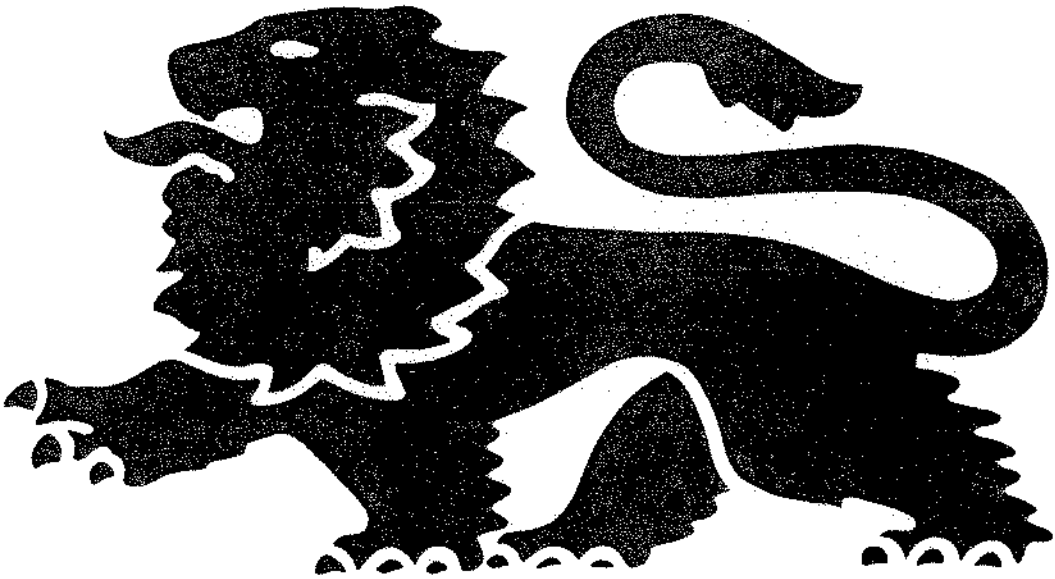




ROTARY SCREW AIR COMPRESSOR

Installation-Operation
Maintenance and Service
Manual

MODELS W20SS-W25SS-W30SS



MODEL	W20-25-30	SS
S/N	4156X	
	4238X	
	4239X	
	4240X	

SAFETY NOTICE

Le ROI Division, Dresser Industries, Inc., has strived through constant research and development to provide this equipment with every necessary safety device. However, there is no substitute for safe operating procedures.

This manual contains numerous "Notes", "Cautions" and "Warnings" intended to protect the equipment from damage and the operator from injury.

The "Notes", "Cautions" and "Warnings" are not, however, all inclusive. Extreme care must be exercised when operating or servicing this equipment.

The operator/serviceman should:

1. Learn all he can about his equipment.
2. Develop safe working habits.
3. Never operate a unit without guards and shields in place.
4. Never operate a unit that is not properly grounded.
5. Never service a unit without disconnecting and locking out the electrical power supply unless following specific operation manual instructions.
6. Never service a unit with air pressure in the air receiver-oil reservoir unless following specific operation manual instructions.
7. Take all necessary precautions, when adjusting controls, etc., to prevent electrical shock.

Air delivered by these compressor **must not** be used for breathing air.

DON'T PLAY WITH COMPRESSED AIR!

DON'T POINT AIR HOSES AT ANYONE!

DON'T USE COMPRESSED AIR TO BLOW DIRT FROM CLOTHING!

At close range, compressed air, at the pressures these units develop, can put out eyes, burst ear drums, cause serious skin blisters and other injuries.

Check Pressure Relief valves daily to make certain they are working properly. An over pressurized air receiver has the potential destructive force of a small bomb.

**A CAREFUL OPERATOR
IS THE BEST INSURANCE
AGAINST AN ACCIDENT**

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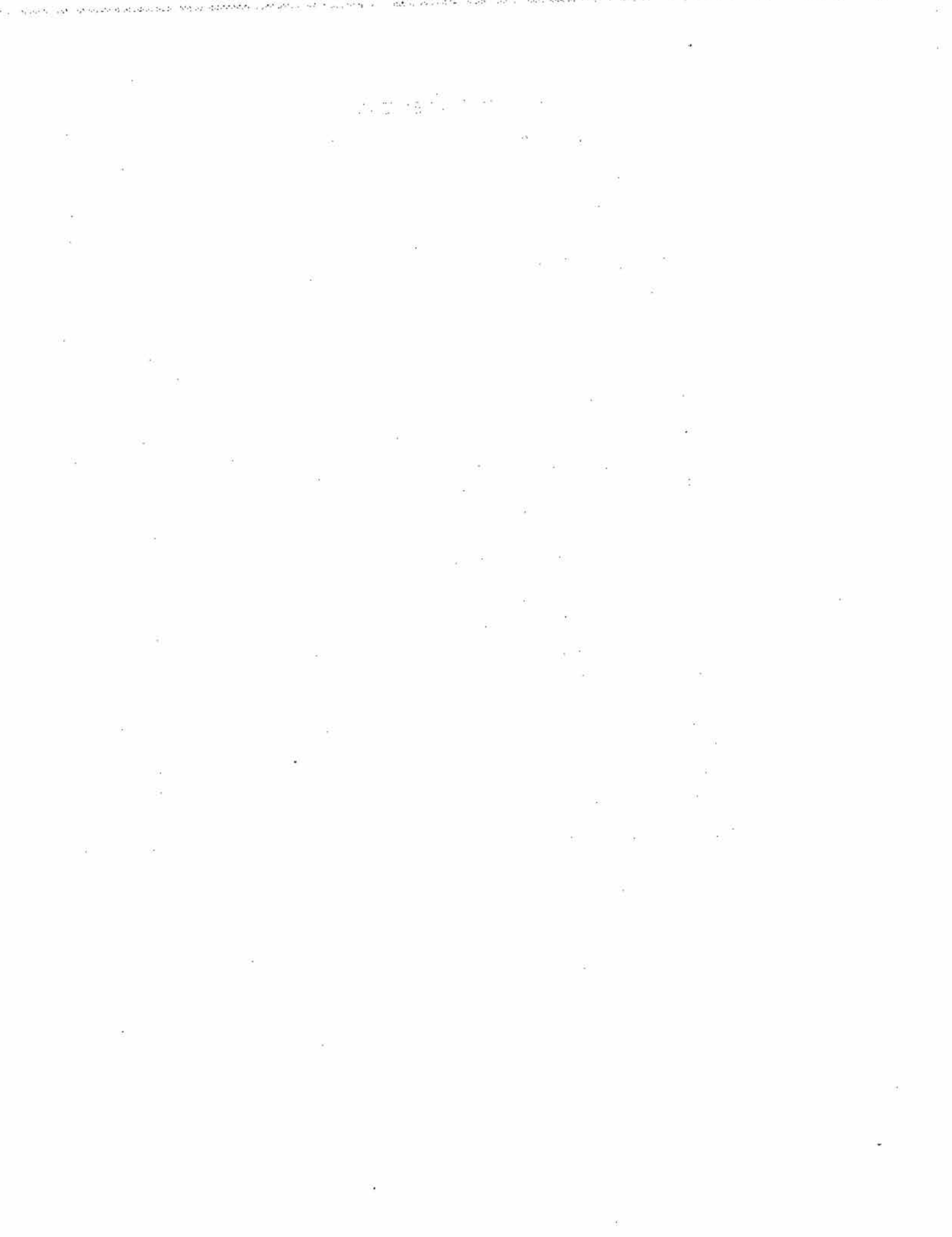
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Section I

GENERAL INFORMATION

This manual includes installation, operating instructions, maintenance and service procedures for the Model W20-25-308S Air Compressor units.

An explanation of the model code follows:

Example: W25S8

25 — Approximate horsepower required to drive the air end.

SS — Stationary screw

W — Indicates series

This series of air compressor units are electric motor driven, oil flooded, single stage, rotary screw type.

These compressor units are air cooled. They may be furnished with or without an aftercooler.

AIR END {Figure 11

The air end (male rotor) is belt driven using "3V" section belts.

The female rotor is driven by the male rotor because the rotors are meshed. Figure 2 shows direction of rotor rotation and the air/oil flow through the air end. Note that the air flow through the air end is between the rotors and the inside diameter of the cylinder bore.

Each rotor is mounted with two angular contact ball bearings at the rear or discharge end. This provides positive rotor location. The front or inlet end of each rotor is supported by a single row roller bearing. This allows the rotors or cylinder to freely expand or contract due to changes in temperature without affecting critical running clearances.

The rear bearing retainer provides for mounting a full flow oil filter element. A spring loaded ball

type filter by-pass valve is also located in the rear bearing retainer.

AIR AND OIL FLOW

The oil that circulates through the air end provides cooling, sealing and lubrication.

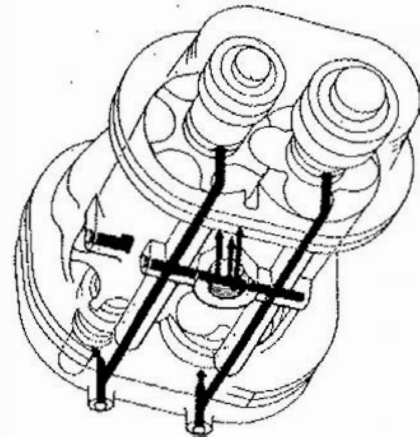
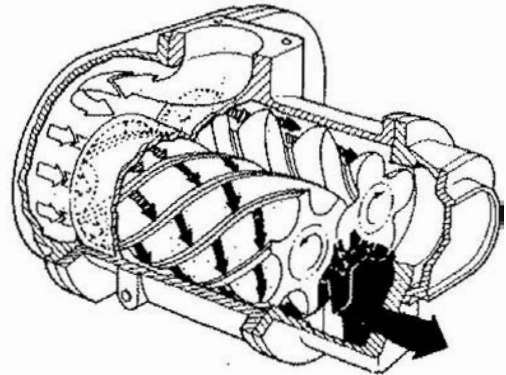


Figure 2 - Air Flow-Oil Flow 1 vplca!

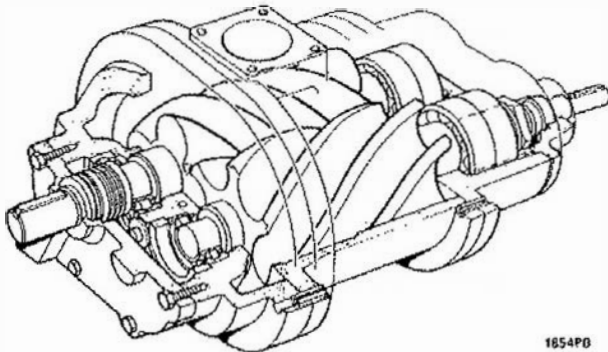


Figure 1 - Air End

Air circulates through the system beginning at the air cleaner, passing through the intake valve and into the air end where it is compressed. From the air end compressed air is discharged at rated pressure into the unit air receiver-oil reservoir.

Separation of the oil from the air, which was injected into the air end during compression, begins in the unit air receiver-oil reservoir. From 90 to 95% of the oil separation from the air is accomplished with a decrease in air velocity, changes in flow direction, adequate baffling and proper location of the air receiver-oil reservoir inlet port.

Final air/oil separation is obtained using a composition material "can" type separator element to provide nearly oil free air at the separator out or service connection. Oil collected by the separator element is returned to the system by a filter equipped separator drain line.

To prevent over pressuring the air receiver-oil reservoir, an air pressure relief valve is installed in the receiver-reservoir. This pressure relief valve is located on the upstream or wet side of the separator element.

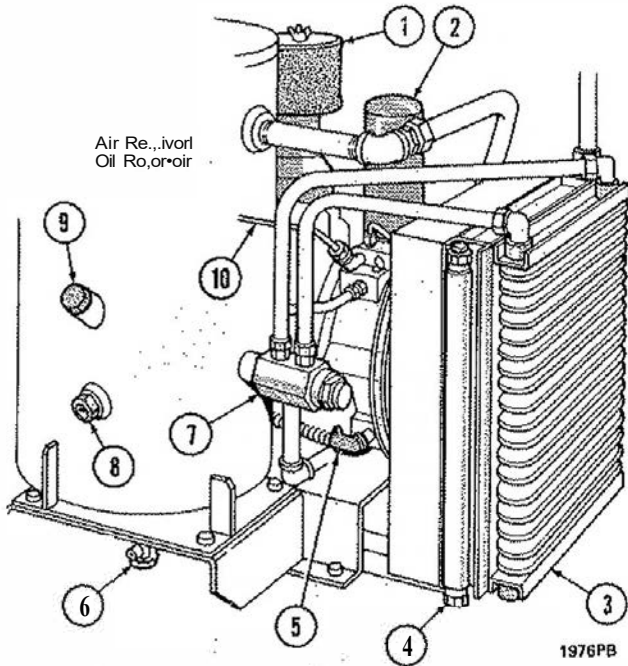


Figure 3

1. Air Cleaner
2. Oil Filter
3. Oil Cooler
4. Aftercooler
5. Discharge Temperature Shut Down Switch
6. Drain Valve
7. Thermal By-Pass Valve
8. Sight Gage
9. Reservoir Filler
10. Oil Pressure Gage Line

For all units, oil flows, forced by air pressure, from the air receiver-oil reservoir to the thermal valve. Then depending on oil temperature, oil flow by-passes the oil cooler (cold oil) or flows through the oil cooler, (hot oil). From the thermal valve and/or the oil cooler, oil is forced through the filter and injected into the air end to provide cooling, sealing and lubrication. The temperature of the oil is controlled automatically by the thermal by-pass valve.

Oil injection temperatures for air cooled units should be 130° or above depending on ambient air temperature.

Air flow to/through the air end is controlled by the intake valve. When there is a demand for air, up to the rated capacity of the air end, the intake valve will be open (air end fully loaded). When there is no demand for air the intake valve will be closed (air end fully unloaded).

When a unit is equipped with the modulating control option the intake valve will open and close (modulate) based on air demand below full unload pressures.

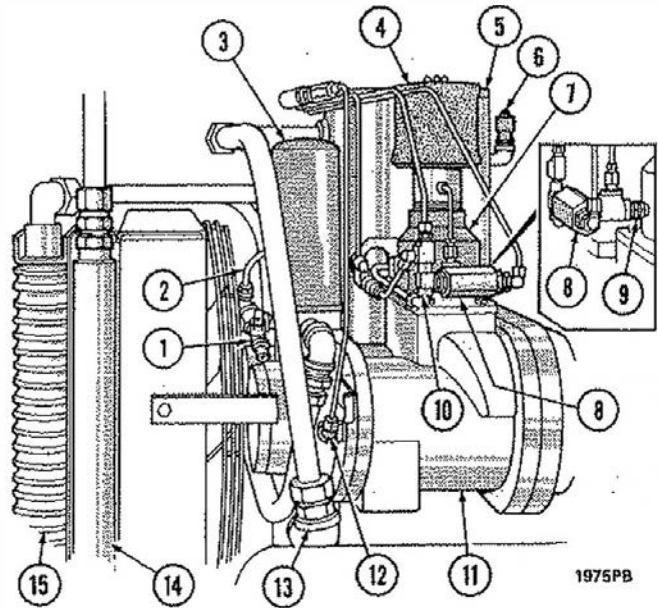


Figure 4

1. Drain Valve
2. Oil Pressure Gage Line
3. Oil Filter
4. Air Cleaner
5. Air Receiver-Oil Reservoir
6. Pressure Relief Valve
7. Intake Valve
8. Blow Down/Dump Valve
9. Check Valve
10. Check Valve
11. Air End
12. Separator, Drain Line
13. Discharge Pumping
14. Aftercooler
15. Oil Cooler

CONTROL FUNCTION

Five basic modes of control are available for these units. These are:

- 1) Load/Unload Control
- 2) Modulating Control
- 3) Dual Control (Modulating and Start/Stop)
- 4) Auto Dual Control (Modulating and Timed Stop)
- 5) Lead/Lag Control

The basic modes of control are predetermined by installing the required electrical and pneumatic control components and properly positioning selector switches on the control circuit board.

All but three electrically operated components are mounted on a printed circuit board which is located in the instrument panel enclosure. The remaining three components (2 for auto dual, 1 additional for lead/lag) are mounted in or on the electrical control enclosure.

When operating a unit with a predetermined basic mode of control other than load/unload, the user may select either of two types of control available, in each basic mode. As an example, a unit equipped with auto dual control may be operated with modulating (continuous run) or timed stopped control.

The selection of type of control is made at the instrument panel.

LOAD/UNLOAD CONTROL (STANDARD)

Load/unload control consists of a pilot valve that, when the maximum desired operating pressure is reached, will open allowing control (storage receiver) air pressure to close the intake valve (unload). At the same time the blow down (dump) valve is actuated (opened to atmosphere) by control air pressure to blow down the unit air receiver to reduce power requirements.

When there is a demand for air (falling receiver pressure - 15 PSI approximately), the pilot valve will close removing control air pressure from the intake valve allowing it to open (load).

Also, air (control) pressure is removed from the blow down (dump) valve. The blow down valve will close preventing air from escaping from the unit receiver to atmosphere for loaded operation.

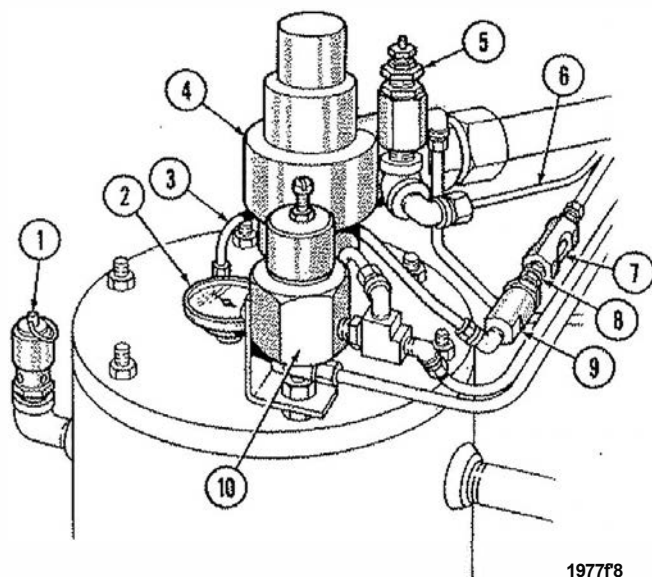
This mode of control requires using a plant system storage receiver to prevent too rapid cycling of controls. (Also refer to receiver size note under Auto-Dual Control)

MODULATING CONTROL (OPTIONAL)

To obtain modulating control, a control pressure regulator is added to the control circuit.

The control pressure regulator valve functions to partially or fully unload the air end based on air demand. As air demand is reduced (unit air receiver pressures rises), the control pressure regulator will gradually close the intake valve.

When/if air demand is increased (air receiver pressure falls) the control pressure regulator valve



1977P8

Figure 5

1. Pressure Relief
2. Air Temperature Gauge thermometer)
3. Separator Drain Line
4. Minimum Pressure/Check Valve
5. Pilot Valve
6. Air Pressure Gauge Line
7. Sight Gauge
8. Check Valve
9. Filter
10. Control Pressure Regulator (CPRJ Valve) (when used)

will gradually allow the intake valve to open. When the demand for air is less than the rated capacity of the air end, the control pressure regulator valve will hold the intake valve partially closed causing the air end to deliver air in direct proportion to demand.

