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PMP-25 Installation Check and Notes

1. **Installation Wiring**

Wiring Terminals - MAKE SURE terminals 1 to 8 are on the BOTTOM and 9 to 16 on the TOP. The RED plastic insert in the TOP plug (terminals 9 to 16) and RED plastic insert in the BOTTOM socket (on back of PMP-25 for wiring terminals 1 to 8) are there to BLOCK each other, NOT to match up for insertion. They can be forced together. Reversing the connectors which may damage the PMP-25 if power is applied.

120V Input - Verify that the 120V connected to terminals 15 and 16 is stepped down from 2 of the 3 phases that run the motor. Typically the control voltage transformer in the panel is used. This transformer will have it's primary wired to 2 of the 3 phases that run the motor. The 120V CANNOT come from a lighting panel or some voltage source that is unrelated to the phases that run the motor. The PMP-25 measures HP and uses this 120V input for a Voltage sample to be multiplied with the current sampled with the Range Finder Toroid.

Range Finder Toroid - Verify that the Range Finder Toroid is on the CORRECT phase. The correct phase is the phase that is NOT used for the 120V control voltage transformer. If a current transformer is used with the Range Finder Toroid (motors larger than 50HP) it MUST be on the phase not used for the control voltage transformer.

Scale - Verify that the DIP SWITCH on the Range Finder Toroid is set to the correct position following the Installation Manual. Page 2 of the manual shows the wiring diagram and a chart where scaling numbers for HP, % Full Load, DIP switch position and # Turns are shown for different size motors @ 460VAC.

*** The PMP-25 CANNOT work with Variable Speed Motor Drives (Use the V series)**

2. **Digital Display - Full Scale Setup**

Tap the FULL SCALE button to scroll the display through the Full Scale setup parameters.

To change the display Full Scale setup use this procedure :

A. Choose the Full Scale Capacity or % Full Load number from the chart on page 2 of the installation manual that corresponds to the motor size. **This is the Full Range of the instrument**. This is the number to be entered into the display to read either HP or %Load.

*** After pressing the FULL SCALE button the display will reset in 5 seconds back to reading the load if no further setup actions are taken. Tap the FULL SCALE button to scroll through and get back to where setup information is needed if the display resets before setup is completed.**

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B. Displaying HP - Press and release the FULL SCALE button and use the UP or DOWN arrow to make the 3 digits the same as the Full Scale Capacity number. Do not be concerned with the decimal point, it will be placed into the 3 digit number in the next step. After arriving at the number press and hold the ENTER button for 5 seconds, the blinking will stop, release the button. Tap the FULL SCALE button until the decimal point moves over to the correct position. Again, press and hold the ENTER button until the blinking stops, release the button. Tap the Full Scale button until the HP indicator lights. Again, press and hold the ENTER button until the blinking stops, release the button. The HP indicator will now remain ON to show the display is reading in terms of HP. The display will reset back to reading the load.

C. Displaying KW - Calculate KW based on .746 KW per HP. Multiply the Full Scale Capacity numbers in the chart on page 2 of the installation manual by .746 for KW Full Scale Capacity numbers. Follow the procedure in step B and enter the KW number for Full Scale and light the KW indicator.

D. Displaying % Load - Press and Release the FULL SCALE button and use the UP or DOWN arrow to arrive at the Full Scale % Full Load number from the chart on page 2 of the installation manual that corresponds to the motor size. Press and hold the ENTER button for 5 seconds, the blinking will stop, then release the button. Tap the FULL SCALE button to move the decimal point fully to the right hand side and hold the ENTER button until the blinking stops. Tap the FULL SCALE button to light the % indicator and again hold the ENTER button until the blinking stops. Release the button. The display will reset back to reading the load.

3. Set Point Adjustments.

Tap the blue Cycle Arrow in the blue Circled Area to scroll down through for the settings made during the initial installation. Check the HIGH and LOW set points and their trip DELAY timers. Also check the START timer delay that allows the motor to get past the starting torque and settle down to the normal running power before the set points become active. Both the trip DELAY timers and the START delay timer are set in 1 second intervals from 1 to 999 seconds.

* Applications like tank unloading may require a longer trip DELAY on the LOW set point to insure the tank is empty and the pump is not just in momentary cavitation.

* Self Priming pumps may require a longer START delay to get the pump primed before releasing the set points to become active.

To change the settings use the UP or DOWN arrows to change the display to the new number then press and hold the ENTER button for 5 seconds until the blinking stops.

