Threaded Fastener Types

The majority of threaded fasteners used throughout the vehicle have U.S. customary threads (diameter and pitch are measured in inches). See **Fig. 1**. However, the engine and some items attached to the cab use metric fasteners (diameter and pitch are measured in millimeters).

Most threaded fasteners used on the vehicle that are 1/2-inch diameter or larger are plain hex-type fasteners (non-flanged); *all* metric fasteners are non-flanged. Special hardened flatwashers are used under the bolt head, and between the part being attached and the hexnut, to distribute the load, and to prevent localized overstressing of the parts. The washers are cadmium- or zinc-plated, and have a hardness rating of 38 to 45 HRC.

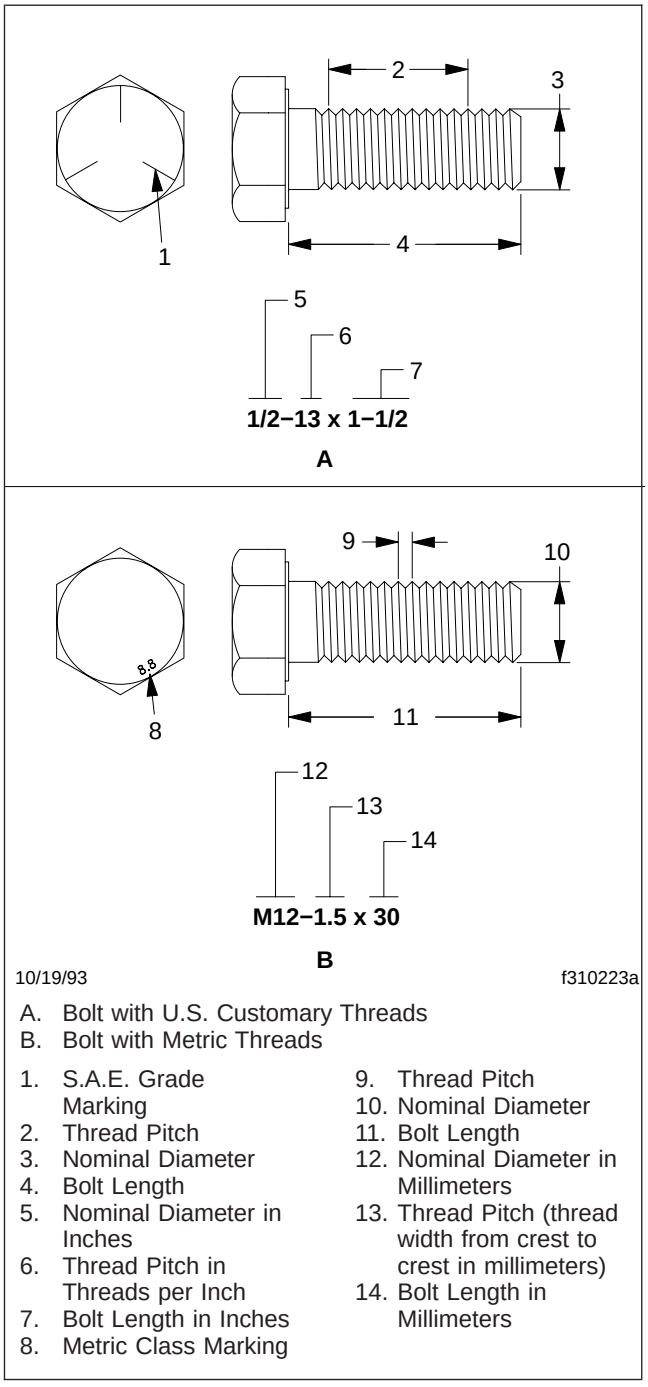
Some fasteners smaller than 1/2-inch diameter are flanged fasteners, which have integral flanges that fit against the parts being fastened. The flanges eliminate the need for washers.

NOTE: The standard fasteners used to assemble the vehicle frame and to attach components to the vehicle frame are threaded lockbolts (Spin Hucks). These fasteners are covered in **Section 31.00**.

Fastener Grades and Classes

Fasteners with U.S. customary threads are divided into grades established by the Society of Automotive Engineers (S.A.E.) or the International Fastener Institute (I.F.I.). The fastener grades indicate the relative strength of the fastener; the higher the number (or letter), the stronger the fastener. Bolt (capscrew) grades can be identified by the number and pattern of radial lines forged on the bolt head. See **Fig. 2**. Hexnut (and locknut) grades can be identified by the number and pattern of lines and dots on various surfaces of the nut. See **Fig. 3**. Nearly all of the bolts used on the vehicle are grades 5, 8, and 8.2. Matching grades of hexnuts are always used: grade 5 or grade B hexnuts are used with grade 5 bolts; grade 8, grade C, or grade G (flanged) hexnuts are used with grade 8 or 8.2 bolts.

Fasteners with metric threads are divided into classes adopted by the American National Standards Institute (ANSI). The higher the class number, the stronger the fastener. Bolt classes can be identified by the numbers forged on the head of the bolt. See **Fig. 4**. Hexnut (and locknut) classes can be identified by the marks or numbers on various surfaces of the



A. Bolt with U.S. Customary Threads
B. Bolt with Metric Threads

1. S.A.E. Grade Marking
2. Thread Pitch
3. Nominal Diameter
4. Bolt Length
5. Nominal Diameter in Inches
6. Thread Pitch in Threads per Inch
7. Bolt Length in Inches
8. Metric Class Marking
9. Thread Pitch
10. Nominal Diameter
11. Bolt Length
12. Nominal Diameter in Millimeters
13. Thread Pitch (thread width from crest to crest in millimeters)
14. Bolt Length in Millimeters

Fig. 1, Fastener Size and Thread Identification

Clutch Removal

Fig. 3. An old transmission input shaft may be used for this purpose.

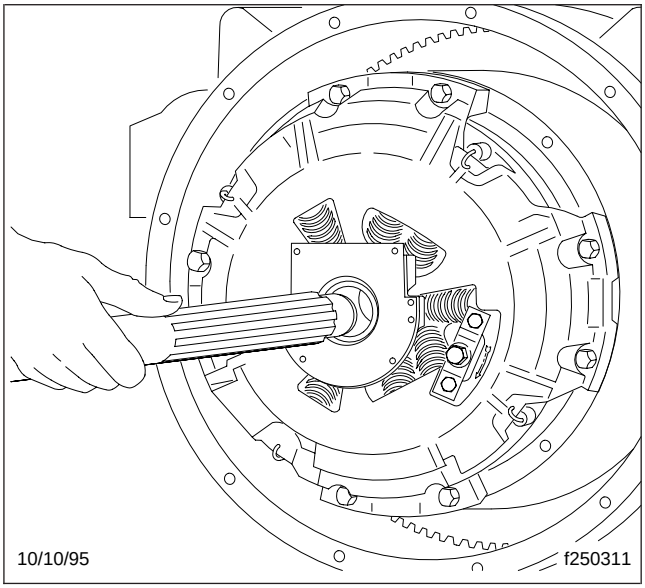


Fig. 3, Installing a Spline Aligning Tool

NOTE: Shipping bolts are installed on the clutch cover prior to removal to prevent the clutch adjustment mechanism from unloading.

5. Cage the pressure plate, as follows.

   For a 14-inch clutch, install four 3/8–16 x 1-1/4 shipping bolts (if available) or hexhead machine screws into the four clutch cover holes, and tighten them finger-tight plus one full turn.

   For a 15.5-inch clutch, install four 7/16–14 x 1-3/4 shipping bolts (if available) or hexhead machine screws into the four clutch cover holes, and tighten them finger-tight plus one full turn.