When/if there is no demand for air both the unit and storage receiver pressures will rise to the maximum operating pressure. The *pilot valve* will then open, fully unload the air end, and dump the unit air receiver to atmosphere as described under load/unload control.

A plant system or additional storage receiver *may not* be required for the modulating control option provided the air demand is very near the rated air delivery of the unit on a continuous basis.

If the air demand varies widely (short periods of high demand with short periods of low or no demand) a system receiver is desirable and recommended to prevent too frequent cycling of the controls.

DUAL CONTROL (Optional)

Dual control consists of the pilot valve, control pressure regulator valve and two pressure switches. (PS-1, PS-2)

The operation of the pilot valve and/or the control pressure regulator valve, for dual control, is exactly the same as described under "Modulating Control".

When there is no demand for air, both the unit and storage receiver pressures will rise to the maximum operating pressure. The pilot valve will then open to fully unload the air end (close the intake valve). At the same time the blow down valve will open, to dump the unit air receiver pressure to atmosphere, and pressure PS-1 will actuate stopping the unit. (No delay)

This mode of control also requires the use of a plant system storage receiver.

AUTO-DUAL (TIMED STOP) CONTROL (OPTIONAL)

Auto-Dual control consists of the same components as dual control with the addition of a timer.

The timer functions to stop the unit after it has run unloaded for a pre-determined time (timer setting).

Auto-Dual control units require the use of system storage receiver. This receiver is to be part of the plant air distribution system. A nominal system air receiver size is 200 gallon.

NOTE

Actual receiver size varies depending on distribution pipe size, air usage, etc. For further information on sizing storage receivers, consult the CAGI handbook.

Auto-Dual control may be used in single unit applications but is especially well suited for multiple unit installations.

For single unit installations the timer should be adjusted for longer time delay periods (10 minutes).

In multiple unit installations, the controls may be adjusted so that one (or more) unit(s) operate in the rated pressure range with time delay stop times of 10 minutes.

The second unit(s) (one or more) would have the controls set 5 PSI below the first unit with a short (5 minute) delay stop setting.

When air demand is no more than what is delivered by the first unit(s) the second unit(s) will stop.

If/when there is a demand for air greater than what the first unit(s) will deliver, the second unit(s) will restart.

NOTE

Additional units may be added for very high air demands. The controls of these additional unit(s) can then be set at 5 PSI below the first and second unit(s). This allows the controls to automatically put an additional unit(s) "on line" to meet air demands.

LEAD/LAG CONTROL

Lead/Lag control is obtained by modifying the control piping, adding a control solenoid to the circuit and correctly adjusting pressure switch PS-1.

The solenoid valve may be actuated either electrically or pneumatically.

The air pressure switch PS-1 must be adjusted to actuate (close) at 5 PSI below the opening pressure of the pilot valve.

Changing unit operation from lead to lag may be obtained by correctly positioning the selector switch on the instrument panel.

COMPONENT FUNCTION

Piping and wiring diagrams and schematics have been provided to assist in locating components on the unit and determining component function.

The following explanation of component function will assist in determining if the compressor is operating properly. This information may then be used to locate component malfunctions.

INTAKE VALVE

The intake valve is located on top of the air end. The primary purpose of the intake valve is to control air flow to the air end. The secondary purpose of the intake valve is to check off possible reverse air/oil flow when the unit is shut down.

AIR RECEIVER — OIL RESERVOIR

The air receiver-oil reservoir provides an oil sump, primary oil separation and a mounting location for the separator element. The separator element is mounted on the receiver-reservoir cover. Other components which are mounted on the receiver-reservoir are the minimum pressure/check valve, pressure relief valve, control pressure regulator valve (when used) and air pressure gages.

MINIMUM PRESSURE/CHECK VALVE

The minimum pressure/check valve is located on the air receiver-oil reservoir cover in the separator out port.

The purpose of this valve is to maintain minimum air pressure in the air receiver-oil reservoir.

The valve consists of a spring loaded piston which opens when air pressure reaches approximately 80 PSI and maintains a minimum pressure of 60 to 70 PSI.

In addition, this valve checks off the return flow of air from the system receiver (storage tank and/or distribution system) when the compressor is stopped or running unloaded.

NOTE

Compressor should not be operated at minimum pressure for extended periods. Excessive oil loss will result.

SEPARATOR DRAIN LINE

The separator drain line is mounted on the air receiver-oil reservoir cover. This tube extends down into and touches on the bottom of the separator element.

The other end of the drain line is connected to a low pressure port on the air end.

The drain line is equipped with a filter, a check valve and a flow sight gage.

The filter prevents foreign matter from entering the air end. The check valve allows free flow of air/oil from the separator to the air end but prevents reverse air/oil flow at shut down. The sight gage may be used to assist with service diagnosis.

HIGH AIR TEMPERATURE SHUT DOWN SWITCH

The high air temperature shut down switch is located in the discharge cavity of the rear bearing retainer on the air end

This is a normally closed temperature sensitive switch. The purpose of this switch is to shut the unit down in the event the air temperature at the air end discharge rises above $230^{\circ}\text{F} \pm 7^{\circ}$.

CAUTION

The cause of a shut down due to high air/oil temperature must be corrected before restarting the unit.

To restart a unit, allow the unit to cool, push the stop button to reset the electrical controls and then push the start button.

BLOW DOWN (DUMP) VALVE

The air receiver-oil reservoir blow down or dump valve is located on the side of the intake valve.

The purpose of this valve is to allow air to escape from the air receiver-oil reservoir when the unit is running unloaded or stopped.

This is a normally closed valve which is opened by air pressure. When the unit is running unloaded air pressure to open this valve is supplied by the control circuit.

This valve is opened by air pressure from the intake valve when the unit is shut down.

Blow down (dump) air flows to atmosphere through the air cleaner.

RETURN AIR BLEED LINE

The atmospheric blow down (dump) line is used to provide a return air bleed back circuit when the unit is running unloaded.

This line connects, with suitable fittings and a check valve, between the side of the intake valve and the air cleaner.

When the unit is running unloaded (intake valve closed) a small amount of air is allowed to enter the air end from either atmosphere or from the unit air receiver-oil reservoir.

The check valve is installed directly into the side of the intake valve to prevent air from escaping from the air end when the unit is shut down.

PILOT VALVE (LOAD-UNLOAD CONTROL — STANDARD)

The pilot valve is located on the air end near the intake valve.

The purpose of the pilot valve is to provide control pressure (un-modulated) to acutate control components.

The pilot valve is a normally closed spring loaded valve which is opened by air pressure supplied from the system receiver.

CONTROL PRESSURE REGULATOR VALVE (OPTIONAL MODULATING, DUAL, OR AUTO-DUAL CONTROL ONLY)

The control pressure regulator valve is located on the unit air receiver-oil reservoir cover.

The purpose of this valve is to furnish control pressure to operate the intake valve for modulating control.

This valve senses unit air receiver-oil reservoir air pressures between 100 and 110 PSI (approximately) and opens or closes the intake valve to control air delivery based on demand.

The higher the unit receiver air pressure, the higher the control pressure and the more the intake valve is closed. (low demand)

The lower the unit receiver air pressure, the lower the control pressure and the more the intake valve is opened. (high demand)

When the unit air receiver air pressure falls below 100 PSI (approximately) the control pressure regulator can no longer maintain control pressure. This allows the intake valve to fully open. (full load)

NOTE

The pilot valve and control pressure regulator valve, on some units, may be adjusted to obtain a maximum of 150 PSI full load pressure. The control operation as described above would then work between 150-160 PSI. (approximately) Check the specifications for each unit to obtain the maximum operating pressure before making adjustments.

PRESSURE SWITCHES PS-1 and PS-2 — OPTIONAL, DUAL OR AUTO DUAL (TIMED STOP) CONTROL ONLY

Pressure switches PS-1 and PS-2 are located in the electrical control enclosure.

The function of pressure switch PS-1 is to stop and start the unit for dual control and start the timer for auto-dual (timed stop) mode of operation.

Pressure to actuate this switch is obtained from a control line connected to the pilot valve. When the pilot valve opens, at the maximum desired operating pressure, pressure switch PS-1 will actuate stopping the unit or start the timed stop function.

PS-1 pressure switch must be adjusted to actuate at some pressure below maximum operating pressure.

The function of pressure switch PS-2 is to prevent the unit from restarting until unit receiver pressure falls below 20 PSI (approximately).

This switch must be connected electrically to operate as a normally closed switch.

Pressure to actuate this switch is obtained from the unit receiver.

CONTROL LINE SHUTTLE CHECK VALVE — LOAD-UNLOAD (STANDARD) CONTROL UNITS ONLY (Figure 8)

The shuttle check valve used on the load-unload (standard) control unit is located in the con-

trol piping at the pilot port of the blow down (dump) valve. The dump valve is located on the side of the intake valve.

The purpose of this shuttle check valve is to:

1. Allow the pilot valve to unload the air end, (close intake valve) and open the blow down valve without allowing air to pass into the air end when the unit is running unloaded.

OR

2. Allow the normal build up of air pressure, in the air end, to hold the intake valve closed and open the blow down (dump) valve when the unit is *shut down*.

CONTROL LINE SHUTTLE CHECK VALVES — OPTIONAL MODULATING, DUAL AND AUTO-DUAL (timed stop) CONTROL

One shuttle check valve is located in the pilot port of the air receiver blow down (dump) valve. (The blow down valve is located on the side of the intake valve.)

The function of this check valve is to:

1. Allow control pressure to open the blow down valve when the unit is running unloaded.

OR

2. Allow normal air pressure build up, in the air end, to open the blow down (dump) valve when the unit is *shut down*.

The second shuttle check valve is located on the operating piston cover end of the intake valve.

The function of this check valve is to:

1. Allow modulated control pressure, from the control pressure regulator valve, to open and close the intake valve for modulating control

OR

2. Allow the pilot valve (unmodulated control pressure) to fully close the intake valve when the storage receiver pressure rises to the maximum desired operating pressure.

INSTRUMENTATION

Instrumentation (gages and indicators) are provided on these units to monitor function and provide assistance with service diagnosis.

The following chart lists the instrumentation, location of each and a brief description of function.

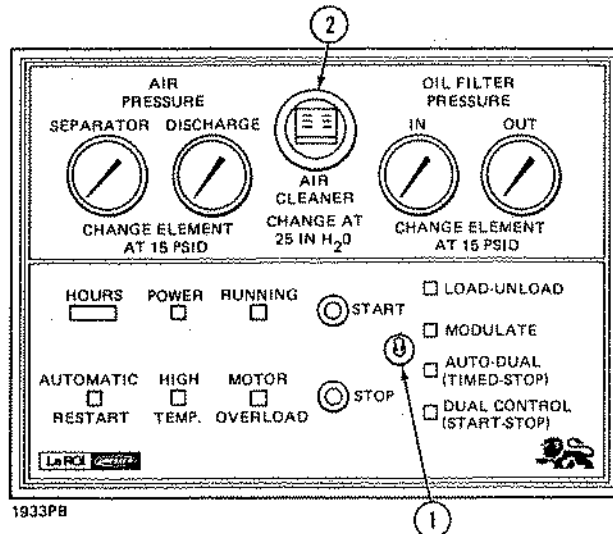
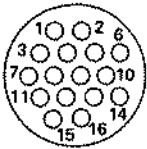
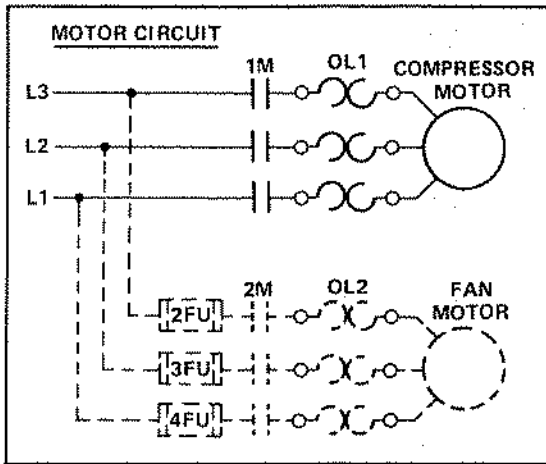


Figure 6

1. Mode Selector Switch 2. Air Cleaner Restriction Indicator

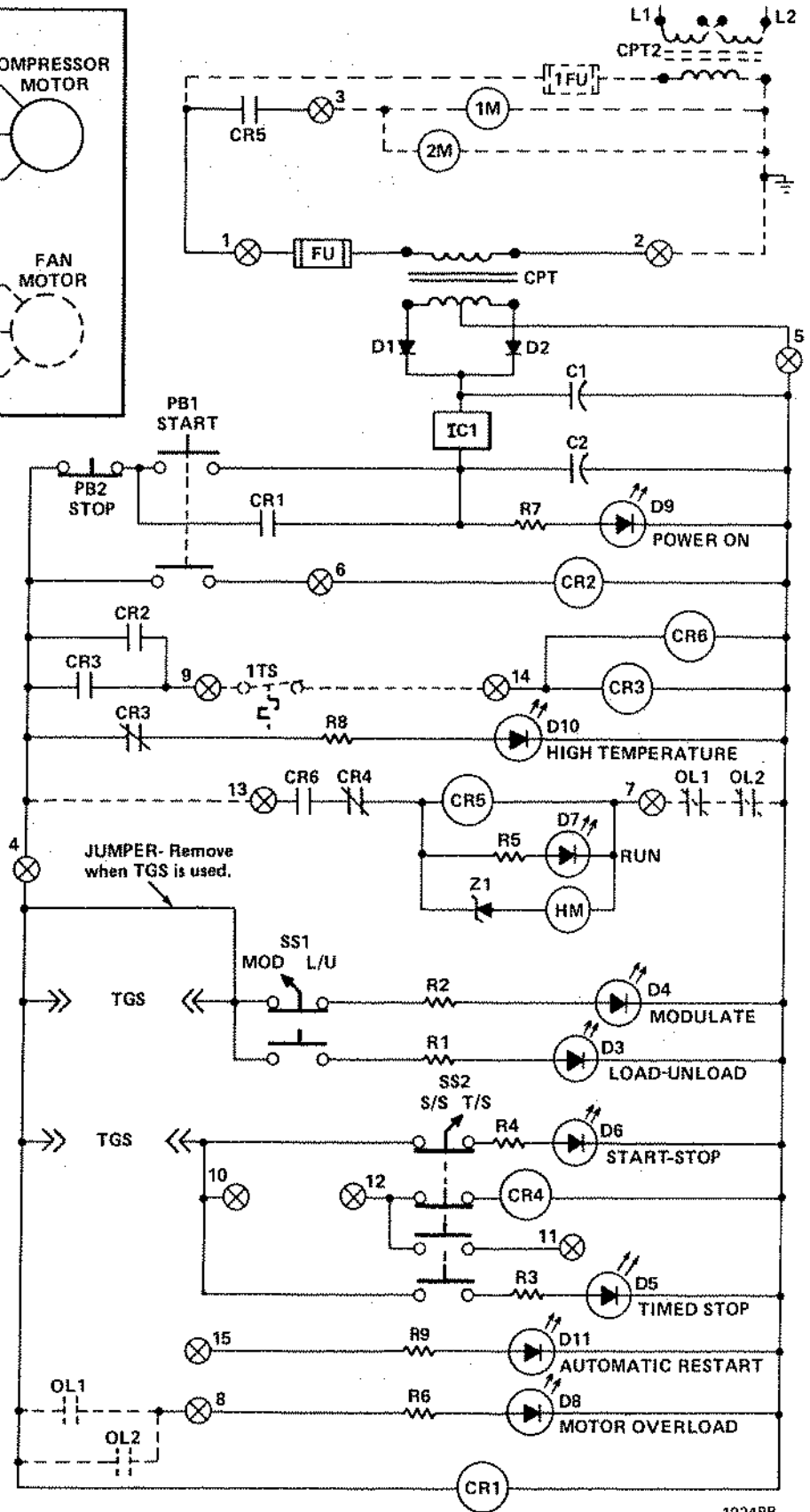
ITEM	LOCATION	INDICATION
"POWER" ON LAMP	Instrument Panel	Shows power to unit is turned on. Ready to start.
HOURLMETER	Instrument Panel	Shows unit total run time.
AIR CLEANER RESTRICTION INDICATOR	Instrument Panel	Shows restriction of air cleaner and need for service. (25" of water maximum)
OIL PRESSURE GAGE(S)	Instrument Panel	(1) Shows filter inlet oil pressure (1) Shows filter outlet pressure. Used to check oil pressure drop across filter.
AIR PRESSURE GAGE(S)	Instrument Panel	(1) Shows air pressure upstream (wet) side of separator element. (1) Shows air pressure downstream (dry) side of the separator element (storage and distribution system). Used to check air pressure drop across separator element.
"RUNNING" LAMP	Instrument Panel	Indicates unit is running.
"LOAD/UNLOAD" LAMP	Instrument Panel	Indicates unit will operate continuous run with load/unload control.
"MODULATE" LAMP	Instrument Panel	Indicates unit will operate continuous run with modulating control.
"DUAL CONTROL" LAMP	Instrument Panel	Indicates unit will operate continuous run or start/stop.
"AUTO DUAL" LAMP	Instrument Panel	Indicates unit will operate continuous run or time delay stop.
"AUTOMATIC RESTART" LAMP	Instrument Panel	Indicates unit is stopped. Could restart at any time.
"MOTOR OVERLOAD" LAMP	Instrument Panel	Indicates unit shut down due to tripped motor overload relay (switch).
"HIGH TEMPERATURE" LAMP	Instrument Panel	Indicates cause of shut down due to high air temperature at air end discharge.
CONTROL SELECTOR SWITCH	Instrument Panel	Provides user selection of type of control in basic mode of control. I.E. Dual Control-Select Modulating or Start/Stop Control.



Wire No.	Wire Color	Tracer Color	To Location Pin
1	BLK		No. 1
2	WHT		No. 2
3	RED		No. 3
4	GRN		No. 4
5	ORG		No. 5
6	BLU		No. 6
7	WHT/BLK	BLK	No. 7
8	RED/BLK	BLK	No. 8
9	GRN/BLK	BLK	No. 9
10	ORG/BLK	BLK	No. 10
11	BLU/BLK	BLK	No. 11
12	BLK/WHT	WHT	No. 12
13	RED/WHT	WHT	No. 13
14	GRN/WHT	WHT	No. 14
15	BLU/WHT	WHT	No. 15
* 16		NOT USED	

- CPT - TRANSFORMER
- FU - FUSE
- M - MAGNETIC CONTACTOR (SWITCH)
- HM - HOURMETER
- OL - OVERLOAD RELAY
- CR - CONTROL RELAY
- SV - SOLENOID VALVE
- PB - PUSHBUTTON SWITCH
- D - DIODE
- IC1 - VOLTAGE REGULATOR
- C - CAPACITOR
- TS - TEMPERATURE SWITCH
- TR - TIMER RELAY
- R - RESISTOR
- PS - PRESSURE SWITCH
- Z1 - DIODE (ZENER)
- TGS - TOGGLE SWITCH
- SS - SELECTOR SWITCH
- ⊗ - TERMINAL

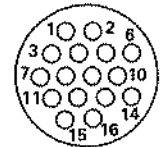
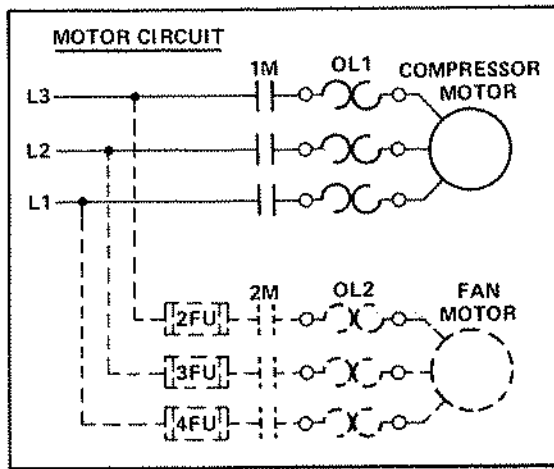
NOTES:
 1. Dashed lines represent items NOT part of P.C.Board.
 2. Selector switches (SS) are located on Printed Circuit Board.
 For factory selection of Control Circuit only.



