

XOS Technical Service Bulletin

Bulletin No.: 001-26

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Subject: Manual Axles Stops and Steering Gear Poppets

Applicability: All XOS Trucks

Service Category: Axle & Steering

Section: Axle & Steering Components

Market: USA and Canada

Introduction:

This procedure establishes the correct sequence for (a) setting and verifying the front axle knuckle stop screws to achieve the specified **45° wheel cut** on the Hendrickson 10K front axle, and (b) setting the internal unloading (poppet) valves on the TRW THP60 steering gear so that hydraulic pressure is relieved just before axle stop contact in both directions.

The axle stops MUST be set and verified before the poppets are set. The poppets self-position against the axle stops; if stops are moved after poppet setting, the poppets must be reset. The THP60 is equipped with unloading (poppet) valves, one at each end of the rack piston. When correctly set, a poppet trips **just before** the steered wheels contact the axle stops in each direction, dropping hydraulic pressure in the gear for the last fraction of travel. This is intentional and required behavior:

1. **Heat and pump protection.** Without poppet relief, steering to the lock puts the pump at relief pressure (up to 2,685 psi / 185 bar max operating pressure on the THP60), dumping energy into the fluid as heat. Sustained operation at relief pressure degrades seals and damages the pump — this is also why full-lock holds are limited to 10 seconds during setting.
2. **Steering linkage load reduction.** Relieving pressure before stop contact prevents the drag link, pitman arm, steering arm, kingpin stops, and axle beam stop pads from reacting full hydraulic force every time the vehicle is steered to the lock. On the 10,000 lb front axle this is a meaningful fatigue and durability consideration for the linkage and knuckle stops.
3. **Full wheel cut must be preserved.** The poppet trip point must be just short of stop contact — the wheels must still physically reach the stops to achieve the specified 45° wheel cut and turning radius. Poppets that trip too early reduce usable wheel cut; poppets that trip too late (or not at all) leave the system steering against relief pressure at every lock.

Distinction — poppets vs. relief valve: The relief valve only limits maximum supply pressure to protect the gear. It is not position-sensitive and does nothing as the wheels approach the stops. Audible pump/relief squeal held at the locks is evidence the poppets are NOT functioning or are set incorrectly.

Why axle stops come first: The poppets self-position against the axle stops during the setting procedure. The stops therefore define the poppet trip points. Any change to the stop screws, steering linkage, pitman arm timing, or transfer of the gear to a different vehicle invalidates the poppet setting and requires it to be redone

Repair Procedure Overview:

1. Update to latest software.
2. Perform a functional check of the vehicle to confirm its current state so we know if the repair process unexpectedly impacts other vehicle systems.
3. Pull all open cases for the vehicle, these should all be completed during this repair process.
4. Determine if any batteries need to be replaced. If any batteries need to be replaced, procure the new batteries, remove the respective batteries from the vehicle, and leave them off the vehicle.
5. Perform the removal and installation of HV boxes and cables per repair instructions
6. Record date and time of completion of repair to track Viriciti data post repair.
7. Drive 50 miles.
8. Perform an AC charge session to full charge.
9. Review telematics for approval of truck release.

Vehicle Applicability:

Model Year	Model
All	ALL

Warranty Information:

Model	Operation Code	Operation Description	Time (Hours)	Impacted Part #
ALL	0204X	Steering and Axles	1-2	VN00-JB-A0027 VN00-KB-A0065

Tools and Parts Information:

Item	Spec
Turn plates (wheel cut gauges), L/R	Capable of reading $\geq 50^{\circ}$
Jack + jack stands	Rated for front axle load (10,000 lb axle)
Allen wrench	7/32" (THP60 poppet adjusting screw)
Open end wrench / socket	3/4" (THP60 poppet sealing nut), 5/8" (fixed stop bolt, if equipped)
Torque wrench, ft-lb	Calibrated
Combination wrenches for knuckle stop screw & jam nut	Per axle hardware
Approved hydraulic fluid	Per TRW approved fluid list / vehicle spec
Feeler stock or machinist scale	For stop screw gap checks
New poppet adjusting screw & nut kit	TRW kit 021407-X1 (THP/PCF60) IF RESETTING Poppets

Procedure:

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A. Preconditions

1. Vehicle unloaded, on level floor, tires at specified cold pressure.
 2. Steering linkage complete: drag link connected, pitman arm installed with timing marks aligned, tie rod set to specified toe.
 3. No leaks; reservoir at FULL; system air-bled per TRW manual p.16 if the gear was recently serviced.
 4. Wheel cut spec is **45°**.
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B. Part A — Axle Stop Setting & Verification (45° Wheel Cut)

a. Position vehicle

1. Center the front tires on the turn plates. Zero the turn plates with wheels straight ahead (steering gear on its timing-mark center).
2. Start the Vehicle; idle 5–10 minutes to warm the hydraulic fluid.