   These bolts will cage the pressure plate, preventing the four plate spacers from moving out of position when the clutch is removed from the flywheel. See **Fig. 4**.

6. Progressively loosen each of the mounting capscrews in the pattern shown in **Fig. 5**. This will prevent warping or bending within the clutch, and will ease removal of the clutch mounting capscrews.

7. Remove the two top mounting capscrews from the cover assembly, and install two guide studs in the open holes to help support the clutch assembly during removal. See **Fig. 6**. *For a 14-inch clutch*, use 3/8–16 x 3 guide studs. *For a 15.5-inch clutch*, use 7/16–14 x 5 guide studs.

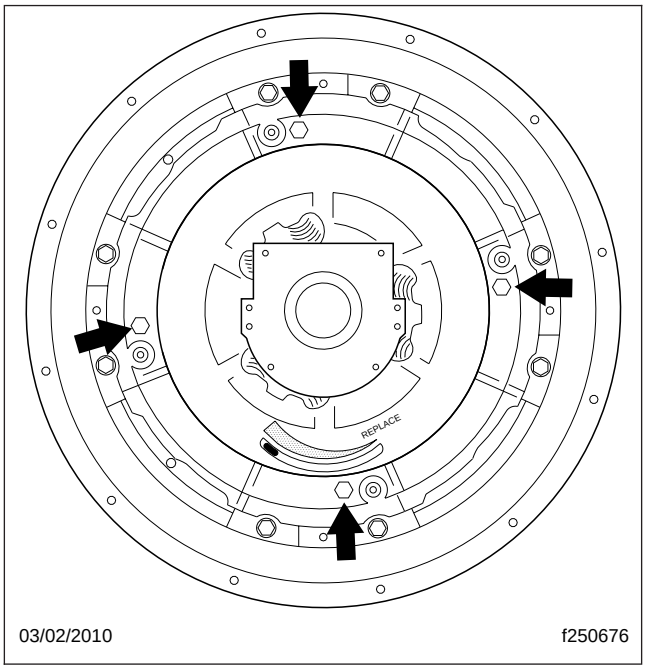


Fig. 4, Installed Shipping Bolts

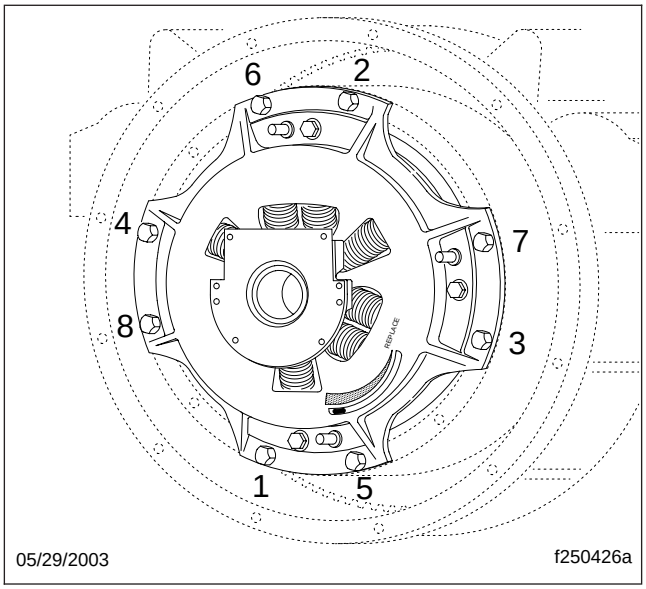


Fig. 5, Loosening Sequence

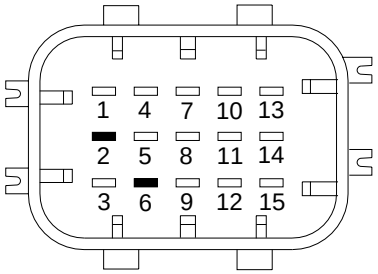
PID 60, FMI 14—The Rail Position Sensor Gives Incorrect Resistance Readings		
Failure Reason: • The resistance values broadcast on the datalink are not plausible. • There is a defect in the wiring. • There is a defect in the rail position sensor. • There is a defect in the TCU.		 07/16/2004 f544484g
Problem	**Procedure**	**Action**
Pins on the X2 connector or the rail position sensor connector are not making good contact.	Do the "Harness Visual Check, Rail Position Sensor."	If the connectors and/or pins are damaged, soiled, worn, broken, or corroded, replace the damaged components.
		If all connectors and pins are OK, go to the next row in the table.
The rail position sensor is not providing the correct resistance data.	Disconnect the rail position sensor wiring. Check for resistance between pins 1 and 2 of the sensor connector.	Contact Mercedes-Benz Transmissions Service Support with the resistance values, AGS codes, and results of the electrical pre-test. NOTE: One hour of troubleshooting time is alloted for printing the AGS codes and completing the electrical pre-test. 1. Using ServiceLink, print the AGS codes (130). 2. Complete the electrical pre-test result sheet in **Subject 301**. 3. With the results, contact Mercedes-Benz Transmissions Service Support by fax (503.961.8435), email (MBTServiceSupport@Freightliner.com), or phone (503.745.4965 or 503.745.4988).

Table 5, The Rail Position Sensor Gives Incorrect Resistance Readings

Harness Visual Check, Rail Position Sensor

1. Remove the X2 female connector from the TCU. Check the plugs on the connector. If any plug(s) in the connector is damaged, soiled, worn, broken, or corroded, replace the connector. If no female connectors are available, replace the transmission wiring harness. See **Subject 180** for procedures.
2. Check the pins on the X2 male connector. If any pin(s) on the connector is damaged, soiled, worn, broken, or corroded, replace the TCU. See **Subject 110** for procedures.
3. Remove the female connector from the rail position sensor. If any plug(s) in the connector is damaged, soiled, worn, broken, or corroded, replace the connector. If no female connectors are available, replace the transmission wiring harness. See **Subject 180** for procedures.
4. Check the pins on the male connector of the rail position sensor. If any pin(s) on the connector is damaged, soiled, worn, broken, or corroded, replace the x-y actuator assembly. See **Subject 170** for procedures.

General Information

The Fontaine 6000 series fifth wheel couples to trailers having the standard kingpin. When installed with an A36 angle mount, the fifth wheel is bracket-mounted to the tractor frame in a position that best distributes the trailer load over the tractor axles.

The Fontaine fifth wheel lock mechanism for the trailer kingpin consists of a spring-loaded jaw and a sliding wedge. Kingpin release is accomplished by pulling a manual lock control handle located on either the right side or the left side of the fifth wheel. Kingpin lockup occurs when the kingpin enters the throat of the fifth wheel, triggers the jaw and wedge to slide into place behind the kingpin, and moves the lock control handle into the locked position.

As the kingpin enters the lock mechanism, the jaw is moved first with the spring-loaded wedge sliding in place against the jaw. See **Fig. 1**. The jaw will move behind the kingpin, followed by the wedge. The wedge reinforces the jaw and automatically adjusts for slack around the kingpin.

Placing the lock control handle in the unlocked position moves the wedge and jaw out from behind the kingpin and unlocks the fifth wheel.

See Chapter 10 in the *Business Class M2 Driver's Manual* for complete operating instructions.