The display will reset in 5 seconds back to reading the load if no further setup actions are taken at any step. Tap the blue Cycle Arrow to move back down through the settings and get back to where the setup information is needed if the display does reset.

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4. Where to put the Set Points ?

Set Points can be entered by choosing HP points off the Flow Curve for the pump. The flow curve will show HP versus flow. The PMP-25 measures HP.

Centrifugal Pumps - If the flow curves are not available or if they were not made exactly for the fluid being pumped then the best way to find where to place the trip points is to momentarily open and close the discharge valve and record the desired max flow HP (Open Valve) and the dead head HP (Closed Valve). Place the HIGH Set Point at the desired max flow HP and the LOW Set Point just above the dead head HP.

*** Using the discharge valve will keep fluid in the pump during the momentary blocked condition. Closing the inlet valve may cause heating in the pump. Consult your pump distributor before closing the inlet valve to test the Pump Monitor behavior. Again, closing either valve should be done momentarily just to get readings from the display for each condition.**

Positive Displacement Pumps - Use the Flow Curve for HIGH and LOW flow HP limits to be used in the PMP-25.

*** Positive Displacement Pumps behave differently than Centrifugal pumps. If the discharge valve is closed, pressure will build and the load increases. The HIGH set point is used for dead heading conditions as well as a blocked impeller. The LOW set point will detect low flow. The discharge and the inlet valves can be used to force these conditions momentarily and test Pump Monitor behavior. Consult your pump distributor before doing so to make sure it will not be harmful to that particular pump.**

5. Output Relays

Both the HIGH and LOW output relays are shown in the Installation Manual on page 2. The Relays are shown with POWER ON (120V Connected) and NOT TRIPPED. The state of the relays shown is actually the energized state of the relays. **The TRIPPED condition will be the shelf state of the relays**. This is done for “Fail Safe” operation. If the 120V is lost to the control for any reason, the relays will fail to the tripped condition.

Contact Specifications :

LOW trip relay	Form C	3A @ 300VAC or 1/8HP @ 240VAC
HIGH trip relay	Form C	3A @ 300 VAC or 1/8HP @ 240VAC

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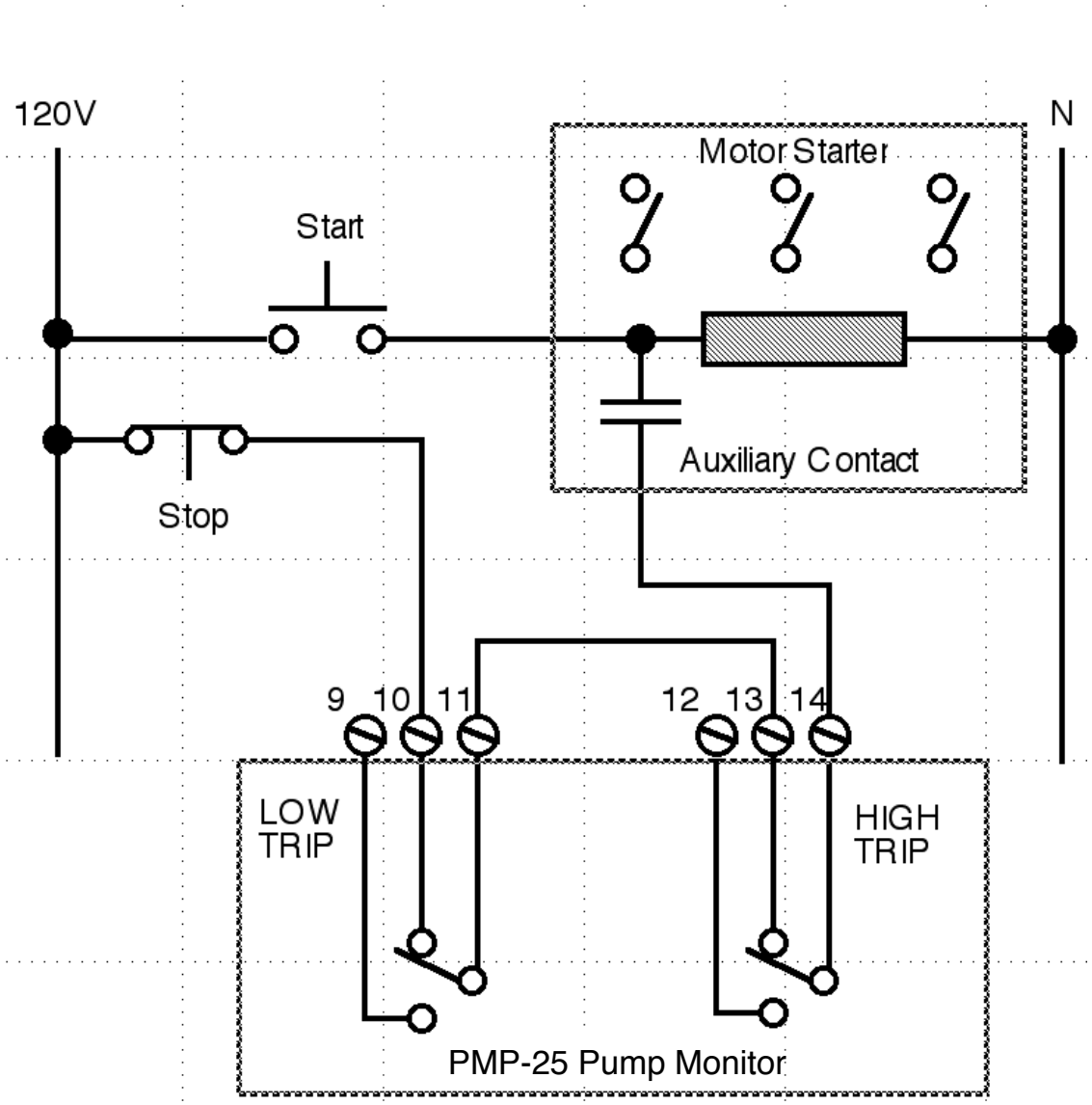
6. Relay Wiring

