs x3 (x4 for non-CAN configurations):**

**All models:**

1 x SPCO (RL1), 1 x SPNC (RL2), 1 x SPNO (RL3),  
dry/volt-free contacts (common feed for RL1, RL2 & RL3)

**Standard models (non-CAN configurations):**

1 x SPNC (RL4), dry/volt-free contacts  
standard output functions (charge fail, AC fail, low battery volts,  
high battery volts) are NFPA 110 compliant.

**Rating (all relays):** 1A max @ 30 VDC (resistive load), UL class 2

**Inputs x2:**

Closed to negative DC to activate, configurable function

#### Physical

**Operating temperature:** –40 to +140°F / –40 to +60°C

Display viewability (LCD models): 32 to 122°F / 0 to 50°C

**Humidity:** 20% to 90% RH

**Electrical safety:** 2006/95/EC

**Electromagnetic compatibility:**

2004/108/EC, EN 55022 class B

(EN 61000-6-1, EN 61000-6-3)

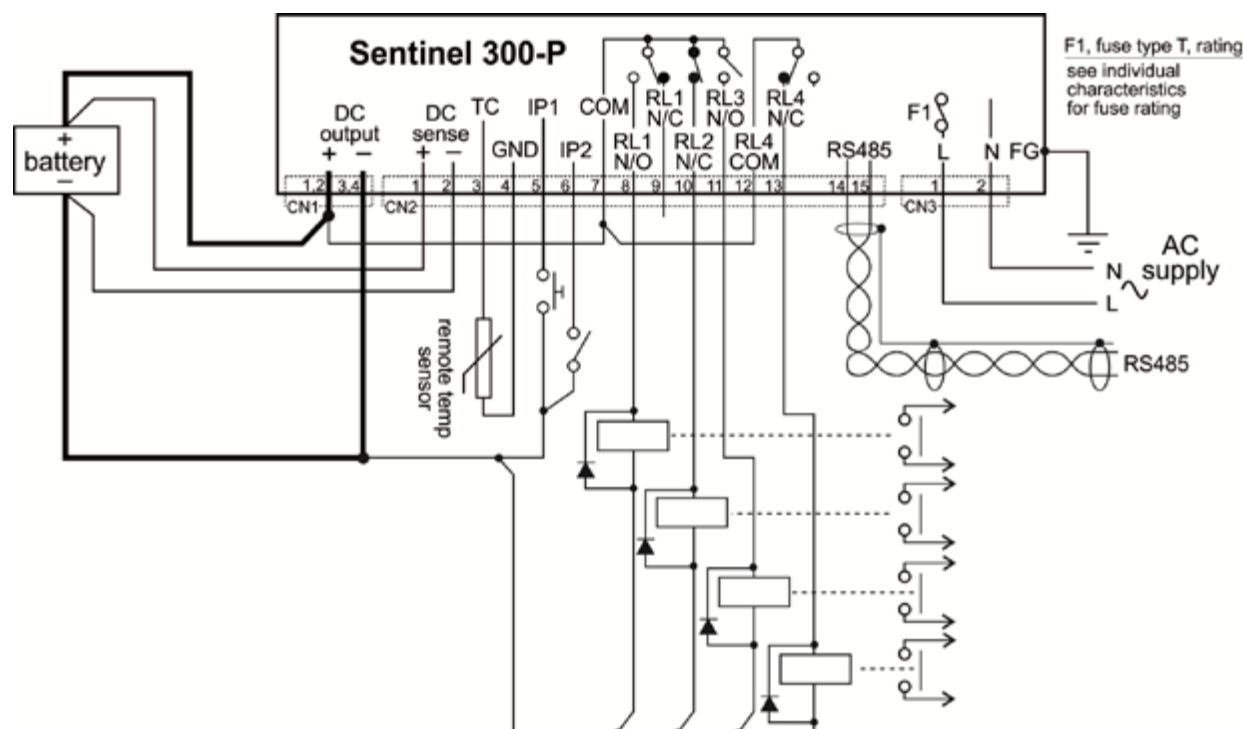
**UL approvals**

**All standard (E)SNTL300P models:**

BBGQ: UL1236, CSA22.2 no. 107.2

BBHH: UL1236 SE

## Electrical Connection



Notes:

- 1) AC input fusing (F1): replaceable, circuit board mounted fuse, rating as shown on the product label.
- 2) DC output fusing: all models include a self-resetting electronic output fuse.
- 3) DC output is isolated from chassis.
- 4) connection shown for standard configurations with output RL4. (RL4 is not available on units configured for CAN communication.)

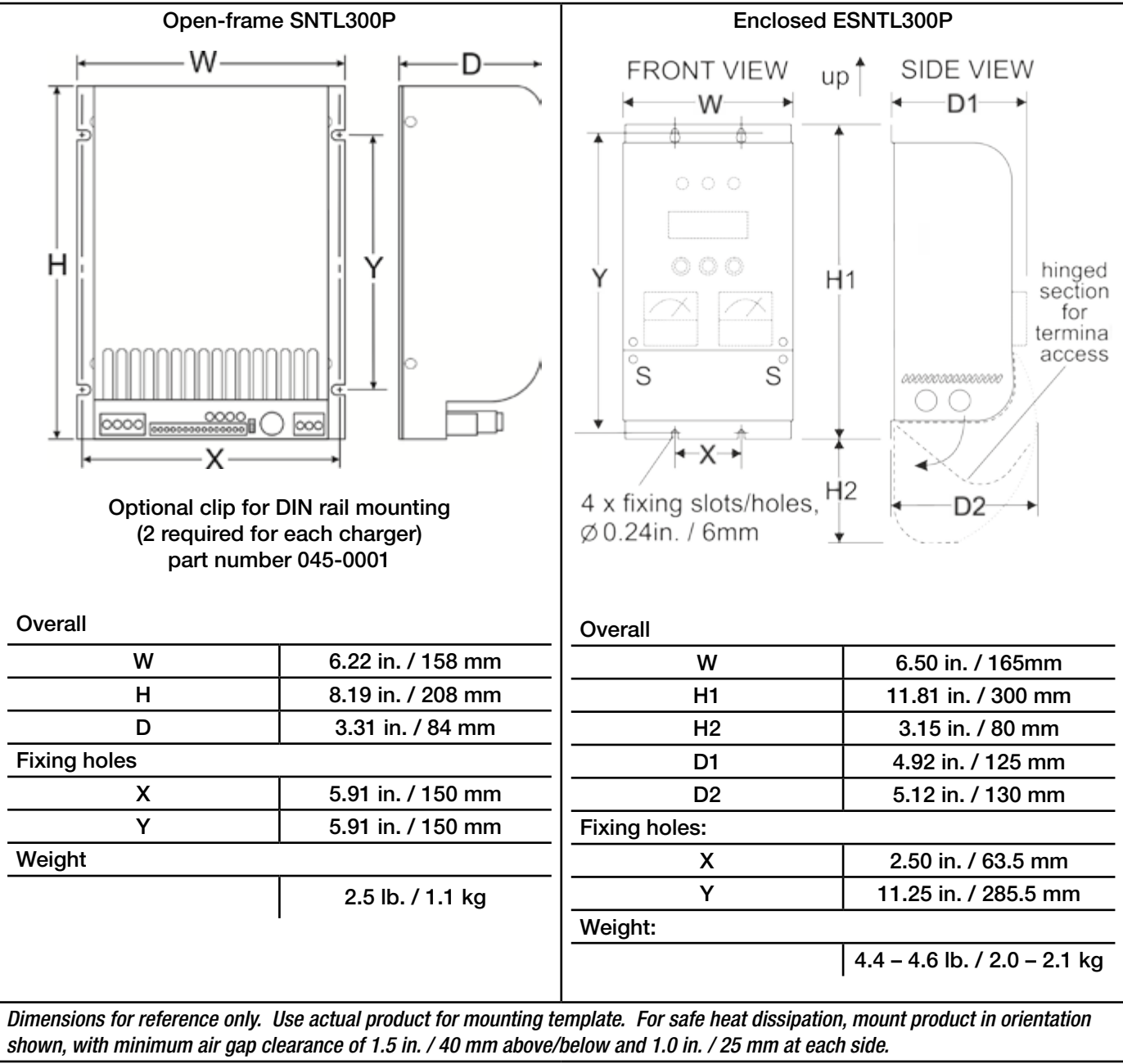
## Output Calibration

Battery type is selected by circuit board DIP switches or SNTL300P-PCSUITE configuration software.

Calibration figures at 20 deg C. If temperature compensation is enabled, and remote SNTL-RTC temperature sensor connected, output voltage automatically varies by 3mV per cell per 1°C deviation from 20°C, within the range -10 to +50°C. Increasing temperatures give decreasing outputs; decreasing temperatures give increasing outputs.

Battery Type		float volts (V DC)	boost volts (V DC)
12V	Wet (vented) lead acid, 6 cells	13.5	14.1
	Calcium-Calcium, 6 cells	13.8	15.6
	Lead acid hybrid Sb-Ca (Antimony-Calcium), 6 cells	13.5	14.7
	VRLA, AGM, 6 cells	13.5	14.4
	VRLA, Gel, 6 cells	13.5	13.8
	NiCd, 10 cells	14.1	14.5
24V	Wet (vented) lead acid, 12 cells	27.0	28.2
	Calcium-Calcium, 12 cells	27.6	31.2
	Lead acid hybrid Sb-Ca (Antimony-Calcium), 12 cells	27.0	29.4
	VRLA, AGM, 12 cells	27.0	28.8
	VRLA, Gel, 12 cells	27.0	27.6
	NiCd, 18 cells	25.6	26.1
	NiCd, 20 cells	28.2	29.0





## How to Order

Part Number	Model and Description	Notes
42703850	SNTL300P: Open-frame (protective cover) Sentinel 300P Input supply 110/120/220/240VAC (50Hz/60Hz) Output 10A @ 12/24V	 
42703852	SNTL300PC: As above, plus CAN/J1939 communication	
42703879	ESNTL300PM: Enclosed Sentinel 300P Input supply 110/120/220/240VAC (50Hz/60Hz) Output 10A @ 12/24V Analog ammeter and voltmeter	 
42703877	ESNTL300PCL: Enclosed Sentinel 300P Input supply 110/120/220/240VAC (50Hz/60Hz) Output 10A @ 12/24V LCD readout, control/program buttons and CAN communications	 
42703875	ESNTL300PCLM: As above, plus analog ammeter and voltmeter	 
42703619	SNTL-RTC: Remote temperature sensor with 9.8 feet / 3.0 meter lead assembly, for automatic charge output temperature compensation	
42703898	SNTL300P-PCSUITE: Windows®-based software suite for all (E)SNTL300P models. Request by email with company name, details and valid email address	
42703899	SNTL300P-PCCONN: PC connection suite for all (E)SNTL300P models. Includes SNTL300P-PCSUITE software on CD-ROM, charger RS485 lead (6.5 feet / 2 meter), RS485/USB converter and USB lead (3.2 feet / 1 meter)	

	<b>PowerView™ Displays</b>	
1110920	PowerView™ PV25 — Engine and Diagnostic Display . . . . .	331
1110823	PowerView™ PV101 — Engine and Diagnostic Display . . . . .	333
1411568	PowerView™ PV101-A-HAZ & PV101-C-HAZ . . . . .	335
1311321	PowerView™ PV350 — Engine and Diagnostic Display . . . . .	337
1311242	PowerView™ PV380 — Engine and Diagnostic Display . . . . .	339
1010638	PowerView™ PV450 — Engine and Diagnostic Display . . . . .	341
1211067	PowerView™ PV780 — Engine and Diagnostic Display . . . . .	343
	<b>HelmView™ Displays</b>	
1211117	HelmView™ HV450 — Commercial Marine Display . . . . .	345
	<b>PowerView™ PVA Gages and Accessories</b>	
1010612	PowerView™ CAN Gages . . . . .	347
02125	PowerView™ Analog Gages — PVA Series . . . . .	349
03020	Wiring Harness Accessories — PowerView™ PV101 Module and PVA Analog Gages . .	353
	<b>PowerView™ PVM Gages and Accessories</b>	
0710178	PowerView™ Gages — PVM Series . . . . .	355
0710179	Wiring Harness Accessories — PowerView™ PV101 and PVM Gages . . . . .	359
	<b>PowerView™ PVM Gages and Accessories</b>	
0910389	PVS-5 Power Supply . . . . .	361

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# PowerView™ PV25

## Engine and Diagnostic Display

The PowerView 25 is an engine and diagnostic display in an economical, compact package. This J1939-compliant device provides electronic engine parameter data, is simple to install, matches the PowerView line of rugged displays and can be powered by 12-volt or 24-volt systems.

The PV25 is equipped with two push buttons to quickly access a convenient menu. In addition, a back-lit graphic display and two LEDs indicate Active-fault Alarm or Shutdown status.

Active and Stored Fault messages display the SPN (Suspect Parameter Number), FMI (Failure Mode Indicator) and the OC (Occurrence Count) using the SAE J1939 protocol.

The PV25 displays up to 20 standard J1939 parameters in standard or metric units. The following are some of the engine parameters of the PV25 displays:

Engine RPM	Coolant Temperature
Engine Oil Pressure	ITA/Stage IIIB Parameters
Engine Hours	Active Service Codes
System Voltage	Stored Service Codes

## Specifications

### Tier 4 / Stage IIIB/IV Compliant Ready

**Operating Voltage:** 6 VDC minimum to 36 VDC maximum

### Power Supply Operating Current:

460mA max @ 12 VDC

810mA max @ 24 VDC

**Reversed Polarity:** Withstands reversed battery terminal polarity

### Environmental

**Operating Temperature:** -40° to 158°F (-40 to 70°C)

**Storage Temperature:** -67° to 185°F (-55 to 85°C)

**Sealing:** IP68

**CAN Bus:** SAE J1939 compliant

### Connectors

4-pin AMP Mini-universal Mate-N-Lok Connector

AMP Plug: P/N 172338-1

AMP Socket: P/N 171639-1 (4 each, assumes 18 gage wire. See

AMP Plug specification to match socket and wire size.)

**Maximum Panel Thickness:** 3/8 inch (9.6 mm)

**Shipping Weight:** (all models) 0.2 lb. (0.1 kg)

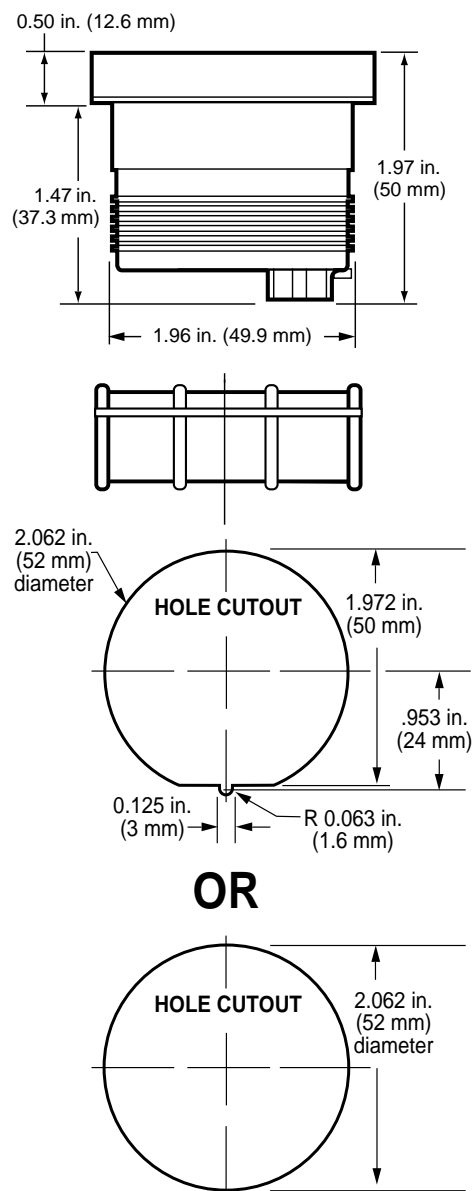
**Shipping Dimensions:** (all models)

3-7/8 x 2-3/4 x 2-3/4 in.

(98.4 x 69.85 x 69.85 mm)





## Dimensions



# Bezel Options

Two Bezel styles are available. One is low profile, and both are constructed of ABS.

PV25 Bezel Styles	
AB A-20 Style	BB Low Profile SAE Style
 †	 †

# How to Order

Part Number	Description	Notes
78700541	PV25 Bezel type (flat lens) AB = A20 (Black)	Displays
78700571	PV25 Bezel type (flat lens) BB = Low Profile SAE (Black)	
78000613	Wiring Harness PVW-PDA-12 PowerView 10 CAN & Power	Accessories
78000614	Wiring Harness PA-30View 10 Loose Wiring	
78000480	Terminating Resistor, PVMJRM	



# PowerView™ PV101

## Engine and Diagnostic Display

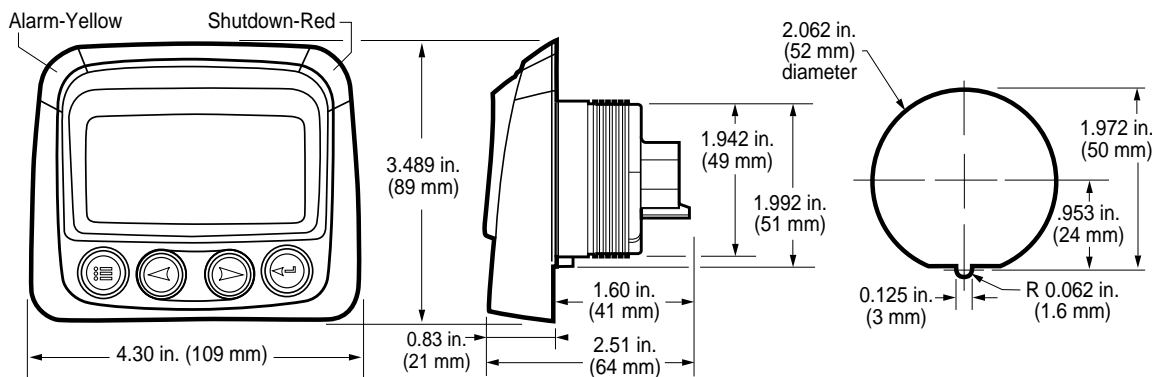
The PowerView PV101 display is a multifunction tool that enables equipment operators to view standard engine and transmission parameters and active/stored trouble codes. The display can show a single or a four-parameter simultaneous display with text descriptions for most common fault conditions. The enhanced alarm indicators have ultra-bright alarm and shutdown LEDs.

