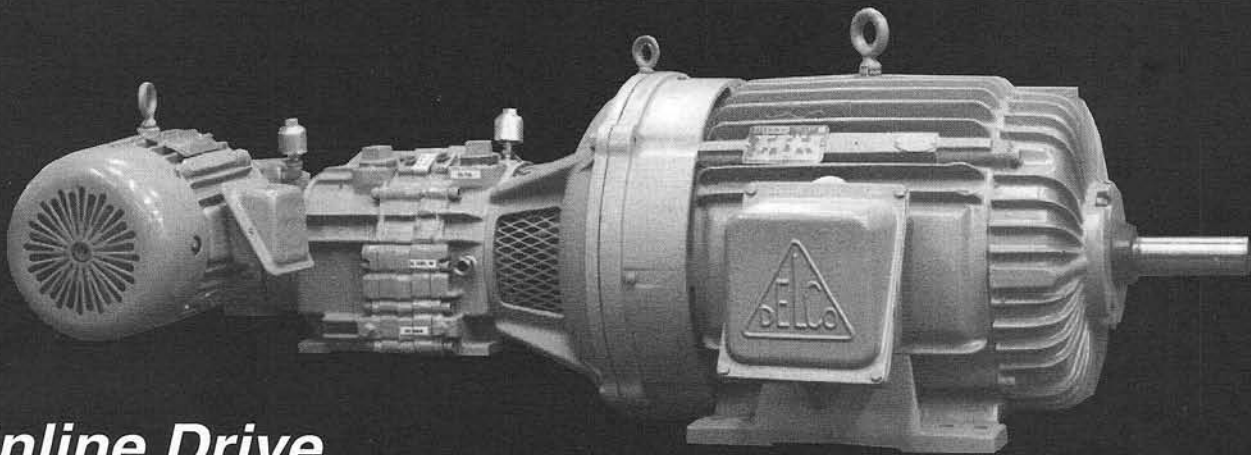
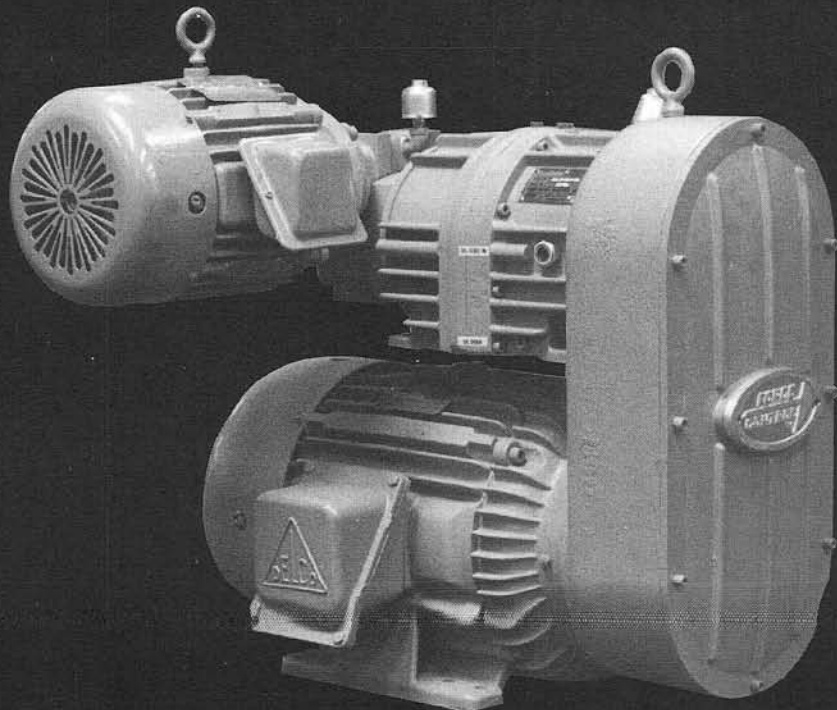


Force Control Two Speed Drive



Inline Drive



C-Flow Drive

IMPORTANT: READ ENTIRE MANUAL PRIOR TO
INSTALLING AND OPERATING
EQUIPMENT.

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Section I

Description & Operation of Two Speed Drive

The Force Control Two Speed Drive is built from five separate modules. Each module offers several choices, making a complete unit essentially tailor-made specifically for each application.

See Figure 1 Inline Drive and 2 C-Flow Drive.

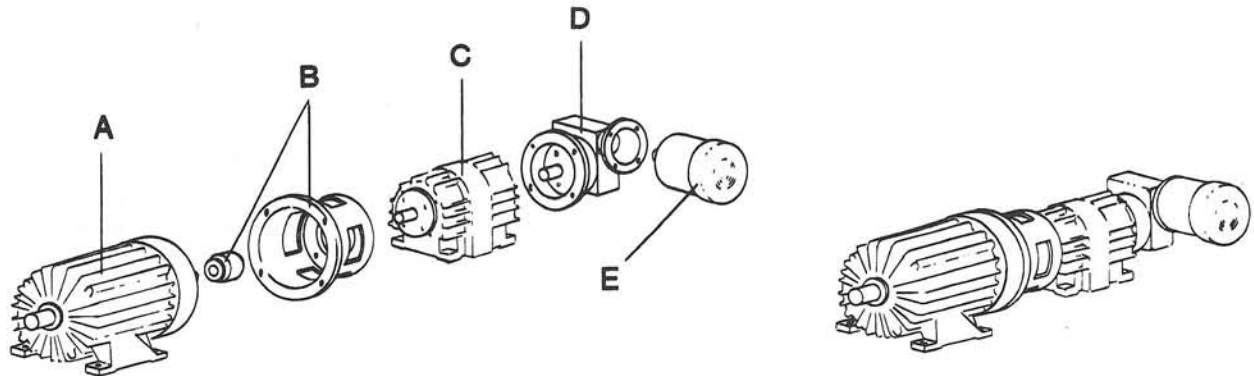


Figure 1 Inline Drive

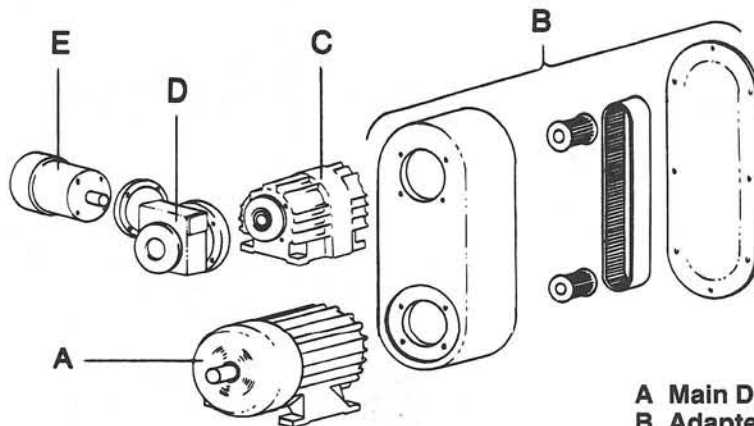


Figure 2 C-Flow Drive

- A Main Drive Motor
B Adapter Case
C Posidyne Clutch/Brake
D Gear Reducer
E Slow Speed Drive Motor

Item A

The high speed main drive motor provides acceleration and running torque to the driven machine. U-line motors are normally used, while others are available for special needs. Most applications on transfer machines or thrust drive units require alternating the direction of rotation between main motor starts. This is to provide a forward and reverse alternating motion. The need of reversals make the use of a single clutch/brake impractical.

The most common base speed of the high speed or main motor is 1200 RPM, although a few drives will require 1800 RPM main motors. Both base speeds are available with AC motors. Horsepowers available are from 3 to 30, and all motors are supplied as T.E.F.C. unless otherwise requested. It should be pointed out that the specific motors used are equipped with double extended shafts and modified end bells. However, the advantage of standard windings and bearings is important. The main motor can be repaired by any qualified repair center.

Item B

The Inline adapter case 'B' shown in figure 1 connects the output housing of the Posidyne to the accessory end of the main drive motor. A low inertia sleeve type gear coupling is used to couple the motor and Posidyne shafts together. The coupling hub bores are machined to shrink fit tolerances.

The C-flow adapter case 'B' shown in figure 2 permits an over/under, C-flow arrangement of the main drive motor and the Posidyne. The adapter case is mounted via a NEMA flange on the main drive motor.

The Posidyne output housing is also flange mounted to the adapter case. The main motor accessory end shaft is connected to the Posidyne output shaft via a H.T.D. positive belt drive with a minimum service factor of 3. Small diameter wide face sprockets are used to keep the sprocket inertia effect to a minimum. Tapered bushing type sprockets are used to prevent keyway failures and provide easy installa-

tion of the fixed center drive belt. The positive belt drive is totally enclosed by a bolt-on case cover to prevent fluids and oil present around the machines from shortening belt life.

Item C

The Posidyne clutch/brake, as noted above is flange mounted to the adapter case, item B. The output shaft is connected to the main drive motor shaft.

The Posidyne used in the TSDr units are equipped with a spring set, and air boost brake with air release. When no air is supplied to the Posidyne the brake is set by the springs. During normal operation the braking torque may be increased by air pressure directed to the brake pressure chambers at the brake port. Braking torque is released by directing pressure to the clutch pressure chamber at the clutch port.

