

SECTION 11: REAR AXLES

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1. DRIVE AXLE

1.1 Description

The Rockwell drive axle is equipped with a single reduction standard carrier mounted in front of the axle housing. The carrier has a hypoid drive pinion, a ring gear set and gears in the differential assembly.

A straight roller bearing (spigot) is mounted on the head of the drive pinion. All other bearings in the carrier are tapered roller bearings. When the carrier operates, there is a normal differential action between the wheels all the time.

Several speed ratios are available for the drive axle. These ratios depend upon the motor and transmission. Also, special applications may suggest slightly different gear ratios.

1.2 Drive Axle Lubrication

Additional lubrication information is covered in the Rockwell *"Maintenance Manual No. 5"* annexed to this section. During initial stage of normal operation, tiny metal particles originating from moving parts can be found on mating surfaces. These particles are carried by the lubricant through the assembly and act as lapping compound which accelerates wear of all parts. To ensure maximum life of the differential and prevent premature failure, the original "factory fill" lubricant should be drained. Change break-in oil before 3,000 miles (4 800 km) of initial operation (drain the unit while it is still warm from operation), in accordance with the lubrication and servicing schedule.

Change differential oil and clean the breathers, the magnetic fill and drain plug, every 100,000 miles (160 000 km) or once every two years, whichever comes first. Use Multigrade gear oil MIL-L-2105-D. Use the 75W90 gear oil for northern climates and the 80W140 for southern climates. In extreme conditions, or for better performance, full synthetic gear oil can be used.

Check oil level and add (if necessary) every 6,250 miles (10 000 km) or twice a year, whichever comes first (Fig. 1).

Note: Drive axle wheel bearings may be lubricated by the differential oil. If this is the case on your vehicle, maintain differential oil level to ensure adequate lubrication of drive axle wheel bearings at all times.

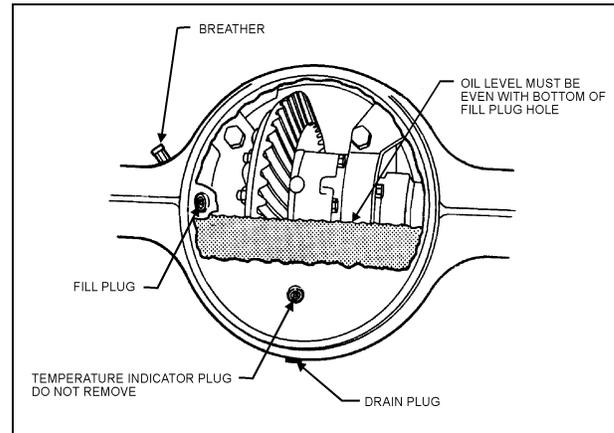


FIGURE 1: DIFFERENTIAL AXLE HOUSING BOWL 11007

1.3 Maintenance

Proper vehicle operation begins with preventive maintenance, such as good differential use. The most common types of drive axle carrier failures are spinout, shock, fatigue, overheating and lubrication. Avoid neglecting these points since they would be the first steps to improper maintenance, expensive repairs, and excessive downtime.

Inspect the pinion oil seal, axle shaft flange and carrier housing gaskets for evidence of lubricant leakage. Tighten the bolts and nuts, or replace the gaskets and seals to correct leaks. Maintenance of the axle mountings consists primarily in a regular and systematic inspection of the air suspension units and radius rods, as directed in Section 16, "SUSPENSION".

1.3.1 Checking and Adjusting the Oil Level

Warning: Before servicing, park safely over a repair pit, apply parking brake, stop engine and set main battery disconnect switch (XL-40

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& 45E) or battery master switch (XL-45) to the "OFF" position.

1. Make sure the vehicle is parked on a level surface.

Caution: Check the oil level when the axle is at room temperature. When hot, the oil temperature may be 190°F (88°C) or more and can cause burns. Also, a correct reading is not obtained when the axle is warm or hot.