The PV101-C and PV101-A have many features including:

- Tier 3/Euro Stage III and earlier (PV101-A)
- Tier 4/Euro Stage IV (PV101-C) – Three icons indicating Active Regeneration, Inhibit Regeneration and Diesel Particulate Filter DPF Restricted. Menu offers Auto DPF Regen and Request DPF Regen.
- OEM Menu - A password protected menu offers access to MODBUS Setup, Engine Speed Control ON/OFF and other critical menu items that require restricted access.
- TSC1 (Torque Speed Control) (PV101-C only) – Allows users to set run speed via CAN if supported by engine manufacturer
- Additional 4-Up Screen (PV101-C only) – Allows user to have two 4-Up screens to toggle between. Second user configurable screen is defaulted to show Tier 4 Parameters: DEF Level (Diesel Exhaust Fluid Level), DPF Active Regen Status, Exhaust Filter Outlet Temp and Exhaust Filter Inlet Temp.
- Multiple language options – English, Spanish, German, Italian, French, Brazilian Portuguese, Chinese, Japanese, Czech and Russian
- Sender Input – Select between backlight dimmer function or fuel level. Can be calibrated to use non-Murphy fuel senders.
- Service Reminders – Five service reminders allow users to set hours for: Change Engine Oil, Air Filters, Hydraulic Oil, and Service Engine and Service Machine.
- Select Source Address – Select the exact address the PV101 will claim on the bus
- The ability to select CAN bus Data Rate
- PV101-C Configuration Tool (PV101-C only) – PC tool allows users to create, view, edit and download configurations for the PV101
- The PV101-C Display Gages – Compatible with PVA and PVM gages as well as additional J1939 I/O modules
- Displays more than 50 standard SAE J1939 parameters
- Shows helpful troubleshooting description for the supported parameters. Shows SPN, FMI and OC for all faults



## Dimensions



Specifications

**Operating Voltage:** 8 - 32 VDC

**Reversed Polarity:** Withstands reversed battery terminal polarity indefinitely within operating temperatures

**Environmental**

**Operating Temperature:** -40° to +185°F (-40° to +85°C)

**Display Viewing Temperature:** -20° to +185°F (-29° to +85°C)

**Storage Temperature:** -40° to +185°F (-40° to +85°C)

**Environmental Sealing:** IP68, ± 5 PSI (± 34kPa)

**Power Supply Operating Current**

    (@ 14VDC) 52 mA min.: 300 mA max

    (@ 32VDC) 1A max (with LCD heater)

**CAN Bus:** SAE J1939 compliant

**Case:** Polycarbonate/polyester

**Maximum Panel Thickness:** 3/8 inch (9.6 mm)

**Auxiliary RS485 Communications Port**

User configurable as MODBUS MASTER or MODBUS RTU SLAVE

MASTER ACTIVE (default) drives optional PVA or PVM gages

SLAVE ACTIVE offers user adjustable communication parameters

**Resistive Input:** user selectable as one of the following

Backlighting Potentiometer: 1 K Ohm, 1/4 W

Murphy Fuel Sender: 33 Ohm full, 240 Ohm empty set standard from factory for use with Murphy fuel sender. Programmable for use with non-Murphy fuel senders.

**Shipping Weights (all models):** 1 Lb. (450 g.)

**Shipping Dimensions (all models):**

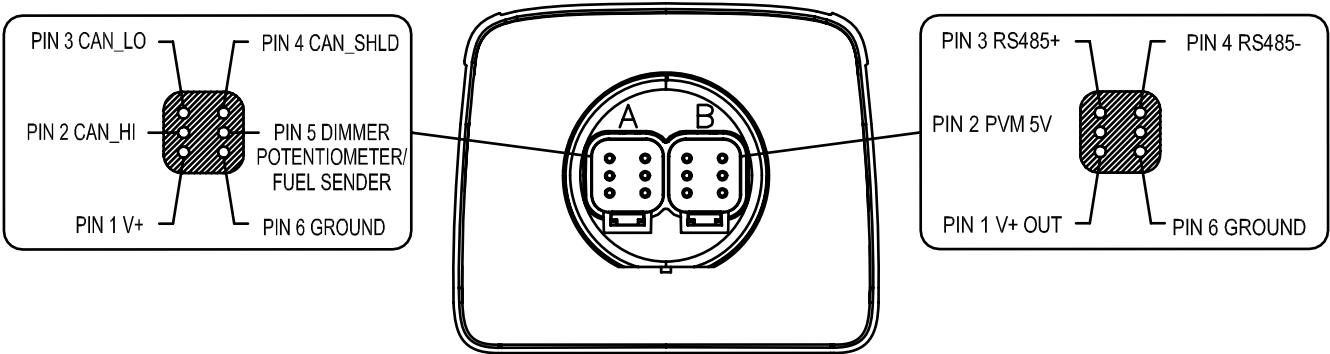
5 x 6 x 6 in. (127 x 152 x 152 mm)

**Clamp:** PBT

**Connectors:** 6-pin Deutsch DT Series

Pinout

DEUTSCH DT06-6 STYLE CONNECTIONS




How To Order

Part Number	Model	Description	Languages Available
78700439	PV101-C	Murphy STD	English, Spanish, French, Italian, German
78700497	PV101-C-M01	Murphy STD Russian	English, Russian, French, German, Spanish
78700498	PV101-C-M02	Murphy STD Chinese	English, Chinese
78700499	PV101-C-M03	Murphy STD Japanese	English, Japanese
78700500	PV101-C-M04	Murphy STD Brazilian Portuguese	English, Brazilian Portuguese, French, German, Spanish
78700501	PV101-C-M05	Murphy STD Czech	English, Czech, French, German, Spanish
78700435	PV101-C Configuration Tool Kit	User Configuration Tool	
78700244	PV101-A	Murphy STD	English, Spanish, French, Italian, German
78700396	PV101-A-M01	Murphy STD Russian	English, Russian, French, German, Spanish
78700409	PV101-A-M02	Murphy STD Chinese*	English, Chinese
78700411	PV101-A-M03	Murphy STD Japanese*	English, Japanese
*Added features not available in these language models.			

# PowerView™ PV101-A-HAZ & PV101-C-HAZ

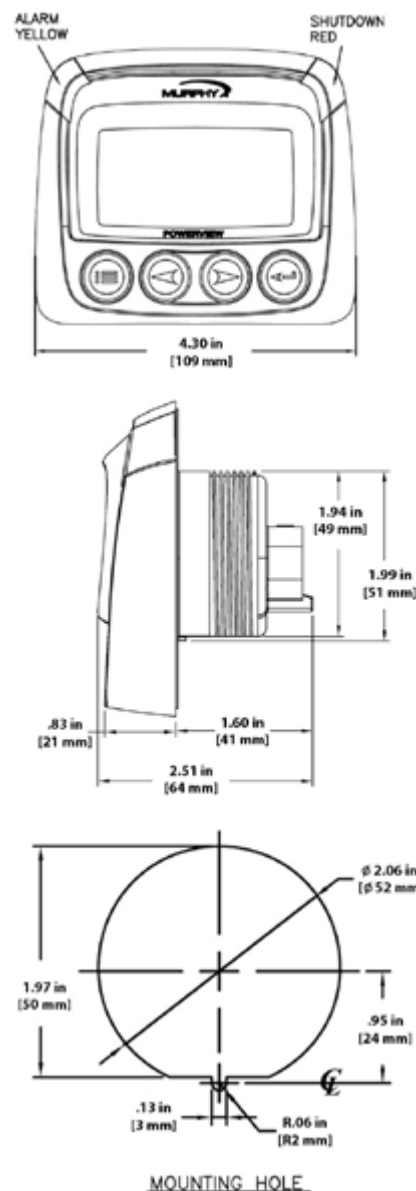
The PowerView PV101 display is a multifunction tool that enables equipment operators to view standard engine and transmission parameters as well as active and stored trouble codes. The device can show a single parameter or display four parameters simultaneously. Diagnostic capabilities include codes with text description for most common fault conditions. The enhanced alarm indicators have ultra-bright alarm and shut-down LEDs (amber and red). The HAZ models of the PV101-C and PV101-A have many features including:

- ATEX Certified, Zone 2, Category 3G  II 3G IIC T3 Ta = -10°C to 70°C (14°F to 158°F)
- Tier 4 Emissions Implementation (PV101-C only) – Three icons indicating Active Regeneration, Inhibit Regeneration and Diesel Particulate Filter (DPF) Restricted. Menu offers Auto DPF Regen and Request DPF Regen.
- OEM Menu – A password protected menu offers access to MODBUS Setup, Engine Speed Control ON/OFF and other critical menu items that require restricted access.
- TSC1 (Torque Speed Control) (PV101-C only) – Allows user to set run speed via CAN if supported by engine manufacturer.
- Additional 4-Up Screen (PV101-C only) – Allows user to have two 4-Up screens to toggle between. Second user configurable screen is defaulted to show Tier 4 parameters: DEF Level (Diesel Exhaust Fluid Level), DPF Active Regen Status, Exhaust Filter Outlet Temp and Exhaust Filter Inlet Temp.
- Multiple language options – Russian, Czech, Brazilian Portuguese, Chinese and Japanese models have been added to the line of existing languages (English, Spanish, French, German and Italian).
- Sender Input – Select between backlight dimmer function or fuel level. Can be calibrated to use non-Murphy fuel senders.
- Service Reminders – Five service reminders allow users to set hours for: Change Engine Oil, Change Air Filters, Change Hydraulic Oil, Service Engine and Service Machine.
- Select Source Address – Select which address the PV101 will claim on the bus.
- Select CAN bus Data Rate – Allows user to select CAN bus data rate.
- PV101-C Configuration Tool (PV101-C only) – PC tool allows users to create, view, edit and download configurations for the PV101.
- The PV101-C Display Gauges – Compatible with PVA and PVM gauges, as well as additional J1939 I/O modules.

The MurphyLink system includes the microprocessor-based PowerView Analog (PVA) Gages for displaying critical engine data broadcast by an electronic engine or transmission's Engine Control Unit (ECU). Other components include engine RPM, oil pressure, coolant temperature and system voltage. A combination audible alarm/relay unit offers warning and shut-down alerts. Up to 32 components may be linked to the PowerView using a simple daisy chain wire connection scheme using RS485. The PowerView and all connected components can be powered by either 12- or 24-volt systems.



## Product Dimensions



## Specifications

### Operating Voltage

12/24V (8-32 VDC minimum and maximum voltage)

### Reversed Polarity

Withstands reversed battery terminal polarity indefinitely within operating temperatures.

### Environmental

**ATEX Operating Temperature:** -10°C to 70°C (+14°F to 158°F)

**Storage Temperature:** -40°C to 85°C (-40°F to 185°F)

**Environmental Sealing:** IP68, ±5 PSI (±34.4 kPa)

### Power Supply Operating Current

(@ 14VDC) 52 mA min: 300mA max

(@ 32VDC) 1A max (with LCD heater)

**CAN bus:** SAE J1939 compliant

**Case:** Polycarbonate / polyester

**Maximum Panel Thickness:** 3/8 inch (9.6mm)

**Resistive Input:** (user selectable as one of the following)

Backlighting Potentiometer: 1K Ohm, 1/4 W

Murphy Fuel Sender: 33 Ohm full, 240 Ohm empty set from the factory or programmable to work with non-Murphy fuel senders.

**Fuel Sender Input:** 33 Ohm full, 240 Ohm empty set standard from factory for use with Murphy Fuel Sender. Programmable for use with non-Murphy fuel senders.

**Shipping Weights (all models):** 1 lb. (450g)

**Shipping Dimensions (all models):**

5 x 6 x 6 in. (127 x 152 x 152 mm)

**Clamp:** PBT

**Connectors:** 6-pin Deutsch DT Series

## How To Order

Part Number	Model and Description	Notes
78700248	PV101-A-HAZ: Murphy Standard, Hazardous Environment	English, Spanish, French, Italian German
78700581	PV101-C-HAZ: Murphy Standard, Hazardous Environment	English, Spanish, French, Italian German
78700428	PV101 Shield: Impact Shield Assembly	
78700430	HAZ Environment Kit: PV101-A-HAZ w/PV101 Shield	English, Spanish, French, Italian German

# PowerView™ PV350

## Engine and Diagnostic Display

The PowerView 300 Series features robust, multifunctional displays for advanced monitoring of multiple electronic engines. The PV350 display in this series monitors multiple engine and machine parameters on an easy-to-read 3.8-inch (97mm) QVGA monochrome LCD. The display is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown.

The PV350 display is customizable using the PowerVision Configuration Studio®, an intuitive tool designed to make personalization simple. Using the software tool, users can tailor basic graphics, designate screen layout and define custom parameters.

This panel is equipped with five tactile push buttons to quickly access a convenient menu. In addition, a backlit, heated graphic display and two LEDs indicate active-fault alarm or shutdown status.



### Specifications

**Operating voltage:** 6-36 VDC

**Vibration and shock:** 7.86 random vib (5-2000Hz) and ±50g shock in three axes

**Reversed polarity:** withstand reversed battery terminal polarity

**Operating temperature:** -40 to 185°F (-40 to 85°C)

**Storage temperature:** -40 to 185°F (-40 to 85°C)

**Communications:** (2) CAN 2.0B; second CAN port is NMEA 2000 isolated; J1939 and NMEA 2000 protocol; proprietary messaging

**EMC/EMI:** 2004/108/EC and 2006/95/EC directives

EN61000-6-4:2001 (emission)

EN61000-6-2:2001 (immunity)

EN-50121-3-2 and EN 12895

**Connectors:** Deutsch DT series 6 pin; M12 for NMEA 2000 (micro-C)

**Inputs:** (1) resistive analog

**Outputs:** (1) 500 mA; switched low-side

**SAE J1113/2, 4, 11, 12, 21, 24, 26 and 41 display**

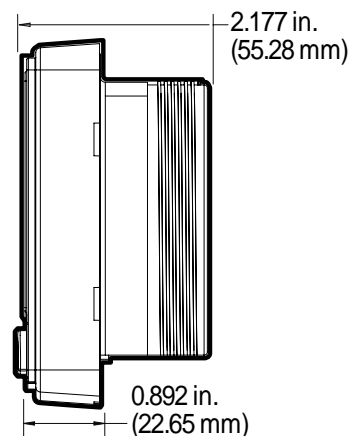
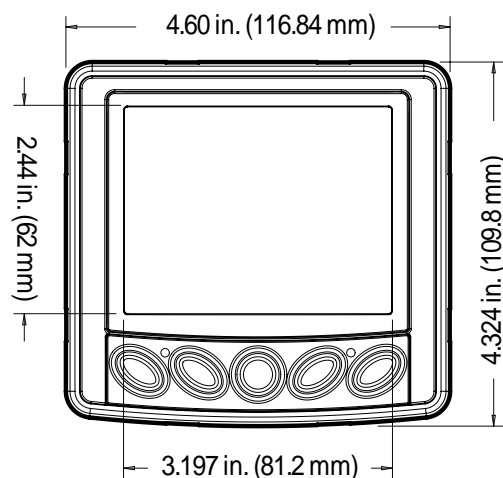
**Display:** 3.8" (97 mm) QVGA (320x240 pixels); monochrome transfective LCD with white LED backlight and heater

**Viewing angle:** ±50° horizontally; +45°/-60° vertically

**Keys:** 5 tactile push buttons

**Alarms:** Red and amber warning LEDs; capable of set points-triggered output for external piezo buzzer or shutdown relay

### Dimensions



# Pinout



# How To Order

Part Number	Description	Notes
78700545	PV350, Murphy Standard	Display
78090100	Programming Kit, PV380-350 with dongle	Accessories
78051077	Seal, PV380-350 gasket	Service
78000752	PowerVision Configuration Studio® CD and license	Software



# PowerView™ PV380

## Engine & Diagnostic Display

The PowerView 300 Series features robust, multifunction displays for advanced monitoring of multiple electronic engines. It's capable of monitoring multiple engines and machine parameters on an easy-to-read 3.8-inch (97mm) QVGA monochrome LCD. The display is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown.

Customize the PV380 display using the PowerVision Configuration Studio®, an intuitive tool designed to make customization simple. Using the software tool, users can tailor basic graphics, designate screen layout and define custom parameters.

The PV380 is equipped with five tactile push buttons to quickly access a convenient menu. In addition, a backlit and heated graphic display with LEDs indicate alarm or shutdown status.



## Specifications

**Operating Voltage:** 6-36 VDC

**Vibration and Shock:** 7.86 random vibrate (5-2000Hz) and  $\pm 50g$  shock in 3 axes

**Reversed Polarity:** withstands reversed battery terminal polarity

**Operating Temperature:** -40° to 185° F (-40° to 85° C)

**Storage Temperature:** -40° to 185° F (-40° to 85° C)

**Communications:** (1) CAN 2.0B; J1939 Protocol; Proprietary Messaging; (1) RS-485 serial

### EMC/EMI:

2004/108/EC and 2006/95/EC directives

EN61000-6-4:2001 (emission)

EN61000-6-2:2001 (immunity)

EN-50121-3-2 and EN 12895

**Connectors:** Deutsch DT Series 6 and 12 pin

**Inputs:** (4) resistive analog; (3) analog; 0-5V analog or digital; (1) frequency 2-10000Hz, 3.6-120VAC

**Outputs:** (1) 500 mA; switched low-side

(1) 5V supply (70mA); protected

**SAE J1113/2, 4, 11, 12, 21, 24, 26 and 41**

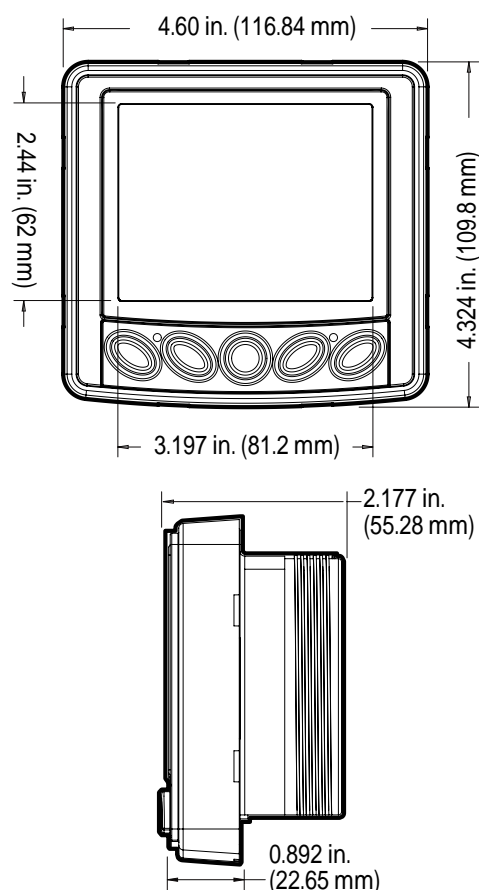
**Display:** 3.8" (97mm) QVGA (320x240 pixels); monochrome trans-flective LCD with white LED backlight and heater

**Viewing Angle:**  $\pm 50^\circ$  horizontally;  $+45^\circ/-60^\circ$  vertically

**Keys:** 5 tactile push buttons

**Alarms:** Red and amber warning LEDs; capable of set point-triggered output for external piezo buzzer or shutdown relay

## Dimensions



# Pinout



## How To Order

Part Number	Description	Notes
78700587	PV380, Murphy Standard	Display
78000752	PowerVision Configuration Studio® CD and license	Software
78051077	Seal, PV380-350 gasket	Service
78001104	Connector Kit, PV380, 12 and 6 position connector	Accessories
78001060	12 position, one foot whip harness	
78090100	Programming Kit, PV380-350 with dongle	

# PowerView™ PV450

## Engine and Diagnostic Display

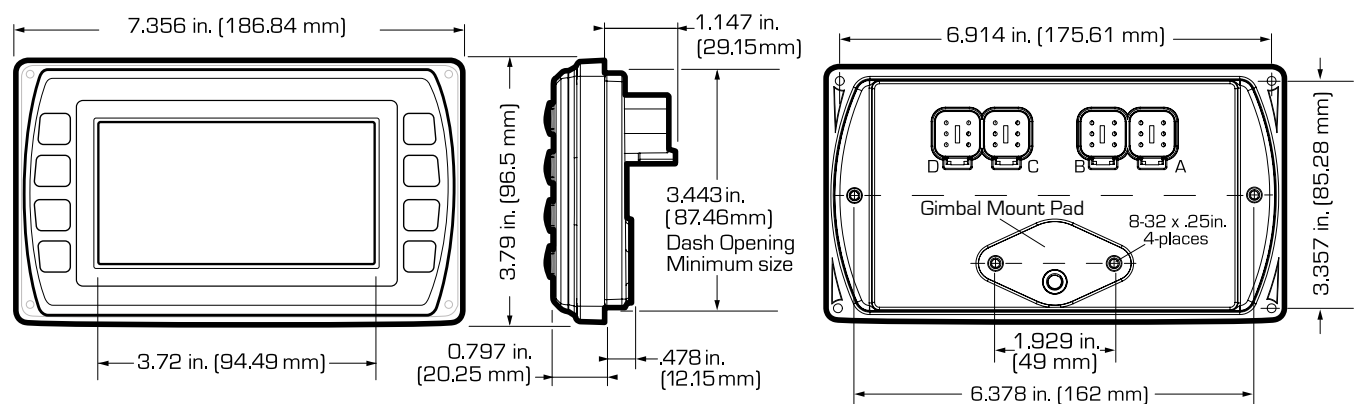
The PowerView 450 display features a freely configurable design allowing custom software to be quickly developed.

