INSTALLATION INSTRUCTIONS

This Sheppard Power Steering Gear has been manufactured and tested for proper operation prior to shipment. Every effort has been made to ensure that it will provide you with many miles of trouble-free, safe operation. To protect your investment and comply with your warranty, it is important that these instructions be closely followed.

1. Anytime a power steering gear or power steering pump is replaced, the oil and oil filter in the power steering system should be changed. All lines and fittings should be flushed of any possible contaminants. Use the type of fluid specified by the vehicle manufacturer or 15W40 Engine Oil if none is specified.

2. If a power steering pump has been replaced, it should be tested to ensure that its pressure and oil flow are the same as originally specified by the vehicle manufacturer.

3. Transfer the hose fittings from the old steering gear to the new one. Replacing the o-rings is recommended.

4. Install the steering gear on the vehicle. Care should be taken to ensure the mounting bracket or steering gear is not distorted when the bolts are drawn up. This condition could cause binding in the gear.

5. Attach all hoses to the gear or gears. Ensure they are in good condition and routed with no kinks in the line. Refer to the Sheppard Service Manual for proper routing of dual steer systems. On M-Series gears, the inlet and outlet ports are staggered. The inlet port is always the one closest to the output shaft.

6. Install the steering column or intermediate shaft to the steering gear input shaft, ensuring the clamp bolt is torqued to the vehicle manufacturer's specification.

7. Install the pitman arm using the guidelines in this instruction. Take care not to move the arm more than 2 inches in either direction until the draglink has been installed. Over-traveling the piston will prematurely set AUTO relief plungers.

8. Install the draglink on the pitman arm (except slave gears) and torque the fastener to the vehicle manufacturer's specification. Slave gears should not have the draglink installed until the Bleeding procedure is performed.

NOTE: If you cannot turn the steering all the way until the stops contact the axle in each direction with the steer tires off the ground, the pitman arm may be mistimed.

9. Fill the power steering system with an approved fluid. Start the engine and let it idle. DO NOT ALLOW THE RESERVOIR TO RUN DRY!

10. **IMPORTANT!** Set the AUTO relief plungers or adjust the manual relief plungers to obtain proper wheel cut. Use the guidelines in this instruction.

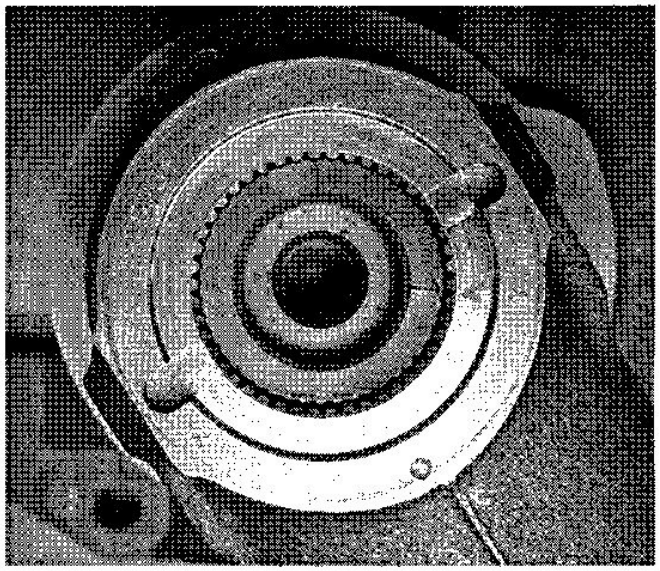
11. Bleed the gear or gears using the guidelines in this instruction.

12. Double-check all fasteners, fittings, hose routings, and check for leaks. Top off the power steering system and return the vehicle to service.

13. Today's systems typically have smaller reservoirs and operate at much higher temperatures than in the past. Regular preventive maintenance is essential to extended steering system life. Follow the OEM's recommendations for power steering fluid and filter change intervals.

If you have questions at any time, our entire Service Manual can be found on our website at www.rhsheppard.com. or contact our Field Service Hotline at 1-800-274-7437.

