

# WAI-Series Engine Protection System Installation Instructions and Maintenance

Please read the following instructions before installing. Contact factory if additional information is needed.  
A visual inspection of this product for damage during shipping is recommended.



## 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.



**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.

### Basic Installation Procedure

1. Be sure the WAI-Series panel you have chosen is the correct one for the desired operation and has the appropriate SWICHGAGE® instruments for your application.
2. **DISCONNECT BATTERY GROUND.**
3. Select a mounting location appropriate for the WAI-Series panel you have selected; or remove the existing gauges from your instrument panel where the Murphy SWICHGAGE® instruments will be installed.  
*NOTE: mounting hole size must be 2-1/16 in. (52 mm).*
4. Mount the WAI-Series instrument panel onto the vehicle dash or install the individual SWICHGAGE® instruments into the vehicle instrument panel. Refer to the typical dimensions shown on page 4; also refer to Connecting Pressure SWICHGAGE® and Connecting Temperature SWICHGAGE® on page 2).
5. Route the temperature capillary, pressure lines and electrical wires through the firewall and connect to the engine. **Do not** allow Capillary Tube, Oil Pressure Line, or Wires to rest, or vibrate against exhaust manifold or a sharp metal surface that might cut the sensing lines, and short out the Control Wires.

#### NOTES:

- a. Use of high quality flexible pressure hose such as Murphy DHK series is recommended. Do not use light duty "plastic" hose. **BE SURE HOSE DOES NOT LAY ON OR NEAR EXHAUST MANIFOLD.** Connect to the pressure SWICHGAGE®.
- b. **BE SURE TEMPERATURE CAPILLARY DOES NOT LAY ON OR NEAR EXHAUST MANIFOLD.**
- c. **BE SURE TEMPERATURE CAPILLARY DOES NOT HAVE A TIGHT BEND IN IT.** Minimum bend radius is 3 in. (76 mm). Install the temperature sensing bulb into the water jacket connection—note correct thread size. Be sure temperature sensing bulb does not bottom out in the water jacket.



Model shown: WAI-7

6. **IF THE ENGINE HAS KEY SHUTOFF,** disconnect the power wire at the key switch which feeds the energized-to-run device. If your WAI panel has a terminal block, reconnect this wire to the appropriate terminal, and connect another wire from the key switch to the WAI terminal block. This wire powers the energized-to-run device through the WAI panel. (See appropriate wiring diagram for your WAI panel.)  
If your WAI panel has wire leads connect appropriate wire lead from your WAI panel to the key switch and to the energized-to-run device. (See appropriate wiring diagram packed with your WAI panel.)
7. **IF THE ENGINE DOES NOT HAVE KEY SHUTOFF,** you must add a switch controlled power wire and a "power out" wire to the electrically controlled energized-to-run device.
8. See Notes on the wiring diagram for your WAI-Series panel.
9. For WAI panel with a terminal block, connect a wire from the vehicle dash light control to the appropriate WAI terminal. This controls the SWICHGAGE® lighting.  
For WAI panel with terminal leads, a wire lead is provided for connection to the vehicle dash light control.
10. When all electrical connections are made and tight, reconnect the battery ground and perform the Function Test described in page 2.

### Tools & Equipment Needed for Installation

- 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.

### 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.

**IMPORTANT:** SWICHGAGE® instruments, Magnetic Switches and shutdown 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.

## Connecting the Pressure SWICHGAGE®



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

1. Pressure tubing is generally not provided. Use of good quality flexible pressure tubing/hose and fittings, such as Murphy DHK series, 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. Route tubing away from hot surfaces and sharp edges,

## Connecting the Temperature SWICHGAGE®

### LIQUID COOLED ENGINES:

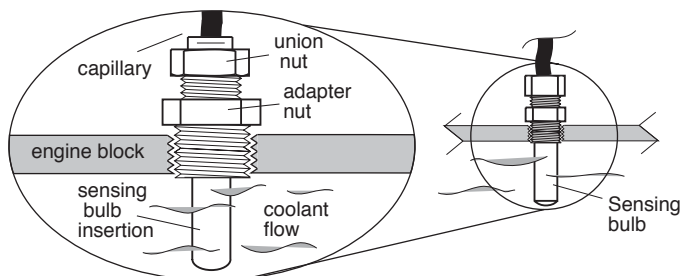
1. Drain engine coolant to a level below the temperature sensing connection/plug. This connection is on the engine side of the thermostat generally near the thermostat housing. *Consult your engine manual.*
2. Remove adapter nut from temperature sensing bulb and union nut.
3. Apply a non-hardening thread 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 and sharp edges.
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.*



