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Control Systems Manual

WATERFLOOD SERVICE

MURPHY CONTROL SYSTEMS AND SERVICES

JOB # 50-30-3517



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FWMURPHY
CONTROL SYSTEMS AND SERVICES
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FWMurphy would like to take this opportunity to thank you for purchasing your new *Murphymatic®* Control System. This system was designed and built by qualified engineers, and technicians, with your control requirements in mind. We use the best materials and equipment in fabricating your controls systems.

We continually strive to provide defect-free products and services on time. This dedication allows us to maintain ISO 9001 registration.

Whatever your instrumentation and automation control application needs, *FWMurphy* provides quality products and services. We are available to define your requirements, provide design solutions and customer support.

Notice:

The information in this guide is subject to change without notice. *FWMurphy* shall not be liable for technical or editorial errors or omission contained herein; nor for incidental or consequential damages resulting from the furnishing, performance or these materials. This manual contains information on the components and operation of those components supplied as part of the control systems. Photocopies may be made without the consent of *FWMurphy*. *Murphymatic®*, *Selectronic®* and *Tattletale®* are registered of *FWMurphy* registered with the U.S. Patent and Trademark Office.

In order to get the most reliable operation from a Murphy control system, listed below are a few wiring tips.

- Connect power to a DC cranking battery powered system directly from the cranking battery for both positive and ground connections. Connecting from any other point could result in problems. There is a greater voltage drop seen at other connection points when the engine is cranked, if you do not connect at the battery.
- Install diodes, i.e., IN4005 diodes, across inductive loads, such as solenoid coils, as close as possible to the coil. The banded end of the diode should be towards the positive side of the coil or inductive load.
- Use shielded wire for magnetic pick-up and analog wiring. Ground the drain wire (shield) at the panel only.
- Insure the following separation of wiring by using multiple runs of conduit. Listed below are the levels of separation from noisiest to weakest. Some of this separation is required by codes and recommended practices.
 - Ignition wiring, the "G" lead and CD ignition fuel valve wiring
 - AC wiring
 - DC power wiring - Magnetic pick up wiring can be run with this, but it must be in shielded cable
 - Analog signals, i.e. 4-20 milliamp and sender signals - Magnetic pick up wiring can be run with this, but it must be in shielded cable
 - Thermocouple wiring - Must use shielded thermocouple grade extension wire for the proper type, such as J & K
 - Sensor wires that are either "non-incentive" for Class I, Division II or "intrinsically safe" for Class I, Division I

Limited Warranty

MURPHY SWICHGAGE® and MURPHYMATIC® CONTROL SYSTEMS

This Murphy supplied product is warranted to be of good quality materials and workmanship. This limited warranty is for a period of ONE year. Any unit suspected of a quality flaw, verified by Murphy, will be either repaired or replaced, at our option, when returned to our factory, transportation charges paid. If a customer is requesting on-site service assistance for a MURPHYMATIC® control system, we will engage the proper resources to repair, adjust or replace the MURPHYMATIC® control system in accordance with our Service Philosophy and Limited Warranty. 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 and are not liable for equipment on which this product is installed.

Murphy SWICHGAGE® control instruments, MURPHYMATIC® control systems, or their parts, and supplied product shall be of kind and quality described in the spec-

ifications as supplied and no other warranty except of title shall be implied. All other warranties, express or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, are explicitly disclaimed. The liability of the company shall not in any case exceed the cost of correcting defects in the supplied product; and upon the expiration of above mentioned one year, all such liability shall terminate. The company shall not in any event be liable for indirect or consequential damages.

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. Any claim for shortage or damage of this shipment must be accompanied by this Packing Slip within 15 days of receipt or invoice date, whichever is later.



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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.

Printed in U.S.A.

This Murphy supplied control device is warranted to be of good quality materials and workmanship. Murphy warrants this quality for a period of ONE FULL YEAR. (Parts and systems are code dated.) This is only a time limit extension of the standard warranty; all other statements in the Murphy Limited Warranty remain in effect.

As with any monitoring and/or control system, the purchase, installation and use of SWICHGAGE® control instruments and other Murphy Systems is NOT AN INSURANCE POLICY. It is, however, the simplest means of adding inexpensive, reliable protection—protection that is as sound as the instruments, installation, and follow-up preventive maintenance program that is applied to these instruments and to the equipment they help protect. SWICHGAGE® control instruments, properly installed and maintained, are important and effective tools in any preventive maintenance program.

All "work machines" have life signs such as pressures, temperatures, levels, and overspeed conditions. Each of these vital signs can be monitored by a SWICHGAGE® capable of accurate indication and reliable limit switching. Teamed with Murphy electrical and SELECTRONIC® components, SWICHGAGE® control instruments can constantly monitor pressures, levels, temperatures, vibration, and overspeed conditions and activate alarm and/or shutdown when preset limits are reached. As these vital signs are constantly monitored, the SWICHGAGE® control instruments and their related components must be periodically inspected, both

visually and physically. Look for frozen pointers, bad contacts, kinked or broken pressure tubing or capillaries. Check floats on Level SWICHGAGE® control instruments visually and, if possible, mechanically. Test electric circuits and move limit contacts into the operating range to see that the proper sequence of events occurs when the contacts meet.

If a SWICHGAGE®, TATTLETALE® or other component fails the visual, physical, or electrical check, then repair or replace the unit or its parts as necessary to bring it back to proper operation. When a question exists on warranty, the questionable part should be returned to the factory or affiliate company for warranty inspection. If within the warranty period the unit is found to operate improperly and it appears to be related to material quality or workmanship, Murphy will repair or replace the product. (See Warranty above.)

Murphy SWICHGAGE® control instruments, MURPHYMATIC® panels and SELECTRONIC® systems are not a substitute for, but can be important tools in, a routine preventive maintenance program. Since 1939 we have been building our worldwide reputation as the source for simple, reliable monitoring and protection, featuring simplicity of maintenance. Please refer any questions regarding tests, repair or replacement parts to the factory, your nearest affiliate company, or your authorized servicing dealer.

Limited Warranty

MURPHY SWICHGAGE® and MURPHYMATIC® CONTROL SYSTEMS

This Murphy supplied product is warranted to be of good quality materials and workmanship. This limited warranty is for a period of TWO years. Any unit suspected of a quality flaw, verified by Murphy, will be either repaired or replaced, at our option, when returned to our factory, transportation charges paid. If a customer is requesting on-site service assistance for a MURPHYMATIC® control system, we will engage the proper resources to repair, adjust or replace the MURPHYMATIC® control system in accordance with our Service Philosophy and Limited Warranty. 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 and are not liable for equipment on which this product is installed.

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specifications as supplied and no other warranty except of title shall be implied. All other warranties, express or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, are explicitly disclaimed. The liability of the company shall not in any case exceed the cost of correcting defects in the supplied product; and upon the expiration of above mentioned two years, all such liability shall terminate. The company shall not in any event be liable for indirect or consequential damages.

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both visually and physically. Look for frozen pointers, bad contacts, kinked or broken pressure tubing or capillaries. Check floats on Level SWICHGAGE® control instruments visually and, if possible, mechanically. Test electric circuits and move limit contacts into the operating range to see that the proper sequence of events occurs when the contacts meet.

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FW MURPHY
CONTROL & INSTRUMENTATION SOLUTIONS

DC POWER CONNECTION SOURCE

FWMurphy recommends that the power source (+ and -) connection points of any panel containing any solid state device (i.e. EMS 447, 547, C267, ASM or AS series controllers, etc.) be made directly to the terminals of the battery (+ and -). This will allow the battery to act as a filter and absorb any voltage spikes or noise generated by the alternator or other devices located on the equipment being controlled by the solid-state device. The preferred method is to tie the negative battery terminal to proper earth ground, (i.e. earth ground rod) and tie any needed frame/chassis grounds to that same point as well. Connection of power and DC common at any other point will cause increased noise susceptibility in the system. Depending on the actual configuration of the end application, this can cause various control problems, such as erratic operation, inaccurate sender/transducer readings, remote communication problems, etc.

INDUCTIVE LOADS

FWMurphy recommends that any inductive load tied to a solid-state output (relays, solenoids, incandescent lamps, etc.) have a reverse biased diode across the coil to snub the inductive kickback. This prevents the field collapse of the coil from damaging the solid-state output devices and keeps the DC power "clean" from spikes.

WELDING PRECAUTION

FWMurphy recommends that no welding take place directly on the equipment or on the equipment that is physically connected to equipment where solid state electronics are used. If welding **must** be performed on this equipment, FWMurphy recommends that the following precautions are taken to reduce the chance of the solid state electronics being permanently damaged, or damaged enough to fail at some later time. FWMurphy will not warrant any device that has been subjected to damage caused by welding.

Open the control panel and any associated sub-panels or swing panels. Disconnect power and ground connections; and all ribbon and other cable types leading to or from any solid state device (i.e. EMS 447, 547, C267, etc.). Note: Most cables should have a keyed connector for ease of reconnection, or have removable terminal blocks. Even if this is an outdoor field repair, wires should be removed from screw terminals where necessary to prevent any possibility of damage.

Attach the welders' ground clamp as close as possible to the area where the welding will occur and use the lowest feasible setting of the welding machine output. These precautions will lessen the chance that a high electrical potential will pass through or across the control panel and/or its components.

IN ORDER TO GET THE MOST RELIABLE OPERATION OUT OF A MURPHY CONTROL SYSTEM, HERE ARE A FEW WIRING TIPS.
REVISED 30 NOVEMBER, 1997

ALWAYS CONNECT POWER TO A DC CRANKING BATTERY POWERED SYSTEM DIRECTLY FROM THE CRANKING BATTERY FOR BOTH POSITIVE AND GROUND CONNECTIONS. ANY OTHER CONNECTION POINT RATHER THAN DIRECTLY FROM THE BATTERY COULD RESULT IN PROBLEMS. THERE IS A GREATER VOLTAGE DROP SEEN AT OTHER CONNECTIONS POINTS WHEN THE ENGINE IS CRANKED, THAN AT THE BATTERY.

ALWAYS INSTALL DIODES, SUCH AS 1N4005 DIODES ACROSS INDUCTIVE LOADS LIKE SOLENOID COILS AS CLOSE AS POSSIBLE TO THE COIL. THE BANDED END OF THE DIODE SHOULD BE TOWARDS THE POSITIVE SIDE OF THE COIL, OR INDUCTIVE LOAD.

ALWAYS USE SHIELDED WIRE FOR MAGNETIC PICK-UP, AND ANALOG WIRING. GROUND THE DRAIN WIRE (SHIELD) AT THE PANEL, ONLY.

PLEASE TRY TO INSURE THE FOLLOWING SEPARATION OF WIRING BY USING MULTIPLE RUNS OF CONDUIT. HERE ARE THE LEVELS OF SEPARATION FROM NOISIEST TO THE WEAKEST VICTIM. SOME OF THIS SEPARATION IS REQUIRED BY CODES AND RECOMMENDED PRACTICES. IN ANY CASE, THIS IS EXPLAINED WITH THE IDEA THAT AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE.

1. IGNITION WIRING, THE "G" LEAD, AND CD IGNITION FUEL VALVE WIRING
2. AC WIRING
3. DC POWER WIRING (MAGNETIC PICK-UP CAN BE RUN WITH THIS, BUT IT MUST BE IN SHIELDED CABLE).
4. ANALOG SIGNALS, LIKE 4-20 MILLIAMP AND SENDER SIGNALS. (MAGNETIC PICK-UP WIRING CAN BE RUN WITH THIS, BUT IT MUST BE IN SHIELDED CABLE).
5. THERMOCOUPLE WIRING (MUST USE SHIELDED THERMOCOUPLE GRADE EXTENSION WIRE FOR THE PROPER TYPE (TYPICALLY J & K)
6. SENSOR WIRES THAT ARE EITHER "NON-INCENDIVE" FOR CLASS I, DIVISION 2, OR "INTRINSICALLY SAFE" FOR CLASS I, DIVISION 1

GENERAL WIRING PRECAUTIONS

There are several precautions you can take on initial installation to reduce chances of failure over time. Many of these steps may take a few extra minutes to do at the time of installation; however, they can also save many headaches in the future. We strongly recommend that you follow these precautionary steps.

1. **Suppression Diodes**

Place suppression diodes across all inductive loads. These loads typically include pilot relays, solenoid valves, starter solenoids, etc. This helps increase contact life and eliminate a source of electrical interference.

2. **Wire power leads directly to battery Post.**

When hooking your power supply to your Test- Off - Auto switch (AUTOMATIC MODE) or OFF-ON switch (MANUAL MODE), run you're wiring directly to the battery post. This helps minimize noise generated from battery chargers and alternators.

3. **Pilot excessive loads.**

Many of the outputs on the EMS Controller are rated for low current, control type loads. Do not run high current loads directly to the unit.

4. **Use stranded wire for hookup.**

Solid wire transmits vibration and is more likely to crystallize and break when it is subjected to movement.

5. **Separate AC and DC wiring.**

Never run AC and DC handling wiring together. AC signals may get coupled into the control circuits leading to erratic operation.

6. **Wire standby battery charger directly to battery.**

Standby chargers must be wired directly to the battery. Failing to do this may result in erratic operation due to electronic "noise" coupled into the microprocessor.

7. **Special precautions for spark ignition engines.**

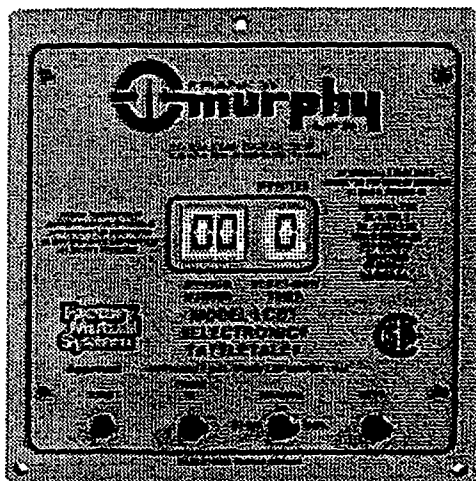
Magnetos and ignition coils produce high voltage and cause high frequency interference. The EMS Controller is designed to filter out much of this interference; however, precautions must be taken to protect the unit. Sender and shutdown wiring must be routed away from the magneto and spark coil wiring. Resistor spark plugs and spark plug wires reduce electrical interference and may also be required in especially "noisy" environments.

8. **Use shielded cable on magnetic pickup.**

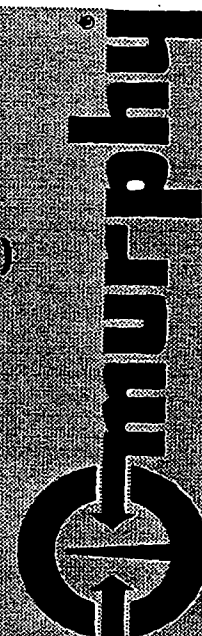
Shielded cable is recommended for connecting the magnetic pickup to the EMS Controller. This helps prevent signal loss and the possible coupling of electrical interference into the relatively sensitive speed sensing circuit. The shield should only be grounded on one end.

Remember, proper care during installation will help your EMS Controller live a long and trouble-free operating life. If for any reason you have questions during installation, feel free to give us a call.

LCDT Digital TATTLETALE® by Murphy ELECTRONIC®



- Monitor Engine or Motor Driven Pumps and Compressors
- 47 Normally Open (N.O.) or Normally Closed (N.C.) Sensor Inputs
- CSA* and Factory Mutual** Listed
- Rated for Hazardous Locations



Description

The LCDT SELECTRONIC® TATTLETALE® is a compact fault annunciator with an electronic alarm/shutdown control system. It was designed to protect engine-driven or motor-driven compressors and pumps. The TATTLETALE® 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 gives a digital reading of the tripped sensor and the lockout timer countdown.

As the heart of the system, the LCDT's 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 accommodates 47 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. 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

- System alarm or shutdown for up to 47 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.
- A battery maintains the electronics while the engine is not running.
- 3-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, (one or two) 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 via a ribbon cable. The LCDT was designed to be used with sensor switches having normally open or normally closed contacts such as Murphy SWICHGAGE®. NOTE: An approved isolation barrier such as the LCDT-15B barrier for normally open sensors or a thermocouple type barrier for normally closed sensors, 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.

Laboratory Approvals: CSA* and Factory Mutual System** Listed for Class I, Division 1, Group D, Hazardous Locations.

* When used with approved ignition. Contact Murphy for details.

** When installed per Murphy drawings HC-9450-A or HC-9450-AA.

LCDT System

The basic LCDT system consists of (1) the LCDT module, (2) the terminal strip and cable assembly, (3) the power supply, and (4) (optional) barrier for non-intrinsically safe (normally open) sensors. LCDT Module—described on front page.

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) long 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 1, Divisions 1 and 2, Group D Hazardous Locations. FM and CSA listed.

Barrier for Non-Intrinsically safe sensors

An optional barrier is designed to accept non-intrinsically safe normally open inputs and convert them to intrinsically safe outputs. **NOTE: Each barrier accommodates 2 sensor inputs.**

How to Order

To order complete LCDT system, specify each component as follows:

(1) LCDT Module: Specify LCDT-

- NO: For normally open applications
- NC: For normally closed applications

(2) Terminal Strip and Cable Assembly: Specify LCDT-

- 50CA-36: Normally open
- 100CA-36: Normally closed

(3) Power Supply: Specify LCDT-

- PS-CD (R)-P: CD ignition positive ground
- PS-CD-N: CD one or two ignitions negative ground
- PS-120/24/12: Voltage: 120 AC, 12/24 DC

(4) Barrier: Specify LCDT-

- ISB: Optional, for non intrinsically safe circuits. Cl. I, Div. 1, Gr. D.

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-NO and NC-50CA-36 or 100CA-36: 7-1/4 x 12 x 5-1/2 in. (184 x 305 x 140 mm).

LCDT-ISB: 9 x 10 x 6 in. (229 x 254 x 152 mm).

Shipping Weights:

LCDT-NO/NC Head: 5 lb. (2.2 kg.).

LCDT-PS-CD (R)-P: 9 lb. (4.08 kg.).

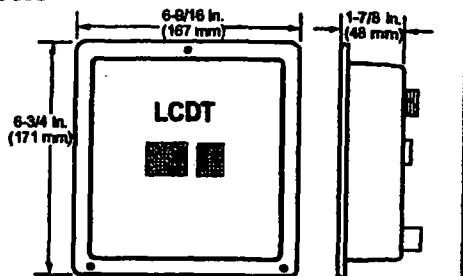
LCDT-PS-120/24/12: 21 lb. (9.5 kg.).

LCDT-NO and NC-50CA-36 or 100CA-36: 3 lb. (1.3 kg.).

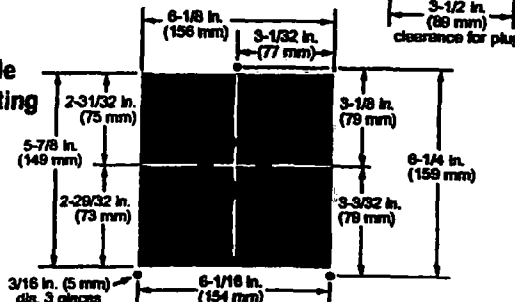
LCDT-ISB: 3 lb. (1.3 kg.).

Dimensions

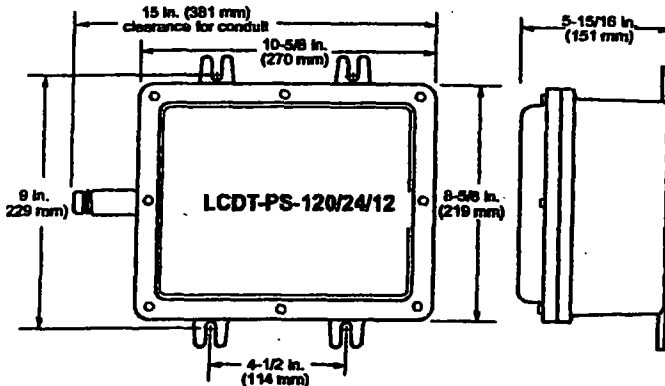
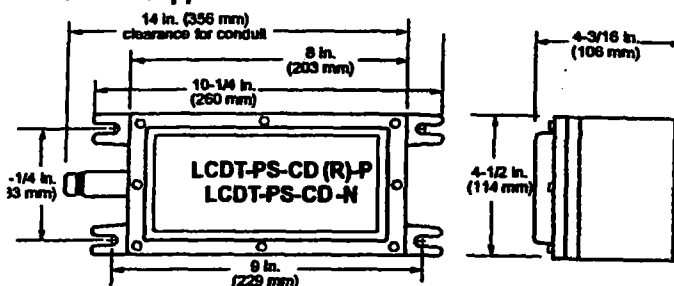
LCDT Module



Module Mounting Hole



Power Supplies



Warranty

A two-year limited warranty on materials and workmanship is provided with this Murphy product. Details are available on request and are packed with each unit.

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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LCDT Series Digital TATTLETALE® Installation and Operation Manual



Models: LCDT-NO and LCDT-NC

Power Supplies: LCDT-PS-CD (R)-P, LCDT-PS-CD-N, and LCDT-PS-120/24/12

Options: LCDT-ISB barrier, and Class "C" lockout adapter

Please read the following information before installing. A visual inspection of this product for damage during shipping is recommended before mounting. This installation manual is intended for all LCDT SELECTRONIC® TATTLETALE® Series models.

GENERAL INFORMATION

WARNING

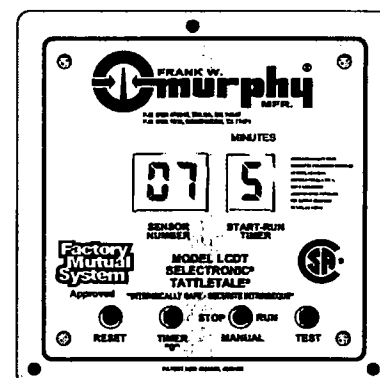
BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT

- ✓ 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.



Factory Mutual System **

Suitable for Class I,
Division 1, Group D,
Hazardous Locations.



Description

The LCDT is a solid state fault annunciator and shutdown control system rated for Class I, Division 1, Group D hazardous areas. It is designed to protect engine and motor-driven compressors and pumps.

The LCDT basic system consists of (1) the module, (2) the power supply, (3) the terminal block and cable assembly, (4) an optional barrier for non-intrinsically safe normally open sensors and (5) a class "C" adapter for normally open or normally closed sensors.

The System can be powered by a CD ignition, 120 VAC, or by 12 or 24 VDC battery. Two basic models are available:

LCDT-NO for NORMALLY OPEN sensors.

LCDT-NC for NORMALLY CLOSED sensors.

CAUTION: We do not recommend the use switches having contacts immersed in oil. Because the LCDT operates on low voltage, the oil may act as an insulator between the contacts.

Module

The module indicates the sensor by number and hence the parameter, that causes an alarm or shutdown. It is enclosed in an aluminum box that accommodates 47 sensor inputs; 15 sensors can be locked out during start-up period. The sensors can be tested without shutting down the engine.

A liquid crystal display window gives a digital reading of the tripped sensor and the lockout timer countdown. A backup battery is provided to retain the display after engine shutdown.

Power Supply

Converts CD ignition voltage (± 90 -250 volts) or 12/24 VDC or 120 VAC to approximately 5.8 to 9.5 VDC for system operation. A voltage barrier within the power supply isolates the inputs from the outputs to prohibit transfer of voltage/current that could cause a spark in the input circuit.

Upon receipt of a shutdown signal, the power supply provides switching outputs to first operate a fuel gas valve for the engine and then to ground the engine ignition, as well as a relay for shutdown indication.

Terminal block and Cable Assembly

The plug-in type Terminal strip has 50 screw-type connections for normally open sensors or 50 pairs of connections for normally closed sensors. The terminal strip is connected to the LCDT module with the 36 in. (914 mm) long flat ribbon cable.

LCDT-50CA-36 for normally open sensors.

LCDT-100CA-36 for normally closed sensors.

Barrier for Non-intrinsically Safe (normally open) Sensors

The LCDT-ISB barrier option is designed to accept non-intrinsically safe normally open inputs and convert them to intrinsically safe outputs for the input terminal strip. Within a Class I, Division 1, Group D area, the input circuits to the barrier must be enclosed in conduit with applicable explosion-proof seals.

Class "C" Lockout Adapter (optional)

Class "C" adapter to lock out the sensor input until a clear signal is received. Available for normally open and for normally closed systems.

Compatible Engine Type Ignitions for LCDT-PS-CD

| Ignition Mfr. & Series | Polarity (Gnd.) | Output | Power supply |
|--------------------------|-----------------|----------|--------------|
| Altronic I, III, & V | Negative | Positive | -PS-CD-N |
| Altronic II | Positive | Negative | -PS-CD(R)P |
| American Bosch Magtronic | Negative | Positive | -PS-CD-N |
| Bendix S-1800, BLAR | Negative | Positive | -PS-CD-N |
| Bendix Sidewinder | Positive | Negative | -PS-CD(R)P |
| Fairbanks Morse SCSA | Positive | Negative | -PS-CD(R)P |
| Fairbanks Morse 9000 | Negative | Positive | -PS-CD-N |

*When used with approved ignitions. Contact Murphy for details.

**When installed per Murphy drawings HC-9450-A or HC-9450-AA.

SPECIFICATIONS

Power: Supplied by CD ignition of an engine, 120 VAC line, or by 12 or 24 VDC battery.

Power Consumption: CD ignition (2 mA @ 100V), 120 VAC (4 watts), 24 VDC (1 watt), or 12VDC (0.5 watts).

Power Inputs (Operating Voltage):

LCDT-PS-CD (R)-P: 90-250 VDC, CD ignition positive ground.
Relay for fuel valve and alarm outputs.

LCDT-PS-CD-N: 90-250 VDC, CD ignition (one or two) negative ground. (FET for output to fuel valve, ignition ground, and SPDT alarm relay.)

LCDT-PS-120/24/12: 120 VAC (6 VA), 24 VDC (1 watt), and 12 VDC (0.5 watts). Operated relay output.

Sensor Inputs: Accepts up to 47 sensors via a ribbon cable.

NOTE: An approved isolation barrier such as the LCDT-ISB barrier for normally open sensors or a thermocouple type barrier for normally closed sensors, 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, $\frac{1}{20}$ HP, 125/250 VAC 3A, 30 VDC.

LCDT-PS-120/24/12 Contact rating: 5A, 28 VDC.

FET Outputs: LCDT-PS-CD-N rating (for fuel valve and ignition ground): 0.5 Amp. @ 250 V.

Operating Temperature: Module (head): -40 to 185°F (-40 to 85°).
Power Supply: 0 to 158°F (-18 to 70°C).

Storage Temperature: -40 to 302°F (-40 to 150°C).

Case: Module: LCDT-NO or NC: Anodized aluminum.

Power Supply (all models): Explosion-proof aluminum enclosure.

Multiplexer Scan Rate: Scans all 47 sensors in 0.7 seconds.

Start-Run/Test Timer: Standard 5 minutes. Specify other, (1 to 7 min. maximum, on increments of 1 minute only).

Laboratory Approvals: CSA[†] and Factory Mutual System^{††} approved for Class I, Division 1, Group D, Hazardous Locations.

[†]When used with approved ignitions. Contact Murphy for details.

^{††}When installed per Murphy drawings HC-9450-A or HC-9450-AA.

Power Inlet: Customer furnished 1/2 in. conduit (must be sealed).

Output Voltage: Approximately 5.8 to 9.5 VDC. Safety barrier on power supply maintains control circuits intrinsically safe.

Voltage Barrier: Clamps output at 9.5 VDC and ensures intrinsic safety

of all input circuits connected to the LCDT.

Power and Control Outlet: Conduit outlet employs sealing fitting for hazardous locations. Power and control color-coded, 4-conductor cable, is factory installed through outlet conduit seal. Conductors are connected to terminal block on intrinsically safe side of barrier.

Backup Battery:

LCDT-PS-CD (R)-P: 6 VDC, PX28L Lithium.

LCDT-PS-CD-N: 6 VDC, DL223A Lithium.

LCDT-PS 120/24/12: 1.2 VDC CH15 Nickel-cadmium (5 pcs.)

Shutdown Outputs:

By Relay outputs: LCDT-PS-CD (R)-P

LCDT-PS-120/24/12

By FET outputs: LCDT-PS-CD-N

Output Selections: (Customer selected, see page 5.)

- Ground Ignition immediately.
- Trip fuel shutoff valve, then ground ignition after 3-5 seconds delay.

Alarm Relay Output: SPDT form "C" contacts, provide for operation of a shutdown alarm (for rating refer to relay outputs).

LCDT-50CA-36 Terminal Strip/Cable Assembly

Ribbon Cable: 50 conductor, 36 in. (914 mm) long cable, with push-on type connector.

Terminal Block:

Normally Open Sensors: 50 screw type terminals (#6 screws), with mounting bracket.

Normally Closed Sensors: 50 pairs screw type terminals (#6 screws) and factory installed jumper with mounting bracket.

LCDT-ISB Intrinsically Safe Barrier (for Normally Open sensors)

Hazardous Area Design: Explosion-proof design according to NEC requirements for Class I, Division 1, Group D areas, CSA and Factory Mutual System approved (see *Laboratory Approvals*)

Enclosure: Aluminum explosion-proof case, tapped at customer's end for 1/2 in. conduit. (see mounting section for dimensions.)

Sensor Inlet: Customer furnished 1/2 in. conduit, (must have approved seal within 18 in. [458 mm] of enclosure).

Output to Terminal Block: Manufacturer furnished electrical cable is connected to barrier outlet. Normally OFF electronic switch turns ON when either sensor trips.

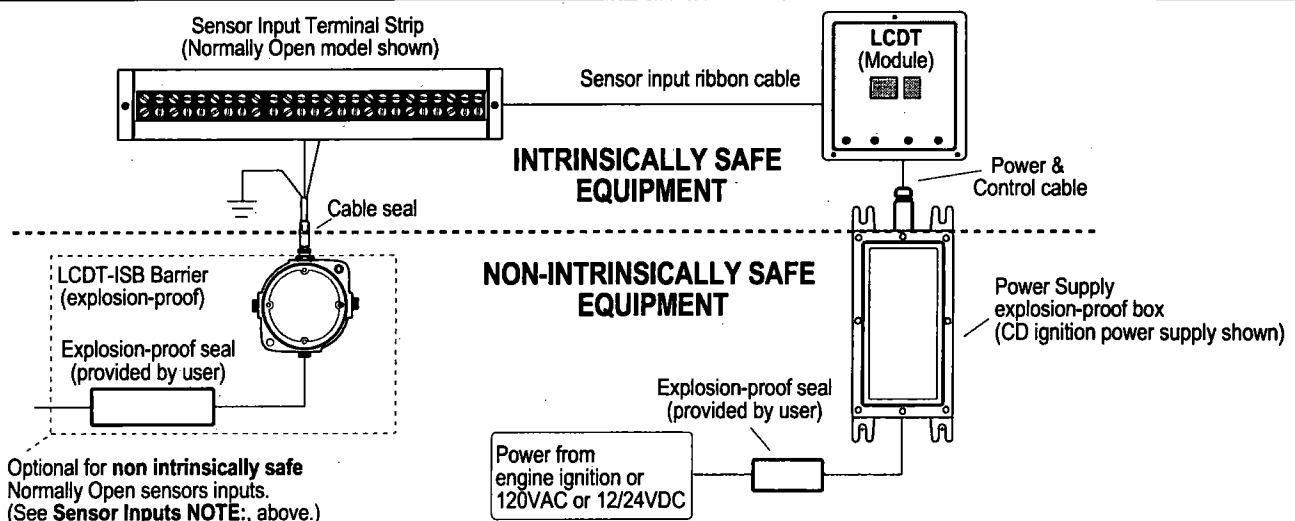
Class "C" lockout Adapter (normally open or normally closed sensor)

Intended for use between the LCDT and dry mechanical switches, this option is NOT listed for CSA or Factory Mutual standards.

SYSTEM INSTALLATION



CAUTION: For hazardous application requirements, the LCDT complete system must be installed in accordance with the National Electrical Code (NEC) Class I, Division 1, Group D (article 504) specifications, and per Murphy drawings HD-9450-AA or HC-9450-A.

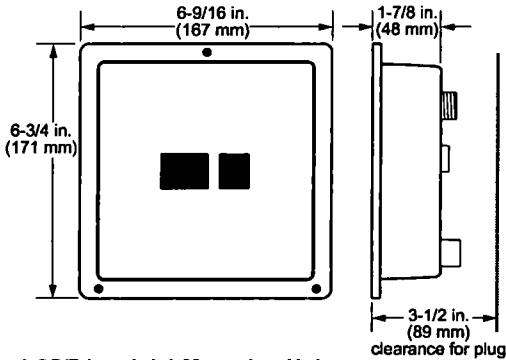


MOUNTING DIMENSIONS

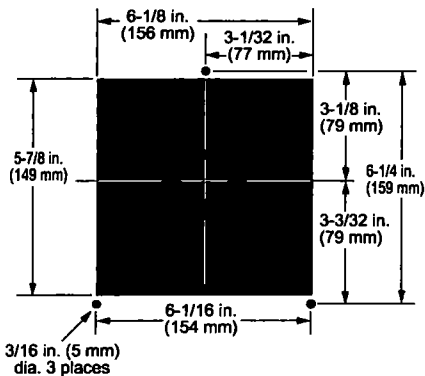


CAUTION: The LCDT system should be mounted within a weatherproof enclosure. A mounting hole of 5-7/8 in. (149 mm) high x 6-1/8 in. (156 mm) wide and three (3) 3/16 in. (5 mm) dia. screw holes are needed, see mounting drawing. Insert the LCDT from the front side of the panel and install the three mounting screws. Plan the terminal block and the power supply mounting for easy wiring and access.

