INSTALLATION INSTRUCTIONS

600-Series Hydraulic Release Bearing

A. Description

Tilton's two-piece 600-Series Hydraulic Release Bearings consist of a **hydraulic assembly** and a **base assembly** that replace the original input shaft front bearing retainer. This assembly eliminates the stock mechanical release bearing linkage and slave cylinder. The Tilton Hydraulic Release Bearing is ideal for racing, high performance and kit car applications. Our release bearing components are machined from billet aluminum that provides strength while remaining lightweight. The release bearing mounts on the transmission face and is fully adjustable for proper free-play. Hydraulic assemblies come complete with hydraulic lines and fittings.

Base Assembly Sold Separately

B. How It Works

The hydraulic release bearing assembly is self-adjusting in that the bearing stays close to the clutch spring at all times, even though the spring changes position with clutch wear. There is no extra return spring that pulls the piston back all the way to the bottomed position. In this respect, the piston in the hydraulic bearing assembly works like the piston in a disc brake caliper, returning only as far as forced. This is why with a Tilton Hydraulic Release Bearing assembly the clutch pedal feel does not change with clutch wear allowing the driver to make more consistent shifts.

Installation Notes

- Refer to **Diagram 1** and **Tables 1 & 2** and verify that the correct hydraulic assembly and base assembly have been chosen.
- A pedal stop must be installed on the clutch pedal to prevent over-stroking the hydraulic release bearing.
- Remove the original equipment (OE) base assembly from the front of the transmission.
- It is important that the distance from the back of the clutch housing to the clutch fingers/levers be sufficient for proper installation. Refer to **Table 2** for the adjustment range of the hydraulic assemblies.
- If the bearing piston is not fully retracted, you will need to fully compress the piston before taking any measurements.
- An extra long hydraulic line has been provided in the kit that can be cut to the specific length required for both the supply and bleed lines.

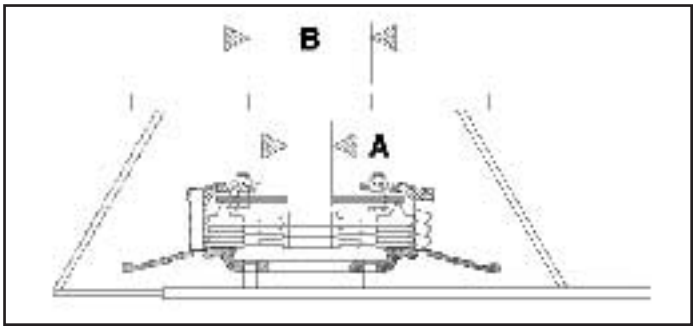
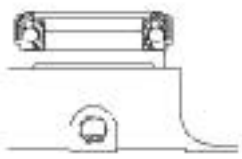


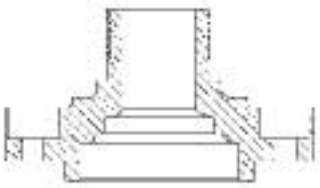
Diagram 1
Clutch Spring Hole & Bellhousing Retainer Diameter

Hydraulic Assembly Part Number	Clutch Spring Hole Diameter *Dimension "A" in Diagram 1*	Clutch Diameter	Bearing Contact Diameter	Bearing Type	Replacement Bearing Part Number	Seal Kit Part Number
61-600	1 7/8"	7.25" Non-Tilton	52mm	Radius face	62-002	62-905
61-601	N/A	8.5" - 10.5" Bent finger or lever	1.75" - 2.60"	Flat face	62-616	62-905
61-602	1 3/4"	7.25" Tilton	44mm	Self-centering	62-031	62-905
61-603	1 1/4"	4.5" - 5.5" Tilton	38mm	Self-centering	62-008	62-905
61-604	N/A	11" - up Bent finger or lever	1.75" - 3.30"	Flat face	62-616	62-905

Table 1
Hydraulic Assembly Selection



Hydraulic Assembly
(Table 1)



Base Assembly
(Table 2)