The clutch pressure chamber is interconnected with a secondary, or clutch lockout piston, which, when normally pressurized, sets the spring and stop pins to prevent movement of the primary actuating piston beyond center, or neutral position. In this position neither brake nor clutch is engaged.

When clutch engagement is called for, the secondary piston chamber is exhausted and force is transmitted by the prim-

ary piston through the bearing into the clutch thrust plate, thereby, compressing the clutch disc stack.

Pressures are externally adjustable. As shown in table 2, both brake and clutch torques are linear with respect to air pressure.

A "B/ACP" model is also available. This is the same as the above "SA/ACP" model except greater braking torque is provided by the spring set and it does not have the brake air assist feature.

Item D

A gear reducer is flange mounted to the input housing of the Posidyne and drives the input shaft at a slow speed. Torque limiting feature is inherent in the Posidyne and is a function of clutch actuation pressure. Eight gear ratios are available to provide a wide range of slow speeds. NEMA C-face mounting for 56 or 180 frame series motors is used for the slow speed drive motor.

Item E

The slow speed drive motor is C-face mounted to the gear reducer input. Standard drive motors are 1800 RPM base speed round body, with C-face mounting option. Horse-powers range from 1/4 to 3.

Description and Operation of the Posidyne Clutch Brake

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 constantly replenished film 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, controlled by the clamping pressure and 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 constantly replenished oil film also effectively transmits heat away from the friction elements.

Description

In the Posidyne Clutch/Brakes, the friction surfaces consist of alternate carbon steel plates and sintered metal bronze-on-steel discs. The oil control grooves are molded into the sintered bronze 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. The splined sections of the Posidyne output shaft contain centrifugal impellers to maintain a positive flow of oil between the discs and plates.

Operation

The Posidyne cross section, figures #6 & 9, shows the unit in the "Off" setting with the brake engaged through the primary actuating piston by the spring set (not shown). This is the normal condition when air and electrical services are "Off".

When services are "On", the brake is released by directing air pressure to the clutch pressure chamber. If the clutch is not to be engaged, air pressure is also normally directed to the secondary, or clutch lockout piston port so that the spring and stop pins are set to hold the primary piston in a neutral position.

Exhausting the air pressure from the clutch lockout port will allow the primary piston to transmit force through the bearing to the clutch thrust plate, thereby, compressing the clutch disc stack.

Driving torque is then transmitted due to the drive plates being keyed to the input shaft and the friction discs splined to the output shaft. Both shafts will rotate as a unit at the same speed.

The clutch is released by exhausting the clutch pressure chamber. This allows the spring set to exert force against the primary piston and compress the brake disc stack. The compressed stack, being fixed to the stationary housing and splined to the output shaft, stops output rotation.

The "SA/ACP" model has a brake air assist feature which provides the means of increasing brake torque by directing air pressure to the brake pressure chamber, thereby, increasing the compressive force on the stack through the primary piston.

Section II

Specifications

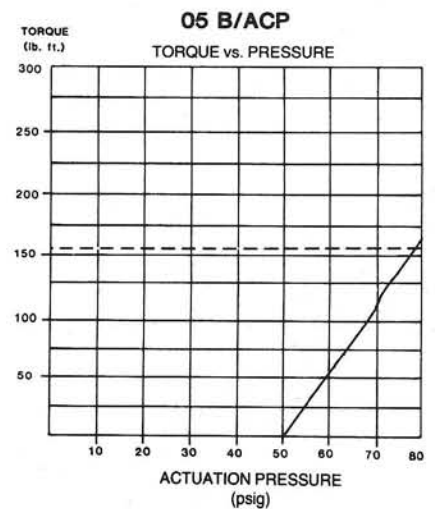
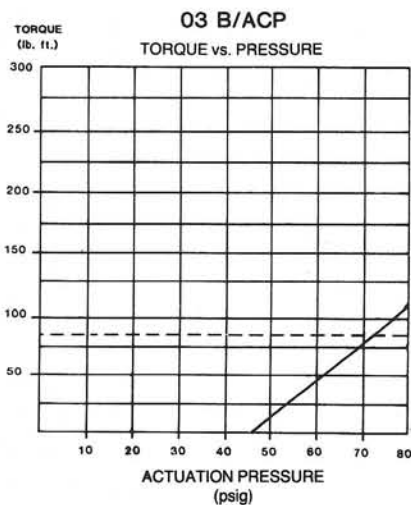
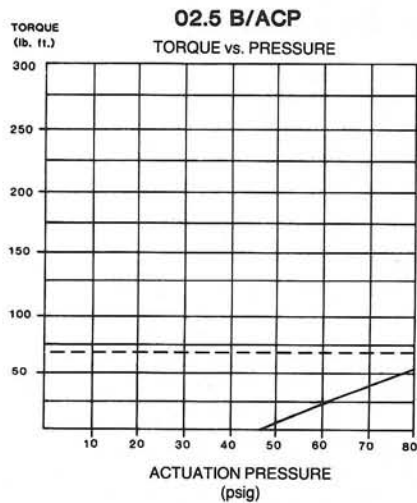
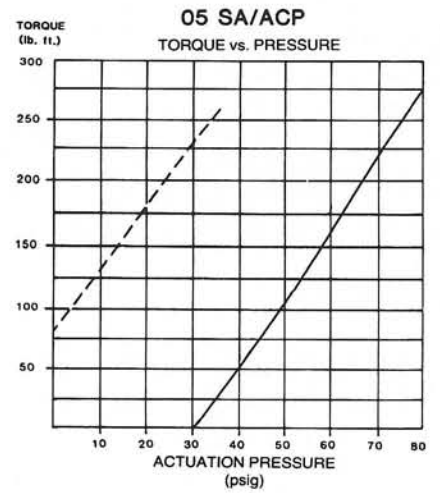
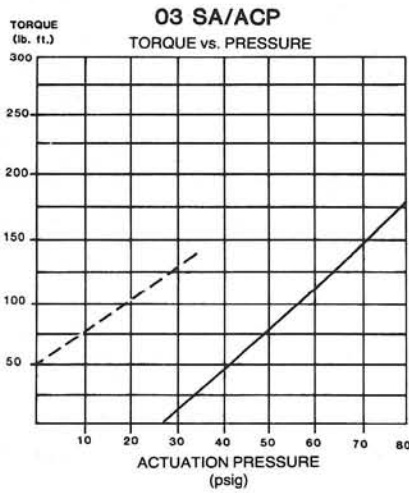
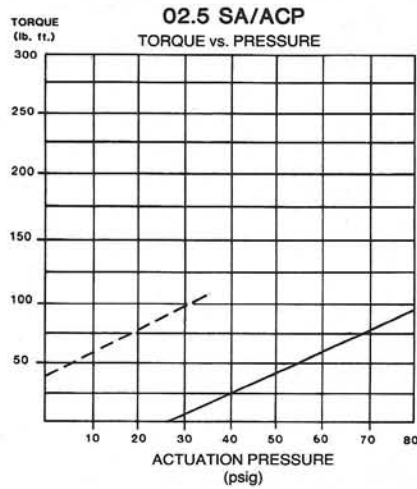
Table 1

Posidyne Clutch/Brakes for Two Speed Drives

Spring Set Brake Model No.	Clutch Torque Ft. Lb. @ 80 P.S.I.	Brake Torque Ft. Lb. (Spring-Set)	Brake Torque Ft. Lb. With 35 P.S.I. Air Boost
02 $\frac{1}{2}$ -SA/ACP	94	35	105
02 $\frac{1}{2}$ -B/ACP	58	66	*
03-SA/ACP	182	44	141
03-B/ACP	114	85	*
05-SA/ACP	275	80	255
05-B/ACP	167	156	*

Table 2

Torque vs. Pressure Chart



BRAKE -----
CLUTCH —————

**Table 3
Performance Rating**

Two Speed Drives W/ T-Line Motors

	Main Motors		C-Flow		Inline	
	HP/RPM	ROTOR WK ² (lb.ft. ²)	*WK _D ² (lb.ft. ²)	NO LOAD STARTS/MIN (S/M)	*WK _D ² (lb.ft. ²)	NO LOAD STARTS/MIN (S/M)
02½	3/1200	.642	.802	36	.75	33
	5/1200	.728	.888	36	.84	33
	7½/1200	2.22	2.38	26	2.33	24
03	10/1200	3.26	2.90	22	3.37	20
	15/1200	5.64	N/A	N/A	5.80	16
**03/05	20/1200	6.90	N/A	N/A	7.06/7.12	14
05	25/1200	5.60	N/A	N/A	5.82	18
	30/1200	6.30	N/A	N/A	6.52	18

02½	3/1800					
	5/1800					
	7½/1800	.685	.845	30	.80	28
03	10/1800	.771	.931	36	.88	28
	15/1800	1.78	1.94	22	1.94	20
**03/05	20/1800	2.08	N/A	N/A	2.24/2.30	20
05	25/1800	3.25	N/A	N/A	3.47	14
	30/1800	3.51	N/A	N/A	3.73	10

N/A = Not available

NOTE: * WK² Values include main motor rotor, Posidyne cyclic inertia, and coupling or belt drive.

** Either size, 03 or 05, may be used depending on application.

To Determine STARTS/MIN. Capability of Two Speed Drives, use the following formula,

Refer to Tables 3 or 4.

$$S/MI = \frac{WK_D^2}{WK_L^2 + WK_D^2} \times S/M$$

S/MI = Starts/Min capability of installed Drive.

