Engine

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Engine

Safety

The purpose of this safety summary is twofold. First, it is to help ensure the safety and health of personnel performing maintenance on, or operation of, the Blue Bird All American Series bus. Second, it is to help protect equipment used in maintaining and operating the All American bus.

Warnings

Warnings apply to a procedure or practice that, if not correctly adhered to, could result in injury or death. Particular attention should be paid to sections of this manual where warnings appear.

Cautions

Cautions apply to a procedure or practice that, if not correctly adhered to, could result in damage to or destruction of equipment.

Notes

Notes are used to explain, clarify or otherwise give additional insight for a given subject, product or procedure. Please note that on occasion, notes may also advise of potential hazards.

Introduction

These procedures were documented using a Blue Bird All American bus with a Cummins ISB engine and an Allison AT 545 transmission. Vehicles with other engines or transmissions will use similar or identical procedures. For variations, refer to the appropriate installation drawing.

Because of options and other variations, not all vehicles will have the same components described in this procedure. These procedures are generic for connections, fittings, lines and other parts.

Tools Required

- General mechanic tools, consisting of common hand tools
- Engine jack or dolly to lower and manipulate the engine at removal and installation
- Recovery equipment for engine oil, transmission fluid, hydraulic fluid and antifreeze

Note

The engine jack or dolly must be strong enough to take the weight of the engine and transmission, as a unit.

Warning

Use the parking brake. Use wheel chocks at the rear wheel. Make sure the vehicle is stable before moving under the vehicle.

Preparatory Work

1. Park the vehicle on a level surface. Once the vehicle is parked, set the parking brake and chock the rear wheels. (Much of the under vehicle work would be made easier through the use of a sufficient lift.)
2. Disconnect the battery.

Warning

Hydraulic fluid, fuel and transmission oil is flammable and toxic to the skin, eyes and respiratory tract. Skin and eye protection is required. Avoid repeated or prolonged contact. Drain fluid in a well-ventilated area.

3. Drain antifreeze, engine oil and transmission fluid into appropriate recovery containers.

Hood, Bumper and Grill Removal

1. Open hood by pressing the release hatch button located on top. See **Figure 1—Hood Removal.** Lift open engine access hood.

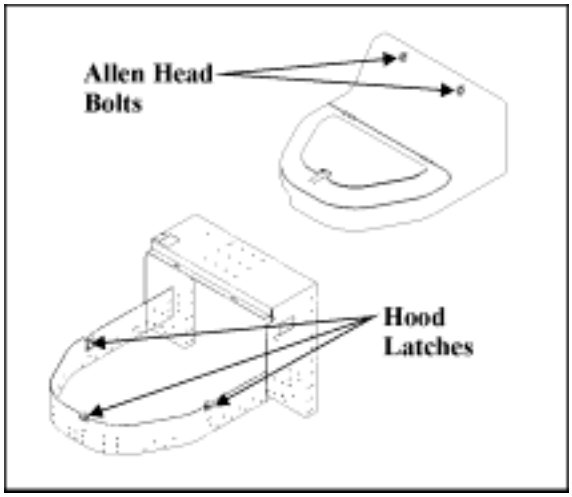

Figure 1—Hood Removal

2. Locate five hood latches (1). See **Figure 1**. Press the tension release button located in the center of each latch and pull the latch handle back. This will allow removal of the entire hood assembly.
3. Lift out hood assembly and store the hood safely out of the way**.**
4. Remove the front bumper in accordance with instructions under "Front Bumper Removal".
5. Open front grill panel (5). **Figure 2—Front Body Components.**

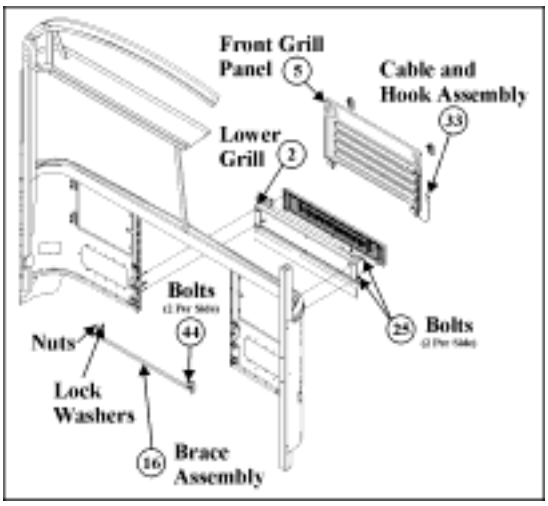

Figure 2—Front Body Components

6. Disconnect the cable and hook assembly (33) from the body.
7. Remove attaching hardware (25).
8. Remove lower grill (2).
9. Remove front grill (5).
10. Remove brace assembly (16).

