



SHEPPARD

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SEAL KIT INSTALLATION INSTRUCTIONS

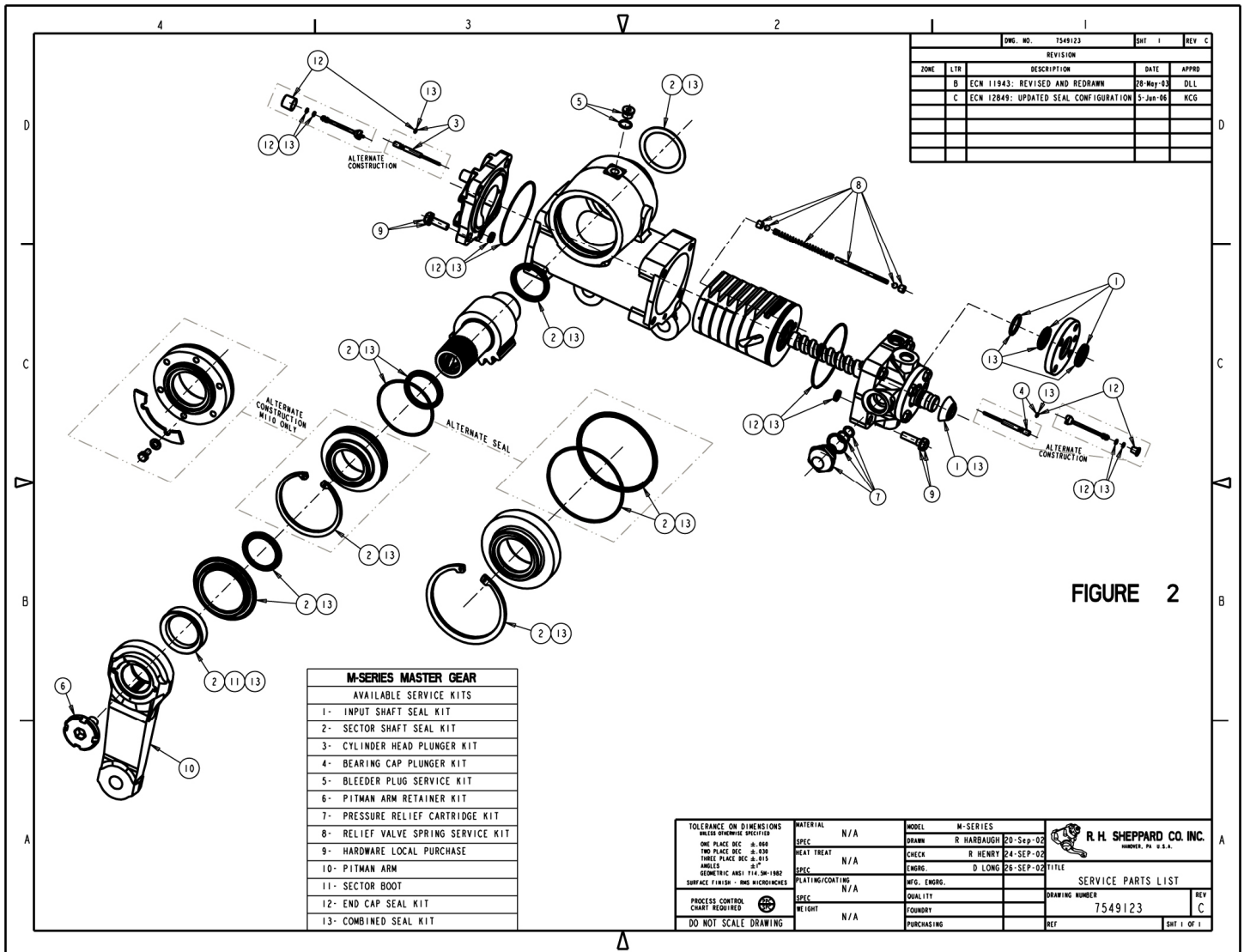


FIGURE 2

INPUT SHAFT SEAL REPLACEMENT

TOOLS REQUIRED:

Drain Pan	15/16", 1/2" Drive Socket	1/4" Flat Screwdriver	Seal Pick
Rags	1", 1/2" Drive Socket	Small Ball Peen Hammer	
5/8", 1/2" Drive Socket	1/2" Drive Ratchet Handle	11/16" Combination Wrench	
16mm, 1/2" Drive Socket	0-100 ft/lb (minimum) 1/2" Drive Torque Wrench		

1. Park the vehicle on a clean dry surface, set the parking brake and shut off the engine. Place a drain pan under the steering gear. Remove the steering column lower yoke from the steering gear input shaft using the 5/8" socket and 11/16" wrench (most common sizes). Place the drain pan below the steering gear. Depending on how the gear is mounted, some fluid may be lost.
2. Remove the rubber boot from the input shaft with the screwdriver.
IMPORTANT! CLEAN THE AREA AROUND THE INPUT SHAFT!
WARNING! DO NOT TURN THE INPUT SHAFT WITH THE BEARING CAP COVER REMOVED! TURNING THE SHAFT CAN CAUSE DAMAGE TO THE INPUT SHAFT, ROTARY VALVE, THRUST BEARINGS AND BEARING CAP.
3. Remove the four bolts on the bearing cap cover with the 16mm socket and remove the cover by prying it off evenly with the screwdriver.
CAUTION! THE THRUST WASHER MAY STICK TO THE COVER. IF IT DOES, REINSTALL THE WASHER ON TOP OF THE THRUST BEARINGS IN THE BEARING CAP.
4. Pry the outside salt seal from the cover with the screwdriver and discard it. Be careful to not damage the cover. Remove the steel washer (if equipped) pressed into the bottom of the cover with the screwdriver.
5. Using the 15/16" socket or seal driver, tap the input (high pressure) seal out of the cover and discard it.
6. Remove the o-ring from the bottom of the cover with the seal pick and discard it.
7. Using the 1" socket or a seal driver, tap the new input seal (**GOLD SPRING**) into the cover with the gold spring facing the bottom of the cover, toward the thrust bearings. A press or vice may also be used.
8. Locate the appropriate size salt seal and tap it into the outside of the cover with the 1" socket. Ensure the seal lip and SILVER SPRING are facing the top of the cover, toward the steering column.
9. Install the new o-ring onto the cover. Tap the steel cover washer back into the cover if equipped.
10. Using #2 chassis grease, fill the area between the seals. No further greasing is required or recommended. If the cover has a grease fitting, remove it and fill the hole with silicone sealant.
11. Lube the o-ring, seal lips and input shaft with a light coat of grease. Wrap the input shaft splines with tape to avoid damaging the new seals and install the cover onto the bearing cap making sure not to roll the lip of the high pressure seal. Ensure the small hole in the cover is aligned with the relief plunger hole in the bearing cap. Torque the bolts to 53-64 ft/lbs.
12. Choose the correct size rubber boot. Pack some grease under the lip of the boot and install it over the input shaft. Ensure it is pushed down below the bottom of the splines and makes good contact with the cover. If it does not fit tight, it is the wrong size boot.
13. Remove the tape from the input shaft and reinstall the steering column lower yoke. Torque the pinch bolt to manufacturer's specification.
14. Fill the system with an approved fluid. Start the engine, check and correct the fluid level. Check for leaks. Bleed the system if necessary. Refer to the Sheppard Power Steering Service Manual for the proper bleeding procedure. Return the vehicle to service.