PITMAN ARM INSTALLATION INSTRUCTIONS



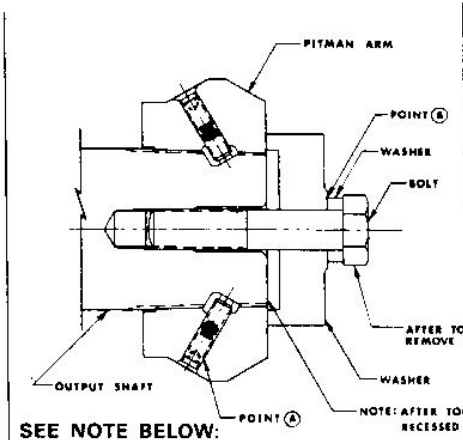
When the pitman arm is installed, the timing arrows on the arm and the output shafts must be aligned. If the pitman arm has two timing arrows marked "L" and "R" the same arm is used on both the master and the slave gear. The "L" arrow is used on the left or master gear and the "R" arrow is used on the right or slave gear.

The following charts detail the various pitman arm installation methods offered by The Sheppard Co.

Follow these procedures for the attachment method you are working with. Correct torque values are very important. Use the lubricant where indicated.

CAUTION: IF THE PITMAN ARM IS NOT APPLIED TO THE FOLLOWING SPECIFICATIONS, THE PITMAN ARM COULD WORK LOOSE AND AN ACCIDENT WITH PERSONAL INJURY COULD RESULT. IF A LOOSE PITMAN ARM IS FOUND, REPLACE THE PITMAN ARM AND OUTPUT/SECTOR SHAFT.

IMPORTANT! DO NOT WELD PITMAN ARM OR OUTPUT/SECTOR SHAFT. IF DIMENSIONS ARE NOT ACHIEVED, REPLACE THE PITMAN ARM AND OUTPUT/SECTOR SHAFT.



SEE NOTE BELOW:

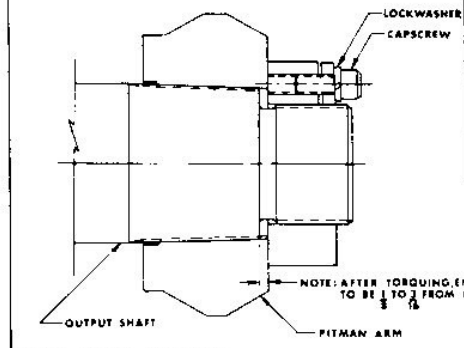
TORQUE SPECIFICATIONS				
MODEL NO.	WASHERS	BOLT NO.	TORQUE BOLT TO:	
292, 292 S-1	2261521	181441	85 FT. LBS.	115 N·M
392, 392 S	2261611	1/2-20 UNF X 2 3/4 LG GRADE 5		
492	2261571	181463	160 FT. LBS.	217 N·M
	2261621	5/16-18 UNF X 3 1/2 LG GRADE 5		
592	2261581	271591	170 FT. LBS.	230 N·M
	2261631	1/2-13 UNF X 3 LG GRADE 5		

USE LOK-CEASE, NEVER SEEZ OR WHITE LEAD ON THREADS OF SETSCREWS (POINT (A)) AND BETWEEN WASHERS (POINT (B)).

TORQUE SET SCREWS TO 12 TO 15 FT. LBS. (16 TO 20 N·M)

SET SCREWS – PART NO. 2420791 HEX SOCKET HEAD HALF DOG WITH ALLEN NYLOK SPOT LOK. 2 REQUIRED AND SUPPLIED WITH PITMAN ARM

①



SEE NOTE BELOW:

TORQUE SPECIFICATIONS				
MODEL NO.	CAPSCREW TORQUE TO:		TORQUE NUT TO:	
292, 392, 392 S	12 TO 15 FT. LBS.	16 TO 20 N·M	285 FT. LBS.	386 N·M
492	" "	" "	675 FT. LBS.	915 N·M
592	" "	" "	775 FT. LBS.	1050 N·M

USE LOK-CEASE, NEVER SEEZ OR WHITE LEAD BETWEEN PITMAN ARM AND NUT; IN THE THRDS. OF THE NUT, AND ON THRDS. OF THE OUTPUT SHAFT.