Charge Air Cooler and Radiator Removal

1. Remove coolant hoses. **Figure 3—Coolant Hose Assembly.**
2. Remove lower radiator hose (108) and upper radiator hose (104) from the radiator.
3. Remove elbow (103) from engine.
4. Remove upper radiator hose (104) from the engine.
5. Disconnect coolant tube (35) from elbow (102) and remove bracket (34).
6. Remove bracket (34).
7. Remove coolant tube (35).
8. Remove charge air hoses (107).
9. Remove the turbo outlet tube (13) from the charge air cooler and the engine air intake.
10. Remove the charge air cooler to air inlet tube (14) from the charge air cooler and the turbo outlet.
11. Remove any tubes or hoses between the radiator (1) and the surge tank (2). **Figure 3.1—Radiator and Surge Tank.**

12. Disconnect the braided heater hose (107).
13. Remove shutter control hose connection (13). **Figure 3.2—Hydraulic Shutter Controls.**
14. Remove attaching hardware nuts, bolts and washers.
15. Remove the radiator and charge air cooler assembly.

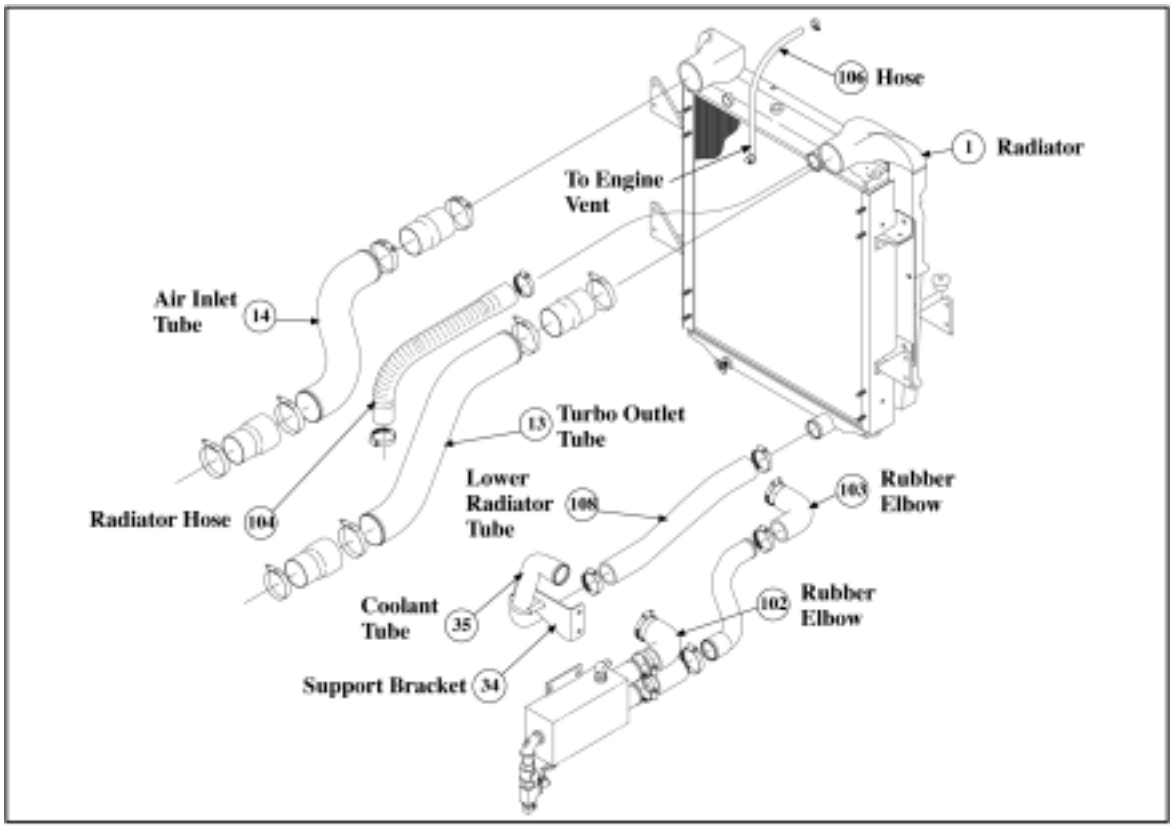

Figure 3—Coolant Hoses

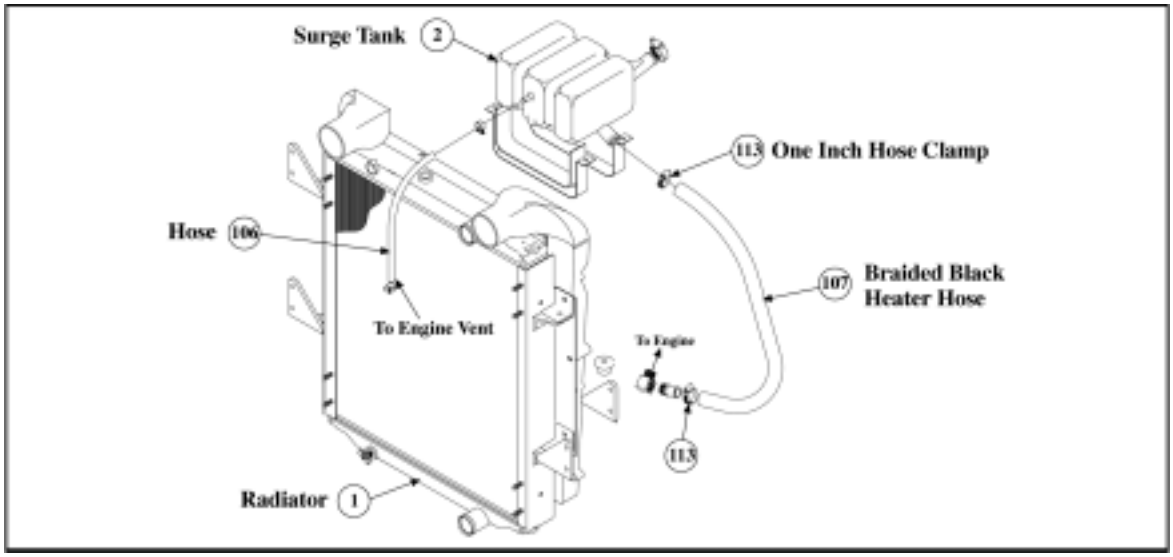

Figure 3.1—Radiator and Surge Tank

Note

The charge air cooler can be separated from the radiator and removed first by removing the attaching hardware.

16. Remove heater hoses from the heater and move the hoses to the driver's side of the bus and tie hoses out of the work area.
17. Disconnect shutter control hoses (13) and (14) from the engine**. Figure 3.1—Hydraulic Shutter Controls.**
18. Disconnect the shutter solenoid electrical harness connection (4) from the alarmstat (6).
19. Examine the engine and transmission and disconnect all electrical connectors.
20. Mark connectors for easy at installation.

