502-11/20-001-01

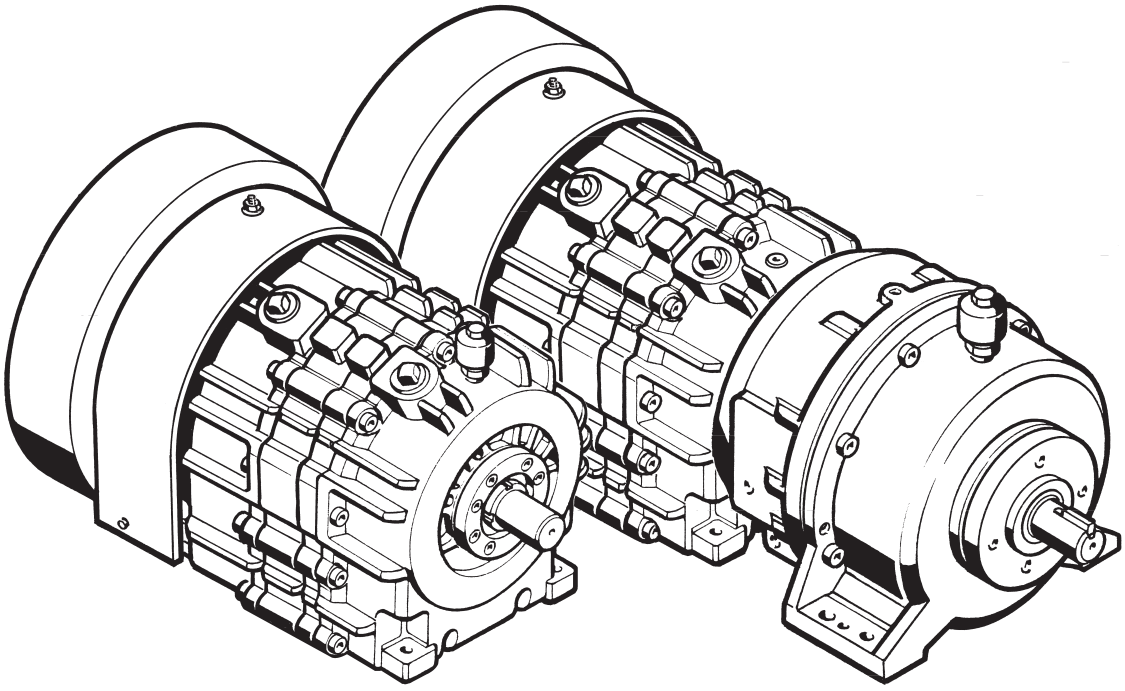
SERVICE MANUAL

AND

REPAIR PARTS

FOR

Sizes #11, #20 & #20 PLANETARY Posidyne® INDEXING Clutch/Brake DRIVES



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

FORCE CONTROL INDUSTRIES, Inc.

MANUFACTURERS OF MECHANICAL AND ELECTRICAL POWER TRANSMISSION EQUIPMENT

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Section 1
DESCRIPTION and OPERATION

1-1 THEORY OF OPERATION

Clutch/Brakes have been used for many years to index to position for feeding, cutting, packing, etc. Through the years the consistency of clutch/brakes to stop in position has improved some, but not to a great extent. The multiple disc, oil shear *Posidyne* Clutch/Brake has been a leader in dependable and accurate positioning drive systems. The **Oil Shear System** lubricates and cools the friction surfaces creating an environment which maintains a very consistent coefficient of friction. Therefore the transmitted torque is very consistent.

Here in lies the problem. Most machine drives are required to operate under varying loads, speeds or other variable conditions. Therefore even with a very consistent torque the acceleration and deceleration time can vary causing inaccuracies in position. Various attempts have been tried to better control positioning accuracy. Adjustable limit switches or proximity switches have been tried, but need to be manually adjusted. On newer equipment the PLC is often used to read an encoder and stop the drive at the proper time. There are several problems with this system. (1) The scan time of the PLC, even though it is only 20 to 40 milliseconds, can be enough to cause different stop positions on high speed applications. (2) Unless a very sophisticated feed back loop system is used, the PLC has no way to correct for varying conditions.

The **CLPC Closed Loop Positioning Control** developed by **Force Control Industries, Inc.** uses a positioning encoder and home sensor to continually look at the stopping position, compare it to the actual home position, and make corrections as errors begin to occur.

1-2 TYPICAL APPLICATIONS

A. Single Revolution - A single revolution cut-off drive for a guillotine cutter, fly cutter, etc. (See Figure 1.1)

In these applications the final shaft turns one revolution each index cycle. In most cases it is critical that the blade reach the same point at the same time in the cycle for accurate cut length. Here the acceleration rate as well as the stop position are critical for consistency. On these applications usually the index length, once set, never changes.

B. Index to Length - These are applications such as feeding steel, tubing or wire for Cut-To-Length. This application requires the ability to change the index length for each product change. A product is fed with nip rolls to feed a preset length of product.

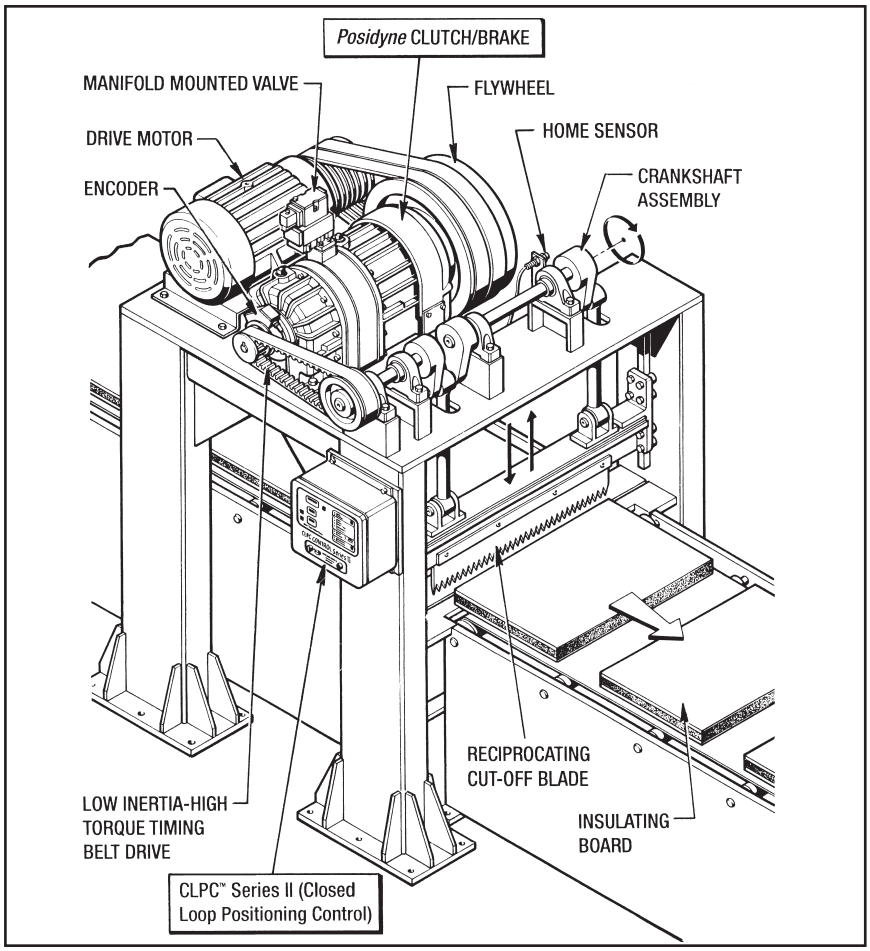


Figure 1.1 - Typical Single Revolution Application

1-3 COMPONENTS IN A TYPICAL SYSTEM

A. *Posidyne* Clutch/Brake

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.

2. Description and Operation

(See Figure 1.2)

In the *Posidyne* Clutch/Brakes, 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. An optional Force Lube Brake Stack is also available to add additional oil flow between the Brake Friction Discs and Drive Plates.

The #20 *Posidyne* with a Planetary Gear Reducer cross-section (Figure 1.2) shows the drive with the Brake engaged. A nominal braking force is provided by springs located in the Piston Housing. 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 Brake Drive Plates are keyed to the Piston Retainer Housing and the Friction Discs are splined to the *Posidyne* Output Shaft. The Output Shaft of the integrally mounted Planetary Gear Reducer 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 Clutch Drive Plates are keyed to the Input Shaft and the Friction Discs are splined to the *Posidyne* Output Shaft. This allows both *Posidyne* shafts to rotate at the same speed.

The *Posidyne* output module is integrally mounted to the 3.68:1 ratio, four planet output shaft by a shrink disc locking assembly. The sun gear drives the four planet gears which in turn drives the main reducer output shaft.

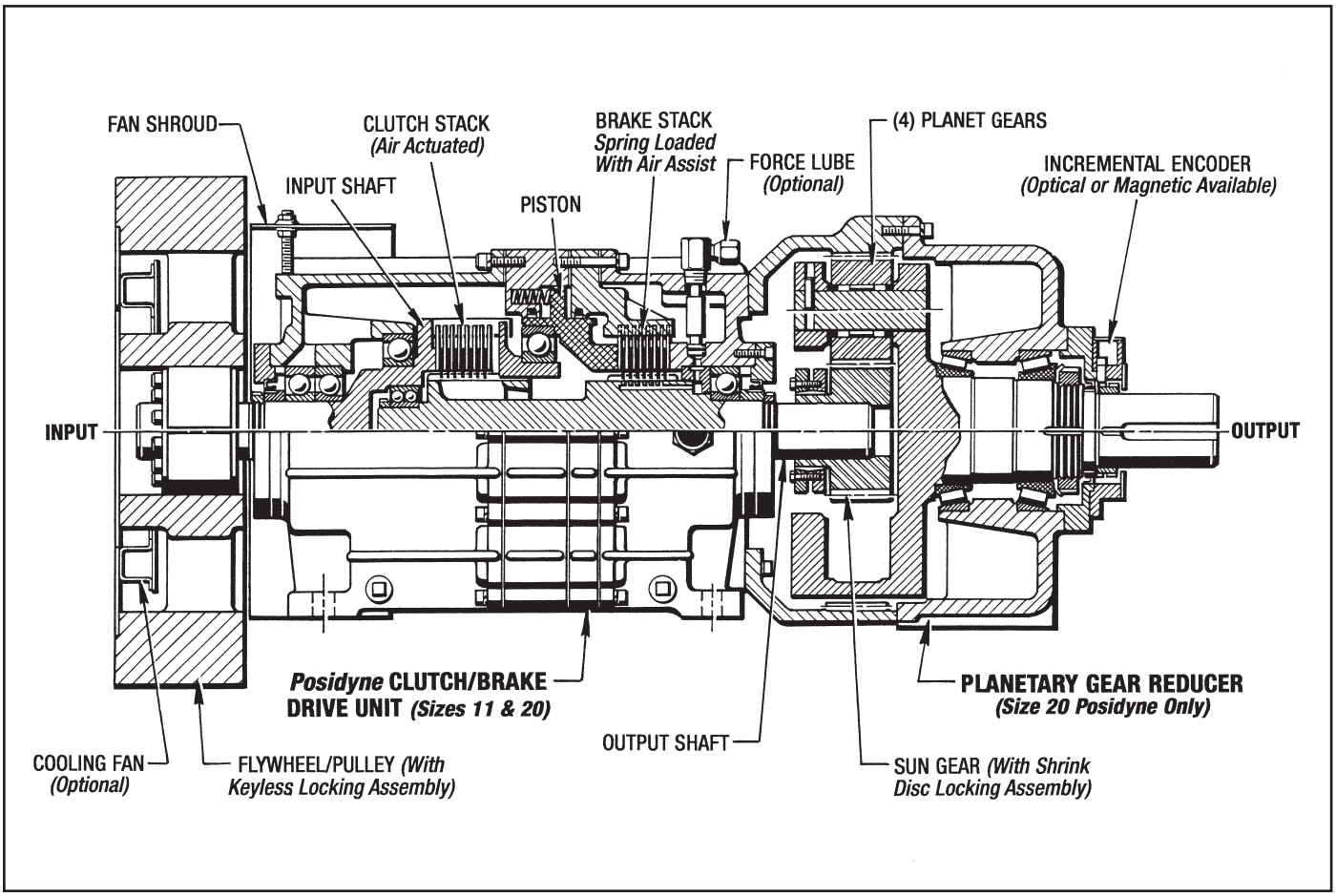


Figure 1.2 - Posidyne Indexing Clutch/Brake Drive

B. External Cooling and Filtration System (Optional)

A typical External Cooling and Filtration System would include a fluid pump drive motor, heat exchanger, 25 micron fluid filter with gauges, flexible hoses, hose fittings and a temperature switch. This system is shown on Figure 10.11.

C. Forced Lubrication System (Optional)

Forced Lube is also available for the Brake Stack on the **#20 *Posidyne* Clutch/Brake Unit**. The system consists of an Inlet Manifold, a Labrynth and a pre-drilled Output Shaft to deliver the fluid to the Brake Stack. These components are shown on Figure 10.5. This **Forced Lube System** also utilizes the External Cooling and Filtration System shown on Figure 10.11.

D. CLPC Model LC Closed Loop Position Control

(See CLPC Model LC Closed Loop Position Control Operation and Service Manual for Installation, Operation and Servicing.)

The **CLPC Model LC Closed Loop Position Control** is an electronic, error correcting, closed loop positioning control used to control the ***Posidyne*** **Clutch/Brake** in a positioning or index to length application. It is designed primarily as a stand alone interface control between a main machine process controller, (PLC) or other machine control and the ***Posidyne*** **Clutch/Brake** unit. It can also be used to operate other types of clutch/brake units.

Upon a signal from the machine control the **CLPC Model LC Control** will energize the actuation valve solenoid from a 24 VDC output to engage the clutch and allow the drive to run until a preset trigger point is reached, at which time the valve solenoid is de-energized engaging the brake (a separate 24 VDC brake output is available if required) to stop the drive in position.

E. Position Encoder

The **CLPC Model LC Control** operates by counting pulses generated by an incremental quadrature magnetic encoder or differential line driver optical encoder to determine actual position and facilitate stopping position. The control will recognize various types of encoders, however they must meet the following specifications:

> **NOTE -** The Differential Line Driver Encoder is not available on the size 20 *Posidyne* with the Planetary Gear Reducer.

1. Sinking open collector output.
2. RS 422 / RS 485 differential output.
3. 5 to 12 Volts DC.
4. Either single ended, open collector output or differential line driver.
5. TTL compatible: 0-.3 VDC (low), 2-12 VDC (high)

The number of pulses per revolution or resolution is determined by the location of the encoder, accuracy of the stopping position required and the accuracy of the drive train. Resolution must be high enough to be accurate without being overly fine with no actual positioning benefit.. The closer the encoder to the final shaft the higher resolution required.

F. Home Sensor

The CLPC Model LC Closed Loop Positioning Control requires a home sensor to indicate where the mechanical home of the drive is located. This can be any kind of a single pulse generated from a limit switch, proximity switch optical limit switch, Z pulse encoder, etc. The duration of the pulse must be at least 15 milliseconds and meet the following specifications:

1. Output saturation (voltage drop across conducting sensor) to be a maximum of 1.0 Volts @ 50 milliamps if single ended.
2. Normally open (NO) or normally closed (NC).
3. NPN Sinking.
4. 3 wire.
5. TTL compatible: 0-.3 VDC (low), 2-12 VDC (high)
6. If a Limit Switch is used it may need a capacitor. Typical value of the capacitor is 10 µF, 35 V. Contact factory for further assistance.

G. Actuation Output (Solenoid Valve Actuator)

The CLPC Model LC Closed Loop Positioning Control has a direct actuation output which is 24 VDC, at a maximum of 1 Amp.

The ***Posidyne*** actuation valve solenoid is normally 24 VDC, 17.1 Watts.

H. Start Cycle (PLC Interface)

The start cycle signal required by the **CLPC Model LC Control** is a short pulse of 50 milliseconds in duration which can be furnished from a PLC output or other source. The required signal can be AC or DC and must be:

1. 90 to 140 VAC (typ. 115 VAC), cold contact, 50 milliseconds minimum in duration with 6 to 10 milliampere input current and 2.5 milliampere drop out current.
2. 10 to 30 VDC and 1 millisecond minimum in duration.

Section 2
SPECIFICATIONS

Table 2.1 SPECIFICATIONS - *Posidyne* Indexing Clutch/Brake Drives

Size	Clutch Torque (Lb. In.)		Brake Torque (Lb. In.)				Max. RPM **	Max. KE per Engmt. (Ft. Lbs.)	Average Thermal HP Cooling*			Air Vol per Engmt ($In.^3$)	Oil Cap. *Posidyne* / Gear Box (Qts.)	Inertia of Cyclic Parts ($Lb. Ft.^2$)
			Springs Only		With Maximum Air Assist									
	Static @ PSIG	Dynamic @ PSIG	Static	Dyn	Static	Dynamic			Basic	Fan	Heat Exch.			
11	10314 @ 60	8870 @ 60	1532	1309	7778 @ 35	6689 @ 35	995	50,000	1.0	2.0	5.0	15	10 / ---	1.60
20	18348 @ 60	15779 @ 60	2959	2545	16188 @ 35	13922 @ 35	995	60,000	1.5	2.5	6.0	23	25 / ---	4.37
20P	69355 @ 60	59644 @ 60	11185	9620	61190 @ 35	52625 @ 35	995	60,000	1.5	2.5	6.0	23	25 / 10	11.3

NOTES:

* - Ratings based on 80° F Ambient Temperature. Higher thermal ratings available with Forced Lube. Consult factory with special application details.

** - RPM based on maximum Input RPM with flywheel.

Size 20P indicates a #20 *Posidyne* with Planetary Gear Reducer.

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 except drive units that have an external cooling system. However, before placing the unit in service or storage, check the oil levels to make sure none has spilled out in transit. Add oil if necessary. **(Refer to Section 4 - Lubrication.)**

IMPORTANT

Remove the (2) red plastic pipe plugs located in the top of the Output Housing and Planetary Gear Box Housing and install the (2) Air Breathers (#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

1. The *Posidyne* Indexing 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 the flatness of your existing base or frame. If a .005" Feeler Gauge can be inserted under any one of the four mounting feet with the mounting screws just started (but not tightened down) into the mounting holes, shimming procedure must be followed to compensate for any warping in the base.
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 MOUNTING #20 *Posidyne* WITH PLANETARY GEAR REDUCER

The primary attachment to the machine frame or base must be done off the (4) mounting holes on the Planetary Gear Reducer.

The (2) mounting feet on the Posidyne Output Housing are not used.

A nominal 1/2" Spacer plus shims has to be used under the *Posidyne* Input Housing feet to take up the gap for vertical alignment. (See Figure 3.2 for Mounting Hole Layout.)

After final installation and alignment to driving and driven machinery is completed, (2) removable dowel pins must be installed under the Planetary Gear Reducer feet. **(See 3-5 for procedure.)**

3-4 FLYWHEEL INSTALLATION

(See Figure 10.1 or 10.2)

1. If your drive is fan cooled then remove the Fan (#543) from the Flywheel (#542) by taking out the (8) Screws (#475).

   Also make sure the Fan Shroud (#24) is mounted to the Input Housing.
2. Make sure the Locking Assembly (#540) is in the bore of the Flywheel.
3. Cut a wood 2x4 to an 8" length and drill a 13/32" hole in the center.
4. Install a 1/2"-13 x 8" Lg "all thread rod" into the end of the input shaft until it bottoms out.
5. With an overhead crane and soft sling position the Flywheel on the end of the input shaft.
6. Place the 2x4, 1/2" Flat Washer, and a 1/2"-13 Nut onto the threaded rod and tighten the hex nut so it pushes the Flywheel onto the input shaft until it is approx. 1/8" from the Fan Shroud (#24) or 1/2" from the Bearing Retainer (#7) (See Figure 3.1)

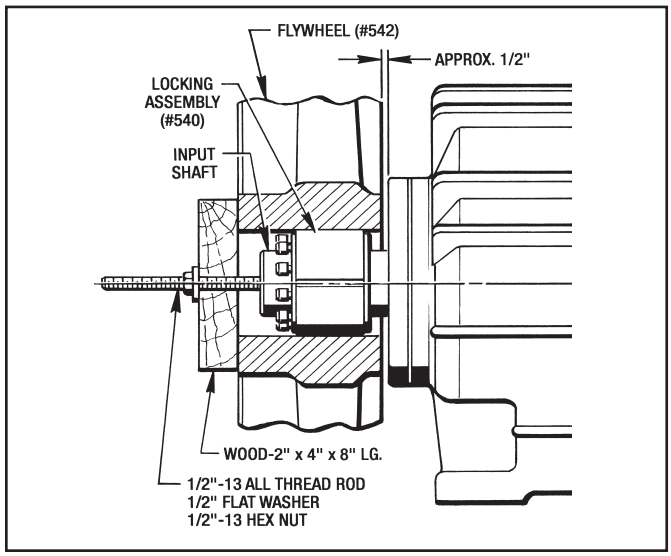


Figure 3.1 - Installing Flywheel on Input Shaft

7. Remove the 2x4, Washer, Nut and Threaded Rod from the input shaft after the Flywheel is in position. Also remove the lifting strap from the Flywheel.
8. Tighten up the B-Loc Locking Assembly (#540) according to manufacturers specifications. **(See B-Loc spec. sheet at end of this manual.)**
9. Reinstall Cooling Fan (#543) into the Flywheel.

3-5 INSTALLING MOUNTING DOWEL PINS

(#20 *Posidyne* With Planetary Gear Reducer)

1. Drill (2) .484" Dia. holes through the machine base, using the (2) .484" Dia. holes in the feet of the Gear Reducer Main Housing (#800) as pilot holes as shown in Figure 3.2.

   NOTE: Drilling through the machine base will facilitate removal of dowel pins when drive has to be removed for servicing.

2. Final ream both holes to a light clearance fit for 1/2" Dowel Pins. Install (2) 1/2" x 1" Lg. Removable Dowel Pins.

   IMPORTANT: Do not Loc-Tite these Dowel Pins.

3-6 INSTALLING EXTERNAL COOLING SYSTEM

(See Figure 10.11)

1. Install Heat Exchanger (#4), Filter (#15) and the Cooling Pump and Motor Assembly as close as possible to the drive unit.

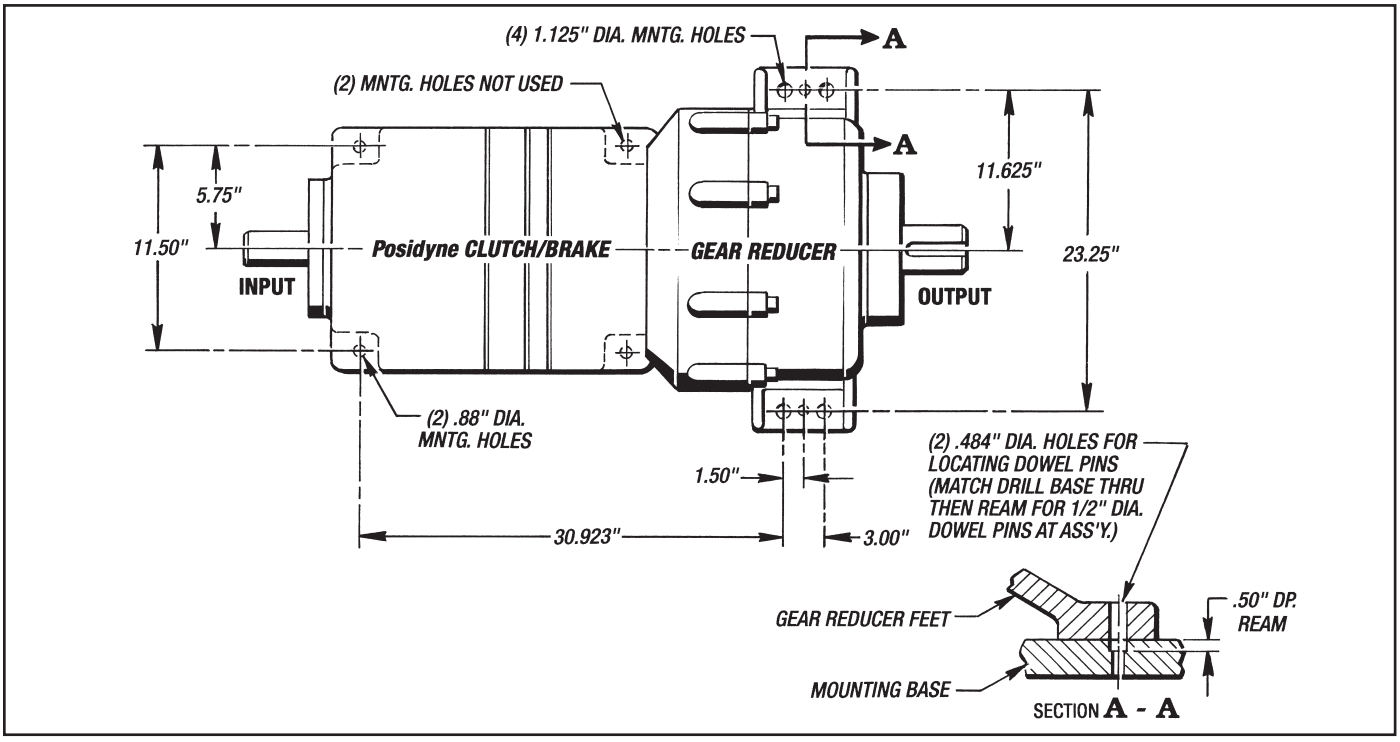


Figure 3.2 - Mounting Hole Layout and Installing Mounting Dowel Pins

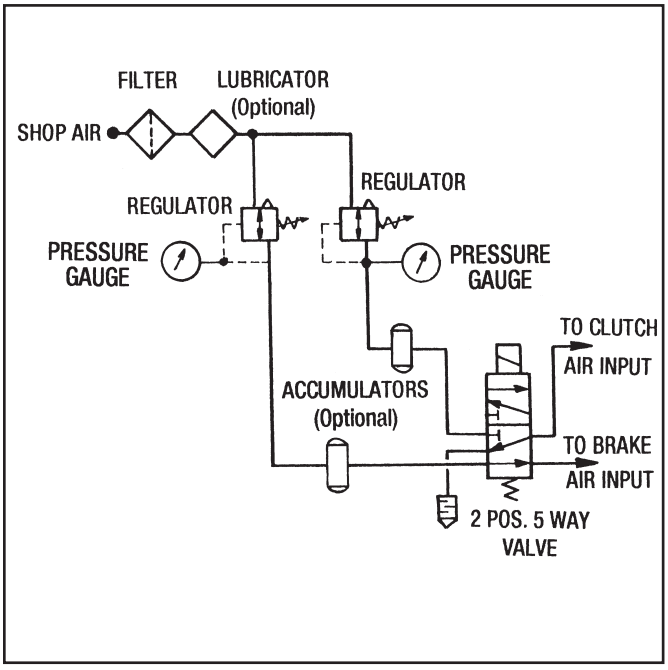


Figure 3.3 - Pneumatic Schematic

2. Remove any necessary pipe plugs and hook hoses up as shown in Figure 10.11.
3. Fill drive unit with oil as specified in **Section 4 - Lubrication.**

3-7 INSTALLING PNEUMATIC SYSTEM

(See Figure 10.9 and 10.10)

A. With Manifold Mounted Control Valve

Most of the Indexing Drives are furnished with a Manifold Mounted Control Valve because of the quick response time required.

