

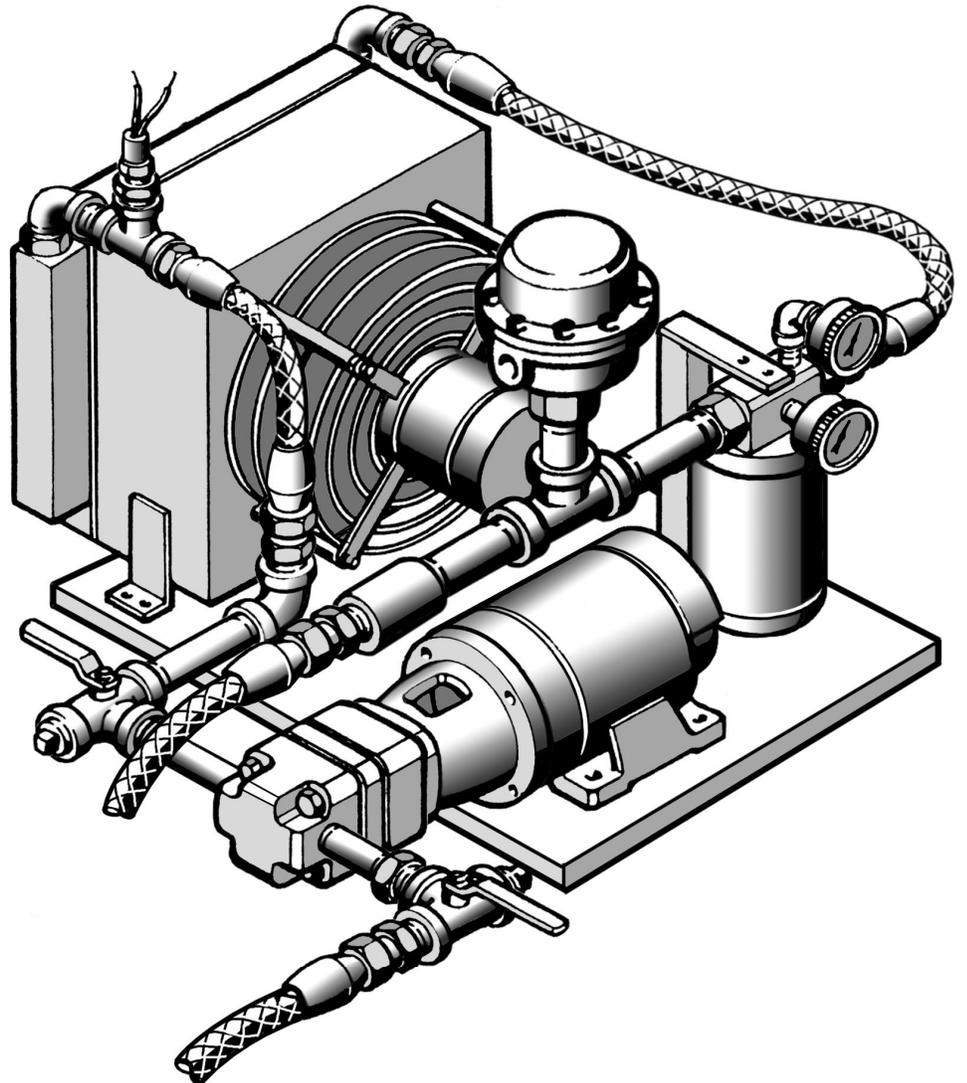


502-EC-001-01

# SERVICE MANUAL

FOR

## ***“Oil-to-Air” Fan Cooled External Cooling System***



**WARNING - Read this manual before any installation, maintenance or operation.**



**FORCE CONTROL INDUSTRIES, INC.**

**MANUFACTURERS OF MECHANICAL AND  
ELECTRICAL POWER TRANSMISSION EQUIPMENT**

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Force Control Industries, Inc. ("Force Control") warrants its products to be free from defects in material and workmanship under normal and proper use for a period of one year from the date of shipment. Any products purchased from Force Control that upon inspection at Force Control's factory prove to be defective as a result of normal use during the one year period will be repaired or replaced (at Force Controls' option) without any charge for parts or labor. This limited warranty shall be void in regard to (1) any product or part thereof which has been altered or repaired by a buyer without Force Control's previous written consent or (2) any product or part thereof that has been subjected to unusual electrical, physical or mechanical stress, or upon which the original identification marks have been removed or altered. Transportation charges for shipping any product or part thereof that the buyer claims is covered by this limited warranty shall be paid by the buyer. If Force Control determines that any product or part thereof should be repaired or replaced under the terms of this limited warranty it will pay for shipping the repaired or replaced product or part thereof back to the buyer. EXCEPT FOR THE EXPRESS WARRANTY SET OUT ABOVE, FORCE CONTROL DOES NOT GRANT ANY WARRANTIES EITHER EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR USE. The warranty obligation set forth above is in lieu of all obligations or liabilities of Force Control for any damages. Force Control specifically shall not be liable for any costs incurred by the buyer in disconnecting or re-installing any product or part thereof repaired or replace under the limited warranty set out above. FORCE CONTROL EXPRESSLY EXCLUDES ALL LIABILITY FOR ANY INDIRECT OR CONSEQUENTIAL DAMAGES THE BUYER MAY SUSTAIN IN