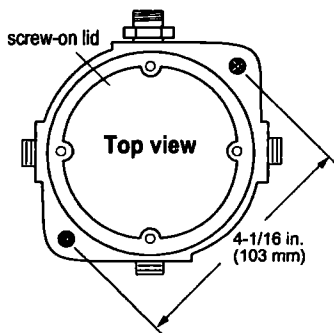
LCDT Module



LCDT (module) Mounting Hole

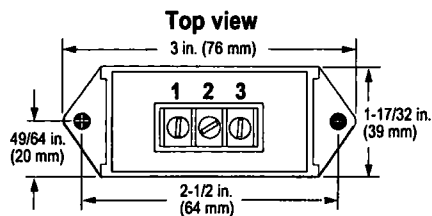


LCDT-ISB Barrier (For Normally Open inputs)

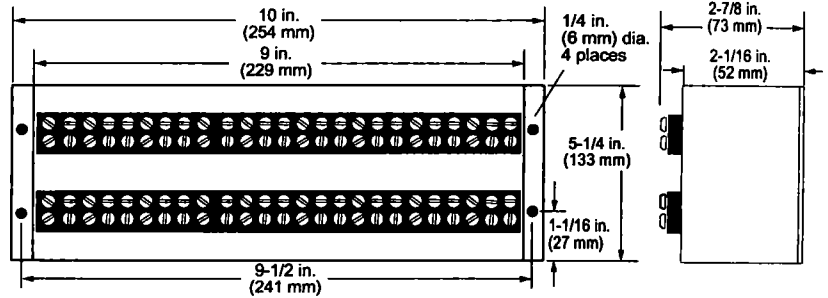


NOTE: Allow 3-7/8 in. L x 3-7/8 in. W x 2-7/8 in. H (98 x 98 x 73 mm) for barrier clearance.

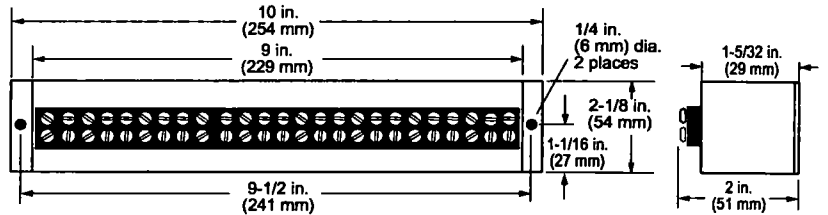
LCDT Class "C" Lockout Adapter



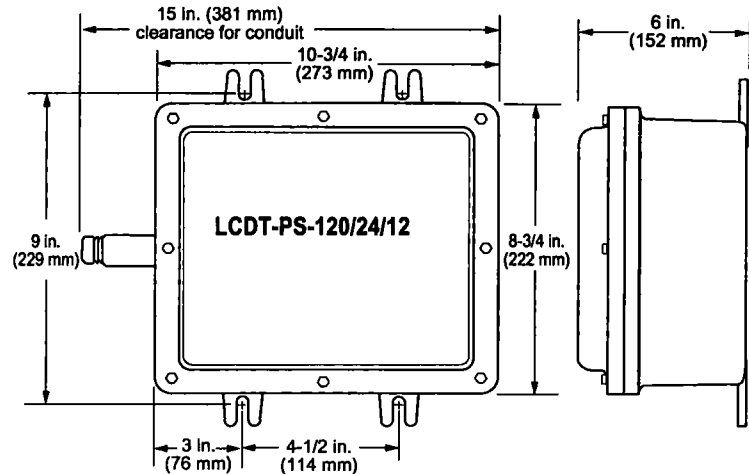
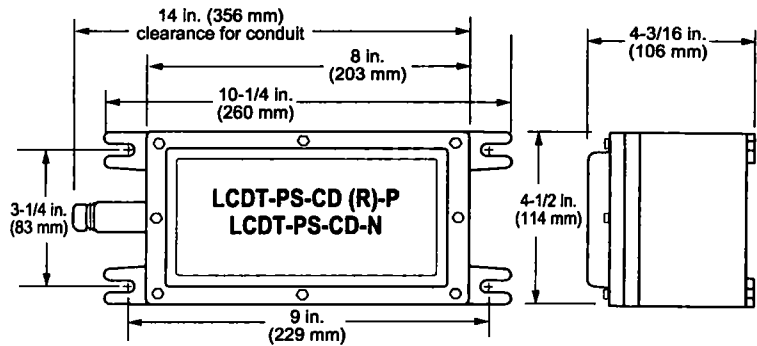
LCDT-TB-NC (50 pairs screw type terminals)



LCDT-TB-NO (50 screw type terminals)



LCDT-Power Supplies (explosion-proof box)



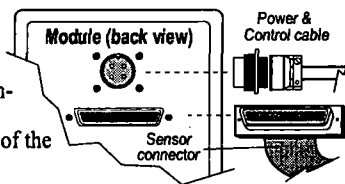
SYSTEM TYPICAL WIRING



WARNING: Perform the wiring operation with the power source "OFF" and the area made non-hazardous. Make sure the voltage and current requirements are within the LCDT ratings. Hard conduit with approved seals is required by the NEC for non-intrinsically safe connections.

1. Module connections

Interconnect the module and the power supply with the power and control cable. The sensor connector from the terminal strip, simply plugs into the back of the LCDT module.



2. Power supply typical connections



CAUTION: Do not run the power supply leads and the sensor leads wiring in the same conduit.

- Conduit installation:** Remove power before opening power supply cover. Install a 1/2 in. (13 mm) dia. conduit, from customer end of power supply to ignition or power source. Install an approved explosion-proof seal in the conduit within 18 in. (457 mm) of power supply enclosure.

Important: Use the green screw above conduit inlet (in power supply), to attach equipment ground per National Electrical Code (NEC).

- To obtain a built-in delay of 3-5 seconds for grounding the ignition after fuel valve has been tripped, remove jumper between eyelets E1 and E2, on all power supplies models.
- If ignition grounding is not required, cut jumper between eyelets E3 and E4. Refer to fuel valve wiring-power supply wiring, (CD ignition models only).

- Customer Wiring:** Refer to Power Supply Wiring, pages 5/6.

Important: Run wiring from ignition and fuel valve to power supply through conduit installed in "step 2-a".

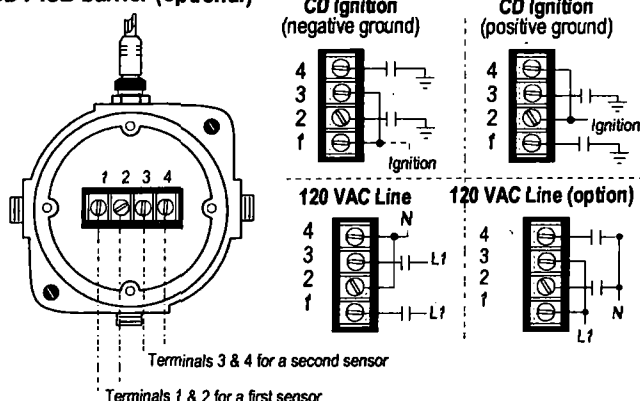
3. Intrinsically safe barrier wiring (normally open sensor only)



WARNING: Secure the area of hazardous conditions before opening barrier cover or operating sensor contacts.

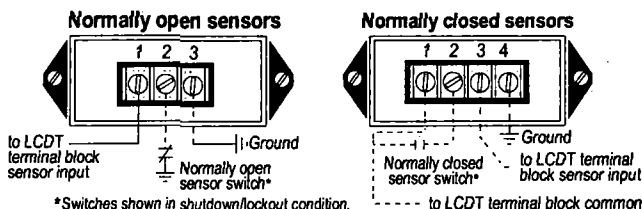
- Run Sensor switches wiring through conduit and isolate from the LCDT terminal block with an explosion-proof barrier.
- For wiring refer to the following typical wiring diagrams.

Normally Open System Barrier LCDT-1SB barrier (optional)



NOTE: Terminals #1 & #3 must be (+) positive with respect to #2 and #4.

CLASS "C" LOCKOUT ADAPTER TYPICAL WIRING



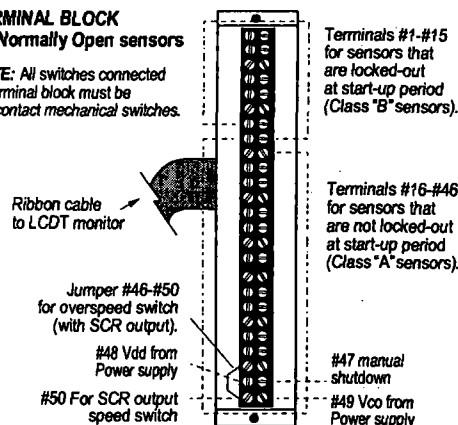
4. Normally open sensor input wiring

a. Jumper Installation/Removal:

- When digital electronic speed switch with SCR output is used for overspeed protection, install jumper between terminals #46 and #50 of the sensor input terminal block.
- Wire each intrinsically safe sensor to be locked out during start up to one of the terminals #1 through #15.
- Wire sensors not locked out at start up to terminals #16 through #46. Jumper between terminal #50 and #46 for overspeed from SCR output. Terminal #47 is manual stop.

TERMINAL BLOCK for Normally Open sensors

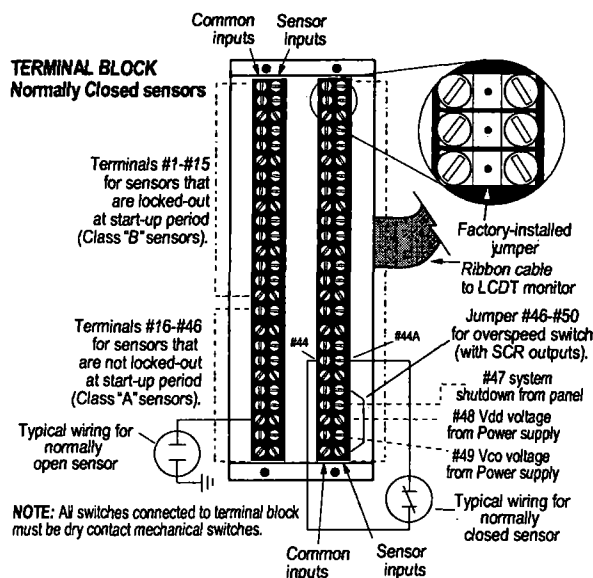
NOTE: All switches connected to terminal block must be dry contact mechanical switches.



5. Normally closed sensor input wiring

a. Jumper Installation/Removal:

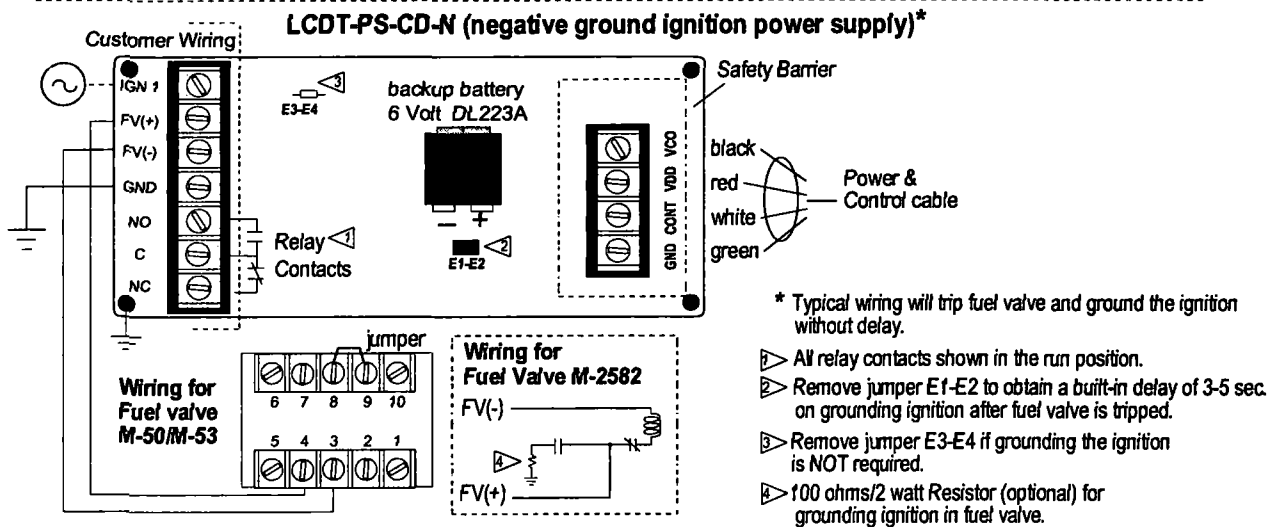
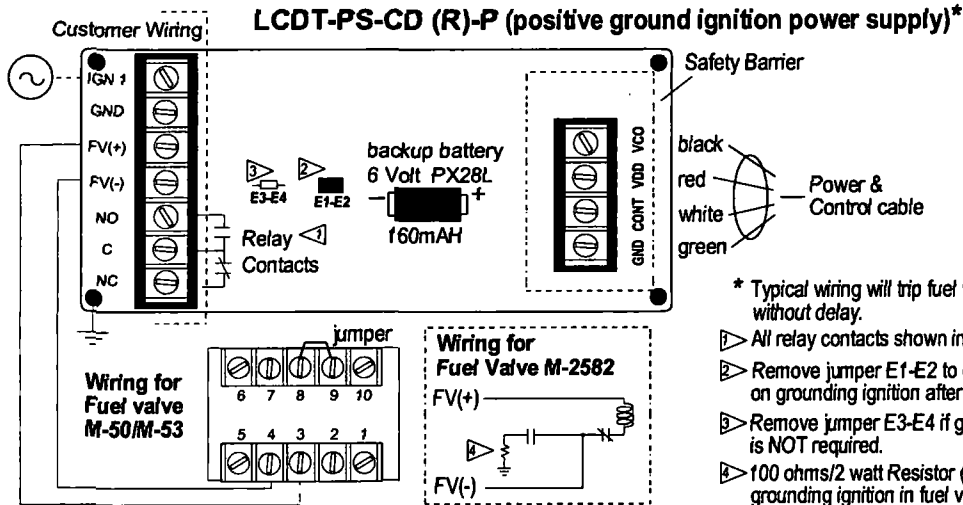
- When digital electronic speed switch with SCR output is used for overspeed protection, install jumper between terminals #46 and #50 of the sensor input terminal block.
- Remove the factory-installed jumper and connect a wire from terminals #1 through #46 to one side of each sensor switch.
- For sensors to be locked out during startup wire other side of sensor switch to one of sensor terminals #1A through #15A. For sensors not locked out during startup wire other side to one of terminals #16A through #46A.
- To wire Normally Open sensors to Normally Closed terminal block leave the factory-installed jumper in place. Connect sensor between jumpered input terminals and ground.



POWER SUPPLY TYPICAL WIRING INSTALLATION



WARNING: Perform the wiring operation with the power source "OFF" and the area made non-hazardous. Conduit is recommended to protect wires from damage. Do NOT route sensor leads and power supply wiring in the same conduit.

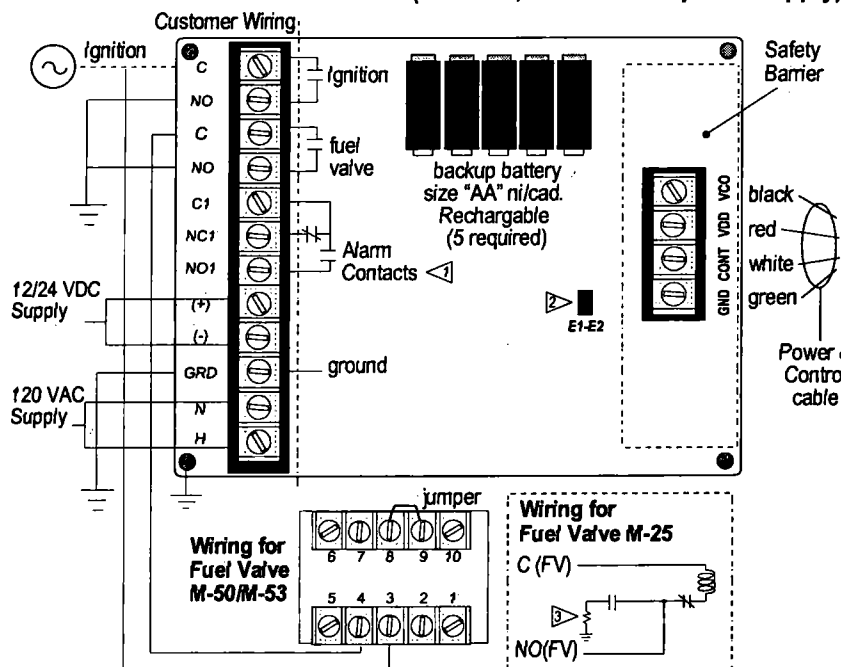


POWER SUPPLY TYPICAL WIRING INSTALLATION



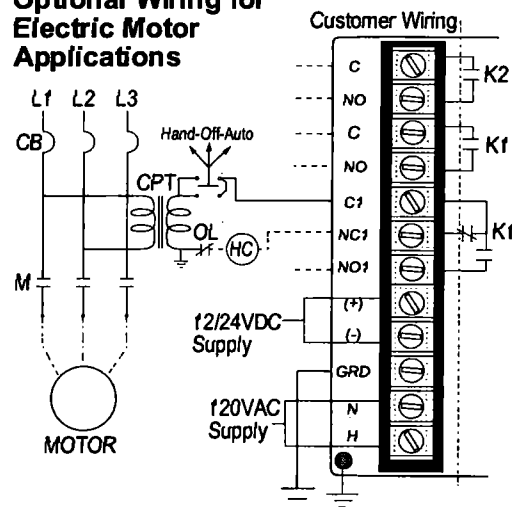
WARNING: Perform the wiring operation with the power source "OFF" and the area made non-hazardous. Conduit is recommended to protect wires from damage. Do NOT route sensor leads and power supply wiring in the same conduit.

LCDT-PS-120/24/12 (120 VAC, 12 or 24 VDC power supply)



- ▶ All relay contacts shown in the run position
- ▶ Remove jumper E1-E2 to obtain a delay of 3-5 sec. on grounding ignition after fuel valve is tripped.
- ▶ 100 ohms/2 watt Resistor (optional) for grounding ignition in fuel valve.

Optional Wiring for Electric Motor Applications



SEQUENCE OF OPERATIONS

TYPICAL OPERATING PROCEDURE

To perform this operation, the system must be properly installed and faulted sensors cleared. To demonstrate typical operation, assume that power comes from an engine with CD type ignition.

1. Battery Check

- a. Hold down TEST pushbutton and check Start Run Timer display. A decimal (.) point visible in display indicates low battery.

NOTE: For backup battery replacement, refer to Power Supply typical wiring diagrams.

2. Initially Faulted Sensor Check (before startup) -NO models only.

- a. Set Manual switch to RUN.
- b. Momentarily press RESET pushbutton and observe Sensor Number window for faulted sensor indication.
- c. Initiate Time lockout by clearing any faulted sensors then press the RESET button. Repeat until all faulted sensors are cleared.

3. System Startup.

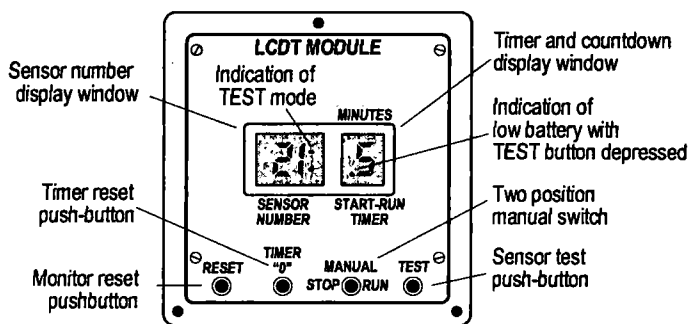
- a. Set Manual Switch to RUN.
- b. Press Reset to clear any faulted sensors and set up power supply for engine operation.
- c. Apply starting power to engine. At time out of the Start-Run Timer, all locked out sensors are made active.

NOTE: If engine fails to start, refer to trouble shooting section, page-8.

4. Sensor Test. To verify that sensors are hooked up and working.

- a. Press RESET first, then press TEST pushbutton to override shut down function while sensors are being tested.
- b. Verify that the colon (:) is in the sensor number window to indicate TEST mode, and that full count appears in the Start Run Timer window.

NOTE: Test ends when the timer times out or Timer "O" button is depressed. (Full time is reset each time RESET is depressed).



c. Test system sensors as follows:

1. Trip first sensor to be tested and verify that sensor number appears in Sensor Number window.
2. Clear sensor just tripped then press the RESET pushbutton. Verify that sensor number is cleared from Sensor Number window and that full count appears in Timer window.

NOTE: If you fail to clear LCDT after tripping sensor, engine will shut down when timer times out.

3. Repeat Steps "1" and "2" for each sensor.

d. To end test, press Timer "0" pushbutton or test will end automatically when timer times out.

5. System Shutdown. Set Manual Switch to STOP.

- a. Verify that engine stops and that Sensor Number 47 appears in the sensor number display.

NOTE: Sensor No. 47 indicates that system has been shut down by operation of the Manual Stop Switch.

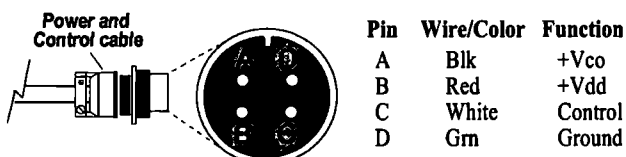
CONTROLS AND INDICATORS DESCRIPTION

The LCDT MODULE is a 47-channel multiplexed data selector with inputs for up to 46 sensor channels. Channel #47 is used as a Manual Stop and channel #46 is dedicated to Overspeed. A tripped sensor appears as a Logic-0 to the multiplexer at the associated input. The multiplexer sequentially addresses the 46 input channels and the STOP. Any tripped sensor (or a Panel STOP) will be detected and its assigned number will appear in the sensor number window.

Terminal Block & Sensor Input Cable interconnect the 46 sensor inputs and the LCDT module. The terminal block contains 50 conductors. In system installation, the sensor numbers correspond to the terminal numbers.

Power and Control Inputs/Outputs are connected from the power supply to the LCDT module through the power and control cable. See power and control cable designations in schematic below.

Power and Control cable connector designation



Liquid Crystal Display (LCD) shows the appropriate sensor number in the left-hand two digits, lockout timer countdown (in minutes) is displayed in the right-hand window. Two dots in the left-hand display window indicate that the LCDT is in the TEST mode. *A single dot in the right-hand display (while TEST button is held down) indicates low battery in power supply.*

Terminal Number Function

Terminals #1 - #15 are dedicated to dry contact sensors monitoring parameters such as pressures and flows that are faulted while engine is not running. (Class "B" functions, lockout by start/run timer.)

Terminals #16 - #45 are dedicated to sensors that monitor operating parameters not locked out by start/run timer. (Class "A" functions).

Terminal #46 is dedicated to monitoring overspeed. **Terminal #47** is used for manual shutdown. (Upon a STOP, the number 47 is indicated in the LCD window.)

Terminal #48 is check point for Vdd Voltage from power supply.

Terminal #49 is check point for Vco voltage from power supply. Vco is present on Ignition power systems only when the engine is running.

Terminal #50 is a special output for use with electronic digital speed switches having SCR outputs.

Manual Stop/Run Switch sets the Run or Stop mode from the panel. For normal operation, the switch must be in the RUN position. When placed in the STOP position, this switch shuts down the system by simulating a fault condition on sensor input #47. The number 47 will appear in the Sensor Number (left-hand) display.

Reset Push-Button resets all tripped sensor inputs and resets the display. This push-button resets the Start-Run Timer to full count. If momentarily pressed before system start up, Reset causes any initially-faulted sensors (above sensor number 15) to be detected and displayed. The button also resets shutdown or alarm outputs.

Timer Zero Push-Button zeroes the Start-Run Timer as indicated by "0" in the Start Run Timer window. If in the RUN position, pressing the button ends startup and initiates RUN mode; if in TEST, pressing the button ends the test.

Test Push-Button After system start up the Test push-button can be used to set the unit to the TEST mode. In TEST the unit displays sensor fault inputs just as in normal operation (except that the system is not shut down by sensor operation). In this mode, the timer times the test period and the system automatically comes out of the TEST mode when the time counts down to zero. Pressing this push-button during the start up or test period resets the Start-Run Timer to its maximum time and displays the time in the timer window.

Tripped Sensors When a tripped sensor is detected, the signal is transferred by the multiplexer to the LCDT. The display registers and indicates the sensor number. The unit sends a control signal to the power supply (shut-down relay) to shut down the engine. The faulted sensor number is retained in the display. The remaining sensor inputs are disabled until the LCDT is manually reset.

Start-Run Timer A Start-Run Timer circuit allows five (5) minutes for the system to come up to speed without being shut down by speed-related conditions (such as low oil pressure). Time is indicated in the Start-Run Timer window. As the time period is used up, the timer counts down to zero (0). At startup, the first 15 sensor inputs are locked out until time zero. The system should be up to speed and the locked-out parameters up to normal. If any of the 15 sensors are still tripped at the end of the time period, the unit will shutdown the engine and display the faulted sensor. The balance of the channels (16-46) are functional during the start up period and will shutdown the engine if tripped. Pressing the Timer "0" push-button forces the time count to zero, ending the startup lockout period.

Start-Run Timer as Test Timer In the TEST mode, the Start-Run timer locks out all shutdown functions. This mode enables all sensors to be tripped and displayed individually, but inhibits shutdown due to tripped sensors until time zero. The TEST push-button sets the unit into the TEST mode for the Start-Run timer period. It is indicated by a colon (:) in the Sensor Number window. In the TEST mode, the shutdown function is locked out and each sensor can be tested and displayed without shutting down the system. Reset the unit (press RESET button), and the timer count restarts at full count. The TEST mode ends when the timer counts to zero or if the Timer "0" button is depressed.

BARRIER FOR NON-INTRINSICALLY SAFE INPUTS

The Model LCDT-ISB is designed to accept two non-intrinsically safe, **normally open** inputs and convert them to intrinsically safe outputs. An internal barrier isolates the outputs from the inputs. The internal terminal block provides connection for the user circuits while a factory-installed cable from the output terminal block provides intrinsically safe connection to the LCDT input terminal block.

The minimum input voltage for the LCDT-ISB (intrinsically safe barrier) is 90 volts. For normally closed systems or dry relay contacts use an intrinsically safe (approved) barrier. For any other voltages use a relay and a thermocouple barrier, mounted in a separate explosion-proof box or out of the hazardous area.

Note: Before attempting operation, make sure the system and all related equipment items are properly installed and tested for the normally open system.

TROUBLESHOOTING INSTRUCTIONS



WARNING! Do NOT open power supply until operations have been shut down and area has been rendered non-hazardous. Always make sure on ignition powered devices that the panel ground and the device ground are the same, and well connected. Make sure that the ground from the unit being monitored is connected directly to the ignition. Do NOT run sensor wires in conduit with any other wire. Do NOT apply voltage to any annunciator input terminals. Do NOT bundle sensor wires with any other wiring. When using barriers to the sensor terminal strip, always make troubleshooting checks without the barriers. A blown barrier may short the annunciator. If everything checks okay without the barriers, connect barriers one at a time to find the cause of the problem. Most barriers are polarity sensitive.

These instructions will assist in the correction of most problems which you may encounter with the unit. Before checking the list, first refer back to the connections (wiring) and operation procedures. If problems persist after making the checks, consult any Murphy facility.

| SYMPTOM | CAUSE | TEST | REMEDY |
|-----------------------|--|---|--|
| No display | 1. No power to LCDT module | a. Check that Power & Control cable is connected to the module. b. Check voltage between holes "B" and "D" of the Power and Control cable connector (good above 5.8 VDC)†. c. Check battery voltage while mounted in the power supply. * LCDT-PS-CD-N/(R)-P: 5.8 V minimum. * LCDT-PS-120/24/12: this model has (5) Ni-Cad batteries, each should read at least 1.2 volts, (Ni-Cad batteries are recharged after 24 hours with power supply connected). d. Check the Power supply output by measuring the voltage between terminals VDD and GND of the 4-point terminal block under the Safety cover (reading should be 5.8 V min.). e. Check the Power & Control cable by measuring the resistance between hole "B" of the Power and Control cable connector, and the VDD terminal (4-point terminal block in power supply). f. Check the Power & Control cable by measuring the resistance between hole "D" of the Power and Control cable connector, and the GROUND terminal (4-point terminal block in power supply). Reading should be less than "1" ohm. | a. Connect cable. b. If voltage is correct, replace the module. c. Replace battery(ies). d. If output is less than 5.8 V, replace Power supply. e. If reading is greater than "1" ohm replace the Power & Control cable. f. If reading is greater than "1" ohm replace the Power & Control cable. |
| | 2. Shorted/open trace, (module). | g. If system passes test 1a. thru 1f. . . | g. Replace the module |
| Engine fails to start | 3. Sensor not cleared (on LCDT display). 4. Sensor cleared (on LCDT display) but engine fails to start. 5. Power supply failure. | a. Press RESET. If condition still exists, Check sensor wiring to terminal block according to wiring instructions. (Look for shorted wires, open circuits, closed circuits, broken wires.) b. Turn the Stop-Run switch to Stop, then press Reset and verify for number 47 to be displayed. Turn Stop-Run to Run and RESET. Ignition ground should clear allowing engine to start. c. Check Power and Control cable, place a jumper (metal paper clip can be used) between sockets "B" and "C". The relay in the power supply should pickup, and unground the ignition. d. Repeat the low battery voltage test. (Test-1c, above). | a. Repair or replace wiring as needed. b. If engine fails to start, check Power supply per 1a-1f. c. If engine starts, replace the module. d. Replace battery(ies). |
| Random Shutdowns | 6. High voltage/ignition leads in same conduit or installed close to sensor leads. 7. Open sensor/ lead insulation broken or grounded lead wires. | a. Temporarily reroute sensor leads and any other wiring in separate conduit. b. Check sensor wiring to terminal block according to wiring instructions. (Look for shorted wires, open circuits, closed circuits, broken wires.) | a. Route sensor leads and any other wiring in separated conduit. b. Check sensor switch. Repair or replace sensor wiring if needed. |

† LCDT-PS-CD-N power supply will work with lower battery voltage; however, the battery should be replaced.

WARRANTY

A two-year limited warranty on materials and workmanship is provided with this Murphy product.
Details are available on request and are packed with each unit.

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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Installation for 4-1/2 in. (114 mm) dial Pressure MURPHYGAGE® and SWICHGAGE®

Model Series: OPLC, OPLG, OPLBP, 45PE, 45PEBP and 45 Series

Options: -OS, -ES, -P4 and -P6



Please read the following instructions before installing. A visual inspection is recommended before mounting. General Information and these installation instructions are intended for all 4-1/2 in. (114 mm) dial pressure models.

GENERAL INFORMATION

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.

OPLC and OPLFC SWICHGAGE® instruments have high and low limit contacts to monitor, alarm or shut down. The OPLC has a flanged case. A method to override the low limit contact for start-up is provided on most models. See Operation Test section—page 3. OPLFC can be direct or panel mounted (see page 2).

OPLG and OPLFG MURPHYGAGE® instruments are indication-only pressure gages. Same as OPLC and OPLFC models except without switch (limit) contacts.

45 Series includes a magnetic switch to stop an engine or electric motor each time the gage contact operates. A lockout push button overrides low contact for startup. Other variations available.

45PE and 45PEF Series are versions of the OPLC Series featuring 2 snap-acting SPDT switches instead of the pointer type contacts. These units do not include low contact lockout.

OPLBP and 45PEBP are versions of the OPLC and 45PE models. They feature pilot duty limit switches connected to an internal latching control relay for “on/off” control directly or through a motor starter.

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.

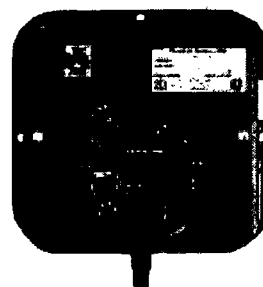
Overrange: Do not exceed 10% FS above full range.

Process Connection: 1/4 NPTM thru 1000 psi; 1/2 NPTM 1500 - 20,000 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%.



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

Switch Reset Deadband: Approximately 10% FS.

Snap-Acting Switches: See wiring information (page 4).

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 mm²) x 9 in. (229 mm) long.

Wire Connections (-ES, -OS, -CC): 1/2 NPTM conduit and wire leads, 24 AWG (0.22 mm²) x 33 in. (838 mm) long.

Item Weight: 5 lbs 6 oz (2.4 kg) approximately.

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

Item 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.



Precautions

- Do NOT exceed rated pressure range.
- Dope or use teflon tape on connection threads. Do not block the inlet orifice.
- For direct mount into the process, a vertical or ninety degree mounting is recommended.
- Use wrench on shank to tighten or loosen connection.
- Do not twist case when installing, this will damage internal components and will void the warranty. **Do not overtighten.**
- Use shock mounts as necessary to prevent excessive vibration.
- **COLD WEATHER WARNING:** If liquid in the system is allowed to freeze, it will expand and may damage the tube.
- Drain the system when freezing temperatures are expected.