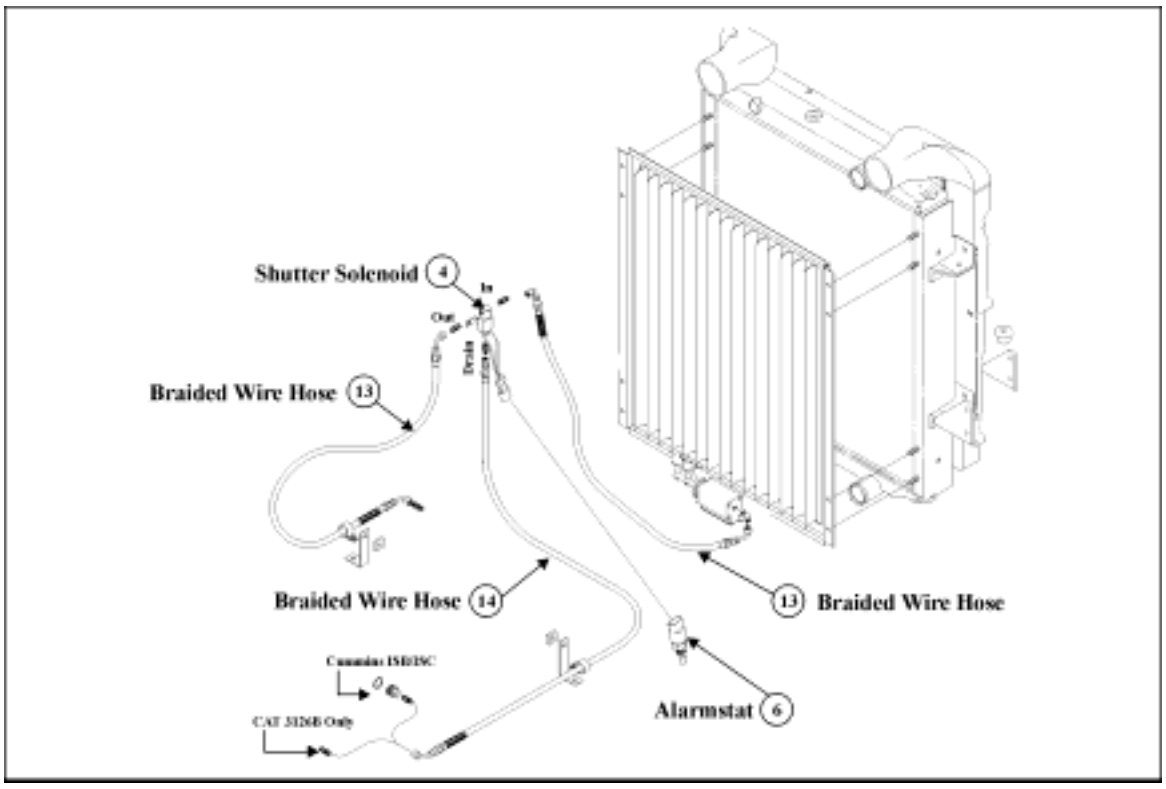

Figure 3.2—Hydraulic Shutter Controls

Turbo-Charger Compressor Air Inlet Assembly Removal

1. Disconnect Turbo-Charger Compressor Air Inlet. **Figure 4—Turbo-Charger Compressor Air Inlet Assembly.**
2. Disconnect the plastic air restriction indicator tube (12) from air intake tube (9).

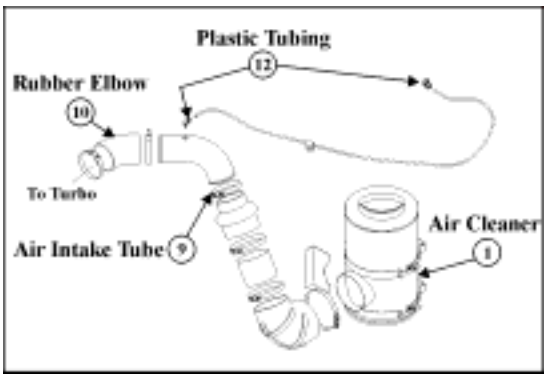

Figure 4—Turbo-Charger Compressor Air Inlet Assembly

3. Remove inlet rubber elbow (10) from Turbo-Charger.

Turbo-Exhaust Assembly Removal

1. Disconnect exhaust pipe. **Figure 4.1—Turbo-Exhaust Assembly.**
2. Disconnect the clamp attaching the exhaust pipe (3) to the turbo-pipe.
3. Remove attaching hardware, U-bolt (13) and saddle (15).
4. Flex exhaust pipe (2) down and away from the engine.
5. Remove hardware and the exhaust pipe support bracket (1) from the engine.

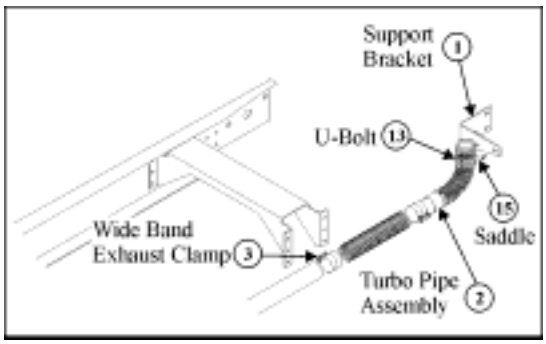

Figure 4.1—Turbo-Exhaust Assembly

Power Steering Assembly

Disconnect power steering hose (25) and (26) from the power steering pump (38) and tie the hoses back from work area. **Figure 5—Power Steering Assembly.**

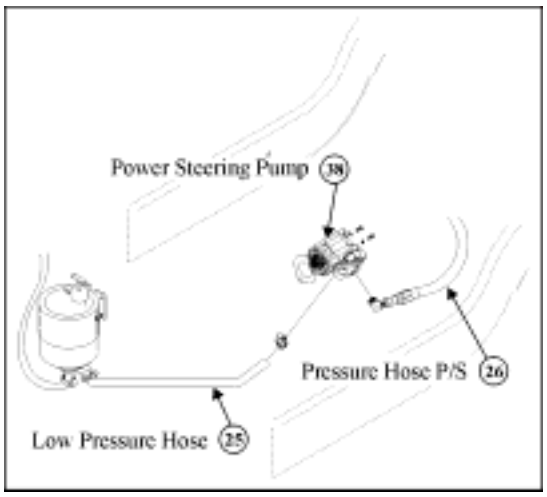

Figure 5—Power Steering Assembly

Drive Shaft Removal

1. Disconnect drive shaft. **Figure 6—Drive Shaft Assembly**.

Note

Removal of the universal joint may require removal of the attaching hardware, allowing the forward hanger bearing to hang.

