

### FEATURES

- A. Time delay circuit to avoid “nuisance” shut-down.
- B. Alarm circuit connection.
- C. Manual Reset.
- D. Replaceable time delay switch.
- E. Field adjustable and fixed pressure difference.

### DESCRIPTION

The P30 Lube Oil Pressure Control provides protection for pressure lubricated type refrigeration compressors, against the loss of lubricating oil pressure, which could cause severe bearing damage, resulting in a compressor breakdown.

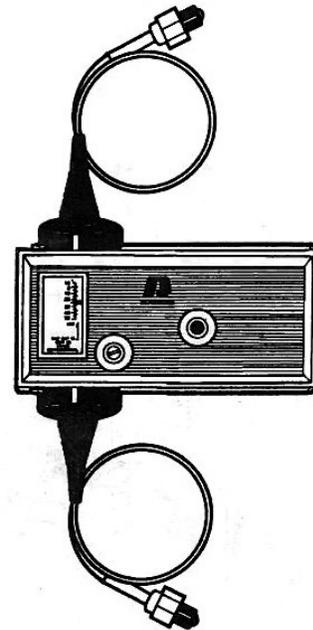
### APPLICATIONS

The P30 control monitors compressor oil pressure status and prevents compressor failures due to the lack of adequate oil pressure. When the P30 control senses inadequate oil pressure, the control will shut down compressor operation. The P30 Lube Oil Control uses two pressure operated power element assemblies to sense the differences between the crankcase pressure, and the oil pump pressure. This difference in pressure is the “effective oil pressure” that is available to circulate the lubricating oil to the bearing surfaces.

A time delay switch allows the oil pressure to build up to a preset operating pressure on compressor start, and also prevents “nuisance” shut-down of the compressor on oil pressure drops of short duration.

### IMPORTANT

1. The schematic drawings and other information included in these installation instructions are for the purpose of illustration and general reference only.
2. These instructions do not expand, reduce, modify or alter the Ranco Terms in any way; and no warranty or remedy in favor of the customer or any other person arises out of these instructions.
3. With very few exceptions, Ranco controls have been approved by the Underwriters’ Laboratories as UL listed and/or UL recognized (components); however, approval does not extend to their use for any other purpose. Ranco assumes no responsibility for any unconventional application of its control unless such application has been approved in writing by Ranco.
4. This is the responsibility of the customer to assure that the application and use of all Ranco products are in compliance with all federal, state and local requirements, including, without any limitation, all requirements imposed under the National Electric Code and any applicable building codes.



### OPERATION

When the compressor operating control closes, the contactor and the time delay switch are energized, and the compressor starts. If the oil pressure does not build up to proper operating pressure within the time delay limit, the time delay switch opens the reset circuit by thermal action, the contactor is de-energized, the current path through the contactor is broken, and the compressor stops.

The compressor cannot be started again until the reset button is pushed, restoring the current path through the contactor to the compressor. Compressor start-up will take place, however, only if the operating control circuit is closed.

Note: Allow approximately five minutes after the time delay switch has tripped for the bimetal element in the switch to return to ambient temperature, before pushing the reset button.

The reset mechanism is constructed so that the normally-closed contacts of the time delay switch are open as long as the reset button is depressed. This is a safety feature designed to prevent deliberate “lock-out” of the safety function by taping or jamming the reset button in the depressed position.

If the operating oil pressure is reached within the specified limit after compressor start, the time delay switch is de-energized when the pressure-operated switch opens terminals (#1 & #2). Thus the compressor will continue to run through its normal cycle.

Should the oil pressure drop below the P30 “cut-out” setting while the compressor is running, the time delay switch will open by thermal action. This switch action opens the reset circuit, thereby stopping the compressor.

The circuit must be restored by pushing and releasing the reset button, before the compressor can be re-started. An oil pressure drop of short duration will also energize the time delay switch, but since the normal oil pressure is restored before the time delay limit is reached, the time delay switch is de-energized and the compressor continues to run, thus avoiding a “nuisance” shut-down.