2. Make sure the axle is "cold" or at room temperature.
3. Clean the area around the fill plug. Remove the fill plug from the differential axle housing bowl (Fig. 1).
4. The oil level must be even with the bottom of the hole of the fill plug.
 - a. If oil flows from the hole when the plug is loosened, the oil level is high. Drain the oil to the correct level.
 - b. If the oil level is below the bottom of the hole of the fill plug, add the specified oil.
5. Install and tighten the fill plug to 35-50 lbf•ft (48-67 N•m).

1.3.2 Draining and Replacing the Oil

Warning: Before servicing, park safely over a repair pit, apply parking brake, stop engine and set main battery disconnect switch (XL-40 & 45E) or battery master switch (XL-45) to the "OFF" position.

1. Make sure the vehicle is parked on a level surface. Put a large container under the axle's drain plug.

Note: Drain the oil when the axle is warm.

2. Remove the drain plug from the bottom of the axle. Drain and discard the oil in an environment friendly manner.
3. Install and tighten the drain plug to 35-50 lbf•ft (48-67 N•m).
4. Clean the area around the fill plug. Remove the fill plug from the differential housing bowl.
5. Add the specified oil until the oil level is even with the bottom of the hole of the fill plug. Allow the oil to flow through the axle and check the oil level again (lube capacity 41 pints [13,3 liters]).
6. Install and tighten the fill plug to 35-50 lbf•ft (48-67 N•m).

1.3.3 Differential Oil Sensor (if applicable)

An oil temperature sensor is located in the housing bowl and its gauge is located on the central dashboard. The normal operating temperature is below 250°F (120°C).

Caution: The differential overheats when the oil temperature rises above 250°F (120°C).

1.4 Removal and Replacement

The following procedure deals with the removal of the drive axle assembly and its attachments as a unit. The method used to support the axle during removal and disassembly depends upon local conditions and available equipment.

1.4.1 Removal

1. Raise vehicle by its jacking points on the body (see Section 18, "BODY" under heading "VEHICLE JACKING POINTS"). Place jack stands under frame. Remove drive axle wheels (if required, refer to

Section 13, "WHEELS, HUBS AND TIRES".

2. Exhaust compressed air from the air supply system by opening the drain cock on each air reservoir.
3. Disconnect the propeller shaft as directed in Section 9, "PROPELLER SHAFT", in this manual.
4. On both sides of the vehicle, unscrew fasteners retaining front wheelhouse plastic guards, and remove them from vehicle.
5. Disconnect both height control valve links from air spring mounting plate brackets.
6. Remove cable ties securing the ABS cables (if vehicle is so equipped) to service brake chamber hoses. Disconnect the ABS cable connectors located at the opposite extremity of the sensor ends.

Note: When you remove cable ties for ease of operation, remember to replace them afterwards.

7. Disconnect the brake chamber hoses.

Note: Position the hoses so they will not be damaged when removing the axle.

8. Install jacks under the axle jacking points to support the axle weight.
9. Remove the four shock absorbers as outlined in Section 16, "SUSPENSION" under heading "SHOCK ABSORBER REMOVAL".
10. Remove the lower and upper longitudinal radius rod supports from vehicle subframe as outlined in Section 16, "SUSPENSION", under heading "RADIUS ROD REMOVAL".
11. Remove the transversal radius rod support from the vehicle subframe.

12. Remove the two retaining nuts from each of the four air bellows' lower mounting supports.
13. Use the jacks to lower axle. Carefully pull away the jacks axle assembly from underneath vehicle.

1.4.2 Replacement

Reverse removal procedure to reinstall drive axle.

Note: Refer to Section 16, "SUSPENSION" for suspension components' proper tightening torques.

Note: Refer to section 13 "WHEELS HUBS AND TIRES" for correct wheel bearing adjustment procedure.

1.5 Disassembly and Reassembly

Disassembly and reassembly procedures are covered under applicable headings in Rockwell's "MAINTENANCE MANUAL, NO. 5", annexed to this section.