Base Assembly Part Number	Transmission	Base Assembly Outside Diameter *Dimension B in Diagram 1*	Installed Height Adjustment Range of Hydraulic Assembly & Base Combinations. *Shown in Diagram 4, dimension E.*				
			Hydraulic Assembly Part Numbers				
			61-600 Min - Max	61-601 Min - Max	61-602 Min - Max	61-603 Min - Max	61-604 Min - Max
62-600PF	Generic base, can be modified by customer	----------	----------	----------	----------	----------	----------
61-610	GM Saginaw 3 & 4-speed	4.68”	2.79”-3.51”	2.55”-3.27”	2.88”-3.60”	2.88”-3.60”	2.62”-3.34”
61-611	GM Muncie	4.68”	2.57”-3.29”	2.33”-3.05”	2.66”-3.38”	2.66”-3.38”	2.39”-3.11”
61-613	GM Doug Nash/Richmond 5 & 6-speed	4.68”	2.84”-3.56”	2.60”-3.32”	2.93”-3.65”	2.93”-3.65”	2.66”-3.38”
61-614	GM Borg-Warner T-10 (‘65-on T-10, Super T-10	4.68”	2.84”-3.56”	2.60”-3.32”	2.93”-3.65”	2.93”-3.65”	2.66”-3.38”
61-615	GM Borg-Warner T-5, 5-speed	4.68”	2.78”-3.50”	2.54”-3.26”	2.87”-3.59”	2.87”-3.59”	2.60”-3.32”
61-616	GM Jerico to ‘93 (3.345” O.D. front bearing, 4.0” BCD)	4.68”	2.83”-3.55”	2.59”-3.31”	2.92”-3.64”	2.92”-3.64”	2.65”-3.37”
61-622	GM Jerico ‘94-on (3.545” O.D. front bearing, 4.2” BCD)	4.68”	2.87”-3.53”	2.63”-3.29”	2.96”-3.62”	2.96”-3.62”	2.69”-3.35”
61-620	GM Lenco	4.68”	2.71”-3.43”	2.47”-3.19”	2.80”-3.52”	2.80”-3.52”	2.53”-3.25”
61-621	Ford Tremec 5-speed	4.85”	3.28”-4.00”	3.04”-3.76”	3.37”-4.09”	3.37”-4.09”	3.10”-3.82”
61-612	Ford Borg-Warner T-5, late (2.567” OD front bearing)	4.91”	3.28”-4.00”	3.04”-3.76”	3.37”-4.09”	3.37”-4.09”	3.10”-3.82”
61-613F	Ford Doug Nash/Richmond 5 & 6-speed	4.85”	2.84”-3.56”	2.60”-3.32”	2.93”-3.65”	2.93”-3.65”	2.66”-3.38”
61-616F	Ford Jerico to ‘93	4.85”	2.83”-3.55”	2.59”-3.31”	2.92”-3.64”	2.92”-3.64”	2.65”-3.37”
61-623	Ford Jerico ‘94-on (308 bearing)	4.85”	2.87”-3.53”	2.63”-3.29”	2.96”-3.62”	2.96”-3.62”	2.69”-3.35”
61-618	Ford Toploader 3 & 4-speed (1 1/16” x 10 input shaft)	4.85”	2.95”-3.67”	2.71”-3.43”	3.04”-3.76”	3.04”-3.76”	2.77”-3.49”
61-619	Ford 4-speed (1 3/8” x 10 input shaft)	4.85”	2.85”-3.57”	2.61”-3.33”	2.94”-3.66”	2.94”-3.66”	2.67”-3.39”
61-620F	Ford Lenco	4.85”	2.71”-3.43”	2.47”-3.19”	2.80”-3.52”	2.80”-3.52”	2.53”-3.25”
61-613M	Chrysler Doug Nash/Richmond 5 & 6-speed	4.81”	2.84”-3.56”	2.60”-3.32”	2.93”-3.65”	2.93”-3.65”	2.66”-3.38”
61-616M	Chrysler Jerico to ‘93	4.81”	2.83”-3.55”	2.59”-3.31”	2.92”-3.64”	2.92”-3.64”	2.65”-3.37”
61-624	Chrysler Jerico ‘94-on (308 bearing)	4.81”	2.87”-3.53”	2.63”-3.29”	2.96”-3.62”	2.96”-3.62”	2.69”-3.35”
61-620M	Chrysler Lenco	4.81”	2.71”-3.43”	2.47”-3.19”	2.80”-3.52”	2.80”-3.52”	2.53”-3.25”
61-617	Chrysler A-833 (1” x 23 input shaft	4.81”	2.76”-3.48”	2.52”-3.24”	2.85”-3.57”	2.85”-3.57”	2.58”-3.30”

