



**Application Engineering Bulletin
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GUIDELINES TO USING A THREE PHASE VOLTAGE MONITOR

INTRODUCTION

A phase monitor can be used with any three phase motor. A monitor such as the Copeland 085-0160-00 is recommended for monitoring remote locations or environments with a history of adverse voltage fluctuations.

Many compressor failures are caused by an intolerable line voltage. These voltage variations can have many different sources such as contactor failure or ground interference. Irrelevant of the cause, compressor failures due to voltage fluctuations may be prevented. Although the voltage fluctuations themselves may be inevitable, actual motor damage can usually be averted.

FAULT DETECTION

The phase monitor checks for critical faults

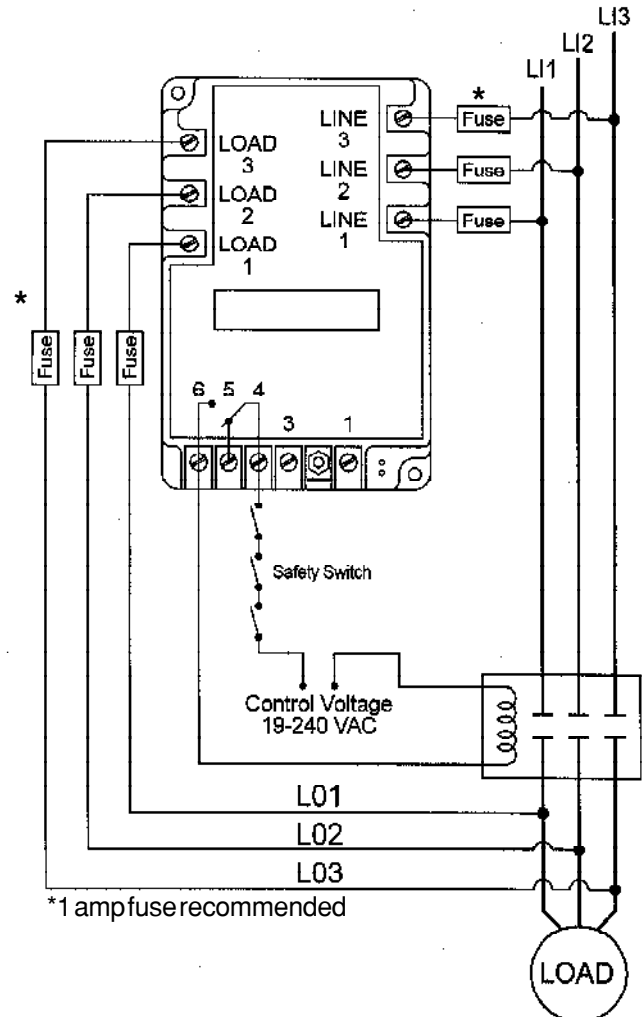
- Phase loss
- Phase reversal
- High voltage
- Low voltage
- Voltage unbalance

A phase reversal is very damaging to phase sensitive machines such as scroll compressors, screw compressors, and fan motors. A phase loss will cause excessively high current resulting in high temperatures in the other two motor phases. High voltage causes excessive temps inside the motor. Low voltage increases the slip of the motor producing excess heat. Phase unbalance is when the voltage to each phase is not equal, as a result, some windings do more work than others. This causes excessive heat.

ELECTRICAL WIRING SET UP

For single contactor systems, connect the monitor to the three phase power supply as shown in **Figure 1**.

For a part winding start with two contactors and two phase monitors, connect the monitors as shown in **Figure 2**.