WK_D² = Inertia of Two Speed Drive from above table.

WK_L² = Inertia of driven load reflected to Two Speed Drive.

S/M = Starts/Min rating from above table.

Table 4
Performance Rating

Two Speed Drives W/ U-Line Motors

	Main Motors		C-Flow		Inline	
	HP/RPM	ROTOR WK ² (lb.ft. ²)	*WK _D ² (lb.ft. ²)	NO LOAD STARTS/MIN (S/M)	*Wk _D ² (lb.ft. ²)	NO LOAD STARTS/MIN (S/M)
02½	3/1200	.64	.80	36	.75	38
	5/1200	2.46	2.62	26	2.57	27
	7½/1200	2.70	2.86	22	2.81	23
03	10/1200	4.20	4.36	15	4.36	15
	15/1200	5.30	N/A	N/A	5.46	13
**03/05	20/1200	7.30	N/A	N/A	7.46/7.52	16
05	25/1200	11.40	N/A	N/A	11.62	12
	30/1200	12.70	N/A	N/A	12.92	11

02½	3/1800	.47	.63	32	.58	35
	5/1800	.56	.72	25	.67	27
	7½/1800	1.37	1.53	23	1.48	24
03	10/1800	1.37	1.53	21	1.48	22
	15/1800	2.40	2.56	16	2.56	16
**03/05	20/1800	3.25	3.41	16	3.41/3.47	16
05	25/1800	5.50	N/A	N/A	5.72	10
	30/1800	7.10	N/A	N/A	7.32	10

N/A = Not available

Section III Installation

Important Safety Precautions

The Two Speed Drive units described in this manual must not be installed in any manner except as specified herein, and must not be operated at speeds, horsepower loads or temperatures other than those specified in the manual. Failure to limit operation of the Drive to the conditions specified could damage the units and may cause malfunction or damage to interconnected equipment.

Suitable guards for rotating shafts and couplings must be used at all times when operating equipment and is the responsibility of the customer.

Warning

Before attempting repairs to the drive, open the disconnects to both motors, shut off air supply to the Posidyne and lock them out to avoid possibility of personal injury. Bleed off pressure trapped in the pneumatic system.

Receiving the Drive

Check the drive for shortage or damage immediately after arrival. Prompt reporting to the carrier's agent, with notations made on the freight bill, will expedite satisfactory adjustment by the carrier. When unloading or handling the drive, keep it upright. All Drives are filled with oil, ready to run, when shipped. However, before placing the unit in service or storage, check the oil level to make sure none has spilled out in transit. Add oil if necessary (refer to Section IV LUBRICATION). 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.

Mounting the Drive

Caution

Lock out machine and air. Verify that power is Off to avoid personal injury.

Installation of the Drive should be made in much the same manner, and receive the same care as for a precision gear reducer. Standard Drives are designed for horizontal operation. Note the following precautions when mounting the drive:

- 1 The Drive should be mounted on a firm, level base or foundation.
- 2 Use socket head cap screws or SAE grade 5 bolts to bolt the drive securely in place. Before tightening down the bolts, check alignment with driven machinery, then recheck after tightening.
- 3 If the motor 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 or angular misalignment and use shims as necessary to correct.

Caution

Do not drive couplings or bushings on shaft, as this may damage the bearings.

If the motor drives by belt, coat shaft with heavy oil before installing pulley. See cautionary note above. Mount pulley as close to motor bearing as possible, and align to run true. Consult belt manufacturer's catalog for recommended tension. Install belt guard.

Caution

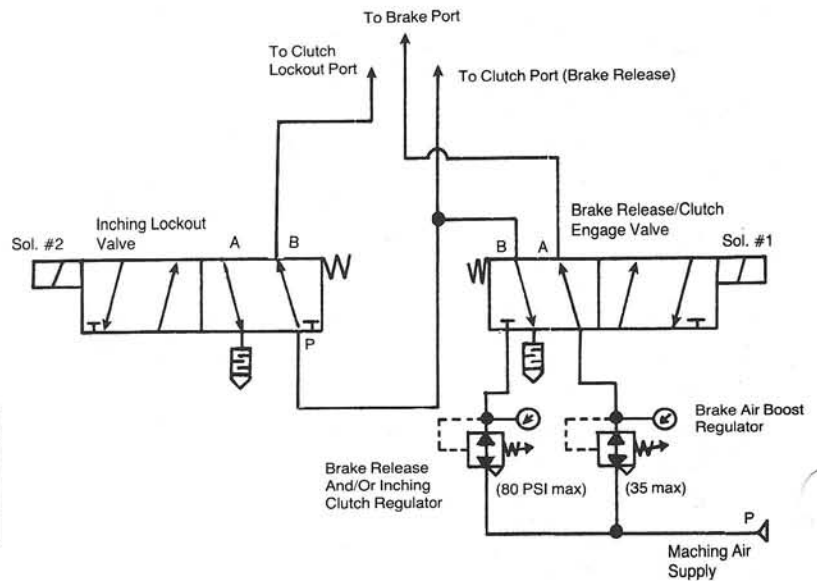
Excessive belt tension will damage bearings.

- 4 Remove red plug and install breather in its place.
- 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.
- 7 Pressure is directly proportional to torque. Use only the pressure necessary. This will give additional life to the clutch-brake.

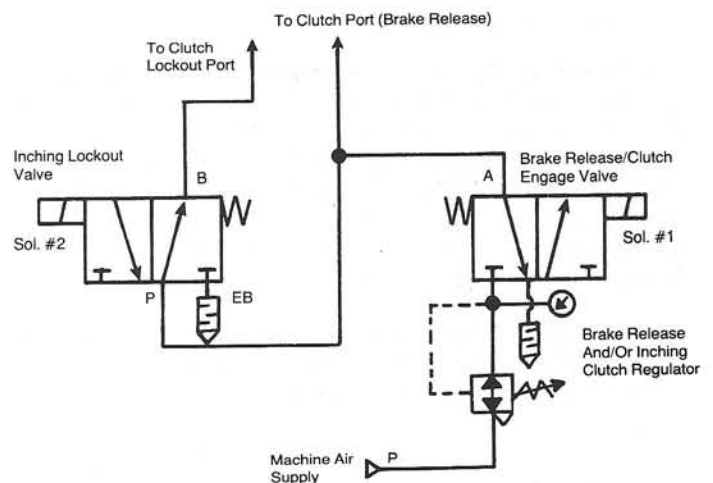
8 Pneumatics

For least delay in actuation use $\frac{3}{8}$ " tube or hose and mount the valve as close to the Posidyne as possible. Use of bottom air ports, with valve lower than ports will prevent accumulation of airline moisture in the Posidyne.

- 9 Air logic to be such that the slow speed motor/gearbox must not be used for dynamic braking.



Pneumatic Schematic for SA/ACP Models



Pneumatic Schematic for B/ACP Models

Figure 3

10 Start up

- a Lock out machine and air. Verify that power is OFF to avoid personal injury.
- b Recheck all air connections for tightness and that they are per schematic.
- c Set air regulators to;
 - 35 PSI maximum on Brake.
 - 80 PSI maximum on Clutch.
- d Unlock main disconnect.
- e Check out jog mode.
 - Proper rotation.
 - Clutch diagnostic gauge to read full pressure.
 - Brake diagnostic gauge to read zero.
 - Adjust all limit switches.
- f Check operation of main motor.

Section IV

Lubrication

Checking the Oil Level

When the drive is installed and weekly thereafter (until experience dictates otherwise), check the oil level in the Posidyne and gear box. Always check the oil with the unit at room temperature and stationary (not running).

Posidyne clutch-brake has a sight gauge at the side of the housing on horizontal center line. Oil is to show to the center of the gauge. Gear box is to be filled until oil starts to come out of tapped hole on centerline. (Remove plug for this purpose, then reinstall to run).

Changing the Oil

Posidyne—Every 3 months remove the drain plug and completely empty drive. If oil sight gauge is dirty, remove and clean. Reinstall drain plug and refill to center of sight gauge with fresh oil.

Gear Box—Change oil after 2 weeks of operation, and every 6 to 8 months thereafter.

Caution

Do not overfill Posidyne or gear box. Excess oil will cause units to overheat.

Type of Oil

Posidyne—Mobil Automatic Transmission Oil ATF-210 or Type "F."

Gear Box—Socony Vacuum Oil Co: Gargoyle Cylinder Oil 600 W.
The Texas Co: Pinnacle Cylinder Oil.
CITGO Oil Co: Cylinder Oil 140-5.
Mobil Gear 600

Section V

Operational checks

Posidyne

Caution

Make operational checks with the driver shut down and inspection plugs removed from drive.

DO NOT REMOVE PLUGS WHILE RUNNING.

Provisions for manual operational checks are to be made if the unit has been removed for repair. Set up temporary, manually controlled air connections to the drive for 80 psi maximum (or normal pressure) air supply.

Manually apply valve air pressure to the clutch port, but not to the clutch lockout port. Observe the primary piston and check that it actuates quickly and smoothly. If the piston action is irregular, or if it tends to stick or bind, internal damage may be indicated. Also, listen for air leaks and look for air bubbles in the oil that would indicate damage to the piston seal(s).

