OPERATOR'S MANUAL

MCT-119A

JOY®

TWISTAIR® III

ROTARY SCREW COMPRESSOR

TA MODELS 990 thru 1750

FORM NO. MCT-119A

WARRANTY

INDUSTRIAL SCREW COMPRESSOR

The JOY Manufacturing Company warrants that this compressor conforms to applicable drawings and specifications approved in writing by JOY and that the rotary screw compressor, stator and rotor assembly will be free from defects in material and workmanship for a period of 24 months from the date of initial start-up or 30 months from the date of shipment from the factory, whichever period first expires, and in the case of all other components of JOY's manufacture will be free from defects in material or workmanship for a period of 12 months from the date of initial start-up or 18 months from the date of shipment from the factory, whichever period first expires. In cases where a unit is in Distributor stock and start-up is beyond 6 months from shipment from the factory, it will be necessary for the Distributor to obtain approval of satisfactory condition from an authorized JOY Representative to initiate warranty from the date of start-up. Any work or parts necessary to restore the unit to satisfactory condition prior to start-up will be for the Distributor's account. If within such periods, JOY receives from the Buyer written notice of any alleged defect in or non-conformance of the compressor, and if in JOY's judgment the compressor does not conform or is found to be defective in material or workmanship, JOY will at its option either: (a) furnish a Service Representative to correct defective workmanship, or (b) upon return of the component F.O.B. JOY's designated plant in order to receive warranty consideration, defective material must be shipped within 30 days of receipt of authorized return instructions, repair, or replace the component or issue credit for the replacement part ordered by Buyer, or (c) refund the full purchase price for the compressor without interest. Deterioration or wear occasioned by chemical and/or abrasive action or excessive heat shall not constitute defects.

Joy's sole responsibility and buyer's exclusive remedy hereunder is limited to such repair, replacement, or repayment of the purchase price. Component parts or assemblies not of Joy's manufacture are warranted only to the extent that they are warranted by the original manufacturer. Joy shall have no responsibility for any cost or expense incurred by Buyer from Joy's inability to repair under said warranty when such inability is beyond the control of Joy or caused solely by Buyer.

THERE ARE NO OTHER WARRANTIES, EXPRESS, STATUTORY OR IMPLIED, INCLUDING THOSE OF MERCHANTABILITY AND OF FITNESS FOR PURPOSE; NOR ANY AFFIRMATION OF FACT OR REPRESENTATION WHICH EXTENDS BEYOND THE DESCRIPTION ON THE FACE HEREOF.

This warranty shall be void and Joy shall have no responsibility to repair, replace, or repay the purchase price of defective or damaged parts or components resulting directly or indirectly from the use of repair or replacement parts not of Joy's manufacture or approved by Joy or from Buyer's failure to store, install, maintain, and operate the compressor according to the recommendations contained in the Operating and Maintenance Manual and good engineering practice.

NOTICE: UNAUTHORIZED DISASSEMBLY OR REPAIR OF AIR ENDS IN THE FIELD WILL VOID THE WARRANTY AND ADVERSELY AFFECT THE TRADE-IN VALUE.

SCREW COMPRESSOR AIR END EXCHANGE PROGRAM:

A factory re-manufactured screw compressor air end can be purchased on an exchange basis. This is not just a factory-rebuilt air end, but one which is re-manufactured to high quality as new. All bearings, seals, gaskets, and the inlet valve are always replaced. All other parts not meeting our quality standards are also replaced. The air end is then thoroughly factory tested prior to shipment. When you purchase a re-manufactured air end there is a warranty which is twelve (12) months from date of shipment in accordance with the terms set forth in the above warranty.

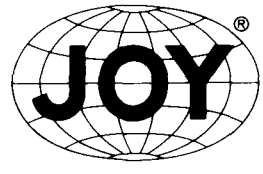
OPERATOR'S MANUAL

JOY®
TWISTAIR®III
Rotary Screw Compressor

WARNING

THIS MANUAL CONTAINS VITAL INFORMATION FOR THE SAFE USE AND EFFICIENT OPERATION OF THIS UNIT. CAREFULLY READ THE OPERATOR'S MANUAL BEFORE STARTING THE UNIT. FAILURE TO ADHERE TO THE INSTRUCTIONS COULD RESULT IN SERIOUS BODILY INJURY.

TA Models 990 thru 1750



JOY MANUFACTURING COMPANY
INDUSTRIAL COMPRESSOR GROUP
MICHIGAN CITY, INDIANA 46360

FORM NO. MCT-119A
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FPSI-11/84

⚠ DANGER

DISCHARGE AIR USED FOR BREATHING.
WILL CAUSE SEVERE INJURY OR DEATH.

CONSULT FILTRATION SPECIALIST FOR ADDITIONAL FILTRATION AND TREATMENT EQUIPMENT TO MEET HEALTH AND SAFETY STANDARDS.

TABLE OF CONTENTS

SPECIFICATIONS

COMPRESSOR MODEL		TA-0990	TA-1025	TA-1150	TA-1225	TA-1250	TA-1325	TA-1350	TA-1500	TA-1575	TA-1600	TA-1700	TA-1750
COMPRESSOR: Delivery	CFM	990	1025	1150	1225	1250	1325	1350	1500	1575	1600	1700	1750
	CMM	28	29	33	35	35.5	37.5	38	42	44.5	45	48	50
Maximum Operating Pressure	PSIG	150	110	125	150	110	150	125	110	150	125	110	125
	BARS	10	7.5	8.6	10	7.5	10	8.6	7.5	10	8.6	7.5	8.6
Minimum Operating Pressure (PSIG)	PSIG	70	70	70	70	70	70	70	70	70	70	70	70
	BARS	5	5	5	.5	5	5	5	5	5	5	5	5
Normal Control Range (PSI)	PSI	10	10	10	10	10	10	10	10	10	10	10	10
	BARS	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
Ambient Operating Temperature Range	FAHRENHEIT	35° F. to 110 ° F.											
	CELSIUS	2 ° C. to 43 ° C.											
Oil Sump Capacity	GALLONS	55											
	LITERS	208											
Weight (Wet) Base Model Air Cooled	POUNDS	10000	9800	10000	10300	10000	10500	10300	10300	10600	10500	10500	10600
	KILOGRAMS	4500	4400	4500	4700	4500	4750	4700	4700	4800	4750	4750	4800
Length	INCHES	(Air-cooled) 170							(Water-cooled) 152				
	MILLIMETERS	432							386				
Width	INCHES	72											
	MILLIMETERS	183											
Height	INCHES	(Air-cooled) 75							(Water-cooled) 67.5				
	MILLIMETERS	190							171				
MOTOR, Compressor Drive: Horsepower	HP	250	200	250	300	250	350	300	300	400	350	350	400
	KW	187	150	187	225	187	262	225	225	300	262	262	300
Current		3 Phase 60 Hertz											
Voltage		460, 575, 2300, 4160											
Type		Squirrel Cage Induction											
Standard Enclosure		Open Drip Proof											
MOTOR, Fan: (Aircooled (With Aftercooler)	HP	10	5	10	5	10	7.5	5	5	10	7.5	7.5	10
	KW	7.5	3.75	7.5	3.75	7.5	5.6	3.75	3.75	7.5	5.6	5.6	7.5
Type		Squirrel Cage Induction											
Standard Enclosure		Totally Enclosed Fan Cooled											
WATER COOLED UNITS Water Flow Rate	GPM	50	43	50	60	50	70	60	60	75	70	70	75
	LPS	3.2	2.7	3.2	3.8	3.2	4.4	3.8	3.8	4.7	4.4	4.4	4.7
Maximum Water Inlet Temperature	FAHRENHEIT	95											
	CELSIUS	35											
Evacuation Fan (Enclosed Only)	HP	2											
	KW	1.5											

JOY Manufacturing Company reserves the right to alter or improve the design or construction of its machinery as described herein and to furnish it, when so altered, without reference to the illustrations in this bulletin.

SECTION 1

DESCRIPTION AND INSTALLATION

JOY®
TWISTAIR®III
Rotary Screw Compressor

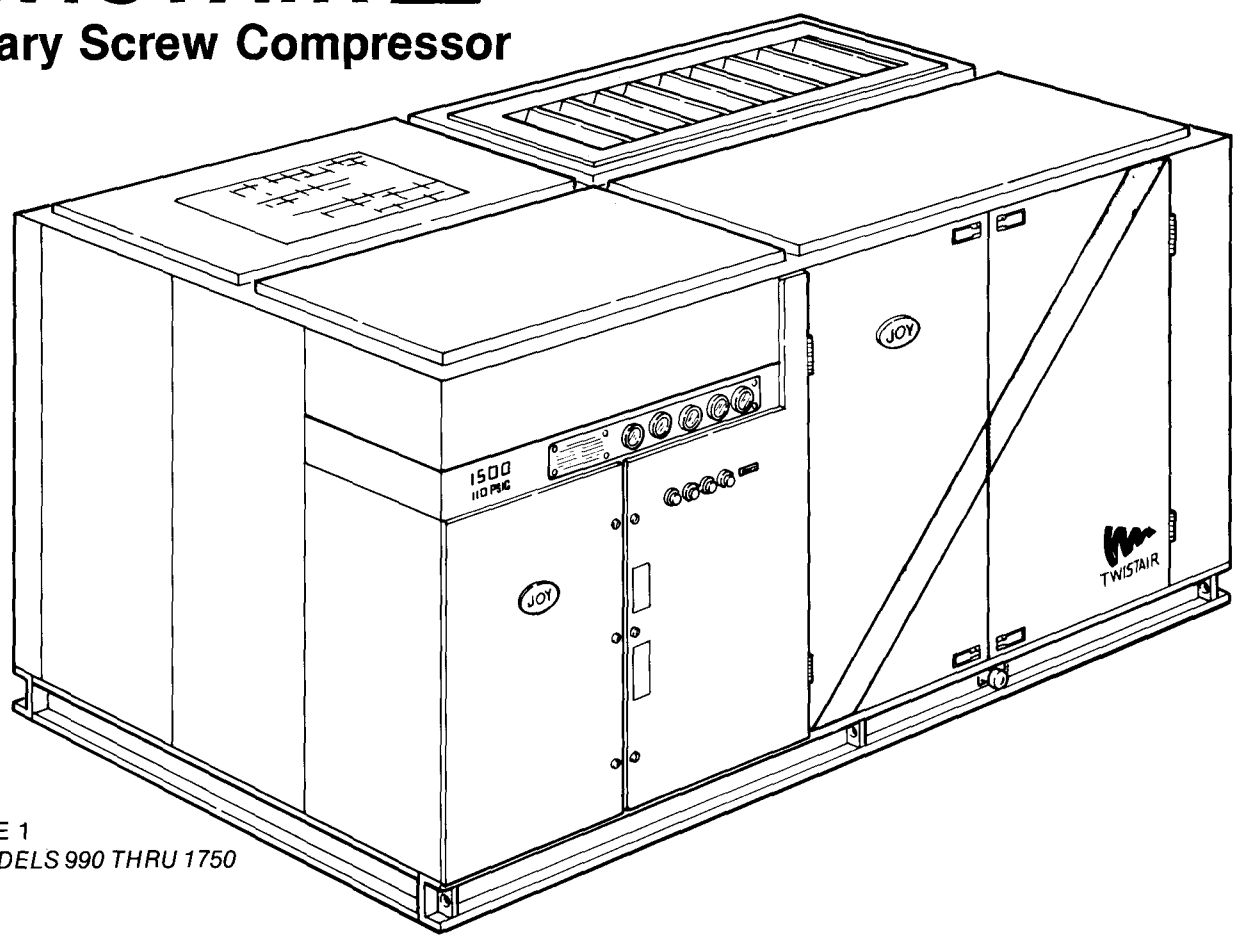

FIGURE 1
TA MODELS 990 THRU 1750

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INTRODUCTION

The JOY® Rotary Screw Compressor is an electric motor-driven, single-stage, screw-type, heavy-duty air compressor. It is sold as a complete package unit mounted on a steel base. See Figure 1. The package includes the compressor, motor, air intake system, electrical starting unit, control system, cooling system, air/oil separator, and instrument panel. Installation requires only the connection of electric power, a service line; and when applicable, a water line and drain.

There are several models of Rotary Screw Compressors covered in this manual. Refer to "Specifications" for the air delivery capability, horsepower, and operating pressure of each unit. All models are available either air or water cooled. They are intended for indoor installation. Although the unit is generally totally enclosed, it can be ordered without enclosure.

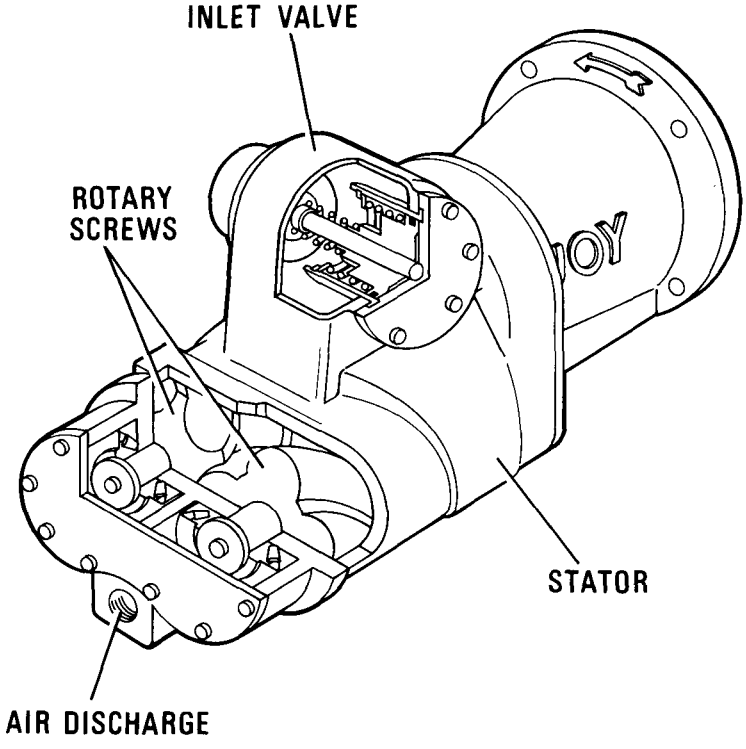

FIGURE 2
Cut-Away View of Compressor Unit *82-24*

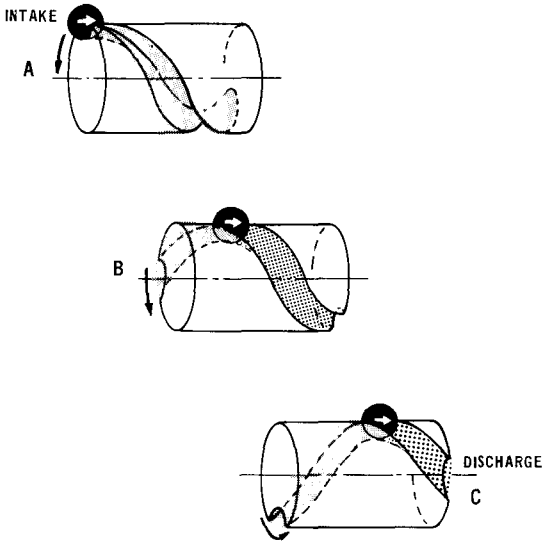

FIGURE 3
Principles of Compression *74-61A*

DESCRIPTION

The complete operating unit consists of the following major components.

1. Compressor and motor
2. Oil sump/separator
3. Oil cooling system
4. Air cooling system
5. Electrical control
6. Instrument panel

COMPRESSOR

COMPRESSOR AND MOTOR

The compressor assembly is a positive displacement, oil flood lubricated, screw type unit employing one stage of compression to achieve the desired pressure. Components include a housing (stator), two screws (rotors), bearings and bearing supports. See Figure 2. The male rotor has four lobes and the female has six.

In operation, two helically grooved rotors (Figure 2) mesh to compress air. Inlet air entering the casing is compressed as the male lobes roll down the female grooves, pushing trapped atmospheric air along and compressing it in one stage of compression. This process delivers smooth-flowing air at full pressure to the receiver.

To illustrate the compression sequence, consider the action of the male lobe as similar to a ball. In Figure 3, one compression cycle has been isolated for simplication. As a helix rotates, the ball (male lobe) meshes with the groove to start a compression cycle with trapped atmospheric air (A). As the ball moves down the groove, air is compressed (B). The compressed air is discharged as the ball reaches the end of the groove (C). Atmospheric air fills in behind the ball preparing the groove for another compression cycle as rotation continues and the male lobe again meshes with the groove.