SINGLE MODE

1934PB

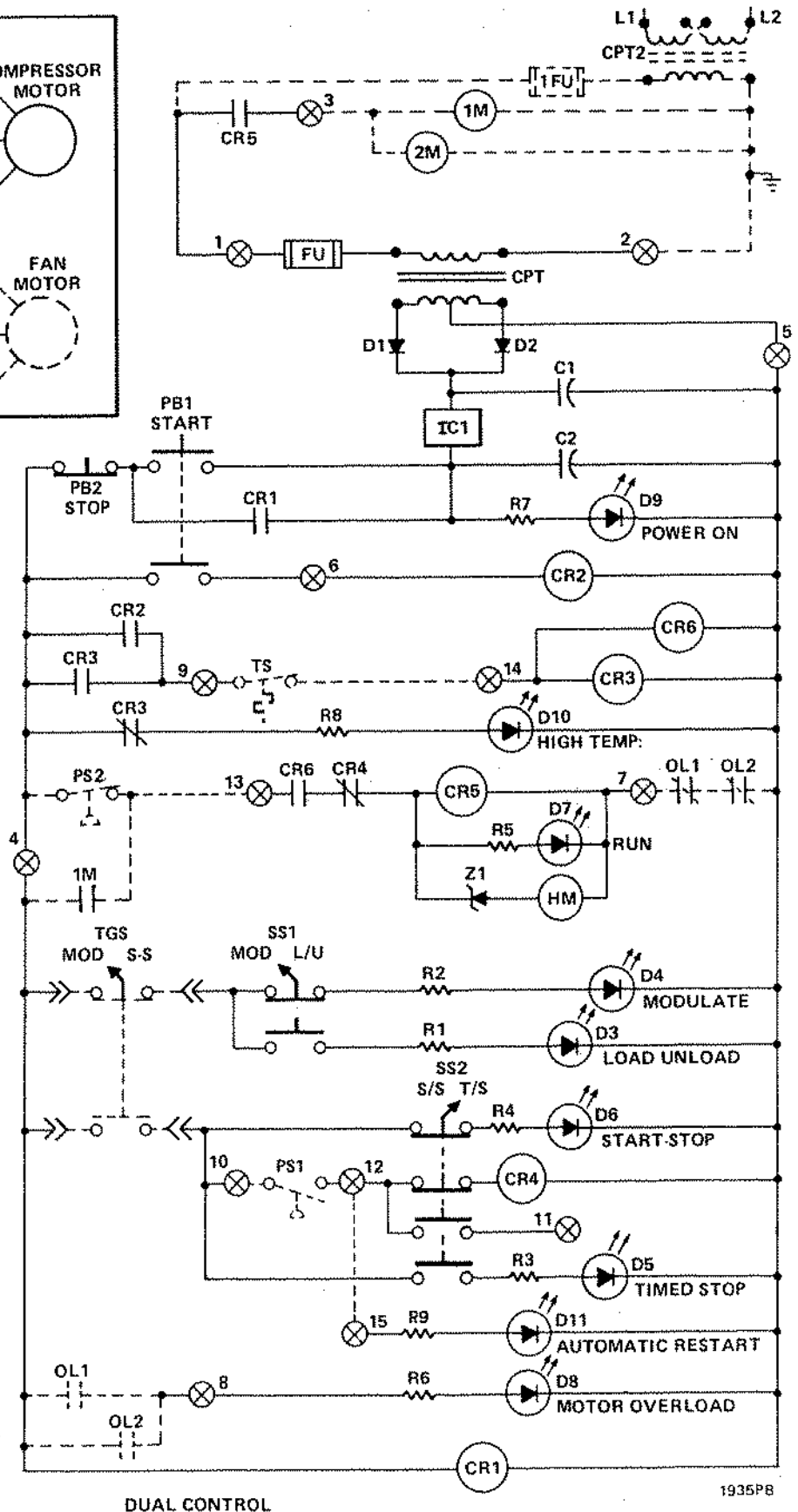
Figure 7 - Wiring Diagram



Wire No.	Wire Color	Tracer Color	To Location Pin
1	BLK		No. 1
2	WHT		No. 2
3	RED		No. 3
4	GRN		No. 4
5	ORG		No. 5
6	BLU		No. 6
7	WHT/BLK	BLK	No. 7
8	RED/BLK	BLK	No. 8
9	GRN/BLK	BLK	No. 9
10	ORG/BLK	BLK	No. 10
11	BLU/BLK	BLK	No. 11
12	BLK/WHT	WHT	No. 12
13	RED/WHT	WHT	No. 13
14	GRN/WHT	WHT	No. 14
15	BLU/WHT	WHT	No. 15
16		NOT USED	

- CPT - TRANSFORMER
- FU - FUSE
- M - MAGNETIC CONTACTOR (SWITCH)
- HM - HOURMETER
- OL - OVERLOAD RELAY
- CR - CONTROL RELAY
- SV - SOLENOID VALVE
- PB - PUSHBUTTON SWITCH
- D - DIODE
- IC1 - VOLTAGE REGULATOR
- C - CAPACITOR
- TS - TEMPERATURE SWITCH
- TR - TIMER RELAY
- R - RESISTOR
- PS - PRESSURE SWITCH
- Z1 - DIODE (ZENER)
- TGS - TOGGLE SWITCH
- SS - SELECTOR SWITCH
- ⊗ - TERMINAL

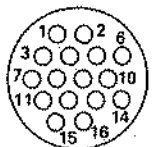
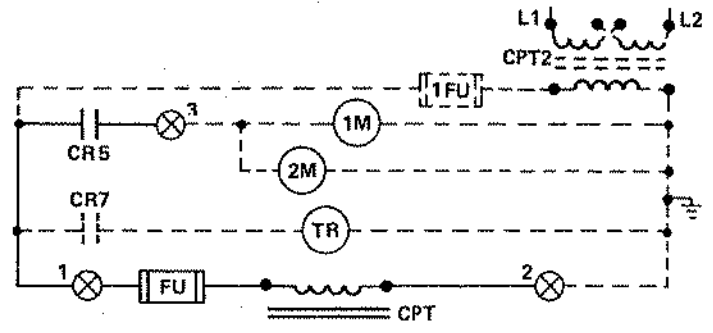
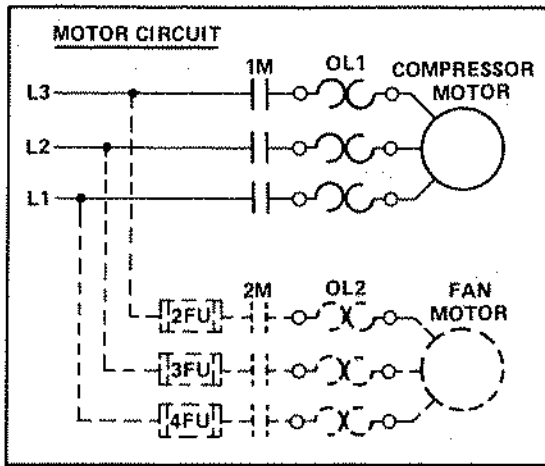
NOTES:
 1. Dashed lines represent items NOT part of P.C. Board.
 2. Selector switches (SS) are located on Printed Circuit Board.
 For factory selection of Control Circuit only.



DUAL CONTROL

1935PB

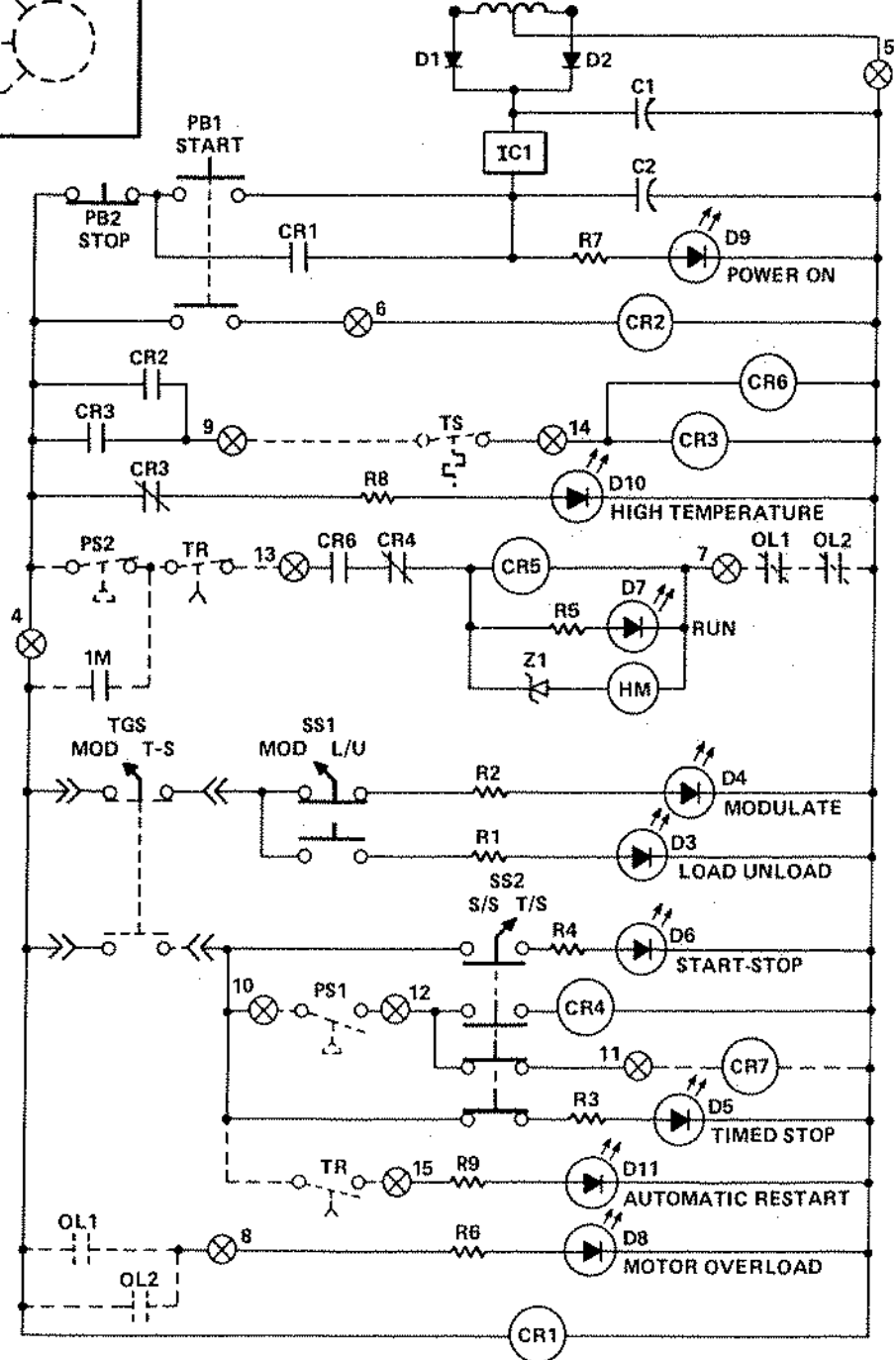
Figure 8 - Wiring Diagram



Wire No.	Wire Color	Tracer Color	To Location Pin
1	BLK		No. 1
2	WHT		No. 2
3	RED		No. 3
4	GRN		No. 4
5	ORG		No. 5
6	BLU		No. 6
7	WHT/BLK	BLK	No. 7
8	RED/BLK	BLK	No. 8
9	GRN/BLK	BLK	No. 9
10	ORG/BLK	BLK	No. 10
11	BLU/BLK	BLK	No. 11
12	BLK/WHT	WHT	No. 12
13	RED/WHT	WHT	No. 13
14	GRN/WHT	WHT	No. 14
15	BLU/WHT	WHT	No. 15
16		NOT USED	

- CPT - TRANSFORMER
- FU - FUSE
- M - MAGNETIC CONTACTOR (SWITCH)
- HM - HOURMETER
- OL - OVERLOAD RELAY
- CR - CONTROL RELAY
- SV - SOLENOID VALVE
- PB - PUSHBUTTON SWITCH
- D - DIODE
- IC1 - VOLTAGE REGULATOR
- C - CAPACITOR
- TS - TEMPERATURE SWITCH
- TR - TIMER RELAY
- R - RESISTOR
- PS - PRESSURE SWITCH
- Z1 - DIODE (ZENER)
- TGS - TOGGLE SWITCH
- SS - SELECTOR SWITCH
- ⊗ - TERMINAL

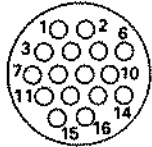
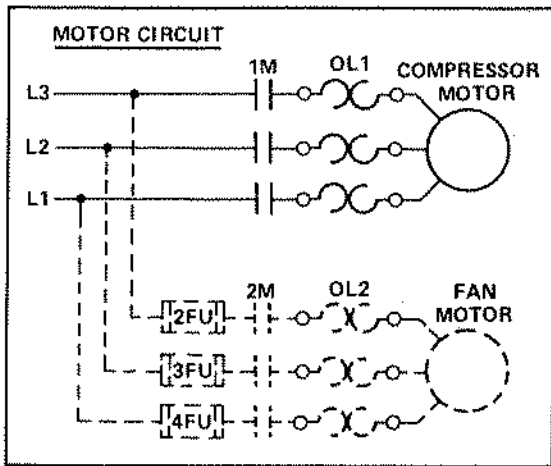
NOTES:
 1. Dashed lines represent items NOT part of P.C. Board.
 2. Selector switches (SS) are located on Printed Circuit Board.
 For factory selection of Control Circuit only.



AUTO DUAL

1936PB

Figure 9 - Wiring Diagram



Wire No.	Wire Color	Tracer Color	To Location Pin
1	BLK		No. 1
2	WHT		No. 2
3	RED		No. 3
4	GRN		No. 4
5	ORG		No. 5
6	BLU		No. 6
7	WHT/BLK	BLK	No. 7
8	RED/BLK	BLK	No. 8
9	GRN/BLK	BLK	No. 9
10	ORG/BLK	BLK	No. 10
11	BLU/BLK	BLK	No. 11
12	BLK/WHT	WHT	No. 12
13	RED/WHT	WHT	No. 13
14	GRN/WHT	WHT	No. 14
15	BLU/WHT	WHT	No. 15
16		NOT USED	

- CPT - TRANSFORMER
- FU - FUSE
- M - MAGNETIC CONTACTOR (SWITCH)
- HM - HOURMETER
- OL - OVERLOAD RELAY
- CR - CONTROL RELAY
- SV - SOLENOID VALVE
- PB - PUSHBUTTON SWITCH
- D - DIODE
- IC1 - VOLTAGE REGULATOR
- C - CAPACITOR
- TS - TEMPERATURE SWITCH
- TR - TIMER RELAY
- R - RESISTOR
- PS - PRESSURE SWITCH
- Z1 - DIODE (ZENER)
- TGS - TOGGLE SWITCH
- SS - SELECTOR SWITCH
- ⊗ - TERMINAL

NOTES:
 1. Dashed lines represent items NOT part of P.C.Board.
 2. Selector switches (SS) are located on Printed Circuit Board.
 For factory selection of Control Circuit only.

