Mounting the Panel

**WARNING:** Perform mounting operation with power source OFF. Disable the engine so it cannot start. Remove the battery ground cable.

1. Select a suitable mounting location on or near the engine. The location should provide easy access to the panel and provide unobstructed viewing of the SWICHGAGE® instruments.

2. The mounting location should avoid shock and vibration to the extent possible. Generally, a location low on the engine is preferred. Avoid mounting on top of the engine if possible. Shockmounts are suggested where possible to dampen shock and vibration.

**IMPORTANT:** Use of improper shockmounts can accelerate the shock and vibration effects. Consult the factory if you are in doubt.

**NOTE:** If shockmounts are used, it is suggested that a separate ground wire be attached to the panel assembly and to the engine. This assures electrical continuity between the SWICHGAGE® contacts and the battery ground across the shockmounts (see mounting detail below).

Connecting the Pressure SWICHGAGE®

1. Pressure tubing is generally not provided. Use of good quality flexible pressure tubing/hose and fittings is strongly suggested. 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 pressure SWICHGAGE® to the rigid tubing. This prevents damaging vibration from reaching the SWICHGAGE®.

2. Connect the pressure tubing to the 1/8-27 NPT pressure port of the pressure SWICHGAGE®. Use of a non-hardening thread sealing compound is recommended although the thread is “dry seal”. Be sure that thread sealant does not foul the pressure orifice.

**NOTE:** The orifice can be removed for cleaning.

3. Connect the pressure tubing to the pressure galley of the engine. Generally this is at the oil filter housing. Use of non-hardening thread sealant is recommended. Avoid droops or sink traps in routing of the pressure line.

**Installation Accessories**

Tools and equipment needed:
- Thread sealant or Teflon® tape.
- Straight edge screwdriver (medium).
- Wire stripping and terminal crimping tools.
- Electrical wire for use on power connections.
- Adjustable wrench or open end wrench set.
Connecting High Temperature SWICHGAGE®

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 the 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 on 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 mounting detail below.
6. Coil excess temperature capillary into a 2 in. (51 mm) diameter minimum coil. Tie the coil to prevent excessive movement.

Sensing Bulb Mounting Detail

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.
d. Observe all precautions for liquid cooled engines.

Installing the Engine Stop Device or Alarm
Follow instructions provided with the stop device or alarm.

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.

Electric Wiring
1. Disconnect the battery ground cable or otherwise disconnect electric power from the engine and panel.
2. See the appropriate typical or specific wiring diagram for the nerve center/magnetic switch in your panel.
3. Generally you will only be required to wire the battery or other electrical power to the nerve center/magnetic switch and the output circuit from the nerve center/magnetic switch to the alarm or shutdown device.
4. Ammeters should be direct wired according to the wiring included with this panel. Use minimum 10 AWG cable.
5. Be sure that the connected load(s) does not exceed the voltage and current ratings of the nerve center/magnetic switch or SWICHGAGE®.

CAUTION: Never check for voltage by shorting a wire or terminal to ground. This will ALWAYS damage the electrical components.

Placing Into Operation
1. Refill oil and coolant to proper levels.
2. Reconnect electrical power.
3. Service the engine as required by the engine manufacturer before attempting to start the engine.

To Start the Engine
1. Fully depress the red or black push button of the nerve center/magnetic switch on the panel face. Hold in the button while cranking the engine. This overrides the engine shutdown to allow starting. When the oil pressure pointer moves away from the pointer contact (or when pressure exceeds the preset low trip point) release the push button. The engine should be operating. If the push button is red, it should remain depressed. If the push button is black, it should return to an extended position.

CAUTION: If the pressure SWICHGAGE® is equipped with a face mounted lockout push button, be sure that pressure has been established and that the lockout mechanism has disengaged. Failure to disengage will prevent the SWICHGAGE® control from operating on low pressure.

To Stop the Engine
1. Return the engine to idle speed and unload any driven equipment.
2. 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.
3. Loosen the oil line fitting slightly at the pressure SWICHGAGE® to allow trapped air to escape from the tubing. Retighten the fitting.