1.6 Gear Set Identification

Gear set identification is covered under applicable heading in Rockwell's "MAINTENANCE MANUAL NO. 5", annexed to this section.

1.7 Adjustments

Adjustments are covered under applicable headings in Rockwell's "MAINTENANCE MANUAL NO. 5", annexed to this section.

1.8 Fastener Torque Chart

A differential fastener torque chart is provided in Rockwell's "MAINTENANCE MANUAL NO. 5", annexed to this section.

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1.9 Tire Matching

Drive axle tire matching is covered under the applicable heading in Section 13, "WHEELS, HUBS AND TIRES", of this manual.

1.10 Drive Axle Alignment

1.10.1 Description

The drive axle alignment consists in aligning the axle according to the frame. The axle must be perpendicular to the frame. The alignment is achieved with the use of shims inserted between the lower longitudinal radius rod supports and the frame.

Drive axle alignment is factory set and is not subject to any change, except if the vehicle has been damaged by an accident or if there are requirements for replacement.

Caution: *If this setting is significantly altered, the vehicle will produce offset tracking (dog tracking).*

If the axle has been removed for repairs or servicing and if all the parts are reinstalled exactly in the same place, the axle alignment is not necessary. However, if the suspension supports have been replaced or altered, proceed with the following instructions to verify or adjust the drive axle alignment.

1.10.2 Procedure

1. Park vehicle on a level surface, then chock front vehicle wheels.
2. Using two jacking points (which are at least 30 inches [76 cm] apart) on drive axle, raise the vehicle sufficiently so that wheels can turn freely at about ½ inch from ground. Secure in this position with safety stands, and release parking brake.
3. Using an optical toe and tracking system installed on each side of the drive axle, fix and position the projector in the center of the wheel. Measure the distance on each side of projector mounting rods. Distance should be equal on both sides. If not, adjust the projector.

4. Place target boards against the front wall of the rear baggage compartment (Fig. 2).
5. Connect the projectors and set to zero. Rotate the wheel and set projectors to zero at four opposite positions.

Note: *It is important to have a zero marking when rotating the wheel in order to eliminate wheel run-out.*

6. Aim projector on the target board. Measure distance between target center line (provided by the projector) and the frame post located immediately adjacent to the target board. Record measurement, then repeat procedure on the other side (Fig. 2). Dimensions obtained are identified RR on rear right-hand side and RL on rear left-hand side.
7. Move the target boards to the front of vehicle: On XL-40 & 45 vehicles, place target boards against the front wall of the first baggage compartment - on XL-45E vehicles, place target boards against the front wall of the second baggage compartment.

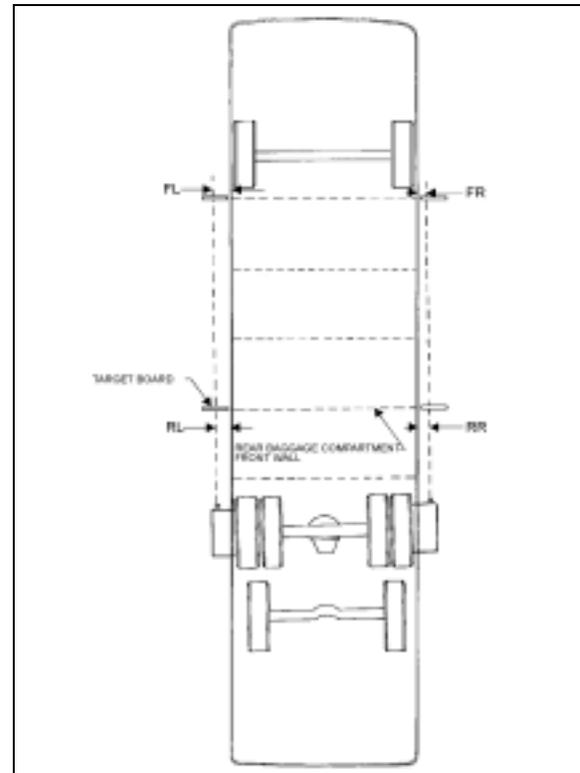


FIGURE 2: XL-40 & 45 DRIVE AXLE ALIGNMENT (XL-45E SIMILAR - SEE STEP 7)

