



# Shock/Vibration Control Switches

Models: VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94

## *Installation Instructions*

**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



Please read the following information before installing.

**BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:**

- A visual inspection of this product for damage during shipping is recommended before installation.
- It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.
- Disconnect all electrical power to the machine.
- Make sure machine cannot operate during installation.
- Follow all safety warnings of the machine manufacturer.
- Read and follow all installation instructions.
- Please contact FW MURPHY immediately if you have any questions.

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## General Information

### Description

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The 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, an inertia mass exerts force against the latch arm and forces 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 latch arm plate. Applications include all types of rotating or reciprocating machinery such a cooling fan, engine, pump, compressors, pump jacks, etc.

### Models

- **VS2:** Base mount; non-hazardous locations
- **VS2C:** C-clamp mount; non-hazardous locations
- **VS2EX:** Explosion-proof; Class I, Div. 1, Groups C and D (CSA and UL approved).
- **VS2EXR:** Explosion-proof with remote reset (CSA and UL approved).
- **VS2EXRB:** Explosion-proof; Class I, Div.1, Group B: with remote reset (no third party approval for this product).
- **VS94:** Base mount; non-hazardous locations, NEMA 4X/IP66.

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

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Include built-in electric solenoid which allows reset of tripped unit from a remote location. Standard on models: VS2EXR and VS2ERB. Optional on VS94 (options listed below).

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

### Time Delay Option (VS94 only)

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Overrides trip operation on start-up. 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

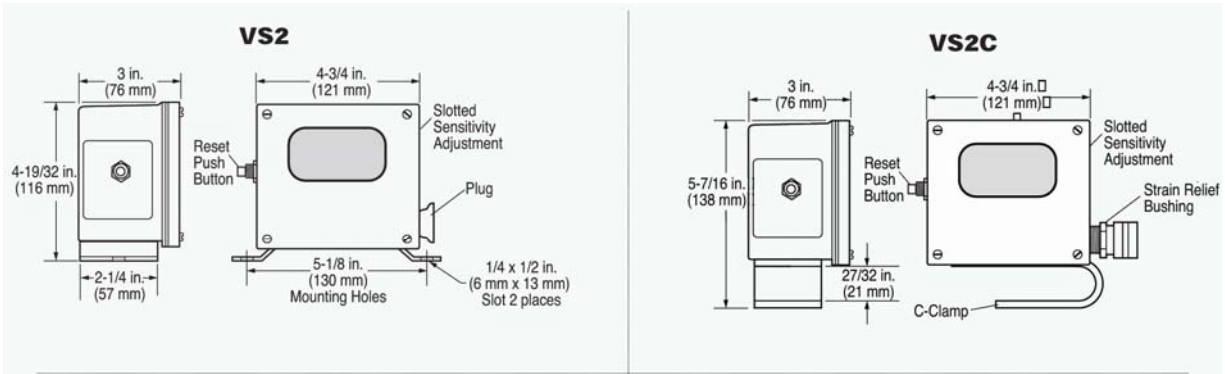
## **Space Heater Options (VS94 only)**

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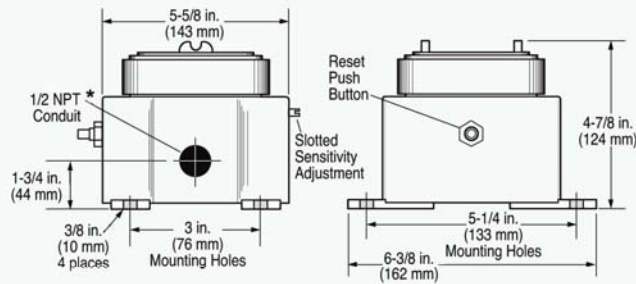
This optional space heater board prevents moisture from condensing inside the VS94 Series case. Options listed below:

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

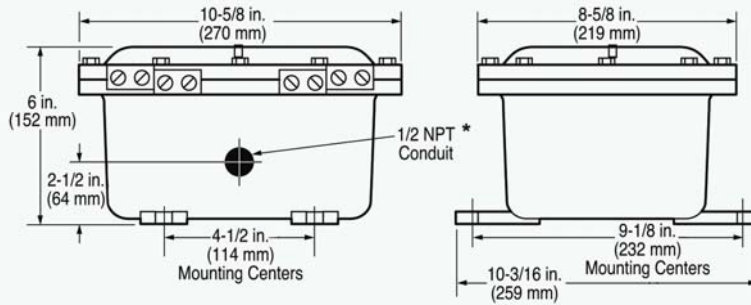
# Dimensions



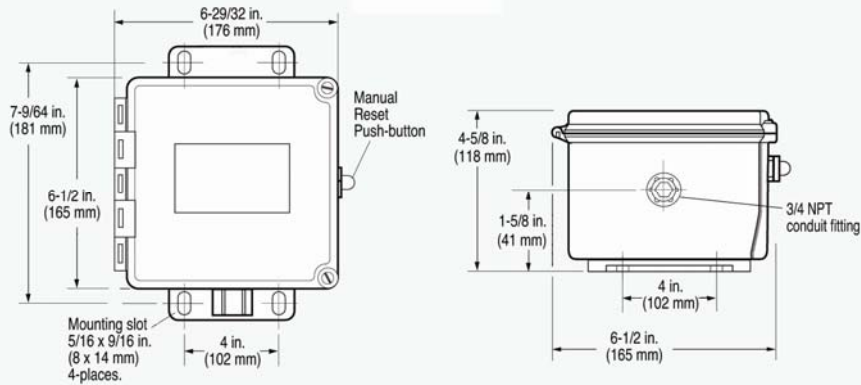
## VS2EX and VS2EXR



## VS2EXRB



## VS94



\* NEVER mount with conduit hole pointing up.

## Installation

The VS2 and VS94 series shock 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 (the reset pushbutton is located on the “front” of the unit). For maximum sensitivity, mount the unit so that the front faces into the direction of machine rotation. (See **Dimensions** for sensitivity adjustment location).

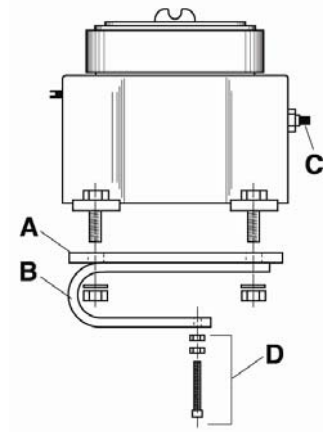
The VS2 and VS94 Series must be firmly attached/mounted to the machine so that all mounting surfaces are in rigid contact with the mounting service of the machine. For best results, mount the instrument in-line with the direction of rotating shafts and/or near bearings. In other words, the reset pushbutton should be mounted pointing out, perpendicular to the axis of rotation (see **Typical Mounting Locations**). It might be necessary to provide a mounting plate or bracket to attach the VS2 or VS94 Series to the machine. The mounting bracket should be thick enough to prevent induced acceleration/vibration upon the VS2 or VS94 Series. Typically ½ in. (13mm) thick plate is sufficient. See illustrations in **Typical Mounting Locations**.

CAUTION: A dust boot is provided on the reset pushbutton 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. 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 Installation (VS2C model only)

A C-Clamp is supplied with the VS2C model only. The C-Clamp is shipped installed on the VS2C but may optionally be installed on the VS2EX and VS2EXR switches.

1. The C-Clamp (**B**) will already be installed on a ¼ in. (6mm) thick steel mounting plate. (**A**). Bolt the VS2EX and/or VS2EXR switch to the mounting plate as illustrated – with four 5/16 in bolts, nuts and washers.
2. The mounting location should provide convenient access to the TATTLETALE® pushbutton (**C**).



3. The hardened set screw and nuts (**D**) are used to tighten the switch to an I-Beam or cross member such as a Sampson post of an oil well pump jack.

CAUTION: Conduit fittings, especially for explosion proof enclosures, are not weather proof. Make sure to mount the products horizontally to minimize water ingress. The conduit opening should NEVER be pointing up. A dust plug is installed in these products in the conduit hole. It is not meant to prevent water intrusion.

## All Models

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WARNING: STOP THE MACHINE AND DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING INSTALLATION.

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 Sampson post or walking beam. See **Typical Mounting Locations**.

2. Making 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 the 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

WARNING: 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.