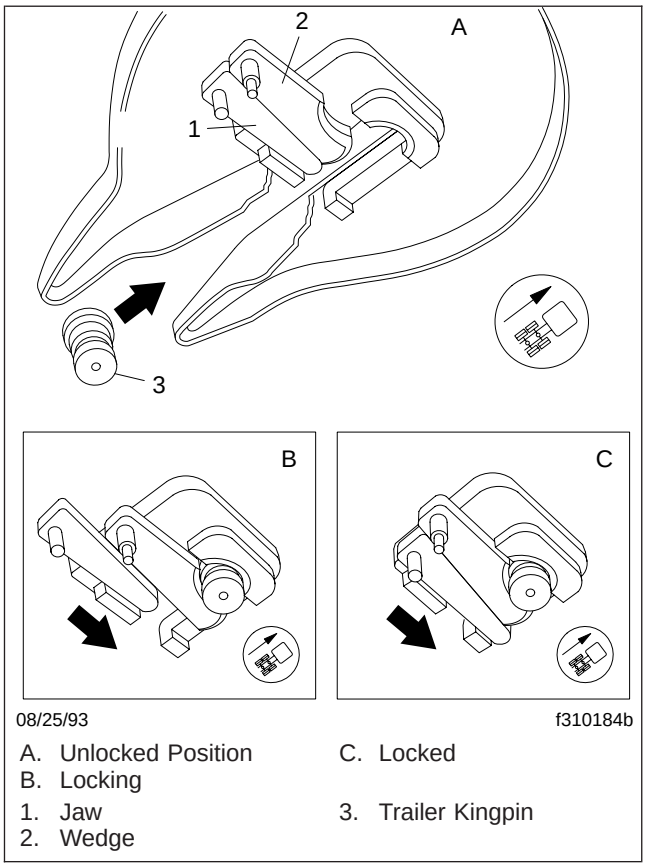
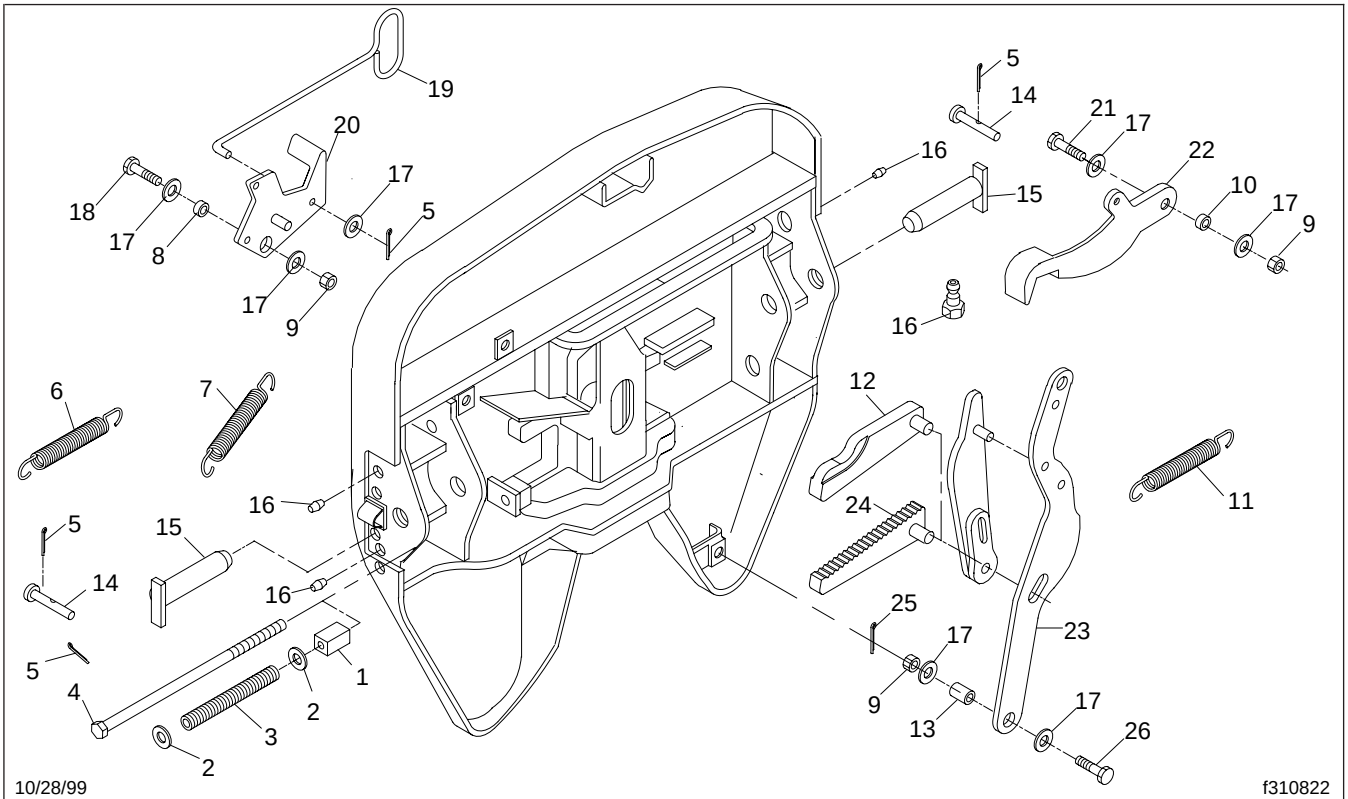


