TYPE PVR
PHASE VOLTAGE RELAY

DESCRIPTION

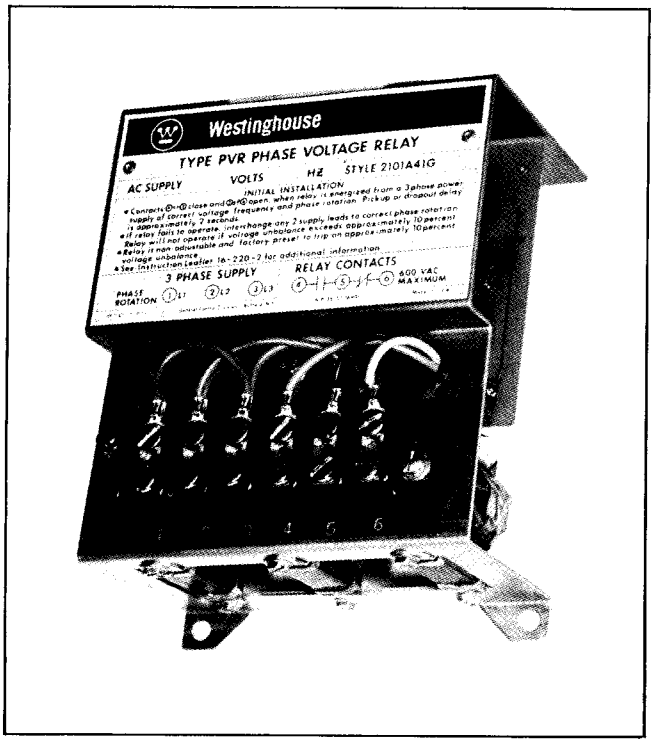


FIG. 1 Type PVR Relay **(Photo 73-0732)**

The Type PVR Relay is designed to monitor line to line voltages of any three phase distribution system and functions independently of line currents. It protects three phase motors and driven equipment from possible damaging effects of reverse phasing and phase voltage unbalance of prescribed magnitude (See Operating Conditions Below.)

For most applications where all motors on the power circuit are heavily loaded the PVR Relay will also protect against phase failure. However, if an open phase condition occurs while a motor is running, this motor and/or other lightly loaded motors, also single phased on the same power circuit, may generate sufficient voltage in the open phase and insufficient voltage unbalance to operate the relay.

RATING

The relay is insulated for 600 VAC maximum. The contacts are capable of continuously carrying and interrupting the currents shown in Figure 2, with loads of a minimum .35 power factor at 50 or 60 Hertz. The contacts are rated for 5A maximum continuous current and must be connected to the same polarity of the AC line in the control circuit.

Volts AC	Make Current In Amperes	Break Current In Amperes
120	30	3.0
240	15	1.5
480	7.5	0.75
600	6.0	0.60

FIG. 2 Contact Rating

A wide range of standard input voltage Type PVR relays are available, as shown in Figure 3. For other input voltages, contact factory.

Input Volts AC	Hertz	Style
120	60	2101A41G01
200	60	2101A41G02
240	60	2101A41G03
480	60	2101A41G04
600	60	2101A41G05
110	50	2101A41G06
220	50	2101A41G07
380	50	2101A41G08
440	50	2101A41G09
550	50	2101A41G10

FIG. 3 Input Voltage Rating

CONSTRUCTION

The Type PVR relay is completely assembled on a rugged steel mounting base. The internal magnetically operated relay is mounted on a glass polyester plate, which provides both support and insulation from the mounting base. The contact and coil leads are long enough so that the relay may be fully removed from the mounting base for inspection. (This must, of course, be done with all electrical power removed).

The use of special lugs for all connections to the terminal block prevents the terminals from slipping out in case the terminal screws are inadvertently loosened. Leads to the printed circuit board are soldered to turret terminals to assure reliable connections. For ease of locating solid state components, the printed circuit board is imprinted with individual component outlines and identifications. The board itself is made of a high quality glass base, epoxy resin, flame retardant laminant with two-ounce copper bonded to the interconnection side. Basic installation instructions are included on the nameplate.

