



502-03/20-001-02

SERVICE MANUAL

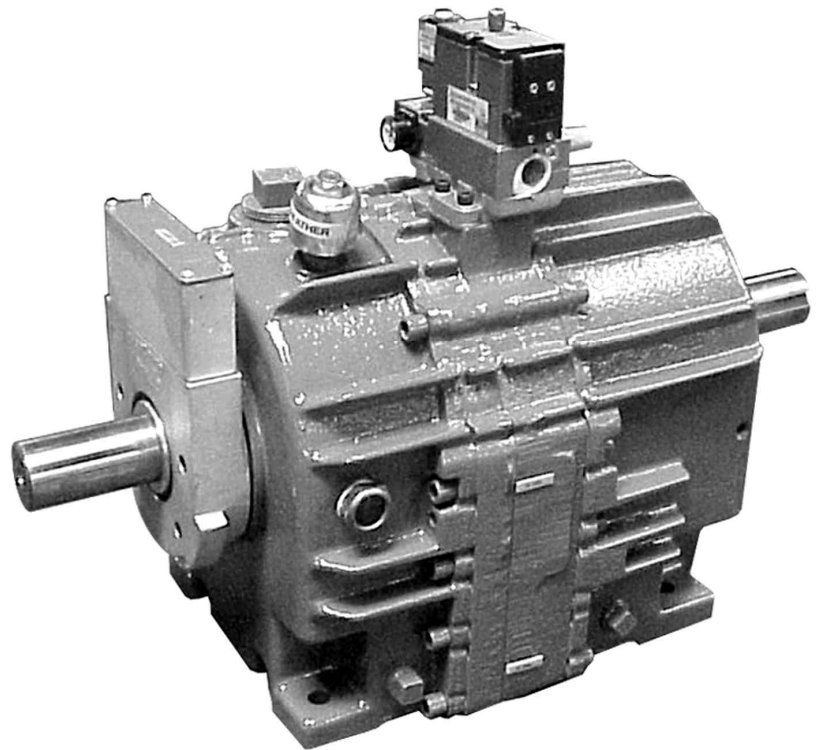
AND

REPAIR PARTS

FOR

Size 03 to 20 Posidyne®

CLUTCH/BRAKE DRIVES



FORCE CONTROL INDUSTRIES, INC.

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

MANUFACTURERS OF MECHANICAL AND ELECTRICAL POWER TRANSMISSION EQUIPMENT

Limited Warranty

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.

Force Control believes that the information in this document is accurate. The document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist, Force Control reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult Force Control if errors are suspected. In no event shall Force Control be liable for any damages arising out of or related to this document or the information contained in it.



Table of Contents

Section 1-DESCRIPTION and OPERATION

1-1	The Oil Shear Principle	1
1-2	Description	1
1-3	Operation	1

Section 2-SPECIFICATIONS

2-1	Model Designations	2
2-2	Specifications	2
	Table 2.1 Operating Specifications	3

Section 3-INSTALLATION

3-1	Receiving the Drive	4
3-2	Mounting the Drive	4
3-3	Compressed Air Connections	4

Section 4-LUBRICATION

4-1	Checking the Oil Level	5
4-2	Oil Capacity	5
4-3	Changing the Oil	5
4-4	Type of Oil	5

Section 5-OPERATIONAL CHECKS

5-1	General Set-Up Instructions	6
5-2	Checking Clutch/Brake Piston Seals and Movement	6
5-3	Checking Clutch/Brake Engagement	6
5-4	Drive Motors	7
5-5	Pneumatic Control	7

Section 6-TROUBLESHOOTING

6-1	Trouble Shooting Chart	7
6-1	Trouble Shooting Chart (Continued)	8
6-1	Trouble Shooting Chart (Concluded)	9
6-2	Checking Clutch/Brake Stacks for Wear	10

Section 7-DISASSEMBLY

7-1	General Disassembly Procedure	11
7-2	Removing C-Face Mounted Drive Motor	11
7-3	Removing Fan Shroud and Fan	11
7-4	Removing Quadrature Encoder	11
7-5	Removal of Quadrature Sensor (#355) and Magnetic Pick-Up (#22)	11
7-6	Removal and Disassembly of Differential Line Driver Encoder	12
7-7	Removing Manifold Mounted Control Valve	12
7-8	Separation and Removal of Major Subassemblies for Access to the Clutch/Brake Stacks	12
7-9	Removal of Water Cooled Heat Exchanger	13
7-10	Input Housing Disassembly (With Male Input Shaft)	13
7-11	Wear Sleeve Removal Procedure	13
7-12	Removing Male Input Shaft from Input Housing	14
7-13	Quill Input Shaft Removal	14
7-14	Piston Housing and Retainer Disassembly	14
7-15	Output Housing Disassembly	15
7-16	Wear Sleeve Removal Procedure (#11 & #14 Only)	15
7-17	Removing Output Shaft from Output Housing	15

Section 8-CLEANING and INSPECTION

8-1	Cleaning and Inspection	17
8-2	Repair and Replacement	17

Section 9-REASSEMBLY

9-1	General Reassembly Instructions	17
9-2	Installing Bearings on Output Shaft	17
9-3	Output Housing Subassembly	18
9-4	Piston Housing and Retainer Subassembly	19
9-5	Input Housing Subassembly (With Male Input Shaft)	19
9-6	Input Housing Subassembly (With Quill Input Shaft)	21
9-7	Installing Water Cooled Heat Exchanger	21
9-8	Measuring and Controlling Stack Depth Dimensions	22
9-9	Reassembly of Major Subassemblies and Clutch/Brake Stacks	22
9-10	Measuring Piston Stroke	23
9-11	Fan and Fan Shroud Installation	24
9-12	Attaching C-Face Mounted Motor	24
9-13	Installing Belt Driven Sheave or Pulley	24
9-14	Installing Manifold Mounted Control Valve	24
9-15	Installing Quadrature Encoder Housing and Pulse Gear	24
9-16	Installing Quadrature Encoder (#355) and Magnetic Pick-Up (#22)	25
9-17	Reassembly and Installation of Differential Line Driver Encoder	26
9-18	Final Reassembly	27

Section 10-ILLUSTRATED PARTS LIST

10-1	General Information	28
10-2	Drive Motors	28
10-3	Factory Rebuild Service	28
10-4	Ordering Replacement Parts	28
10-5	Name Plate	28
	Posidyne Option Availability	28
10-6	Posidyne Model Numbers	29

REPAIR PARTS (Sub-Assemblies)

Figure 10.1	Major Sub-Assemblies and Clutch/Brake Stacks	31
Figure 10.2	Input Housing Sub-Assembly	33
Figure 10.3	Fan Cooling and Water Cooling Options	35
Figure 10.4	Piston Housing and Retainer Sub-Assembly	37
Figure 10.5	Manifold Mounted Valve	37
Figure 10.6	Output Housing Sub-Assembly	39
Figure 10.7	Open Collector Quadrature Encoder	40
Figure 10.8	Differential Line Driver Encoder	41
Figure 10.9	Dimensional Check Chart	42

Section 1

DESCRIPTION and OPERATION

1-1 THE OIL SHEAR PRINCIPLE

Conventional clutches and brakes depend on the friction between solid surfaces operating in air to transmit torque. Friction does the job, but produces a great amount of heat and wear. The *Posidyne* Clutch/Brake units are oil shear drives, with the friction surfaces operating in a bath of oil. The oil molecules tend to cling to each other, and to the friction surfaces. As moving and stationary elements are brought together, a thin but positive film of oil is maintained between them. The oil film is controlled by a clamping pressure and by carefully designed grooves in the elements. Torque is transmitted from one element to the other through the viscous shear of the oil film. So long as there is relative motion between the elements, they are protected by the oil, thus greatly reducing wear. The oil bath also effectively transmits heat away from the friction elements.

1-2 DESCRIPTION

(See Figures 1.1 and 1.2)

In the *Posidyne* Clutch/Brake, the friction surfaces consist of alternate carbon steel plates and advanced friction material on steel discs. The oil control grooves are molded into the friction material disc surfaces. The discs have internal teeth which mate with a spline on the output shaft for both clutch and brake applications. The steel plates are keyed to the input shaft in the clutch and to the housing for the brake when used. The splined sections of the *Posidyne* output shaft contain centrifugal impellers to maintain a positive flow of oil between the discs and plates.

As noted in Section 2, Specifications, standard *Posidyne* units may be equipped with a clutch and a brake, or a clutch only. The Clutch is normally operated by compressed air, although hydraulic pressure can be used. The *Posidyne* brake may be pressure operated, or it may be spring loaded to operate automatically when the clutch is released, or a combination of both springs and pressure.

1-3 OPERATION

The *Posidyne* cross-section (Figure 1.1) shows the drive with the Brake engaged. A nominal braking force is provided by springs located in the Piston Retainer. Heavier springs are used to provide a greater braking force, when needed. Air Assist (as shown), controlled by external valves, also provides a greater braking force. The drive is normally in the Brake Position. The Drive Plates are keyed to the Output Housing and the Friction Discs are splined to the Output Shaft. The Output Shaft is not able to rotate in this Brake Position.

The Clutch is engaged when the air pressure is exhausted from the Brake Port and applied to the Clutch Port. The Piston moves to compress the Clutch Stack on the Input Shaft. The Drive Plates are keyed to the Input Shaft and the Friction Discs are splined to the Output Shaft. This allows both shafts to rotate at the same speed.

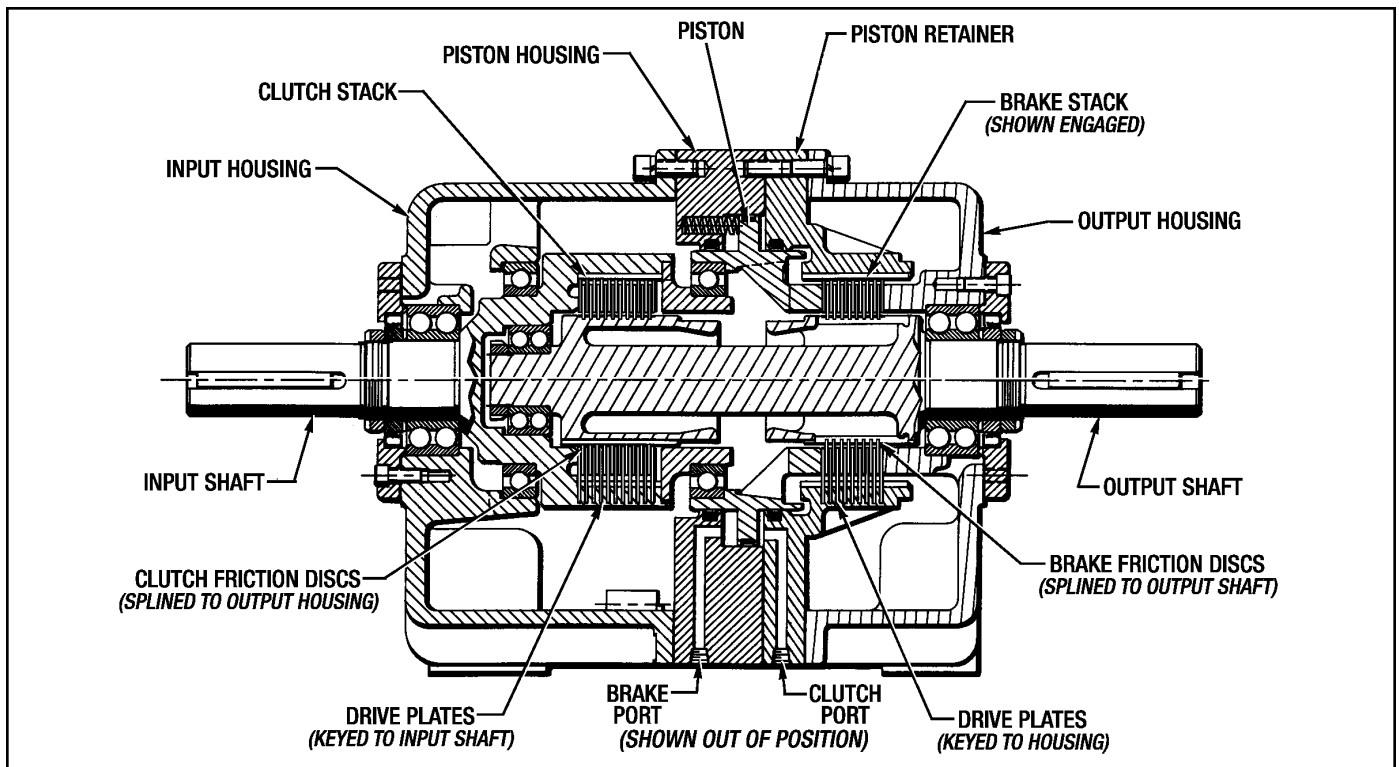


Figure 1.1 - *Posidyne* Clutch/Brake Unit

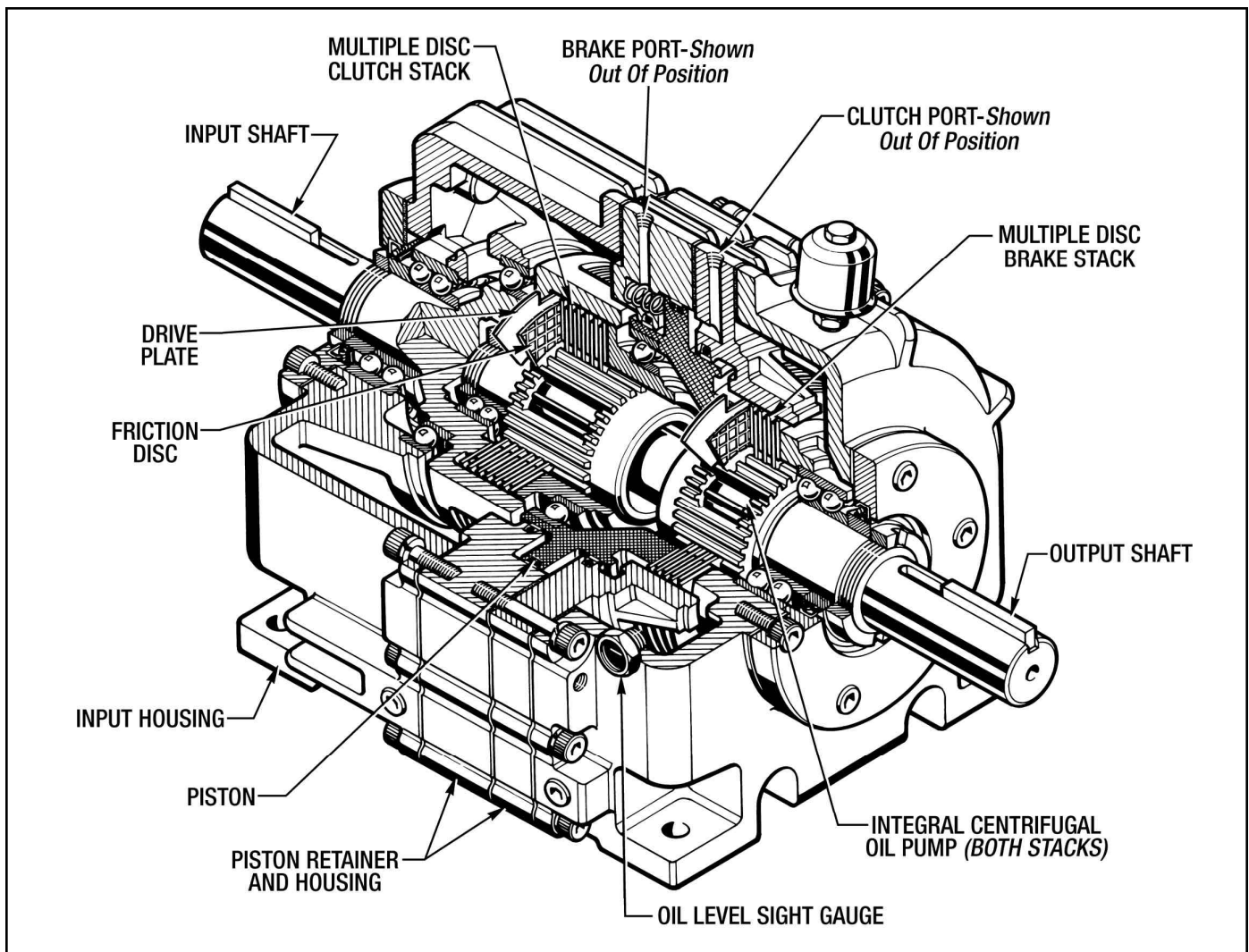


Figure 1.2 - Size 03 to 20 Posidyne Clutch/ Brake Cross Section

Section 2 - SPECIFICATIONS (Posidyne CLUTCH/BRAKE)

2-1 MODEL DESIGNATIONS

The model designations specifies the size (03, 05, etc.) and internal logic type. The types are:

- S** - Pressure actuated clutch, pressure actuated brake.
- SA** - Air set clutch, medium spring set brake with air assist.
- A** - Pressure actuated clutch, medium spring actuated brake (See NOTE following).
- B** - Pressure actuated clutch, heavy spring actuated brake (See NOTE following).
- C** - Pressure actuated clutch, no brake.
- SCP** - Self centered piston, air set clutch and air set brake.

- P** - Pressure actuated clutch and brake, No springs.

NOTE:

Type A and B units both have spring actuated brakes. The difference is that type B units have additional springs.

2-2 SPECIFICATIONS

Operating Specifications for the *Posidyne* Clutch/Brake Drives are listed in Table 2.1

TORQUE RATINGS

The torque ratings listed are based on maximum actuation pressure as specified in the Table 2.1 on the next page.

Table 2.1 OPERATING SPECIFICATIONS - Posidyne Clutch/Brake Units

Size	Logic	Max. Clutch Torque (Lb. In.)			Max. Brake Torque (Lb. In.)					Max. (RPM)		Max. KE per Engmt. (Ft. Lbs.)	Average Thermal HP Cooling*			Air Vol. per Engmt. (In. ³)	Oil Cap. (Qts.)	Inertia of Cyclic Parts (Lb. Ft. ²)
		Static	Dyn.	Max. Air Pr.	Springs Only		With Max. Air Assist			Basic & Fan Cool	Water Cool		Basic Fan Water					
					Static	Dyn.	Static	Dyn.	Max Air Pr.				Basic	Fan **	Water ***			
03	S	2,158	1,856	60 psi	121	104	1,719	1,478	60 psi	1800	3600	21,494	Horizontal .75 2.80 8.00			8	Horiz 3 ----- Vert 4	.20
	SA	2,306	1,983	80 psi	514	444	1,848	1,589	40 psi									
	A	2,368	2,036	80 psi	522	451	---	---	---									
	B	1,530	1,316	80 psi	1,041	899	---	---	---									
	C	2,064	1,775	60 psi	---	---	---	---	---									
	SCP	2,233	1,920	60 psi	---	---	1,518	1,305	60 psi									
	P	2,400	2,064	60 psi	---	---	1,596	1,372	60 psi									
05	S	3,633	3,124	60 psi	176	152	3,380	2,907	60 psi	1800	3600	42,988	Horizontal 1.0 4.50 12.0			8	Horiz 8 ----- Vert 10	.30
	SA	3,792	3,261	80 psi	936	808	3,336	2,869	40 psi									
	A	3,792	3,261	80 psi	936	808	---	---	---									
	B	2,251	1,905	80 psi	1,866	1,611	---	---	---									
	C	3,386	2,912	60 psi	---	---	---	---	---									
	SCP	3,661	3,148	60 psi	---	---	2,942	2,530	60 psi									
	P	4,002	3,442	60 psi	---	---	3,204	2,755	60 psi									
10	S	8,336	7,169	60 psi	619	534	8,848	7,609	60 psi	1800	3600	68,035	Horizontal 1.0 6.00 15.0			12	Horiz 10 ----- Vert 13	.69
	SA	8,253	7,098	80 psi	2,481	2,143	7,968	6,852	40 psi									
	A	8,791	7,560	80 psi	2,366	2,043	---	---	---									
	B	5,030	4,326	80 psi	4,733	4,088	---	---	---									
	C	7,905	6,798	60 psi	---	---	---	---	---									
	SCP	8,501	7,311	60 psi	---	---	7,660	6,588	60 psi									
	P	9,408	8,091	60 psi	---	---	8,244	7,090	60 psi									
11	S	14,220	12,229	80 psi	613	368	11,500	9,890	80 psi	1200	N/A	108,501	Horizontal 4.00**			15	Horiz 10 ----- Vert 13	1.60
	SA	10,314	8,870	80 psi	2,335	1,401	7,778	6,689	40 psi									
	A	10,896	9,370	80 psi	2,354	1,412	---	---	---									
	B	6,234	5,361	80 psi	4,695	2,817	---	---	---									
	C	13,636	11,727	80 psi	---	---	---	---	---									
	SCP	14,424	12,405	80 psi	---	---	10,319	8,874	80 psi									
	P	15,552	13,374	80 psi	---	---	10,888	9,364	80 psi									
14	S	21,453	18,450	80 psi	1,542	1,326	22,055	18,967	80 psi	1200	N/A	170,532	Horizontal 4.00			15	Horiz 10 ----- Vert 13	1.75
	SA	15,478	13,311	80 psi	4,848	4,169	15,104	12,989	40 psi									
	A	15,697	13,499	80 psi	4,725	4,064	---	---	---									
	B	6,714	5,774	80 psi	9,695	8,338	---	---	---									
	C	22,648	19,477	80 psi	---	---	---	---	---									
	SCP	22,851	19,652	80 psi	---	---	18,490	15,901	80 psi									
	P	24,279	20,880	80 psi	---	---	20,544	17,688	80 psi									
20	S	23,229	19,976	80 psi	1,827	1,096	24,915	21,427	80 psi	600 (Basic) 1800 (Fan)	1800	137,221	Horizontal 1.5 8.00 25.0			23	Horiz 25 ----- Vert 30	4.37
	SA	18,348	15,779	80 psi	4,644	2,786	16,188	13,922	40 psi									
	A	20,272	17,433	80 psi	3,538	2,130	---	---	---									
	B	11,910	10,243	80 psi	5,645	3,394	---	---	---									
	C	22,770	19,582	80 psi	---	---	---	---	---									
	SCP	24,377	20,964	80 psi	---	---	21,674	18,640	80 psi									
	P	26,400	22,704	80 psi	---	---	23,088	19,856	80 psi									

NOTES: * - Ratings based on 1800 RPM operating speed and 70° ambient temperature. Higher thermal ratings available with forced lubrication on sizes 03-20. Consult factory with application details.

- Listed air pressures are at maximum. Operating pressures are generally much lower.

** - Size 11 and 14 **Posidyne** rated @ 1200 RPM. Fan cooled only.

*** - Cooling water flow requirements in GPM equals .10 x calculated thermal horsepower load.

Section 3 INSTALLATION

3-1 RECEIVING THE DRIVE

Check the drive 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. When unloading or handling the drive, keep it upright. All Drives are filled with oil, ready to run, when shipped. However, before placing the unit in service or storage, check the oil level to make sure none has spilled out in transit. Add oil if necessary (refer to Section 4 Lubrication). Remove the red plastic plug and install the Air Breather (#45). If the drive is not to be installed and operated soon after arrival, store it in a clean, dry place having slow, moderate change in ambient temperature.

3-2 MOUNTING THE DRIVE

Installation of the Drive should be made in much the same manner, and receive the same care for a precision gear reducer. Standard Drives are designed for horizontal operation only. (Vertical, ceiling and side wall installed units are available.) Note the following precautions when mounting the drive:

1. The Drive should be mounted on a firm, level base or foundation, common with both the driving and driven components.
2. Use SAE Grade 5 Hex Hd. Cap Screws to bolt the drive securely into place. Before tightening down the bolts, check alignment with both the driving and driven machinery, then recheck after tightening.
3. If the input or output shaft is to be directly coupled, use only a flexible coupling (with horsepower service factor 3 to 1) to take care of maximum torque requirements. Make sure that the shafts to be coupled are concentric within 0.005 in. TIR. Check for horizontal, vertical and angular misalignment. Use shims as necessary to correct.

CAUTION:

Do not drive couplings or bushings on shaft.

4. If the Drive is to be connected through a belt, chain or gear drive, locate as close as possible to the housing to minimize overhung loads. Make sure that the sheaves, sprockets or gears are in line and that the shafts are parallel.
5. After the machinery has been in operation for a few hours, make sure that all mounting bolts are tight and recheck the alignment of all components.
6. After machinery has been in operation for 40 hours check the mounting bolts and tighten if necessary.

3-3 COMPRESSED AIR CONNECTIONS

Figures 3.1, 3.2, 3.3 and 3.4 illustrate typical compressed air systems for the Posidyne drives:

See Publication #502-CV-001 for a complete Service Manual and Repair Parts for Pneumatic Control Valves and Accessories.