Exhaust clutch air pressure and check that the piston moves to apply the brake. Then, on SA/ACP models, direct air pressure to the brake port. The piston should not move, but listen for air leaks and look for air bubbles.

Motors

Check wiring connections against diagram on nameplate of motor. "Bump" motor and check direction of rotation. Check for tightness of connections.

Pneumatic Control

Brake should be "On" when electric power is "Off" and 60 psi air is applied to the valve. All pressure is to be verified by the diagnostic pressure gauges. Check that the primary piston is in braking position and compressing the brake disc stack.

When the brake valve is energized, the primary piston should move away from the brake stack and stop against the spring and stop pins. Energize the inching valve which exhausts the clutch lockout port and allows the primary piston, through the clutch thrust plate, to engage the clutch disc stack. When both brake and inching valves are de-energized, the primary piston should return to spring loaded brake position.

NOTE: Customer's electrical control must provide interlock to prevent clutch or brake engagement while the main motor is running.

Section VI

Troubleshooting the Posidyne

Trouble	Possible Cause	Remedy
Section A		
Both clutch and brake fail to engage properly.	Electrical control circuit.	Check control circuit. Check diagnostic pressure gauges.
	Low air pressure.	Increase air pressure. (See Table 2, page 5)
	Air supply pressure regulator or piping.	Check for improper operation or leaks.
	Worn friction surfaces	Check parts for wear and replace, if necessary.
Section B		
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. (See Table 2, page 5)
Section C		
Picks up load too quickly.	Too high air pressure.	Reduce air pressure.
	Low oil level.	Check oil level.
Section D		
Clutch fails to disengage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check valve operation. Replace, if necessary.
	Piston sticking—broken return springs.	Disassemble to extent necessary and inspect for damaged parts.
Section E		
Noise and vibration.	Mounted on poor foundation.	Improve installation. Tighten foot bolts.
	Misaligned couplings.	Recheck alignment.
	Damaged bearing.	Disassemble to extent necessary and inspect for damaged parts.
Section F		
Noise: high pitch whine.	Clutch engaged with main motor running.	Check control circuit.
Section G		
Brake fails to engage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check valve operation. Replace, if necessary.
	Low air pressure.	Increase air pressure. (See Table 2, page 5)
	Internal air leakage.	Check and replace O-rings and liners, if necessary.

Trouble	Possible Cause	Remedy
Section G (con't.)		
Brake fails to engage properly.	Piston sticking.	Disassemble to extent necessary and inspect for damaged parts.
	Weak or broken brake spring.	Replace spring.
Section H		
Brake fails to disengage properly.	Electrical control circuit.	Check control circuit.
	Valve not functioning properly.	Check valve operation. Replace, if necessary.
	Piston sticking.	Disassemble to extent necessary and inspect for damaged parts.
Section I		
Drive overheats. Posidyne—max. 225°	Clutch or brake fails to engage or disengage properly causing excessive slippage.	Refer to Section A, B & G
	Inertia or resistance changed.	Check with Force Control Engineering.
	Improper oil level.	Check oil level. Add or drain oil, as necessary.
Section J		
Oil leakage.	Lip seals.	Disassemble and replace.
	Gaskets.	Tighten all external bolts.
	Poor ventilation.	Remove breather and clean.
	Seal retainers.	Tighten, if loose.
Section K		
Oil leakage out breather.	Damaged seal around piston.	Disassemble and repair.
	Oil level too high.	Drain excess oil.
Section L		
Shaft end play excessive. (.020 max.)	Bearings bad.	Disassemble and replace.
Section M		
Clutch or brake does not repeat.	Air pressure changed.	Check air pressure.
	*Oil temperature changed.	Check temperature.
	Resistance in machine changed.	Lubricate machine bearings.

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

Troubleshooting the Pneumatic Control

Trouble	Possible Cause	Remedy
Excessive water in exhaust.	Wet supply air.	Check supply line.
Brake or clutch fails to engage properly.	Low air pressure.	Increase one regulator at a time in steps until satisfactory. (See Table 2, page 5 for torque vs pressure.)
	Valves	Check valve operation. Replace if necessary.
Slow response of clutch-brake.	Compressed air starvation.	Insufficient air supply. Add accumulator tank before valves. (150 cu. in. min.)
	Exhaust muffler.	Remove and clean.
	Air supply.	Valves too far from Posidyne. Air lines too small. Use 3/8" or 1/2" lines with adapters to 1/4".
	Oil in exhaust.	A. Check Posidyne for piston leakage. B. Check air line for source. (lubricated air not recommended)
Brake engages improperly.	Control signal.	Check limit switch.

Troubleshooting the Gear Reducer

Trouble	Possible Cause	Remedy
Overheating (above 205°F)	Too much oil.	Drain—refill to centerline with clean oil.
	Seal leakage.	Replace seal.
	Bearings.	Replace bearings.
	Gears	Replace gear set complete.

Section VII

Repair

General

When disassembling the Two Speed Drive, remove only enough to gain access to the modular unit that requires repair.

Unless the drive is to be completely overhauled, the modules should be disassembled only to the extent necessary to gain access to worn or damaged parts. Reassembly is the reverse of disassembly.

For both disassembly and reassembly follow the instructions, noting specific points given in the instruction.

Caution

Supporting the parts of drive as they are removed by use of an overhead crane and soft sling is recommended.

Protect the motor shaft from damage—tape is an acceptable way.

Disassembly—Inline Version

To remove motor from Posidyne, simply take out 4 bolts (625) attaching motor to adapter (601). Pull out motor—the coupling will slide apart. (When reassembling, cover (602) is removable to help guide units together.)

Repair

Now remove bolts (626) and adapter is freed from Posidyne.

To take Posidyne apart from gear box (400), take out bolts (415) and slide them apart.

Removal of bolts (411) frees motor (402) from gear reducer (400).

Remove gear coupling (610) with suitable gear puller if posidyne bearing or seal is to be replaced.

NOTE

Gear coupling is a press fit on the Posidyne and motor shafts. Coupling must be heated to assemble. Take care not to damage coupling seal (610) when installing.

Warning

Use suitable gloves when installing heated parts.

Disassembly—C-Flow Version

Unbolt cover (502) from transfer case by removing bolts (525). Loosen tapered bushings (514) and (515) and take bushings, pulleys and belt from case.

If motor (402) is to be disassembled from gear box (400), take out (411) bolts so motor may be removed.

Removal of (415) bolts allows the gear box to be taken from Posidyne (500).

To remove Posidyne from transfer case, support from overhead with sling under the Posidyne before removing bolts (526) that secure Posidyne to transfer case.

Use eyebolt in hole provided at top of transfer case to support case from overhead crane before removing the (527) bolts that secure transfer case to motor.

Disassembly—Posidyne, size 03 & 05

- 1 Removal of cap screws (61 and 69) will allow the unit to be broken down into the input housing group, output housing group, and piston housing group and also permit removal of the clutch and brake drive plates (13) and friction discs (12). Jackscrew holes are provided to aid in separating the housings.

Pins (303), (311) and springs (36) may be removed. Removal of pipe fitting (299) will allow removal of secondary or clutch lockout piston (300), piston guide (301) and spring plate (302).

- 2 Disassemble the input housing group as required noting the following:
 - a Use an arbor press to remove input shaft (2) and bearings (38) and (27), if required.

- b Do not attempt to remove bearing (38) and (27) unless replacement is required.

- 3 Disassemble the output housing group as required, noting the following:

- a Remove output shaft (1) and bearing (26), if required.

- b Do not attempt to remove bearings (28) or (26) unless replacement is required.

- 4 Disassemble the piston housing group as required, noting the following:

- a Jackscrew holes are provided to assist in separating piston retainer (11) from piston housing (10).

- b It may be necessary to heat screws (62) to break the adhesive bond.

- c Use an arbor press to remove clutch thrust plate (5) and bearing (27), if necessary.

Disassembly Posidyne, size 02½

- 1 Removal of cap screws (69) and (62) will allow the unit to be broken down into the input housing group and output housing group and also permit removal of the clutch and brake drive plates (13) and friction discs (12) as well as the piston parts (3, 39, 40, 42 & 43). Jackscrew holes are provided to aid in separating the housings.

Pins (303), (311) and springs (36) may be removed. Removal of pipe fitting (299) will allow removal of secondary or clutch lockout piston (300), piston guide (301) and spring plate (302).

- 2 Use an arbor press to remove the clutch thrust plate (5) and bearing (27), if necessary.
- 3 Disassemble the input housing group as required, noting the following:

- a Use an arbor press to remove input shaft (2). Remove bearings (26) and (38), if required.

- b Do not attempt to remove bearings (26) or (38) unless replacement is required.

- 4 Disassemble the output housing group as required, noting the following:

- a Remove output shaft (1) and bearing (35), if required.

- b Do not attempt to remove bearings (28) or (35) unless replacement is required.

Cleaning and Inspection

Warning

Petroleum-base cleaning solvents are flammable, and open flames or smoking by personnel in the vicinity of these solvents is extremely hazardous and must not be permitted.

Repair

Clean metal parts in a suitable solvent and dry in a stream of low pressure compressed air. Clean the clutch and brake plates and discs one at a time, keeping parts in the same order as they were when removed. After cleaning, inspect parts for cracks, distortion, scoring, nicks, burrs or other damage which 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 the plate where it mates with the disc, the plate should be replaced.
- 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 mating rings (size 03 & 05) or shafts in the area of the rotary seal (size 02½), checking for nicks, scratches or other damage 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.