Fig. 1, Fontaine Kingpin Lock Mechanism

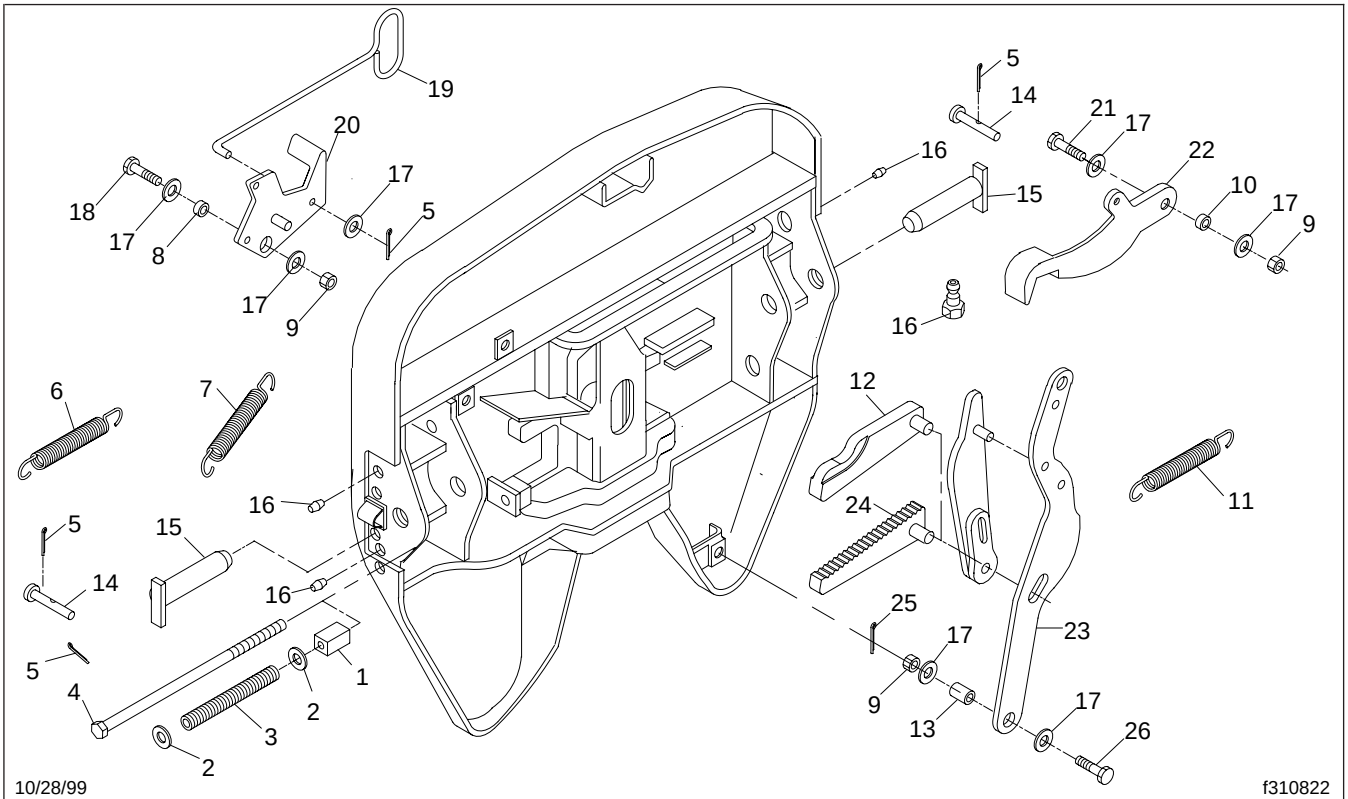
Fifth Wheel Removal and Disassembly



1. Wedge Stop Rod Nut
2. Flatwasher, 5/8-Inch
3. Wedge Stop Rod Spring
4. Wedge Stop Rod
5. Cotter Pin, 3/16 x 1-Inch
6. Bumper Spring
7. Handle Spring
8. Bushing, 7/16-Inch
9. Hex Locknut, 1/2–13, Grade B
10. Bushing, 5/16-Inch
11. Timer Spring
12. Jaw
13. Bushing
14. Bracket Retainer Pin
15. Bracket Pin
16. Grease Fitting
17. Flatwasher, 1/2-Inch
18. Hexhead Bolt, 1/2–13 x 1.5
19. Pull Handle
20. Secondary Lock
21. Hexhead Bolt, 1/2–13 x 1.75
22. Bumper
23. Operating Handle
24. Wedge
25. Hair Pin Cotter
26. Hexhead Bolt, 1/2–13 x 2.25

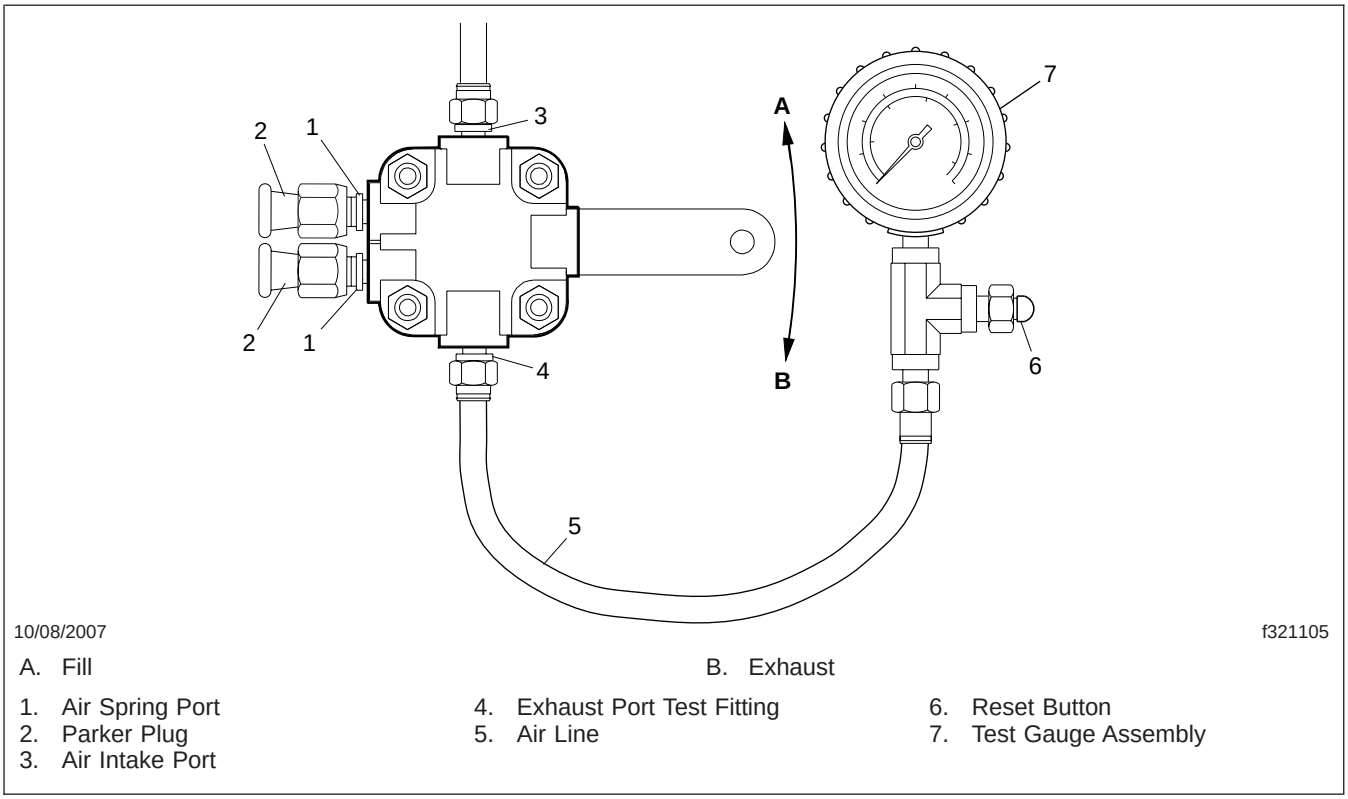
Fig. 1, Fontaine 6A36 Fifth Wheel (left-side release shown)

Fifth Wheel Assembly and Installation



1. Wedge Stop Rod Nut
2. Flatwasher, 5/8-Inch
3. Wedge Stop Rod Spring
4. Wedge Stop Rod
5. Cotter Pin, 3/16 x 1-Inch
6. Bumper Spring
7. Handle Spring
8. Bushing, 7/16-Inch
9. Hex Locknut, 1/2–13, Grade B
10. Bushing, 5/16-Inch
11. Timer Spring
12. Jaw
13. Bushing
14. Bracket Retainer Pin
15. Bracket Pin
16. Grease Fitting
17. Flatwasher, 1/2-Inch
18. Hexhead Bolt, 1/2–13 x 1.5
19. Pull Handle
20. Secondary Lock
21. Hexhead Bolt, 1/2–13 x 1.75
22. Bumper
23. Operating Handle
24. Wedge
25. Hair Pin Cotter
26. Hexhead Bolt, 1/2–13 x 2.25

Fig. 1, Fontaine 6A36 Fifth Wheel (left-side release shown)



A. Fill
B. Exhaust

1. Air Spring Port
2. Parker Plug
3. Air Intake Port
4. Exhaust Port Test Fitting
5. Air Line
6. Reset Button
7. Test Gauge Assembly

Fig. 3, Test Connections

9. Clean the surface around the exhaust port, then install the test fitting into the exhaust port. The centering pin on the fitting must align with the slot on the exhaust port. Rotate the test fitting 45 degrees clockwise to lock it in place; see **Fig. 3**.

NOTE: It may be necessary to cut the tie straps that hold the chassis wiring running below the height-control valve, in order to access the exhaust port.

10. Connect one end of the air hose from the kit to the test connector on the exhaust port, and the other end to the test gauge.
11. Check the height-control valve in the fill mode, as follows.
    - 11.1 Rotate the valve control lever up 45 degrees from the horizontal to the fill position.
    - 11.2 Press the reset button on the test gauge.
    - 11.3 Observe the test gauge for 30 seconds. Refer to **Fig. 4** for the maximum allowable exhaust pressure change versus inlet pressure.

      The valve is not working correctly if the gauge pressure reading exceeds the maximum allowable within 30 seconds.