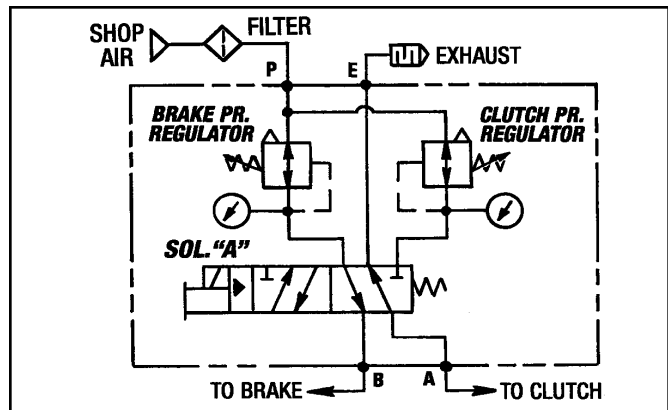


Figure 3.1 - 1PC Control Valve with Sandwiched Regulator - Air operated clutch, Spring-set Brake. (A, B and C Logics)

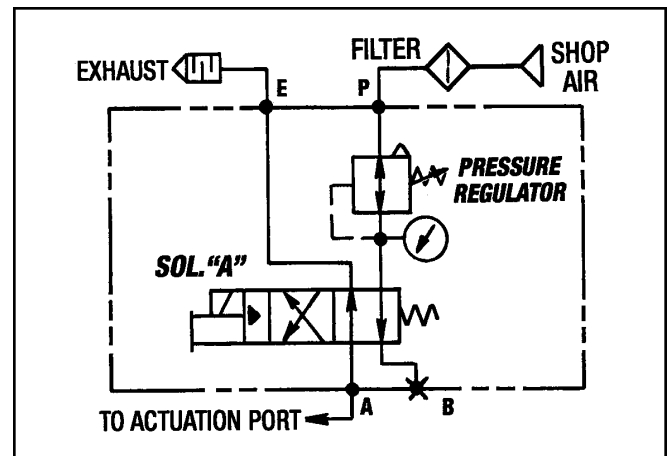


Figure 3.2 - 2PC-3/8 Control Valve with Sandwiched Regulators - Air operated clutch, Spring-set Brake with air assist. (S and SA Logics)

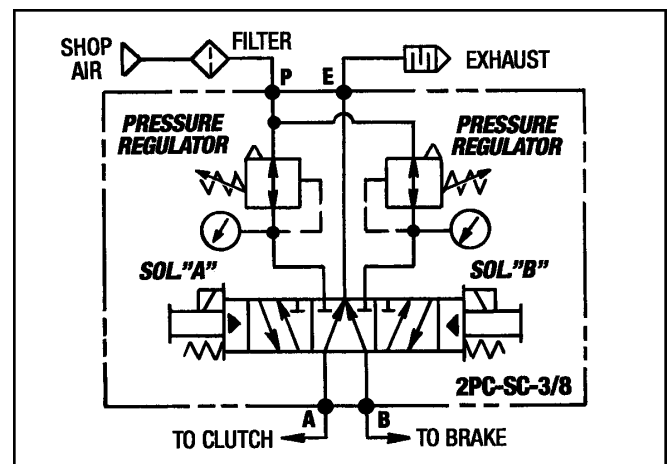


Figure 3.3 - 2PC-SC-3/8 Control Valve with Sandwiched Regulators - Spring Centered Piston, Air operated clutch and brake. (SCP Logic)

Note the following when planning and installing the air system:

1. Use direct acting solenoid air valves or pilot operated valves to give the response speed required. Locate the valves as close as possible to the air inlets on the drive. The valves may be installed directly on the drive if they are supported.
2. Be sure to use valves of at least 1.0 Min. Cv size for the 03 to 10 *Posidyne* and 2.0 Min Cv for 11 & 20 *Posidyne*.
3. The optional accumulators should be used for quick response, particularly if the air line loss and the nature of the air supply is such that recovery is slow. Accumulators can only be used in pneumatic systems where the pressure regulators are installed before the accumulators as shown in Figure 3.4 for the 2PI-3/8 Control Valve. Size the accumulator to be at least 10 times the air required per engagement (See Table 2.1)
4. The air pressure regulator should be sized and set to provide the required torque. (See Table 2.1)
5. Pressure is directly proportional to torque. Use only the pressure necessary. (The clutch is not a variable speed drive. Do not let it slip for extended periods.) This will give additional life to the clutch-brake.
6. After using the drive for a few weeks the acceleration time may increase. Increasing the air pressure will restore the acceleration.

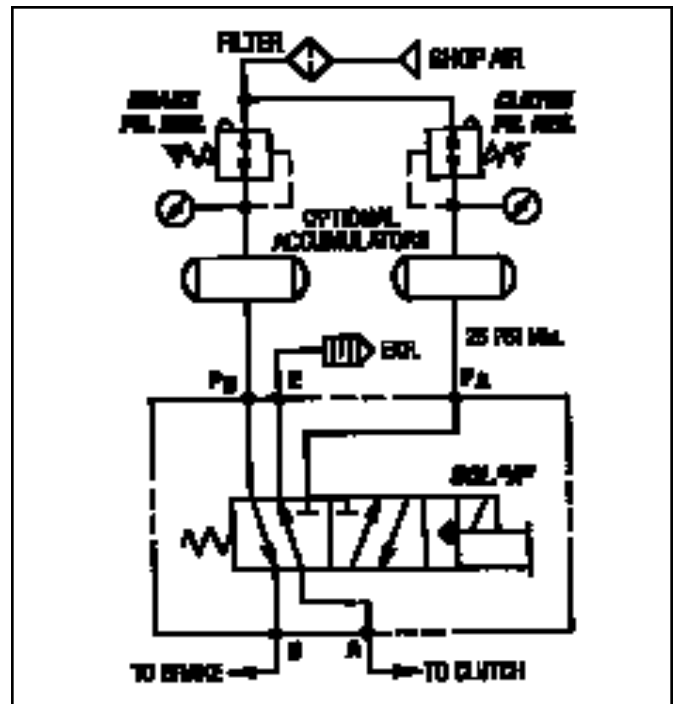


Figure 3.4 - 2PI-3/8 Control Valve without Regulators - Air operated clutch, Spring-set Brake with air assist. (S and SA Logics)

Section 4 LUBRICATION

4-1 CHECKING THE OIL LEVEL

When the drive is installed and weekly thereafter, or until experience dictates otherwise, check the oil level. Always check the oil level with the drive at room temperature and while it is not running.

The drive has an oil sight gauge located at the output end of the drive. The oil level is to be at the center of the gauge.

4-2 OIL CAPACITY

Oil Capacity for the 03-20 *Posidyne* Units are as follows:

<i>Posidyne</i> Size	Horizontal Installation (Quarts)	Vertical Installation (Quarts)
03	3	4
05	8	10
10	10	13
11	10	13
14	10	13
20	25	30

4-3 CHANGING THE OIL

IMPORTANT

Open the disconnects to the drive motors before attempting to change the oil.

Every three months completely drain the oil from the drive using the drain plugs provided. If the oil sight gauge is dirty, it should be removed and cleaned.

Reinstall the drain plugs and refill the drive to the center of the sight gauge with fresh oil.

CAUTION

Do not overfill the Drive Unit. Excess oil will cause the unit to overheat.

4-4 TYPE OF OIL

Use only Mobil Automatic Transmission Fluid ATF-210 (type "F") or Mobil Multi-purpose Automatic Transmission Fluid for most drives. Other fluids may be specified for special applications. Always use the type of fluid specified on the Name Plate.

CAUTION

Use of the wrong type of oil will cause erratic operation, premature wear, damage to the unit and void the Warranty.

Section 5 OPERATIONAL CHECKS

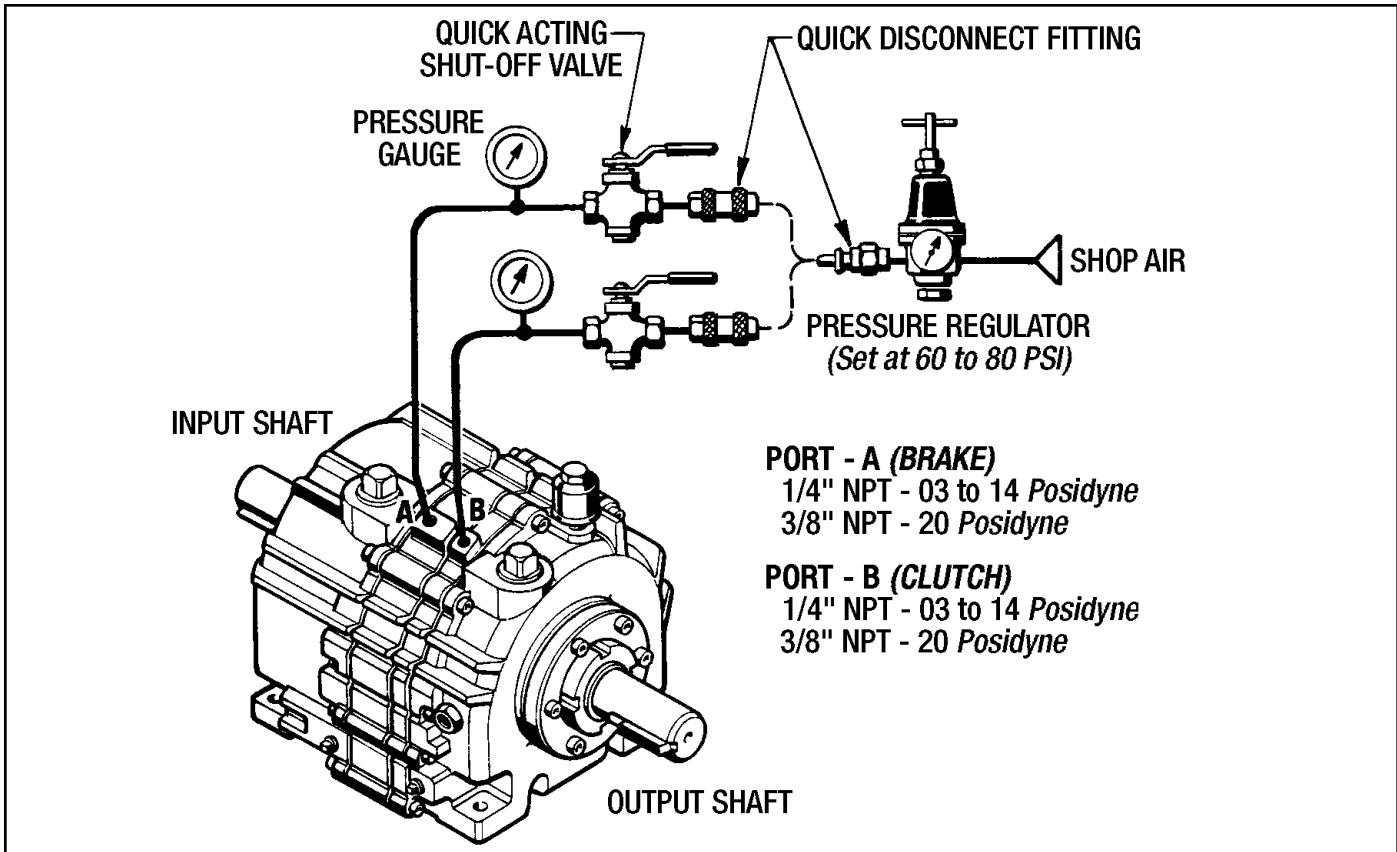


Figure 5.1 - Pneumatic Testing Set-Up for Operational Checks

These Operational Checks are to be made when the Drive Unit is removed from service for repair. Provisions for manually controlled 60 to 80 PSI air pressure must be made for these Operational Checks.

5-1 GENERAL SET-UP INSTRUCTIONS

Assemble a Pneumatic Testing Set-Up similar to the one shown in Figure 5.1

5-2 CHECKING CLUTCH AND BRAKE PISTON SEALS

(See Figure 5.1)

1. Connect the Pneumatic Testing Setup to the Clutch Port and apply shop air to it.
2. Crack the Shut-off Valve until the air pressure reads about 80 PSI on the Pressure Gauge and then quickly shut the air off.
3. Observe the Pressure Gauge to see if the air pressure stays the same or drops. If the pressure stays the same or drops slowly, the Piston Seals are okay. If the pressure drops rapidly (more than 5 PSI in 5 seconds), the Piston Seals are leaking and will need to be replaced.
4. Disconnect the shop air and exhaust the air pressure from the drive unit.

(S, SA and SCP Logic Only) "Air Assist" to Brake

5. Connect the Pneumatic Testing Setup to the Brake Port and apply shop air to it.
6. Repeat Steps 2, 3 and 4.

5-3 CHECKING CLUTCH AND BRAKE ENGAGEMENT OR INPUT SHAFT Vs. OUTPUT SHAFT ROTATION.

(WITH MALE INPUT SHAFTS)

1. When applying air pressure to the Clutch Port, simply rotate the Input Shaft by hand and observe the rotation of the Output Shaft. Likewise, when the air pressure is not applied to the clutch port or when air pressure is applied to the "Air Assist" brake port, the Output Shaft should be locked in the braking position and should not rotate.

With SCP Logic the Output Shaft is free to rotate when air pressure is not applied to the Brake Port. Applying air to the Brake Port should lock the Output Shaft.

(With C-Face Mounted Drive Motor)

If the C-Face mounted drive motor is still attached, then the input shaft is not accessible to be manually rotated to check the Clutch/Brake Stack Engagement and Input Shaft vs. Output Shaft Rotation.

1. Temporally hook-up the drive motor and “Bump” it to check the clutch or brake operating modes and the output shaft rotation.

CAUTION

Do not attempt to run the motor with the inspection plugs (#14) removed. They must first be replaced.

5-4 DRIVE MOTORS

Check wiring connections against the wiring diagram on the Name Plate. “Bump” the motor and check direction of rotation. Check all connections for tightness.

5-5 PNEUMATIC CONTROL

The Pneumatic Control Operational Checks are to be made with Pneumatic Control valves hooked up.

(See Figures 3.1, 3.2, 3.3 and 3.4 for appropriate Pneumatic Control Diagrams.)

1. Shut off air supply, lock it out, and bleed off any trapped air in the system.
2. Insert Diagnostic Pressure Gauges in the air supply between the control valves and the drive. Turn air supply back on.
3. Activate Solenoid Control Valves for desired function.
 - A. Clutch Drive.
 - B. Brake “Air Assist”.
4. Check air pressure with installed diagnostic pressure gauges for each function.
5. Check all electrical connections and the solenoid operation per manufacturer's specifications. With SCP Logic the Output Shaft is free to rotate when air pressure is not applied to the "Brake Port". Applying air should lock the Output Shaft.

Section 6 TROUBLESHOOTING

6-1 TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	REMEDY
Both clutch and brake fail to engage properly.	Electrical control circuit. Low air pressure. Air pressure regulator or piping. Worn friction surfaces. Improper type of oil	Check control circuit. Increase air pressure.** Check for improper operation or leaks. Check parts for wear and replace if necessary. (See Section 6-2) Check name plate and change oil if necessary.
Clutch fails to engage properly.	Electrical control circuit. Valve not functioning properly. Internal air leakage. Low air pressure Worn friction surfaces.	Check control circuit. Check valve operation. Replace if necessary. Check and replace O-Rings and Liners if necessary. Increase air pressure.** Check parts for wear and replace if necessary. (See Section 6-2)

6-1 TROUBLESHOOTING CHART (Continued)

TROUBLE	POSSIBLE CAUSE	REMEDY
Picks up load too quickly.	Air pressure too high. Low oil level.	Reduce air pressure. Check oil level and add if necessary.
Clutch fails to disengage properly.	Electrical control circuit. Valve not functioning properly. Piston sticking-broken return springs.	Check control circuit. Check and replace valve if necessary. Disassemble to extent necessary and inspect for damaged parts.
Noise and vibration	Mounted on poor foundation. Misaligned couplings. Damaged bearings.	Improve installation. Tighten foot bolts. Recheck alignment. Disassemble to extent necessary and inspect for damaged bearings.
Brake fails to engage properly.	Electrical control circuit. Valve not functioning properly. Internal air leakage. Low air pressure Worn friction surfaces. Piston sticking. Weak or broken brake spring.	Check control circuit. Check valve operation. Replace if necessary. Check and replace O-Rings and Liners if necessary. Increase air pressure.** Check parts for wear and replace if necessary. (See Section 6-2) Disassemble to extent necessary and check for damaged parts. Replace spring.
Brake fails to disengage properly.	Electrical control circuit. Valve not functioning properly. Piston sticking.	Check control circuit. Check and replace valve if necessary. Disassemble to extent necessary and inspect for damaged parts.
Drive overheats. (Oil temp. above 225° F.)	Inertia or resistance changed. Improper oil level. Improper type of oil. Water turned off. Fan blocked.	Check with Force Control engineering. Check oil level. Add or drain as needed. Check name plate and change oil if necessary. Check shut-off valve. Clean shroud.

6-1 TROUBLESHOOTING CHART (Concluded)

TROUBLE	POSSIBLE CAUSE	REMEDY
Oil leakage	Oil seal lips damaged. Gaskets Poor ventilation. Seal retainers loose.	Check to see if oil is leaking around shaft and replace if necessary. Tighten all external bolts. Remove breather and clean. Tighten retainer screws.
Oil leakage out breather.	Damaged seal around piston. Oil level too high.	Disassemble and repair. Drain excess oil.
Excessive shaft end play.	Bearings bad.	Disassemble and replace.
Clutch or brake does not repeat.	Air pressure changed. Improper type of oil. *Oil temperature changed. Resistance in machine changed.	Check air pressure and adjust. Check name plate and change oil if necessary. Check temperature. Lubricate bearings.

* - For installations requiring precise starting and stopping, operating temperatures are important. Operating temperatures between 116°F and 165°F are recommended. If the oil is allowed to drop to ambient temperatures overnight, the clutch input shaft should be run approximately 1/2 hour before operating the machinery.

** - Max. Air Pressure
S, P & C Models: 60 PSIG; A & B Models: 80 PSIG; SA Models: 80 PSIG Clutch & 40 PSIG Brake ; SCP Models: 60 PSIG

Zinc anode On all water cooled drives, a brass plug containing a zinc anode is installed in the water line close to one of the water connection ports. **DO NOT REMOVE IT.** The zinc anode is installed to prevent electrolysis damage to the oil cooler. Water supply should enter the oil cooler at the port nearest the zinc anode. The zinc anode should be checked occasionally and replaced before it is completely eroded.

6-2 CHECKING THE BRAKE AND CLUTCH STACKS FOR WEAR

(For Drive Units without a Heat Exchanger)

An easy procedure has been established to visually check the Brake and Clutch Stacks for Wear to determine whether or not they need to be replaced.

Two (2) "Stack Wear" Grooves have been machined in the Input Shaft (#2) Lugs to facilitate this visual check. (See Figure 6.1)

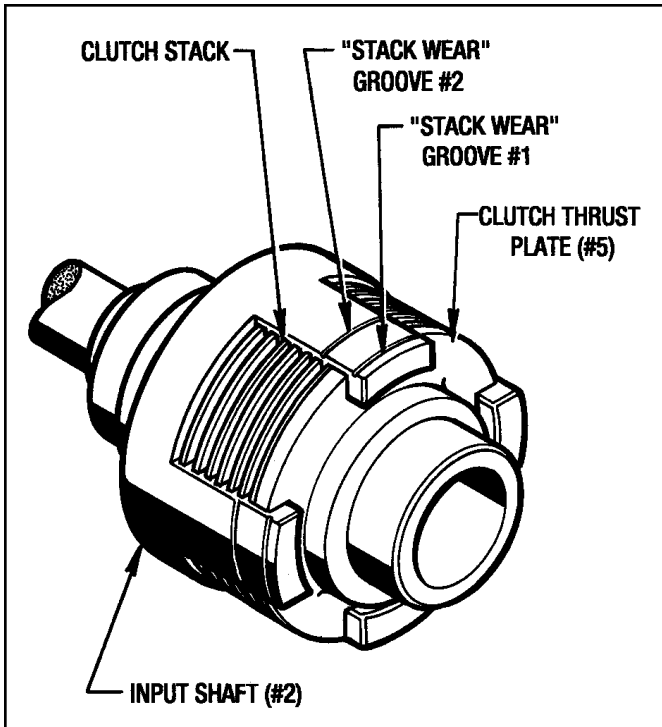


Figure 6.1 - "Stack Wear" Grooves

CAUTION

Disconnect and lock-out all Electrical Power to the Drive Motor. This step must be taken to avoid any possibility of personal injury or damage to the Drive Unit.

1. Remove the Inspection Pipe Plug (#14) from the top of the Input Housing.

A. CLUTCH STACK WEAR

(See Figure 6.2)

2. Apply air pressure to the Clutch Port.
3. Using a flash light, observe the Clutch Stack through the Inspection Port.

If the rear surface of the Clutch Thrust Plate (#5) has moved up to or past the "Stack Wear" Groove #2, the Clutch Stack needs to be replaced.

4. Exhaust the air pressure from the Clutch Port.

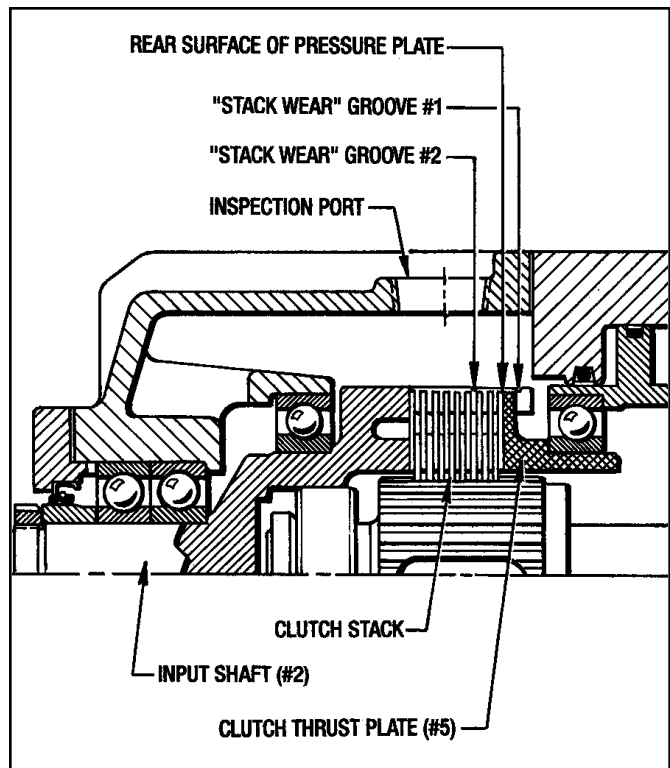


Figure 6.2 - Checking Clutch and Brake Stacks for Wear

B. BRAKE STACK WEAR

(See Figure 6.2)

5. Apply air pressure to the Brake Port.
6. Using a flash light observe the Clutch Stack through the Inspection Port.

If the rear surface of the Clutch Thrust Plate has moved up to or past the "Stack Wear" Groove #1, the Brake Stack is worn and needs to be replaced.

IMPORTANT NOTE:

Even though both the Brake Stack and the Clutch Stack can individually be checked for wear. If either Stack is worn and needs to be replaced, **both Stacks should be replaced as a complete set.** Refer to Section 7 - DISASSEMBLY and Section 9 - REASSEMBLY for Brake and Clutch Stack Replacement.

Section 7 DISASSEMBLY

7-1 GENERAL DISASSEMBLY PROCEDURE

1. Disconnect the Drive and move it to a suitable work area.

NOTES:

1. On Belt Driven or Direct Coupled Units, remove all necessary safety guards, belts, sheaves and couplings
 2. For Water Cooled Units, disconnect water inlet and outlet piping. Drain water from the unit.
 3. Disconnect all necessary pneumatic piping.
2. Remove drain plugs at the bottom of the Drive Unit and drain out all of the oil into suitable container and either save for reuse or discard as conditions warrants.

NOTES:

1. We recommend that you set the Drive Unit on the Output End with the Output Shaft in a vertical down position, for ease of disassembly. Supply suitable bracing and clamping to stabilize the Drive Unit for Disassembly.
2. An overhead crane and a soft sling is also recommended, if necessary, to remove heavy castings and parts.

