

# Installation Instructions

## Pressure and Vacuum Dial Murphygage® and Swichgagage® Instruments

### 20, 25, A20 and A25 Series, 2 and 2-1/2 in. (51 and 64 mm) Dial Sizes

<b>WARNING</b>	<p>Before beginning installation of this Murphy product:</p> <ul style="list-style-type: none"> <li>• Disconnect all electrical power to the machine</li> <li>• Make sure the machine cannot operate during installation</li> <li>• Follow all safety warnings of machine manufacture</li> </ul>
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Please read the following instructions and visually inspect product for shipping damage before installation.

### Description

The 2 and 2-1/2 in. (51 and 64 mm) dial size Murphygage and Swichgagage instruments are diaphragm-actuated, pressure or vacuum gages with a 1/8-27 NPTM pressure port connection (2 pressure ports for differential pressure models).

Models with face-adjustable contact(s) are rated for 2 A @ 30 V (pilot duty). If the gage case is steel (20P, 25P, 20DP, 25DP 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 (A20P, A20DP, A25P, A25DP etc.), the ground path is isolated and is made through the C or P terminals on the back of the gage case (C for A20 models; P for A25 models). Models 20PE, 25PE, A20PE, A25PE etc. have a snap-acting switch instead of the face adjustable 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.

**NOTE:** Select a scale so your normal operating pressure is in the upper middle of the scale.

<b>WARNING</b>	<p>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.</p>
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### Alarm Before Shutdown Models

The models 20PABS, A20PABS, 25PABS and A25PABS feature a front limit contact for equipment shutdown and an internal SPDT snap-switch for Alarm Before Shutdown. When the low side (preset point) of the snap-switch trips, the N.C. terminal completes a circuit to activate an alarm. A continued decrease in pressure will complete the shut-down circuit. An increase in pressure of approximately 10% of scale is necessary before the snap-switch (alarm) will reset and open the circuit.

### Typical Tattletale® Magnetic Switch

Murphy by Enovation Controls manufactures several patented Magnetic Switches for protection of the pilot-duty Swichgagage contacts and to ensure positive shutdown of equipment. There are magnetic switches for CD ignition, Magneto, Battery systems and electric motor-driven equipment. Tattletale annunciators show the cause of shutdown. The first one to trip will lockout all other Tattletale annunciators. Be sure the type of magnetic switch or Tattletale annunciator matches the power source used to trip it.

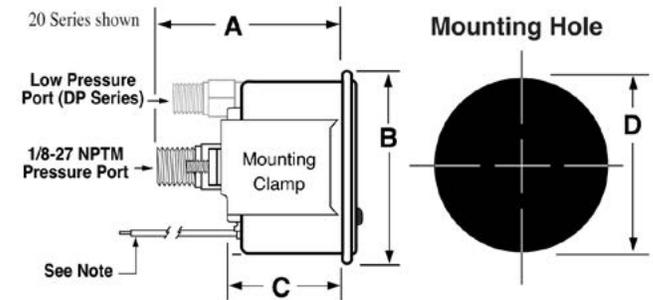
**NOTE:** At equipment startup (for models not having a built-in time delay), the reset button must be held in until normal operation occurs or an external time delay may be used. Instructions are packed with each Magnetic Switch or Tattletale annunciator.

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

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### Typical Mounting Dimensions

**NOTE:** 20/25 Series: 18 AWG pigtails. A20/A25 series: #4/#6 screws.



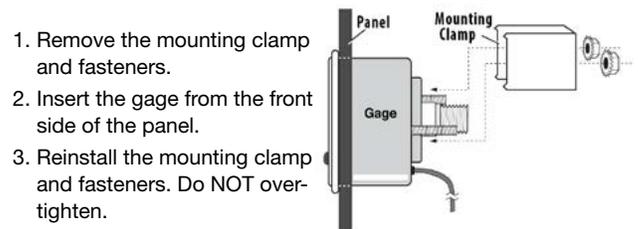
	20 Series	A20 Series	25 Series	A25 Series
A	2-7/32 (56)	2-9/16 (65)	2-1/8 (54)	1-51/64 (46)
B	1-5/16 (33)	1-1/4 (32)	1-3/8 (35)	1-27/64 (36)
C	2-15/64 (57)	2-1/4 (57)	3-1/8 (79)	2-29/32 (74)
D	2-1/16 (53)	2-1/16 (53)	2-11/16 (68)	2-11/16 (68)

The dimensions are in inches and (millimeters).