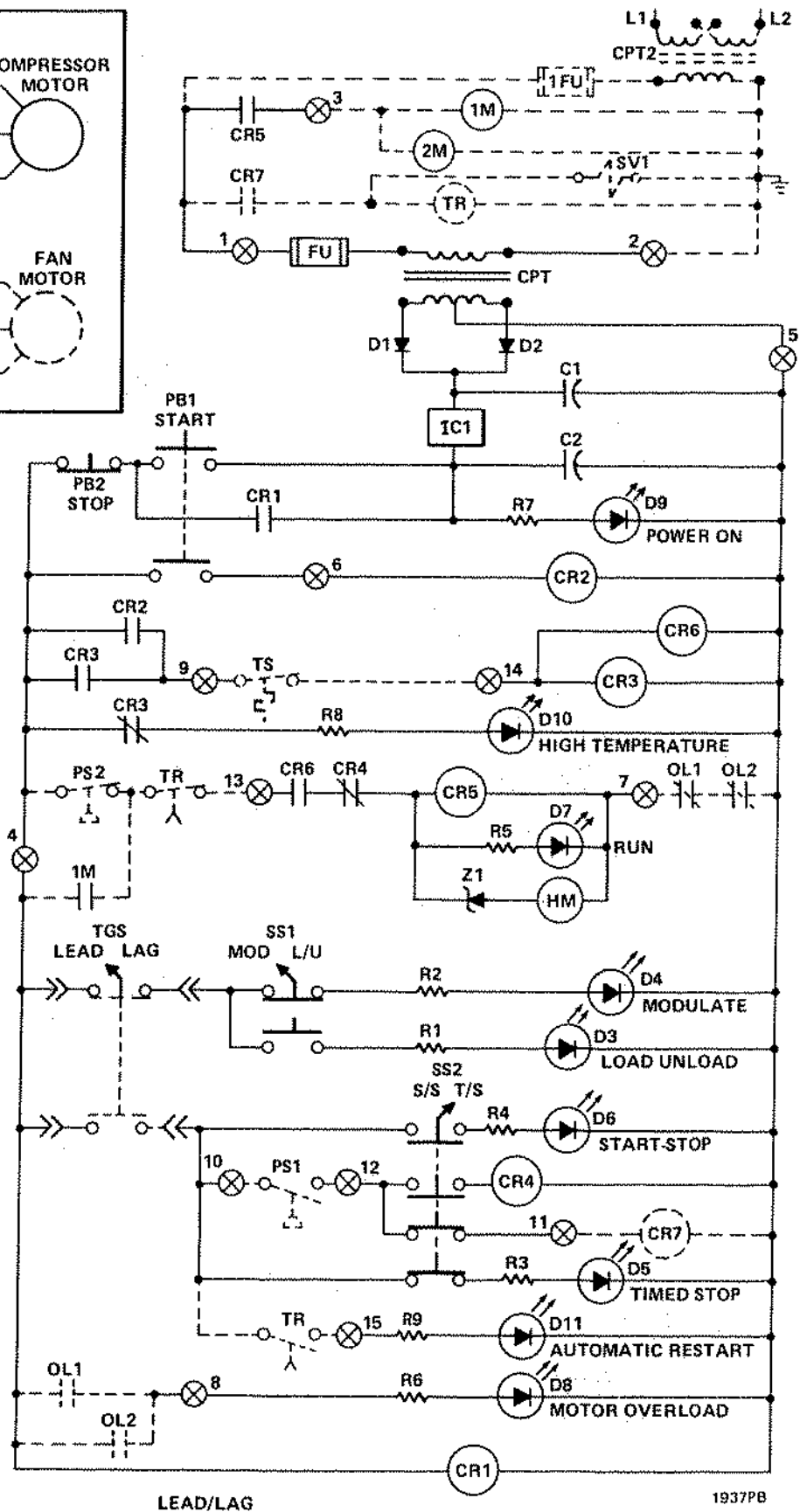
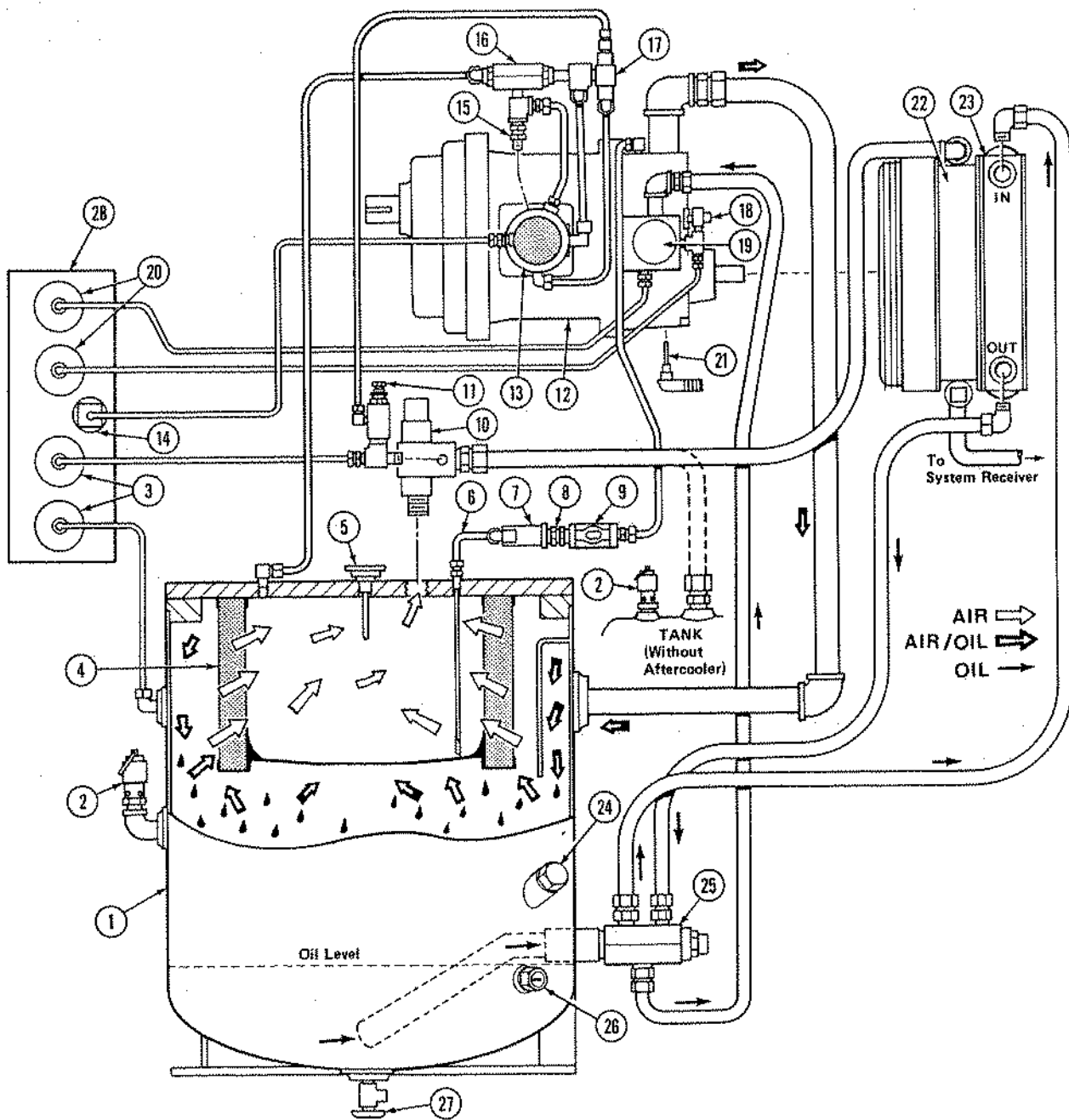


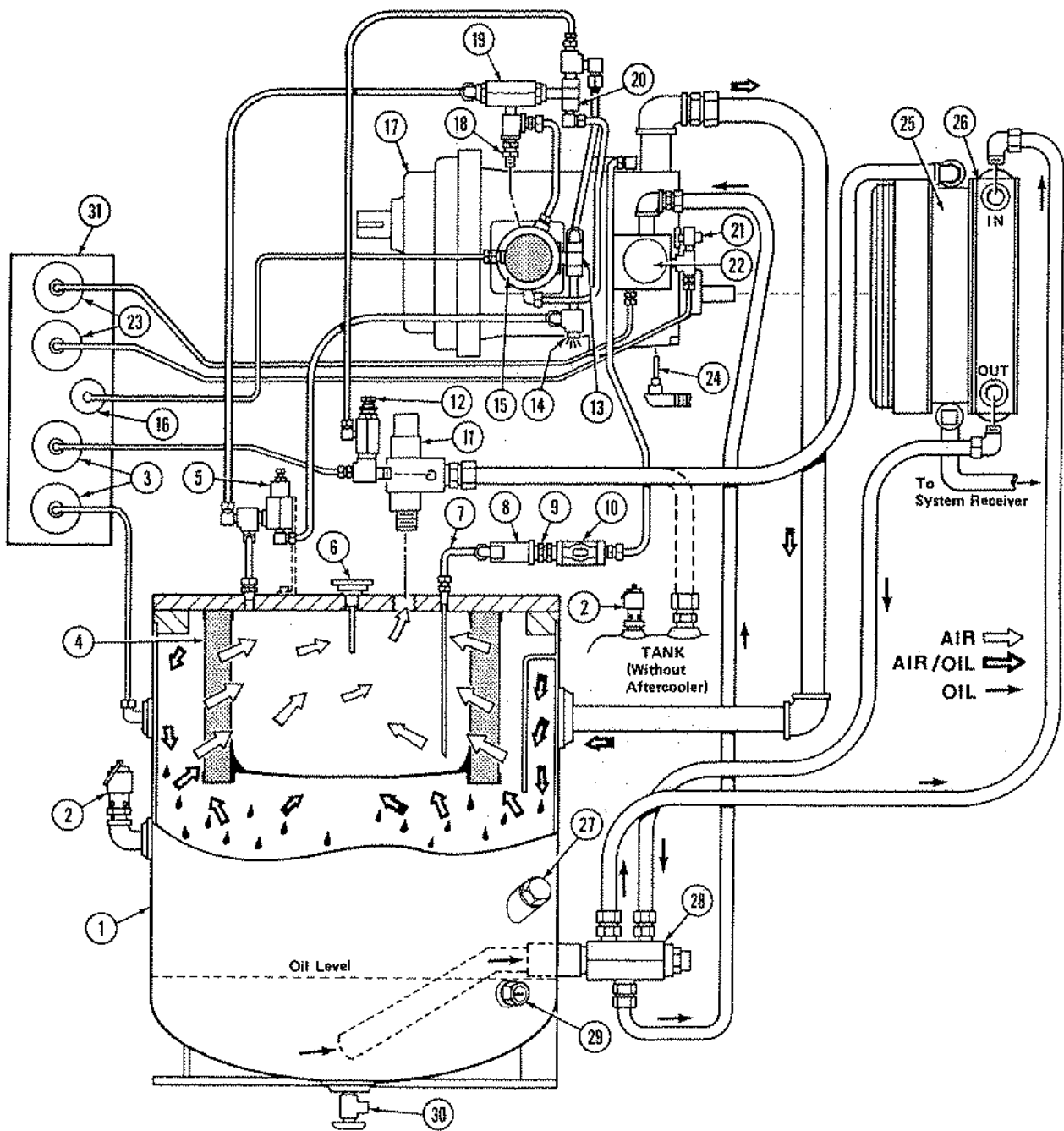
Figure 10 - Wiring Diagram



Index No.	Description	9	Sight Gage	20	Oil Pressure Gage(s)
1	Air Receiver/Oil Reservoir	10	Minimum Pressure/Check Valve	21	Discharge Temperature Switch
2	Pressure Relief Valve	11	Pilot Valve	22	Air Cooled Aftercooler (When used)
3	Air Pressure Gage	12	Air End	23	Air Cooled Oil Cooler
4	Separator Element	13	Intake Valve/Air Filter	24	Oil Filler
5	Air Temperature Gage (Thermometer)	14	Air Filter Restriction Indicator	25	Thermal By-pass Valve
6	Separator Drain Tube	15	Check Valve	26	Sight Gage
7	Drain Line Filter	16	Blow Down (Dump) Valve	27	Drain Valve
8	Check Valve	17	Check Valve	28	Instrument Panel
		18	Drain Valve (Filter)		
		19	Oil Filter (Compressor)		

1969PB

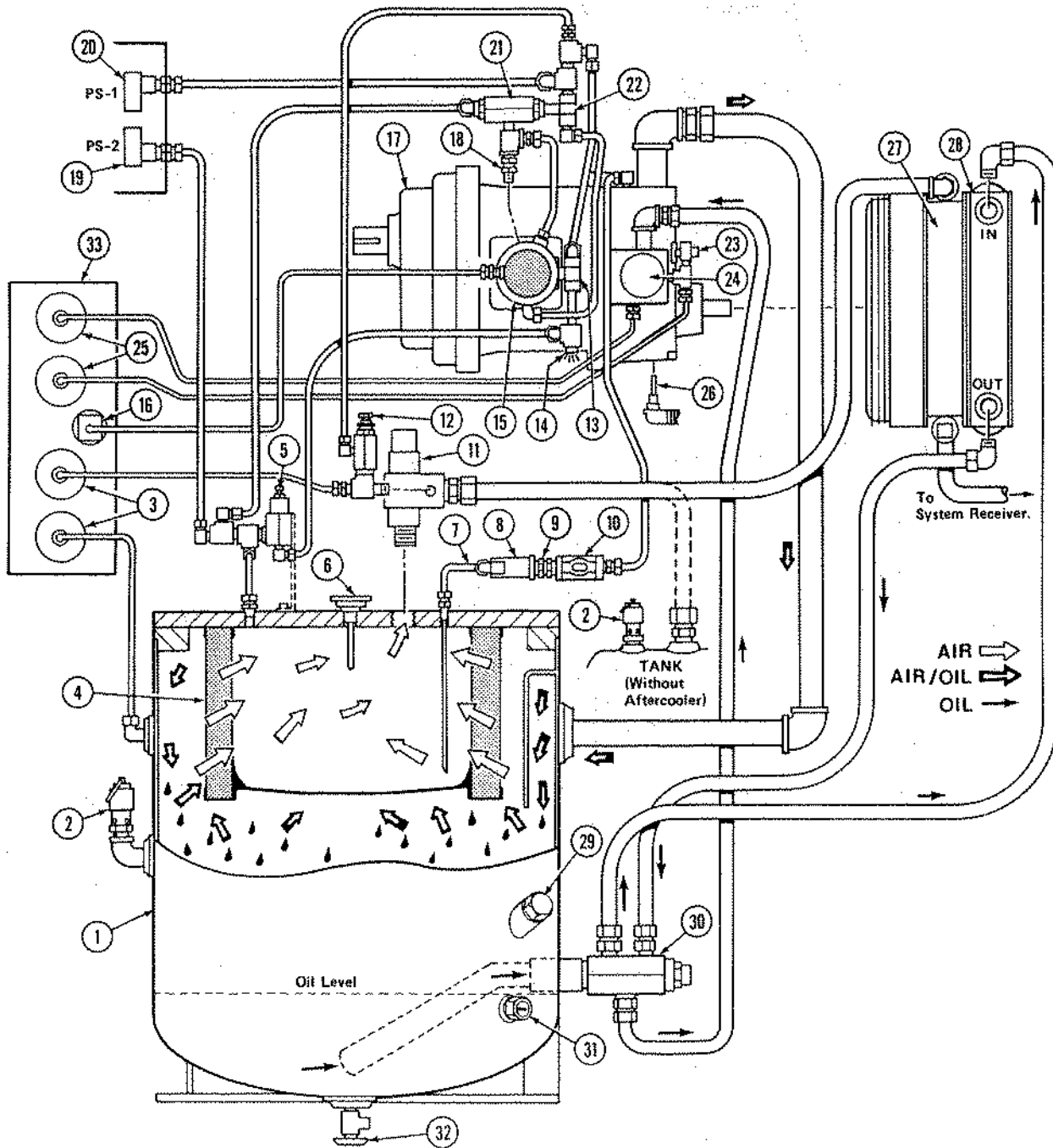
Figure 11 — Piping Diagram — Load/Unload Control



Index No.	Description	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	Air Receiver/Oil Reservoir	Sight Gage	Minimum Pressure/Check Valve	Pilot Valve	Check Valve	Control Bleed Orifice	Intake Valve/Air Filter	Air Filter Restriction Indicator	Air End	Check Valve	Blow Down (Dump) Valve	Check Valve	Drain Valve (Filter)	Oil Filter (Compressor)	Oil Pressure Gage(s)	Discharge Temperature Switch	Air Cooled Aftercooler (When used)	Air Cooled Oil Cooler	Oil Filler	Thermal By-pass Valve	Sight Gage	Drain Valve (Oil Reservoir)	Instrument Panel
2	Pressure Relief Valve																						
3	Air Pressure Gage																						
4	Separator Element																						
5	Control Pressure Regulator Valve (CPRV)																						
6	Air Temperature Gage (Thermometer)																						
7	Separator Drain Tube																						
8	Drain Line Filter																						
9	Check Valve																						

Figure 12 — Piping Diagram — Modulating Control

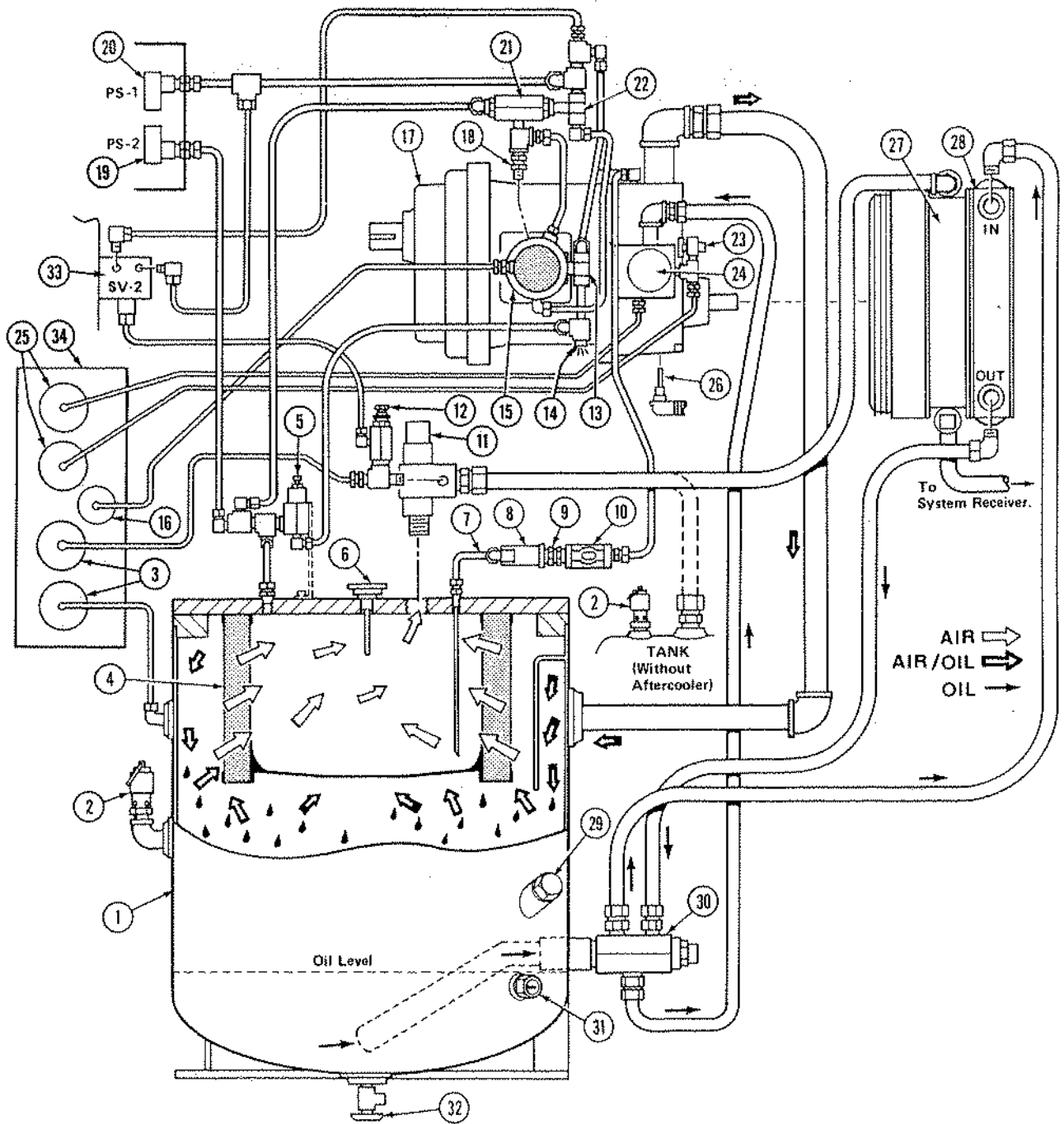
1968PB



Index No.	Description				
1	Air Receiver/Oil Reservoir	11	Minimum Pressure/Check Valve	23	Drain Valve (Filter)
2	Pressure Relief Valve	12	Pilot Valve	24	Oil Filter (Compressor)
3	Air Pressure Gage	13	Check Valve	25	Oil Pressure Gage(s)
4	Separator Element	14	Control Bleed Orifice	26	Discharge Temperature Switch
5	Control Pressure Regulator Valve (CPRV)	15	Intake Valve/Air Filter	27	Air Cooled Aftercooler (When used)
6	Air Temperature Gage (Thermometer)	16	Air Filter Restriction Indicator	28	Air Cooled Oil Cooler
7	Separator Drain Tube	17	Air End	29	Oil Filler
8	Drain Line Filter	18	Check Valve	30	Thermal By-pass Valve
9	Check Valve	19	Pressure Switch (PS-2)	31	Sight Gage
10	Sight Gage	20	Pressure Switch (PS-1)	32	Drain Valve (Oil Reservoir)
		21	Blow Down (Dump) Valve	33	Instrument Panel
		22	Check Valve		

Figure 13 -- Piping Diagram -- Dual (Start/Stop) and Auto-Dual (Timed Stop) Control

1967PB



Index No.	Description	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	Air Receiver/Oil Reservoir	Minimum Pressure/Check Valve	Pilot Valve	Check Valve	Control Bleed Orifice	Intake Valve/Air Filter	Air Filter Restriction Indicator	Air End	Check Valve	Pressure Switch (PS-2)	Pressure Switch (PS-1)	Blow Down (Dump) Valve	Check Valve	Drain Valve (Filter)	Oil Filter (Compressor)	Oil Pressure Gage(s)	Discharge Temperature Switch	Air Cooled Aftercooler (When used)	Air Cooled Oil Cooler	Oil Filter	Thermal By-pass Valve	Sight Gage	Drain Valve (Oil Reservoir)	Solenoid Valve	Instrument Panel
2	Pressure Relief Valve																								
3	Air Pressure Gage																								
4	Separator Element																								
5	Control Pressure Regulator Valve (CPRV)																								
6	Air Temperature Gage (Thermometer)																								
7	Separator Drain Tube																								
8	Drain Line Filter																								
9	Check Valve																								
10	Sight Gage																								

Figure 14 — Piping Diagram — Lead/Lag Control

1966PB

Section II

SPECIFICATIONS — GENERAL

MODEL	20SS	25SS	30SS
Type	Rotary Screw	Rotary Screw	Rotary Screw
Stages	One	One	One
Type of Drive	Belt	Belt	Belt
Motor/Input Shaft Speed, RPM	1755	1760	1765

NOTE

All pressures shown are maximum full load pressures.