The *Posidyne* Units are comprised of (3) basic subassemblies and can be disassembled as complete subassemblies for easy access to the Clutch/Brake Stacks. The exploded view drawings are as follows:

1. MAJOR SUBASSEMBLIES and CLUTCH/BRAKE STACKS (*Figure 10.1*)
2. PRIMARY INPUT HOUSING SUBASSEMBLY (*Figure 10.2*)
3. FAN COOLING AND WATER COOLING OPTIONS (*Figure 10.3*)
4. PISTON HOUSING AND RETAINER SUBASSEMBLY (*Figure 10.4*)
5. MANIFOLD MOUNTED VALVE (*Figure 10.5*)
6. OUTPUT HOUSING SUBASSEMBLY (*Figure 10.6*)
7. OPEN COLLECTOR QUADRATURE ENCODER (*Figure 10.7*)
8. DIFFERENTIAL LINE DRIVER ENCODER (*Figure 10.8*)

7-2 REMOVING C-FACE MNTD. DRIVE MOTOR

(See *Figure 10.2*)

(#03 and #05 *Posidyne* ONLY)

1. Attached appropriate sling to the lifting hook on the Drive Motor for support and removal.
2. Remove (4) Hex Hd. Screws (#415) and (4) Lockwashers (#416) from the C-Face Adapter (#200).
3. Slide the motor shaft out of the Quill Input Shaft (#2).

7-3 REMOVING FAN SHROUD AND FAN (See *Figure 10.3*)

(#03, #10, #11, #14 and #20 *Posidyne*)

1. Loosen Jam Nut (#86) from the top of the Fan Shroud.

(#05 *Posidyne* ONLY)

1. Remove (2) Screws (#67) and (2) Washers (#182) from the side of the Fan Shroud.

(ALL MODELS)

2. Remove (2) Screws (#66) from the bottom rear of the Fan Shroud.
3. Pull the Fan Shroud (#24) away from the Input Housing Subassembly.
4. Loosen Set Screws (#70) and remove Fan (#25) from the Input Shaft (#2).
5. Remove both Keys (#180 and #37).

(#11 and #14 *Posidyne* ONLY)

6. Remove Spacer (#183) from the Input Shaft.

7-4 REMOVING QUADRATURE ENCODER

(See *Figure 10.7*)

1. If the 5-Pin Brad Harrison Cable (#259) is still attached, disconnect it at this time.
2. Take the Housing Cover (#253) off by removing (4) Screws (#268).
3. Remove the (4) Screws (#76) and (4) Lockwashers (#257) from the Pick-Up Housing (#17) and pull the housing off the Output Housing.

NOTES:

1. On the #20 *Posidyne* there are only (2) Screws (#76) and (2) Lockwashers (#257).
 2. On the #10 and #11 *Posidyne* there is also a Gasket (#290) in behind the Encoder Housing. Remove it and discard it.
 4. Loosen the Set Screw (#154) and pull the Pulse Gear (#186) off of the Output Shaft (#1).
 5. Remove both keys (#181) and (#234) from the Output Shaft.
- NOTE:** There is no Key (#234) on the #10 and #11 *Posidyne*.

7-5 REMOVAL OF QUADRATURE SENSOR (#355) and MAGNETIC PICK-UP (#22) (*Quadrature Encoder Only*)

(See *Figure 10.7*)

NOTE: The Quadrature Encoder Assembly does not have to be removed from the Output Housing to replace the Sensors.

1. Remove the (4) Screws (#225) and take the Top Cover (#372) off the Pick-Up Housing (#17).
2. Disconnect the wires from the Brad Harrison Cable Connector (#368) to both Sensors.
3. Loosen the Set Screw (#241) and pull the Magnetic Pick-Up (#22) out of the housing. (**Do not remove this set screw.**)
4. Remove the (2) Screws (#226) and lift the Quadrature Sensor (#355) out of the housing.

5. If any Shims (#214) are under this Sensor, remove them and save for Reassembly.

7-6 REMOVAL and DISASSEMBLY of DIFFERENTIAL LINE DRIVER ENCODER (Optical Encoder)

(See Figure 10.8)

Any Drive Sheaves, Pulleys or Couplings must first be removed from the output shaft.

1. Take out the (4) Screws (#225) and remove the Top Cover (#372) and the upper Gasket (#19) from the Upper Enclosure (#18). This gasket is reusable.
2. Pull the Insulator (#373) up and out of the Upper Enclosure (#18).
3. Loosen the (2) captive screws in the Cable Connector (#368) and unplug it from the Circuit Board (#355). (See Figure 7.1)

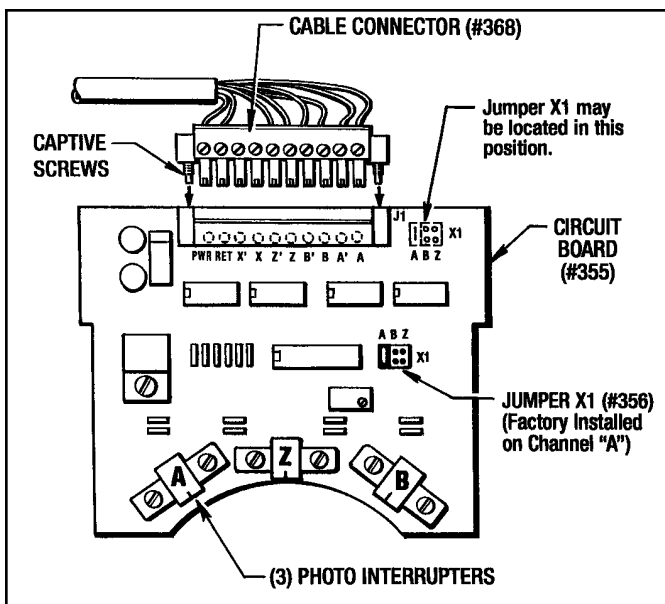


Figure 7.1 - Circuit Board Connector

4. Pull the Cable Grommet (#260), Cable (#259) and Cable Connector (#368) out of the Top Enclosure slot.
5. Remove the (2) Cap Screws (#77) and take the Upper Enclosure (#18) and lower Gasket (#19) off of the Disc Housing (#17). This gasket is also reusable.
6. Pull the Circuit Board (#355) straight up and out of the Disc Housing (#17).
7. Remove the (4) Screws (#76) and pull the Disc Housing off the Posidyne mounting face. Also (4) Washers (#32) on #10, #11 and #20 Sizes.

CAUTION

Be very careful not to bump or bend the Optical Disc (#186) which is still attached to the output shaft or damage the Dirt Seal (#269) located in the Disc Housing (#17).

8. If the Posidyne still has the main driving key in the output shaft, remove it at this time.

9. Loosen the Set Screw (#154) and pull the Optical Disc Assembly (#186) off of the output shaft.
10. Remove the Key (#234) from the output shaft.
11. Check the Dirt Seal (#269) in the Disc Housing (#17) and remove it if it is damaged.

7-7 REMOVING MANIFOLD MOUNTED CONTROL VALVE

(See Figure 10.5)

1. Disconnect the Air Hoses and the 4-Pin Brad Harrison Cable.
2. Unscrew (2) Screws (#725) and lift the Control Valve (#700) off the Manifold (#701).
3. Check the (2) Seal Rings (#808) and replace if necessary.
4. Remove the Manifold by taking out the (4) Screws (#730) and (4) Washers (#740).
5. Remove Gasket (#807) and discard.

7-8 SEPARATION AND REMOVAL OF MAJOR SUB-ASSEMBLIES FOR ACCESS TO THE CLUTCH AND BRAKE STACKS (See Figure 10.1)

NOTES:

1. Jackscrew holes are provided to aid in the separation of the subassemblies from each other.
2. Do not attempt to reuse the (2) Gaskets (#53). They must be replaced with new ones when reassembled.
3. When removing the Clutch and Brake Stacks, always keep the Drive Plates (#13) and the Friction Discs (#12) in the same order as they were removed.
1. Remove (11) Soc. Hd. Cap Screws (#61) and (11) Lockwashers (#127) from the input end of the Input Housing Subassembly.
2. Using jackscrews, separate and lift the Input Housing Subassembly away from the Drive Unit.
3. Remove and discard Gasket (#53).
4. The Clutch Stack can now be removed from the Output Shaft Spline.
5. Remove (11) Soc. Hd. Cap Screws (#69) and (11) Lockwashers (#127) from the output end of the Output Housing.
6. Using jackscrews, separate and lift the Piston Housing Subassembly away from the Output Housing Subassembly.
7. Remove and discard Gasket (#53).
8. The Brake Stack can now be removed from the Output Shaft Spline.

If repair or replacement of the Clutch or Brake Stacks are the only repair to be done, then proceed to **Section 8 CLEANING AND INSPECTION.**

7-9 REMOVAL OF WATER COOLED HEAT EXCHANGER

(See Figure 10.3)

NOTES:

1. Only remove the Heat Exchanger (#48) if replacement or repair is required.
2. It will be necessary to use a suitable punch to drive the tube ends out of the Input Housing. Care must be taken not to damage external machined surfaces.

1. Remove both Elbows (#71), Tee (#242) and the Zinc Anode (#176) from the Input Housing.
2. Remove (2) Screws (#56).
3. Tap out the tube ends, with a suitable punch, from the Housing (#8) and remove the Heat Exchanger (#48).

MAJOR SUBASSEMBLIES

7-10 INPUT HOUSING DISASSEMBLY

(See Figure 10.2)

(WITH MALE INPUT SHAFT)

1. If the Key (#180) is still intact in the Input Shaft (#2), remove it at this time.

(#03 and #05 Posidyne)

2. Remove Locknut (#15) from the Input Shaft (#2).
3. Remove (6) Screws (#63) and remove the Bearing Retainer (#7) taking care not to damage the lip of the Oil Seal (#31).
4. Check Oil Seal (#31) and replace if necessary.
5. Remove and discard Gasket (#55).

(#10 Posidyne)

2. Remove Locknut (#15) from the Input Shaft (#2).
3. Remove (6) Screws (#63) and remove the Bearing Retainer (#7) taking care not to damage the lip of the Oil Seal (#31).
4. Check Oil Seal (#31) and replace if necessary.
5. Remove O-Ring (#87) and replace if necessary.
6. The Mating Ring (#4) is not a press fit for these Models so it can be removed by hand. Also remove and check O-Ring (#80).

(#11 and #14 Posidyne)

2. Remove (6) Screws (#63) and remove Bearing Retainer (#7), taking care not to damage the lip of the Oil Seal (#31).
3. Check Oil Seal (#31) and remove if it is damaged and needs to be replaced.
4. Remove and check O-Ring (#87).
5. Remove the Wear Sleeve (#4). **See 7-12 WEAR SLEEVE REMOVAL PROCEDURE. (Figure 7.2)**
6. Remove Locknut (#15) and Lockwasher (#155) if Bearings (#26) or (#35) need to be replaced and the Input Shaft is to be pressed out of the Input Housing.

(#20 Posidyne)

2. Remove Locknut (#15) from the Input Shaft (#2).

3. Remove (6) Screws (#63) and remove the Bearing Retainer (#7), taking care not to damage the lip of the Oil Seal (#31).
4. Check Oil Seal (#31) and O-Ring (#87) and replace if necessary.
5. If the Wear Sleeve (#250) needs to be replaced see **Section 7-12 WEAR SLEEVE REMOVAL PROCEDURE. (Figure 7.2)**

7-11 WEAR SLEEVE REMOVAL PROCEDURE (#11, #14 and #20 Posidyne)

Only remove this Wear Sleeve if it is damaged and needs to be replaced.

(#11 and #14 Posidyne)

1. With a chisel the same width as the Wear Sleeve (#4), make about 5 or 6 notches in the Sleeve parallel to the Input Shaft. (See Figure 7.2)

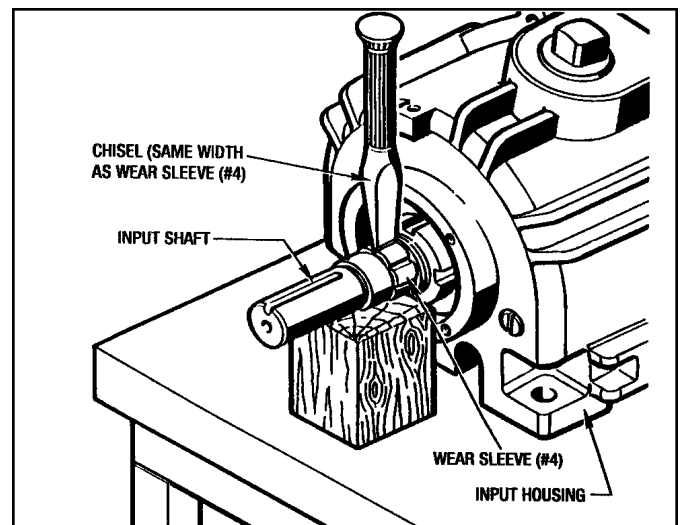


Figure 7.2 - Wear Sleeve Removal (#11 and 14 Posidyne)

(#20 Posidyne)

1. Pull the Mating Ring (#4), with the Wear Sleeve (#250) on it, off the Input Shaft.
2. With a chisel the same width as the Wear Sleeve (#250) make about 5 or 6 notches in the Wear Sleeve, as shown in Figure 7.3. It can now be removed from the Mating Ring by hand.

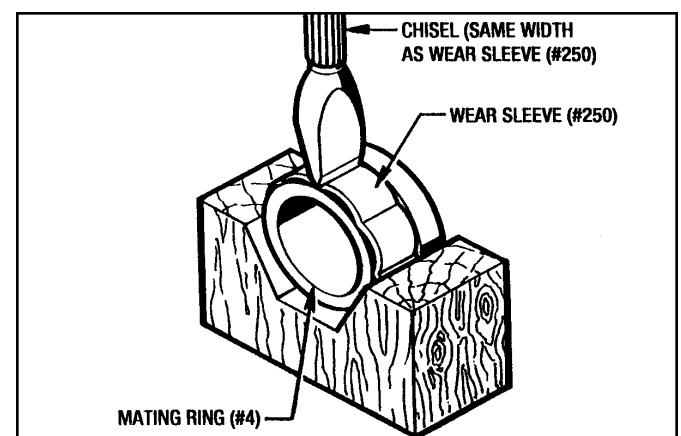


Figure 7.3 - Wear Sleeve Removal (#20 Posidyne Only)

7-12 REMOVING THE MALE INPUT SHAFT FROM THE INPUT HOUSING (See Figure 10.2)

IMPORTANT

Do not attempt to remove the Input Shaft unless Bearings (#26), (#27) or (#35) need to be replaced.

(ALL MODELS)

1. Place the Input Housing in an arbor press with the Input Shaft pointing up. Use appropriate spacers (approximately 2-1/2" high) under the Housing. Press the Input Shaft down and out of the Input Housing.

(#03 and #05 Posidyne)

2. The Mating Ring (#4) will be pushed off the Input Shaft when pressed out of the Input Housing. Check the Mating Ring for damage. Remove Bearing (#26) from the Input Housing.

(#10, #11, #14 and #20 Posidyne)

2. Remove Bearings (#26) from the Input Housing.

(#03, #05, #10 Posidyne)

3. Use a Bearing Splitter to remove Bearing (#27) from the Input Shaft. (See Figure 7.4).

(#11, #14 and #20 Posidyne)

3. Use a Bearing Splitter to remove Bearing (#35) from the Input Shaft. (See Figure 7.4).

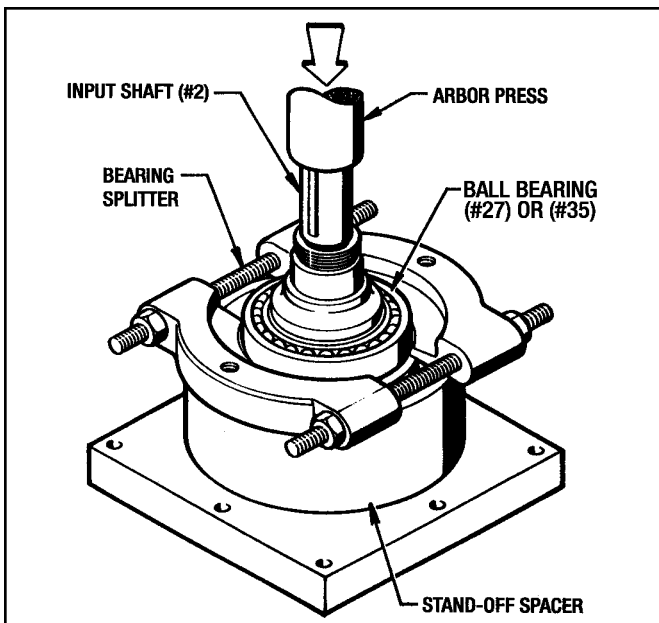


Figure 7.4 - Removing Bearing From Input Shaft

7-13 QUILL INPUT SHAFT REMOVAL

(See Figure 10.2)

(#03 and #05 Posidyne)

1. If the C-Face Adapter (#200) is still attached to the input housing, remove the (6) Screws (#201) and (6) Washers (#202) and remove the C-Face Adapter.
2. Remove (6) Screws (#63) and remove the Bearing Retainer (#207) and Gasket (#206). Discard the Gasket.
3. Check Oil Seal (#208) for damage and remove if necessary.

4. Take the Locknut (#209) off of the Quill Input Shaft (#2).
5. Using the same procedure as described in Section 7-13 remove the Quill Input Shaft (#2) from the Housing with an Arbor Press.
6. Remove Bearing (#38) from the Housing.
7. As shown in Figure 7.4, remove Bearing (#27) from the Quill Input Shaft using a Bearing Splitter.

If leakage was indicated within the Quill Input Shaft, then the O-Ring (#104) needs to be replaced.

8. With a suitable dull punch, knock out the Freeze Plug (#99) from the input end of the shaft. Check and replace O-Ring (#104) if necessary.
9. Remove and check the Retaining Ring (#52).

7-14 PISTON HOUSING AND RETAINER DISASSEMBLY

(See Figure 10.4)

1. Evenly back out and remove (4) Screws (#62) and (4) Lockwashers (#128).

CAUTION - The Piston Subassembly is under spring pressure and care must be taken to avoid personal injury when removing these Screws (#62) and separating the Subassembly.

2. Separate the Piston Retainer (#11) from the Piston Housing (#10). Remove and discard Gasket (#51).
3. Remove the Piston Subassembly which consists of: (a) Thrust Plate (#5), (b) Piston (#3), (c) Bearing (#37), (d) Teflon Liner (#43) and (e) (2) O-Rings (#40).
4. The Teflon Liner (#43) and the (2) O-Rings (#40) can now be removed for inspection and replacement. (See Figure 7.5)

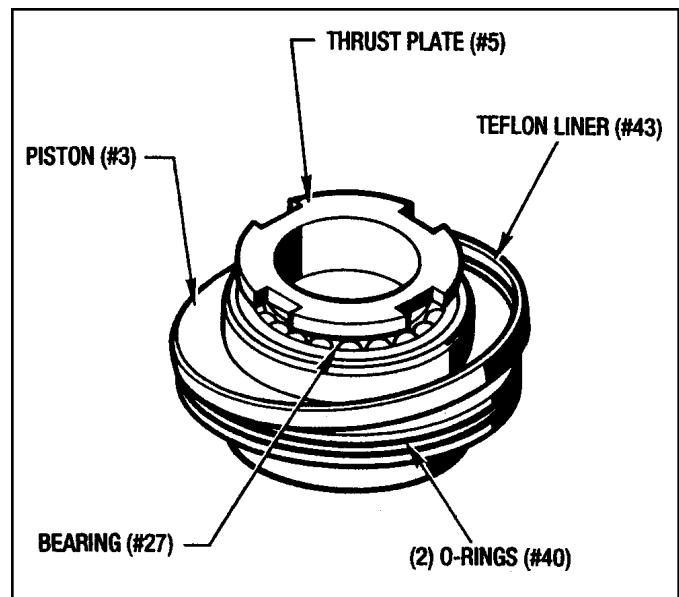


Figure 7.5 - Piston Sub-Assembly

5. Using an Arbor Press, remove the Clutch Thrust Plate (#5) and Bearing (#27) from the Piston (#3).

IMPORTANT

Only remove the Clutch Thrust Plate (#5) and the Bearing (#27) if replacement of either one is necessary.

6. Remove Springs (#36), and on Drives with SCPLogic, also remove Springs (#96). The quantity of Springs are pre-determined at the factory for your Torque Requirements.

When removing these Springs, it would be helpful for you to make a free hand sketch locating the position of the Springs. This will help at Reassembly.

7. Remove the Teflon Liner (#42) and O-Ring (#39) from the Piston Retainer (#11) and, for SCP Logic, the Piston Housing (#10).

7-15 OUTPUT HOUSING DISASSEMBLY

(See Figure 10.6)

(ALL MODELS)

1. First, remove the Key (#181) from the Output Shaft (#1) and place tape over the keyway.

(#03 AND #05 Posidyne)

2. Heat up the Locknut (#15) with an acetylene torch to melt the Loctite and with a special Locknut Ass'y. Tool, remove it from the Output Shaft (#1). **CAUTION: Wear suitable gloves when handling heated parts.**

NOTE:

This Locknut Ass'y. Tool is available from the Force Control factory. Order Part No. 601-05-003.

3. Remove (6) Screws (#63) and remove the Bearing Retainer (#7) taking care not to damage the lip of the Oil Seal (#31).
4. Check Oil Seal (#31) and replace if necessary.
5. Remove and discard Gasket (#55).
6. The Wear Ring (#4) is not a press fit so remove it from the output shaft by hand. Check it carefully and replace it if necessary.

(#10 Posidyne)

2. Heat up the Locknut (#15) and remove it from the Output Shaft (#1). **CAUTION: Wear suitable gloves when handling heated parts.**
3. Remove (6) Screws (#63) and remove the Bearing Retainer (#7) taking care not to damage the lip of the Oil Seal (#31). Also check to see if there is a Bearing Shim (#378). If there is remove it from the bearing bore.
4. Check Oil Seal (#31) and replace if necessary.
5. Remove O-Ring (#87) and replace if necessary
6. The Mating Ring (#4) is not a press fit for these models so it can be removed by hand. Also remove and check O-Ring (#80).

(#11 and #14 Posidyne)

2. Remove (6) Screws (#63) and remove the Bearing Retainer (#7) taking care not to damage the lip of the Oil Seal (#31). Also check to see if there is a Bearing Shim (#378). If there is remove it from the bearing bore.

3. Check Oil Seal (#31) and replace if necessary.
4. Remove O-Ring (#87) and replace if necessary.

(#14 Posidyne Only)

5. Also remove (2) O-Rings (#104) from the rear face of the Bearing Retainer (#104).

(#11 and #14 Posidyne)

6. Remove the Wear Sleeve (#4) as shown in Figure 7.6 and described in **WEAR SLEEVE REMOVAL PROCEDURE - Section 7-16.**
7. Heat up the Locknut (#15) and remove it and the Lockwasher (#155) if the Bearings (#26) or (#35) are to be replaced and the Output Shaft is to be pressed out of the Output Housing. **CAUTION: Wear suitable gloves when handling heated parts.**

(#20 Posidyne)

2. Remove Locknut (#15) from the Output Shaft (#1).
3. Remove (6) Screws (#63) and remove the Bearing Retainer (#7) taking care not to damage the lip of the Oil Seal (#31).
4. Check Oil Seal (#31) and replace if necessary.
5. Remove O-Ring (#87) and replace if necessary
6. Pull the Mating Ring (#4), with the Wear Sleeve (#250) on it, off of the Output Shaft (#2)
7. Use the same procedure as described in **Section 7-11 WEAR SLEEVE REMOVAL PROCEDURE (Figure 7.3)** to remove the Wear Sleeve (#250) from the Mating Ring (#4).

7-16 WEAR SLEEVE REMOVAL PROCEDURE

(#11 and #14 Posidyne ONLY)

NOTE:

Only remove this Wear Sleeve if damage is indicated and replacement is necessary.

With a chisel, the same width as the Wear Sleeve, make about 5 or 6 notches in the ring parallel to the Output Shaft. It can now be removed from the Output Shaft by hand. (See Figure 7.6)

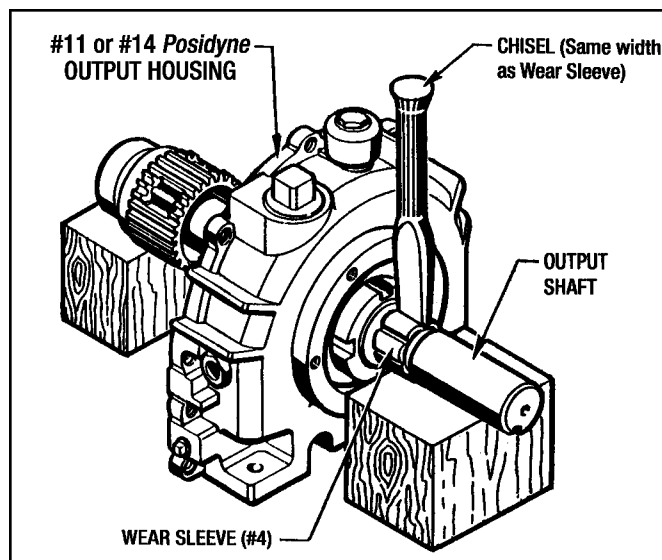


Figure 7.6 - Wear Sleeve Removal

7-17 REMOVING THE OUTPUT SHAFT FROM THE OUTPUT HOUSING (See Figure 10.6)

IMPORTANT

Do not attempt to remove the Output Shaft unless Bearings (#26) or (#28) have to be replaced.