### Panel Mounting

<b>!</b>	<b>IMPORTANT:</b> Mount the magnetic switches and valves upright to prevent moisture collection.
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All models can be installed in a panel from 0.032 to 0.250 in. (1 to 6 mm) thick.



### Check List

When properly used, the Swichgagage instruments, magnetic switches and shut-down or alarm devices 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.

## Pressure Port Connection

Pressure tubing is generally not provided. The use of good, quality flexible pressure tubing/hose and fittings are strongly suggested.

**CAUTION: DO NOT FOUL the pressure orifices with pipe dope or dirt or the SWICHGAGE® instrument will not operate.**

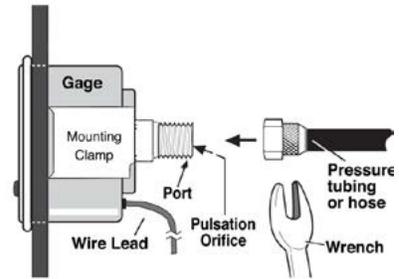
Use at least 3/16 in. (5 mm) I.D. tubing. If using copper or rigid tubing, install at least 12 in. (305 mm) flexible hose from the gage to the rigid tubing. This prevents damaging vibration from reaching the gage.

For most models a pulsation orifice, within the pressure port, is provided, and it is removable for cleaning.

1. Apply sealant on the male threads being careful not to contact the pressure orifice.

Description	Sealant Specification
Pressure Port Threads	Teflon Base Pipe Dope or Teflon Tape

2. Connect the tubing to the 1/8-27 NPTM port and tighten.



## Vacuum Models Connection

The vacuum instruments measure intake manifold vacuum and give an indication of the load applied to the engine.

**CAUTION: DO NOT FOUL the pressure orifices with pipe dope or dirt or the SWICHGAGE® instrument will not operate.**

Mount the gage in a suitable location so that the face is visible and easily accessible.

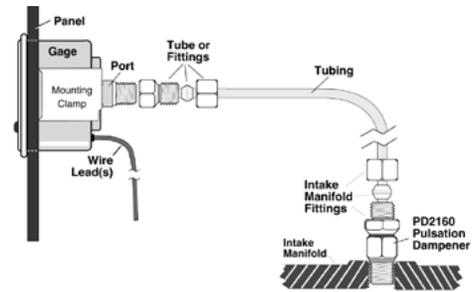
Connect suitable tubing to the 1/8-27 NPT port of the gage and to an open port in the intake manifold. Mounting kit V5179 is suggested and includes tubing and necessary fittings.

The manifold fitting is 1/4 NPT. The drawing to the right shows a typical mounting using V5179 kit. A Murphy PD2160 is also recommended.

1. Apply sealant on the male threads being careful not to contact the pressure orifice.

Description	Sealant Specification
Port Threads	Teflon Base Pipe Dope or Teflon Tape

2. Connect the tubing to the 1/8-27 NPTM port.
3. Be sure connections are tight—gage will not operate properly if line leaks.



## Differential Pressure Models Connection

Differential pressure models are typically applied to indicate restriction in oil/fuel filters. The High pressure port (center mounted) is piped to the Inlet side of the filter. The Low pressure port (top center mounted) is piped to the Outlet side of the filter.

**CAUTION: Failure to use a second wrench on the low pressure port when tightening tube fittings may result in damage to the internal mechanisms.**

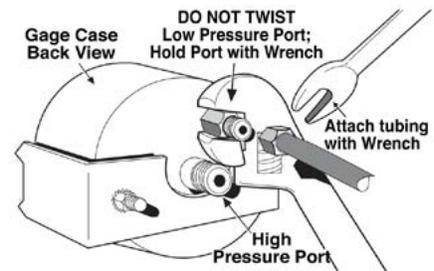
**CAUTION: DO NOT FOUL the pressure orifices with pipe dope or dirt or the SWICHGAGE® instrument will not operate.**

To connect the high pressure tubing use at least 3/16 in. (5 mm) I.D. flexible pressure tubing/hose and fittings. If using copper or rigid tubing, install at least 12 in. (305 mm) flexible hose from the gage to the rigid tubing (to prevent damaging vibration to the gage).