**IF YOU HAVE QUESTIONS OR PROBLEMS CONTACT SHEPPARD FIELD SERVICE
AT 1-800-274-7437 OR REFER TO THE SERVICE SECTION OF OUR WEBSITE AT
www.rhsheppard.com TO VIEW A VIDEO OF THE PROCEDURE**

SECTOR SHAFT SEAL REPLACEMENT

TOOLS REQUIRED:

Drain Pan	5/8" or 3/4", 1/2" Drive Allen Socket	15/16" Impact Socket	Seal Pick
Rags	Silicone Sealer	Impact Wrench	1/2" Drive Ratchet Handle
1/8" Punch	Large Retaining ring Pliers	13mm 1/2" Drive Socket	
Medium sized Hammer	0-600 ft/lb Torque Wrench	18mm 1/2" Drive Socket	
1/4" Flat Screwdriver	Sheppard Pitman Arm Puller 3589922K or equivalent		

1. Park the vehicle on a clean dry surface, shut off the engine and set the parking brake. Place a drain pan under the steering gear.
Note: For steering gear models mounted inside the frame rail or where the pitman arm is between the steering gear and the frame rail, the steering gear must be removed from the vehicle for sector seal replacement.
2. Bend the locking tabs away from the pitman arm retainer using the punch and hammer. Remove the retainer using the 5/8" or 3/4" Allen Drive Socket. **NOTE THE TIMING MARK ON THE PITMAN ARM AND SECTOR SHAFT!** Remove the pitman arm with the puller, using the 15/16" impact socket and impact wrench. **Only a Sheppard pitman arm puller or a jaw-type puller should be used to remove the pitman arm on retaining ring design housings.**
CAUTION: Do not attempt to remove the arm by using a wedge between the pitman arm and housing. Housing damage will result! Do not apply heat to the pitman arm!
3. Remove the V-boot from the sector shaft. Remove the retaining ring protective cover, if equipped, by carefully prying the plastic seal from the housing with a screwdriver. Take care to not damage the housing during removal. Clean the retaining ring area.
4. Remove the stick on plastic dust cover or metal hub cap from the back side of the housing if equipped.
5. Carefully clean any paint or corrosion from the housing to allow the cover to slide freely out of the housing. Remove the retaining ring clip if present by prying it from the retaining ring cover. Remove the retaining ring using a suitable size pair of retaining ring pliers or "walk it out" with a pair of flat bladed screwdrivers. Remove the retaining clips and bolts (with 13mm socket), if equipped, or the bolt on cover (with 18mm socket) as required.
DANGER: The retaining ring can slip off of the pliers when removed from the housing. Take care when removing the retaining ring as personal injury can result.
6. Slide the pitman arm loosely back onto the sector shaft splines and spin the retainer on finger tight. Use the pitman arm as a handle to pull the sector shaft and cover out of the housing. A slide hammer may also be used to remove the sector shaft and cover, or the cover and shaft can be driven out of the housing from the opposite side if the steering gear is removed from the vehicle.
7. Remove the sector shaft and cover from the steering gear housing.
8. Remove the sector shaft seals from the housing and cover using the seal pick. Carefully pry the pressed in excluder from the cover with the screwdriver, taking care not to damage the housing surface.
9. Remove the O-ring from the sector shaft cover, or the 2 piece L-seal from the housing.
10. Install 1 new sector shaft seal in the sector cover and 1 new sector shaft seal in the housing. Install the sector shaft seals so the black side (pressure seal) faces the inside of the steering gear towards the teeth. Lubricate the seals with clean chassis lube after installation.

SECTOR SHAFT SEAL REPLACEMENT (CONTINUED)

CAUTION: The sector shaft oil seals are two piece seals. It will be necessary to bend the seals to install them. Set one side of the seal in the groove, and walk it in using your fingers. When the seal is in place it may be necessary to work the seal with your fingers or a **blunt** seal pick to properly seat the seal. When using a seal pick to seat the seal, push only on the body of the seal and not on the seal lip. Damage to the seal lip will cause an oil leak. The seal should look perfectly round when installed.

NOTE: All retaining ring style gears will utilize the thicker O-ring supplied or the 2 piece L-seal.