The display is compatible with PowerVision Configuration Studio® software to enable quick and easy changes to the programming.

The highly durable display features a full-color, robust 4.3-inch bonded LCD for best-in-class sunlight readability. The PV450's rugged design makes it a great solution for all types of environments and applications.



## Dimensions



## Specifications

### Technical

**Display:** Bonded 4.3" color transmissive TFT LCD  
**Resolution:** WQVGA, 480 x 272 pixels, 16-bit color  
**Aspect Ratio:** 16:9  
**Orientation:** Landscape or portrait  
**Backlighting:** LED, 500-650 cd/m<sup>2</sup> (30,000 hr lifetime)  
**Microprocessor:** Freescale i.MX357 32bit, 532Mhz  
**QNX Realtime Operating System**  
**Flash Memory:** 256 MB  
**RAM:** 128 Mbytes DDR2 SDRAM  
**Operating Voltage:** 6-32 VDC, protected against reverse polarity and load dump (CSA, 6-30 VDC)  
**Power Consumption:** 10W max. (CSA, 163 mA max @ 30VDC)  
**CAN:** (2) CAN 2.0B; optional NMEA 2000 isolation, isolation with HVS450  
**Protocols:** J1939, NMEA 2000, CAN open  
**RS-485:** (1) MODBUS Master/Slave  
**Video input (Optional):** (2) NTSC/PAL input channels with one displayed at a time  
**Connection:** (4) Deutsch DT 6-pin connectors  
**Keyboard:** (8) tactile buttons with white LED backlight  
**USB:** 2.0 host, full speed  
**Output:** (1) Open-drain, capable of sinking 500 mA

**Input:** (1) Resistive, 0-5 V or 4-20 mA (software configurable) (10-bit resolution)  
**Clock:** Real time clock with built-in rechargeable Li-ion battery backup (0.033 mWh)

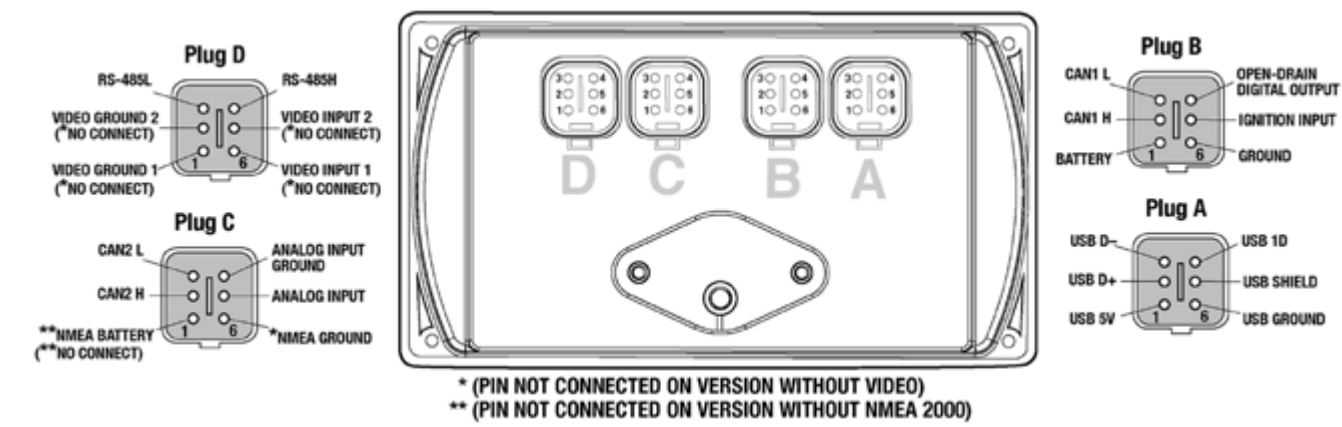
### Environmental

**Operating Temperature:** -40°C to +85°C (-40°F to +185°F)  
**Storage Temperature:** -40°C to +85°C (-40°F to +185°F)  
**Protection:** IP 66 and 67, front and back  
**Electromagnetic Compatibility:**  
 2004/108/EC EN 60945:2002  
 EN 61000-6-4 EN 50121-3-2  
 EN 61000-6-2 (immunity) EN 12895  
 J1113/2, 4, 11, 12, 21, 24, 26 and 41  
**Vibration:** Random vibration, 7.86 Grms (5-2000 Hz), 3 axes  
**Shock:** ± 50G in 3 axes

### Specifications applicable to CSA-certified PV450 only

**CSA Certification:** Class I Div 2 Groups B, C & D; T4; IP66  
**CAN:** (2) CAN 2.0B (transmission rates up to 1Mbps)  
**Protocols:** J1939 and CAN open  
**Environmental Protection:** IP 66 and 67

Pinout



How To Order

Part Number	Model/Description	Notes
78700436	PV450	Display
78700538	PV450, J1939, NMEA, with Video	
78700515	PV450, with Video	
78700543	PV450-01-CSA, with Video (cCSAus)	
78700544	PV450NV-01-CSA, (cCSAus)	
78000831	PV450, Visor Kit	Accessories
78000814	PV450, Mounting Plug Kit	

# PowerView™ PV780

## Engine and Diagnostic Display

The PowerView 780 display is a full-featured, configurable display that shows integrated engine, transmission and diagnostic information in an easy-to-read operator interface. Equipment functionality can be further integrated through the available I/O and controlled via the CAN bus.

The PV780 features a full-color, 7-inch bonded LCD for brighter, smoother graphics and best-in-class sunlight readability. The rugged design makes this display a great solution for extreme environments.

The PV780 display is compatible with PowerVision Configuration Studio® which allows users to edit CAN parameters, add OEM branding and create custom equipment screens for a unique and sophisticated user interface.

Features include:

- CAN-based display with rich, full-color graphics
- Compatible with both mechanical and electronic engines
- Rugged design for extreme environments
- Multiple languages

## Specifications

### Tier 4 / Euro Stage IV Ready

#### Environmental

**Operating Temperature:** -40°F to +185°F (-40°C to +85°C)

**Storage Temperature:** -40°F to +185°F (-40°C to +85°C)

**Protection:** IP66 and 67, front and back.

#### EMC/EMI:

- 2004/108/EC and 2006/95/EC directives
- EN 61000-4-3 (radiated EMF immunity radiated)
- EN 61000-4-4 (EFT immunity power and I/O lines)
- EN 61000-4-5 (surges power lines)
- EN 61000-4-6 (RF immunity)
- EN 61000-4-8 (magnetic field immunity)
- EN 60945 (ESD)
- EN 60945 (conducted emissions)
- HYBRID EN 60945 CISPR 11 CLASS B (radiated emissions)

#### Electrical:

- J1113-2, -4, -11, -13, -21, -26 and -41

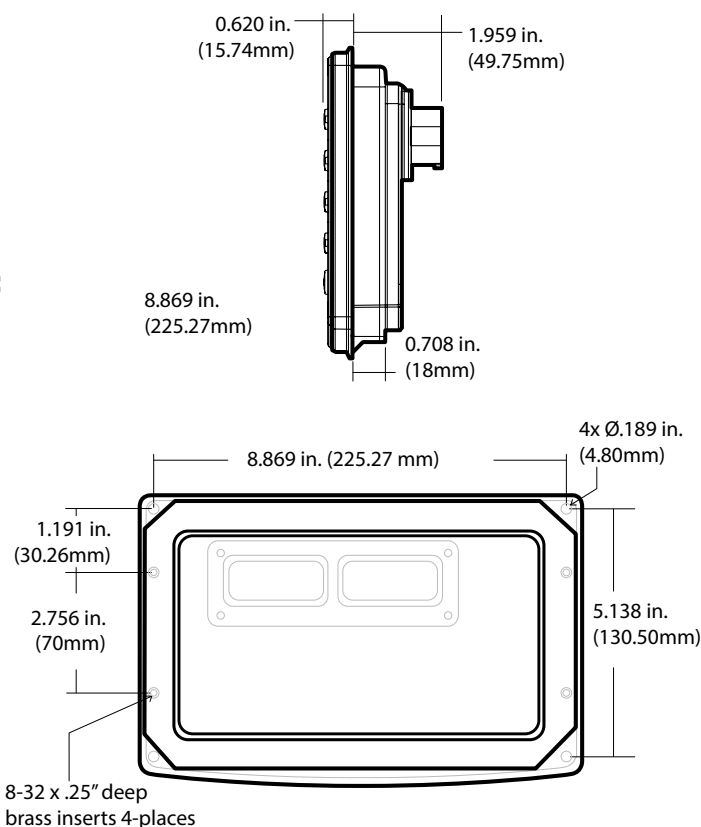
**Vibration:** Random vibration, 7.86 Grms (5-2000 Hz), 3 axes

**Shock:** ±50G in 3 axes

Specifications are continued on the next page.



## Dimensions





## Specifications - continued

### Technical

**Display:** Bonded print/glare-free glass and 7" (178mm) color transmissive TFT LCD

**Resolution:** WVGA, 800 x 480 pixels, 16-bit color

**Viewing Angle:** ±65° horizontal, +55°/-65° vertical

**Orientation:** Landscape or portrait

**Backlighting:** LED, 1000 nit typical brightness 40,000 hr. minimum

**Contrast Ratio:** 400:1

**Refresh Rate:** 60 Hz

**Microprocessor:** Freescale™ i.MX357, 32 bit, 532 MHz, ARM11 core QNX® Realtime Operating System

**Flash Memory:** 2 GB total, 1 GB available for data logging

**RAM:** 128 Mbytes SRAM

**Operating Voltage:** 6-36 VDC, reverse polarity protected

**Video Inputs:** 3 NTSC/PAL (single channel viewable)

**Connectors:** 2 AMPSEAL 23 Pin (AMP 770680-1 and AMP 770680-4)

**Keyboard:** 10 tactile pushbuttons with white LED backlight

**Touchscreen:** (optional) projected capacitive

**USB:** (1) USB 2.0 host (OTG, full speed)

**Real time clock:** with Li-ion rechargeable battery backup

### Communications:

- (2) CAN 2.0B according to ISO-11898-2; J1939 and CANopen protocols; proprietary messaging
- (1) RS-485 serial (MODBUS master/slave or PVA gage)
- (1) USB host (OTG)

### Outputs:

- (1) 500mA switched low-side
- (1) Frequency Out (2Hz - 3 kHz, Vbat rms square wave) for tach

### Inputs:

- (3) Analog 0-5VDC, 4-20 mA, or resistive, 10-bit resolution
- (5) Discrete Digital, Active High
- (1) Frequency In (2Hz - 10 kHz), 5Vpk-pk min, 120Vpk-pk max

### Mechanical

**Dimensions:** 8.37 x 6.0 in. (212.5 x 152.3 mm) landscape

**Unit Depth:** 3.57 in. (90.8 mm)

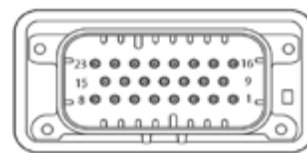
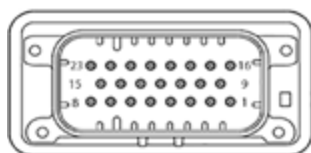
**Case Material:** PC/ABS, ISO 3795 (SAE J369, FMVSS 302) rated

**Mounting Options:** Front mount, back mount or RAM mount

### Certifications:

- CE
- E-mark capable

## Pinout



Connector 2 (Gray)			
Pin	Description	Pin	Description
1	Video Input 1	13	Frequency Input
2	Video Input 2	14	Frequency Return
3	Video Input 3	15	no connect
4	RS-485 High	16	USB D-
5	RS-485 Low	17	USB D+
6	no connect	18	USB 5V
7	no connect	19	USB GND
8	no connect	20	USB Shield
9	Video Input 1 GND	21	no connect
10	Video Input 2 GND	22	no connect
11	Video Input 3 GND	23	no connect
12	USB ID		

Connector 1 (Black)			
Pin	Description	Pin	Description
1	Digital Input 1	13	Digital Input 2
2	Analog Input 3	14	Frequency Output 1
3	Analog Input 2	15	Ignition In
4	Analog Input 1	16	no connect
5	CAN 1 L	17	no connect
6	CAN 1 H	18	CAN 2 L
7	Battery	19	CAN 2 H
8	Ground	20	Digital Input 4
9	Analog Input 3 GND	21	Digital Input 5
10	Analog Input 2 GND	22	Digital Output
11	Analog Input 1 GND	23	no connect
12	Digital Input 3		

## How To Order

Part number	Description	Note
78700560	PV780 Display, Murphy Standard Configuration	Displays
78700564	PV780 Touch Display (no configuration; bootloader only)	
78090098	Programming Kit, PV780	Accessories
78051181	Cover, PV780	
78001053	Bracket Kit (screws included)	
78001055	Harness, Gray Connector, USB	
78001056	Harness, Gray Connector, Flying Leads	
78001057	Harness, Black Connector, Flying Leads	
78001017	Harness, Black Connector, Development	
78001018	Harness, Gray Connector, Development	
78090069	Harness, PV750 Conversion, Power/CAN	Service
78051180	Bezel, PV780	



# HelmView® HV450

## Commercial Marine Display

The HelmView 450 is a 4-inch display specifically designed to meet the engine monitoring needs of the commercial marine industry. Its durable design and easy-to-use interface offer a complete view of your vessel's engines. Monitor propulsion, auxiliary, transmission and genset engines all on one display. It is equipped with the ability to switch between day and night mode operations and even has a blackout option. There are multiple screens to choose from, and it features the ability to turn screens on/off to meet your specific marine application needs. The HV450 has the ability to be connected to a video camera for monitoring the engine room or other important areas of the vessel. It can utilize modern electronic engines and vessel monitoring using a SAE J1939 CAN network.

This multifunctional, bonded screen allows you to monitor multiple engines, transmissions, fuel usage and more using only one device, thus greatly reducing operating costs. It has eight tactile push buttons that can easily be pressed with or without gloves. The HV450's sunlight-viewable, full-color screen makes seeing lifelike gages, alarm warnings, service codes and video easy to view in virtually any condition. The HV450 is fully programmed to display Diagnostic Trouble Codes showing critical alarms and text explanations.

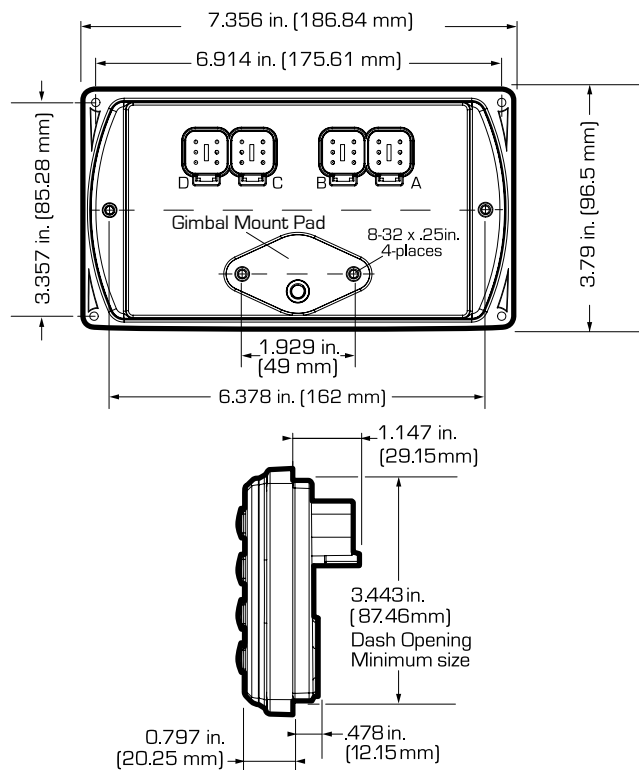
### Display Parameters

The following are some of the parameters displayed by the HV450 in Imperial or Metric units (when applicable, consult engine or transmission manufacturer for SAE J1939 supported parameters).