All models of the VS2 and VS94 Series cover a wide range of sensitivity. Each model is adjusted to the specific piece of machinery on which it is installed in a satisfactory location. 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 start-up. Remote reset versions are available to hold the switch in reset during equipment start-up. 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 start-up. This is typically done as follows:

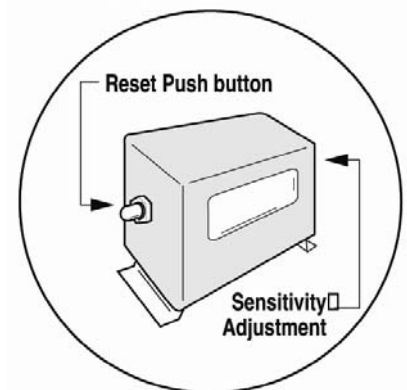
1. REPLACE ALL COVERS, LIDS AND ELECTRICAL ENCLOSURES.
2. Press the reset pushbutton to engage the magnetic latch. To be sure the magnetic latch has engaged, observe latch through the window on the VS2 and VS2C (see **DETAIL A**). On the VS2EX, VS94 Series the reset button remains depressed meaning the magnetic latch has engaged.
3. Start the machine.
4. If the instrument trips on start-up, allow the machine to stop. Turn the sensitivity adjustment  $\frac{1}{4}$  turn clockwise, (adjustment for VS94 and VS2EXRB models is located within the box, see **DETAIL B**).

WARNING: MAKE THE AREA NON-HAZARDOUS OR DE-ENERGIZE ALL CIRCUITS BEFORE OPENING THE EXPLOSION-PROOF (-EX) ENCLOSURES.

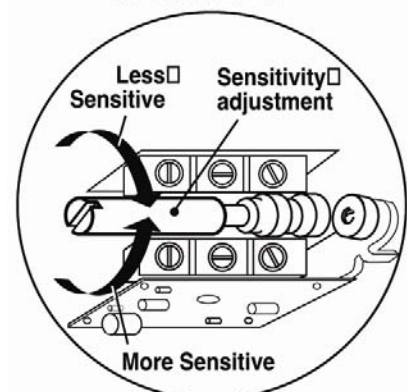
Depress the reset button and restart the machine. Repeat this process until the unit does not trip on start-up.

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

**DETAIL "A"**



**DETAIL "B"**



## VS94 Time Delay Adjustment

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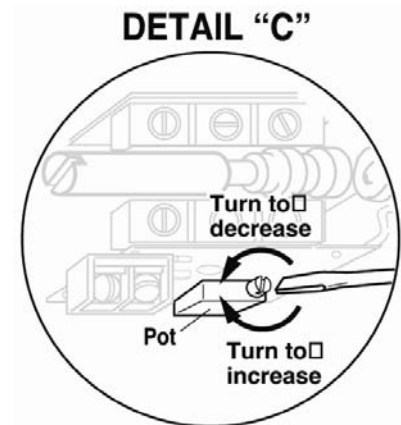
1. Apply power to the time delay circuit. (See **Electrical** for the time delay circuit). The time delay function is initiated.
2. Time the length of the delay with a watch. Let time delay expire. After it expires, the override circuit will de-energize the solenoid, allowing the latch to trip. A clicking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

WARNING: REMOVE ALL POWER BEFORE OPENING ACCESS DOOR. IT IS YOUR RESPONSIBILITY TO HAVE A QUALIFIED PERSON ADJUST THE UNIT, AND MAKES SURE IT CONFORMS TO NEC AND LOCAL CODES.

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.



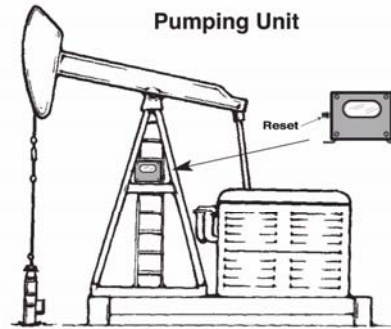
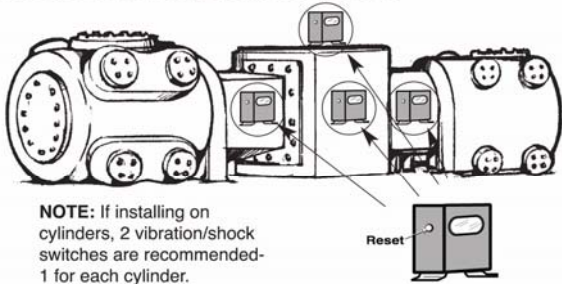
**NOTE:** An external time delay can be used with the remote reset feature of the VS2EXR series to provide a remote reset and override of the trip operation on start-up. Time delay must automatically disconnect after equipment start-up.