1. Install the Pneumatic Accumulator Assembly as close as possible and hook-up the hoses as shown in Figures 10.9 and 10.10.

B. Customer Furnished Control Valve

Figure 3.3 illustrates a typical pneumatic system for the *Posidyne* Indexing Drive.

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. Be sure to use valves of at least 2.0 Cv.

2. The optional accumulator 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. Size the accumulator to be at least 10 times the air required per engagement (See Table 2.1)
3. The air pressure regulator should be sized and set to provide the required torque. (See Table 2.1)
4. 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.
5. After using the drive for a few weeks the acceleration time may increase. Increasing the air pressure will restore the acceleration.

3-8 INSTALLING THE CLPC Model LC CONTROL

See CLPC Model LC Control Operation and Service Manual for Installation, Operation and Servicing.

Section 4
LUBRICATION

4-1 CHECKING THE OIL LEVEL

(See Figure 4.1)

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 (#46) located at the output end of the drive. The oil level is to be at the center of the gauge with the drive motor turned off.

The Planetary Gear Box has a Pipe Plug (#92) in the side of the Transfer Case. Remove this pipe plug to check the oil level. The oil level is to be at the bottom of the hole.

4-2 CHANGING THE OIL

(See Figures 4.1 and 4.2)

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

A. *Posidyne* Unit Without External Heat Exchanger

Every three months completely drain the oil from the *Posidyne* Drive by removing a Drain Plug (#73). Drain the oil into a suitable container. If the Sight Gauge (#46) is dirty, it should be removed and cleaned.

Re-install the Drain Plug (#73), Sight Gauge (#46) and remove the Inspection Plug (#14) from the Input Housing. Refill the unit with fresh oil to the center of the Sight Gauge (#46).

NOTE: The capacity of the #11 Posidyne is 10 Qts. (2-1/2 Gal.) and the #20 *Posidyne* requires 25 Qts. (6-1/4 Gal.) of oil.

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

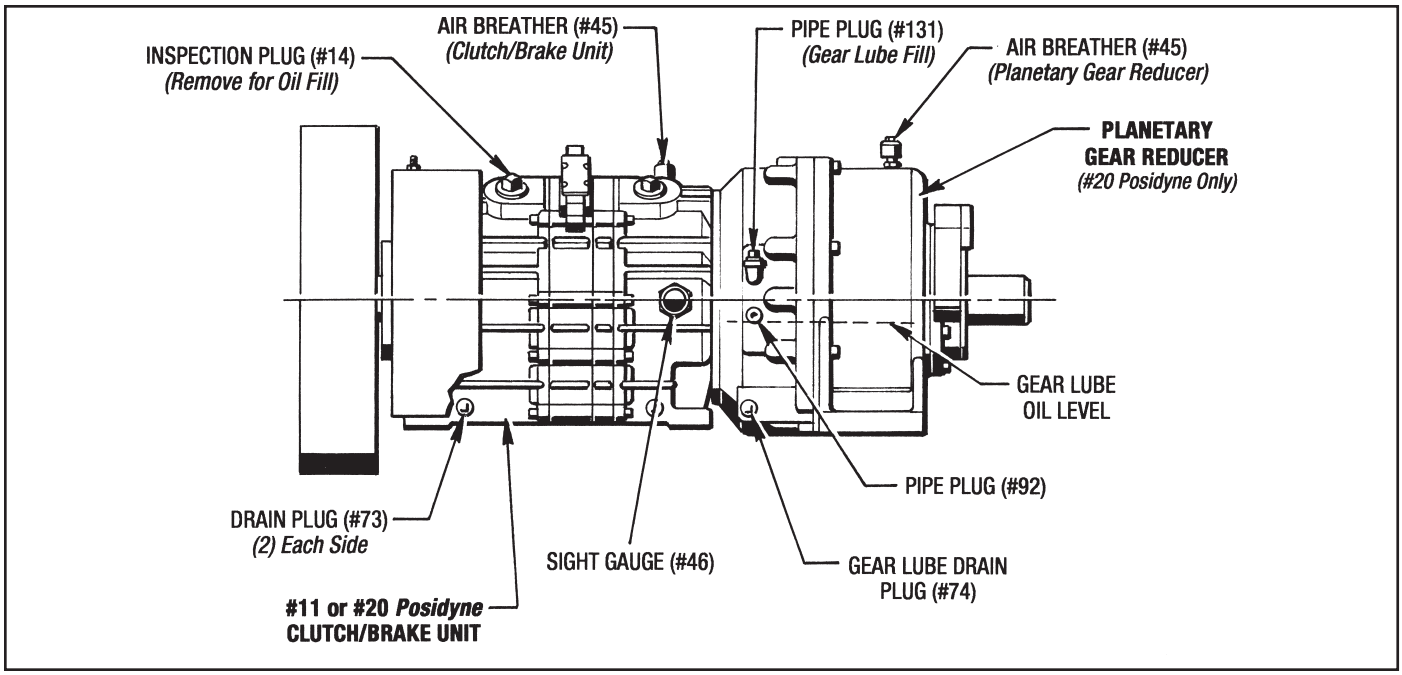


Figure 4.1 - Lubrication

B. Planetary Gear Reducer

After initial installation drain the oil after 30 days and refill with fresh oil. After first oil change check the level at least once per month and change at least every 12 months.

If the oil in the Planetary Gear Reducer needs replaced then remove the Drain Plug (#74) and drain the oil into a suitable container. Replace this plug after the oil is drained.

Remove Pipe Plugs (#131) and (#92) and fill the Transfer Case until the oil starts to come out the "Oil Level Hole" as shown in Figure 4.1. The Gear Reducer hold approx. 10 Qts. (2-1/2 Gal.) of Gear Lube. Replace the (2) Pipe Plugs (#131) and (#92).

C. *Posidyne* Unit With External Heat Exchanger)

(See Figures 4.2 and 10.11)

1. Replacing Filter Element (#16)

Check the pressure drop on the (2) Pressure Gauges (#216) with the Cooling Pump turned on to see if the Filter Element (#16) needs to be replaced.

If the pressure drop on the filter outlet is **15 PSI or more**, less than the filter inlet, replace the Filter Element (#16). First turn the Cooling Pump off then replace the Element.

2. Draining the Oil.

a. Remove Pipe Plug (#45) from **Valve "A"** and connect a suitable hose to drain the oil.

b. Turn the handle on **Valve "A"** to **Drain Position** as shown in Figure 4.2. (**Valve "B"** should be in **Normal Position**.) Start the Cooling Pump and drain out all of the oil into a suitable container.

c. Turn **Valve "A"** back to **Normal Position** and replace the Pipe Plug (#45).

3. Filling with Oil

a. Remove the Pipe Plug (#45) from **Valve "B"** and connect a suitable fill hose to it.

b. Turn handle on **Valve "B"** to **Fill Position** as shown in Figure 4.2. Make sure that **Valve "A"** is in **Normal Position**.

c. Start the Cooling Pump and fill the unit until the oil is in the center of the Sight Gauge (#46) located in the output housing. It should take approx. 27 Qts. to completely fill the system. Turn pump off when filled.

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

d. Turn handle on **Valve "B"** back to **Normal Position** and replace the Pipe Plug (#45).

4-3 TYPE OF OIL

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

The Planetary Gear Reducer uses **HD-80W90 Gear Lube**.

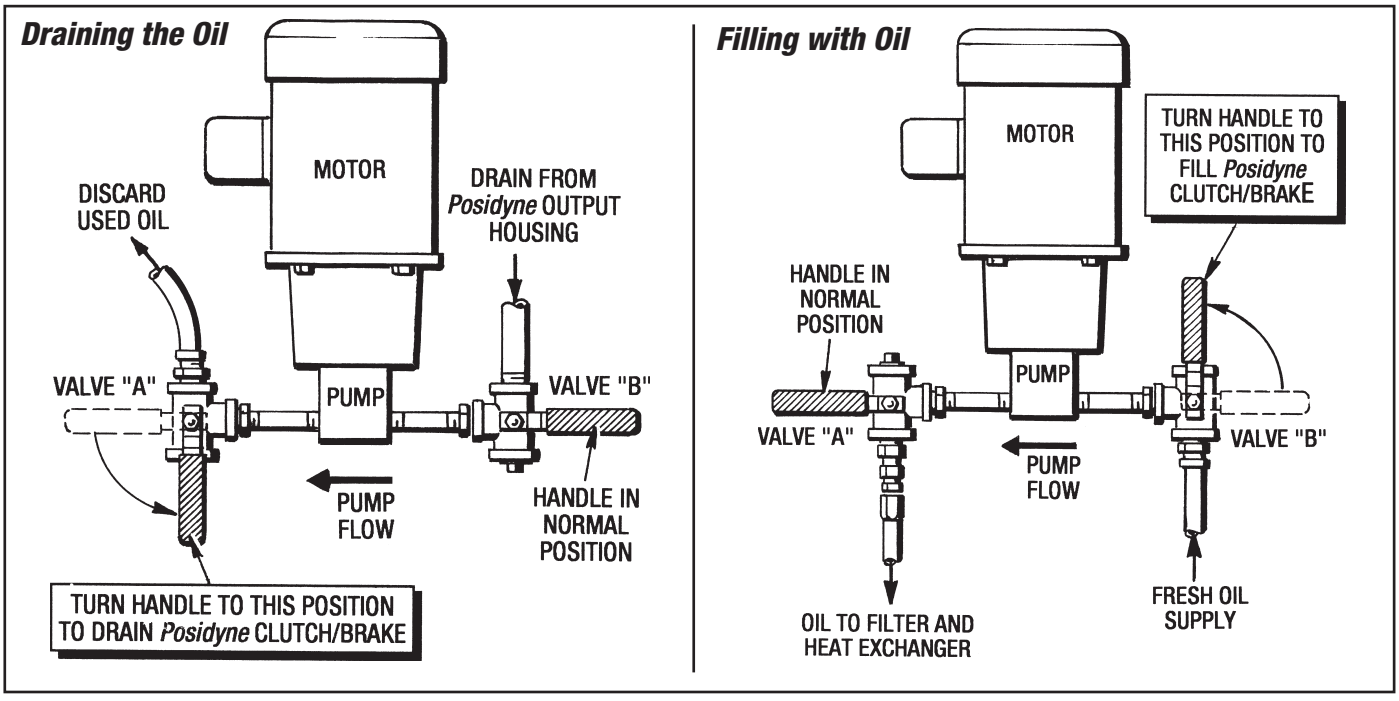


Figure 4.2 - Valve Positions for Draining and Filling Oil

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

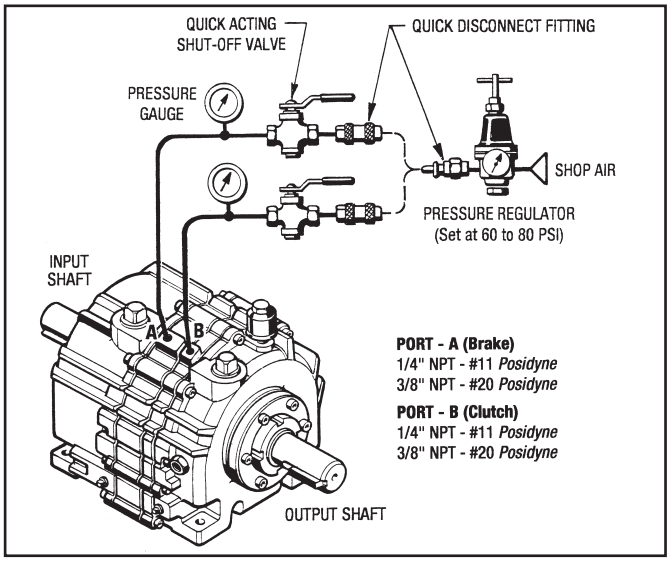


Figure 5.1 - Pneumatic Testing Set-Up for Operational Check

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

1. When applying air pressure to the Clutch Port, simply rotate the Input Shaft and Flywheel 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.

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 Figure 3.3 for appropriate Pneumatic Control Diagram.)

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.

5-6 CHECKING ACCUMULATOR TANKS

(See Figure 10.10)

This procedure is done while the Drive Unit is still in service.

To ensure proper air pressure and long life for your Indexing Drive this Accumulator Check should be done at least once a month. If excessive water is found in the accumulators, then the check needs to be done more frequently.

1. Shut the drive down and lock-out all electrical power.
2. Shut-off the main air supply to the Pneumatic Accumulators.
3. Open each Drain Cock (#401) and drain all air and water from the accumulators.
4. Visually check the Pressure Gauges (#407) to make sure they have both returned to **Zero**.

   IMPORTANT

   If either of these pressure gauges does not return to zero when the air pressure is drained from the accumulators, the pressure gauge needs to be replaced. It is very important that the correct air pressure is maintained for proper operation of your Indexing Drive.
5. Shut the Drain Cocks (#401) and turn the air supply back on. Check the pressure gauge readings to see if the air pressure is set correctly. The correct air pressure is designated on a tag attached to each regulator.
6. Turn the unit back on and resume operation.

Section 6
TROUBLESHOOTING

6-1 TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	REMEDY
Both clutch and brake fail to engage properly.	Electrical control circuit.	Check control circuit.
	Low air pressure.	Increase air pressure.**
	Air pressure regulator or piping.	Check for improper operation or leaks.
	Worn friction surfaces.	Check parts for wear and replace if necessary. (See Section 6-2)
Clutch fails to engage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check valve operation. Replace if necessary.
	Internal air leakage.	Check and replace O-Rings and Liners if necessary.
	Low air pressure	Increase air pressure.**
	Worn friction surfaces.	Check parts for wear and replace if necessary. (See Section 6-2)
Picks up load too quickly.	Air pressure too high.	Reduce air pressure.
	Low oil level.	Check oil level and add if necessary.
Clutch fails to disengage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check and replace valve if necessary.
	Piston sticking-broken return springs.	Disassemble to extent necessary and inspect for damaged parts.
Noise and vibration	Mounted on poor foundation.	Improve installation. Tighten foot bolts.
	Misaligned couplings.	Recheck alignment.
	Damaged bearings.	Disassemble to extent necessary and inspect for damaged bearings.
Brake fails to engage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check valve operation. Replace if necessary.
	Internal air leakage.	Check and replace O-Rings and Liners if necessary.
	Low air pressure	Increase air pressure.**
	Worn friction surfaces.	Check parts for wear and replace if necessary. (See Section 6-2)

TROUBLE	POSSIBLE CAUSE	REMEDY
Brake fails to engage properly. (Continued)	Piston sticking.	Disassemble to extent necessary and check for damaged parts.
	Weak or broken brake spring.	Replace spring.
Brake fails to disengage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check and replace valve if necessary.
	Piston sticking.	Disassemble to extent necessary and inspect for damaged parts.
Drive overheats. (Oil temp. above 225° F.)	Inertia or resistance changed.	Check with Force Control engineering.
	Improper oil level.	Check oil level. Add or drain as needed.
	Water turned off.	Check shut-off valve.
	Fan blocked.	Clean shroud.
Oil leakage	Oil seal lips damaged.	Check to see if oil is leaking around shaft and replace if necessary.
	Gaskets	Tighten all external bolts.
	Poor ventilation.	Remove breather and clean.
	Seal retainers loose.	Tighten retainer screws.
Oil leakage out breather.	Damaged seal around piston.	Disassemble and repair.
	Oil level too high.	Drain excess oil.
Excessive shaft end play.	Bearings bad.	Disassemble and replace.
Clutch or brake does not repeat.	Air pressure changed.	Check air pressure and adjust.
	*Oil temperature changed.	Check temperature.
	Resistance in machine changed.	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 & C Models: 60 PSIG; A & B Models: 80 PSIG; SA Models: 80 PSIG Clutch & 40 PSIG Brake ; SCP Models: 60 PSIG; except for size 11 & 20 which is 80 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

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)

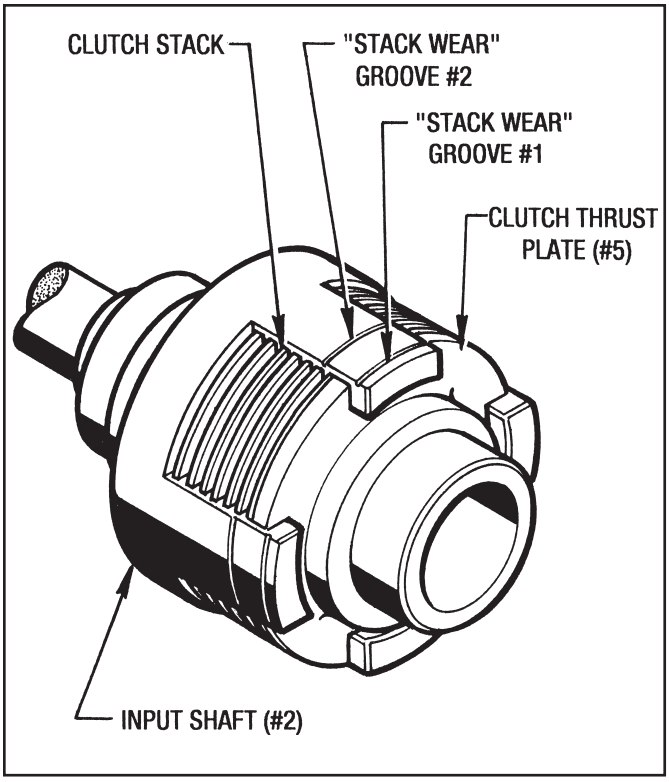


Figure 6.1 - "Stack Wear" Grooves

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 flashlight, 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.

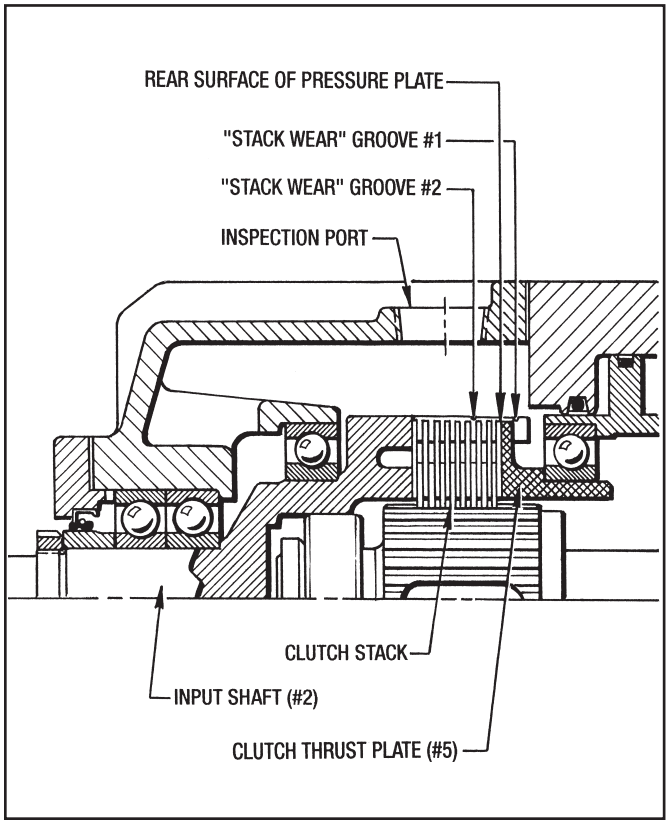


Figure 6.2 - Checking Brake and Clutch Stacks for Wear

B. BRAKE STACK WEAR

(See Figure 6.2)

5. Apply air pressure to the Brake Port.
6. Using a flashlight 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. Disconnect all necessary pneumatic piping.

3. Remove all external hoses and piping from External Cooling System if applicable.

4. Disconnect the (2) Brad-Harrison Cables.

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 SUB-ASSEMBLIES and CLUTCH/BRAKE STACKS (#11 and #20 Posidyne Units Without Planetary Gear Reducer) (Figure 10.1)
2. MAJOR SUB-ASSEMBLIES and CLUTCH/BRAKE STACKS (#20 Posidyne Units With Planetary Gear Reducer) (Figure 10.2)
3. INPUT HOUSING ASSEMBLY (Figure 10.3)
4. PISTON RETAINER AND HOUSING ASSEMBLY (Figure 10.4)
5. OUTPUT HOUSING ASSEMBLY (Figure 10.5)
6. PLANETARY GEAR REDUCER (Figure 10.6)
7. OPEN COLLECTOR QUADRATURE ENCODER (Magnetic) (Figure 10.7)
8. DIFFERENTIAL LINE DRIVER ENCODER (Optical) (Figure 10.8)
9. MANIFOLD MOUNTED CONTROL VALVE (Figure 10.9)
10. PNEUMATIC ACCUMULATOR ASSEMBLY (Figure 10.10)
11. EXTERNAL COOLING SYSTEM (Figure 10.11)

7-2 REMOVING FAN, FLYWHEEL AND FAN SHROUD

(See Figures 10.1 or 10.2)

1. The Fan (#543) can be removed from the Flywheel (#542) by taking out the (8) Screws (#475) and pulling it out of the Flywheel.

To remove the Flywheel (#542) a special procedure must be followed to loosen the Locking Assembly (#540) from the Input Shaft. (See Figure 7.1)

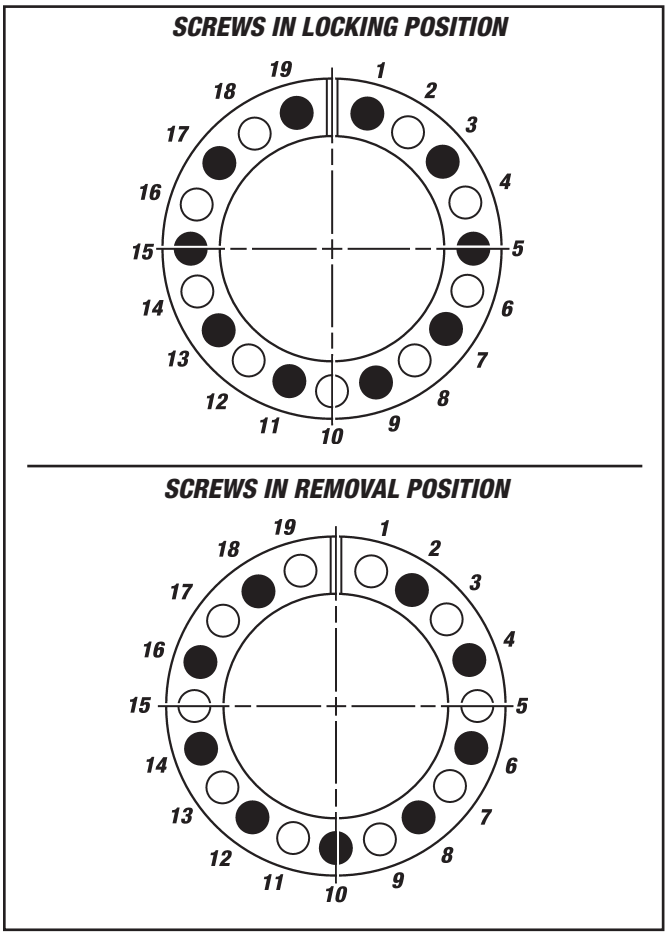


Figure 7.1 - Flywheel Locking Assembly Removal

2. Complete the following steps to release the Locking Assembly (#540) from the Input Shaft.

Step 1 - Remove the Locking Screw in position 1 completely.

Step 2 - Remove the remaining (9) Locking Screws and install them into the previous holes as shown in Figure 7.1.

a. Move Screw in position 3 to position 2.
b. Move Screw in position 5 to position 4.
c. Move Screw in position 7 to position 6.
d. Move Screw in position 9 to position 8.
e. Move Screw in position 11 to position 10.
f. Move Screw in position 13 to position 12.
g. Move Screw in position 15 to position 14.
h. Move Screw in position 17 to position 16.
i. Move Screw in position 19 to position 18.

