

# Installation of Shock/Vibration Control Switches

Model Series: VS2™, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94

Please read the following instructions and warnings before installation. Visually inspect the product for any damage that may have occurred during shipping.

<b>Warnings</b>	<p>Before beginning installation of this 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 the machine manufacturer</li> <li>• Read and follow all installation instructions</li> <li>• It is your responsibility to ensure that qualified mechanical and electrical technicians install this product</li> <li>• Please contact FW Murphy immediately if you have any questions</li> </ul>
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The FW Murphy shock and vibration switches are available in a variety of models. They are used for applications on machinery or equipment where excessive vibration or shock can damage the equipment or otherwise pose a threat to proper operation. A set of contacts is held in a latched position through a mechanical latch and magnet mechanism. As the level of vibration or shock increases, inertia forces act against the latch arm and force it away from the magnetic latch. This action causes the latch arm to operate the contacts. Sensitivity is obtained by adjusting the size of the air gap between the magnet and the target or bolt head on the adjusting mechanism. Applications include all types of rotating or reciprocating machinery such as cooling fans, engines, pumps, compressor, and pump jacks, etc.



## Models and Options

- **VS2:** Base mount; suitable for non-hazardous locations or as simple apparatus connected to a certified non-incendive or intrinsically safe electrical digital input. Meets IP54 specifications when mounted on a horizontal surface with the drain holes down.
- **VS2C:** VS2 with C-clamp mount installed on switch.
- **VS2EX:** Explosion-proof; meets IP54 specifications; Class I, Div. 1, Groups C and D hazardous locations; CSA for Canada and US.
- **VS2EXR:** Explosion-proof with remote reset (CSA approved).
- **VS2EXRB:** Explosion-proof; Class1, Div.1, Group B: with remote reset (no third-party approval for this product). No IP rating for this product.
- **VS94:** Base mount; non-hazardous locations, NEMA 4X/IP66.

### Optional Remote Reset Feature (VS2EXR, VS2EXRB and VS94)

An optional remote reset includes built-in electric solenoids which allows reset of tripped unit from a remote location, or hold-in reset during starting. Options are listed below:

- R15: Remote reset for 115 VAC
- R24: Remote reset for 24 VDC

### VS94 Time Delay Option

Overrides trip operation on startup. For VS94 series models, the delay time is field adjustable from 5 seconds up to 100 seconds with a 20-turn potentiometer (5 seconds per turn approximately). Options listed below:

- T15: Time Delay for 115 VAC
- T24: Time Delay for 24 VDC

### VS94 Space Heater Option

This optional space heater board prevents moisture from condensing inside the VS94 Series case. Options listed below:

- H15: Space Heater for 115 VAC
- H24: Space Heater for 24 VDC

## Service Parts

Part Number	Description
20000031	Glass and gasket assembly
20000032	Reset push button assembly
20000261	Cable clamp assembly (1 each) (VS2C)
20000288	Snap-switch and insulator kit (one switch per kit)
20000289	C-clamp conversion mounting kit
25050506	Dust boot

## Specifications

### VS2 and VS2C

**Case:** Environmental Protection: Ingress protected to IP54 (when mounted on a horizontal surface with drain holes down)

**VS2:** Base Mount

**VS2C:** C-Clamp mount. Includes 45' (13.7M), 2-conductor 16 AWG, 30 strands/0.25mm strand diameter (1.5mm2) cable and five cable hold-down clamps

**Contacts:** SPDT double make leaf contacts, 3A @ 240 VAC, 10A @ 120 VAC; 10A @ 32 VDC

**Operating Temperature Range:** -40° F to 185° F (-40° C to 85° C)

**Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement

### VS2EX

**Case:** Base mount, explosion-proof aluminum alloy housing; meets IP54 specifications; Class I, Division1, Groups C&D

**Certification:** CSA Canada and US

**Snap switches:** 2-SPDT snap-switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC

**Operating Temperature Range:** -40°F to 185°F (-40° C to 85° C)

**Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement

## Specifications (continued)

### VS2EXR

**Case:** Same as VS2EX

**Snap switch:** 1-SPDT snap-switch and reset coil; 5A @480 VAC; 2A resistive, 1A inductive, up to 30 VDC

**Certification:** CSA Canada and US

**Remote reset:**

**Option Operating Current**

-R15: 350 mA @ 115 VAC (momentary duty, not continuous)

-R24: 350 mA @ 24 VDC (momentary duty, not continuous)

**Operating Temperature Range:** -40° F to 185° F (-40° C to 85° C)

**Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement

### VS2EXRB

**Case:** Explosion-proof aluminum alloy housing; constructed to meet Class I, Division 1, Group B hazardous areas. No third-party certifications.