Table 2
Base Assembly Selection

C. Installation

Free-play & Installed Height Determination

1. Disconnect and remove any existing mechanical clutch linkage, clutch fork and bearing.
2. Install the clutch, flywheel and clutch housing. Torque the components in place referring to the appropriate instructions provided by the manufacturer. The transmission should not be installed at this time.
3. Refer to **Diagram 2** and measure the distance from the clutch spring fingers to the back face of the clutch housing. This is dimension **C** in **Diagram 2**. The measurement accuracy must be within *.010”*.

4a. The free-play value for Tilton clutches with **piston fully compressed** is *.230/.170”*. This dimension is shown as **D** of **Diagram 3**. If this figure is below this range, there will not be enough clearance between the clutch spring fingers and the fully retracted bearing to allow *.035”* of total clutch disc pack wear. If the figure is above this range, there is a chance that the piston could be overextended.

4b. The free-play value for Original Equipment (OE) type clutches with the **piston fully compressed** is *.150/.100”*. This measurement is the distance between the clutch spring fingers and the bearing face as shown by dimension **D** of **Diagram 3**.

5. Subtract dimension **D** of **Diagram 3** from dimension **C** in **Diagram 2** (C-D=E).
6. This will give you the value for dimension **E** in **Diagram 4**, the installed height required for your hydraulic release bearing assembly.

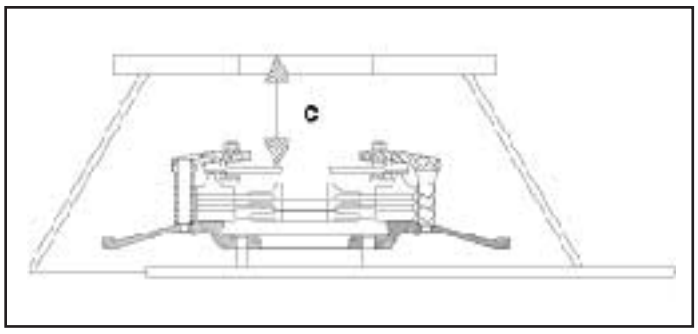


Diagram 2
Distance from Spring Fingers to Bellhousing Face

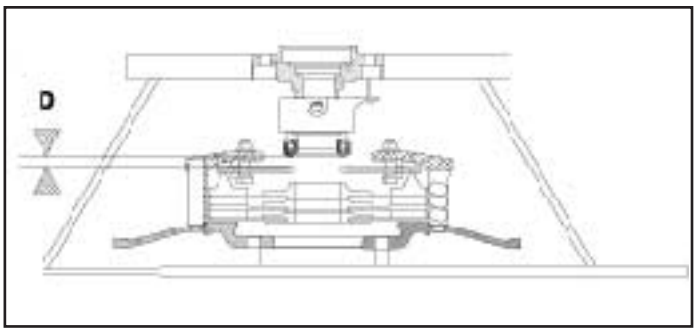


Diagram 3
Free Play

Installed Height Adjustment

1. Verify that the determined installed height, dimension ***E*** in ***Diagram 4***, is within the min-max values listed for your application in ***Table 2***. If the determined installed height is not within the min-max range of the selected hydraulic assembly call Tilton for assistance.
2. Orient the base assembly as shown in ***Diagram 6*** and attach it to the transmission face. One of the ports must point upward to be used for the bleed line. Use a base gasket or sealant as specified by the transmission manufacturer.
3. Torque the base assembly mounting bolts as specified by the transmission manufacturer.
4. Ensure that the piston assembly is fully compressed into the hydraulic assembly.
5. Thread the hydraulic assembly onto the base retainer until you achieve the determined installed height, shown as label ***E*** in ***Diagram 4***. Each full rotation of the bearing assembly will adjust the height by *1/16" (.062")*.
6. When the correct installed height is achieved apply a small amount of thread locking compound to the shoulder screw and secure the hydraulic assembly in place with the anti-rotation shoulder screw included in the kit. The anti-rotation shoulder screw must thread all of the way in until the shaft of the screw seats flush against the base assembly. Ensure that the head of the screw does not touch or apply pressure to the bearing assembly.

