OPERATOR'S MANUAL

480 VIBRATION SWITCH: 120/240V AC

TABLE OF CONTENTS

CAUTION

All model 480 Vibration Switches are shipped from the factory with the Input Voltage switch S5 set to **120V AC**.

For **240V AC** applications, the S5 setting must be changed prior to applying power to the unit, or **damage will occur**.

Switches damaged by incorrect power applied to the unit are not covered under Factory Warranty.

Vitec, Inc.
26901 Cannon Rd.
Cleveland, OH 44146
Phone: 216-464-4670
Email: vitec@vitec-inc.com
Web: https://www.vitec-inc.com

1.0 Introduction

The Vitec 480 Vibration Switch is an economical approach to accurate and reliable vibration protection for rotating machinery. It is a complete vibration monitoring system, including a 4-20mA output proportional to vibration level, two setpoints (Alarm and Trip), and an AC signal output for connection to analysis equipment.

1.1 Receiving and Handling

This section covers acceptance, storage and warranty.

1.1.1 Acceptance

Inspect this equipment thoroughly before accepting from the transportation company. If any of the goods are missing or damaged, have the agent make the proper notation on the freight bill or express receipt. Request the carrier to make an inspection. Claims for loss or damage in shipment must not be deducted from the Vitec invoice, nor should payment of the Vitec invoice be withheld awaiting adjustment of such claims since the carrier guarantees safe delivery.

If damage has been incurred to your shipment, contact Customer Service at Vitec for assistance.

1.1.2 Warranty

Seller warrants that the goods manufactured by it will be free from defects in material or workmanship for one year from the date of the invoice for the material. For this warranty to be in effect, the specific item claimed to be defective must be returned to the seller, transportation prepaid, no later than five days after the expiration of the warranty period. The seller's liability for incidental and consequential damages is expressly excluded. This warranty shall not apply to any goods that have been subjected to misuse, improper installation, repair, alteration, neglect, accident, use exceeding the published maximum ratings, or damage during shipment. The foregoing warranty is in lieu of all other warranties, expressed or implied, including those of merchantability or fitness for any purpose not expressly set forth herein.

2.0 Product Description

The 480 measures the vibration level of the machine to which it is mounted. It incorporates a vibration sensing element and electronics to measure the vibration in terms of vibration velocity. Those familiar with setpoints given in displacement (mils) can convert to velocity (in/sec) via the Vibration Conversion chart (page 4. For detailed information on acceptable vibration levels, please contact Customer service and request a copy of our Vibration Primer.

Electrical Outputs

The Vitec 480 provides two solid-state relay outputs that activate when preset vibration levels are exceeded, thereby offering protection from excessive vibration. One provides a warning (Alarm), the second provides for shutdown (Trip).

The 4-20mA DC output signal, proportional to overall vibration level, allows the unit to be connected to a remote device to read or record the vibration level. Common applications include connection to data loggers, recorders, PLCs or loop-powered meters.

An AC signal, switch selectable with S1 (see Page 6) for either acceleration or velocity, is also provided. This is a buffered signal proportional to the actual vibration being measured by the internal transducer. The signal may be connected to an oscilloscope to view the raw transducer signal, or to a real-time analyzer for analysis of the vibration being measured.

3.0 Electrical Installation

The 480 is often used to replace simple mechanical switches which have few electrical installation restrictions. A little care here will ensure a trouble-free installation.

Follow the wiring diagram shown on Page 5. Make special note of the following:

1. The system requires a good instrument earth ground; connecting to the machine itself isn't recommended, as this may not always provide proper grounding.

   Do not use a ground that is common to other large electrical machinery. Electrical noise or surges from these machines can feed back into the 480 and cause false tripping.

2. The Alarm and Trip outputs are isolated from the monitor electronics. Maximum relay load current is 1 amp, AC only.

3. Ensure that the power supply input lines and relay output lines are fused as shown on Page 5

4. If the AC output signal is utilized, use a good grade of shielded twisted cable.

5. Do not use oversized cable, as space inside the 480 housing is limited. Trim the cable to proper length, so that excess cable is not crammed into the housing. Route the cable to avoid physical contact with the sensing element in the bottom of the housing. Failure to do this may cause noise and false alarms or trips. Make sure that the wiring does not put excessive force on the terminal block or printed circuit board.

4.0 Mechanical Installation

The 480 Vibration Switch is sensitive to vibration in one direction. Ensure that the unit is properly oriented, usually perpendicular to the machine's shaft.

Mounting tips:

1. Be sure the vibration switch is mounted firmly to the machine. Any looseness can contribute additional vibration, causing inaccurate readings.