CAPSCREW – HEX. SOCKET HEAD 1/2 - 24 UNF X 3/4 LONG

②

NOTE: WHENEVER A PITMAN ARM IS INSTALLED A MEASUREMENT MUST BE TAKEN FROM THE END OF THE SHAFT TO THE FACE OF THE PITMAN ARM. THIS SHOULD BE TAKEN AFTER THE ARM HAS BEEN TORQUED TO THE PROPER SPECIFICATION AND THE INSTALLATION TOOL OR NUT HAS BEEN REMOVED. IF THE NUT STYLE RETENTION IS USED ②, RETORQUING IS REQUIRED.

PITMAN ARM INSTALLATION INSTRUCTIONS – CONT'D

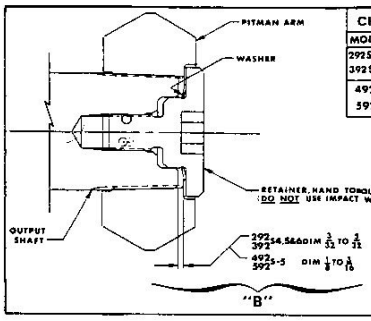


CHART "A" TORQUE SPECIFICATIONS

MODEL NO.	RETAINER NO.	WASHER NO.	TORQUE RETAINER TO:	
29254,5&6 39254,5&6	1790322	2261861	225 FT. LBS.	305 N·M
4925-5 5925-5	1790312	2261851	450 FT. LBS.	610 N·M

USE LOK-CEASE, NEVER SEEZ OR WHITE LEAD BETWEEN PITMAN ARM AND RETAINER, IN THE THROS. OF THE OUTPUT SHAFT, AND ON THE THROS. OF THE RETAINER, AND ON BOTH SIDES OF THE WASHER.

③

HAND TORQUE THE RETAINER TO THE VALUE SHOWN IN CHART "A" ABOVE. REMOVE THE RETAINER AND MEASURE THE DISTANCE FROM THE END OF THE SHAFT TO THE RECESSED AREA OF THE PITMAN ARM. THE ACCEPTABLE DIMENSIONS ARE LISTED IN "B" ABOVE. IF THESE DIMENSIONS ARE NOT ACHIEVED, REPLACE THE PITMAN ARM AND OUTPUT/SECTOR SHAFT.

REINSTALL THE RETAINER AND TORQUE TO THE VALUE SHOWN IN CHART "A" ABOVE.

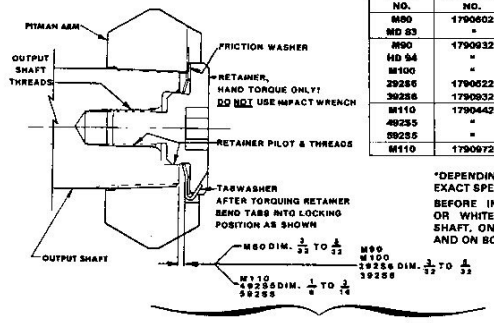


CHART "A" TORQUE SPECIFICATION

MODEL NO.	RETAINER NO.	TABLOCK WASHER NO.	FRICTION WASHER NO.	TORQUE RETAINER TO:	
M80	1790602	2262221	2262241	225 FT. LBS.	305 N • M
MD 83	"	"	"	"	"
M90	1790932	2262121	2262021	350 FT. LBS.	475 N • M
MD 94	"	"	"	"	"
M100	"	"	"	"	"
29256	1790622	"	"	225 FT. LBS.	305 N • M
39256	1790932	"	"	350 FT. LBS.	475 N • M
M110	1790442	2262141	2262131	450 FT. LBS.	610 N • M
49255	"	"	"	"	"
59255	"	"	"	"	"
M110	1790972	2262141	2262131	550 FT. LBS.	746 N • M

*DEPENDING ON APPLICATION. CHECK RETAINER FOR EXACT SPECIFICATION.