Warranty

A two-year limited warranty on materials and workmanship is given with these Murphy products. Details are available on request and are packed with each unit.

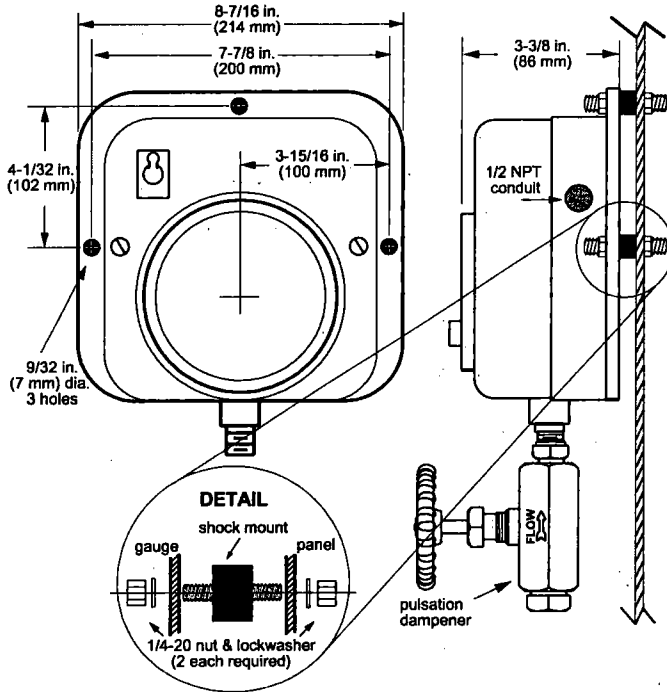
*Selected configurations are third party listed. Consult factory for details.

**Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted. Does not cover “BP” models.

CASE MOUNTING

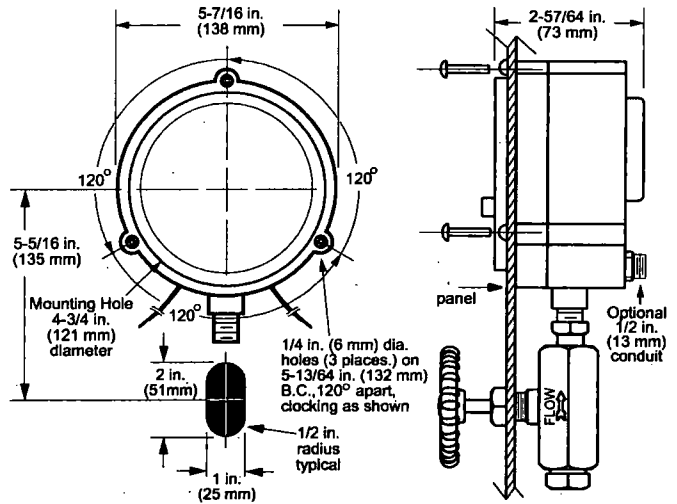
Wall Mount

Flanged case design intended for wall mount, it can also be direct mounted. Shown with shock mounts and pulsation dampener, (optional).

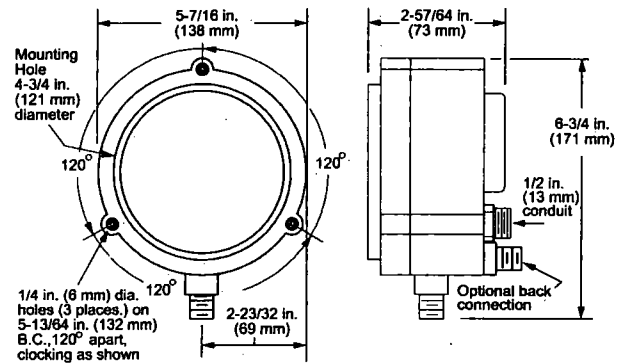


Flush Mount

A round case design to be mounted within a panel from 1/32 in. (1 mm) to 1/8 in. (3 mm) thick. It can also be direct mounted. Shown with pulsation dampener option.

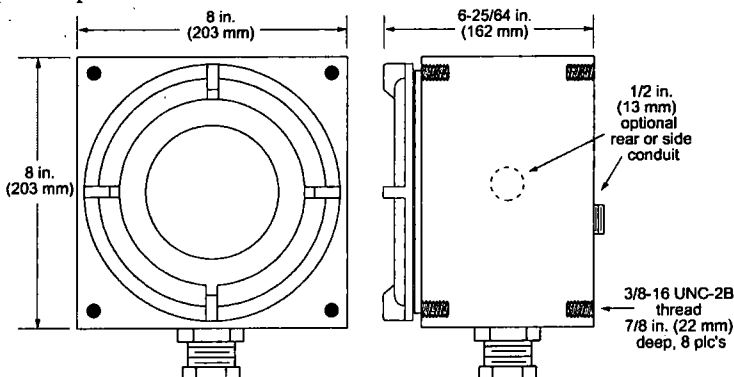


Options "OS" and "ES" (flush mount case)

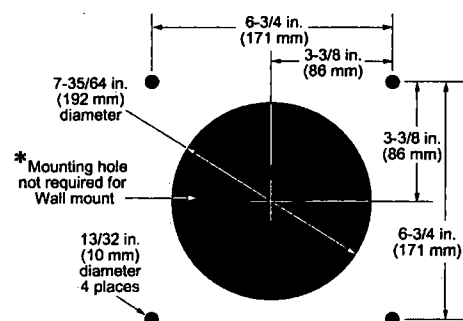


Explosion-proof Case Mount

Explosion-proof case can be mounted from face or rear.



Flush mount/Wall mount*



OPTIONS

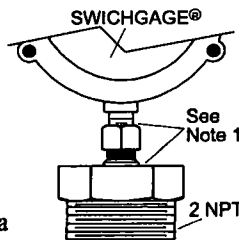
"OS" and "ES": The "OS" (oil sealed case) and the "ES" (environment sealed case) options for corrosive environment feature a panel mount case design or screw directly into the process. See page 2 for mounting.

Pulsation Dampener controls any pressure indicating instrument subject to pulsation. This device is NOT intended as a "shutoff" valve. (See mounting instructions, page 2).

P6 (was PT167) is a sealed mechanism with a typical application for oil well lead lines. It consists of a 2 NPT housing with a diaphragm seal filled with silicon fluid which attaches directly into the process.

NOTES:

1. Do not tamper with or break sealed connections.
2. The pressure transmitter threads into a 2 NPT tee on the lead line. Tighten only the 2-5/8 in. (67 mm) hex fitting.



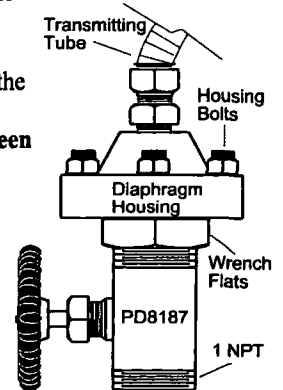
P4 (was PT147) is a remote seal mechanism with stainless steel armored capillary to protect the SWICHGAGE® from highly viscous and/or corrosive fluids.

1. Install the pulsation dampener into the source pressure connection. Use of thread sealant is suggested.

2. Loosen the eight housing bolts until the bottom housing is free to turn.

CAUTION: do not unscrew the green diaphragm capsule.

3. Tighten the bottom housing to the 1 NPT on pulsation dampener.
4. Tighten the eight housing bolts to 25±3 foot lbs. by staggering the tightening to assure even clamping.
5. Route capillary away from heat source such as exhaust manifold.
6. Excess transmitting tube should be carefully coiled and secured to avoid any damage.
7. Do NOT cut capillary or make sharp bends.



LIMIT CONTACT / INDICATION POINTER ADJUSTMENTS

Limit Contact Adjustments

Facing the dial, left side knob is "Low limit" contact. "High limit" contact is located next to the "Low" limit contact.

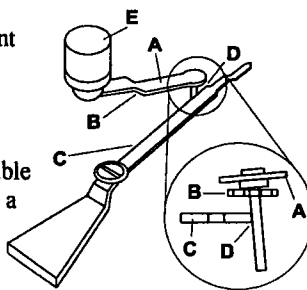
NOTE: the 45PE Series features a stacked limit indicator knob with both limit adjustments included. The bottom half knob adjusts the "Low" limit indicator; the top half is to adjust the "High" limit indicator.

To set limit contact simply turn the fingertip type knob to the desired point on the scale.

Limit Contact Wiping Feature

The force of pointer causes the flexible contact arm (A) to "tilt" resulting in a wiping action (D). This clears away film or corrosion formed on the contact surfaces.

- A. Contact arm-flex
- B. Contact arm
- C. Pointer Contact
- D. Initial point of contact
- E. Limit contact knob



Indication Pointer Adjustments

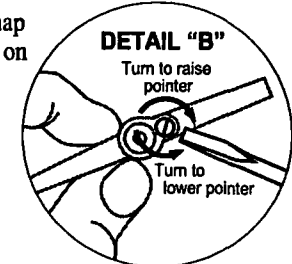
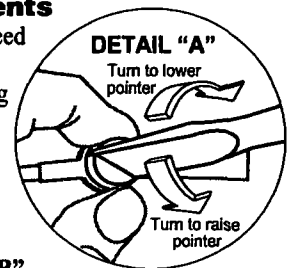
To reset to zero or to a known value proceed as follows:

1. Turn off power. Remove the snap ring and the lens/contact assembly (or open hinged cover).
2. Hold the pointer hub with thumb and forefinger then turn screw to desired point. See DETAIL "A".

For the 45PE Series see DETAIL "B".

3. Replace lens contact assembly and snap ring (or close hinged cover), and turn on power.

NOTE: Span adjustments and recalibration must be performed by authorized mechanic or return the unit to Frank W. Murphy Mfr.



OPERATION TEST INSTRUCTIONS

OPLC, OPLFC, OPLFDP and OPLBP

1. Perform operation test after the unit is installed and wired appropriately. (See typical wiring diagram page 4.)
2. When pressure is applied to the instrument either directly from a process variable or through a fluid/gas filled capillary, the pointer will travel in a clockwise direction. (Adjust contacts to desired set points.)
3. To start, place the toggle switch in the "start" position or otherwise override low contact.
4. After the indication pointer rises past the low limit contact, return the toggle switch or override device to the "run" position.
5. To test the limit contacts, turn the limit contact to be tested until it touches the pointer. That will trip the control circuit.
6. Reset the shutdown or alarm circuit device and repeat above sequence.

45 Series

1. Repeat steps 1 and 2. (See OPLC operation test instructions.)
2. Press the semi-automatic pushbutton located on the low contact knob.
3. Reset the magnetic switch pushbutton.
4. After the indication pointer rises past the low limit contact the lockout-pushbutton automatically disengages and the low limit is armed.
5. Repeat steps 5 and 6. (See OPLC operation test instructions.)

45PE, 45PEF and 45PEBP

1. Repeat steps 1 and 2. (See OPLC operation test instructions.)
2. To test the switches, turn the limit indicator until it touches the pointer, then continue to rotate until the snap switch operates*.
3. Reset the shutdown or alarm circuit device.

* The trip point indicator will stop the pointer movement slightly before the snap switch operates. As pressure continues to increase or decrease, the trip point setting is reached.

TYPICAL ELECTRICAL DIAGRAMS



WARNING: PERFORM THE WIRING OPERATION WITH THE POWER SOURCE "OFF". MAKE SURE THE VOLTAGE AND CURRENT REQUIREMENTS ARE WITHIN THE SWITCHGAGE® RATINGS. BEFORE WIRING DETERMINE VOLTAGE AND POLARITY FOR THE APPLICATION. USE THE APPROPRIATE WIRE SIZE. ALL CONNECTIONS SHOULD BE MADE USING A SPADE (FORKED) OR RING TERMINALS. FOR PIGTAIL CONNECTIONS USE WIRE NUTS. CONDUIT IS RECOMMENDED TO PROTECT WIRES FROM DAMAGE.

OPLC and OPLFC

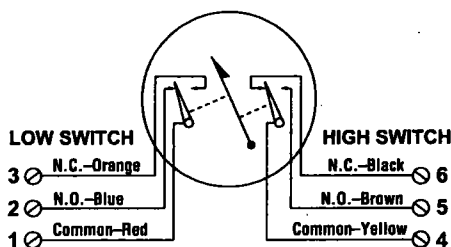
Contact Rating: 1 SPDT, Center Off; 2 A, 30 VDC, 1 A, 125 VAC pilot duty.



NOTE: Diagrams above show the pointer in the at rest (shelf) position.

45PE and 45PEF

Contact Rating: 2-SPDT snap-switches (one for high and low pressure), 2 A inductive, 250 VAC each switch. *NOTE:* Diagram below shows the pointer in the at rest (shelf) position.



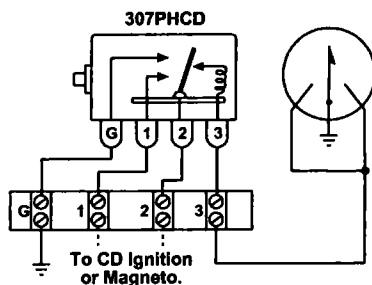
45 Series with 307PHCD

Contact Rating: 12/32 VDC coil, 10 A, 32 VDC battery ignition contacts; Magneto ignition coil, 10 A magneto ignitions contacts; CD ignition coil, 10 A CD ignition contacts; 120 VAC coil, 10 A, 120 VAC contacts.

NOTE: Diagram below shows the pointer in the operating position.

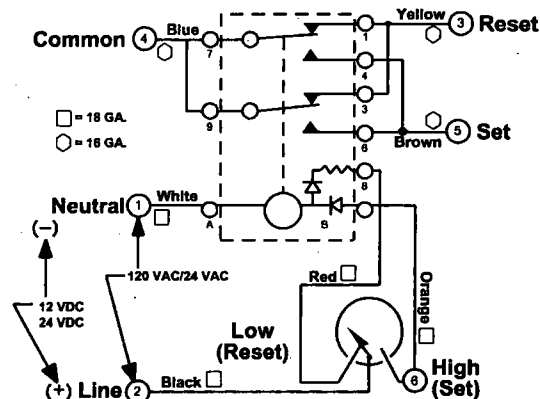
IMPORTANT:

Use with 110/120 VAC requires isolated ground SWITCHGAGE® instruments.



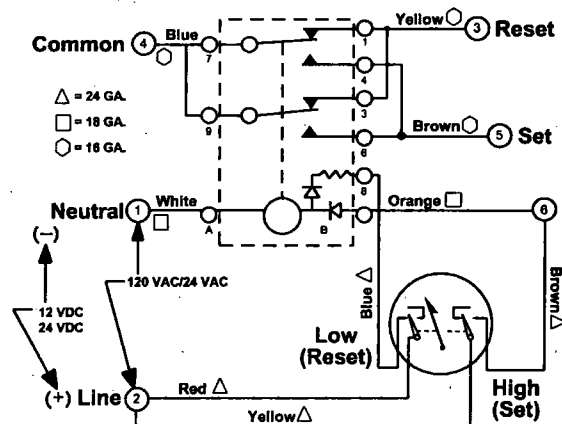
OPLBP

Contact Rating: SPDT dry relay contacts; 10 A, 125 VAC. *NOTE:* Diagram below shows the pointer in the at rest (shelf) position.



45PEBP

Contact Rating: SPDT dry relay contacts; 10 A, 125 VAC. *NOTE:* Diagram below shows the pointer in the at rest (shelf) position.



Transformer Relay Assemblies

For higher voltages, Murphy TR Assemblies can be used in conjunction with any SWITCHGAGE®.



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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.

Instructions for Installation and Maintenance

For all 2 in. (51 mm) and 2-1/2 in. (64 mm) Dial Temperature MURPHYGAGE® and SWICHGAGE®

T-8446N
Revised 10-00
Section 10
(00-02-0168)



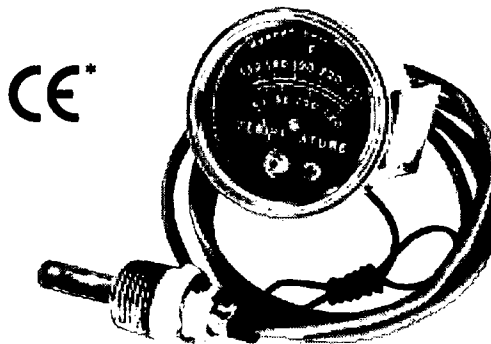
Please read the following information before installing. A visual inspection of this product for damage during shipping is recommended before mounting. General information and these installation instructions are intended for all 20T, 25T, A20T, and A25T series models.

GENERAL INFORMATION

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.



Description

Murphy 2 in. (51 mm) and 2-1/2 in. (64 mm) MURPHYGAGE® and SWICHGAGE® instruments have a remote sensing bulb connected to the gauge head by a sealed capillary system. **DO NOT CUT THIS CAPILLARY OR BEND AT A SHARP ANGLE.** The sensing bulb and capillary are filled with a liquid. When heat is applied to the sensing bulb the liquid turns to vapor which exerts pressure against the diaphragm movement of the gauge. This movement is read on the dial face as temperature.

Models having face adjustable contact(s) are rated for 2 A @ 30 V (pilot duty). If the case is steel (models 20T, 20SD, 25T, etc.), the ground path for the contact circuit is through the case. Therefore, the case must be installed in the ground plane of the electrical power supply.

If the case is polycarbonate (models A20T, A25T), the ground path is isolated and is made through the "C" or "P" terminal on the back of the case.

Models 20TE, A20TE, 25TE and A25TE have a snap-acting switch instead of the face adjusted pointer type contact. Electrical rating is 3 A @ 30 VDC, 4 A @ 125 VAC. Reset differential for the switch is approximately 10% of the scale below the trip point. Trip point is factory set and must be special ordered for field adjustable.

SWICHGAGE® models with Alarm Before Shut-down

The 20TABS, A20TABS, 25TABS and A25TABS feature a front limit contact for high temperature equipment shut-down and an internal SPDT snap switch for Alarm Before Shut-Down (see Wiring Diagram, page 3). When the high side (preset high temperature point) of the snap switch trips, the N.O. terminal completes a circuit to activate an alarm. A continued increase in temperature will complete the shutdown circuit. A decrease in temperature of approximately 10% of scale is necessary before the snap-switch (alarm) will RESET and open the circuit.

NOTE: The front contact shut-down limit setting (adjustable) and snap switch high point are preset at the factory; if settings other than standard are necessary, then specify when ordering.

Typical TATTLETALE® Magnetic Switch

Murphy manufactures several, patented Magnetic Switches for protection of the light duty SWICHGAGE® contacts and to ensure positive shut-down of equipment. There are Magnetic Switches for Capacitor Discharge ignition, Magneto, or Battery systems, and models for electric motor driven equipment. TATTLETALE® annunciators are indicators that show the cause of shut-down. TATTLETALE® annunciators are used in conjunction with several different SWICHGAGE® instruments. The first one to trip will lockout all other TATTLETALE® annunciators. Be sure the type of Magnetic Switch matches the power source used to trip it.

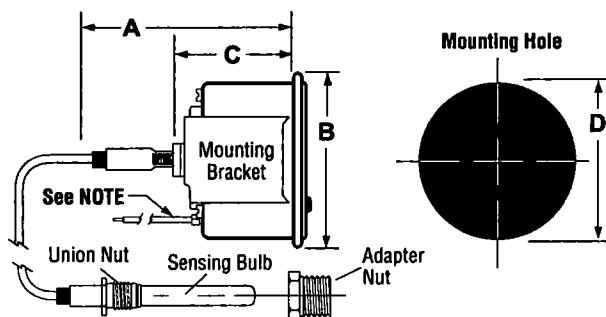
NOTE: At equipment start-up, the Magnetic Switch reset button must be held in until normal operation occurs, or an external time delay may be used. See examples of typical wiring and instructions packed with each Magnetic Switch.



CAUTION: Certain dangers to human safety and to equipment may occur if some equipment is stopped without pre-warning. It is recommended that monitored functions be limited to alarm-only or to alarm before shutdown.

IMPORTANT: SWICHGAGE® instruments, Magnetic Switches and shut-down or alarm devices, properly used, are effective tools in any preventive maintenance program. For optimum performance, check these tools periodically: look for frozen pointers, kinked/worn tubing, broken wiring or loose connections; operate the contacts and watch for expected results. Replace damaged/worn parts; clean/repair as necessary. Check for correct/complete wiring, unbroken insulation and no accidental grounds. **DO NOT run shut-down wires with ignition wiring.** Check all tubing and connections for leaks. Mount Magnetic Switches and valves upright, to prevent moisture collection.

MOUNTING DIMENSIONS



NOTE: 20 and 25 Series have 18 AWG pigtails. A20 series has #4 screws. A25 series has #6 screws.

For All 20, 25, A20, and A25 Series Temperature MURPHYGAGE® and SWICHGAGE® instruments

| | 20 Series | A20 Series | 25 Series | A25 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: The dimensions above are in inches and (millimeters).

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

INSTALLATION



WARNING: DISCONNECT THE BATTERY OR POWER SOURCE BEFORE BEGINNING THE INSTALLATION. DO NOT OPEN RADIATOR CAP OR FITTINGS ON A HOT ENGINE. DANGEROUS BURNS CAN OCCUR.

Panel Mounting

The 20, 25, A20 and A25 series models can be installed in a panel from 0.032 in. (1 mm) to 0.250 in. (6 mm) thick. See Mounting Dimensions, page 1. Remove the mounting bracket completely and insert the MURPHY-GAGE®/SWICHGAGE® from the front side of the panel. Replace the bracket and secure it in place. **IMPORTANT: Do NOT overtighten the mounting bracket. Shockmount the panel as necessary.**

LIQUID COOLED ENGINES:

1. Drain engine coolant to a level below the temperature sensing connection/plug. This connection is on the engine side of the thermostat generally near thermostat housing. *Consult your engine manual.*
2. Remove adapter nut from temperature sensing bulb and union nut.
3. Apply a non-hardening thread sealant to the adapter nut and screw securely into the water jacket opening in the engine.
4. Route the temperature capillary AWAY from hot surfaces such as exhaust manifolds.
5. Place the sensing bulb into the adapter nut and observe that the sensing bulb does not "bottom" in the water jacket nor are there other obstructions in the water jacket opening. Secure sensing bulb into the adapter nut with the 5/8-18 union nut. *See Figure 2.*



CAUTION: Do NOT cut or bend the temperature capillary at a sharp angle. Excess capillary must be carefully coiled and secured. The temperature sensing bulb must be immersed directly into the water jacket flow to sense coolant temperature. Do NOT install into a tee or other fitting. Use only Murphy adapter nuts.

6. Coil excess temperature capillary into a 2 in. (51 mm) diameter minimum coil. Tie the coil to prevent excessive movement.
7. Allow the engine to warm up and the thermostat to open. Slightly loosen the 5/8-18 union nut on the temperature sensing bulb to allow trapped air to escape from the cooling system. Retighten the nut.



WARNING: Perform this operation using appropriate protection. Trapped air and coolant may cause burns.

AIR COOLED ENGINES:

Temperature for air cooled engine can be measured in the cylinder head or in the lubricating oil. Oil temperature will give a more uniform reading than cylinder head since the oil circulates throughout the engine. Refer to specific instructions supplied, if any, for your specific application.

1. Oil Temperature

- a. The SWICHGAGE® sensing probe must be fully immersed in the oil pan, oil filter housing, oil cooler, etc. depending on engine model and configuration.
- b. Observe all precautions for liquid cooled engines.

2. Cylinder Head Temperature

- a. Generally the cylinder head must already have a hole drilled and tapped for insertion of the temperature sensing probe.
- b. If a hole is not provided in the cylinder head and no provision is made to drill and tap one, it may be possible to install an external bolt on heat sink such as the Murphy HS7.
- c. Coat the temperature sensing probe with a high temperature grease. A mixture of silicone and graphite flakes is recommended although grease alone can be used.



CAUTION: Do NOT apply too much grease. If grease is pushed out of the hole when temperature probe is inserted, remove some grease.

- d. Observe all precautions for liquid cooled engines.

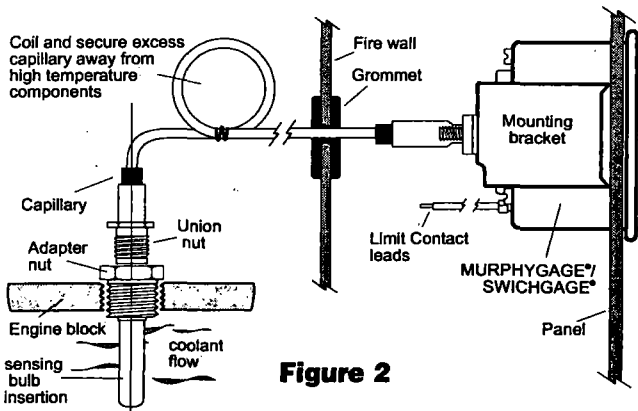


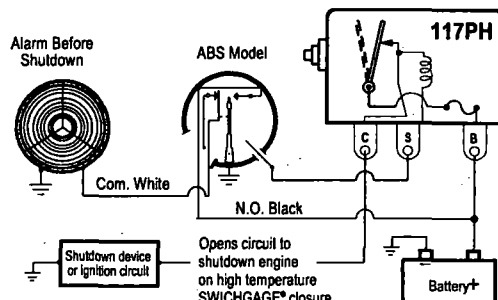
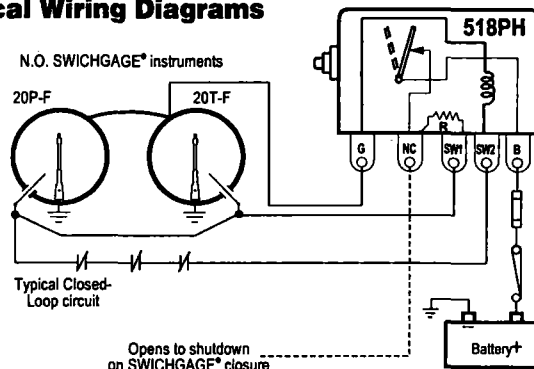
Figure 2

Connecting the TATTLETALE®/Magnetic Switch

1. Mount with electrical lugs down. If necessary, drill the case and pilot-stud holes (template provided).
2. Clean away burrs and filings. Position the Magnetic Switch in the panel, making sure the pilot stud is in place.
3. Add decal, then washer, then nut and tighten.

NOTE: Murphy components are easily wired and maintained. Use good quality wire and terminals. The type of Magnetic Switch differs for various applications. See examples of typical wiring (below). Wiring and instructions are packed with each Magnetic Switch.

Typical Wiring Diagrams



IMPORTANT INFORMATION: Do NOT clean MURPHY-GAGE®, SWICHGAGE® and Magnetic Switch with steam or high pressure washes. Many solvents and cleaners can haze and permanently damage the clear, polycarbonate. Clean your devices with: mild soap and water, mineral spirits, methyl/isopropyl/isobutyl alcohols, or 1 & 3 denatured alcohols.

WARNING: Do not clean the MURPHY-GAGE®/SWICHGAGE® - Magnetic Switch when equipment is running or very hot.

INSTALLATION Continued

Setting the SWICHGAGE® contacts



IMPORTANT: For 20TE, 25TE, A20TE and A25TE models the switch trip point **CANNOT** be set at either the lowest or the highest extremes of the scale. Trip point **MUST** allow for the switch reset differential. For adjustable switch versions, the switch point is adjustable **ONLY** over the upper half of the scale.

1. All contacts are set using a 1/16 in. hex wrench (Figure 3).
2. Some models such as A20TE, A25TE, etc. may not have field adjustment. Consult the factory if in doubt.
3. Observe the "normal operating" temperature readings. Set the contact slightly above maximum reading observed or slightly below maximum temperature recommended by equipment manufacturer.

Testing the Contacts

1. With equipment running, use a 1/16 in. hex wrench to rotate contact until it touches the pointer. Do NOT force contact against the gage pointer. Equipment should shut down and/or alarm should operate.

Reset the contact (Figure 3).

2. **VERY IMPORTANT** Each time you start the machine, observe that the SWICHGAGE® is indicating temperature. Visual inspection and regular testing should be normal procedure to ensure proper operation and to achieve maximum results from your SWICHGAGE®.

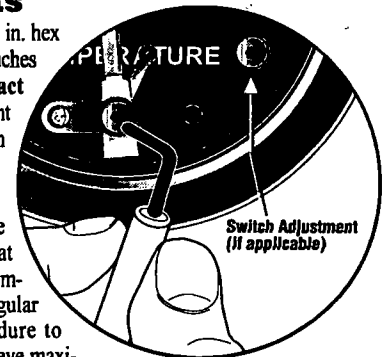


Figure 3

TYPICAL WIRING DIAGRAMS



WARNING: DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING THE WIRING INSTALLATION

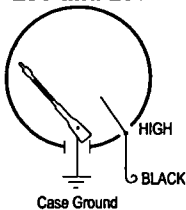
20 and 25 Series models

These diagrams are shown with the pointer in the at rest (shelf) position.

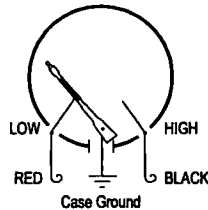
Pointer contact rating: pilot duty 2 A @ 30 VAC/DC.

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

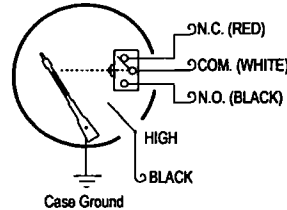
20T and 25T



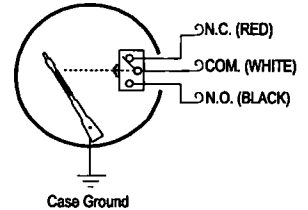
20T-HL and 25T-HL



20TABS and 25TABS



20TE and 25TE



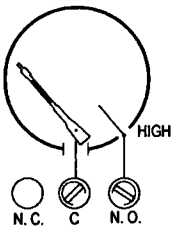
A20 Series models

These diagrams are shown with the pointer in the at rest (shelf) position.

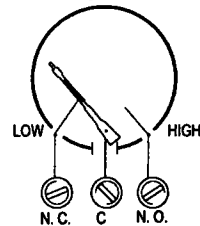
Pointer contact rating: pilot duty 2 A @ 30 VAC/DC.

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

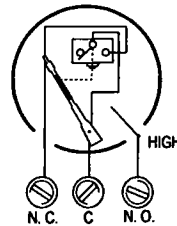
A20T



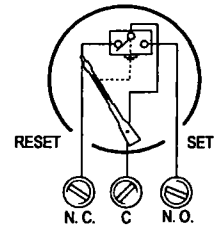
A20T-HL



A20TABS*



A20TE



* CAUTION Pointer contact and ABS switch share the same "Common." Voltage source MUST be the same. Maximum voltage is 30 V. Consult factory for 120 VAC applications.

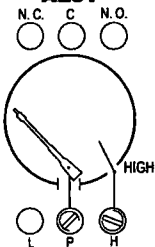
A25 Series models

These diagrams are shown with the pointer in the at rest (shelf) position.

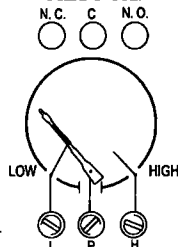
Pointer contact rating: pilot duty 2 A @ 30 VAC/DC.

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

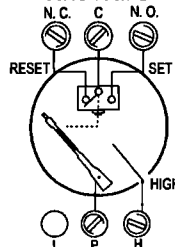
A25T



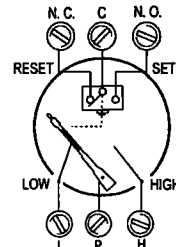
A25T-HL



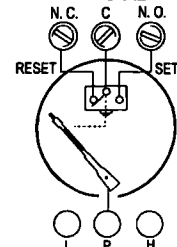
A25TABS



A25TABS-HL



A25TE



TROUBLESHOOTING TIPS

DO THIS FIRST:

- Verify that the SWICHGAGE® has not been damaged (hit or dropped).
- Check for kinked or broken/worn capillary tubing.
- Verify that the sensing bulb is immersed in coolant flow.
- Look for broken wiring, frozen pointer, dirty contacts (will not make).
- Verify that there is coolant or water flowing inside the engine.
- Reset Magnetic Switch and verify that it stays latched.