CONNECTION WITH THE DELIVERY, USE, OR PERFORMANCE OF FORCE CONTROL PRODUCTS. Under no circumstances shall any liability for which Force Control is held responsible exceed the selling price to the buyer of the Force Control products that are proven to be defective. This limited warranty may be modified only in writing signed by a duly authorized officer of the company. This limited warranty applies exclusively to Force Control products; warranties for motors and gear reducers and other component parts may be provided by their respective manufactures. Any legal action for breach of any Force Control warranty must be commenced within one year of the date on which the breach is or should have been discovered.

A Return Goods Authorization (RGA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. Force Control will pay the shipping costs of returning the owner parts that are covered by warranty.

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# Table of Contents

<b>Section 1 - System Description</b> . . . . .	1	<b>Section 4 - Motor Lubrication</b> . . . . .	4
1-1 System Description . . . . .	1	4-1 Lubrication . . . . .	4
<b>Section 2 - Installation</b> . . . . .	1	A. Re-Lubrication Intervals . . . . .	4
2-1 Receiving the Unit . . . . .	1	B. Type of Lubricant . . . . .	4
2-2 Electrical . . . . .	1	C. Lubrication Procedure . . . . .	4
A. Recommended System Interlock/Switch Handling . . . . .	1	<b>Section 5 - Ordering Repair Parts</b> . . . . .	4
B. Motor Wiring . . . . .	1	5-1 Drive Motors . . . . .	4
C. Temperature Switches . . . . .	1	5-2 Ordering Replacement Parts . . . . .	4
2-3 Plumbing . . . . .	2	5-3 Name Plate and Model Numbers . . . . .	4
Air Cooled Drive . . . . .	2	Figure 7 - External Cooling System . . . . .	5
2-4 Final Check and Fill . . . . .	2		
<b>Section 3 - Maintenance</b> . . . . .	2		
3-1 Fluid Filters and Indicators . . . . .	2		
A. Dirty Filter Indicators . . . . .	2		
B. Replacing the Fluid Filter Element . . . . .	3		
3-2 Heat Exchanger Air Filter . . . . .	3		
3-3 Cooling Fluid Pump Motor . . . . .	3		
3-4 Coolant Pump . . . . .	3		
3-5 Flow Switch . . . . .	3		

## Section 1 SYSTEM DESCRIPTION

### 1-1 SYSTEM DESCRIPTION

(See Figure 1)