**Snap-switch:** 1-SPDT snap-switch with reset coil (option available for additional SPDT switch); 5A @ 480 VAC; 2A resistive, 1 A inductive, up to 30 VDC (-D option adds another SPDT with the same rating)

**Remote Reset:**

**Option Operating Current**

-R15: 350 mA @ 115 VAC (momentary duty, not continuous)

-R24: 350 mA @ 24 VDC (momentary duty, not continuous)

**Operating Temperature Range:** -40° F to 185° F (-40° C to 85° C)

**Range Adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement

## Installation

The VS2 and VS94 series shock/vibration control switches are sensitive to shock and vibration in all three planes of motion – up/down, front/back and side/side. Front/back is the most sensitive.

- Always mount the shock/vibration control switches to the machine so that all mounting surfaces are in rigid contact with the mounting surface of the machine.
  - ◊ It may be necessary to provide a mounting plate or bracket to attach the shock/vibration control switches to the machine. The mounting bracket should be thick enough to prevent induced acceleration/vibration upon the control switches. Typically ½ in. (13mm) thick plate is sufficient.
- Position the shock/vibration control switches in line with the direction of rotating shafts (or near bearings) and with the Reset Push Button (front of unit) positioned pointing out, perpendicular (90°) to the axis of rotation.
- Refer to the illustrations in Typical Mounting Locations for examples of positioning and mounting plate/bracket use.

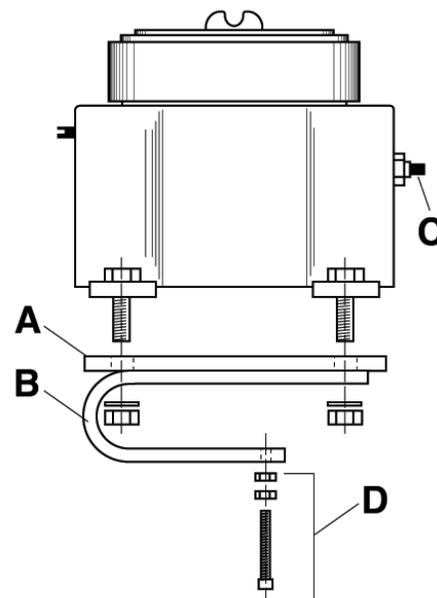
**CAUTION: A dust boot is provided on the Reset push button for all series to prevent moisture or dust intrusion. The sensitivity adjustment for model VS2EX is not sealed; therefore, mounting orientation should be on a horizontal plane or with the sensitivity adjustment pointing down. Never point pressure washer wand directly at the sensitivity adjustment screw. Doing so will cause water intrusion resulting in internal corrosion issues. Sensitivity adjustment for model VS2 is covered by a plug. The plug must be in place and tight to prevent moisture or dust intrusion.**

### C-Clamp Mounting and Conversion Mounting Kit

The VS2C switch is shipped with a factory installed C-clamp for mounting. A C-Clamp Conversion Mounting Kit is available for the for VS2EX and VS2EXR switches.

1. Attach C-Clamp Conversion Kit to VS2EX or VS2EXR: The C-clamp (B) is installed on a ¼ in. (6 mm) thick steel mounting plate. (A). Bolt the switch to the mounting plate as illustrated – with four 5/16 in. bolts, nuts and washers.
2. When mounting the VS2C, VS2EX or VS2EXR, position the switch so the Reset push button is convenient to access (C).
3. Tighten the C-clamp's hardened set screw and nuts (D) to secure the switch to an I-beam or cross member such as a Samson post of an oil well pump jack.

**CAUTION: Conduit fittings, especially for explosion-proof enclosures, are not weatherproof. Make sure to mount the products horizontally to minimize water ingress. The conduit opening should NEVER be pointing up. An NPT plug is installed in the conduit opening as a temporary measure to prevent moisture or dust intrusion until permanent installation.**



<b>Warnings</b>	<b>Stop the machine and disconnect all electrical power before beginning installation.</b>
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1. Firmly secure the unit to the equipment using the base foot mount or C-Clamp, if applicable. See C-Clamp Installation.  
For oil well pump jacks, attach the VS2 and VS94 Series to the Samson post or walking beam. See Typical Mounting Locations.
2. Make the necessary electrical connections to the vibration switch. See Internal Switches for electrical terminal locations and for typical wiring diagrams. **DO NOT EXCEED VOLTAGE OR CURRENT RATINGS OF THE CONTACTS.** Follow appropriate electrical codes/methods when making electrical connections. Be sure that the run of electrical cable is secured to the machine and is well insulated from electrical shorting. Use of conduit is recommended.

**NOTE:** If the electrical cable crosses a pivot point such as at the pivot of the walking beam, be sure to allow enough slack in the cable so that no stress is placed on the cable when the beam moves.