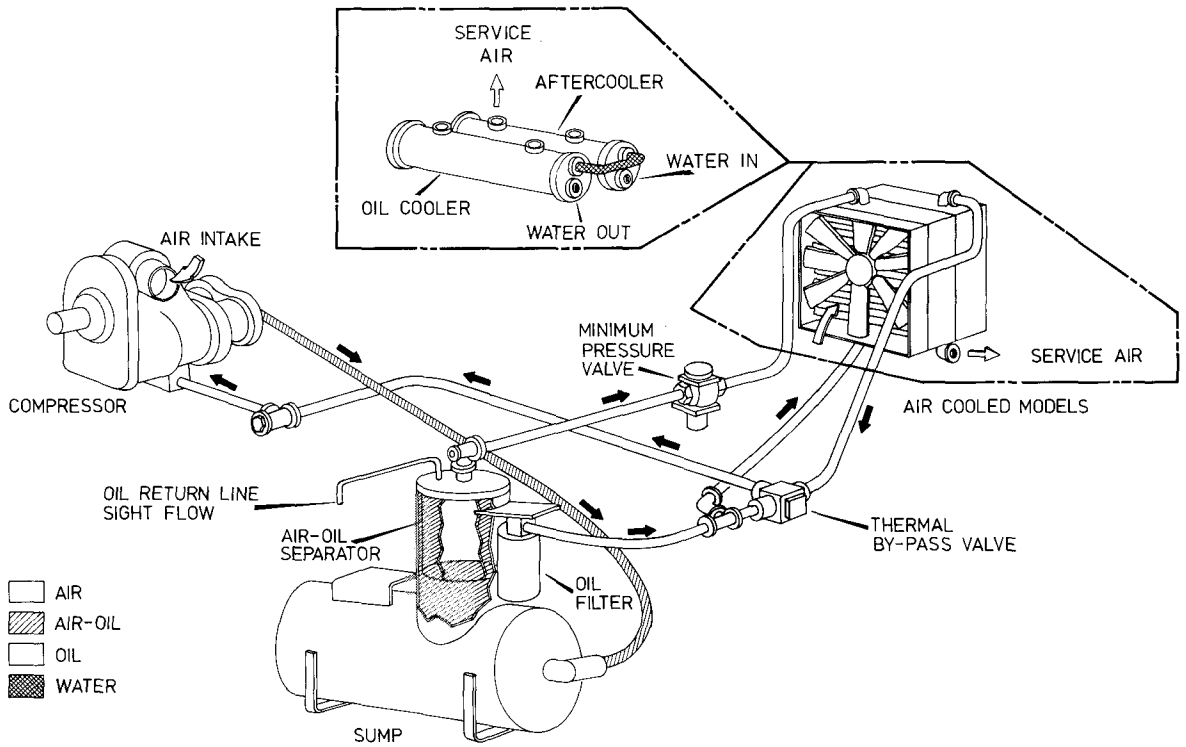

FIGURE 4
Air and Oil Flow Diagram

84-14

During the compression cycle, oil is injected into the compressor for the purpose of lubricating, cooling, and sealing. Compressed air laden with oil leaves the compressor unit through a discharge port which is designed to give optimum performance within the desired discharge pressure range.

Related components to the compressor assembly include the air filter, the inlet valve, and a full flow oil filter. The air filter is a two-stage, dry type with a pleated paper replaceable element.

The inlet valve (Figure 2) is pneumatically operated. It functions in response to the control system which regulates the amount of valve opening and closing in proportion to the air demand.

Pressure Differential System

Sump pressure and air end suction pressure create conditions necessary for oil to flow. This system reduces the package horsepower by eliminating the oil pump.

Compressor Lubrication System

The oil that is directed to the compressor from the oil sump serves three purposes:

1. Lubricates the rotating parts and bearings.
2. Serves as a cooling agent for the compressed air to maintain the discharge temperature within 100 Deg. F. of ambient temperature.
3. Helps assure high efficiency and maximum air delivery by sealing the running clearances.

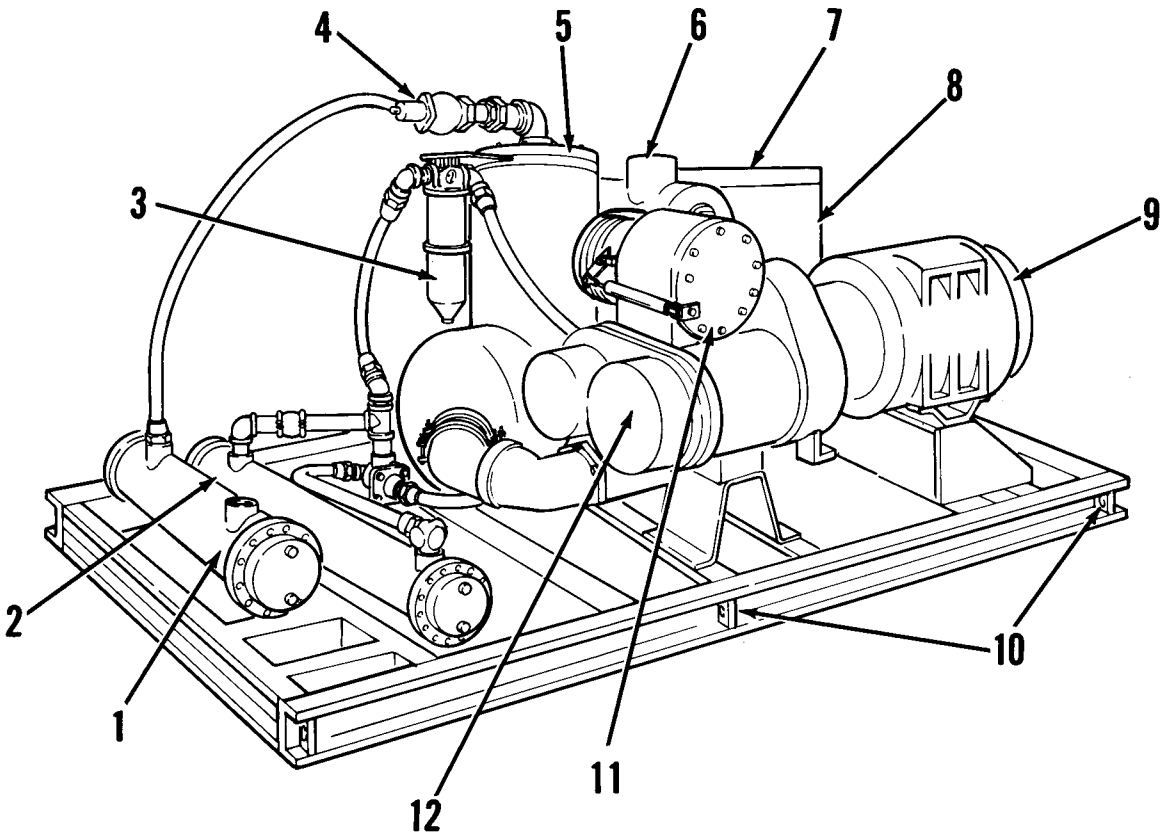

FIGURE 5
Major Compressor Components (Water Cooled Model Without Enclosure Shown) *84-15*

1. Aftercooler
2. Oil Cooler
3. Oil Filter
4. Minimum Pressure Valve
5. Oil Sump
6. Air Intake Filter
7. Instrument Panel
8. Control Center
9. Compressor Motor
10. Lifting Eyes
11. Inlet Valve
12. Air End

As oil passes through the compressor, it mixes with the air being compressed and is discharged with the compressed air into the oil sump. Here the oil accumulates, then moves on to be filtered, and finally returns through the oil cooler for recirculation through the compressor—completing the cycle.

The flow schematic, Figure 4, illustrates air/oil separation and the circulation of oil in an air or water cooled system.

MINIMUM PRESSURE VALVE

The function of the minimum pressure valve (See Figures 4 and 5) is to insure maximum oil flow upon start-up, also it maintains proper velocity for high effeciency of air/oil separator. It also acts as a check valve; in the event the compressor is manifolded with other compressors, it will not be pressurized during shutdown.

AIR/OIL SEPARATOR AND SUMP

Compressed, oil-laden air enters the oil sump directly from the compressor discharge through a large unrestricted pipe to a point above the oil level of the sump. As the oil-laden air enters the sump, much of the oil is separated from the air by impact action. The oil then runs downward and accumulates at the bottom of the sump for reoirculation.

An air/oil separator is located in the upper portion of the oil sump. When air is demanded at the service line, it first passes through the separator element which is the final stage of oil separation. Any oil that does pass through the element will collect at the bottom of the separator and be removed by the oil return line (Figure 4).

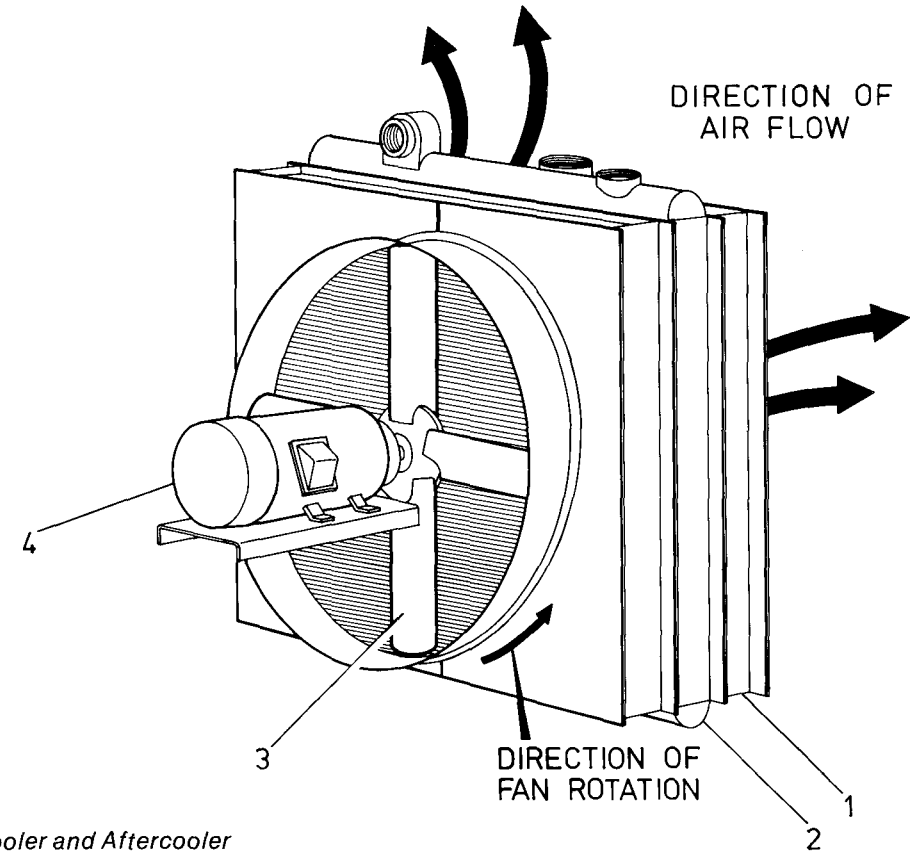

FIGURE 6
Air Cooled Oil Cooler and Aftercooler

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1. Oil Cooler
2. Aftercooler
3. Fan
4. Fan Motor

OIL RETURN LINE

The oil return line is provided to remove any oil accumulation from the bottom of the separator and return it to the compressor. A semi-clear tubing is provided in this line to observe the oil flow daily. Under loaded conditions, oil bubbles will continuously trickle through the tubing. If the tubing shows full of oil or no oil flow at all, it is a sign that oil is not being drained.

OIL FILTER

The oil filter is the replaceable element type. It is equipped with a built in maintenance indicator which signals when a clogging element requires changing. If the oil filter plugs very rapidly, an internal bypass will continue to allow oil to flow to the compressor.

COOLING

OIL COOLING SYSTEM

The prime components of the oil cooling system include a thermal valve and oil cooler. The thermal valve is located in the oil cooler piping and is designed to be fully open until the oil temperature reaches approximately 135 Deg. F., thus allowing the oil to bypass the cooler and maintain a desirable oil temperature for operaton in cool or humid ambients. This decreases the probability of water build up in the sump. Above 135 Deg. F., the thermal valve gradually strokes to allow cooled oil from the cooler to mix with the hotter oil from the sump to maintain the discharge air temperature approximately 100 Deg. F. over ambient. The discharge air temperature is also dependent on the ambient air temperature, the quantity of oil for injection; and if water cooled, the temperature and quantity of cooling water supplied.

The oil cooler may be either air or water cooled. If air cooled, a finned heat exchanger is used and a fan provides cooling air circulation through the exchanger. When water cooled, a shell and tube bundle cooler is used and a cooling water supply is required. See Figures 5 and 6.

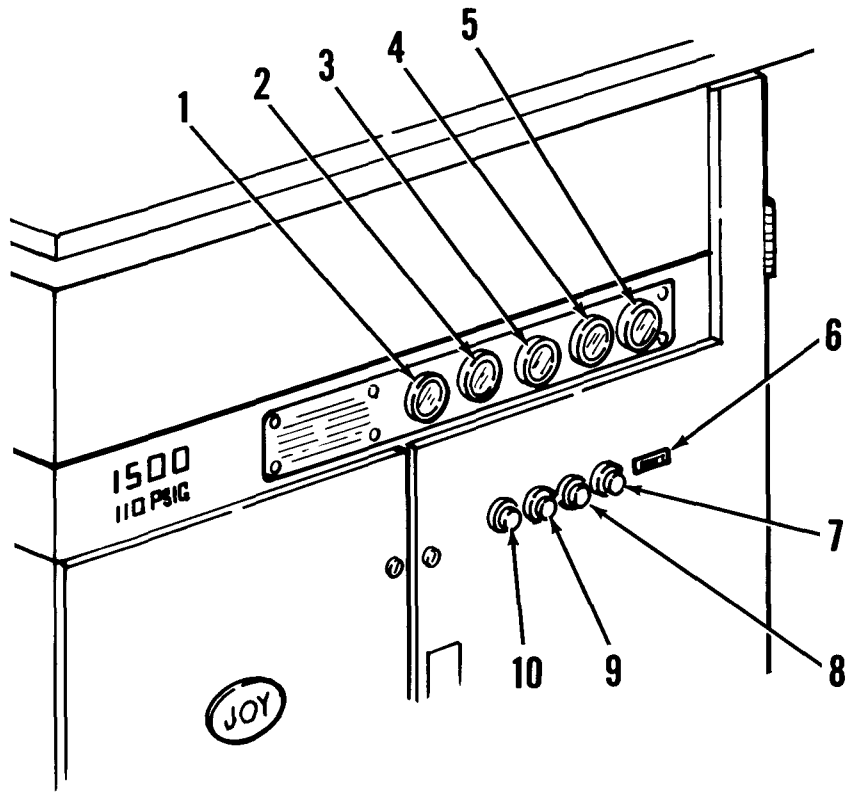


FIGURE 7
Instrument Panel *84-17*

1. Rotor Coolant Injection Temperature
2. Discharge Air Temperature
3. Discharge Air Pressure
4. Delivery Air Temperature
5. Delivery Air Pressure
6. Hourmeter
7. High Discharge Air Temperature Shutdown Indicator
8. Load/Unload Button
9. Stop Button
10. Start Button

AIR COOLING SYSTEM (OPTIONAL)

This system contains an aftercooler and a moisture separator with automatic condensate trap. The aftercooler is used to reduce the temperature of the compressed air and remove moisture before it reaches the service lines. Depending on the configuration, the cooling medium used for aftercooling may be air or water and will be connected in series with the oil cooler. If air cooled, a finned, radiator type aftercooler is used. Water cooled units are provided with a shell and tube bundle aftercooler. The resultant approach temperature is at least 15°F.

In reducing the air temperature at the aftercooler, moisture is condensed out of the air and then separated by action of the moisture separator. Water and other impurities removed accumulate at the moisture trap and are automatically eliminated. Condensate should be piped to an "open" drain avoiding freezing conditions. Keep the line the same size as the connection provided. The line should be pitched slightly downward away from the installation being careful not to create a trap in the piping. See Section 5 for suggested installation. To accommodate varying applications, the separator trap must be piped exterior to the machine during installation.

COOLING WATER

On water cooled units, an adequate supply of clean water must be available to maintain proper operation of the compressor (See SPECIFICATIONS for water flow rate). The use of dirty or scale forming water will clog the tubes of the heat exchanger and reduce its efficiency. This will lead to high temperature shutdowns of the compressor.

The flow rate can be as important as the quality of the water. Too low of a flow rate will promote scale promotion. If the water flow is too high tube erosion will occur causing a failure of the heat exchanger.

Care should also be taken in using moderate flow rates of extremely cold water. Oil near the tubes will cool too quickly and form a heat transfer boundry. This boundry will reduce the heat exchanger efficiency and cause high discharge temperature problems.

CONTROLS AND INSTRUMENTATIONS

Start Button

The START button (Figure 7) will start the compressor providing the main disconnect is connected and the safety circuit is cleared.

Stop Button

The STOP button (Figure 7) will stop the compressor at any time. When the stop button is pushed, the "Run" light will go out and the stop light will become lighted.

The reset feature of this button is connected to the compressor's safety circuit. Whenever the compressor shuts down due to a malfunction detected by the safety circuit, it will be necessary that the trouble be corrected and that the stop-reset button be pushed before another start is tried.

Load/Unload Button

The LOAD/UNLOAD (Figure 7) button permits the operator to unload the compressor at anytime during operation. It is recommended that under normal conditions the machine be unloaded prior to stopping.

High Air Temperature Shutdown Indicator

If this red light (7, Figure 7) comes ON, it signals that the compressor was overheated (235 Deg. F.) and automatic shutdown has occurred. Its function and compressor shutdown is affected by the High Air Discharge Temperature Switch and probes.

Hourmeter

The HOURMETER (Figure 7) records the accumulated total hours of compressor operation. It serves to determine when periodic inspections and maintenance should be performed.

Reset Operator

The RESET OPERATOR is provided to reset the motor overloads. Whenever the compressor shuts down due to the tripping of the motor overloads, it will be necessary that the trouble be corrected and that the reset button be pushed before another start is tried.

GAUGES

The gauges are available in two panel configurations (Standard, Optional).

STANDARD

Rotor Coolant Injection Temperature

This gauge (Figure 7) shows the temperature of the oil just prior to injection into the compression chamber. Normal temperature in operation is approximately 40-60 Deg. F. below the air discharge temperature.

Discharge Air Temperature

This gauge (Figure 7) indicates the temperature of the air/oil mixture immediately after final compression. Normal temperature in operation is approximately 100 Deg. F. above ambient.

Discharge Air Pressure

The discharge pressure gauge (Figure 7) is a measure of the pressure in the sump.

OPTIONAL

The optional gauges are available for units with attached cooler packages having aftercoolers only.

Delivery Air Temperature

The DELIVERY AIR TEMPERATURE gauge (Figure 7) measures the temperature of air being delivered into your system. A comparison of this reading to the discharged temperature reading gives you a performance measure on the aftercooler. A drop off in this performance would indicate maintenance requirement on coolant side.

