

Service Bulletin #TAS-113

On-Vehicle Poppet Readjustment for TAS/ RCS Dual Gear Set-ups

Released February, 1996

This TRW Commercial Steering Division service bulletin has been written to help you repair commercial vehicles more efficiently. This bulletin should not replace your manuals; you should use them together. These materials are intended for use by properly trained, professional mechanics, NOT "Do-it-yourselfers". You should not try to diagnose or repair steering problems unless you have been trained, and have the right equipment, tools and know-how to perform the work correctly and safely.

What are poppets?

Poppets are pressure unloading valves set to trip just before full turn is reached in each direction. When this procedure is completed correctly, system pressure will be reduced before the axle stop screw contacts the axle stop in both directions.

To determine if the poppets require readjustment or if they are performing properly, install a Power Steering System Analyzer (PSSA) between the power steering pump and the steering gear. If poppet readjustment is necessary, you can leave the PSSA in the system to verify that the following procedure is completed properly.

Why might poppets need to be readjusted?

- Changing to larger tires
- Reduced vehicle wheelcut
- Pitman arm mistimed, condition corrected
- Steering gear being installed on a different truck
- Steer axle stop bolt(s) were bent or broken
- Steer axle u-bolt(s) were bent or broken

Mirror Image systems and Reversed Image systems

Before using this procedure you must determine whether the system on which you're working has Mirror Image gears or reversed image gears. The procedures are slightly different for each type of system.

To check:

1. Park the vehicle with the wheels turned all the way to the axle stop in either direction. Turn the vehicle off.
2. Look at the output shaft timing mark nearest the housing piston bore on the master gear. Is this mark pointing toward the input shaft or the poppet screw?
3. Now check the same timing mark on the rotary cylinder. Does it point toward the input shaft or the poppet screw?

If they point to opposite ends of the gears you have a mirror image system.

If they both point toward the input shafts, or both point toward the poppet screws, you have a reversed image system.

NOTE

This resetting procedure will work in most cases with at least 1 $\frac{3}{4}$ hand-wheel-turns from each side of center. If you're making a large reduction in wheelcut and this procedure does not work, you may have to internally reset the poppets using the procedure described in the TAS Service Manual.

Mirror Image Systems

NOTE	Page 1 describes how to determine if you have a mirror image system.
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1. Set the axle stops to vehicle manufacturer's wheelcut or clearance specifications.

Start the engine, and allow the vehicle to idle for 5-10 minutes to warm the hydraulic fluid. Shut off the engine.

2. If new poppet adjusting screws and nuts will be used, turn each screw into the non-sealing end of the jam nut until the drive end of screw is flush with the nut.

Your steering gear and rotary cylinder will both have either a fixed stop bolt or an adjusting screw. If the adjusting screw is already part of the gear or cylinder, back the nut off of the adjusting screw until it is flush with the end of the adjusting screw.

3. Make sure the engine is off and the road wheels are in straight ahead position. Remove and discard the poppet fixed stop bolt (if equipped) and washer (if equipped) from the lower end of housing on both the gear and the cylinder.

If either unit has a poppet adjusting screw and sealing nut that need to be replaced, remove and discard them.

4. On both the master gear and the rotary cylinder, turn the adjusting screw and sealing nut assembly, without rotating the nut on the screw, into the housing until the nut is firmly against the housing using a $\frac{7}{32}$ " allen wrench. Tighten the sealing nut against the housing.

5. Refill system reservoir with approved hydraulic fluid.

CAUTION	Do not mix fluid types. Mixing of transmission fluid, motor oil, or other hydraulic fluids will cause seals to deteriorate faster.
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6. Place a jack under the center of the front axle and jack up the front end of the vehicle so the steer axle tires are off the ground.

7.
 - a) Start the engine and let it run at idle speed.
 - b) Turn the steering wheel in the direction that makes the timing mark on the master gear move toward the adjusting screw just installed. Turn in this direction until axle stop contact is made.

- c) Pull hard on the steering wheel (put 40 lbs. rim pull on a 20" dia. steering wheel) after the axle stop is contacted.

8.
 - a) Turn the steering wheel in the opposite direction (end of timing mark on the master gear away from adjusting screw) until the other axle stop is contacted.

- b) Pull hard on the steering wheel (put 40 lbs. rim pull on a 20" dia. steering wheel).