**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.

### Sensing Bulb Mounting Detail



## Placing Into Operation

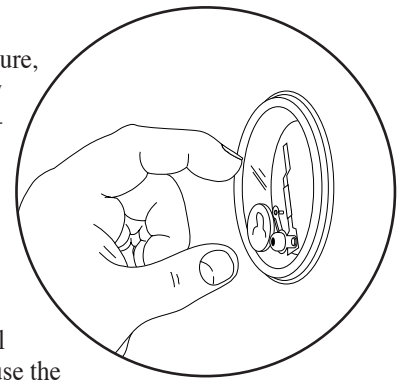


**WARNING:** Perform this operation using appropriate protection. Trapped air and coolant may cause skin burns.

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.
4. 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.
5. Loosen the oil line fitting slightly at the pressure SWICHGAGE® to allow trapped air to escape from the tubing. Retighten the fitting.

## Procedure for Function Testing a SWICHGAGE® Instrument

1. Start the Engine.
2. Visually observe the Oil Pressure, Coolant Temperature and any other functions you are monitoring with Murphy SWICHGAGE® instruments to determine that you have normal operating pressures and temperatures.
3. When you are starting the engine, you will have a visual and/or audible warning because the pressure SWICHGAGE® pointer is resting against its low pressure shutdown contact.
4. As soon as the pointer on the pressure SWICHGAGE® rises above the shutdown setpoint, visual and/or audible warning will stop (light and/or siren will go OFF).
5. To test the contact take a small metal device, such as a coin, and place it on the lens of the SWICHGAGE®. Carefully slide the coin in between the allenhead contact adjustment knob, located at the bottom—center of the SWICHGAGE® and the metal bezel. This procedure does **NOT** test the contact. This procedure will test the wiring.
6. Visual and/or audible warning will come on, such as a flashing light or a siren. The warning will continue as long as contact is made by the coin. Time delay warning before shutdown will be either 15, 30 or 60 seconds. See your Time Delay Control Relay 760 to determine exact time.
7. After the 760 Control Relay times out (15, 30 or 60 seconds) engine should shutdown completely. Also the light will stop flashing and siren will stop alarming.
8. Turn ignition switch OFF and restart engine. Perform procedures 5, 6, and 7 for each SWICHGAGE® function being monitored such as Oil Pressure, Coolant Pressure loss, Engine Temperature and Transmission Temperature.