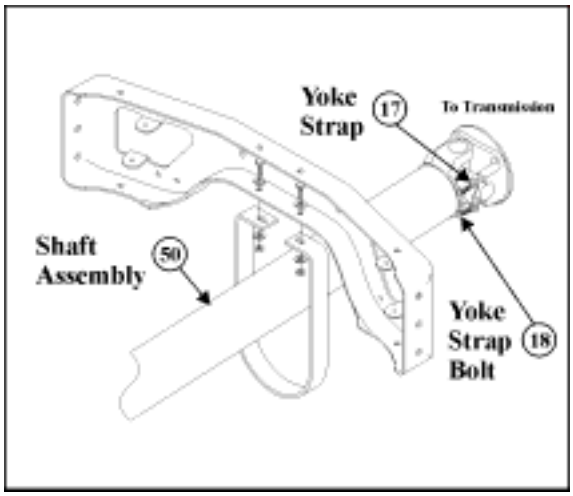

Figure 6—Drive Shaft Assembly

2. Disconnect and remove universal joint between 1st drive shaft section (50) and transmission output yoke (17) and (18).

Forward Crossmember Removal

Remove forward crossmember (11). **Figure 7—Forward Crossmember.**

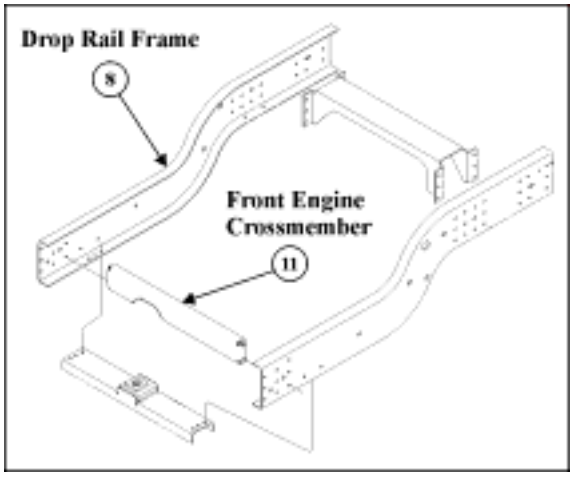

Figure 7—Forward Crossmember

Transmission Assembly Removal

Note

Do not turn or adjust the trunion.