- Engine RPM
- Engine Hours
- System Voltage
- % Engine Load at the Current RPM
- Coolant Temperature
- Oil Pressure
- Transmission Oil Temperature
- Transmission Oil Level
- Tank Levels
- Course Over Ground\*
- Speed Over Ground\*
- Longitude and Latitude\*
- Real-Time Display\*
- Instantaneous Fuel Usage
- Trip Fuel
- Navigational Bearing
- Active Service Codes
- Stored Service Codes (when supported)
- Video
- \*NMEA GPS Antennae required



### Dimensions



# Specifications

## Technical

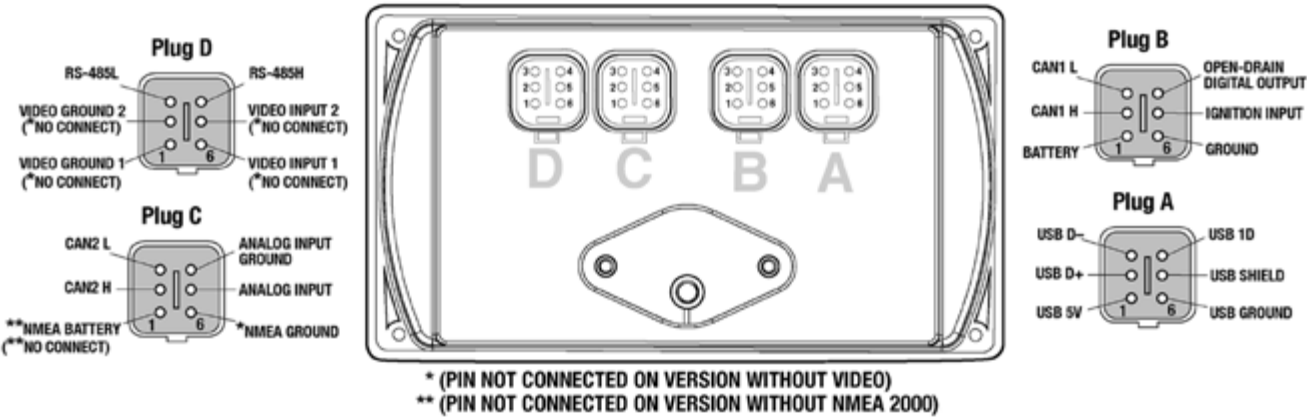
**Display:** Bonded 4.3" color transmissive TFT LCD  
**Resolution:** WQVGA, 480 x 272 pixels, 16-bit color  
**Aspect Ratio:** 16:9  
**Orientation:** Landscape  
**Backlighting:** LED, 500-650 cd/m2 (30,000 hr lifetime)  
**Microprocessor:** Freescale i.MX357 32bit, 532Mhz  
QNX Realtime Operating System  
**Flash Memory:** 256 MB  
**RAM:** 128 Mbytes DDR2 SDRAM  
**Operating Voltage:** 6-32 VDC, protected against reverse polarity and load dump  
**Power Consumption:** 10W max.  
**CAN:** (2) CAN 2.0B; optional NMEA 2000 isolation  
**Protocols:** J1939, NMEA 2000  
**RS-485:** (1) MODBUS Master/Slave  
**Video Input:** (2) NTSC/PAL input channels - one displayed at a time  
**Connection:** (4) Deutsch DT 6-pin connectors  
**Keyboard:** (8) tactile buttons with white LED backlight  
**USB:** 2.0 host, full speed

**Output:** (1) Open-drain, capable of sinking 500 mA  
**Input:** (1) Resistive, 0-5 V, or 4-20 mA (software configurable) (10-bit resolution)  
**Clock:** Real-time clock with built-in rechargeable Li-ion battery back-up (0.033 mWh)

## Environmental

**Operating Temperature:** -40° to +185°F (-40° to +85°C)  
**Storage Temperature:** -40° to +185°F (-40° to +85°C)  
**Protection:** IP 66 and 67, front and back  
**Electromagnetic Compatibility:**  
2004/108/EC  
EN 61000-6-4 EN 501121-3-2  
EN 61000-6-2 (immunity) EN 12895  
J1113/2, 4, 11, 12, 21, 24, 26 and 41  
**Vibration:** Random vibration, 7.86 Grms (5-2000 Hz), 3 axes  
**Shock:** ± 50G in 3 axes

# Pinout



# How To Order

Part Number	Description	Notes
78700563	HV450, J1939, with video	Commercial marine configuration and non-isolated CAN ports
78700538	HV450, J1939, NMEA, with video	Commercial marine configuration with one NMEA 2000 isolated CAN port

# PowerView™ CAN Gages

The PowerView CAN Gages (PVCAN) are a series of intelligent gages designed to display easy-to-read information broadcast over the SAE J1939 communications. These gages are designed to be wired directly to the J1939 CAN bus without the need of another device driving them.

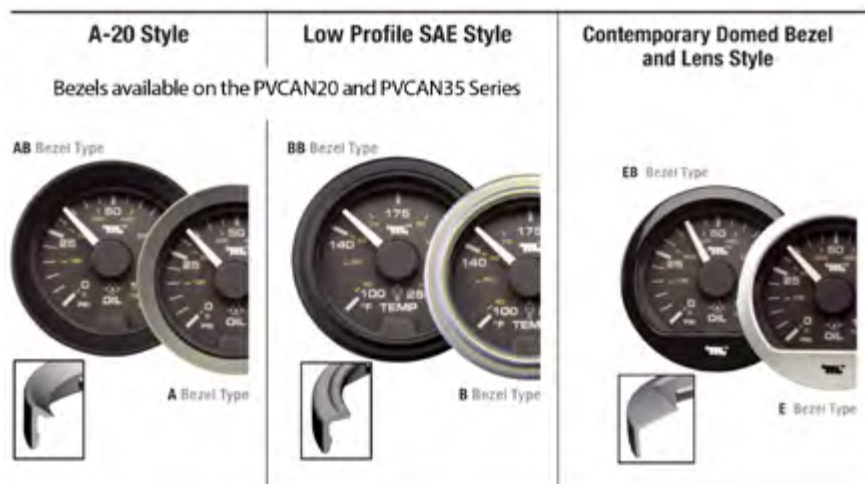
The PVCAN gage includes features such as a smooth stepper motor operation for the 270-degree sweep pointer, an environmentally sealed case with two Deutsch DT style connectors molded into the case and green LED backlighting.

They are available for standard 2 1/6-inch (52mm) and 3 3/8-inch (86mm) diameter hole sizes. In addition, its polycarbonate/polyester alloy cases incorporate a D shape allowing panel cutouts that eliminate gage rotation during installation.

All PowerView gages can be powered by 12- or 24-VDC systems.



## Styles



## Specifications

**Power Supply Input Voltage:** 12/24V (8-32VDC Minimum and Maximum Voltage)

**Power Supply Operating Current:** Typically 70mA

**Backlight Maximum Current:** 45mA

**Input:** CAN (SAE J1939)

**Operating Temperatures:** -40°F to 185°F (-40°C to 85°C)

**Storage Temperatures:** -76°F to 185°F (-60°C to 85°C)

**Dial:** White numerals over black background

**Gage Accuracy:** Better than  $\pm 1\%$  of full scale

**Environmentally Sealed Enclosure:** IP68:  $\pm 5$ PSI ( $\pm 34.4$ kPa).

**Case Material:** Polycarbonate/Polyester (PC+PBT)

**Clamp Material:** Polyester (PBT)

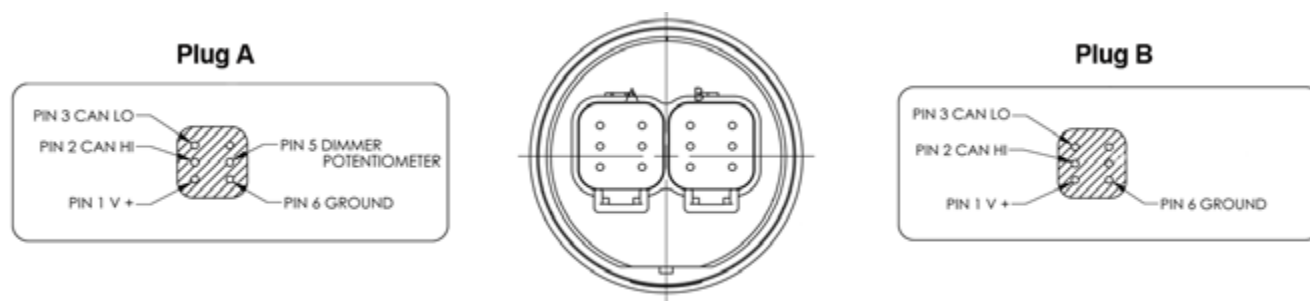
**Lens Material:** Polycarbonate

**Bezel Material:** ABS

**Maximum Panel Thickness:** 3/8 in. (9.6mm)

**Connectors:** 6-Pin Deutsch DT06 Series

## Pinout PVCAN 20 and PVCAN 30 Series



## How To Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

**PVCAN20 - A - 100 - A**

### Model

**PVCAN20** = 2 inch size PowerView Gage  
**PVCAN35** = 3 1/2 inch size PowerView Gage  
 (Tachometer or Speedometer only)

### Gage Function

**A** = Engine Oil Pressure  
**B** = Engine Coolant Temperature  
**BA** = % Diesel Exhaust Fluid (DEF) Level  
**BB** = % Diesel Particulate Filter (DPF) Soot Level  
**C** = Voltmeter  
**D** = Percent Load at Current RPM  
**E** = Transmission Oil Pressure  
**F** = Transmission Oil Temperature  
**G** = Engine Oil Temperature  
**H** = Hydraulic Oil Temperature  
**J** = Percent Fuel Level  
**K** = Boost Pressure  
**L** = Exhaust Gas Temperature  
**M** = Intake Manifold Temperature  
**N** = Auxiliary Temperature  
**P** = Auxiliary Pressure  
**T** = Tachometer  
**S** = Speedometer  
**SS** = Shaft Speed

### Bezel (All Models)

#### Bezel Type (flat lens)

**A** = A20 (Brushed Silver)  
**AB** = A20 (Black)  
**B** = Low profile SAE (Brushed Silver)  
**BB** = Low profile SAE (Black)

#### Bezel Type (domed lens)

**E** = Contemporary Domed (Brushed Silver)  
**EB** = Contemporary Domed (Glossy Black)

### Gage Ranges Available for Gage Functions

**100** = 100 psi/700 kPa  
**150** = 150 psi/1000 kPa (PVCAN20-A only)  
**7B** = 7 Bar/100 psi  
**10B** = 10 Bar/150 psi  
**250** = 250°F/120°C  
**120C** = 120°C/250°F  
**12** = 12 VDC  
**12C** = 12 VDC Cummins (SPN 168)  
**24** = 24 VDC  
**24C** = 24 VDC Cummins (SPN 168)  
**100** = 100%  
**400** = 400 psi/28 bar  
**28B** = 28 Bar/400 psi  
**150C** = 150°C/300°F  
**40** = 40psi/275 kPa  
**1600** = 1600°F/870°C  
**280** = 280°F/138°C  
**85** = 85 mph/130 kmh  
**130K** = 130 kmh/85 mph  
**3000** = 3000 RPM  
**6000** = 6000 RPM

**A, BA**  
**A**  
**A**  
**A**  
**B, F, G, H, M**  
**B**  
**C**  
**C**  
**C**  
**D, J, BA, BB**  
**E, P**  
**E, P**  
**F, G, N**  
**K**  
**L**  
**N**  
**S (PVCAN35 model only)**  
**S (PVCAN35 model only)**  
**T, SS (PVCAN35 model only)**  
**T (PVCAN35 model only)**

Part Number	Description	Notes
78000761	CANJR, Terminating Resistor	Accessories
78000745	CANW-J-9, 9" Jumper Harness*	
78000746	CANW-J-12, 12" Jumper Harness*	
78000747	CAN-J-24, 24" Jumper Harness*	
78000748	CANW-J-36, 36" Jumper Harness*	
78000124	PVW-P-12, 12" Power/CAN Harness	

\*According to recommended SAE J1939 wiring practices, any device on the CAN bus should be noded into the bus with a distance of no more than 1 meter.



# PowerView™ Analog Gages

## PVA Series

The PowerView Analog Gages (PVA) are a series of intelligent gages designed to display easy-to-read information transmitted by the PowerView. The PVA gages communicate with the PowerView via a single RS485 twisted pair MODBUS RTU serial link. The gages can be daisy-chained using quick-connect harnesses with watertight connectors.

The major feature of the PVA gages is its balance between design and functionality. These modern gages offer a selection of lens and bezel styles and colors.

The PVA gages also include features such as a smooth stepper motor operation for the 270-degree sweep pointer, an environmentally sealed case with two Deutsch DT style connectors molded into the case and green LED backlighting.

They are available for standard 2-1/8-inch (52mm) and 3-3/8-inch (86mm) diameter mounting hole sizes. In addition, the polycarbonate/polyester alloy cases incorporate a D shape allowing panel cutouts that eliminate gage rotation during installation.

The PowerView Audible Alarm (PVAA) alerts operators to fault conditions via piezoelectric alarm and relay contacts. It also has a temporary silencer button that silences the audible tone for two minutes on warnings and 30 seconds on shutdown conditions. All PowerView gages can be powered by 12- or 24-VDC systems.

## Specifications

**Power Supply Input:** 12/24V (8-32VDC min/max voltage)

**Power Supply Operating Current:** (@ 14VDC) =

**PVA20, PVA35:** 28 mA minimum; 52 mA maximum

**PVAA20:** 19 ma minimum; 46 mA maximum

**Backlight Maximum Current:** 24 mA (Not valid for PVAA20)

**Input:** RS485 MODBUS RTU Data

**Output:** Analog readout

**Operating Temperature:** -40°F to 185°F (-40°C to 85°C)

**Storage Temperature:** -76°F to 185°F (-60°C to 85°C)

**Dial:** White text over black background

**Indicating Pointer:** Stepper motor Operation with 270° sweep

**Gage Accuracy:** Better than ± 1% of full scale

**Environmentally Sealed Enclosure:**

**Sealing:** IP68, ±5 psi (±34.4 kPa)

**Case Materials:** Polycarbonate/Polyester (PC+PBT)

**Clamp Materials:** Polyester (PBT)

**Lens Material:** Polycarbonate

**Bezel Material:** ABS

**Maximum Panel Thickness:** 3/8 inch (9.6mm)

**Connectors:** 6-pin Deutsch DT06 Series

**The following items apply only to PVAA20**

**Sound Output Level:** 90 dB @ 30cm

**Relay Rated Load:** 0.5A, 125VAC; 1A, 24VDC

**Relay Maximum Switching Capacity:** 62.5VA, 30W

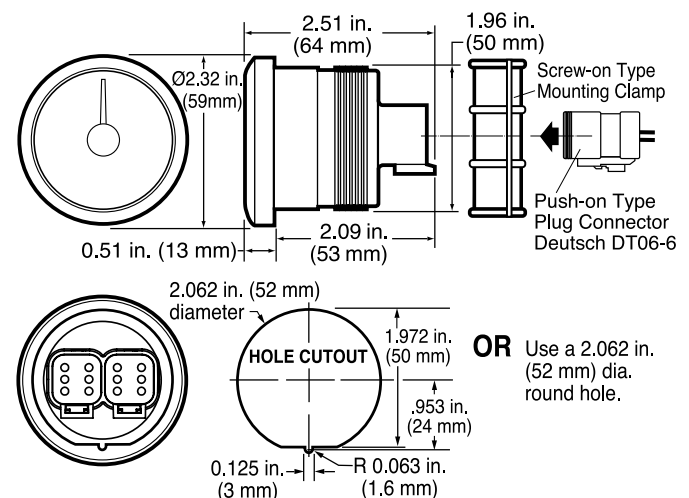
**External Audible Alarm Output:** 28VDC, 30 mA maximum current sink

**Temporary Silence Button:** Charge transfer technology

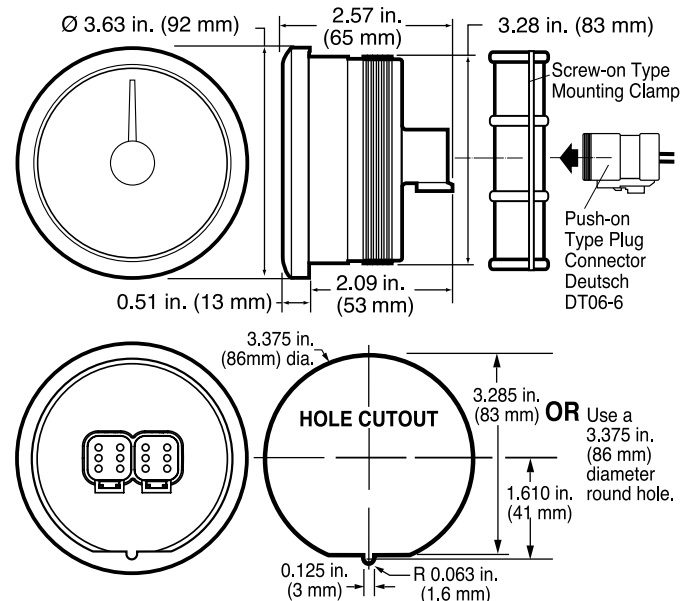


## Dimensions

### PVA20/PVAA20 Series - Typical Gage Dimensions



### PVA35 Series - Typical Gage Dimensions



## Available Bezels

### A-20 Style

### Low Profile SAE Style

### Contemporary Style

Gauges available in the PVA20, PVA35 and PVAA20 Models

AB Bezel Type



A Bezel Type

BB Bezel Type



B Bezel Type

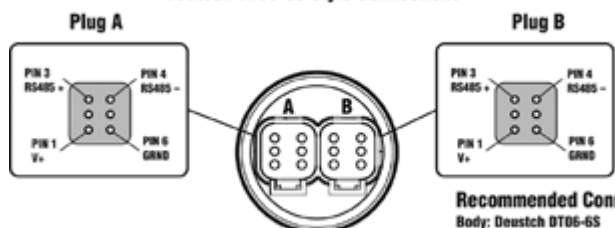
CB Bezel Type



C Bezel Type

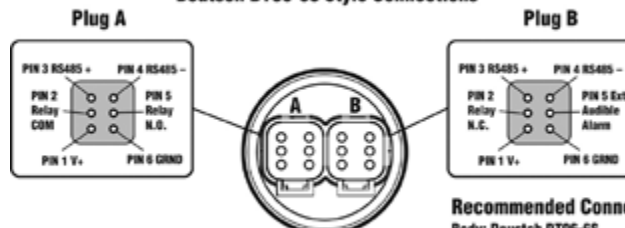
## Pinout

PowerView Gages Back View  
Deutsch DT06-6S Style Connections



**Recommended Connectors:**  
Body: Deutsch DT06-6S  
Wedge Lock: W6S  
Terminals: 0462-201-16141  
Sealing Plug: 114017

PowerView Audible Alarm Back View  
Deutsch DT06-6S Style Connections

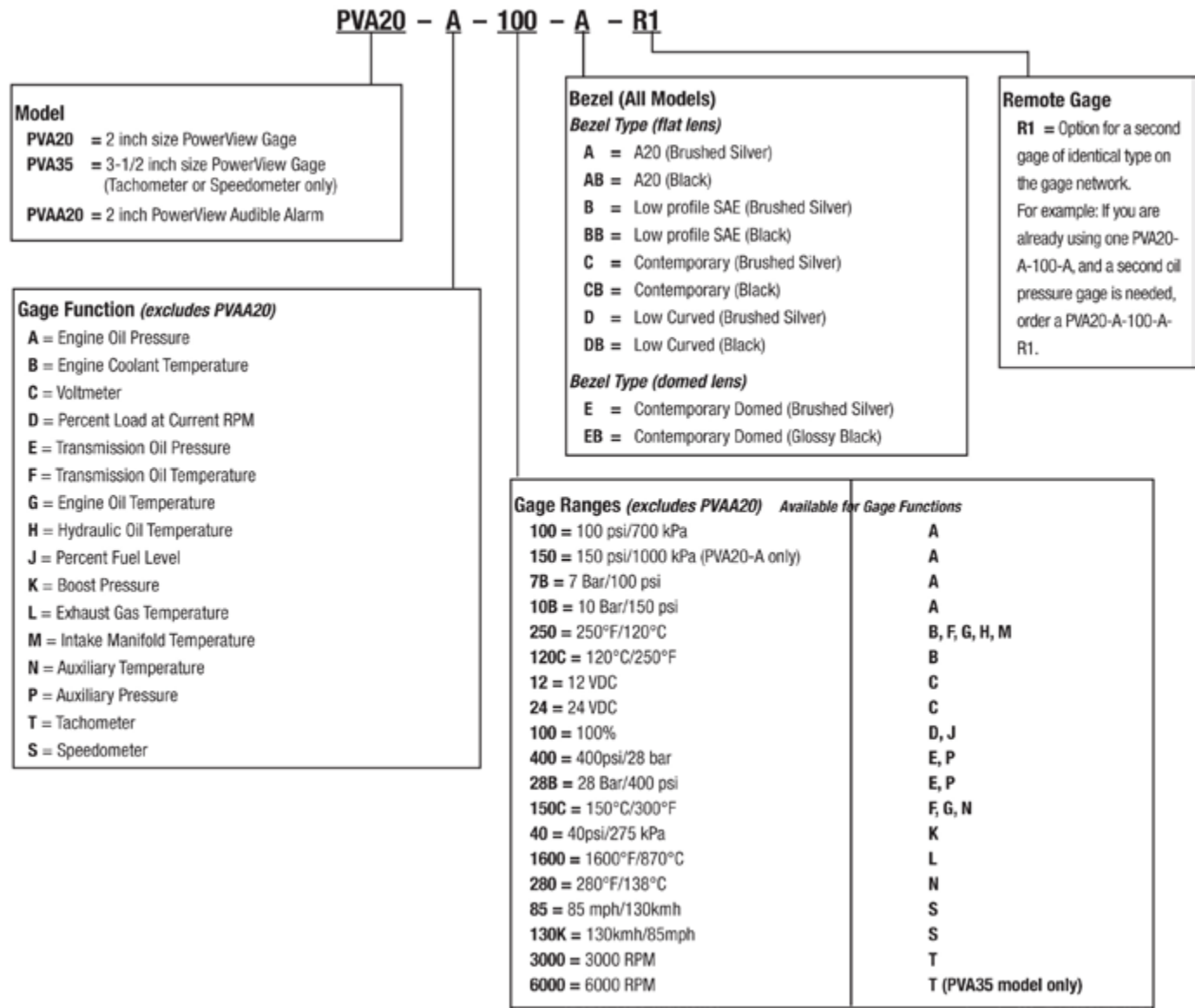


**Recommended Connectors:**  
Body: Deutsch DT06-6S  
Wedge Lock: W6S  
Terminals: 0462-201-16141  
Sealing Plug: 114017



How To Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Shipping Weight: 1 lb. (450 g) All models  
Shipping Dimensions: 6x6x6 in. (153x153x153mm) All models