(ALL MODELS)

1. With a mallet tap the Output Shaft (#1) out of the Output Housing as shown in Figure 7.7.

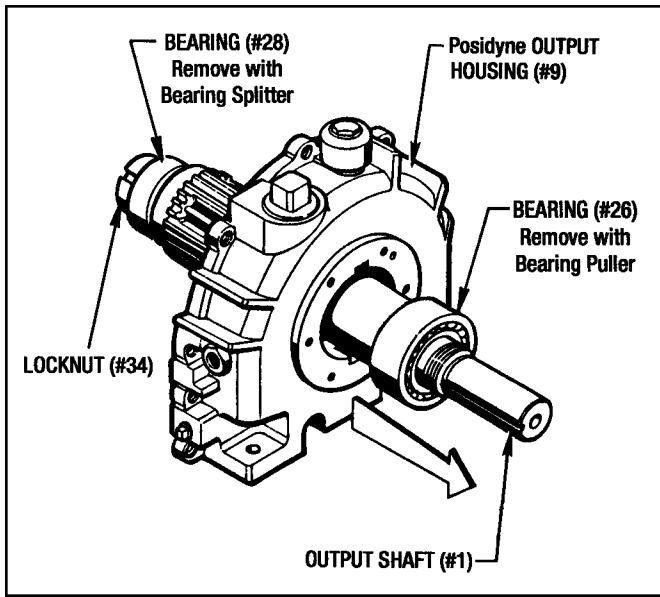


Figure 7.7 - Removing the Output Shaft

(#03 and #05 Posidyne)

2. Remove Bearing (#26) from the Output Shaft with a Bearing Puller or a Bearing Splitter like the one shown in Figure 7.4.

(#10, #11, #14 and #20 Posidyne)

2. With a Bearing Puller or Bearing Splitter, remove both Bearings (#26). For #10 Posidyne only, also remove the Bearing Spacer (#183) from the output shaft. Remove Bearing Spacer (#288) from #20 Posidyne.

(#03, #05, #10 and #20 Posidyne)

3. Heat up the Locknut (#34) and remove it from the Output Shaft (#1). **NOTE:** Clamp the Output Shaft in a vice to ease the removal of the Locknut (#34) and Bearing (#28).

CAUTION: Wear suitable gloves when handling heated parts.

(ALL MODELS)

4. If Bearing (#28) has to be replaced, use a Bearing Splitter, like the one shown in Figure 7.4, to remove it.

(#20 Posidyne)

5. Also Remove the Pilot Bearing Spacer (#289).

THE DISASSEMBLY PROCEDURE FOR YOUR Posidyne CLUTCH/BRAKE UNIT IS NOW COMPLETE.

Section 8 CLEANING and INSPECTION

8-1 CLEANING AND INSPECTION

Clean metal parts in a suitable solvent and dry in a stream of low pressure compressed air. The Clutch and Brake Drive Plates (#13) can be cleaned in a solvent, but DO NOT clean the Clutch and Brake Friction Discs (#12) in solvent. Use only a clean, dry and lint-free rag to clean these Friction Discs. (Solvent will damage the resilient paper-based friction material used on the Friction Discs). Keep the Drive Plates and Friction Discs in the same order as they were removed. After cleaning, inspect parts for cracks, distortion, scoring, nicks, burrs or other damage would affect serviceability. Pay particular attention to the following:

1. Check the disc wear surfaces for scoring, galling or evidence of uneven wear.
2. Check the clutch and brake plates for scoring or galling. Make sure they are flat. If a perceptible ridge is worn in any of the drive plates, replace all of the drive plates and friction discs as a complete set.
3. Carefully check the piston and bore surfaces for nicks, scratches, scoring or other damage which would affect operation or cause leakage.

4. Pay particular attention to shafts in the area of rotary seals. Check for nicks, scratches which would cause leakage. Replace any damaged parts.
5. It is not necessary to remove the ball bearings to check their operation. Slowly rotate the free race of each bearing by hand checking to see if it turns freely without rough or flat spots.

8-2 GENERAL REPAIR & REPLACEMENT INFORMATION

A fine stone or crocus cloth may be used to remove minor surface defects from parts so long as the operating or sealing action of the part is not affected. The use of coarser abrasive or other machining methods should not be attempted. Otherwise, damaged parts should be replaced.

Replacement is recommended also for the following, as applicable:

1. Replace all O-Rings, Liners, Gaskets and Oil Seals removed during the course of disassembly.
2. Replace Clutch or Brake Discs and Drive Plates in complete sets only.

Section 9 REASSEMBLY

9-1 GENERAL REASSEMBLY INSTRUCTIONS

1. Lubricate O-Rings and the lips of all the Oil Seals with the same oil as used in the Drive Unit immediately before Reassembly and Installation of any mating parts.
2. O-Ring Liners (#43) will be easier to install if heated in a oven to 250° F. maximum.

The installation of press fitted parts can be eased by heating the outside parts in a oven. Heat Bearings to 250° F. maximum.

CAUTION

Wear suitable gloves when handling heated parts.

3. Apply Gasket Sealant (Permatex #3), or equivalent, to all flat gaskets.
4. Use Cap Screw Adhesive (Loctite #271), or equivalent, on all Cap Screws and Locknuts. Use sparingly and clean off any excess with (Loctite (#755) Adhesive Cleaner.

MAJOR SUBASSEMBLIES

Basically the Reassembly is just a reverse order of the Disassembly Procedure described in Section 7.

9-2 INSTALLING BEARINGS ON OUTPUT SHAFT

(See Figure 10.6)

IMPORTANT

#03 and #05 Posidyne Outboard Bearing (#26) must be installed with the Loading Slots towards the output end of the shaft. (See Figure 9.1).

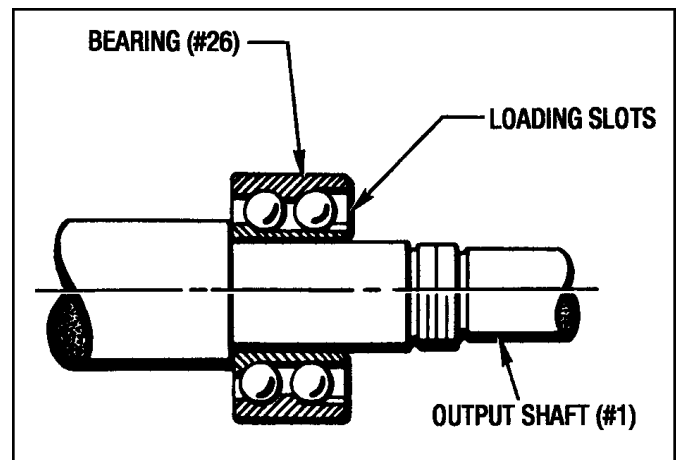


Figure 9.1 - Bearing Loading Slots (#03 and #05 Posidyne)

(#03 AND #05 Posidyne)

1. Press Bearing (#26) onto the Output Shaft (#1) using an Arbor Press.
2. Place Mating Ring (#4) onto the Output Shaft and with the special Locknut Ass'y. Tool, screw the Locknut (#15) on to the Output shaft.

NOTES:

1. Use (Loctite #271) on the threads.
2. This Locknut Ass'y. Tool is available from the Force Control factory. To order use Part No. 601-05-003.
3. Press Bearing (#28) onto the other end of the Output Shaft. Screw Locknut (#34) onto the shaft. Use Thread-Locker (Loctite #271) on the threads.

(#10, #11 AND #14 Posidyne)

To determine if a Bearing Shim (#378) is needed for the output shaft, measure the thickness of the (2) Bearings (#26) when clamped together as shown in Figure 9.2. If the bearings measure smaller than 2.1160" for Size #10 and 1.9586" for Size #11 and #14, then a Bearing Shim (#378) will be required. If the bearings measure larger than the specified dimensions, no shim will be needed. **NOTE:** This Shim will be installed when the Bearing Retainer (#7) is attached to the housing.

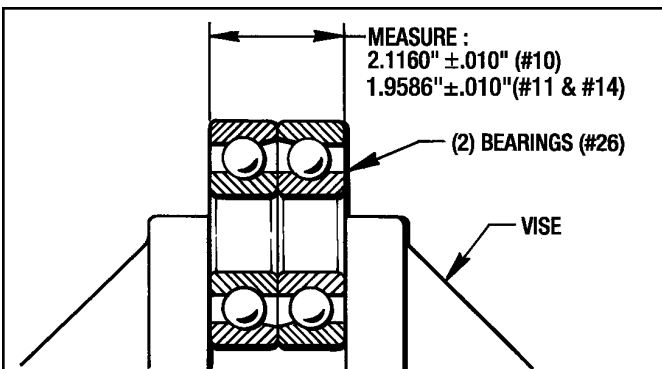


Figure 9.2 - Measuring Thickness of Bearings (#26)

(#10, #11, #14 AND #20 Posidyne)

1. Press (2) Outboard Bearings (#26) onto the Output Shaft (#1) using an Arbor Press. **NOTE:** First install Bearing Spacer (#183) for #10 Posidyne and (#288) for #20 Posidyne as shown in Figure 9.3.

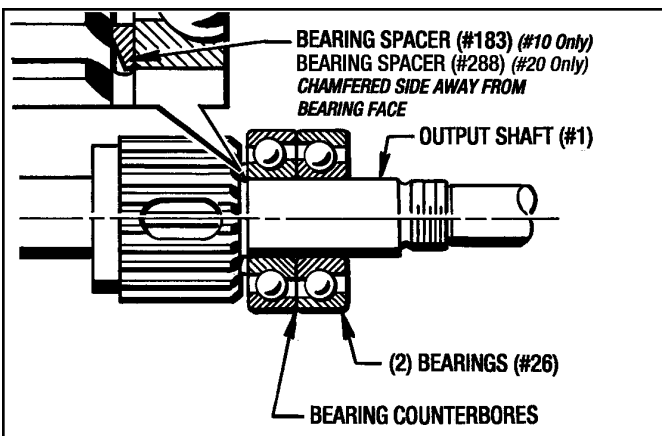


Figure 9.3 - Installing Outboard Bearings

IMPORTANT

#10, #11, #14 and #20 Posidyne Outboard Bearings (#26) must be installed with the Counterbores facing each other. (See Fig. 9.3)

(#10 Posidyne ONLY)

2. Place O-Ring (#80) onto the Output Shaft. Slide the Mating Ring (#4) onto the Output Shaft after the O-Ring. Install Locknut (#15) onto the Output Shaft (#1). Use (Loctite #271) Thread Locker on the threads. Wipe off any excess.
3. Press Bearing (#28) onto the other end of the Output Shaft. Screw Locknut (#34) onto the Output Shaft, using (Loctite #271) Thread Locker on the threads. Wipe off any excess.

(#11 AND #14 Posidyne ONLY)

2. Place Lockwasher (#155) onto the Output Shaft and screw Locknut (#15) onto the shaft. Use (Loctite #271) Thread-Locker on the threads, Wipe off any excess.
3. Press Bearing (#28) onto the other end of the Output Shaft.
4. Press Wear Sleeve (#4) onto the Output Shaft. Also use (Loctite #271) between the shaft and the sleeve. Wipe off any excess.

(#20 Posidyne ONLY)

2. Place O-Ring (#80) onto the Output Shaft.
3. Press Wear Sleeve (#250) onto the Mating Ring (#4) Use a sealant (Loctite #271) between the Wear Sleeve and Mating Ring. Wipe off any excess.
4. Place Mating Ring and Wear Sleeve (#4 and #250) onto the Output Shaft. Screw Locknut (#15) onto the Output Shaft. Use (Loctite #271) Wipe off any excess.
5. Place the Bearing Spacer (#289) on the tail end of the Output shaft. Press the Bearing (#28) on the shaft with an arbor press.
6. Install Locknut (#34) on the shaft. Use Loctite #271.

9-3 OUTPUT HOUSING SUBASSEMBLY

(See Figure 10.6)

(ALL MODELS)

1. Guide the Output Shaft Subassembly into the Output Housing (#9), as shown in Figure 9.4.

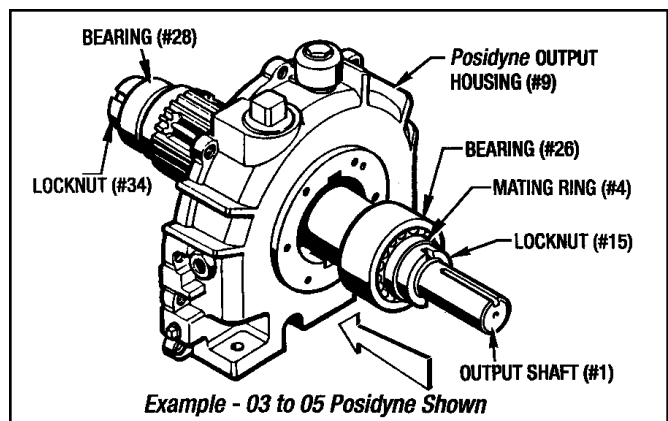


Figure 9.4 - Installing Output Shaft Sub-Assembly

- Press the Oil Seal (#31) into the Bearing Retainer (#7). Use sealant (Permatex #30) on the outside of the Oil Seal.

(#03 AND #05 Posidyne)

- Lubricate the lip of the Oil Seal (#31) and the Mating Ring (#4) with ATF-210 oil.
- Place the Gasket (#55) onto the Bearing Retainer (#7). Align the holes in the Gasket with the holes in the Bearing Retainer.
- Slide the Bearing Retainer (#7), Gasket (#55) and Oil Seal (#31) onto the Output Shaft (#1), being careful not to damage the lip of the Oil Seal. Attach with (6) Screws (#63) to the Output Housing. (See **Figure 10.6** for Torque Specs.)

(#10, #11 and #14 Posidyne)

- Lubricate and install O-Ring (#87) onto the shoulder of the Bearing Retainer (#7). On #14 Posidyne only, also install (2) O-rings (#104) into the back face of Bearing Retainer (#7).
- Lubricate the lip of the Oil Seal (#31) and the Mating Ring (#4) with ATF-210 oil.
- If it was determined earlier that a Shim (#378) was needed, place it into the bearing bore and slide the Bearing Retainer (#7), O-Ring (#87) and Oil Seal (#31) onto the Output Shaft (#1), being careful not to damage the lip of the Oil Seal. Attach with (6) Screws (#63) to the Output Housing. (See **Figure 10.6** for Torque Specs.)

(#20 Posidyne)

- Lubricate and install O-Ring (#87) onto the shoulder of the Bearing Retainer (#7).
- Lubricate the lip of the Oil Seal (#31) and the Mating Ring (#4) with ATF-210 oil.
- Slide the Bearing Retainer (#7), O-Ring (#87) and Oil Seal (#31) onto the Output Shaft (#1), being careful not to damage the lip of the Oil Seal Lip. Attach with (6) Screws (#63) to the Output Housing. (See **Fig. 10.6** for Torque Specs.)

(ALL MODELS)

- Replace Air Breather (#45), Sight Gauge (#46) and any other plugs or fittings removed at disassembly.
- Install Key (#181) back into the Output Shaft keyway.

9-4 PISTON HOUSING AND RETAINER SUBASSEMBLY

(See **Figure 10.4**)

- Install O-Rings (#39) and Liners (#42) into Piston Retainer (#11) and Piston Housing (#10). Lubricate O-Rings before installation.

NOTES:

- Drive Units "A" and "B" Logic will not have an O-Ring and Liner in the Piston Housing.
- Spring (#96) is only used for "SCP" Logic only.

IMPORTANT

Before applying (Loctite #620) to the Bearing (#27) I.D. and O.D. clean it well with (Loctite #755) cleaning solvent or equivalent.

- Apply Sealant (Loctite #620) to the I.D. of Bearing (#27) and press it into the Thrust Plate (#5). Make sure that the Bearing is firmly seated on the Thrust Plate Shoulder.

- Apply Sealant (Loctite #620) to the O.D. of Bearing (#27) and press the Bearing and Thrust Plate into the Piston (#3). Again, make sure that the Bearing is firmly seated against the Piston Shoulder.
- Lubricate the (2) O-Rings (#40) and install them onto the Piston (#3).
- Heat the Teflon Liner (#43) in an oven to 200° F. maximum and install it on the outside diameter of the Piston.
- Place Springs (#36 and / or #96), back into the appropriate holes in the Housing or Retainer. Grease may be used to hold the Springs in their holes during assembly.
- Insert the Piston Sub-assembly into the Piston Retainer (#10).

IMPORTANT - When placing the Piston Retainer over the Piston, be careful not to damage the Teflon Liner (#42) in the Piston Retainer and the Teflon Liner (#43) on the Piston.

- Align Gasket (#51) on the Piston Housing, using the Dowel Pins (#68) to ensure proper alignment.
- Assemble the Piston Retainer to the Piston Housing with (4) Screws (#62) and (4) Lockwashers (#128).

IMPORTANT - Tighten down Screws (#62) in an even manner to compress the Springs correctly. (See Figure 10.4 for Torque Specs.)

9-5 INPUT HOUSING SUBASSEMBLY WITH MALE INPUT SHAFT (See **Figure 10.2**)

(ALL MODELS)

- Press Bearing (#27 or #35) onto the Input Shaft (#2).
- Insert the Input Shaft (#2) into the rear of the Input Housing (#8) until the Bearing (#27 or #35) seats in the bearing bore.
- Set the Input Housing Subassembly into an Arbor Press as shown in **Figure 9.5**. Using an appropriate size tube, press on the inner race of Bearing (#26) until it bottoms out. (**Do not press on the bearing cage of the outer race**)

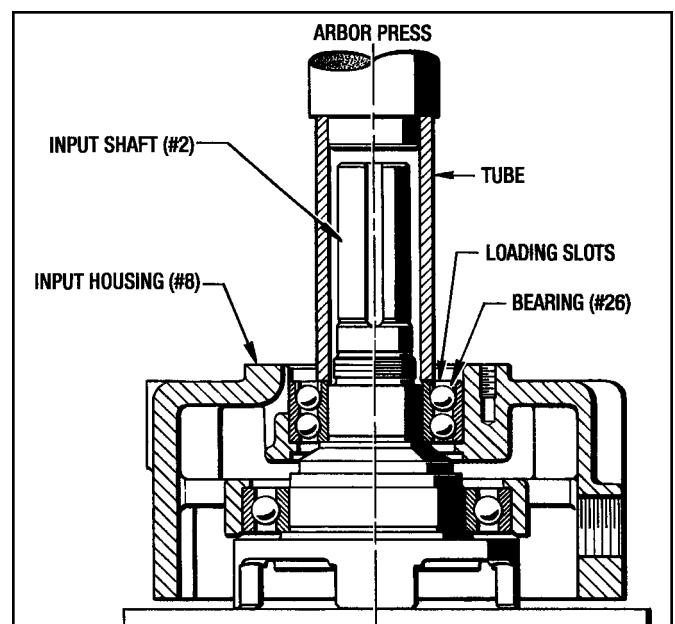


Figure 9.5 - Pressing Bearing (#26) into Input housing

- Apply a thin coat of Sealant (Permatex #3) to the oil seal bore in the Bearing Retainer (#7) and press the Oil Seal (#31) into the Bearing Retainer (#7).

(#03 AND #05 Posidyne)

- Press the Wear Sleeve (#4) onto the Input Shaft. Screw Locknut (#15) onto the Input Shaft. Use Thread-Locker (Loctite #271) on the threads. Be sure to wipe off any excess.
- Place the Gasket (#55) on to the Bearing Retainer (#7). Align the holes in the gasket with the holes in the bearing retainer.
- Place tape over the keyway and then slide the Bearing Retainer (#7) over the shaft, being careful not to damage the lip of the Oil Seal (#31). Attach the Bearing Retainer with (6) Screws (#63). (See Fig. 10.2 for Torque Specs.)

(#10 Posidyne ONLY)

- Lubricate the O-Ring (#80) and place it on the Input Shaft. Slide Mating Ring (#4) onto the Input Shaft after the O-Ring (#80). Screw the Locknut (#15) onto the Input Shaft, using Thread-Locker (Loctite #271) on the threads. Wipe off any excess.
- Lubricate the O-Ring (#87) and place it on the Bearing Retainer Shoulder.
- Place tape over the keyway and slide the Bearing Retainer (#7) over the Input Shaft, being careful not to damage the lip of the Oil Seal (#31). Attach the Bearing Retainer with (6) Screws (#63). (See Figure 10.2 for Torque Specs.)

(#11 AND #14 Posidyne ONLY)

- Place the Lockwasher (#155) and the Locknut (#15) on to the Input Shaft (#2). Tighten the Locknut. Use (Loctite #271) on the threads. Wipe off any excess.

A special Wear Sleeve Assembly Tool must be used to install the Wear Sleeve (#4) onto the Input Shaft. This Tool can be ordered from Force Control by using Part Number 601-11-003. Machining Dimensions are given in Figure 9.6 if you prefer to make your own.

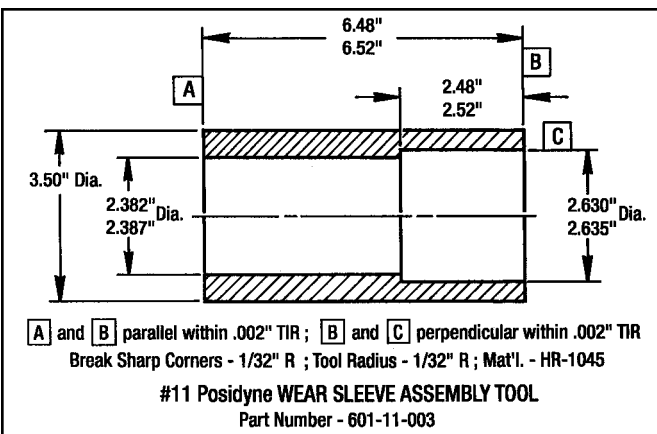


Figure 9.6 - Wear Sleeve Assembly Tool (#11 & #14 Posidyne)

- Place the Input Housing and Input Shaft into an arbor press. Using Surface "A" of the Ass'y. Tool, press the Wear Sleeve (#4) until it is flush with the input shaft shoulder (See Figure 9.7 Step 1). Turn the Tool around and proceed

to press the Wear Sleeve (#4) completely onto the shaft until it bottoms out on the next shaft shoulder. (See Figure 9.7 Step 2).

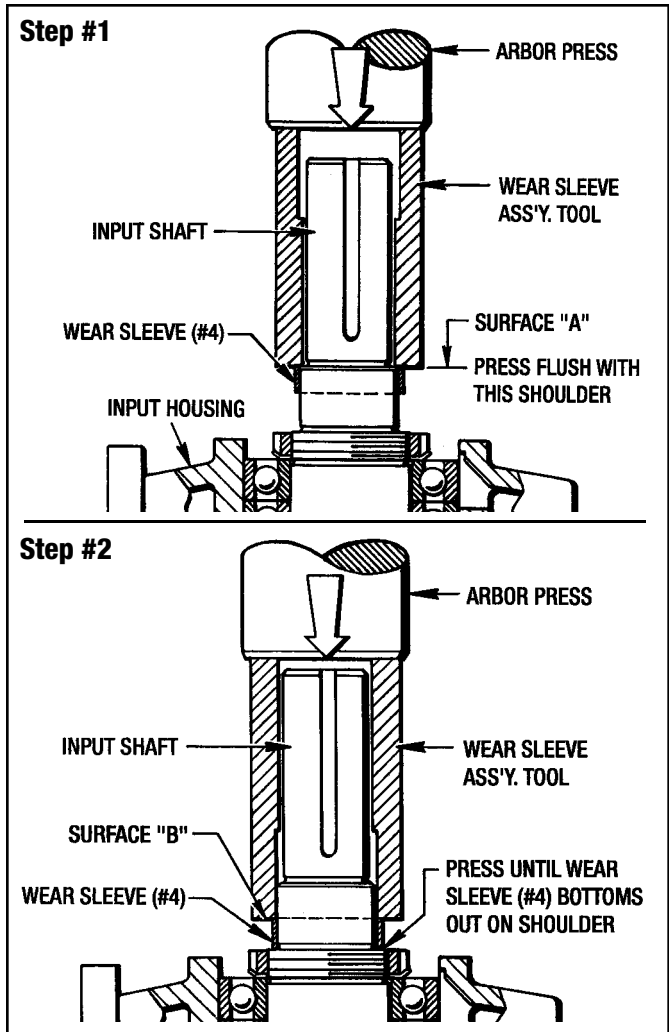


Figure 9.7 - Installing Wear Sleeve (#4)

- Lubricate the O-Ring (#87) and place it on the Bearing Retainer shoulder.
- Place tape over the keyway and slide the Bearing Retainer (#7) over the Input Shaft, being careful not to damage the lip of the Oil Seal (#31). Attach the Bearing Retainer with (6) Screws (#63).