The following information will assist in the correction of most problems which you may encounter with the unit. If any problems persist after you have made these checks, consult your nearest Murphy facility.

| SYMPTOM | CAUSE | TEST/REMEDY |
|---|---|--|
| Engine will not start. | <ol style="list-style-type: none"> 1. Short or Open circuit, be sure that the Magnetic Switch latches and either puts out power to run device or removes ground (magneto or CD ignition). Check for power or ground at run device. 2. Control circuit overloaded by accessories (blown fuse in Magnetic Switch). 3. False ground in control circuit. | <ol style="list-style-type: none"> 1. Reset Magnetic Switch and make sure it stays latched. For 518PH check battery voltage and place a jumper between SW1 and SW2. If switch latches, check SWICHGAGE® wiring circuit and repair. If switch does not latch, repair or replace Magnetic Switch. 2. Find the cause of the blown fuse and replace it (use a 14 A fuse). Reroute the accessories. 3. Repair. |
| False shutdown. | <ol style="list-style-type: none"> 1. SWICHGAGE® circuit has intermittent open or short. 2. Vibration causes the Magnetic Switch to trip. | <ol style="list-style-type: none"> 1. Check all wiring and replace as necessary. 2. Repair and relocate the switch as needed. |
| SWICHGAGE® closes but does not trip the magnetic switch or kill the engine. | <ol style="list-style-type: none"> 1. Incomplete shutdown circuit. 2. Dirty SWICHGAGE® contacts. 3. Magneto not providing power to primary terminal post. 4. SWICHGAGE® case may not be grounded. 5. Incorrect Magnetic Switch for type of power. | <ol style="list-style-type: none"> 1. Locate open circuit and repair. 2. Clean and check that contacts make. 3. Repair magneto. 4. Ground case. 5. Replace with correct Magnetic Switch. |
| TATTLETALE® tripped but engine is still running (magneto or CD ignition) | <ol style="list-style-type: none"> 1. Open circuit between the TATTLETALE® and the shutdown device. 2. Lost ground to kill the engine. | <ol style="list-style-type: none"> 1. Check wiring from TATTLETALE® to shutdown device, repair or replace. 2. Check all wiring and connections and repair. |
| Pointer will not operate properly. Inaccurate reading. | <ol style="list-style-type: none"> 1. Frozen pointer 2. Loose pointer spring (caused by hitting or dropping gauge). 3. Bulb not inserted to full length or low coolant level. 4. Kinked/crimped/broken capillary. | <ol style="list-style-type: none"> 1. Return for repair or replace. 2. Return for repair or replace. 3. Correct. 4. Correct |
| Pointer or contact burned-in-two. | <ol style="list-style-type: none"> 1. Without exception this condition is caused by incorrect wiring or a short circuit. | <ol style="list-style-type: none"> 1. Refer to wiring diagram and recheck wiring; replace SWICHGAGE® or return for repair. Observe voltage and current ratings. |

WARRANTY

A two-year limited warranty on materials and workmanship is provided with this Murphy product. Details are available on request and are packed with each unit.



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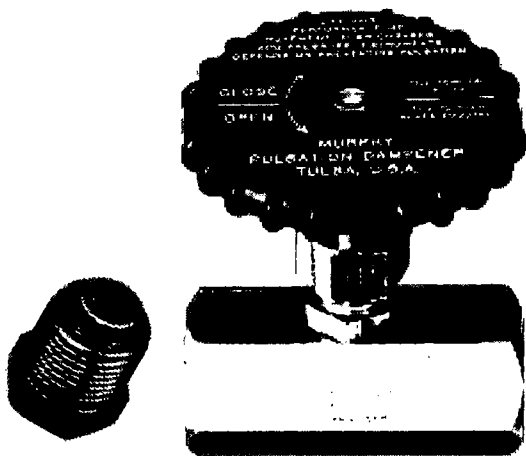


In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time.

Pulsation Dampener

PD-95145B
Revised 05-02
Catalog Section 55
(00-02-0125)

FWMurphy



PD8100 Series

- Used On Controllers, Instruments and Recorders to Dampen Pressure Pulsation
- Eliminate Gage Pointer Flutter
- Aids In Providing More Accurate Pressure Indication
- Decreases Wear On Gage's Geared Movement

NOT INTENDED FOR USE AS A SHUTOFF VALVE

Description

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 NOT FOR USE ON OXYGEN OR LIQUID OXYGEN APPLICATIONS.

Quality built with a large diameter valve stem wheel for ease of adjustment with clearly printed operating instructions. Machined from 1-3/8 in. (35 mm) hex bar stock. A two degree taper on valve and stem assure positive dampening.

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 3,000 psi (20.68 MPa) [206.80 bar].

PD8184: All wetted parts are Carbon steel. Rated to 5,000 psi (34.47 MPa) [344.70 bar].

PD8185: All wetted parts are 303 stainless steel. Rated to 10,000 psi (68.95 MPa) [689.50 bar].

PD8190: All wetted parts are 316 stainless steel. Rated to 10,000 psi (68.95 MPa) [689.50 bar]. Meets NACE standard MR-01-75 for direct exposure to H₂S.

Operating Temperature:
-15 to 400°F (-26 to 204°C)

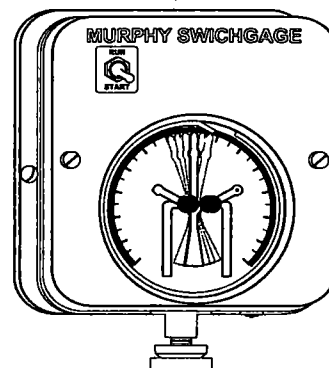
Shipping Weight (all models):
2 lbs. (0.9 kgs.)

Shipping Dimensions (all models):
4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)

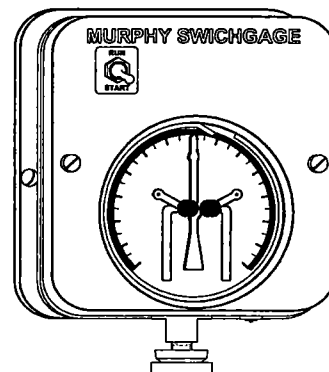
Warranty

A two-year limited warranty on materials and workmanship is given with this Murphy product. Details are available on request and are packed with each unit.

Eliminate pointer flutter like this.



Make SWICHGAGE® instruments and recorders operate like this.



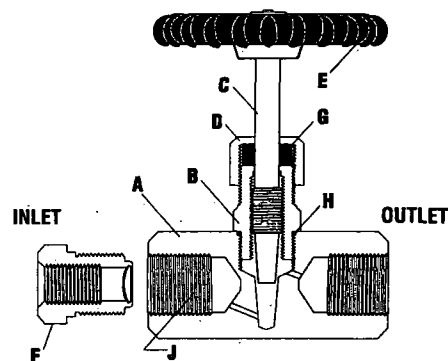
Service Parts

| DESCRIPTION (see drawing-right) | PD8183 | PD8184 | PD8185 | PD8190 |
|------------------------------------|------------|------------|------------|------------|
| A. 1/2 NPT inlet x 1/4 NPT outlet* | 65-05-0104 | 65-05-0210 | 65-05-0204 | 65-05-1136 |
| 1/2 NPT inlet x 1/2 NPT outlet* | 65-05-0105 | 65-05-0212 | 65-05-0206 | 65-05-1135 |
| B. Bonnet Fitting | 65-05-0099 | 65-05-0209 | 65-05-0203 | 65-05-1139 |
| C. Valve Stem | 65-05-0175 | 65-05-0208 | 65-05-0202 | 65-05-1140 |
| D. Packing Nut | 65-05-0098 | 65-05-0211 | 65-05-0205 | 65-05-1137 |
| E. Hand Wheel (with 10-32 nut) | 55-00-0179 | 55-00-0179 | 55-00-0179 | 55-00-0179 |
| F. Strainer Bushing Assembly† | 55-00-0174 | 55-00-0173 | 55-00-0175 | 55-00-0206 |
| G. Molded Packing Gland | 00-00-0936 | 00-00-0936 | 00-00-0936 | 00-00-0936 |
| H. 'O' Ring Bonnet Seal | 00-00-0302 | 00-00-0302 | 00-00-0302 | 00-00-0302 |
| J. Stainless Steel Mesh Filter** | 65-05-0214 | 65-05-0214 | 65-05-0214 | 65-05-0214 |

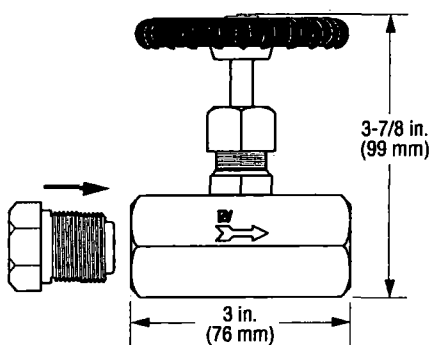
†Provided only for units with 1/4 NPT inlet.

*For 1/4 NPT inlet use with strainer bushing assembly.

**Provided in units with 1/2 NPT inlet.



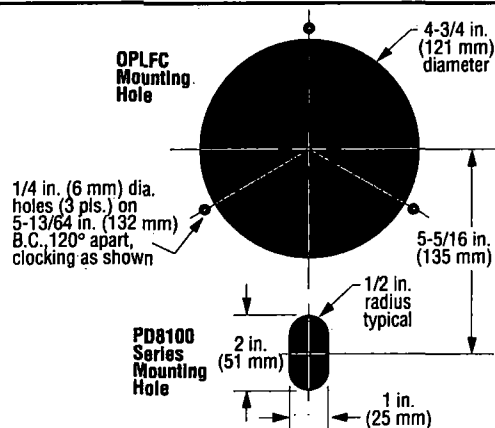
Dimensions



Mounting for the OPLFC Pressure SWITCHGAGE® and PD8100 Series
The PD8100 Series pulsation dampener is mounted directly below the OPLFC.



Precautions: Do not use teflon tape on connection threads. Do not block the inlet orifice.



How to Order

PD8185 - 01/4 x 1/4

Base Model
PD8183
PD8184
PD8185
PD8190

Connection Size

1/4 x 1/4 = 1/4 NPT inlet x 1/4 NPT outlet
1/4 x 1/2 = 1/4 NPT inlet x 1/2 NPT outlet
1/2 x 1/2 = 1/2 NPT inlet x 1/2 NPT outlet
1/2 x 1/4 = 1/2 NPT inlet x 1/4 NPT outlet

Shown at right, is a typical MURPHYMATIC® compressor panel featuring three Pulsation Dampeners and Murphy's OPLFC gages.

The PD's are recommended for use on piston pumps and compressors to eliminate pointer contact flutter and gage wear.



murphy

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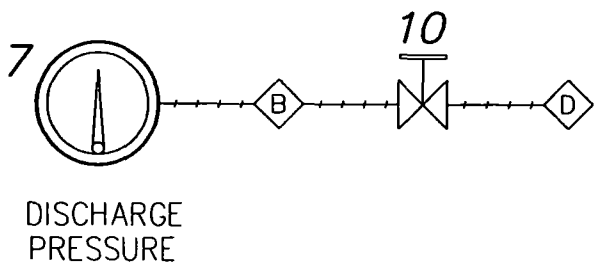
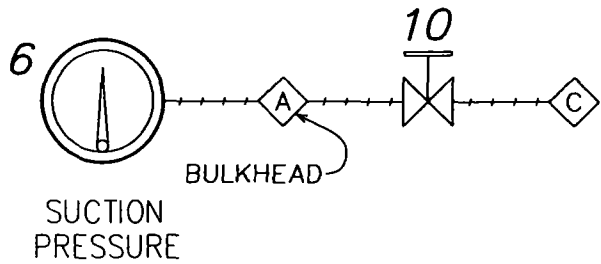


In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time.




Printed in U.S.A.

PANEL LEGEND


| ITEM | MURPHY PART NO. | MFR. | MODEL NO. | DESCRIPTION |
|------|--------------------|---------|-------------------|--|
| 1. | 50225195 | HOFFMAN | ----- | ENCLOSURE, ENC-P-H-A242408LP-MR |
| 2. | 50225634 | MURPHY | ----- | STAND, STD-P-40X24X9-CP-MR |
| 3. | 00004851 | HOFFMAN | A-24P24 | BACKPLATE |
| 4. | 50700006 | MURPHY | LCDT-NC | "SELECTRONIC TATTLETALE" ANNUNCIATOR |
| 5. | 50225495 | MURPHY | ----- | VERTICAL LEGEND HOLDER W/303517.xls INSERT |
| 6. | 05701550 | MURPHY | 45PEF-R-30V30 | SUCTION PRESSURE "SWICHGAGE" |
| 7. | 05701522 | MURPHY | 45PEF-R-100 | DISCHARGE PRESSURE "SWICHGAGE" |
| 8. | 10700333 | MURPHY | 45TEF-350P15 | DISCHARGE GAS TEMPERATURE "SWICHGAGE" |
| 9. | 10701414 | MURPHY | A25TEF-250-16-1/2 | COMPRESSOR WATER TEMPERATURE "SWICHGAGE" |
| 10. | 55700208 | MURPHY | PD8184-1/4X1/4 | PULSATION DAMPENER |
| 11. | 50700010 | MURPHY | LCDT-PS-120/24/12 | POWER SUPPLY |
| 12. | 50700004 | MURPHY | LCDT100CA-36NC | TERMINAL BLOCK & CABLE ASSEMBLY, NORMALLY CLOSED |

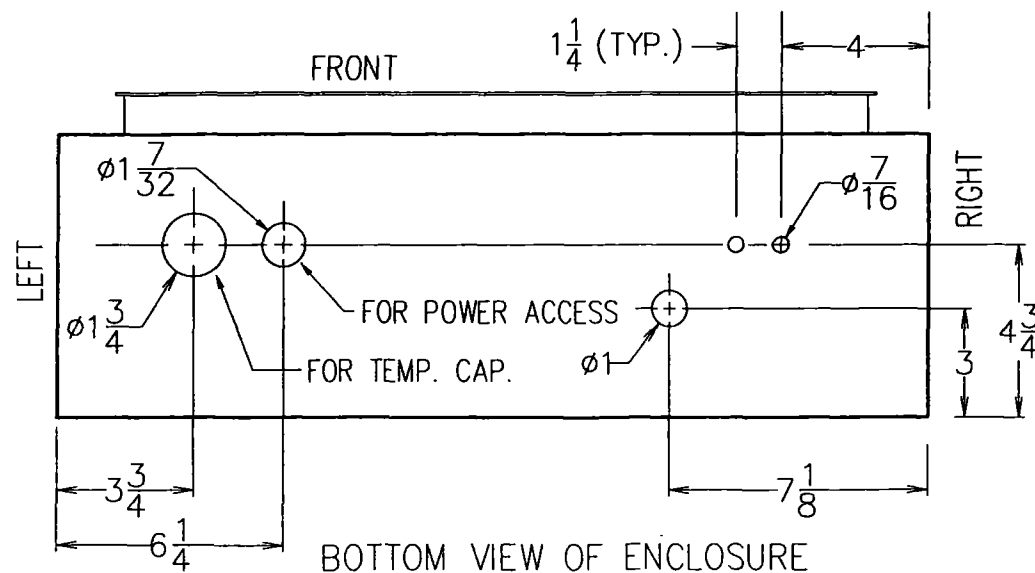
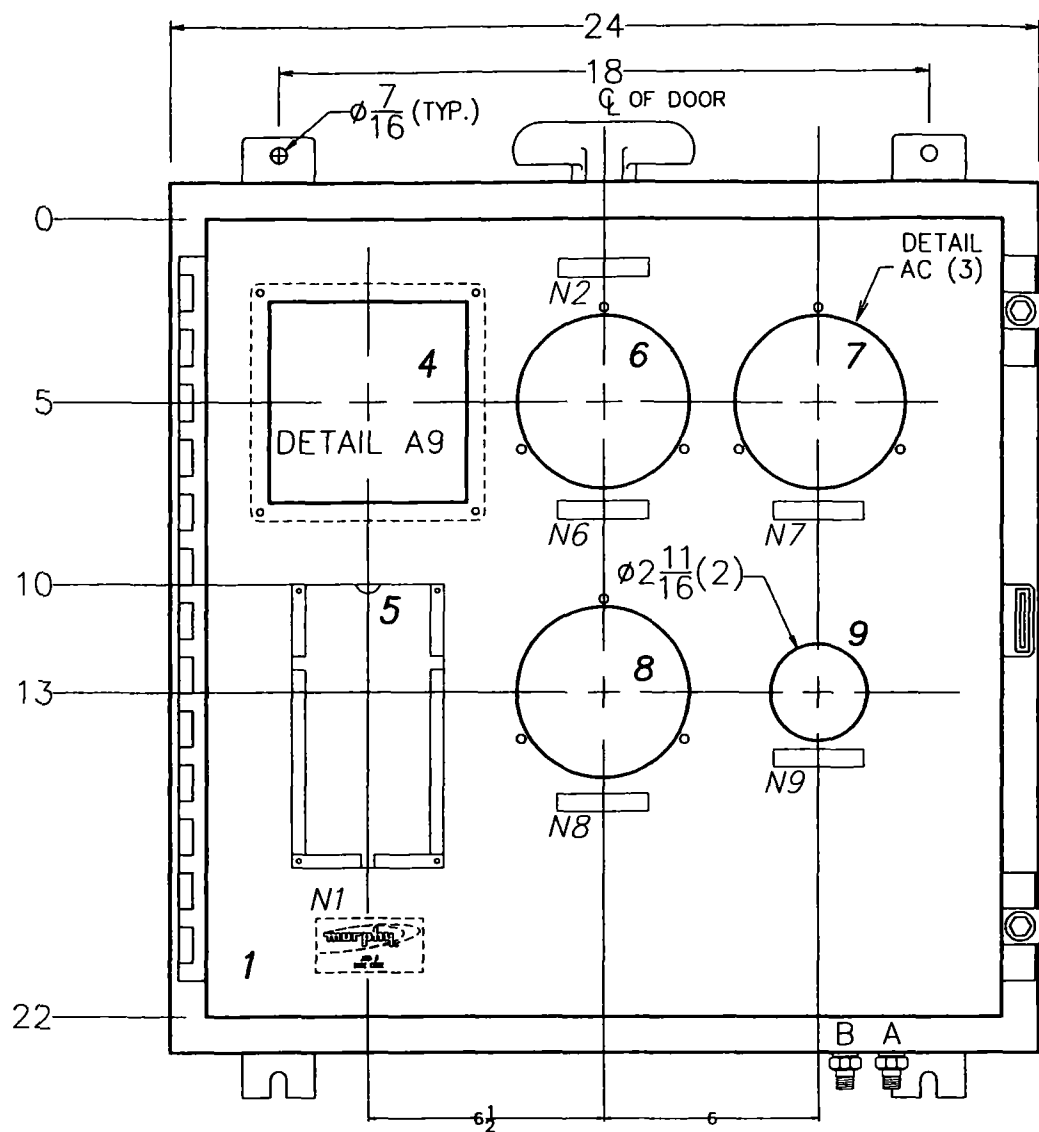


NOTES:

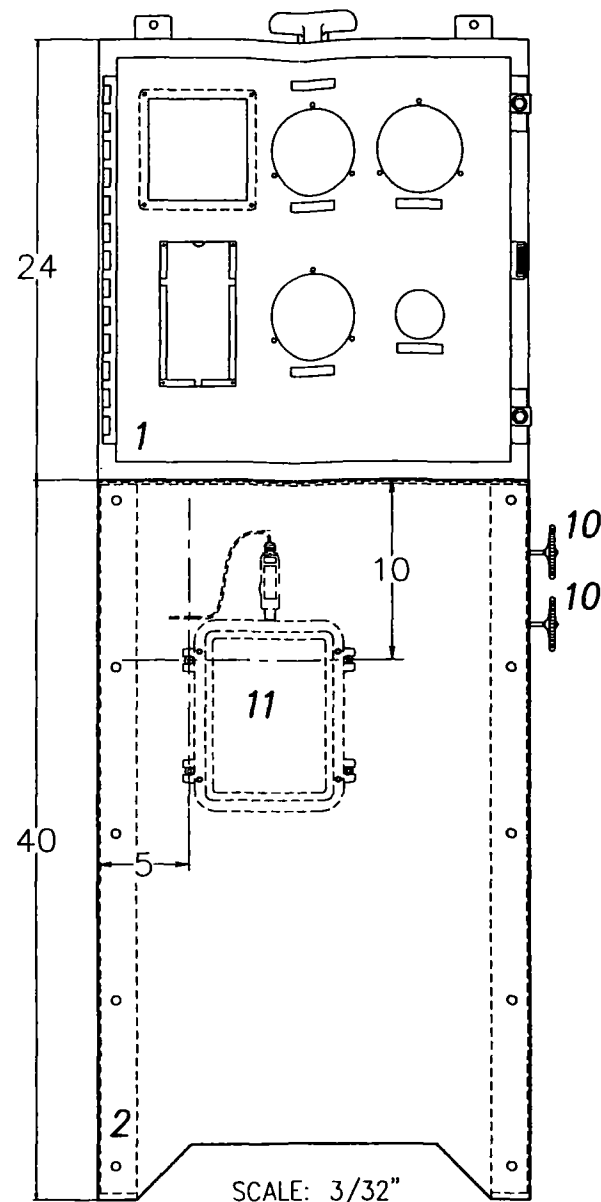
1. FACTORY WIRING: _____
CUSTOMER WIRING: -----
END USER WIRING: -----
PNEUMATIC TUBING: ++++++
2. TUBING: 1/4 316 STAINLESS STEEL FLEX HOSE
FITTINGS: SWAGelok STEEL
3. ROUTE SENSOR LEADS SEPARATE FROM ALL OTHER WIRING.
4. MAXIMUM LENGTH OF SENSOR LEADS IS 500 FEET.
5. "18-BL-25" REPRESENTS "WIRE GAUGE-WIRE COLOR-WIRE NUMBER"
6. LAST WIRE NUMBER USED: 18-BL-S19
7. **CAUTION:** DISCONNECT ALL SENSOR LEADS BEFORE WELDING.
8. THIS PANEL IS SUITABLE FOR USE IN CLASS I, DIV. 1, GROUP D HAZARDOUS LOCATIONS.
9. GROUND SYMBOLS WILL BE SHOWN PER THE FOLLOWING:
EARTH/POWER CHASSIS/NON-INCENDIVE DC COM/CLOSE LOOP
  
10. UNLESS OTHERWISE NOTED ALL DEVICES ARE SHOWN IN THE SHELF POSITION.
11. TERMINALS 1-15 ARE LOCKED OUT BY TIMER FOR START-UP.
12. RUN A GROUND STRAP TO BACKPLATE OF POWER SUPPLY.
13. DO NOT CONNECT SENSOR LEADS TO #48 OR #49.
14. TERMINAL #45 IS OVERSPEED.
15. TERMINAL #47 IS MANUAL STOP (INTERNAL).
16. ALL WIRING TO BE 18 GA. UNLESS OTHERWISE NOTED.
17. INSTALL A JUMPER BETWEEN ANY UNUSED TERMINALS (SEE EXAMPLE ON TERMINAL BLOCK PIN #42).
18. INSTALL A JUMPER BETWEEN ANY TERMINALS WIRED TO A NORMALLY OPEN SENSOR.
19. ROUTE RIBBON CABLE UNDER TERMINAL BLOCK & ATTACH ENCLOSURE W/ CLIPS WHERE NECESSARY. (PART #00008000)
20. LCDT-100CA-36 TO BE MOUNTED WITH 6/32x3/8STUD ON 3/4" STANDOFFS (PART #00005075)
21. FOR ADDITIONAL INFORMATION, SEE INSTALLATION BULLETIN.

JUN 05 2002

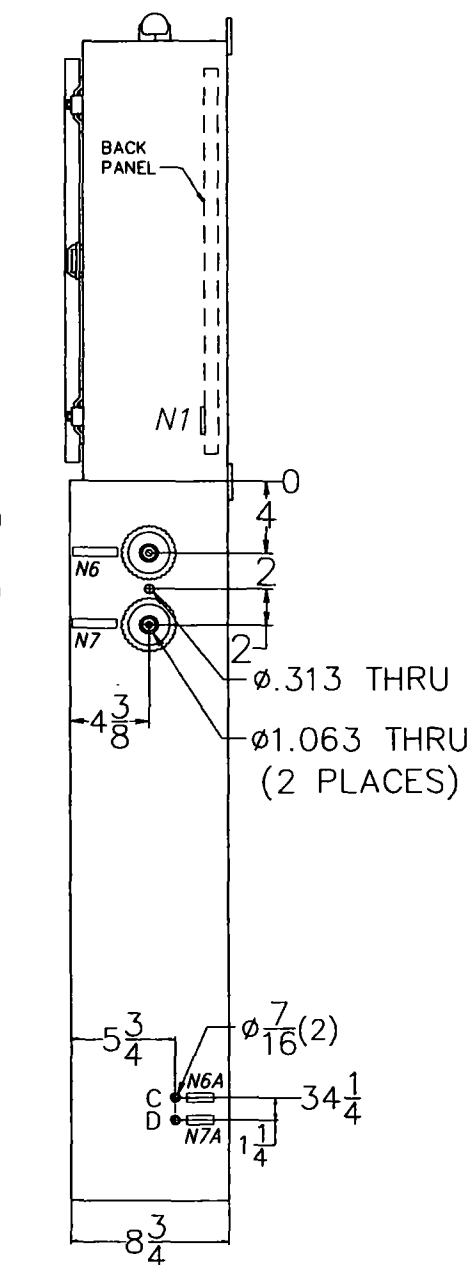
| | | | | | | | |
|---|-------------|---------|--------|-----------------------------|----------------------------|---|--|
| | | | | DRAWN BY LINDA | |  CONTROL SYSTEMS & SERVICES - ROSENBERG, TX | |
| | | | | CHK'D BY <i>Kyle</i> | | | |
| | | | | APPROVED BY <i>Chris</i> | | FOR WATERFLOOD SERVICE | |
| | | | | DATE 05-13-02 | | | |
| | | | | SCALE None | | WIRING DIAGRAM | |
| | | | | SHEET 1 OF 2 | | | |
| REV. | DESCRIPTION | ECR No. | DATE | CHK'D BY | YOUR NO. REF. NO. 50303268 | | |
| A | AS BUILT | | 6/4/02 | <i>Q</i> | DWG. NO. 50-30-3517 REV. A | | |
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BOTTOM VIEW OF ENCLOSURE

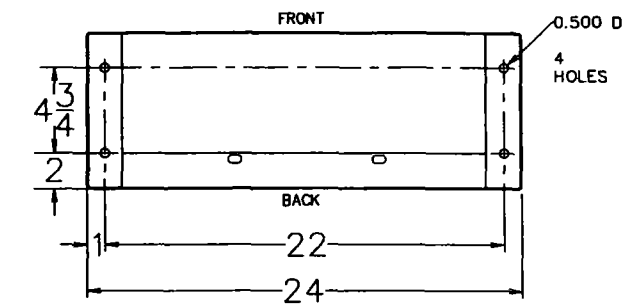


40X 24 STAND
(REVERSED)



RIGHT SIDE VIEW

| INDIVIDUAL NAMEPLATE SCHEDULE | | | | |
|-------------------------------|-------|-------------|--------------------------------|----------|
| QTY. | TAG # | LETTERS/TAG | DESCRIPTION | PART # |
| 1 | N1 | B/W | Small serial number tag | 50225434 |
| 1 | N2 | B/W | UNIT #: SEE ORDER | 50225266 |
| 2 | N6 | B/W | SUCTION > PRESSURE | 50225266 |
| 2 | N7 | B/W | DISCHARGE > PRESSURE | 50225266 |
| 1 | N8 | B/W | DISCHARGE > TEMPERATURE | 50225266 |
| 1 | N9 | B/W | COMPRESSOR WATER > TEMPERATURE | 50225266 |
| 1 | N6A | B/W | SUCTION > PRESSURE | 50225307 |
| 1 | N7A | B/W | DISCHARGE > PRESSURE | 50225307 |



BOTTOM OF STAND

ENCLOSURE: HOFFMAN A-242408LP (OR EQUAL)
BACKPLATE: HOFFMAN A-24P24 (OR EQUAL)
ITEM NUMBERS CORRESPOND TO PANEL LEGEND
ON DRAWING NO. 50-30-3517

JUN 05 2002

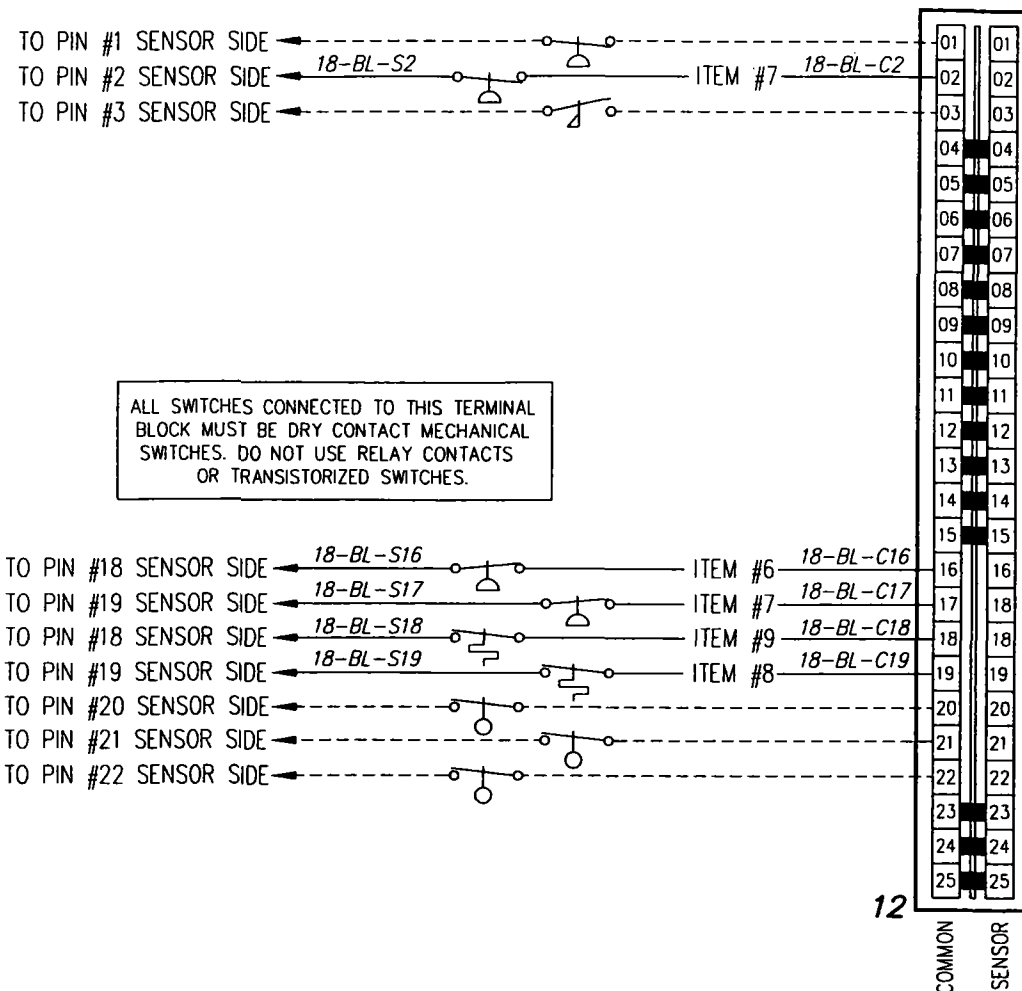
| | | | | | |
|----------------------|--|--|--|--|--|
| DRAWN BY LINDA | | | | CONTROL SYSTEMS & SERVICES - ROSENBERG, TX | |
| CHK'D BY 6/4/02 Kyle | | | | | |
| APP'D BY 6/4/02 | | | | | |
| DATE 05-13-02 | | | | | |
| SCALE 3/16" | | | | FOR WATERFLOOD SALES & SERVICE | |
| SHEET 1 OF 1 | | | | PANEL LAYOUT | |
| YOUR NO. 20546-979 | | | | REF No. 50-30-3245 | |
| DWC. NO. | | | | REV. | |
| 50-29-3517 | | | | A | |

FINISH
PREBRUSHED

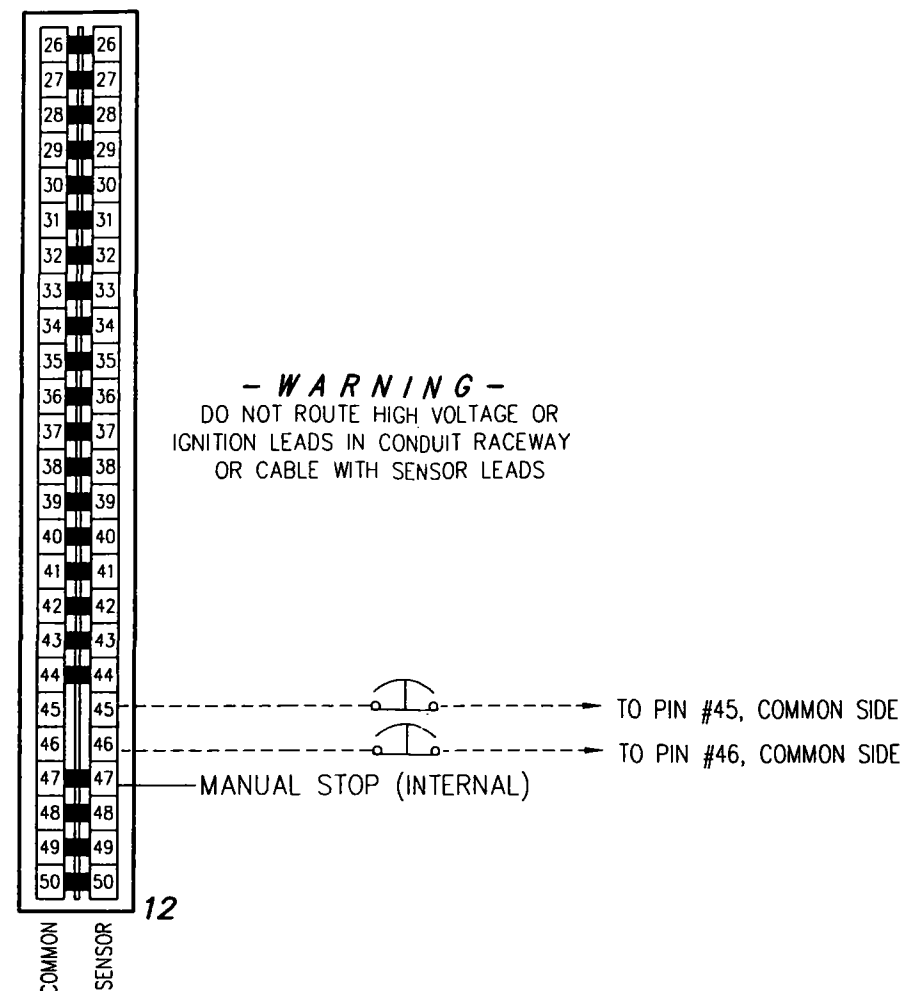
UNLESS OTHERWISE NOTED
DIMENSIONS ARE IN INCHES
.xx ±.030 ANGLES ±2°
.xxx ±.010 ✓ 125
FRACTIONS ±1/16

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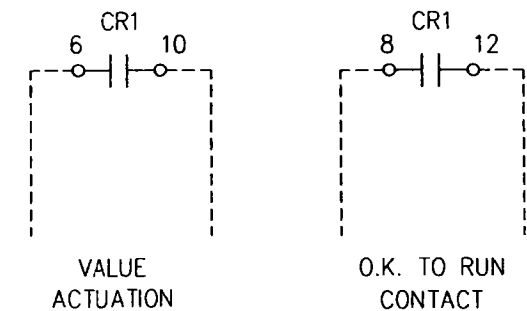
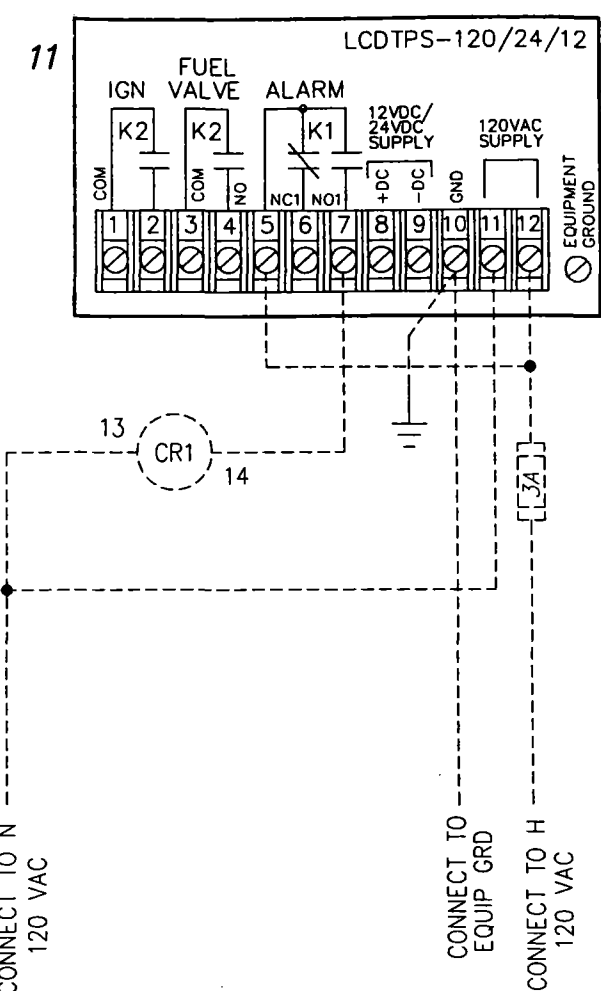
ALL SWITCHES CONNECTED TO THIS TERMINAL BLOCK MUST BE DRY CONTACT MECHANICAL SWITCHES. DO NOT USE RELAY CONTACTS OR TRANSISTORIZED SWITCHES.