Repair or 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 in complete sets.

Reassembly

Note the following general reassembly instructions, as applicable:

- 1 Lubricate O-rings and the lips of oil seals with oil (the same as used in the assembled unit) immediately before assembly and installation of mating parts.
- 2 O-ring liner (43) will be easier to install if heated in an oven to 200°F maximum.

Warning

Use Suitable Gloves When Handling Heated Parts.

- 3 The installation of press-fitted parts can be eased by heating the outside parts in an oven. Heat bearings to 250°F maximum.

Warning

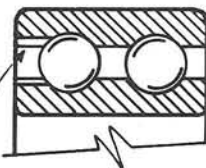
Use Suitable Gloves When Handling Heated Parts.

- 4 Apply capscrew adhesive (Loctite No. 271, or equivalent) to the threads of screws and locknuts immediately before assembly. Use adhesive sparingly and wipe up any excess. Use Loctite Cleaner No. 755.
- 5 Apply gasket sealant (Permatex No. 30, or equivalent) to all flat gaskets immediately before installation and assembly of mating parts. Use sealant sparingly and wipe up any excess.

Caution

Bearings Must Be Installed In Proper Direction: When mounting the outboard bearings during re-assembly of the Posidyne, install the bearings as noted below.

MOUNT BEARING WITH LOADING SLOTS TOWARD BEARING RETAINER



Size 02½ Input Shaft. (26)
Size 03 & 05 - Both Shafts. (26 and 38)

Figure 4.

Table V. Number of Plates and Discs

Model No.	Clutch		Brake	
	Plates	Discs	Plates	Discs
02½	4	4	5	4
03	7	6	6	5
05	11	10	10	9

Posidyne, Size 03 & 05

- 1 Output Housing Group
 - a A double row bearing (26) is used on output shaft (1). When installing the bearing, make sure that it is positioned as shown on figure 4.
 - b Press bearings (26) & (28) onto output shaft (1). Install locknut (34), use Loctite Cleaner No. 755 and Loctite No. 271 or equal. Install mating ring (4) and locknut (15), use Loctite Cleaner No. 755 and Loctite No. 271 or equal.
 - c Insert output shaft assembly thru the output housing (9) from outside-in. Install bearing retainer (7), seal (31) and gasket (55).

2. Piston Housing Group

- a Bearing (27) must seat against shoulders on both the clutch thrust plate (5) and the piston (3). Use Loctite Retaining Compound No. 620 or equal on I.D. and O.D. of bearing.
- b Use care not to cut or otherwise damage liners (42, 43, 304 and 310) when installing mating parts. Proper position of O-rings, liners and mating parts is shown in figure 5.
- c Place springs (36) into matching blind holes in piston housing (10).

Alternately place pins (303) and (311) with o-rings (294) in the through holes in the piston housing (10). Slide clutch lockout piston assembly (300, 302, 36, 301 and 298), with their respective seals into input housing (8), lining up hole in manifold (298) with hole in housing (8).

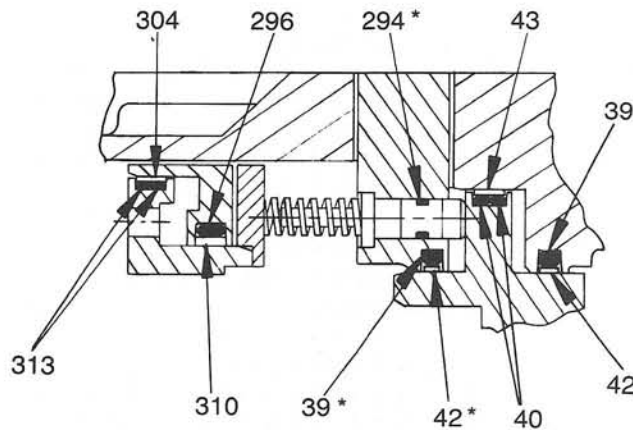


Figure 5

*Not used on B/ACP

3. Input Housing Group

- a Press bearings (27) onto input shaft (2). Insert input shaft into input housing (8) from inside-out. Set this assembly on the four shaft lugs into an arbor press. Place bearing (38) over shaft, use a tube to push against the inner race of the bearing. Press the bearing over the shaft and into the housing until it bottoms out. Install locknut (209), use Loctite Cleaner No. 755 and Loctite No. 271.
- b Install bearing retainer (207), seal (208) and gasket (206).

4. Final Assembly.

- a Position the brake plates (13) and discs (12) on the output shaft (1) splines in the output housing group. See Section V for the number of plates and discs to use for the brake. Install the plates so that the notches on the O.D. are all lined up.

When building up the plate and disc stacks, alternate plates and discs. Whether for the brake or the clutch, always begin and end the stack with a plate.

- b Position gasket (53) on output housing, turn plates so that plate notches will line up with piston retainer (11) lugs, and install piston housing group.
- c Position the clutch plates (13) and discs (12) on the output shaft splines. See Section V for number required. Make sure that plate notches are lined up with each other and notches in clutch thrust plate (5).
- d Drop input housing group onto piston housing/output housing group. Guide shaft lugs thru the slots in the drive plates as they progress along the stack.

Caution

Do not force the input housing assembly down over the clutch stack, as this may bend the drive plates.

Posidyne, Size 02½

1. Output Housing Group

- a Press bearings (28) and (35) onto output shaft (1). Install locknut (34), use Loctite Cleaner No. 755 and Loctite No. 271 or equal.
- b Insert output shaft assembly through the output housing (9) from outside-in. Install bearing retainer (7), seal (31) and gasket (55).

2. Input Housing Group

- a Press bearing (38) onto input shaft (2). Insert input shaft into input housing (8) from inside-out. Set this assembly on the four shaft lugs into an arbor press. Place bearing (26) over shaft, use a tube to push against the inner race of the bearing. Press the bearing over the shaft and into the housing until it bottoms out. Install locknut (209), use Loctite Cleaner No. 755 and Loctite No. 271.
- b Install bearing retainer (207), seal (208) and gasket (206).

3. Final Assembly.

- a Press bearing (27) into piston (3) and clutch thrust plate (5) into bearing. Use Loctite Retaining Compound No. 620 or equal on I.D. and O.D. of bearing. Fit one O-ring (39) and one liner (42) in I.D. groove of output housing and piston retainer (11). Fit two O-rings (40) and one liner (43) in O.D. groove of piston.
- b Alternately position five plates (13) and four discs (12) over output shaft in output housing group. Begin and end the stack with a plate.
- c Position piston (3) and attached parts in output housing (9). Position piston retainer (11) over piston—make sure springs (36) and gasket (51) are in place. Use care not to cut or otherwise damage liners. Attach piston retainer with screws and lockwashers (62 and 127).

- d Alternately position four discs (12) and four plates (13) over output shaft against clutch thrust plate (5). Begin the stack with a disc and finish with a plate.
- e Drop input housing group onto piston retainer/output housing group. Guide shaft lugs through the slots in the drive plates as they progress along the stack.

Caution

Do not force the input housing assembly down over the clutch stack, as this may bend the drive plates.

Completion of Repair

After complete reassembly, fill the unit with the proper amount and type of oil (refer to Section IV, LUBRICATION). Supply approximately 50 PSIG to clutch and clutch lockout ports. Rotate input and output shafts by hand. They should rotate freely and independently with no roughness or hesitation.

Before placing the drive in service, check out its operation as described in Section V, OPERATIONAL CHECKS.

Section VIII

Illustrated Parts List

General Information

This section illustrates, lists and describes all available repair parts for the Force Control Two Speed Drives. Separate exploded view illustrations for various sizes are provided as follows:

- Two Speed Drive IN-LINE
- Two Speed Drive C-FLOW
- GEAR BOX
- 02½ & 03 & 05 POSIDYNE

Parts are identified on the exploded views with numbers or letters.

These numbers or letters are listed in the corresponding parts list for each exploded view along with the part name and quantity required.

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 or Letter.
- 4 Part Name (from the parts list).
- 5 Quantity.
- 6 Complete Shipping Information.

Failure to include information for items 1 thru 5 will only delay your parts order. Unless another method is specified for item 6, parts less than 70 pounds will be shipped United Parcel Service, parts over 70 pounds will be shipped motor freight. Air freight and other transportation services are available, but only if specified on your order.

Factory Rebuild Service

Reconditioning service of Posidyne is offered by Force Control Industries at the factory. Unless major parts (such as housings) are damaged, the cost of a complete factory rebuild will be 50% of the cost of a new unit. 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 packaging 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 (Hamilton), Ohio 45014
Telephone: 513-868-0900
Fax: 513-868-2105

Motors

The motors used with Force Control's Two Speed Drives are standard and may be repaired by any qualified motor rebuild facility.

Gear Reducer

Force Control will rebuild gear reducers on request.