Male Rotor Speed, RPM (100 PSI)	1755	2168	2665
Female Rotor/Fan Speed RPM (100 PSI)	1169	1444	1775
Male Rotor Speed, RPM (125 PSI)	1462	2024	2363
Female Rotor/Fan Speed RPM (125 PSI)	975	1348	1576
Male Rotor Speed, RPM (150 PSI)	N/A	1760	2030
Female Rotor/Fan Speed RPM (150 PSI)	N/A	1172	1353
Rated Delivery, CFM 100 PSI	77	98	123
Rated Delivery, CFM 125 PSI	64	89	115
Rated Delivery, CFM 150 PSI	N/A	76	101
Minimum Working Pressure, (PSI Gage)	80 (5.44 Bar)	80 (5.44 Bar)	80 (5.44 Bar)
Minimum Pressure Valve Set, (PSI Gage)	70 (4.76 Bar)	70 (4.76 Bar)	70 (4.76 Bar)
Oil Reservoir Capacity, U.S. Gallons	3.5	3.5	3.5
Air Receiver-Oil Reservoir-Maximum Working Pressure (PSI Gage)	175 (11.9 Bar)	175 (11.9 Bar)	175 (11.9 Bar)
Pressure relief valve setting for full load of 100 or 125 PSI gage	145 (9.86 Bar)	145 (9.86 Bar)	145 (9.86 Bar)
Pressure relief valve setting for full load of 150 PSI gage	N/A	170 (11.6 Bar)	170 (11.6 Bar)
Air Cleaner Type	Dry Type		
Air Cleaner Change Interval, Hours	As Required		

CAUTION

Observe the air cleaner restriction indicator. Change element when indicator shows red. Under dirty operating conditions, the air cleaner element will require changing more often.

Oil Filter Change Interval Hours	1000	1000	1000
----------------------------------	------	------	------

NOTE

To prevent spilling excessive amounts of oil, allow the unit to sit, shut down, approximately 10 minutes before removing the oil filter.

or

Drain the filter with the filter drain valve provided.

CAUTION

Conditions in which the unit is running may require changing the oil filter more often. Always renew the oil filter at each oil change.

Oil pressure gages (filter in, filter out) are provided so that the pressure drop across the filter, (filter condition) may be checked.

If a difference in oil pressure (rated pressure, normal operating temperature) readings (filter in, filter out) is 15 PSI or greater, change the filter.

Oil separator element change interval as required.

CAUTION

Always check the separator drain line and drain line filter for damage or plugging before condemning a separator element.

Observe the air pressure gages furnished to check the pressure drop

across the separator element. (Rated pressure, normal operating temperature) If the pressure drop is 15 PSI or higher, renew the separator element.

LUBRICATION—COMPRESSOR

The useful life of compressor oil depends on the quality of the oil and the conditions in which the unit is operating.

For these reasons oil and oil filter change intervals are to be determined by oil sampling and analysis.

Oil sampling and analysis is recommended every 200 hours of compressor operation at least until an oil/oil filter change pattern or schedule is established.

The quality of the oil is left to the oil manufacturer.

The responsibility for testing and evaluating useful oil life is left to the oil manufacturer and/or the compressor end user.

It is recommended that LeRoi SSL-32 (petroleum) or SSL-46 (synthetic) lubricant be used.

Either of these lubricants may be obtained, conveniently packaged, from your nearest LeRoi distributor.

If SSL-32 or SSL-46 is not available contact your local lubricant supplier for a lubricant which meets the specifications given below.

TYPICAL LUBRICANT SPECIFICATIONS

Non-Detergent Turbine or Hydraulic Oil or Synthetic PAO (polyalphaolefin) Lubricant	
Viscosity @ 100 °F	160-200 SSU
Viscosity @ 0 °F	11,000 SSU or Less
Minimum Viscosity Index	90
Pour Point, °F	20° lower than lowest expected starting temperature.
Minimum Flash Point, °F	400
Rust Inhibitor	ASTM, D665 (latest) No rust after 24 hours sea water.
Oxidation Inhibitor	ASTM, D943 (latest) Neutral No. 2.0 or less after 1000 hours.
Anti-Foam Additive	ASTM, D892 (latest) 3 cycles stability nil.

LUBRICATION-ELECTRIC MOTOR

Refer to the motor manufacturer's recommendation for motor bearing lubrication.

Section III

INSTALLATION

MOUNTING AND SPACE REQUIREMENTS

A suitable smooth floor should be provided for placing the compressor.

A special foundation is not required unless the floor or other mounting surface is extremely rough or unable to support the weight of the unit. The unit should sit level. It is advisable to use shims, as required, to make certain the frame is resting firmly on the mounting surface.

If there is danger of the unit being moved out of

position for any reason it may be bolted to the mounting surface.

Adequate space must be provided to service the unit once it is installed. Both housed and unhoused units must be positioned at least 24" away from a wall or other obstruction on all sides to allow adequate cooling air circulation and service access.

The following tables show the *approximate* overall dimensions and weights which may be used for selecting a suitable location for the compressor.

TABLE I

	Length, In.	Width, In.	Height, In.	Weight, Lbs.
W20SS	58.5	38.7	42.1	1315
W25SS	58.5	38.7	42.1	1370
W30SS	58.5	38.7	42.1	1400

ELECTRICAL SUPPLY

An adequate electrical power supply of the correct voltage must be provided. All control enclosure wiring has been completed at the factory. This includes magnetic starter wiring for units furnished with starter. Units furnished without a starter require wiring the starter on the job site.

The electrical supply should be equipped with a fused line disconnect switch or circuit breaker so that electrical power may be disconnected while the unit is being serviced.

The fused line disconnect should be located and mounted in accordance with all state, local and national regulations.

The unit must be properly grounded to provide adequate ground fault protection. As a guide, it is suggested that the ground wire be equal in size to one of the conductors which feeds the compressor motor circuit. Make certain the ground wire connections are clean and tight.

The wire used to feed the compressor circuit should be selected and sized based on the following conditions:

- (1) Motor full load amperage plus service factor.
- (2) Ambient temperature in the area where the wire is located.
- (3) Length of wire.
- (4) Insulation type.

This information may be found in the latest edition of the *National Electrical Code*.

When installing a unit in a "Hazardous Location"; that is in a location where fire or explosion is a definite hazard, refer to the appropriate section of the *National Electrical Code* for further information.

CAUTION

In all cases the local, state and national electrical codes must be strictly followed.

AIR SUPPLY TO COMPRESSOR (COOLING AND COMPRESSION)

Air supplied to the compressor should be free of contaminants such as paint spray mist and vapors, and other chemical vapors as well as normally air borne dust and dirt particles.

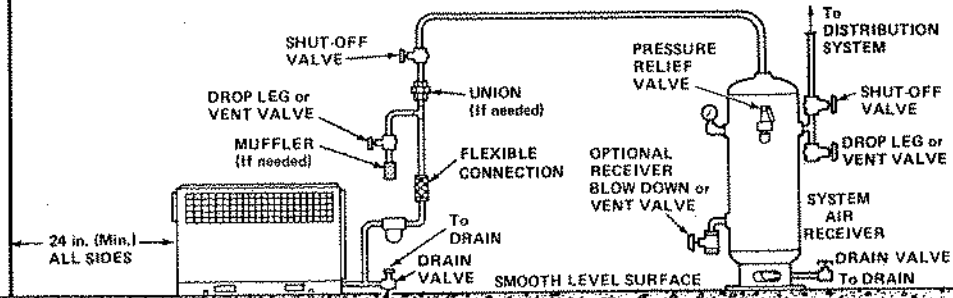
Inlet air to the compressor may vary slightly in temperature without adversely affecting the performance of the compressor. However, ambient air temperature should be maintained between 32° and 100°F to obtain desirable performance.

The air filter supplied with the compressor has an adequate flow capacity for most applications. In particularly dirty locations clean air may be ducted in from a clean air source or special air cleaners may be installed. Generally, most adverse conditions

THIS VIEW SHOWS THE TYPICAL PIPING LAYOUT FOR COMPRESSOR UNITS AND AIR RECEIVERS.

CONTROL ROOM TEMPERATURE
32° - 100° F.

NOTE:
Suitably support all piping and/or ducting to prevent strain on compressor housing/cooler or system air receiver.

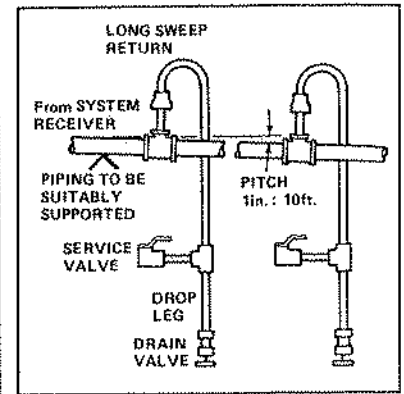


ANCHOR SECURELY HERE. IF REQUIRED. (Minimum 4 in. concrete floor or slab).

NOTE:
This valve is required to drain aftercooler and vent system for operational checks.

ALL PIPING, VALVES, MUFFLERS, etc; TO BE OBTAINED LOCALLY.

NOTE:
Ventilation air should always flow across compressor unit.

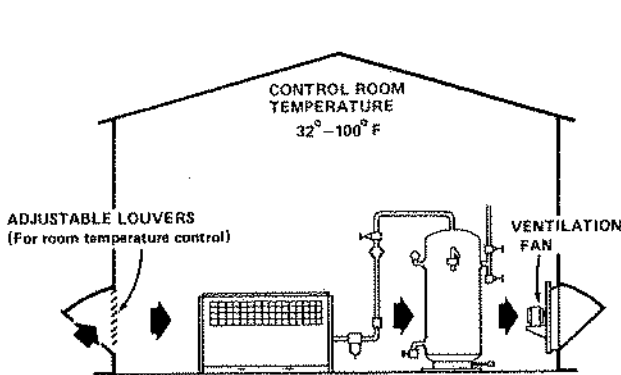


TYPICAL DISTRIBUTION SYSTEM

Always install dryers and/or filters in a distribution system down stream from a system receiver.

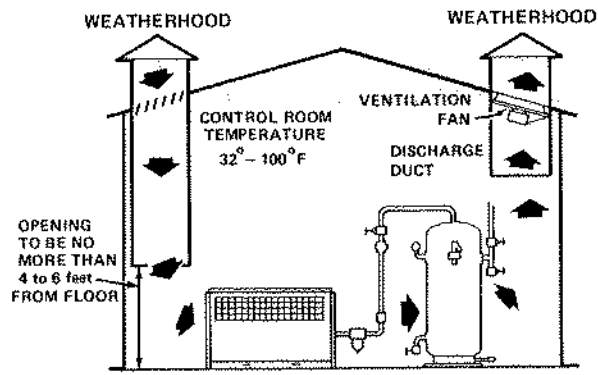
VENTILATION FANS

Thermostatically controlled to control room temperatures. Sized to exchange air in room once per minute. Minimum size fan allowable: 10,000 CFM

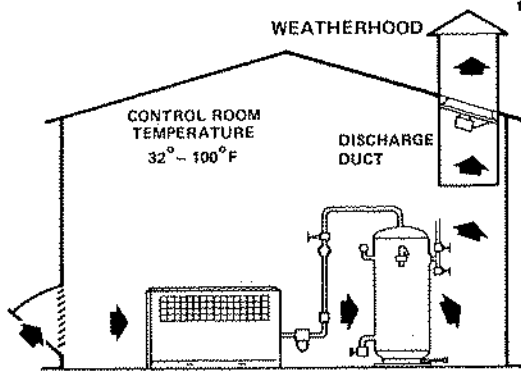


SIDE WALL INLET - SIDE WALL OUTLET COOLING and MAKE UP AIR FLOW

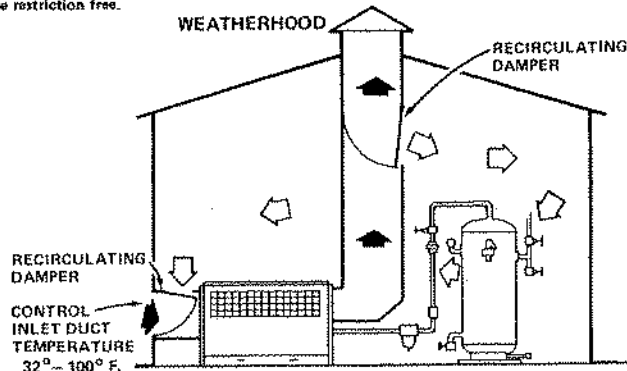
NOTE:
All ventilating air ducts and/or filters must be sized to be restriction free.



ROOF INLET - ROOF OUTLET COOLING and MAKE UP AIR FLOW



SIDE WALL INLET - ROOF OUTLET COOLING and MAKE UP AIR FLOW



DIRECT DUCTING OF COOLING (HEAT RECOVERY) and MAKE UP AIR FLOW

1974PB

Figure 15 - Typical Installation

may be overcome by regular servicing of the filter furnished with the unit.

When bringing outside air into the compressor building for cooling and/or compression the air inlet to the compressor building should be located away from contaminants such as engine exhaust, gases, steam and other harmful vapors.

Also the opening to the duct/building must be protected from rain, snow and other air borne debris by hoods as well as being located above the ground/roof to prevent other foreign matter pick up. For a typical ducting arrangement refer to Figure 15.

Both inlet and outlet ducts must be sized so that they are restriction free. Where ambient temperatures are below 32°F (inlet air) the temperature may be tempered by controlled recirculation. This may be accomplished by using adjustable louvers (or duct dampers) to admit warm air from the outlet duct back into the inlet duct as a controlled rate.

If duct filters are used, the filters must be restriction free. Typical furnace filter material may be used.

The following table shows the air flow in cubic feet per minute (CFM) required for cooling:

FAN AIR FLOW

Operating Pressure	Model	With	Without
		Aftercooler Cooling Air Flow, CFM	Aftercooler Cooling Air Flow, CFM
100 PSI	W20SS	3250	3400
	W25SS	4000	4200
	W30SS	4500	5100
125 PSI	W20SS	2750	2900
	W25SS	3800	4000
	W30SS	4400	4950
150 PSI	W20SS	N/A	N/A
	W25SS	3250	3400
	W30SS	4000	4200

DISCHARGE PIPING

It is recommended that all units be equipped with a system receiver or storage tank. The nominal size of the storage tank should be 200 gallons.

WARNING

THE SYSTEM STORAGE RECEIVER MUST BE EQUIPPED WITH A PRESSURE RELIEF VALVE WITH THE CORRECT

PRESSURE RELIEF SETTING AND FLOW CAPACITY.

The compressor should be located as near the plant storage receiver as possible. Piping should be as short and as direct as possible with minimum number of elbows and fittings. Never reduce discharge line size. Never install dryers or filters (except a moisture separator on aftercooled units) in the discharge line.

Manual shut off valves should also be included in the discharge piping so that the compressor and/or the system receiver may be isolated from the rest of the system to permit servicing the compressor.

It is also necessary to install a drop leg and valve in the discharge piping. Refer to Figure 15 for a typical piping arrangement.

All piping must be adequately supported to prevent excessive strain on the compressor or plant storage receiver.

CHECKS TO BE MADE AT INITIAL START UP:

- (1) Make certain that all electrical, air and water (if required) connections have been properly made.
- (2) Check the compressor reservoir oil level and correct as required. (Use correct type of oil)
- (3) Turn on cooling water, if required.
- (4) Close the line disconnect switch. The "Power" signal lamp should be glowing.
- (5) Jog the compressor motor by actuating the START switch and immediately pushing the STOP switch. Observe the air end for correct rotation.

NOTE

Rotation of the air end is correct when the input (drive) shaft turns clockwise when viewing the air end from the rear or discharge end.

If rotation is incorrect, disconnect the line switch and rewire the compressor motor to obtain correct direction of rotation. After rewiring return to Steps 4 and 5 to double check rotation and correct as required.

- (6) Determine the type of control. (Load/Unload, Modulating, Dual or Auto-Dual). Also determine full load operating pressure. (100, 125 or 150 PSI)

NOTE

To determine the mode (type) of control observe for the following:

- a. *Load/Unload* control will have a pilot valve *only* located on the minimum pressure valve.
- b. *Modulating* control will have a pilot valve (same location as above) *and* a control pressure regulator valve (CPRV) located on the unit air receiver-oil reservoir cover.
- c. Dual control will have a pilot valve, CPR valve (same location as above) *and* two pressure switches located in the control enclosure.
- d. *Auto-Dual* (timed stop) control will have a pilot valve, CPR valve, two pressure switches and a delay timer.
- e. *Lead/Lag* control may be identified by the instrument panel selector switch legend decal.

For load/unload control proceed to Step 7. For modulating control proceed to Step 8. For Auto-Dual proceed to Step 9.

LOAD-UNLOAD CONTROL

- (7) a. Make certain the electrical line disconnect switch is closed. The "Power" signal lamp should glow.
- b. Close the shut off valve located between the system receiver and the system distribution piping.
- c. Open the system receiver or compressor drop leg or vent valve.

WARNING

AIR ESCAPING TO ATMOSPHERE IS NOISY. ALWAYS WEAR EAR PROTECTION TO PROTECT HEARING.

- d. Start the unit by actuating the START switch. The unit should start and continue to run.
- e. Slowly close the drop leg or vent valve. As pressure rises in the unit and system receiver(s) the pilot valve should actuate, fully unloading the unit (close the intake valve). (110, 135 or 160 PSI) In addition, the blow down (dump) valve should open to lower unit receiver

air pressure. With the drop leg valve closed the unit should continue to run unloaded.

- f. Slowly open the drop leg or vent valve. As pressure falls in the system storage receiver the pilot valve and the blow down valve should close. The intake valve should open, returning the unit to full load operation.
- g. Slowly open and close the drop leg valve to cycle the controls. If the controls operate as described, the unit is ready for use.

MODULATING CONTROL

- (8) a. Make certain the electrical line disconnect switch is closed. The "Power" signal lamp should glow.

NOTE

If the unit is equipped with Dual or Auto-Dual Control make certain the mode selector switch is positioned for Modulating Control. The "Modulate" Control lamp should glow.

- b. Close the shut off valve located between the system receiver and system distribution piping.
- c. Open the system receiver vent or drop leg valve.

WARNING

AIR ESCAPING TO ATMOSPHERE IS NOISY. ALWAYS WEAR EAR PROTECTION TO PROTECT HEARING.

- d. Start the unit by actuating the START switch. The unit should start and continue to run.
- e. Slowly close the drop leg or vent valve. As air pressure rises in the unit and system receiver(s) the control pressure regulator (CPR) valve should begin to unload the unit at the pressure for which the CPR valve is set. (100, 125 or 150 PSI)
- f. Observe that, as the system receiver pressure approaches the full unload pressure (110, 135 or 160 PSI) the pilot valve will actuate fully unloading the unit (close intake valve) and opening the blow down

(dump) valve lowering unit receiver pressure.

- g. Slowly open and close the drop leg valve to cycle the controls. If the controls operate as described, the unit is ready for use.