11. Install the new O-ring on the sector shaft cover taking care not to twist it during installation if so equipped or, install the new 2 piece L-seal into the housing by first inserting the black pressure seal into the housing with the L side facing out. Then insert the flat backup ring into the L side of the pressure seal. When assembled, the backup ring will be on the side of the L-seal facing out towards the pitman arm . Apply a coat of clean chassis lube to the O-ring or L-seal prior to installing the cover into the housing.
12. Install the new excluder seal into the face of the sector cover by tapping it into place with the hammer.
13. Lubricate the end of the sector shaft with clean chassis lube and insert the sector shaft into the housing. Align the timing mark on the center tooth of the sector shaft between the 2 timing marks on the piston.
Failure to align the timing marks will result in incorrect turn radius.
14. Lubricate the cover sector shaft seal with clean chassis lube and install the cover over the sector shaft. Drive the cover into the housing using light hammer blows until it is firmly seated into the housing.

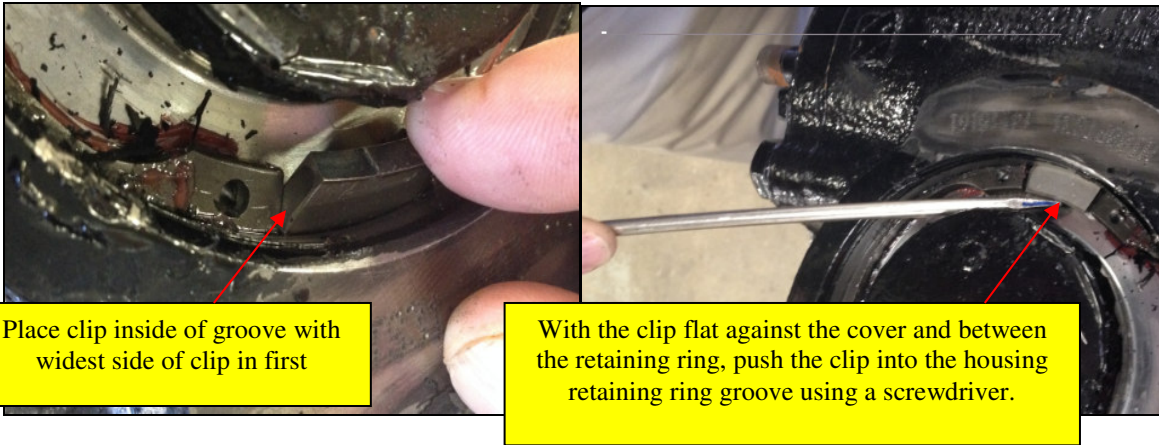
CAUTION: Use only enough force to install the cover. Excessive force on the cover could damage the sector shaft cover or bearing and steering gear damage will result. The cover must be installed to flush or below the retaining ring groove in the housing on retaining ring and clip retained covers.

15. Install the retaining ring or install the cover retaining bolts or retaining clips with bolts in bolt on cover designs. Torque the cover bolts to 72-87 ft/lbs and clip bolts to 31-38 ft/lbs
DANGER: The retaining ring can slip off the pliers when removed from the housing. Take care when installing the retaining ring as personal injury can result.
DANGER: The retaining ring must be fully seated in the retaining ring groove. Improperly seated retaining rings can come out without warning! Loss of steering control, an oil leak or personal injury may result.

Inspect the Retaining Ring for any signs of compression.

Insert the retaining ring clip into the retaining ring groove for all models that are designed with the retaining ring.

Place backing face down to install and insert at an angle. Carefully drive into groove with screwdriver and mallet. If the clip fits into the groove as shown, the retaining ring is seated correctly. The retaining ring clip must be installed completely into the groove in order for the retaining ring cover to be installed and seated correctly.



Place clip inside of groove with widest side of clip in first

With the clip flat against the cover and between the retaining ring, push the clip into the housing retaining ring groove using a screwdriver.