02¹/₂ SA/ACP Posidyne Drive

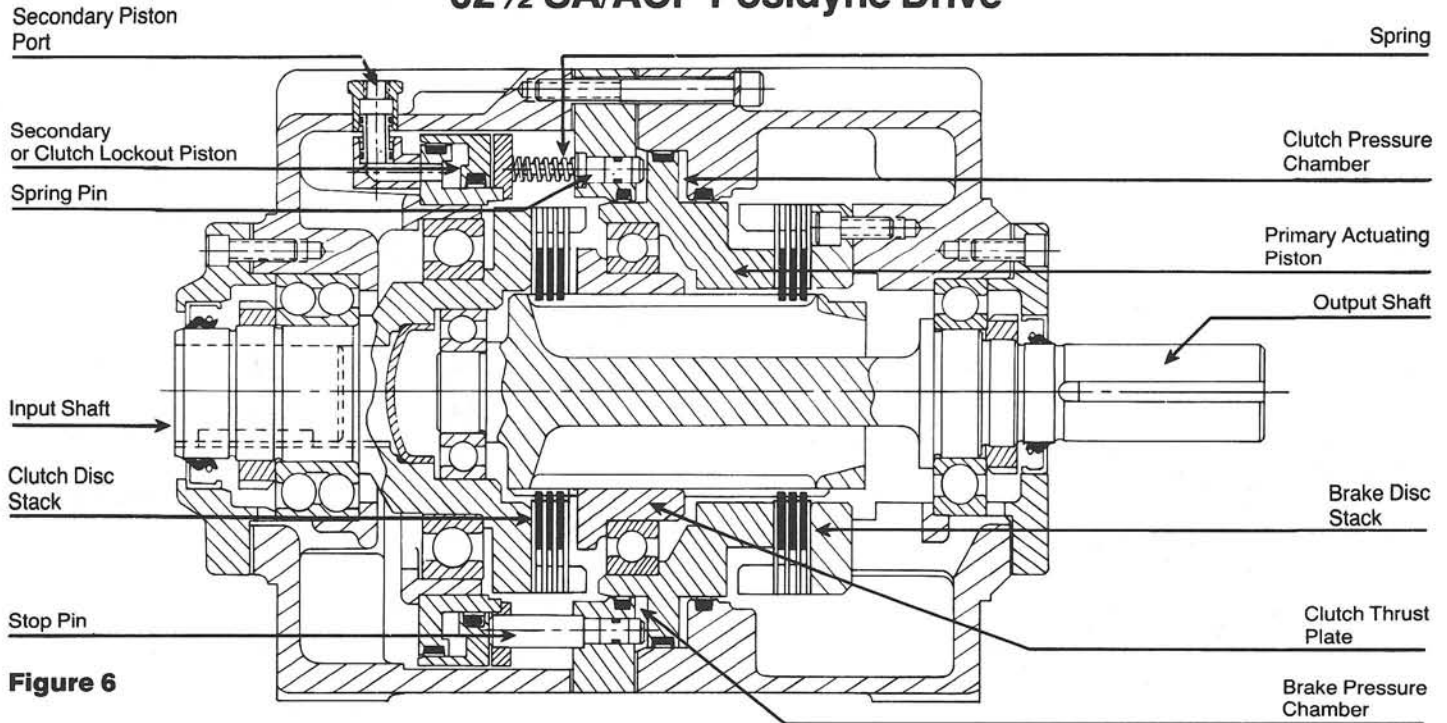


Figure 6

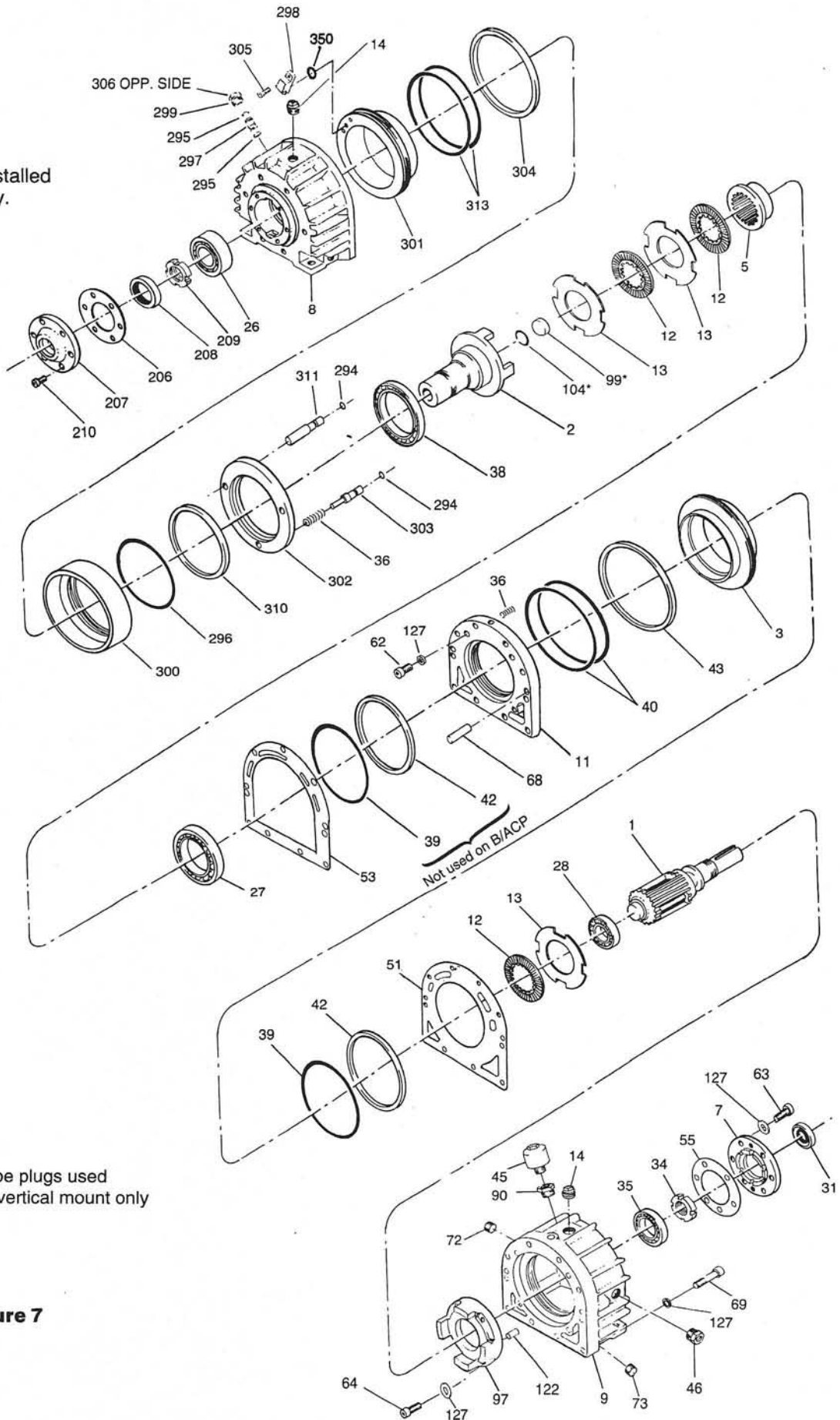
Parts List for 02¹/₂ SA/ACP Posidyne

Ref. No.	Part Name	Req'd.	Ref. No.	Part Name	Req'd.
1	Output shaft	1	72	C'sunk pipe plug	1
2	Input shaft	1	73	Mag input plug C'sunk	2
3	Piston	1	90	Reducer Bushing	1
5 **	Thrust plate, clutch	1	96 *	Spring B/ACP	3
7	Bearing retainer	1	97	Brake pressure plate	1
8	Input housing	1	99	Special plug	1
9	End housing output	1	104	O-ring	1
11	Piston retainer	1	122	Dowel Pin	2
12 *	Friction disc	8	127	Lockwasher hi collar	14
13 *	Drive plate	9	177	C'sunk pipe plug	2
14	C'sunk pipe plug	2	178	C'sunk pipe plug	3
26 *	Bearing	1	180	Key - input	1
27 *	Bearing	1	181	Key - output	1
28 *	Bearing	1	206 *	Gasket, bearing retainer	1
31 *	Oil seal, hi-temp	1	207	Bearing retainer	1
34 **	Locknut	1	208 *	Oil seal, hi temp	1
35 *	Bearing	1	209	Locknut	1
36 *	Spring, 19 SA/ACP; 18 B/ACP & REF: 96	1	210	SHCS	6
38 *	Bearing	1	294 *	O'ring	6
39 *	O-ring - (Qty. 1 B/ACP)	2	295 *	O'ring	2
40 *	O-ring	2	296 *	O'ring	1
42 *	Liner, ID sealing - (Qty. B/ACP)	2	297	Tube manifold	1
43 *	Liner, OD sealing	1	298	Manifold - air	1
45 **	Breather	1	299	Manifold - tube	1
46 **	Sight gauge	1	300	Piston (O.D. seal)	1
51 *	Gasket, piston housing	1	301	Piston guide	1
53 *	Gasket, input housing	1	302	Spring retainer	1
55 *	Gasket, bearing retainer	1	303	Spring pin	3
62	SHCS	4	304 *	Liner, O.D. sealing	1
63	SHCS	6	305	SHCS	2
64	SHCS	4	306	C'sunk pipe plug	1
68	Dowel pin	2	310 *	Liner	1
69	SHCS	10	311	Stop pin	3
			313 *	O-Ring	2
			350 *	O-Ring	1

* Parts furnished with minor overhaul kits

** Additional parts furnished with major overhaul kits

*#104 & 99 installed
in #2 at factory.