BEFORE INSTALLATION, PUT LOK-CEASE, NEVER SEEZ OR WHITE LEAD IN THE THREADS OF THE OUTPUT SHAFT, ON THE PILOT AND THREADS OF THE RETAINER, AND ON BOTH SIDES OF THE FRICTION WASHER.

④

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WHEN INSTALLING THE PITMAN ARM AND RETAINER ASSEMBLY, ALIGN THE TABS OF THE RETAINER WITH THE TWO NOTCHES IN THE PITMAN ARM. HAND TORQUE THE RETAINER TO THE VALUE SHOWN IN CHART "A" ABOVE. REMOVE THE RETAINER AND MEASURE THE DISTANCE FROM THE END OF THE SHAFT TO THE RECESSED AREA OF THE PITMAN ARM. THE ACCEPTABLE DIMENSIONS ARE LISTED IN "B" ABOVE. IF THESE DIMENSIONS ARE NOT ACHIEVED, REPLACE THE PITMAN ARM AND OUTPUT/SECTOR SHAFT.

REINSTALL THE RETAINER AND TORQUE TO THE VALUE SHOWN IN CHART "A" ABOVE. CONTINUE ADVANCING THE RETAINER UNTIL TWO OF THE RESTRAINING TABS ALIGN WITH NOTCHES IN THE RETAINER. BEND THE TWO RESTRAINING TABS INTO THE RETAINER.

RELIEF PLUNGERS

A relief plunger is placed in each end of all Sheppard steering gears (with the exception of slave gears) to unload steering system pressure prior to the axle stops contacting the axle. One is located in a small hole in the bearing cap cover next to the input shaft. The other plunger is on the opposite end of the steering gear and may be in a hole in the cover, in the hole in the end of a boss sticking out from the cover, or in a cartridge screwed into the cover. The plungers prevent the power steering pump from operating at maximum relief pressure at the end of steering travel. When properly adjusted, the relief plungers reduce system temperature and excessive stress on the mechanical components of the steering system by preventing the axle stops from contacting the axle under full pump pressure.

CAUTION: Failure to set or adjust the relief plungers could result in damage to the steering system. Plungers MUST be set or adjusted whenever a steering gear is replaced.

AUTO PLUNGERS

1. AUTO plunger gears are identified by the word AUTO in raised letters cast into the side of the steering gear housing and plastic caps on each end of the gear covering the plunger hole.

2. Raise the steer tires off the ground.

3. Start the engine and let it run at idle speed. Ensure the axle stops are set for maximum wheel cut with a minimum of 1" clearance between the tire and any part of the chassis.

4. Set the AUTO plungers by turning the steering wheels from side to side until the axle stops contact the axle. This allows the piston in the steering gear to contact the AUTO plunger assembly and push it back to its set position. The stops MUST contact the axle.

5. Set the vehicle back on the ground. Turn the steering wheel completely from stop to stop. The chassis should not flex when the steering reaches the end of travel. If it does, the AUTO plungers must be reset. Normally you will see a small gap between the axle stop and the axle.

6. Vehicle wheels should be in the straight ahead position.Reset AUTO plungers by tapping them in with a 1/4" punch and hammer until you feel the plunger bottom out in the bore. Be careful not to score the plunger bore. Scoring the bore will cause a leak which cannot be repaired. After the AUTO plungers are reset, set them by following steps 2 through 4.

MANUAL PLUNGERS

1. Your steering gear has manual plungers if you can back them out of the plunger hole with a small flat-bladed screwdriver.

2. Manual plungers are turned all the way in from the factory for *minimum* wheel cut. Adjust the plungers **IN** to decrease wheel cut, adjust **OUT** to increase wheel cut. Use a long, flat bladed screwdriver.