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

To Stop the Engine
1. Return the engine to idle speed and unload any driven equipment.
2. DISTRIBUTOR IGNITION engine panels may have an Emergency Stop Button, a start key switch or other power on/off switch. Operate that switch or button. The nerve center/Magnetic Switch will trip and open the ignition circuit to stop the engine.
3. DIESEL ENGINES may be equipped with “energized to RUN” or “energized to STOP” devices. For “energized to RUN” devices such as Murphy SV series fuel valves or RP-type solenoids, operation is identical to above for distributor ignition engines. The “energized to RUN” device is de-energized and the engine stops. For “energized to STOP” devices the nerve center/magnetic switch applies battery power to the stop device. Power is removed after a short time delay depending on the specific nerve center/magnetic switch. See instructions supplied with the shutdown or alarm device. For normal stop, pull the manual stop cable.
Setting the SWICHGAGE® contacts
1. Face mounted contacts are set using a 1/16 in. hex wrench.
2. Some models such as 20PE, 20TE, etc. may not have field adjustment. Consult the factory if in doubt.
3. Observe the “normal operating” oil pressure and coolant temperature readings. Set the oil pressure SWICHGAGE® contact slightly below the minimum reading observed or slightly above the minimum pressure recommended by the engine manufacturer.

WARNING: If the pressure SWICHGAGE® instrument has a lockout push button on the face, a contact setting higher than the factory setting will make the lockout device inoperative.

4. Set the temperature SWICHGAGE® contact slightly above the “normal operating” temperature reading observed or slightly below the maximum temperature recommended by the engine manufacturer.

NOTE: More detailed instructions are contained in Installation Sheet P-95033N for pressure SWICHGAGE® instruments and T-8446N for Temperature SWICHGAGE® instruments.

Testing the SWICHGAGE® Instruments
For face mounted contacts (20P, 20T, 20PW7, etc.):
1. With the engine running; use a 1/16 in. hex wrench to rotate the contact until it touches the gauge pointer. Do NOT force the contact against the pointer. Engine should shut down and/or alarm should operate. Reset the contact.
2. An alternative method of testing the shutdown circuit is to place a coin or other metal object between the contact adjustment and the bezel.

NOTE: This method does NOT test the actual contact pair. It does test the circuit beyond the contact.
3. VERY IMPORTANT Each time you start the engine, observe that the SWICHGAGE® instruments are indicating pressure or temperature, etc. Visual inspection and regular testing should be normal procedure to ensure proper operation and to achieve maximum results from your SWICHGAGE® system.

TYPICAL WIRING DIAGRAM WITH 117PH MAGNETIC SWITCH

CAUTION: This wiring is typical for Murphy W-Series small engine panels. Items shown may or may not be included in your panel; however, the circuit is typical of how the component will be wired if it is included. Refer to installation instructions for the specific component if included. For off-panel items such as shutdown devices, see specific instructions supplied with the device.
CAUTION: This wiring is typical for Murphy W-Series small engine panels. Items shown may or may not be included in your panel; however, the circuit is typical of how the component will be wired if it is included. Refer to installation instructions for the specific component if included. For off-panel items such as shutdown devices, see specific instructions supplied with the device.

518PH WIRED CLOSED LOOP™
MUST specify 12 or 24 VDC

- PB128S Stop Switch
- Other SWICHGAGE® (S)
- 20P-F Pressure
- 20T-F Temperature
- 518PH WIRED CLOSED LOOP™
- To Magnetic Sensor, Alternator “Tach” Terminal, or Signal Generator
- Hourmeter
- Voltmeter
- Ammeter
- Battery
- Starter
- Alternator
- Ignition coil
- Distributor
- Fuel Valve
- Energized to Run Rack Pull Solenoid (RP2300 Series shown)

TYPICAL WIRING WITH 518PH TATTLETALE® CLOSED LOOP™

CAUTION: This wiring is typical for Murphy W-Series small engine panels. Items shown may or may not be included in your panel; however, the circuit is typical of how the component will be wired if it is included. Refer to installation instructions for the specific component if included. For off-panel items such as shutdown devices, see specific instructions supplied with the device.
518PH WIRED WITH JUMPER
Must specify 12 or 24 VDC

CAUTION: This wiring is typical for Murphy W-Series small engine panels. Items shown may or may not be included in your panel; however, the circuit is typical of how the component will be wired if it is included. Refer to installation instructions for the specific component if included. For off-panel items such as shutdown devices, see specific instructions supplied with the device.