For simplicity, the state of the contacts shown in the manual will be termed the NORMAL STATE of the relays.

Typically, the N.C. (Normally Closed) contacts for the HIGH and LOW output relays are wired in series with the stop circuit to DROP OUT the motor starter after a trip condition. In the following diagram, the N.C. contacts for the LOW TRIP on terminals 10 and 11 are jumped over to the N.C. contacts for the HIGH TRIP on terminals 13 and 14 and wired in series with the STOP button. The motor starter will DROP OUT and it's auxiliary contact will open if either the LOW or HIGH contacts open or the STOP button is pressed.



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7. Reset - After a HIGH or LOW trip, the output contacts latch in the tripped condition and the trip indicator lights. The output contacts can only reset if the trip condition no longer exists or if the motor has been shut down and the START indicator is ON.

The PMP-25 can be Reset one of three ways:

Manual Reset - Press the RESET button on the keypad to reset the output contacts allowing a restart to be made using the Start Button in the Start / Stop circuit.

Remote Reset - A remote switch can be wired to the reset terminals 4,5 and 6. A jumper can be made across terminals 4 and 5 and then the switch wired from 4 and 5 to 6. This will reset both LOW and HIGH set points simultaneously.

Automatic Reset - Reset Terminals 4,5 and 6 can be jumped together. The output relays for LOW and HIGH will reset after the trip condition no longer exists or the motor is shut down and the START indicator is ON.

8. 4-20MA Wiring

Check Polarity - Terminal 2 is Positive and terminal 3 is Negative. This is a **SOURCING TYPE** 4-20ma output, it will power the 4-20ma loop. The open voltage for the 4-20ma current source is 12V. The maximum connected impedance is 500 ohms. The 4-20ma output is isolated and no external isolation is required. Shielded wire should be used between the output and the DCS, meter or computer system receiving the signal. Ground the shield at the readout device that is receiving the signal.

DO NOT connect a 24V power supply or a powered input to this output

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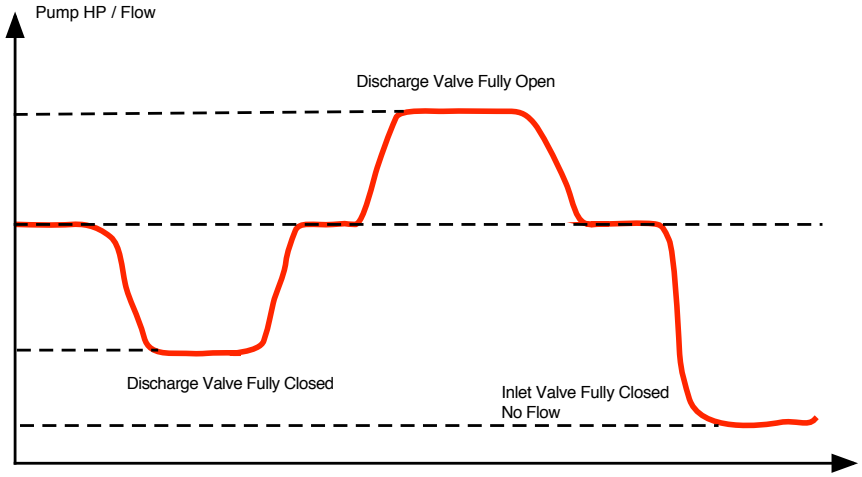
Application Notes