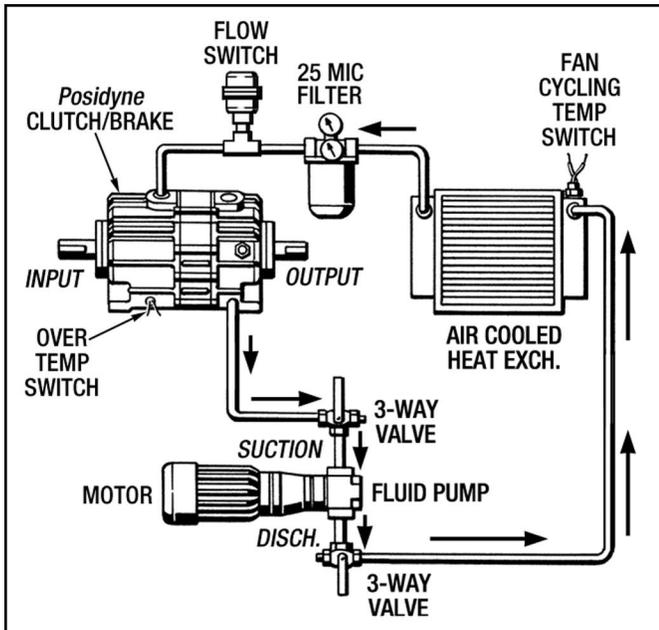


Figure 1 - System Components

The optional **External Cooling System** is a self contained hydraulic pump, oil to air heat exchanger, 25 mic. filter and related equipment designed to take the heated and aerated fluid from the drive. It cools and filters it and returns it to the drive to be reused. When connected with a drive it becomes a complete system. The drive either transmits torque from a prime mover to a driven load for acceleration and running or provides torque for deceleration and holding the load (or both). In either case heat is developed during the dynamic (slipping) condition. The **External Cooling System** completes the system by assuring the sufficient cooled fluid is always present to keep the working surfaces in the drive stack(s) both cool and lubricated at all times. Figure 1 above shows a typical **External Cooling System** with the following components:

1. **Main Fluid Pump** - A gear type pump is basically used for this external cooling system.
2. **Heat Exchanger** - The heat exchanger is a fan cooled oil-to-air type.
3. **Fan Cycling Temperature Switch** - This is wired to turn the fan on when a high temperature condition exists. This is installed on the Heat Exchanger and set to 120° F.
4. **Over Temperature Switch** - Installed in the *Posidyne* sump and should be set to 180° F. to 200° F.
5. **Filter System** - A standard spin-on 25 mic filter is used for systems with a flow capacity of less than 60 GPM. Vacuum gauges or a dirty filter indicator is included to identify a dirty filter. A ball valve arrangement is used to allow use of the filter system to pump old fluid out of the clutch/brake unit and new fluid in. Fluid coming in is pumped through the filter before going into the clutch/brake unit.

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## Section 2 INSTALLATION

### 2-1 RECEIVING THE UNIT

Check the unit for shortage or damage immediately after arrival. Prompt reporting to the carrier's agent, with notations made on the freight bill; will expedite satisfactory adjustment by the carrier. If the unit is not to be installed and operated soon after arrival, store it in a clean, dry place having slow, moderate change in ambient temperature.

Turn motor shaft every six months for bearing protection while the unit is in storage. If the motor has been in storage for an extended period, the insulation should be checked with a megohm-meter. See motor manufacturers instructions.

### 2-2 ELECTRICAL

#### A. Recommended System Interlock/Switch Handling (See Figure 2)

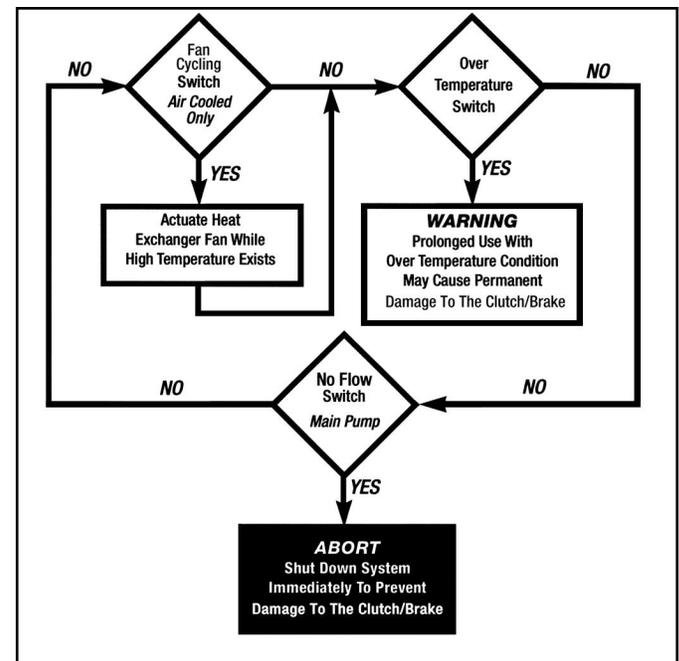


Figure 2 - Recommended System Interlock/Switch Handling

#### B. Motor Wiring

Check power supply to make certain that voltage, frequency and current carrying capacity are in accord with the motor nameplate.

Connect the motor to the power supply according to the diagram on the connection plate. Connections should be clean and tightly bolted. **Important-Set the motor rotation as shown in Figure 7.** To reverse the direction of rotation of a three-phase motor, interchange any two of the line wires to the motor leads.

#### C. Temperature Switches

The **Fan Cycling Temperature Switch** is to be wired in series with the motor starter for 3-phase motors.

The **Over Temperature Switch** is to be wired to a warning light or alarm to indicate an over temperature condition

Use N.O. connections and tape unused wire.