TYPICAL WIRING DIAGRAM WITH 518PH TATTLETALE® JUMPERED

Other SWITCHGAGE(s)

20P Pressure

20T Temperature

Jumper

PB128S Stop Switch

Distributor

Ignition coil

Fuel Valve

Energized to Run

Rack Pull Solenoid
(RP2300 Series shown)

Ammeter

Battery

Start Switch

Alternator

Exciter

CAUTION: This wiring is typical for Murphy W-Series small engine panels. Items shown may or may not be included in your panel; however, the circuit is typical of how the component will be wired if it is included. Refer to installation instructions for the specific component if included. For off-panel items such as shutdown devices, see specific instructions supplied with the device.
**NOTE 1:** With terminal “G” grounded, the time delay operates only on start; after the initial time delay, the shut-down circuit is operated immediately when SWICHGAGE® contact operates. With terminal “G” not grounded, the time delay operates both on start and stop.
TROUBLESHOOTING TIPS

Make sure the voltage and current requirements are within the W-Series ratings. Determine the polarity for the application. Use appropriate wire size for voltage and current.

These instructions will assist in the correction of most problems which you may encounter with the panel. Before checking the list, first refer to the wiring connections and operation procedures and make sure the panel is properly installed. If problems persist after making the following checks, consult any Murphy facility.

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine will not start.</td>
<td>1. Blown fuse at magnetic switch.</td>
<td>1. Replace fuse.</td>
</tr>
<tr>
<td></td>
<td>2. Accidental ground to (S) or (C) terminals.</td>
<td>2. Check for ground and correct.</td>
</tr>
<tr>
<td></td>
<td>3. Overload circuit due to accessories.</td>
<td>3. Re-route accessory circuits.</td>
</tr>
<tr>
<td>Pointer burned in two.</td>
<td>Overload of pointer contact due to excessive load or short circuit.</td>
<td>Remove or reduce load; remove short circuit and replace SWICHGAGE®.</td>
</tr>
<tr>
<td>False shutdown.</td>
<td>1. Wire from SWICHGAGE® is grounded or shorted to contact.</td>
<td>1. Remove ground or short.</td>
</tr>
<tr>
<td></td>
<td>2. CLOSED LOOP™ circuit has intermittent open or short.</td>
<td>2. Check all wiring and repair.</td>
</tr>
<tr>
<td></td>
<td>3. Excessive shock or vibration causes magnetic switch to trip.</td>
<td>3. Isolate panel from shock/vibration.</td>
</tr>
<tr>
<td></td>
<td>4. Lack of coolant around temperature sensing bulb causes “hot spot”.</td>
<td>4. Check coolant level; loosen the union nut to allow trapped air to escape.</td>
</tr>
<tr>
<td></td>
<td>5. Temperature capillary routed too close to exhaust manifold.</td>
<td>5. Reroute temperature capillary.</td>
</tr>
<tr>
<td>SWICHGAGE® contact closes but does not trip the magnetic switch to stop the engine.</td>
<td>Incomplete circuit.</td>
<td>Locate open circuit and repair; turn the contact adjustment against the pointer causing them to “wipe” against each other. Be sure magneto is providing power to primary terminal post. CD type magnetic switch used with magneto.</td>
</tr>
<tr>
<td>Inaccurate readings.</td>
<td>1. Pressure orifice plugged with thread sealant.</td>
<td>1. Remove and clean pressure orifice.</td>
</tr>
<tr>
<td></td>
<td>2. Temperature capillary rerouted too close to exhaust manifold.</td>
<td>2. Reroute capillary.</td>
</tr>
<tr>
<td></td>
<td>3. Broken or crushed temperature capillary.</td>
<td>3. Replace SWICHGAGE®.</td>
</tr>
<tr>
<td>Engine does not stop immediately.</td>
<td>Fuel shutoff valve used on diesel engine.</td>
<td>Be sure all fittings are air tight; use check valve in bypass line; use rack puller in place fuel valve.</td>
</tr>
<tr>
<td>Magnetic Switch trips but engine does not stop.</td>
<td>Feedback from alternator.</td>
<td>Install diode in excitation circuit.</td>
</tr>
</tbody>
</table>

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.

CALL MURCAL TO PLACE YOUR ORDER

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