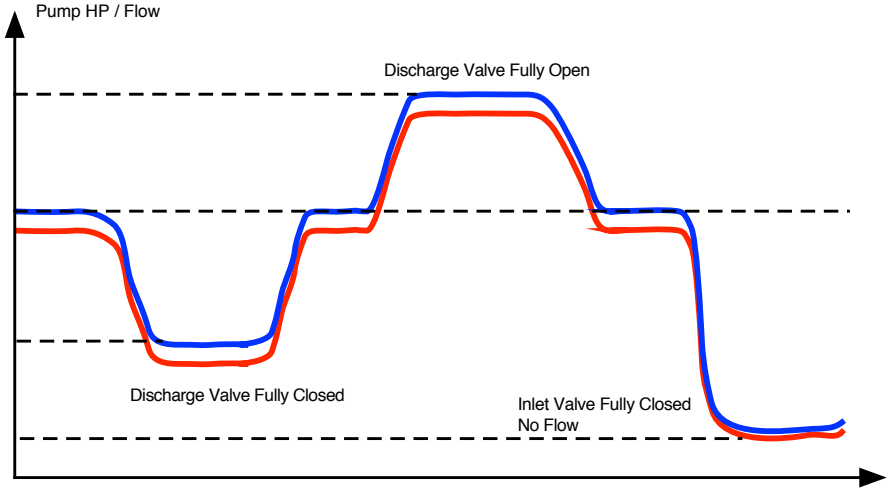
Centrifugal Pumps



Pump Motor HP will change with Flow. As shown above, as flow is restricted using the discharge valve the HP will change proportionally. With the discharge valve fully closed, DEAD HEADED, some fluid remains in the pump and the power will not drop as low as compared to when the inlet valve is fully closed. With the inlet valve fully closed, NO FLOW, the pump will be empty and the power will be almost an idle condition on the pump motor before the pump starts to heat and trouble occurs.

Fluid Viscosity

The viscosity of the material being pumped will affect the pump HP proportionally. The more viscous the material, the more power the pump will pull. The closed / open discharge valve conditions will behave as illustrated above but the entire curve will be offset by the change in power because of viscosity. The NO FLOW condition will be close to the same. This is shown below in blue. When there is no fluid in the pump, the motor goes unloaded before the pump heats and trouble occurs. The LOW trip point for the PMP-25 can be set to catch both LOW/ NO FLOW conditions. The HIGH trip point can be set above the more viscous fluids profile.