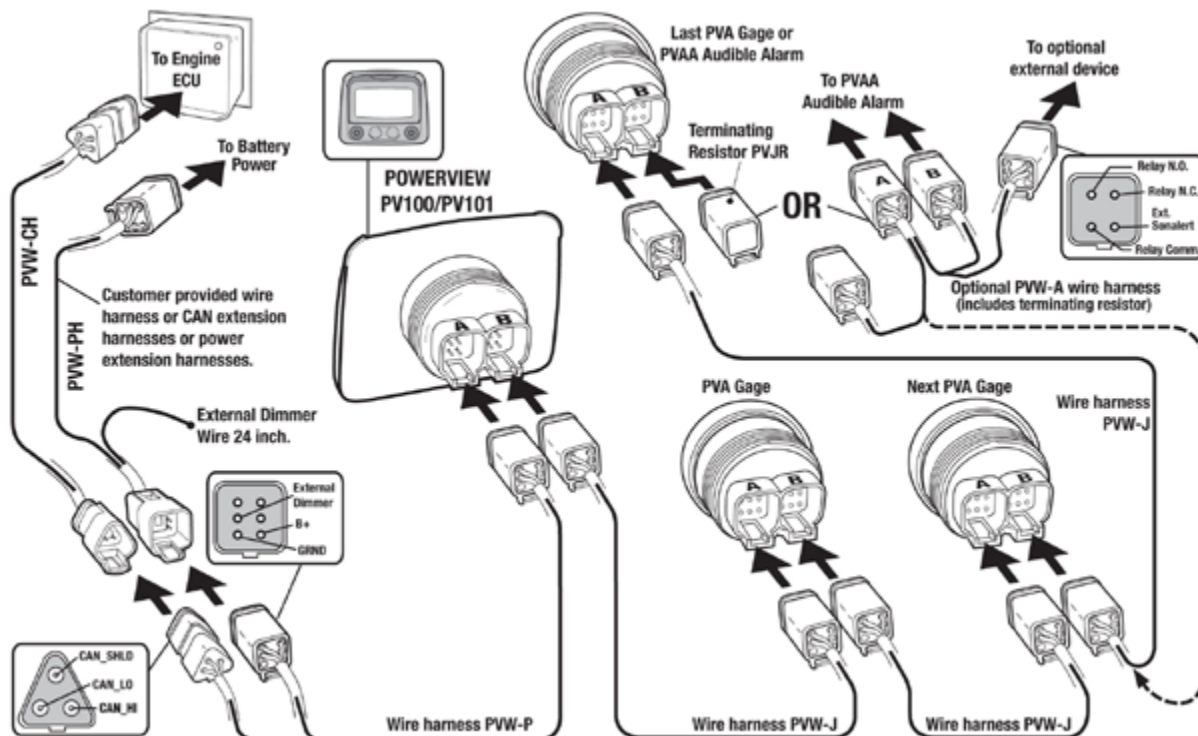
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# Wiring Harness Accessories

## PowerView™ PV101 Module and PVA Analog Gages

### Diagram


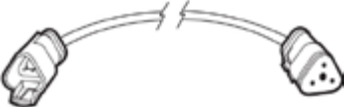

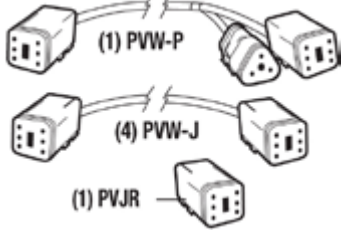
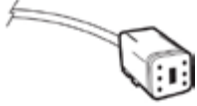



Use this easy-connect diagram to help you locate the wiring harness you need.



### How To Order

Part Number	Length	Model: Description	Diagram
78000124	12 in. (305 mm)	PVW-P-length: CAN and power harness for PowerView module (includes 120Ω CAN resistor)	
78000121	9 in. (229 mm)	PVW-J-length: PowerView jumper harness	
78000122	12 in. (305mm)		
78000123	24 in. (607 mm)		
78000153	9 in. (229 mm)		
78000154	12 in. (305mm)	PVW-A-length: PowerView audible alarm jumper harness (provides alarm ready contacts for external devices)	
78000155	24 in. (607 mm)		

## How To Order - continued

Part Number	Length	Description	Diagram
78000128	–	PVJR: Terminating resistor (use on last PVA gage in a series - not needed for PV100)	
78000157	72 in. (1.82 m)	PVW-CH-length: PowerView CAN extension harness	
78000158	144 in. (3.65 m)		
78000159	240 in. (6.10 m)		
78000160	360 in. (9.10 m)		
78000149	72 in. (1.82 m)	PVW-PH-length: PowerView battery Power extension harness	
78000150	144 in. (3.65 m)		
78000151	240 in. (6.10 m)		
78000152	360 in. (9.10 m)		
78000188	12 in. (305 mm)	PVW-K: PowerView wiring kit includes: one PVW-P, four PVW-J, one PVJR	
78000189	24 in. (607 mm)		
78000125	30 in. (762 mm)	PVW-PW-length: PowerView CAN and power loose wiring (includes 120Ω CAN resistor)	
78000127	24 in. (607 mm)	PVW-CC-length: PowerView CAN loose wiring	
78000126	24 in. (607 mm)	PVW-PC-length: PowerView power loose wiring	
00009510	–	PVW-CT: CAN BUS tee wiring harness	

# PowerView™ Gages

## PVM Series

The PowerView PVM Series Gages are intelligent gages designed to display easy-to-read information transmitted by PowerView. The PVM gages communicate with PowerView via a single RS485 twisted pair MODBUS RTU serial link. The gages can be daisy-chained using quick-connect harnesses.

The major feature of the PVM gage is its balance between design and functionality. These modern gages offer a selection of lens and bezel styles and colors.

The PVM gages also include features such as a smooth stepper motor operation for the 270° sweep pointer, an environmentally sealed case with two Amp Mini Universal Mate-N-Lok connectors molded into the casing, and green LED backlighting. They are available for standard 2-1/6" (52mm) and 3-3/8" (86mm) diameter hole sizes. Their plastic cases incorporate a D shape allowing panel cutouts that eliminate gage rotation during installation.

### Features

- For modern electronic engines and equipment using SAE J1939 Controller Area Network
- Display SAE J1939 parameters broadcast by the PowerView system
- Cutting-edge, stepper motor technology and robust functionality combined
- Microprocessor-driven for high accuracy
- Simple installation and wiring design

### Specifications

#### **PV101 Compatibility**

**Maximum supported:** 5 PVM gages

**Maximum distance to last gage:** 8.5 meters

**Power Supply Input Voltage:** 5V (4.5-5, 5.5 VDC minimum & maximum voltage)

**Power Supply Operating Current (@ 5 VDC):** PVM20, PVM35: 18 mA minimum; 80 mA maximum

**Backlight Maximum Current:** 60 mA

**Input:** RS485 MODBUS RTU data

**Output:** Analog readout

#### **Environmental**

**Operating Temperature:** -40° to 185°F (-40° to 85°C)

**Storage Temperature:** -67° to 185°F (-55° to 85°C)

#### **Environmental Sealed Enclosure:**

Sealing: IP68, ±5PSI (±34.4 kPa)

Case and Clamp Material: Polyester (PBT)

Lens Material: Polycarbonate

Bezel Material: Polyester (PBT)



### PVM20 Series

- PVM20-A - Engine Oil Pressure
- PVM20-B - Coolant Temperature
- PVM20-C - Voltmeter
- PVM20-D - Percent Load at current RPM
- PVM20-E - Transmission Oil Pressure
- PVM20-F - Transmission Oil Temperature
- PVM20-G - Engine Oil Temperature
- PVM20-H - Hydraulic Oil Temperature
- PVM20-J - Percent Fuel Level
- PVM20-K - Boost Pressure
- PVM20-L - Exhaust Gas Temperature
- PVM20-M - Intake Manifold Temperature
- PVM20-N - Auxiliary Temperature
- PVM20-P - Auxiliary Pressure
- PVM20-T - Tachometer

### PVM35 Series

- PVM35-T - Tachometer
- PVM35-S - Speedometer

**Dial:** White numerals over black background

**Return-to-Zero Needle Movement:** Not available for PVM20 models

**Indicating Pointer:** Stepper motor operation with 270° sweep

**Gage Accuracy:** Better than ±1.0% of scale

**Maximum Panel Thickness:** 3/8 in. (9.6 mm)

#### **Connectors:**

Amp Mini Universal Mate-N-Lok

Amp Plug P/N: 172338-1

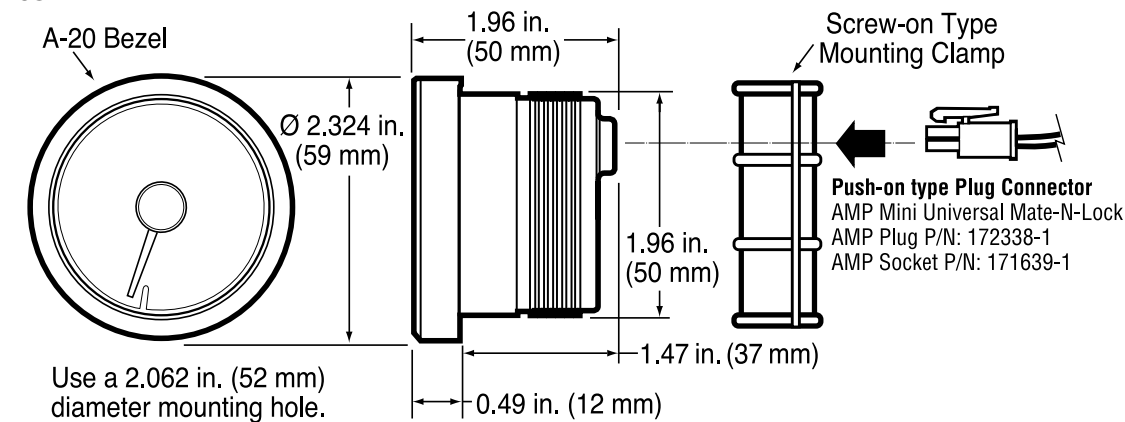
Amp Socket P/N: 171639-1

**Shipping Weight:** 1 lb. (450 g)

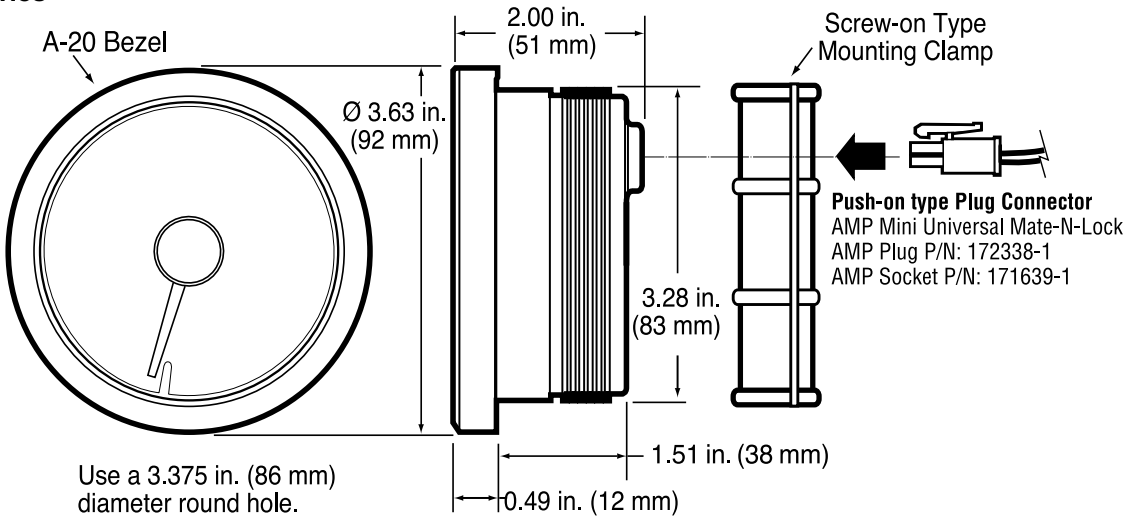
**Shipping Dimensions:** 6 x 6 x 6 in. (153 x 153 x 153 mm)