**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.

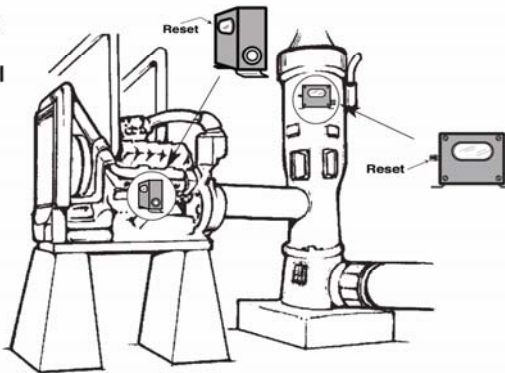
## Typical Mounting Locations

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

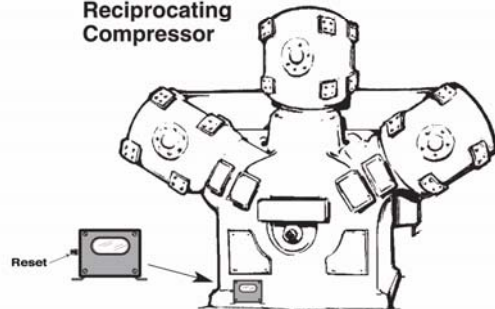
2-Throw Balance-Opposed Compressor



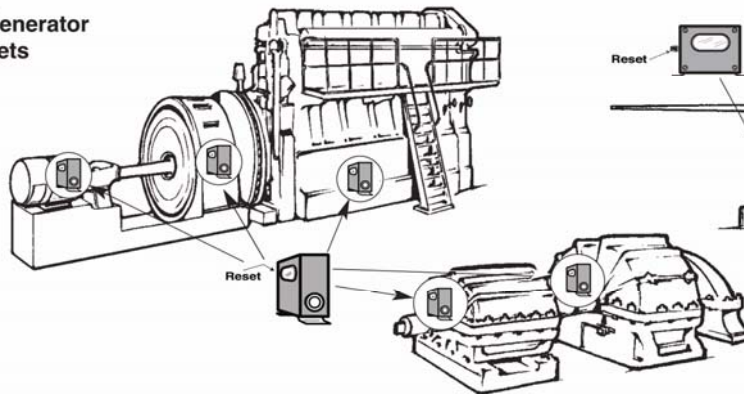
Engine and Vertical Shaft Pump



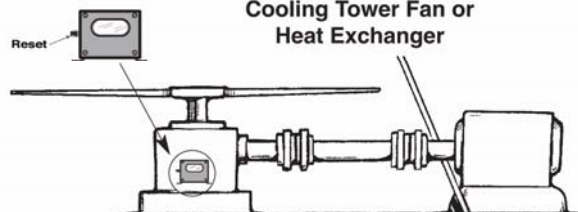
“Y” Type Reciprocating Compressor



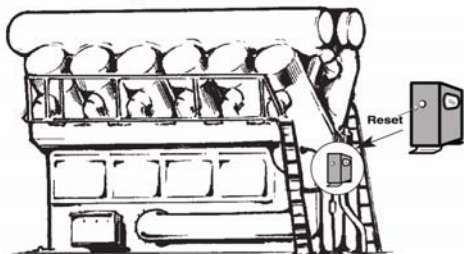
Generator Sets



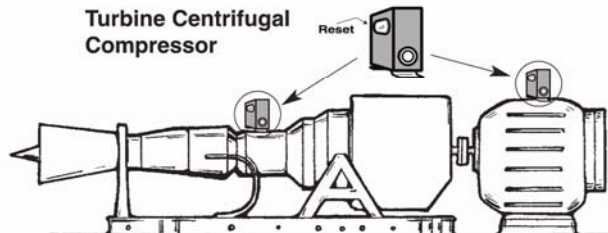
Cooling Tower Fan or Heat Exchanger



Engine Compressor

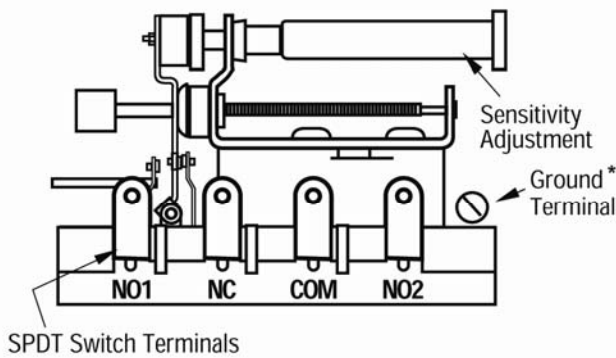


Turbine Centrifugal Compressor



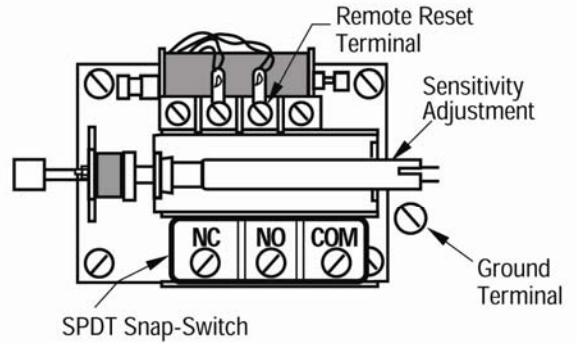
# Internal Switches

**VS2 and VS2C**

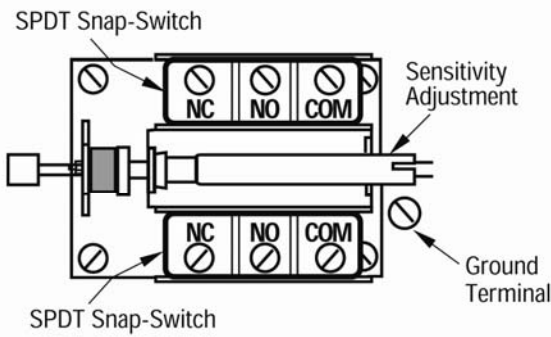


\*The internal ground connection is only available on the VS2 by threading the nut supplied in the hardware kit onto the base mounting bolt.