Step 3 - Tighten all of these Locking Screws in an even manner until the Locking Elements are released from the input shaft.

3. Attach a sling and overhead hoist to the Flywheel (#542) and manually back it off the Input Shaft.

IMPORTANT

Do not use any kind of crow bar or lever to back the Flywheel off the input shaft. The Locking Assembly can get cocked and jammed on the input shaft and get damaged in the process.

4. Remove the (2) Screws (#544) from the Fan Shroud (#24). Remove the top Flange Nut (#86) and pull the Fan Shroud (#24) off the Input Housing.

7-3 REMOVING QUADRATURE ENCODER (Magnetic)

(See Figures 10.1 or 10.2 and 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. (See Figure 10.1 or 10.2)

NOTES:

1. On the #20 *Posidyne* there are only (2) Screws (#76) and (2) Lockwashers (#257).

2. On the #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 #11 Posidyne Drive Unit.

7-4 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.

7-5 REMOVAL and DISASSEMBLY of DIFFERENTIAL LINE DRIVER ENCODER (Optical Encoder)

(See Figures 10.1 and 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 7.2)

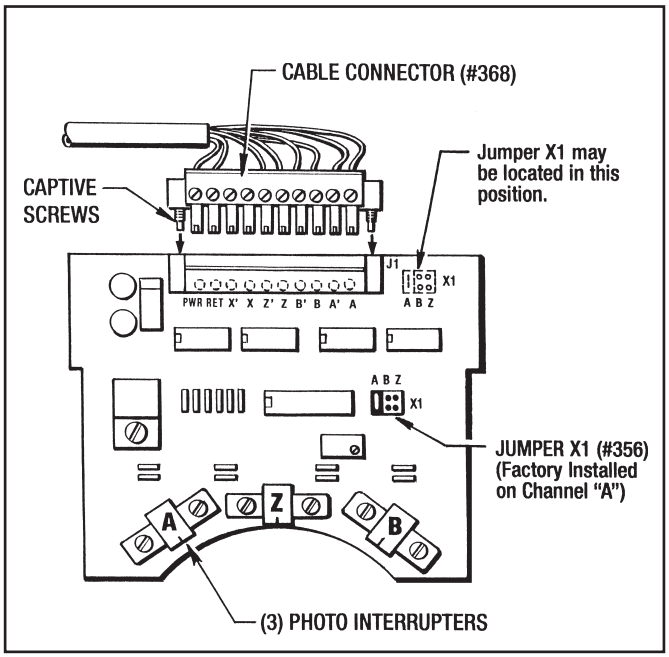


Figure 7.2 - Circuit Board Connector

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 (4) Washers (#32) Pull the Disc Housing off the Posidyne mounting face.

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.

7-6 REMOVING MANIFOLD MOUNTED CONTROL VALVE (See Figure 10.9)

1. Disconnect the Air Hoses and the 4-Pin Brad Harrison Cable if they are still connected.

(#11 *Posidyne* Indexing Drive)

2. Unscrew (2) Screws (#725) and (2) Lockwashers (#739) and lift the Control Valve (#700) off the Manifold (#703). Check the (2) O-Rings (#808) and replace if necessary.
3. Remove the Manifold by taking out the (3) Screws (#726) and (3) Lockwashers (#737). Check the (2) O-Rings (#812) and replace if necessary.

(#20 *Posidyne* Indexing Drive)

2. Unscrew (4) Screws (#725) and (4) Lockwashers (#739) and lift the Control Valve (#700) off the Manifold (#703). Check the (2) O-Rings (#808) and replace if necessary.
3. Remove the Manifold by taking out the (3) Screws (#726) and (3) Lockwashers (#737).
4. Remove the Gasket (#807) and discard it.

7-7 SEPARATION AND REMOVAL OF MAJOR SUBASSEMBLIES FOR ACCESS TO THE CLUTCH AND BRAKE STACKS

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), (#323) and the Friction Discs (#12) in the same order as they were removed.

4. On #20 Planetary Indexing Drives the Planetary Gear Reducer must also be removed from the Output Housing. (See 7-16 for removal procedure.)

7-8 CLUTCH AND BRAKE STACKS

(See Figure 10.1 or 10.2)

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.

MAJOR SUBASSEMBLIES

7-9 INPUT HOUSING SUBASSEMBLY

(See Figure 10.3)

(#11 *Posidyne*)

1. Remove (6) Screws (#63) and remove Bearing Retainer (#7), taking care not to damage the lip of the Oil Seal (#31).
2. Check Oil Seal (#31) and remove if it is damaged and needs to be replaced.
3. Remove and check O-Ring (#87).
4. Remove the Wear Sleeve (#4). See **7-10 WEAR SLEEVE REMOVAL PROCEDURE.** (Figure 7.3)
5. Remove Locknut (#15) and Lockwasher (#155) if Bearings (#26) or (#35) need to be replaced then the Input Shaft has to be pressed out of the Input Housing.

(#20 *Posidyne*)

1. Remove Locknut (#15) from the Input Shaft (#2).
2. Remove (6) Screws (#63) and remove the Bearing Retainer (#7), taking care not to damage the lip of the Oil Seal (#31).
3. Check Oil Seal (#31) and O-Ring (#87) and replace if necessary.

4 If the Wear Sleeve (#250) needs to be replaced see **Section 7-10 WEAR SLEEVE REMOVAL PROCEDURE.** (Figure 7.4)

7-10 WEAR SLEEVE REMOVAL PROCEDURE

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

(#11 *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. It can now be removed from the Input Shaft by hand. (See Figure 7.3)

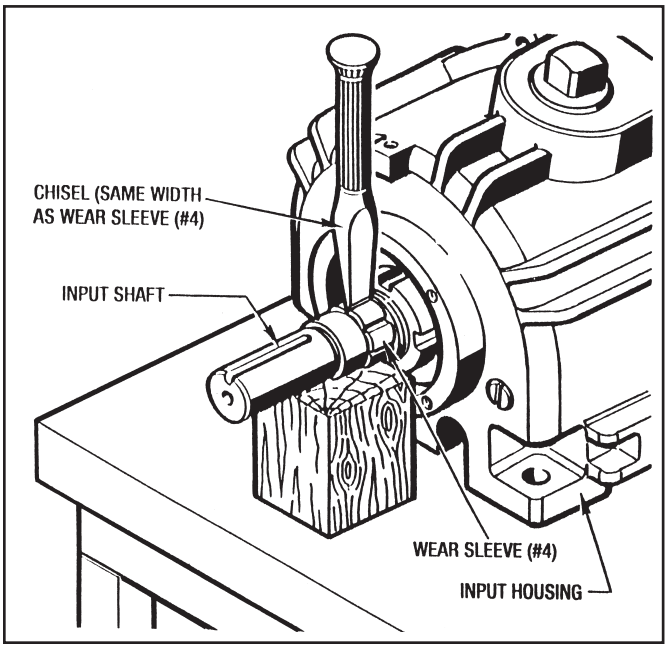


Figure 7.3 - Wear Sleeve Removal (#11 *Posidyne* Only)

(#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 7.4. It can now be removed from the Mating Ring by hand.

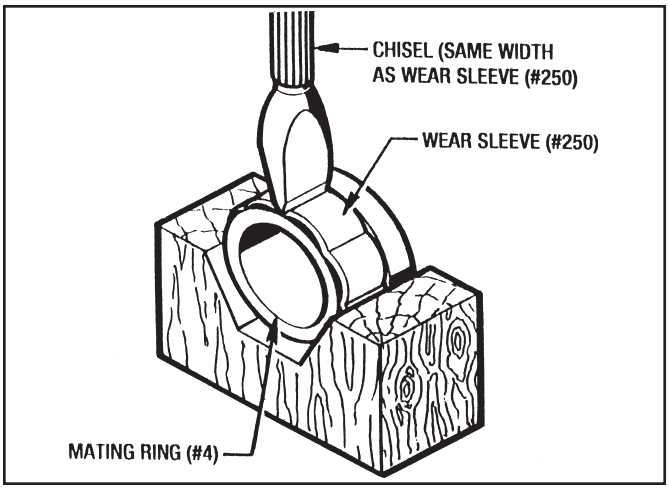


Figure 7.4 - Wear Sleeve Removal (#20 *Posidyne* Only)

7-11 REMOVING THE MALE INPUT SHAFT FROM THE INPUT HOUSING (See Figure 10.3)

IMPORTANT

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

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.
2. Remove Bearings (#26) from the Input Housing.
3. Use a Bearing Splitter to remove Bearing (#35) from the Input Shaft. (See Figure 7.5).

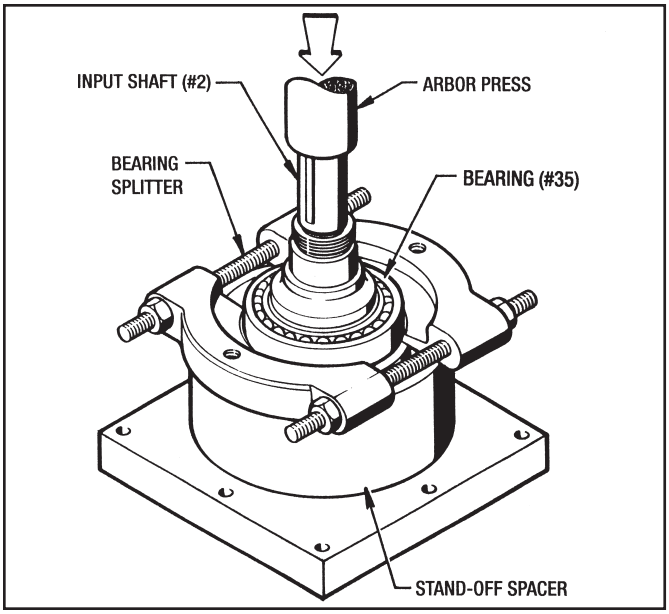


Figure 7.5 - Removing Bearing from the Input Shaft

7-12 PISTON HOUSING AND RETAINER SUBASSEMBLY

(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 (#27), **(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 7.6)

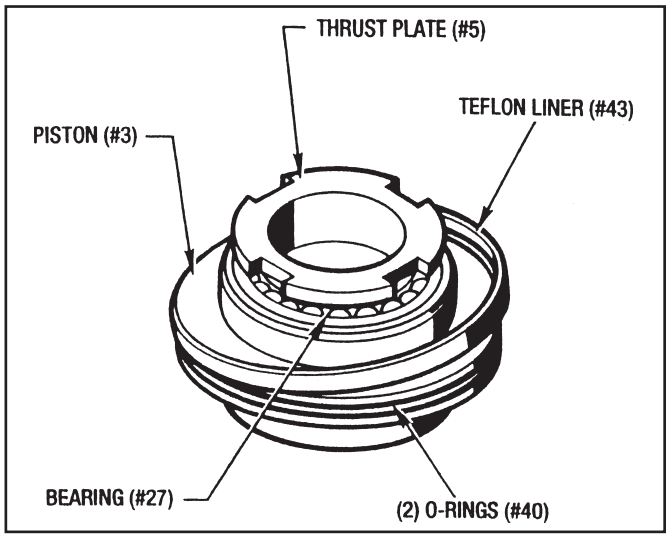


Figure 7.6 - Piston Sub-Assembly

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). 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 Liners (#42) and O-Rings (#39) from the Piston Retainer (#11) and the Piston Housing (#10).

7-13 OUTPUT HOUSING SUBASSEMBLY

(See Figure 10.5)

(All Models except #20 Planetary Drives)

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

(#11 *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
5. Remove the Wear Sleeve (#4) as shown in Figure 7.7 and described in **WEAR SLEEVE REMOVAL PROCEDURE - Section 7-14.**
6. Heat up the Locknut (#15) and remove it and the Lockwasher (#155) if the Bearings (#26) or (#28) are to be replaced and the Output Shaft is to be pressed out of the Output Housing. (See Section 7-15) **CAUTION: Wear suitable gloves when handling heated parts.**

(#20 *Posidyne*)

2. Heat up and remove Locknut (#15) 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).
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 7-10 WEAR SLEEVE REMOVAL PROCEDURE** (Figure 7.4) to remove the Wear Sleeve (#250) from the Mating Ring (#4).

7-14 WEAR SLEEVE REMOVAL PROCEDURE (#11 *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 7.7)

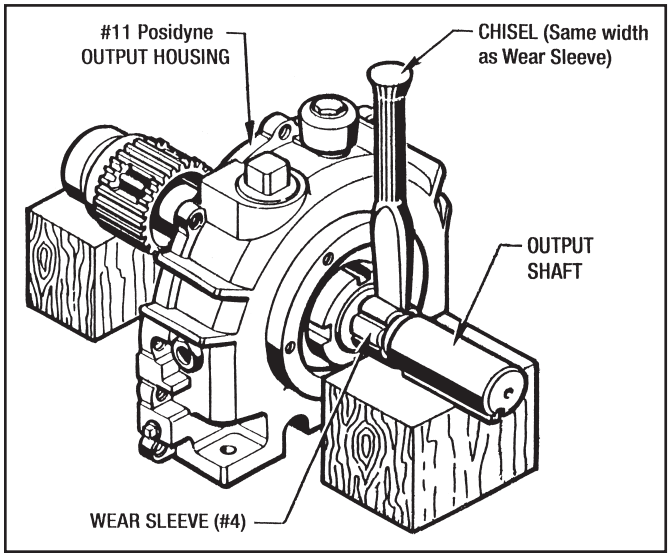


Figure 7.7 - Wear Sleeve Removal

7-15 REMOVING THE OUTPUT SHAFT FROM THE OUTPUT HOUSING (See Figure 10.5)

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 7.8.

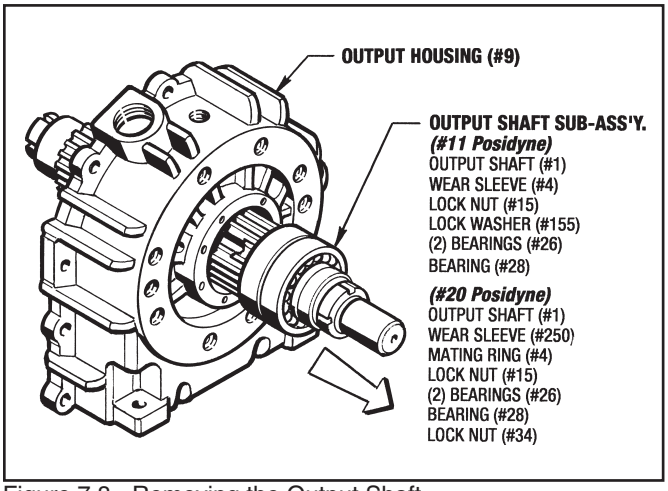


Figure 7.8 - Removing the Output Shaft

(Without Force Lube)

2. With a Bearing Puller, remove both Bearings (#26).

(With Force Lube)

2. With a Bearing Puller, remove Bearing (#38) and Labyrinth (#344).

(#20 Posidyne Only)

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).

(All Models)

4. If Bearing (#28) has to be replaced, use a Bearing Splitter, like the one shown in Figure 7.5, to remove it.

7-16 REMOVING PLANETARY GEAR REDUCER

(See Figure 10.6)

1. 1st. place the whole drive unit in a vertical position with the Planet Hub (#886) shaft pointed upwards.
2. Screw a 3/4" eyebolt into the end of the Planet Hub shaft and attach an overhead crane to the eyebolt.
3. Remove the (8) Screws (#843) and (8) Lockwashers (#850) from the Main Housing (#800).
4. Lift the Main Housing straight up an off the Transfer Case (#801).
5. Remove and inspect the O-Ring (#873). Save or discard as condition warrants.

6. Next install (2) 1/2-13 eyebolts into the upward mounting face of the Transfer Case (#801). Attach the overhead crane to these eyebolts.
7. Remove the (8) Screws (#843) and (8) Lockwashers (#850) from the Transfer Case (#801) and lift it off the Posidyne Output Housing Assembly.
8. Remove and inspect the O-Ring (#872). Save or discard as condition warrants.
9. Loosen up the Locking Screws in the Shrink Disc (#822) as described in the **B-Loc Removal Instruction Sheet** on Page 52.
10. Pull the Shrink Disc (#822) and Sun Gear (#819) off the *Posidyne* Output Shaft.

    NOTE: It may be necessary to use a gear puller to get the gear off the shaft.

7-17 PLANETARY GEAR REDUCER DISASSEMBLY

(See Figure 10.6)

A. Removing Bearing Retainer (#803)

1. Take out the (4) Screws (#843) and (4) Lockwashers (#850) and remove the Bearing Retainer (#803). **Be careful not to damage the lip of Oil Seal (#824).**
2. Remove and discard the O-Ring (#881).
3. Inspect the Oil Seal (#824) and if it needs replaced, press it out of the bearing retainer bore.

B. Removing Roller Bearings

CAUTION - Do not attempt to remove these roller bearings unless they are damaged and have to be replaced.

1. Take the Locknut (#897) and Lockwasher (#852) off the Planet Hub (#886). You may have to use heat to loosen the Locknut.

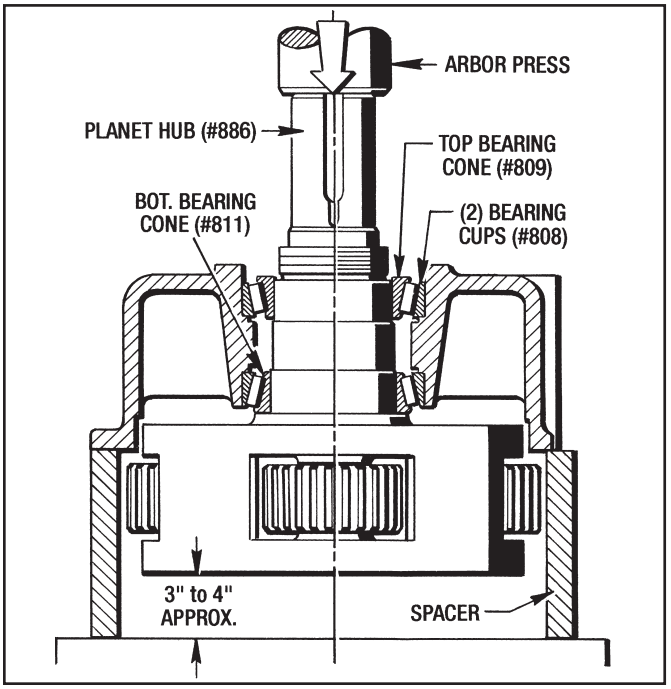


Figure 7.9 - Removing Planet Hub (#886)

2. Place the remaining assembly into an arbor press with the Planet Hub (#886) shaft in an upward position. Use appropriate spacers to raise the Planet Hub approx. 2" to 3" off the table. (See Figure 7.9)
3. Press the Planet Hub (#886) down and out of the Main Housing (#800).

   The top Bearing Cone (#809) will be pushed off the shaft. It can be removed from the Main Housing bore by hand.

   The bottom Bearing Cone (#811) will remain on the shaft. Use a bearing puller to remove it from the Planet Hub shaft.
4. The (2) Bearing Cups (#808) are loc-tited into the Main Housing bores and will have to be pounded out with a straight bar as shown in Figure 7.10.

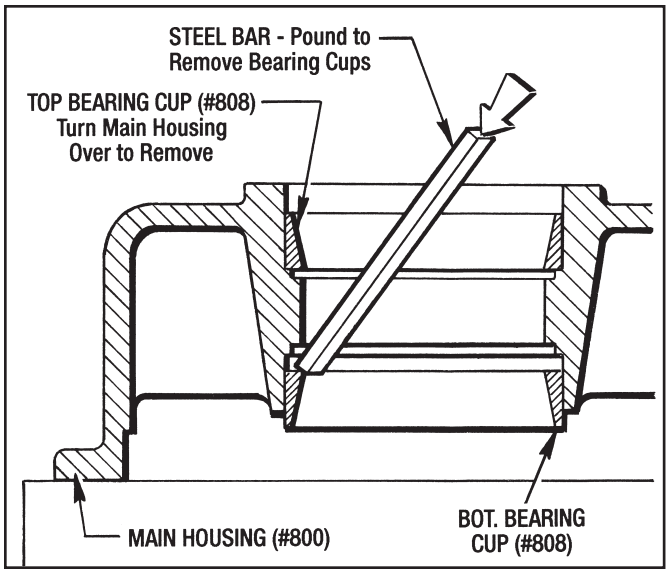


Figure 7.10 - Removing Bearing Cups (#808)

C. Removing Wear Sleeve (#874)

1. With a chisel the same width as the Wear Sleeve (#874), make about 5 or 6 notches as shown in Figure 7.11. The Wear Sleeve (#874) can then be removed by hand.

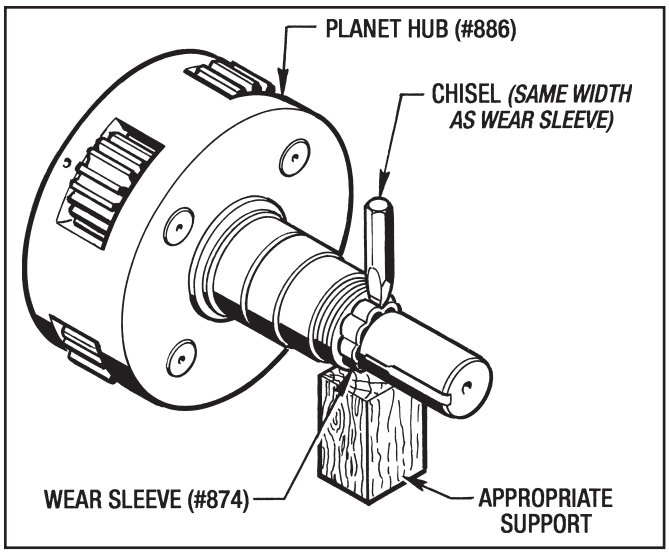


Figure 7.11 - Removing Wear Sleeve (#874)

D. Removing Planet Gears (#818) to replace Needle Bearings (#812).

1. Remove the Set Screw (#877) as shown in Figure 7.12. This step is necessary so the Planet Gear Pin (#820) can be pushed out of the Planet Hub (#886).

   Push the Planet Gear Pin (#820) out of the Planet Hub (#886) and the Planet Gear (#818).

2. Remove the (2) Thrust Washers (#827) and Planet Gear (#818).

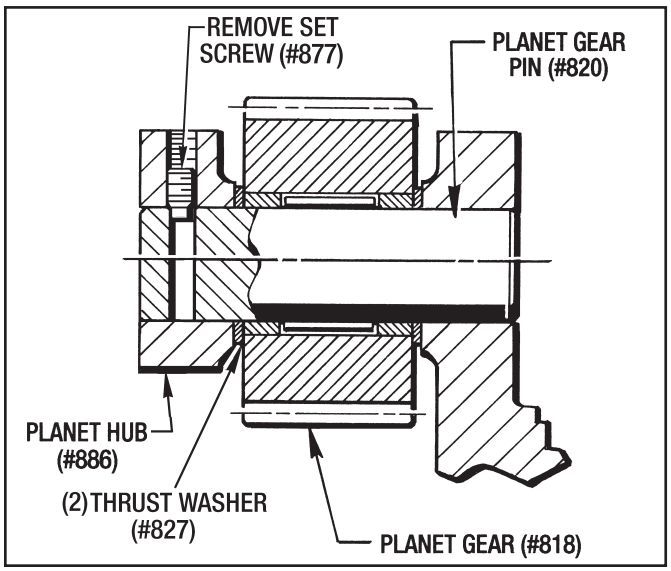


Figure 7.12 - Removing Planet Gear Pin (#820)

3. The (2) Spacers (#813) can be removed from the Planet Gear (#818) by hand but the Needle Bearing (#812) will have to be pressed out with an arbor press and appropriate size tube. (See Figure 7.13)

Do the same procedure for each Planet Gear to be removed.

THE DISASSEMBLY PROCEDURE FOR YOUR *Posidyne* INDEXING DRIVE UNIT IS NOW COMPLETE.

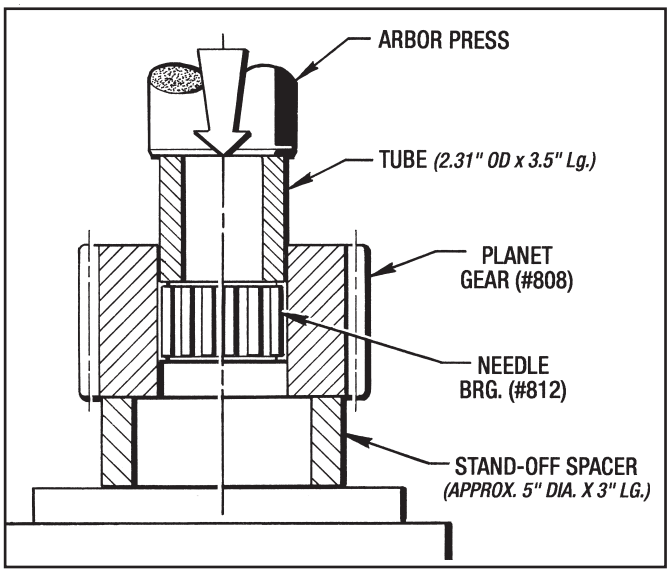


Figure 7.13 - Removing Needle Bearing (#812)

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) and (#323) 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 Wear Sleeve (#250), Mating Ring (#4) and Wear Sleeve (#874) and 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 REPAIR AND REPLACEMENT

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 abrasives 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 #30), 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 10.5)

(#11 *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 9.1. If the bearings measure smaller than 1.9586" for Size #11 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.