**Both Temperature Switch Wiring Colors are as follows:**

- N.O. - Brown
- Common - White
- N.C. - Yellow

Provide adequate space around the heat exchanger for unrestricted flow of air at entrance to the fan and discharge from the coil.

After initial wiring of fan, start the fan momentarily and disconnect it. Observe the rotation of the blade to be sure rotation is in proper direction. Do not allow the fan to run backward except momentarily.

**CAUTION; Do not remove fan guard except when fan is not running and power is disconnected.**

**2-3 PLUMBING**

Check installation drawings for location and sizes of connections for the interconnecting lines. The lines may either be hose or black pipe. In either case clean pipe fittings and/or hose insides thoroughly before installing. Excessive turns or length will cause additional pressure drops in the lines. If this condition exists the lines should be enlarged then reduced as they go into the drive and the External Cooling System..

**Air Cooled Drives**

1. Connect the oil supply line to the *Posidyne* from the Flow Switch. (See Figure 7)

**NOTE:** Without Force Lube the oil supply line will go to the inspection port in the *Posidyne* input housing. With Force Lube the oil supply line will connect to the Swivel Fitting (#299) on top of the *Posidyne* output housing.

2. Connect the drain or return line from the *Posidyne* output housing to the 3-Way Valve on the pump inlet side.
3. Make sure the lines are properly connected from the heat exchanger to the pump and filter.

**2-4 FINAL CHECK & FILL**

1. Before starting the cooling unit, make sure that all lines are hooked up properly and are tight. Check the motor and temperature switch wiring.
2. Fill the *Posidyne* to the proper oil level line on the sight gauge. See the *Posidyne* Drive Manual for oil specs.
3. Bump cooling oil pump motor and check rotation with arrow on pump mounting bracket (See Figure 7). To reverse the direction of rotation of a three-phase motor, interchange any two of the line wires to the motor leads. Start the cooling oil pump to purge air out of the lines and components of the cooling system. Stop the motor and allow oil to drain back to the sump. Check out level and add oil as required. Weekly thereafter (until experience dictates otherwise) check the oil level. When the drive is stationary the oil level should be at the full mark.

Every three months completely drain the oil from the *Posidyne*. If the sight gauge on the *Posidyne* Unit is dirty, it should also be removed and cleaned.

**NOTE:** During the break-in period the oil will turn dark from carbon during the "burnishing-in" period. When this happens, the oil and filter should be changed regardless of the amount of usage.

**Section 3  
MAINTENANCE**

**3-1 FLUID FILTERS AND INDICATORS**

The Fluid Filter uses a 25 micron Filter Element . This type of filter has an internal pressure relief valve set a 25 psi. When the filter element gets too dirty and when the pressure differential reaches 25 psi the filter is completely by-passed and dirty coolant will be allowed to flow through the system. This is a necessary and required feature so the filter element housing can not explode under extreme pressure conditions.

**IMPORTANT-The Fluid Filter Element should be changed approx. 5 to 7 days after initial installation. Monitor the Clean Filter Indicator very closely during this first week.** After this first week check the Clean Filter Indicator periodically and change the filter as condition warrants.

**A. Dirty Filter Indicators**

There are two basic ways to determine when a filter is dirty and needs replaced.

1. **Using (2) pressure gauges installed on the fluid filter.** One on the filter inlet and one on the filter outlet. When the inlet pressure differential reaches 10 psi, it is time to replace the filter element. (See Figure 3)

**NOTE -** All liquid filled pressure gauges are sealed for shipment. They must be vented to atmosphere as per manufacturers instructions on each type of pressure gauge.