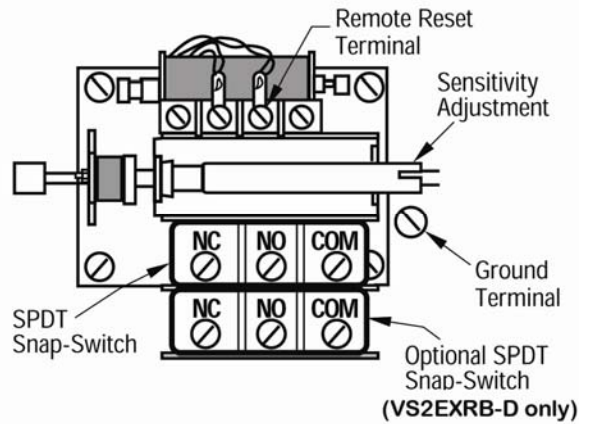
**VS2EXR**



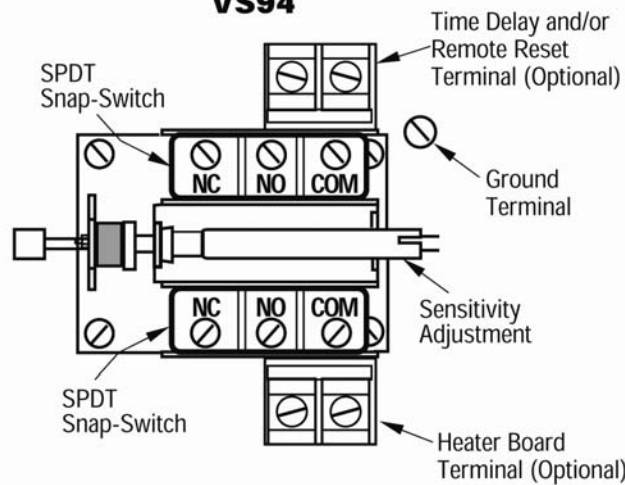
**VS2EX**



**VS2EXB and VS2EXRB**



**VS94**



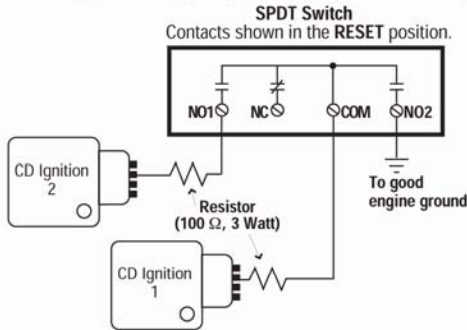


# Electrical

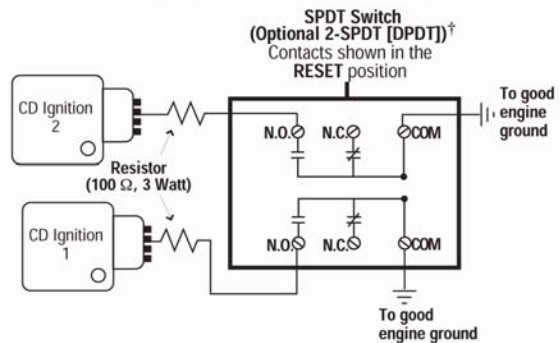


**WARNING:** REMOVE POWER BEFORE OPENING THE UNIT (ACCESS DOOR). STOP THE MACHINE AND DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING THE WIRING OPERATION. IT IS YOUR RESPONSIBILITY TO HAVE A