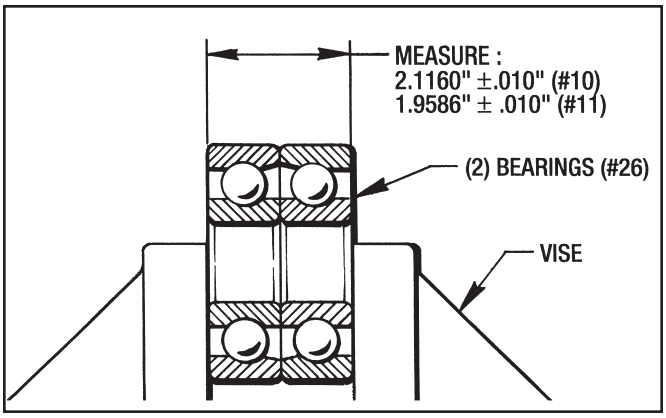


Figure 9.1 - Measuring Thickness of Bearings (#26)

(#11 and #20 *Posidyne* without Force Lube)

1. Press (2) Outboard Bearings (#26) onto the Output Shaft (#1) using an Arbor Press.

IMPORTANT
#11 and #20 *Posidyne* Outboard Bearings (#26) must be installed with the Counterbores facing each other. (See Figure 9.2)

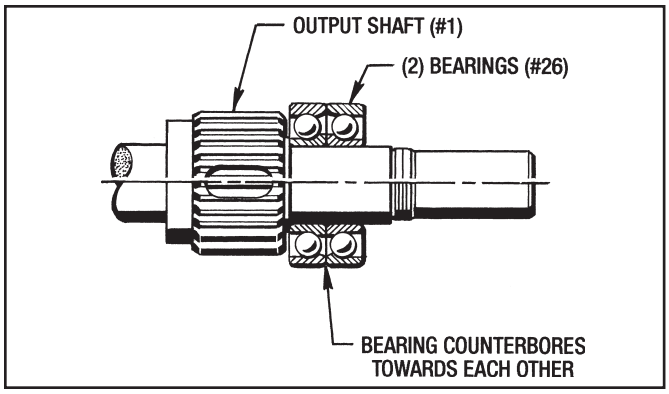


Figure 9.2 - Installing Bearings (#26) (Without Force Lube)

(#20 *Posidyne* with Force Lube)

1. Install the Labyrinth (#344) and then press the Bearing (#38) onto the Output Shaft (#1)

(#11 *Posidyne*)

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.

   NOTE: Use Wear Sleeve Assembly Tool #601-11-003 shown in Figure 9.5 and the same procedure shown in Figure 9.6 to press this Wear Sleeve (#4) onto the Output Shaft.

(#20 *Posidyne*)

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.

   NOTE: Use Wear Sleeve Assembly Tool #601-20-011 shown in Figure 9.7 and the same procedure shown in Figure 9.8 to press this Wear Sleeve (#250) onto the Mating Ring (#4).

4. Place Mating Ring and Wear Sleeve (#4 and #250) onto the Output Shaft. Screw Locknut (#15) onto the Output Shaft. Use (Loctite #271) Thread-Locker on the threads. Wipe off any excess.
5. Press Bearing (#28) onto the other end of the Output Shaft. Install Locknut (#34), using Loctite #271 on the threads. Wipe off any excess.

9-3 OUTPUT HOUSING SUBASSEMBLY

(See Figure 10.5)

(All Models)

1. Guide the Output Shaft Subassembly into the Output Housing (#9), as shown in Figure 9.3.

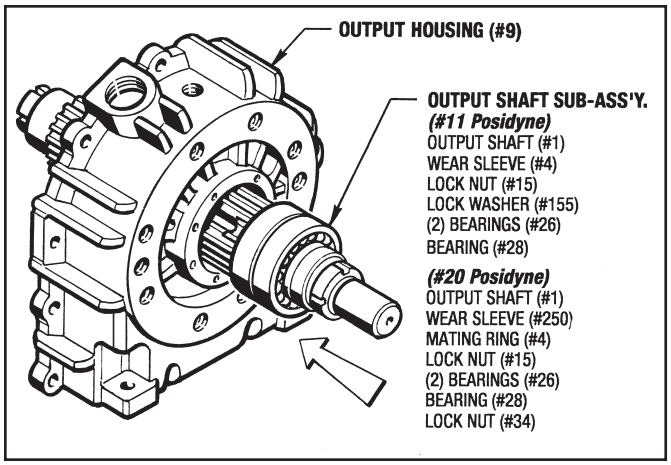


Figure 9.3 - Installing Output Shaft Sub-Assembly

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

(#11 *Posidyne*)

3. Lubricate and install O-Ring (#87) onto the shoulder of the Bearing Retainer (#7).
4. Lubricate the lip of the Oil Seal (#31) and the Mating Ring (#4) with ATF-210 oil.
5. 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 (8) Screws (#63) and (8) Lockwashers (#128) to the Output Housing. **(See** Fig. 10.5 **for Torque Specs.)**

(#20 *Posidyne*)

3. Lubricate and install O-Ring (#87) onto the shoulder of the Bearing Retainer (#7).
4. Lubricate the lip of the Oil Seal (#31) and the Mating Ring (#4) with ATF-210 oil.
5. 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 (8) Screws (#63) and (8) Lockwashers (#128) to the Output Housing. **(See** Fig. 10.5 **for Torque Specs.)**

(All Models)

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

   NOTE: This Key (#181) is not used with a Planetary Gear Reducer.

9-4 PISTON HOUSING AND RETAINER SUBASSEMBLY

(See Figure 10.4)

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

IMPORTANT

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

2. Apply Sealant (Loctite #620) to the I.D. of Bearing (#27) and press it onto the Thrust Plate (#5). Make sure that the Bearing is firmly seated on the Thrust Plate Shoulder.
3. 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.
4. Lubricate the (2) O-Rings (#40) and install them onto the Piston (#3).
5. Heat the Teflon Liner (#43) in an oven to 200° F. maximum and install it on the outside diameter of the Piston.
6. Place Springs (#36), back into the appropriate holes in the Housing or Retainer. Grease may be used to hold the Springs in their holes during assembly.
7. Insert the Piston Subassembly 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.

8. Align Gasket (#51) on the Piston Housing, using the Dowel Pins (#68) to ensure proper alignment.
9. 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 Fig. 10.4 **for Torque Specs.)**

9-5 INPUT HOUSING SUBASSEMBLY WITH MALE INPUT SHAFT (See Figure 10.3)

(All Models)

1. Press Bearing (#35) onto the Input Shaft (#2).
2. Insert the Input Shaft (#2) into the rear of the Input Housing (#8) until the Bearing (#35) seats in the bearing bore.
3. Set the Input Housing Subassembly into an Arbor Press as shown in Figure 9.4. Using an appropriate size tube, press on the inner race of the first Bearing (#26) until it bottoms out. **(Do not press on the bearing cage of the outer race.)** Press the second Bearing (#26) onto the Input Shaft until it is flush with the first Bearing
4. Apply a thin coat of Sealant (Permatex #30) to the oil seal bore in the Bearing Retainer (#7) and press the Oil Seal (#31) into the Bearing Retainer.

(#11 *Posidyne*)

5. 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**.

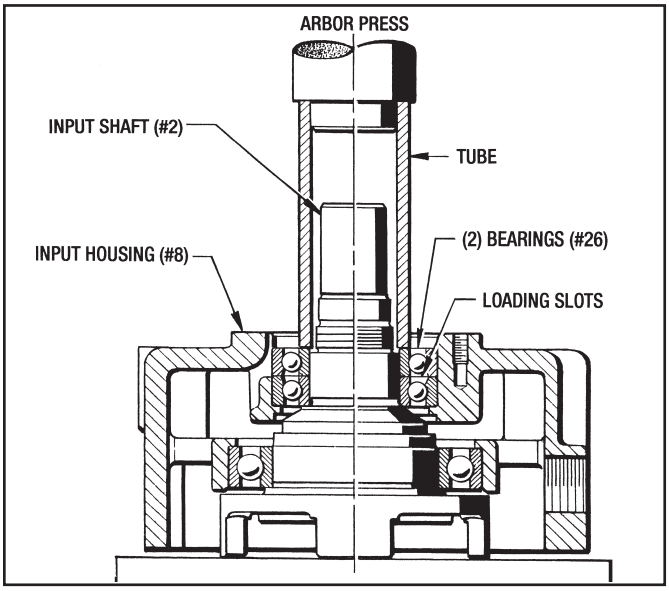


Figure 9.4 - Pressing Bearings (#26) into Input Housing

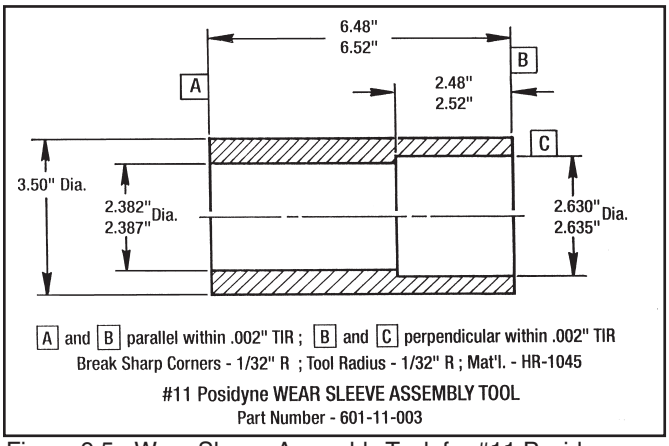


Figure 9.5 - Wear Sleeve Assembly Tool for #11 Posidyne

Machining Dimensions are given in Figure 9.5 if you prefer to make your own.

6. 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 9.6 Step 1). Turn the Tool around and with **Surface :B"** 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).
7. Lubricate the O-Ring (#87) and place it on the Bearing Retainer shoulder.
8. 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 (8) Screws (#63). **Torque to 25 Ft. Lbs.**

(#20 *Posidyne*)

5. 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 9.7 if you prefer to make your own.

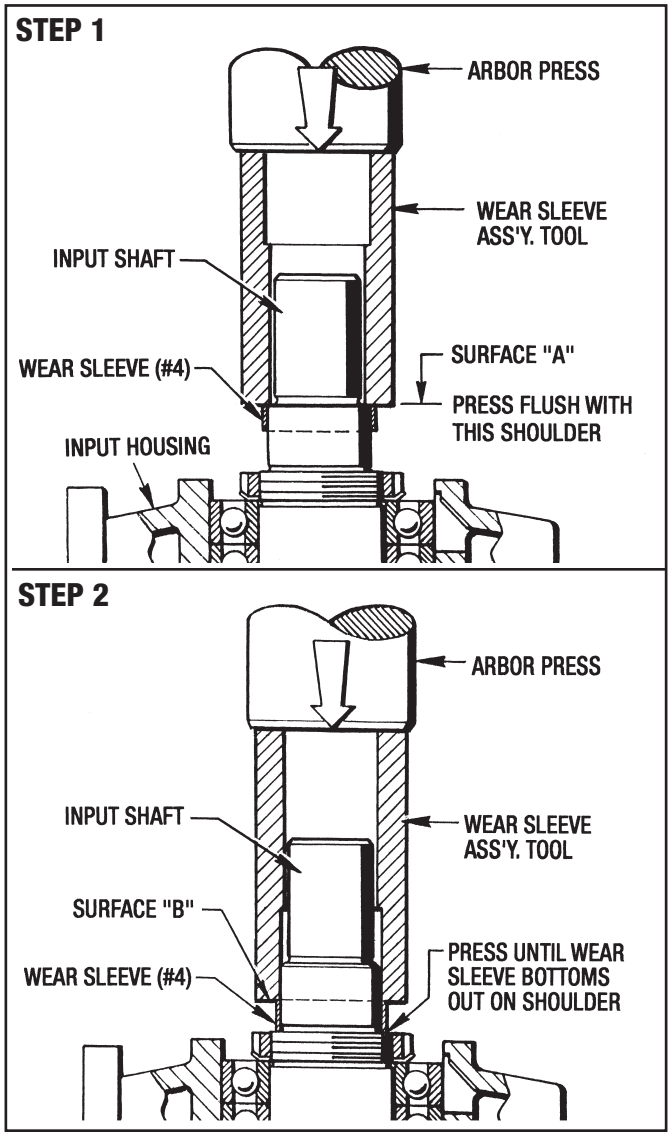


Figure 9.6 - Installing Wear Sleeve (#4) on #11 *Posidyne*

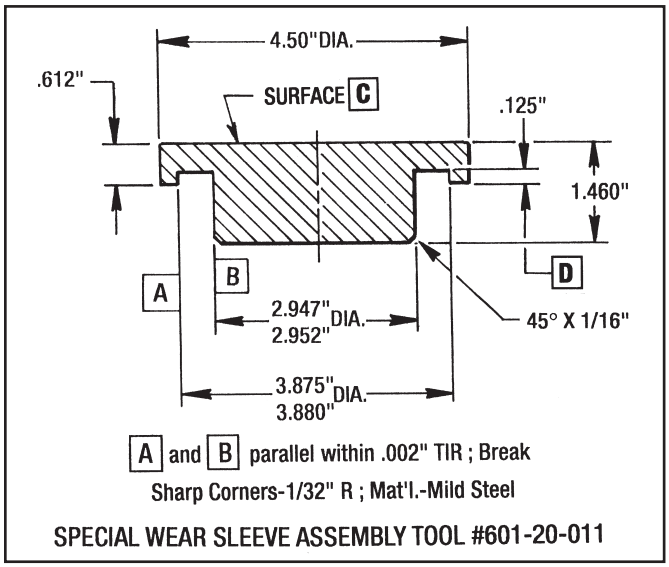


Figure 9.7 - Wear Sleeve Assembly Tool for #20 *Posidyne*

6. Apply Sealant (Loctite #271) on the I.D. of the Wear Sleeve (#250) and with surface "C" of the Assembly Tool press the Wear Sleeve (#250) onto the Mating Ring (#4) until it is flush. Turn the tool over. Use surface "D" to seat the Wear Sleeve properly. (See Figure 9.8.)

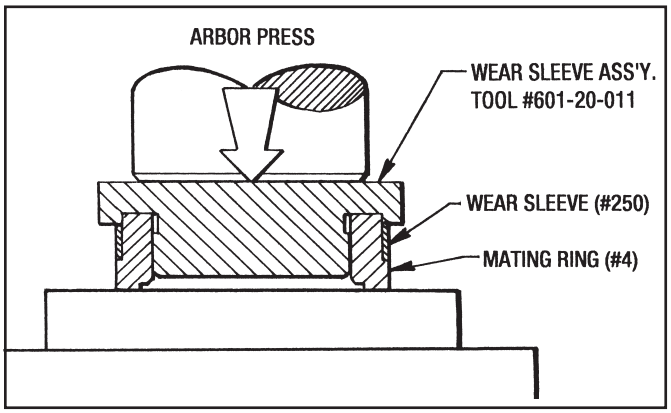


Figure 9.8 - (Step 2) Installing Wear Sleeve (#250) on Mating Ring (#4) for #20 Posidyne

7. Slide Wear Sleeve / Mating Ring Subassembly onto the Input Shaft.
8. 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 (8) Screws (#63). **Torque to 60 Ft. Lbs.**

9-6 MEASURING AND CONTROLLING STACK HEIGHT DIMENSIONS

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

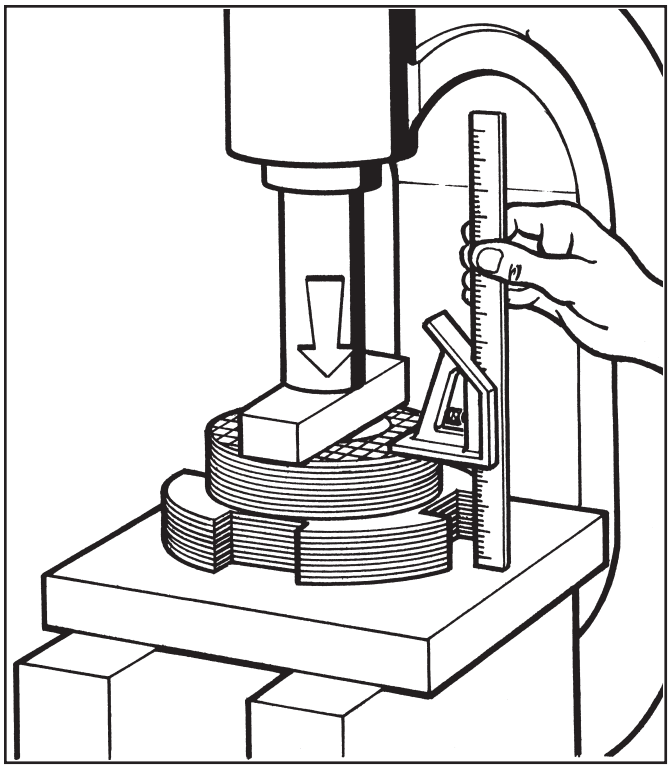


Figure 9.9 - Measuring Stack Height

STACK HEIGHT TABLE

SIZE	MIN. *(Nearest Fraction)*
#11.	3.529" (3-13/32")
#20	5.578" (5-37/64")

1. Based on the parts list, place the total number of Friction Discs and Drive Plates in an arbor press as shown in Figure 9.9.
2. Clamp firmly and measure the Stack Height
3. Compare the measurement with the tabulated values (See Stack Height Table) and, if necessary, add one or two Filler Plates (#380) to bring the stack within limits shown.

NOTE:
Always add the extra filler plate to the stack side away from the piston. Add 1st. extra filler plate to clutch stack and add 2nd. extra filler plate to the brake stack.

9-7 REASSEMBLY OF MAJOR SUBASSEMBLIES AND CLUTCH / BRAKE STACKS (See Figure 10.1 or 10.2)

1. Place the Output Housing in such a position that the splined end of the Output Shaft is pointed up and the Housing is on a stable flat surface.
2. Install the **Brake Stack** onto the Output Shaft Spline as follows:

Align the notches in the Drive Plates with the lugs on the Piston Retainer and align the internal teeth in the Friction Discs with the teeth on the Output Shaft Spline.

a. First install a Filler Plate (#380) if it was required to maintain the correct Stack Height as described in Section 9-6.

b. Add a Drive Plate (#13) and a Friction Disc (#12). **NOTE:** This Drive Plate (#13) does not have any Separator Springs on it.

c. Next add a Drive Plate (#323) with (4) Separator Springs (#377) then a Friction Disc (#12) ending with a Drive Plate (#323) with (4) Separator Springs (#377). **Always install the Drive Plates (#323) with the Separator Springs pointed down.**

There will be (1) Drive Plate (#13), (7) Drive Plates (#323) with (4) Separator Springs (#377) on each and (7) Friction Discs (#12) in the Brake Stack plus any Filler Plates (#380) required.

3. Apply Gasket Sealant (Permatex #30) on the mating surfaces of the Output Housing and Piston Retainer. Align and place Gasket (#53) onto the Output Housing (#9) using the dowel pin holes for proper alignment.
4. 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.
5. Lay the Piston Housing and Output Housing Subassembly over into a horizontal position on the table.
6. 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 Fig. 10.1 or 10.2 for Torque Specs.)**

7. Stand the Piston Housing and Output Housing Subassembly back on the Output Housing with the splined end of the Output Shaft pointed up.
8. 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 (#13). Align the notches in the Drive Plates 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.

(#11 *Posidyne*)
There will be (11) Drive Plates (#13) and (10) Friction Discs (#12) in the Brake Stack plus any Filler Plates (#380) required.

(#20 *Posidyne*)
There will be (9) Drive Plates (#13) and (8) Friction Discs (#12) in the Brake Stack plus any Filler Plates (#380) required.

9. Apply Gasket Sealant (Permatex #30) on the mating surfaces of the Input Housing and Piston Housing. Align and position Gasket (#53) onto the Piston Housing (#10) using the Dowel Pins (#68) for proper alignment.
10. 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 (11) Screws (#61) and (11) Lockwashers (#127) to attach the Input Housing to the Piston Housing. Use Thread-Locker (Loctite #271) on the screw threads. Wipe off any excess. **(See** Fig. 10.1 or 10.2 **for Torque Specs.)**

This completes the Reassembly Procedure for the Major Subassemblies. Before proceeding any further, an **OPERATIONAL CHECK** 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.

9-8 MEASURING PISTON STROKE

1. 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 9.10, must be used. To order this Gap Tool from the Force Control factory use **(Part No. 601-11-001)**.

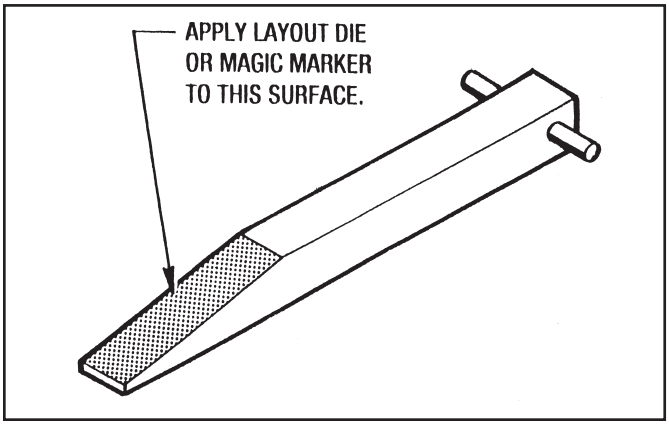


Figure 9.10 - Gap Tool

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

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

(All Models)
3. Apply machinist's fast drying layout die or (use a black magic marker) to the sloping surface of the Gap Tool as shown in Figure 9.10.
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 9.11)

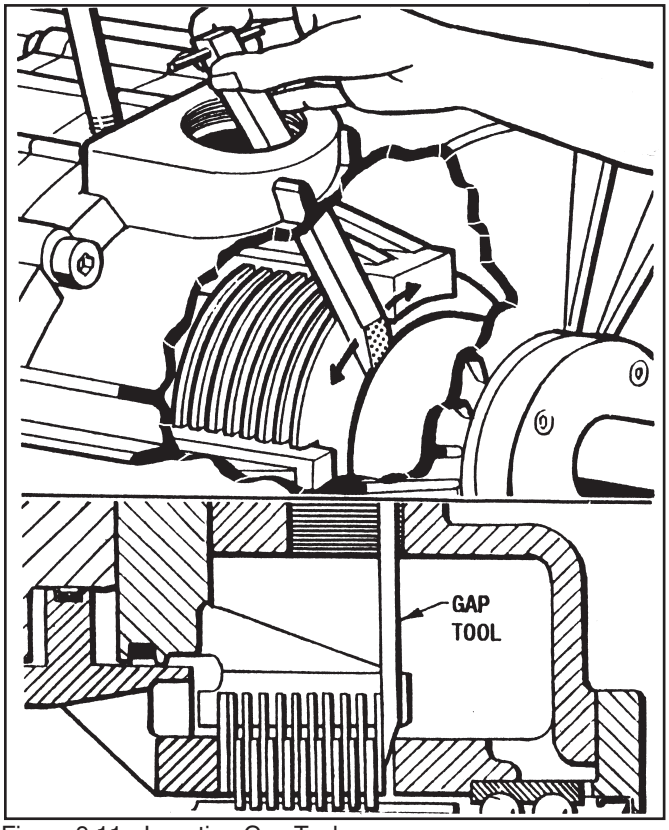


Figure 9.11 - Inserting Gap Tool

5. The solid shoulder will scrape the bluing off the Gap Tool as shown in Figure 9.12 on the next page. 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.)
6. Measure distance "X" with a micrometer as shown in Figure 9.12. Compare the measurement with the tabulated limits shown in the Piston Stroke Table below.

PISTON STROKE TABLE

SIZE	"X" MIN.	"X" MAX.
11	.100"	.190"
20	.100	.230

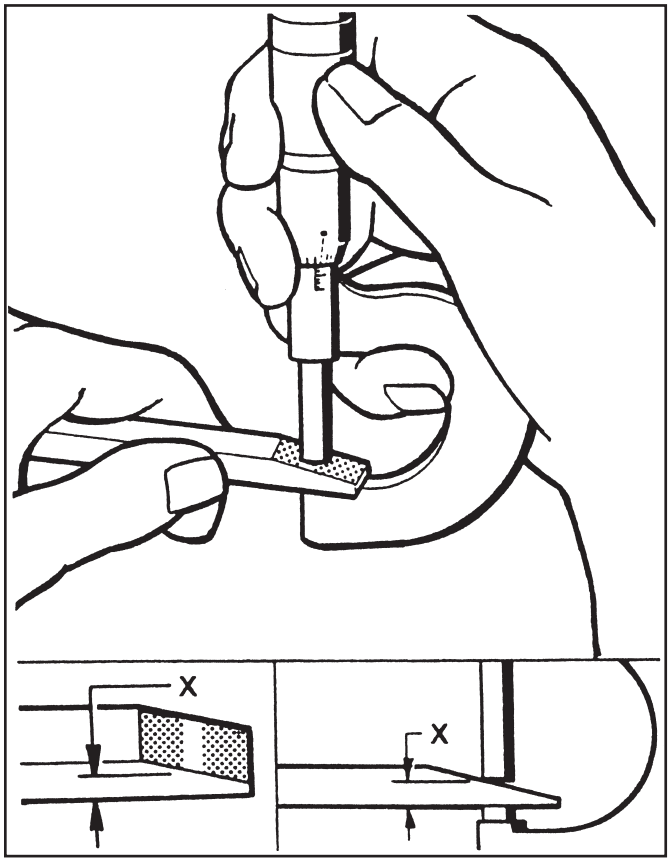


Figure 9.12 - Measuring Piston Stroke

9-9 FAN, FAN SHROUD AND FLYWHEEL INSTALLATION

(See Figure 10.1 or 10.2)

1. If your drive unit is Fan Cooled, attach the Fan Shroud (#24) to the Input Housing feet with (2) Screws (#544) and to the top with the Set Screw (#88) and (2) Flanged Nuts (#86).
2. Position the Flywheel (#542) onto the Input Shaft with the same procedure described in **Section 3 - INSTALLATION; 3-4 - Flywheel Installation** and shown in Figure 3.1.
3. Tighten up the B-Loc Locking Assembly (#540) in the Flywheel according to manufacturer's specifications. **(See B-Loc Specification Sheet at end of this manual.)**
4. Attach Cooling Fan (#543) with (8) Screws (#475) into the Flywheel.