16. Install the retaining ring protective cover into the housing over the retaining ring by using a suitable driver or by lightly tapping on the outside diameter of the cover until it bottoms in the bore. It may be necessary to tap on the body of the cover with the punch and hammer to fully seat the cover.
17. Pack the V-boot with clean chassis lube and slide the V-boot over the sector shaft splines until the lip contacts the sector shaft cover. On models with a groove cut into the sector shaft under the splines using the boot which has one lip larger than the other, the larger lip should be facing the pitman arm. Slide the boot on until it snaps into the groove. Clean all excess grease from the sector shaft splines.
18. Attach the new frame side dust cover by cleaning the housing with a solvent and applying the new disk over the sector shaft bore with a small bead of RTV silicone on the edge of the disk. Apply a bead of silicone inside the edge of the housing before installing the hub cap (if equipped).
19. Install the pitman arm by aligning the timing mark on the arm to the timing mark on the end of the sector shaft. Ensure the splines of the arm and shaft are clean and dry. Screw the retainer in making sure the tabs on the washer sit into the grooves machined into the pitman arm. Torque the retainer to the value stamped on the face of the retainer. Keep applying torque until the locking tabs on the washer align with the slots in the retainer. Bend the lock tabs into the retainer.
WARNING: Proper installation of the pitman arm is critical. Improper installation of the arm can cause an accident at a later date. DO NOT BACK OFF WHEN TIGHTENING RETAINER!
20. Fill the system with an approved fluid. Start the engine, check and correct the fluid level. Check for leaks. Bleed the system if necessary. Refer to the Sheppard Power Steering service manual #1000400 for the proper bleeding procedure. Return the vehicle to service.

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END CAP SEAL REPLACEMENT

TOOLS REQUIRED:

Drain Pan	1 1/4" Socket	1/8" and 1/4" Flat Screwdriver	Vice Grip Locking Pliers
Rags	Seal Pick	Small Ball Peen Hammer	11/16" Combination Wrench
5/8", 1/2" Drive Socket		1/2" Drive Ratchet Handle	2-7/8" Combination Wrenches
16,18,21 or 24mm, 1/2" Drive Socket		0-300 ft/lb (minimum) 1/2" Drive Torque Wrench	

Park the vehicle on a clean dry surface, set the parking brake and shut off the engine. Place a drain pan under the steering gear. **NOTE: Auto Plunger steering gears may require part number 18212821K if the plunger is damaged during disassembly or reassembly.**

M-SERIES GEARS CYLINDER HEAD:

1. Mark the cylinder head and housing for alignment. Remove the four large bolts from the cylinder head using a 16,18,21 or 24mm socket. Remove the cylinder head.
2. Remove the square ring and tetra seal from the cylinder head with the seal pick and discard.
3. If desired, remove the relief plunger and replace the o-ring supplied in the kit. Manual plungers can be unscrewed using a flat bladed screwdriver. AUTO Plungers must be disassembled (flange nut removed from the plunger) and the plunger pushed out of the cylinder head. Replace the o-ring, coat with clean chassis lube and install the plunger back into the cylinder head or cartridge. Apply lock-tite to the plunger threads and tighten the flange nut against the spring pin. Do not over tighten.
NOTE: You will need to check and correct the relief plunger settings after repair.
4. Clean the cylinder head using a suitable solvent. Install the square ring or o-ring in the groove of the cylinder head and install the tetra seal in the small gland of the cylinder head. Place the solid orange side into the recess. Apply a light coat of clean chassis lube to hold the seals in place during installation.
5. Install the cylinder head onto the housing, taking care to align the marks made during disassembly. Insure that the tetra seal aligns with the port in the housing.
6. Torque the bolts to the spec listed in this instruction.

M-SERIES GEARS BEARING CAP:

1. Clean and match mark the bearing cap and housing for reassembly. Remove the lower u-joint from the steering gear input shaft using the 5/8" socket and 11/16" wrench (most common). Remove the hoses and fittings using the 7/8" wrenches and vice grip pliers (if required for removing clamps).
2. Using the 16,18,21 or 24mm socket remove the four large bolts from the bearing cap. **DO NOT REMOVE THE SMALLER BEARING CAP COVER AROUND THE INPUT SHAFT.** Turn the input shaft and raise the bearing cap off the housing until it stops so the seal can be accessed. Do not allow the bearing cap to rotate.
3. Using a seal pick, remove the square ring or o-ring and tetra seal from the bearing cap and discard.
4. Carefully stretch the square ring over the bearing cap assembly. Take care not to over stretch the seal. (You may need to give the seal time to shrink back to its original size.) Push the square ring into the seal groove of the bearing cap. Use clean chassis lube to hold the seal into the groove. Install the solid orange side of the tetra seal into the recess of the bearing cap and lightly coat the seal with clean chassis lube.
5. If desired, remove the relief plunger and replace the o-ring supplied in the kit. Manual plungers can be unscrewed using a flat bladed screwdriver. AUTO Plungers must be disassembled (flange nut removed from the plunger) and the plunger pushed out of the cylinder head or cartridge. Replace the o-ring, coat