Piston Travel

The maximum piston travel is *.700"* and is shown as label ***F*** in ***Diagram 5***.

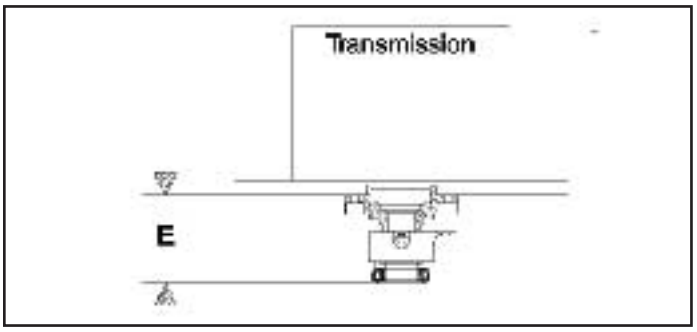


Diagram 4
Installed Height

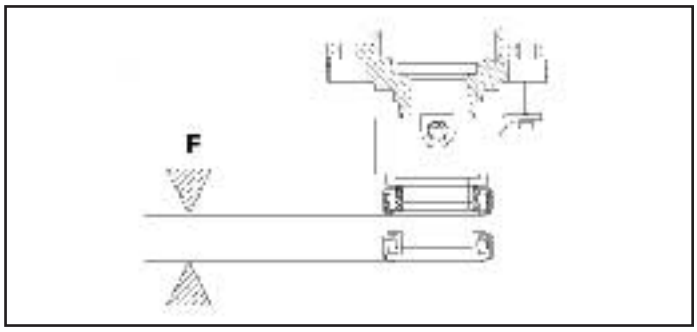


Diagram 5
Piston Travel

Banjo Bolt Assembly

1. Slide the o-ring that is supplied in the kit over the threads of the banjo fitting until it seats into the groove.
2. Place one of the crush-washers over the threads and around the previously placed o-ring.
3. Refer to ***Diagram 6*** and thread the assembled banjo fitting into the top port of the hydraulic assembly. Do not use thread compound or Teflon tape.
4. Tighten the banjo fitting using an 11/16" open-end wrench. The fitting is free to swivel when tightened.
5. Repeat steps 1 through 4 for the other banjo fitting and install it into the lower port for the supply line.

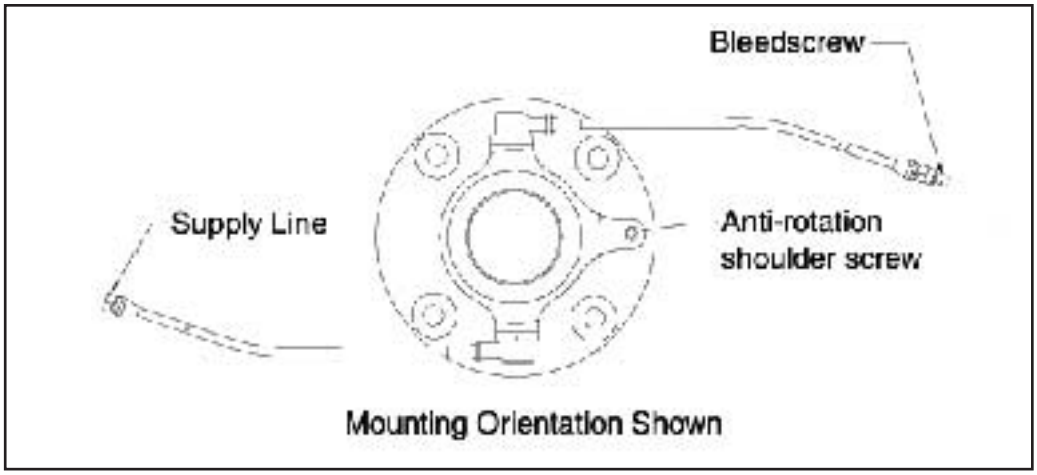


Diagram 6
Hydraulic Lines

Supply Line Assembly

Note: Tilton master cylinder outlet port is AN3. Fittings on the line supplied in the kit are AN4 female. The single hydraulic line included in the kit is to be used for both the supply line and bleed lines.