1. Apply sealant on the male threads being careful not to contact the pressure orifice.

Description	Sealant Specification
High and Low Pressure Port Threads	Teflon Base Pipe Dope or Teflon Tape

2. Connect the tubing to the Low Pressure 1/8-27 NPTM port.
3. You MUST use a wrench to hold the low pressure port in position while using a second wrench to tighten the pressure tubing/hose fitting onto the port. Doing so will prevent damage to the internal mechanisms of the gage.
4. Connect the tubing to the High Pressure 1/8-27 NPTM port and tighten.



**IMPORTANT: NEVER exceed maximum static pressure or differential pressure ratings for your gage range; listed below.**

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

Values are shown in psi, (kPa/MPa) and [bar]. Values in kPa/MPa and bar are mathematical conversions from psi—they do not reflect actual second scale range.

# Pressure Ranges and Factory Settings

Ranges Available		Maximum	Std. Settings*		Hi Settings**		20/25PABS Settings				Start-up Lockout Settings					
							Low		Alarm*		Contact		Lockout		Release (max.)	
psi	bar	pressure	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar
0-15 (103)	1.0	30 psi (21 MPa)	3 (21)	0.2	12 (83)	0.8	3 (21)	0.2	6 (41)	0.3	3 (21)	0.2	4 (28)	0.3	6 (41)	0.4
0-30 (207)	2.0	60 psi (21 MPa)	7 (48)	0.4	24 (165)	1.6	7 (48)	0.4	10 (69)	0.6	4 (28)	0.4	7 (48)	0.5	10 (69)	0.7
0-50 (345)	3.5	100 psi (21 MPa)	10 (69)	0.8	40 (276)	2.8	10 (69)	0.8	13 (90)	1.0	10 (69)	0.5	13 (90)	1.0	20 (138)	1.4
0-75 (517)	5.0	150 psi (21 MPa)	15 (103)	1.0	60 (414)	4.0	15 (103)	1.0	18 (124)	1.5	10 (69)	0.7	15 (103)	1.0	23 (159)	1.6
0-100 (690)	7.0	200 psi (21 MPa)	20 (138)	1.5	80 (552)	5.5	20 (138)	1.0	23 (159)	1.5	20 (138)	1.0	25 (173)	2.0	35 (241)	2.4
0-150 (1.0 MPa)	10	300 psi (3.4 MPa)	30 (207)	2.0	120 (827)	8.0	30 (207)	1.5	33 (228)	2.0	20 (138)	1.5	30 (207)	2.0	45 (310)	3.1
0-200 (1.4 MPa)	14	400 psi (3.4 MPa)	50 (345)	3.0	150 (1 MPa)	10	50 (345)	3.0	53 (365)	4.0	40 (276)	3.0	50 (345)	3.5	70 (482)	4.8
0-300 (2.1 MPa)	20	500 psi (3.4 MPa)	75 (517)	5.0	225 (1.6MPa)	15	75 (517)	5.0	78 (538)	5.0	50 (345)	3.5	75 (517)	5.0	105 (724)	7.2
0-400 (2.8 MPa)	28	500 psi (3.4 MPa)	150 (1MPa)	7.0	300 (2.1MPa)	20	75 (517)	5.0	150 (1MPa)	10	100 (690)	6.0	—	7.0	150 (1MPa)	10

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

\* Standard setting for 20P/25P and 20PE/25PE models

\*\* Low settings for Hi/Lo option same as a standard settings. Hi/Lo option available for 20P/25P models only.

\* SPDT Snap-switch is the alarm switch.

## Setting the Swichgag Instrument Contacts

Some models such as A20PE, A25PE, etc. may not have field adjustment. Consult the factory if in doubt.



**IMPORTANT:** If the Swichgag has a lockout push button on the face, a contact setting higher than the factory setting will make the lockout device inoperative. For 20PE, 25PE, 25DPE, A20PE, A25PE and A25DPE 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 lower half of the scale.

For adjustable models:

1. Use a 1/16 in. hex wrench to set contacts. A 1/4 turn clockwise lowers switch operating point approximately 7% of scale.
2. Observe the normal operating pressure or vacuum readings.
3. Set the contact slightly below minimum reading observed or slightly above minimum pressure recommended by equipment manufacturer. For differential pressure models, set the contact slightly below the desired maximum differential pressure.