with clean chassis lube and install the plunger back into the cylinder head or cartridge. Apply lock-tite to

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M-SERIES GEARS BEARING CAP (CONTINUED)

the plunger threads and tighten the flange nut against the spring pin.

NOTE: You will need to check and correct the relief plunger settings after repair.

6. Turn the input shaft into the steering gear taking care to align the marks on the housing and bearing cap. Take care not to pinch the seals during assembly.
7. Install the four attaching bolts and torque to specifications listed in this instruction.
8. Attach the hose fittings, hoses and steering column u-joint following the vehicle manufacturers' guidelines.
9. Fill the system with an approved fluid. Start the engine, check and correct the fluid level. Check for leaks. Bleed the system if necessary. Refer to the Sheppard Power Steering service manual for the proper bleeding procedure.
10. Check and correct relief plunger settings as required. Return the vehicle to service.

D SERIES GEARS BEARING CAP:

1. Ensure the steer tires are pointing straight ahead and the steering wheel is centered. Thoroughly clean the steering gear prior to disassembly.
2. **IMPORTANT: Use a paint pen or similar marker to place reference marks on the pitman arm, housing and bearing cap. These marks are critical for proper reassembly!**
3. Remove the draglink from the pitman arm using the 1 ¼" socket.
4. Remove the lower u-joint from the steering gear input shaft using the 5/8" socket and 11/16" wrench (most common sizes) and secure it out of the way. Remove all hoses and fittings from the bearing cap using the 7/8" wrench.
5. Using the 21 (HD94) or 24 (SD110) mm socket remove the four large bolts from the bearing cap. **DO NOT REMOVE THE SMALLER BEARING CAP COVER AROUND THE INPUT SHAFT.**
6. **In the next steps, DO NOT REMOVE ANYTHING FROM THE PISTON. DO NOT REMOVE ANY PLUGS OR THE PISTON RING-YOU WILL NOT HAVE THE PARTS TO PUT IT BACK TOGETHER.**
7. While pulling up on the bearing cap with one hand, pull the pitman arm with the other hand to push the bearing cap and piston assembly up and out of the housing. **IMPORTANT!! MARK THE POSITION OF THE PITMAN ARM WHEN THE SECTOR SHAFT TEETH DISENGAGE THE PISTON TEETH AND ALLOW THE PISTON TO COME OUT OF THE HOUSING!!** Pull the bearing cap and piston assembly out of the housing and sit it on a clean work area. **DO NOT REMOVE ANYTHING FROM THE PISTON!!**

DO NOT SPIN THE PISTON ON THE INPUT SHAFT. IT MUST GO BACK INTO THE HOUSING EXACTLY THE WAY IT CAME OUT OF THE HOUSING.

8. Using a seal pick, remove the large o-ring and the small tetra seal from the bottom of the bearing cap and discard. Thoroughly clean the seal grooves and the piston with a suitable solvent.
NOTE: Any small pieces of dirt or brush hairs in the seal grooves will cause a leak!
9. Carefully stretch the new o-ring (it should be a BLACK material) over the piston assembly (take care not to over stretch the seal), moving it up the length of the piston to the bearing cap and place it in the seal groove. Ensure the o-ring is free from twists by running the seal pick around it. Apply a light coat of clean chassis lube to the new o-ring, and the piston ring.
10. Lightly coat the new tetra seal with clean chassis lube and install it in the recess of the bearing cap. The

newest style seal is an orange silicone with a white nylon backup ring surrounding it. Place the solid

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D SERIES GEARS BEARING CAP (CONTINUED)

orange side into the recess in the bearing cap. Once installed you should be looking at both a white and orange ring. It is a direct replacement for the old black seal, and the old orange and white seal.