If conduit is not used for the entire length of wiring, conduit should be used from the electrical supply box to a height above ground level that prevents damage to the exposed cable from the elements, rodents, etc. or otherwise required by applicable electrical codes. If conduit is not directly attached to the VS2 and VS94 Series switch, use a strain relief bushing and weatherproof cap on the exposed end of the conduit. A drip loop should be provided in the cable to prevent moisture from draining down the cable into the conduit should the weatherproof cap fail.

**NOTE:** Hazardous area enclosures installed in hazardous areas require explosion-proof, poured conduit seals. Installation should only be done by qualified personnel trained in hazardous area electrical practices

### Sensitivity Adjustment

<b>Warnings</b>	<b>Remove all power before opening the enclosure. It is your responsibility to have a qualified person perform adjustments and make sure it conforms to NEC and local codes. Do not adjust sensitivity while the machine is running. Stand clear of the machine at all times when it is operating.</b>
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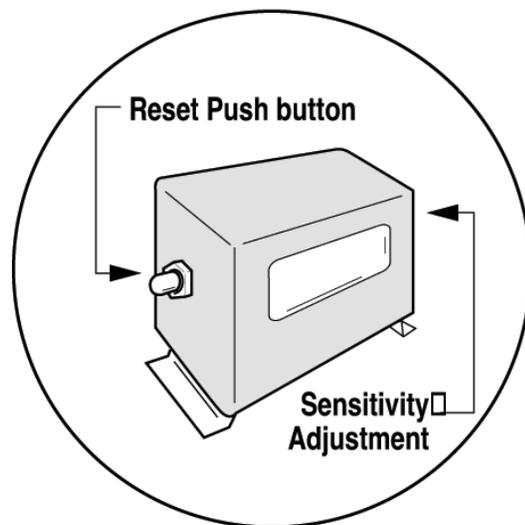
All models of the VS2 and VS94 Series cover a wide range of sensitivity. Each model is expected to be adjusted to the specific piece of machinery on which it is installed in a satisfactory location.

**NOTE:** The sensitivity of this device is affected by extreme temperatures. Some adjustment may be necessary in extreme environments.

The sensitivity adjustment will be increased or decreased so that the switch does not trip during start up or under normal operating conditions. Some machinery experiences a shock on startup. Remote reset versions are available to hold the switch in reset during equipment startup. This allows a more sensitive setting of the switch; however, it is not always practical. Instructions are given for adjusting sensitivity to not trip on startup. This is typically done as follows:

1. Replace all covers, lids and electrical enclosures.
2. Press the Reset push button to engage the magnetic latch. To be sure the magnetic latch has engaged, observe latch through the window on the VS2 and VS2C (see DETAIL A). On the VS2EX and VS94 Series, the Reset button remains depressed meaning the magnetic latch has engaged.
3. Start the machine.
4. If the instrument trips on startup, allow the machine to stop. Turn the sensitivity adjustment  $\frac{1}{4}$  turn clockwise (less sensitive), (adjustment for the VS94 is located within the box, see DETAIL B).

### DETAIL A

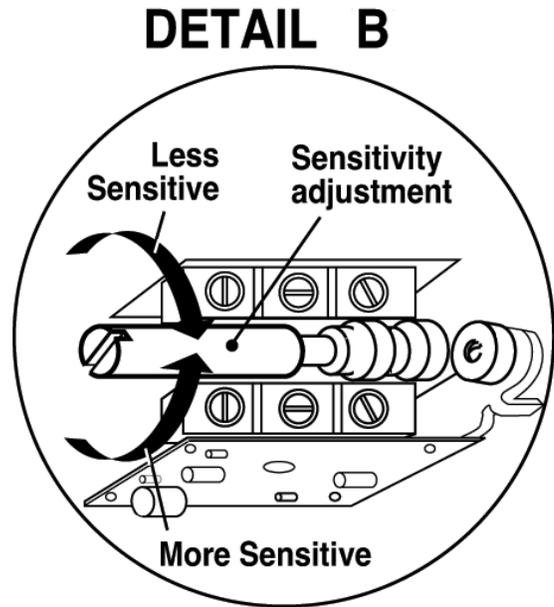


## Sensitivity Adjustment (continued)

<b>Warnings</b>	<b>Make the area non-hazardous or de-energize all circuits before opening the explosion-proof (-ex) enclosures.</b>
<b>Warnings</b>	<b>Rotating sensitivity adjustment screw clockwise / less sensitive after latch has tripped could damage the adjustment shaft.</b>

Depress the Reset button, and restart the machine. Repeat this process until the unit does not trip on start up.