1. When using a Tilton master cylinder, thread an AN3 male-AN4 male union into the master cylinder outlet. *Earl's part number for union is 963243.* Other master cylinders may require a different union.
2. Thread the fitting attached to one end of the supplied line onto the banjo fitting that is installed in the lower part of the hydraulic assembly. Trial fit the line in place and determine the length required for the supply line to reach the master cylinder. Route the supply line clear of any obstructions to prevent damage and away from heat sources to prevent pedal fade.
3. Remove the supply line from the car.
4. Refer to ***Diagram 7*** for cutting the line to length and attaching the fitting.
5. Install the completed supply line.

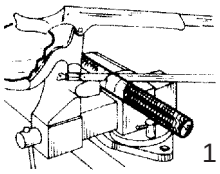
Bleed Line Assembly

1. Thread the fitting attached to one end of the remaining section of line on to the banjo fitting.
2. Trial fit the line, selecting a location for the bleed fitting that is outside of the bellhousing.
3. Remove the bleed line from the car.
4. Refer to ***Diagram 7*** for cutting the line to length and attaching the fitting.
5. Install the completed bleed line.
6. Thread the supplied bleedscrew into the newly attached fitting on the bleed line and tighten.

Driveline Assembly

1. While installing the transmission, carefully route both lines through either the release fork window or holes that have been drilled to accommodate the lines.
2. Ensure that the lines do not interfere with the clutch or flywheel. A string may be used to help guide the lines around any obstacles during installation.
3. Once the transmission is seated, confirm that all parts of the release bearing clear the clutch and flywheel. Complete the driveline installation.

1. Cut the line to the required length. We recommend the use of a radiac wheel but it can be done satisfactorily with a 32 teeth-per-inch hacksaw blade. In either case, the line must be tightly wrapped with electrical masking tape and the cut be made through the tape. DO NOT cut SPEED-FLEX line with a chisel, snips, pliers or a shear as these may crush the Teflon liner.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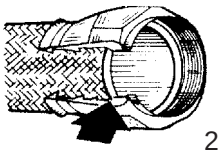
2. Deburr the Teflon and trim any loose ends of braid with sharp snips or diagonal cutting pliers.

3. Install the socket on the hose with the threaded end of the socket toward the cut end of line. This will be a lot easier and you will end up with fewer holes in your hand if you clamp the socket in a vise. Push socket on well beyond end.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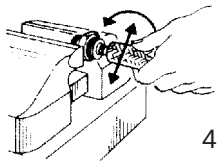
4. Place the hex portion of the nipple in the vise. Insert the end of the line onto the nipple and bottom of the hose against the chamfer seat of the nipple with a rotary motion of the line. This will size the I.D. of the Teflon tube.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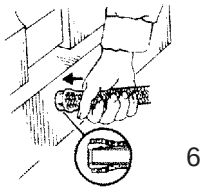
5. Separate the braid from the O.D. of the Teflon tube. The best way is to use a braid spreader tool. In the absence of the tool, separate the braid with a small screwdriver or a scribe. Be careful not to scratch or nick the Teflon.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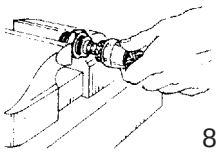
6. Install the sleeve between the braid and the Teflon tube. Make sure that none of the braid is trapped between the Teflon and the sleeve. Bottom the tube against the shoulder of the sleeve and make sure that the sleeve is inserted square.

7. With the nipple held in the vise, push the line and the sleeve onto the nipple until the sleeve bottoms. Remove the line and make sure that the Teflon tube is still bottomed against the shoulder of the sleeve and that the sleeve is square.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8. Push the line and the sleeve back onto the nipple and bottom against the chamfer. Start the socket onto the nipple threads and hand tighten.

9. Place the socket in the vise and complete the assembly by tightening the nipple onto the socket with a wrench until the gap between the face of the socket and the hex of the nipple is *.023" - .046"*, using a feeler gauge.

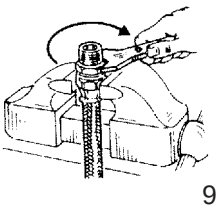
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Diagram 7

D. Master Cylinder Selection

1. Refer to ***Table 3*** and note the recommended master cylinder bore size and the associated master cylinder pushrod stroke. These pushrod strokes are listed for reference only.
2. Refer to section "G" for adjusting the clutch pedal stop.