2. Water or moisture in the electronics can cause failure of the unit. Be sure to seal all threads with the provided sealing tape. Failures caused by improper sealing will not be covered under warranty.

3. Try to orient the unit so that the setpoint adjustments are accessible after the unit is mounted, in the event that setpoints need to be adjusted in the future.

5.0 Setpoint Adjustment

Setpoints are adjusted via two potentiometers (VR67 for Alarm, VR66 for Trip) located on the PC board (see Page 6). DO NOT attempt to adjust the small square potentiometers on the opposite side of the board – these are used for calibration of the unit. Any adjustment of these by unauthorized personnel will result in inaccurate readings, and will void the warranty.

The setpoint adjustments are calibrated for 0 to 100% of full scale range. Simply turn the potentiometer until the arrow lines up with the desired setpoint level. Do not use excessive force, or try to turn the potentiometer beyond its stops.

A 0- to 20-second adjustable time delay is built into the alarm and trip circuits to help avoid false warnings or shutdowns. All units are shipped with the time delay set for 0 seconds, but can be adjusted in the field for up to 20 seconds. Turn the potentiometers (VR59 for Alarm, VR65 for Trip) clockwise to increase the time delay.

6.0 Relays

The alarm and trip solid-state relays are factory set to be normally open below the setpoint. They are to be wired in series with a load rated at up to 120 or 240V AC, 1A maximum.

The relays can be changed to normally closed (open when vibration exceeds setpoint) using switches S3 (Alarm) and S4 (Trip).

The relays are latching, and must be reset by connecting terminals 5 and 9. This can be done either with a jumper wire, for automatic reset when vibration level has dropped below the setpoint, or through an external switch or relay contact.

Relay action can be inhibited by connecting terminal 6 and 9. **NOTE: When relay action is inhibited, the 480 provides no alarm or shutdown relay operation**.

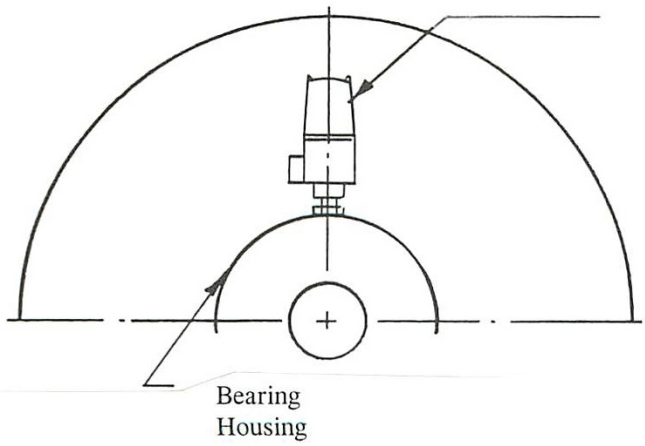
7.0 Typical Installation

This section covers mounting and electrical installation and checkout.

7.1 Mounting

Mount the 480 perpendicular to the shaft for radial vibration applications, or parallel to the shaft for axial vibration applications. The 480 may be mounted in any position perpendicular to the direction of vibration to be monitored. See mounting detail below.

Turn the jam nut by hand up to the body of the 480, then thread the 480 into a 3/4-10 tapped hole by turning the 480 body. When a minimum of 3/4" thread engagement is attained, continue to turn the unit until the desired cable direction is reached, then tighten the jam nut against the attachment point. DO NOT attempt to turn the stud in the 480 body.