DUAL CONTROL

- 9. a. Make certain the electrical line disconnect switch is closed. The "Power" lamp should glow.
- b. Close the shut off valve between the system receiver and system distribution piping.
- c. Open the system receiver vent or drop leg valve.

WARNING

AIR ESCAPING TO ATMOSPHERE IS NOISY. ALWAYS WEAR EAR PROTECTION TO PROTECT HEARING.

- d. Position the dual control mode selector switch to the Dual Control position. The "Dual Control" lamp should glow.
- e. Start the unit by actuating the START switch. The unit should start and continue to run.
- f. Slowly close the drop leg or vent valve. As air pressure rises in the unit and system receiver(s) the control pressure regulator (CPR) valve should begin to unload the unit at the pressure for which the CPR valve is set. (100, 125 or 150 PSI)
- g. Observe that, as the system receiver pressure reaches the full unload pressure (110, 135 or 160 PSI) the pilot valve will open actuating pressure switch PS-1 stopping the unit. The "Automatic Restart" lamp should glow.
- h. Slowly open and close the drop leg or vent valve to cycle the controls. If the controls operate as described, the unit is ready for use.

NOTE

When the unit stops automatically or is manually shut down for any reason, it will not restart until the unit air receiver-oil reservoir air pressure is below 20 PSI

(approximately). If the unit attempts to start/starts, shut down and refer to Control Adjustment Procedures.

AUTO-DUAL (Timed Stop) CONTROL

- (10) a. Make certain the electrical line disconnect switch is closed. The "Power" signal lamp should glow.
- b. Position the control mode selector switch in the Auto-Dual Control position. The "Auto-Dual" signal lamp should glow.
- c. Close the shut off valve located between the system receiver and system distribution piping.
- d. Open the system receiver vent or drop leg valve.

WARNING

AIR ESCAPING TO ATMOSPHERE IS NOISY. ALWAYS WEAR EAR PROTECTION TO PROTECT HEARING.

- e. Locate the time delay timer (T-1) in the electrical control enclosure and adjust the timer to minimum time. (30 seconds approximately.)
- f. Start the unit by actuating the START switch. The unit should start and continue to run.
- g. Slowly close the drop leg or vent valve. As air pressure rises in the unit and system receivers, the control pressure regulator (CPR) valve should begin to partially unload the unit at the pressure for which the CPR valve is set. (100, 125 or 150 PSI)
- h. Observe that, as the system receiver pressure approaches the full unload pressure (110, 135 or 160 PSI) the pilot valve will actuate fully unloading the unit (close intake valve) and opening the blow down (dump) valve lowering unit receiver pressure. Observe also, that the pressure switch PS-1 actuates turning on the timer. The "Timed Stop" lamp should glow.
- i. The unit should continue to run unloaded, until the "set" time of the

timer elapses (30 seconds approximately), and then stop automatically. The "Automatic Restart" lamp should glow.

- j. Slowly open and close the drop leg valve to cycle the controls allowing time for the delay timer to stop the unit. When testing is completed reset the desired time delay. (Suggest 10 minutes)

If the controls operate as described, the unit is ready for use.

NOTE

If the unit stops automatically, or is manually shut down for any reason, it will not restart until the unit air receiver-oil reservoir air pressure is below 20 PSI (approximately). If the unit attempts to Start/Starts shutdown and refer to control adjustment procedures.

LEAD/LAG CONTROL

11. a. Make certain the electrical line disconnect switch(es) is/are closed. The "Power" signal lamp should glow on both the lead and lag units.
- b. Position the lead/lag control selector switch to lead on the first unit and to lag on the second unit.
- c. Close the shut off valve located between the system receiver and the system distribution piping.
- d. Open the system receiver vent or drop leg valve.

WARNING

AIR ESCAPING TO ATMOSPHERE IS NOISY. ALWAYS WEAR EAR PROTECTION TO PROTECT HEARING.

- e. Locate the time delay timer in the electrical enclosure on both units. Adjust the timer to minimum time. (30 seconds, approximately.)
- f. Start both units by actuating the START switch. Both units should start and continue to run.

- g. Slowly close the drop leg or vent valve. As air pressure rises in the unit and system receivers, the control pressure regulator (CPR) valve(s) should begin to unload both units at the pressure for which the CPR valves are set (100, 125 or 150 PSI)
- h. Observe that, as the system receiver pressure rises the pressure switch PS-1 will actuate and the lag unit will fully unload. The "Timed Stop" lamp should glow.
- i. The lag unit should continue to run unloaded, until the "set" time of the timer elapses (30 seconds approximately) and the stop automatically. The "Automatic Restart" lamp should glow.

NOTE

The lead unit will continue to run with modulating control.

- j. Slowly open and close the drop leg valve to cycle the controls allowing time for the delay timer to stop the unit.
- k. Shut down both units. Reposition the lead/lag selector switch to lag on the first unit and to lead on the second unit.
- l. Repeat Steps f through j above to check the operation of the unit selected for lag control. When testing is completed reset the desired time delay.

If the controls operate as described, the units are ready for use.

NOTE

When a unit stops automatically, or is manually shut down for any reason, it will not restart until the unit air receiver-oil reservoir air pressure is below 20 PSI (approximately). If a unit attempts to start/starts shut down and refer to Control Adjustment Procedure.

**BE ALERT — A CAREFUL OPERATOR
IS THE BEST INSURANCE AGAINST AN ACCIDENT!**

Section IV

OPERATION AND PREVENTIVE MAINTENANCE

Satisfactory performance of a stationary screw air compressor requires a good preventive maintenance program.

The following information is provided as a guide for such a program.

START UP

Daily start up may be accomplished as follows:

- (1) Drain the condensate (water) from the oil reservoir. Close the drain valve securely when oil appears.
- (2) Check the compressor oil reservoir oil level.

NOTE

The reservoir is full when the oil level reaches the bottom of the filler hole. If oil covers the sight gage it is safe to operate the unit.

- (3) Operate the air receiver-oil reservoir pressure relief valve manually to make certain it will open.
- (4) Make certain adequate ventilation and cooling water, if required, is supplied.
- (5) Open the service valve which connects the unit to the system receiver (distribution piping) and actuate the START switch to start the unit.
- (6) Observe instrument panel indicators and all gages for proper readings. If the indicators read normally the unit may be continued in service.

SHUT DOWN

- (1) Allow the unit to fully unload.
- (2) Push the stop switch to shut the unit down.

PREVENTIVE MAINTENANCE

Regular testing of oil as specified in the following maintenance guide is intended to assist in establishing oil and oil filter change intervals.

It is possible, however, to obtain information about the wear characteristics of the machine with continued oil testing. The oil tests performed should

include analyzing the particulate matter in the oil sample, as well as testing for oxidation inhibitors and anti-rust additives.

As an example, an increase in cast iron particles in an oil sample may give advance warning of excessive wear. This information could possibly prevent damaging the entire unit beyond repair, without periodic disassembly and visual inspections.

Normally the oil analysis sheet will list the results of the oil test, in addition to recommendations of the analyzing laboratory showing what maintenance is required.

The following information is furnished as a guide to the critical limits of items which are listed on an oil analysis sheet.

Viscosity increase	10% over new oil
Neutral No. Increase (total acid)	0.5% over new oil
Total solids by weight	0.20%
Oxidation, by weight, oxidized material	0.10%
Sediment, by volume	0.20%
Water, by volume	0.5%

DAILY

- (1) Check the air cleaner and service as required.
- (2) Drain water (condensate) from the oil reservoir. Close the drain valve securely when oil appears.

NOTE

Always drain condensate after the unit has been shut down for a reasonable length of time (usually over night) allowing the water to settle.

- (3) Check the compressor oil reservoir oil level. Add correct type of oil as required. *Do not over fill.*

NOTE

Fill until oil reaches the bottom of the filler hole. Oil must be added if it does not cover the sight gage.

- (4) Operate air receiver-oil reservoir pressure relief valve manually to make certain it will open before starting the unit.

- (5) Visually inspect all air and oil lines and fittings for leaks. This includes the air cleaner and any inlet piping of the air induction system. Correct leaks as required.
- (6) Start and run the unit at rated full load pressure long enough to reach normal operating temperature. (N. O. T.)
- (7) Observe the air cleaner restriction indicator. If the restriction indicator shows a red "flag", the air cleaner element must be cleaned or renewed.
- (8) With the unit running, observe the oil pressure gages (top rear of air end near oil filter) and compare the pressure readings. (Filter In-Filter Out) A difference in pressure reading of 15 PSI or more indicates that the oil filter element must be renewed.
- (9) With the unit running, observe the air pressure gages (top and side of air receiver-oil reservoir) and compare the pressure readings. (Pressure drop across separator element) A difference in pressure readings of 15 PSI or more indicates the separator element is restricted.
If the restriction is caused by dirt or other foreign matter, renew the separator element.

NOTE

Oil saturation can cause excessive restriction across a separator element. Always check the separator drain tube and line, the check valve (installation & condition)

and clean the drain line filter before condemning a separator element.

EVERY 200 HOURS

- (1) Repeat daily service as applicable.
- (2) Remove surface dirt and dust from the exterior surfaces of the oil cooler and after-cooler, if required. (Air cooled units)
- (3) Obtain an oil sample from the compressor oil system and have the sample analyzed for condition. Change oil and oil filter, if required, based on results of the oil analysis.

NOTE

Oil samples may be obtained from the oil reservoir (at filler, not drain) or from the oil system drain valve located near the oil filter on the air end.

EVERY 1000 HOURS

- (1) Repeat daily and 200 hour service as applicable.
- (2) Change compressor oil filter element.

NOTE

To prevent spilling excessive amounts of oil, allow the unit to sit, shut down, approximately 10 minutes before removing the oil filter.

OR

Drain the filter with the filter drain valve provided.

Section V

CONTROL ADJUSTMENT PROCEDURE

CONTROLS

Adjustments to all of the controls are made very carefully at the factory. However, it may be necessary to make certain adjustments at the time the unit is installed, to fit specific applications, or after repair or replacement of components.

LOAD/UNLOAD CONTROL units require the adjustment of the pilot valve.

MODULATING CONTROL units require adjustments to the pilot valve and the control

pressure regulator (CPR) valve.

DUAL AND AUTO-DUAL CONTROL (timed stop) units require adjustments to the pilot valve, the control pressure regulator (CPR) valve and the pressure switches PS-1 and PS-2.

CAUTION

Do not exceed the specified maximum full load operating pressure of any unit. Refer to "Specifications", Section II.

The air pressure gages on the unit instrument panel may be used to make the following adjustments, if they are not broken or damaged.

However, for more accurate results, it is recommended that test gages of known accuracy be used for adjusting pressures.

CONTROL ADJUSTMENT PROCEDURES

LOAD-UNLOAD CONTROL—PILOT VALVE ADJUSTMENT (Figure 16)

To adjust the pressure at which the pilot valve will open (unload compressor) loosen the locknut (2) and turn adjusting nut (sleeve) (1) in (clockwise) to increase pressure or out (counterclockwise) to decrease pressure. Tighten locknut (2) securely when adjustment has been completed.

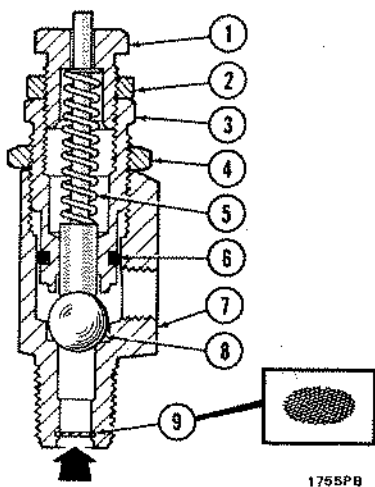


Figure 16 — Pilot Valve

- | | | |
|---------------------------|----------------|------------------|
| 1. Adjusting Nut (Sleeve) | 4. Locknut | 7. Valve Body |
| 2. Locknut | 5. Spring | 8. Ball |
| 3. Adjusting Nut (Sleeve) | 6. O-Ring Seal | 9. Filter Screen |

To adjust the difference between opening and closing pressures (differential) of the pilot valve, loosen the locknut (4) and turn the adjusting nut (sleeve) (3) in (clockwise) to increase differential (lower closing pressure) or out (counterclockwise) to decrease differential (raise closing pressure). Tighten locknut (4) securely when adjustment has been completed.

NOTE

Any change in adjustment to either the unload pressure or the differential will change both settings.

For this reason these adjustments must be made and rechecked/adjusted alternately and carefully to obtain correct settings.

Follow this procedure:

- (1) Install pressure test gages. (Minimum pressure range 200 PSI), if needed, in place of the existing air pressure gages.
- (2) Start the unit as outlined under "Start Up", Section IV.
- (3) Allow the unit to run long enough to reach normal operating temperature.
- (4) Cycle the controls by adjusting the service (drop leg or vent) valve to raise and lower system receiver pressure.
- (5) Follow the instructions on pilot valve adjustment under "Load-Unload Control . . .", Section V and adjust the pilot valve to the pressure settings given in Table A. Make certain all locknuts are securely tightened when finished.
- (6) Shut down the unit and remove any test gages. Reconnect/reinstall unit gages. Restart and check for/correct any leaks.

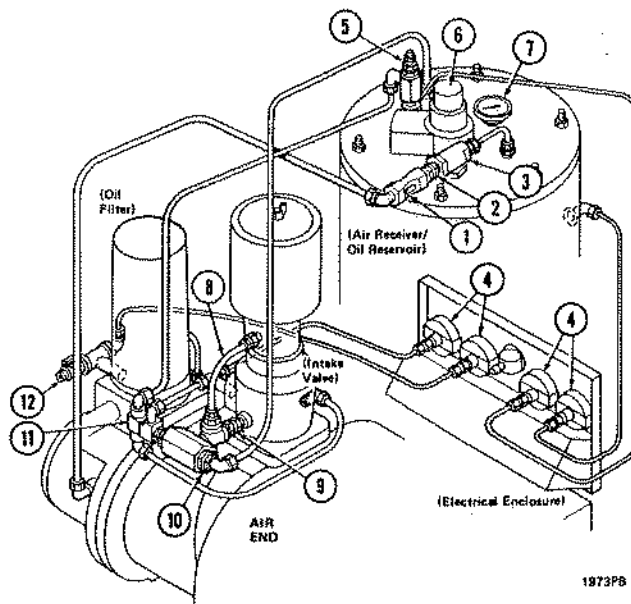


Figure 17 — Load/Unload Control

1. Sight Gage
2. Check Valve
3. Filter
4. Pressure Gage(s)
5. Pilot Valve
6. Minimum Pressure/Check Valve
7. Temperature Gage (Thermometer)
8. Return Air Bleed/Blow Down Line
9. Check Valve
10. Blow Down (Dump) Valve
11. Shuttle Check Valve
12. Drain Valve

TABLE A

LOAD/UNLOAD CONTROL
PILOT VALVE PRESSURE SETTINGS

FULL LOAD PRESSURE	W20SS		W25SS		W30SS	
	Unload (Open)	Load (Close)	Unload (Open)	Load (Close)	Unload (Open)	Load (Close)
100 PSI	110	95	110	95	110	95
125 PSI	135	120	135	120	135	120
150 PSI	N/A	N/A	160	145	160	145

MODULATING, DUAL AND AUTO-DUAL CONTROL — PILOT VALVE AND CONTROL PRESSURE REGULATOR (CPR) VALVE ADJUSTMENT (Figure 18)

Refer to "Load-Unload Control . . .", Section V, for pilot valve adjustment instructions.

To change the pressure at which the CPR (control pressure regulator) valve will fully unload the compressor, loosen the adjusting screw locknut and turn the adjusting screw in (clockwise) to increase or out (counterclockwise) to decrease pressure. Tighten the locknut securely when finished.

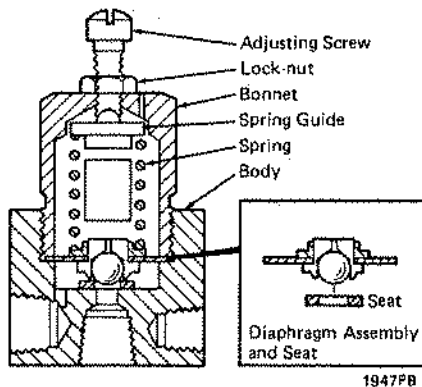


Figure 18 — Control Pressure Regulator Valve

Follow this procedure:

- (1) Install/connect pressure test gages (minimum pressure range 200 PSI), if required, in place of the existing air pressure gages.
- (2) Connect a pressure test gage with a minimum range of 100 PSI in the control pressure line near the control bleed orifice. (Install a tee fitting - do not remove bleed orifice).

NOTE

If the unit has optional Dual or Auto-Dual Control make certain the mode selector switch is positioned in the "Modulate" Control position.

- (3) Start the unit as outlined under "Start Up", Section IV. Allow the unit to run long enough to reach normal operating temperature.
- (4) Close the drop leg or vent valve to raise both the unit and system receiver air pressure. Observe the pressure test gage connected in the control pressure line. Loosen the locknut on the control pressure regulator valve adjusting screw and turn the screw in (clockwise) until control pressure always reads zero. (Drop leg or vent valve closed.)
- (5) Adjust the pilot valve according to the instructions given under "Load-Unload Control . . .", Section V to the pressures shown in Table A. Be certain to use the correct full load pressure range (i.e. 100, 125 or 150 PSI) for the unit being adjusted. After the pilot valve adjustment has been completed make certain the adjustment locknuts are tightened securely.
- (6) Adjust the service (drop leg or vent) valve to maintain a constant full load pressure. (i.e. 100, 125 or 150 PSI)
- (7) Observe the pressure test gage connected in the control pressure line. Adjust the control pressure regulator (CPR) valve by turning the adjusting screw out (counterclockwise) until a pressure of 3 to 5 PSI is observed on the control line test gage.

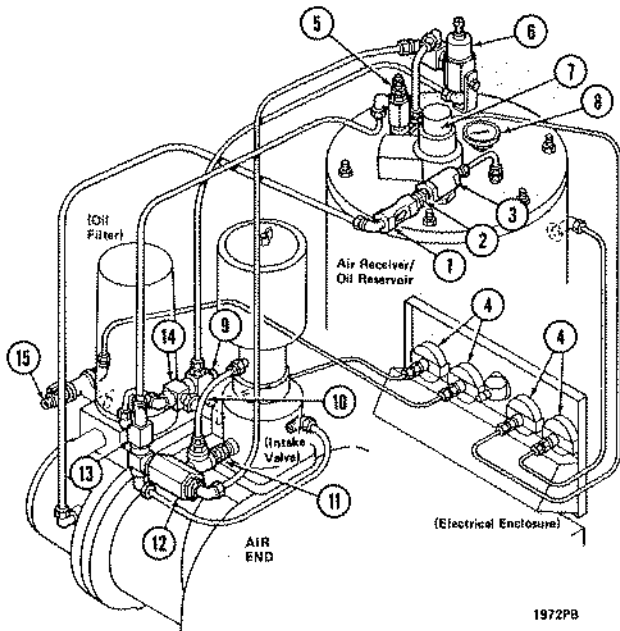


Figure 19 — Modulating Control

1. Sight Gage
2. Check Valve
3. Filter
4. Pressure Gage(s)
5. Pilot Valve
6. Control Pressure Regulator Valve
7. Minimum Pressure/Check Valve
8. Temperature Gage (Thermometer)
9. Control Bleed Orifice
10. Return Air Bleed/Blow Down Line
11. Check Valve
12. Blow Down (Dump) Valve
13. Shuttle Check Valve
14. Shuttle Check Valve
15. Drain Valve

(8) Then turn the CPR valve adjusting screw in (clockwise) far enough to obtain a control pressure of zero. (No control air bleed)

(9) Cycle the controls by adjusting the service (drop leg or vent) valve to raise and lower both unit and system receiver air pressure.