5. If the instrument does NOT trip on startup, stop the machine. Turn the sensitivity adjustment  $\frac{1}{4}$  turn counter-clockwise (more sensitive). Repeat the startup/stop process until the instrument trips on startup. Turn the sensitivity adjustment  $\frac{1}{4}$  turn clockwise (less sensitive). Restart the machine to verify the instrument will not trip on startup.
6. Verify that the unit will trip when abnormal shock/vibration exists.



## VS94 Time-Delay Adjustment

1. Apply power to the time-delay circuit. (See Electrical for the time-delay circuit). The time-delay function is initiated.
2. Time the length of the delay with a watch. Let time delay expire. After it expires, the override circuit will de-energize the solenoid, allowing the latch to trip. A clicking noise is heard

<b>Warnings</b>	<b>Remove all power before opening the instrument. It is your responsibility to have a qualified person adjust the unit and make sure it conforms to NEC and local codes.</b>
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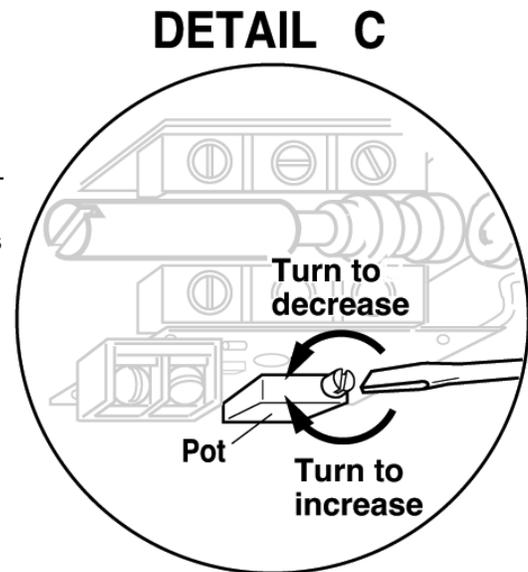
3. TURN THE POWER OFF TO RESET THE TIME-DELAY CIRCUIT

**NOTE:** Allow 30 seconds bleed time between turning the power OFF and ON.

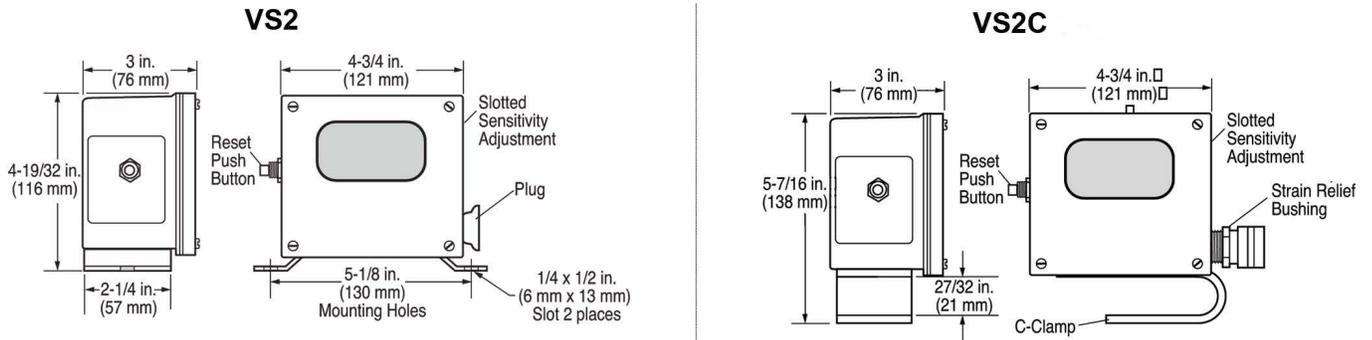
4. Locate the time adjustment pot (DETAIL C). The time is factory-set at the lowest setting (approx. 5 seconds). To increase time, rotate the 20-turn pot clockwise as needed (approx. 5 seconds per turn).
5. Repeat the above steps as necessary to obtain desired time delay.

**NOTE:** An external time delay can be used with the remote reset feature of the VS2EXR series to provide a remote reset and override of the trip operation on startup. Time delay must automatically disconnect after equipment startup.