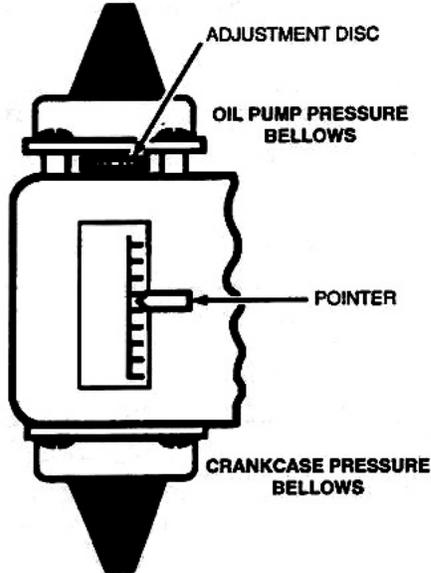


### CAUTION

To prevent possible electrical shock or equipment damage, disconnect electrical power to the unit before and during installation. **DO NOT** restore electrical power to unit until the control is properly installed and the cover is assembled. **DO NOT** locate the control in an explosive atmosphere as a safety hazard can result due to possible spark generation in the control. Controls are not to be located in areas of significant moisture, dirt or dust, or in a corrosive explosive atmosphere. Use of controls in such environments may result in injury or damage to the persons or property (or both) and are likely to shorten control life; **Ranco assumes no responsibility for any such use.**

## P30-3000 SERIES

The P30-3000 series has a field adjustable pressure differential by which the pressure differential (effective oil pressure) may be adjusted to suit the individual application. An adjustment disc below the crankcase bellows can be rotated (by means of a screw driver) to vary the sensed crankcase pressure in relation to the sensed oil pump pressure. The pointer on the scale plate moves with the operation of the adjustment disc to indicate the "cut-out" pressure differential in PSI.



## CAPILLARY CARE AND MOUNTING

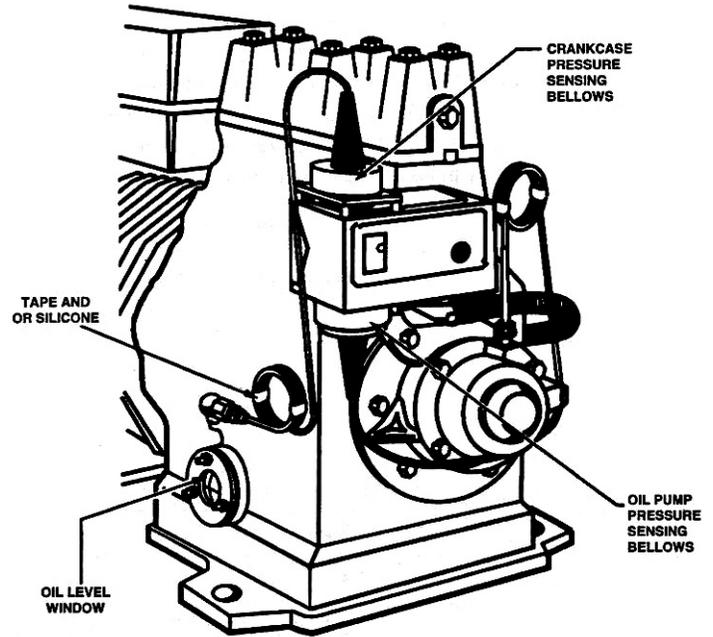
When compressors vibrate, copper work-hardens and fractures when flexed beyond its physical limits. Combine these two factors and broken capillaries can result. Breakage can be prevented by proper installation practices.

1. Minimize the number of times the capillary is bent. Each time it is rebent, it work-hardens making it more susceptible to breakage.
2. Avoid sharp bends, kinks, strains or pinch marks in the capillary. Never allow the capillary to rest against sharp edges or rub against metal surfaces where it can be damaged by friction.
3. The capillary should be straight within 4 inches of the pressure connection so the pulsations do not work-harden the capillary,
4. Purge all tubing lines before connecting pressure controls.
5. Route the capillary so that it will be self-draining to minimize oil logging.
6. When tightening the flare nut, care should be taken so that the flared  $\frac{1}{4}$ " extension tubing does not turn. Turning of the tube while tightening causes twisting at the capillary joint. A drop of refrigeration oil on the backside of the tubing flare prior to installation reduces the chances of twisting.
7. To improve capillary' life under vibrating conditions, Ranco has developed the "SUPER CAP". This unique capillary system incorporates a vibration damper at the bellows head to protect the capillary and minimize breakage at the capillary to bellows head joint. Under destructive vibration conditions, SUPER CAP provides up to 10 times the life of conventional capillary systems.