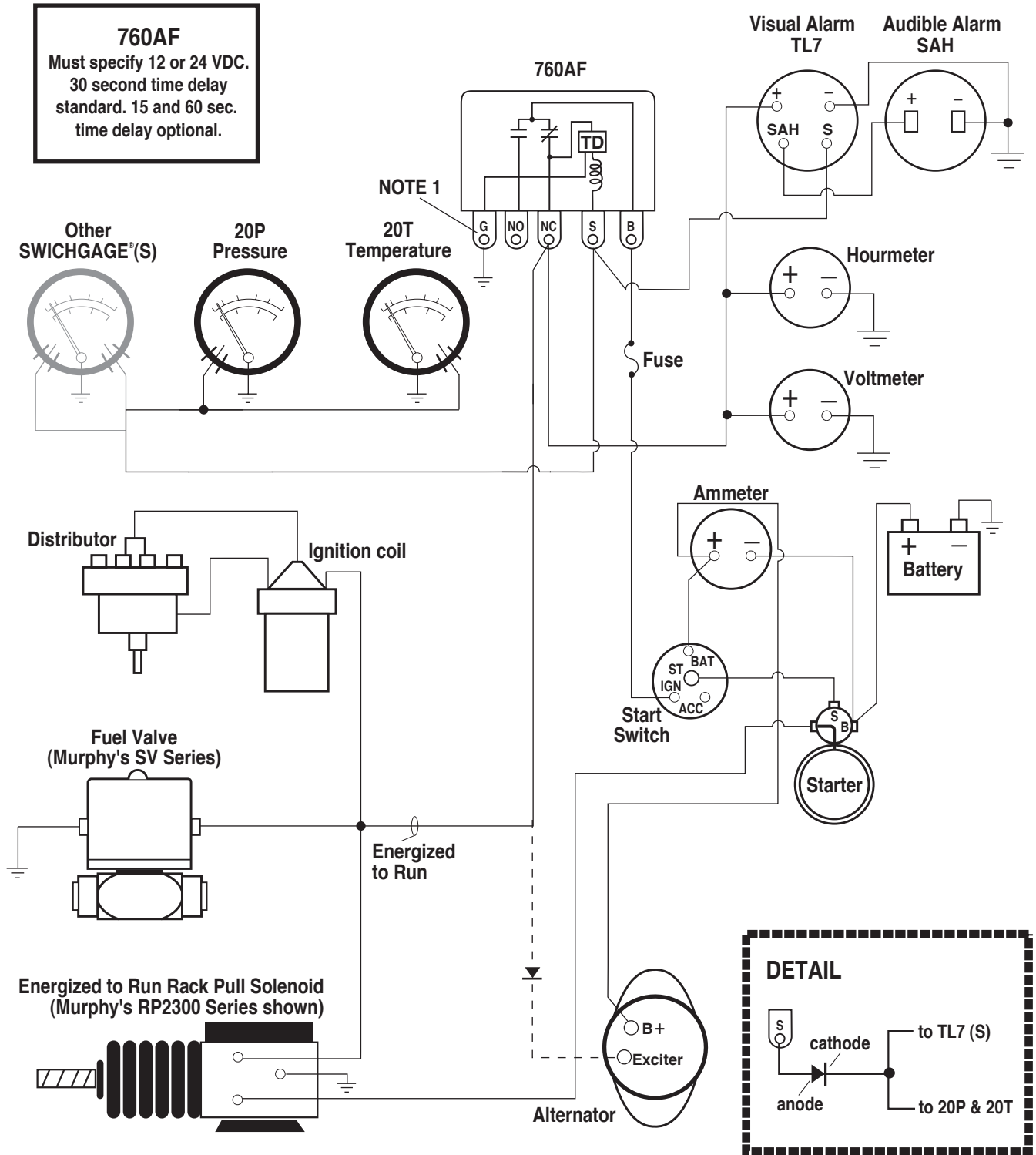


- NOTE 1.** On Transmission Temperature test, the system normally is wired for audible and visual warning only with no shutdown.
- NOTE 2.** Maintain continuous contact of coin. Any momentary loss of contact will cause the relay to reset.
- NOTE 3.** Look to see that the setpoint on the SWICHGAGE® is still functional.

# Typical Wiring Diagram With 760AF



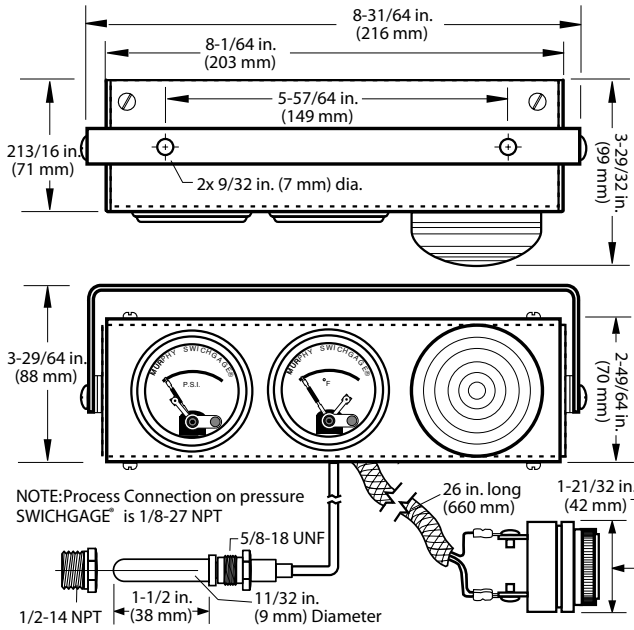
**CAUTION:** This wiring is typical for Murphy panel components. Items shown may or may not be included in your panel; however, the circuit is typical of how the component will be wired if it is included. Refer to installation instructions for the specific component if included. For off-panel items such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



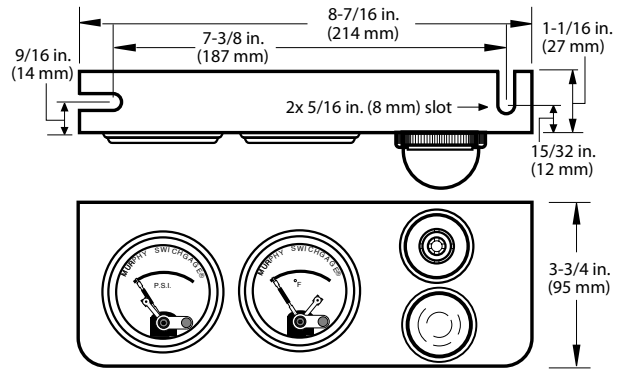
**NOTE 1:** With 760AF terminal "G" grounded, the time delay operates only on start; after the initial time delay, the shut-down circuit is operated immediately when SWICHGAGE® contact operates. With terminal "G" not grounded, the time delay operates both on start and stop. It is NOT recommended to ground terminal "G" when using the 760AF in conjunction with TL7 and SAH – If terminal "G" is grounded TL7 and SAH alarms will turn "ON" and remain "ON" indefinitely. If necessary, remove wires from 760AF terminal "S" and connect a commercially available 1N4005 diode as shown on the DETAIL (above right).