9-10 INSTALLING MANIFOLD MOUNTED CONTROL VALVE (See Figure 10.9)

(#11 *Posidyne*)

1. Lubricate the (2) O-Rings (#812) and place them into the counterbores under the Manifold (#703)
2. Attach Manifold (#703) with (3) Screws (#726) and (3) Lockwashers (#737) to the Piston Housing (#10).
3. Attach the Control Valve (#700) to the Manifold (#703) with (2) Screws (#725) and (2) Lockwashers (#739). **Also make sure that the (2) O-Rings (#808) are in place under the Control Valve.**
4. Reinstall any Hose Fittings, Pipe Fittings and the Silencer (#809) that may have been removed at disassembly.

(#20 *Posidyne*)

1. Put the Gasket (#807) on the Piston Housing (#10). Use (Permatex #30) gasket sealant. **Make sure that no sealant gets into the (2) pressure ports.**
2. Attach Manifold (#703) with (3) Screws (#726) and (3) Lockwashers (#737) to the Piston Housing (#10).
3. Attach the Control Valve (#700) to the Manifold (#703) with (2) Screws (#725) and (2) Lockwashers (#739). **Also make sure that the (2) O-Rings (#808) are in place under the Control Valve.**
4. Reinstall any Hose Fittings, Pipe Fittings and the Silencer (#809) that may have been removed at disassembly.

9-11 INSTALLING QUADRATURE ENCODER HOUSING AND PULSE GEAR

(See Figure 10.7)

(#11 *Posidyne*)

1. 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 9.13. Tighten Set Screw (#154).
2. 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.**

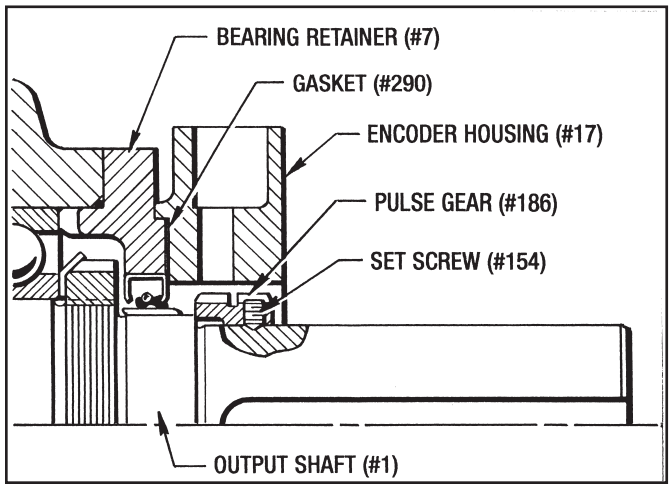


Figure 9.13 - Pulse Gear Alignment (#11 *Posidyne*)

3. 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). (See Figure 10.1)

   Jump ahead to Section 9-12 and install the Quadrature Encoder (#355) and the Magnetic Pick-Up (#22).
4. Attach the Top Cover (#372) with (4) Screws (#225) and the Front Cover (#253) with (4) Screws (#268).

(#20 *Posidyne* without Planetary Gear Reducer)

1. Replace Key (#234) into the Posidyne output shaft if it was removed.
2. 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 9.14)

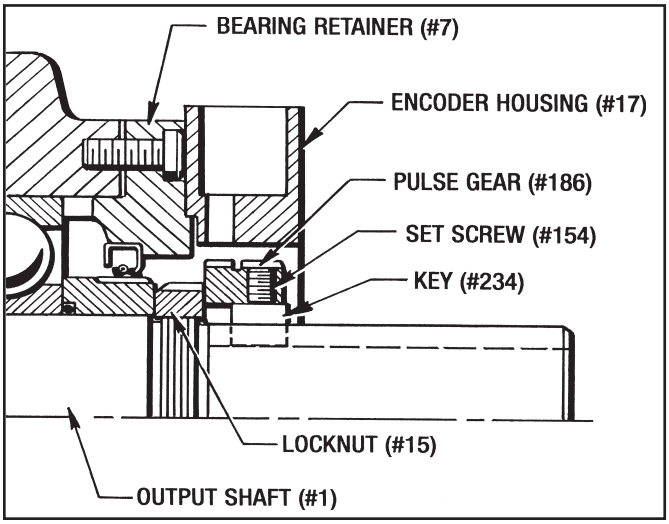


Figure 9.14 - Pulse Gear Alignment (#20 w/o Reducer)

3. 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). (See Figure 10.1)

   Jump ahead to Section 9-12 and install the Quadrature Encoder (#355) and the Magnetic Pick-Up (#22).

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

(#20 *Posidyne* with Planetary Gear Reducer)

1. Replace Key (#234) into the Planet Hub Shaft (#886) if it was removed.

2. Slide the Pulse Gear (#186) onto the Planet Hub Shaft (#886). Butt it up against the shaft shoulder and align the Set Screw (#154) with the Key (#234) and tighten. (See Figure 9.15)

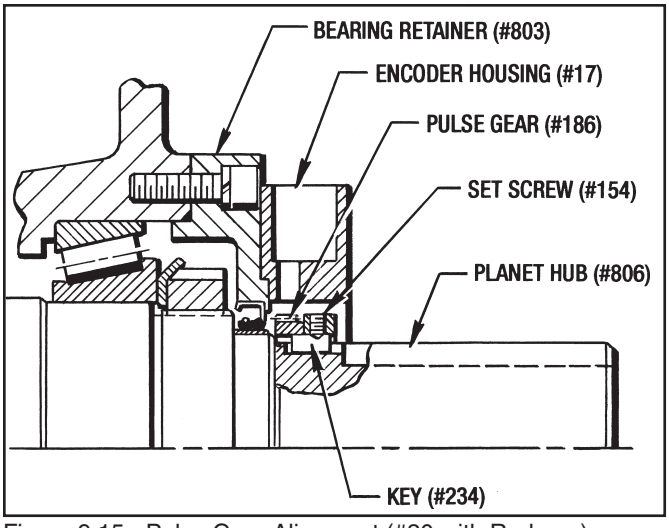


Figure 9.15 - Pulse Gear Alignment (#20 with Reducer)

3. Attach the Encoder Housing (#17) to the Bearing Retainer (#803). Attach with (2) Screws (#76) and (2) Lockwashers (#257). (See Figure 10.2)

   Jump ahead to Section 9-12 and install the Quadrature Encoder (#355) and the Magnetic Pick-Up (#22).

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

9-12 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 9.16)

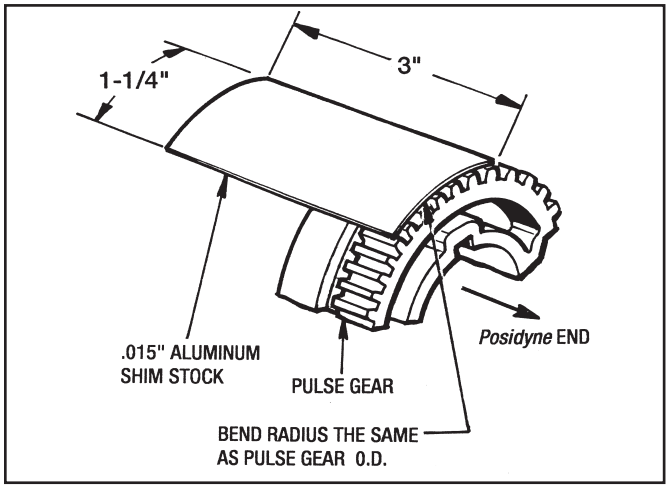


Figure 9.16 - Sensor Gap Shim

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 9.17)

4. Connect the sensor wires to the Brad Harrison Connector.

B. MAGNETIC PICK-UP SENSOR (See Figure 9.17)

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.

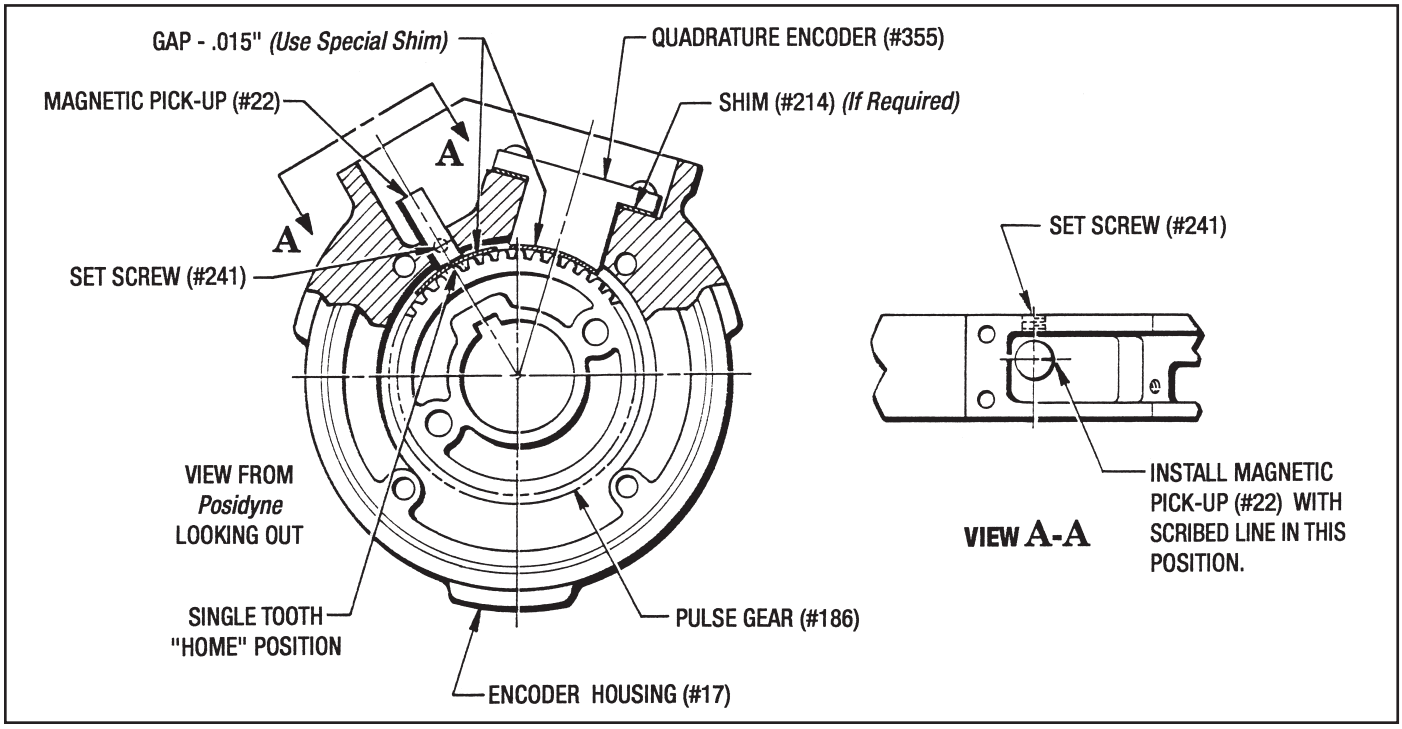


Figure 9.17 - Position Sensors Installation

9-13 REASSEMBLY and INSTALLATION of DIFFERENTIAL LINE DRIVER ENCODER (Optical Encoder)

(See Figures 10.1 and 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 9.18)

   NOTE: On size 11 *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.

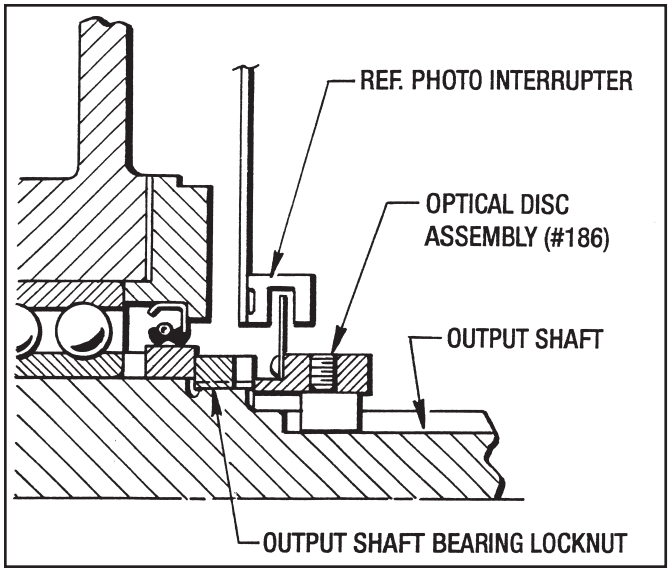


Figure 9.18 - Optical Disc and Hub Positioning

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 into the Disc Housing (#17).
5. Attach the Disc Housing (#17) to the output end of the Posidyne with the (4) Screws (#76) and (4) Lockwashers (#257).
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 9.18 and 9.19)
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 9.19)

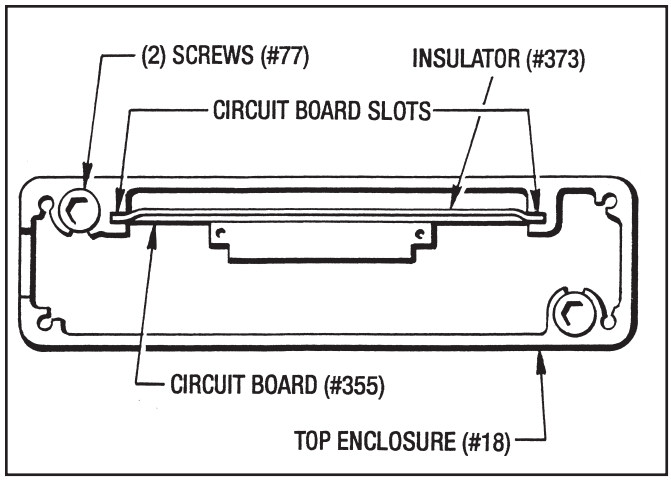


Figure 9.19 - Circuit Board Slots

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 9.19)

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 9.20)

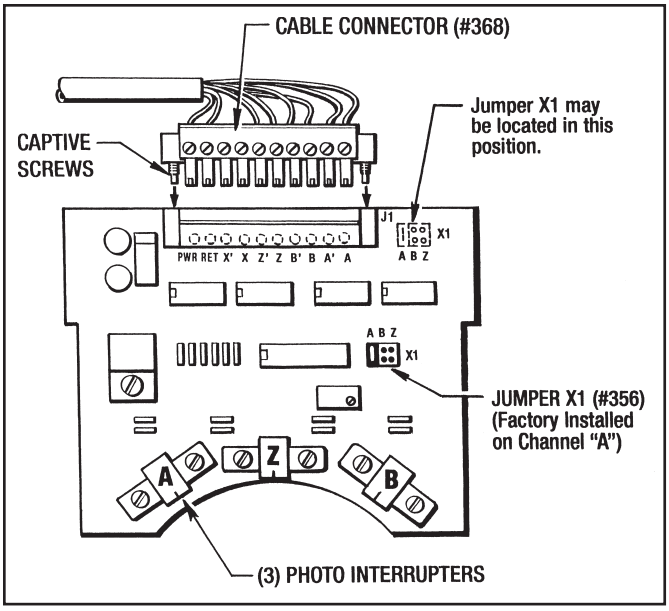


Figure 9.20 - Circuit Board Connector

12. Place the top Gasket (#19) on the Upper Enclosure and attach the Top Cover (#372) with (4) Screws (#225).

9-14 PLANETARY GEAR REDUCER REASSEMBLY

(See Figure 10.6)

A. Planet Gear Reassembly

1. Press the Needle Bearing (#812) into the Planet Gear (#818) with an arbor press until it is flush with the gear face.

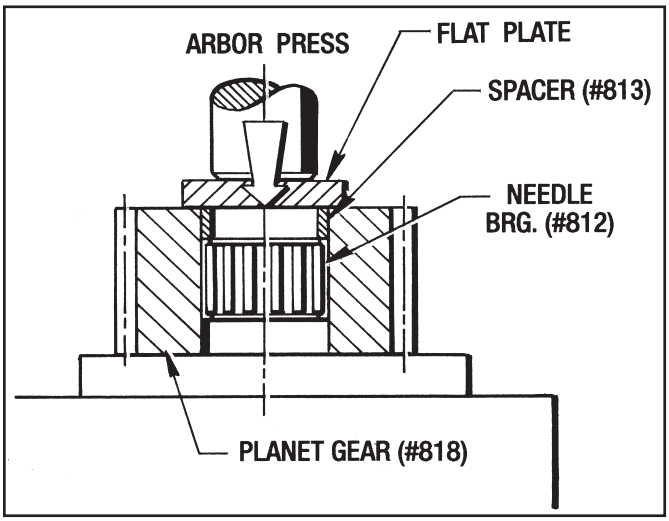


Figure 9.21 - Installing Needle Bearings (#812)

2. Place a Spacer (#813) on top of the Needle Bearing (#812) and press it into the gear until the Spacer (#813) is flush with the gear face. (See Figure 9.21)

This will insure that the Needle Bearing (#812) is positioned exactly in the middle of the Gear (#818).

3. Insert another Spacer (#813) into the hole on the other side of the Bearing (#812). Pack Bearing and Spacers with **Mobilith SHC-PM white grease**, or equivalent. This will also hold the Spacers (#813) in place for further reassembly.

Complete this procedure for all (4) four Planet Gears (#818).

4. Place the Planet Hub (#886) on a table with the shaft end pointed up. (See Figure 9.22)

5. Slide each assembled Planet Gear into the opening with a Thrust Washer (#827) on the top and bottom. Align all (3) parts with the planet gear pin hole.

6. Press the Planet Gear Pin (#820) into the hole until it bottoms out on the table. **Make sure the hole in the Planet Gear Pin (#820) is aligned with the tapped hole in the Planet Hub (#886).**

7. Screw each Set Screw (#877) into the Planet Hub (#886) until it bottoms out into the hole in the Planet Gear Pin (#820). (See Figure 9.22) **Use Blue Loctite #242 and torque to 25 Ft. Lbs.**

   This will insure that the Planet Gear Pins (#820) will be held in place.

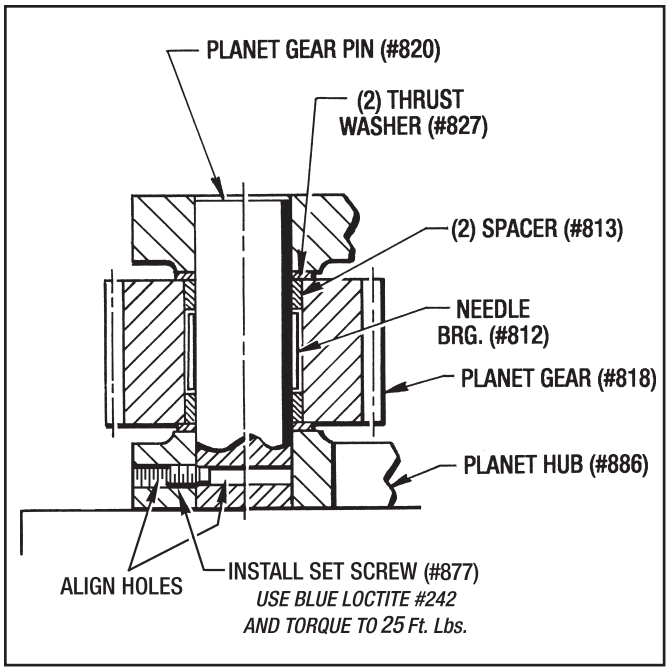


Figure 9.22 - Installing Planet Gears

B. Installing Wear Sleeve (#874)

(See Figure 10.6)

A special Wear Sleeve Assembly Tool must be used to install this Wear Sleeve (#874) on to the Planet Hub (#886).

It can be ordered from Force Control Industries with the Part Number #601-20-012-00. Machining Dimensions are given in Figure 9.23 if you prefer to make your own tool.

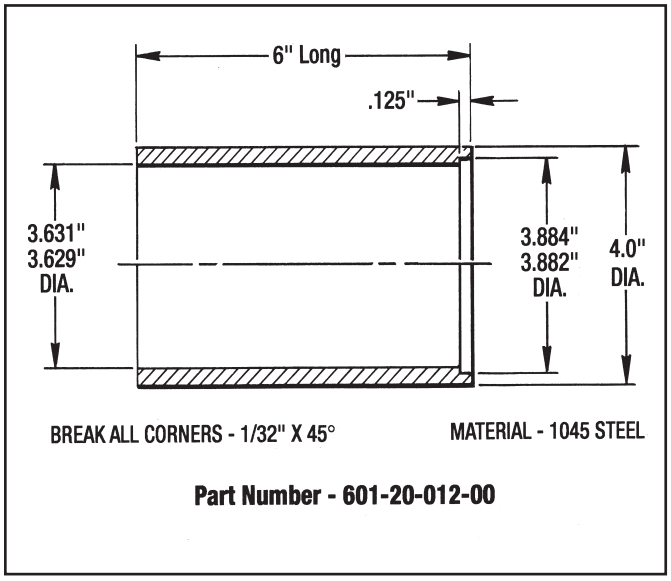


Figure 9.23 - Wear Sleeve (#874) Assembly Tool

1. Place the Planet Hub into an arbor press and with the Wear Sleeve Assembly Tool press the Wear Sleeve (#874) on to the Planet Hub (#886) until it bottoms out on the shoulder. (See Figure 9.24)

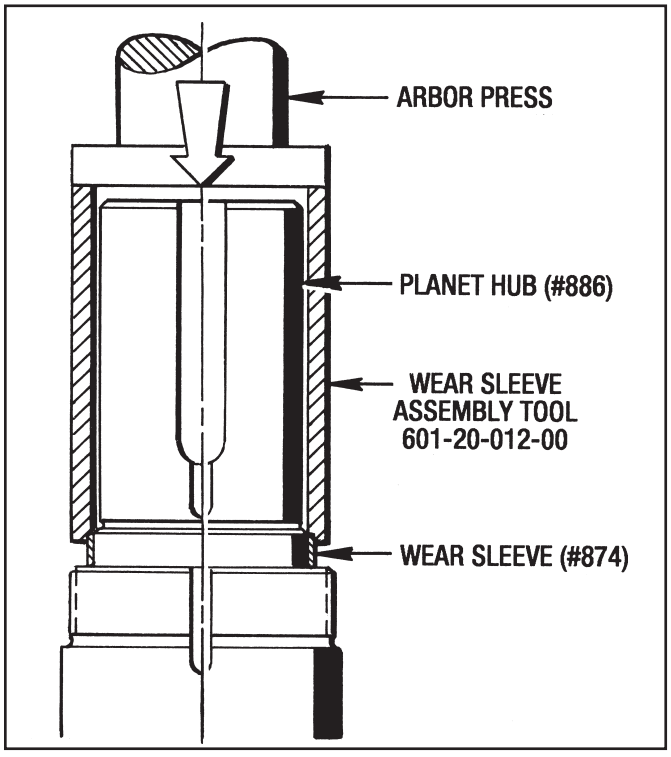


Figure 9.24 - Installing Wear Sleeve (#874)

C. Installing Planet Hub Assembly into Main Planetary Gear Housing (See Figure 10.6)

1. Set Planet Hub (#886) upright on a table with the shaft end pointed up.
2. Heat up the Bearing Cone (#811) to 250° F. and drop it on to the Planet Hub Shaft.

CAUTION
Always wear suitable gloves when handling heated parts.

3. Apply Green Loc-tite #680 to the O.D. of both Bearing Cups (#808) and install them into the Main Housing bores. Wipe off any excess.
4. With an overhead hoist, carefully lower the Main Housing (#800) on to the Planet Hub (#886).
5. Heat up the other Bearing Cone (#809) to 250° F. and install it on to the Planet Hub shaft.

CAUTION
Always wear suitable gloves when handling heated parts.

6. Let Bearings cool, then install Lockwasher (#852) on Planet Hub (#886).
7. Place a Magnetic Dial Indicator on the Main Housing and Planet Hub Shaft as shown in Figure 9.25 to set the Bearing End Play.