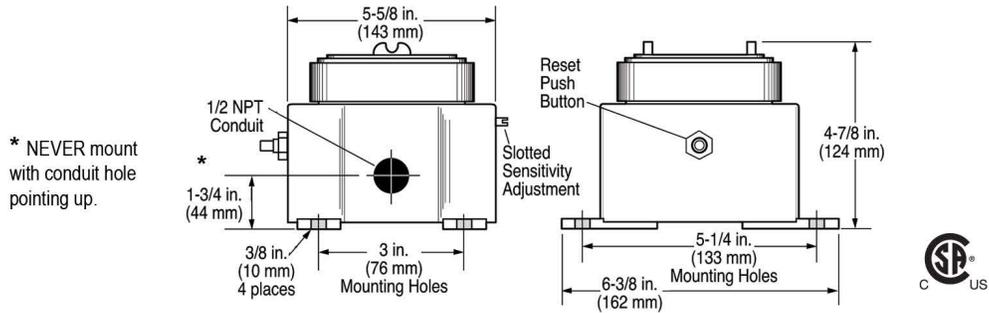
**NOTE:** The remote reset solenoids are for momentary use. They are not rated for continuous operation. Continuous operation will damage the solenoids and void the warranty.



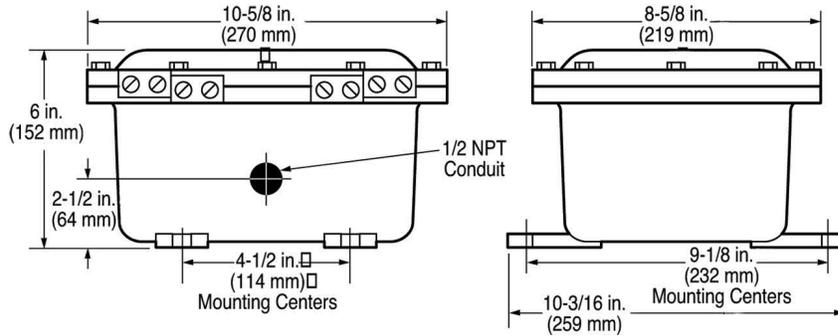
# Dimensions



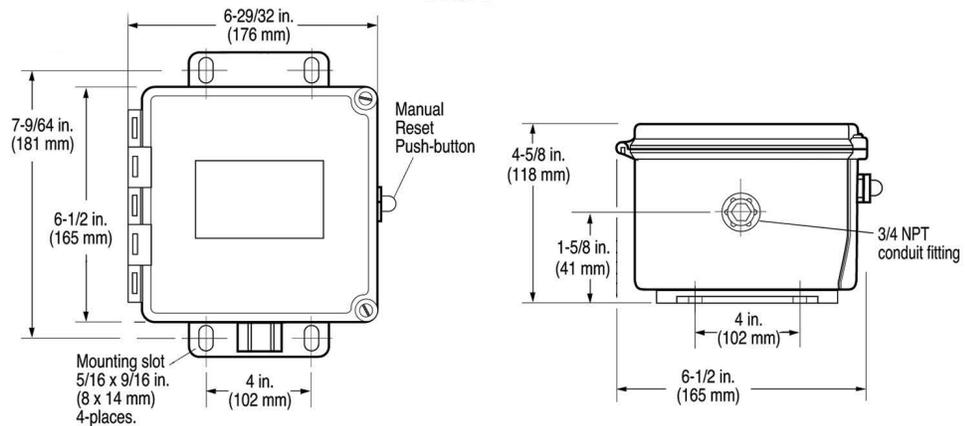
## VS2EX and VS2EXR



## VS2EXRB



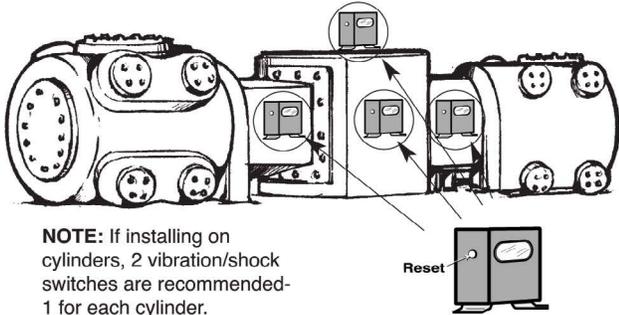
## VS94



# Typical Mounting Locations

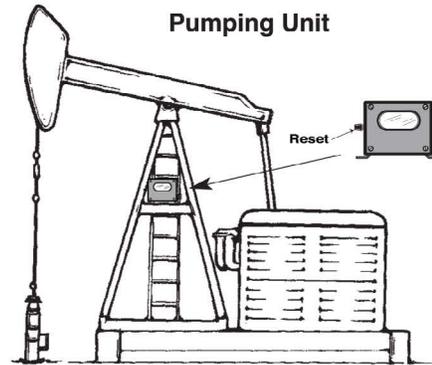
These are typical mounting locations for best operation. Other mountings are possible. See Installation section for more information.