Remove transmission components. **Figure 8—Transmission Components Assembly.**

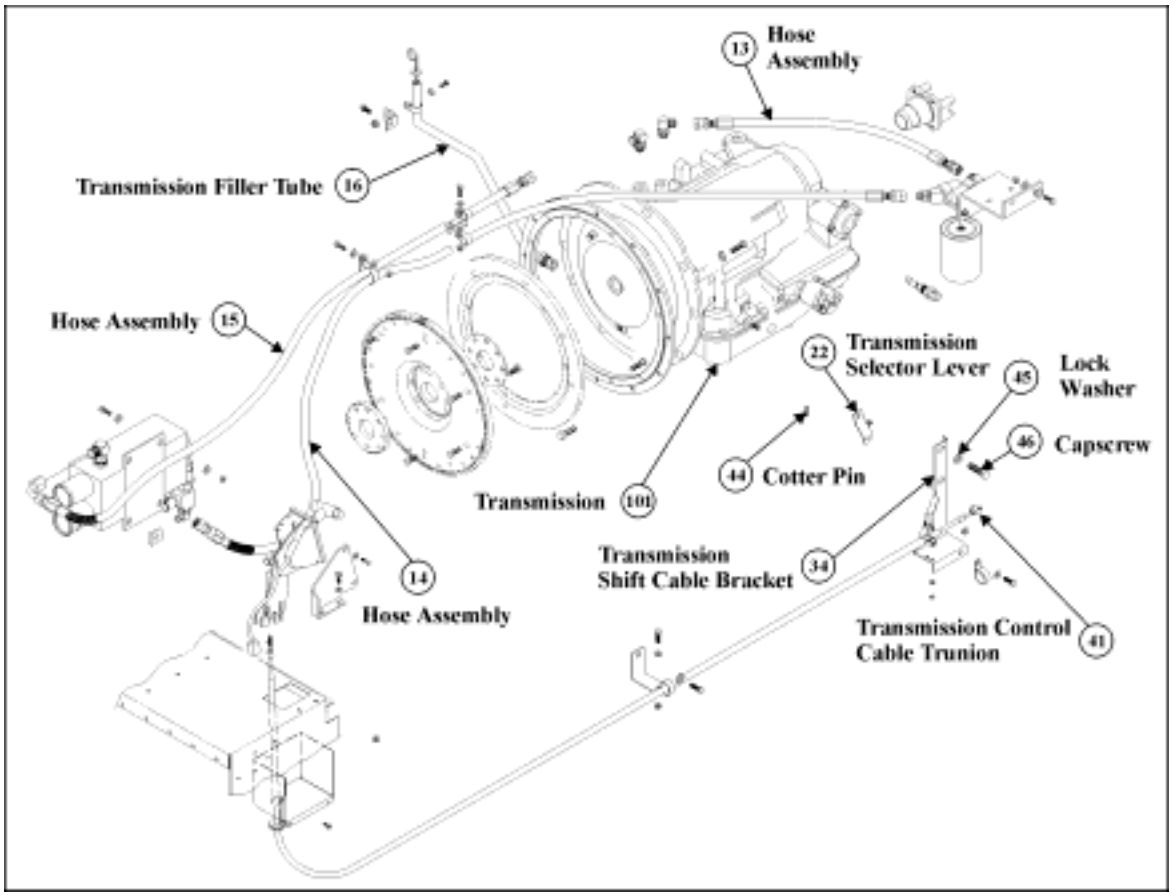

Figure 8—Transmission Component Assembly

Engine Assembly Removal

Note

*See **Figure 9—Cummins Engine Assembly, Detail A** or **Figure 10—Caterpillar Engine Assembly**. For Caterpillar Lifting Bracket, see Section on Caterpillar Lifting Bracket and **Figure 11** at the end of this section. These instructions are for A3FE removal only.*

1. Remove the stowed engine lifting bracket from the inside of right frame rail.
2. Install the engine lifting bracket on the engine.
3. Position the engine jack or removal device under the engine and jack to support the engine.
4. Remove hose from elbow.
5. Disconnect water temperature sensor.
6. Loosen the hardware attached to the engine crossmember.
7. Remove the forward engine mount bolt and washers.
8. Remove forward engine mount.

Warning

Hydraulic fluid, fuel and transmission oil is flammable and toxic to the skin, eyes and respiratory tract. Skin and eye protection is required. Avoid repeated or prolonged contact. Drain fluid in a well-ventilated area.

9. Disconnect fuel lines from the engine; catch the fuel in a suitable container.

Caution

Make sure you install the rear lifting bracket to the engine.

Caution

Make sure the engine and transmission are secure in the jack or removal device.

10. Remove the engine mount nut, larger washer, isolator, washer and bolts.
11. Raise the back of the engine so engine mounts clear.
12. Check to ensure all hoses, lines, linkages and connectors have been disconnected.
13. Raise or lower the engine as necessary while pulling engine out of the chassis to ensure the engine or transmission does not hang or bind.

Caution

Make sure all open ports to the engine and transmission are covered.

14. Cap or cover all lines and fittings on the vehicle, engine and transmission.
15. Secure all hoses, wire harnesses and lines to prevent damage.
16. Dispose of drained fluids properly, in compliance with local, state and federal laws.