      If the gauge reads less than the maximum allowable pressure change in 30 seconds, the valve is okay.

NOTE: The test gauge will register the exhausting air. *This does not indicate a defective valve.*

12. Check the height-control valve in the exhaust mode, as follows.
    - 12.1 Rotate the valve control lever down 45 degrees from the horizontal to the exhaust position.
    - 12.2 Press the reset button on the test gauge.
    - 12.3 Observe the test gauge for 30 seconds. Refer to **Fig. 4** for the maximum allowable

Equalizer Beam Rubber Center Bushing Removal and Installation

Removal

NOTE: If using Owatonna tools, it is not necessary to remove the equalizer beam to remove or install the rubber center bushing.

1. Chock the front tires.
2. Raise the rear of the vehicle so that all weight is removed from the suspension. Block the axles and the frame with safety stands. Make sure the stands will securely support the weight of the axles and the frame.

NOTE: Do not raise the vehicle to the point where the weight of the suspension and axles hangs from the vehicle.

3. Remove the saddle cap nuts and washers from each side of the vehicle, and remove the saddle caps.
4. Raise the rear of the truck frame until the saddle studs clear the equalizer beam. Install safety stands under the frame.
5. Using a 2-1/2 inch diameter hole saw (see **Fig. 1**), cut out the end plug from the center bushing on each side of the suspension, and remove the crosstube.

⚠ CAUTION

Do not use a cutting torch to burn out the end plugs. The equalizer beams are heat-treated, and the use of a cutting torch could weaken the beam.

6. On the inboard side of the equalizer beam, inspect the exposed edge of the bushing's outer sleeve.
7. Chisel or grind off any portion of the outer sleeve that has flared over the surface of the equalizer beam.
8. If using Owatonna tools, remove the rubber center bushings as follows (see **Fig. 2**):

   8.1 Position the hydraulic ram and slide the pulling screw through the center bushing.

   8.2 Install the center bushing removing adapter on the inboard side of the beam eye.

   IMPORTANT: Align the receiving tube so that the bushing will clear the edges of the tube when force is exerted against the beam. Align the removing adapter so that force is exerted only on the bushing to ensure a clean pull through the beam.

   8.3 Install the hexnut on the pulling screw. Full thread engagement is needed.

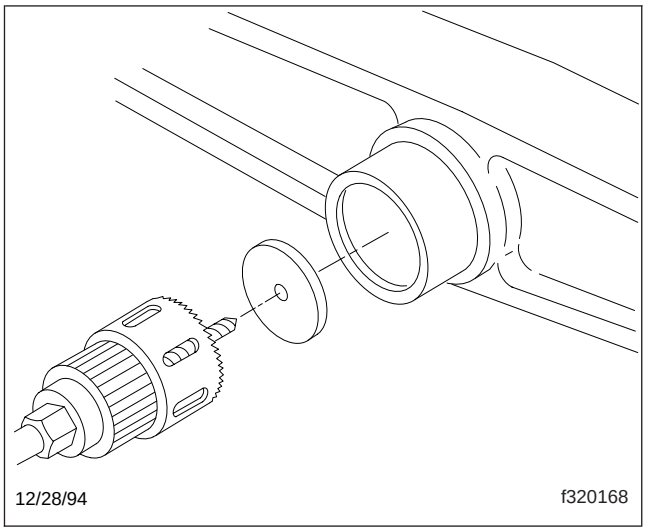
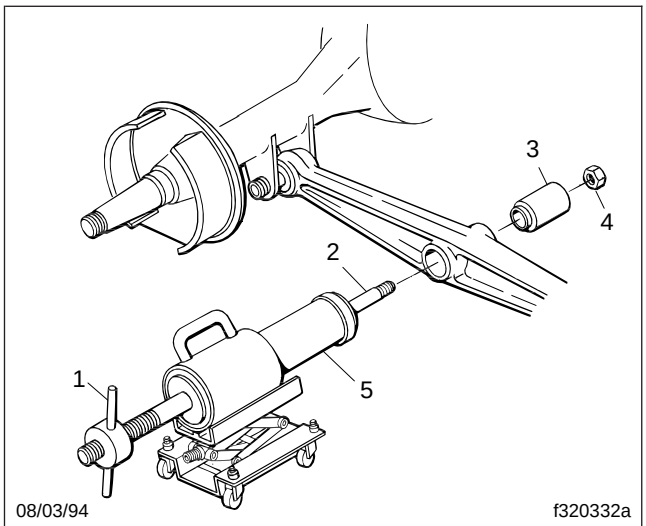


Fig. 1, Removing the End Plug



1. Speed Nut
2. Pulling Screw
3. Removing Adapter
4. Hexnut
5. Receiving Tube

Fig. 2, Removal of the Rubber Center Bushing

Steering Knuckle Disassembly and Assembly

Disassembly

NOTE: The following procedures can be done with the axle installed on the vehicle or with the axle removed from the vehicle.

1. If the axle has been removed, make sure it is securely mounted on a suitable stand. Go to the step for removing the tie rod from the tie-rod arm.

   If the axle is on the vehicle, park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the rear tires. Drain the air system.

2. If the axle is on the vehicle, do the following substeps to gain access to the steering knuckle:

   2.1 Remove the wheel and tire assembly from the applicable side of the vehicle.

   2.2 Remove the hub and brake drum. For instructions, see **Section 33.01**.

   2.3 Remove the brake shoes. For instructions, see the applicable section in **Group 42**.

   2.4 If so equipped, remove the ABS sensor and wiring from the brake anchor plates and secure the sensor and the wiring out of the way.

   2.5 Disconnect the air line from the brake air chamber, then remove the air chamber and the slack adjusters. For instructions, see the applicable section in **Group 42**.

   2.6 Disconnect the drag link from the steering arm, if present.

   NOTE: On the driver's side of the vehicle, the steering arm connects to the steering knuckle. On the passenger's side, no steering arm is present.

3. If not already done, disconnect the tie rod from the tie-rod arm.
4. Remove the tie-rod arm from the steering knuckle. See **Fig. 1**.
5. If applicable, remove the steering arm. See **Fig. 1**.
6. Remove the steering knuckle and spindle assembly from the axle beam. See **Fig. 1**.

   6.1 Remove the upper and lower snap rings that hold the cover plates in place. See **Fig. 1**.

   6.2 Remove the upper and lower cover plates from the steering knuckle.

   6.3 Remove and discard the O-ring from the edges of each cover plate.

   6.4 Note the orientation of the draw keys and the kingpin, then remove the draw keys and nuts that hold the kingpin in place.

   6.5 Using a brass drift, remove the kingpin by driving it downward. Make a note of where the needle bearings were installed.

   6.6 Remove the spacer(s) and shim(s) from the upper surface of the axle beam bore.

   6.7 Push down on the steering knuckle and spindle assembly to clear the lip on the thrust friction bearing and remove the assembly from the axle beam bore.

NOTE: The steering knuckle on the passenger's side (side without a steering arm) has a thrust roller bearing instead of a thrust friction bearing. Unlike the thrust friction bearing, the thrust roller bearing has no protruding lip at the top. When removing the thrust roller bearing from the axle beam bore, it is not necessary to push down on the steering knuckle.

7. Remove the grease seal from the upper steering-knuckle bore.
8. Remove the thrust friction bearing (driver's side) or the thrust roller bearing (passenger's side) from the top of the lower steering knuckle bore.

NOTE: If removing the thrust friction bearing (driver's side), note the orientation of the bearing for future reference.

9. Using a brass drift, drive out the needle bearings from the steering knuckle bores.
10. If needed, repeat the entire procedure for the other side of the axle assembly.