Typical Gage Dimensions

PVM20 Series



PVM35 Series



Bezel Styles

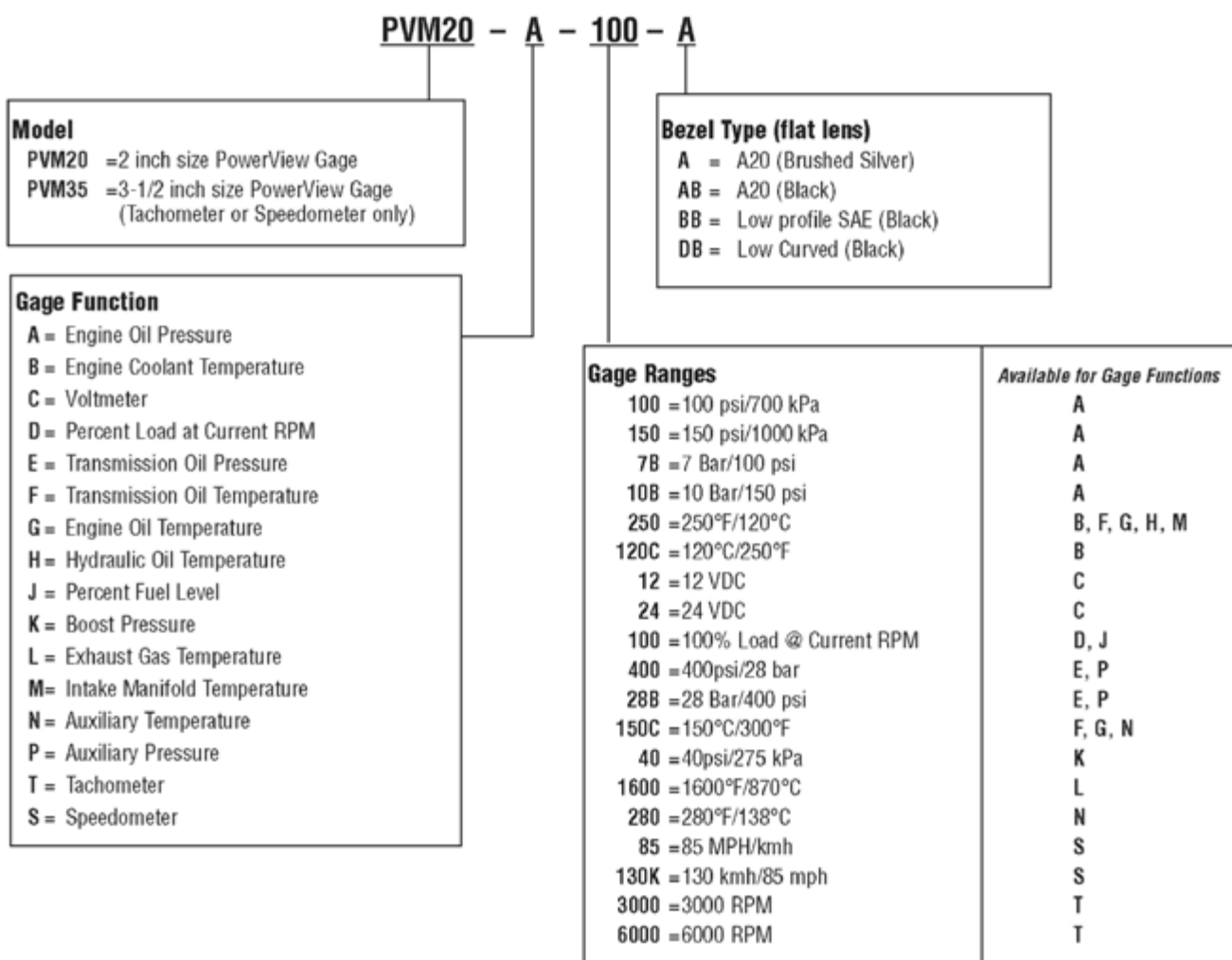
PVM20 Series and PVM35 Series

AB A-20 Style	A A-20 Style	BB Low Profile SAE Style	DB Low Curved Style
 	 	 	 



## How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Wiring Harnesses and Accessories

For details see bulletin 0710179 - Wiring Harness Accessories for PVM Gages

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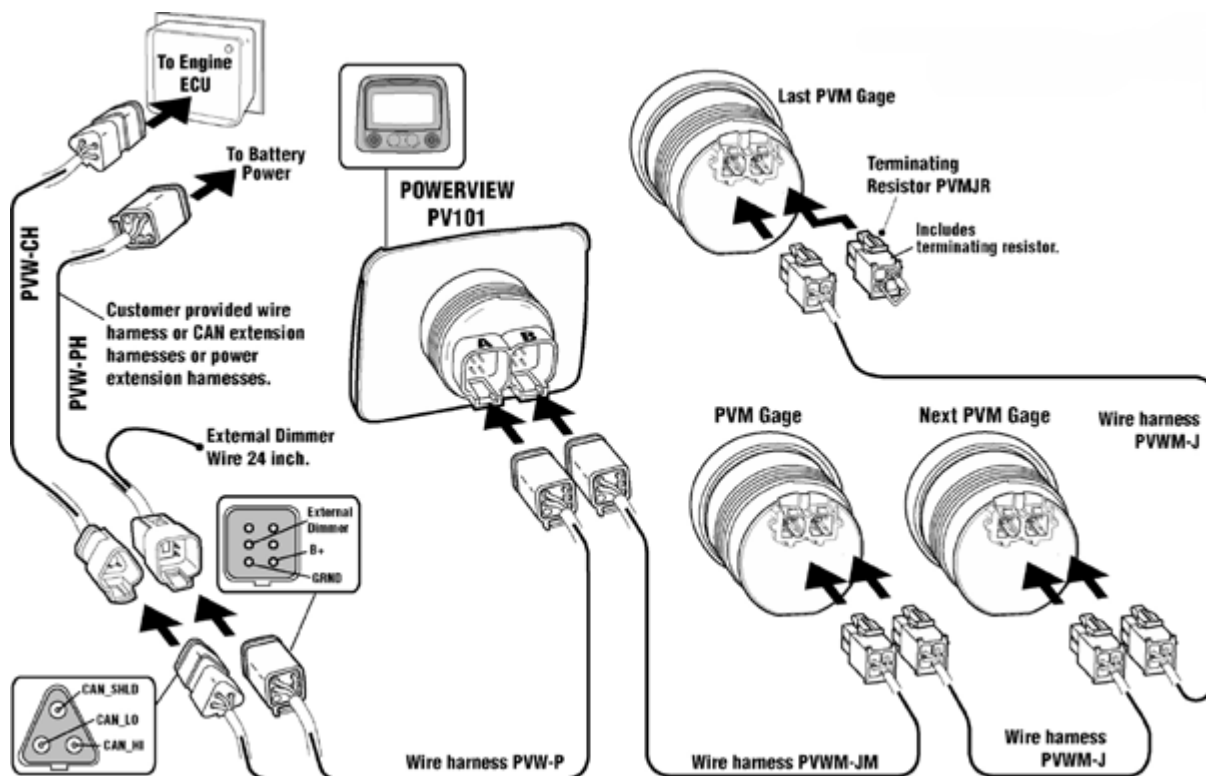
# Wiring Harness Accessories

## PowerView™ PV101 and PVM Gages

### Diagram

Use this easy-connect diagram to help you locate the wiring harness you need.

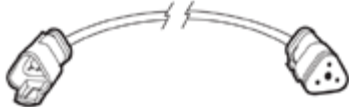


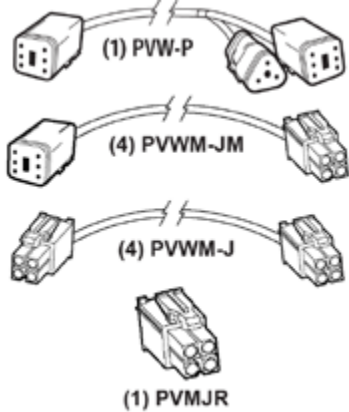
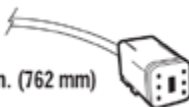
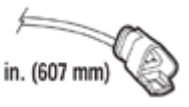
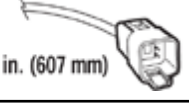

**NOTE:** The PV101 can support up to five PVM gages in a distance less than 8.5 meters.



### How to Order

Part Number	Length	Model: Description	Diagram
78000124	12 in. (305 mm)	PVW-P-length: CAN and power harness for PowerView module (includes 120Ω CAN resistor)	
78000479	9 in. (229 mm)	PVWM-J-length: Gage harness	
78000490	12 in. (305mm)		
78000503	24 in. (607 mm)		
78000481	9 in. (229 mm)	PVWM-JM-length: PowerView jumper harness	
78000504	12 in. (305mm)		
78000505	24 in. (607 mm)		

## How to Order - continued

Part Number	Length	Model: Description	Diagram
78000157	72 in. (1.82 m)	PVW-CH-length: PowerView CAN extension harness	
78000158	144 in. (3.65 m)		
78000159	240 in. (6.10 m)		
78000160	360 in. (9.10 m)		
78000149	72 in. (1.82 m)	PVW-PH-length: PowerView battery power extension harness	
78000150	144 in. (3.65 m)		
78000151	240 in. (6.10 m)		
78000152	360 in. (9.10 m)		
78000480	–	PVMJR: Terminating Resistor (use on last PVM gage in a series - not needed for PV101)	
78000511	12 in. (305 mm)	PVWM-K-length: PV101 - PVM Wiring Kit includes: one PVW-P, four PVWN-J, one PVWM-JM, one PVMJR	 <p>(1) PVW-P</p> <p>(4) PVWM-JM</p> <p>(4) PVWM-J</p> <p>(1) PVMJR</p>
78000512	24 in. (607 mm)		
78000125	30 in. (762 mm)	PVW-PW-length: PowerView CAN & Power Loose Wiring (includes 120Ω CAN resistor)	 <p>Length: 30 in. (762 mm)</p>
78000127	24 in. (607 mm)	PVW-CC-length: PowerView CAN Loose Wiring	 <p>Length: 24 in. (607 mm)</p>
78000126	24 in. (607 mm)	PVW-PC-length: PowerView Power Loose Wiring	 <p>Length: 24 in. (607 mm)</p>
00009510	–	PVW-CT: CAN bus tee Wiring Harness	

# PVS-5 Power Supply

External power is required to make the PVM gage line compatible with existing MurphyLink products, such as PV1000, Cascade, iGuard and eGuard. The PVS-5 power supply device supplies 5 volts of external power and load dump protection for up to 6 PVM gages. The maximum length of the power and data connection between gages is 0.5 meters (8.5 meters total).

The unit may be installed inside a panel or behind a dash.



## Specifications

### Input Voltage:

6 VDC minimum to 32 VDC maximum  
12/24 VDC nominal

**Output Voltage:** 5 VDC @ 450 mA maximum

**Reverse Polarity Protection:** -36 VDC and above

**Overcurrent Protection:** 600 mA @ 36 VDA maximum

**Connector:** AMP 1-770968-1

**Operating Temperature:** -40° to 185° F (-40° to 85° C)

**Storage Temperature:** -40° to 221° F (-40° to 105° C)

**Random Vibration:** 5-2000 Hz

**Operating Shock:** 50G

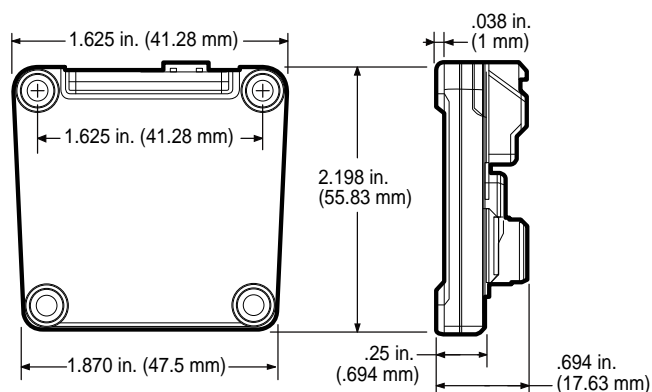
**Certification:** CE

**Case Material:** Polyamide

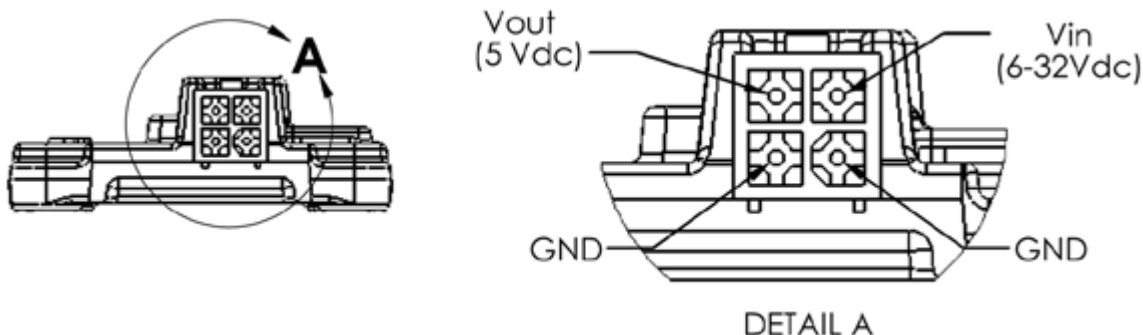
**Dimensions:** 2 x 2 x .75"

**Mounting Hole Dimensions:** Two #8 screws, 1.625" offset

## Dimensions

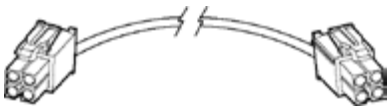


## Wiring Diagram



Mating Connector - Tyco Electronics AMP Mini Universal Mate-N-Lok Plug Housing 4 Position,  
AMP P/N 172338-1  
Murphy P/N 00006935

How To Order

Part Number	Description	Notes
78700383	PVS-5 Power Supply	
00006935	Murphy Mating Connector	Accessory
78000479	9-inch Harness	PVM Gage Harnesses 
78000490	12-inch Harness	
78000503	24-inch Harness	



## Section 80 CAN I/O Modules

CAN/I/O Modules	
0810313	SenderCAN™ — SAE J1939 Input/Output Module . . . . .365
0810332	MeCAN™ — Mechanical Engine to J1939 CAN Interface . . . . .367
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1311322	PowerCore™ Intelligent Xpansion™ — IX3212 Power Distribution Module (PDM) . . . . .371
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0610067	CANdrive™ — CAN bus J1939 to Electric Gage Interface . . . . .375

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# SenderCAN™

## SAE J1939 Input and Output Module

The SenderCAN™ is a compact, encapsulated input and output module for J1939 CAN bus systems. SenderCAN allows the integration of analog and digital measurement, control and indicating devices into modern CAN and ECU-based engines and systems.

SenderCAN has up to four inputs and two outputs, each of which is factory configured to OEM requirements. Inputs can be set for use with resistive sender or switch signals, which are translated into J1939 CAN bus messages with appropriate PGN address, data scaling and transmission rate. Outputs can be configured to drive gages, lamps, relays or other control devices based on received J1939 data.

Standard versions are available for use with common senders (for example, the FuelCAN and MeCAN), but SenderCAN is primarily intended for OEM-specified input, output and CAN bus requirements. Please note that minimum order quantities or charges apply for custom solutions.

SenderCAN is compact and light enough for inclusion in most wiring harnesses but can also be surface mounted. The case is fully sealed in epoxy resin for high impact and environmental resistance.

### Specifications

#### Power supply

**Operating voltage:** 7 to 35 VDC

**Current consumption:** 25mA (typ.)

#### Input/Output

**Input range:** OEM/application specific, -2 to +35 VDC max

**Output:** OEM/application specific, 250mA max.

**CANbus:** SAE J1939 protocol, optional 120 Ohm terminating resistor

#### Physical

**Case material:** High impact ABS, epoxy filled

**Weight:** Approx 60 g / 0.13 lb

**Operating temperature:** -40°F to +185°F / (-40° C to +85° C)

**Environmental Sealing:** IP65 case, exposed lead ends

**Electromagnetic compatibility:** 2004/108/EC

#### Electrical:

J1113-11 pulses 1c, 2a, 3a/b and 5a

EN 61000-4-2 ESD

EN 61000-4-3 Radiated disturbance

EN 61000-4-4 Fast transients

EN 61000-4-5 High Energy transients

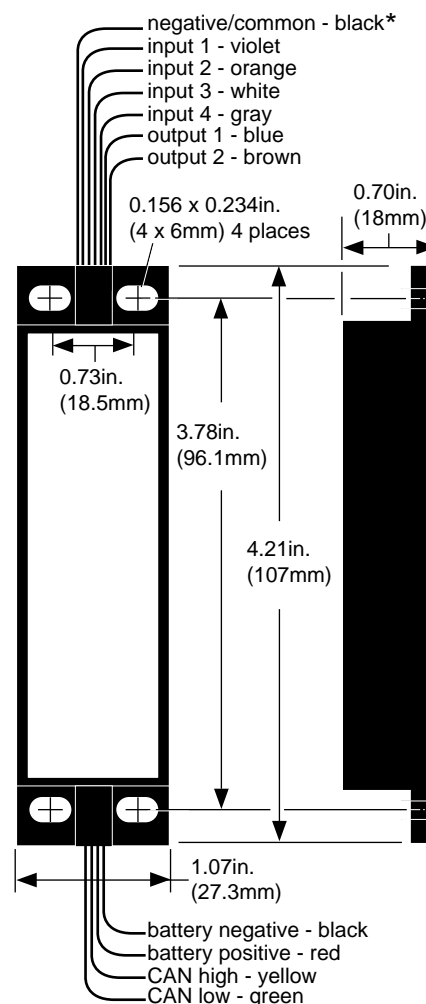
EN 61000-4-6 Conducted RF disturbance

CISPR 16-1-2, 4.3 Conducted emissions

CISPR 16-2-3 Radiated emissions



### Dimensions\* and Connections



\* Wire lead not available for all configurations.  
Standard lead length 4in. (100mm) approx.

\*Dimensions to be used for reference only. Use actual product for template.

### How To Order

Please contact your Murphy representative to discuss requirements. Also see FuelCAN and MeCAN variants literature.

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# MeCAN™

## Mechanical Engine to J1939 CAN Interface

The MeCAN™ is a compact, encapsulated interface module that translates resistive sender, fault switch and speed signals into SAE J1939 CAN bus data. MeCAN allows quick and simple integration of mechanical engines into modern CAN bus systems. Applications include the retrofit of older engine fleets with modern digital instruments, controls and telemetry, engine hour tracking and the development of standard control panels for mechanical engines.

MeCAN has three sensor inputs and one output. Two inputs are for oil pressure and coolant temperature sensing, either by fault switches or resistive senders. The third input measures engine speed using a magnetic pickup or charge alternator signal. Input signals are translated into SAE J1939 CAN bus messages with assigned PGN address, data scaling and transmission rate. The output can drive an alarm lamp or buzzer or actuate a shut-down relay if the pressure, temperature or speed inputs deviate outside preset fault limits.

A fourth input is connected to a speed calibration potentiometer during set-up mode only. DIP switches allow selection of normal/set up mode and two speed input ranges. An LED gives indication of operating mode and CAN bus activity.

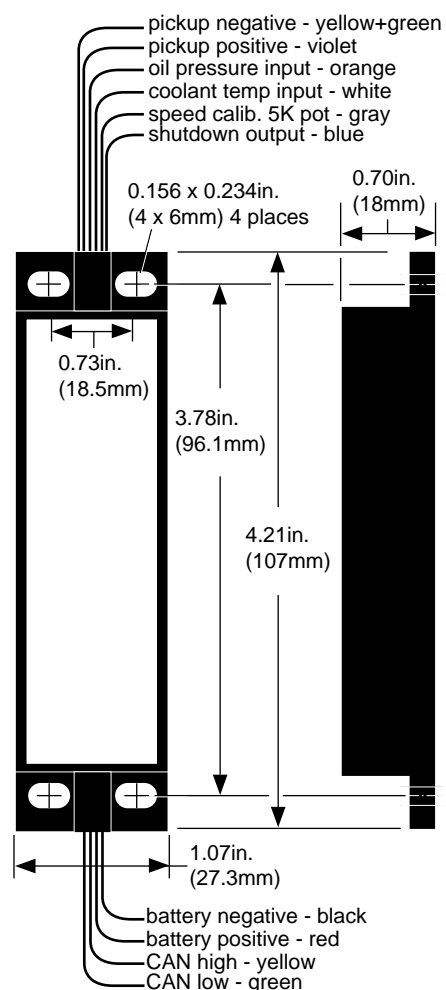
MeCAN is compact and light enough for inclusion in engine wiring harnesses but can also be surface mounted. The case is fully sealed in epoxy resin for high impact and environmental resistance. Two standard versions allow use with either fault switches or Murphy ES series resistive senders. Custom solutions are also available for non-standard, volume OEM requirements.

### Messages Broadcast

PGN	Description
61444	Engine RPM
65263	Oil Pressure
65262	Coolant Temperature
65271	Battery Voltage
65253	Engine Hours



### Dimensions\* and Connections



Standard lead length 4in. (100mm) approx.

\*Dimensions are to be used only for reference purposes. Use actual product for template.

## Specifications

### Power supply

**Operating voltage:** 7 to 35 VDC

**Current consumption:** 25 mA (typ.)

### Inputs

**Maximum operating range:** -2 to +35 VDC max.

Oil pressure, coolant temperature (model MEC301-1):

for Murphy ES(2)P and ES(2)T series resistive senders

Oil pressure, coolant temperature (model MEC301-2):

for fault switch, closing to negative DC on fault

**Speed (magnetic pickup):** Opto-isolated, 3 – 30 Vrms,

adjustable 10 – 180 pulses per rev

**Speed calibration:** 0 – 5 kOhm potentiometer (setup only)

**Outputs** (all ratings non-reactive)

**Shutdown:** Negative low-side or ground switch, 250 mA max.

**CAN bus:** SAE J1939 protocol with 120 Ohm terminating resistor

### Physical

**Case material:** High impact ABS, epoxy filled

**Weight:** Approx 60 g / 0.13 lb

**Operating temperature:** -40° F to 185° F (-40° C to 85° C)

**Environmental sealing:** IP65 case (with DIP switch protective film intact),  
exposed lead ends

**Electromagnetic compatibility:** 2004/108/EC

### Electrical:

-J1113-11 pulses 1c, 2a, 3a/b and 5a

-EN 61000-4-2 ESD

-EN 61000-4-3 Radiated disturbance

-EN 61000-4-4 Fast transients

-EN 61000-4-5 High energy transients

-EN 61000-4-6 Conducted RF disturbance

-CISPR 16-1-2, 4.3 conducted emissions

-CISPR 16-2-3 Radiated emissions

## How To Order

Part Number	Description	Notes
E2501000	MeCAN, with terminating resistor	
E2501200	MeCAN, with terminating resistor	Use with pressure and temperature switches (output closes to ground on fault)
E2501300	MeCAN, with terminating resistor	Use with ES(2)P pressure and ES(2)T temperature senders



# FuelCAN™

## Fuel Level Sender to J1939 Transmitter

The FuelCAN is a compact interface that translates fuel level sender signals into SAE J1939 CAN bus messages. The device allows integration of standard senders into modern J1939/CAN bus engine instrument and control systems.