Not shown
177 } Pipe plugs used
178 } in vertical mount only
306

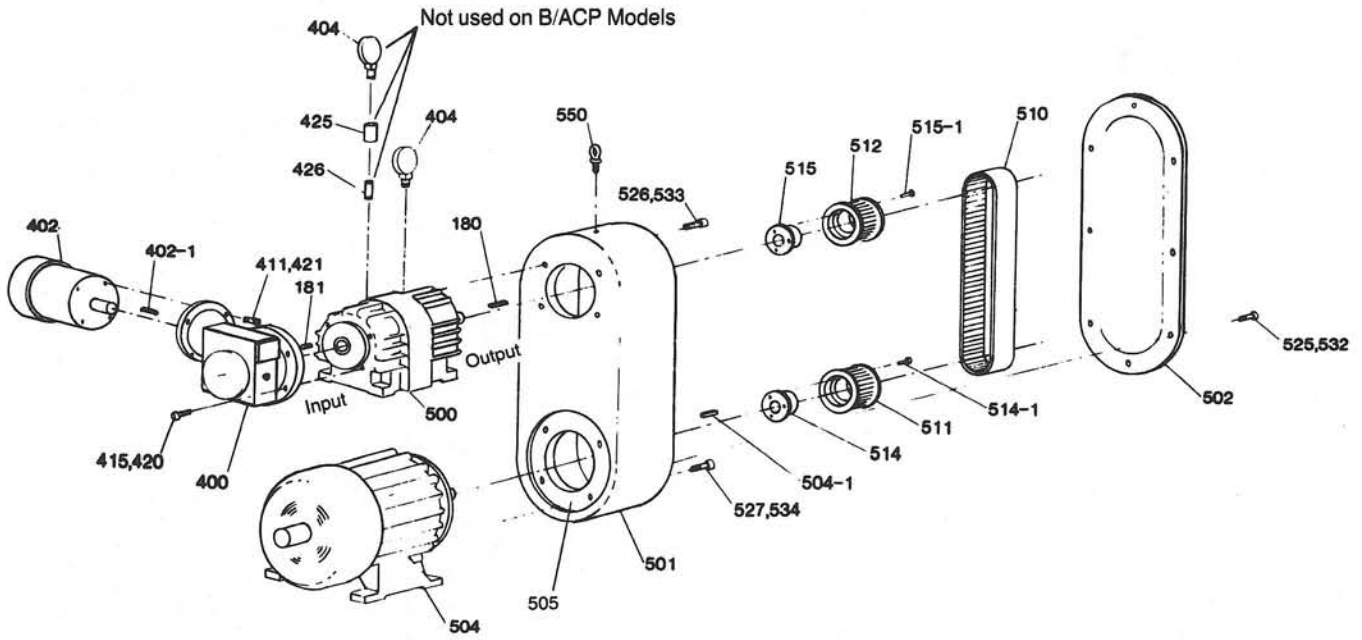
Figure 7

02 1/2 SA/ACP Posidyne Drive

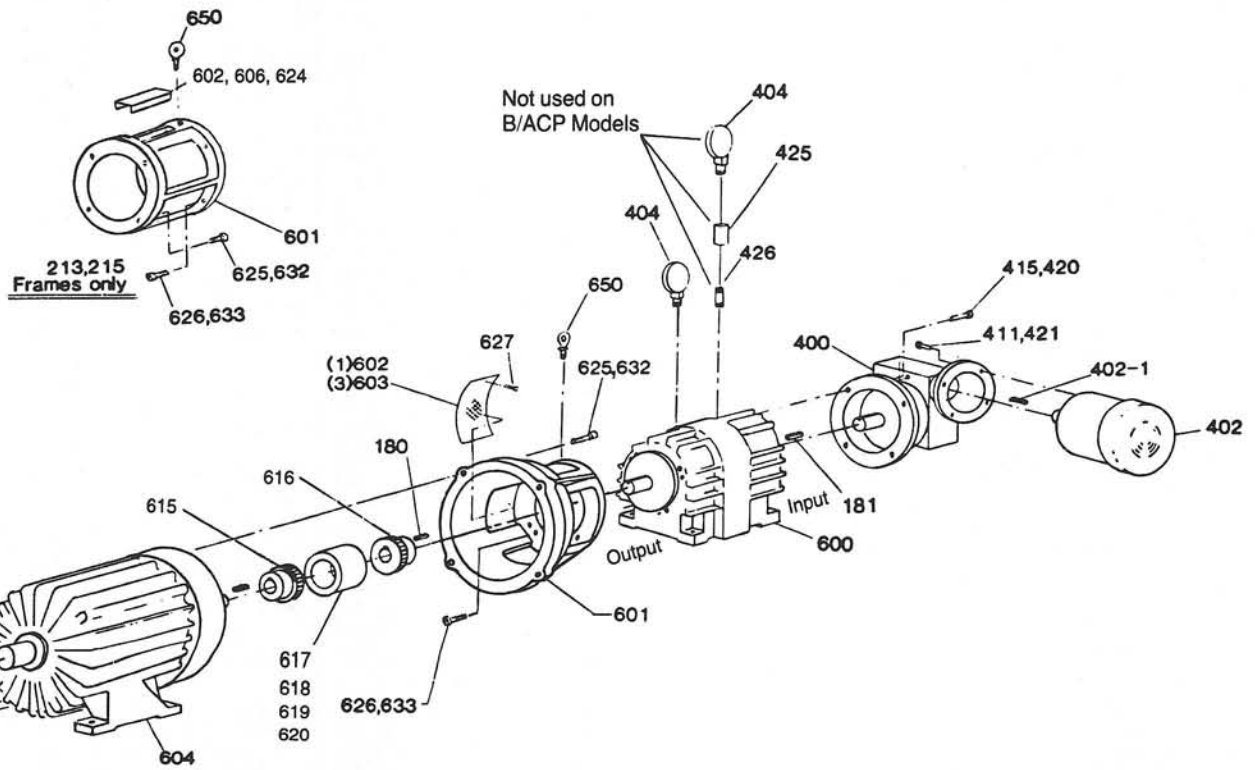
Parts List for 503-TS-001-02

Ref. No.	Part Name	Req'd.
Slow Speed Drive Motor		
181	Key, reducer	1
400	Gear reducer	1
402	Motor, feed	1
402-1	Key, feed motor	1
404	Diagnostic pressure guage	2
411	Soc. hd. cap screw	4
415	Hex. hd. cap screw	6
420	Lockwasher	6
421	Lockwasher	4
424	Pipe fitting	1
425	Pipe fitting	1
426	Pipe fitting	1
Main Drive C-Flow		
180	Key	1
500	Posidyne	1
501	Transfer case	1
502	Cover	1
504	Main motor	1
504-1	Key, motor	1
505	Adaptor (284U & 286U frame motors only)	1
510	Belt, timing	1
511	Pulley, motor	1
512	Pulley, drive	1
514	Bushing, motor	1
514-1	Soc. hd. cap screw	1
515	Bushing, drive	1
515-1	Soc. hd. cap screw	1
525	Soc. hd. cap screw	8
526	Soc. hd. cap screw	8
527	Soc. hd. cap screw	4
532	Lockwasher	8
533	Lockwasher	8
534	Lockwasher	4
550	Eyebolt	1
Main Drive In-Line		
180	Key	1
600	Posidyne	1
601	C-face adaptor	1
602	Cover, adaptor	1
603	Cover, adaptor	3
604	Main motor	1
604-1	Key, motor	1
606	Finger guards	8
615	Hub	1
616	Hub	1
617	Sleeve	1
618	Retaining ring	2
619	Spacer	2
620	Oil Seal	2
624	Washer	8
625	Soc. hd. cap screw	4
626	Soc. hd. cap screw	02½ (8), 03 (7)
627	Hex. hd. cap screw	6
632	Lockwasher	4
633	Lockwasher	02½ (8), 03 (7)
650	Eyebolt	1

Not all parts on the parts lists are used on all models.
Refer to drawings for parts used.