11008XL

8. Aim the projector on the target board, then measure the distance between target centerline (provided by the projector) and the frame post adjacent to the target board. Record measurement, then repeat on the other side. Dimensions obtained are identified FR on front right-hand side and FL on front left-hand side.
9. Subtract measurement taken at rear of the vehicle from measurement taken at front of the vehicle on the same side. Record results. Repeat previous operation on other side of vehicle. Record results.
 $FR - RR = \text{RESULT "A"}$
 $FL - RL = \text{RESULT "B"}$
10. The results on either side must be less than or equal to 5/8 inch (16 mm) on XL-40 & 45E vehicles and 9/16 inch (14 mm) on XL-45 vehicles. If one or both results exceed the value specified for the vehicle, corrective action should be taken with respect to axle position. If difference is excessive, inspect for probable cause by checking for worn or damaged bushings, bent radius rods and/or brackets. Prior to V.I.N. 2P9M33494S1001524 drive axle alignments are factory set and are otherwise not adjustable.
11. Starting with V.I.N. 2P9M33494S1001524 drive axles are adjustable. Correct axle position by inserting a shim between the lower longitudinal radius rod support and the axle, on right or left side of vehicle, according to the previous results.

Note: Refer to Section 16, "SUSPENSION", for proper torque tightening of the longitudinal radius rod support nuts.

12. Repeat steps 6 to 10 to ensure that axle is truly perpendicular to the frame.

1.11 Axle Shaft Sealing Method

The following method is to be used to ensure that axle shaft installation is fluid-tight:

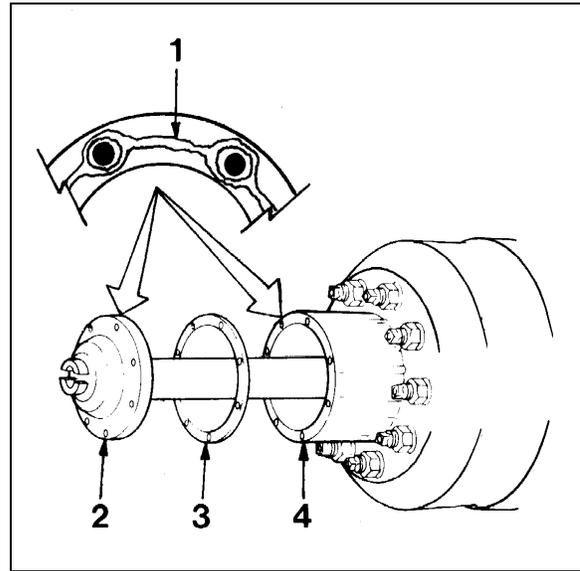


FIGURE 3: AXLE SHAFT INSTALLATION 11003

- 1Silicone sealant*
- 2Axle shaft
- 3Gasket
- 4Wheel hub

1. Clean the mounting surfaces of both the axle shaft flange and wheel hub where silicone sealant will be applied. Remove all old silicone sealant, oil, grease, dirt and moisture. Dry both surfaces.
2. Apply a continuous thin bead of silicone sealant* (Prévost P/N 680053) on the mounting surfaces and around the edge of all fastener holes of both the axle shaft flange and wheel hub.

Warning: Carefully read cautions and instructions on the tube of silicone sealant and its packing.

* GENERAL ELECTRIC Silicone Rubber Adhesive Sealant RTV 103 Black.

3. Assemble components immediately to permit the silicone sealant to compress evenly between parts.
 - a. Place a new gasket, then install the axle shaft into the wheel hub and differential carrier. The gasket and flange of the axle shaft must fit flat against the wheel hub.