Delivery Air Pressure

The DELIVERY AIR PRESSURE gauge (Figure 7) measures the pressure being delivered in your system. A comparison of this reading with discharge pressure indicates aftercooler performance. An increase in the difference will indicate a blockage on the air side requiring maintenance.

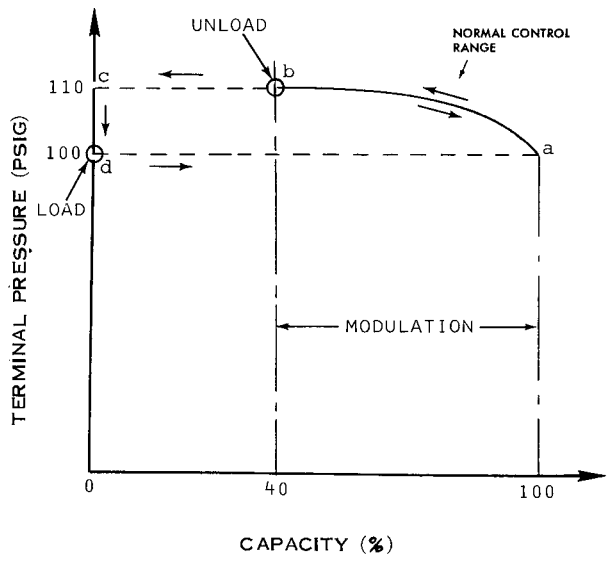


FIGURE 8
Modulation Control Diagram *69-60A*

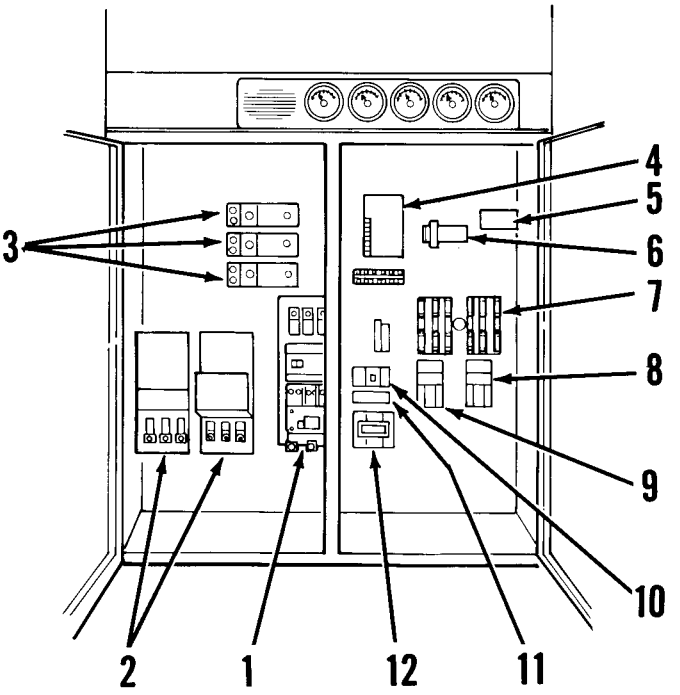


FIGURE 9
Control Center *84-18*

1. Main Motor Starter
2. Contactors Run/Start (Wye Delta)
3. Power Pads (Lugs)
4. Elec. Time Delay Relay
5. Air Pressure Switch
6. Electrical Temp. Switch
7. Fuses
8. Evacuation Motor Starter
9. Fan Motor Starter
10. Control Relay
11. Timer
12. Control Transformer

MAINTENANCE INDICATORS

Air Filter

A pop-up indicator is located at the outlet of the AIR FILTER. A red element appears indicating the need to change the filter element. This is at a pressure drop of twenty five inches of water.

Air-Oil Separator

A pop-up indicator is located on the vertical section of the sump. A red element will appear at a ten PSI differential to indicate the need to change the air oil separator element.

Oil Filter

An indicator is located on the OIL FILTER head. When a machine has two filters, both filters should be changed when either indicator shows a change required. These indicators show a need to change the elements at a fifteen PSI differential.

PNEUMATIC CONTROL SYSTEM

The compressor control system (Figure 10) is designed to match output capacity to the air demand by operating the inlet valve. As the air demand varies within the control range the inlet valve will modulate the intake air flow to the necessary capacity. See Figure 8.

The primary components that govern the operation of the inlet valve are the control valve, air pressure switch, and unloader valve (Figure 10). In operation, let us assume that the compressor is to operate at 110 psig maximum pressure. On start-up, the inlet valve will be fully open. As compression commences, pressure rises. At 100 psi, the control valve will begin to send a secondary pressure to the inlet valve which will start to close the inlet valve. Thus, as discharge pressure increases, capacity diminishes. See a to b Figure 8. If discharge pressure should drop, control valve pressure will decrease, allowing the inlet valve to move open and capacity to increase. Between 100 psi and 110 psi, output capacity will modulate between 40 percent and 100 percent.

At 110 psig, the unloader valve is de-energized by the air pressure switch and sends discharge pressure to close the inlet valve — reducing capacity to 0%. (See c to d). At 100 psig, the air pressure switch energizes the unloader valve, allowing the inlet valve to open and capacity to go to 100%. (See d to a).

At shut-down, the inlet valve is closed and the blow-down valve is de-energized. This relieves unit pressure.

CONTROL CENTER

The Control Center (Figure 9) is designed as a NEMA 12 standard. It houses the electrical components which support starting and automatic operation. Items included will depend upon the compressor model and options.

WARNING

A LOCKABLE DOOR IS PROVIDED FOR SAFETY PURPOSES. THE DOOR SHOULD ONLY BE OPENED BY A QUALIFIED ELECTRICIAN. BE CAREFUL OF ELECTRICAL SHOCK WHEN DOOR IS OPEN AND POWER IS ON. FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

Electrical Control Wiring

ALL electrical control wiring (main motor, fan motor, and high air temperature probes) is wired with 16 gauge wire, in liquid-tite flexible metal conduit to keep oil and dust out of electrical system.

WARNING

DO NOT PERFORM MAINTENANCE ON MACHINE WHEN THE "RUN LIGHT" IS ON, AS THE MACHINE COULD START WITHOUT WARNING. FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

Air Pressure Switch

The AIR PRESSURE SWITCH functions in response to discharge pressure to close or open the electrical circuit to the unloader valve. This action causes the unloader valve to pneumatically close the inlet valve and "unload" the compressor; or, to vent the unloading air line to atmosphere and allow the compressor to "load."

When control pressure rises to the top setting of the pressure switch, the electrical circuit to the unloader valve is opened and the compressor "unloads." When control pressure drops to the lower setting, the circuit is closed and the compressor "loads."

Control Relay

The function of the CONTROL RELAY is the primary control of the compressor and all its circuitry. The start-stop push button latches the compressor "on" through a control relay contact in parallel with the start push button. Any one of three failure models may shut down the compressor control or main power. All of these, as well as the stop push button, de-energize the control relay, stopping the compressor. To restart, the start push button must be manually actuated. After high air temperature shutdown, the stop-reset push button and then the start push

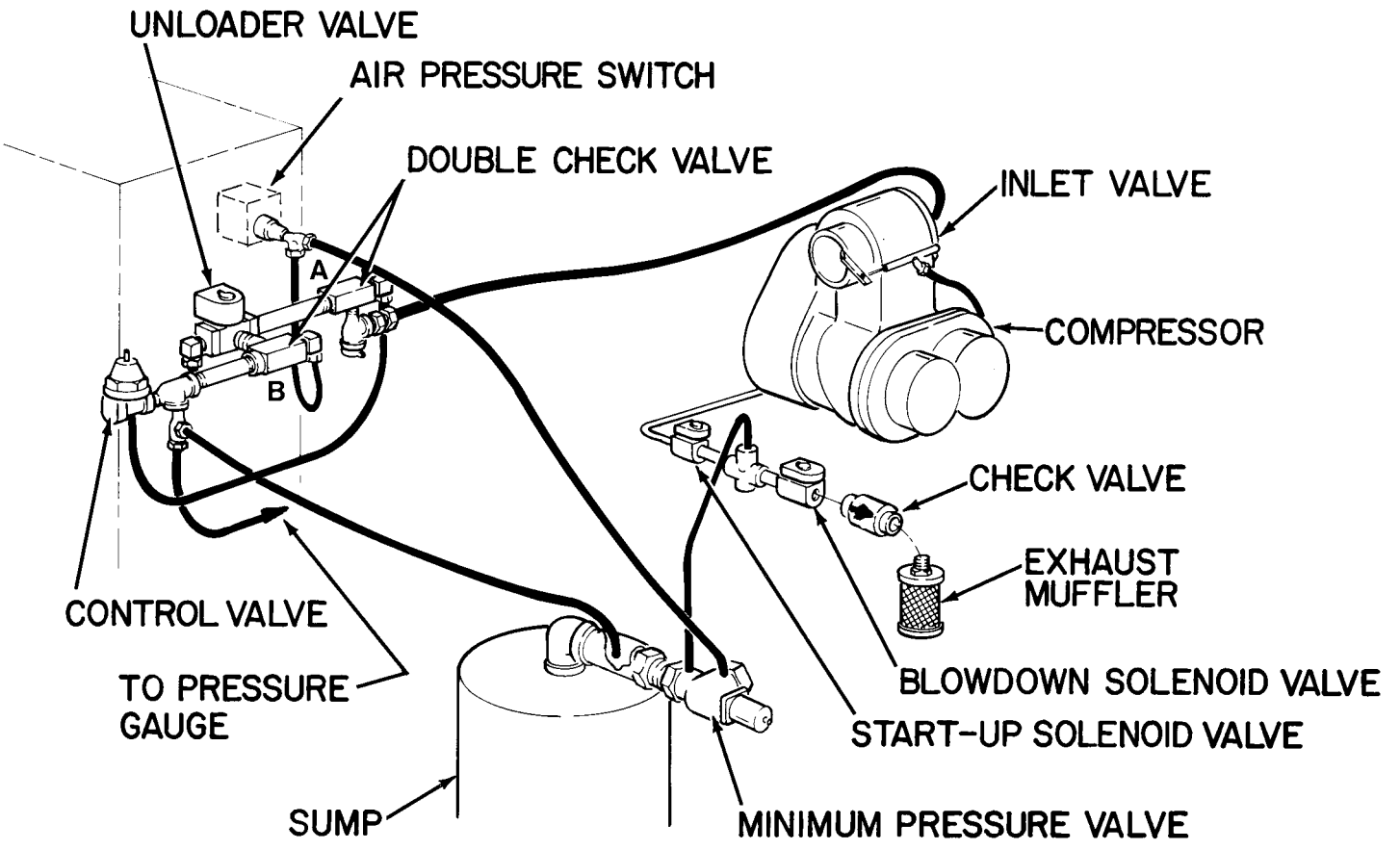


FIGURE 10
Control Circuit Diagram And Components *84-19*

Dual Control (Time Delay Relay Shutdown)

A TIME DELAY RELAY (Figure 9) will automatically shut down the compressor after a predetermined interval of unloaded operation. This interval is factory set for 20 minutes which is the minimum setting recommended. Automatic re-start will occur at the low limit of the air pressure switch control range.

The 20 minute minimum delay interval is based on the motor manufacturers' recommendation of three starts per hour.

Any reloading during the timing interval will reset the timer to zero. The green "Run" light on the control center will be lit when the machine is in a shutdown interval.

ELECTRONIC TIMING RELAY (ETR)

A TIMING RELAY is used to start the machine in an unloaded condition. After 18.5 seconds the ETR will return the control system to its normal condition and open the butterfly valve.

CONTROL SYSTEM COMPONENTS

Following is an explanation of the function served by components in the control system.

Butterfly Valve

The BUTTERFLY VALVE is located between the air filter and the inlet valve, it is used to insure an unloaded start of the compressor.

Start-Up Solenoid Valve

This SOLENOID VALVE is used to operate the butterfly valve. After the initial starting sequence this valve will be de-energized and supply air pressure to the pneumatic cylinder to open the butterfly valve.

Control Valve

The CONTROL VALVE provides the control air signal required to operate the inlet valve when discharge pressure is in the "normal control range" or modulation. See Figure 10

Blow-Down Valve

The BLOW-DOWN VALVE serves to relieve the compressor system of pressure upon shut-down and while operating "unloaded." It functions in response to the air pressure switch.

Double Check Valve (A)

This device differentiates between control pressures for load and unload sequences. During the load cycle it supplies the inlet valve with modulating service pressure. During the unload cycle it supplies the inlet valve with unloading control air via the double-check valve (B).

Double Check Valve (B)

This valve differentiates between sump and service pressures for control air pressure. It supplies the higher of the two pressures for use by the control and unloader valves.

Unloader Valve

The UNLOADER VALVE is a 3-way, normally open, solenoid valve that functions in response to the air pressure switch to pneumatically operate the inlet valve.

WARNING

DO NOT PERFORM MAINTENANCE ON MACHINE WHEN THE "RUN LIGHT" IS ON, AS THE MACHINE COULD START WITHOUT WARNING. FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

INSTALLATION

RECEIVING

(Refer to Figures 14 thru 14A)

Upon receiving, remove the crating and inspect the unit for signs of damage in shipment. If there is shipment damage the carrier should be notified immediately.

Refer to "Specifications" for compressor weight and dimensions.

NOTICE

DO NOT LIFT MACHINE WITH THE MOTOR EYEBOLT

LOCATION

The compressor is designed for indoor operation in ambient temperatures ranging from 35 Deg. F. to 110 Deg. F. In selecting the location for the compressor, it is important that there is an ample supply of cool, clean, well-circulated air. Do not set the unit with an air-cooled oil cooler closer than 48 inches from a wall or other obstruction which would restrict the free flow of air through the cooler. A good circulation of air through the cooler is important. For additional information refer to Figures 14 and 14A.

If contaminated air containing acid, paint, corrosive matter, toxic fumes, etc. is present, then a clean outside source of air must be provided for the compressor air intake.

FOUNDATION

No special foundation is required. It is only necessary that the units frame be located on a floor that provide the necessary contact and support. It is recommended that the unit be bolted to the floor.

ELECTRICAL CONNECTIONS

Have electrical connections to the power source made by a competent electrician in accordance with local codes.

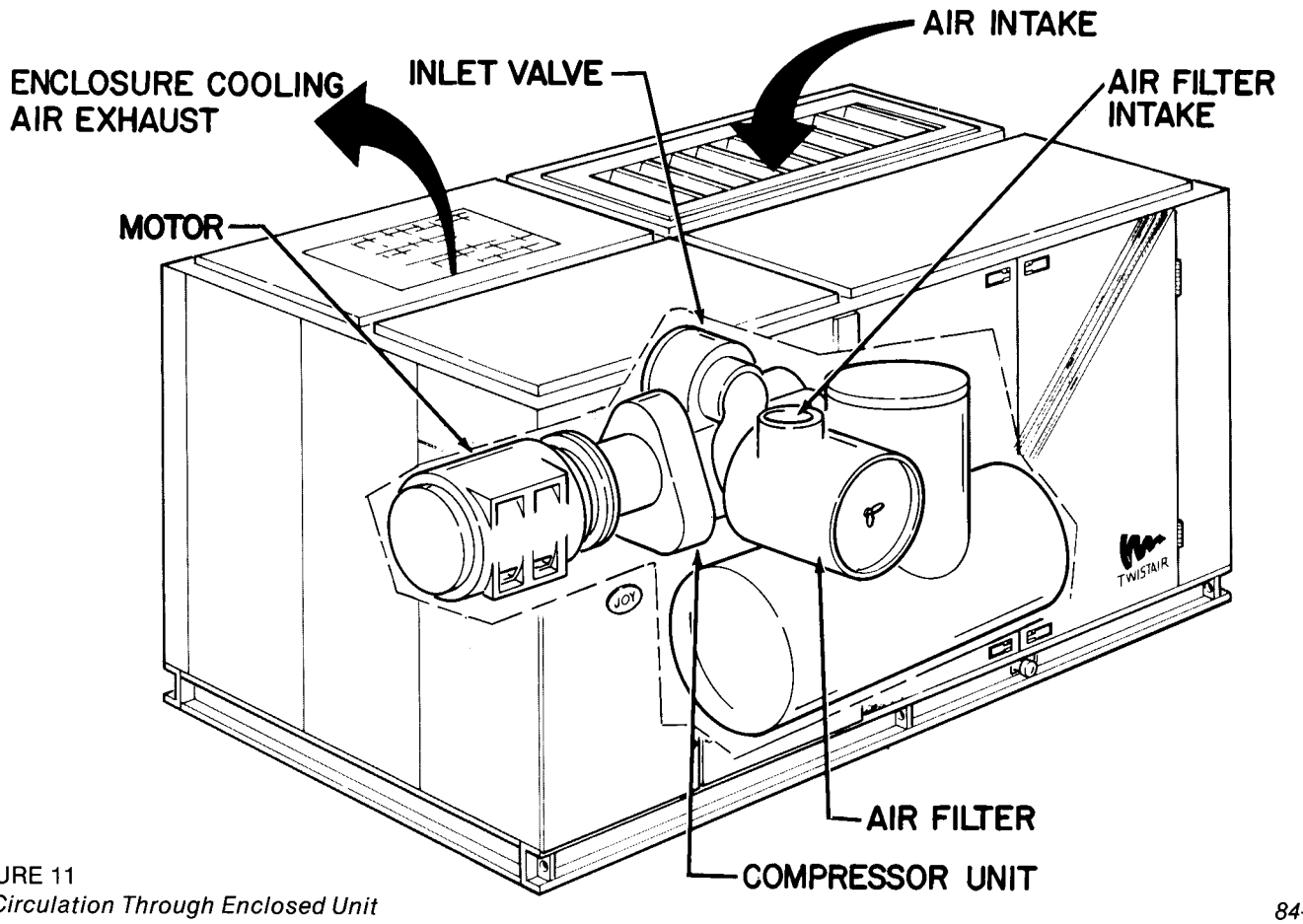


FIGURE 11
Air Circulation Through Enclosed Unit

84-20

The electrical source must have the same characteristics and voltage as indicated on the motor nameplate and as is called for on the compressor nameplate.