- WARNING -
DO NOT ROUTE HIGH VOLTAGE OR IGNITION LEADS IN CONDUIT RACEWAY OR CABLE WITH SENSOR LEADS

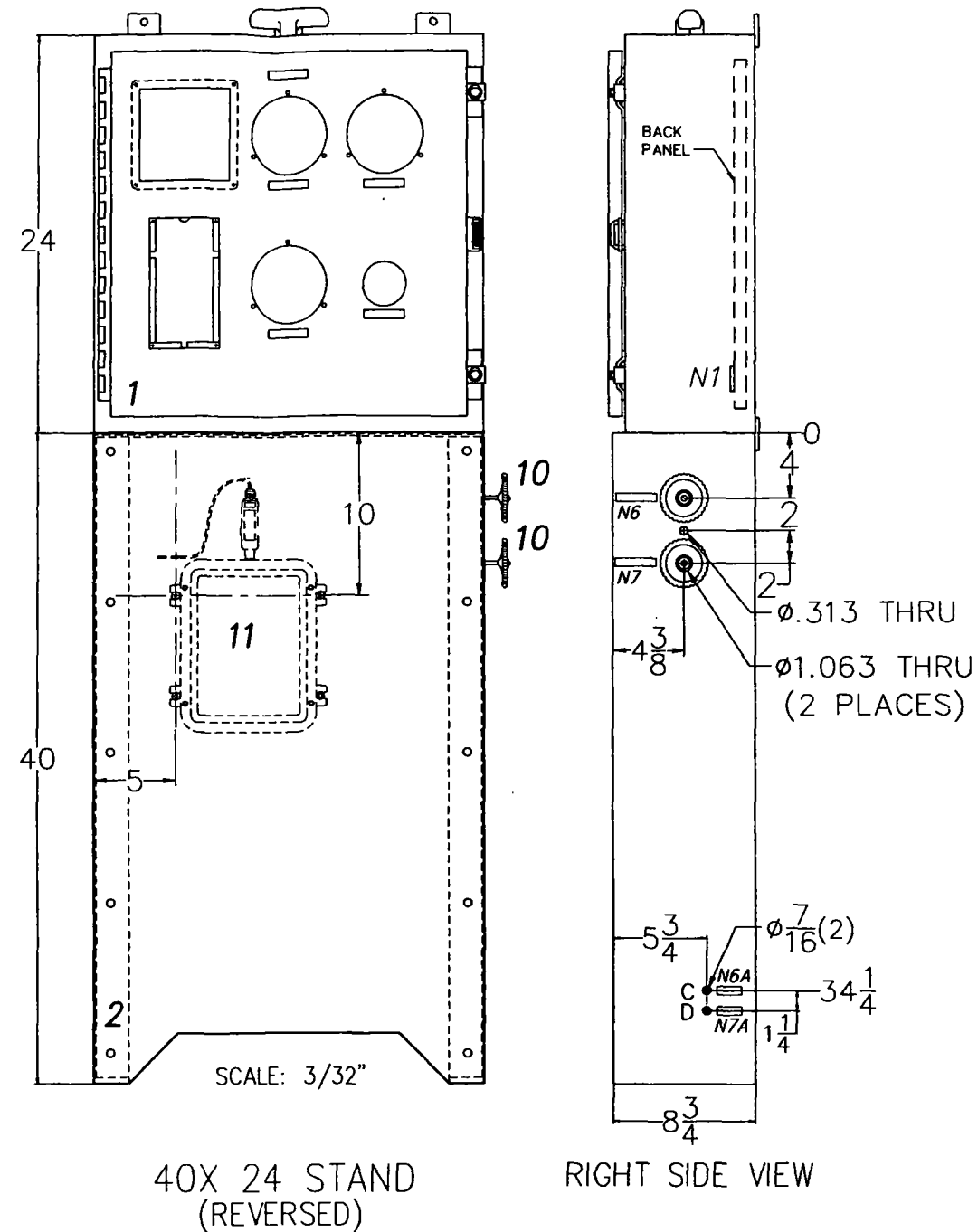
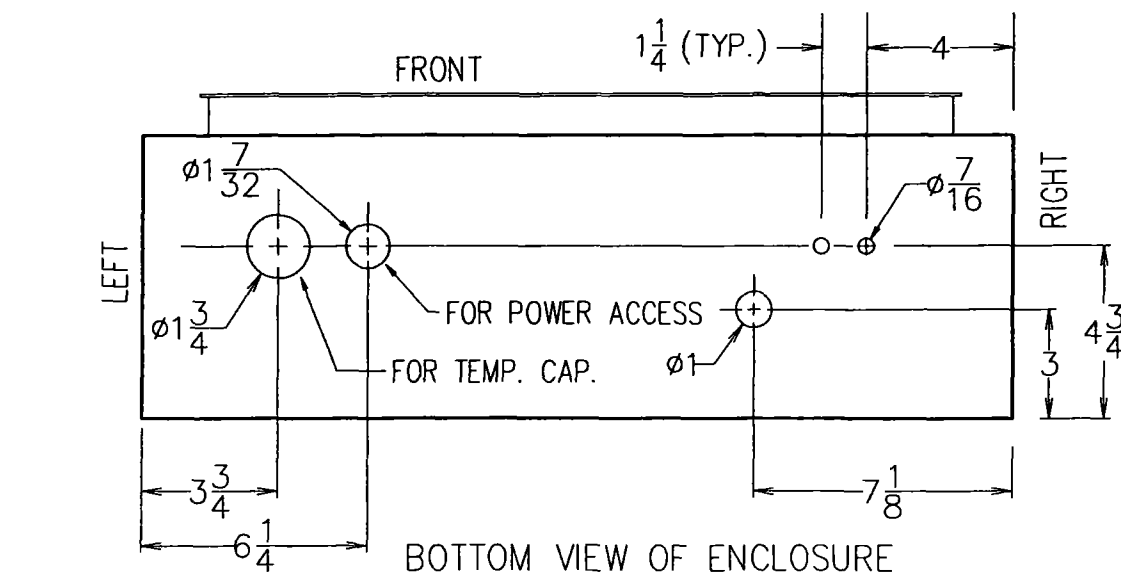
INDICATOR READOUTS

| CLASS/DISPLAY | DESCRIPTION | (303517.xls) |
|---------------|---|--------------|
| B 01 | LOW SUCTION PRESSURE | |
| B 02 | LOW DISCHARGE PRESSURE | |
| B 03 | COMPRESSOR LUBRICATOR NO-FLOW | |
| B 04-15 | SPARE | |
| A 16 | HIGH SUCTION PRESSURE | |
| A 17 | HIGH DISCHARGE PRESSURE | |
| A 18 | HIGH COMPRESSOR WATER TEMPERATURE | |
| A 19 | HIGH COMPRESSOR DISCHARGE GAS TEMPERATURE | |
| A 20 | HIGH SUCTION SCRUBBER LEVEL | |
| A 21 | HIGH DISCHARGE SCRUBBER LEVEL | |
| A 22 | HIGH DESICCANT DRYER LEVEL | |
| A 23-44 | SPARE | |
| A 45 | LOCAL-EMERGENCY STOP | |
| A 46 | REMOTE-EMERGENCY STOP | |
| A 47 | MANUAL STOP | |



JUN 05 2002


| | | | | | | |
|--|----------|-------------|---------|----------------------|----------------------|--|
| | | | | DRAWN BY LINDA | | CONTROL SYSTEMS & SERVICES - ROSENBERG, TX |
| | | | | CHK'D BY <i>hyle</i> | | |
| | | | | AP'D BY <i>hyle</i> | | |
| | | | | DATE 05-13-02 | | |
| | | | | SCALE None | | WATERFLOOD SERVICE WIRING DIAGRAM |
| | | | | SHEET 2 OF 2 | | |
| REV. A | AS BUILT | DESCRIPTION | ECR No. | DATE 6/4/02 | CHK'D BY <i>hyle</i> | YOUR NO. |
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| | | | | | | REV. A |

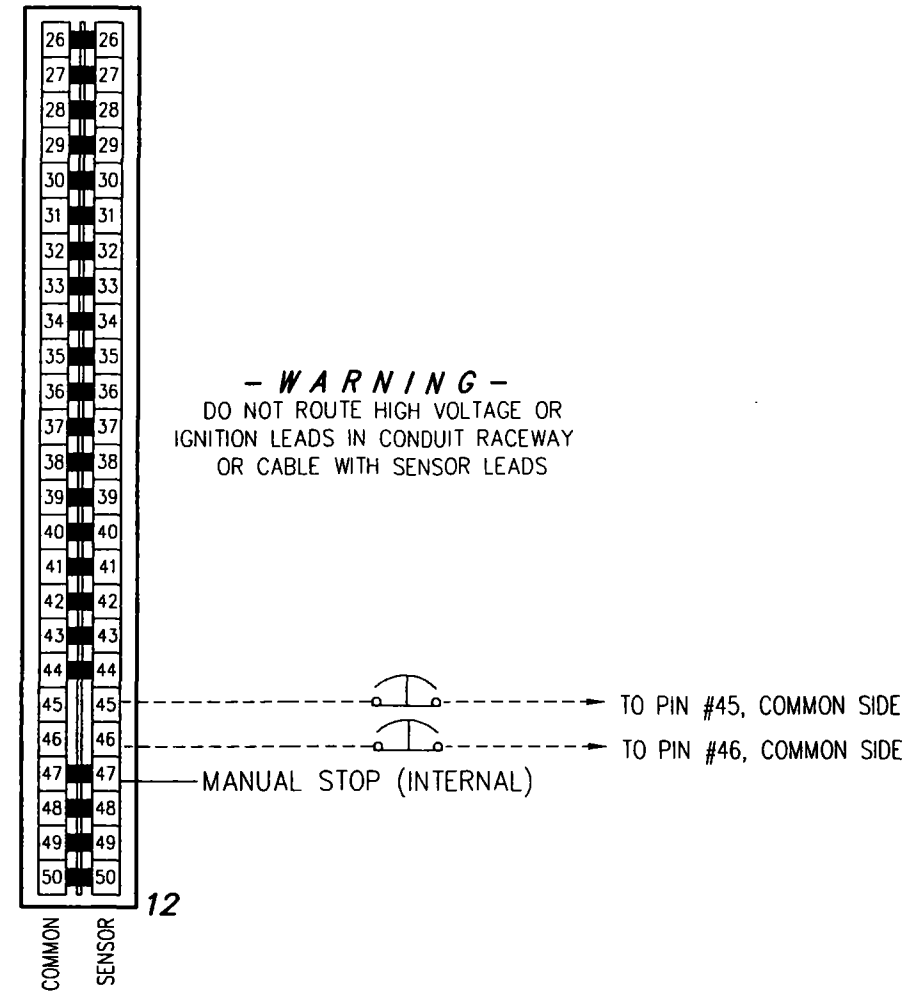
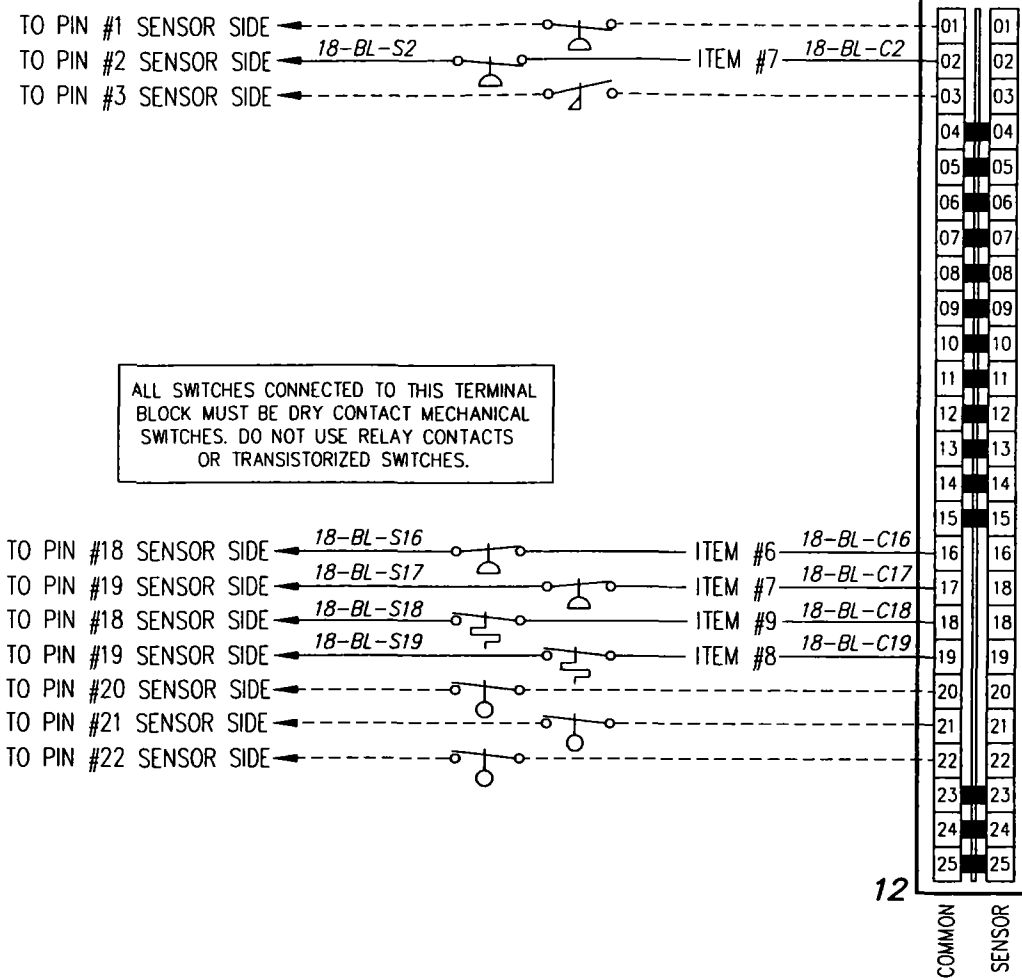


Technical drawing of a rectangular plate. The drawing shows the front and back views. The front view is labeled "FRONT" and the back view is labeled "BACK". The plate has a total width of 24 and a total height of 13. There are 4 holes, each with a diameter of 0.500 D. The holes are located on the front and back faces. The distance from the left edge to the center of the first hole is 4. The distance from the center of the first hole to the center of the second hole is 4. The distance from the center of the second hole to the right edge is 2. The distance from the left edge to the center of the first hole is 1. The distance from the center of the first hole to the center of the second hole is 22. The distance from the center of the second hole to the right edge is 2. The distance from the left edge to the center of the first hole is 1. The distance from the center of the first hole to the center of the second hole is 22. The distance from the center of the second hole to the right edge is 2.

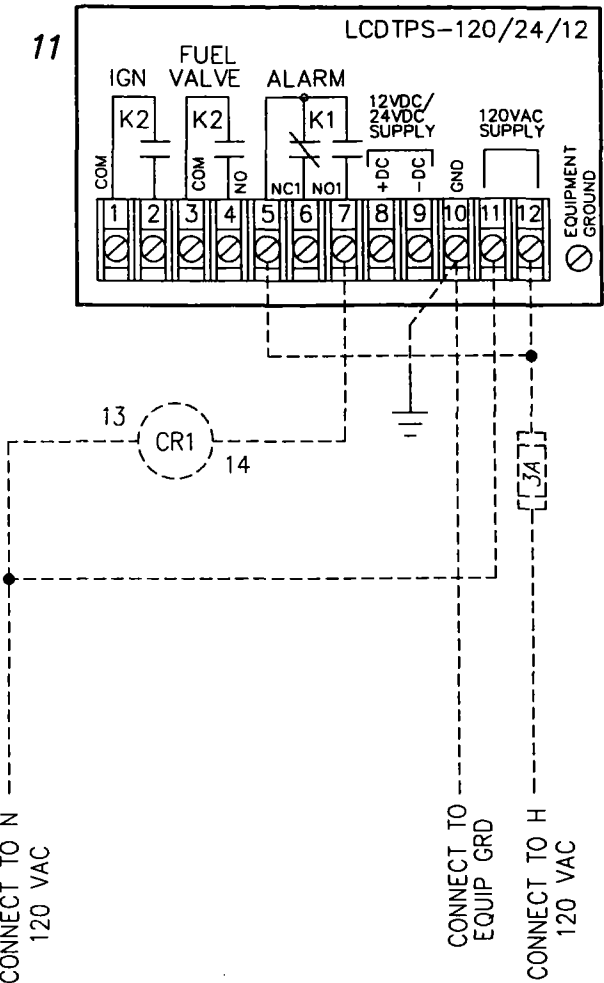
ENCLOSURE: HOFFMAN A-242408LP (OR EQUAL)
BACKPLATE: HOFFMAN A-24P24 (OR EQUAL)
ITEM NUMBERS CORRESPOND TO PANEL LEGEND
ON DRAWING NO. 50-30-3517

JUN 05 2002

| | | | | | | |
|--|-------------|---------|--------|----------|-------------------------|---|
| | | | | | DRAWN BY LINDA |  CONTROL SYSTEMS & SERVICES - ROSENBERG, TX |
| | | | | | CHK'D BY 6/4/02 Kyle | |
| | | | | | APP'D BY 6/4/02 | |
| | | | | | DATE 05-13-02 | |
| | | | | | SCALE 3/16" | |
| A | AS BUILT | | 6/4/02 | D. S. G. | | FOR WATERFLOOD SALES & SERVICE |
| REV. | DESCRIPTION | ECR No. | DATE | CHK BY | SHEET 1 OF 1 | PANEL LAYOUT |
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| | | | | | YOUR NO. 20546-979 | REF No. 50-30-3245 |
| | | | | | DWG. NO. 50-29-3517 | REV. A |

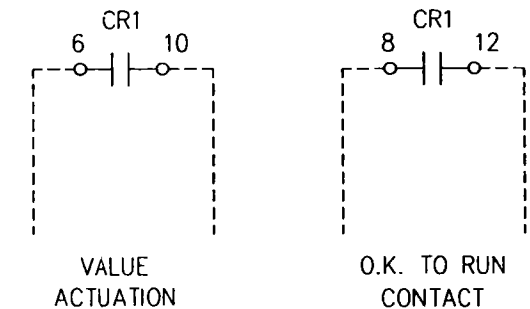


- WARNING -
DO NOT ROUTE HIGH VOLTAGE OR
IGNITION LEADS IN CONDUIT RACEWAY
OR CABLE WITH SENSOR LEADS




INDICATOR READOUTS

| CLASS/DISPLAY | DESCRIPTION | (303517.xls) |
|---------------|---|--------------|
| B 01 | LOW SUCTION PRESSURE | |
| B 02 | LOW DISCHARGE PRESSURE | |
| B 03 | COMPRESSOR LUBRICATOR NO-FLOW | |
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| A 16 | HIGH SUCTION PRESSURE | |
| A 17 | HIGH DISCHARGE PRESSURE | |
| A 18 | HIGH COMPRESSOR WATER TEMPERATURE | |
| A 19 | HIGH COMPRESSOR DISCHARGE GAS TEMPERATURE | |
| A 20 | HIGH SUCTION SCRUBBER LEVEL | |
| A 21 | HIGH DISCHARGE SCRUBBER LEVEL | |
| A 22 | HIGH DESICCANT DRYER LEVEL | |
| A 23-44 | SPARE | |
| A 45 | LOCAL-EMERGENCY STOP | |
| A 46 | REMOTE-EMERGENCY STOP | |
| A 47 | MANUAL STOP | |

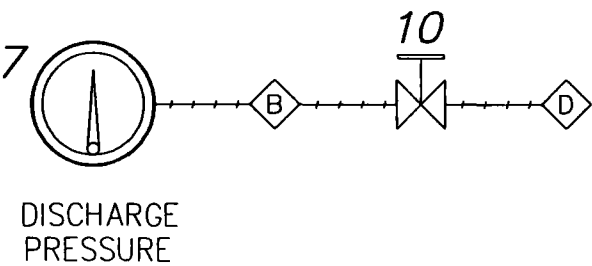
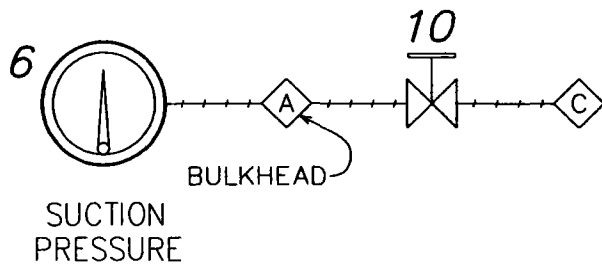


JUN 05 2002

| | | | | | | |
|--|--|-------------|--|-----------------------|--|---|
| | | | | DRAWN BY LINDA | |  CONTROL SYSTEMS & SERVICES - ROSENBERG, TX |
| | | | | CHK'D BY <i>h/ye</i> | | |
| | | | | DATE 05-13-02 | | |
| | | | | SCALE None | | |
| A AS BUILT | | 6/4/02 | | SHEET 2 OF 2 | | WATERFLOOD SERVICE WIRING DIAGRAM |
| REV. | | DESCRIPTION | | ECR No. DATE CHK'D BY | | |
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PANEL LEGEND

| ITEM | MURPHY PART NO. | MFR. | MODEL NO. | DESCRIPTION |
|------|--------------------|---------|-------------------|--|
| 1. | 50225195 | HOFFMAN | ----- | ENCLOSURE, ENC-P-H-A242408LP-MR |
| 2. | 50225634 | MURPHY | ----- | STAND, STD-P-40X24X9-CP-MR |
| 3. | 00004851 | HOFFMAN | A-24P24 | BACKPLATE |
| 4. | 50700006 | MURPHY | LCDT-NC | "SELECTION TATTLETALE" ANNUNCIATOR |
| 5. | 50225495 | MURPHY | ----- | VERTICAL LEGEND HOLDER W/303517.xls INSERT |
| 6. | 05701550 | MURPHY | 45PEF-R-30V30 | SUCTION PRESSURE "SWICHGAGE" |
| 7. | 05701522 | MURPHY | 45PEF-R-100 | DISCHARGE PRESSURE "SWICHGAGE" |
| 8. | 10700333 | MURPHY | 45TEF-350P15 | DISCHARGE GAS TEMPERATURE "SWICHGAGE" |
| 9. | 10701414 | MURPHY | A25TEF-250-16-1/2 | COMPRESSOR WATER TEMPERATURE "SWICHGAGE" |
| 10. | 55700208 | MURPHY | PD8184-1/4X1/4 | PULSATION DAMPENER |
| 11. | 50700010 | MURPHY | LCDT-PS-120/24/12 | POWER SUPPLY |
| 12. | 50700004 | MURPHY | LCDT100CA-36NC | TERMINAL BLOCK & CABLE ASSEMBLY, NORMALLY CLOSED |



NOTES:


- FACTORY WIRING: _____
CUSTOMER WIRING: -----
END USER WIRING: -----
PNEUMATIC TUBING: ++++++
- TUBING: 1/4 316 STAINLESS STEEL FLEX HOSE
FITTINGS: SWAGelok STEEL
- ROUTE SENSOR LEADS SEPARATE FROM ALL OTHER WIRING.
- MAXIMUM LENGTH OF SENSOR LEADS IS 500 FEET.
- "18-BL-25" REPRESENTS "WIRE GAUGE-WIRE COLOR-WIRE NUMBER"
- LAST WIRE NUMBER USED: 18-BL-S19
- CAUTION:** DISCONNECT ALL SENSOR LEADS BEFORE WELDING.
- THIS PANEL IS SUITABLE FOR USE IN CLASS I, DIV. 1, GROUP D HAZARDOUS LOCATIONS.
- GROUND SYMBOLS WILL BE SHOWN PER THE FOLLOWING:
EARTH/POWER CHASSIS/NON-INCENDIVE DC COM/CLOSE LOOP

⏏
EARTH/POWER

⏏
CHASSIS/NON-INCENDIVE

⏏
DC COM/CLOSE LOOP
- UNLESS OTHERWISE NOTED ALL DEVICES ARE SHOWN IN THE SHELF POSITION.
- TERMINALS 1-15 ARE LOCKED OUT BY TIMER FOR START-UP.
- RUN A GROUND STRAP TO BACKPLATE OF POWER SUPPLY.
- DO NOT CONNECT SENSOR LEADS TO #48 OR #49.
- TERMINAL #45 IS OVERSPEED.
- TERMINAL #47 IS MANUAL STOP (INTERNAL).
- ALL WIRING TO BE 18 GA. UNLESS OTHERWISE NOTED.
- INSTALL A JUMPER BETWEEN ANY UNUSED TERMINALS (SEE EXAMPLE ON TERMINAL BLOCK PIN #42).
- INSTALL A JUMPER BETWEEN ANY TERMINALS WIRED TO A NORMALLY OPEN SENSOR.
- ROUTE RIBBON CABLE UNDER TERMINAL BLOCK & ATTACH ENCLOSURE W/ CLIPS WHERE NECESSARY. (PART #00008000)
- LCDT-100CA-36 TO BE MOUNTED WITH 6/32x3/8STUD ON 3/4" STANDOFFS (PART #00005075)
- FOR ADDITIONAL INFORMATION, SEE INSTALLATION BULLETIN.

JUN 05 2002

| | | | | | | | | |
|---|--|--|--|--------------------------------|--------------------|---|----------|------------------|
| | | | | DRAWN BY LINDA | |  CONTROL SYSTEMS & SERVICES - ROSENBERG, TX | | |
| | | | | CHK'D BY <i>[Signature]</i> | | | | |
| | | | | APR'D BY <i>[Signature]</i> | | | | |
| | | | | DATE 05-13-02 | | | | |
| | | | | SCALE None | | FOR WATERFLOOD SERVICE | | |
| | | | | SHEET 1 OF 2 | | WIRING DIAGRAM | | |
| A AS BUILT | | | | 6/4/02 | <i>[Signature]</i> | YOUR NO. | | |
| REV. | | | | DESCRIPTION | ECR No. | DATE | CHK'D BY | REF NO. 50303268 |
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| | | | | | | | | REV. A |

UNDERWRITERS LABORATORIES, INC. LISTED

ASCO TRIPOINT Pressure Switches



Form No. P7022R4

UL LISTINGS

This sheet is a listing of switch unit and transducer unit combinations that are Listed by Underwriters Laboratories, Inc. The table below is provided to ensure that the proper switch unit (section) is assembled to the proper transducer (section), thus providing a complete, UL Listed pressure switch. Only completely assembled combinations are UL Listed. See table and notes below for UL complementary product category listing and guide card numbers.

INSTALLATION INSTRUCTIONS

To determine the proper switch and transducer combinations, first locate the switch unit catalog number in the table below. Then going to the right on the same line (as the switch unit catalog number) find the transducer unit catalog number which may be used with this particular switch unit.

IMPORTANT: The third digit in both the switch unit and transducer unit catalog numbers must be identical. For example, a switch unit Catalog No. SC41D can be used with transducer unit Catalog No. TD40A11. The mating produces a complete pressure switch Catalog No. SC41D/TD40A11.

| SWITCH UNITS See Notes [1] and [2] | | | | PRESSURE TRANSDUCER UNITS See Notes [1], [2], and [3] | | | | | | | |
|---|---|---|---|--|---|---------------------------------------|---------|---------|---|--|--|
| Series: SA, SB, SC, SD, & SE Followed by nos. below | | | | | | | | | | | |
| General Purpose Enclosure Type 1 | Watertight Enclosure Types 3, 3S, 4, & 4X | Explosion-proof Enclosure Types 3, 3S, 4, 4X, 7 & 9 | Applicable Options | Air Non-Hazardous Oil & Gas Aluminum/Buna N Construction | Air-Water Non-Hazardous Oil & Steam 303 Stainless Steel & Buna N Construction | Fuel Gas Aluminum/Buna N Construction | | | Corrosive Fluids Air-Water Non-Hazardous Gas & Oil 303 or 316 Stainless Steel & VITON* Construction | | |
| 40D | 41D | 42D | Switch unit option suffixes 1 or 2. Suffix "K" option is applicable to Series SA and SB only. | TA40A11 | TA40A31 | - | - | - | TA40A32, -42 | | |
| 30D | 31D | 32D | | TA30A11 | TA30A31 | - | TA31A11 | - | TA30A32, -42 | | |
| 20D | 21D | 22D | | TA20A11 | TA20A31 | - | TA21A11 | - | TA20A32, -42 | | |
| 20D | 21D | 22D | | TB20A11 | TB20A31 | - | TB21A11 | - | TB20A32, -42 | | |
| 10D | 11D | 12D | | TB10A11 | TB10A31 | - | TB11A11 | - | TB10A32, -42 | | |
| 10D | 11D | 12D | | TC10A11 | TC10A31 | - | TC11A11 | - | TC10A32, -42 | | |
| - | - | - | | - | Brass & Buna N | Brass & Buna N [5] | | | - | | |
| 30D | 31D | 32D | | TV34A11 | TV34A21 | - | - | - | TV34A32, -42 | | |
| 20D | 21D | 22D | | TV24A11 | TV24A21 | - | - | - | TV24A32, -42 | | |
| 40D | 41D | 42D | | TD40A11 | TD40A21 [2] | - | TK42A21 | - | TD40A32, -42 | | |
| 30D | 31D | 32D | | TD30A11 | TD30A21 [2] | TF32A21 | TK32A21 | TN32B21 | TD30A32, -42 | | |
| 20D | 21D | 22D | | TD20A11 | TD20A21 [2] | TF22A21 | TK22A21 | TN22B21 | TD20A32, -42 | | |
| 10D | 11D | 12D | | - | - | TF12A21 | TK12A21 | TN12B21 | - | | |
| - | - | - | | - | 316 St. St. & VITON* | - | - | - | - | | |
| 10D | 11D | 12D | | - | TH13A42 | - | - | - | - | | |
| 10D | 11D | 12D | | - | TG13A42 | - | - | - | - | | |
| 20D | 21D | 22D | | - | TG23A42 | - | - | - | - | | |
| 30D | 31D | 32D | | - | TG33A42 | - | - | - | - | | |
| - | - | - | | - | - | 316 Stainless Steel & VITON* | | | - | | |
| 30D | 31D | 32D | | - | - | - | - | TN32B42 | - | | |
| 20D | 21D | 22D | | - | - | - | - | TN22B42 | - | | |
| 10D | 11D | 12D | | - | - | - | - | TN12B42 | - | | |
| 10D | 11D | 12D | | - | - | - | - | TQ12B42 | - | | |
| - | - | - | | - | - | Fuel Oil-316 Stainless Steel | | | - | | |
| 40D | 41D | 42D | | - | - | - | TE40A44 | - | - | | |
| 30D | 31D | 32D | | - | - | - | TE30A44 | - | - | | |
| 20D | 21D | 22D | | TE20A11 | TE20A21 [2] | - | - | - | TE20A32, -42 | | |
| 10D | 11D | 12D | | TE10A11 | TE10A21 [2] | - | TE10A44 | - | TE10A32, -42 | | |
| 10D | 11D | 12D | | TF10A11 | TF10A21 [2] | - | TF10A44 | - | TF10A32, -42 | | |
| 10D | 11D | 12D | | TG10A11 | TG10A21 [2] | - | TG10A44 | - | TG10A32, -42 | | |
| 10D | 11D | 12D | | TH10A11 | TH10A21 [2] | - | TH10A44 | - | TH10A32, -42 | | |
| 10D | 11D | 12D | | TJ10A11 | TJ10A21 [2] | - | TJ10A44 | - | TJ10A32, -42 | | |
| 10D | 11D | 12D | | - | TK10A21 | - | - | - | TK10A32, -42 | | |
| 10D | 11D | 12D | | - | TL10A21 | - | - | - | TL10A32, -42 | | |
| 10D | 11D | 12D | | - | TM10A21 | - | - | - | TM10A32, -42 | | |
| 10D | 11D | 12D | | - | TN10B21 | - | - | - | TN10B42 | | |
| 10D | 11D | 12D | | - | - | - | - | - | TQ10B42 | | |

NOTES:

- [1] All transducers with general purpose and watertight switch units are UL Listed as Industrial Control Equipment—Enclosed, Motor Controllers—Pressure Operated, Guide NKPZ. Transducers which end in -11, -21, -22, -31, -32, -42 or -44 and used with general purpose and watertight switch units are also UL Listed as switches for Heating and Cooling Appliances, Guide MFHX. When used with explosionproof switch units, they are UL Listed Industrial Control Equipment for Hazardous Locations Guide NOWT.
- [2] When used for steam service, these transducers with general purpose and watertight switch units are also UL Listed as Limit Controls, Guide MBPR.