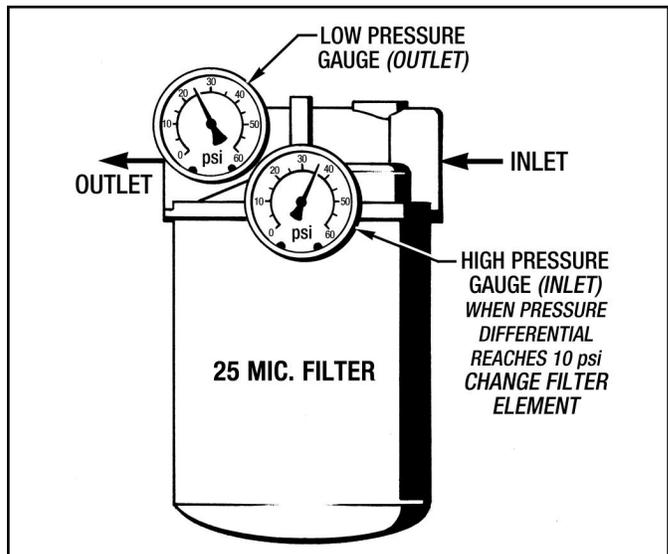


Figure 3 - Fluid Filter and Gauges

2. A Pressure Differential (*Dirty Filter*) Indicator (#201) is installed on the filter as shown in Figure 4.

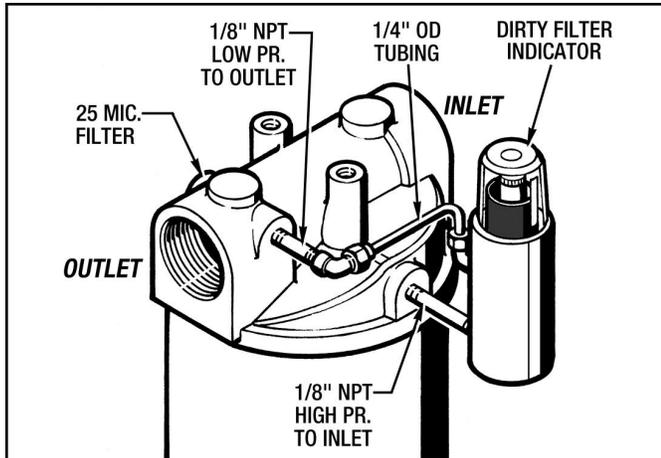


Figure 4 - Installing Dirty Filter Indicator

When the red indicator is showing on top of the Dirty Filter Indicator (#201), it is time to replace the Filter Element (#16). A yellow indicator says that the filter is still clean. (See Figure 5)

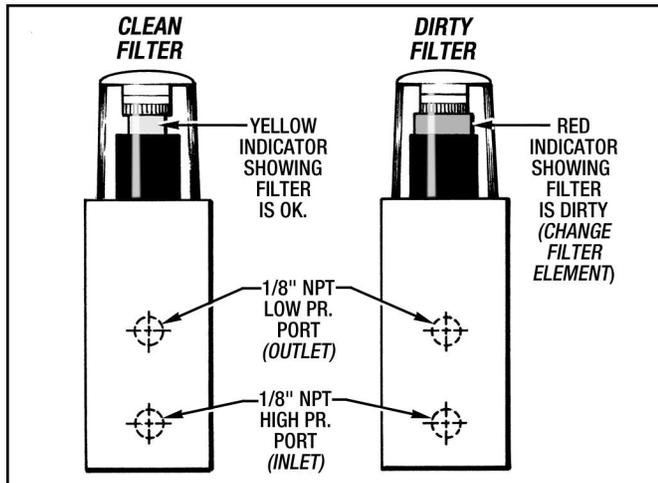


Figure 5 - Dirty Filter Indicator Operation

### B. Replacing the Fluid Filter Element (#16)

1. Turn-off and lock-out power to the pump motor.
 

**NOTE** - When the hydraulic pump is shut down the *Posidyne* load should be locked out.
2. Remove the Filter Element from the Filter Body with a strap wrench, turning it CCW.
3. Check the filter rubber seal ring and if it has become hard or brittle, replace it with a new one the same size. Lubricate the seal groove with a light weight oil first.
4. Screw on the new Filter Element CW by hand until it is fairly tight. Use a strap wrench to turn the element another 3/4 turn of a full rotation. This will insure that the filter will not leak. **Do not over tighten.**

### 3-2 HEAT EXCHANGER AIR FILTER

This air filter is located at the air inlet on the heat exchanger. Periodically clean this air filter as required.

### 3-3 COOLING FLUID PUMP MOTOR

1. **Cleaning and inspection.** A clean motor runs cooler. The motor should be cleaned and inspected at regular intervals. Inspect bearings for roughness by uncoupling the motor from the pump and turning shaft by hand.

**CAUTION** - Open the disconnect switch to the cooling motor and lock out to avoid the possibility of personal injury.

If the bearings feel "rough" or stick in spots, replace them. Always check bearings when any unusual noise or vibration develops in motor.

2. **Lubrication.** See Section 4. Motors with provision for lubrication should be lubricated periodically. For specific lubricating instructions, check lubrication tag on motor or consult manufacturer. Motors with no provision for lubrication are equipped with sealed bearings and require no maintenance.