WARNING

IT IS EXTREMELY IMPORTANT THAT THE WIRING IS INSTALLED PROPERLY TO ASSURE CORRECT ROTATION OF THE COMPRESSOR AS INDICATED BY THE DIRECTION OF THE ROTATION ARROW ON THE COUPLING HOUSING. ANY FAN POWERED BY THE UNIT MUST ALSO BE OBSERVED FOR PROPER ROTATION (FIGURE 6). FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

Unit must be grounded

Ground from ground connection behind control center on main frame to a metal, cold water pipe or other good ground. Use #4 or larger.

Complete connection details for the electrical wiring are provided in Figures 15 thru 18A.

AIR INTAKE PIPING

A clean air supply is desirable for the satisfactory operation of your JOY compressor. Where alternate sources of intake air are available, select the source supplying the cleanest air. The standard air filter with which the compressor is equipped is of sufficient size and design to meet all normal operating conditions.

When an outside air intake source is used, a flexible sleeve should be provided to connect the filter inlet to the inlet piping. The machine should be located as close as possible to the intake source because a restriction at the inlet will result in a capacity loss for the machine. It is not intended that the filter be removed except for maintenance. In making up this installation, consideration should be given to the following:

1. Keep the piping as short and direct as possible.
2. Piping size must be at least as large as the inlet opening.
3. MAKE ABSOLUTELY SURE THAT INLET PIPING IS CLEANED AFTER FABRICATION.
4. Consider using corrosion resistant piping such as plastic, aluminum, etc.
5. Support piping properly so that its weight is carried by supports and not by compressor.
6. See that there are no leaks in the intake piping which would permit the entrance of dirt.

DISCHARGE PIPING TO SERVICE LINES

As previously stated, the compressor should be located as closely as possible to the point of compressed air usage. However, whatever piping is used in the distribution system should be constructed to offer a minimum amount of resistance to air flow between the compressor and point of use. Long radius elbows and pipe of sufficient size should be used. In no case should the piping be of smaller size than the discharge opening.

In cases where the compressor is in the same line as a reciprocating compressor, a surge volume chamber must be installed in the line between the two compressors to dampen pulsations.

If the compressor is discharging into a plant system that has other compressors in the system, it is recommended that a gate valve be placed in the discharge line from the compressor. This is to isolate the unit for service. The valve should be of the same size as the discharge pipe. The use of a check valve is not recommended.

WATER PIPING

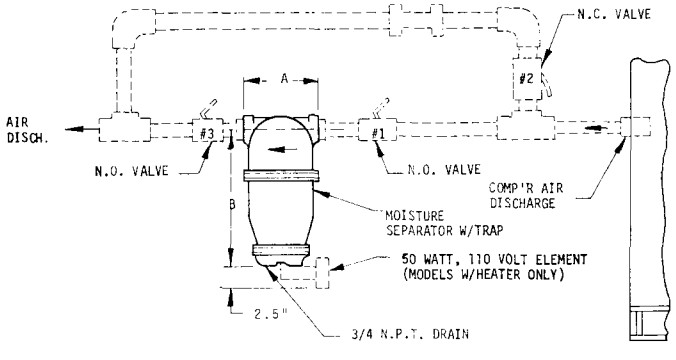
On water cooled units any water flow shut-offs or regulation valves should be on the down side of the heat exchanger. This insures the heat exchangers are filled with water in case of accidental valve closure or failure while the machine is in operation.

WARNING

AN OVER PRESSURED MACHINE CAN CAUSE INJURY, DEATH, AND WILL CAUSE SEALS TO BLOW. INSTALL A SAFETY VALVE BETWEEN THE COMPRESSOR AND RELIEF GATE VALVE.

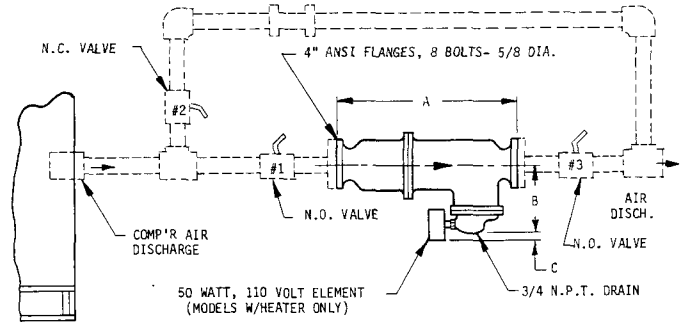
HEATED MOISTURE SEPARATOR WITH TRAP (OPTIONAL)

Units provided with an aftercooler will include a standard separator with trap. See "Air Cooling Group" – Section 1. A heated moisture separator can be supplied for those applications where the separator may be subjected to freezing conditions.



Compressor Model Size	Air Discharge Pipe Size	Dimensions A	B	C	Moisture Separator Part Number	Separator w/heater Part Number
TA-1225/1325/1350/1500	3	27"	9½"	1⅛"	00543275 0011	00543275 0012
TA-1575/1600/1700/1750	3	27"	9½"	1⅛"	00543275 0011	00543275 0012

FIGURE 12



Compressor Model Size	Air Discharge Pipe Size	Dimensions A	B	Moisture Separator Part Number	Separator w/heater Part Number
TA-990/1025/1150/1250	3	11 1/16"	19"	00543275 0006	00543275 0010

79-50 FIGURE 13 78-87

Moisture Separator W/Trap Installation

PRECAUTIONS

AIR COMPRESSOR OPERATING AND SAFETY PRECAUTIONS

Because an air compressor is a high-speed, rotating piece of machinery, the same common sense safety precautions should be observed as with any piece of machinery of this type where carelessness in operation or maintenance is hazardous to personnel.

In addition to the many obvious safety rules that should be followed with this type of machinery, we are suggesting additional safety precautions as listed below:

1. Pull main disconnect switch and disconnect any separate control lines, if used, before attempting to work or perform maintenance on the unit.
2. Do not attempt to remove any compressor parts without first relieving the entire system of pressure.
3. Do not attempt to service any part while machine is operating.
4. Do not operate the compressor at pressures in excess of its rating as indicated on the compressor nameplate.
5. Do not operate the compressor at speeds in excess of its rating as indicated on the compressor nameplate.
6. Do not remove any guards, shields, or screens while the compressor is operating.
7. Observe terminal pressure gauge daily to be sure automatic control system is governing compressor operation within proper limits.
8. Periodically check all safety devices for proper operation.
9. Do not play with compressed air. Pressurized air can cause serious injury to personnel.
10. Be sure no tools, rags, or loose parts are left on the compressor or drive parts.
11. Do not use flammable solvents for cleaning parts.
12. Exercise cleanliness during maintenance and when making repairs. Keep dirt away from parts by covering parts and exposed openings with clean cloth or kraft paper.
13. Do not operate the compressor without guards, shields, and screens in place.
14. Do not install a shut-off valve in the discharge line without installing a safety relief valve in the line between the shut-off valve and the compressor discharge.
15. Do not operate compressor in areas where there is a possibility of ingesting flammable or toxic fumes.
16. Never disconnect (or jumper) high air temperature switch and operate the machine.

Pressure vessels (receivers, aftercoolers, intercoolers) may require ASME Code stamping to meet local codes. Investigate code requirements before operation to make sure all requirements have been met.

The owner, lessor, or operator of the compressor is hereby notified and forewarned that any failure to observe these safety precautions may result in damage or injury.

Joy Manufacturing Company expressly disclaims responsibility or liability for any injury or damage caused by failure to observe these specified precautions or by failure to exercise that ordinary caution and due care required in operating or handling the compressor even though not expressly specified above.

CAUTION

IT IS IMPORTANT THAT THE COMPRESSOR OIL BE OF A RECOMMENDED TYPE AND THAT THIS OIL, AS WELL AS THE AIR FILTER, OIL FILTER AND AIR/OIL SEPARATOR ELEMENTS BE INSPECTED AND REPLACED AS STATED IN THIS MANUAL. FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

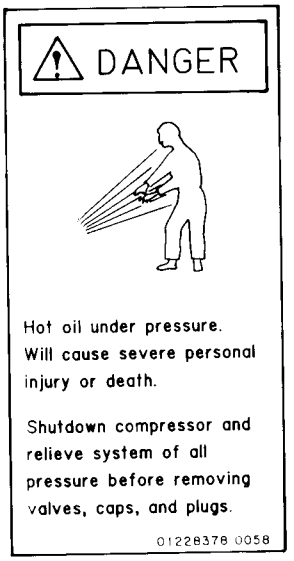
DANGER

DISCHARGE AIR USED FOR BREATHING.
WILL CAUSE SEVERE INJURY OR DEATH.

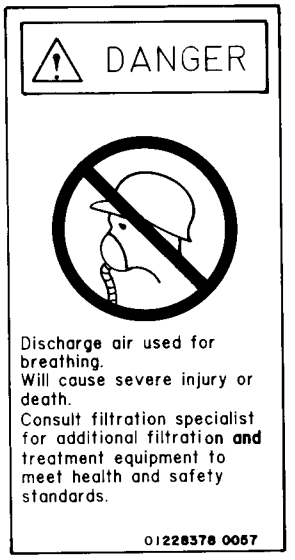
CONSULT FILTRATION SPECIALIST FOR ADDITIONAL FILTRATION AND TREATMENT EQUIPMENT TO MEET HEALTH AND SAFETY STANDARDS.

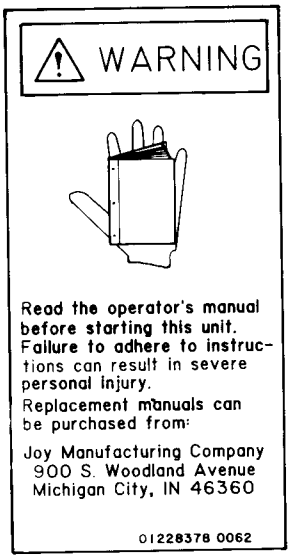
SAFETY DECALS

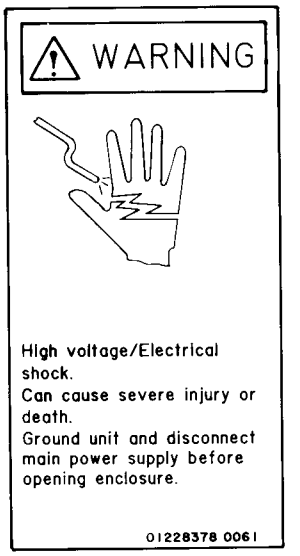
The following decals are designed to warn the user of potential hazards and to protect against personal injury and property damage. Locate each safety decal on the machine and adhere to instructions. Also, review additional safety information that is located throughout this book.