OPERATING CONDITIONS

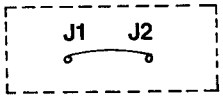
Condition	Value
Normal Voltage Range	85% to 110% of rating
Phase unbalance to open ④⑤ with jumper J1 to J2 on back of printed circuit board	9 ± 3% @ 25% C.
Phase unbalance to open ④⑤ without J1 to J2 Jumper	12 ± 3% @ 25% C.
Delay on opening ④⑤ after excessive unbalance	2 Sec. Approx.
Ambient Temperature Range	-40° C. to 65° C.
Percent Unbalance from opening to reclosure ④⑤	2%
Line Power Required	7 VA
Time Delay from energizing relay on balanced system to closing of ④⑤	3.5 Sec. App.

FIG. 4 Operating Conditions

Percent voltage unbalance by definition is maximum deviation from the average phase voltage divided by the average phase voltage. For example: If phase voltage are 120, 110 and 96, the average is 108.7 volts. Deviations from average are 11.3, 1.3 and 12.7 volts, and the maximum is 12.7 volts.

$$\% \text{ Unbalance} = \frac{12.7 \times 100}{108.7} = 11.7\%$$

Printed Circuit Board on back of relay



Note: Cut Jumper if relay point is too sensitive.

CIRCUIT OPERATION

The circuit consists of a phase unbalance detector and a threshold-sensitive amplifier. The phase unbalance detector continuously monitors the three phase input, converting the input unbalance to a D.C. voltage present between the amplifier input terminals. When the input unbalance exceeds the specified level, the threshold-sensitive amplifier de-energizes the internal magnetically operated relay coil. The amplifier provides approximately 2 seconds delay from instant of unbalance to de-energization (opening of contacts ④⑤) to prevent tripping because of short-time line voltage disturbances.

INSTALLATION

1. The relay frame is arranged for 3 point mounting with .190-32 screws. See Fig. 5.

2. With all input electrical power disconnected, connect leads from the three phase supply to be monitored to terminals ① , ② and ③ in proper phase sequence, L1-L2-L3 on the terminal block. Connect leads from the control circuit to terminals ④ , ⑤ or ⑥ , as required for the control scheme.The contacts must be connected to the same polarity of the AC line in the control circuit.

3. If contacts ④⑤ fail to close in approximately 3.5 seconds after application of power:

   A. Check for phase sequence L1 - L2 - L3 of the supply. This is most conveniently done by interchanging any two of the external leads to terminals ① , ② and ③ .
   B. Check for line voltage unbalance exceeding values listed in Figure 4.
   C. Check for average input line voltage less than 85% of voltage stamped on nameplate.

4. This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

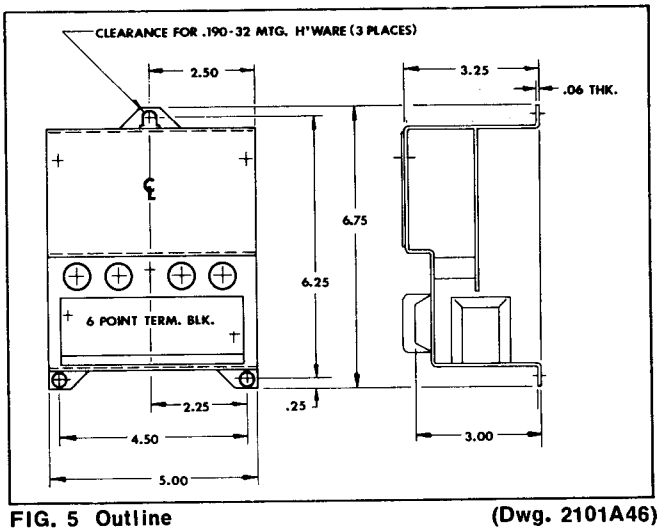


FIG. 5 Outline **(Dwg. 2101A46)**

MAINTENANCE

Little maintenance is required by the Type PVR relay other than occasional inspection to see that the internal relay movable contact assembly moves freely from the open to the closed position. The terminal screws should be checked for tightness.

The Type PVR relay is factory calibrated for proper operation and should not require further adjustment. However, in the event the potentiometer adjusting screw is moved from its factory-set position, the following procedure may be used for re-calibration.

With a three phase input supply voltage in a range of 85% to 110% of that specified on the nameplate, with a phase sequence of L1-L2-L3, and with voltage unbalance less than ½%, applied as L1 to ① , L2 to ② and L3 to ③ , adjust the linear potentiometer on the PC board for point of minimum AC volts from TP1 to TP2. An AC voltmeter with an impedance of 5000 ohms/volt or greater must be used. The minimum voltage obtained by this method should be less than 1.5 VAC for a properly operating Type PVR relay.

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