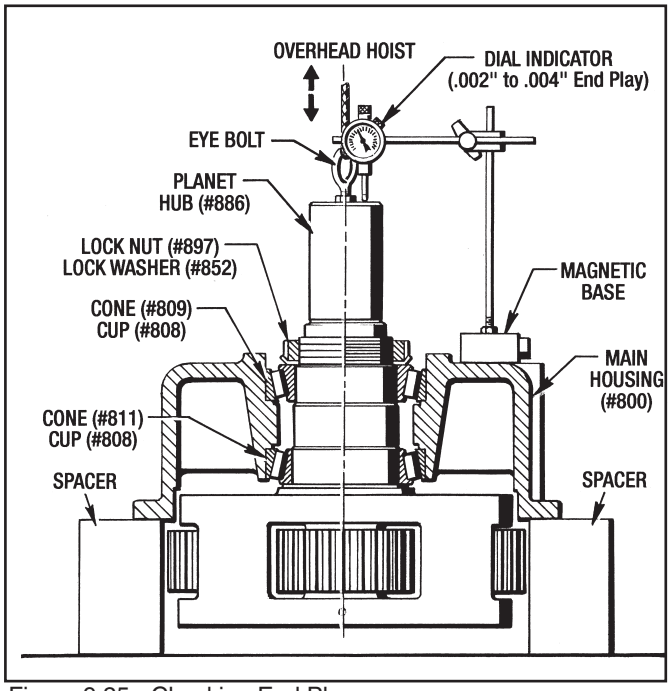


Figure 9.25 - Checking End Play

8. Apply Loc-tite #271 Thread Locker to threads and install Lock Nut (#897). Raise and lower the Planet Hub (#886) with the overhead hoist to check the End Play. **Tighten Lock Nut (#897) to achieve .002" to .004" End Play.**
9. Lubricate the O-Ring (#881) and install it on to the Bearing Retainer (#803). Attach the Bearing Retainer (#803) to the Main Housing (#800) with (4) Lockwashers (#850) and (4) Screws (#843). **Torque to 60 Ft. Lbs.**

9-15 ATTACHING PLANETARY GEAR REDUCER TO *Posidyne* OUTPUT HOUSING (See Figure 10.6)

1. Attach Sun Gear (#819) and Shrink Disc (#822) to the Posidyne Output Shaft according to manufacturers specifications. **(See B-Loc Specification Sheet on Page 50 for correct Installation Procedure.)**

2. Set the #20 *Posidyne* with the output shaft pointed up. Lubricate and install (8) O-Rings into the output housing face counterbores. Also lubricate and install the large O-Ring (#872) into the O-Ring Groove in the Transfer Case (#801).
3. Set the Transfer Case (#801) on the output housing using the (2) Pins (#876) for alignment. Attach with (6) Screws (#843) and (6) Lockwashers (#850). **Torque to 60 Ft. Lbs**.
4. Lubricate (2) O-Rings (#882) and install them over the (2) Pins (#876) in the back face of the Main Housing (#800). Also lubricate and install the large O-Ring (#873) into the O-Ring Groove in the back face of the Main Housing (#800).
5. Install an eye-bolt into the end of the Planet Hub shaft and with an overhead hoist carefully lower the Main Housing and Planet Hub Assembly on to the Transfer Case (#801). Use the (2) Pins (#876) for alignment. (See Figure 9.26)

NOTE:

The gear teeth in the (4) Planet Gears (#818) have to mesh with the internal gear teeth in the Transfer Case (#801) and the external gear teeth in the Sun Gear (819).

6. Attach with (8) Lockwashers (#850) and (8) Screws (#843). **Torque to 60 Ft. Lbs.**

9-16 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 and the Planetary Gear Reducer with HD-80W90 Gear Lube, as indicated in **Section 4 - LUBRICATION.**

NOTE:

Other fluids may be specified for special drives. Always use the same oil as specified on the Name Plate.

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

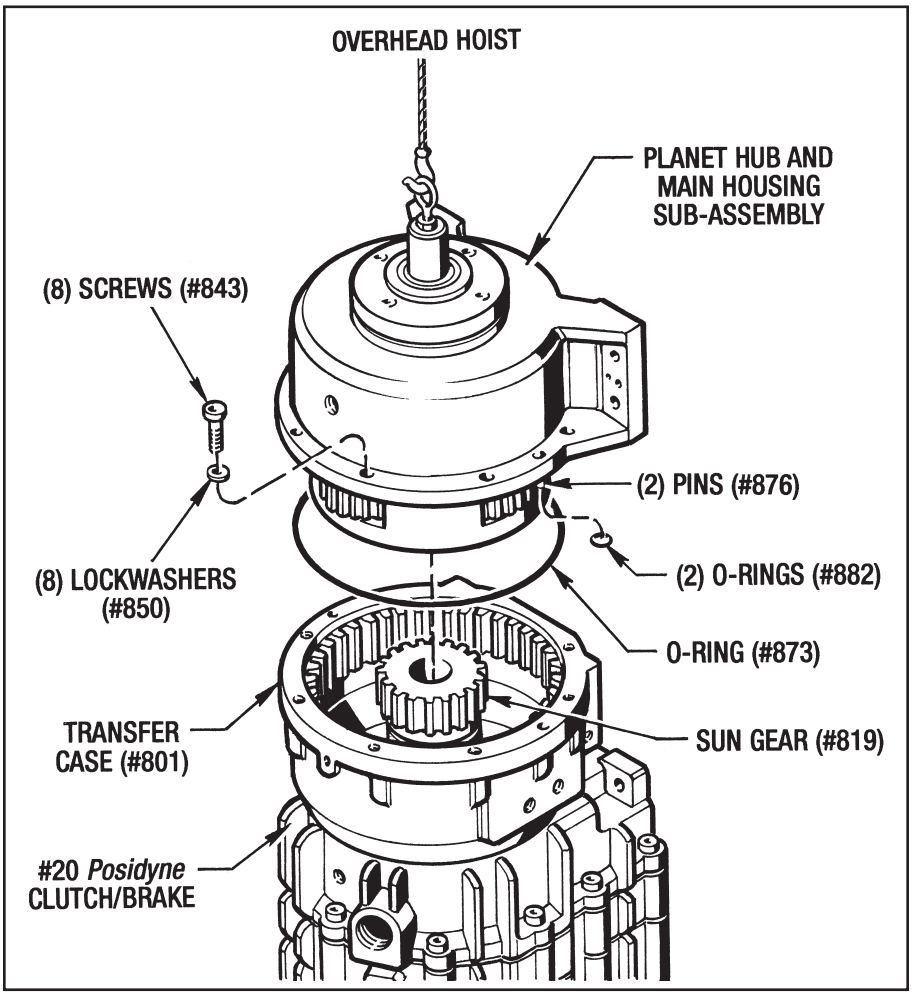


Figure 9.26 - Planetary Gear Reducer Installation

Section 10
ILLUSTRATED PARTS LIST

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. 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
Telephone: 513-868-0900
Fax No.: 513-868-2105

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 AND MODEL NUMBERS

The Name Plate shown is located on the Piston Housing.

Force Control Industries, Inc.
Fairfield, Ohio
FORCE CONTROL®
For Service / Parts Call
513-868-0900
Posidyne® Clutch/Brake
Model No.
Serial No.
Use Mobil® ATF 210

Repair Parts List (Figure 10.1)

MAJOR SUBASSEMBLIES and CLUTCH/BRAKE STACKS

(#11 and #20 *Posidyne* Indexing Drives Without Planetary Gear Reducer)

REF. No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
*12	Friction Disc		88	Soc. Set Screw (With Fan Cooling)	1
	(#11 *Posidyne*)	17	127	Lockwasher	22
	(#20 *Posidyne*)	15	257	Lockwasher	4
*13	Drive Plate (Without Rivets)		*323	Drive Plate (With Rivets)	7
	(#11 *Posidyne*)	12	*377	Separator Spring	28
	(#20 *Posidyne*)	10	*380	Stack Filler Plate	AR
24	Fan Shroud (With Fan Cooling)	1	475	Button Hd. Screw (With Fan Cooling)	8
*53	Gasket	2	540	Locking Assembly	1
61	Soc. Hd. Cap Screw	11	542	Flywheel	1
69	Soc. Hd. Cap Screw	11	543	Fan (With Fan Cooling)	1
76	Soc. Hd. Cap Screw	4	544	Hex Hd. Screw (With Fan Cooling)	2
86	Flanged Nut (With Fan Cooling)	2			

* Indicates parts in Minor Overhaul Kit
AR- As Required

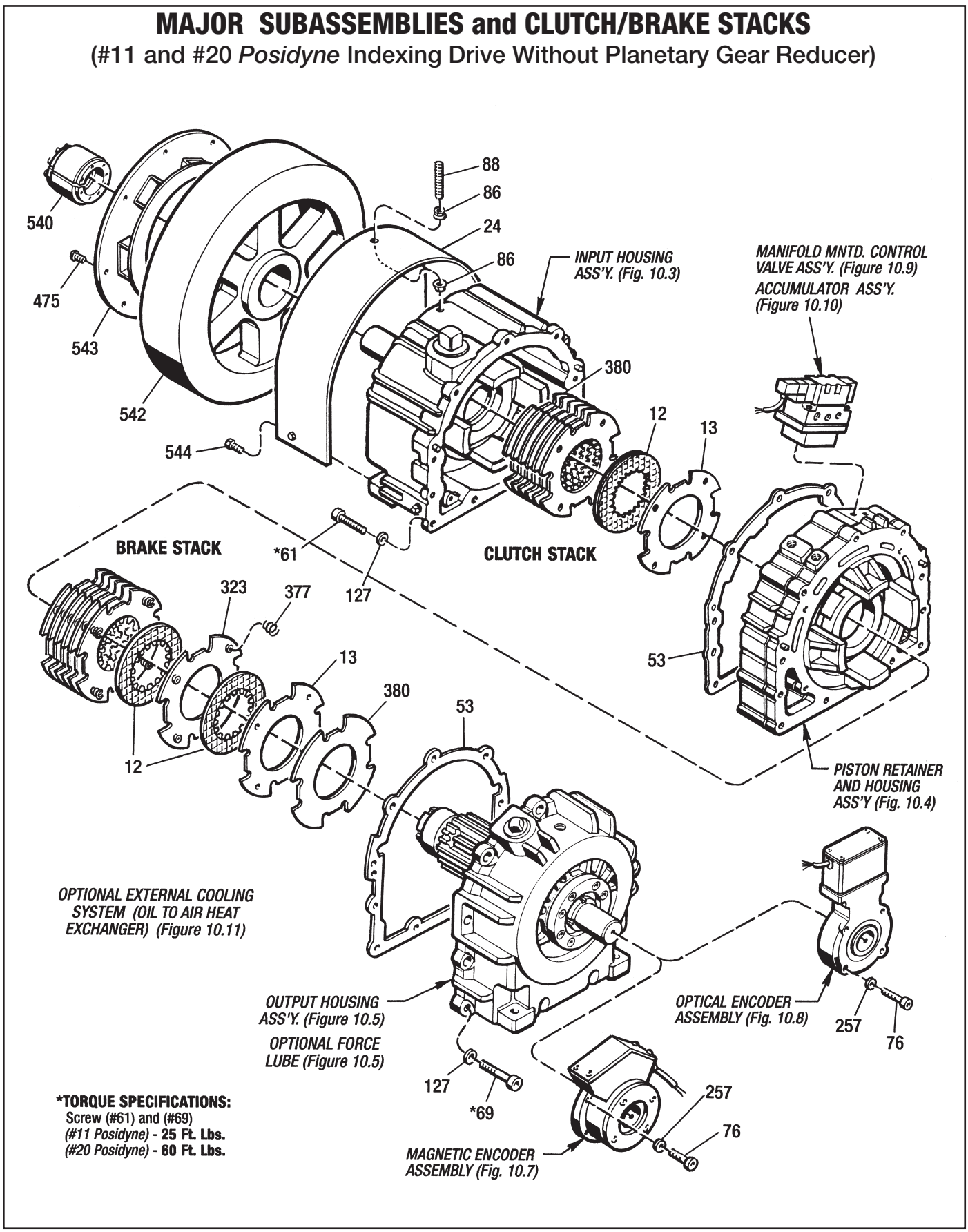


Figure 10.1 - #11 and #20 *Posidyne* Indexing Drive (Without Planetary Gear Reducer)

Repair Parts List (Figure 10.2)

MAJOR SUBASSEMBLIES and CLUTCH/BRAKE STACKS

(#20 *Posidyne* Indexing Drives With Planetary Gear Reducer)

REF. No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
*12	Friction Disc	15	257	Lockwasher	4
*13	Drive Plate (Without Rivets)	10	*323	Drive Plate (With Rivets)	7
24	Fan Shroud (With Fan Cooling)	1	*377	Separator Spring	28
*53	Gasket	2	*380	Stack Filler Plate	AR
61	Soc. Hd. Cap Screw	11	475	Button Hd. Screw (With Fan Cooling)	8
69	Soc. Hd. Cap Screw	11	540	Locking Assembly	1
76	Soc. Hd. Cap Screw	4	542	Flywheel	1
86	Flanged Nut (With Fan Cooling)	2	543	Fan (With Fan Cooling)	1
88	Soc. Set Screw (With Fan Cooling)	1	544	Hex Hd. Screw (With Fan Cooling)	2
127	Lockwasher	22			

* Indicates parts in Minor Overhaul Kit
AR- As Required

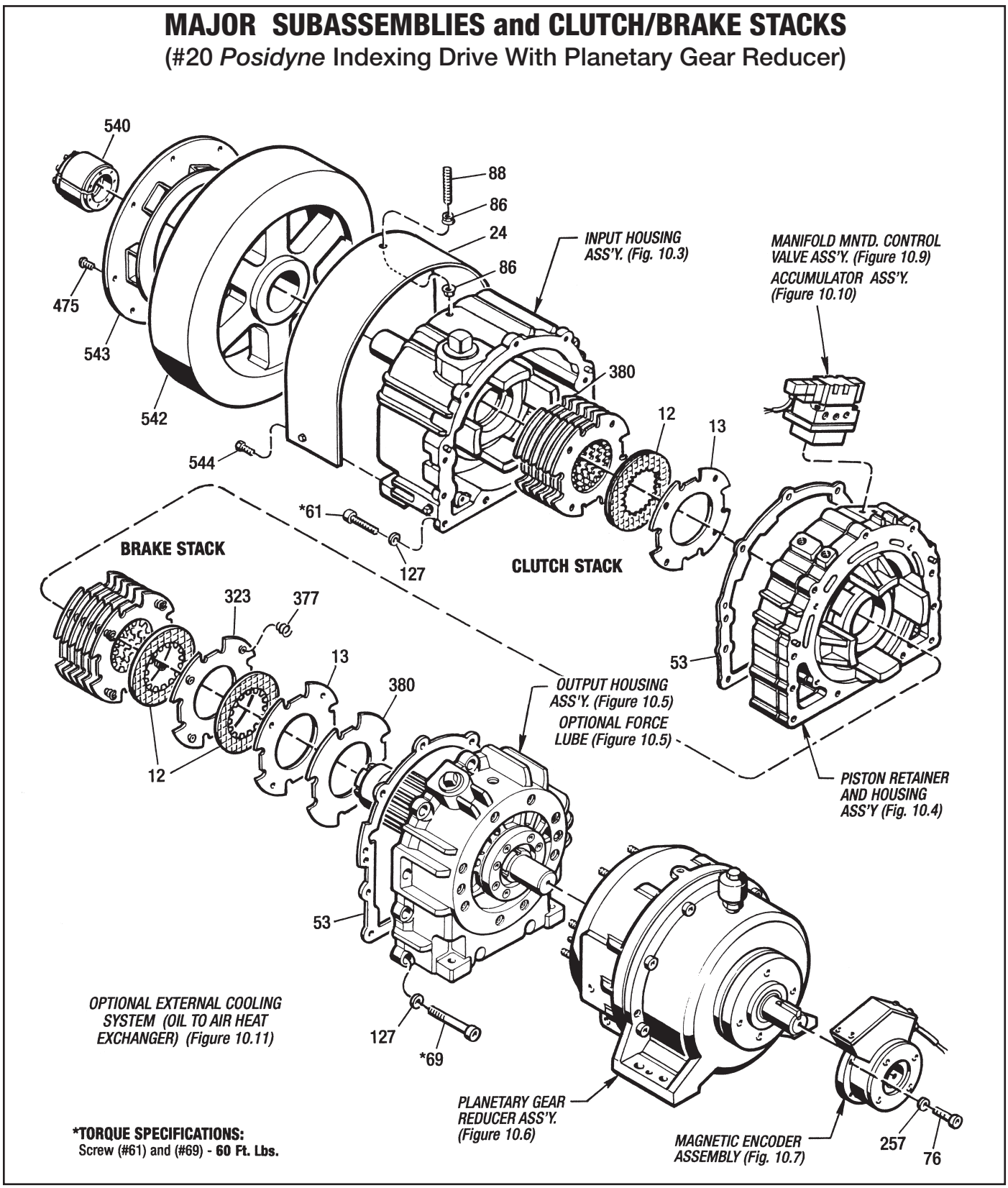


Figure 10.2 - #20 *Posidyne* Indexing Drive (With Planetary Gear Reducer)

Repair Parts List (Figure 10.3)

INPUT HOUSING SUBASSEMBLY

REF. No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
2	Input Shaft	1	63	Soc. Hd. Cap Screw	6
*4	Mating Ring (#20 Only)	1	68	Dowel Pin	2
*4	Wear Sleeve (#11 Only)	1	73	Mag. Hd Pipe Plug	2
7	Bearing Retainer	1	75	Water Port Plug	2
8	Input Housing	1	*80	O-Ring (#20 Only)	1
14	Sq. Hd. Pipe Plug	1	*87	O-Ring	1
**15	Locknut	1	155	Lockwasher (#11 Only)	1
*26	Ball Bearing	2	213	Roll Pin (#20 only)	1
*31	Oil Seal	1	*250	Wear Sleeve (#20 Only)	1
*35	Ball Bearing	1			

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

INPUT HOUSING ASSEMBLY

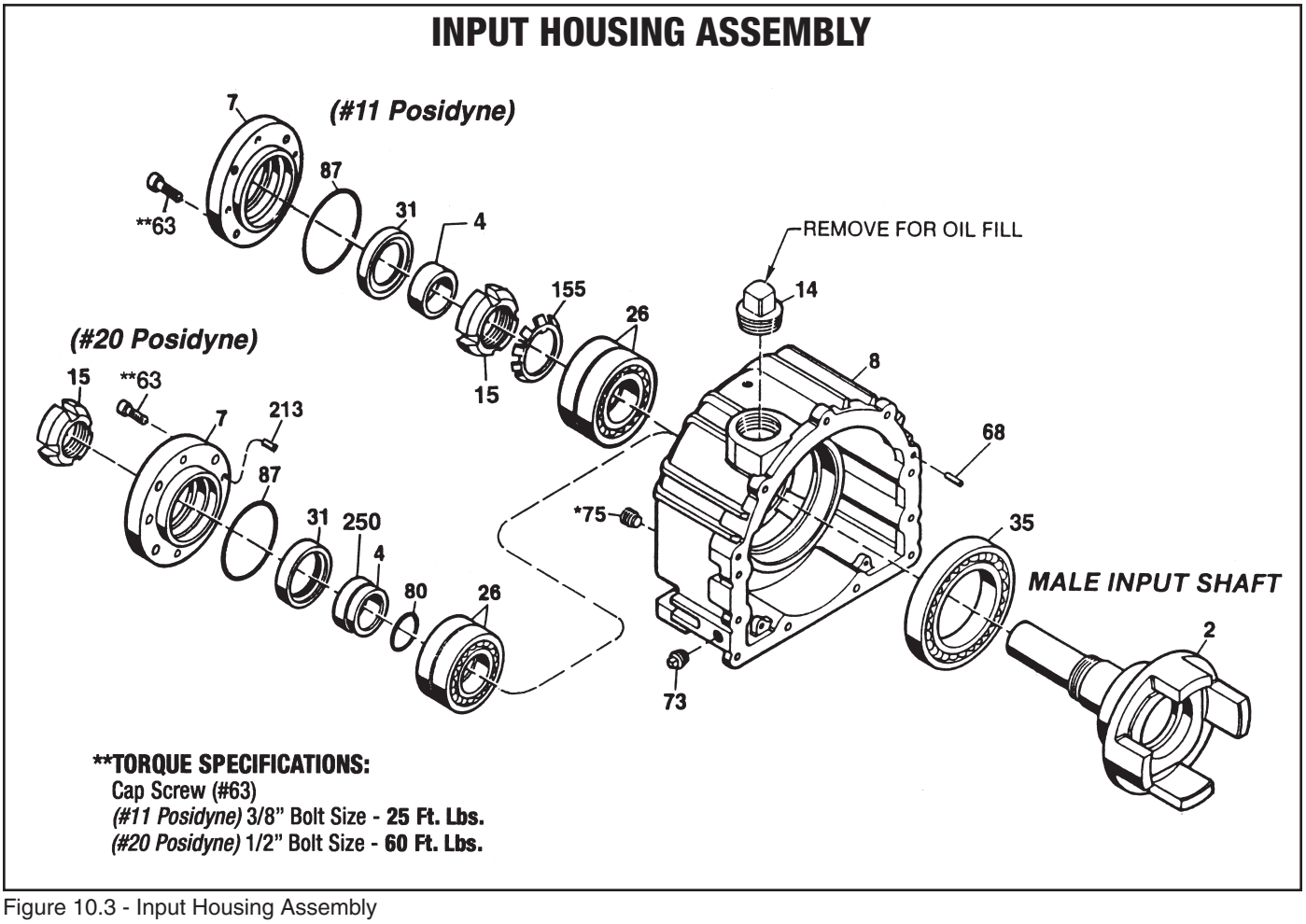


Figure 10.3 - Input Housing Assembly

Repair Parts List (Figure 10.4)

PISTON RETAINER AND HOUSING ASSEMBLY

REF. No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
3	Piston	1	*40	O-Ring	2
**5	Clutch Thrust Plate	1	*42	I.D. Sealing Liner	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	8	68	Dowel Pin	4
*39	O-Ring	2	128	Lockwasher, 5/16"	4

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

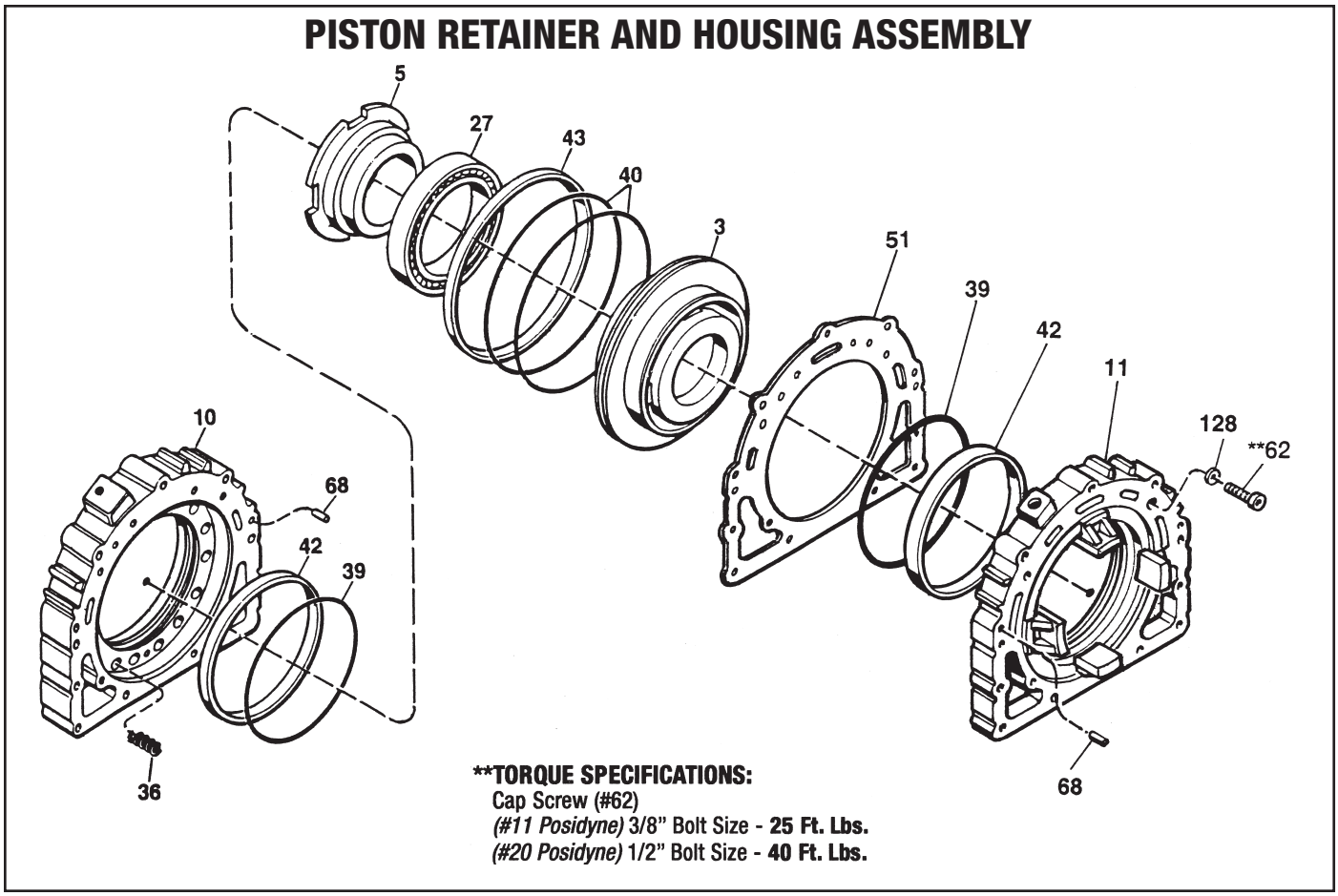


Figure 10.4 - Piston Retainer and Housing Assembly

Repair Parts List (Figure 10.5)