(#20 Posidyne ONLY)

- Lubricate O-Ring (#80) and install it on the Input Shaft (#2).

A special Wear Sleeve Assembly Tool must be used to install the Wear Sleeve (#250) onto the Mating Ring (#4). This Tool can be ordered from Force Control by using Part Number 601-20-011. Machining Dimensions are also given in Figure 9.8 on the next page if you prefer to make your own.

- Apply Sealant (Loctite #271) on the I.D. of the Wear Sleeve (#250) and press the Wear Sleeve (#250) onto the Mating Ring (#4). (See Figure 9.9 on next page).
- Slide Wear Sleeve / Mating Ring Subassembly onto the Input Shaft.

- Place tape over the keyway and slide the Bearing Retainer (#7) over the Input Shaft, being careful not to damage the lip of the Oil Seal (#31). Attach the Bearing Retainer with (6) Screws (#63).

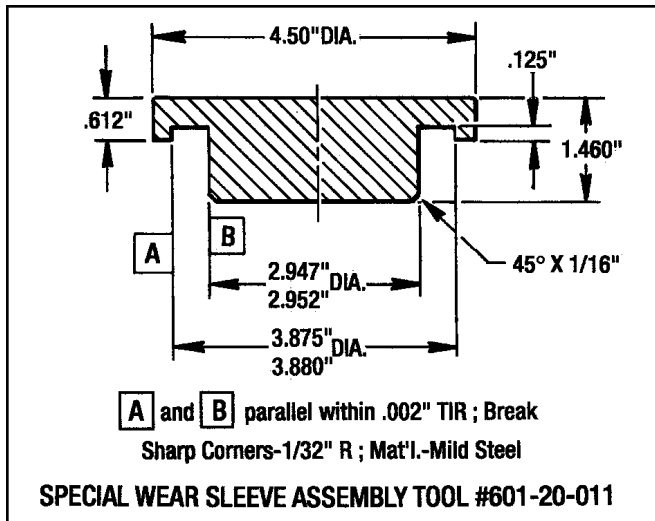


Figure 9.8 - Wear Sleeve Assembly Tool (#20 Posidyne)

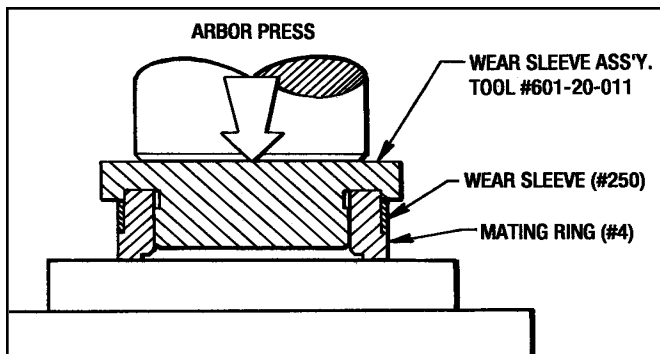


Figure 9.9 - Installing Wear Sleeve (#250) on Mating Ring (#4)

9-6 INPUT HOUSING SUBASSEMBLY WITH QUILL INPUT SHAFT

(See Figure 10.2)

(#03 AND #05 Posidyne)

- Press the Bearing (#27) onto the Input Shaft (#2), using an arbor press.
- Assemble the Retaining Ring (#52), O-Ring (#104) and press the Freeze Plug (#99) into the Input Shaft bore from the lugged end of the Input Shaft.
- Insert the Quill Input Shaft (#2) into the rear of the Input Housing (#8).
- Set the Quill Input Shaft and Housing Subassembly into an arbor press as shown in Figure 9.10. Use an appropriate sized tube and press on the inner race of Bearing (#38) until it bottoms out.
- Install Locknut (#209) onto the Input Shaft. Use sealant (Loctite #271) on the threads. Clean off any excess with (Loctite #755) Cleaner.
- Coat the oil seal bore of Bearing Retainer (#207) with a thin coat of Sealant (Permatex #3) and press the Oil Seal (#208) into the bore. Clean off any excess sealant.

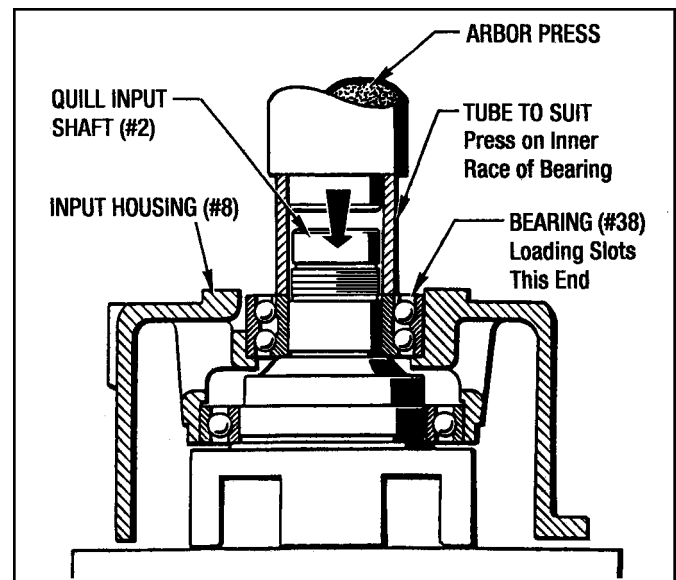


Figure 9.10 - Pressing Bearing (#38) on Output Shaft

- Place and align Gasket (#206) onto the Bearing Retainer (#207).
- Attach the Bearing Retainer (#207) to the Housing with (6) Screws (#63). (See Figure 10.2 for Torque Specs.)
- If the C-Face Adapter (#200) was removed, remount the C-Face Adapter (#200) back on the Input Housing with (4) Screws (#201) and (4) Lockwashers (#202). (See Figure 10.2 for Torque Specs.)

9-7 INSTALLING WATER COOLED HEAT EXCHANGER

(See Figure 10.3)

- Guide the Heat Exchanger (#48) into the Input Housing, making sure that the tube ends project out the (2) holes in the rear face of the Housing. Attach with (2) Screws (#56).
- Mark the tubing approximately 1/16\"/>

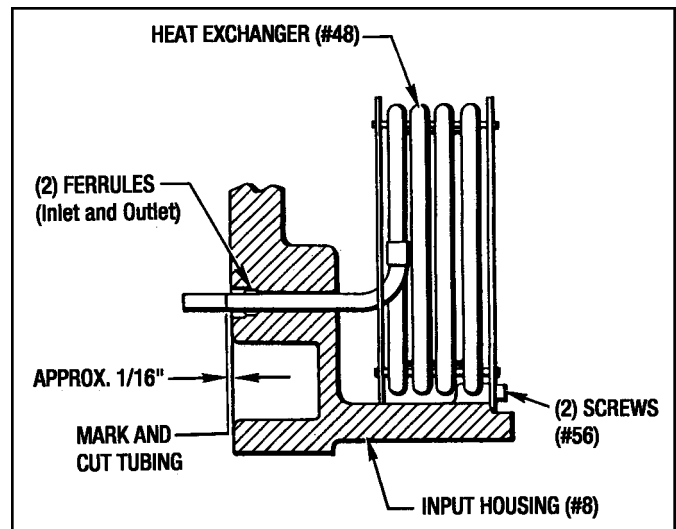


Figure 9.11 - Installing Water Cooled Heat Exchanger

- Reinstall the Heat Exchanger back into the Housing. Apply Loctite #271 to the tubing O.D. Then place the (2) Compression Fittings with Ferrules (#71) on the tubing. (See Figure 9.11).

IMPORTANT

When tightening Fittings (#71), do not overtighten and then back off. This will cause the compression seal to leak.

- Add Pipe Fitting (#242) and Zinc Anode (#176) to the Inlet Compression Fitting (#71).

9-8 MEASURING AND CONTROLLING STACK HEIGHT DIMENSIONS

(Does Not Apply to SCP Logic)

To assure correct piston travel, the following steps must be done when replacing the Clutch and Brake Stacks.

- Based on the parts list, place the total number of Friction Discs and Drive Plates in an arbor press as shown in Figure 9.12.

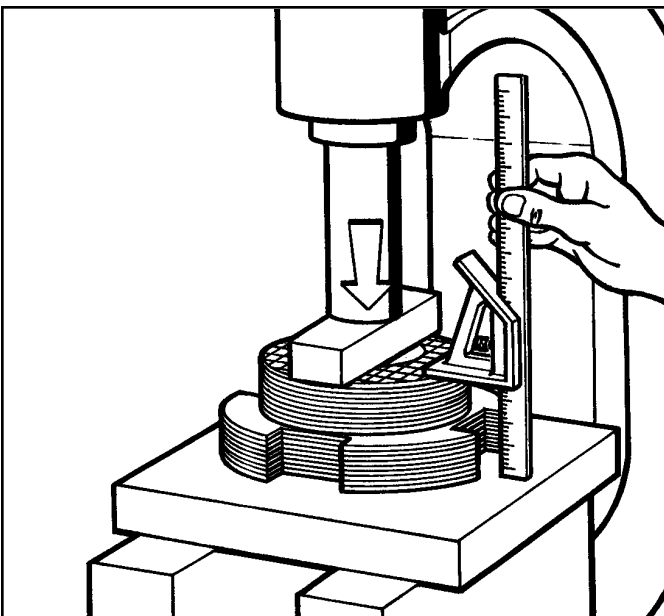


Figure 9.12 - Measuring Stack Height

STACK HEIGHT TABLE

SIZE	MIN. (Nearest Fraction)
03S	1.735 (1-47/64)
03SA, A, B	1.899 (1-29/32)
05S	3.120 (3-1/8)
05SA, A, B	3.284 (3-9/32)
10	3.287 (3-9/32)
11	3.537 (3-17/32)
14	4.908 (4-29/32)
20	N/A

- Clamp firmly and measure the Stack Height
- Compare the measurement with the tabulated values (See Stack Height Table) and, if necessary, add Stack Shim Plate(s) (#380 and/or #381) to bring the stack above Minimum Height

NOTE:

Always add the extra Stack Shim Plate(s) to the stack side away from the piston. Add 1st. extra Stack Shim Plate to clutch stack and add 2nd. extra Stack Shim Plate to the brake stack.

9-9 REASSEMBLY OF MAJOR SUBASSEMBLIES AND CLUTCH / BRAKE STACKS (See Figure 10.1)

- Place the Output Housing in such a position that the key end of the Output Shaft is down and the Housing is on a stable flat surface.
- Install the Brake Stack onto the Output Shaft Spline, starting with a Drive Plate (#13) and then a Friction Disc (#12), ending with a Drive Plate. Align the notches in the Drive Plate with the lugs on the Piston Retainer and align the internal teeth in the Friction Discs with the teeth on the Output Shaft Spline.

VERTICAL INSTALLATION - Also install (4) Separator Springs (#229) on each Drive Plate (#13) except the 1st. one installed as shown in Figure 10.1.

- Align Gasket (#53) onto the Output Housing (#9) using the dowel pin holes for proper alignment.
- Lower the Piston Housing Subassembly onto the Output Housing, aligning the lugs with the slots in the Drive Plates. Press the Piston Housing until the Dowel Pins (#68) engage the Output Housing. Check the Gasket (#53) to see if it is still properly aligned.
- Lay the Piston Housing and Output Housing Subassembly over until the Pilot Bearing (#38) rests on the table.
- Use (11) Screws (#69) and (11) Lockwashers (#127) to attach the Piston Housing to the Output Housing. Use Thread-Locker (Loctite #271) on the threads. Wipe off any excess. (See Figure 10.1 for Torque Specs.)
- Stand the Piston Housing and Output Housing Subassembly back on the Output Housing with the Output Shaft down.
- Install the Clutch Stack onto the Output Shaft Spline, starting with a Drive Plate (#13) and then a Friction Disc (#12), ending with a Drive Plate. Align the notches in the Drive Plate with the notches in the Clutch Thrust Plate (#5) and align the internal teeth in the Friction Discs with the teeth on the Output Shaft Spline.

VERTICAL INSTALLATION - Also install (4) Separator Springs (#229) on each Drive Plate (#13) except the 1st. one installed as shown in Figure 10.1.

- Align Gasket (#53) onto the Piston Housing (#10) using the Dowel Pins (#68) for proper alignment.
- Lower the Input Housing Subassembly onto the Piston Housing, aligning the lugs on the Input Shaft (#2) with the

slots in the Drive Plates (#13) and Clutch Thrust Plate (#5). Press the Input Housing down until the Dowel Pins (#68) engage the Input Housing. Check the Gasket (#53) to see if it is still properly aligned.

11. Use Screws (#69) and Lockwashers (#127) to attach the Input Housing, Piston Housing and Output Housing together. Use Thread-Locker (Loctite #271) on the screw threads. Wipe off any excess. **(See Figure 10.1 for Torque Specs.)**
12. If your Drive Unit had a Male Input Shaft and is not equipped with Fan Cooling, then replace the Key (#180) into the Input Shaft.

This completes the Reassembly Procedure for the Major Subassemblies. Before proceeding any further, an OPERATIONALCHECK of the Clutch and Brake Movement should be made. Apply 60 to 80 PSI to the Clutch and Brake Ports, as indicated in **Section 5 - OPERATIONAL CHECKS**, and observe the piston movement through the inspection ports.

9-10 MEASURING PISTON STROKE
(Does Not Apply to SCP Logic)

After the unit has been completely assembled, set the unit upright on a table and apply 60 PSI air to the Clutch Port.

To measure the Piston Stroke a Gap Tool, as shown in Figure 9.13, must be used. To order this Gap Tool from the Force Control factory use the following Part Numbers:

- Size #03, #05 and #10(Part No. 601-03-011)
- Size #11, #14 and #20(Part No. 601-11-001)

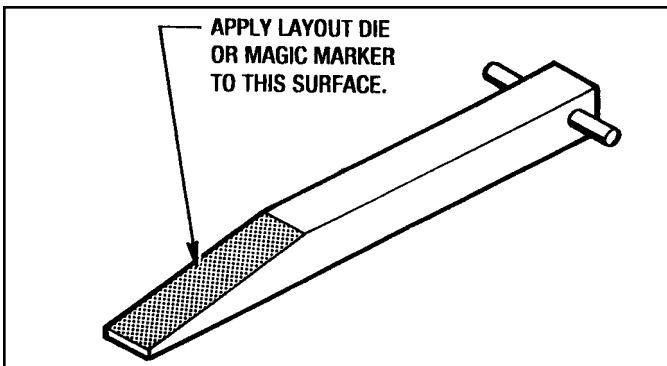


Figure 9.13 - Gap Tool

(#03, #05, #10 and #20 Posidyne)

2. Remove the Sq. Hd. Pipe Plug (#14) from the top of the Output Housing.

(#11 AND #14 Posidyne ONLY)

2. Remove the Air Breather (#45) and the Special Reducer Fitting (#216) from the top of the Output Housing.

(ALL MODELS)

3. Apply machinists fast drying layout die or (use a black magic marker) to the sloping surface of the Gap Tool as shown in Figure 9.13.
4. Firmly insert the Gap Tool through the inspection port above the Brake Stack so that any slack is removed from the Brake Stack. **NOTE:** The straight side of the Gap Tool is towards the Brake Stack. (See Figure 9.14)

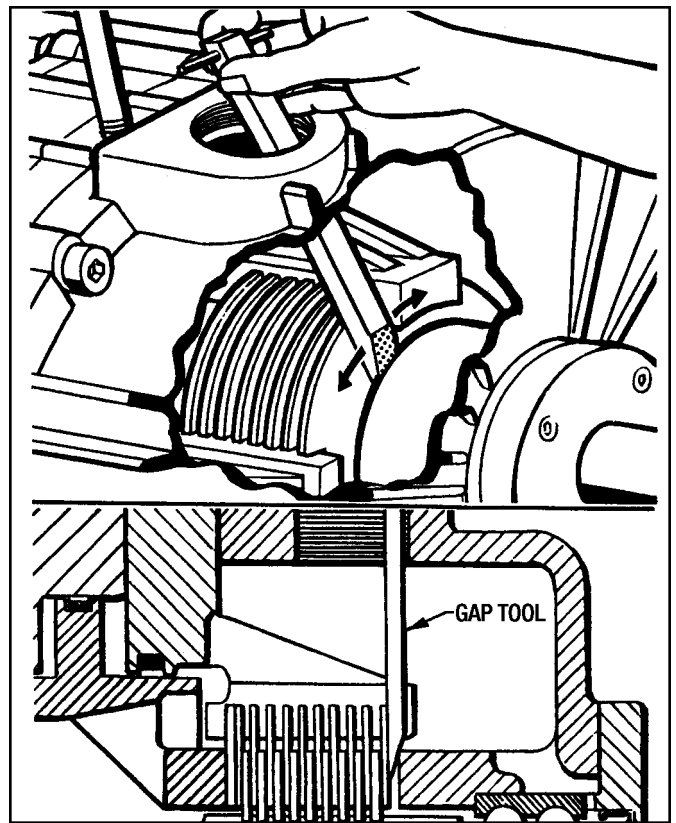


Figure 9.14 - Inserting Gap Tool

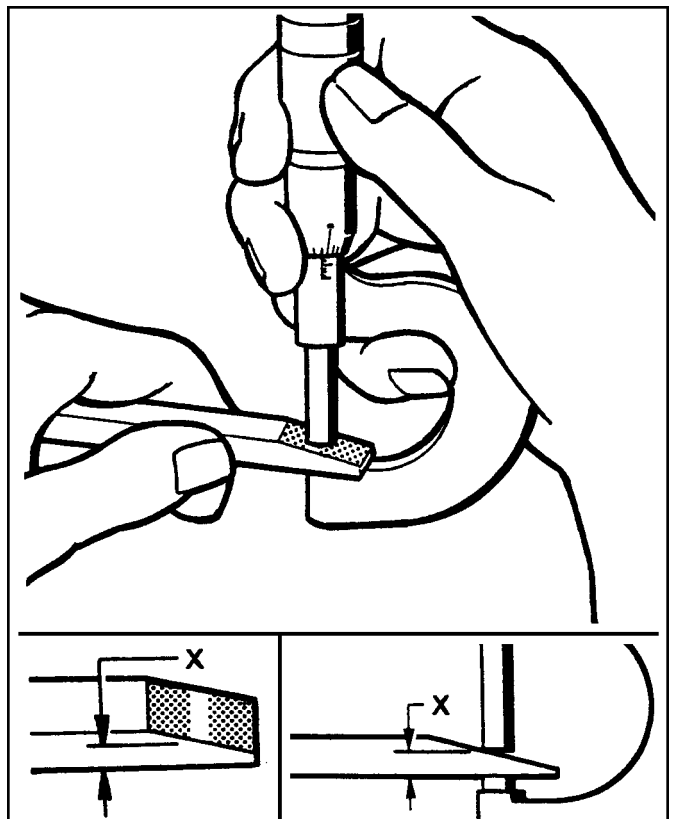


Figure 9.15 - Measuring Piston Stroke

- The solid shoulder will scrape the bluing off the Gap Tool as shown in Figure 9.15. To get an accurate measurement, slightly push the Gap Tool side to side when it is firmly inserted. (This will remove the bluing in a straight line rather than an arc.)
- Measure distance "X" with a micrometer as shown in Figure 9.15. Compare the measurement with the tabulated limits shown in the Piston Stroke Table on the next page.

PISTON STROKE TABLE

SIZE	"X" MIN.	"X" MAX.
03	.070"	.135"
05	.085"	.150"
10, 11, 14	.100"	.190"
20	.100"	.230"

9-11 FAN AND FAN SHROUD INSTALLATION

(#11 AND #14 Posidyne ONLY)

- Place Spacer (#183) on the Input Shaft (#2).

(ALL MODELS)

- Install Key (#37) on the Input Shaft (#2).
- Place Fan (#25) on the Input Shaft and tighten Set Screw (#70).
- Place the Fan Shroud (#24) into place and attach with (2) Screws (#66) from the front of the Shroud.
- Install Key (#180) into the Input Shaft.

(#03, #10, #11, #14 AND #20 Posidyne)

- Clamp the Fan Shroud with Nuts (#86)

(#05 Posidyne ONLY)

- Attach Fan Shroud with (2) Screws (#67) and (2) Washers (#182) on both sides of the Shroud.

9-12 ATTACHING C-FACE MOUNTED MOTOR

- Attach an appropriate soft sling or lifting hook to the Drive Motor, and, with care, slide the motor shaft into the Quill Input Shaft, making sure the key in the motor shaft aligns with the keyway in the Input Shaft.

CAUTION

Be very careful not to bump the Input Shaft. This could damage the Bearings and the lip of the Oil Seals.

- Attach the Drive Motor with (4) Screws (#216) and (4) Lockwashers (#202).

9-13 INSTALLING BELT DRIVEN SHEAVE OR PULLEY (Male Input Shaft Only)

- Install Guard Back Plate if necessary.
- Assemble the Taper Lock Bushing and the Drive Sheaves or Pulley with the (2) Set Screws placed in the (2) Locking Holes.
- Place assembled Drive Sheave or Pulley onto the Male Input Shaft as close as possible to the Drive Unit to mini-

mize overhang shaft deflection. Tighten (2) Set Screws to lock it on the Input Shaft. (See Figure 9.16)

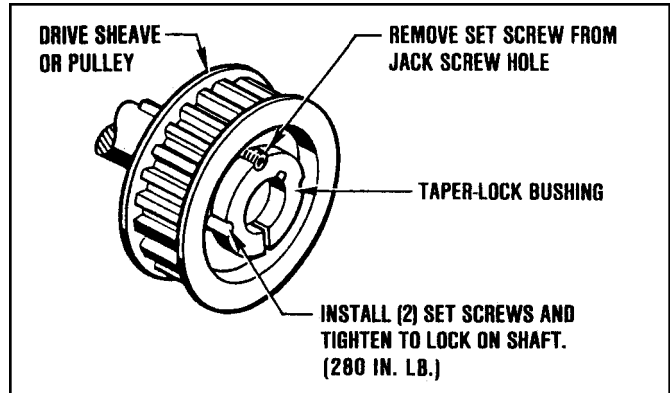


Figure 9.16 - Installing Pulley with Taper Lock Bushing

9-14 INSTALLING MANIFOLD MOUNTED CONTROL VALVE (See Figure 10.5)

- Put the Gasket (#807) on the Piston Housing (#10). Use (Permatex #30) Gasket Sealant. Make sure that no sealant gets into the pressure ports.
- Attach Manifold (#701) with (4) Screws (#730) and (4) Lockwashers (#740).
- Attach the Control Valve (#700) to the Manifold (#701) with (2) Screws (#725). Align the pressure port in the control valve with the Locating Tube (#810) sticking up out of the Manifold (#701). Also make sure that the (2) Seal Rings (#808) are in place under the Control Valve.

9-15 INSTALLING QUADRATURE ENCODER HOUSING AND PULSE GEAR

(See Figure 10.7)

(#03 AND #05 Posidyne)

- Replace Key (#234) into the Posidyne output shaft if it was removed.
- Slide the Pulse Gear (#186) onto the output shaft, until it butts up against the Locknut (#15). Align the Set Screw (#154) with the Key (#234) and tighten Set Screw (#154). (See Figure 9.17)

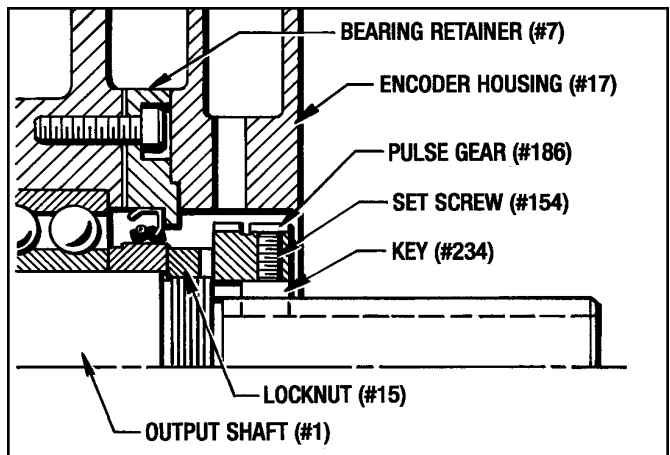


Figure 9.17 - Pulse Gear Alignment (#03 & #05 Posidyne)

- Attach the Encoder Housing (#17) to the Bearing Retainer (#7) on the output end of the *Posidyne* with (4) Screws (#76) and (4) Lockwashers (#257).