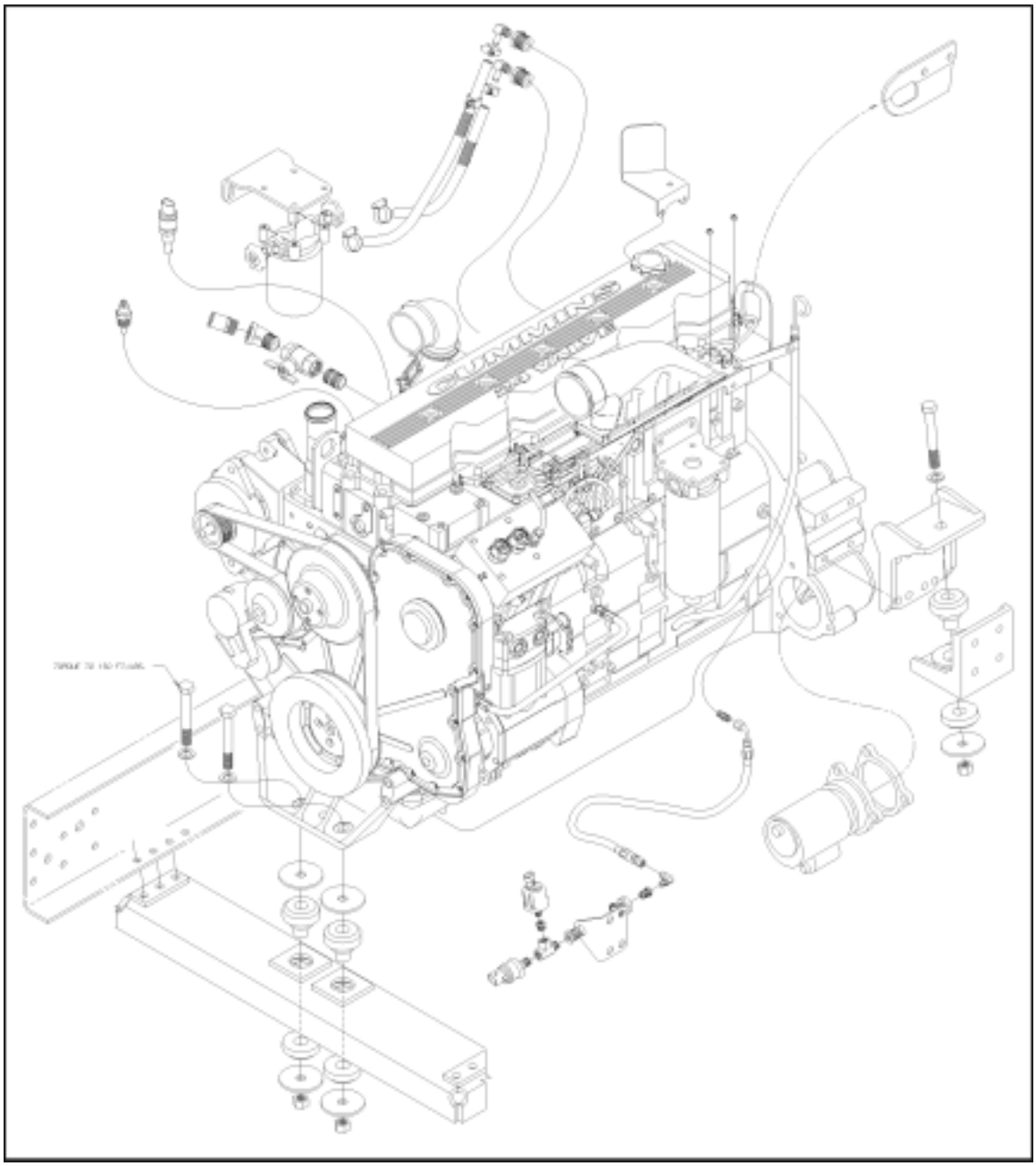

Figure 9—Cummins Engine Assembly Detail A

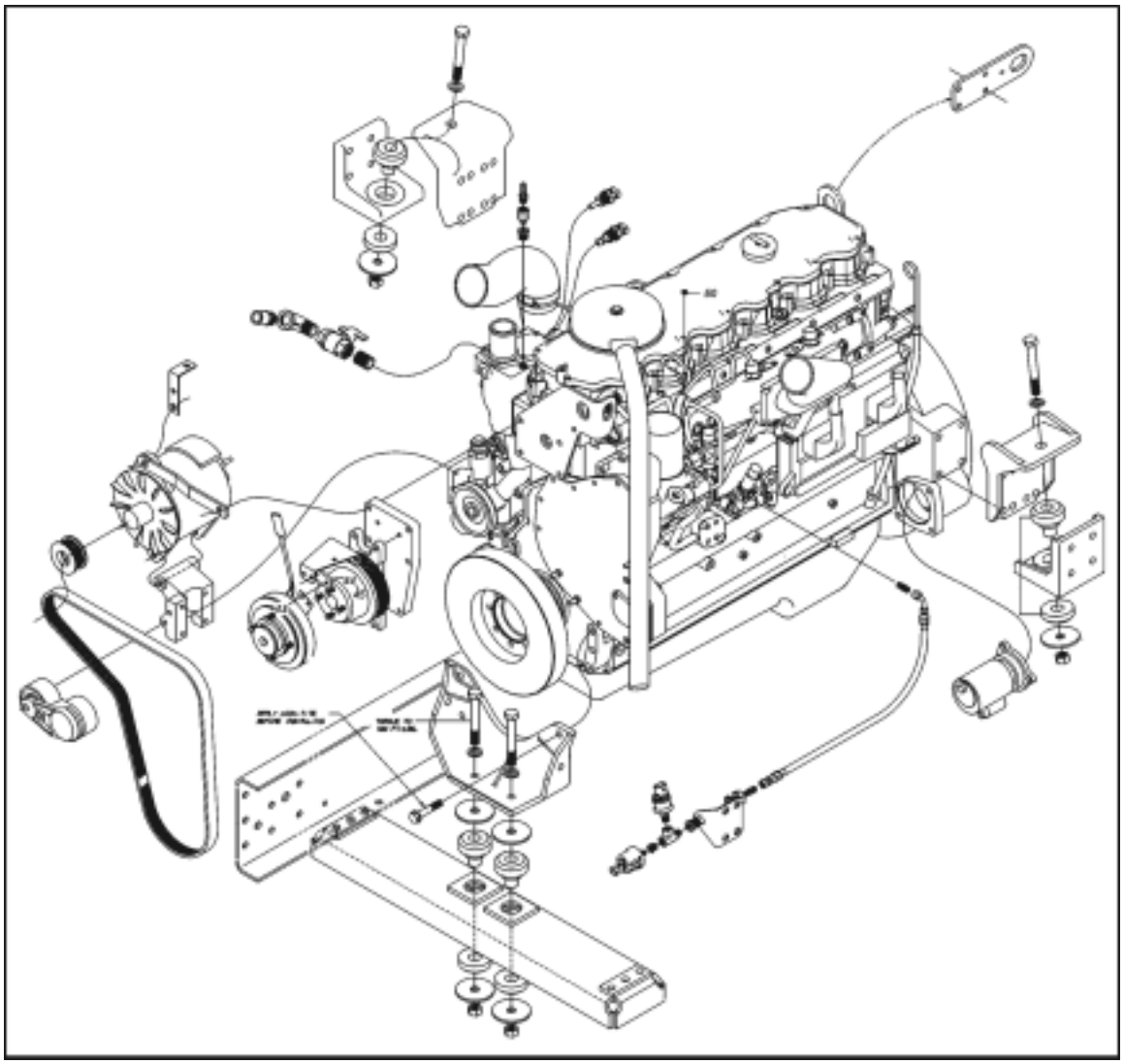

Figure 10—Caterpillar Engine

Caterpillar Lifting Bracket

The Caterpillar 3126 engine is equipped with two lifting brackets. The brackets are located at the front and rear of the valve cover. The rear bracket is bolted to the cylinder head. **Figure 11**.

Due to manufacturing design of the All American Forward Engine model, the rear lifting bracket has been relocated. The bracket is bolted inside the right hand frame rail, directly above the front axle for stowage purposes only.