### 3-4 COOLANT PUMP

1. **Inspection:** Inspect bearings for roughness by uncoupling the pump from the motor and turning shaft by hand. If bearings feel "rough" or stick in spots, replace the pump. Always check bearings when any unusual noise or vibration develops in the pump.

**CAUTION** - Open the disconnect switch to the cooling motor and lock out to avoid the possibility of personal injury

2. **Maintenance:** The manufacturer of this pump recommends only the hydraulic shaft seal be replaced. All other items require matching if they should wear. Therefore, a new pump would be the solution.

### 3-5 FLOW SWITCH

A flow switch is used to prevent running the drive without oil.

If flow is not present in the supply line, the switch will shut down the prime mover until corrections have been made. See Section 2-2-A for electrical hookup. The switch should be wired **normally open**.

**Adjustment:** Remove cap and turn adjusting screw in clockwise direction for a higher velocity switch point. This is only a

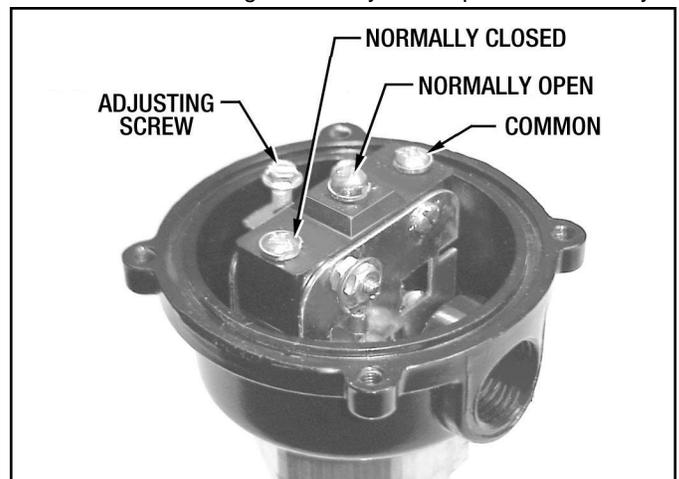


Figure 6 - Typical Flow Switch

typical Flow Switch. Consult the manufacturers Installation and Maintenance Literature for detailed information on proper adjustment procedure. (See Figure 6)

## Section 4 MOTOR LUBRICATION

### 4-1 LUBRICATION

This is a ball bearing motor. No lubrication need be added before start up. The bearings have been lubricated at the factory.

#### A. Re-Lubrication Intervals

The following intervals are suggested as a guide.

HOURS OF SERVICE PER YEAR	H.P. RANGE	SUGGESTED RE-LUBE INTERVAL
5,000	1/8 TO 7-1/2 10 TO 40 50 TO 150	5 YEARS 3 YEARS 1 YEAR
CONTINUOUS NORMAL APPLICATIONS	1/8 TO 7-1/2 10 TO 40 50 TO 150	2 YEARS 1 YEAR 9 MONTHS
SEASONAL SERVICE MOTOR IS IDLE FOR 6 MONTHS OR MORE	ALL	1 YEAR (BEGINNING OF SEASON)
CONTINUOUS HIGH AMBIENT, DIRTY OR MOIST LOCATIONS, HIGH VIBRATIONS, OR WHERE SHAFT END IS HOT (PUMPS - FANS)	1/8 TO 40 50 TO 150	6 MONTHS 3 MONTHS

#### B. Type of Lubricant

Use high quality ball bearing grease. Use consistency of grease suitable for class of insulation stamped on nameplate as follows:

INSULATION CLASS	CONSISTENCY	TYPE	TYPICAL GREASE	FRAME TYPE
A & B	#2	LITHIUM BASE	SHELL ALVANIA	215T & Smaller
A & B	MEDIUM	POLYUREA	SHELL DOLIUM	56 & Larger
F & H	MEDIUM	POLYUREA	SHELL DOLIUM R	All

#### C. Lubrication Procedure

If motor is equipped with Alemite fitting, clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes on NEMA 404 frames and larger. On motors having drain plugs, remove grease drain plug and operate motor for 20 minutes before replacing drain plug.

On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 2 to 3 inch length of grease string into each hole on motors in NEMA 215 frame and smaller. Insert 3 to 5 inch length on larger motors. Motors having grease drain plugs, remove plug and operate motor for 20 minutes before replacing drain plug.