- c) Release the steering wheel and shut off the engine.

(Step 8 will set the upper poppet of the master gear, and push the upper poppet of the rotary cylinder out to prepare it for setting.)

9. Loosen the sealing nut and back out the adjusting screw on the master gear until 1" is past the nut. Tighten the sealing nut against the housing.

CAUTION	Do not hold the steering wheel at full turn for more than 10 seconds at a time; the heat build-up at pump relief pressure may damage components.
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10.
 - a) Start the engine and let it idle.
 - b) Turn the steering wheel in the original direction (end of timing mark on the master gear toward adjusting screw), until axle stop contact is made.
 - c) Hold the steering wheel in this position (with 40 lbs. rim pull) for 10 seconds, then release. Repeat this hold and release process as many times as necessary while completing step 11.

(Steps 10 and 11 will set the lower poppet of the master gear, and set upper poppet on the rotary cylinder.)

11.
 - a) With steering wheel held at full turn, loosen the jam nut on the master gear and hold it in place with a wrench.
 - b) Turn the adjusting screw in (clockwise) using finger- pressure only (don't use a ratchet), until the Allen wrench comes to a stop. Do not attempt to turn it in farther. Pause the turning-in process each time the driver releases the steering wheel; Continue turning only while the wheel is held at full turn.
 - c) Back off the adjusting screw $3\frac{1}{4}$ turns and tighten the sealing nut. Torque the sealing nut to **33-37 lbf•ft.**

Reversed Image Systems

- d) Release the steering wheel and shut off the engine.
12. Loosen the sealing nut and back out the adjusting screw on the rotary cylinder until 1" is past the nut. Tighten the sealing nut against the housing.
 13.
 - a) Start the engine and let it idle.
 - b) Turn the steering wheel in the opposite direction (end of timing mark on master gear away from adjusting screw), until axle stop contact is made.
 - c) Hold the steering wheel in this position (put up to 40 lb. rim pull on a 20" dia. steering wheel) for 10 seconds, then release. Repeat this hold and release process as many times as necessary while completing step 14.

(Steps 13 and 14 will set the lower poppet of the rotary cylinder.)

14.
 - a) With steering wheel held at full turn, loosen the jam nut on the rotary cylinder and hold it in place with a wrench.
 - b) Turn the adjusting screw in (clockwise) using finger- pressure only (don't use a ratchet), until the Allen wrench comes to a stop. Do not attempt to turn it in farther. Pause the turning-in process each time the driver releases the steering wheel; Continue turning only while the wheel is held at full turn.
 - c) Back off the adjusting screw 3¼ turns and tighten the sealing nut. Torque the sealing nut to **33-37 lbf-ft.**
 - d) Release the steering wheel and shut off the engine.
15. The poppets have now been completely reset. Lower the vehicle. Check the reservoir and fill if required.

⚠ WARNING	The length of the adjusting screw beyond the nut must be <u>no more than 1¼"</u> for proper thread engagement.
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NOTE	The length of adjusting screw beyond the sealing nut may be different for each vehicle.
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NOTE	Page 1 describes how to determine if you have a reversed image system.
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1. Set the axle stops to vehicle manufacturer's wheelcut or clearance specifications.

Start the engine, and allow the vehicle to idle for 5-10 minutes to warm the hydraulic fluid. Shut off the engine.
 2. If new poppet adjusting screws and nuts are being used, turn the screws into the non-sealing end of the jam nuts until the drive end of screw is flush with the nut.

Your steering gear and rotary cylinder will have either fixed stop bolts or adjusting screws. If the adjusting screw is already part of the steering gear or cylinder, back the nut off of the adjusting screw until it is flush with the end of the adjusting screw.
 3. Make sure the engine is off and the road wheels are in straight ahead position. Remove and discard the poppet fixed stop bolts (if equipped) and washers (if equipped) from the lower end of housing on both the master gear and the rotary cylinder.