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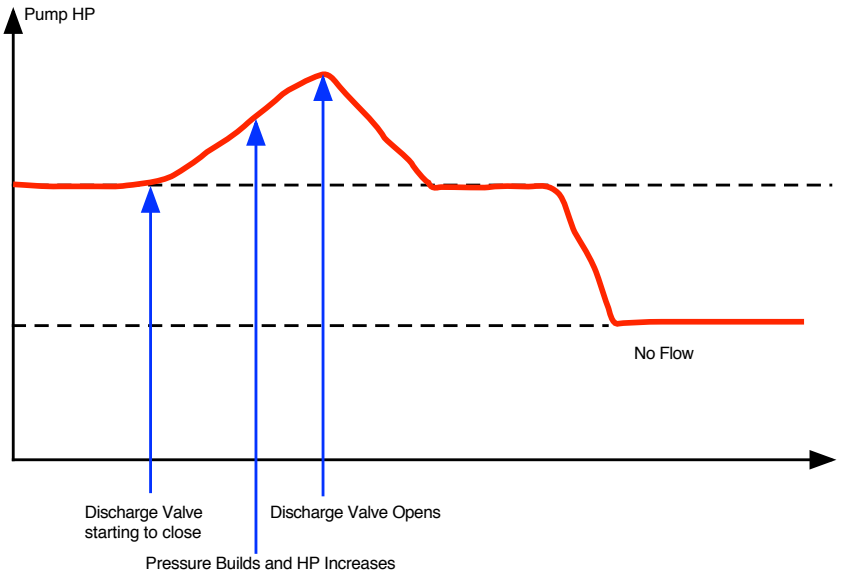
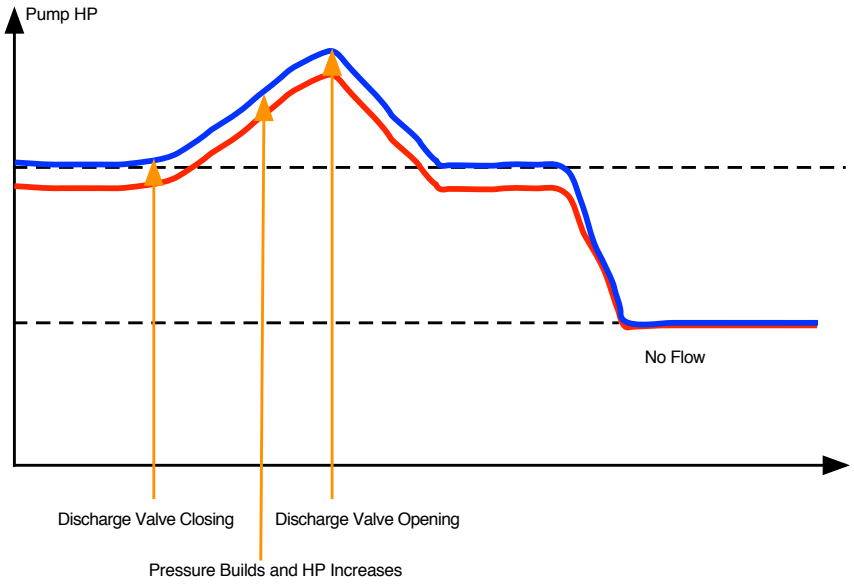
Positive Displacement Pumps



With a PD pump, a blocked outlet will increase pressure in the pump and the HP will increase. The diagram above shows a discharge valve starting to close and the HP starting to increase with pressure in the pump. When the valve again opens, the HP drops back down to the normal pumping power. When Flow is lost, the pump motor goes unloaded. The HP will drop to almost an idle condition on the pump motor until the pump heats and trouble occurs.

Viscosity

Like the Centrifugal pump, motor HP will increase with the viscosity of the material being pumped as shown below in blue. The PMP-25 set points can be adjusted to catch both conditions. For Blocked Outlet, adjust the HIGH set point above the normal running HP for the more viscous material. The LOW set point will not be a problem because the pump goes unloaded.



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Input Electrical HP versus Motor Output HP

The PMP-25 measures Electrical HP. The Electrical HP is the power looking into the pump motor. A motor is rated by mechanical HP at the shaft which is Output HP. The difference between Input HP and Output HP is motor efficiency.

Pump Flow Curves

HP versus GPM shown in Flow Curves for pumps is measured and documented using a dynamometer that measures the HP at the shaft of the motor. The Flow Curves are in terms of shaft or output HP(Brake HP). Since the PMP-25 measures electrical HP, motor efficiency MUST be considered in the scaling numbers. The PMP-25 does have efficiency numbers worked into the Full Scale Capacity that appears in the chart on page 2 of the Installation Manual. The efficiency numbers used are based on the size of the motor. Smaller motors are not as efficient as larger motors. The efficiency numbers that were applied to the Full Scale Capacity chart were taken as an average of different types of motors and in MOST cases will be very close because pump manufactures try to use higher efficiency motors. From 5 to 50 HP motor efficiencies will be close to 90%.

When PMP-25 scaling numbers need to be adjusted

In some situations, typically PD pumps where motor efficiencies can be 60% to 75%, the PMP-25 display will read high. In this case the efficiency numbers need to be backed out of the scaling numbers and the real efficiency numbers applied. Below is a chart showing the real electrical INPUT HP Full Scale Capacity numbers for the PMP-25 Range Finder Toroid at 460VAC. Actual motor efficiency numbers can be applied to these Electrical HP numbers for each scale. Divide by the number of Turns taken through the Range Finder.

Dip Switch	INPUT H.P.
1	5.00A (Used with CT's on motors larger than 50HP)
2	7.37
3	10.89
4	13.78
5	34.35
6	67.10

For Voltages other than 460V multiply each scale by the following multipliers :

230V - .5
380V - .83
415V - .90
575V - 1.25