*DuPont's Registered Trademark

- [3] Switch units with explosionproof enclosures are UL Listed for Class I, Groups B, C, and D (Types 7B, 7C, and 7D) and Class II, Groups E, F, and G (Types 9E, 9F, and 9G) Hazardous Locations.
- [4] Suffix B is an applicable option.
- [5] UL Listing also includes transducers TF_2A series with suffix 22, 31, or 32, and TK_2A series with suffix 22.
- [6] UL approval includes revisions identified by Fifth (V) character letter in industrial switch unit catalog number as follows:

General Purpose and Watertight Enclosures

- A - First Construction
- B - SC switch units redesigned
- D - Steel balance plate construction

Explosionproof Enclosures

- B - Class I, Group B (Hydrogen)
- C - SC switch units redesigned
- D - Steel balance plate construction



ASCO Valves

ASCOLECTRIC limited BRANTFORD, ONTARIO

PRINTED IN CANADA

Form No. V7022R4

Page 1 of 2

UNDERWRITERS LABORATORIES, INC. LISTED

ASCO. TRIPoint. Temperature Switches



Form No. P7022R4

UL LISTINGS

This sheet is a listing of switch unit and transducer unit combinations that are Listed by Underwriters Laboratories, Inc. The table below is provided to ensure that the proper switch unit (section) is assembled to the proper transducer (section), thus providing a complete, UL Listed pressure switch. Only completely assembled combinations are UL Listed. See table and notes below for UL complementary product category listing and guide card numbers.

INSTALLATION INSTRUCTIONS

To determine the proper switch and transducer combinations, first locate the switch unit catalog number in the table below. Then going to the right on the same line (as the switch unit catalog number) find the transducer unit catalog number which may be used with this particular switch unit.

IMPORTANT: The third digit in both the switch unit and transducer unit catalog numbers must be identical. For example, a switch unit Catalog No. SA10D can be used with transducer unit Catalog No. QB10A4. The mating produces a complete temperature switch Catalog No. SA10D/QB10A4.

| SWITCH UNITS See Notes ③ and ④ | | | | TEMPERATURE TRANSDUCER UNITS See Notes ① and ② | | | | |
|---|---|---|--|---|---------------------|----------------------------|---------------------------------------|--|
| Series: SA, SB, SC, SD, & SE Followed by numbers below | | | | | | | | |
| General Purpose Enclosure Type 1 | Watertight Enclosure Types 3, 3S, 4, & 4X | Explosion-proof Enclosure Types 3, 3S, 4, 4X, 7 & 9 | Applicable Options | Copper | 316 Stainless Steel | Cooper (Armored Capillary) | 316 Stainless Steel (Plain Capillary) | Applicable Options For Capillary & Bulb Only |
| 10D | 11D | 12D | Optional Suffixes 1 or 2; Suffix "K" for Series SA or SB only. | QA10A1 | QA10A4 | QA11A1 | QA11A4 | Suffixes C, D, E, F, & G |
| 10D | 11D | 12D | | QB10A1 | QB10A4 | QB11A1 | QB11A4 | |
| 10D | 11D | 12D | | QD10A1 | QD10A4 | QD11A1 | QD11A4 | |
| 10D | 11D | 12D | | QF10A1 | QF10A4 | QF11A1 | QF11A4 | |
| 10D | 11D | 12D | | QJ10A1 | QJ10A4 | QJ11A1 | QJ11A4 | |
| 10D | 11D | 12D | | QL10A1 | QL10A4 | QL11A1 | QL11A4 | |
| 10D | 11D | 12D | | - | - | QN11A1 | QN11A4 | |
| 10D | 11D | 12D | | - | - | QT11A1 | QT11A4 | |
| 10D | 11D | 12D | | - | - | QU11A1 | QU11A4 | |

NOTES:

- ① All transducers with general purpose and watertight switch units are UL Listed as Temperature - Indicating and Regulating Equipment, Guide XAPX. When used with explosionproof switch units, they are UL Listed Temperature-Indicating and Regulating Equipment for use in Hazardous Locations, Guide XBDV.
- ② Optional features, armored capillary and capillary length identified by the seventh, eighth, and ninth digit codes respectively of the transducer catalog number are also UL Listed.
- ③ Switch units with explosionproof enclosures are UL Listed for Class I, Groups B, C and D (Types 7B, 7C, and 7D) and Class II, Groups E, F, and G (Types 9E, 9F, and 9G) Hazardous Locations.

- ④ UL approval includes revisions identified by Fifth (V) character letter in industrial switch unit catalog number as follows:

General Purpose and Watertight Enclosures

- A - First Construction
- B - SC switch units redesigned
- D - Steel balance plate construction

Explosionproof Enclosures

- B - Class I, Group B (Hydrogen)
- C - SC switch units redesigned
- D - Steel balance plate construction

ASCO Valves



ASCOELECTRIC limited BRANTFORD, ONTARIO



Installation for 4-1/2 in. (114 mm) dial Temperature MURPHYGAGE® and SWICHGAGE®

Model Series: SPLG, SPLC, SPLBP, 45TE and 45TEBP
Options: -OS and -ES



Please read the following instructions before installing. A visual inspection is recommended before mounting. General Information and these installation instructions are intended for all 4-1/2 in. (114 mm) dial temperature models.

GENERAL INFORMATION

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.

SPLC and SPLFC SWICHGAGE® instruments have high and low limit contacts to monitor, alarm or shutdown. The SPLC has a flanged case. SPLFC has a flush mount case intended for installation within a panel. A method to override the low limit contact for startup is provided on most models (see Operation Test Instructions on page 3).

45TE and 45TEF Series are versions of the SPL Series with 2-snap acting SPDT switches instead of the pointer type contacts. The 45TE Series does not include low contact lockout.

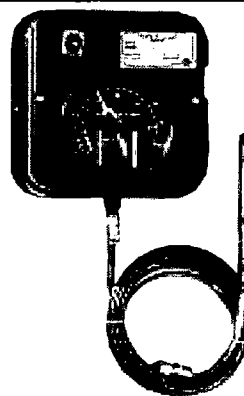
SPLBP and 45TEBP models are designed to start and stop electric motor driven equipment. The pilot duty contacts are connected to a latching control relay for automatic ON/OFF control, either directly or through a motor starter.

Options -OS and -ES

The -OS (oil sealed case) and the -ES (environment sealed case) options for corrosive environment feature flush mount case design to be installed within a panel.

Precautions

- Do NOT exceed rated temperature range.
- Use shock mounts as necessary to protect from vibration.
- Cutting or sharp bending the capillary will cause permanent damage to the SWICHGAGE® and will void the warranty.
- Excess capillary should be carefully coiled and secured away from damage.
- Do not route capillary along exhaust manifold.
- Avoid routing capillary at level higher than gage mounting.



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. (1.5 m) long standard.

Sensing Bulb: Copper bulb std.: 1/2 in. (13 mm) OD;

Length 7 in. (178 mm). Pressure rating: 600 psi (4.1 MPa)

[41 bar]. Connection: 1/2 NPTM compression fitting.

NOTE: Use of thermowell is highly recommended.

Switch Reset Deadband: Approximately 10% FS.

Snap-Acting Switches: See wiring information (page 4).

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 mm²) x 9 in. (229 mm) long.

Wire Connections (-ES, -OS, -CC): 1/2 NPTM conduit and wire leads, 24 AWG (0.22 mm²) x 33 in. (838 mm) long.

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

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

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

Accuracy

| Temperature Range | Lower 1/4 | Middle 1/2 | Upper 1/4 |
|--------------------------------|------------------|------------------|--------------------|
| -40 to 136°F (-40 to 58°C) | ± 4°F (± 2°C) | ± 2°F (± 1°C) | ± 2°F (± 1°C) |
| 15 to 250°F (9 to 121°C) | ± 8°F (± 4°C) | ± 2°F (± 1°C) | ± 2°F (± 1°C) |
| 130 to 350°F (54 to 177°C) | ± 8°F (± 4°C) | ± 2°F (± 1°C) | ± 3°F (± 1.5°C) |
| 260 to 450°F (127 to 232°C) | ± 8°F (± 4°C) | ± 2°F (± 1°C) | ± 3°F (± 1.5°C) |

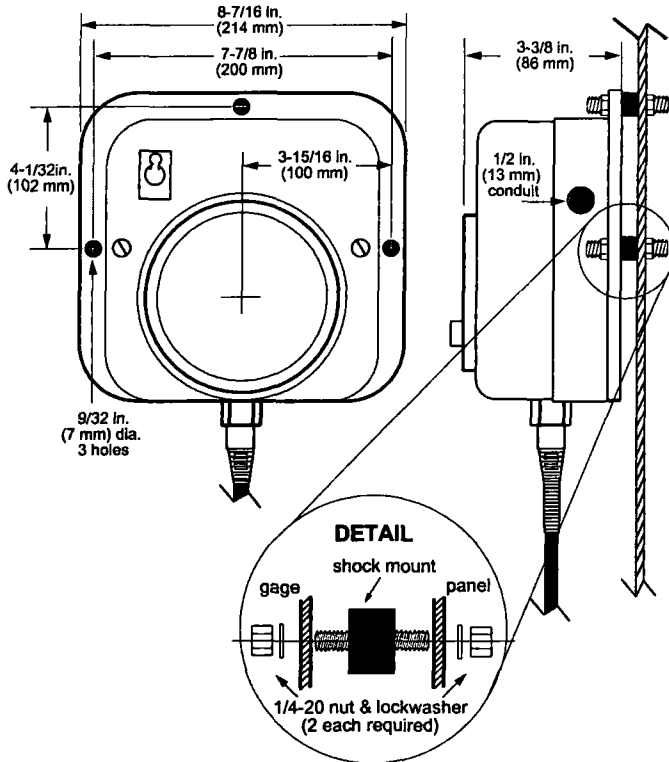
*Selected configurations are CSA approved. Consult factory for details.

**Products covered by this literature comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted. Does not cover "BP" models.

CASE MOUNTING

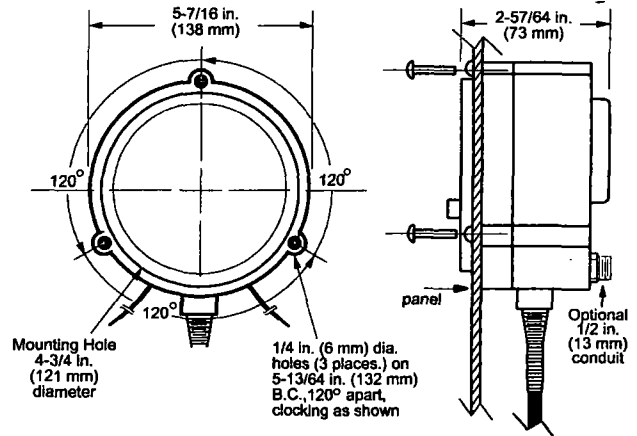
Wall Mount

Flanged case design intended for wall mount. Shown with shock mounts (optional).

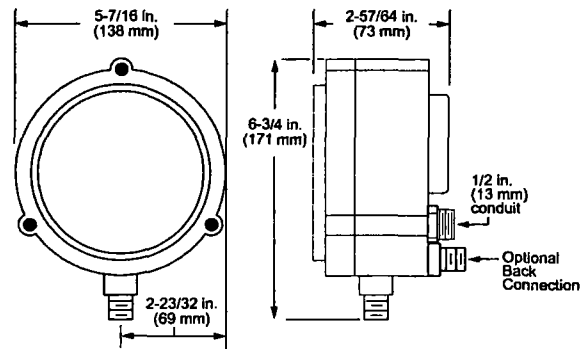


Flush Mount

A round case design to be mounted within a panel from 1/32 in. (1 mm) to 1/8 in. (3 mm) thick.

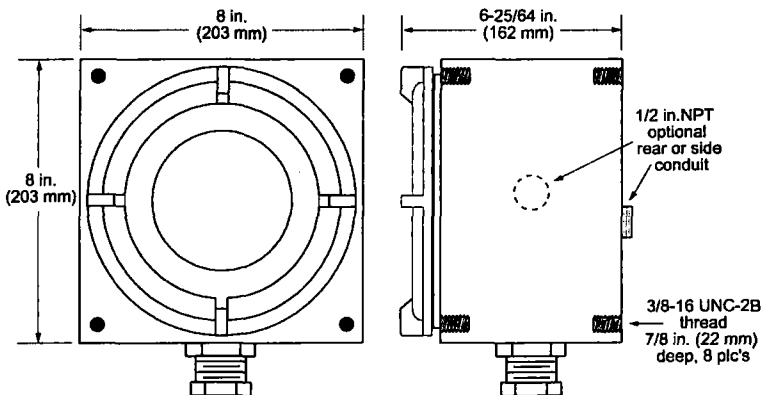


Options -OS, -ES (flush mount case)

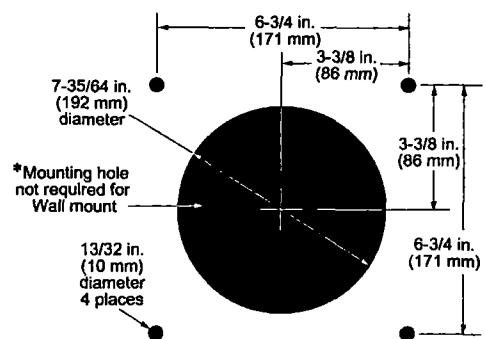


Explosion-proof Case Mount

Explosion-proof case can be mounted from face or rear.



Flush mount/Wall mount*



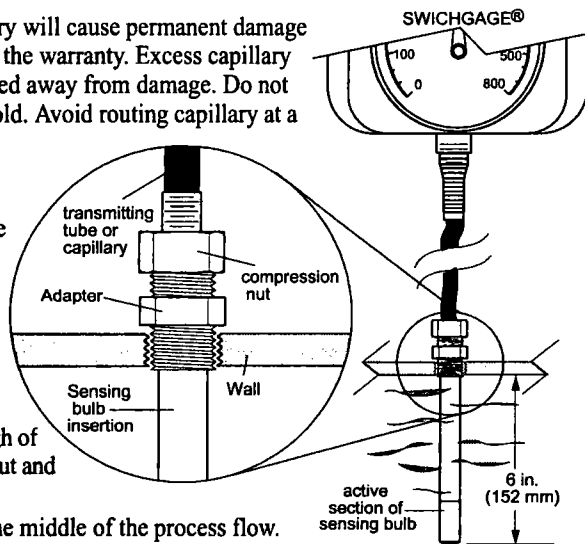
SENSING BULB-THERMOWELL INSTALLATION

Precautions

Cutting or sharp bending the capillary will cause permanent damage to the SWICHGAGE® and will void the warranty. Excess capillary should be carefully coiled and secured away from damage. Do not route capillary along exhaust manifold. Avoid routing capillary at a level higher than gage mounting.

Installing Sensing Bulb

1. Install the 1/2 NPT adapter into the application.
2. Slip compression nut and ferrule onto bulb.
3. Insert the sensing bulb directly through the adapter and fully immerse it into the process without interference. Be sure to leave enough of the bulb to allow the compression nut and ferrule to be tightened.
4. Keep the bulbs active section in the middle of the process flow.
5. Tighten the compression nut and ferrule. This will keep the bulb in place and obtain a full seal.



Installing Thermowell

Thermowell is recommended for high pressure applications or corrosive environments. It also allows temperature sensor to be changed or adjusted without opening connection to process.

1. First screw the thermowell into the process (pipe line).
2. Pass the sensing bulb through the nut and ferrule.
3. Fully insert the sensing bulb into the thermowell housing and secure it with the compression nut.

NOTE: The use of temperature transmitter grease or silicon grease on the tip of the sensing bulb is recommended to facilitate heat transfer to sensing bulb junction.

LIMIT CONTACTS / INDICATION POINTER ADJUSTMENTS

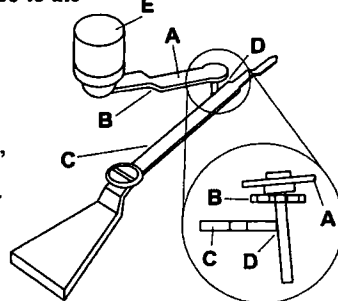
Limit Contact Adjustments

Facing the dial, left side knob is "Low limit" contact. Right side is "High limit" contact.

NOTE: the 45TE Series features a stacked limit indicator knob with both limit adjustments included. The bottom half knob adjusts the "Low" limit indicator; the top half is to adjust the "High" limit indicator.

To set limit contact, turn the knob to the desired point on the scale.

- A. Contact arm-flex
- B. Contact arm
- C. Pointer Contact
- D. Initial point of contact
- E. Limit contact knob



Limit Contact Wiping Feature (SPL)

The force of pointer causes the flexible contact arm (A) to "tilt" resulting in a wiping action (D). This clears away film or corrosion formed on the contact surfaces.

Indication Pointer Adjustments

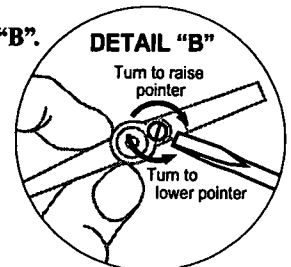
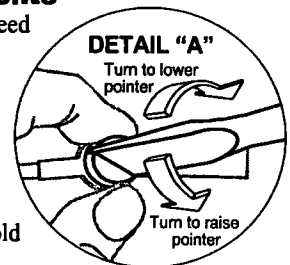
To reset to zero or to a known value proceed as follows:

1. Turn off power. Remove the snap ring and the lens/contact assembly (or open hinged cover).
2. Hold the pointer hub with thumb and forefinger then turn screw to desired point. Avoid touching the gold flashed, silver contact areas. See **DETAIL "A"**

For the 45TE Series see **DETAIL "B"**.

3. Replace lens contact assembly and snap ring (or close hinged cover), and turn on power.

NOTE: Span adjustments and recalibration must be performed by an authorized mechanic or return the unit to Frank W. Murphy Mfr.



OPERATION TEST INSTRUCTIONS

SPLC and SPLFC Series

1. Perform operation test after the unit is installed and wired appropriately (see Typical Electrical Diagrams on page 4).
2. When temperature is applied to the sensing bulb the pointer will travel in a clockwise direction. (Adjust contacts to desired set points.)
3. Place the toggle switch (SPLC Series only) in the "start" position or otherwise override low contact. After the indication pointer rises past the low limit contact, return the toggle switch to the "run" position.
4. To test the limit contacts, turn the limit contact to be tested until it touches the pointer. That will trip the control circuit.
5. Reset the shutdown or alarm circuit device.

45TE Series

1. Perform steps 1 and 2 in the SPLC Operation Test Instructions.
2. To test the switches, turn the limit indicator until it touches the pointer, then continue to rotate until the snap-switch operates*.
3. Reset the shutdown or alarm circuit device.

*The trip point indicator will stop the pointer movement slightly before the snap-switch operates. As temperature continues to increase or decrease, the trip point setting is reached.

TYPICAL ELECTRICAL DIAGRAMS

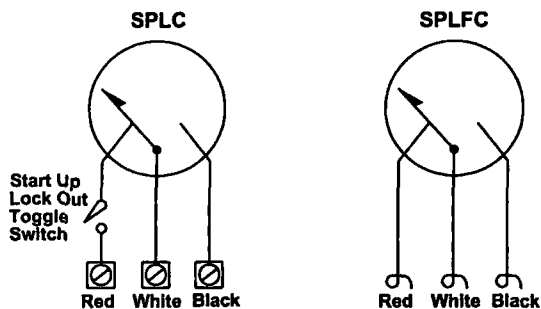


WARNING: Perform the wiring operation with the power source "OFF". Make sure the voltage and current requirements are within the SWITCHGAGE® ratings. Before wiring determine voltage and polarity for the application. Use the appropriate wire size. All connections should be made using a spade (forked) or ring terminals. For pigtail connections use wire nuts. Conduit is recommended to protect wires from damage.

SPLC and SPLFC

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

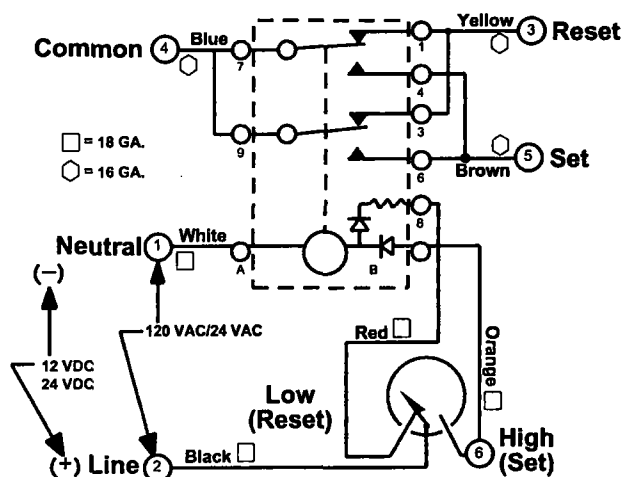
NOTE: Diagrams below show the pointer in the at rest (shelf) position.



SPLBP

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

NOTE: Diagrams below show the pointer in the at rest (shelf) position.



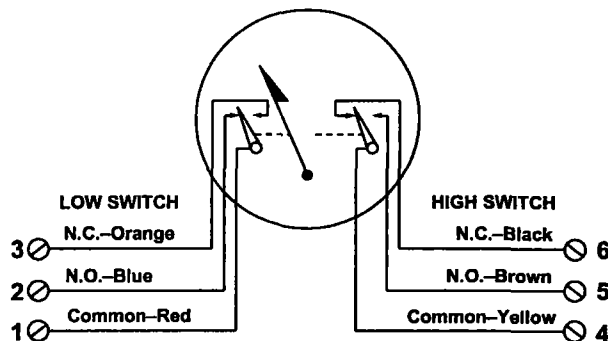
Transformer Relay Assemblies

For higher voltages the Murphy TR Assemblies can be used in conjunction with any SWITCHGAGE®

45TE and 45TEF

Contact Ratings: 2-SPDT snap-switches (One for high and low temperature); 2 A inductive, 250 VAC each switch.

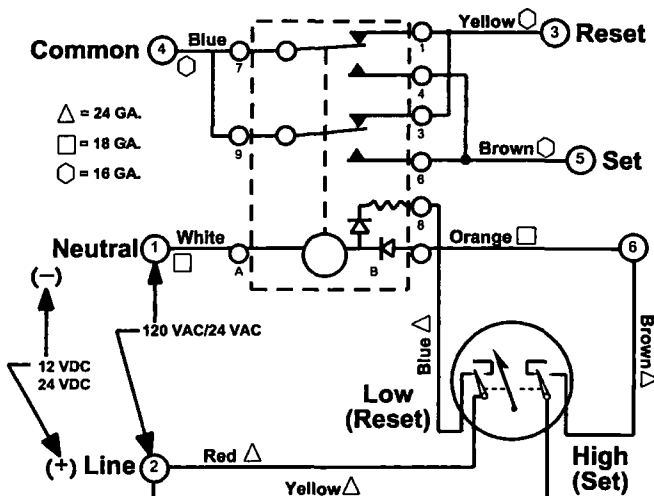
NOTE: Diagram below show the pointer in the at rest (shelf) position.



45TEBP

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

NOTE: Diagrams below show the pointer in the at rest (shelf) position.



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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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Installation for L1100, L1200, L1200N Series Liquid Level Switches and DV850, DV875, and DV2100 Series Dump Valves

DV models are Patent pending.

LDV-92151N
Revised 12-01
Section 15
(00-02-0175)



Please read the following instructions before installing. A visual inspection for damage during shipping is recommended before mounting.

GENERAL INFORMATION



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.
- ✓ OBSERVE all pressure and electrical ratings and requirements for the devices and the operating environment.
- ✓ BE SURE all pressure HAS BEEN REMOVED from the vessel before opening any pressure connections.

Description



Series L1100 and L1200 Liquid Level Switches 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. They screw directly into the wall of the vessel. Series L1200 can also be used with a weld collar or external float chamber.

Series L1200N is a float-activated, pneumatic-vent level device used to operate dump valves or similar devices. This model screws directly into the vessel or can be mounted via an external float chamber. It cannot be used with weld collar 15050375. Model variations include a dump valve operator with or without a filter/pressure regulator and indicating pressure gauge.

NOTE: All stainless steel versions of L1100, L1200, L1200N, L1200NDVO, and L1200NDVOR series carry Canadian Registration Number OF1476.2.

Series DV850, DV875 & DV2100 Dump Valves receive a pneumatic input signal to cause an orifice to open or close allowing liquid condensate to be drained from a pressure vessel. A pop up button indicates valve open/closed. Stainless steel versions available. **NOTE:** All stainless steel versions of DV850, DV875, and DV2100 series carry Canadian Registration Number OC1476.2.

| Specifications | L1100 | L1111 | L1150 | L1200 | L1250 | L1200N | L1200NDVO | L1200NDVOR |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Body | | | | | | | | |
| • Standard: Electroless Nickel plated steel | X ^A | X ^A | X ^A | X ^B | X ^B | X ^B | X ^B | X ^B |
| • Optional: 316 Stainless Steel† | X ^A | X ^A | X ^A | X ^B | X ^B | X ^B | X ^B | X ^B |
| Pressure Rating | | | | | | | | |
| • 15 psi (103 kPa) [1.03 bar] Polyethylene Float | | | X | | X | | | |
| • 1500 psi (10.3 MPa) [103.42 bar] Stainless Float | X | X | | X | | X | X | X |
| • 2000 psi (13.8 MPa) [138 bar] BUOYGLAS™ Float | X | X | | X | | X | X | X |
| Temperature Rating | | | | | | | | |
| • Standard: -20/175°F (-29/79°C) | | | X | | X | | | |
| • Standard: -20/300°F (-29/149°C) | X | X | | X | | X | X | X |
| • Optional: -20/400°F (-29/204°C)* | X | X | | X | | X | X | X |
| Specific Gravity | | | | | | | | |
| • Standard: 0.5 with BUOYGLAS™ float | X | X | | X | | X | X | X |
| • Optional: 0.65 with 304 Stainless Steel† | X | X | | X | | X | X | X |
| • Standard 0.73 Polyethylene Float | | | X | | X | | | |
| Electrical | | | | | | | | |
| • Standard SPDT: 5 A @ 125/480 VAC (see p. 3 for full ratings) | X | X | X | X | X | | | |
| • Optional DPDT: 10 A @ 250 VAC (see p. 3 for full ratings) | X | X | X | X | X | | | |
| Wire: 18 AWG x 36 in. (1.0 mm² x 914 mm) | X | X | X | X | X | | | |
| O-Rings: Viton | X | X | X | X | X | X | X | X |
| Valve: Two-way snap-action vent type | | | | | | | | |
| • 1/8 in. (3 mm) orifice w/Viton "A" seat | | | | | | | | |
| • 1/8 NPT inlet; 1/4 NPT outlet | | | | | | X | X | X |
| • 30-70 psi (207-483 kPa) [2.07-4.83 bar] operating pressure | | | | | | | | |
| Dump Valve Operator: Operates Murphy DV Series dump valves or similar. | | | | | | | X | X |
| Pressure Regulator/Filter and Murphy 20BPG: 0-75 psi (0-517 kPa) [0-5.17 bar] pressure gauge. Maximum input 300 psi (2.07 MPa) [20.68 bar]. | | | | | | | | X |
| Operation: H=For high level, L=For low level | H | L | H | H | H | H | H | H |

^A=1-1/2 NPT

^B=2 NPT

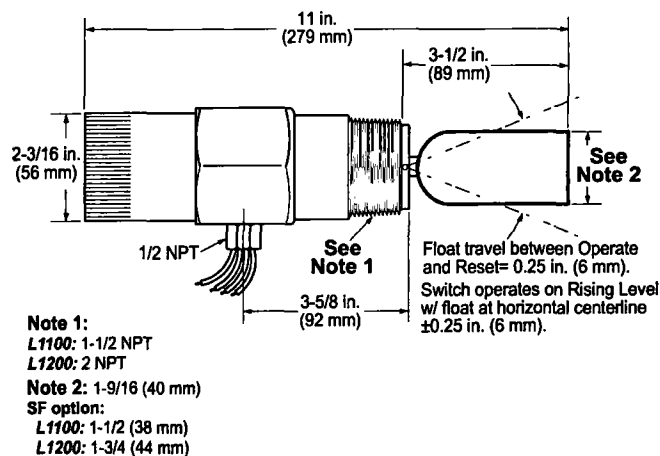
†Meets NACE standard MR-01-75 for direct exposure to H₂S service.

*Not available with DPDT snap-switch.

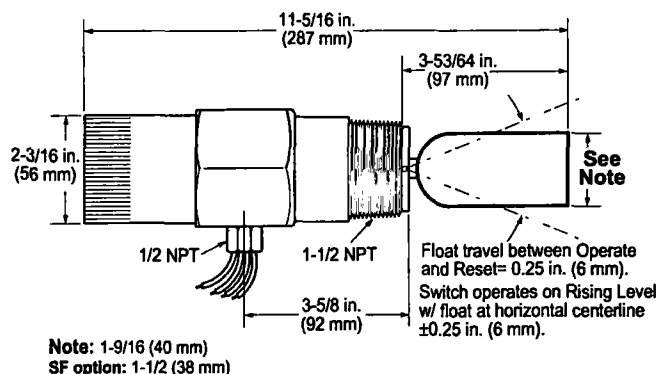
**Products covered by this literature comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility.