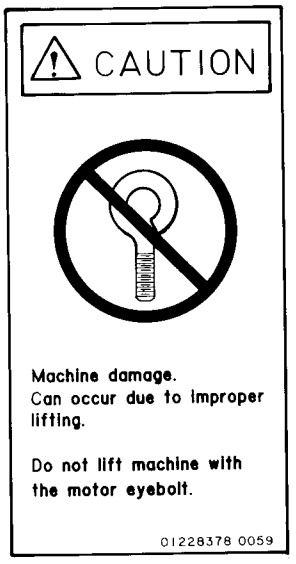
See Section 3
Pages 2 and 6



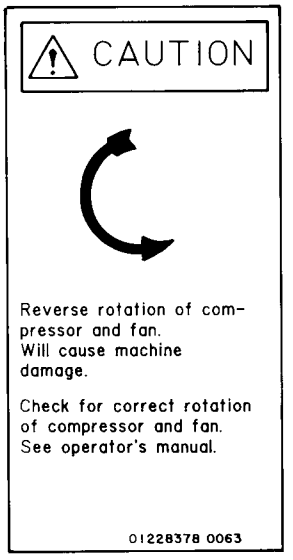




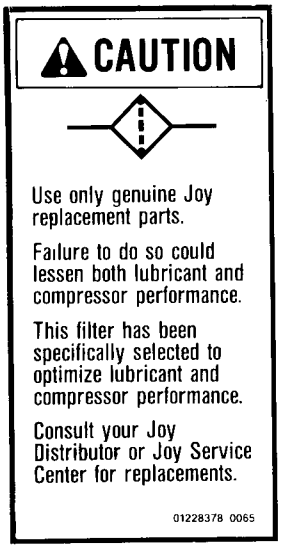
See Section 1
Pages 8 and 9

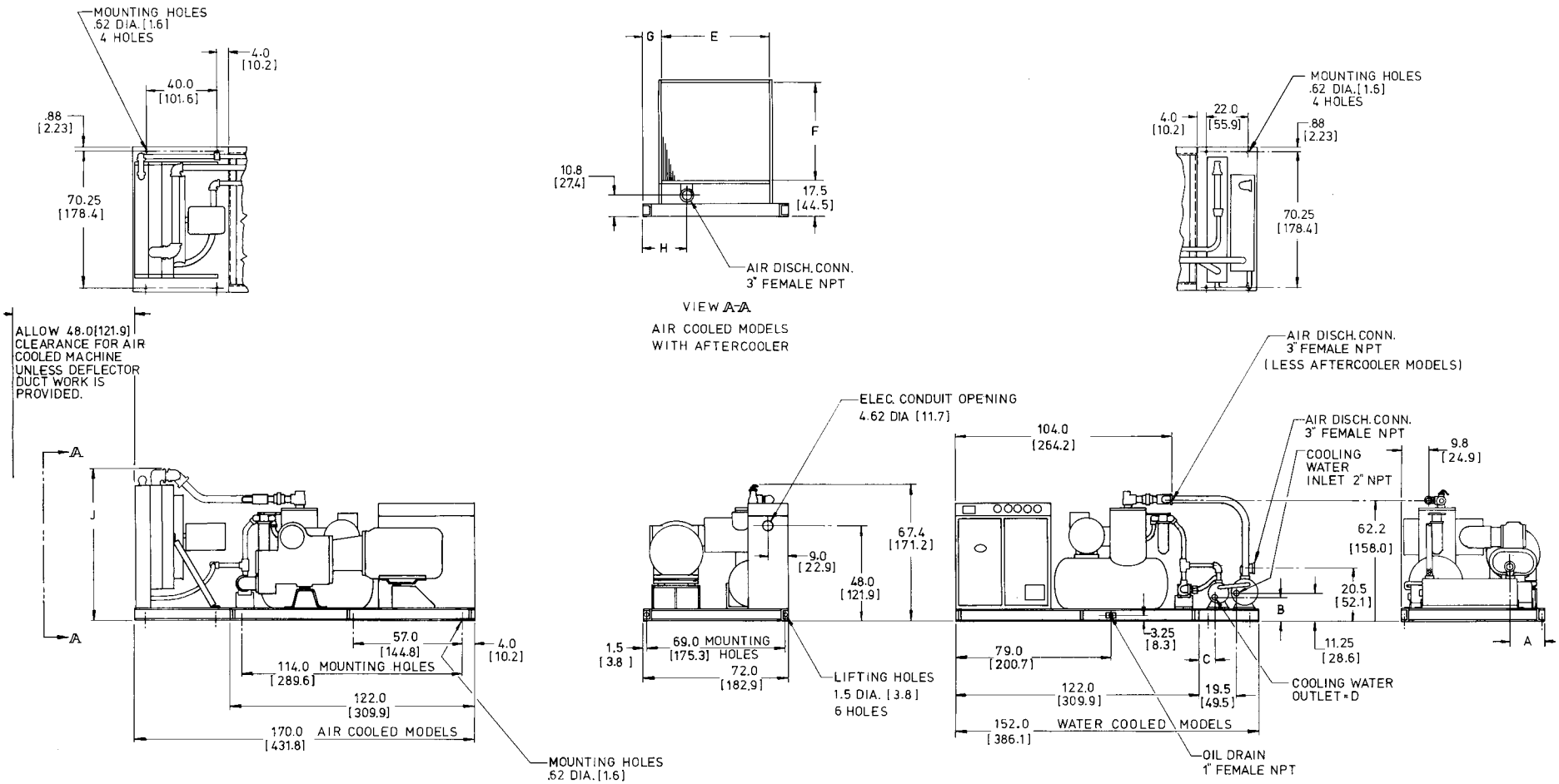


See Section 1
Page 11



See Section 1
Page 12

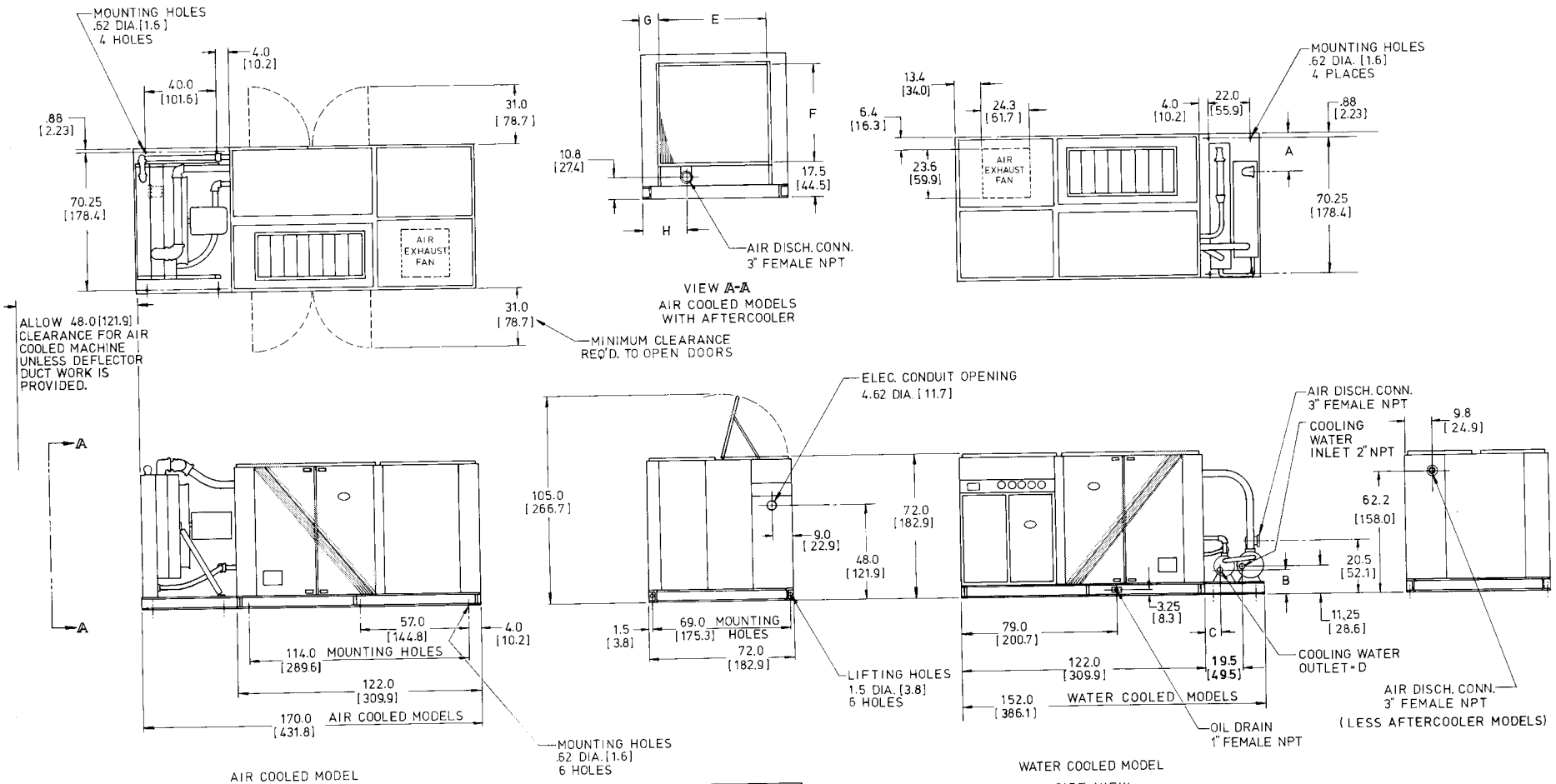




MODEL	WATER COOLED				AIR COOLED				
	A	B	C	D	E	F	G	H	J
TA0990, 1025, 1150, 1250	26.25 [66.7]	10.5 [26.7]	8.5 [21.6]	1 1/2" NPT	43.08 [109.4]	41.12 [104.4]	14.46 [36.7]	27.15 [69.0]	69.3 [176.0]
TA1225, 1350, 1500	26.25 [66.7]	9.4 [23.9]	11.6 [29.5]	2" NPT	54.02 [137.2]	48.00 [121.9]	8.99 [22.8]	21.68 [55.1]	75.0 [190.5]
TA1325, 1575, 1600, 1700, 1750	14.25 [36.2]	11.25 [28.6]	8.0 [20.3]	2" NPT	54.02 [137.2]	48.00 [121.9]	8.99 [22.8]	21.68 [55.1]	75.0 [190.5]

FIGURE 14
Installation Drawing — TA-990 thru 1750 "B" Model

DWG S2674-11

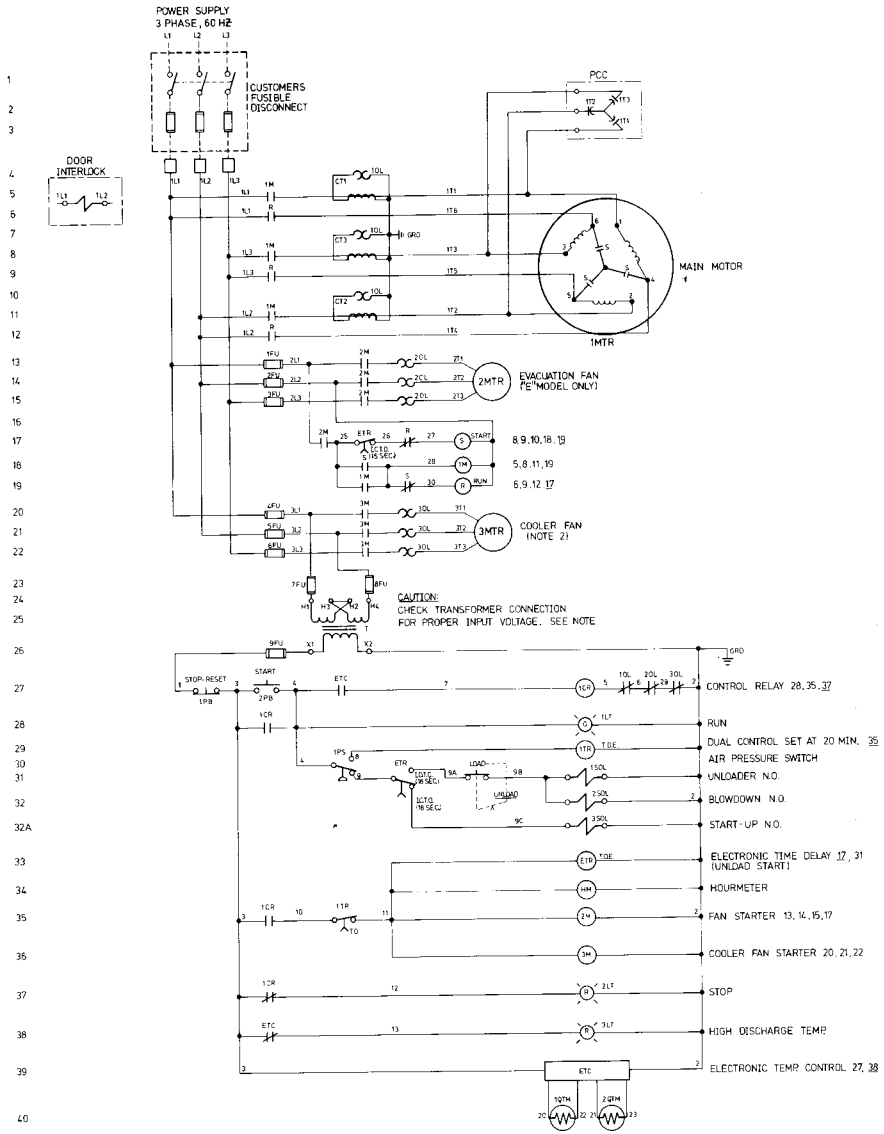


AIR COOLED MODEL SIDE VIEW

MODEL	WATER COOLED				AIR COOLED			
	A	B	C	D	E	F	G	H
TA0990, 1025, 1150, 1250	26.25 [66.7]	10.5 [26.7]	8.5 [21.6]	1 1/2" NPT	43.08 [109.4]	41.12 [104.4]	14.46 [36.7]	27.15 [69.0]
TA1225, 1350, 1500	26.25 [66.7]	9.4 [23.9]	11.6 [29.5]	2" NPT	54.02 [137.2]	48.00 [121.9]	8.99 [22.8]	21.68 [55.1]
TA1325, 1575, 1600, 1700, 1750	14.25 [36.2]	11.25 [28.6]	8.00 [20.3]	2" NPT	54.02 [137.2]	48.00 [121.9]	8.99 [22.8]	21.68 [55.1]

DWG. S2674-12

FIGURE 14A
Installation Drawing— TA-990 thru 1750 "E" Model



NOTE:

1.

CONTROL TRANSFORMER			
TYPE	POWER SUPPLY	CONNECT TOGETHER	TO LINE
230/460 V PRIMARY	460 V	H3 & H2	H1-H4
115 V SECONDARY			

2. REMOTE ON "E" MODELS OR "B" MODELS PER CUSTOMER REQUEST.

NOMENCLATURE:

CR - CONTROL RELAY
CT - CURRENT TRANSFORMER
ETC - ELECTRONIC TEMPERATURE CONTROL
ETR - ELECTRONIC TIME DELAY RELAY
FU - FUSE
G - GREEN
HM - HOURMETER
LT - LIGHT
M - MOTOR STARTER
N.O. - NORMALLY OPEN
OL - OVERLOAD
P.B. - PUSHBUTTON
PS - PRESSURE SWITCH
R - RED
SOL - SOLENOID VALVE
T - TRANSFORMER
TB - TERMINAL BLOCK
TDE - TIME DELAY ON ENERGIZATION
T.O. - TIME OPEN
TR - TIME DELAY RELAY
QTM - THERMISTOR
PCC - POWER CORRECTION CAPACITOR
IOTC - INSTANT OPEN TIME CLOSE
ICTO - INSTANT CLOSE TIME OPEN
—— OPTIONAL
---- WIRED BY CUSTOMER
J - JUMPER

FIGURE 15
Wiring Diagram (1 of 2) Wye-Delta Starting

DWG. WD13580

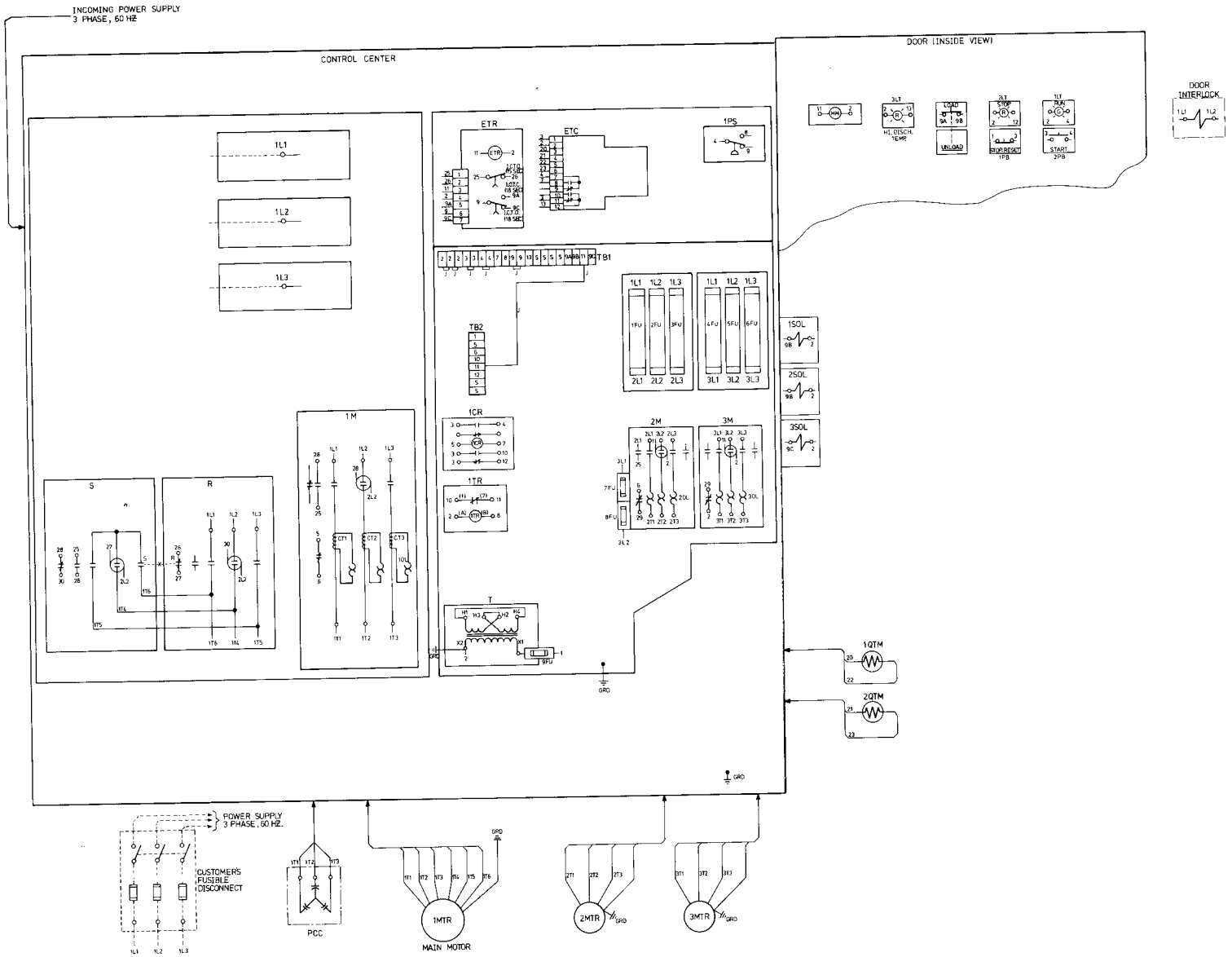
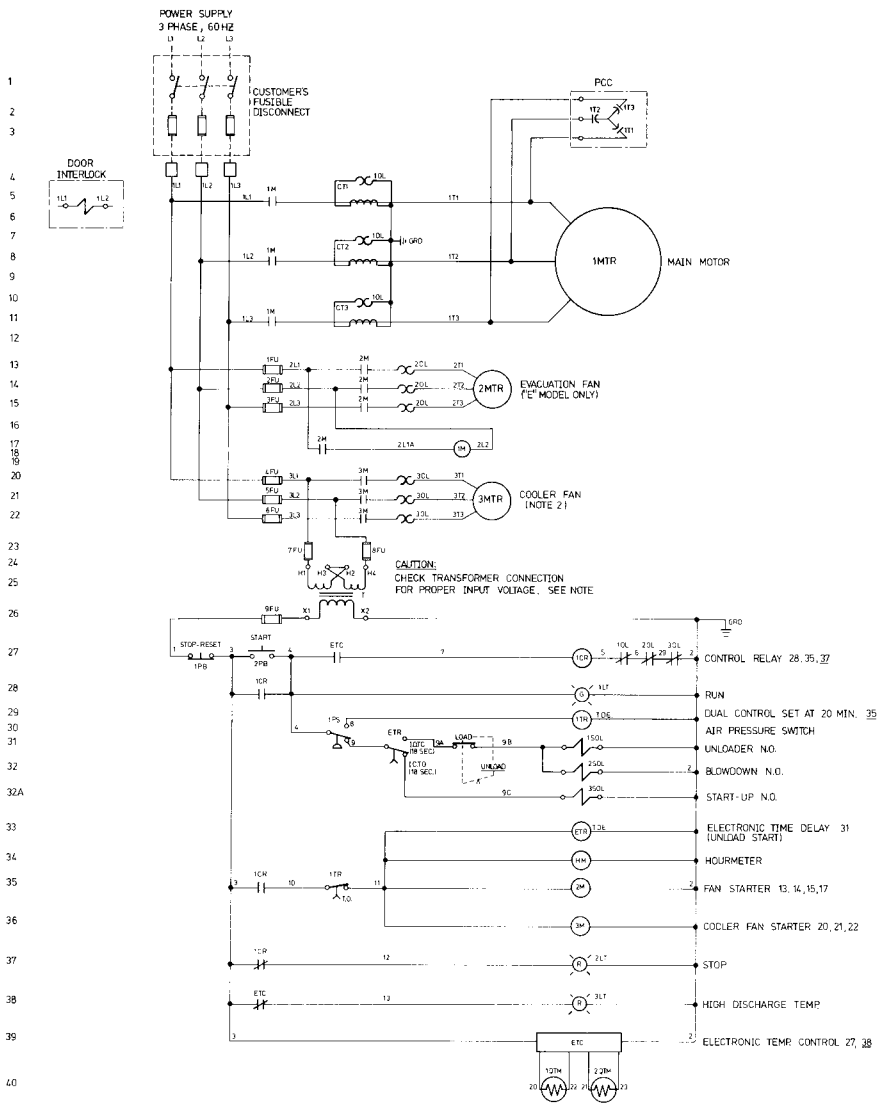


FIGURE 15A
Wiring Diagram (2 of 2) Wye-Delta Starting

DWG. WD13580



NOTE:

1.