## COMPRESSOR MOUNTING

When the control is mounted directly on the compressor, the capillary must be secured so that everything moves together. If the capillary or control is shaking or vibrating, work-hardening of the capillary may occur, leading to capillary failure.

Coil and secure any excess capillary to avoid vibration damage. Capillary coils should be no less than 2" in diameter (3 inches is recommended). Silicone adhesive applied between the coils will keep them from rubbing.



## CONTROL WIRING

1. Disconnect electrical power to the unit.
2. All electrical wiring should conform to the National Electrical Code and local regulations.
3. The P30 is rated for pilot duty only, requiring the use of a contactor to carry the compressor load. The L to M (compressor contactor) and L to A (alarm) circuits are related to 720 VA or 240 VAC.
4. Use copper conductors only.
5. Refer to the equipment manufacturer's wiring diagram. The diagrams shown are for reference only and the actual unit may differ.
6. When mounting a conduit connector to the control frame, take care to not damage the control mechanism.
7. The terminals must not be bent, cut off, drilled or retapped. Allow some slack in the electrical leads for temperature change and equipment motion.
8. Attach electrical leads to time delay module terminals using accepted practice. Use the screws provided and tighten them to 15- to 20-inch pounds.

## ELECTRICAL RATINGS

PILOT DUTY - 720 VA @ 120 or 240 VAC

## PROPER TIME DELAY CHECK

1. Turn off all electrical power to system.
2. Remove the P30 Lube Oil control cover. Install a jumper wire between terminals #1 and #2. Make sure the wiring to the other terminal is correctly fastened. PUT THE COVER ON THE CONTROL. The timing module is designed to function properly only when the control cover is in place.
3. Turn electrical power back on.
4. Adjust or jumper the cycling control, noting the time the compressor starts.
5. Check to see if the time delay stops the compressor within the specified time interval.
6. If the timing period is within the specifications, turn off, remove the Lube Oil control cover, remove the jumper wire, then replace the control cover.
7. Let the time delay heater cool for at least five minutes, then push the reset button.

Note: If it is desirable to recheck the time delay, allow at least 15 minutes for the timer to cool before resetting and making another check.

The timing values specified are approximate. Timing values are affected by control circuit voltage. Low voltage will extend timing, while high voltage will shorten timing.

## LOCKOUT ON RUN CYCLE

When the compressor is running normally and the oil pressure drops below the proper lubricating point, the pressure switch closes and energizes the heater timing circuit. If the oil pressure does not build up within the time specified, the heater circuit opens and shuts the compressor down. This is called "lock-out". The control has done its job of protecting the compressor. You should next find out why the oil pressure dropped, causing the control to lock out. Correct the problem, then push the manual reset button to restart the compressor.

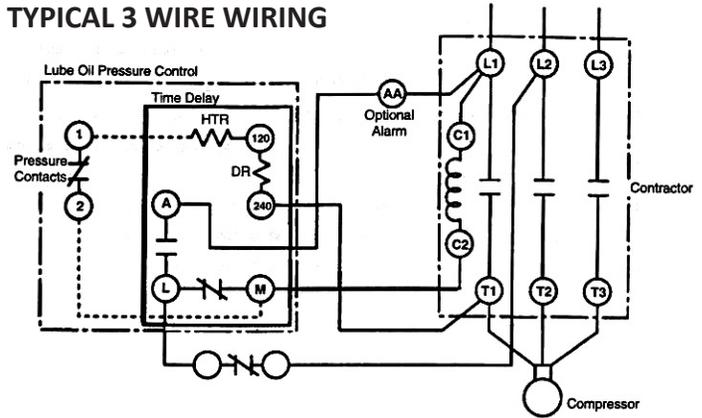
Short cycling of the compressor on the operating or limiting controls can also cause the lube oil protection control to lock-out. This occurs when the timer module accumulates heat during the repeated startups with insufficient time for cooling down. On compressors with internal line-break motor protectors, when the compressor stops due to the opening of the motor protector, the lack of oil pressure will cause the timer to begin timing, since it is still receiving electrical power. When the timer reaches the end of its cycle, it will open the P30 contacts. Even though the motor protector will automatically reset, the P30 control must be manually reset before the compressor can be restarted.