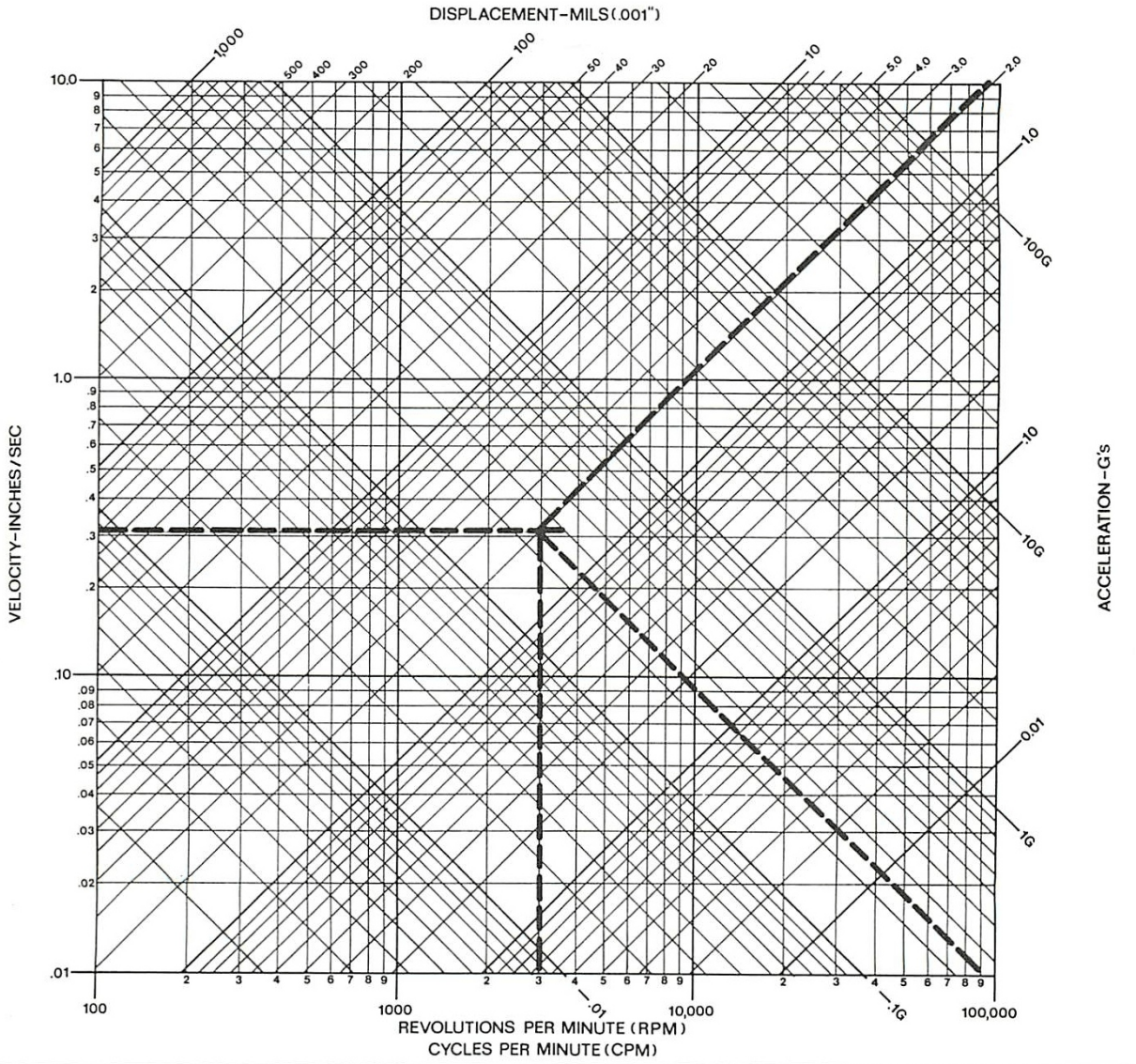


Mount 480 on or as close as possible to the bearing housing. A 0.75 inch-10 UNC tapped hole, or a 0.75- inch spot welded nut, with a minimum 0.75 inch full thread depth required.

7.2 Electrical Installation and Checkout

Prior to installation, vibration readings should be taken at the location of the installation on the machine bearing to be monitored. Ideally, this reading should be at least 20% of the 480's full scale range.

Remove the top cover of the 480 and make electrical connections as shown on Page 5. Adjust the Alarm and Trip potentiometers for the desired alarm and trip points. Replace the cover, using the provided teflon tape to seal the threads. Tighten the cover securely.



CONVERSION FORMULAS

Symbols:

- D = Displacement: Inches peak to peak
- d = Displacement: Mils peak to peak
- V = Velocity: Inches per second peak
- A = Acceleration: G's peak
- Hz = Cycles per second
- CPM = Cycles per minute