QUALIFIED PERSON INSTALL AND WIRE THE UNIT, AND MAKE SURE IT CONFORMS WITH NEC AND APPLICABLE CODES.

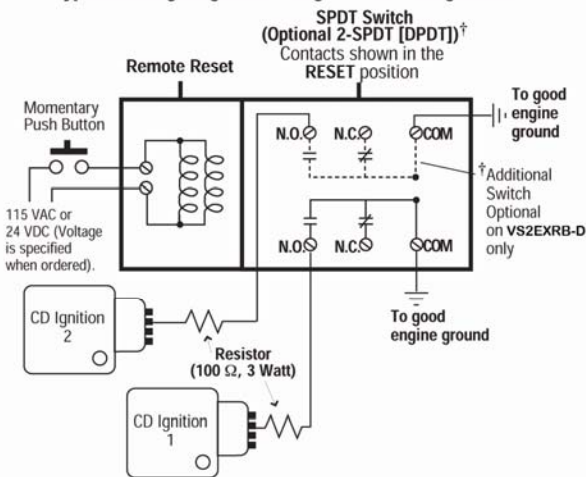
**VS2 and VS2C**  
Typical Wiring Diagram for Single or Dual CD Ignition



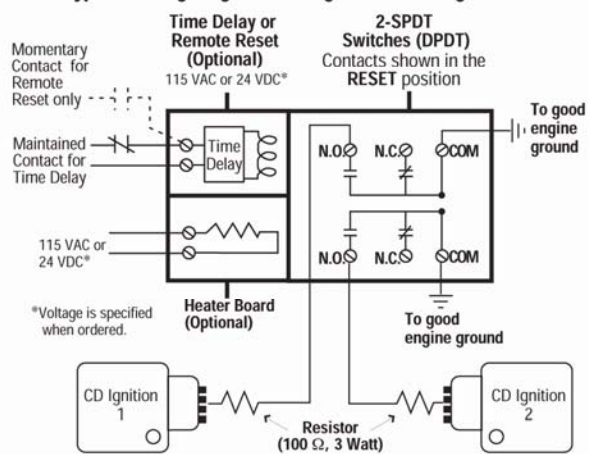
**VS2EX**  
Typical Wiring Diagram for Single or Dual CD Ignitions



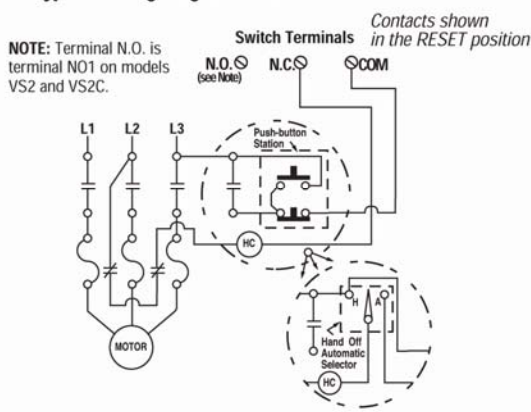
**VS2EXR and VS2EXRB**  
Typical Wiring Diagram for Single or Dual CD Ignitions