DIMENSIONS

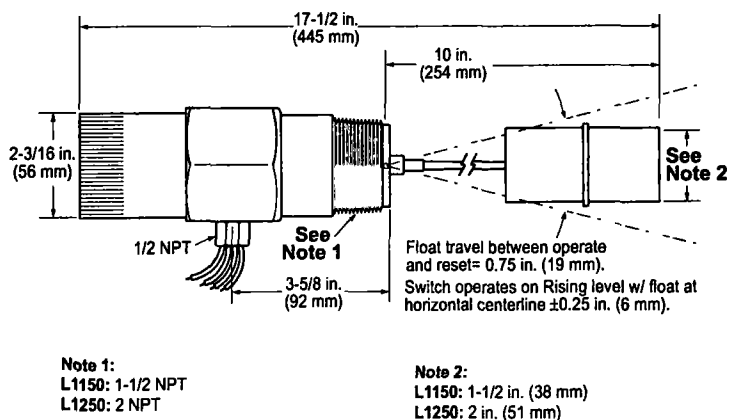
L1100 and L1200



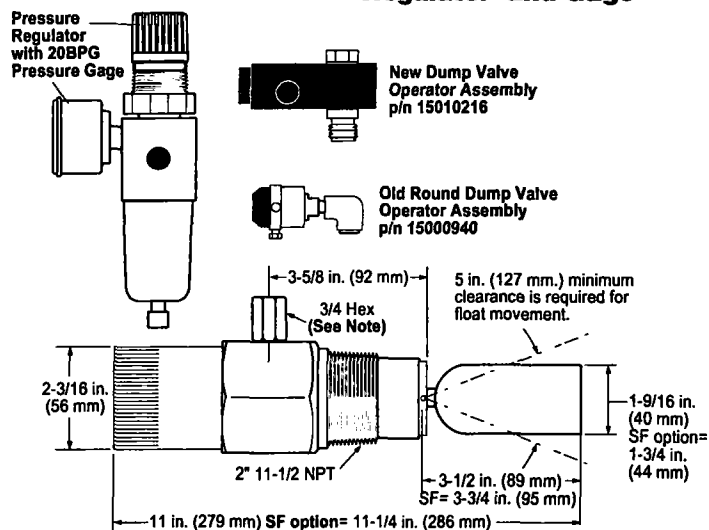
L1111



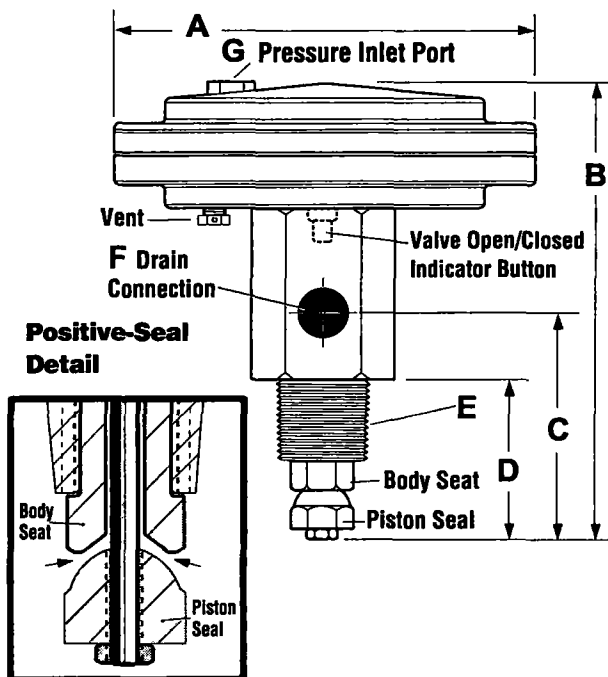
L1150 and L1250



L1200N, L1200NDVO and L1200NDVOR with Dump Valve Operator, Pressure Regulator and Gage



DV850, DV875, and DV2100 Series Dump Valves



| | DV850/SS | DV875/SS | DV2100/SS |
|---|--------------|--------------|---------------|
| A | 6-3/4 (171) | 6-3/4 (171) | 6-3/4 (171) |
| B | 7-9/64 (181) | 7-9/64 (181) | 7-59/64 (201) |
| C | 3-9/32 (83) | 3-9/32 (83) | 3-63/64 (101) |
| D | 2-19/64 (58) | 2-19/64 (58) | 2-5/32 (55) |
| E | 1 NPT | 1 NPT | 2 NPT |
| F | 1/2 NPT | 3/4 NPT | 1 NPT |
| G | 1/8 NPT | 1/8 NPT | 1/8 NPT |

NOTE: Dimensions are in inches and (millimeters)

REPLACING AND INSTALLING THE DVOA ASSEMBLY

When replacing/installing the old style DVO assembly with the new style (DVOA), tubing and fitting modifications are required. We suggest removing the L1200NDVO/DVOR from the vessel. Relieve pressure from the vessel or use block valves before removing the L1200NDVO/DVOR.

Replacing and Installing the DVOA Assembly For Models L1200NDVO & L1200NDVOR

Tools Needed: Strap or pipe wrench; 3/4" Hex wrench; 9/16" hex wrench; needle nose pliers; tubing cutters and benders and the appropriate tools for the fittings.

1. Block off and bleed the instrument gas pressure supply to the L1200NDVO.
2. Remove the tubing between the L1200NDVO and the separator dump valve, and remove the supply gas tubing (regulator [-R] if used).
3. Remove the L1200NDVO from the vessel (optional).
4. If the L1200N was removed from the vessel, mount it in a suitable vise on a work bench (if possible).
5. Using the proper tools, disconnect the Inlet, Outlet and Exhaust fittings from the existing DVO (see fig. 1). You will re-connect these to the new DVOA in a later step.

NOTE: The following steps must be done with the DVO in the upright position (on top of the L1200N).

6. Remove the L1200N cover (this will aid with the alignment of the new DVOA Valve Bushing). The use of a strap wrench or a pipe wrench may be needed.
7. Insert the new Valve Bushing through the new DVOA (see fig. 2). The markings on top of the DVOA must be facing up. This will be needed in step 9.
8. With a 3/4" hex wrench loosen the existing DVO, valve stem, and static seal (see fig. 3). Once the assembly is loosened, **VERY CAREFULLY** use needle nose pliers to hold the Valve Seat Assembly in place. Remove the existing DVO making sure the Valve Seat Assembly inside the L1200NDVO is aligned and straight (see fig. 4).



CAUTION: MAKE SURE the Valve Seat Assembly inside the L1200N remains in place after removing the DVO.

9. Holding the Seat Assembly up with the needle nose pliers inside the L1200NDVO body, place the tip of the new DVOA valve bushing through the spring and into the hole in the center of the valve seat, and tighten the valve bushing. The Valve Seat Assembly should be able to move freely up and down after the bushing has been tighten. The DVO red button must face away from the vessel.
10. With the new DVOA aligned over the hex on the L1200NDVO body, tighten the Valve Bushing using the 9/16" hex wrench. You may need to hold the DVOA while tightening the Valve Bushing to keep it from rotating (see fig. 5).
11. If the L1200N is in the vise, operate the float and inspect for smooth and proper operation of the Valve Seat Assembly.
12. Replace the L1200NDVO cover (see fig. 6).
13. Using the appropriate tools re-install the Inlet, the Outlet and the Exhaust fittings to the new DVOA (see fig. 5).
14. If the L1200N was removed from the vessel re-install it at this time.
15. Modify existing or install new tubing to connect the Inlet, the Outlet and Exhaust fittings.

NOTE: Clean, dry instrument quality gas should be used. Use of filters will improve service life and reliability.

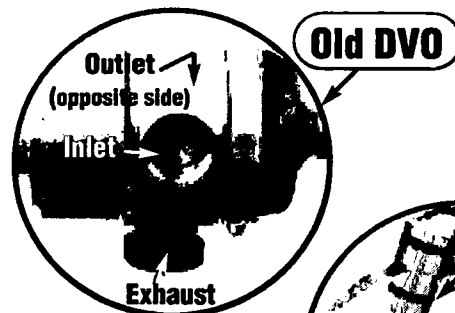


Figure 1



Figure 2 New DVOA



Figure 3

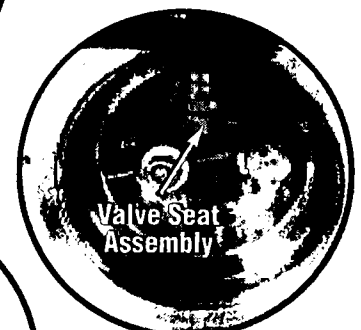


Figure 4

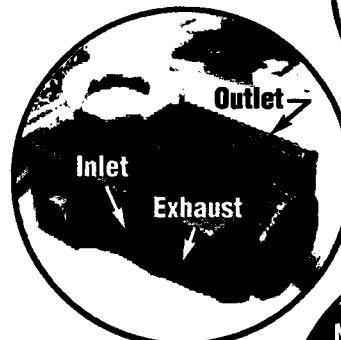


Figure 5

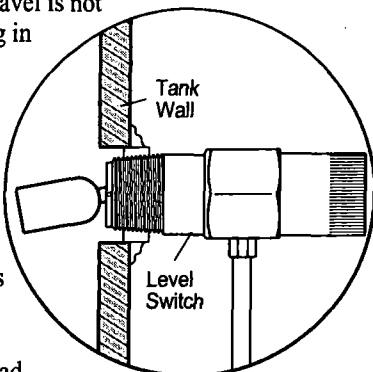


Figure 6

PRESSURE VESSEL INSTALLATION: L1100, L1200, and L1200N

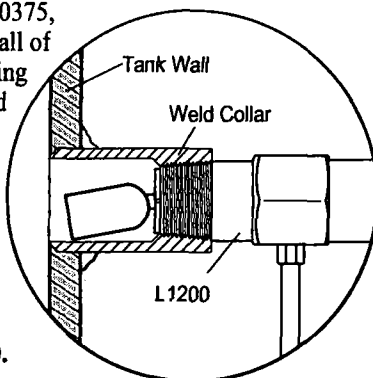
Direct Installation into the Wall of the Pressure Vessel

1. Determine that the float travel is not obstructed by the coupling in the vessel wall, internal baffles, etc.
Do NOT use more than one arm extension P/N 15050395.
2. BE SURE that the float and extension are tight and that the lock washer is in place.
3. Before installing the level switch a suitable pipe thread sealant is recommended. Screw the unit directly into the threaded connection in the wall of the pressure vessel.
4. Be sure that the electrical connection is positioned at the bottom. For L1200N the 1/8 NPT pneumatic connection should be on top (the 1/4 NPT vent connection should be on the bottom). See "Pneumatic models" section for further instructions for the L1200N.
5. Make the electrical wiring connections according to appropriate wiring diagrams for the alarm or shutdown system to be used. The electrical connection is 1/2-14 NPT.
6. BE SURE all electrical connections are insulated and the cover is fully installed before reconnecting electrical power.
7. BE SURE all pressure connections are tight before pressurizing the system.



Installation with a Weld Collar

1. The weld collar, P/N 15050375, must be welded into the wall of the pressure vessel according to code standards and good welding practices.
2. Follow above instructions for installation directly into the wall of the pressure vessel.
3. **NOTE:** Weld collar 15050375 can be used ONLY with model L1200.



Installation Using External Float Chamber 15050697

CAUTION: USE "NON SPARKING TOOLING".

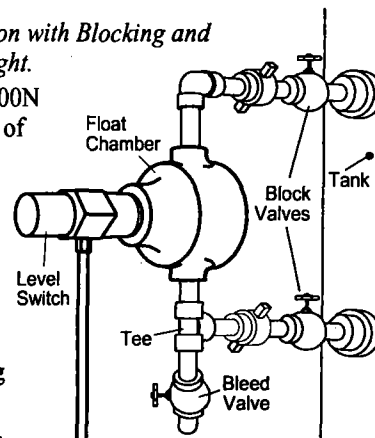
1. Install the float chamber 15050697 on the outside wall of the pressure vessel using 1 NPT piping. Position the 2 NPT threaded connection at the height where you want the level switch to operate. The 2 NPT threaded connection must be positioned away from the tank wall.

2. A tee is typically installed at the bottom of the lower 1 inch pipe riser to allow draining of the float chamber for servicing or replacement.

NOTE: A typical installation with Blocking and Bleed valves is shown at right.

3. Install the L1200 or L1200N in the 2 NPT connection of the float chamber. BE SURE float travel is not restricted and that the float is tight onto the float shaft.

4. To complete installation and wiring, follow the instructions for mounting directly into wall of the vessel and for wiring.



Pneumatic Models

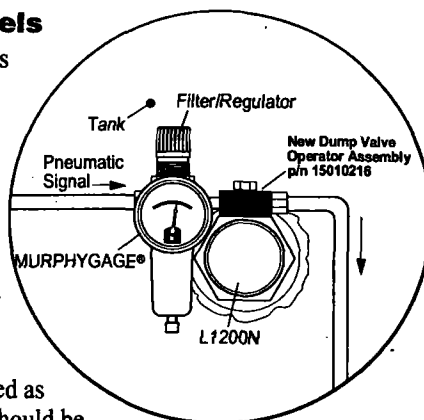
1. All pneumatic models operate on the vent principle. The pneumatic signal source MUST BE CLEAN AND DRY. The input pneumatic signal must be regulated between 30 and 70 psi (207-483 kPa) [2.07-4.83 bar].

If produced gas is used as the signal source, it should be taken after gas passes through the final scrubber.

A suitable filter must be positioned before the L1200NDVO to prevent liquids and/or particulates from entering the dump valve operator.

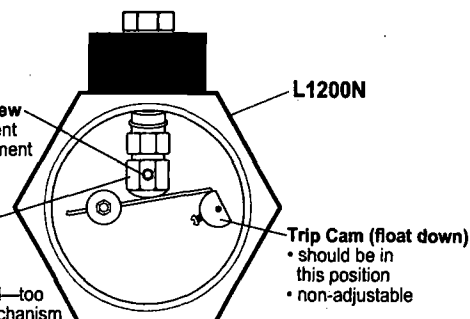
NOTE: Check filter periodically for wear and tear and elements that hamper the flow of the pneumatic signal.

2. All pressure connections must be tight and maintained tight so as not to leak air/gas.
3. Valve seat adjustment can be made if air/gas begins to leak. Care should be taken when adjusting as only slight movement is necessary to stop the leakage; excessive force will bind the seating mechanism.



Hex Socket Set Screw
• loosen for adjustment
• tighten after adjustment

Hex Adjustment Nut
• turn left until air seepage stops
• **Caution:** only slight adjustment is needed—too much will lock up mechanism



L1200N

Trip Cam (float down)
• should be in this position
• non-adjustable

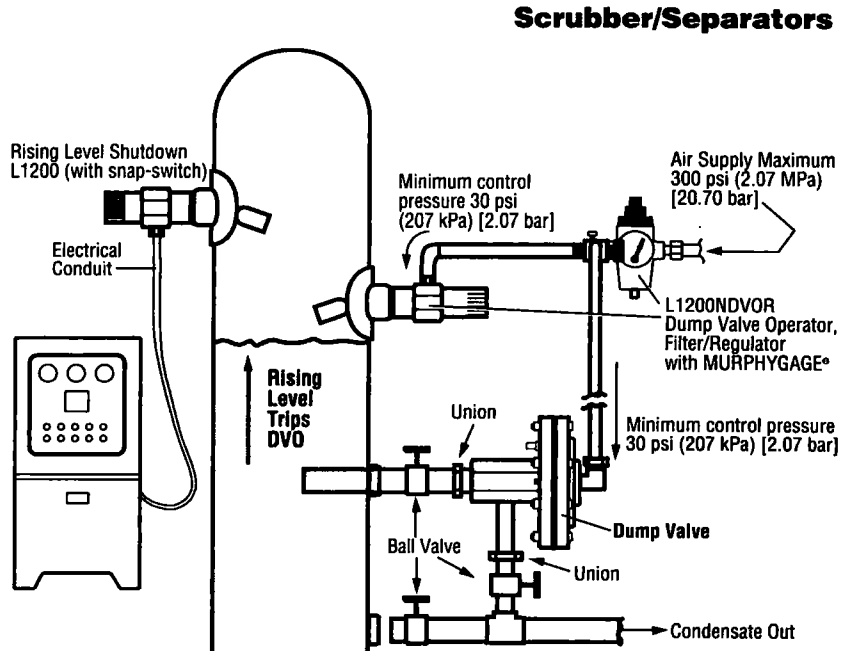
TYPICAL INSTALLATION ON GAS COMPRESSORS

Basic Operation

As condensate rises in the scrubber, the float on the L1200NDVOR rises and trips its pneumatic valve. The valve opens allowing pressure to enter the dump valve pilot chamber. Once the pressure enters the pilot chamber it forces the diaphragm and valve stem forward thus opening the valve seat (valve open/closed indicator button pops out) and releasing condensate through the valve stem and out the drain. As the condensate level drops, the L1200NDVOR pneumatic valve closes to shut off the pressure to the dump valve causing it to close.

If for any reason the condensate continues to rise beyond normal dump levels, model L1200 operates the alarm and/or shuts down the equipment.

The L1200NDVOR Filter/Regulator and the MURPHYGAGE® help keep the control pressure clean and dry. They also allow the operator to adjust pressure to recommended levels.



DUMP VALVE INSTALLATION

DV850 - DV875 - DV2100



CAUTION: USE "NON SPARKING TOOLING".

The following steps describe the "Block and Bleed" method for installing the dump valve. The "Direct Mounting" method to the tank wall is also accepted.

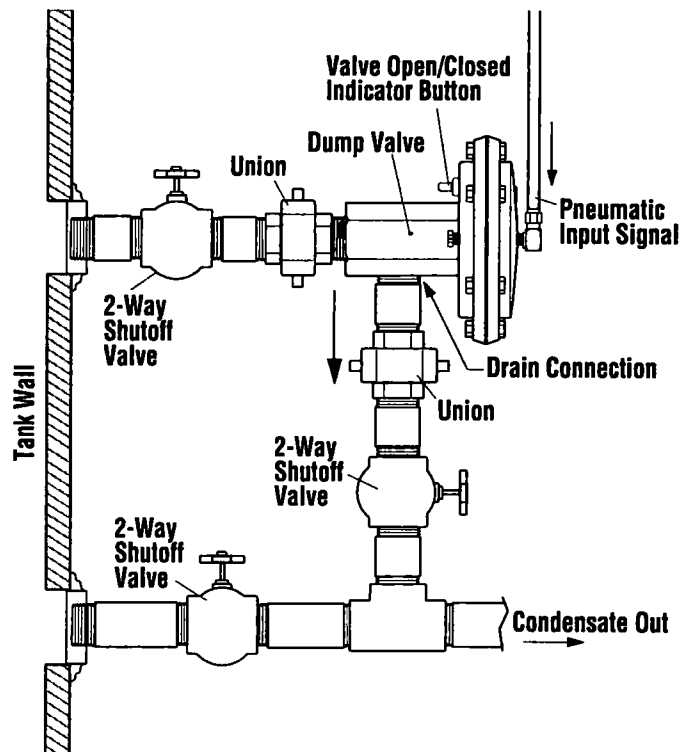
1. Install a manual shutoff (2-way) valve and a union between the DV valve and the vessel to facilitate valve repair or replacement.
2. Position the DV valve drain connection so it is on the bottom.
3. Install a 2-way valve to the drain line between the lower vessel entry and the condensate out line.
4. Be sure the unit is screwed tight and does not leak liquid.
5. Install the piping for the pneumatic input signal into the 1/8 NPT threaded connection of the pressure inlet port (on top of the DV valve).
6. Install a 2-way valve and union between the DV drain connection and the condensate out line.

NOTE: The typical procedure to remove the valve should be:

1. Close the shutoff valve between the scrubber and the DV valve.
2. Operate the dump valve to equalize pressure to the drain (condensate out) line.
3. Close the shutoff valve downstream of the drain.

Be Careful, pressure will still be in the system at the drain pressure when the unions are loosened.

Typical Dump Valve installation



REPLACING THE DUMP VALVE SEAT KIT

Replacing the Seat Kit on the Dump Valves

Tools needed: 7/8" hex wrench, 7/16" hex wrench, 1-1/8" hex wrench, and thread sealer; optional pressure source.

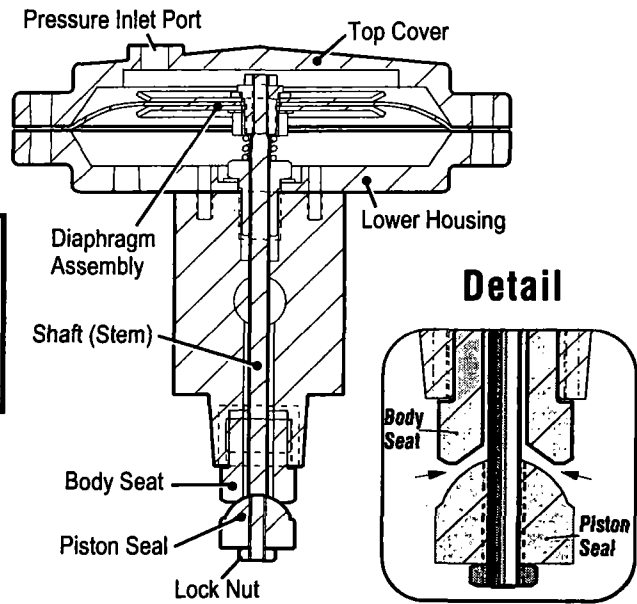
NOTE: Relieve pressure from scrubber or use the block valves before removing the DV dump valve.

1. Remove the valve from the Scrubber.



CAUTION: THE BODY SEAT AND PISTON SEAL WILL BE DAMAGED IF ALLOWED TO TURN AGAINST EACH OTHER. THE PREFERRED METHOD IS TO USE AIR TO KEEP THE VALVE OPEN. IF AIR IS NOT AVAILABLE, CAREFULLY FOLLOW THE ALTERNATE INSTRUCTIONS (STEPS 2A & 8A). ALSO, DO NOT GRIP THE OPERATING STEM WITH ANY TOOLS. IF STEM NEEDS TO BE HELD, USE THE NUT ON THE BACK OF THE DIAPHRAGM.

2. Apply 30 psi to the pressure inlet port (top of valve). The Shaft and Piston Seal will extend.
- 2A. **IF AIR IS NOT AVAILABLE DO THE FOLLOWING:** Remove the valve Top Cover (bolts/nuts). Note the orientation of the Top Cover to the bottom. Mark both sides of the Diaphragm Housing before dis-assembly. Once the Top Cover is removed, carefully turn the valve upside down with the Piston Seal pointing up. Clamp the bottom housing down, or secure it against a flat surface to compress the spring and open the Piston Seal and Body Seat. Be careful not to damage the diaphragm. The valve must be kept in this fashion, with this much clearance throughout the following operations.
3. Hold the Piston Seal with the 7/8" hex wrench, and remove the Locknut with 7/16" hex wrench.
4. Unscrew the Piston Seal with the 7/8" hex wrench. Now, unscrew the Body Seat (use 7/8" hex wrench for DV850 and DV875 models). Use the 1-1/8" hex wrench for the DV2100 Series models.



5. Apply thread sealer to new Body Seat, and screw it in place tightening with the wrench until it stops. **NOTE:** Clean the female threads in the body before inserting the new Body Seat to facilitate threading.
6. Apply thread sealer to the shaft (stem), and screw the new Piston Seal on to the shaft (stem).
7. Hold the Piston Seal with the 7/8" hex wrench and screw the Locknut in place.
8. Remove the 30 psi pressure to the pressure inlet port, and re-install the valve into the scrubber.
- 8A. Re-install the Top Cover, paying attention to the alignment marks made in step 2A. Re-install the DV into the scrubber.

REPLACING THE DUMP VALVE DIAPHRAGM ASSEMBLY

Replacing the Diaphragm Assembly for all DV models (Refer to the Illustration above)

Tools needed: 7/8" hex wrench, 7/16" hex wrench, 5/8" hex wrench or socket, and thread sealer.

NOTE: Relieve pressure from scrubber or use the block valves before removing the DV dump valve.

1. Remove the valve from the Scrubber.
2. Remove the valve Top Cover (bolts/nuts). Note the orientation of the Top Cover to the bottom. Mark both sides of the Diaphragm Housing before dis-assembly.



CAUTION: MAKE SURE TO USE A 7/8" HEX WRENCH TO HOLD THE PISTON SEAL WHILE REMOVING THE DIAPHRAGM ASSEMBLY. DO NOT GRIP THE DIAPHRAGM (BLACK RUBBER) WITH ANY TOOLS.

3. Hold the Piston Seal with a 7/8" hex wrench making sure to keep the shaft (stem) from turning, and remove the nut on the back of the diaphragm assembly with the 7/16" wrench.
4. While holding the piston seal with the 7/8" wrench, proceed to remove the diaphragm assembly by hand.

NOTE: You will be turning the assembly against the spring when unscrewing the diaphragm assembly.

5. To re-assemble the assembly, apply thread sealer to the shaft/stem threads and hold the Piston Seal with a 7/8" hex wrench.
6. Keep holding the Piston Seal with 7/8" hex wrench. Make sure the 3/4" nut side of the new diaphragm assembly is toward the shaft. Press the diaphragm assembly into the shaft threads and tighten it on to the shaft threads by hand.
7. Keep holding the Piston Seal with 7/8" hex wrench. Apply thread sealer to 7/16" nut, and screw it on to the shaft threads to lock the diaphragm assembly in place, tighten the nut with the 7/16" wrench.
8. Press down the diaphragm assembly with your hands to open the valve, and very carefully turn to align the diaphragm holes with the lower housing bolt holes.

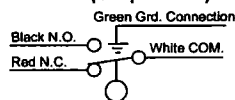


CAUTION: THE BODY SEAT AND PISTON SEAL WILL BE DAMAGED IF ALLOWED TO TURN AGAINST EACH OTHER.

9. Re-install the Top Cover, paying attention to the alignment marks made in step 2. Be sure to tighten the bolts and nuts evenly. Re-install the DV into the scrubber.

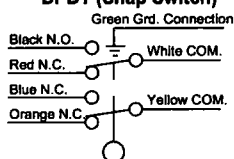
ELECTRICAL INFORMATION

SPDT (Snap Switch)



Switch Rating: 5 A @ 125-250- 480 VAC
1/2 A @ 125 VDC
1/4 A @ 250 VDC
2A @ 6-30 VDC Resistive
1A @ 6-30 VDC Inductive

DPDT (Snap Switch)



Switch Rating: 10 A @ 125-250 VAC
1/2 A @ 125 VDC
1/4 A @ 250 VDC
10 A @ 6-24 VDC Inductive/Resistive

REPLACEMENT PARTS

Order by part number designation.

L1100/L1200*

15000893: *BUOYGLAS™ float*
15000894: *Stainless Steel float for L1200*
15000937: *Stainless Steel float for L1100/L1111*
15000124: *SPDT snap switch assembly*
15010213: *L1100 counter balance assembly*
15010214: *L1200 counter balance assembly*

L1200N

15050420: *Cam spring return*
15050421: *Cam*
15000893: *BUOYGLAS™ float*
15000894: *Stainless Steel float for L1200N*
15050453: *Valve stem*
15010189: *Counter balance assembly*

L1200NDVO and L1200NDVOR

55050621: *Regulator only*
05706499: *20BPG-D-75 Pressure MURPHYGAGE®*
0-75 psi (517 kPa) [5.17 bar]
15010216: *DVOA assembly (New rectangular style)*
15000940: *DVO assembly (Old round style)*
00003341: *Filter for regulator*
00003340: *Regulator Diaphragm Kit*

DV850, DV850SS, DV875, DV875SS, DV2100 and DV2100SS

55000219: *Diaphragm Assembly (all models)*
55000224: *Seat Kit (DV850, DV850SS, DV875 and DV875SS)*
55000225: *Seat Kit (DV2100 and DV2100SS)*
55050617: *Optional Adapter Bushing 2 NPT to 1 NPT*

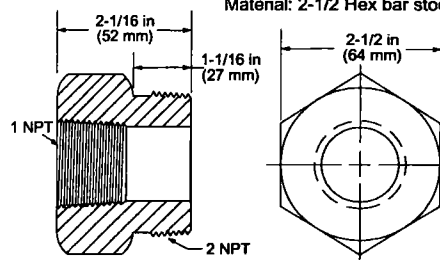
*To maintain hazardous location listings, all other repairs must be made by the factory.

ACCESSORIES

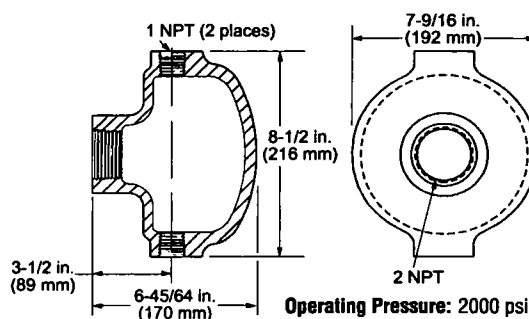
Order by part number designation.

55050617: DV850/DV875 Adapter Bushing

Material: 2-1/2 Hex bar stock C.R.S

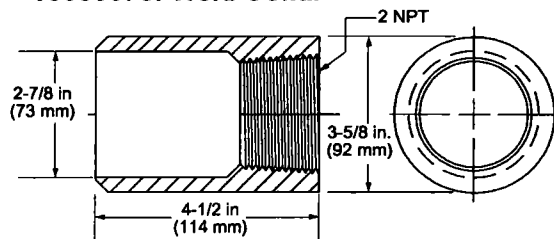


15050697: External Float Chamber



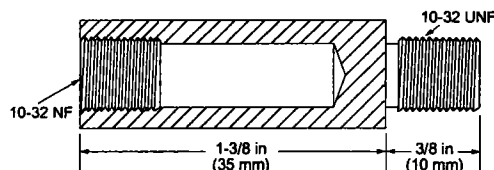
Operating Pressure: 2000 psi (13.8 MPa) [138 bar].
Operating Temperature: 400°F (204°C).

15050375: Weld Collar



Operating Pressure: 2000 psi (13.8 MPa) [138 bar].
Operating Temperature: 400°F (204°C).

15000892: Float Shaft Extension



NOTES

Warranty

A two-year limited warranty on materials and workmanship is given with this Murphy product. Details are available on request and are packed with each unit.



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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.

Instructions for Installation and Maintenance

For all 2 in. (51 mm) and 2-1/2 in. (64 mm) Dial Temperature MURPHYGAGE® and SWICHGAGE®

T-8446N
Revised 10-00
Section 10
(00-02-0168)



Please read the following information before installing. A visual inspection of this product for damage during shipping is recommended before mounting. General information and these installation instructions are intended for all 20T, 25T, A20T, and A25T series models.

GENERAL INFORMATION

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.

Description

Murphy 2 in. (51 mm) and 2-1/2 in. (64 mm) MURPHYGAGE® and SWICHGAGE® instruments have a remote sensing bulb connected to the gauge head by a sealed capillary system. **DO NOT CUT THIS CAPILLARY OR BEND AT A SHARP ANGLE.** The sensing bulb and capillary are filled with a liquid.

When heat is applied to the sensing bulb the liquid turns to vapor which exerts pressure against the diaphragm movement of the gauge. This movement is read on the dial face as temperature.

Models having face adjustable contact(s) are rated for 2 A @ 30 V (pilot duty). If the case is steel (models 20T, 20SD, 25T, etc.), the ground path for the contact circuit is through the case. Therefore, the case must be installed in the ground plane of the electrical power supply.

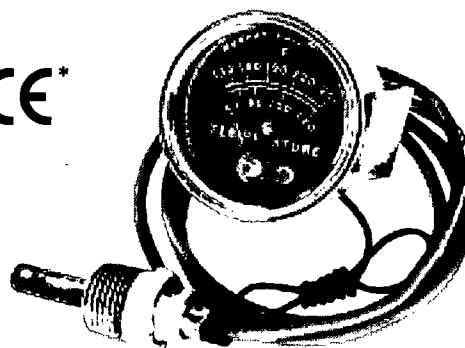
If the case is polycarbonate (models A20T, A25T), the ground path is isolated and is made through the "C" or "P" terminal on the back of the case.

Models 20TE, A20TE, 25TE and A25TE have a snap-acting switch instead of the face adjusted pointer type contact. Electrical rating is 3 A @ 30 VDC, 4 A @ 125 VAC. Reset differential for the switch is approximately 10% of the scale below the trip point. Trip point is factory set and must be special ordered for field adjustable.

SWICHGAGE® models with Alarm Before Shut-down

The 20TABS, A20TABS, 25TABS and A25TABS feature a front limit contact for high temperature equipment shut-down and an internal SPDT snap switch for Alarm Before Shut-Down (see Wiring Diagram, page 3). When the high side (preset high temperature point) of the snap switch trips, the N.O. terminal completes a circuit to activate an alarm. A continued increase in temperature will complete the shutdown circuit. A decrease in temperature of approximately 10% of scale is necessary before the snap-switch (alarm) will RESET and open the circuit.

NOTE: The front contact shut-down limit setting (adjustable) and snap switch high point are preset at the factory; if settings other than standard are necessary, then specify when ordering.



Typical TATTLETALE® Magnetic Switch

Murphy manufactures several, patented Magnetic Switches for protection of the light duty SWICHGAGE® contacts and to ensure positive shut-down of equipment. There are Magnetic Switches for Capacitor Discharge ignition, Magneto, or Battery systems, and models for electric motor driven equipment. TATTLETALE® annunciators are indicators that show the cause of shut-down. TATTLETALE® annunciators are used in conjunction with several different SWICHGAGE® instruments. The first one to trip will lockout all other TATTLETALE® annunciators. Be sure the type of Magnetic Switch matches the power source used to trip it.

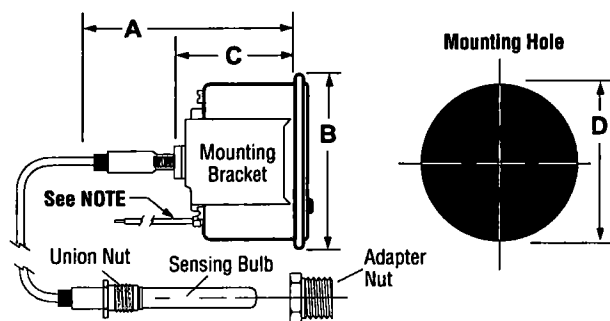
NOTE: At equipment start-up, the Magnetic Switch reset button must be held in until normal operation occurs, or an external time delay may be used. See examples of typical wiring and instructions packed with each Magnetic Switch.