OUTPUT HOUSING ASSEMBLY

REF. No.	PART NAME	QTY.	REF. No.	PART NAME	QTY.
1	Output Shaft	1	73	Pipe Plug, Mag. Sq. Hd.	
*4	Mating Ring (#20 Only)	1		Without External Cooling	2
*4	Wear Sleeve (#11 Only)	1		With External Cooling	1
7	Bearing Retainer	1	*80	O-Ring (#20 Only)	1
9	Output Housing	1	*87	O-Ring	1
14	Sq. Hd. Pipe Plug (#20 Only)	1	90	Reducer Bushing (#20 Only)	1
**15	Locknut	1	128	Lockwasher	8
*26	Ball Bearing (Without Force Lube)	2	**155	Lockwasher (#11 Only)	1
*28	Ball Bearing	1	181	Key (Without Gear Reducer)	1
*31	Oil Seal	1	213	Roll Pin (#20 only)	1
**34	Locknut (#20 Only)	1	216	Special Reducer Fitting (#11 Only)	1
*38	Ball Bearing (With Force Lube)	1	*250	Wear Sleeve (#20 Only)	1
**45	Breather	1	*295	O-Ring	2
**46	Oil Sight Gauge	1	297	Inlet Manifold	1
63	Soc. Hd. Cap Screw	8	344	Labyrinth	1
71	Pipe Plug (#11 Only)	1	*378	Bearing Shim (#11 Only)	AR
72	Pipe Plug	1			

* - Indicates Parts in Minor Overhaul Kit
** - Indicates Parts in Major Overhaul Kit. (Plus all parts in Minor Overhaul Kit.)
AR - As Required

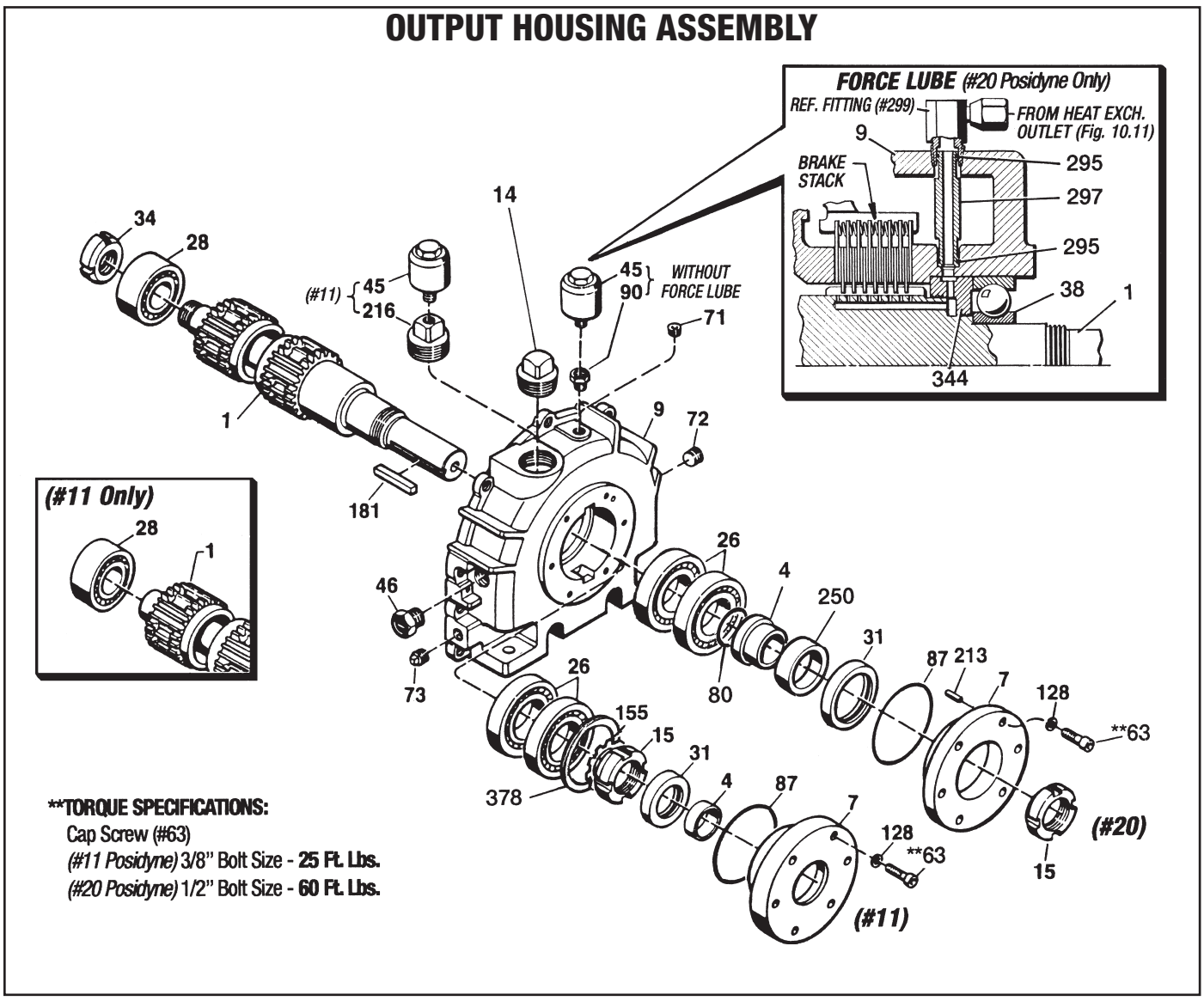


Figure 10.5 - Output Housing Assembly

Repair Parts List (Figure 10.6)

PLANETARY GEAR REDUCER

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
**45	Breather	1	*827	Thrust Washer	8
74	Pipe Plug, 3/4" Sq. Hd. Mag.	2	830	Reducer Bushing, 1/2" x 1/4"	1
92	Pipe Plug, 3/4"	3	840	Key	1
117	Street Elbow, 3/4" NPT	1	843	Soc. Hd. Cap Screw, 1/2"-13 x 1-3/4" Lg.	20
131	Pipe Plug, 3/4" Sq. Hd.	1	850	Lockwasher	20
800	Main Housing	1	**852	Lockwasher	1
801	Transfer Case	1	*872	O-Ring	1
803	Bearing Retainer	1	*873	O-Ring	1
*808	Bearing Cup	2	*874	Wear Sleeve	1
*809	Bearing Cone	1	876	Dowel Pin	4
*811	Bearing Cone	1	877	Set Screw	
*812	Needle Bearing	4		English, 1/2"-13 x 1-1/2" Lg.	4
813	Spacer	8		Metric, M12-1.75 x 40 mm Lg.	4
818	Planet Gear	4	*881	O-Ring	1
819	Sun Gear	1	*882	O-Ring	12
820	Planet Gear Pin	4	886	Planet Hub	1
822	Shrink Disc	1	**897	Lock Nut	1
*824	Oil Seal	1			

* - Indicates parts in Minor Overhaul Kit.

** - Indicates parts in Major Overhaul Kit plus all parts in Minor Overhaul Kit.

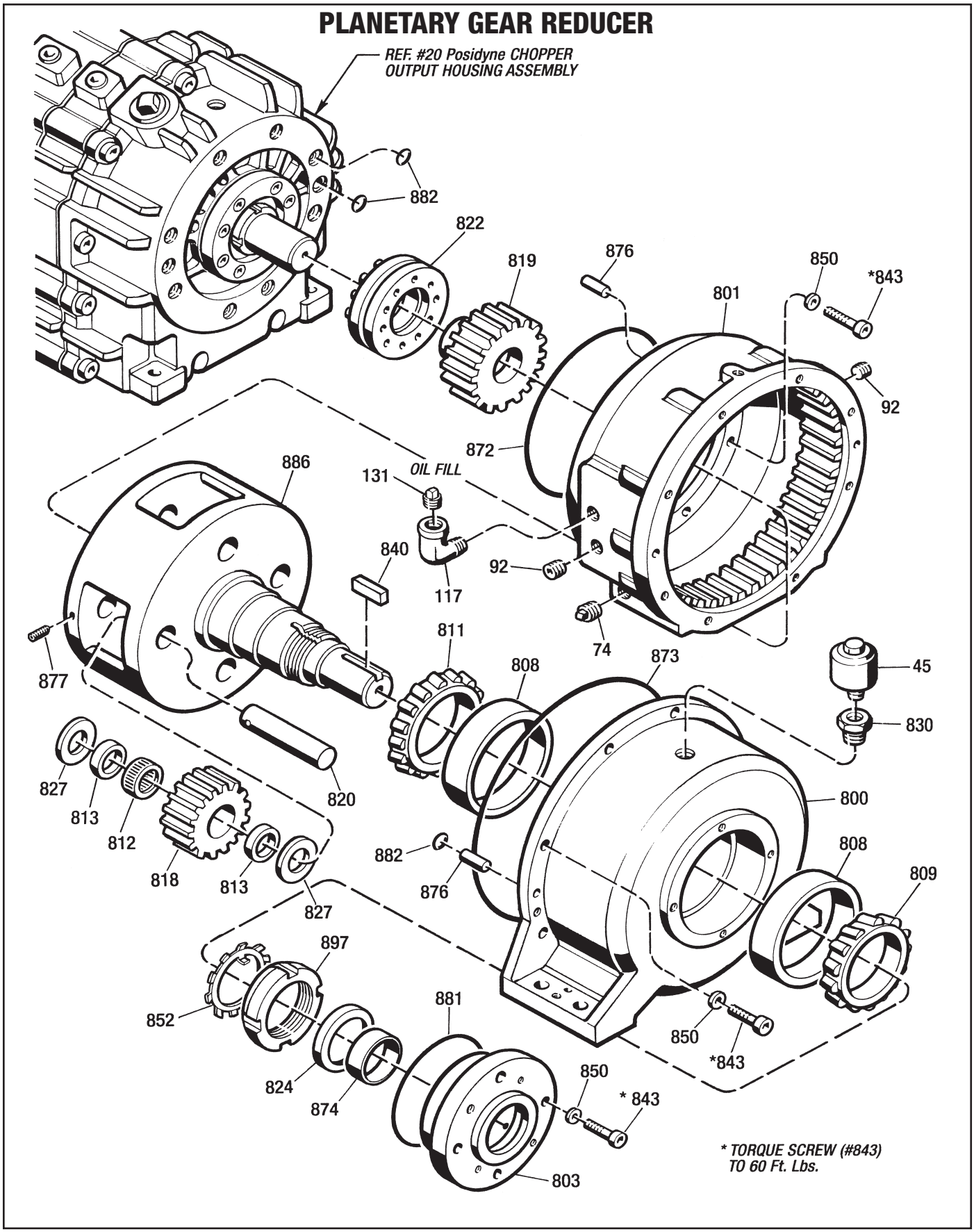


Figure 10.6 - Planetary Gear Reducer

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	268	Button Hd. Cap Screw	4
22	Magnetic Pickup (Home)	1	*290	Gasket (#11 Only)	1
154	Set Screw	1	355	Quadrature Pickup	1
186	Pulse Gear	1	368	Receptacle, 5-Pin	1
225	Button Hd. Screw	4	372	Top Cover	1
226	Round Hd. Machine Screw	2	900	Shim, .005" Thick	AR
234	Key (#20 Only)	1	901	Shim, .010" Thick	AR
241	Soc. Set Screw	1	900	Shim, .020" Thick	AR
253	Housing Cover	1	901	Shim, .030" Thick	AR
259	Encoder Cable, 5 Wire	1			

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

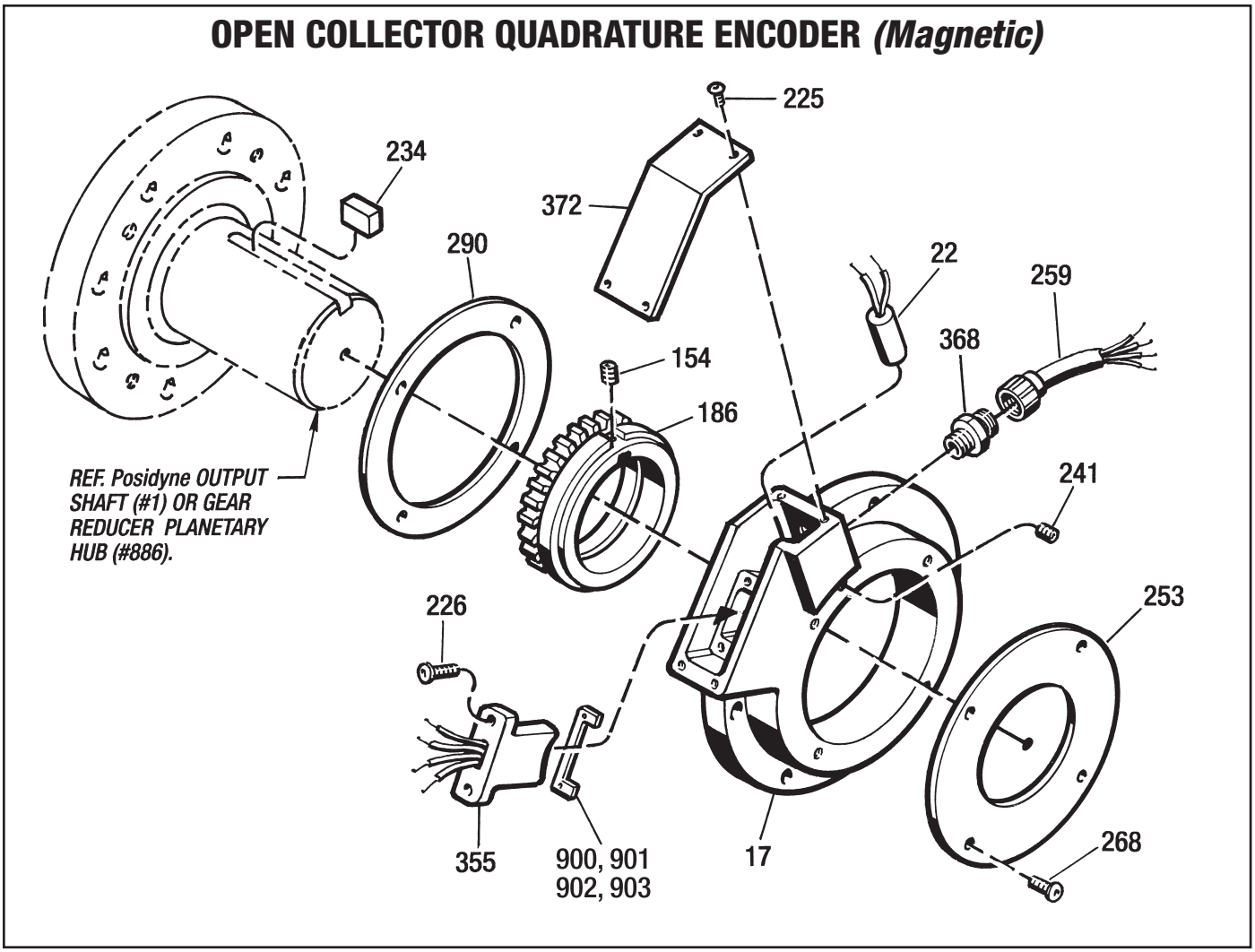


Figure 10.7 - Open Collector Quadrature Encoder (Magnetic)

Repair Parts List (Figure10.8)

DIFFERENTIAL LINE DRIVER ENCODER *(Optical)*

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

* - Indicates parts in the Minor Overhaul Kit.

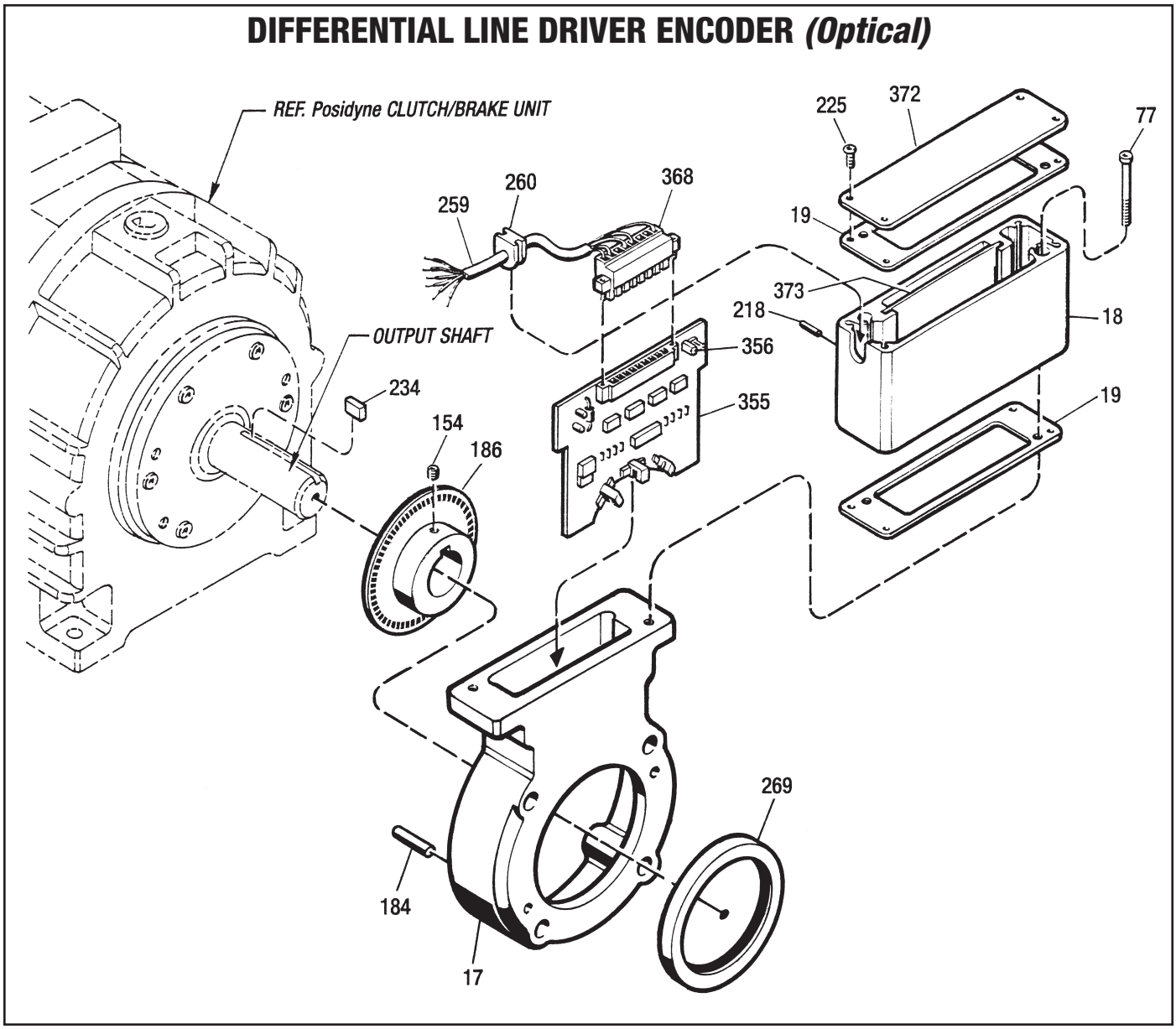


Figure 10.8 - Differential Line Driver Encoder (Optical)

Repair Parts List (Figure 10.9)

MANIFOLD MOUNTED CONTROL VALVE

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
422	Hose Fitting	2	737	Lockwasher	
700	Control Valve			(#11) 1/4"	3
	(#11) ISO II	1		(#20) 5/16"	3
	(#20) ISO III	1	739	Lockwasher	
703	Spacer Manifold	1		(#11) 1/4"	2
712	90° Swivel Adapter	2		(#20) 5/16"	4
713	Swivel Adapter (#20 Only)	1	746	Hose Fitting (#11 Only)	1
715	Pipe Nipple		758	Reducer Bushing, 3/4" x 1/2"	
	(#11) 1/2" x 2" Lg.	1		(#11)	1
	(#20 3/4" x 2" Lg.	1		(#20)	2
716	Pipe Plug, 1/8" NPT	1	768	90° Elbow, 1/2" NPT (#11 Only)	1
717	Pipe Plug		774	Pipe Nipple, 1/2" x 3" Lg. (#11 Only)	1
	(#11) 1/2" NPT	2	*807	Gasket (#20 only)	1
	(#20) 3/4" NPT	2	*808	O-Ring	2
725	Soc. Hd. Cap Screw		809	Silencer	1
	(#11) 1/4"-20 x 2-1/4" Lg.	2	*812	O-Ring	2
	(#20) 5/16"-18 x 2-1/2" Lg.	4			
726	Soc. Hd. Cap Screw				
	(#11) 1/4"-20 x 3/4" Lg.	3			
	(#20) 5/16"-18 x 1-1/2" Lg.	3			

* - Indicates parts in the Minor Overhaul Kit.

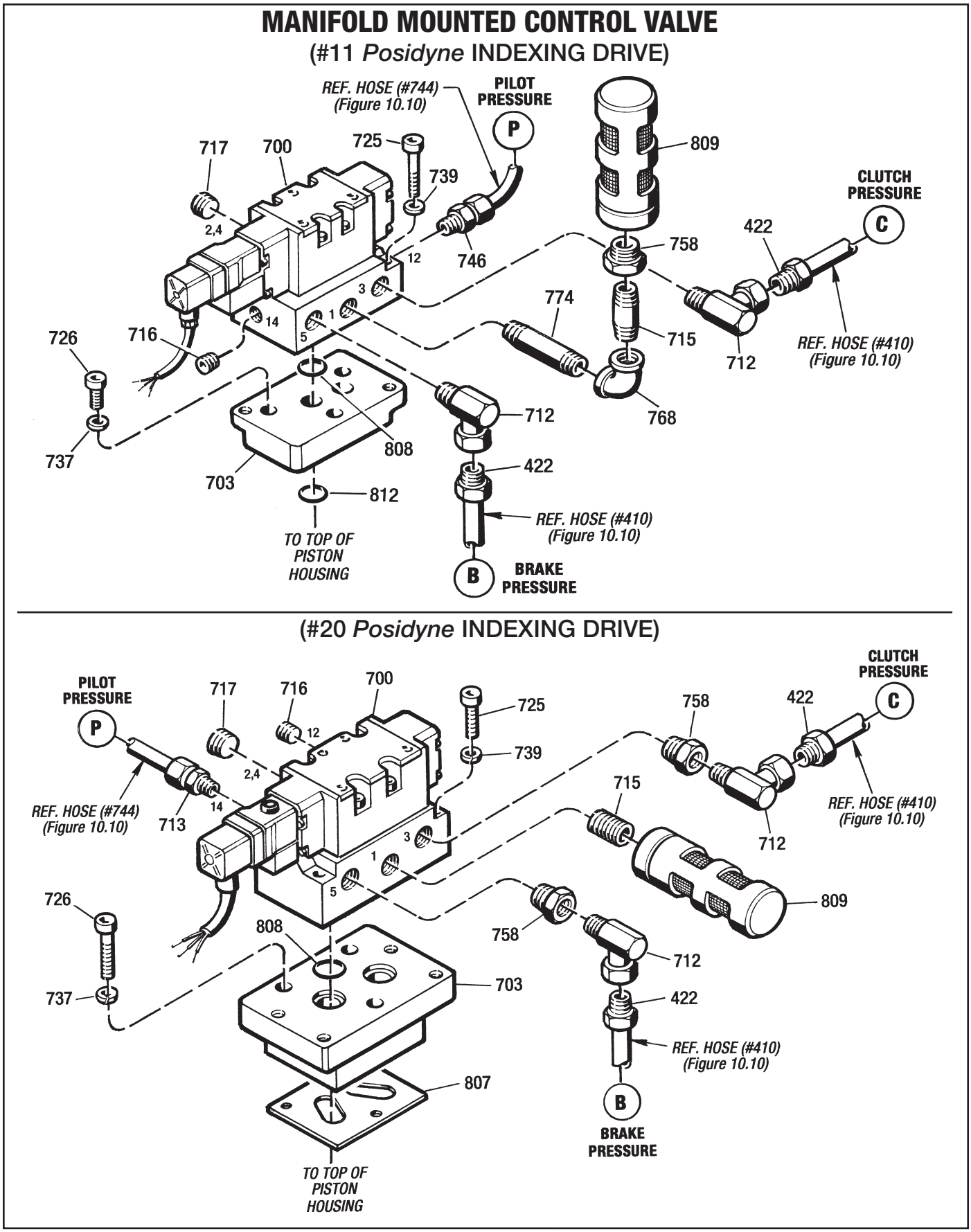


Figure 10.9 - Manifold Mounted Control Valve

Repair Parts List (Figure 10.10)

PNEUMATIC ACCUMULATOR ASSEMBLY

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
401	Drain Cock	2	439	Reducer Bushing, 1-1/2" x 1/4"	2
405	Pneumatic Regulator	2	440	Pipe Union, 3/8"	2
407	Pressure Gauge	2	441	Pipe Nipple, 3/8" Close	4
410	Hose	2	461	Mounting Plate	1
421	Swivel Adapter	2	476	Soc. Hd. Cap Screw, 3/8"-16 x 5/8" Lg.	4
422	Hose Fitting	2	489	Lockwasher, 3/8"	4
436	Pipe Nipple, 4" x 13" Lg.	2	496	Pipe Clamp	4
437	Bell Reducer, 4" x 1-1/2"	4	505	Mounting Channel	2
438	Reducer Bushing, 1-1/2" x 3/8"	2			