Assembly

IMPORTANT: If replacing the kingpin, use a complete rebuild kit with all new components.

use a midship bearing, mounted on a frame crossmember, for additional support. See **Fig. 2**, example D. This allows the No. 2 driveline to be separated into two, shorter shafts (a coupling shaft and a No. 2 driveshaft), thus improving balance and stability.

Vehicles having an even longer wheelbase use two crossmember-mounted midship bearings, allowing the No. 2 driveline to be separated into three short shafts, joined by four U-joints. See **Fig. 2**, example E. The first shaft is the primary coupling shaft, the second is the intermediate coupling shaft, and the third is the No. 2 driveshaft.

Slip-Joints, U-Joints, and Yokes

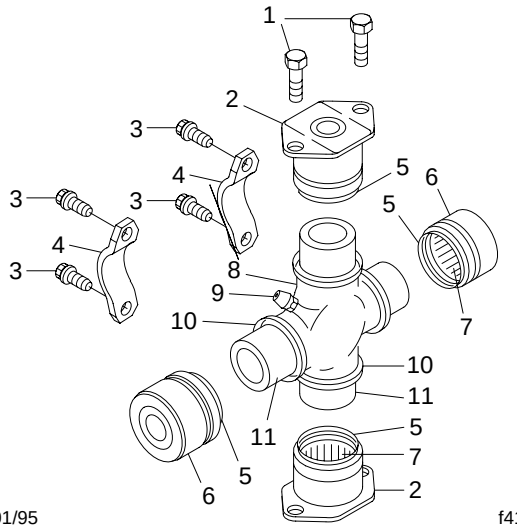
The basic function of the driveline is to send torque from the transmission to the axle in a smooth and continuous action. Because the vehicle axles are not attached directly to the frame, but are suspended by springs, they ride in an irregular, floating motion (when going over bumps or depressions), thus changing the distance between the transmission (or coupling shaft) and the rear axle, and the distance between the rear axles. The slip-joints of the No. 2 and No. 3 driveshafts, by expanding and contracting, allow for length changes between drivetrain components. Coupling shafts do not require a slip-joint.

Motion of the rear axle(s) also causes changes to the relative angles between drivetrain components. U-joints allow transfer of torque from an output shaft (or coupling shaft) to the driveshaft, and from the driveshaft to an input shaft, even though the angles between the shafts may be constantly changing.

Each U-joint consists of a cross with a close-tolerance ground cylindrical surface (trunnion) at the end of each of the four arms. Installed on each trunnion is a bearing cup lined with bearing needles. All bearing cups are sealed to retain lubricants, and to prevent entry of foreign material. See **Fig. 3**. In operation, the four bearing cups are held stationary in a pair of yokes, while the U-joint cross pivots on its trunnions.

Full-round yokes are installed at the front of coupling shafts and at both ends of the No. 2 and No. 3 driveshafts. All tube-yokes (yokes that are welded into driveshaft tubes) and all sleeve-yokes (yokes that are part of the internally splined half of slip-joints) are full-round yokes. See **Fig. 4**, items 4 and 9.

An end-yoke is an internally splined yoke, held on an externally splined shaft by a locknut. As standard



1. Bearing-Plate Capscrews
2. Bearing Cup (for full-round yoke)
3. Bearing-Strap Capscrew
4. Bearing Strap
5. Bearing-Cup Seal
6. Bearing Cup (for half-round yoke)
7. Bearing Needles
8. U-Joint Cross
9. Grease Fitting
10. U-Joint Cross Slinger
11. Trunnion

Fig. 3, Typical U-Joint

equipment, all No. 2 driveline end-yokes are half-round, with full-round optional. And, as standard equipment, all No. 3 driveline end-yokes are full-round, with half-round optional. End-yokes are installed on the transmission output shaft, on each axle input and output shaft, and behind the midship bearing of most coupling shafts. See **Fig. 4**, items 2, 7, 12, and 14.

Meritor 17T and 18T U-joints are coupled to half-round end-yokes by capscrews inserted through semicircular bearing straps that hold the bearing cups in place under tabs in the yoke cross-holes. See **Fig. 5**.

Meritor RPL Series U-joints are coupled to half-round end-yokes by capscrews inserted through the bearing cups. See **Fig. 6**.

U-joints are installed in full-round tube-yokes, sleeve-yokes, and end-yokes, by inserting the cross through from the inside of both yoke cross-holes, then install-

ABS Tone Ring Installation on Service Hubs

Installation

IMPORTANT: Some ABS service hubs do not have a tone (tooth) ring installed on the hub. The tone ring must be ordered separately and installed on the hub before installation of the hub onto the axle. Tone rings are made of a special material and require a specific installation procedure for proper installation.

⚠ WARNING

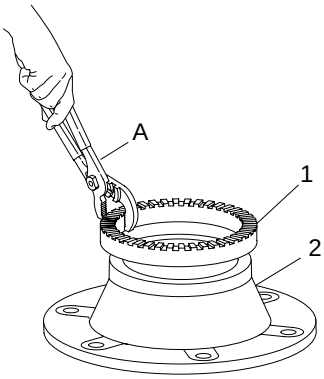
When installing an ABS system, special ABS hubs must be ordered. Machining older hubs to accommodate the installation of tone rings can cause problems due to insufficient hub bore wall thickness. Machining an older hub with insufficient hub bore wall thickness could result in cracking, causing bearing damage and wheel loss. This could cause an accident resulting in personal injury and property damage.

1. Submerge the tone ring in boiling water or place it in an oven at 250°F (121°C) for approximately 15 minutes.

⚠ CAUTION

Do not attempt to heat the tone ring with a torch as this can damage the ring.

2. Using pliers, remove the tone ring from the boiling water or oven and center it on the machined area of the hub bore. See **Fig. 1**.
3. While the tone ring is still hot, make sure it is properly centered on the machined surface. Using a rubber mallet, tap the tone ring until it bottoms out around the machined surface on the hub. See **Fig. 2**.
4. Install the hub on the axle. Place a dial indicator with a magnetic base so the dial indicator is against the tone-ring teeth. See **Fig. 3**.
5. Rotate the hub and check the ring for runout. The runout should be less than 0.005 inch (0.13 mm). See **Fig. 4**.
6. Install the wheel. For instructions, see **Group 40**.



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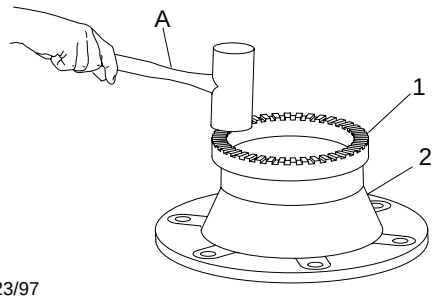
A. Use pliers to apply the ring.
1. Tone Ring 2. Hub

Fig. 1, Install the Ring on the Hub



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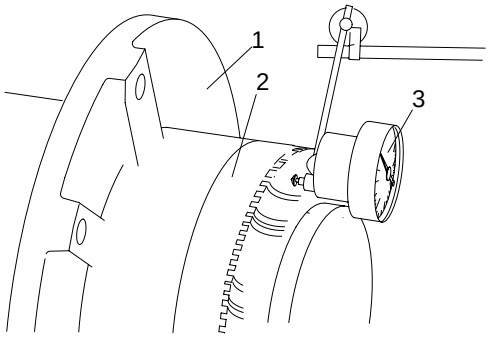
A. Use a rubber mallet.
1. Tone Ring 2. Hub

Fig. 2, Tap the Tone Ring



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1. Hub 3. Dial Indicator
2. Tone Ring

Fig. 3, Position the Dial Indicator

General Information

WARNING

Before testing a vehicle equipped with Automatic Traction Control (ATC) on a dynamometer, the ATC system must be disabled. See Subject 160 for instructions. Activation of the vehicle ATC on a dynamometer will cause unequal drive-wheel torque that can result in loss of vehicle control and personal injury or death.