Observe that the CPR valve (modulated) control pressure rises and begins to unload the compressor. When the air pressure in the system receiver reaches the pressure for which the pilot valve is set (see Table A for correct pressure range) the pilot valve should actuate (open) fully unloading the compressor. After the pilot valve opens the dump valve should actuate lowering unit receiver pressure. Modulated control pressure (test gage) should fall to zero.

As system receiver air pressure falls the pilot valve should close. Rising system receiver pressure should cause the con-

trols to repeat the above sequence of events.

(10) Cycle the controls long enough to make certain adjustments are correct. Repeat adjustments as required.

(11) Shut the unit down and remove all test equipment. Restart, check for and correct any leaks.

DUAL AND AUTO-DUAL (TIMED STOP) CONTROL — PRESSURE SWITCH ADJUSTMENT

To change a pressure switch adjustment turn the hexagonal head adjusting screw.

Thread the adjusting screw out (counterclockwise) to decrease the pressure setting or in (clockwise) to increase the setting.

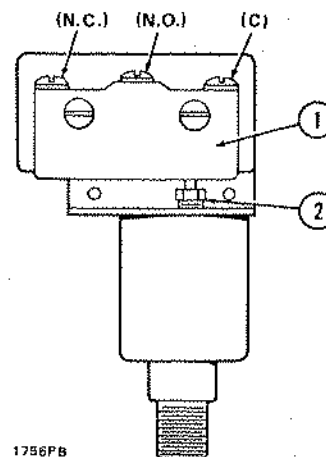
The pressure setting of pressure switch 1 (PS-1) should be 50 PSI. (Approximately)

The pressure setting of pressure switch 2 (PS-2) should be 20 PSI.

The pressure setting of pressure switch PS-1 is correct if the timer circuit signal lamp (and timer) turns on when the unit is running fully unloaded in the "Auto-Dual" mode of operation. To adjust this switch to 50 PSI it is recommended the switch be removed from the unit and adjusted independently of other controls. (Use shop air supply)

NOTE

Make certain the pilot valve and control pressure regulator (CPR) valve are correctly adjusted before proceeding.



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Figure 20 — Pressure Switch

1. Switch
2. Adjusting Screw

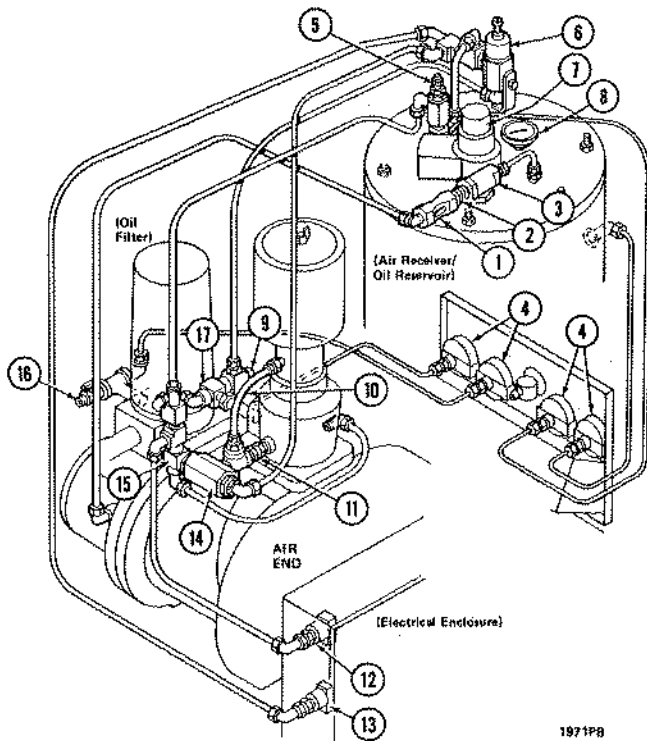


Figure 21 -- Dual and Auto-Dual Control

- | | |
|-------------------------------------|-------------------------------------|
| 1. Sight Gage | 10. Return Air Bleed/Blow Down Line |
| 2. Check Valve | 11. Check Valve |
| 3. Filter | 12. Pressure Switch PS-1 |
| 4. Pressure Gage(s) | 13. Pressure Switch PS-2 |
| 5. Pilot Valve | 14. Blow Down (Dump) Valve |
| 6. Control Pressure Regulator Valve | 15. Shuttle Check Valve |
| 7. Minimum Pressure/Check Valve | 16. Drain Valve |
| 8. Temperature Gage (Thermometer) | 17. Shuttle Check Valve |
| 9. Control Bleed Orifice | |

To check/adjust the pressure setting of pressure switch 2 (PS-2) proceed as follows:

- (1) Set the mode selector switch to the "Auto-Dual" position.
- (2) Start the unit as outlined under "Start Up", Section IV.
- (3) Allow the unit to reach full rated pressure and unload. (Timer signal on)
- (4) Stop the unit by actuating the stop switch.
- (5) Wait several seconds and actuate the START switch. The unit should *not* start.
- (6) Observe the unit air receiver air pressure gage for falling pressure. The unit *should not restart automatically* until the unit air receiver pressure falls to or below 20 PSI.

CAUTION

If the unit should attempt to start before the air pressure falls to 20 PSI

shut down immediately by actuating the STOP switch.

- (7) Adjust the pressure setting on pressure switch PS-2 following instructions under "Pressure Switch Adjustment" above.
- (8) Restart the unit and repeat steps 3 through 7 until the correct setting is obtained.

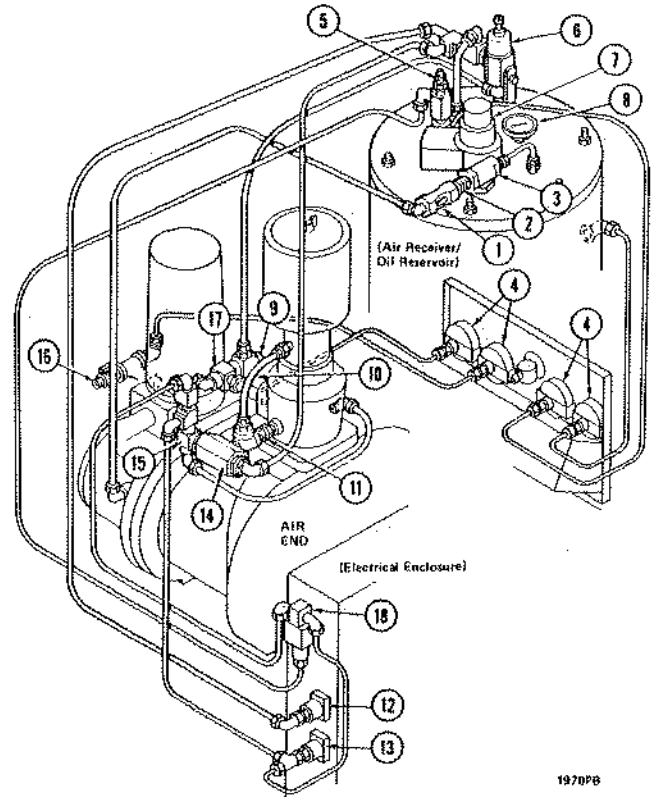


Figure 22

- | |
|-------------------------------------|
| 1. Sight Gage |
| 2. Check Valve |
| 3. Filter |
| 4. Pressure Gage(s) |
| 5. Pilot Valve |
| 6. Control Pressure Regulator Valve |
| 7. Minimum Pressure/Check Valve |
| 8. Temperature Gage (Thermometer) |
| 9. Control Bleed Orifice |
| 10. Return Air Bleed/Blow Down Line |
| 11. Check Valve |
| 12. Pressure Switch PS-2 |
| 13. Pressure Switch PS-1 |
| 14. Blow Down (Dump) Valve |
| 15. Shuttle Check Valve |
| 16. Drain Valve |
| 17. Shuttle Check Valve |
| 18. Solenoid Valve |

LEAD/LAG CONTROL ADJUSTMENT PROCEDURE

Lead/lag control requires that pressure switch PS-1 be set to actuate (open) at 5 PSI below the pilot valve setting.

Example:

Pilot valve adjusted to open at 110 PSI.
Set pressure switch PS-1 to actuate at 105
PSI. Both units.

Section VI

SERVICE PROCEDURES — COMPONENTS

PILOT VALVE SERVICE

The pilot valve is furnished only as a complete assembly.

The only service required is to clean the air inlet screen/filter periodically.

The screen is located in the bottom of the valve. To gain access remove the fitting in the bottom of the valve.

CONTROL PRESSURE REGULATOR VALVE SERVICE

The control pressure regulator valve is furnished either as a complete unit, or may be serviced with a diaphragm assembly and valve seat.

Installation of the diaphragm and seat may be accomplished as follows:

- (1) Remove the control pressure regulator from the unit.
- (2) Loosen the adjusting screw locknut and turn the screw counterclockwise to release spring pressure on the diaphragm.
- (3) Support the hexagon body in a bench vise or other suitable fixture. With a wrench unthread the bonnet from the body and remove the bonnet.
- (4) Remove the spring guide and spring from the body.
- (5) Remove the diaphragm assembly from the body and discard.
- (6) Remove the valve seat from the valve body. Discard the valve seat.
- (7) Clean the remaining parts thoroughly.
- (8) Lubricate the new valve seat with silicone grease. (Suggest Dow Corning 55M). Install the new valve seat in the

valve body, centered over the hole, with the small chamfer on the outside diameter down.

- (9) Install the new diaphragm in the body. Reinstall the spring and spring guide in the body.
- (10) Install the bonnet in the body and tighten securely.

The control pressure regulator valve may now be mounted on the unit and adjusted according to instructions in Section V of this manual.

INTAKE VALVE SERVICE

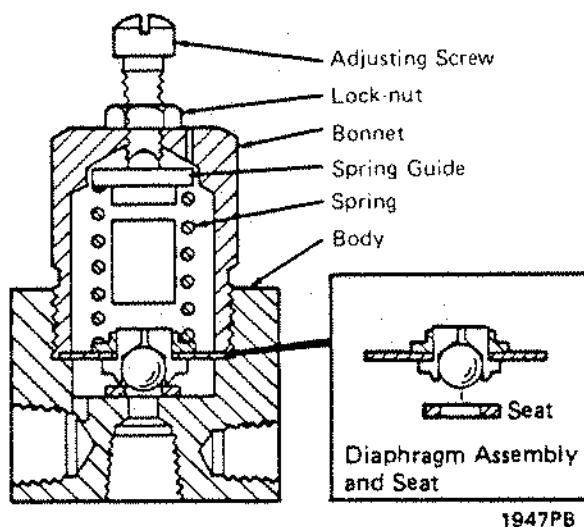
The intake valve may be obtained as a complete assembly if required. Service parts are available, however, to repair the intake valve if desired.

Do not attempt to disassemble/reassemble an intake valve while it is mounted on the air end. Loose or broken parts could accidentally drop into the air end causing further difficulty.

- (1) Disconnect the by pass line from the base of the air cleaner assembly and thread the air cleaner assembly out of the intake valve.
- (2) Disconnect all control air lines (tubes) from the intake valve. **CAREFULLY MARK THESE LINES TO AID IN CORRECT REASSEMBLY.**
- (3) Remove the intake valve to air end attaching capscrews and remove the intake valve and gasket from the air end. Discard the gasket.

NOTE

Cover the air end inlet port to prevent foreign matter from entering the cylinder.



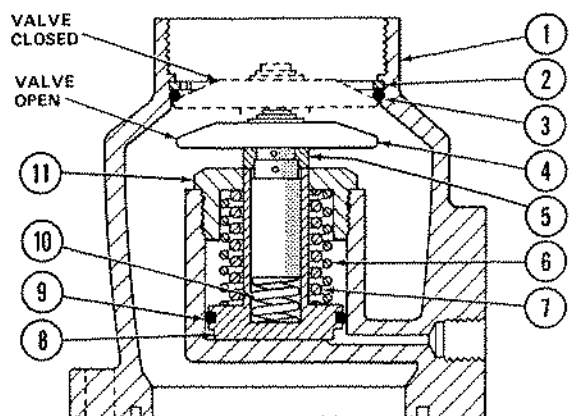
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Figure 23 — Control Pressure Regulator Valve

- (4) Using a flat bladed tool remove the valve plate seal ring (o-ring) retaining ring. Remove the seal ring. Discard seal ring.
- (5) Lift and remove the valve plate assembly and spring from the valve body.
- (6) Using the correct size socket wrench unthread and remove the piston retaining cap from the valve body.
- (7) Lift and remove both piston springs (one large, one small) from the valve body.
- (8) Lift and remove the operating piston assembly from the valve body. Remove the piston seal ring (o-ring) from the piston.
- (9) Thoroughly clean all parts. Make certain the air passage in the valve body and the air holes in the piston assembly are clean.
- (10) Inspect all parts for wear or damage. (Chipped, score marks, etc.) Replace worn or damaged parts as required.

If the valve plate assembly must be disassembled to replace parts, etc., continue with Step 11. If the valve plate assembly is suitable for reuse proceed to Step 12.

- (11) To disassemble the valve plate assembly proceed as follows:
 - a. Clamp the piston section of the plate assembly in a soft (wood, brass) jaw vise.
 - b. With the correct size hexagon socket head capscrew (allen) wrench unthread the valve plate retaining capscrew from the piston.



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Figure 24 — Intake Valve

- | | |
|-------------------|------------|
| 1. Valve Body | 7. Spring |
| 2. Retaining Ring | 8. Piston |
| 3. Seal | 9. Seal |
| 4. Valve Plate | 10. Spring |
| 5. Spacer | 11. Cap |
| 6. Spring | |

- c. Remove the valve plate and spacer from the piston.
- d. Reassemble in reverse order. Make certain that the spacer is in place and that the socket head capscrew is securely tightened.
- (12) Install a new o-ring seal on the operating piston.
- (13) Lubricate the piston o-ring and piston bore with a silicone lubricant. (Suggest Dow Corning 55M or equivalent.)
- (14) Install the operating piston into the valve body bore. Take care not to cut or deform the o-ring seal.
- (15) Install the two operating piston springs into the valve body.
- (16) Coat the threads of the piston (spring) retaining cap with Loctite 271 or equivalent. Thread the retaining cap into the valve body and tighten securely.
- (17) Coat the valve plate assembly piston and valve body bore with silicone lubricant (suggest Dow Corning 55M) and install the spring and valve plate assembly into the valve body.
- (18) Install the valve plate seal in the valve body. Make certain that the seal ring is firmly seated in the groove. Reinstall the seal retaining ring.
- (19) Using a new gasket, install the intake valve on the air end. Tighten the attaching capscrews securely.

- (20) Reinstall the air cleaner assembly on the intake valve.
- (21) Reconnect all control air lines to the intake valve. Tighten all fittings securely.

MINIMUM PRESSURE/CHECK VALVE SERVICE

The minimum pressure valve may be purchased as an assembly if required. Service parts are available, however, to repair/overhaul this valve. This valve may be serviced as follows:

- (1) Remove the service and control piping from the minimum pressure valve.
- (2) Remove the valve from the air receiver-oil reservoir cover.
- (3) Clamp the valve securely in a vertical position (cap end up) in a suitable fixture (bench vise).
- (4) With a suitable wrench remove the valve cap from the valve body.

WARNING

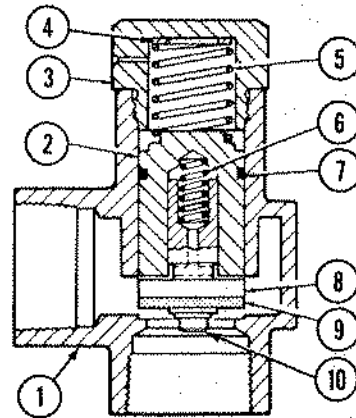
THE SPRING BENEATH THE CAP IS UNDER PRESSURE, EXERISE EXTREME CARE WHEN REMOVING CAP.

- (5) Remove the spring from the body.

NOTE

Save spring shim(s) (washers) (if any) for reuse.

- (6) Insert a suitable tool (wood stick) into the inlet port of the valve and push the piston and valve assembly upward and out of the body.
- (7) Remove the check valve piston from inside the larger piston. Take care not to lose the small spring.
- (8) Remove the o-ring from the large piston and discard the o-ring.
- (9) With an allen wrench remove the socket head screw from the check valve. Remove the check valve seat and discard. (Hold small piston in soft jaw vise)
- (10) Thoroughly clean all remaining parts. Visually inspect all parts for damage or wear. Replace as required.
- (11) Install a new seat on the check valve. Reinstall the seat retaining socket head screw and tighten screw securely.



1871PA

Figure 25 — Minimum Pressure Check Valve

- | | |
|------------------|-----------------------|
| 1. Valve Body | 6. Spring, Small |
| 2. Piston | 7. Seal |
| 3. Cap | 8. Check Valve Piston |
| 4. Shim | 9. Seat |
| 5. Spring, Large | 10. Capscrew |

- (12) Install a new o-ring on the large piston.
- (13) Reassemble the small check valve piston, with the spring, in the large piston.
- (14) Lubricate the o-ring on the piston with a silicone base lubricant. (Example: Dow Corning 55M).
- (15) Reinstall the check valve and piston assembly in the valve body. Take care not to damage the o-ring during installation.
- (16) Install the large spring in the valve body on top of the piston. Reinstall spring shim(s).
- (17) Lightly coat the cap thread with "Loctite" 271 and install the cap (compress the spring) by threading the cap into the valve body. Torque the cap to 60-70 ft. lbs.
- (18) Reinstall the minimum pressure valve on the air receiver-oil reservoir cover. Use a good grade of pipe thread sealer on all pipe threads. Tighten securely. Do not over tighten.
- (19) Reconnect the service and control piping to the valve using pipe thread sealer on the pipe threads. Tighten service piping securely. Do not over tighten.

BLOW DOWN (DUMP) VALVE

The blow down (dump) valve is furnished as a complete assembly.

No service is required.

OIL SEPARATOR SERVICE

An oil separator element may be removed as follows:

- (1) Remove the separator out (service) piping separator drain piping and control piping from the air receiver/oil reservoir cover.

NOTE

Mark or tag the piping/fittings to make certain they will be reconnected correctly.

- (2) Remove the receiver/reservoir cover to flange nuts and washers. Remove the cover and the separator element as an assembly.
- (3) Remove the element retaining lock nut from the support rod. Remove the element.

To install a new separator element, reverse the above removal sequence. Make certain the flange and cover surfaces are clean.

Make certain the element to cover gasket has a grounding staple. Install a new cover to flange gasket. Torque the separator to flange capscrews evenly and securely to 142 ft. lbs. Make certain also that the separator drain tube touches the bottom of the element. (Make a new tube, if necessary).

For information concerning the conditions which indicate a separator element is defective refer to the service diagnosis chart, Section VII.

CAUTION

Receiver/reservoir cover retaining studs and nuts are special. Do not substitute common bolts in place of these studs and nuts.

AIR END

The air end for these units is serviced only as a complete assembly using a new or factory rebuilt air end.

Parts available for field service include the input shaft rotary oil seal and seal retainer o-ring for both air and water cooled units. Also the fan drive shaft rotary seal and seal retainer o-ring is available for air cooled units.