(#10 *Posidyne*)

- Slide the Pulse Gear (#186) onto the output shaft. Align the Set Screw (#154) with the drilled hole in the output shaft. Position the Pulse Gear as shown in *Figure 9.18*. Tighten Set Screw (#154).
- Place the Gasket (#290) onto the Bearing Retainer (#7) using the (2) Pins (#218) for alignment. Do not use any gasket sealant on this gasket.
- Attach the Encoder Housing (#17) to the Bearing Retainer (#7) on the output end of the *Posidyne* with (4) Screws (#76) and (4) Lockwashers (#257).

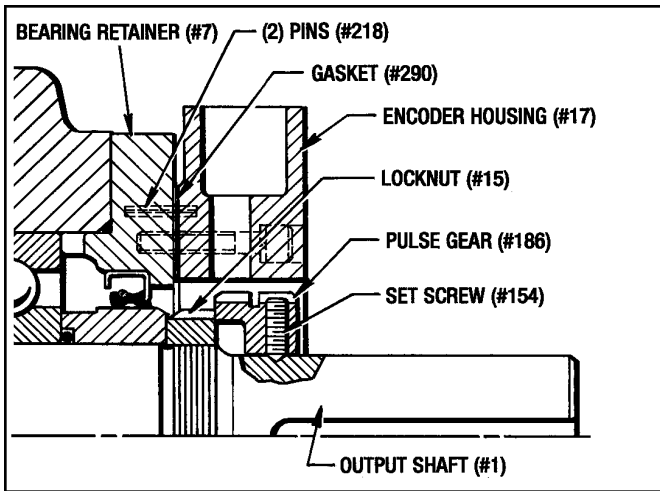


Figure 9.18 - Pulse Gear Alignment (#10 *Posidyne*)

(#11 AND #14 *Posidyne*)

- Slide the Pulse Gear (#186) onto the output shaft. Align the Set Screw (#154) with the drilled hole in the output shaft. Position the Pulse Gear as shown in *Figure 9.19*. Tighten Set Screw (#154).
- Place the Gasket (#290) into the recessed diameter in the rear face of the encoder housing. Do not use any gasket sealant on this gasket.

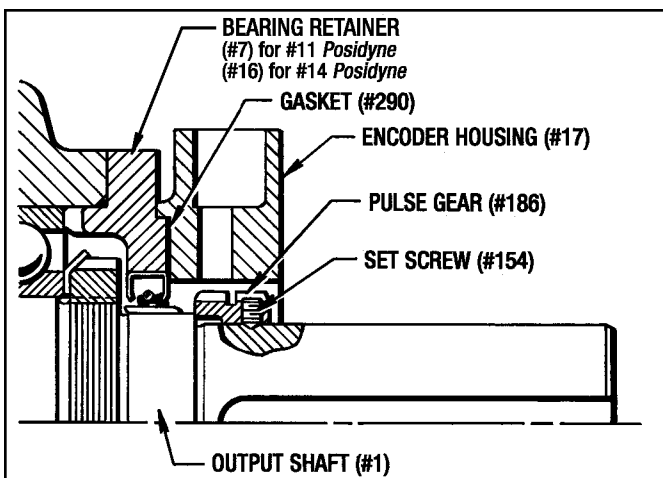


Figure 9.19 - Pulse Gear Alignment (#11 and #14 *Posidyne*)

- Attach the Encoder Housing (#17) to the Bearing Retainer (#7) on the output end of the *Posidyne* with (4) Screws (#76) and (4) Lockwashers (#257).

(#20 *Posidyne*)

- Replace Key (#234) into the *Posidyne* output shaft if it was removed.
- Slide the Pulse Gear (#186) onto the output shaft. Butt it up against the Locknut (#15) and align the Set Screw (#154) with the Key (#234) and tighten. (See *Figure 9.20*)
- Attach the Encoder Housing (#17) to the Bearing Retainer (#7) on the output end of the *Posidyne* with (2) Screws (#76) and (2) Lockwashers (#257).

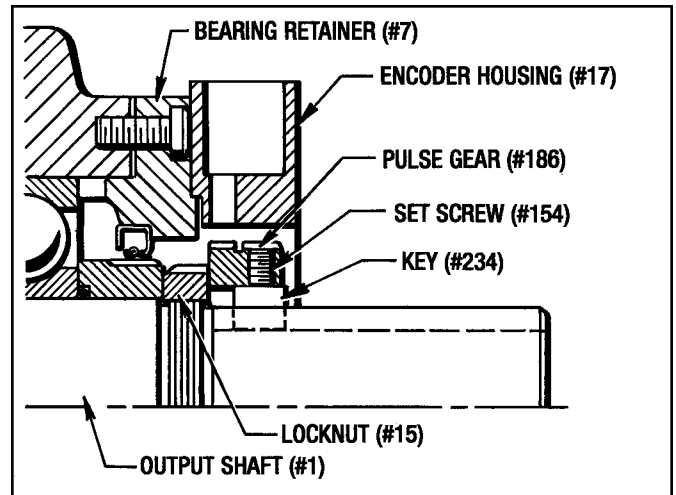


Figure 9.20 - Pulse Gear Alignment (#20 *Posidyne*)

Jump ahead to Section 9-16 and install the Quadrature Encoder (#355) and the Magnetic Pick-Up (#22).

- Attach the Top Cover (#372) with (4) Screws (#225) and the Front Cover (#253) with (4) Screws (#268).

9-16 INSTALLING QUADRATURE ENCODER (#355) AND MAGNETIC PICK-UP (#22) (See *Figure 10.7*)

Before installing the Quadrature Encoder and Magnetic Pick-Up a Special .015" Shim must be made to set the Gap between them and the Pulse Gear. (See *Figure 9.21*)

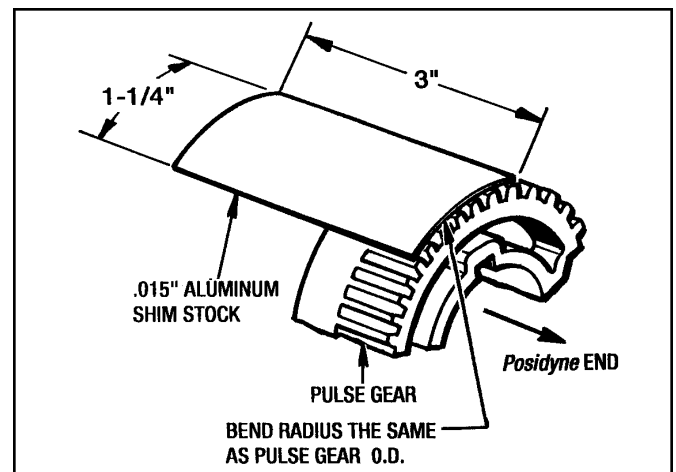


Figure 9.21 - Sensor Gap Shim

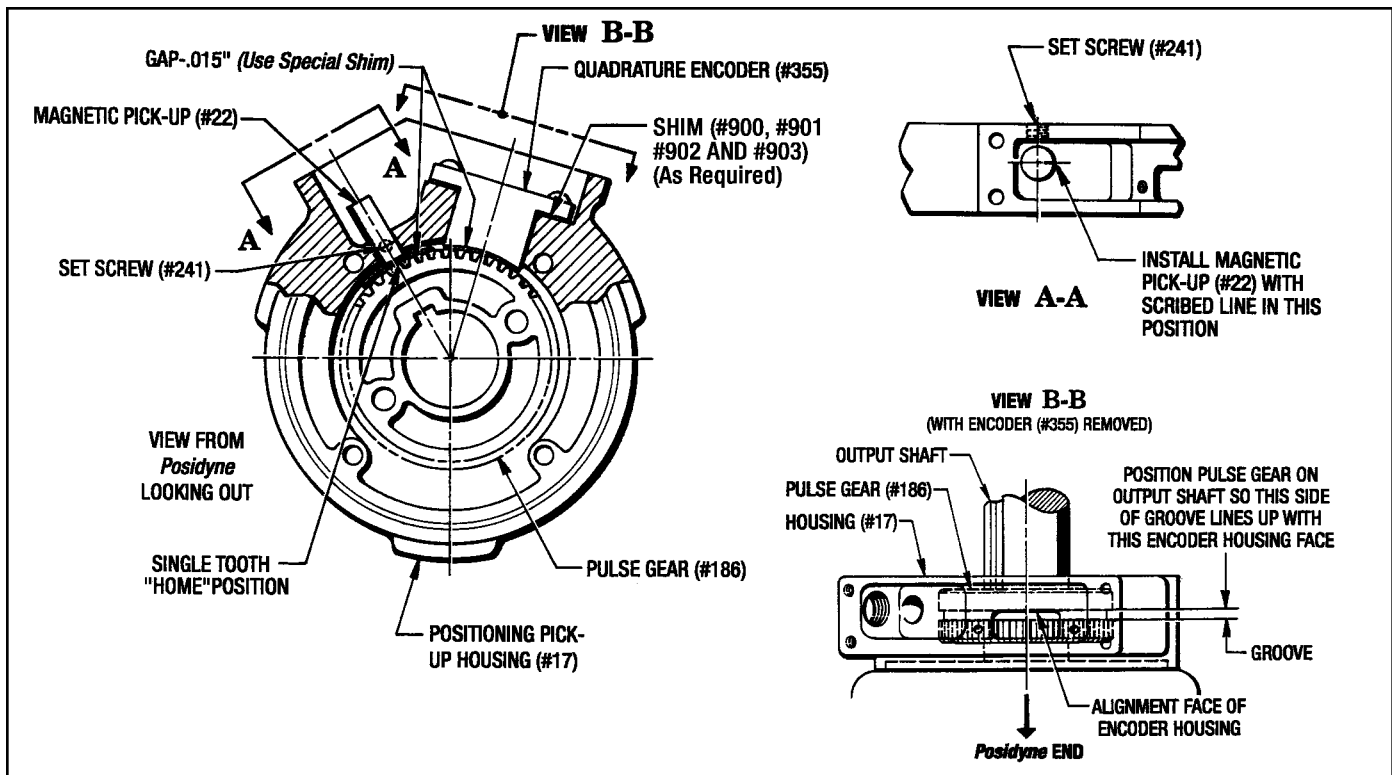


Figure 9.22 - Quadrature Encoder Position Sensors Installation

A. QUADRATURE ENCODER (See Figure 9.22)

1. Looking through the hole where the Encoder (#355) is to be placed, check to see that the Pulse Gear (#186) is in position so the teeth will be aligned with the Encoder (#355).
2. Position the Encoder (#355) so the (2) mounting holes are lined up with the holes in the housing. Insert the Sensor into the slot and attach with (2) Screws (#226).

NOTES:

1. The holes are offset to one side so the Encoder can only be installed one way.
2. Do not install any Shims (#214) at this time. The Gap must be checked first.
3. Check the Gap between the Pulse Gear and the Quadrature Encoder (#355) with the Special .015" Shim that you made. If necessary, remove the Encoder and place Shims (#214) under the Encoder. (Usually .015" is sufficient.) Re-attach the Encoder (#355) and re-check the Gap. (See Figure 9.22)
4. Connect the sensor wires to the Brad Harrison Connector.

B. MAGNETIC PICK-UP SENSOR (See Figure 9.22)

1. Visually check through the hole to see if the single tooth in the Pulse Gear (#186) is aligned with the Sensor (#22) and that the teeth for the Quadrature Encoder (#355) will not be visible to the Magnetic Pick-Up Sensor (#22).

The Magnetic Pick-Up Sensor (#22) has a Scribed Line down one side of it. To facilitate installation, highlight this Scribed Line with a felt tip pen.

2. Insert the Magnetic Pick-Up Sensor (#22) into the hole with the Scribed Line in position as shown in Figure 9.22, View A-A.
3. Insert the Special .015" Shim in between the Pulse Gear and the Sensor. Tighten the Set Screw (#241).
4. Connect the sensor wires to the Brad Harrison Connector.

9-17 REASSEMBLY and INSTALLATION of DIFFERENTIAL LINE DRIVER ENCODER (Optical Encoder)

(See Figure 10.8)

1. Install Key (#234), then slide the Optical Disc Assembly (#186) onto the output shaft, butting it up against the Locknut (#15). (See Figure 9.23)

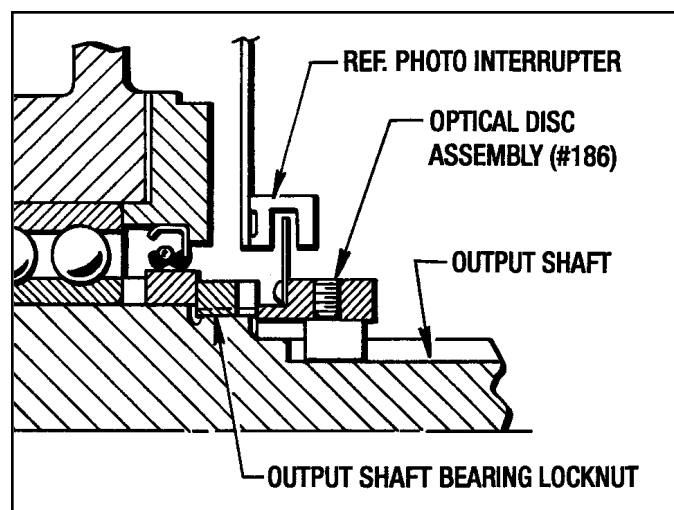


Figure 9.23 - Optical Disc and Hub Positioning

NOTE: On size 11 and 14 *Posidyne* the Optical Disc Assembly (#186) will butt up against the output shaft shoulder.

2. Tighten Set Screw (#154) and recheck the Hub position on the output shaft.
3. Apply a light coat of grease to the area on the Hub where the Dirt Seal (#269) rides.
4. If the Dirt Seal (#269) was removed then install it onto the Disc Housing (#17).
5. Attach the Disc Housing (#17) to the output end of the *Posidyne* with the (4) Screws (#76).

NOTE: There is also (4) Lockwashers (#32) on sizes 10, 11 and 20.

6. Place the Gasket (#19) on top of the Disc Housing.
7. Carefully insert the Circuit Board (#355) into the top of the Disc Housing making sure the (3) Photo Interrupters straddle the Optical Disc. (See Figures 9.23 and 9.24)

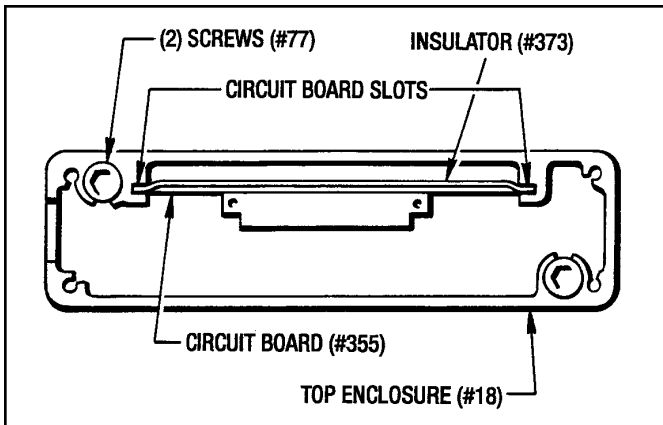


Figure 9.24 - Circuit Board Slots

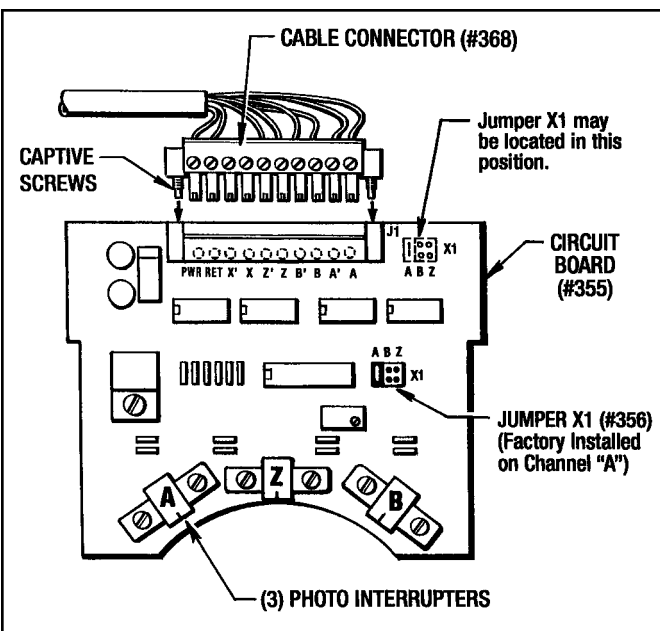


Figure 9.25 - Circuit Board Connector

8. While holding the Circuit Board upright slide the Upper Enclosure (#18) down over the Circuit Board onto the Disc Housing. Make sure the edges of the Circuit Board are in the (2) side retaining slots located in the Upper Enclosure. (See Figure 9.24)
9. Check the Gasket (#19) to see if it is still in place. Insert the (2) Screws (#77) and tighten down.
10. Slide the Insulator (#373) down and into the Upper Enclosure (#18) behind the Circuit Board (#355) placing the upper tabs into the circuit board slots. (See Figure 9.24)
11. Place the Cable Grommet (#260) and Cable (#259) into the upper slot and plug in the Cable Connector (#368) to the Circuit Board Connector and tighten the (2) Captive Screws in the Cable Connector. (See Figure 9.25)
12. Place the top Gasket (#19) on the Upper Enclosure and attach the Top Cover (#372) with (4) Screws (#225).

9-18 FINAL REASSEMBLY

1. Replace all Pipe Plugs and Fittings removed for Inspection or Disassembly.
2. Fill the *Posidyne* Clutch/Brake Drive Unit with Mobil Automatic Transmission Fluid type ATF-210 type "F" or Mobil Multi-purpose Automatic Transmission Fluid, as indicated in Section 4 LUBRICATION.

NOTE:

Other fluids may be specified for special drives. Check the Name Tag.

3. Replace all external motor drive parts, safety guards, sheaves, pulleys, belts and couplings on belt drive units.

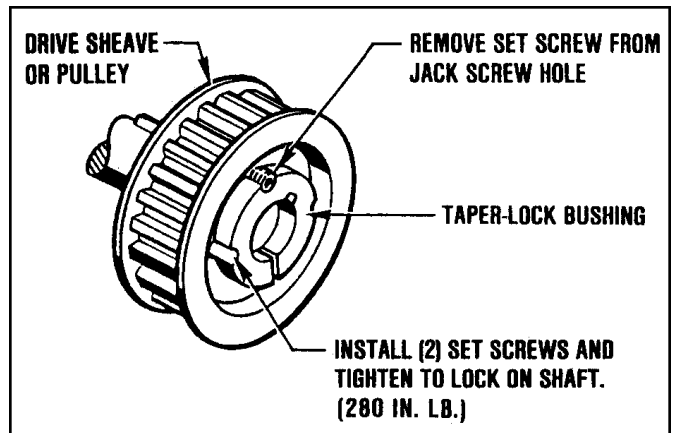


Figure 9.26 - Installing Pulley With Taper Lock

4. Before placing the Drive Unit back into service, completely check out the Operation as described in Section 5 OPERATIONAL CHECKS.

REASSEMBLY IS NOW COMPLETE AND THE DRIVE UNIT IS READY FOR SERVICE.

Section 10 ILLUSTRATED REPAIR PARTS

10-1 GENERAL INFORMATION

This section illustrates, lists and describes all available repair parts for the Force Control *Posidyne* Clutch/Brake Drives. Parts are identified on the exploded views with Part Reference Numbers. These Numbers correspond to the Part Reference Number given in the Parts List. The Part Name and Quantity Used is also given in the Parts List. This Part Reference Number, Part Name and Quantity should be used when ordering parts.

10-2 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.

10-3 FACTORY REBUILD SERVICE

Reconditioning service is offered by Force Control Industries at the factory. The cost of a complete factory rebuild will be 50% the cost of a new unit if the housings are reusable. If the housings need to be replaced there will be an additional cost. Before returning a unit for this service, however, be sure to first contact the Force Control Industries Service Sales Department for authorization and shipping instructions. Force Control Industries cannot be responsible for units returned to the factory without prior notice and authorization.

Care must be given to the packing of return drives. Always protect mounting feet by attaching to a skid. Shipment-damaged drives always delay repairs. It is usually impossible to recover damage costs from the carrier. When possible describe the problem experienced on your shipping papers.

Return to: **Force Control Industries, Inc.**
3660 Dixie Highway
Fairfield, Ohio 45014
Phone: (513) 868-0900
Fax: (513) 868-2105
E-Mail: info@forcecontrol.com

10-4 ORDERING REPLACEMENT PARTS

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

1. **Drive Model Number** (on the nameplate)
2. **Drive Serial Number** (on the nameplate)
3. **Part Reference Number** (from the parts list or exploded view drawing.)
4. **Part Name** (from the parts list)
5. **Quantity** (from the parts list)
6. **Complete Shipping Information**

Failure to include information for items 1 thru 6 will only delay your parts order. Unless another method is specified for item 6, 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.

10-5 NAME PLATE

The Name Plate shown is located on the housing. See next page for **Model Number Information**.

Force Control Industries, Inc.
Fairfield, Ohio

FOR
CONTROL For Service/Parts Call
513-868-0900

Posidyne® Clutch/Brake

Model No.

Serial No.

Use Mobil® ATF 210

Posidyne Available Options

INPUT (3)

	03	05	10	11	14	20
1	X	X	X	X	X	X
4	X	---	---	---	---	---
5	X	---	---	---	---	---
7	X	X	X	---	---	---
A	X	---	---	---	---	---
B	X	---	---	---	---	---

OUTPUT (5)

	03	05	10	11	14	20
1	X	X	X	X	X	X
4	X	---	---	---	---	---
5	X	---	---	---	---	---
7	X	X	X	---	---	---
8	X	X	X	X	X	X
C	X	X	X	X	X	X

FUNCTION (4)

	03	05	10	11	14	20
S	X	X	X	X	X	X
A	X	X	X	X	X	X
B	X	X	X	X	X	X
C	X	X	X	X	X	X
D	X	X	X	X	X	X
F	X	X	X	---	---	X
G	X	X	X	---	---	X
J	X	X	X	---	---	X
P	X	X	X	X	X	X

MOUNTING POSITION (6)

All options available in all sizes

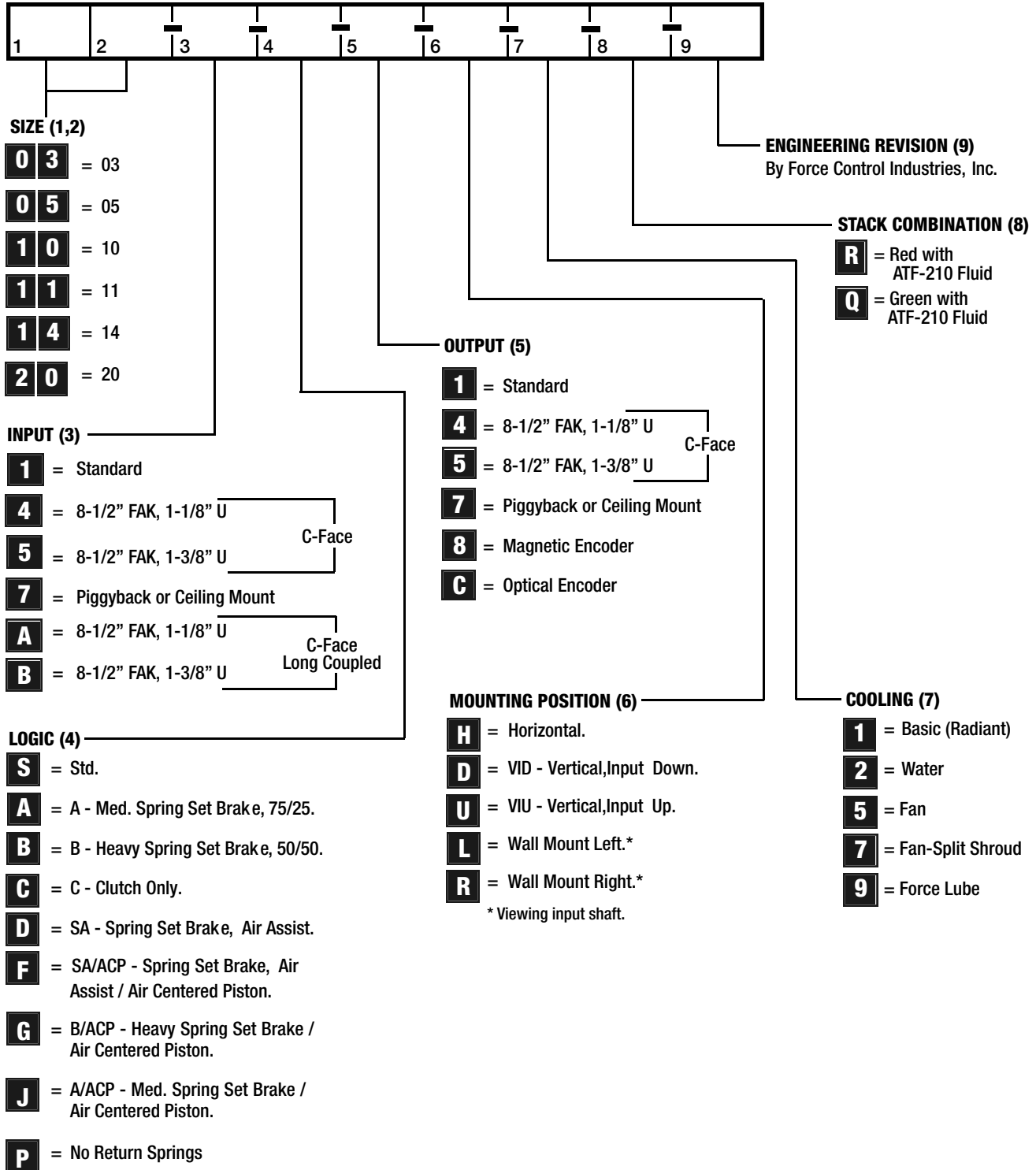
COOLING (7)

	03	05	10	11	14	20
1	X	X	X	---	---	X
2	X	X	X	---	---	X
5	X	X	X	X	X	X
7	X	X	X	X	X	X
9	X	X	X	X	X	X

STACK COMBINATIONS (8)

Both combinations are available in all sizes. Consult factory for other Stack Combinations

10-6 Posidyne MODEL NUMBERS



Repair Parts List - *Figure 10.1*
MAJOR SUB-ASSEMBLIES AND CLUTCH/BRAKE STACKS

REF No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
*12	Friction Disc (See Below).....	AR	127	Lockwasher	22
*13	Drive Plate (See Below)	AR	*229	Separator Spring (Vertical Installation Only)	AR
*53	Gasket	2	380	Full Thickness Stack Shim (#10 & #20 Only)	AR
61	Soc. Hd. Cap Screw	11	381	Half Thickness Stack Shim	
69	Soc. Hd. Cap Screw	11		(#3, #5, #11 and #14 Only)	AR

* - Indicates parts in Minor Overhaul Kit.
AR - As Required
- Not used on SCP Logic.