b. Measure existing wheel cut

3. With the Vehicle on, steer slowly to full LEFT until the knuckle stop contacts the axle beam stop pad. Do not exceed 40 lb rim pull.
4. Record inside-wheel angle (LH wheel on a left turn) and outside-wheel angle.
5. Repeat to full RIGHT and record.

c. Adjust stop screws

6. If the measured inside-wheel angle is not **45° (+0° / -0.5°, or per Xos vehicle-level spec if tighter)** in either direction: a) Loosen the stop screw jam nut on the affected knuckle. b) Turn the stop screw IN to reduce wheel cut, OUT to increase, in small increments. c) Re-steer to full lock and re-measure. Iterate until 45° is achieved at the inside wheel on each side. d) Hold the screw and torque the jam nut to the Hendrickson/Xos fastener spec. **This should typically be 1 in between the nut and the top of the axle's stop.**



7. **Clearance check (mandatory):** At both full locks, verify minimum clearance between tire/wheel and all chassis, suspension, brake hose, harness, and body structures per Xos vehicle spec. Hydraulic disc brake hoses (15.0" disc, hydraulic per dwg 080920-000) must have no tension or contact at full lock through full jounce/rebound where accessible.

8. Verify LH and RH wheel cut are symmetric within 1° unless the vehicle spec states otherwise.

C. Part B — THP60 Poppet Setting

a. Determine which case applies

Condition	Action
Case 1: New gear from TRW/OEM, or poppet seats replaced/reset internally during overhaul (poppets ready for automatic positioning)	Use Initial Poppet Setting , Section 7.2
Case 2: Gear previously in service on this vehicle and axle stops were just moved, OR gear transferred from a different vehicle, OR poppets may have been disturbed	Use Poppet Readjustment , Section 7.3
Case 3: Gear removed/reinstalled on the same vehicle, stops and linkage unchanged	Verify only (Section 7.4). Reset per 7.3 if poppets do not relieve correctly

CAUTION (Case 1 gears): With the drag link disconnected or before poppet setting, never rotate the input shaft more than **1.5 turns from center** — this can disrupt the automatic poppet feature and require gear disassembly to reposition the poppet seats.

b. Initial Poppet Setting — New or internally reset gear (per TRW manual).

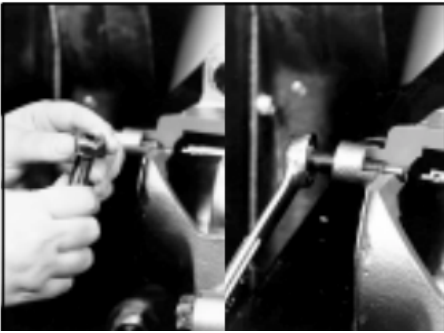
Prerequisites: axle stops set per Part A; pitman arm correctly timed; a fixed stop screw installed in the housing, or a poppet adjusting screw installed so it duplicates the fixed stop screw length.

1. Vehicle on, vehicle unloaded.
2. Turn the steering wheel to full travel in one direction until axle stop contact is made. Maximum input: **40 lb rim pull on a 20" wheel**. If excess effort is encountered, allow the vehicle to roll forward or jack the front axle.
3. Turn the steering wheel to full travel in the opposite direction the same way.

4. The poppets are now automatically positioned to trip and relieve pressure as the wheels approach the stops in both directions. Proceed to Section 7.4 verification.

c. Poppet Readjustment — Single gear (per TRW manual, THP60 values).

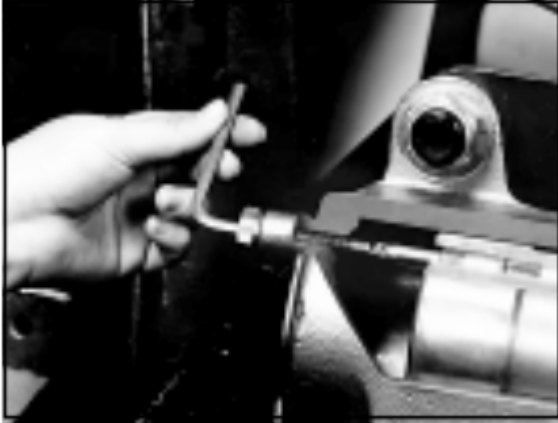
This procedure works in most cases with at least 1¾ hand-wheel turns each side of center. For a large wheel-cut reduction where this fails, poppets must be replaced/internally reset per the TRW Poppet Component section.