Depending on equipment used for removal and installation of engine, you may deem it necessary to re-attach the rear lifting bracket to its original engine mounted location. The original bolts used to attach the lifting bracket have been reassembled with the engine cylinder head.

Caution

Engine hood must be removed when rear lifting bracket is installed on engine.

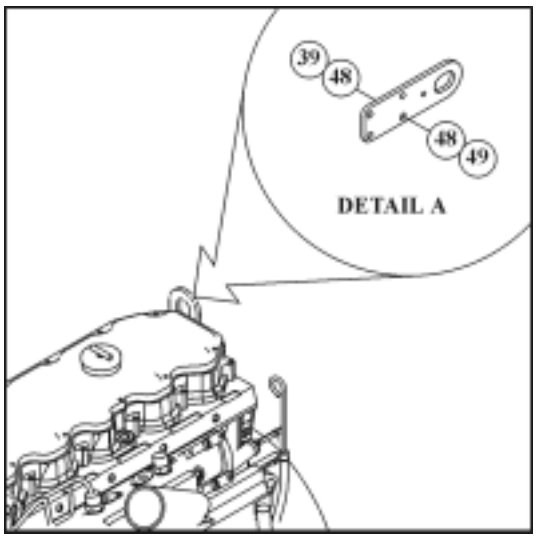

Figure 11—Caterpillar Detail A

To remove lifting bracket from frame rail, remove bolt (39), washers (48) and nut (49). **Figure 11.**

Retain bolt, washers and nut for reinstallation of lifting bracket in stowage location.

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