3. Start the engine and let it run at idle speed. Ensure the axle stops are set for maximum wheel cut with a minimum of 1" clearance between the tire and any part of the chassis.

4. With the full weight of the vehicle on the ground, have a helper turn the steer tires full left. Check the gap between the axle stop and the axle on the left steer tire. If it is greater than 1/8" adjust the plunger out (counter clockwise). Adjust the plunger in the end of the gear which the piston has moved toward. If the stop is touching the axle try turning the plunger in then recheck it.

NOTE: The plungers are fine thread so it may take several turns to get them properly adjusted. Do not back the head of the plunger out past flush with the end of the hole. The plunger could be ejected from the gear.

5. After making an adjustment, center the steering and recheck the gap at the axle stop.

6. When the steer tires have been turned back and forth about 4 times, rubber will accumulate under the tires and make setting the plungers difficult. Roll the vehicle ahead or back about 1 foot and recheck the gap at the axle stop.

7. Turn the steer tires full right and adjust the opposite plunger for the gap at the right side axle stop using the same procedure.

Once the relief plungers are set, no further adjustment is necessary unless tire size or wheel offset is changed.

BLEEDING AIR FROM STEERING GEARS

Most single steering gears can be bled simply by turning the steering wheel all the way from stop to stop after the gear has been installed, lines connected, system filled with fluid, and relief plungers set. Some gears however, require bleeding through a bleeder screw or in the case of dual gear systems, a special procedure. The following guidelines can be used.

SINGLE GEAR SYSTEMS

If the gear is mounted with the bulge in the housing for the sector shaft hanging below the piston cylinder:

1. With the weight of the vehicle on the ground, start the engine and let it run at idle speed.

2. Turn the steering wheel lock to lock 3 times. Hold the wheel in pressure for about 5 seconds when you reach the lock position in each direction. Center the steering, bleeding complete.

If the gear is mounted with the bulge in the housing for the sector shaft sitting above the piston cylinder:

1. Locate the bleeder plug on the sector housing. It will look like a bolt head that a 3/4" wrench would fit. There will be a piece of tape on it covering a 1/8" allen set screw in the center of it. Remove the tape to expose the set screw.

2. Do not remove the bleeder screw from the plug. There is a check ball behind it which likes to get lost.

3. With the weight of the vehicle on the ground, start the engine and let it run at idle speed.

4. With a helper, turn the steering wheel to full left. Open the set screw in the bleeder plug 4 turns. With the bleeder still open, turn the wheels all the way to the right and shut the bleeder. Turn the wheels all the way to the left and repeat the procedure 2 more times. **The bleeder should only be open when turning right. If it is open when turning left, air will be forced back into the system.** Center the steering, bleeding complete.

DUAL GEAR SYSTEMS

1. With the weight of the vehicle on the ground, start the engine and let it run at idle speed. The draglink should be connected to the pitman arm on the main gear but not connected to the salve gear.

2. Turn the steering wheel all the way to the left until the axle stop contacts the axle and hold until the pitman arm on the slave gear moves its full travel. It should move in the opposite direction of the pitman arm on the main gear.

3. Now turn the steering wheel all the way to the right until the axle stop contacts the axle and hold until the pitman arm on the slave gear moves its full travel.

4. Repeat the procedure 3 more times or until there is no air in the system and the slave gear moves freely.

NOTE: Avoid moving the pitman arm on the slave gear by hand. Air may be drawn into the system.

5. Turn the steering wheel until the pitman arm on the slave gear lines up with the draglink and install the draglink.

6. Cycle the steering from stop to stop. If a catch is noted, look for bleed plugs on the steering gears. If the gear is mounted with the bulge in the housing for the sector shaft sitting above the piston cylinder, follow the procedure outlined for bleeding a single gear with the bulge in the housing for the sector shaft sitting above the piston cylinder. If both gears have bleeder plugs, bleed only when turning the steering wheel to the right.

NOTE: Do not allow the reservoir to run dry at any time. Bleeding is complete when the steering operates smoothly from lock to lock in both directions.

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