**CAUTION: Keep grease clean. Lubricate motors at stand-still. Remove and replace drain plugs at stand-still. Do not mix petroleum grease and silicone grease in motor bearings.**

## Section 5 REPAIR PARTS

### 5-1 DRIVE MOTORS

The motors used with these Drive Units are standard and may be repaired or replaced by any qualified motor rebuild facility or supplier.

### 5-2 ORDERING REPLACEMENT PARTS

When ordering replacement parts, please specify all of the following information:

1. **Model Number** (On the name plate.)
2. **Serial Number** (On the name plate.)
3. **Part Name**
4. **Quantity Required**
5. **Complete Shipping Information**

Failure to include information for items 1 thru 5 will only delay your parts order. Unless another method is specified for item 5, parts less than 150 pounds will be shipped United Parcel Service, parts over 150 pounds will be shipped Motor Freight. Air freight and other transportation services are available but only if specified on your order.

**Force Control Industries, Inc.**  
3660 Dixie Highway  
Fairfield, Ohio 45014

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Fax No.: 513-868-2105

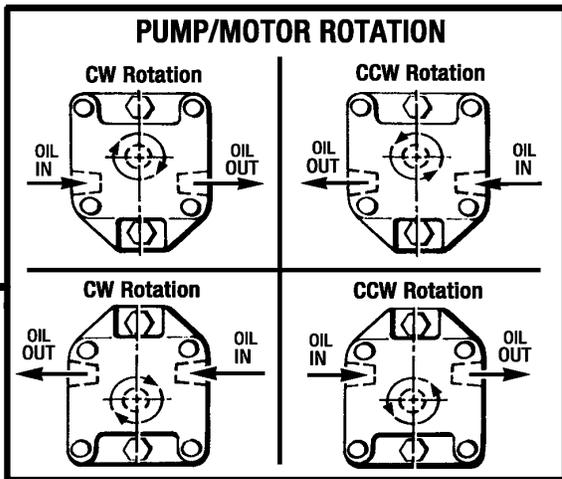
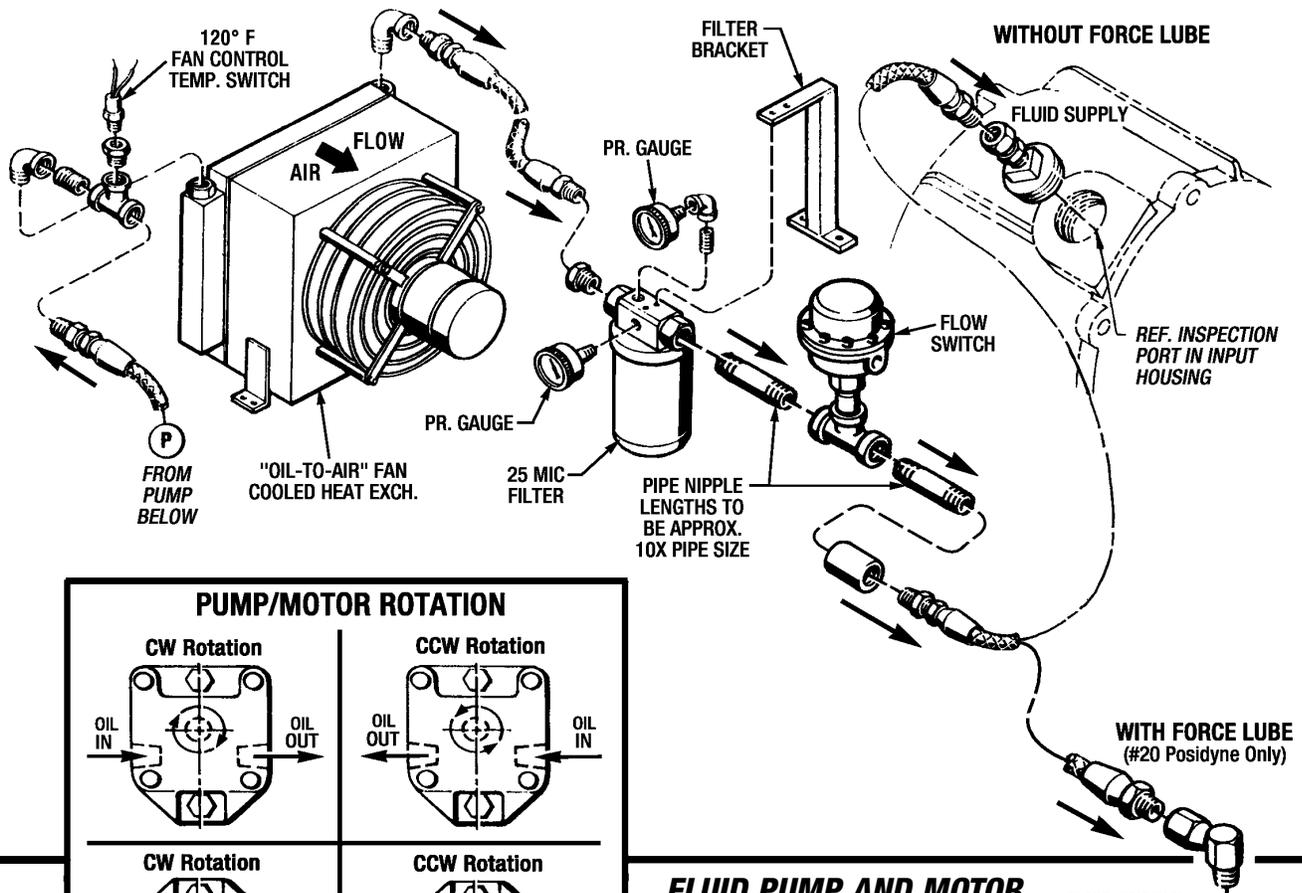
E-Mail: [info@forcecontrol.com](mailto:info@forcecontrol.com)