$D = 0.318 \frac{V}{Hz}$

$D = 19.607 \frac{A}{(Hz)^2}$

$V = \pi(Hz)(D)$

$V = 61.440 \frac{A}{Hz}$

$A = 0.051 (Hz)^2 (D)$

$A = 0.016 (V) (Hz)$

$d = (1.910)(10^4) \frac{V}{CPM}$

$d = (7.059)(10^7) \frac{A}{(CPM)^2}$

$V = (5.236)(10^{-5})(CPM)(d)$

$V = (3.696)(10^3) \frac{A}{CPM}$

$A = (1.417)(10^{-8})(CPM)^2 (d)$

$A = (2.704)(10^{-4})(CPM)(V)$

EXAMPLE: 2.00 Mils at 3000 RPM

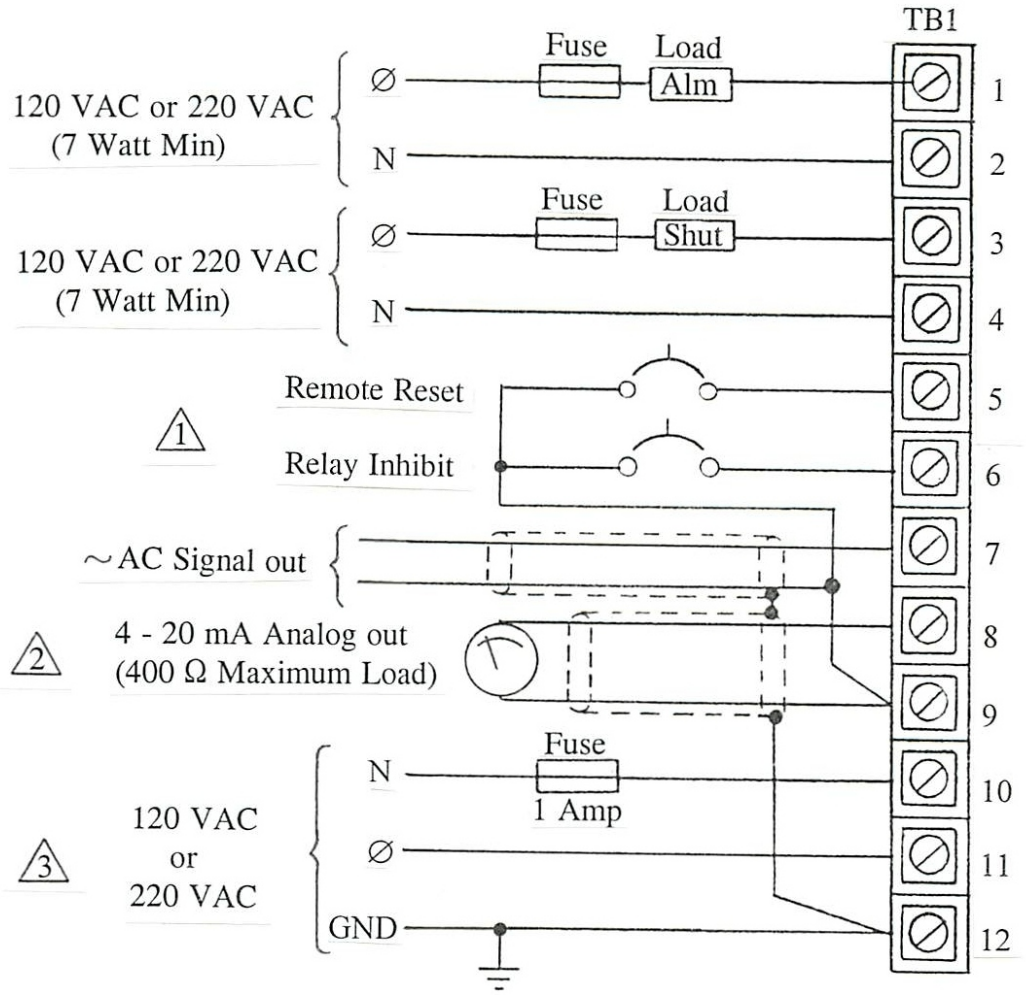
By Chart V = 0.3 inches per second

A = 0.25 G's

By Formula $V = (5.236)(10^{-5})(3000)(2.00) = 0.31$ inches per second

$A = (1.417)(10^{-8})(3000)^2 (2.00) = 0.26$ G's

Displacement, Velocity and Acceleration Conversion Chart & Formulae



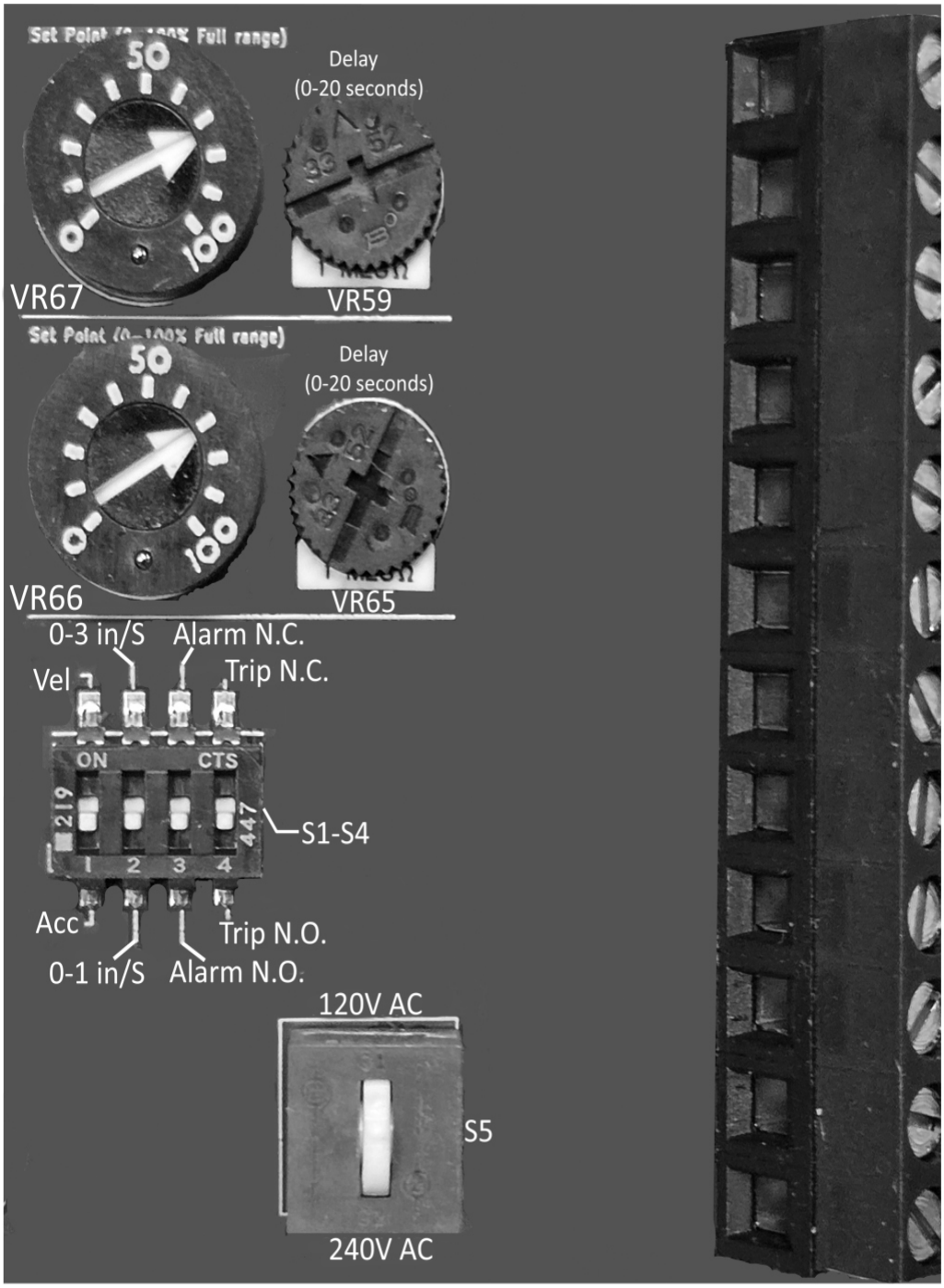
Notes:

1. Relays are inhibited while switch between terminals 9 and 6 is closed. Latching relays reset when switch between terminals 9 and 5 is closed. For non-latching relays, install jumper between terminals 5 (Remote eset) and 9 (Com.)

2. If 4 - 20 mA analog output is not used, install a 100 Ω l/4 W resistor across terminals 8 and 9.

3. **Be sure Switch S2 is set to proper voltage prior to connecting power to unit.**

Wiring of the 480 Vibration Switch



Field-Selectable Provisions of the 480

480 Vibration Switch Specifications

Full scale range	0-1.0 in/sec* or 0-3.0 in/sec
Input voltage	120V AC* or 240V AC, 50/60 Hz
Frequency range	3 to 1,000 Hz
Setpoint adjustability	5% to 100% of full scale
Time Delay Adjustability	0 to 20 seconds
Setpoint Accuracy	± 5% of full scale
Setpoint Repeatability	± 1% of full scale
Operating Temperature Range	-25 F to +160 F
Analog Output	4 - 20 mA proportional to selected full scale range
AC Signal Output	100 mV/g* or 100 mV/in/sec
Solid-State Relays	Two triacs, designated as Alarm and Trip 1 amp maximum load current at 120 or 240V AC Minimum load current: 50mA Normally open* or normally closed below setpoint Latching* – must be reset with either a jumper wire (automatic reset) or external switch wired between TB1-5 and 1-9

* Indicates configuration as shipped from the factory.