Before testing a wheel speed sensor, modulator valve, or ATC valve, make sure the supply voltage to the antilock braking system (ABS) electronic control unit (ECU) is sufficient (see "ECU Supply Voltage Test") and check for leaks in the ABS pneumatic system.

The sensor and valve resistance tests are given in two steps. First, disconnect the applicable cable from the ECU and measure the resistance across the terminals in the cable connector. If the resistance is within the specified range, both the cable and the sensor or valve are good.

Next, if the resistance reading is not acceptable, disconnect the cable from the sensor or valve and measure the resistance across the sensor or valve terminals. This two-step procedure quickly determines whether the problem is in the cable or the component.

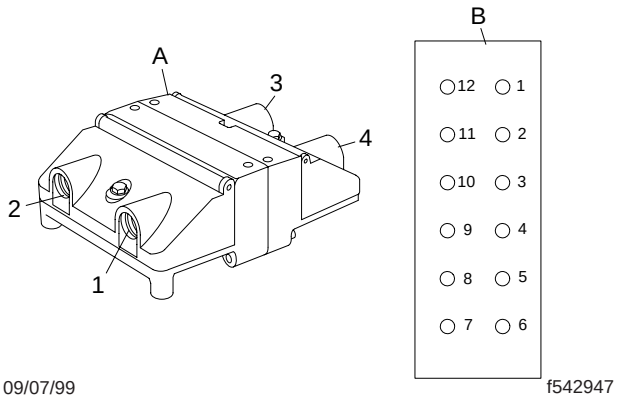
NOTE: The valve circuits and wheel sensors can be tested by Meritor PC diagnostics. If PC diagnostics indicate a problem, test the individual component to determine whether the component or the wiring has failed.

Wire Numbers and Connector Pin Locations

CAUTION

The ignition switch must be off when connecting or disconnecting connectors from the ECU. Power applied to the ECU during connector installation or removal could damage the pins.

The WABCO E-Version, frame-mounted ECU has several multi-pin connectors that must be disconnected to test the wheel speed sensors, modulator valves, or ATC valve. To disconnect the electrical connectors from the ABS ECU, remove the capscrews and lift the covers. See **Fig. 1** to identify the pin locations on the ECU connector. **Table 1** provides the wire numbers and circuit descriptions for testing the ABS/ATC components.



A. Frame-mounted ECU.
B. ECU connector pin locations.
1. X1 Connector (gray)
2. X2 Connector (black)
3. X3 Connector (green)
4. X4 Connector (not used)

Fig. 1, Frame-Mounted ECU and Pin Locations

ECU Supply Voltage Test

Use Meritor WABCO PC Diagnostics system to check the supply voltage to the ABS ECU. If the PC Diagnostics is not available, use the following procedure to check the voltage.

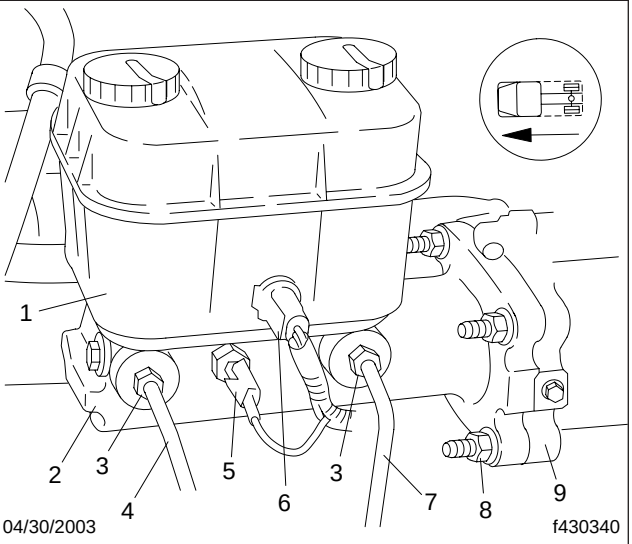
1. Park the vehicle on a level surface, set the parking brake, shut down the engine, and chock the rear tires.
2. Disconnect the X1 (gray) connector at the ABS ECU.
3. Turn the ignition switch on.
4. Connect a voltmeter between pin 1 and a good chassis ground. The voltmeter must indicate 9.5 to 14 volts.
5. Connect a voltmeter between pin 2 and a good chassis ground. The voltmeter must indicate 9.5 to 14 volts.

Removal

⚠ WARNING

Before starting the procedure below, read the information in Safety Precautions 100. Exposure to brake fluid could cause serious, permanent health damage. Take precautions against exposing yourself to it.

1. Park the vehicle on a level surface and set the parking brake. Shut down the engine. Chock the rear tires.
2. Open the hood.
3. Disconnect the wires from the pressure differential switch on the master cylinder body and the fluid level sensor on the reservoir. See **Fig. 1**.



1. Reservoir
2. Master Cylinder Housing
3. Brake Line Tube Nuts
4. Secondary Subsystem Brake Line
5. Pressure Differential Switch
6. Fluid Level Sensor
7. Primary Subsystem Brake Line
8. Flanged Hexnut
9. Power Brake Booster Mounting Flange

Fig. 1, Master Cylinder Assembly

⚠ CAUTION

Do not let the brake fluid get on any painted surface; it will quickly damage the paint. Wrap a rag around the fitting you are working on, or put a container underneath it to catch any fluid leaking as it is disconnected.

4. Disconnect the brake lines from the outlet ports of the master cylinder. See **Fig. 2**. Plug the brake lines to prevent contamination and leakage.
5. Remove the four flanged hexnuts that attach the master cylinder to the power brake booster unit. See **Fig. 3**.

   Remove the master cylinder from the vehicle. See **Fig. 4**. Keep it upright with a rag wrapped around it so you do not drip any brake fluid.

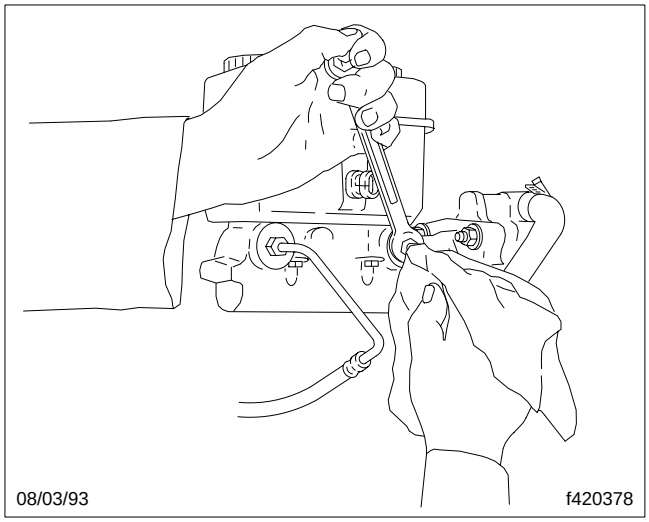


Fig. 2, Brake Lines

6. Remove the caps from the master cylinder reservoir, then carefully turn it over and dump the brake fluid into a container. Dispose of used brake fluid in a responsible and approved manner.

Installation

1. Bench bleed the master cylinder.
   - 1.1 Put the master cylinder and reservoir assembly in a vise.
   - 1.2 Install the plastic adapter and clear tubing on the master cylinder outlet ports, as shown in **Fig. 5**.