C-Flow



In-Line

Figure 8

03 & 05 SA/ACP Posidyne Drive

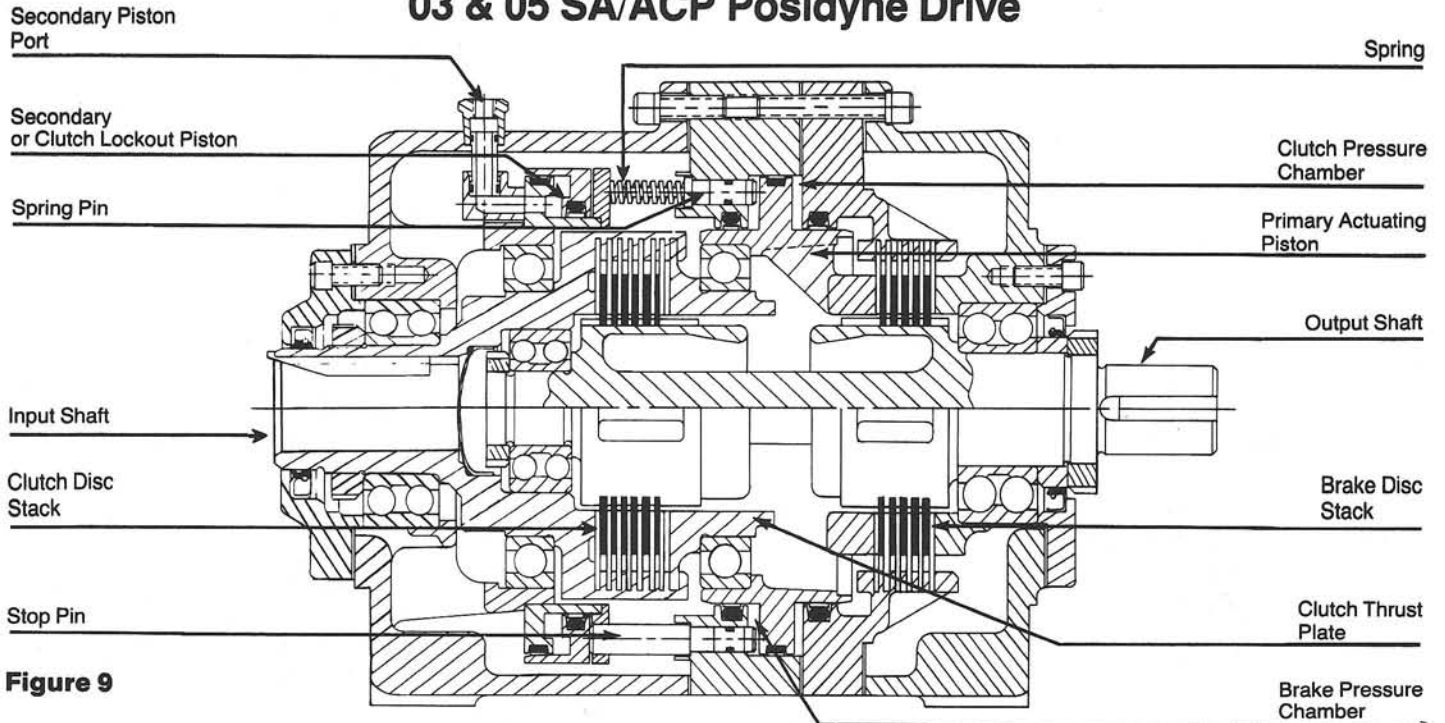


Figure 9

Parts List for 03 & 05 SA/ACP Posidyne

Ref. No.	Part Name	Req'd.	Ref. No.	Part Name	Req'd.
1	Output shaft	1	61	SHCS	13
2	Input quill shaft	1	62	SHCS	4
3	Piston	1	63	SHCS	12
4 **	Mating ring	1	68	Dowel pin	6
5 **	Thrust plate, clutch	1	69	SHCS (size 03-9, size 05-13)	6
7	Bearing retainer	1	72	C'sunk pipe plug	1
8	End housing input	1	73	Mag pipe plug sq. hd.	4
9	End housing output	1	76	SHCS	2
10	Piston housing	1	90	Reduce bushing	1
11	Piston retainer	1	96 *	Spring B/ACP	3
12 *	Friction disc	See Table V Page 14	99	Special plug	1
13 *	Drive plate	See Table V Page 14	104	O-ring	1
14	SQ HD pipe plug	2	127	Lockwasher hi collar	26
15	Special locknut	2	128	Lockwasher hi collar	4
26 *	Bearing	1	180	Key - input	1
27 *	Bearing	2	181	Key - output	1
28 *	Bearing	1	206 *	Gasket, bearing retainer	1
31 *	Oil seal, hi-temp	2	207	Bearing retainer	1
34 **	Locknut	1	208 *	Oil seal, hi temp	1
36 *	Spring	See chart below	209	Locknut	1
38 *	Bearing	1	294 *	O'ring	6
39 *	O'ring - (Qty. 1 B/ACP)	2	295 *	O'ring	2
40 *	O'ring	2	296 *	O'ring	1
42 *	Liner, ID sealing - (Qty. 1 B/ACP)	2	297	Manifold - tube	1
43 *	Liner, OD sealing	1	298	Manifold - air	1
45 **	Breather	1	299	Manifold - tube	1
46 **	Sight gauge	1	300	Piston guide	1
51 *	Gasket, piston housing	1	301	Piston (O.D. seal)	1
53 *	Gasket, ip & op housing	2	302	Spring retainer	1
55 *	Gasket, bearing retainer	1	303	Spring pin	3
			304 *	Liner, O.D. seal	1
			305	SHCS	2
			306	C'sunk pipe plug	1
			310 *	Liner, ID sealing	1
			311	Stop pin	3
			313 *	O'ring	2
			351 *	O-ring	1

* Parts furnished with minor overhaul kits
 ** Additional parts furnished with major overhaul kits

NO SPRINGS	SA/ACP	B/ACP
03	21	20 & REF. 96
05	27	20 & REF. 96

Gear Reducer

Item	Description	Qty.
A	Cover-Output	1
B	Plug	1
C	Brg.-Cup & Cone	2
D	Gear	1
E	Mtg. Base	1
F	Soc. Hd. Cap Scr.	4
G	Oil Seal	1
H	Key	1
J	Output-Shaft	1
K	Hex Hd. Cap Scr.	8
L	C Flange	1
M	Worm	1
N	Main Housing	1
O	Hex. Hd. Cap Scr.	4
P	Cover-Input	1
Q	Hex. Hd. Cap Scr.	1
R	Brg. Washer	1
S	Gasket-Input	1
T	Bearing-Input	1
U	Snap Ring	1
V	Gasket-Output	2
W	Gasket-Input	1
X	Seal-Input	1

Maintenance Instructions

- 1 The reducer has been filled at factory. Fill to oil level plug only.
- 2 Change oil after two weeks of operation and every 6 to 8 months thereafter.
- 3 Recommended oils:
 - Socony Vaccum Oil Co.—Gargoyle Cylinder Oil 600W
 - The Texas Co.—Pinnacle Cylinder Oil
 - CITGO Oil Co.—Cylinder Oil 140-5
- 4 In operation a temperature of 205°F. may be reached without danger to reducer.

Gear Reducer

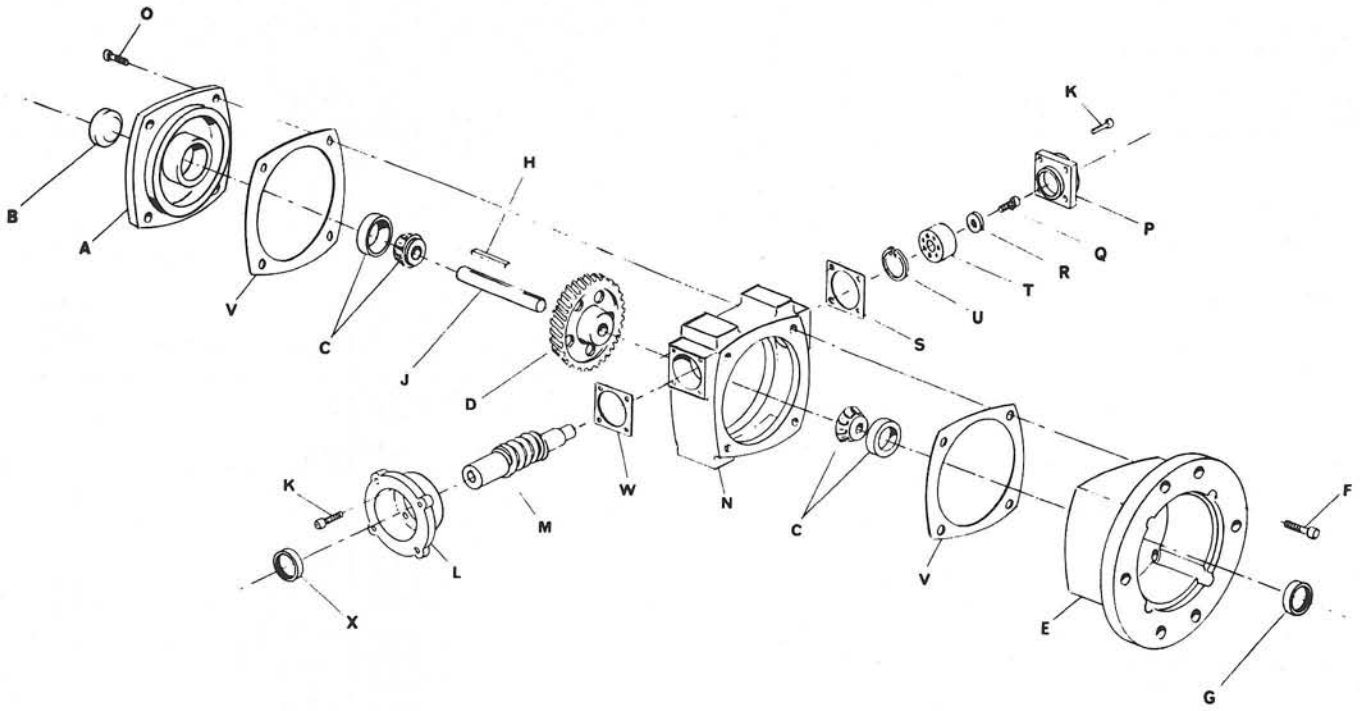


Figure 11



Force Control Ind., Inc.
3660 Dixie Highway
Fairfield, OH 45014

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513-868-2105 fax
www.forcecontrol.com