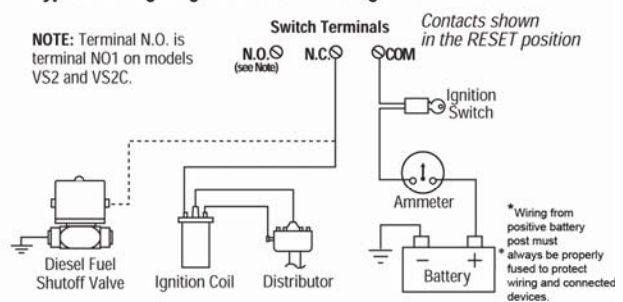
**VS94**  
Typical Wiring Diagram for Single or Dual CD Ignitions



**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



## Specifications

### VS2 and VS2C

- **Case:** Weatherproof (comparable to NEMA 3) suitable for non-hazardous areas.
- VS2: Base Mount
- VS2C: C-Clamp mount. Includes 45' (13.7M), 2-conductor 16 AWG, 30 strands/0.25mm strand dia (1.5mm<sup>2</sup>) cable and five cable hold-down clamps.
- **Contacts:** SPDT double make leaf contacts, 5A @ 480 VAC.
- **Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement

### VS2EX

- **Case:** Explosion-proof aluminum alloy housing; meets NEMA 7/IP52 specifications; Class I, Division 1, Groups C&D; UL and CSA listed.\*
- VS2EX: Base mount
- **Snap switches:** 2-SPDT snap-switches; 5A @ 480 VAC\*; 2A resistive, 1A inductive, up to 30 VDC.
- **Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement.
- **Normal Operating Temperature:** -40 to 140°F (-40 to 60°C)

### 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.
- **Remote reset:**

Option	Operating Current
-R15:	350 MA @ 115 VAC (momentary duty, not continuous)
-R24:	350 mA @ 24 VDC (momentary duty, not continuous)
- **Normal Operating Temperature:** -40 to 140°F (-40 to 60°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)
- **Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement

## VS94

- **Case:** Polyester fiberglass reinforced; NEMA type 4 and 4X; IP66; CSA types 4 and 12.
  - **Conduit Fitting:** ¾ NPT conduit fitting connection.
  - **Normal Operating Ambient Temperature:** -40 to 140°F (-40 to 60°C).
  - **Snap switches:** 2-SPDT snap acting switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC
  - **Range adjustment:** 0-7 G's; 0-100 Hz/0.10 in. displacement
  - **Heater:** (Optional)

Option	Operating Current
-H15:	.023 A @ 115 VAC
-H24:	.12 A @ 24 VDC
  - **Remote Reset:**

Option	Operating Current
-R15:	.17 A @ 115 VAC (momentary duty, not continuous)
-R24:	.36 A @ 24 VDC (momentary duty, not continuous)
  - **Time Delay:**

Option	Operating Current	Standby Current
-T15:	.360 A @ 115 VAC	.01 A @ 115 VAC
-T24:	1.15 A @ 24 VDC	.01 A @ 24 VDC
  - **Time Delay/Remote Reset:** Adjustable 20-turn potentiometer from 5 seconds to 100 seconds (5 seconds per turn approximately).
- \*CSA and UL listed with 480 VAC rating.

## Service Parts

PART NO.	DESCRIPTION
<b>VS2</b>	
20000030	Movement assembly
20000031	Glass and gasket assembly
20000032	Reset pushbutton assembly
<b>VS2C</b>	
20000030	Movement assembly
20000031	Glass and gasket assembly
20000032	Reset pushbutton assembly
20050021	Mounting clamp
20000261	Cable clamp assembly (1 each) (VS2C)
20000137	5 clamps and 45 feet (13.7 meters) of cable (VS2C)
<b>VS2EX</b>	
20010091	Movement assembly
<b>20000288</b>	<b>Snap switch and insulator kit (1switch per kit) for models manufactured on September 1, 1995 or later</b>
20000289	C-clamp conversion mounting kit
<b>VS2EXR</b>	
20000262	Movement assembly
20050087	Cover
00000309	Cover gasket
<b>20000288</b>	<b>Snap switch and insulator kit (1switch per kit) for models manufactured on September 1, 1995 or later</b>
20000289	C-clamp conversion mounting kit
<b>VS2EXRB</b>	
<b>20000288</b>	<b>Snap switch and insulator kit (1switch per kit) for models manufactured on September 1, 1995 or later</b>
20000262	Movement assembly
<b>VS94 Series</b>	
25050506	Dust boot
<b>20000288</b>	<b>Snap switch and insulator kit (1switch per kit) for models manufactured on September 1, 1995 or later</b>



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