11. If desired, remove the relief plunger and replace the o-ring supplied in the kit. Manual plungers can be unscrewed using a flat bladed screwdriver. AUTO Plungers must be disassembled (flange nut removed from the plunger) and the plunger pushed out of the bearing cap. Replace the o-ring, coat with clean chassis lube and install the plunger back into the bearing cap. Apply lock-tite to the plunger threads and tighten the flange nut against the spring pin.

NOTE: You will need to check and correct the relief plunger settings after repairs are completed.

12. **REASSEMBLE** the steering gear by first making sure the piston is in the same position relative to the bearing cap as when it came out of the housing, and then begin sliding the assembly back into the cylinder bore. Make sure to align the paint marks on the housing and bearing cap.
13. Align the paint mark on the pitman arm with the position mark on the housing and slide the piston into the cylinder until it stops. Move the pitman arm back to the starting position and it should pull the piston into the cylinder until the bearing cap is seated against the housing. Take care not to pinch the seals during assembly.

IF THE PITMAN ARM IS NOT IN THE SAME POSITION AS WHEN YOU STARTED THE JOB, YOU ARE PROBABLY 1 TOOTH OUT OF TIME TO THE PISTON. PUSH THE PISTON BACK UP AND TRY AGAIN.

14. Install the four attaching bolts using a criss-cross pattern and torque to spec.
15. Attach the steering column and torque the pinch bolt to the vehicle manufacturer's specs. Attach the draglink to the pitman arm and torque the nut to manufacturer's specs. Install the cotter pin and bend it over. Reconnect the hoses.
16. Fill the system with an approved fluid. Start the engine, check and correct the fluid level. Check for leaks. Bleed the system if necessary. Refer to the Sheppard Power Steering Service Manual for the proper bleeding procedure.
17. Check and correct relief plunger settings as required.
18. Check for proper turning radius and steering wheel alignment.
19. Return the vehicle to service.

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**TORQUE SPECS AND SOCKET SIZES
FOR BOLTS ON ALL
D-SERIES AND M-SERIES SHEPPARD STEERING GEARS**

APPLICATION	SIZE	GRADE	FT/LBS	(NM)	SOCKET
Bearing Cap Cover Bolts-All D&M Series	M10 X 1.5	10.9	53-64	(72-87)	16mm
Bearing Cap Bolts -					
M80	M10 X 1.5	10.9	53-64	(72-87)	16mm
M90	M12 X 1.75	8.8	72-87	(97-118)	18mm
M100	M14 X 2.0	8.8	114-140	(154-190)	21mm
M110	M16 X 2.0	10.9	230-277	(312-376)	24mm
MD83	M14 X 2.0	9.8/10.9	114-140	(154-190)	21mm
HD94	M14 X 2.0	9.8/10.9	114-140	(154-190)	21mm
SD110	M16 X 2.0	10.9	230-277	(312-376)	24mm
XD120	M16 X 2.0	10.9	230-277	(312-376)	24mm
Cylinder Head Bolts-					
M80	M10 X 1.5	10.9	53-64	(72-87)	16mm
M83	M10 X 1.5	10.9	53-64	(72-87)	16mm
M90	M12 X 1.75	8.8	72-87	(97-118)	18mm
M100	M14 X 2.0	8.8	114-140	(154-190)	21mm
M110	M10 X 1.5	10.9	53-64	(72-87)	16mm
XD120	M16 X 2.0	10.9	230-277	(312-376)	24mm
All M100 Bolt-On Sector Cover Bolts	M12 X 1.75	9.8	72-87	(97-118)	18mm
All Clip-Style M110 Sector Cover Bolts	M8 X 1.25	12.9	31-38	(42-52)	13mm

NOTES