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- b. Install the tapered dowels at each stud and into the flange of the axle shaft. Use a punch or drift and hammer if needed.
- c. Install the lock washers and nuts on the studs. Tighten nuts to the correct torque value.

Note: Torque values are for fasteners that have a light application of oil on the threads (refer to Rockwell Maintenance Manual).

9/16-18 plain nut: 110 - 165 lbf•ft (149 - 224 N•m)
5/8-18 plain nut: 150 - 230 lbf•ft (203 - 312 N•m)

2. TAG AXLE

2.1 Description

The tag axle is located behind the drive axle. It carries a single wheel and tire on each side. The standard system allows unloading of the tag axle air springs without raising the axle, while the optional system enables unloading and raising of the tag axle (refer to the "OPERATOR'S MANUAL" for location of controls). Both these systems have been designed for the following purposes:

1. Shortening of wheelbase, thus allowing tighter turning in tight maneuvering areas such in a parking lot or when making a sharp turn.
2. Transferring extra weight and additional traction to the drive wheels on slippery surfaces.

Caution: Never exceed 30 mph (50 km/h) with tag axle up or unloaded and resume normal driving as soon as possible.

The tag axle service brakes operate only when the axle is in normal driving (loaded) position.

2.2 Lubrication

2.2.1 Oil Lubricated Wheel Bearings

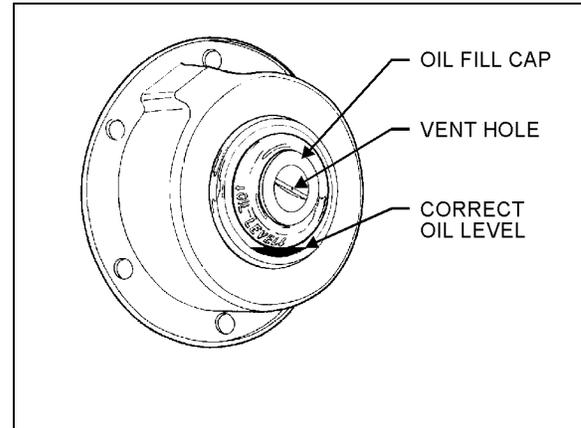


FIGURE 4: Oil Fill Cap

13003

The oil level on the tag axle wheel bearings must be maintained to the level mark in the cap. The level is determined by a line, indicated by arrows, that is incorporated to the plastic lens and passes underneath the words "OIL LEVEL" (Fig. 4). To check oil level after vehicle has been driven, wait at least 15 minutes to ensure that oil has settled.

2.2.2 Grease Lubricated Wheel Bearings

Repack the tag axle wheel bearing with multipurpose grease every 50,000 miles (80 000 km) or once a year, whichever comes first. Use a good quality lithium-base grease: NLGI No. 2 (suitable for most temperatures) or NLGI No. 1, (suitable for extremely low temperatures).

2.3 Removal and Replacement

The following procedure deals with the removal of the tag axle assembly along with the suspension components. The method used to support the axle and suspension components during removal and disassembly depends upon local conditions and available equipment.

2.3.1 Removal

1. Raise vehicle by its jacking points on the body (see Section 18, "BODY" under heading "VEHICLE JACKING POINTS"). Place jack under frame. Remove drive axle wheels (if required, refer to Section 13, "WHEELS, HUBS AND TIRES").
2. Exhaust compressed air from the air supply system by opening the drain cock on each air reservoir.
3. Install jacks under tag axle jacking points to support the axle weight.
4. Applies only to vehicles equipped with retractable tag axles: Disconnect tag axle lifting chain collars from lower longitudinal radius rods.
5. Remove the propeller shaft as directed in Section 9, "PROPELLER SHAFT", in this manual.
6. Disconnect the tag axle brake chamber hoses.