If the unit has poppet adjusting screws and sealing nuts that need to be replaced, remove and discard them.
 4. Turn the adjusting screws and sealing nut assemblies, without rotating the nut on the screw, into the housing until the nut is firmly against the housing, on both the master gear and the rotary cylinder, using a 7/32" allen wrench. Tighten the sealing nut against the housing.
 5. Refill system reservoir with approved hydraulic fluid.
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| ⚠ CAUTION | Do not mix fluid types. Mixing of transmission fluid, motor oil, or other hydraulic fluids will cause seals to deteriorate faster. |
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6. Place a jack under the center of the front axle and jack up the front end of the vehicle so the steer axle tires are off the ground.
 7.
 - a) Start the engine and let it run at idle speed.
 - b) Note which output shaft timing mark is nearest the housing piston bore.
 - c) Turn the steering wheel in the direction that makes this timing mark move toward the adjusting screws just installed on both the gear

and the cylinder. Turn in this direction until axle stop contact is made.

d) Pull hard on the steering wheel (put 40 lbs. rim pull on a 20" dia. steering wheel) after the axle stop is contacted.

8. a) Turn the steering wheel in the opposite direction (end of timing mark away from adjusting screw) until the other axle stop is contacted.

b) Pull hard on the steering wheel (put 40 lbs. rim pull on a 20" dia. steering wheel).

c) Release the steering wheel and shut off the engine.

(Step 8 will set the upper poppets.)

9. Loosen the sealing nut and back out the adjusting screw until 1" is past the nut on both the master gear and the rotary cylinder. Tighten the sealing nuts against both housings.

CAUTION Do not hold the steering wheel at full turn for more than 10 seconds at a time; the heat build-up at pump relief pressure may damage components.

10. a) Start the engine and let it idle.

b) Turn the steering wheel in the original direction (end of timing mark toward adjusting screw), until axle stop contact is made.

c) Hold the steering wheel in this position (with 40 lbs. rim pull) for 10 seconds, then release. Repeat this hold and release process as many times as necessary while completing steps 11 and 12, first on the master gear, then on the rotary cylinder.

(Steps 11 and 12 will set the lower poppets.)

11. a) With steering wheel held at full turn, loosen the jam nut on the master gear, and hold it in place with a wrench.

b) Turn the adjusting screw in (clockwise) using finger- pressure only (don't use a ratchet), until the Allen wrench comes to a stop. Do not

attempt to turn it in farther. Pause the turning-in process each time the driver releases the steering wheel; Continue turning only while the wheel is held at full turn.

c) Back off the adjusting screw $3\frac{1}{4}$ turns and tighten the sealing nut. Torque nut to **33-37 lbf-ft.**

12. a) With steering wheel held at full turn, loosen the jam nut on the rotary cylinder and hold it in place with a wrench.

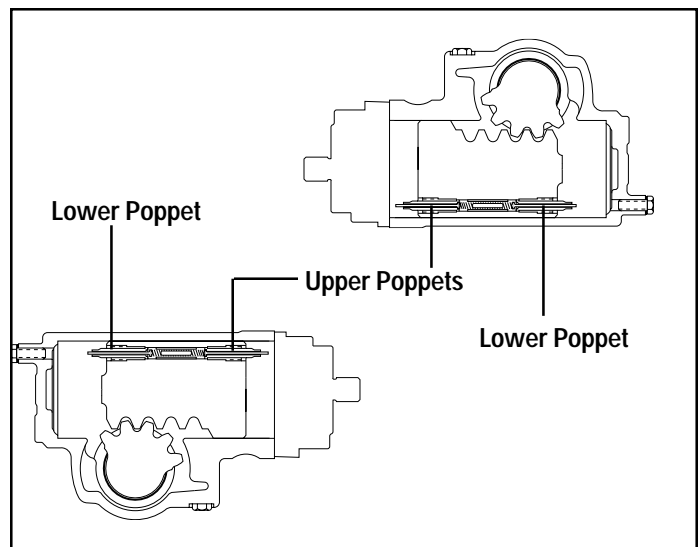
b) Turn the adjusting screw in (clockwise) using finger- pressure only (don't use a ratchet), until the Allen wrench comes to a stop. Do not attempt to turn it in farther. Pause the turning-in process each time the driver releases the steering wheel; Continue turning only while the wheel is held at full turn.

c) Back off the adjusting screw $3\frac{1}{4}$ turns and tighten the sealing nut. Torque nut to **33-37 lbf-ft.**

13. The poppets on both the master gear and rotary cylinder have now been completely reset. Lower the vehicle. Check the reservoir and fill if required.

WARNING The length of the adjusting screw beyond the nut must be no more than $1\frac{1}{16}$ " for proper thread engagement.

NOTE The length of adjusting screw beyond the sealing nut may be different for each vehicle.



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