## 2-Throw Balance-Opposed Compressor

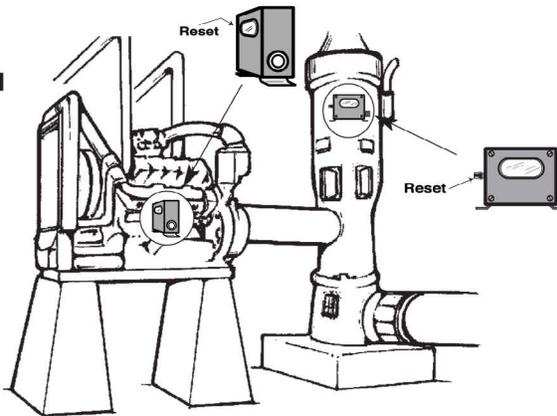


**NOTE:** If installing on cylinders, 2 vibration/shock switches are recommended- 1 for each cylinder.

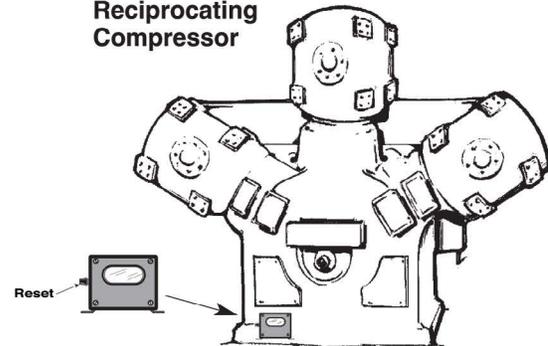
## Pumping Unit



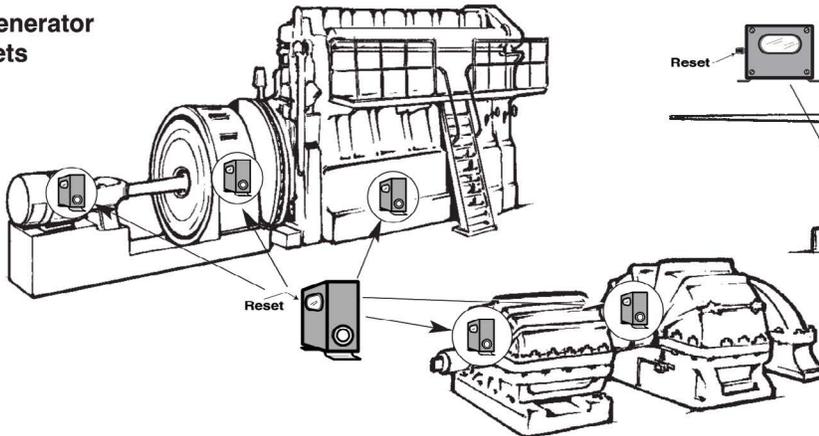
## Engine and Vertical Shaft Pump



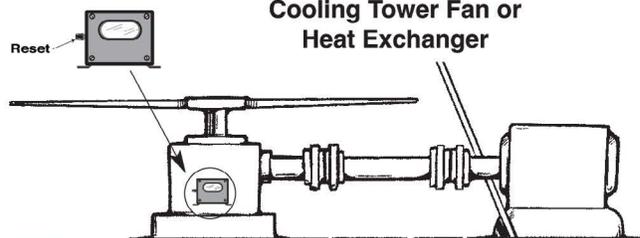
## Y Type Reciprocating Compressor



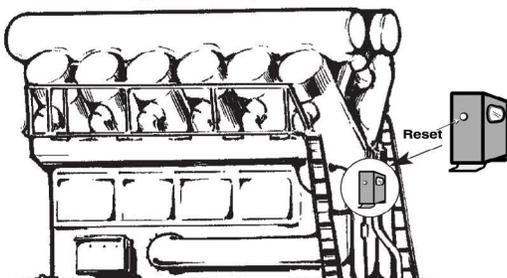
## Generator Sets



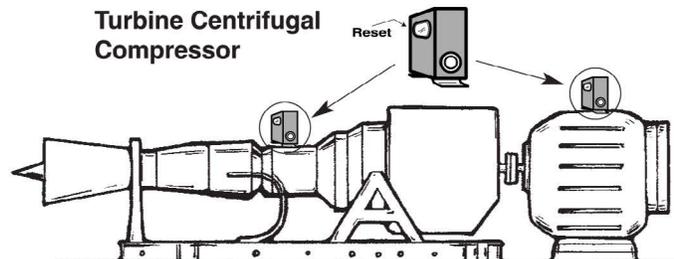
## Cooling Tower Fan or Heat Exchanger



## Engine Compressor



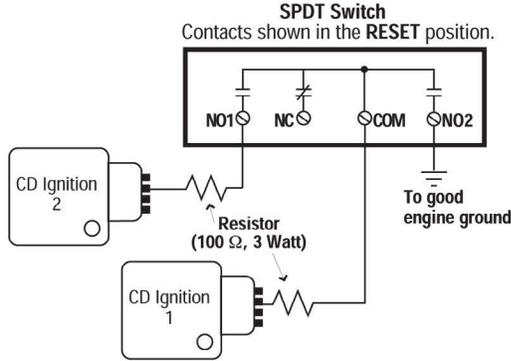
## Turbine Centrifugal Compressor



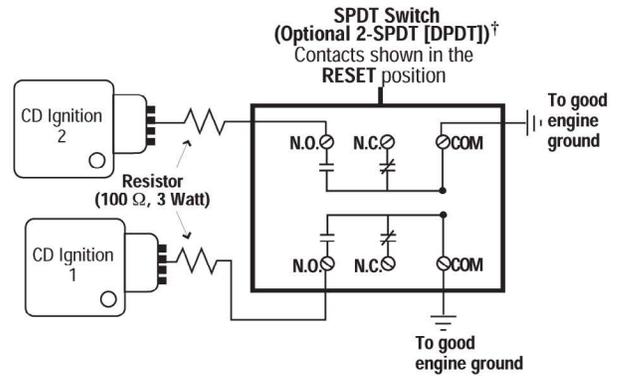