If this condition is not considered desirable, a current sensing relay can be wired in series with the S30 timer delay circuit. Then when the motor protector opens, the current sensing relay will de-energize the S30 timer delay circuit.

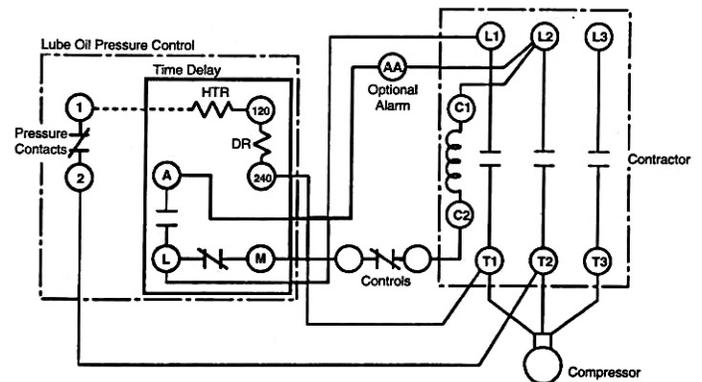
## LOCKOUT ON START-UP

1. Turn off electrical power.
2. Remove the lube oil control cover. Connect voltmeter leads to SPST pressure switch contacts #1 and #2. Open or disconnect the cycling control from the circuit.
3. Turn the power back on. The voltmeter will indicate NO VOLTAGE.
4. Cycle the operating control to start the compressor on initial start-up. The voltmeter will show no voltage (insufficient oil pressure at start-up).
5. Check the elapsed time from the compressor startup to when the voltmeter shows a reading. This reading means the pressure switch is open and that the proper oil pressure has been achieved. The heater circuit is also de-energized.
6. Turn off the electrical power. Remove the voltmeter leads. Replace the P30 cover and turn the electrical power back on.