QUANTITIES REQUIRED FOR FRICTION DISCS (#12)

LOGIC	Posidyne DRIVE SIZE											
	03		05		10		11		14		20	
	Clutch	Brake	Clutch	Brake	Clutch	Brake	Clutch	Brake	Clutch	Brake	Clutch	Brake
S	6	4	10	8	8	7	10	7	13	11	8	7
A	6	5	10	9	8	7	10	7	13	11	8	7
B	6	5	10	9	8	7	10	7	13	11	8	7
C	6	---	10	---	8	---	10	---	13	---	8	---
SA	6	5	10	9	8	7	10	7	13	11	8	7
SCP	6	4	10	8	8	7	10	7	13	11	8	7
P	6	4	10	8	8	7	10	7	13	11	8	7

QUANTITIES REQUIRED FOR DRIVE PLATES (#13)

LOGIC	Posidyne DRIVE SIZE											
	03		05		10		11		14		20	
	Clutch	Brake	Clutch	Brake	Clutch	Brake	Clutch	Brake	Clutch	Brake	Clutch	Brake
S	7	5	11	9	9	8	11	8	14	12	9	8
A	7	6	11	10	9	8	11	8	14	12	9	8
B	7	6	11	10	9	8	11	8	14	12	9	8
C	7	---	11	---	9	---	11	---	14	---	9	---
SA	7	6	11	10	9	8	11	8	14	12	9	8
SCP	7	5	11	9	9	8	11	8	14	12	9	8
P	7	5	11	9	9	8	11	8	14	12	9	8

MAJOR SUB-ASSEMBLIES AND CLUTCH/BRAKE STACKS

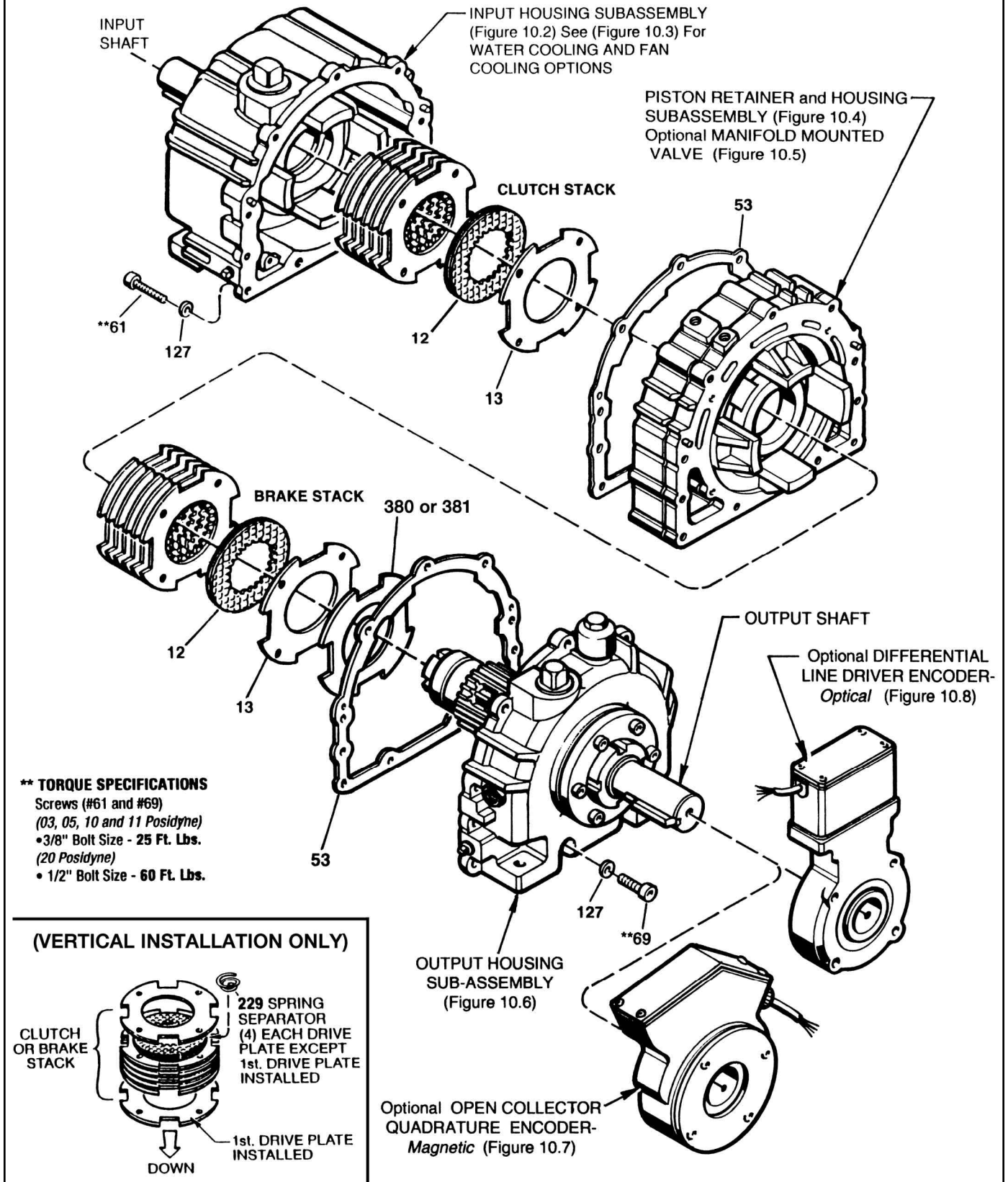


Figure 10.1 - Major Sub-Assemblies and Clutch/ Brake Stacks

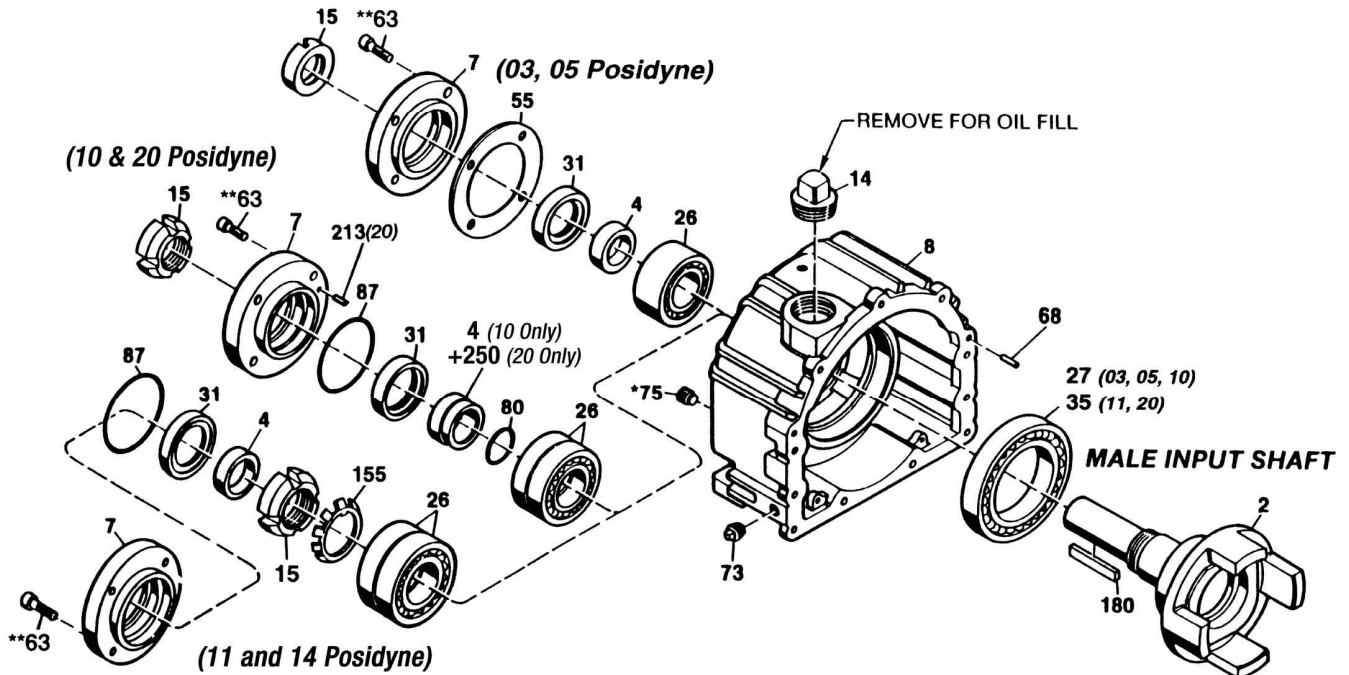
Repair Parts List - Figure 10.2
INPUT HOUSING SUB-ASSEMBLY

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
2	Input Shaft	1	75	Water Port Plug.....	2
*4	Mating Ring (03, 05, 10, 20).....	1	*80	O-Ring (10 Only).....	1
*4	Wear Sleeve (11 Only).....	1	*87	O- Ring (10,11 and 20).....	1
7	Bearing Retainer	1	99	Freeze Plug.....	1
8	Input Housing.....	1	*104	O-Ring.....	1
14	Sq. Hd. Pipe Plug	1	155	Lockwasher (11 Only).....	1
**15	Locknut	1	180	Key.....	1
*26	Ball Bearing		200	C-Face Adapter.....	1
	(03 and 05)	1	201	Soc. Hd. Cap Screw	6
	(10, 11 and 20)	2	202	Lockwasher	6
*27	Ball Bearing (03, 05 and 10).....	1	*206	Gasket.....	1
*31	Oil Seal	1	207	Bearing Retainer.....	1
*35	Ball Bearing (11 and 20)	1	*208	Oil Seal	1
*38	Ball Bearing.....	1	**209	Locknut	1
52	Internal Retaining Ring	1	213	Roll Pin, 1/4 x 1 (#20 only)	1
*55	Gasket.....	1	*250	Wear Sleeve (20 Only)	1
63	Soc. Hd. Cap Screw	6	415	Hex Hd. Cap Screw	4
68	Dowel Pin	2	416	Lockwasher	4
73	Mag. Hd Pipe Plug	2			

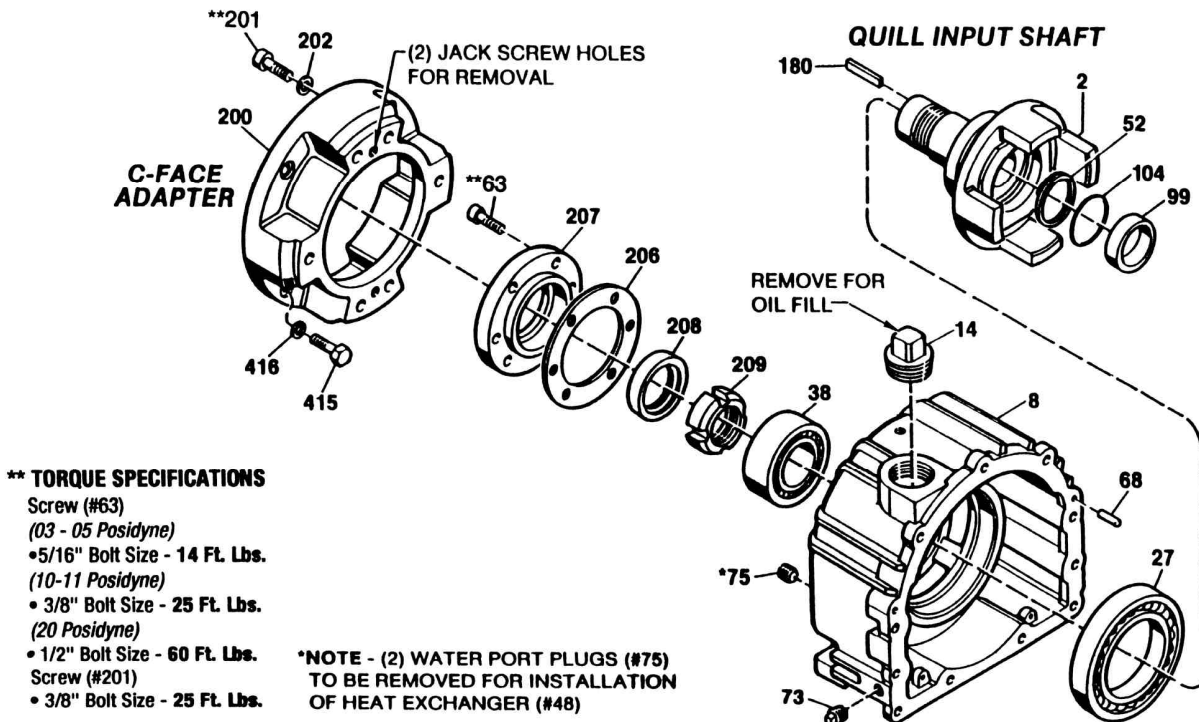
* - Indicates parts in Minor Overhaul Kit.

** - Indicates parts in Major Overhaul Kit. (Plus all parts in Minor Overhaul Kit.)

INPUT HOUSING SUB-ASSEMBLY (With Male Input Shaft For Coupling or Belt Drive)



(With Quill Input Shaft For C-Face Mounting)



**** TORQUE SPECIFICATIONS**

- Screw (#63)
- (03 - 05 Posidyne)
- 5/16" Bolt Size - 14 Ft. Lbs.
- (10-11 Posidyne)
- 3/8" Bolt Size - 25 Ft. Lbs.
- (20 Posidyne)
- 1/2" Bolt Size - 60 Ft. Lbs.
- Screw (#201)
- 3/8" Bolt Size - 25 Ft. Lbs.

***NOTE - (2) WATER PORT PLUGS (#75) TO BE REMOVED FOR INSTALLATION OF HEAT EXCHANGER (#48)**

Figure 10.2 - Input Housing Sub-Assembly

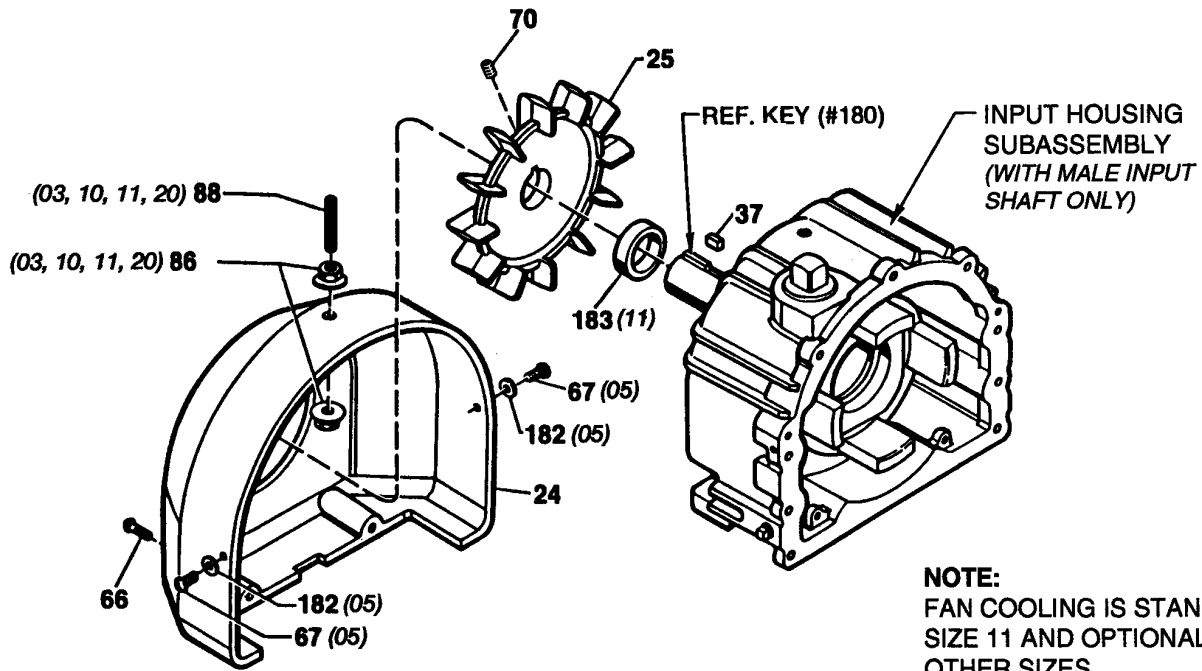
Repair Parts List - Figure 10.3
FAN COOLING AND WATER COOLING OPTIONS

REF No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
24	Fan Shroud	1	86	Flanged Locknut (03, 10, 11 and 20)	2
25	Fan	1	88	Soc. Set Screw (03, 10, 11 and 20)	1
37	Key	1	*176	Zinc Anode	1
48	Water Cooled Heat Exchanger	1	182	Flat Washer	2
56	Soc. Hd. Cap Screw	2	183	Fan Spacer (11 Only)	1
66	But. Hd. Cap Screw	2	242	Pipe Tee (Galvanized)	1
67	Rd. Hd. Mach. Screw (05)	2	237	Anti-Rotation Tag	2
70	Soc. Set Screw	1	244	Caution Tag, Zinc Anode	1
71	Comp. Elbow (with Nut Removed)	2			

* - Indicates parts in Minor Overhaul Kit.

AR - As Required.

FAN COOLING OPTION (With Male Input Shaft Only)



WATER COOLING OPTION

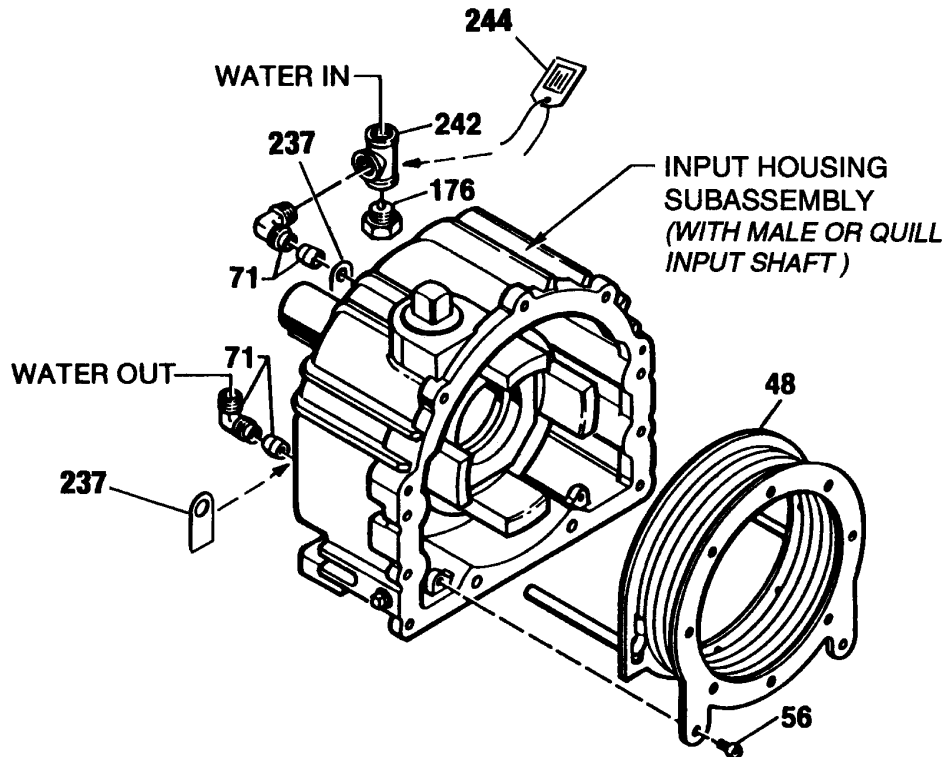


Figure 10.3 - Fan Cooling and Water Cooling Options

Repair Parts List - *Figure 10.4*
PISTON RETAINER AND HOUSING SUB-ASSEMBLY

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
3	Piston	1	*42	I.D. Sealing Liner	
3	Piston	1		A and B Logic	1
**5	Clutch Thrust Plate	1		S, C, SA and SCP Logic	2
10	Piston Housing	1	*43	O.D. Sealing Liner	1
11	Piston Retainer	1	*51	Housing Gasket	1
*27	Ball Bearing	1	62	Soc. Hd. Cap Screw	4
*36	Compression Spring (See Chart Below)	AR	68	Dowel Pin	4
*39	O-Ring		*96	Compression Spring (SCP Logic Only)	
	A and B Logic	1		03, 05, 10 and 11 Size	10
	S, C, SA and SCP Logic	2		14 Size	7
*40	O-Ring	2		20 Size	8
			128	Lockwasher, 5/16"	4

* - Indicates parts in Minor Overhaul Kit.

Quantity Required for Spring (#36)

Posidyne Size	Control Logic						
	S	A	B	C	SA	SCP	P
03	5	10	20	4	18	10	0
05	5	10	20	4	10	10	0
10	6	10	20	4	24	10	0
11	6	10	20	8	20	10	0
14	7	11	22	4	22	7	0
20	4	8	16	4	12	8	0

Repair Parts List - *Figure 10.5*
MANIFOLD MOUNTED CONTROL VALVE

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
700	Manifold Mounted Valve	1	779	Muffler	1
701	Valve Manifold	1	*807	Manifold Gasket	1
725	Soc. Hd. Cap Screw	2	*808	O-Ring	2
727	Soc. Hd. Cap Screw	2	810	Locating Tube	1
737	Lockwasher	2	811	Fastener	2
767	Pressure Gauge				
	1PC-3/8 Valve	1			
	2PC-3/8 Valve	2			

* - Indicates parts in Minor Overhaul Kit.