**Figure 1
Voltage Wiring for Three Phase Line Monitors**

Part Winding Start (PWS) For 3-Phase Motors

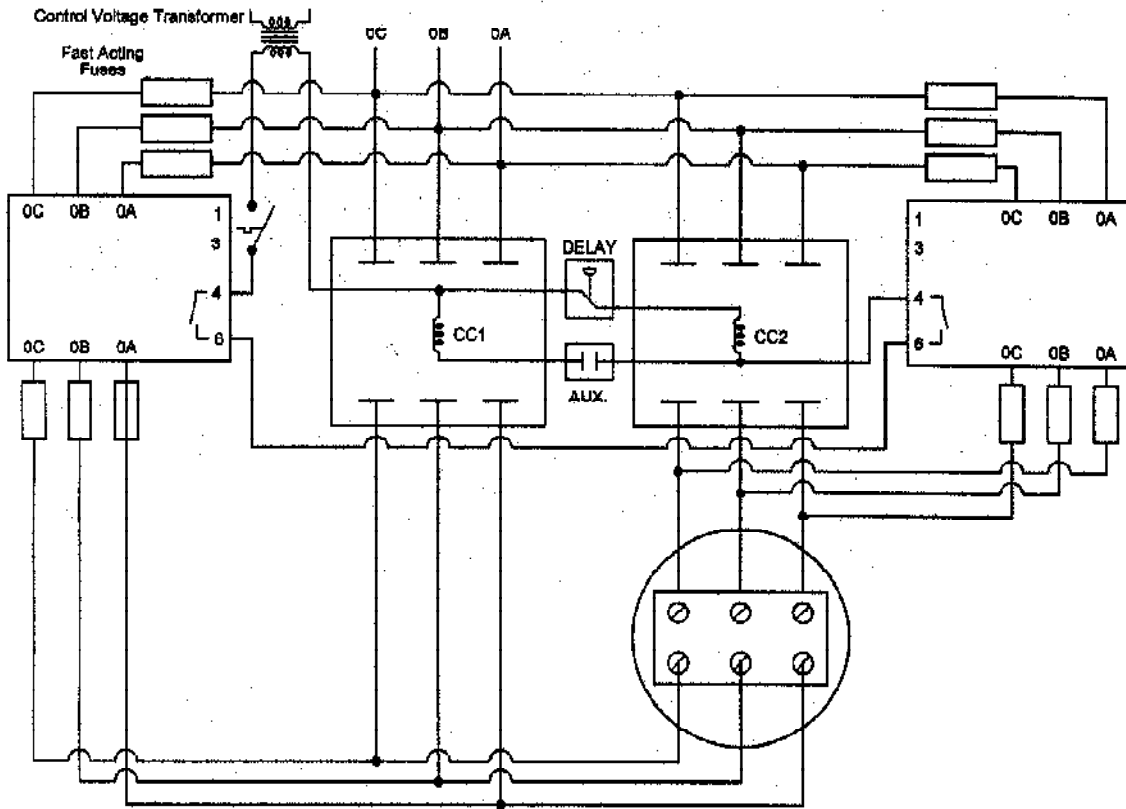


Figure 2

LOAD/ALARM RELAY

The relay shown in **Figure 3** is used to control the contactor coil. Wire terminals 4 and 6 are in series with the control circuit as shown in **Figure 3**. If needed, terminal five (the normally closed side of the relay) can be used for alarm installation.

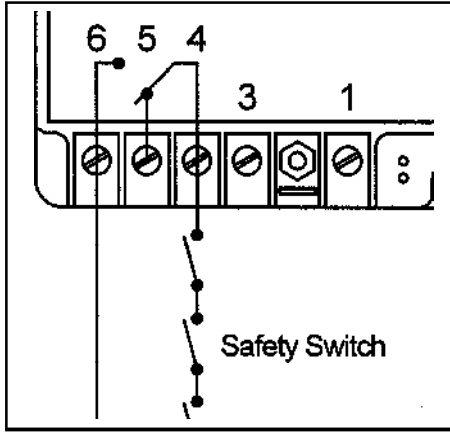


Figure 3

PARAMETER SETTINGS

Changes to parameter settings may result in less than optimum protection. The parameter settings are as follows:

Average Line Voltage

Factory setting : 208VAC

Set the expected phase to phase line voltage value. It is adjustable from 190 to 630 volts.

Time Phase Loss/Unbalance

Factory setting: 2 min

Enter the amount of time that the phase monitor waits after a fault before trying to restart. It is adjustable from 2 to 10 minutes.

Time Phase Unbalance

Factory setting: 15 sec

Enter the amount of time that the monitor allows a fault to exist before tripping into a fault mode. It is adjustable from 0 to 15 seconds.

% Over Voltage

Factory setting: 10%

Enter the allowable over voltage percent. When the voltage exceeds this range, the monitor trips. It can be adjusted from two to 10 percent.

% Under Voltage

Factory setting: 10%

Enter the allowable under voltage percent. When the voltage goes under this range, the monitor trips. It can be adjusted from 2 to 10 percent.

Phase Unbalance

Factory setting: 5%

Enter the acceptable phase unbalance percent. It can be adjusted from two to five percent.

Reset Mode

Factory setting: 5 retrys

The reset mode determines what the unit does after recording a fault. If the reset mode is Auto, the unit restarts when the input conditions are correct.

If you choose a number between 1 and 5, this is the number of times that the unit restarts before going into lockout. Thereafter it requires a manual restart. If you enter 0, the unit always goes into lockout after a failure. Note: This unit will lockout only on load side faults. For any line side faults, the unit will lock out just for the duration of the fault.

Control Mode

Factory setting: off

Adjustment not permitted when used on the Copeland compressors.

Note: It may be necessary to clear any faults that occurred during initial power up. To clear faults, simply hold down the [FAULT] button until the LCD screen flashes Faults Cleared (approximately 5 seconds).

Should adjustment be desired, the touch pad shown in **Figure 4** can be used.

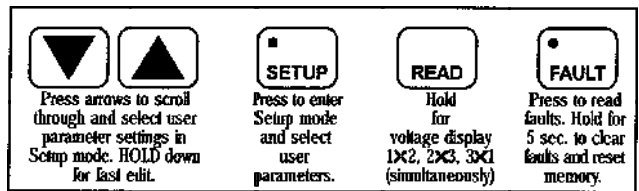


Figure 4
Touchpad

**Table 1
Troubleshooting**

Symptom	LCD Readout	LED Status	Corrective Action
Load will not energize	Phase Avg (Phase Average)	Load LED OFF, Fault LED blinking	1)Confirm that the control input is properly connected. 2)Press [FAULT] to observe the current fault. Correct the condition of the first fault which appears. (See Table 2 for a list of corrective actions).
Fault LED blinks repeatedly while load is energized.	Phase Avg	Fault LED blinking. Load LED ON.	Indicates that there are faults saved in the memory. To clear faults, press and hold [FAULT] for more than 2 seconds
Setup LED is on while load is being energized	Other than Phase Avg	Setup LED ON. Load LED ON.	To exit the Setup mode, press either the [READ] or the [FAULT] button.
Load will not energize	RESET	Fault LED blinking.	Unit in Lockout. Maximum #of retries in manual reset mode has expired. To reset unit, press [FAULT] and hold for approximately 2 seconds.
Load turns ON and OFF	Does not matter	Fault LED blinking.	The amount of time between the load de-energizing and re-energizing may be too short. Press set up to enter time phase loss/rev (Delay on break) mode. Use the arrow up to lengthen the delay.