FuelCAN modules have three inputs (only one of which is connected at any one time): input 1 is configured for use with Murphy ES series resistive fuel level senders; inputs 2 and 3 can be used with fuel level senders having compatible resistance ranges as shown below.

FuelCAN inputs can also be factory configured for use with other types of fuel level or resistive senders. FuelCAN is compact and light enough to be incorporated into most wiring harnesses but can also be surface mounted. The polycarbonate case is fully sealed in epoxy resin for high impact and environmental resistance. A rear facing LED indicates input/CAN bus status.

	Fuel level / approx. resistance, Ohms				
	Empty	1/4	1/2	3/4	Full
Input 1 (Murphy)	240	147	96	60	33.5
Input 2	240	158	100	58	30
Input 3	10	56	95	138	180

## Specifications

### Power supply

**Operating voltage:** 7 to 35 VDC

**Current consumption:** 25 mA (typ.)

### Inputs

**Maximum operating range:** -2 to +35 VDC

**Input 1 sender range, Ohms:** 240 (empty) to 33.5 (full)

**Input 2 sender range, Ohms:** 240 (empty) to 30 (full)

**Input 3 sender range, Ohms:** 10 (empty) to 180 (full)

### Outputs

**CAN bus:** SAE J1939 protocol, PGN 65276 (00FEFC<sup>16</sup>)

-2 sec update rate

-120 Ohm terminating resistor optionally fitted

**Source Address:** 160 (0xA0)

### Physical

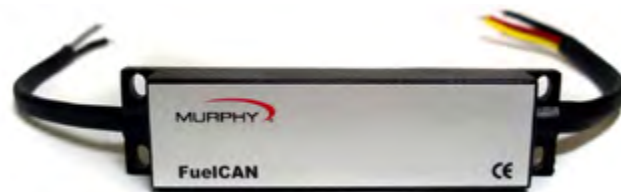
**Case material:** High impact ABS, epoxy filled

**Weight:** Approx 60 g / 0.13 lb

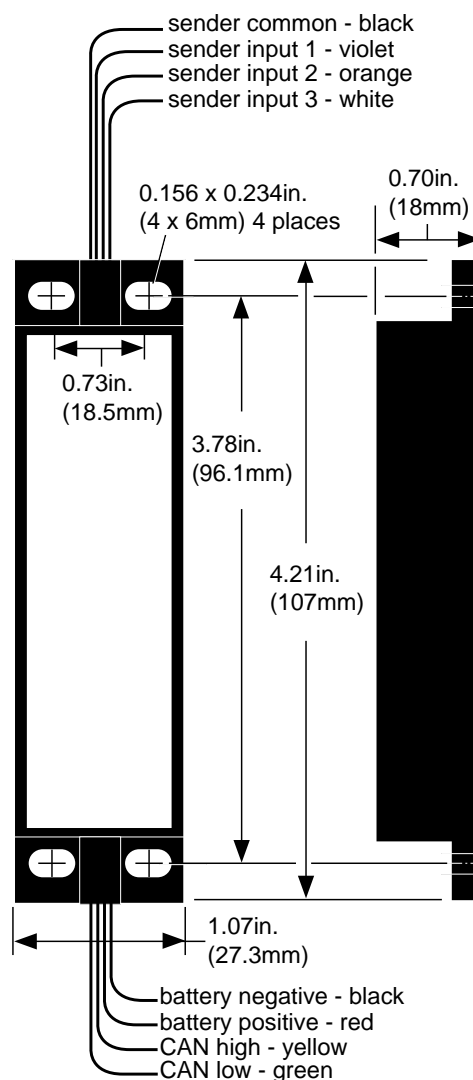
**Operating temperature:** -40° F to 185° F (-40° C to 85° C)

**Environmental sealing:** IP65 case, exposed lead ends

**Electromagnetic compatibility:** 2004/108/EC



## Dimensions\* and Connections



Standard lead length 4in. (100mm) approx.

\*Dimensions to be used only for reference. Use actual product for template.

## Specifications - continued

---

### Electrical:

- J1113-11 pulses 1c, 2a, 3a/b and 5a
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated disturbance
- EN 61000-4-4 Fast transients

- EN 61000-4-5 High energy transients
- EN 61000-4-6 Conducted RF disturbance
- CISPR 16-1-2, 4.3 Conducted Emissions
- CISPR 16-2-3 Radiated Emissions

## How To Order

---

Part Number	Description	Notes
E2502000	FuelCAN	
E2502100	FuelCAN, with terminating resistor	

Please contact your Murphy representative to discuss requirements. Also see SenderCAN and MeCAN variants literature.

**NOTE:** Minimum order quantities apply for custom solutions.

# PowerCore™ Intelligent Xpansion™ IX3212 – Power Distribution Module (PDM)

The Murphy PowerCore™ Intelligent Xpansion™ Power Distribution Module (PDM) expands CAN bus control networks by replacing existing relay and fuse boxes with more reliable solid-state switches that can directly drive work lights, wiper motors, cooling fans, directional DC motors and other high current loads.

Each of the 12 IX3212 outputs can switch or proportionally control up to 15 A loads in 2.5 A increments and feature built-in over-current detection and shut-down capability. Outputs are paired to run up to six electric motors with H-bridge direction control. Twelve digital inputs monitor switched battery, ground and floating inputs. Additionally, eight analog inputs are available with a 5V sensor supply.

Wiring length is reduced and costs are cut by remotely locating the IX module near loads and signals. The I/O is multiplexed using a CAN bus network which allows engineers to greatly simplify harness design for ease of installation and improved reliability.

For applications not requiring a CAN bus controller, the inputs can directly trigger the outputs so there is no need for a separate controller.

The enclosure is fully sealed and potted to withstand wash down and protect from dust.



## Features

Model	IX3212-12	
Inputs	Analog	8
	Digital	12
Outputs	Digital	12
	PWM	12
	H-Bridge	6

## Specifications

**Operating Voltage:** 8-32V (IX3212-24) for 12V and 24V systems

**Total Current:** 70 A maximum continuous

**Dimensions:** 245 mm (L) x 140 mm (W) x 50 mm (H)

**Mass:** 0.9 kg (2.0 lb)

**Operating Temperature:** -40° F to 185° F (-40° C to 85° C)

**Storage Temperature:** -40° F to 275° F (-40° C to 135° C)

### Electrical and EMI/EMC:

2004/108/EC and 2006/95/EC directives

IEC 61000-4-3, -4-6 and -4-8

EN 60945 / CISPR 11

EN 61326-1

**Shock:** 30 G, 3 cycles

**Vibration:** 5-25 g, 50-2,000 Hz, 72 hrs per axis

**Sealing:** IP66 and 67, SAE J1455 4.5.3 (10,300 kPa @ 50° C and 100 mm away for 15 min)

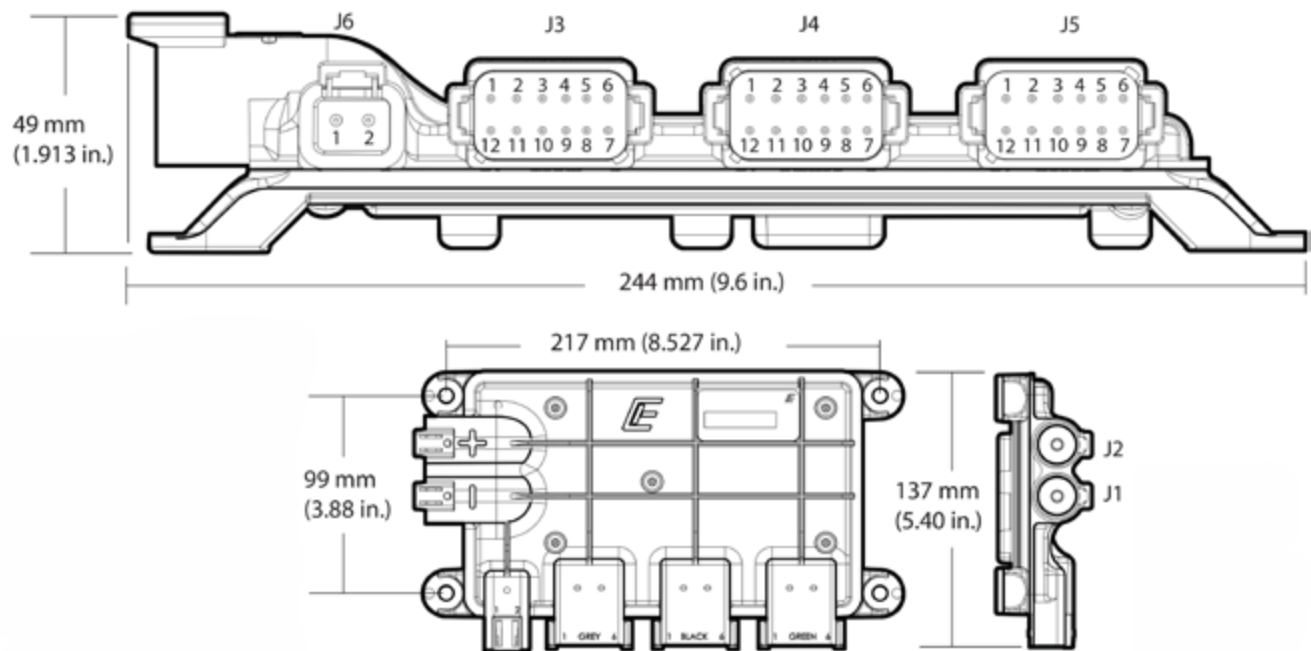
12 Outputs	<ul style="list-style-type: none"> <li>(6) 15 A max per channel, 500 Hz</li> <li>(6) 15 A max, 100 Hz</li> <li>Channel overload set in 2.5 A increments</li> <li>High-side, open-loop PWM and directional DC motor control (H-bridge) modes</li> <li>Off-state leakage current &lt;0.1 mA</li> </ul>
20 Inputs	<ul style="list-style-type: none"> <li>12 digital, tri-state, input impedance 7.7 kΩ</li> <li>6 analog, 0-5 V, input impedance 100 kΩ pull-down</li> <li>2 analog, resistive, input impedance 2.2 kΩ pull-up</li> <li>10 bit resolution on all analog inputs</li> </ul>
Sensor Supply	5V @ 70 mA
Communications	1 CAN 2.0B, 250 kbps, J1939 proprietary messaging
Mating Connectors	Deutsch DTHD, DT and DTP Series <ul style="list-style-type: none"> <li>J1, J2 – DTHD06-1-4S</li> <li>J3 – DT06-12SA (Gray)</li> <li>J4 – DT06-12SB (Black)</li> <li>J5 – DT06-12SC (Green)</li> <li>J6 – DTP06-2S</li> </ul>
Certifications	CE mark

Connectors

Connector J1		
Pin	Name	Function
1	GND	Ground (-)
Connector J2		
Pin	Name	Function
1	PWR	Power (+)
Connector J3		
Pin	Name	Function
1	5V_GND	5V Sensor Ground (-)
2	DI12	Digital Input 12
3	DO7/PWM7	Digital Output 7 / PWM 7 (15 A, 100 Hz)
4	DO8/PWM8	Digital Output 8 / PWM 8 (15 A, 100 Hz)
5	DO9/PWM9	Digital Output 9 / PWM 9 (15 A, 100 Hz)
6	DO10/PWM10	Digital Output 10 / PWM 10 (15 A, 100 Hz)
7	AI8	Analog Input 8 (0-5V)
8	AI7	Analog Input 7 (0-5 )
9	AI6	Analog Input 6 (0-5V)
10	AI5	Analog Input 5 (0-5 )
11	AI4	Analog Input 4 (0-5V)
12	5V_PWR	5V Sensor Power (+)
Connector J6		
Pin	Name	Function
1	DO12/PWM12	Digital Output 12 / PWM 12 (15 A, 100 Hz)
2	DO11/PWM11	Digital Output 11 / PWM 11 (15 A, 100 Hz)

Connector J4		
Pin	Name	Function
1	DO1/PWM1	Digital Output 1 / PWM 1 (15A, 500 Hz)
2	DO2/PWM2	Digital Output 2 / PWM 2 (15A, 500 Hz)
3	DO3/PWM3	Digital Output 3 / PWM 3 (15A, 500 Hz)
4	DO4/PWM4	Digital Output 4 / PWM 4 (15A, 500 Hz)
5	DO5/PWM5	Digital Output 5 / PWM 5 (15A, 500 Hz)
6	DO6/PWM6	Digital Output 6 / PWM 6 (15A, 500 Hz)
7	AI3	Analog Input 3 (0-5V)
8	AI2	Analog Input 2 (Resistive)
9	AI1	Analog Input 1 (Resistive)
10	DI11	Digital Input 11
11	DI2	Digital Input 2 (Source Address 1)
12	DI1	Digital Input 1 (Source Address 0)
Connector J5		
Pin	Name	Function
1	CANLO	CAN - (Green)
2	DI3	Digital Input 3
3	DI4	Digital Input 4
4	DI5	Digital Input 5
5	DI6	Digital Input 6
6	5V_GND	5V Sensor Power (-)
7	5V_PWR	5V Sensor Power (+)
8	DI7	Digital Input 7
9	DI8	Digital Input 8
10	DI9	Digital Input 9
11	DI10	Digital Input 10
12	CANH1	CAN + (Yellow)

Dimensions



How To Order

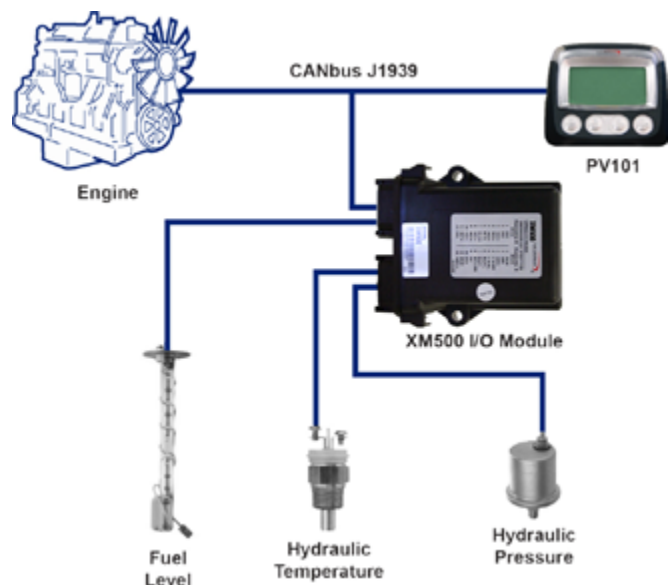
Part Number	Description	Notes
E2443053	IX3212-24, Power Distribution Module	12V or 24V Systems
78001026	Deutsch DTHD, DTP and DT Connector Kit	Plugs, Sockets and Keys

# XM500 I/O Module

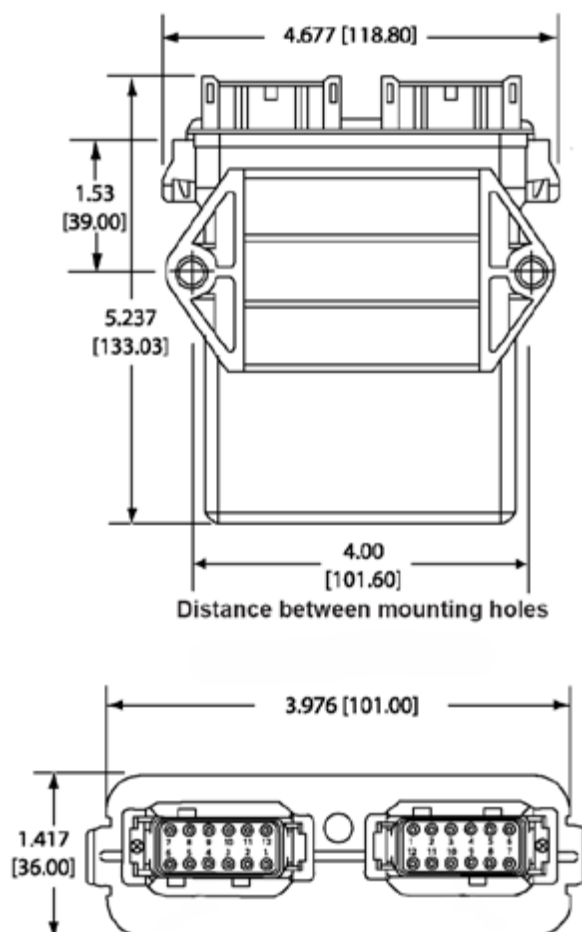
The XM500 Module is a configurable Input/Output (I/O) module designed to bring analog and digital inputs and output onto the SAE J1939 CAN. The XM500 configuration tool provides a user-friendly interface allowing the user to create or change the configuration used on the XM500 module.

Your application may require monitoring of other information which may not be provided by the OEM engine or transmission electronic control unit (ECU), such as fuel level, hydraulic oil pressure or a low engine coolant level switch. The XM500 is ideally suited to bring the additional information you need onto the J1939 CAN bus and can be configured to broadcast fault codes and activate digital outputs per input condition such as fuel level low, hydraulic oil temperature high, etc. Because the XM500 broadcasts information using the J1939 standard protocol, the information can be displayed using standard J1939 display modules, such as the PowerView 101.

## Diagram



## Dimensions and Connections



# Specifications

## Electrical

Power Input: 8 to 28VDC

Communication Ports: CAN J1939

Operating Temperature: -40° F to 185° F (-40° C to 85° C)

Digital Inputs: 4 - Ground or battery positive activation

\*(Outputs are NOT reverse polarity protected. Damage will occur if B+ is connected to the outputs.

Damage incurred from improper installation is not covered under the Murphy limited warranty policy.)

Thermocouple Input<sup>1</sup>: Type K and Type J

## Analog Inputs<sup>2</sup>:

1 - Battery Supply Voltage (dedicated)

7 - Configurable as 0-5 VDC, 4-20 mA, resistive senders<sup>3</sup> or used as an additional digital input

Speed Sensing Input: Magnetic pickup (2 to 120 VAC RMS from 30 to 10,000 Hz)

<sup>1</sup>When the thermocouple input is used, only 5 resistive, 4-20 mA, or 0-5 VDC can be used instead of 7.

<sup>2</sup>Analog inputs can be exchanged for digital inputs (battery ground activation only) for a total of 11 digital inputs.

<sup>3</sup>Other resistive senders can be supported. Contact Murphy's Industrial Panel Division for programming charges.