1. **Warm-up:** Axle stops already set (Part A). Idle 5–10 min to warm fluid. Shut the vehicle off.
2. **Prepare adjusting screw:** Using a new screw/nut kit (021407-X1), thread the screw into the non-sealing end of the jam nut until the drive end of the screw is **flush** with the nut. If the gear already has an adjusting screw, back the nut off until flush with the screw end.



3. **Remove fixed stop bolt:** Vehicle off, wheels straight ahead. Remove and discard the poppet fixed stop bolt and washer (5/8" wrench) from the lower end of the housing, if equipped. If replacing an existing damaged screw/nut, remove and discard them.



4. **Install adjusting screw assembly:** Turn the screw-and-nut assembly (without rotating the nut on the screw) into the housing using the 7/32" Allen until the nut is firmly against the housing (3/4" wrench). Tighten the sealing nut against the housing.

CAUTION: If the drive end of the screw sits below the nut face, the poppet seat flange will break during step 7.

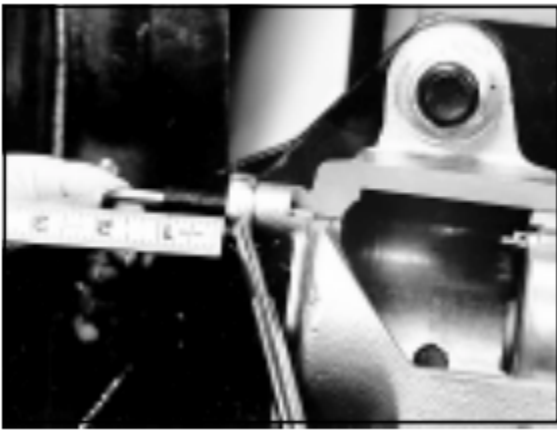
5. **Refill reservoir** with approved fluid. **Jack the front axle** so the steer tires are off the ground; support on stands.



6. **Push the upper poppet out:** a) Start vehicle, idle; b) Note which output shaft timing mark is nearest the housing piston bore. c) Steer in the direction that moves this timing mark **toward** the adjusting screw until axle stop contact. d) Pull hard (up to 40 lb rim pull) after stop contact.



7. **Set the upper poppet:** a) Steer the opposite direction until the other axle stop is contacted. b) Pull hard (up to 40 lb rim pull). c) Release; shut the vehicle off.



8. **Back out the screw:** Loosen the sealing nut and back the adjusting screw out until **1" is past the nut**. Tighten the sealing nut.



9. **Set the lower poppet:** a) Start vehicle, idle. b) Steer in the original direction (timing mark toward screw) to axle stop contact. c) Hold at full turn (≤ 40 lb rim pull) **max 10 seconds at a time**, release, and repeat as needed while performing step 10.



10. **Position the adjusting screw:** a) With the wheel held at full turn, loosen the jam nut and hold it with the 3/4" wrench. b) Turn the adjusting screw in (CW) with the 7/32" Allen using **finger pressure only — no ratchet** — until it stops. Do not force further. Pause whenever the driver releases the wheel; turn only while held at full lock. c) Back the screw off **3¼ turns** and tighten the sealing nut. **Torque sealing nut 35 ft·lb (48 N·m).**

11. Lower the vehicle. Check and top off the reservoir.

WARNING: The adjusting screw must protrude **no more than 1-1/16"** beyond the nut for proper thread engagement. (Protrusion length varies by vehicle; that is normal.)

d. Verification (all cases)

1. Vehicle on, vehicle on the ground, unloaded.
2. Steer slowly toward each lock. Confirm a distinct pressure/effort drop (poppet trip) **just before** axle stop contact in **both** directions. Steering must still reach the stops (full 45° cut confirmed on turn plates).
3. Confirm no relief-valve squeal held at the stops and no more than momentary high-pressure dwell.
4. Re-verify reservoir level; check for leaks at the adjusting screw sealing nut and all fittings.
5. If poppets do not relieve before stop contact in either direction, repeat Section 7.3.

Records

Data	Value
VIN / vehicle no.	
Axle P/N & serial (from tag)	080920-00__
Gear spec no. & date code (stamped opposite input shaft)	
LH wheel cut, inside wheel (deg)	
RH wheel cut, inside wheel (deg)	
Poppet procedure used (7.2 / 7.3 / 7.4 only)	
Sealing nut torque verified (35 ft·lb)	Y / N
Poppet relief confirmed both directions	Y / N
Technician / date	
QA sign-off	