CAUTION: Certain dangers to human safety and to equipment may occur if some equipment is stopped without pre-warning. It is recommended that monitored functions be limited to alarm-only or to alarm before shutdown.

IMPORTANT: SWICHGAGE® instruments, Magnetic Switches and shut-down or alarm devices, properly used, are effective tools in any preventive maintenance program. For optimum performance, check these tools periodically: look for frozen pointers, kinked/worn tubing, broken wiring or loose connections; operate the contacts and watch for expected results. Replace damaged/worn parts; clean/repair as necessary. Check for correct/complete wiring, unbroken insulation and no accidental grounds. **DO NOT run shut-down wires with ignition wiring.** Check all tubing and connections for leaks. Mount Magnetic Switches and valves upright, to prevent moisture collection.

MOUNTING DIMENSIONS



NOTE: 20 and 25 Series have 18 AWG pigtail. A20 series has #4 screws. A25 series has #6 screws.

For All 20, 25, A20, and A25 Series Temperature MURPHYGAGE® and SWICHGAGE® instruments

| | 20 Series | A20 Series | 25 Series | A25 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: The dimensions above are in inches and (millimeters).

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

INSTALLATION



WARNING: DISCONNECT THE BATTERY OR POWER SOURCE BEFORE BEGINNING THE INSTALLATION. DO NOT OPEN RADIATOR CAP OR FITTINGS ON A HOT ENGINE. DANGEROUS BURNS CAN OCCUR.

Panel Mounting

The 20, 25, A20 and A25 series models can be installed in a panel from 0.032 in. (1 mm) to 0.250 in. (6 mm) thick. See Mounting Dimensions, page 1. Remove the mounting bracket completely and insert the MURPHYGAGE®/SWICHGAGE® from the front side of the panel. Replace the bracket and secure it in place. **IMPORTANT: Do NOT overtighten the mounting bracket. Shockmount the panel as necessary.**

LIQUID COOLED ENGINES:

1. Drain engine coolant to a level below the temperature sensing connection/plug. This connection is on the engine side of the thermostat generally near thermostat housing. *Consult your engine manual.*
2. Remove adapter nut from temperature sensing bulb and union nut.
3. Apply a non-hardening thread sealant to the adapter nut and screw securely into the water jacket opening in the engine.
4. Route the temperature capillary AWAY from hot surfaces such as exhaust manifolds.
5. Place the sensing bulb into the adapter nut and observe that the sensing bulb does not "bottom" in the water jacket nor are there other obstructions in the water jacket opening. Secure sensing bulb into the adapter nut with the 5/8-18 union nut. *See Figure 2.*



CAUTION: Do NOT cut or bend the temperature capillary at a sharp angle. Excess capillary must be carefully coiled and secured. The temperature sensing bulb must be immersed directly into the water jacket flow to sense coolant temperature. Do NOT install into a tee or other fitting. Use only Murphy adapter nuts.

6. Coil excess temperature capillary into a 2 in. (51 mm) diameter minimum coil. Tie the coil to prevent excessive movement.
7. Allow the engine to warm up and the thermostat to open. Slightly loosen the 5/8-18 union nut on the temperature sensing bulb to allow trapped air to escape from the cooling system. Retighten the nut.



WARNING: Perform this operation using appropriate protection. Trapped air and coolant may cause burns.

AIR COOLED ENGINES:

Temperature for air cooled engine can be measured in the cylinder head or in the lubricating oil. Oil temperature will give a more uniform reading than cylinder head since the oil circulates throughout the engine. Refer to specific instructions supplied, if any, for your specific application.

1. Oil Temperature

- a. The SWICHGAGE® sensing probe must be fully immersed in the oil pan, oil filter housing, oil cooler, etc. depending on engine model and configuration.
- b. Observe all precautions for liquid cooled engines.

2. Cylinder Head Temperature

- a. Generally the cylinder head must already have a hole drilled and tapped for insertion of the temperature sensing probe.
- b. If a hole is not provided in the cylinder head and no provision is made to drill and tap one, it may be possible to install an external bolt on heat sink such as the Murphy HS7.
- c. Coat the temperature sensing probe with a high temperature grease. A mixture of silicone and graphite flakes is recommended although grease alone can be used.



CAUTION: Do NOT apply too much grease. If grease is pushed out of the hole when temperature probe is inserted, remove some grease.

- d. Observe all precautions for liquid cooled engines.

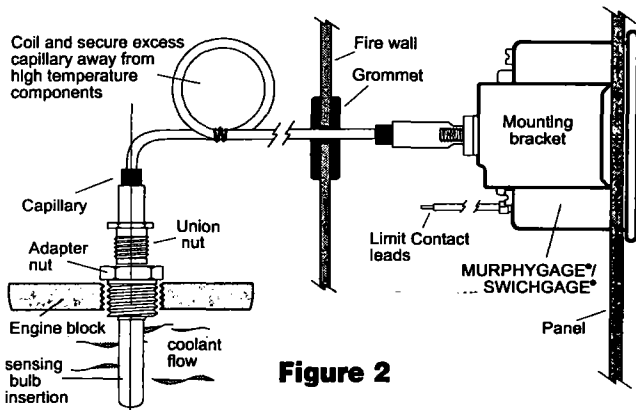


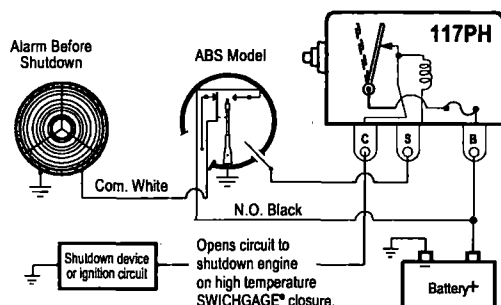
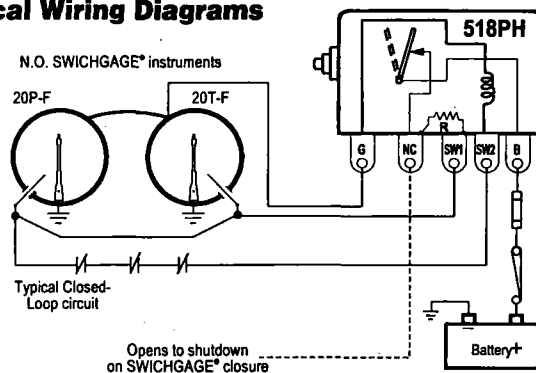
Figure 2

Connecting the TATTLETALE®/Magnetic Switch

1. Mount with electrical lugs down. If necessary, drill the case and pilot-stud holes (template provided).
2. Clean away burrs and filings. Position the Magnetic Switch in the panel, making sure the pilot stud is in place.
3. Add decal, then washer, then nut and tighten.

NOTE: Murphy components are easily wired and maintained. Use good quality wire and terminals. The type of Magnetic Switch differs for various applications. See examples of typical wiring (below). Wiring and instructions are packed with each Magnetic Switch.

Typical Wiring Diagrams



IMPORTANT INFORMATION: Do NOT clean MURPHYGAGE®, SWICHGAGE® and Magnetic Switch with steam or high pressure washes. Many solvents and cleaners can haze and permanently damage the clear, polycarbonate. Clean your devices with: mild soap and water, mineral spirits, methyl/isopropyl/isobutyl alcohols, or 1 & 3 denatured alcohols.

WARNING: Do not clean the MURPHYGAGE®/SWICHGAGE® - Magnetic Switch when equipment is running or very hot.

INSTALLATION Continued

Setting the SWICHGAGE® contacts



IMPORTANT: For 20TE, 25TE, A20TE and A25TE models the switch trip point **CANNOT** be set at either the lowest or the highest extremes of the scale. Trip point **MUST** allow for the switch reset differential. For adjustable switch versions, the switch point is adjustable **ONLY** over the upper half of the scale.

1. All contacts are set using a 1/16 in. hex wrench (Figure 3).
2. Some models such as A20TE, A25TE, etc. may not have field adjustment. *Consult the factory if in doubt.*
3. Observe the "normal operating" temperature readings. Set the contact slightly above maximum reading observed or slightly below maximum temperature recommended by equipment manufacturer.

Testing the Contacts

1. With equipment running; use a 1/16 in. hex wrench to rotate contact until it touches the pointer. **Do NOT** force contact against the gage pointer. Equipment should shut down and/or alarm should operate.

Reset the contact (Figure 3).

2. **VERY IMPORTANT** Each time you start the machine, observe that the SWICHGAGE® is indicating temperature. Visual inspection and regular testing should be normal procedure to ensure proper operation and to achieve maximum results from your SWICHGAGE®.

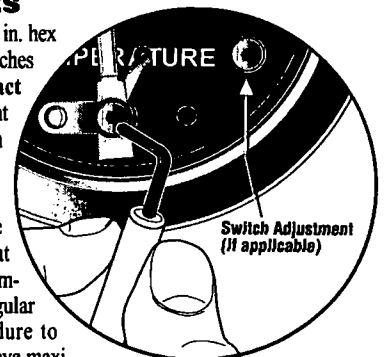


Figure 3

TYPICAL WIRING DIAGRAMS



WARNING: DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING THE WIRING INSTALLATION

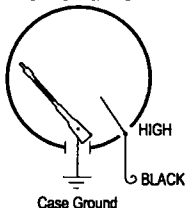
20 and 25 Series models

These diagrams are shown with the pointer in the at rest (shelf) position.

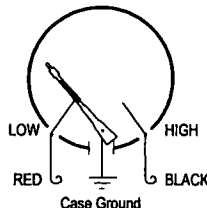
Pointer contact rating: pilot duty 2 A @ 30 VAC/DC.

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

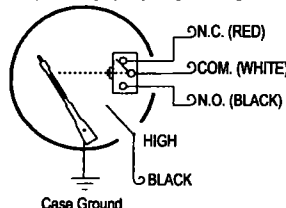
20T and 25T



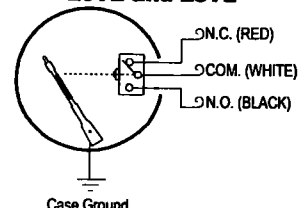
20T-HL and 25T-HL



20TABS and 25TABS



20TE and 25TE



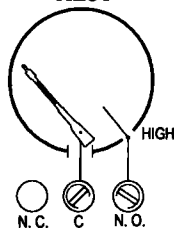
A20 Series models

These diagrams are shown with the pointer in the at rest (shelf) position.

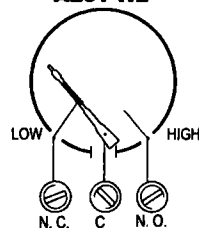
Pointer contact rating: pilot duty 2 A @ 30 VAC/DC.

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

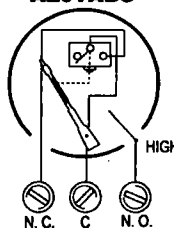
A20T



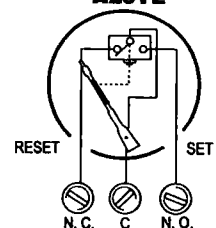
A20T-HL



A20TABS*



A20TE



* **CAUTION** Pointer contact and ABS switch share the same "Common." Voltage source **MUST** be the same. Maximum voltage is 30 V. Consult factory for 120 VAC applications.

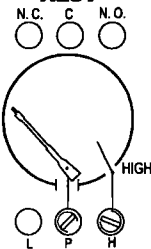
A25 Series models

These diagrams are shown with the pointer in the at rest (shelf) position.

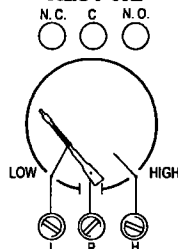
Pointer contact rating: pilot duty 2 A @ 30 VAC/DC.

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

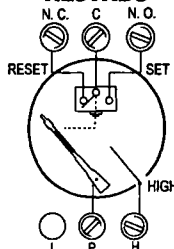
A25T



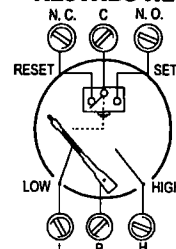
A25T-HL



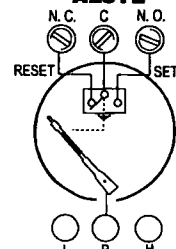
A25TABS



A25TABS-HL



A25TE



TROUBLESHOOTING TIPS

DO THIS FIRST:

- Verify that the SWICHGAGE® has not been damaged (hit or dropped).
- Check for kinked or broken/worn capillary tubing.
- Verify that the sensing bulb is immersed in coolant flow.
- Look for broken wiring, frozen pointer, dirty contacts (will not make).
- Verify that there is coolant or water flowing inside the engine.
- Reset Magnetic Switch and verify that it stays latched.

The following information will assist in the correction of most problems which you may encounter with the unit. If any problems persist after you have made these checks, consult your nearest Murphy facility.

| SYMPTOM | CAUSE | TEST/REMEDY |
|---|---|--|
| Engine will not start. | <ol style="list-style-type: none"> 1. Short or Open circuit, be sure that the Magnetic Switch latches and either puts out power to run device or removes ground (magneto or CD ignition). Check for power or ground at run device. 2. Control circuit overloaded by accessories (blown fuse in Magnetic Switch). 3. False ground in control circuit. | <ol style="list-style-type: none"> 1. Reset Magnetic Switch and make sure it stays latched. For 518PH check battery voltage and place a jumper between SW1 and SW2. If switch latches, check SWICHGAGE® wiring circuit and repair. If switch does not latch, repair or replace Magnetic Switch. 2. Find the cause of the blown fuse and replace it (use a 14 A fuse). Reroute the accessories. 3. Repair. |
| False shutdown. | <ol style="list-style-type: none"> 1. SWICHGAGE® circuit has intermittent open or short. 2. Vibration causes the Magnetic Switch to trip. | <ol style="list-style-type: none"> 1. Check all wiring and replace as necessary. 2. Repair and relocate the switch as needed. |
| SWICHGAGE® closes but does not trip the magnetic switch or kill the engine. | <ol style="list-style-type: none"> 1. Incomplete shutdown circuit. 2. Dirty SWICHGAGE® contacts. 3. Magneto not providing power to primary terminal post. 4. SWICHGAGE® case may not be grounded. 5. Incorrect Magnetic Switch for type of power. | <ol style="list-style-type: none"> 1. Locate open circuit and repair. 2. Clean and check that contacts make. 3. Repair magneto. 4. Ground case. 5. Replace with correct Magnetic Switch. |
| TATTLETALE® tripped but engine is still running (magneto or CD ignition) | <ol style="list-style-type: none"> 1. Open circuit between the TATTLETALE® and the shutdown device. 2. Lost ground to kill the engine. | <ol style="list-style-type: none"> 1. Check wiring from TATTLETALE® to shutdown device, repair or replace. 2. Check all wiring and connections and repair. |
| Pointer will not operate properly. Inaccurate reading. | <ol style="list-style-type: none"> 1. Frozen pointer 2. Loose pointer spring (caused by hitting or dropping gauge). 3. Bulb not inserted to full length or low coolant level. 4. Kinked/crimped/broken capillary. | <ol style="list-style-type: none"> 1. Return for repair or replace. 2. Return for repair or replace. 3. Correct. 4. Correct |
| Pointer or contact burned-in-two. | <ol style="list-style-type: none"> 1. Without exception this condition is caused by incorrect wiring or a short circuit. | <ol style="list-style-type: none"> 1. Refer to wiring diagram and recheck wiring; replace SWICHGAGE® or return for repair. Observe voltage and current ratings. |

WARRANTY

A two-year limited warranty on materials and workmanship is provided with this Murphy product. Details are available on request and are packed with each unit.



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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.

Installation for 4-1/2 in. (114 mm) dial Pressure MURPHYGAGE® and SWICHGAGE®

Model Series: OPLC, OPLG, OPLBP, 45PE, 45PEBP and 45 Series

Options: -OS, -ES, -P4 and -P6



Please read the following instructions before installing. A visual inspection is recommended before mounting. General Information and these installation instructions are intended for all 4-1/2 in. (114 mm) dial pressure models.

GENERAL INFORMATION

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.

OPLC and OPLFC SWICHGAGE® instruments have high and low limit contacts to monitor, alarm or shut down. The OPLC has a flanged case. A method to override the low limit contact for start-up is provided on most models. See Operation Test section—page 3. OPLFC can be direct or panel mounted (see page 2).

OPLG and OPLFG MURPHYGAGE® instruments are indication-only pressure gages. Same as OPLC and OPLFC models except without switch (limit) contacts.

45 Series includes a magnetic switch to stop an engine or electric motor each time the gage contact operates. A lockout push button overrides low contact for startup. Other variations available.

45PE and 45PEF Series are versions of the OPLC Series featuring 2 snap-acting SPDT switches instead of the pointer type contacts. These units do not include low contact lockout.

OPLBP and 45PEBP are versions of the OPLC and 45PE models. They feature pilot duty limit switches connected to an internal latching control relay for “on/off” control directly or through a motor starter.

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.

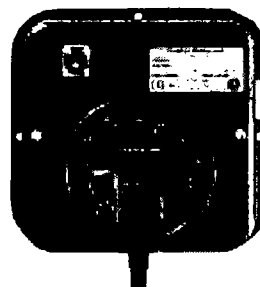
Process Connection: 1/4 NPTM thru 1000 psi;

1/2 NPTM 1500 - 20,000 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%.



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

Switch Reset Deadband: Approximately 10% FS.

Snap-Acting Switches: See wiring information (page 4).

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 mm²) x 9 in. (229 mm) long.

Wire Connections (-ES, -OS, -CC): 1/2 NPTM conduit
and wire leads, 24 AWG (0.22 mm²) x 33 in. (838 mm) long.

Item Weight: 5 lbs 6 oz (2.4 kg) approximately.

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

Item 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.



Precautions

- Do NOT exceed rated pressure range.
- Dope or use teflon tape on connection threads. Do not block the inlet orifice.
- For direct mount into the process, a vertical or ninety degree mounting is recommended.
- Use wrench on shank to tighten or loosen connection.
- Do not twist case when installing, this will damage internal components and will void the warranty. **Do not overtighten.**
- Use shock mounts as necessary to prevent excessive vibration.
- **COLD WEATHER WARNING:** If liquid in the system is allowed to freeze, it will expand and may damage the tube.
- Drain the system when freezing temperatures are expected.

Warranty

A two-year limited warranty on materials and workmanship is given with these Murphy products. Details are available on request and are packed with each unit.

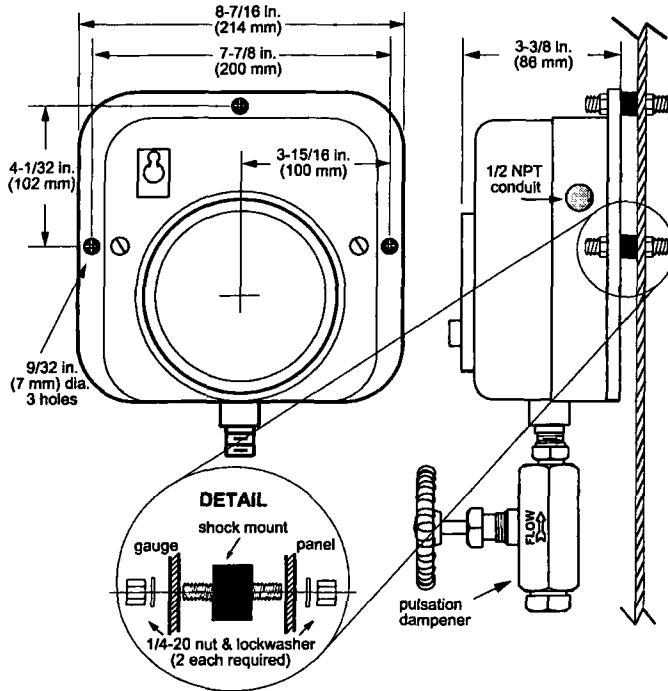
*Selected configurations are third party listed. Consult factory for details.

**Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted. Does not cover “BP” models.

CASE MOUNTING

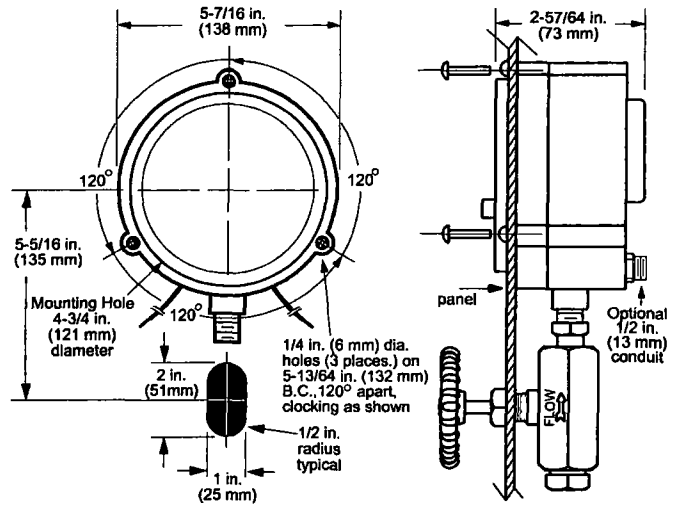
Wall Mount

Flanged case design intended for wall mount, it can also be direct mounted. Shown with shock mounts and pulsation dampener, (optional).

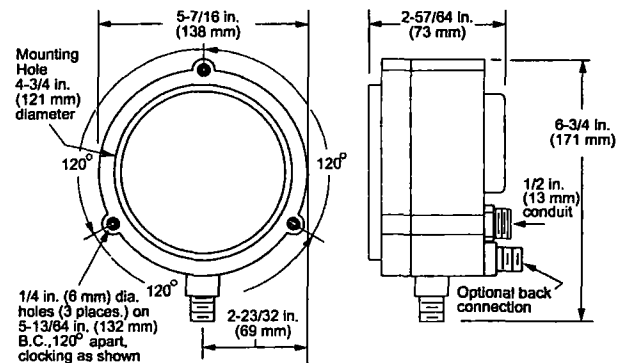


Flush Mount

A round case design to be mounted within a panel from 1/32 in. (1 mm) to 1/8 in. (3 mm) thick. It can also be direct mounted. Shown with pulsation dampener option.

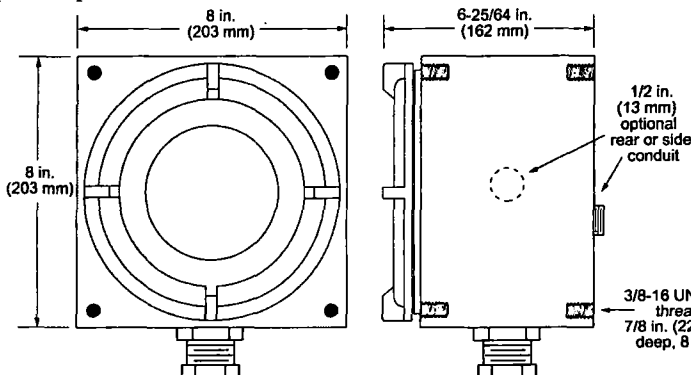


Options "OS" and "ES" (flush mount case)

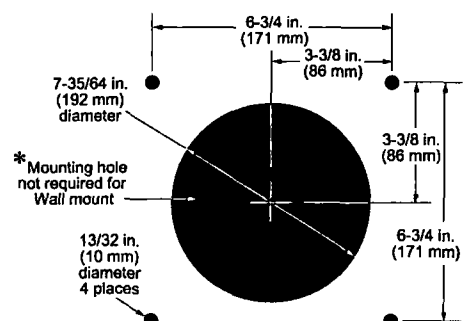


Explosion-proof Case Mount

Explosion-proof case can be mounted from face or rear.



Flush mount/Wall mount*



OPTIONS

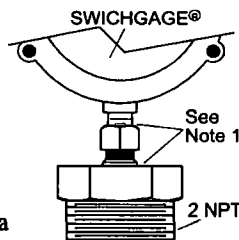
"OS" and "ES": The "OS" (oil sealed case) and the "ES" (environment sealed case) options for corrosive environment feature a panel mount case design or screw directly into the process. See page 2 for mounting.

Pulsation Dampener controls any pressure indicating instrument subject to pulsation. This device is NOT intended as a "shutoff" valve. (See mounting instructions, page 2).

P6 (was PT167) is a sealed mechanism with a typical application for oil well lead lines. It consists of a 2 NPT housing with a diaphragm seal filled with silicon fluid which attaches directly into the process.

NOTES:

1. Do not tamper with or break sealed connections.
2. The pressure transmitter threads into a 2 NPT tee on the lead line. Tighten only the 2-5/8 in. (67 mm) hex fitting.



P4 (was PT147) is a remote seal mechanism with stainless steel armored capillary to protect the SWICHGAGE® from highly viscous and/or corrosive fluids.

1. Install the pulsation dampener into the source pressure connection. Use of thread sealant is suggested.

2. Loosen the eight housing bolts until the bottom housing is free to turn.

CAUTION: do not unscrew the green diaphragm capsule.

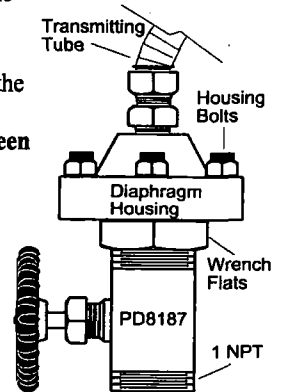
3. Tighten the bottom housing to the 1 NPT on pulsation dampener.

4. Tighten the eight housing bolts to 25±3 foot lbs. by staggering the tightening to assure even clamping.

5. Route capillary away from heat source such as exhaust manifold.

6. Excess transmitting tube should be carefully coiled and secured to avoid any damage.

7. Do NOT cut capillary or make sharp bends.



LIMIT CONTACT / INDICATION POINTER ADJUSTMENTS

Limit Contact Adjustments

Facing the dial, left side knob is "Low limit" contact. "High limit" contact is located next to the "Low" limit contact.

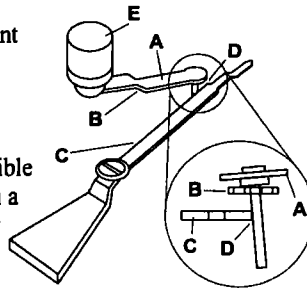
NOTE: the 45PE Series features a stacked limit indicator knob with both limit adjustments included. The bottom half knob adjusts the "Low" limit indicator, the top half is to adjust the "High" limit indicator.

To set limit contact simply turn the fingertip type knob to the desired point on the scale.

Limit Contact Wiping Feature

The force of pointer causes the flexible contact arm (A) to "tilt" resulting in a wiping action (D). This clears away film or corrosion formed on the contact surfaces.

- A. Contact arm-flex
- B. Contact arm
- C. Pointer Contact
- D. Initial point of contact
- E. Limit contact knob



Indication Pointer Adjustments

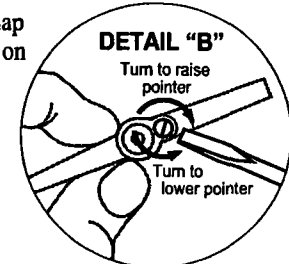
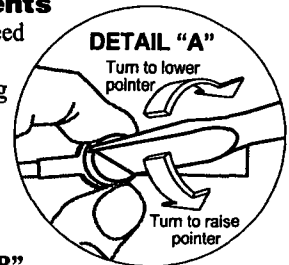
To reset to zero or to a known value proceed as follows:

1. Turn off power. Remove the snap ring and the lens/contact assembly (or open hinged cover).
2. Hold the pointer hub with thumb and forefinger then turn screw to desired point. See DETAIL "A".

For the 45PE Series see DETAIL "B".

3. Replace lens contact assembly and snap ring (or close hinged cover), and turn on power.

NOTE: Span adjustments and recalibration must be performed by authorized mechanic or return the unit to Frank W. Murphy Mfr.



OPERATION TEST INSTRUCTIONS

OPLC, OPLFC, OPLFDP and OPLBP

1. Perform operation test after the unit is installed and wired appropriately. (See typical wiring diagram page 4.)
2. When pressure is applied to the instrument either directly from a process variable or through a fluid/gas filled capillary, the pointer will travel in a clockwise direction. (Adjust contacts to desired set points.)
3. To start, place the toggle switch in the "start" position or otherwise override low contact.
4. After the indication pointer rises past the low limit contact, return the toggle switch or override device to the "run" position.
5. To test the limit contacts, turn the limit contact to be tested until it touches the pointer. That will trip the control circuit.
6. Reset the shutdown or alarm circuit device and repeat above sequence.

45 Series

1. Repeat steps 1 and 2. (See OPLC operation test instructions.)
2. Press the semi-automatic pushbutton located on the low contact knob.
3. Reset the magnetic switch pushbutton.
4. After the indication pointer rises past the low limit contact the lockout-pushbutton automatically disengages and the low limit is armed.
5. Repeat steps 5 and 6. (See OPLC operation test instructions.)

45PE, 45PEF and 45PEBP

1. Repeat steps 1 and 2. (See OPLC operation test instructions.)
2. To test the switches, turn the limit indicator until it touches the pointer, then continue to rotate until the snap switch operates*.
3. Reset the shutdown or alarm circuit device.

* The trip point indicator will stop the pointer movement slightly before the snap switch operates. As pressure continues to increase or decrease, the trip point setting is reached.

TYPICAL ELECTRICAL DIAGRAMS



WARNING: PERFORM THE WIRING OPERATION WITH THE POWER SOURCE "OFF". MAKE SURE THE VOLTAGE AND CURRENT REQUIREMENTS ARE WITHIN THE SWITCHGAGE® RATINGS. BEFORE WIRING DETERMINE VOLTAGE AND POLARITY FOR THE APPLICATION. USE THE APPROPRIATE WIRE SIZE. ALL CONNECTIONS SHOULD BE MADE USING A SPADE (FORKED) OR RING TERMINALS. FOR PIGTAIL CONNECTIONS USE WIRE NUTS. CONDUIT IS RECOMMENDED TO PROTECT WIRES FROM DAMAGE.

OPLC and OPLFC

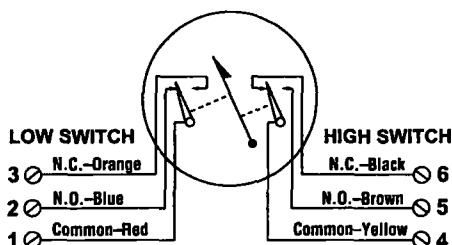
Contact Rating: 1 SPDT, Center Off, 2 A, 30 VDC, 1 A, 125 VAC pilot duty.



NOTE: Diagrams above show the pointer in the at rest (shelf) position.

45PE and 45PEF

Contact Rating: 2-SPDT snap-switches (one for high and low pressure), 2 A inductive, 250 VAC each switch. *NOTE: Diagram below shows the pointer in the at rest (shelf) position.*



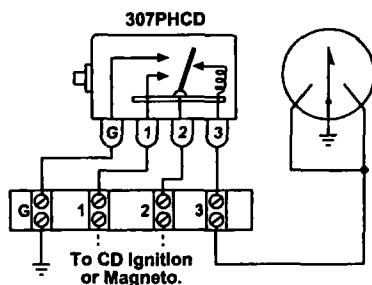
45 Series with 307PHCD

Contact Rating: 12/32 VDC coil, 10 A, 32 VDC battery ignition contacts; Magneto ignition coil, 10 A magneto ignitions contacts; CD ignition coil, 10 A CD ignition contacts; 120 VAC coil, 10 A, 120 VAC contacts.

NOTE: Diagram below shows the pointer in the operating position.

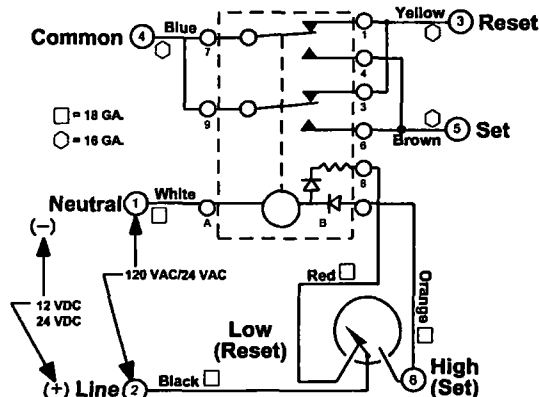
IMPORTANT:

Use with 110/120 VAC requires isolated ground SWITCHGAGE® instruments.



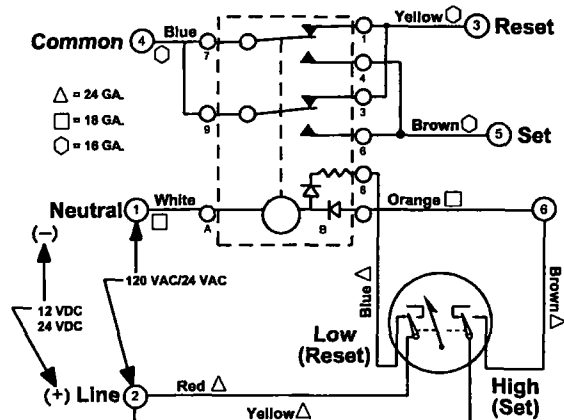
OPLBP

Contact Rating: SPDT dry relay contacts; 10 A, 125 VAC. *NOTE: Diagram below shows the pointer in the at rest (shelf) position.*



45PEBP

Contact Rating: SPDT dry relay contacts; 10 A, 125 VAC. *NOTE: Diagram below shows the pointer in the at rest (shelf) position.*



Transformer Relay Assemblies

For higher voltages, Murphy TR Assemblies can be used in conjunction with any SWITCHGAGE®.



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