# Typical Dimensions

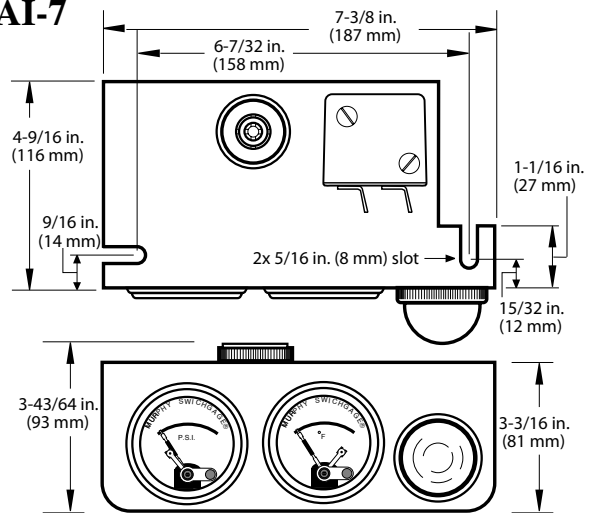
## WAI-2



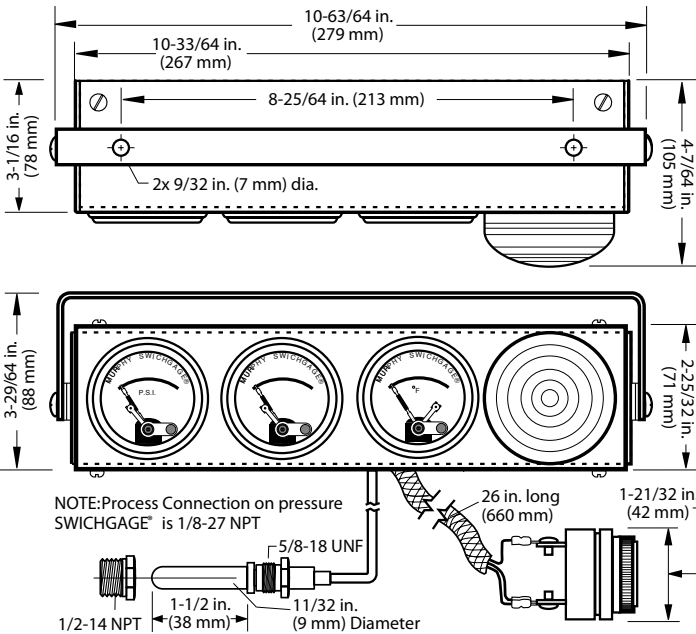
## WAI-271



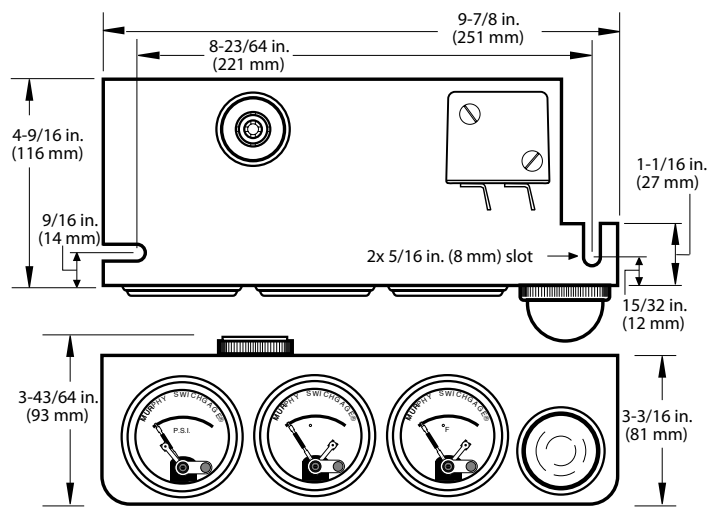
## WAI-7



## WAI-3 / WAI-4



## WAI-8 / WAI-9



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.

**MURPHY**

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