Caution: Position the hoses so they will not be damaged when removing axle.

7. Disconnect hose from the air spring upper mounting plate.
8. Remove the two shock absorbers as outlined in Section 16, "SUSPENSION", under "SHOCK ABSORBER REMOVAL".
9. Disconnect the lower longitudinal radius rods as outlined in Section 16, "SUSPENSION", under "RADIUS ROD REMOVAL".
10. Disconnect the transversal radius rod.
11. Disconnect the upper longitudinal radius rod.

12. Remove the retaining nuts of the air bellows from each of the two upper mounting plates.
13. Use the jacks to move the axle forward to clear the axle of the transmission. Lower the axle.

Caution: On vehicles equipped with an automatic transmission (with or without the output retarder), move tag assembly very carefully. Pay special attention to the U-shaped section, as the transmission end components may be easily damaged through a false maneuver.

2.3.2 Replacement

Reverse removal procedure to reinstall tag axle.

Note: Refer to Section 16, "SUSPENSION", for proper torque tightening of suspension components.

Note: Refer to section 13 "WHEELS HUBS AND TIRES" for correct wheel bearing adjustment procedure.

2.4 Tag Axle Alignment & Toe

2.4.1 Description

The tag axle alignment consists in aligning the tag axle parallel to the drive axle position. Before aligning the tag axle, proceed with the drive axle alignment (paragraph 1.10). Tag axle alignment is achieved with the use of shims inserted between the lower longitudinal radius rod supports and axle. Tag axle alignment is factory set and is not subject to any change, except if vehicle has been damaged by an accident or if there are requirements for parts replacement.

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Note: *It may be necessary to adjust the axle TOE as well as its alignment. In this case, insert shims (7 min. - P/N 121203 or 15 min. - P/N 121240) in between mounting plate and spindle, as required.*

Caution: *If this setting is altered significantly, it will cause excessive tire wear.*

If axle has been removed for repair or servicing and if all parts are reinstalled exactly in their previous locations, axle alignment is not necessary. However, if the suspension supports have been replaced or have changed position, proceed with the following instructions to verify or adjust the tag axle alignment.

2.4.2 Procedure

1. Park the vehicle on a level surface. Unload tag axle (or lift, if so equipped) using the appropriate control (refer to the "OPERATOR'S MANUAL" for details). Chock front vehicle wheels.
2. Using two jacking points (which are at least 30 inches [76 cm] apart) on drive axle, raise vehicle sufficiently so that wheels are raised about ½ inch from ground and secure in this position with safety stands.
3. Using jacking points on tag axle, raise axle sufficiently (no more than ½ inch from the ground) to turn tag axle wheels freely.
4. Using an optical toe & tracking system installed on each side of the drive axle, fix and position the projector in center of wheel. Measure the distance on each side of the projector mounting rods. The distance should be equal on both sides. If not, adjust the projector.

5. Install a mirror on each side of vehicle, against the front wall of the rear baggage compartment (Fig. 5).
6. Connect the projector and set it to zero. Rotate the wheel and set projectors to zero at four (4) opposite positions.

Note: *It is important to have a zero marking when rotating the wheel in order to eliminate wheel run-out.*

7. Aim the projector at the mirror, and adjust the mirror to reflect the beam light reflection exactly on the zero position of the projector centering plate.
 8. Move the optical toe and tracking system installed on each side of the drive axle to the tag axle.
 9. Aim the projector on the mirror as indicated in step 7.
 10. The reflected beam of light on the centering plate of the projector should be within $0 \pm 3/64^\circ$.
 11. If necessary, correct tag axle alignment by inserting shims in between the lower longitudinal rod support and the axle or correct tag axle TOE by inserting shims in between mounting plate and spindle (on R.H or L.H. side of vehicle depending on the results obtained).
- Note:** *Refer to Section 16, "SUSPENSION", for proper torque tightening of the longitudinal radius rod support nuts.*
12. Repeat steps 4 to 10 to ensure that axle is truly parallel to the drive axle.