Web: [www.forcecontrol.com](http://www.forcecontrol.com)

### 5-3 NAME PLATE AND MODEL NUMBERS

<b>Force Control Industries, Inc.</b>	
Fairfield, Ohio	
<b>For Service/Parts Call</b>	
<b>513-868-0900</b>	
	
Model No.	<input type="text"/>
Serial No.	<input type="text"/>
Fluid Type	<input type="text"/>
<b>IMPORTANT: Do not substitute fluid.</b>	

# EXTERNAL COOLING SYSTEM



## FLUID PUMP AND MOTOR

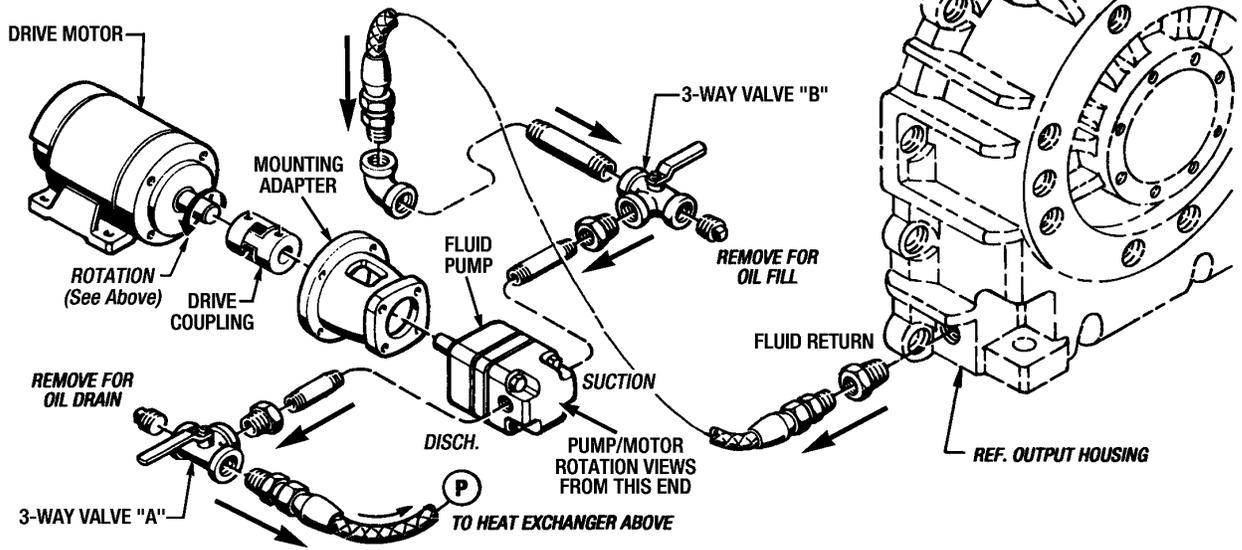


Figure 7 - External Cooling System

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***Worldwide Leader in "Oil Shear" Product Design***

*Providing Today's Industries  
with Oil Shear Clutch & Brake Drives  
and Electronic Drive Systems That Delivers*

- *Flexibility*
- *Performance*
- and ● *Dependability*

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**"BUILT TO LAST - GUARANTEED TO PERFORM"**

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