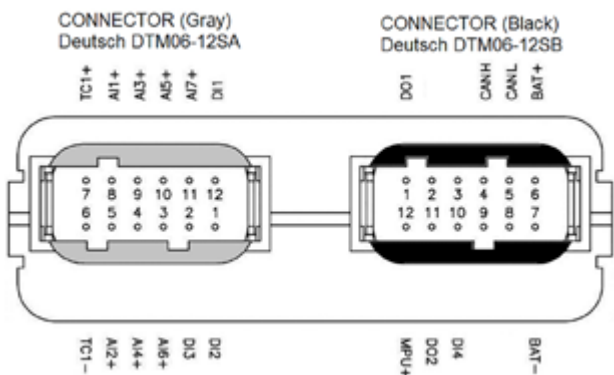
Digital Outputs<sup>\*</sup>: 2 Sinking (500 mA)

Product Weight: 10 ounces

Shipping Weight: 12 ounces

Shipping Dimensions: 4" x 6" x 2"

# Connector Pins



Connector A (gray)	
Pin	Description
1	Digital IN 2
2	Digital IN 3
3	Analog 6
4	Analog 4
5	Analog 2
6	J & K Type -
7	J & K Type +
8	Analog 1
9	Analog 3
10	Analog 5
11	Analog 7
12	Digital IN 1

Connector B (black)	
Pin	Description
1	Digital OUT 1
2	
3	
4	CAN high
5	CAN low
6	Battery +
7	Battery -
8	
9	
10	Digital IN 4
11	Digital OUT 2
12	MAG pickup

# How To Order

Part Number	Description	Notes
78700420	XM500 Murphy Standard*	Module
78700534	XM500 Configuration Tool	Tool
30000669	6' harness with terminating resistor	Wire Harness
30000685	6' harness without terminating resistor	
30000670	12' harness with terminating resistor	
30000686	12' harness without terminating resistor	

\* To determine other configurations, review XM500 Config & Wiring documents at [www.fwmurphy.com](http://www.fwmurphy.com)



# CANdrive™

## CAN bus J1939 to Electric Gage Interface

As part of the MurphyLink® family, CANdrive offers a cost-effective instrument solution for modern electronic engines. CANdrive modules read engine ECU CAN bus/J1939 data, drive standard electric panel gages and provide LED indication of status and faults.

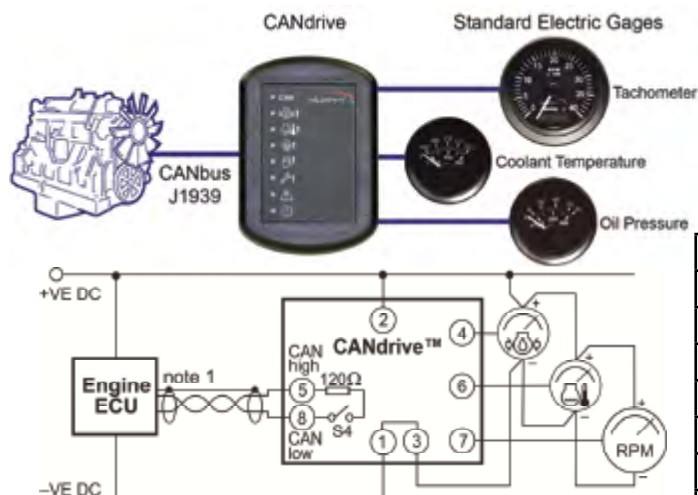
CANdrive has three dedicated outputs for tachometer, oil pressure and coolant temperature gages, with DIP switch selectable compatibility for Murphy, VDO or Datcon gages. For volume orders, the outputs can be custom configured for other gage types, lamps, relays or remote signaling.

CANdrive advantages include:

- the retrofitting of existing electric gage panels to new J1939 compatible engines
- the use of standard, economical electric gages with new J1939 engines
- no need for installation of additional gage senders, tachometer magnetic pickups and wiring.

CANdrive is packaged in a compact, surface-mounted case with epoxy encapsulation for maximum durability and environmental sealing. Electrical connection is via a 12-way automotive type connector. Model CDV100F has a forward facing connector and one power/CAN status LED. Model CDV300R has eight LEDs for indication of J1939-transmitted engine faults and status. All models include a six-way DIP switch for flexible configuration.

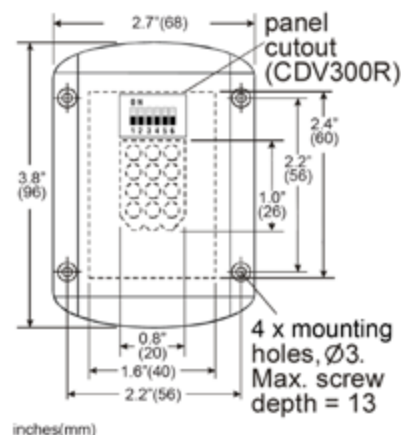
### Diagram



**NOTE:** CAN bus J1939 networks typically have two 120 Ohm terminating resistors (one at each end) with a shield/screen connected to ground/earth at one end only. Check engine and ECU documentation for details.



### Dimensions



### Models and Configuration

CDV100 Front CDV300 Front



Switch Position					Options
S1	S2	S3	S4	S5	
on	on	on			Murphy EG(S) temp. & pressure gages
off	on	on			Datcon temp. & 0 – 7 bar pressure gages
off	on	off			Datcon temp. & 0 – 10 bar pressure gages
on	off	on			VDO temp. & 0 – 5 bar pressure gages
on	off	off			VDO temp. & 0 – 10 bar pressure gages
			on		CAN 120 Ohm terminating resistor in circuit
			off		CAN 120 Ohm terminating resistor removed
				on	12V DC power supply
				off	24V DC power supply

## Specifications

### Power Supply

#### Operating voltage:

12V range (switch S5 on/up): 7 to 16 VDC

24V range (switch S5 off/down): 19 to 30 VDC

#### Current consumption:

**CDV100:** 25 mA typ.

**CDV300:** 50 mA typ. (2 LEDs lit)

#### Inputs

**CAN bus:** SAE J1939 protocol. Input has a 120 Ohm terminating resistor, removable by switch S4.

**Outputs** (all ratings non-reactive)

#### Oil pressure gage, engine temperature gage:

switch selectable for Murphy, VDO or Datcon gages:

see Gage Compatibility section for pressure/temperature verses equivalent sender resistance tables

**Tachometer:** pulsed DC, 119 Hz  $\pm$ 1% @ 1500 RPM

### Physical

**Electromagnetic compatibility:** 2004/108/EC

**Case material:** polycarbonate / polyester / epoxy encapsulation

#### Overall dimensions (w x h x d):

68 x 92 x 22mm / 2.7 x 3.8 x 0.9 in.

(allow 50mm / 2.0 in. depth with connector)

**Weight:** approx 80g / 0.2 lb

#### Temperature:

Operation: -40 to +85°C / -40 to +185°F, 70% RH

Storage: -55 to +105°C / -67 to +221°F

#### Environmental sealing: IP60

(CDV300R: IP65 from front with optional CDVG gasket)

**Vibration:** 15g, 10 to 2000 Hz, 3 axes

**Shock:** 50g, 11 mS, 3 axes

## Gage Compatibility

Pressure Gage Compatibility Table: pressure versus approximate equivalent sender resistance (Ohms)																
Pressure	psi	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
	bar	0	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7
Murphy ES series		240	205	171	143	123	103	88	74	60	47	33				
Datcon 0 – 7 bar		240	195	160	140	115	100	82	68	55	43	35				
Datcon 0 – 10 bar		240	215	190	168	150	135	118	107	97	87	77	67	58	50	42
VDO 0 – 5 bar		10	38	61	85	110	130	155	180							
VDO 0 –10 bar		15	30	45	60	70	81	92	103	114	125	136	148	160	170	182

Temperature Gage Compatibility Table: temperature versus approximate equivalent sender resistance (Ohms)													
Temperature	°C	40	50	60	70	80	90	100	110	120	130	140	
	°F	104	122	140	158	176	194	212	230	248	266	284	
Murphy ES series		1029	680	460	321	227	164	120	89	74	52	40	
Datcon		360		160		80		50		38			
VDO		282.4	190.0	134.0	95.2	69.1	51.2	38.5	29.4	22.7	18.0	14.5	

## How To Order

Part Number	Description	Notes
79700104	CDV100F, CANdrive™ J1939 to gage interface, 1 x CAN status LED, connector forward	CANdrive
79700105	CDV300R, CANdrive™ J1939 to gage interface, 8 x status/fault LEDs, connector rearward	CANdrive
78000437	CDV-PW-30, 8 way wiring harness, length 30 in./760mm	Accessories
79701003	CDVG, optional sealing gasket for CDV300R	
78700363	CDV100F plus CDV-PW-30 harness	
78700364	CDV300R, CDV-PW-30 and CDVG gasket	
79701001	CANdrive connector plug shell	
79701002	Connector pins for above (pack of 50)	Documentation
00020618	CANdrive installation and operation	
00020251	EG(S)21 series electric gage installation	
00020258	AT series tachometer installation	

# Terms and Conditions of Sale

## **Prices:**

Prices are stated in U.S. Dollars at User Net (List Price) less applicable discount, or Net if so stated. Verbal quotes are subject to confirmation by a written quotation from authorized personnel of Enovation Controls. Verbal quotations expire, unless an order is accepted the same day they are made. Written quotations automatically expire in 30 days unless otherwise stated in writing. They can be terminated by written notice within that period. Price changes apply to all orders received after the effective date and will be billed at the latest price. Blanket orders with scheduled releases will be billed at the new price on the effective date.

## **Taxes:**

All prices, published or quoted do not include applicable local, state or federal taxes. Applicable taxes must be paid by the Purchaser.

## **Minimum Billing:**

All orders are subject to a net minimum billing.

## **Orders:**

All orders must be bona fide commitments showing stipulated quantities, complete item descriptions and required dates if applicable. We reserve the right to make design changes or improvements without notice.

## **Penalties and Delays:**

No penalty clause of any kind will be effective unless approved in writing by an authorized officer of Enovation Controls. The company will not be liable for any delay or damage caused by circumstances beyond Enovation Controls reasonable control, including fire, strike, acts of the Purchaser, insurrection, acts of God, transportation failures, or inability to obtain labor, materials or manufacturing facilities.

## **Acceptance:**

No order is binding upon the company until accepted by an authorized official of Enovation Controls.

## **Cancellation and Alterations:**

Any order or contract may be canceled or altered by the Purchaser only upon payment of reasonable charges based upon expenses already incurred and commitments made by Enovation Controls for the benefit of the Purchaser.

## **Damage and Loss:**

Murphy products are packed in specially designed cartons to protect them from shipping damage. Responsibility for delivery lies in the carrier upon our delivery to him and upon his acceptance of the merchandise. All shipments should be inspected upon receipt at destination for damage, either visible or concealed. Claims for loss or damage should be filed with the carrier immediately. Enovation Controls will assist in so far as is practical in securing satisfactory adjustment of claims. However, all claims for loss and damage must be made by the Purchaser to the carrier.

## **Shortages:**

Shortages in shipment must be reported within 15 days of material receipt or of invoice date and must be accompanied by the packing list. We reserve the right to back order any item unless you request that shipment be made in full, in which case we will schedule the complete shipment at the earliest date possible.

## **Terms of Payment and Reservation of Title:**

Terms are net 30 days from date of invoice with approved credit. Enovation Controls reserves the right to require full or partial payment in advance of shipment where the financial condition of the Purchaser does not justify continuance of production or shipment on the terms of payment specified. Orders from Purchasers with unapproved credit ratings may be shipped C.O.D. with reservation of title in Enovation Controls until purchase price shall be paid in full. Export terms will be quoted.

All prices are F.O.B. our plant, Tulsa, Oklahoma, or Rosenberg, Texas.

## **Return of Equipment:**

Material may be returned for credit only upon prior approval of authorized Enovation Controls representative. Accepted items require a Return Authorization Number, must be returned all charges paid and be sufficiently packed to prevent damage during shipment. Items must be new and unused and must have been purchased in the past six months. You must cite your purchase order number and our invoice or order number. Items must be returned through the same channels as purchased. A 15 percent minimum re-stocking charge will be made against all returns of Standard (Make-to-Stock) items. A higher re-stocking charge will apply to all Non-Standard (Assemble-to-Order) items. Custom (Make-to-Order) or special purchase items are not returnable. Credit will apply to future purchases and is not refundable.

## **Repairs:**

Repair services are available for selected products. Customers will be advised of applicable evaluation fees and estimated repair charges prior to the return. Items returned for repair require a Return Authorization Number and must be returned all charges paid.

## **Warranty:**

All Enovation Controls manufactured products are warranted against defects in materials and workmanship. The Warranty statement is available upon request or is available on our Website at [www.fwmurphy.com/warranty](http://www.fwmurphy.com/warranty). Repairs beyond the new product warranty carry a 90-day repair warranty.

**Possession of a Murphy catalog and/or price list does not imply the right to purchase as an authorized Murphy dealer.**

# Enovation Controls Limited Warranty

Enovation Controls supplied products are warranted to be of good quality materials and workmanship. As with any monitoring or control system, the purchase, installation and use of Murphy control instruments and other Murphy systems is NOT AN INSURANCE POLICY. You have purchased dependable instrumentation and with normal care, it will provide long and faithful service and enhance the preventive maintenance program on your valuable equipment.

## **Limited Warranty:**

**Enovation Controls Manufactured Products.** Enovation Controls warrants all Enovation Controls manufactured products that it determines to be defective in materials and/or workmanship, under normal use, for a period of **TWO** years, unless otherwise stated.

## **Non-Enovation Controls Manufactured Products.**

When Enovation Controls supplies product(s) manufactured by others, the warranty extended to Enovation Controls will be passed through to Enovation Controls customer.

During the warranty period, at its sole option, Enovation Controls will use reasonable efforts to repair or replace any defective product; provided, however, that the customer has returned the defective product to Enovation Controls, shipping costs prepaid. Any repair or replacement, at Enovation Controls' option, shall be the customer's sole and exclusive remedy. We are not responsible for damage caused by improper installation, neglect or abuse and are limited under warranty to repairing or replacing the item only. We are not liable for equipment on which this product is installed.

## **Warranty Disclaimer**

ENOVATION CONTROLS SHALL HAVE NO LIABILITY FOR, AND EXPRESSLY DISCLAIMS ANY WARRANTY OR AFFIRMATION OF FACT, EXPRESS OR IMPLIED, OTHER THAN AS SET FORTH IN THIS WARRANTY STATEMENT, INCLUDING, WITHOUT LIMITATION (1) THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE; (2) ANY WARRANTY OR AFFIRMATION OF FACT RELATED TO MISUSE, IMPROPER SELECTION, RECOMMENDATION, OR MISAPPLICATION OF ANY PRODUCT; AND (3) ANY WARRANTY OR AFFIRMATION OF FACT THAT THE CATALOGS, LITERATURE AND WEBSITES IT PROVIDES ACCURATELY ILLUSTRATE AND DESCRIBE PRODUCTS.

## **Murphymatic® Control Systems**

If a customer is requesting on-site warranty review or service assistance for a Murphymatic® control system, we will engage the proper resources to evaluate the request and to repair, adjust or replace the Murphymatic® control system or component(s), in accordance with our Service Philosophy and Limited Warranty.

## **Product Return**

Before returning any product customer believes is defective, customer must provide to Enovation Controls details of the warranty claim situation, a complete description of the product, details from the Model Number label attached to each product, including Model Number, part number and date code and obtain from Enovation Controls a Warranty/Return Authorization Number (W&R Number).

Any claim for shortage or damage to shipment must be accompanied by the packing slip within 15 days of receipt or invoice date, whichever is later. Damages in shipment are the responsibility of the carrier, and customer must make claim directly with the carrier.

## **Limitation of Liability**

ANY LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL EXEMPLARY OR PUNITIVE DAMAGES IS EXPRESSLY DISCLAIMED. ENOVATION CONTROLS' LIABILITY IN ALL EVENTS SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCT THAT GIVES RISE TO ANY LIABILITY. ENOVATION CONTROLS' REPAIR, REPLACEMENT OR PAYMENT OF SUCH AMOUNT SHALL BE THE FINAL AND EXCLUSIVE REMEDY IN THE EXHAUSTION OR UNAVAILABILITY OF ANY OTHER REMEDY SPECIFIED HEREIN AND SHALL NOT BE CONSTRUED OR ALLEGED BY CUSTOMER TO HAVE FAILED OF ITS ESSENTIAL PURPOSE. THE LIABILITY OF THE COMPANY SHALL CEASE WITH THE EXPIRATION OF THE WARRANTY PERIOD MENTIONED ABOVE.

# Warranty

## **Important Notice Regarding Product Repairs and Warranty Claims**

In order to provide you with the best service possible and to expedite all product repairs and warranty claims, certain actions and information are required on your part. Partial details follow. For complete details please contact your product Inside Sales Representative.

### **WR Number:**

A Warranty/Repair Return Authorization Number (WR#) will be required prior to all product returns. This number will allow both of us to track the product and to expedite processing of your request. Simply contact our Inside Sales team to request this number. They will ask certain questions that will identify your exact request so that we can fully comply. They will also advise you of certain procedural changes or conditions that may apply to your request, as outlined below.

### **Complaint/Request Details:**

Warranty claims require a detailed explanation of the problem or complaint so that we can directly address your concerns. A large percentage of times we are unable to find a problem with the product because we don't know the details of your complaint, and we thus don't know what to look for. We evaluate the product against our specifications, but that may not address your complaint. This explanation will be required for Warranty requests in order to receive the return authorization (WR#). This explanation is also recommended for repairs but is not required. See below for Repairs.

### **Evaluation Fee:**

An Evaluation Fee covers certain costs associated with diagnosing product problems (or suspected problems). When you request the WR#, your product Sales Representative will advise you of this charge and when it applies. For example, if our evaluation does not support a Warranty Claim, the customer will be asked to pay the fee. However, the fee can be applied to the cost of repair or against the purchase of a new unit. Likewise, the fee can be applied to the cost associated with a non-warranty repair. If our evaluation supports the Warranty Claim, the fee will be waived. Also see Repairs below.

### **Warranty Claim:**

- Contact Enovation Controls to receive WR#
- Provide detailed explanation of the problem and why Warranty is claimed. Immediate replacement prior to our evaluation will require that the customer purchase a new unit. If the warranty claim is validated, a credit will be issued against the new unit purchased. A customer purchase order is required prior to replacement.
- Evaluation fee may apply. If applicable, the fee may be applied to repairing the unit or to the purchase of a new unit.

### **Repairs (Non-Warranty):**

- Contact Enovation Controls to receive WR#
- Some products may no longer be accepted for repair or because of its design cannot be repaired. Others are uneconomical to repair. In some cases, repair parts are available for the customer to make the repair. Your product Sales Representative will advise details when the WR# is requested.
- (Preferred but not required) Provide detailed explanation of the problem.
- An estimated repair charge is available for those products that can be repaired. When an exact cost is required prior to the actual repair, an evaluation fee will apply. The fee may be applied toward the final repair cost. A purchase order is required for either the estimated repair charge or the evaluation fee.
- If the actual cost to repair is greater than 65 percent of the customer's cost to purchase a new product, we will advise. The customer may then proceed with the repair, purchase a new product, scrap the unit or have it returned as is (at customer's expense). If the unit is scrapped or returned, an evaluation fee will apply.

**NOTE: The evaluation fee is  
\$45 net (no discount).**

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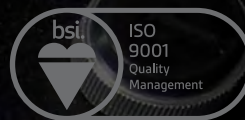
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