Tilton Master Cylinder Push Rod Stroke				
	5/8" M/C Bore	7/10" M/C Bore	3/4" M/C Bore	7/8" M/C Bore
OE-type Clutch	----------	----------	----------	Recommended in most cases
5.5" Clutch with 38mm bearing	.80" recommended	.65"	.57"	Not recommended
7.25" Clutch with 44mm bearing	Not recommended	.90"	.79" recommended	Not recommended

Table 3
Master Cylinder Selection

E. Clutch Master Cylinder Priming

1. Prime the clutch master cylinder by filling the master cylinder reservoir with brake fluid. Do not use DOT 5, silicone based or high temperature resistant brake fluids designed for more than 550ºF as some will cause the seals to swell.
2. Open the bleed fitting at the master cylinder.
3. Gently depress the clutch pedal, close the bleed screw at the master cylinder and release the clutch pedal.
4. Repeat Steps 1 through 3 until fluid emerges and is free of air bubbles. Do not stroke the master cylinder past 1" during this process.
5. Tighten the bleed fitting at the master cylinder.

F. Hydraulic Release Bearing Bleeding

1. Fill the master cylinder reservoir with brake fluid.
2. Apply approximately 3 lbs. of force on the clutch pedal. You want enough force to hold the bearing out against the clutch diaphragm spring, but not enough to compress the clutch diaphragm spring.
3. Open the bleedscrew that is attached to the bleed line on the hydraulic release bearing.
4. Completely stroke the pedal.
5. Close the bleedscrew that is attached to the bleed line on the hydraulic release bearing.
6. Let the pedal return to its relaxed position and wait a few seconds.
7. Repeat Steps 2 through 6 until all air is removed from the system.
8. **Do not stroke the pedal again before the pedal stop is set.**

G. Clutch Pedal Stop

1. Lift the drive wheels off the ground and support the car on jackstands.
2. With the engine off, put the transmission into 1st gear and have someone attempt to rotate the drive wheels.
3. Depress the clutch pedal slowly until the clutch disengages and the drive wheel can be rotated. Do not push it any further.
4. Note the clutch pedal position at this point is labeled **A** in **Diagram 8**.
5. Adjust the pedal stop bolt to allow an additional 1/4" of pedal travel past point **A** in **Diagram 8**. This is labeled as point **B** in **Diagram 8**.

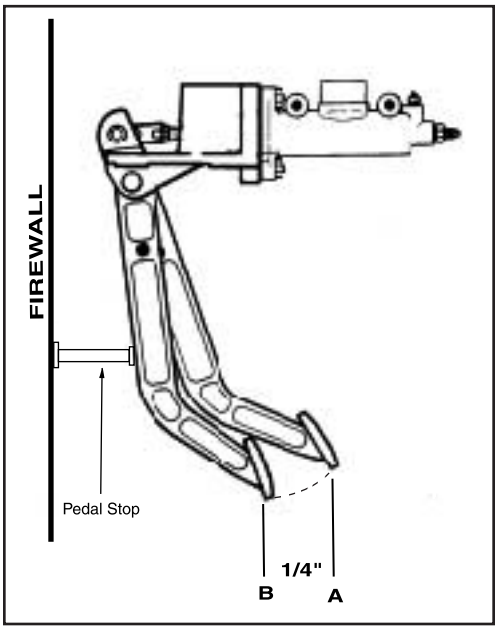

Diagram 8
Clutch Pedal Stop

H. Maintenance

1. Spin the bearing race and check how it feels. If it has a higher than normal resistance or has a slightly notchy feel, replace the bearing.
2. The piston can be removed and replaced without having to break the hydraulic seal or performing the bleeding procedure. Remove the piston assembly and check for any scoring in the bore or on the piston surface. Wipe the piston and orange wiper seal before installing. You may find that the piston is not dry. This could be the rubber grease used when installing the new seal at the factory. Do not mistake this for brake fluid.
3. If the seal needs to be replaced refer to **Table 1** and select the appropriate replacement seal. Remove the piston assembly to access the hydraulic seal. Inspect the piston and hydraulic assembly bore for scratches. To remove the hydraulic seal from the release bearing assembly, block one hydraulic port and apply 5 PSI of air pressure to the other port. **Wear safety glasses and point the seal exit path away from you!** Never try to pry the seal out of the assembly. Refer to **Diagram 9** when installing the new seals and ensure that the flat side of the main hydraulic seal rides against the piston. Always use rubber grease, such as Tilton P/N RG-17, when installing the seal. Take care not to damage the seals during installation.