CONTROL TRANSFORMER			
TYPE	POWER SUPPLY	CONNECT TOGETHER	TO LINE
230/460V PRIMARY	460V	H3 & H2	H1 - H4
115V SECONDARY			

2. REMOTE ON "E" MODELS OR "B" MODELS PER CUSTOMER REQUEST.

NOMENCLATURE:

CR - CONTROL RELAY
CT - CURRENT TRANSFORMER
ETC - ELECTRONIC TEMPERATURE CONTROL
ETR - ELECTRONIC TIME DELAY RELAY
FU - FUSE
G - GREEN
HM - HOURMETER
LT - LIGHT
M - MOTOR STARTER
N.O. - NORMALLY OPEN
OL - OVERLOAD
PB - PUSHBUTTON
PS - PRESSURE SWITCH
R - RED
SOL - SOLENOID VALVE
T - TRANSFORMER
TB - TERMINAL BLOCK
TDE - TIME DELAY ON ENERGIZATION
T.O. - TIME OPEN
TR - TIME DELAY RELAY
QTM - THERMISTOR
PCC - POWER CORRECTION CAPACITOR
IOTC - INSTANT OPEN TIME CLOSE
ICTO - INSTANT CLOSE TIME OPEN
—·— OPTIONAL
- - - - WIRED BY CUSTOMER
J - JUMPER

FIGURE 16
Wiring Diagram (Part 1 of 2) Full Voltage Starting

Dwg. WD13587

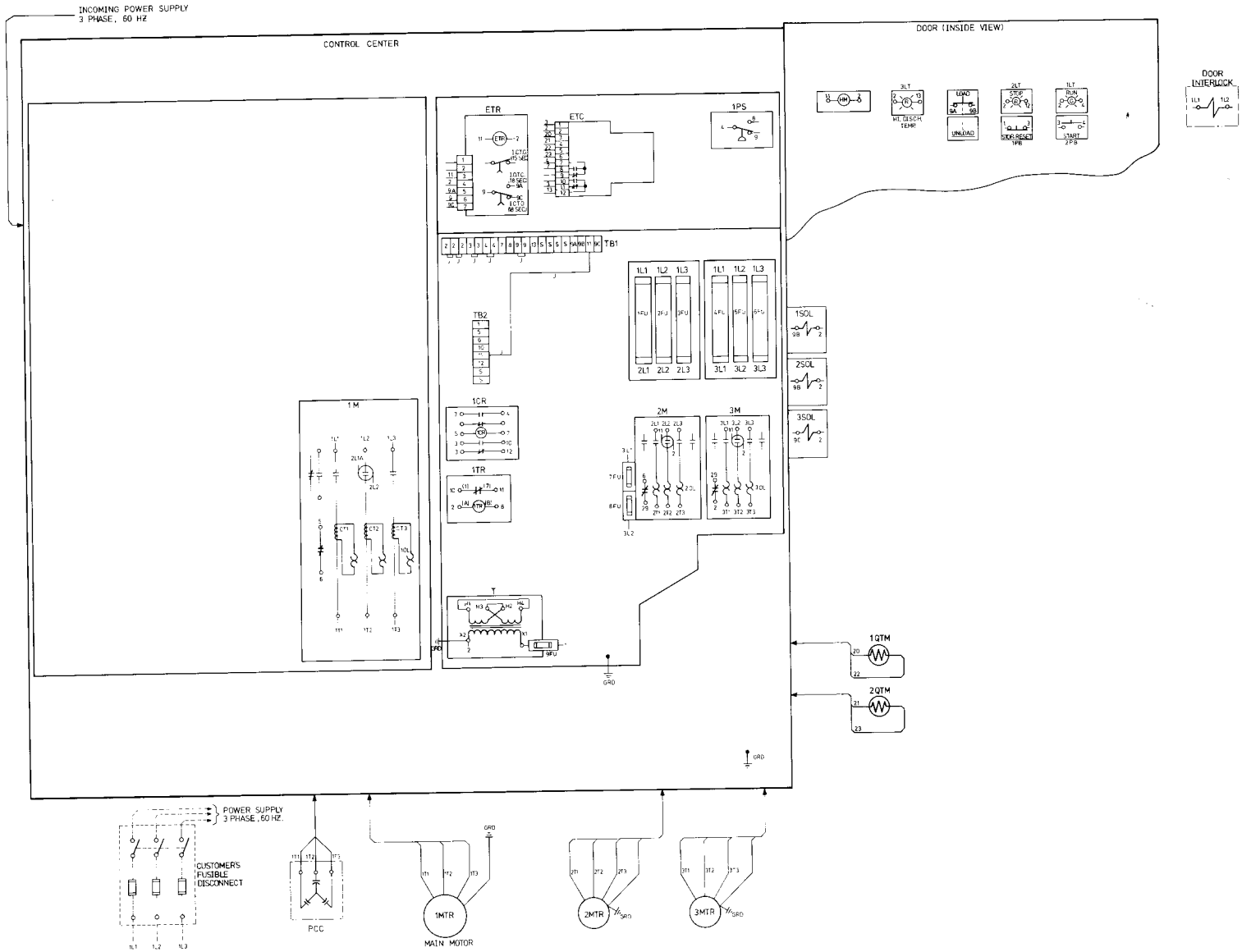
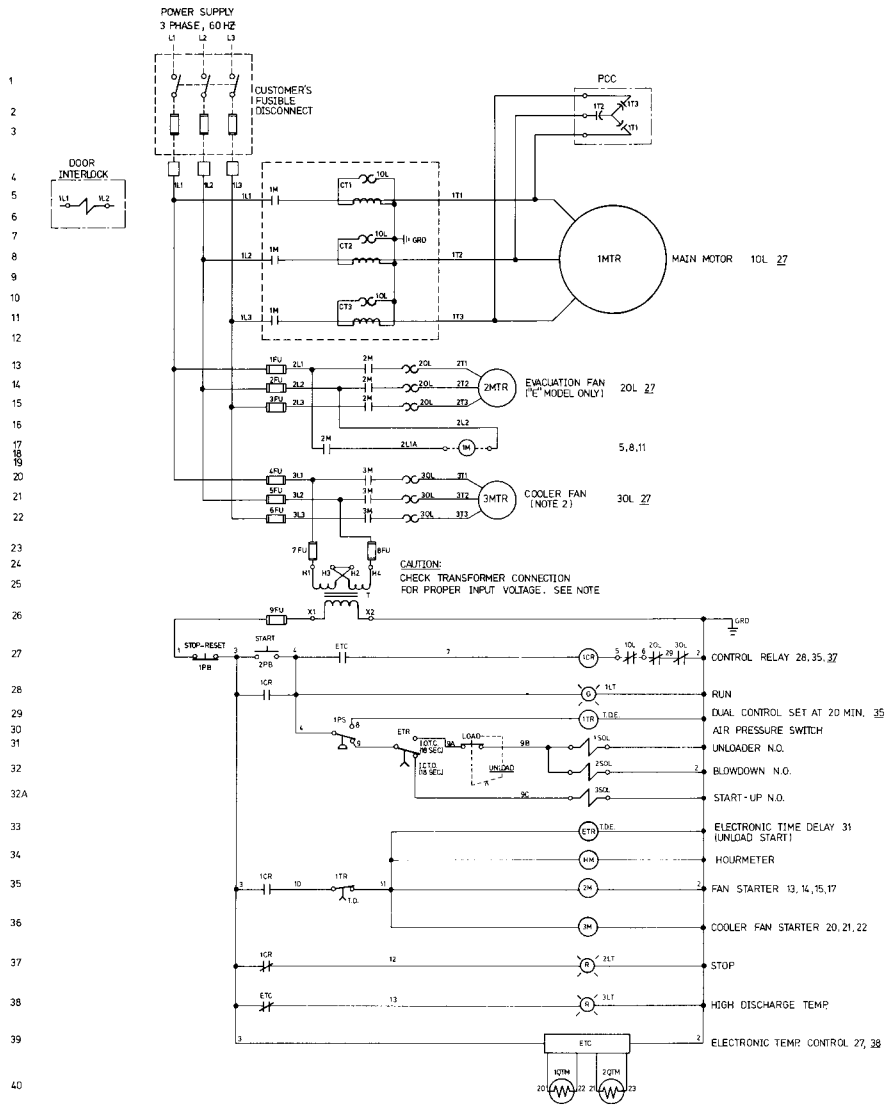


FIGURE 16A
Wiring Diagram (Part 2 of 2) Full Voltage Starting

DWG. WD13587



NOTE:

1.

CONTROL TRANSFORMER			
TYPE	POWER SUPPLY	CONNECT TOGETHER	TO LINE
230/460 V PRIMARY	460 V	H3 & H2	H1-H4
115 V SECONDARY			

2. REMOTE ON "E" MODELS OR "B" MODELS PER CUSTOMER REQUEST.

NOMENCLATURE:

CR - CONTROL RELAY
CT - CURRENT TRANSFORMER
ETC - ELECTRONIC TEMPERATURE CONTROL
ETR - ELECTRONIC TIME DELAY RELAY
FU - FUSE
G - GREEN
HM - HOURMETER
LT - LIGHT
M - MOTOR STARTER
N.O. - NORMALLY OPEN
OL - OVERLOAD
PB - PUSHBUTTON
PS - PRESSURE SWITCH
R - RED
SOL - SOLENOID VALVE
T - TRANSFORMER
TB - TERMINAL BLOCK
TDE - TIME DELAY ON ENERGIZATION
T.O. - TIME OPEN
TR - TIME DELAY RELAY
QTM - THERMISTOR
PCC - POWER CORRECTION CAPACITOR
IOTC - INSTANT OPEN TIME CLOSE
ICTO - INSTANT CLOSE TIME OPEN
—·— OPTIONAL
---- WIRED BY CUSTOMER
J - JUMPER

FIGURE 17
Wiring Diagram (1 of 2) Remote Main Motor Starter

Dwg. WD13588

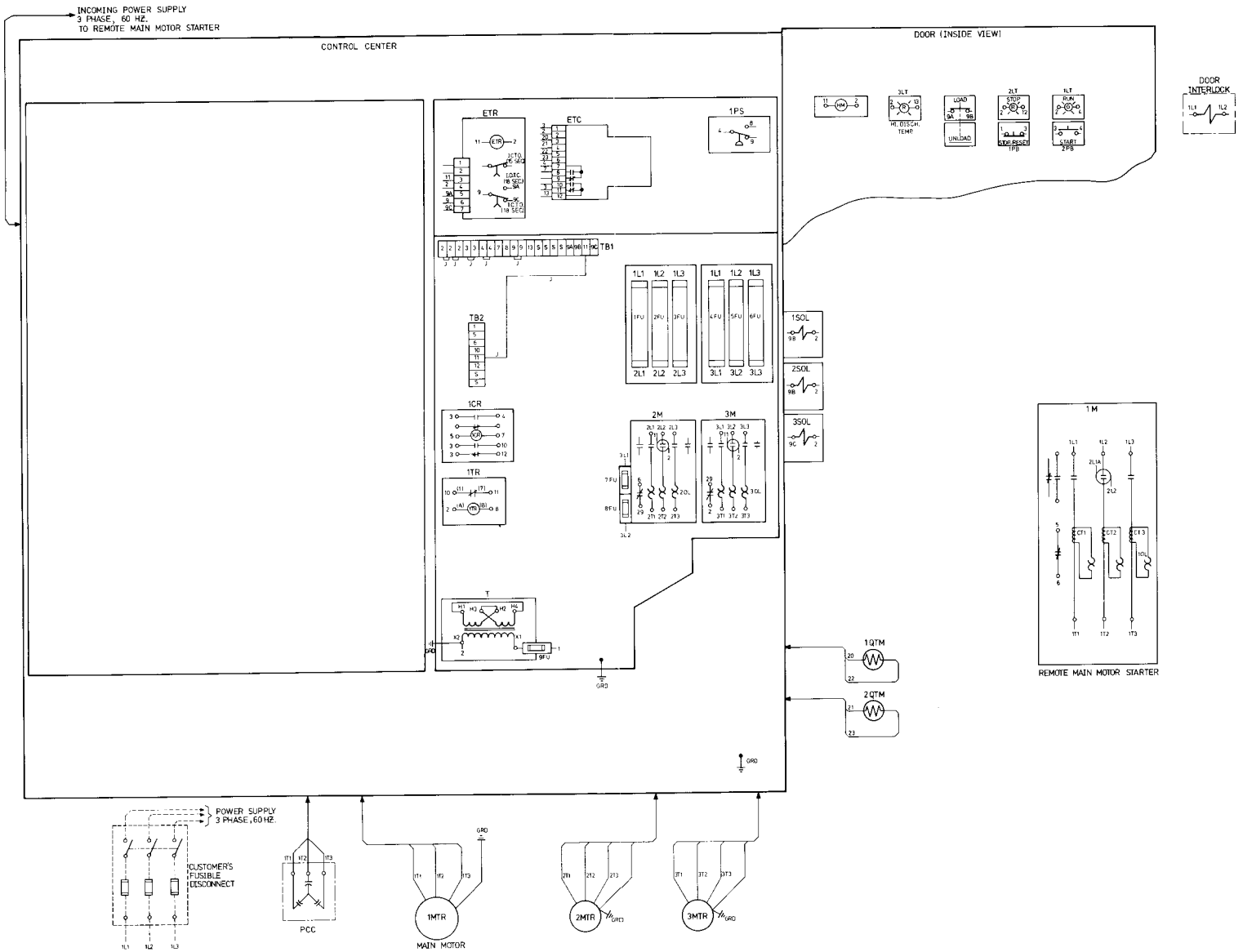


FIGURE 17A
Wiring Diagram (2 of 2) Remote Main Motor Starter

DWG. WD13588

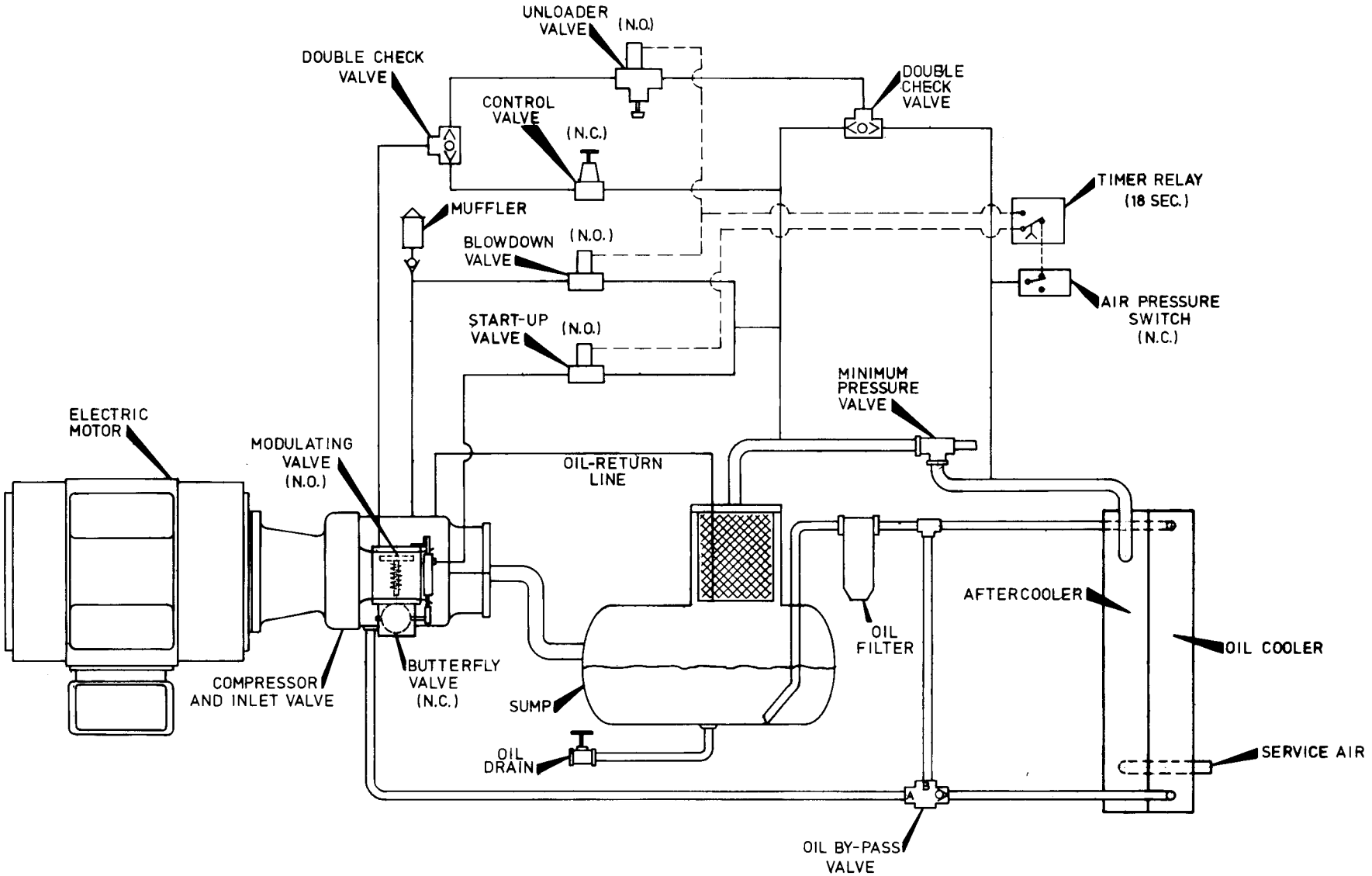


FIGURE 19
TA Systems Schematic

SECTION 2

OPERATION

INTRODUCTION

Every JOY® compressor is operated and thoroughly tested at the factory before shipment. The test assures that the compressor will deliver its rated capacity and is in good working order. However, regardless of the care taken at the factory, there is a possibility that damage may occur in shipment. For this reason, it is recommended that the unit be carefully inspected for evidence of possible damage or malfunction during the first few hours of operation.

WARNING

EXCEEDING MAXIMUM PRESSURE WILL CAUSE COMPONENT AND SYSTEM DAMAGE. DO NOT EXCEED MAXIMUM PRESSURE INDICATED ON COMPRESSOR NAMEPLATE.

START-UP

PREPARATION FOR INITIAL START-UP

1. Pull main disconnect switch to assure that no power is connected to the unit.
2. Review installation as covered in Section 1 to see that applicable instructions have been complied with.

WARNING

DO NOT ATTEMPT TO OPERATE COMPRESSOR ON VOLTAGE OTHER THAN THAT SPECIFIED ON THE COMPRESSOR NAMEPLATE. FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

3. Inspect unit for any visible signs of damage that could have occurred in shipment or during installation.
4. Make sure that protective covering (paper) has been removed from air intake filter, enclosure openings and any other components or area that could require protection from painting or shipping.
5. Make sure sump is at proper level with oil as specified in Section 3, "Lubrication." Do not over-fill. If sump is over-filled, drain to proper level. Tighten oil fill fitting securely. Remember this is a pressurized vessel.
6. On water cooled units, make sure that water supply is connected and open to give proper flow.
7. Check butterfly valve. Work lever back and forth to assure free movement.
8. Reconnect main disconnect switch.
9. Refer to Section 1, Instrument Panel, in regard to the functions of the panel components.
10. Press unload button to keep in unloaded condition.
11. "Jog" motor (press start and then stop button quickly) and check for proper direction of rotation as indicated by direction arrow on coupling housing. Coupling may be observed at top of the housing or viewing directly the motor armature. If rotation direction is wrong, reverse input connections L1 and L2 (ref. Figures 15 thru 18A). Also, check to see that fan is blowing OUTWARD.
12. Press load button to enable control system.
13. After unit has run for several minutes, shut it down and check oil level. It may be necessary to add oil to compensate for the amount of oil needed to fill the entire system.