**WARNING:** REMOVE POWER BEFORE OPENING THE UNIT (ACCESS DOOR). STOP THE MACHINE AND DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING THE WIRING OPERATION. IT IS YOUR RESPONSIBILITY TO HAVE A QUALIFIED PERSON INSTALL AND WIRE THE UNIT AND MAKE SURE IT CONFORMS WITH NEC AND APPLICABLE CODES.

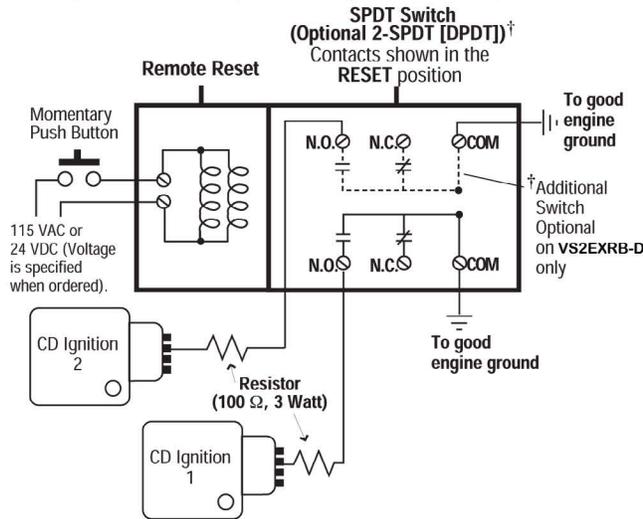
### VS2 and VS2C Typical Wiring Diagram for Single or Dual CD Ignition



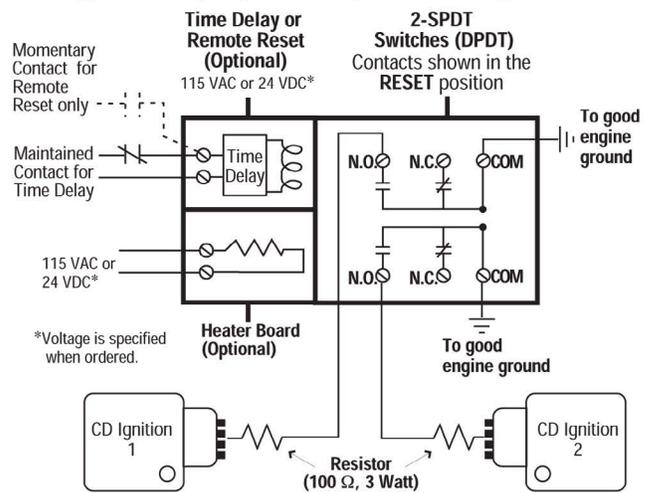
### VS2EX Typical Wiring Diagram for Single or Dual CD Ignitions



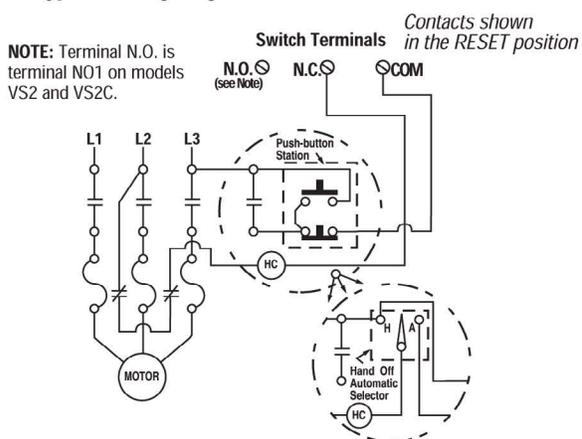
### VS2EXR and VS2EXRB Typical Wiring Diagram for Single or Dual CD Ignitions