PISTON RETAINER AND HOUSING SUB-ASSEMBLY

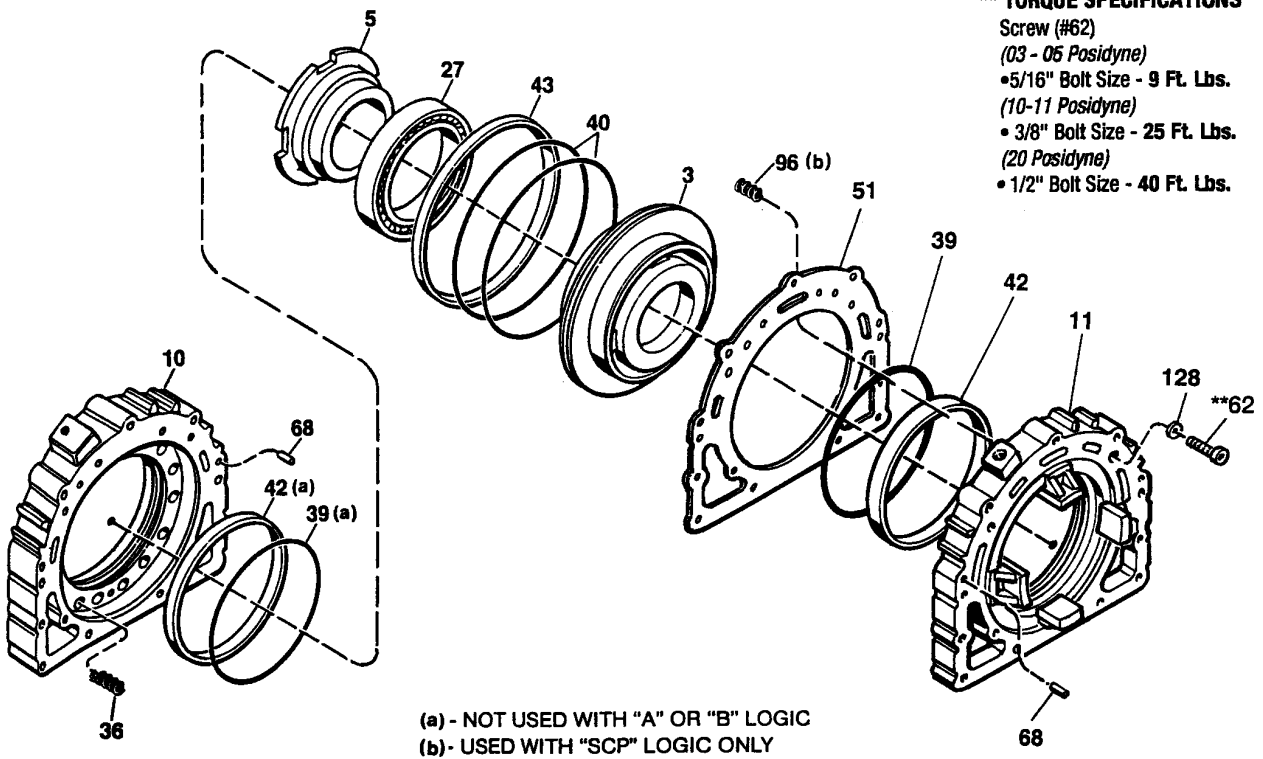


Figure 10.4 - Piston Housing and Retainer Sub-Assembly

MANIFOLD MOUNTED CONTROL VALVE (03 to 10 Posidyne Only)

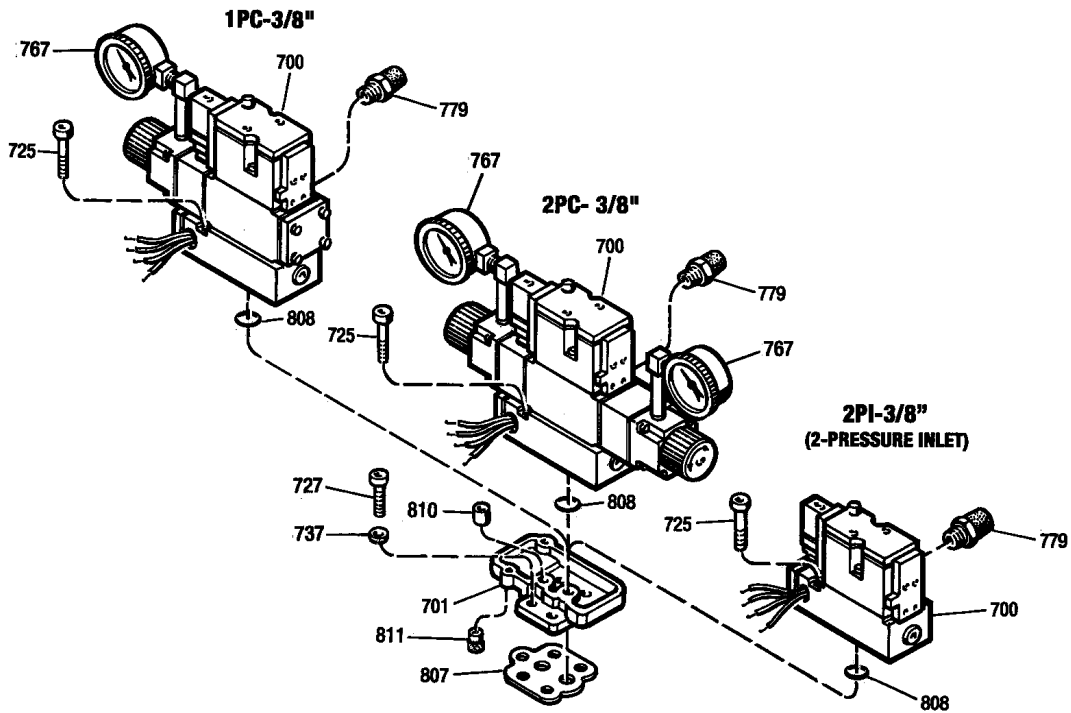


Figure 10.5 - Manifold Mounted Control Valve

Repair Parts List - Figure 10.6
OUTPUT HOUSING SUB-ASSEMBLY

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
1	Output Shaft	1	73	Pipe Plug, Magnetic Sq. Hd.	2
*4	Mating Ring (All sizes except 11 and 14)	1	*80	O-Ring	1
*4	Wear Sleeve (11 and 14)	1	*87	O-Ring	1
7	Bearing Retainer (All sizes except 14).....	1	90	Reducer Bushing.....	1
9	Output Housing	1	92	Pipe Plug (14 Only)	2
14	Sq. Hd. Pipe Plug	1	*104	O-Ring (14 Only)	2
**15	Locknut.....	1	117	Street Elbow	1
16	Bearing Retainer (14 Only)	1	135	Pipe Plug.....	1
*26	Ball Bearing		136	Pipe Plug, Magnetic Sq. Hd.	1
	Double Row (03 and 05).....	1	137	Reducer Bushing.....	1
	Single Row (10, 11, 14 and 20)	2	**155	Lockwasher (11 and 14 Only)	1
*28	Ball Bearing.....	1	177	Street Elbow (03 and 05 Only).....	1
*31	Oil Seal.....	1	181	Key	1
**34	Locknut.....	1	183	Bearing Spacer (10 Only)	1
**45	Breather.....	1	213	Roll Pin, 1/4" x 1" (20 only)	1
**48	Oil Sight Gauge	1	216	Special Reducer Fitting	1
*55	Gasket.....	1	*250	Wear Sleeve (20 Only)	1
63	Soc. Hd. Cap Screw	6	288	Output Shaft Spacer (20 Only).....	1
71	Pipe Plug	1	289	Pilot Bearing Spacer (20 Only)	1
72	Pipe Plug	1	*378	Bearing Shim (10, 11 and 14 Only).....	AR

* - Indicates parts in the Minor Overhaul Kit.

** - Indicates parts in Major Overhaul Kit. (Plus all parts in the Minor Overhaul Kit.

AR - As Required

OUTPUT HOUSING SUB-ASSEMBLY

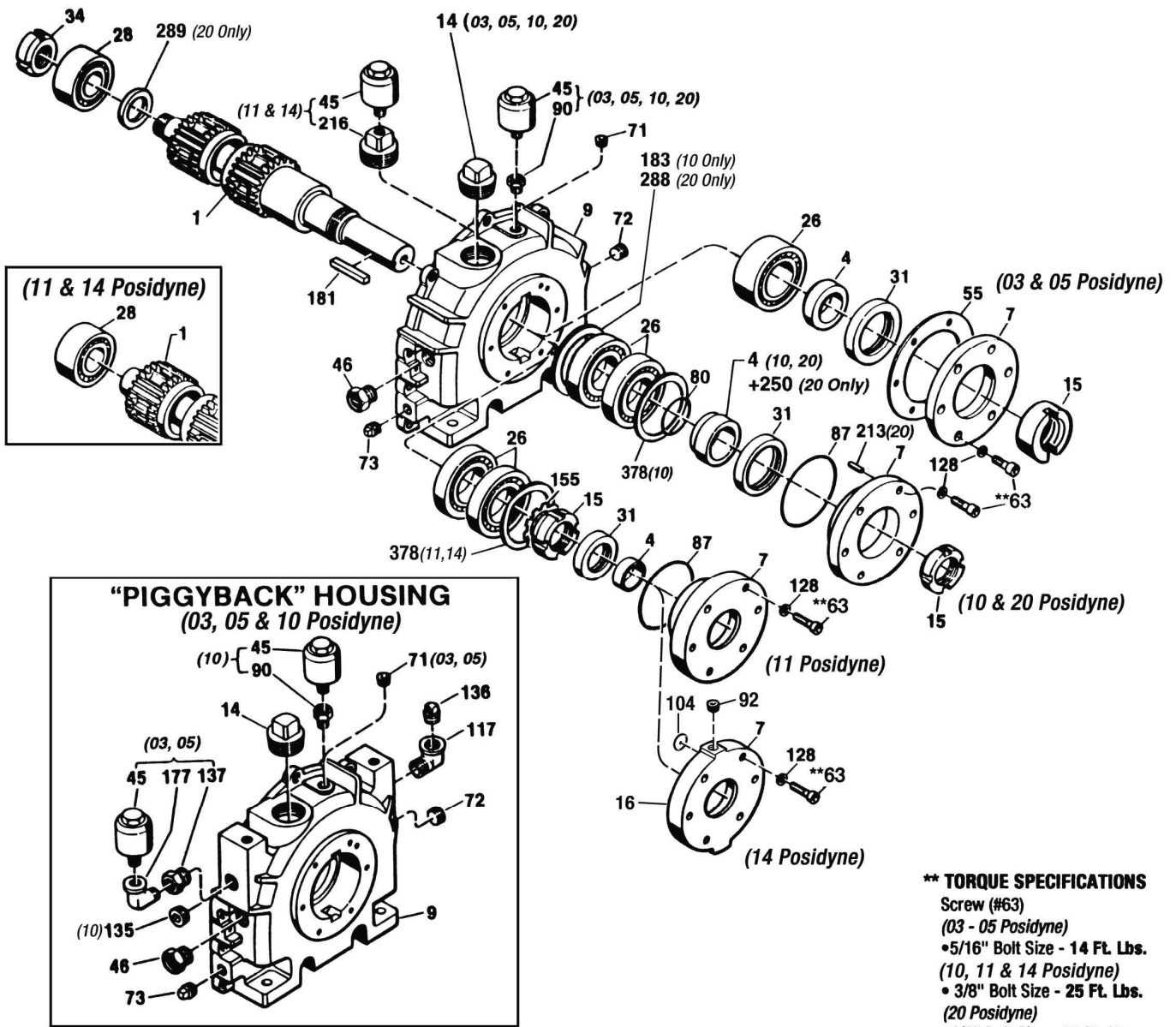


Figure 10.6 - Output Housing Sub-Assembly

Repair Parts List - Figure 10.7
OPEN COLLECTOR QUADRATURE ENCODER (Magnetic)

REF No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
17	Magnetic Pickup Housing	1	257	Lockwasher	
22	Magnetic Pickup	1		03, 05, 10, 11 and 14 Posidyne.....	4
76	Soc. Hd. Cap Screw			20 Posidyne.....	2
	03, 05, 10, 11 and 14 Posidyne.....	4	259	Cable, 5 Pin Straight.....	1
	20 Posidyne.....	2	268	But. Hd. Cap Screw	4
154	Set Screw	1	*290	Gasket (10, 11 and 14 Posidyne).....	1
186	Pulse Gear	1	355	Quadrature Pickup.....	1
218	Roll Pin (10 Posidyne Only).....	2	368	Cable Receptacle	1
225	But. Hd. Cap Screw	4	372	Top Cover	1
226	Rd. Hd. Cap Screw	2	900	Shim, .005" Thick.....	AR
234	Key (03, 05 and 20 Posidyne).....	1	901	Shim, .010" Thick.....	AR
241	Set Screw	1	902	Shim, .020" Thick.....	AR
253	Housing Cover	1	903	Shim, .030" Thick.....	AR

* - Indicates parts in the Minor Overhaul Kit.
 AR - As Required.

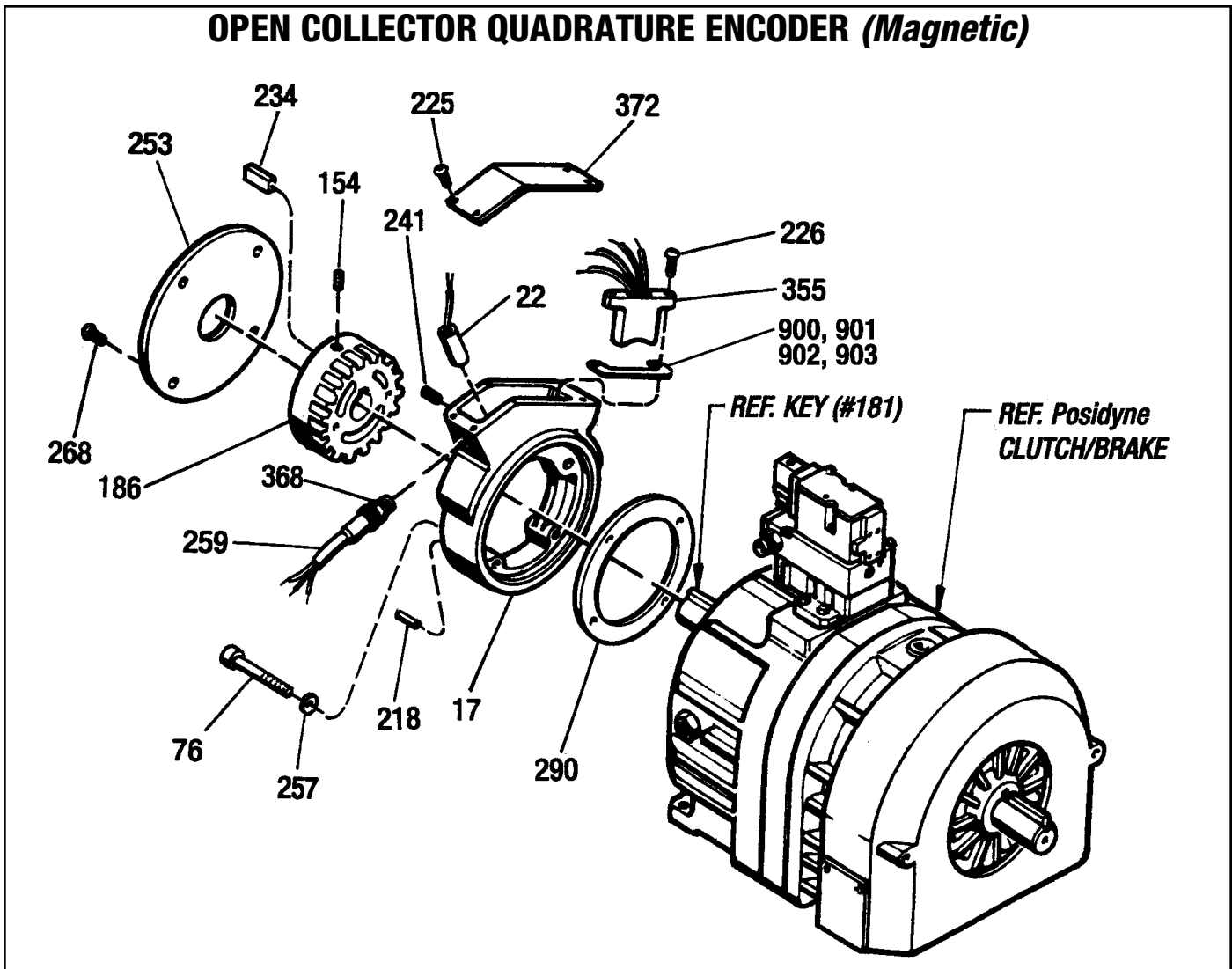


Figure 10.7 - Open Collector Quadrature Encoder (Magnetic)

Repair Parts List - Figure 10.8
DIFFERENTIAL LINE DRIVER OPTICAL ENCODER (Optical)

REF No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
17	Disc Housing	1	225	Button Hd. Screw	4
18	Upper Enclosure	1	234	Key	1
*19	Gasket.....	2	259	Cable	1
32	Lockwasher (10, 11, 14 and 20 Only)	4	260	Cable Grommet.....	1
76	Soc. Hd. Cap Screw	4	*269	Dirt Seal	1
77	Soc. Hd. Cap Screw	2	355	Circuit Board	1
154	Set Screw.....	1	356	Jumper	1
184	Dowel Pin (10, 11, 14 and 20 Only)	2	368	Cable Connector	1
186	Optical Disc Assembly	1	372	Top Cover.....	1
218	Roll Pin.....	2	373	Insulator	1

* - Indicates parts in the Minor Overhaul Kit.

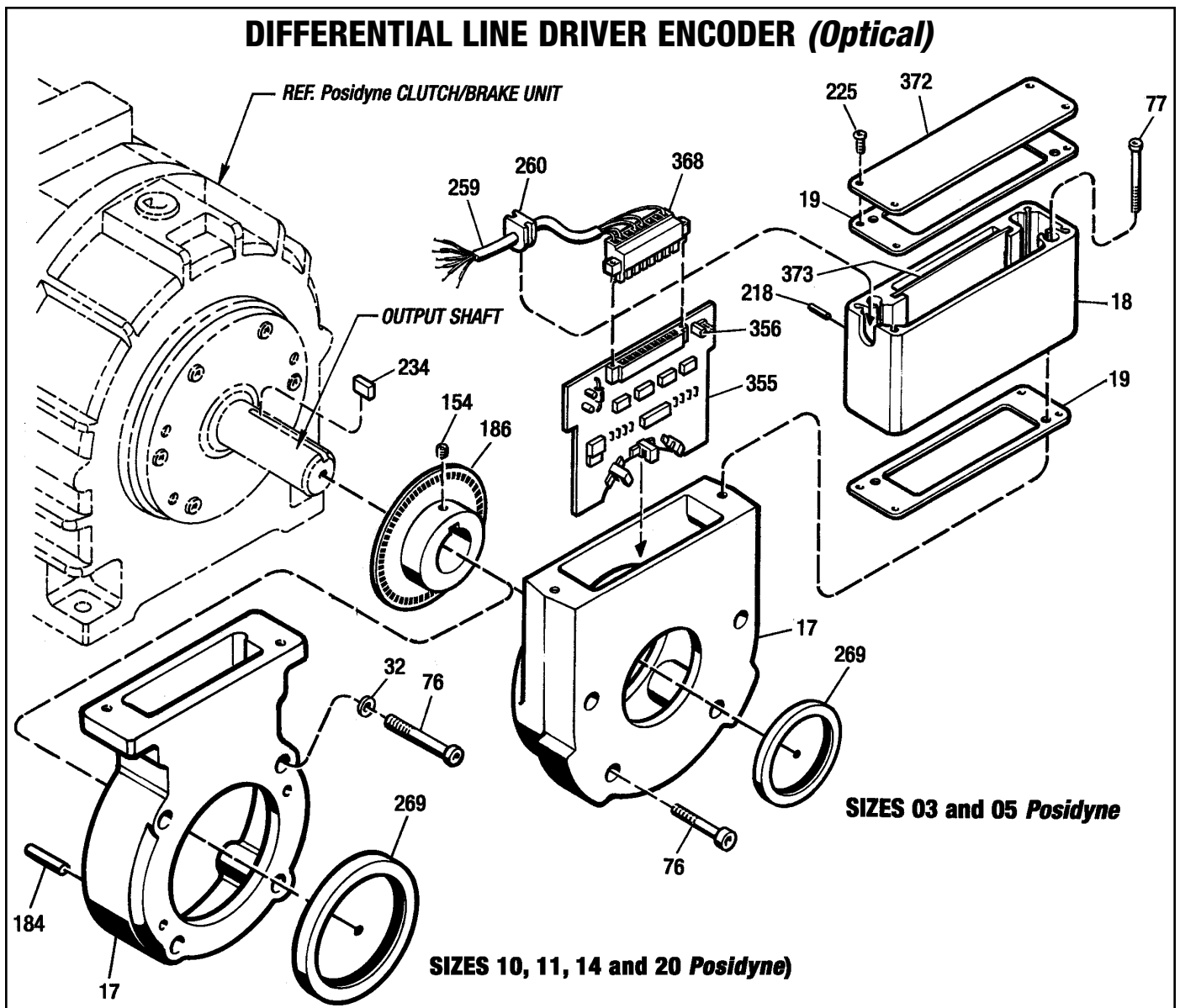


Figure 10.8 - Differential Line Driver Encoder (Optical)

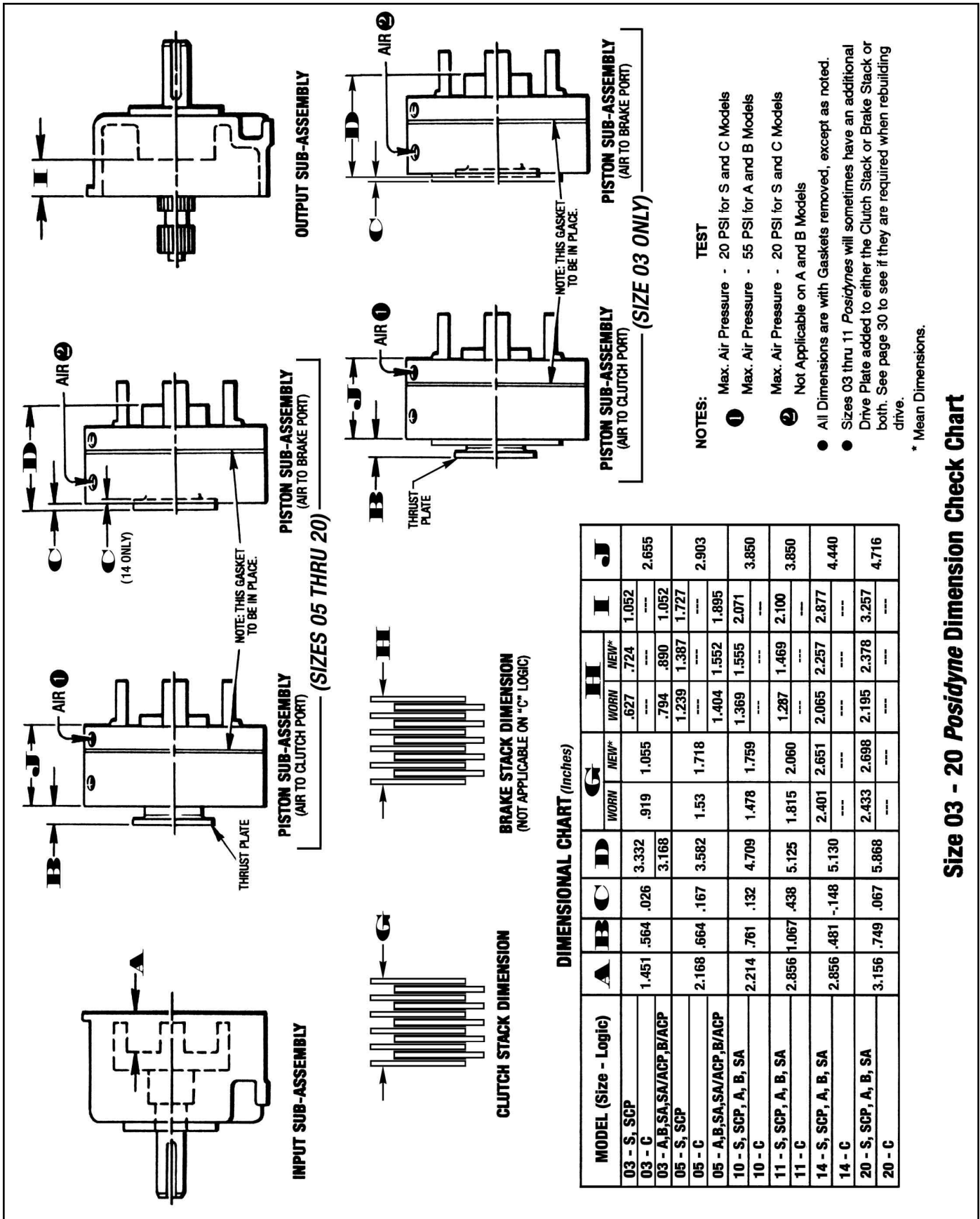


Figure 10.9 - Dimensional Check Sheet

FORCE CONTROL INDUSTRIES, INC.

Worldwide Leader in Oil Shear Technology.

*Providing today's industries
with Oil Shear Clutch and
Brake Drives that delivers:
Flexibility • Efficiency
Endurance • Performance
Dependability*

“Built to Last - Guaranteed to Perform”



FORCE CONTROL INDUSTRIES, INC.

MAIN OFFICE

P.O. Box 18366
Fairfield, Ohio 45018

3660 Dixie Highway
Fairfield, Ohio 45014

Tel: (513) 868-0900

Fax: (513) 868-2105

E-Mail: info@forcecontrol.com

Web; www.forcecontrol.com