AIR END INPUT SHAFT OIL SEAL REPLACEMENT (Figure 26)

To replace a rotary seal, proceed as follows:

- (1) Loosen motor mounting capscrews and slide motor toward the compressor to

relieve drive belt tension. (Loosen motor positioning bolts.)

- (2) Remove the compressor input shaft drive pulley.
- (3) Remove the seal retainer (front cover) to front retainer attaching capscrews and remove the cover and cover to front bearing retainer gasket.
- (4) Remove the oil seal assembly, including the spring and spring guide, from the input shaft.
- (5) Remove the oil seal face insert, with o-ring seal, from the seal retainer. Remove the retainer o-ring seal. Discard the face insert, with o-ring seal, and retainer o-ring seal.
- (6) Thoroughly clean all remaining parts.
- (7) Lubricate the new seal face insert with clean compressor oil and install the insert in the seal retainer.
- (8) Lubricate the rotary seal assembly with clean compressor oil, including the carbon ring, and install the seal spring guide, spring, and seal assembly on the input shaft.

CAUTION

Be careful not to scratch the seal face insert or scratch or break the carbon ring of the seal assembly. Wipe the lapped (mating) surfaces of the seal insert and carbon ring with a clean lint free cloth before installing the seal retainer.

- (9) Using a new gasket, carefully reinstall the seal retainer, retainer capscrews and tighten capscrews securely.
- (10) Reinstall the compressor pulley and align with motor pulley. (See Section VI, "Pulley Alignment").
- (11) Reinstall and tighten drive belts by repositioning the motor. (See Section VI "Belt Tensioning"). Tighten motor mounting bolts securely.
- (12) Recheck pulley alignment and drive belt tension and correct as required.
- (13) Run the unit and check for air or oil leaks and correct as required.

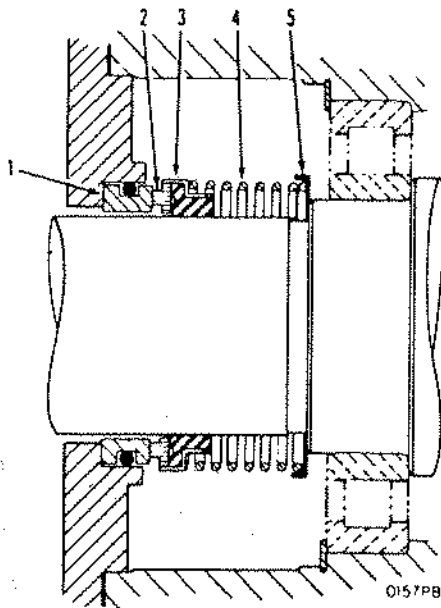
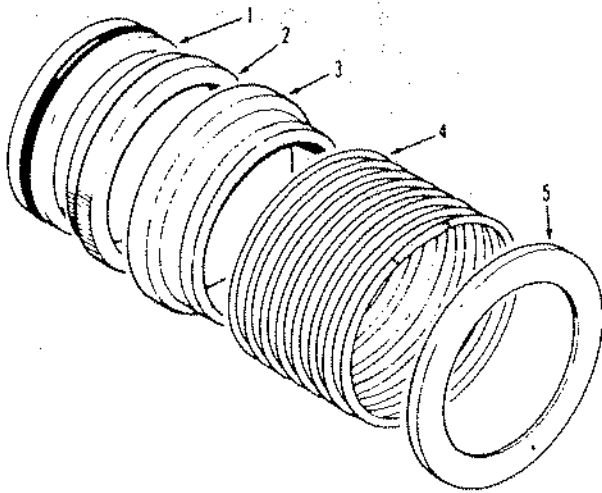


Figure 26 — Air End Input Shaft Oil Seal

- | | |
|-------------------------|-----------------|
| 1. Oil Seal Face Insert | 4. Spring |
| 2. Carbon Ring | 5. Spring Guide |
| 3. Shaft Seal Assembly | |

FAN DRIVE SHAFT OIL SEAL REPLACEMENT (Figure 26)

The fan drive shaft rotary oil seal may be replaced as follows:

- (1) Disconnect and remove service piping. (Moisture separator, etc.)
- (2) Disconnect oil cooler and aftercooler (if so equipped) piping at the coolers.
- (3) Remove the fan guard to shroud attaching capscrews. Position the fan guard toward the air end and suitably support.

- (4) Support the oil cooler (and aftercooler, if so equipped) assembly and remove the two shroud to frame attaching bolts. Move the cooler assembly away from the fan far enough to gain access to the fan.

NOTE

Save and mark the spacers (shims) that fit between the shroud and the frame.

- (5) Loosen the fan hub to fan drive shaft set screws (there are two) and pull or tap the fan off the shaft.
- (6) Remove the oil seal retainer to rear bearing retainer attaching capscrews and remove the seal retainer.
- (7) Remove the oil seal assembly, including spring and spring guide, from the fan drive shaft. Discard the seal assembly.
- (8) Remove the oil seal face insert, with o-ring seal, from the seal retainer. Remove the retainer o-ring seal. Discard the face insert, with o-ring seal, and the retainer o-ring seal.
- (9) Thoroughly clean all remaining parts. (Retainer, seal cavity, shaft, etc.) Check the condition of the shaft and remove all nicks and burrs.
- (10) Lubricate the new seal face insert with clean compressor oil and install in the seal retainer.
- (11) Lubricate the rotary seal assembly with clean compressor oil, including the carbon ring, and install the seal spring guide, spring, and seal assembly on the fan drive shaft.

CAUTION

Be careful not to scratch the seal face insert or scratch or break the carbon ring of the seal assembly. Wipe the lapped (mating) surfaces of the seal insert and carbon ring with a clean lint free cloth before installing the seal retainer.

- (12) Carefully reinstall the seal retainer, retainer attaching capscrews and tighten securely.
- (13) Reinstall the fan on the fan drive shaft. Tighten the fan hub set screws securely.
- (14) Reinstall the cooler assembly on the frame. Make certain the shroud to frame spacers are installed and are in the cor-

rect location. Install the shroud to frame attaching bolts and tighten securely.

- (15) Reinstall the fan guard on the shroud. Tighten attaching capscrews securely.
- (16) Reconnect oil and air piping to the cooler(s).
- (17) Reinstall all service piping. Use a good grade of pipe thread sealer on all pipe threads. Tighten securely. Do not over tighten.
- (18) Following the start up procedure, start and run the unit long enough to reach normal operating temperature. Check for and correct all leaks.

Servicing or replacement of control valves or switches, shut down switches and the oil cooler do not require specific instructions for disassembly and assembly.

WARNING

WHENEVER A UNIT IS BEING SERVICED, MAKE CERTAIN THAT AIR PRESSURE HAS BEEN BLED DOWN AND THE ELECTRICAL POWER DISCONNECTED.

PULLEY ALIGNMENT

To obtain maximum drive belt life, the motor and the compressor pulleys must be correctly aligned.

Check the pulley alignment by placing a straight edge against the side of the drive pulleys and measure to the edge of the belts at points A and B. If these two measurements are the same, the pulleys are correctly aligned.

If these two measurements are not the same, reposition the pulleys to obtain correct alignment.

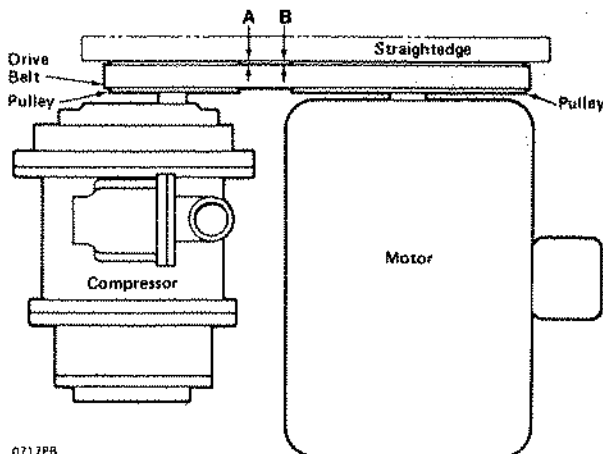


Figure 27

DRIVE BELT INSTALLATION

The drive belt used on 20, 25 and 30 HP compressors are designated as "3V" banded belts. This type of belt is required for the specific horse power of these SS compressors.

To replace drive belt, proceed as follows:

1. Loosen the motor mounting capscrews and release tension on the belts by loosening the motor positioning screws. Move the motor far enough so that the belts may be easily removed.
2. Install the new banded belt(s) over the compressor and motor pulleys.

NOTE

Do not run the belt on.

3. Adjust the belt tension by tightening the motor positioning screws.
4. Check belt tension as noted below. Recheck pulley alignment and correct as required. Tighten motor mounting bolts securely.

BELT TENSIONING

Tension on the banded drive belt must be adjusted carefully to prevent excessive bearing loads and shaft flexing.

One method commonly used for tensioning "V" belts is as follows.

1. With the belt properly installed on pulleys which are correctly aligned, draw the belts fairly tight by adjusting the motor positioning screws.

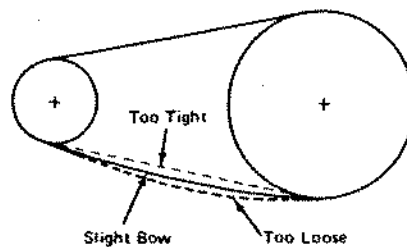


Figure 28

2. Start the unit and observe the bow, due to belt slack, on the slack side of the belt.

After several days of operation, the banded belt will seat in the pulley grooves. By observing the belt for proper idler side bow, under load, it may be determined if further adjustment is required. Adjust according to above procedure to obtain the proper slack side bow.

An alternate method of tensioning belts, provided the small pulley diameter is known, or may be easily measured or estimated, is as follows:

1. Measure the distance between shaft centers of the driving and driven numbers. This is the belt span.
2. Calculate the maximum belt deflection allowable by multiplying the belt span in inches by 1/64 inch.

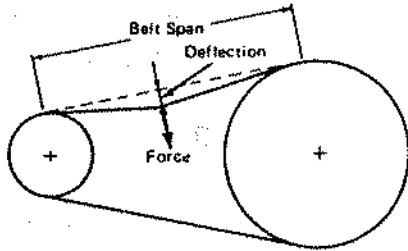


Figure 29

EXAMPLE:

Measured BELT SPAN, Inches x 1/64" = DEFLECTION

Measure BELT SPAN, = 14"
 $14" \times 1/64" = 7/32"$

3. With the unit stopped (line disconnect switch open) measure the actual deflection of the belt.

The force in pounds, for deflection of the entire belt is given in Table 3.

NOTE

A simple spring scale may be used to apply the deflection force. Use a suitable tool to apply the deflection force to the entire width of the belt band.

TABLE 3

BELT DEFLECTION FORCE (POUNDS)

Belt	Diameter Small Pulley	Initial Tension Force	Normal Tension Force
5V	7.1 to 10.9"	42 lbs.	28½ lbs.

NOTE

New belts require the initial deflection force. After several days of running, to allow the belts to seat and to remove normal belt stretch, the smaller 28½ lb. tension force should be used.

4. Loosen the motor mounting capscrews and adjust the motor positioning screws to obtain the required deflection. Securely tighten the motor mounting capscrews.
5. Recheck pulley alignment and belt tension and correct if required.

**BE ALERT
 A CAREFUL OPERATOR
 IS THE BEST INSURANCE
 AGAINST AN ACCIDENT!**

Section VII

SERVICE DIAGNOSIS

MALFUNCTION	POSSIBLE CAUSE	REMEDY
Motor will not run	<ol style="list-style-type: none"> 1. Blown branch circuit fuse. 2. Blown line disconnect fuse or tripped circuit breaker. 3. Blown control circuit fuse. 4. Magnetic starter overload relay tripped. 5. Loose or broken wires. (Motor or control) 6. Pressure switch PS-2 contacts open (Dual and Auto-Dual Control Units only) 7. Defective pressure switch PS-2. (Dual and Auto-Dual Control Units only) 8. Defective or damaged control circuit components. (Relays, Temperature switches, etc.) 9. Damaged motor. 	<ol style="list-style-type: none"> 1. Renew fuse(s). 2. Renew fuse(s) or reset circuit breaker. 3. Renew control circuit fuse. <p>Note: If fuses blow repeatedly check and correct cause.</p> <ol style="list-style-type: none"> 4. Reset overload relay(s). 5. Check and repair or replace broken wire(s) and connection(s). 6. Check cause of open contacts. (Unit air receiver not blown down). 7. Renew pressure switch PS-2. 8. Check components. Renew as required. 9. Repair or replace motor.
Compressor starts but stops as soon as start button is released.	<ol style="list-style-type: none"> 1. Defective CR-1 relay or relay contacts. 	<ol style="list-style-type: none"> 1. Replace control circuit board (behind instrument panel)
Air end will not rotate.	<ol style="list-style-type: none"> 1. Defective or damaged air end. 	<ol style="list-style-type: none"> 1. Replace air end.
Motor will not rotate.	<ol style="list-style-type: none"> 1. Defective or damaged motor. 	<ol style="list-style-type: none"> 1. Replace or repair motor.
Air end/motor will not come up to full speed before starter overload trips.	<ol style="list-style-type: none"> 1. Low line voltage or inadequate power supply. 	<ol style="list-style-type: none"> 1. Have qualified electrician check and correct power supply.

MALFUNCTION	POSSIBLE CAUSE	REMEDY
Air end/motor will not come up to full speed before starter overload trips. (Cont'd)	2. Starting against pressure. Unit receiver not blown down.	2. Check and correct cause of unit receiver not blowing down. (Blow down valve: controls)
Compressor fails to provide sufficient air for demands.	1. Clogged or restricted air filter element. 2. Excessive distribution system leakage. 3. Air demand exceeds compressor capacity. 4. Motor not running up to speed. 5. Damaged or excessively worn intake valve. 6. Air supply to compressor room or enclosure inadequate.	1. Clean or renew air filter element. 2. Correct air leaks as required. 3. Reduce air demand. Install additional compressors. 4. Check power supply to motor and correct as required. 5. Repair or replace intake valve. 6. Properly ventilate compressor room or enclosure.
Compressor fails to pump (load) or is slow to load after running unloaded.	1. Pilot valve stuck in open position. 2. Control bleed orifice plugged. (Modulating control) 3. Sticky intake valve operating parts.	1. Clean, repair or replace pilot valve. 2. Clean control bleed orifice. 3. Disassemble, clean or replace faulty intake valve parts as required.
Compressor fails to restart after time delay stop.	1. Refer to items 1 through 8 under "Motor will not run". 2. Timer relay TR-1 worn or damaged.	1. Refer to items 1 through 8 under "Motor will not run". 2. Renew timer relay TR-1.
Compressor unloads but blow down valve does not actuate. (Modulating Dual and Auto-Dual Control only)	1. Misadjusted control pressure regulator valve and/or pilot valve. 2. Damaged pilot valve. 3. Damaged blow down valve. 4. Loose or broken control circuit wiring.	1. Adjust controls. 2. Renew pilot valve. 3. Renew faulty component. 4. Check and repair wiring.

MALFUNCTION	POSSIBLE CAUSE	REMEDY
Compressor unloads but blow down valve <i>only</i> does not actuate. (Modulating Dual and Auto-Dual Control)	<ol style="list-style-type: none"> 1. Dirty, worn or damaged shuttle check valve. (blow down valve control) 2. Worn or damaged blow down valve. 	<ol style="list-style-type: none"> 1. Clean, repair or renew shuttle check valve. 2. Renew blow down valve.
Compressor unloads but continues to run with modulating controls.	<ol style="list-style-type: none"> 1. Pilot valve not actuated. Misadjusted controls. 2. Faulty pilot valve. 3. Worn or damaged intake valve shuttle check valve (intake valve control) 	<ol style="list-style-type: none"> 1. Adjust controls. 2. Replace pilot valve. 3. Repair or replace shuttle check valve.
Compressor stops but air receiver-oil reservoir does not blow down.	<ol style="list-style-type: none"> 1. Faulty shuttle check valve (blow down control) 2. Faulty blow down valve. 	<ol style="list-style-type: none"> 1. Repair or renew shuttle check valve. 2. Renew blow down valve.
Compressor fails to stop after running unloaded for preset time (Auto-Dual—timed stop control only)	<ol style="list-style-type: none"> 1. Timer TR-1 not completing cycle. 	<ol style="list-style-type: none"> 1. Replace timer TR-1.
Excessive compressor oil consumption.	<ol style="list-style-type: none"> 1. Clogged or restricted separator drain line or filter. 2. External oil leaks. 3. Incorrect oil installed in compressor. 4. Oil reservoir over filled. 5. Low pressure operation. 6. Defective separator element. 	<ol style="list-style-type: none"> 1. Clean or replace line and/or filter. 2. Inspect for and correct all external oil leaks. 3. Refer to oil specifications. Drain unit and install correct oil. 4. Drain to correct oil level. 5. Operate at correct pressure (80 PSI minimum). 6. Renew separator element.
Oil blows out blow down valve when blow down valve actuates.	<ol style="list-style-type: none"> 1. Clogged or restricted separator drain line or filter. 2. Defective blow down valve. 3. Defective separator element. 	<ol style="list-style-type: none"> 1. Clean or replace line and/or filter. 2. Replace blow down valve. 3. Replace separator element.
Air receiver-oil reservoir pressure relief valve actuates.	<ol style="list-style-type: none"> 1. Incorrect or insufficient control pressure due to: <ol style="list-style-type: none"> a. Clogged or restricted pilot or control pressure regulator valve supply and control air lines. b. Incorrectly adjusted control pressure regulator valve and/or pilot valve. 	<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> a. Clean or replace supply or control lines. b. Adjust controls.

MALFUNCTION	POSSIBLE CAUSE	REMEDY
Air receiver-oil reservoir pressure relief valve actuates. (Cont'd)	<ul style="list-style-type: none"> c. Dirty, clogged, or damaged control pressure regulator valve and shuttle check valve. (intake valve control) 2. Worn or damaged intake valve. 3. Incorrect pressure relief valve installed. 4. Damaged or worn pressure relief valve. 5. Restricted separator element. 	<ul style="list-style-type: none"> c. Clean, repair or replace regulator valve and shuttle check valve. 2. Disassemble, inspect, clean, and repair intake valve. 3. Install correct pressure relief valve. 4. Renew pressure relief valve. 5. Renew separator element.
Unit shut down caused by air end discharge or separator out high temperature.	<ul style="list-style-type: none"> 1. Air end discharge temperature too high due to: <ul style="list-style-type: none"> a. In sufficient oil in oil reservoir. b. Compressor operating above maximum recommended pressure. c. Faulty thermal by-pass valve. d. Dirty or clogged oil cooler inside or out. (Air cooled units) e. Insufficient cooling water flow. (water cooled units) f. Water flow control valve misadjusted or faulty. 2. Faulty high temperature shut down switch(es). 3. Low compressor oil flow. 	<ul style="list-style-type: none"> 1. <ul style="list-style-type: none"> a. Fill reservoir to correct level with recommended oil. b. Adjust to correct pressure. c. Renew by-pass valve element or valve body. d. Clean or replace oil cooler. e. Correct cause of lack of cooling water. f. Adjust or replace water flow control valve. 2. Renew high temperature shut down switch(es). 3. <ul style="list-style-type: none"> a. Check for restricted oil filter. Change element as required. b. Check for and correct cause of restriction in oil system including hoses, fitting tubes, etc.