3. SPECIFICATIONS

Drive Axle

Make Rockwell International
 Drive track..... 76.7 inches (1 949 mm)
 Gear type Hypoid
 Axle type Full floating
 Lube capacity.....41 pints (19,3 liters)

Drive axle ratio

w/11.1L - PS130-6B and w/12.7L - PS145-7A
 Standard 3.21:1
 Optional..... 3.07:1

World Transmission

Coaches..... 4.88:1
 Shells 4.56:1

Drive Axle Alignment Specifications

XL-40 5/8" Max.
 XL-45E 5/8" Max.
 XL-45 9/16" Max.

Tag Axle

Axle Beam Manufacturer Prévost
 Hub Manufacturer Rockwell - Disc Brake 1560
 Rear Track 83.6" (2 124 mm)

Tag Axle Alignment Specifications

TOE - All XL Vehicles (Both Sides)

Minimal -3/64"
 Nominal 0
 Maximal +3/64"
 Installation Mirrors

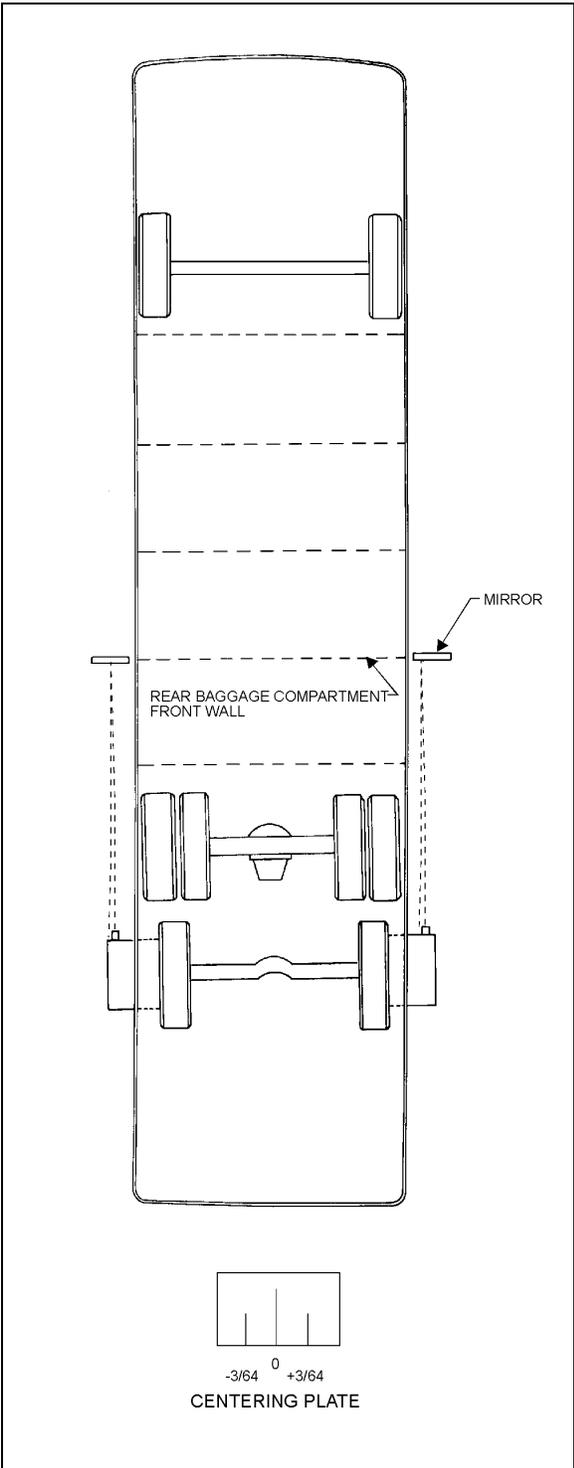


FIGURE 5: TAG AXLE ALIGNMENT 11009XL