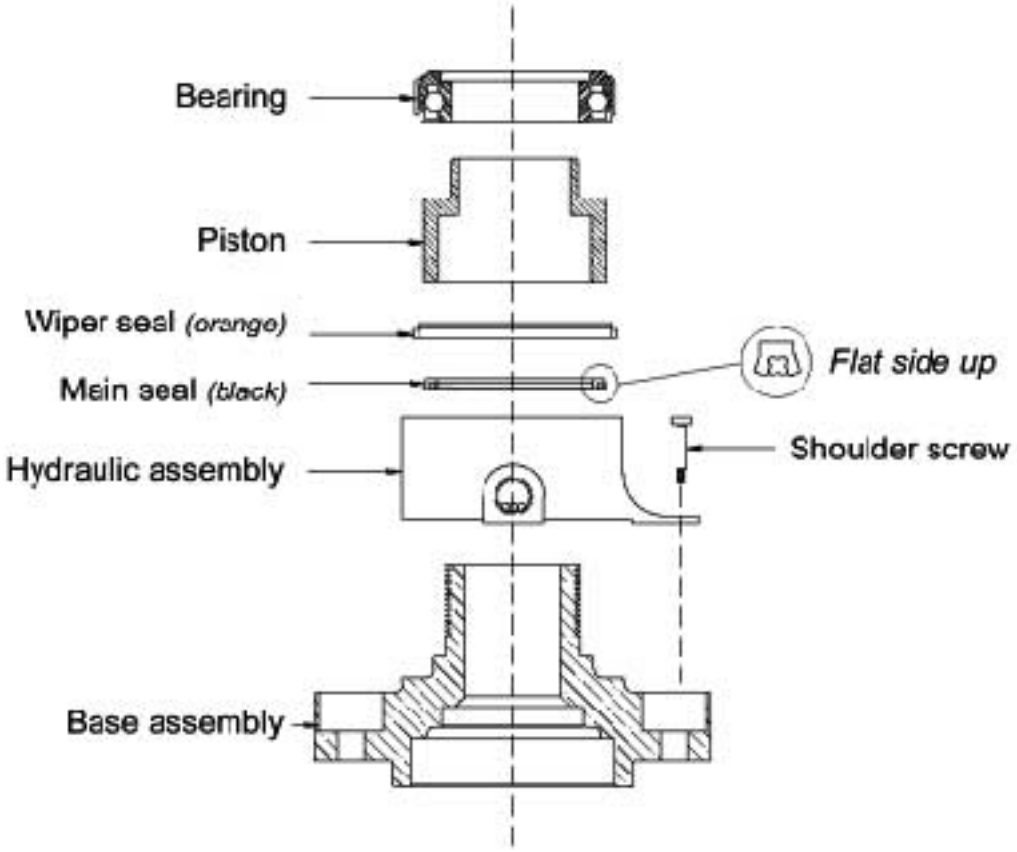

Diagram 9
Exploded View

I. Service Information

1. Contact Tilton's Repair Department (805-688-2353) and describe the problem or the service that is required.
2. If the bearing assembly needs to be sent in, a Returned Goods Authorization (RGA) number is required and will be provided by a Tilton representative.
3. Write the RGA number on the *Repair Information Card* and on the outside of the package.
4. Complete the *Repair Information Card* with the required information.
4. Ship the bearing assembly, with the *Repair Information Card,* to the address found at the bottom of this page.

Repair Information Card **RGA#**_____

Name_____ Phone_____ Date_____

Address_____ City_____ State_____ Zip_____

Vehicle information

Make_____ Year_____ Engine_____

Transmission_____ Bellhousing_____

Reason for return *(details please)*_____

_____

_____

_____

_____

25 Easy Street • Box 1787 • Buellton, CA 93427 • USA • (805) 688-2353 Fax (805) 688-9407