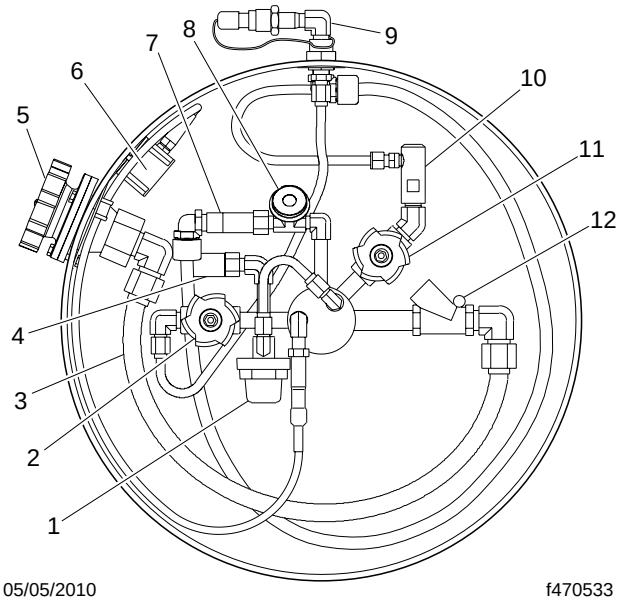
Replacement

WARNING

Liquefied natural gas (LNG) vapors are highly flammable. Refer to the safety precautions listed in Subject 100 before servicing the vehicle. Failure to observe these precautions could lead to ignition of the natural gas, which could cause bodily injury, death, or severe property damage.

Additional fuel system component repair, replacement, and troubleshooting information can be obtained from the fuel system manufacturer's website: **www.nexgenfueling.com**.

1. Shut down the engine and apply the parking brake.
2. De-fuel the LNG tank. See **Subject 110** for more information.
3. Once all fuel has been removed from the LNG tank, close the fuel shutoff and vapor shutoff valves.
4. Shut down all vehicle electrical systems.
5. Carefully remove the U-tube attached to the economizer and the tank knuckle. See **Fig. 1**.
6. Ensuring no threads are damaged, carefully remove the elbow fitting from the economizer.
7. Remove and discard the economizer.
8. When installing a new economizer, it is necessary to clean the internal economizer threads to prevent metal shavings and debris from collecting in the valve seat once installed.
   - 8.1 Counting each turn, thread the economizer onto the nipple fitting.
   - 8.2 Unscrew the economizer from the nipple fitting. Using compressed nitrogen or a wire brush, remove all metal shavings and debris from the external nipple threads and the internal economizer threads.
   - 8.3 Repeat the above two substeps until no shavings or debris are found in the economizer, always using the same number of full turns for each installation.



1. Economizer
2. Vapor Shutoff Valve
3. Fuel Fill Hose
4. Secondary Relief Valve (red cap)
5. Fuel Fill Fitting
6. Fuel Level Sender Box
7. Primary Relief Valve
8. Tank Pressure Gauge
9. Fill Vent Fitting
10. Excess Flow Valve
11. Fuel Shutoff Valve (liquid)
12. Fill Check Valve

Fig. 1, Fuel Tank Plumbing Components

9. Remove the economizer again, then thoroughly clean the threads on the nipple fitting and the economizer with compressed nitrogen or a wire brush.

IMPORTANT: Use nickel tape on all non-compression fittings. See the following section, **Nickel Tape Application**, for more information on using and applying nickel-impregnated or nickel-coated tape.

10. Apply nickel tape to the exposed nipple fitting threads, then install the economizer on the nipple fitting. Tighten the economizer one full turn beyond hand-tight.
11. Using compressed nitrogen or a wire brush, remove any dirt and debris from the elbow fitting threads, then apply nickel tape to the exposed fitting threads.
12. Install the elbow fitting on the economizer. Tighten the elbow fitting three turns beyond

Wiring Schematics

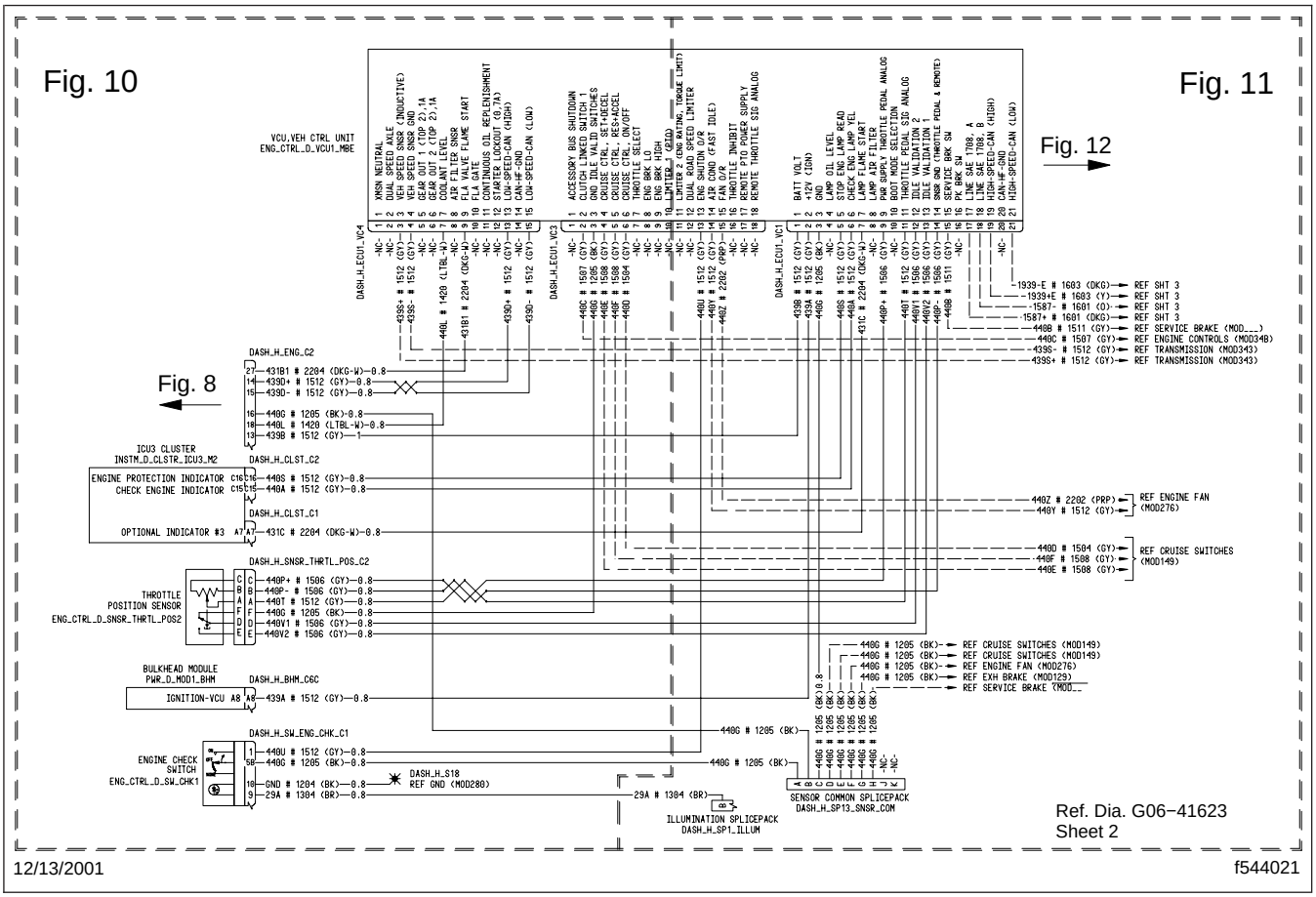


Fig. 9, MBE900 Cab Wiring Schematic, Manual Transmission