CAUTION

REVERSE ROTATION OF THE COMPRESSOR WILL CAUSE AIR END DAMAGE. AFTER ANY CHANGE OR RECONNECTION OF WIRING, CHECK FOR CORRECT ROTATION OF COMPRESSOR AND FAN. DO NOT ALLOW COMPRESSOR TO RUN IN REVERSE ROTATION.

NORMAL STARTING

1. Press START button; the unit will start unloaded, after 18½ seconds, the unit automatic controls will take over.

Low Ambient Temperature – Below 40°F

1. Press UNLOAD button prior to start
2. Press START button
3. Allow unit to warm up unloaded for a period of at least 15 minutes.
4. Press LOAD button and begin normal operation.

It is especially important to let the machine warm up to operating temperature in cold ambients prior to giving the unit an air demand. If this is not done, it is possible to collapse the air/oil separator element on start up because of the oil saturating the element.

NOTICE

ON WATER COOLED UNITS, SEE THAT WATER IS TURNED ON.

NORMAL STOPPING

1. Press UNLOAD button.
2. Press STOP RESET button to stop compressor.
3. Stop flow of cooling water if unit is water cooled.

EMERGENCY SHUT DOWN

To shut down the compressor in case of an emergency, press STOP button.

RESTART AFTER POWER FAILURE

1. Check fuses and re-set starters.
2. Check to see that main disconnect is connected.
3. Follow Normal Starting Procedure.

RESTART AFTER SAFETY CIRCUIT SHUT-DOWN

(Pull main disconnect switch prior to correcting problem).

1. After the cause of shutdown is corrected, press stop-reset button.
2. Follow Normal Starting Procedure.

WARNING

NEVER OPERATE UNIT WITH SAFETY CIRCUIT BYPASSED (OR JUMPERED) OUT OF CONTROL SYSTEM.

STORAGE

PREPARATION FOR STORAGE AND START-UP AFTER PROLONGED STORAGE

Prolonged shutdown or storage requires special consideration as there are many conditions which could affect the compressor. Storage, indoors, outdoors in freezing temperatures, salt air, dampness, etc., only to mention a few. Unless otherwise stated in the sales agreement (sales order), the standard preparation for compressor shipment provides for up to eight weeks of indoor storage, starting from the time the machine leaves the factory.

Should prolonged storage or shutdown become necessary, the following action should be taken to offset a possible malfunction upon start-up:

IN PREPARATION FOR STORAGE:

1. Cover and seal all machine openings to prevent the entrance of dirt and water.
2. Cover all openings on open-drip-proof type motors to prevent the entrance of rodents.
3. If the machine is to be stored for any length of time at all in freezing conditions, it is necessary to drain all the water that may have accumulated in water-cooled coolers, air-cooled aftercoolers, traps, and attendant air piping prior to sealing all machine openings.
4. If the machine is to be stored outside, it must be protected from the weather to prevent the entrance of all dirt and water from any machine components especially the electrical controls.
5. It is suggested that any machine be completely covered with a waterproof tarpaulin that can be easily removed for in-storage maintenance.

IN-STORAGE MAINTENANCE

It is extremely important that the air end shaft be rotated several revolutions every two to three months to protect the bearings from receiving flat spots.

PREPARATION FOR START-UP:

Prior to start-up, after long term storage, the steps for preparation for initial start-up on Page 1, Section 2 should be followed.

NOTICE

IF MACHINE HAS BEEN IN STORAGE FOR MORE THAN A YEAR, IT IS SUGGESTED THAT A FRESH CHARGE OF OIL BE ADDED PRIOR TO START-UP.

If prolonged storage in extreme conditions not considered above becomes necessary, your Joy representative should be contacted immediately so that he may recommend additional precautions which may be taken to offset a possible malfunction upon start-up. It is our desire to maintain customer satisfaction by advising you in anticipation of a trouble-free start-up.

ELECTRICAL SPECIFICATION

JOY rotary screw compressors are designed and manufactured in accordance with the following electrical codes/practices:

N.E.C. – NATIONAL ELECTRICAL CODES
N.E.M.A. – NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
U.L. – UNDERWRITERS LABORATORIES – RECOGNIZED COMPONENTS
C.S.A. – CANADIAN STANDARDS ASSOCIATION – RECOGNIZED COMPONENTS

It is the customer's ultimate responsibility to insure compliance with any additional federal, state or local codes as may be applicable.

NOTES

SECTION 3

LUBRICATION, MAINTENANCE & ADJUSTMENT

LUBRICATION

LUBRICANT

Your machine has been tested and filled with Syn Flo 80 lubricant. This fluid is a compounded olefin specifically formulated to optimize the performance of Rotary Screw compressors. In most installations, this lubricant will last significantly longer than standard petroleum oils.

No matter how good a lubricant, it cannot replace proper maintenance attention. We suggest you adhere to regular filter changes as outlined in the maintenance section of this manual. The filter system of your Joy compressor has been specifically designed to lower contaminantion down to tolerable levels. It is therefore essential to use only genuine Joy replacement parts, since substitutes could impair performance.

To detect these contaminants and to further optimize lubricant life, we recommend an oil sampling program. When properly applied, it will confirm continued useful lubricant life. It will also indicate symptoms of problems, i.e., reactive gas intake, which should be addressed for continued good operation.

NOTICE

YOUR DISTRIBUTOR WILL PROVIDE YOU WITH AN OIL SAMPLE KIT. WE PROPOSE SAMPLING INTERVALS OF EVERY SIX MONTHS, CONDITIONS OR THE OIL ANALYSIS COMPANY MAY DICTATE SHORTER SAMPLING INTERVALS.

NOTICE

JOY MANUFACTURING COMPANY DOES NOT RECOMMEND MIXING DIFFERENT TYPES OR BRANDS OF LUBRICANTS DUE TO THE POSSIBILITY OF A DILUTION OF THE ADDITIVES OR A REACTION BETWEEN ADDITIVES OF DIFFERENT TYPES.

PRIME LUBRICANT CHARACTERISTICS

1. Viscosity
   a. 1200 SSU or less at 50°F.
   b. 160-210 SSU at 100°F.
   c. 47 SSU or greater at 210°F.
2. Flash Point 400°F. minimum (ASTM D-92-COC).
3. Pour point must be at least 20°F. lower than the lowest expected ambient temperature.
4. Contain rust and oxidation inhibitors.
5. Contain foam suppressors if required.

OIL

Industrial Type Oils

Industrial oils should be of premium quality nondetergent mineral oil, viscosity grade SAE 10. Generally, industrial oils are better for high humidity and/or low load factor where condensed moisture and emulsification may occur.

Water, which will separate, must be drained from the oil sump. In addition to the prime oil characteristics, good water separation, therefore, is preferred.

Heavy Duty Detergent Motor Oils

Heavy duty detergent motor oils should be SAE viscosity Grade 10. The following have proven by experience to be satisfactory for use:

API Designation	Military Identification
CD/SC	MIL-L-2104C
CC/SE	MIL-L-45152
CC/SC	MIL-L-2104B

Generally, detergent motor oils are better where severe oil oxidation can occur due to heavy duty, high temperature conditions.

Automatic Transmission Fluids

Automatic transmission fluid (ATF) can be used. Generally, ATF fluids are used in heavy duty, high temperature conditions or in ambients consistently below 20°F.

Synthetic Lubricants

Insofar as known, all elastomeric components and all metals used in the compressor are fully compatible with synthetic lubricants. The viscosity grade chosen for synthetic lubricants should be based upon the suggested viscosity ranges listed under prime lubricant characteristics and the lubricant supplier. However, the synthetic lubricant should not employ viscosity index improver additives. These will precipitate out plugging oil passages and filters, ultimately causing unit failure.

Oil Sump Capacity

The compressor oil sump capacity is given in "Specifications" — Section 1. Maintain oil level at center of sight gauge (2, Figure 19). Do not overfill. An overfilled sump could cause hydraulic locking of the compressor. Oil level must be checked either prior to start up or after shutdown when oil has had a few minutes to settle.

Adding or Changing Oil

The oil sump contains all the oil required for compressor operation. Oil is added through the fill fitting (Figure 20) located on the side of the oil sump.

WARNING

DO NOT ATTEMPT TO ADD OIL WHEN THE COMPRESSOR IS OPERATING OR WHEN SUMP IS UNDER PRESSURE. LIFT THE HANDLE OF SAFETY RELIEF VALVE TO RELIEVE SYSTEM OF ALL PRESSURE. FAILURE TO COMPLY WITH THIS WARNING MAY CAUSE SERIOUS BODILY HARM.

Motor

Grease lubricated motors are properly lubricated at the time of manufacture and it is not necessary to relubricate prior to initial start-up. However, if motor has not been run for a period of six months or longer, it is recommended that it be lubricated before starting. For the type of lubricant to use and the method of lubrication, contact local manufacturer's representative. See motor nameplate for motor identification.

Initial Oil Filter Change

Regardless of the care taken during machine assembly, there are impurities that enter the machine. In the initial hours of operation, these impurities are flushed out and caught by the oil filter. Because of this, it is recommended that the oil filter be changed and the seperator element be checked after the first 300-400 hours of operation. Thereafter the element change interval should be as indicated by the maintenance indicators and in accordance with the following periodic maintenance schedule.

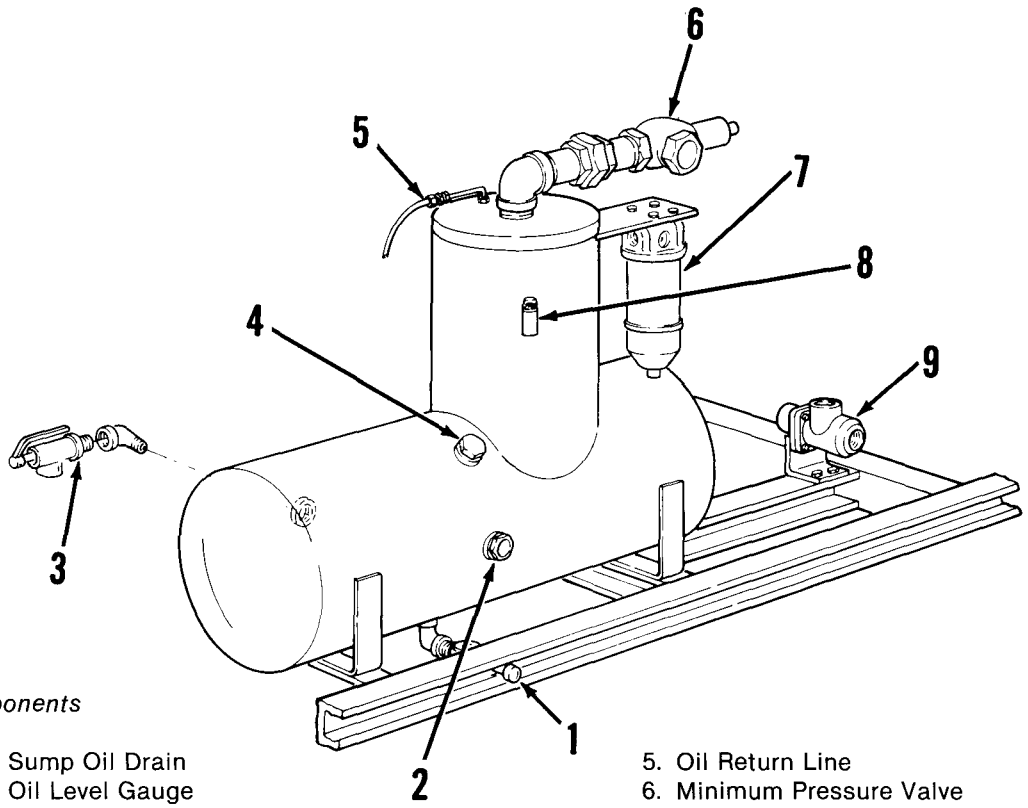


FIGURE 20
Sump and Components

84-22

1. Sump Oil Drain
2. Oil Level Gauge
3. Sump Pressure Relief Valve
4. Oil Fill Plug
5. Oil Return Line
6. Minimum Pressure Valve
7. Oil Filter
8. Pop-up Indicator
9. Thermal Valve

MAINTENANCE

PERIODIC MAINTENANCE SCHEDULE

DAILY OR EVERY 8 HOURS

Prior to Start Up:

Check for correct sump oil level. Level should be at center of bulls-eye sight glass.

In Operation:

Observe oil return line tubing for oil flow.

The following gauges and indicators should be checked for normal indication of operation.

1. Oil Filter Indicator
2. Air Filter Indicator
3. Discharge Air Temperature
4. Discharge Air Pressure
5. Separator Indicator

PERIODICALLY

1. Inspect air intake filter element for clogging or holes.
2. Clean oil return line orifice, Figure 22.
3. Drain condensate from oil sump (Figure 20). Depending on the humidity of the climate, this may be necessary daily. Prior to draining, the compressor should be shut down for two hours to allow the water and oil to separate.
4. Lubricate water temperature regulating valve stem (Option item).
5. Clean cooling system heat exchangers.
6. Check sump pressure relief valve for operation. This valve is factory set and no attempt should be made to adjust it.
7. Check machine for oil leaks and loose fastenings/connections. Also, hose condition and correct or replace if necessary.
8. Check maintenance indicators and clean if necessary, to insure reliable operation.
9. Free operation of butterfly plate.

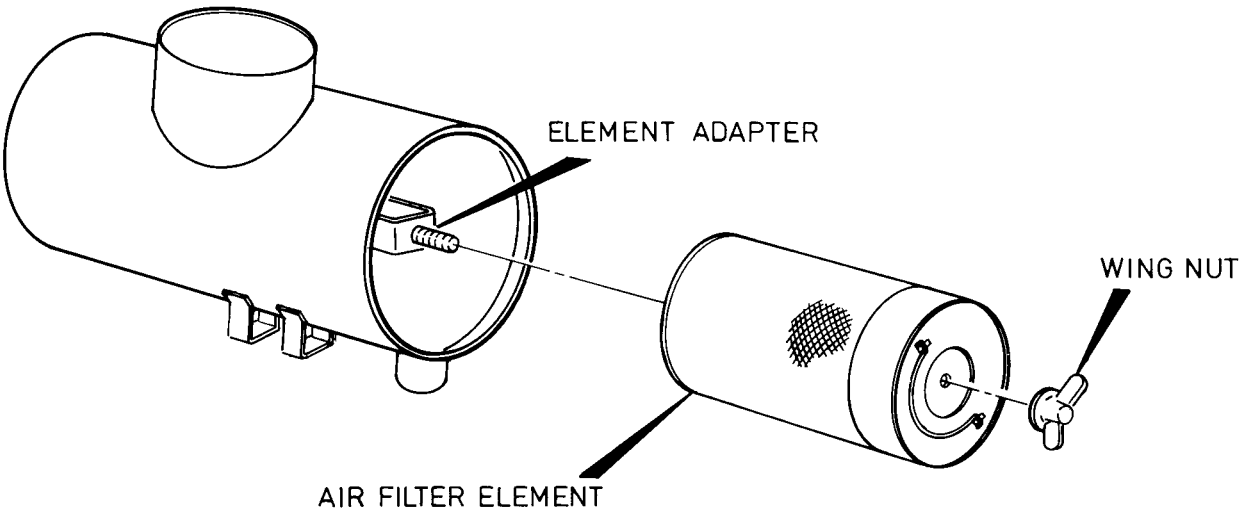


FIGURE 21
Air Filter Assembly

84-23

DANGER

DO NOT OPERATE MACHINE WITHOUT ALL FILTRATION ELEMENTS PROPERLY INSTALLED. MACHINE FAILURE WILL RESULT THAT CAN CAUSE SEVERE INJURY, DEATH OR PROPERTY DAMAGE.

For water cooled heat exchangers, it may be necessary to have the tubes rodded out or steam cleaned occasionally. This need will be a direct reflection on the kind of water used. See "Cooling Water" Section 1. Air cooled heat exchangers may be cleaned with a rag and solvent or compressed air directed through the units.

EVERY SIX MONTHS OR 1000 HOURS

1. Change oil filter, air filter, and air-oil separator elements when maintenance indicators show change out pressure drop has been reached.
2. Change compressor oil, or as indicated by sampling program.
3. Check air/oil separator element and replace if damaged or extremely dirty.

NOTICE

THE USE OF SYNTHETIC LUBRICANTS HAVING EXTENDED USEFUL LIFE DOES NOT CHANGE THE OIL FILTER ELEMENT CHANGE INTERVAL.

DANGER

SUMP FIRES CAN CAUSE SEVERE INJURY, DEATH, OR PROPERTY DAMAGE. AIR/OIL SEPARATOR + DIRT + OXIDIZED OIL PRODUCTS + INCREASED AIR VELOCITY = FIRE.

MAKE SURE AIR/OIL SEPARATOR, OIL, OIL FILTER, AND AIR FILTER ELEMENTS ARE INSPECTED AND REPLACED AS STATED IN THIS MANUAL.