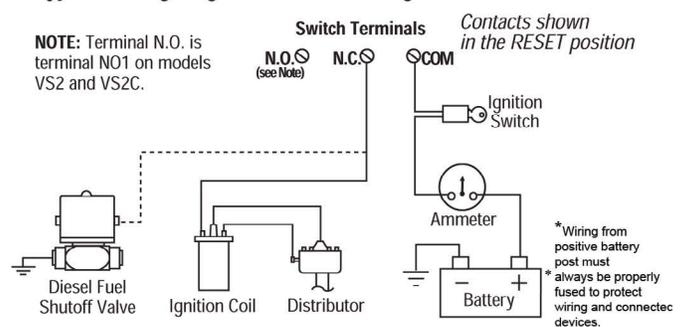
### VS94 Typical Wiring Diagram for Single or Dual CD Ignitions



### VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94 Typical Wiring Diagram for Electric Motors

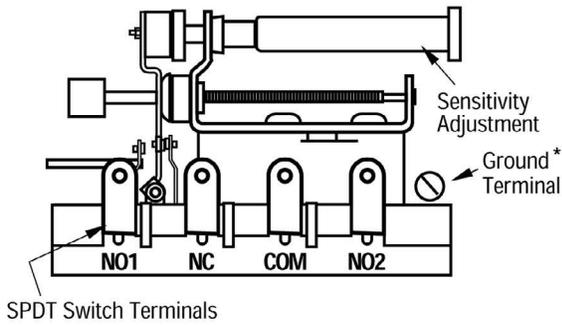


### VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94 Typical Wiring Diagram for Distributor Ignition or Diesel



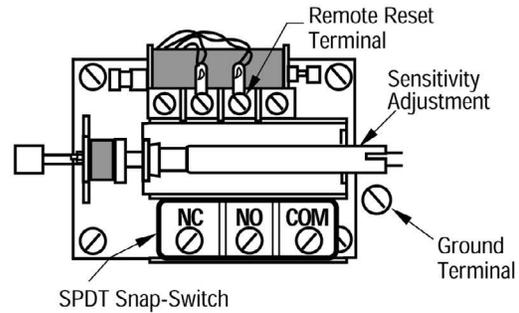
# Internal Switches

## VS2 and VS2C

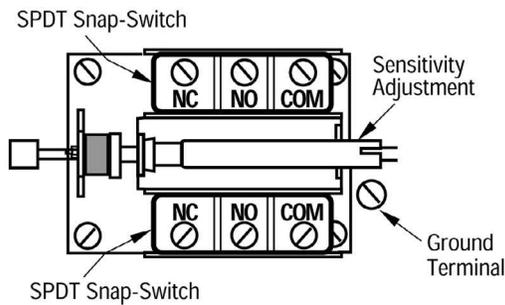


\*The internal ground connection is only available on the VS2 by threading the nut supplied in the hardware kit onto the base mounting bolt.

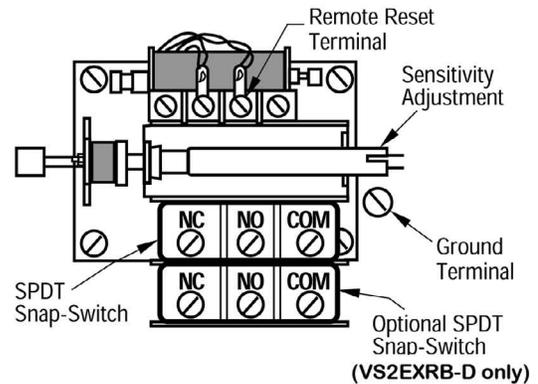
## VS2EXR



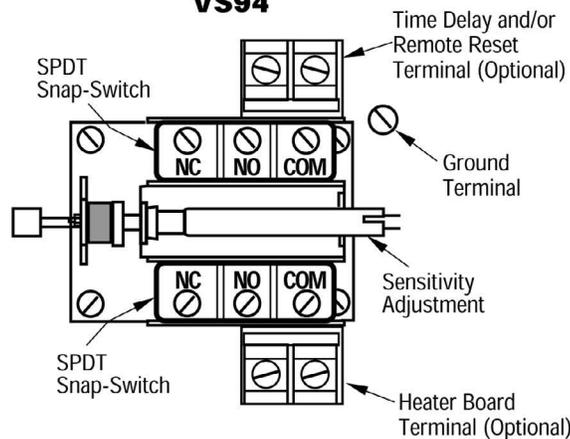
## VS2EX



## VS2EXB and VS2EXRB



## VS94



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