## Testing the Contacts

1. With equipment running, use a 1/16 in. hex wrench to rotate the 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.
2. VERY IMPORTANT: Each time you start the machine, observe that the SWICHGAGE® is indicating pressure or vacuum.
3. Perform a visual inspection and regular testing as a normal procedure to ensure proper operation and to achieve maximum results from your Swichgag instrument.



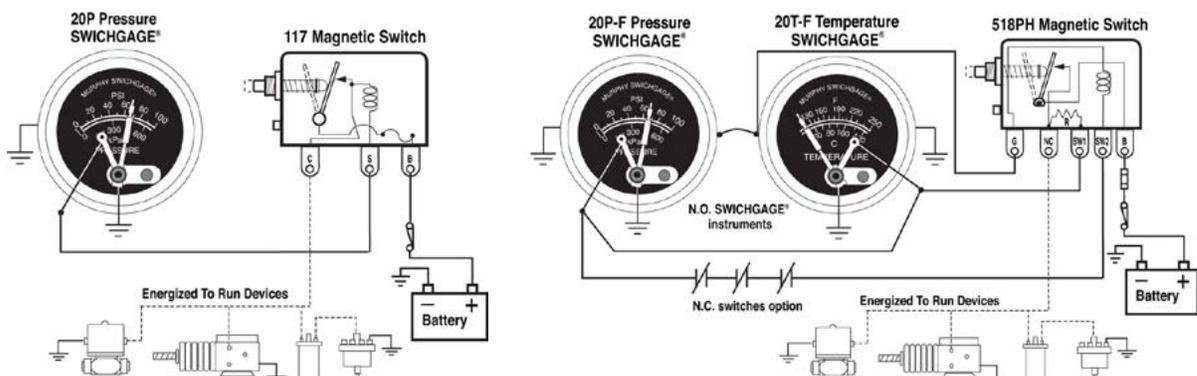
## Installing the Magnetic Switch



**WARNING:** Disconnect the battery or power source before beginning the installation. See specific wiring instructions packed with each magnetic switch or tattletale annunciator.

1. Mount with electrical lugs down. Drill mounting holes in panel.
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 typical wirings below. Wiring and instructions are packed with each magnetic switch.



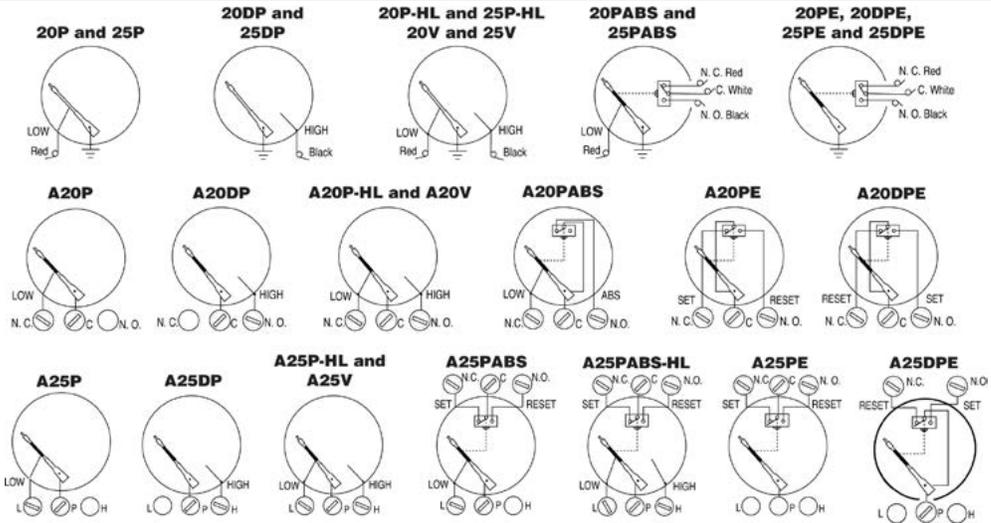
<b>WARNING</b>	<b>WARNING: Disconnect the battery or power source before beginning the installation. For battery ignition systems, disconnect the battery ground strap. Face adjusted pointer type contacts are pilot duty. Do not exceed contact ratings on any switchgag<sup>®</sup> model.</b>
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20 and 25 Series models wire leads are 18 AWG or 20 AWG, 12 in. (305 mm) long. A20 and A25 Series models have number 4 or number 6 screw terminals. When installing the Switchgag instrument on an ungrounded panel, you MUST provide a ground wire from the Switchgag instrument to a common ground. Install ONLY in a 12 or 24 V system. Warning lights or audible signal must be of the same voltage as the battery. Current draw should never exceed Switchgag contact ratings.