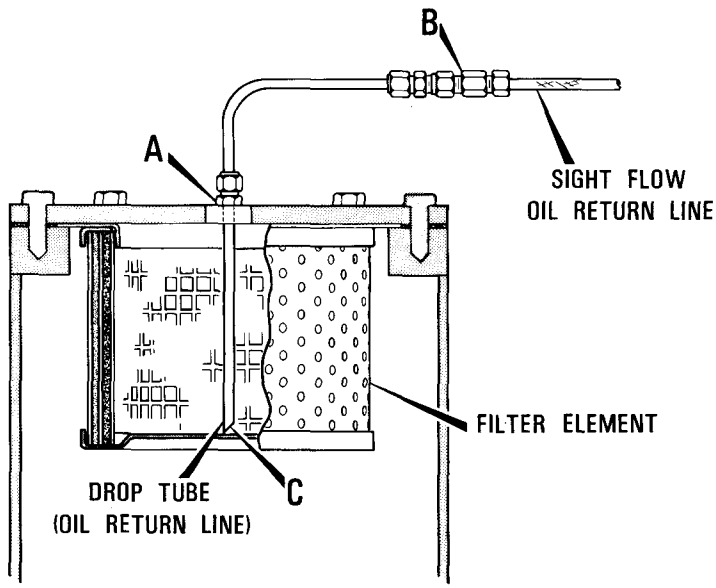


FIGURE 22
Sectional View of Air/Oil Separator *80-34*

Air Intake Filter

Service the air intake filter element (Figure 21) only when indicated by the service filter indicator. Scheduled service based on a set number of operating hours is not required nor recommended.

CAUTION

DO NOT WORK ON THE AIR INTAKE FILTER WHILE THE MACHINE IS IN OPERATION.

Oil Filter

Service oil filter element every 1000 hours or sooner as indicated by the restriction indicator.

This oil filter (Figure 20) is the replaceable element type. To install new element, simply remove and replace. Ascertain that element is secure and gasket is serviceable and in place.

DANGER

HOT OIL UNDER PRESSURE WILL CAUSE SEVERE INJURY, DEATH, PROPERTY DAMAGE. BE SURE COMPRESSOR IS SHUT DOWN AND RELIEVED OF ALL PRESSURE BEFORE ATTEMPTING ANY WORK ON COMPRESSOR.

Air/Oil Separator

The procedure for servicing the separator filter element is as follows:

1. Disconnect necessary piping at separator cover. The oil return line must be first separated at coupling B, Figure 22, loosened at fitting A on the separator cover and then the tube pulled up out of the separator.
2. Unbolt cover and remove.
3. Lift out separator element.
4. Install new element (gaskets are attached). Make sure flange surfaces are clean. All elements will have either a staple in the gasket or a sheet metal tab attached to the inside of the separator. These items are attached to provide metal to metal contact between the element and the sump head. It has been proven that these items reduce the possibility for sump fires.
5. Refer to Table A for Torque Values.
6. Reconnect all piping. Ascertain that oil return tube is "bottomed" at C in the separator.

Thermal Valve

The thermal valve, (Figure 20), should be inspected if the unit shuts down due to high compressor discharge air temperature. A piece of sediment may lodge on the valve seating surface and prevent it from closing and allowing the hot oil to pass into the compressor.

The valve may be inspected by removal and disassembly.

Oil Return Line

The oil return line tubing (Figure 22) serves to visually ascertain that any oil accumulation at the bottom of the air/oil separator is being removed. This tubing should be observed daily (during operation) for an indication of oil flow, a light air/oil mist is normal. If the tube shows completely full of oil, it indicates that the oil line is clogged and oil is not being removed. If the tube shows no flow at all, the oil line may be clogged or the drop tube may not be properly "bottomed" in the separator element. This results in excessive oil consumption and oil in service lines. If clogging is indicated, remove and clean the orifice (Figure 22) by blowing with a reverse flow of air. The plastic tubing will sometimes discolor with age due to the lubricant. If it becomes impossible to distinguish oil flow in the tube, it will be necessary to clean the tube or replace it. A bright light placed behind the tube may also reveal oil flow in a discolored tube.

NOTICE

A NEW AIR/OIL SEPARATOR MAY NOT SHOW OIL IN TUBING FOR APPROXIMATELY THE FIRST 90 HOURS OF OPERATION.

Control Valve

Proper adjustment of the control valve can be ascertained when on rising pressure venting starts, at the control valve vent hole, immediately after discharge pressure reaches the low limit of the control range. For example, if a machine has a maximum operating pressure of 110 psig, the normal control range is from 100 psig to 110 psig. Thus, venting should start at 100 psig.

If the control pressure is indicated too soon, turn the adjustment screw inward to raise the level at which the control pressure starts. Turn the screw outward to start the control pressure at a lower level.

There are three operating conditions under which control valve venting will vary as follows:

1. When the compressor is operating within the Normal Control Range, venting will modulate — that is, low venting will indicate that the inlet valve is open wide. As venting increases, the inlet valve will gradually close.
2. When the compressor reaches its maximum operating limit, it will be unloaded by action of the air pressure switch and venting will, in a short period, stop.
3. At any time that the compressor is operating at a pressure below the Normal Control Range, there should be no venting.

NOTICE

IF THE AIR PRESSURE SWITCH SETTING IS CHANGED, READJUST THE CONTROL AIR VALVE. ALSO TIGHTEN THE LOCKNUT ON THE ADJUSTING SCREW AFTER THE CORRECT SETTING IS OBTAINED.

Air Pressure Switch

The air pressure switch is factory set to the limit indicated on the compressor nameplate. It may be set lower if desired, however, it will keep the minimum pressure valve shut if set below 70 psig. The normal control range is 10 psi. See instructions inside cover of switch for details on adjustment.

Time Delay Relay

The time delay relay, (Figure 9), is set at the factory for a minimum delay of 20 minutes. It can be reset for a longer delay. See Section 1.

Minimum Pressure Valve

The minimum pressure check valve is designed to open at approximately 70 psig. It is not intended to be adjustable.

CAUTION

WHEN REMOVING AIR END **OR** MOTOR, **SUPPORT** THE REMAINING COMPONENTS. FAILURE TO COMPLY WITH THIS WARNING CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

TABLE A

RECOMMENDED TORQUE SPECIFICATIONS

CAPSCREW		TIGHTENING TORQUE	
SIZE	GRADE	DRY	LUBRICATED
1/4-20 UNC	5	96 IN LBS	75 IN LBS
5/6-18 UNC	5	17 FT LBS	13 FT LBS
3/8-16 UNC	5	30 FT LBS	23 FT LBS
1/2-13 UNC	5	75 FT LBS	55 FT LBS
5/8-11 UNC	5	150 FT LBS	110 FT LBS
3/4-10 UNC	5	260 FT LBS	200 FT LBS
*3/4-10 UNC	8	380 FT LBS	280 FT LBS

* These are sump head capscrews

MAINTENANCE SCHEDULE

INTERVAL	ACTION
PERIODICALLY DURING OPERATION	1. CHECK ROTOR COOLANT INJECTION PRESSURE 2. CHECK ROTOR COOLANT INJECTION TEMPERATURE 3. CHECK DISCHARGE AIR TEMPERATURE 4. CHECK DISCHARGE AIR PRESSURE 5. CHECK DELIVERY AIR TEMPERATURE 6. CHECK NORMAL OPERATION 7. CHECK AIR FILTER VISUAL INDICATOR 8. CHECK OIL FILTER VISUAL INDICATOR 9. CHECK AIR/OIL SEPARATOR INDICATOR 10. CHECK DELIVERY AIR PRESSURE
DAILY OR EVERY 10 OPERATING HOURS (PRIOR TO START-UP)	1. DRAIN CONDENSATE FROM OIL SUMP 2. MAINTAIN OIL LEVEL AT CENTER OF SUMP SIGHT GLASS
6 MONTHS OR EVERY 1000 OPERATING HOURS	1. CHANGE COMPRESSOR OIL OR AS INDICATED BY OIL SAMPLING PROGRAM 2. CHANGE OIL FILTER ELEMENTS 3. OIL SAMPLE, UNLESS OTHERWISE INDICATED BY LAB.
PERIODICALLY OR AS REQUIRED	1. INSPECT AIR INTAKE FILTER ELEMENT FOR CLOGGING 2. LUBRICATE WATER TEMPERATURE REGULATING VALVE STEM 3. CHECK COOLING WATER HEAT EXCHANGERS 4. CHECK FOR CLEANLINESS OF HEAT EXCHANGERS (AIR COOLED) 5. CHECK MACHINE FOR OIL LEAKS, LOOSE FASTENINGS/ CONNECTIONS AND CONDITION OF HOSE. CORRECT OR REPLACE AS NECESSARY.

FIGURE 23
Maintenance Schedule

82-41A

SECTION 4

TROUBLE SHOOTING & TESTING

TROUBLE SHOOTING

INTRODUCTION

This section contains instructions for trouble shooting the equipment following a malfunction to permit selection of the maintenance procedure which must be utilized to restore the equipment to operating condition.

The troubleshooting procedures to be performed on the equipment are listed (SEE TROUBLE SHOOTING CHART). Each symptom of trouble for a component or system as listed is followed by a list of probable causes of the trouble and suggested procedures to be followed to eliminate the cause.

In general, the procedures listed should be performed in the order in which they are listed, although the order may be varied if the need is indicated by conditions under which the trouble occurred. In any event, the procedures which can be performed in the least amount of time and with the least amount of removal or disassembly of parts should be performed first.

AUTOMATIC SHUTDOWN

If the compressor discharge temperature exceeds 235°F., the unit will automatically shut down. To determine the cause of this excessive high discharge temperature, SEE CHART.

It should be noted that the recommended water flow in "Specifications" is based on 80°F. inlet water. Should the inlet temperature be significantly less than 80°F., the recommended water flow could result in a cold boundary layer of oil insulating the hot oil from the cold water. In this case the water flow should be reduced to prevent over temperature shutdown. See "Cooling Water", Section 1.

FREQUENT SEPARATOR PLUG-UP OR COLLAPSE

If the separator element has to be replaced frequently because it is plugging up, it is an indication the compressor oil filter is faulty, oil is breaking down, or dirt is entering the inlet system.

Oil Filter

1. Make sure filter has the correct element.
2. Make sure filter is not leaking.

Oil Breakdown (Causes)

1. Extreme operating conditions such as high compressor discharge temperature and high receiver pressure.
2. Wrong type of oil.
3. Ingestion of chemically active gases.

Inlet System

1. Check all piping joints leading to inlet valve for leaks.
2. Check air filter element for breaks.

If the separator element collapses, it could be an indication the element is plugging and should be treated as outlined above.

Starting-up in cold ambient conditions when the unit has an immediate air demand can collapse the element. Allow unit to warm-up.

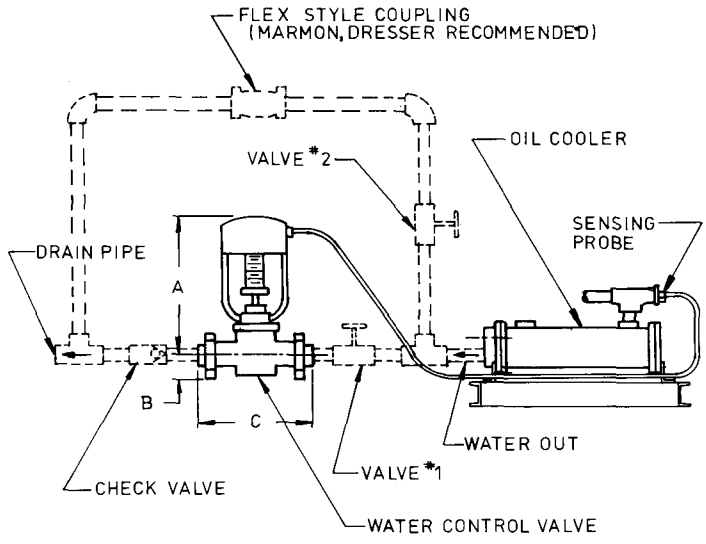
TROUBLE SHOOTING CHART

SYMPTOM	PROBABLE CAUSE
FAILURE TO START	1. MAIN SWITCH DISCONNECTED 2. POWER FAILURE 3. SAFETY CIRCUIT SHUTDOWN 4. FAULTY START SWITCH OR CONNECTION 5. OVERLOADS OUT 6. RESET BUTTON OUT 7. FAULTY ICR COIL 8. ON WYE-DELTA UNITS, BUTTERFLY VALVE IS NOT CLOSED
HIGH AIR TEMPERATURE SWITCH (W/C UNITS) AUTOMATIC SHUTDOWN	1. LOW SUMP OIL LEVEL 2. CLOGGING TUBES OR HEATERS 3. LEAKY THERMAL BY-PASS VALVE 4. PLUGGED OIL FILTER 5. INSUFFICIENT SUPPLY OR COOLING WATER 6. HIGH AIR TEMPERATURE SWITCH
HIGH AIR TEMPERATURE SWITCH (A/C UNITS) AUTOMATIC SHUTDOWN	1. LOW SUMP OIL LEVEL 2. LEAKY THERMAL BY-PASS VALVE 3. RESTRICTION OF HEAT EXCHANGER AIR FLOW 4. PLUGGED OIL FILTER 5. HIGH AIR TEMPERATURE SWITCH
IMPROPER LOW DISCHARGE PRESSURE *IMPROPER HIGH DISCHARGE PRESSURE	1. EXCESSIVE AIR DEMAND 2. SERVICE VALVE OPEN 3. LEAKY SERVICE LINE 4. IMPROPER INLET VALVE OPENING* 5. PLUGGED AIR CLEANER 6. FAULTY SAFETY VALVE* 7. PLUGGED UP OIL SEPARATOR 8. MALAJUSTED CONTROL VALVE 9. MALAJUSTED AIR PRESSURE SWITCH*
EXCESSIVE OIL CONSUMPTION	1. OVERFILLED OIL SUMP 2. BROKEN OIL LINE 3. PLUGGED OIL RETURN LINE 4. OIL RETURN LINE NOT BOTTOMED IN SEPARATOR 5. OPERATING BELOW RATED PRESSURE 6. FAULTY COMPRESSOR SHAFT SEAL 7. DAMAGED SEPARATOR
FREQUENT SEPARATOR PLUG-UP	1. DIRT IS ENTERING THE INLET SYSTEM 2. FAULTY AIR FILTER ELEMENT 3. FAULTY OIL FILTER 4. OIL IS BREAKING DOWN OR OF WRONG VISCOSITY
HIGH DISCHARGE AIR TEMPERATURE SHUTDOWN	1. LOW SUMP OIL LEVEL 2. PLUGGED OIL FILTER ELEMENT 3. INSUFFICIENT AIR CIRCULATION AT A/C OIL COOLER 4. PLUGGED OR DIRTY OIL COOLER FINS 5. CONTAMINATED WATER COOLED OIL COOLER 6. INSUFFICIENT COOLING WATER (W/C) 7. LEAKY THERMAL VALVE

FIGURE 24
Trouble Shooting Chart

SECTION 5

OPTIONAL EQUIPMENT



Compressor Model Size	Recommended Water Drain Pipe Size	Water Control Valve Part Number	Water Control Valve Size	Dimensions A	B	C
TA-990/1025/1150/1250	1¼"	00543276 0012	1¼"	15¼"	3	7"
TA-1225/1325/1350/1500	1¼"	00543276 0012	1¼"	15¼"	3	7"
TA-1575/1600/1700/1750	1¼"	00543276 0012	1¼"	15¼"	3	7"

FIGURE 25
Water Control Valve Installation
(Temperature Regulator Valve)

INTRODUCTION

This section contains information for optional equipment that may be supplied with your compressor. Coverage of equipment other than that supplied may also be included. Check the identification plate or decal on each piece of equipment to ascertain applicable instructions. The service requirements of these components should be included with your Periodic Maintenance Schedule as outlined in Section 3.

A temperature regulating valve may be included in the cooling system to automatically regulate the cooling water flow as necessary to maintain the desired compressor operating temperature. This valve is located in the outlet water supply piping. It thermostatically modulates the water flow in response to a sensing element located in the oil outlet from the oil cooler. The valve has been factory adjusted to maintain the compressor operating temperature at approximately 90° above ambient.

An additional feature of the temperature regulating valve is that by constant modulation, maximum efficiency of the water supply is assured; thus, the amount of water used is maintained at a minimum. Upon shutdown the valve will slowly close in response to the oil temperature.

To install water control valve see Figure 25, remove plenum panel (on right side of water service connections) by taking out the four screws that hold it in place. Remove plug from tee in discharge oil port of oil cooler and install sensing probe. Careful attention to the installation instructions included with the probe will insure correct operation of the valve. It may also be necessary to remove the enclosure panel to the left of the water connections. Place capillary tube in split grommet in support panel. Replace enclosure panel and install water control valve.

NOTICE

SUGGEST GATE TYPE VALVES, OPEN NO. 2 AND CLOSE NO. 1 FOR WATER BY-PASS.

NOTICE

SUGGEST GATE TYPE VALVES, OPEN NO. 2 AND CLOSE NOS. 1 AND 3 FOR AIR BY-PASS.

DOOR INTERLOCK SOLENOID

Complies with California Code. This solenoid prevents the control center door from being opened when the main power is connected to the compressor.

WATER SOLENOID VALVE

Automatically shuts off water supply when compressor is shut down. This is designed to be installed downstream from the coolers.

TOUCH-UP PAINT

An aerosol can of paint matching the compressor.

NEMA 4 CONTROLS

This option is factory mounted upon request for those applications requiring water-tight and dust-tight electrical controls and instrument panel.

COPPER-NICKEL HEAT EXCHANGERS

Copper-nickel tube and tubesheets are available on water cooled applications.

NOTICE

FOR COMPLETE DETAILS REGARDING OPTIONAL EQUIPMENT, CONTACT YOUR JOY REPRESENTATIVE. ALSO, DETAILS REGARDING INSTALLATION OF THESE OPTIONS WILL BE PROVIDED.

JOY MANUFACTURING COMPANY
INDUSTRIAL COMPRESSOR GROUP
MICHIGAN CITY, INDIANA 46360

Gardner Denver

For additional information contact your local representative or
Gardner Denver Machinery Inc., Customer Service Department,
1800 Gardner Expressway, Quincy, Illinois 62301
Telephone: (800) 682-9868 FAX: (217) 224-7814

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