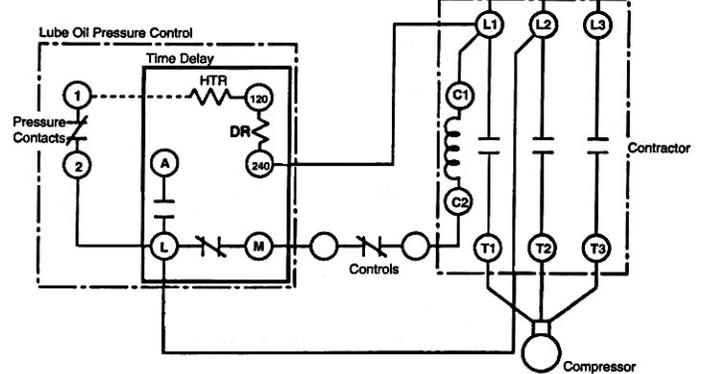
## TYPICAL 3 WIRE WIRING



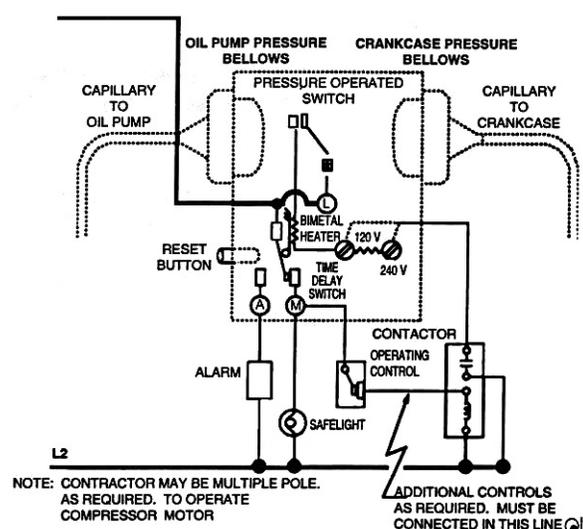
## STANDARD COPELAND WIRING



## TYPICAL 4 WIRE WIRING



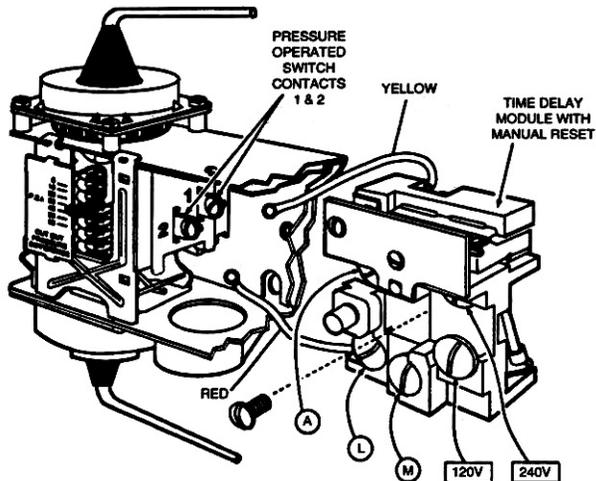
## WIRING SCHEMATIC



## CAUSES OF LOW OIL PRESSURE

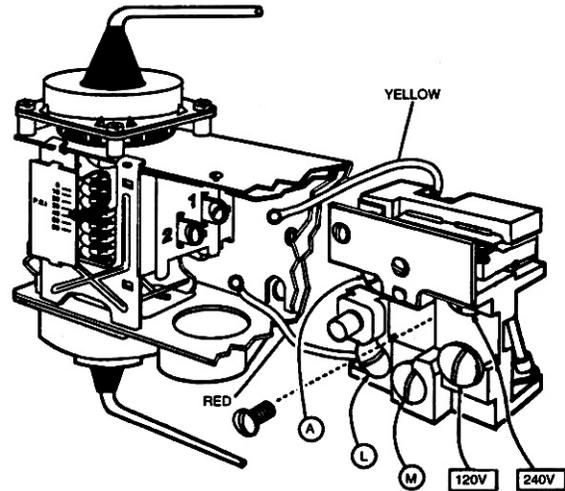
1. Too little or no oil in the compressor crankcase.
2. Oil logging. When the compressor is running, the crankcase oil moves with the refrigerant throughout the refrigeration system. Conditions can occur which cause the oil to remain in the system and not return to the compressor crankcase. The loss of oil can cause the compressor to lock out.
3. Liquid refrigerant can migrate to the compressor crankcase during an off cycle or a flood back condition can occur at startup. The refrigerant flood back to the compressor crankcase causes the oil to foam on compressor start up. The oil pump can pump foam and the refrigerant can lubricate the compressor. The lube oil control reads this as low oil pressure, then locks out.

## TIME DELAY MODULE



1. The circuit to the time delay module (timer) heater must open when the compressor contactor opens.
2. The voltage supplied to the timer should be within 10% of the voltage marked on the terminal used (120 or 240 VAC).
3. Cover must be in place for accurate timing.
4. After tripping, the timer needs to cool for five minutes before it can be reset.
5. Before rechecking the timing, let the timer cool for 15 minutes.
6. Short cycling of other (temperature, pressure, motor-protection, etc.) controls can cause the time delay period to be cumulative.
7. If the reset button is depressed under normal operating conditions, the L to M circuit will open.

8. The timer may be checked by installing a jumper (disconnect power) across the pressure operated contacts (#1 & #2). Replace the cover and start unit. The L to M circuit should open within 25% of the timer setting (60, 90, or 120 seconds). Disconnect power, remove jumper, reset timer, and restore power.
9. The timer is field replaceable (see Field Replacement).



## FIELD REPLACEMENT OF TIME DELAY SWITCH

1. Turn off A.C. power to control.
2. Remove control cover.
3. Remove all wires to external circuits.
4. Remove wires from terminals #1 and #2 or pressure switch.
5. Remove mounting screw (in recess next to reset button) and lift time delay switch out of control frame.
6. Mount new time delay switch with mounting screw into control frame.
7. Connect internal wires to terminals #1 and #2 of pressure switch, as shown in diagram.
8. Reconnect all external wires.
9. Before replacing the control cover, perform the following operational controls:
  - a. Open the main A.C. power switch and connect a jumper wire between terminals #1 and #2 of the pressure switch.
  - b. Close the main power switch and the compressor operating control to start the compressor. The time delay switch should stop the compressor after the preset interval of time.
  - c. After this test is made and the time delay switch is found to be operating satisfactorily, reopen the main power switch, remove the jumper, and install the control cover.
  - d. Reclose the main power switch, reset the operating control, and push the reset button. The system should now be back in normal operation.



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