<b>CAUTION</b>	<b>CAUTION: Ordinary incandescent lights are damaging to Switchgag contacts. We recommend using our direct connected alarms TL-7 flashing lamp and/or SAH mini-siren.</b>
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The pictorial below shows typical wirings for each base model. Look for specific typical wiring diagram with your base model number and wire accordingly. The pointer is shown in the Shelf Position. Face adjusted pointer type contacts are rated pilot duty 2 A @ 30 VAC/DC. Snap-switch contacts are rated 3 A @ 30 VDC; 4 A @ 125 VAC.

<b>CAUTION</b>	<b>CAUTION: On some models pointer contact and ABS switch share the same Common. Voltage source must be the same. Maximum voltage is 30 V. Consult factory for applications with 120 VAC systems.</b>
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## Troubleshooting

### DO THIS FIRST:

- ✓ Look for broken wiring, frozen pointer, dirty contacts (will not make), burnt pointer or contact.
- ✓ Verify that all wiring is intact and connections are tight.
- ✓ Verify that Switchgag has not been damaged (hit or dropped).
- ✓ Verify that there is pressure/vacuum supplied to the gage.
- ✓ Verify that the Switchgag is operative (it reads).
- ✓ Verify that the alarm or shut-down device is fully operable, and check components such as spark plugs, ignition, fuel pump and filter, etc.
- ✓ Reset magnetic switch and verify that it stays latched.

SYMPTOM	CAUSE	TEST/REMEDY
Engine will not start	<ol style="list-style-type: none"> <li>Short or open circuit, be sure the magnetic switch latches and puts out power to the run device or removes ground (ignition). Check for power/ground at run device</li> <li>Control circuit overloaded by accessories (blown fuse in magnetic switch)</li> <li>False ground in control circuit</li> </ol>	<ol style="list-style-type: none"> <li>Reset magnetic switch and make sure it stays latched. Refer to installation instructions for 518PH magnetic switch (provided with unit).</li> <li>Find blown fuse and replace (use 14 A fuse). Reroute the accessories.</li> <li>Repair.</li> </ol>
False shutdown	<ol style="list-style-type: none"> <li>Switchgag circuit has intermittent open or short</li> <li>Vibration causes the Magnetic Switch to trip</li> </ol>	<ol style="list-style-type: none"> <li>Check all wiring and repair/replace as necessary.</li> <li>Repair and relocate the switch as needed.</li> </ol>
Switchgag closes but does not trip the magnetic switch or kill the engine	<ol style="list-style-type: none"> <li>Incomplete shutdown circuit</li> <li>Dirty Switchgag contacts</li> <li>Ignition not providing power to primary terminal post</li> <li>Switchgag case may not be grounded</li> <li>Incorrect magnetic switch for type of power</li> </ol>	<ol style="list-style-type: none"> <li>Locate open circuit and repair.</li> <li>Clean and check that contacts make.</li> <li>Repair ignition.</li> <li>Ground case.</li> <li>Replace with correct magnetic switch.</li> </ol>
Magnetic switch tripped but engine is still running	<ol style="list-style-type: none"> <li>Open circuit between the magnetic switch and the shutdown device</li> <li>Lost ground to kill the engine</li> </ol>	<ol style="list-style-type: none"> <li>Check wiring from magnetic switch to shut-down device, repair or replace.</li> <li>Check all wiring and connections and repair.</li> </ol>
Pointer will not operate properly, inaccurate reading	<ol style="list-style-type: none"> <li>Frozen pointer</li> <li>Loose pointer spring (caused by hitting or dropping gage)</li> <li>Plugged pressure orifice</li> <li>Over Pressure</li> </ol>	<ol style="list-style-type: none"> <li>Return for repair or replacement.</li> <li>Return for repair or replacement.</li> <li>Remove and clean.</li> <li>Return for repair or replacement.</li> </ol>
Pointer/contact burned-in two	Without exception this condition is caused by incorrect wiring or short circuit	Recheck wiring; replace Switchgag or return for repair.