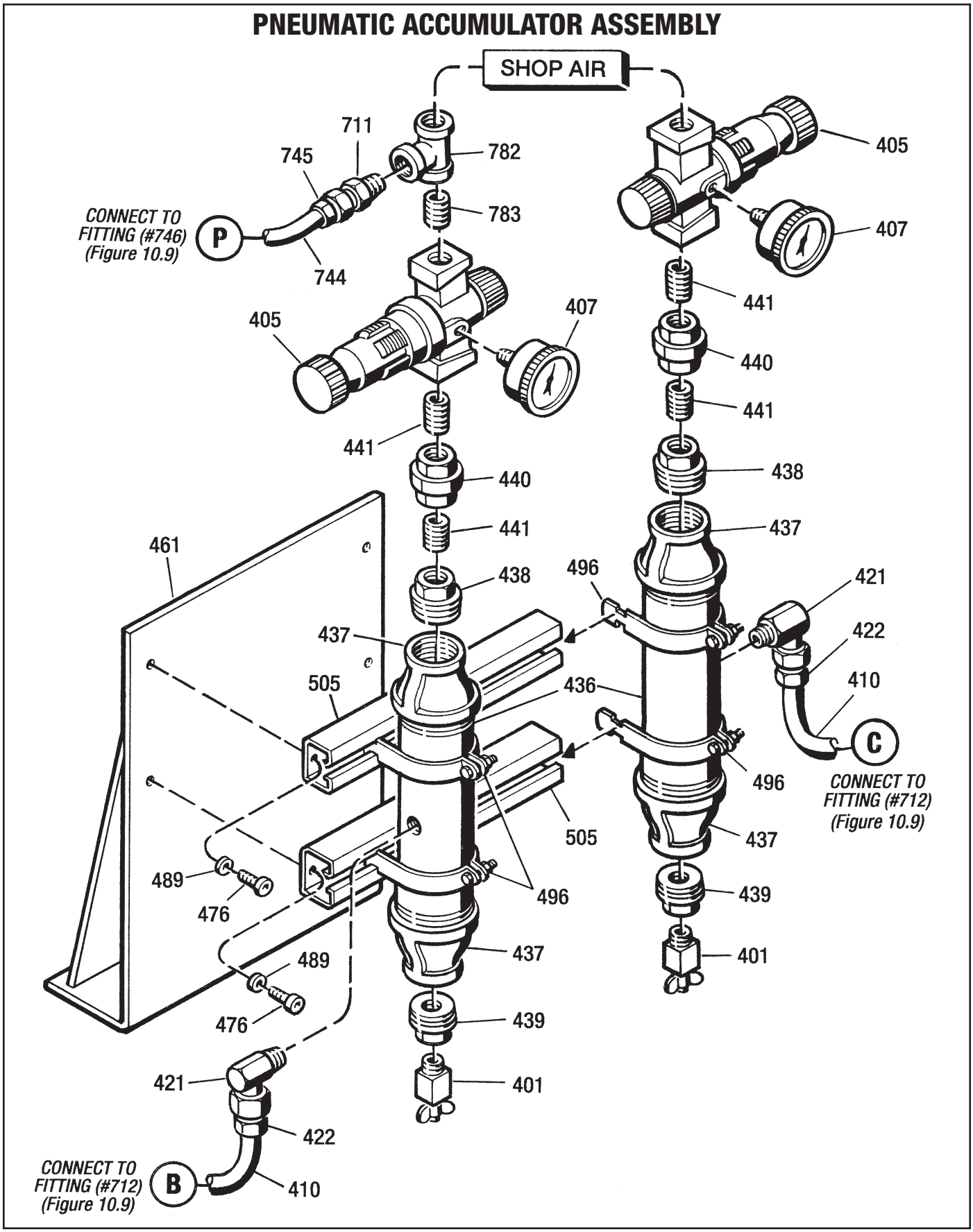


Figure 10.10 - Pneumatic Accumulator Assembly

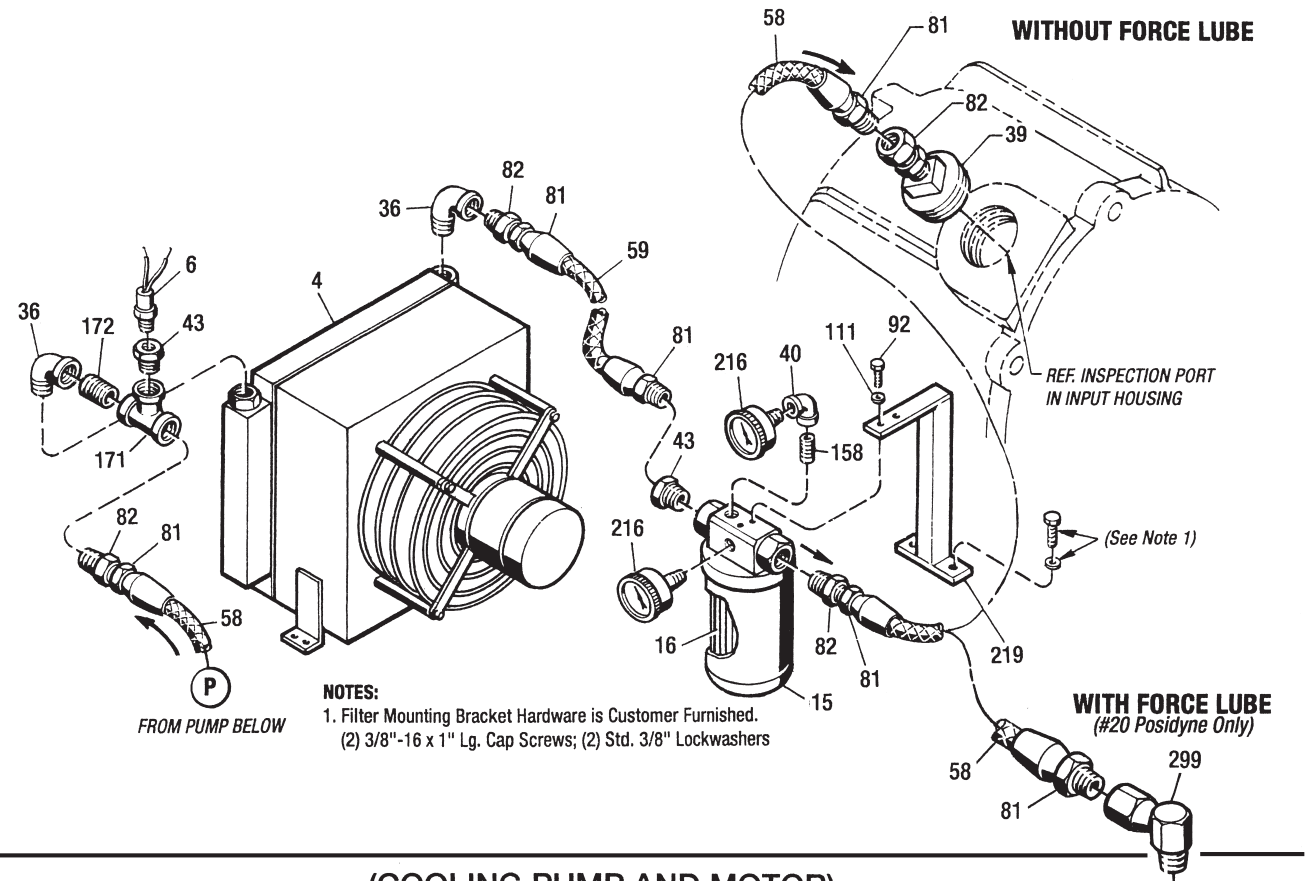
Repair Parts List (Figure 10.11)

OPTIONAL EXTERNAL COOLING SYSTEM

REF No.	PART NAME	QTY.	REF No.	PART NAME	QTY.
2	Cooling Pump	1	82	Swivel Adapter	
3	Motor, 1/2 HP, 1800 RPM	1		With Force Lube	4
4	Heat Exchanger	1		Without Force Lube	5
6	Temperature Switch	1	92	Hex Hd. Cap Screw, 1/4-20 x 3/4 Lg.	2
15	Filter	1	93	Hex Hd. Cap Screw, 5/16-18 x 4-1/2 Lg.	4
16	Filter Element	2	94	Hex Hd. Cap Screw, 3/8-16 x 1 Lg.	4
36	90° Street Elbow, 3/4"	2	109	Lockwasher, 5/16"	4
38	Reducer Bushing, 1" x 3/4" (#20 Only)	1	110	Lockwasher, 3/8"	4
39	Reducer Bushing, 2-1/2" x 3/4"		111	Lockwasher	2
	(W/O Force Lube)	1	157	3-Way Ball Valve	2
40	90° Elbow, 1/8"	1	158	Pipe Nipple, 1/8" x 2" Lg	1
41	Reducer Bushing, 3/4" x 3/8"	2	159	Pipe Nipple, 3/8" x 3-1/2" Lg.	2
43	Reducer Bushing, 3/4 x 1/2"	2	168	Coupling Half, Motor	1
44	Pipe Nipple, 3/4" x 5" Lg	1	169	Coupling Half, Pump	1
45	Pipe Plug, Sq. Hd., 3/4"	2	170	Coupling Spider	1
46	90° Elbow, 3/4"	1	171	Pipe Tee, 3/4"	1
57	Hose, 3/4" I.D.	1	172	Pipe Nipple, 3/4" Close	1
58	Hose, 1/2" I.D.	2	196	Pump Mounting Bracket	1
59	Hose, 1/2" I.D.	1	216	Pressure Gauge	2
80	Hose Fitting	2	219	Filter Bracket	1
81	Hose Fitting	6	299	90° Swivel Fitting (With Force Lube)	1

OPTIONAL EXTERNAL COOLING SYSTEM

(OIL TO AIR HEAT EXCHANGER)



(COOLING PUMP AND MOTOR)

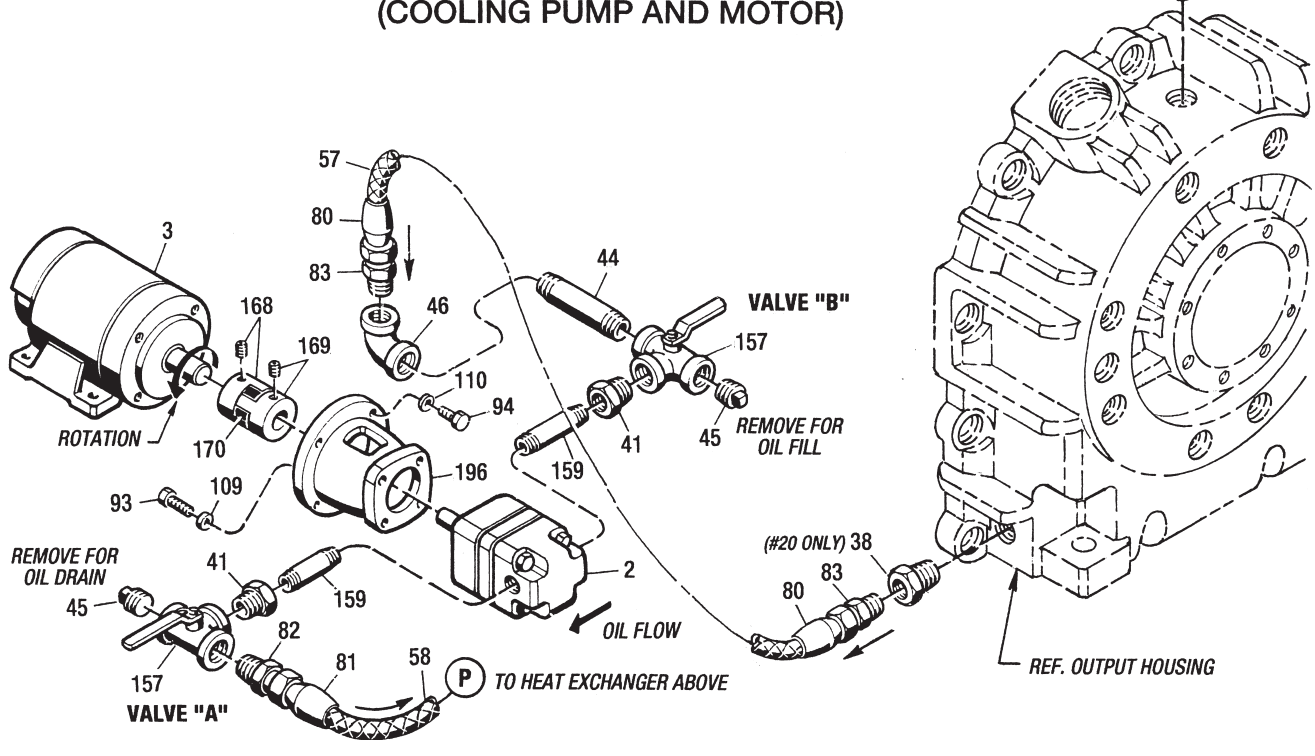
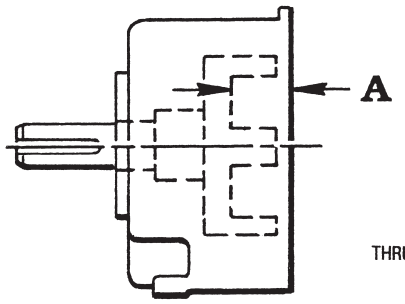
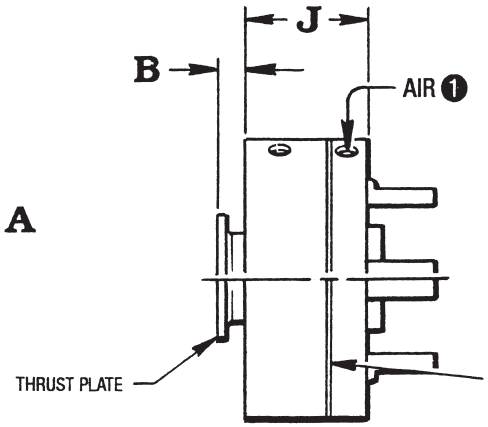


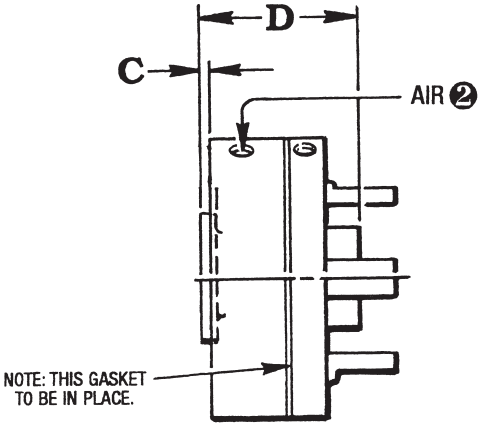
Figure 10.11 - External Cooling System



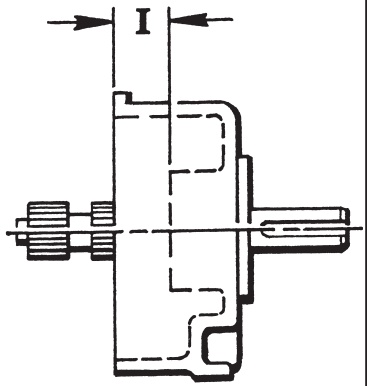
INPUT SUB-ASSEMBLY



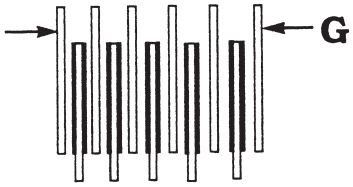
PISTON SUB-ASSEMBLY
(AIR TO CLUTCH PORT)



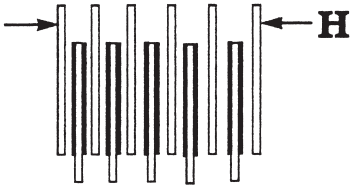
PISTON SUB-ASSEMBLY
(AIR TO BRAKE PORT)



OUTPUT SUB-ASSEMBLY



CLUTCH STACK DIMENSION



BRAKE STACK DIMENSION
(NOT APPLICABLE ON "C" LOGIC)

DIMENSIONAL CHART (Inches)

MODEL (Size/Logic)	A	B	C	D	G		H		I	J
					WORN	NEW *	WORN	NEW *		
11 *Posidyne* - SA Logic	2.856	1.067	.438	5.125	1.789	2.060	1.287	1.469	2.100	3.850
20 *Posidyne* - SA logic	3.344	.687	.005	5.619	2.673	2.964	2.431	2.614	3.305	4.716

NOTES: **TEST**

❶ Max. Air Pressure - 60 PSI

❷ Max. Air Pressure - 35 PSI

- All Dimensions are with Gaskets removed, except as noted.
- Size 11 *Posidyne* will sometimes have an additional Drive Plate added to either the Clutch Stack or Brake Stack or both. See page 33 or 35 to see if they are required when rebuilding drive.

* Mean Dimensions.

Size 11 - 20 *Posidyne* Indexing Drive Dimension Check Chart

FLYWHEEL LOCKING ASSEMBLY (#540)

INSTALLATION AND REMOVAL INSTRUCTIONS FOR SERIES B-112 LOCKING ASSEMBLIES

Series B-112 locking assemblies fit straight-thru hub bores. Their unique design assures a concentric fit without the use of pilot bushings or a pre-centering hub section.

INSTALLATION

Locking assemblies are supplied ready for installation. However, if for some reason they have to be disassembled, make sure that in addition to lined-up slits in all collars, near and far-side clamp collars are not reversed. They are assembled correctly only if there are no holes or threads behind taps in clamp collar item no. 1. Likewise, there must be no threads behind taps in center collar item no. 3 as illustrated in fig. 2. The frictional torque capacity of these devices is based on a coefficient of friction of 0.12 for lightly oiled screw, taper, or shaft and bore contact areas. **Therefore, it is important not to use Molybdenum Disulfide, e. g., Molykote, Never-Seeze or similar lubricants in any locking assembly installation.**

1. Make sure shaft and bore contact areas are clean and lightly oiled.
2. Loosen all locking screws by a minimum of 2 turns and transfer at least 2 screws to push off threads in clamp collar item no. 1 and center collar item no. 3 in order to disengage tapers for easy installation of locking assembly (see fig. 2).
3. After installation of locking assembly, relocate locking screws used for separation of collars.
4. Hand tighten connection and assure that collar item no. 1 is parallel with face of part to be attached to shaft.
5. Use torque wrench and set it approximately 5% higher than specified tightening torque Ma. Torque screws in either a clockwise or counter clockwise sequence, using only 1/4 turns (it is not necessary to tighten in a diametrically opposite pattern) for several passes until 1/4 turns can no longer be achieved.
6. Still apply overtorque for 1 to 2 more passes. This is required to compensate for a system-related relaxation of locking screws since tightening of a given screw will always relax adjacent screws. Without overtorquing, an infinite number of passes would be needed to reach specified tightening torque.
7. Reset torque wrench to specified torque and check all locking screws. No screw should turn at this point, otherwise repeat step "6" for 1 or 2 more passes. It is not necessary to re-check tightening torque after equipment has been in operation.

NOTE: In installations subjected to extreme corrosion, the slits in clamp collars item "1" and "2" as well as in center collar item "3" should be sealed with a suitable caulking compound or otherwise.

LOCKING ASSEMBLY		SCREW SIZE Metric Din 912 Grade 12.9	Tight Torque M_a ft.-lb.
METRIC SIZES	INCH SIZES		
	1 to 1-3/16	M 6 x 35	12
	1-1/4 to 1-7/16	M 6 x 45	12
45 x 75 to 65 x 95	1-1/2 to 2-9/16	M 8 x 50	30
70 x 110 to 90 x 130	2-5/8 to 3-5/8	M 10 x 60	60
100 x 145 to 120 x 165	3-3/4 to 4-3/4	M 12 x 80	105
130 x 180 to 160 x 210	4-15/16 to 6	M 14 x 90	166
170 x 225 to 260 x 325	6-7/16 to 8	M 16 x 110	257
280 x 355 to 340 x 425		M 20 x 130	500
360 x 455 to 600 x 695		M 22 x 150	675

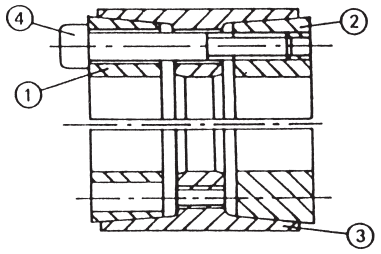


Figure 1

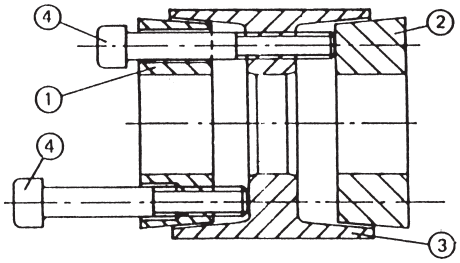


Figure 2

REMOVAL (refer to fig. 2)

IMPORTANT! Make sure ends of locking screws used for removal are ground flat and ends are slightly chamfered to eliminate damage to screw - and collar threads during push-off.

1. Check to assure that axial movement of clamp collars - necessary for release of connection - is not restricted.
2. Remove all locking screws and transfer some into all push-off threads in clamp collar item "1".
3. Release collar "1" by progressively tightening all push-off screws. Typically, the push-off screws appear to be completely tight after just one pass of tightening without any noticeable separation. Although it seems that screws can not be tightened further, several more rounds of torquing in a clockwise (or counter clockwise) sequence actually add more push-off force to the system and ultimately release part of the front collar. Afterwards, only the screws which are still tight, should be tightened further until complete dismounting is achieved.
4. Transfer locking screws used for dismounting of collar "1" to all push-off threads in center collar item "3". Release collar "2" by repeating procedures outlined in step 3.

HEX BIT SOCKET SIZES RECOMMENDED FOR ASS'Y & REMOVAL

SCREW SIZE	M6	M8	M10	M12	M14	M16	M18	M20	M22
S (mm)	5	6	8	10	12	14	14	17	17
DRIVE	1/4"		3/8"		1/2"			3/4"	

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SUN GEAR SHRINK DISC (#822)

INSTALLATION AND REMOVAL INSTRUCTIONS

Shrink Discs are supplied ready for installation. However, prior to tightening of locking screws it is necessary to remove wooden spacers located between outer collars, which are used during shipment of Shrink Discs.

INSTALLATION

Important: Never tighten locking screws before shaft installation, since inner ring of Shrink Disc as well as hub bore can be permanently contracted even at relatively low tightening torques.

1. Clean hub O.D. and Shrink Disc bore and lightly lubricate hub O.D. before assembly of Shrink Disc on hub.
2. Carefully clean shaft and hub bore from *any lubricant* prior to mounting hub onto shaft. THIS STEP IS VERY IMPORTANT, since it will greatly affect the torque transmitting capability of a Shrink Disc connection.
3. After checking correct position of Shrink Disc and hub, handtighten 3 or 4 equally spaced locking screws and make sure that outer collars of Shrink Disc are in a parallel position. Afterwards handtighten rest of locking screws.
4. Use torque wrench and equally tighten all screws one after another in a clock or counterclockwise sequence by approx. 1/4 turns (even if initially some screws will require a low tightening torque) until specified tightening torque M_A is reached.
   NOTE To compensate for torque reduction due to setting of screws adjacent to a screw just being torqued, a tightening torque approx. 5% higher than specified is recommended for the final round.
5. Reset torque wrench and make sure that no screw will turn at specified tightening torque M_A.
   NOTE It is not necessary to check tightening torque again after installation is completed or equipment has been in operation.

REMOVAL

1. Loosen locking screws in several stages by using approx. 1/2 turns, following either a clock or counterclockwise sequence till Shrink Disc can be moved on hub. DO NOT remove locking screws completely.
2. Make sure any rust buildup in front of hub is removed before hub is pulled from shaft.

RE-INSTALLATION OF SHRINK DISCS

In relatively clean operating conditions, Shrink Discs can be re-used without prior cleaning. Severe conditions, however, require thorough cleaning and re-lubrication with the following or similar lubricants:

tapers of inner rings and outer collar bores:	Molykote 321 R-spray or Molykote G RAPID-spray or paste
Screw threads and head contact area:	Multipurpose grease like Molykote BR-2

Damaged O-rings should be replaced.

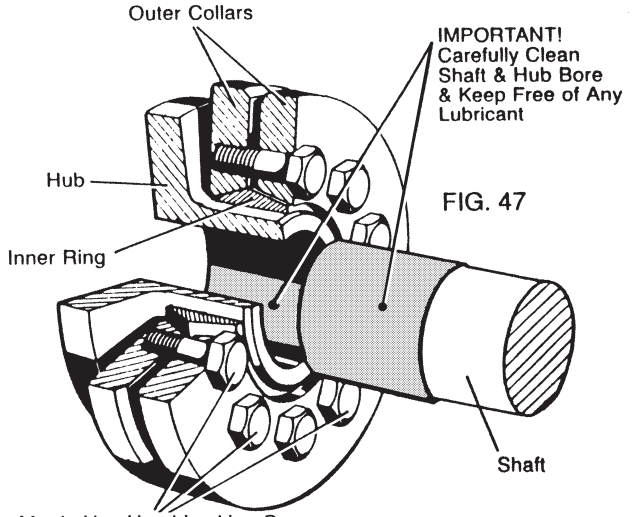

FIG. 47

Metrix Hex Head Locking Screws
DIN 931, Grade 10.9

LOCKING SCREW-TIGHTENING TORQUES "M_A"

screw size	M5	M6	M8	M10	M12	M16	M20	M24	M27
⬡ s mm	8	10	13	17	19	24	30	36	41
M_A [Nm]	5	12	30	59	100	250	490	840	1250
M_A [ft-lbs]	3.6	8.7	22	44	74	185	362	620	922

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