Transmission

Table of Contents

Sub-Headings

Figures

Transmission

Safety

The purpose of this safety summary is twofold. First, it is to help ensure the safety and health of individuals performing service on, or operation of, the Blue Bird All American Series bus. Second, it is to help protect equipment. Before performing any service or operating procedure on the All American bus, individuals should read and adhere to the applicable warnings, cautions and notes located throughout this Blue Bird Service Manual.

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**.**

All personnel attempting repair of this vehicle should have the necessary skills and experience to undertake the task.

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, too, may advise of potential safety issues.

Introduction

These procedures were documented using a Blue Bird All American Series bus with a Cummins ISB engine and Allison AT 545 transmission.

Buses with other engine and/or transmission options will differ slightly in detail, but the process will remain the same. Refer to the appropriate engine manual for the specifics on electrical and fluid line connections and locations. The appearance of or the absence of any specific component or part is determined by the options selected at the time of manufacture.

Tools

General mechanic's tools consisting of common hand tools will be needed to perform most of these instructions.

- Barring tool (Cummins Part Number 3824591)
- Lifting equipment, sufficient to support the weight of the vehicle in a safe and stable manner
- A wheeled jack or dolly fitted with appropriate cradle, strong enough to take the weight of the transmission (approximately 400 pounds)
- Recovery equipment for transmission fluid, engine oil, hydraulic fluids and anti freeze

Note

All materials must be handled and/or disposed of in accordance with applicable federal, state and local laws.

Preparatory Work

1. Park the bus on a flat, level surface of sufficient strength or hardness to support the lifting equipment.
2. Set the park brake.
3. Chock the rear wheels.
4. Disconnect the battery.
5. When using jacks and jack stands, place them under the frame rails.

Removal of Torsion Bar

If the vehicle is equipped with spring suspension and a torsion or sway bar, it must be removed before the transmission can be removed. Refer to Section 130—Suspension for detail on the removal of this optional feature.

Front Axle Removal

To facilitate the removal of the transmission from the TC Series bus, remove the front axle. Refer to Section 010—Front Axle for detailed instructions.

The generalized instructions for spring suspension vehicles are:

1. Remove front shocks. See Section 130—Suspension.
2. Remove draglink at the wheel end. Suspend the draglink to prevent damage to the connector journals and threads. See Section 120—Steering.
3. Remove the front shackle pins from the front springs. See Section 130—Suspension.
4. Raise frame rails to allow the front axle to drop down and to the rear.

Caution

Be careful not to allow the front axle assembly to drop enough to harm the brake lines. It may be necessary to remove the brake lines to have room to work. See Steering Section and Wheel End Section.

The generalized instructions for vehicles equipped with Hendrickson Front Air Suspension are:

1. Support the weight of the bus, on the frame rails, with jacks and jack stands. Do not lift the wheels off the floor; just remove the weight from them.
2. Remove four axle fasteners from each side. See Section 130—Suspension for detailed instruction.

Caution

Observe that the rear/inside axle fastener, on both sides, inserts from the bottom of the assembly. The three remaining fasteners insert from the top of the assembly.

3. Remove front suspension cross member.
4. Be careful to observe that the wheel end components are protected; including brake lines.
5. Remove the draglink at the wheel end. Support the draglink to prevent damage to the connector end journal and threads
6. Lift the frame rails enough to remove the front axle.

Warning

Attempting to remove the transmission over the front axle is dangerous, and not recommended.

Transmission Removal Preparatory Work

Warning

Hydraulic fluid can be hot. If you cannot lay your hand on the transmission, the fluid is too hot to work with. Hydraulic oil, fuel, transmission fluid and anti-freeze are all toxic. They are also an irritant to the skin, eyes and lungs. Wear appropriate protective gear, including eye protection and gloves. Work only in a well-ventilated area and avoid prolonged exposure to these materials.

1. Drain the transmission fluid into appropriate recovery/disposal equipment.
2. Remove bolt (1) and strap (2) from two places at the transmission yoke. **Figure 1.**
3. On units equipped with mechanical park brake, remove the clevis pin and cable clamp as necessary. See Section 030.2—Mechanical Park Brake.

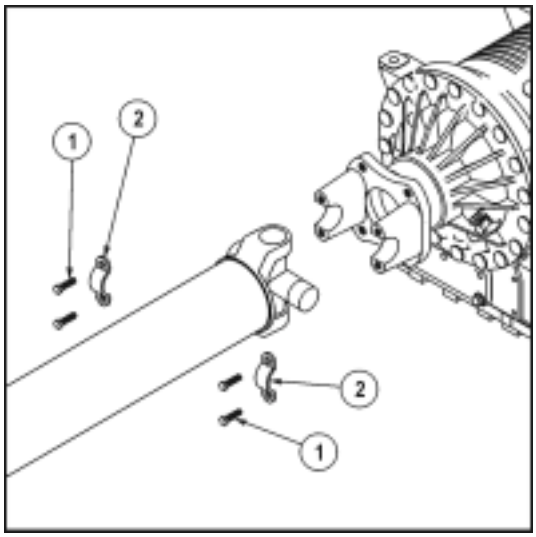

Figure 1—Drive Shaft Disc

4. On units equipped with mechanical park brake, remove the clevis pin and cable clamp as necessary. For detailed instruction, see Section 030.2—Mechanical Park Brake.
5. Loosen the mid-ship bearing hanger bracket to allow the slip joint to move rearward far enough for the cross journals to clear the yoke. See Section 050—Driveline for details on driveline hanger bearing and brackets.
6. Loosen and remove the constant tension clamp on the Turbo charge exhaust, at the turbo charger. **Figure 1A.**
7. Loosen the clamps and hangers and remove the exhaust piping at least past the flex pipe. **Figure 1A.**

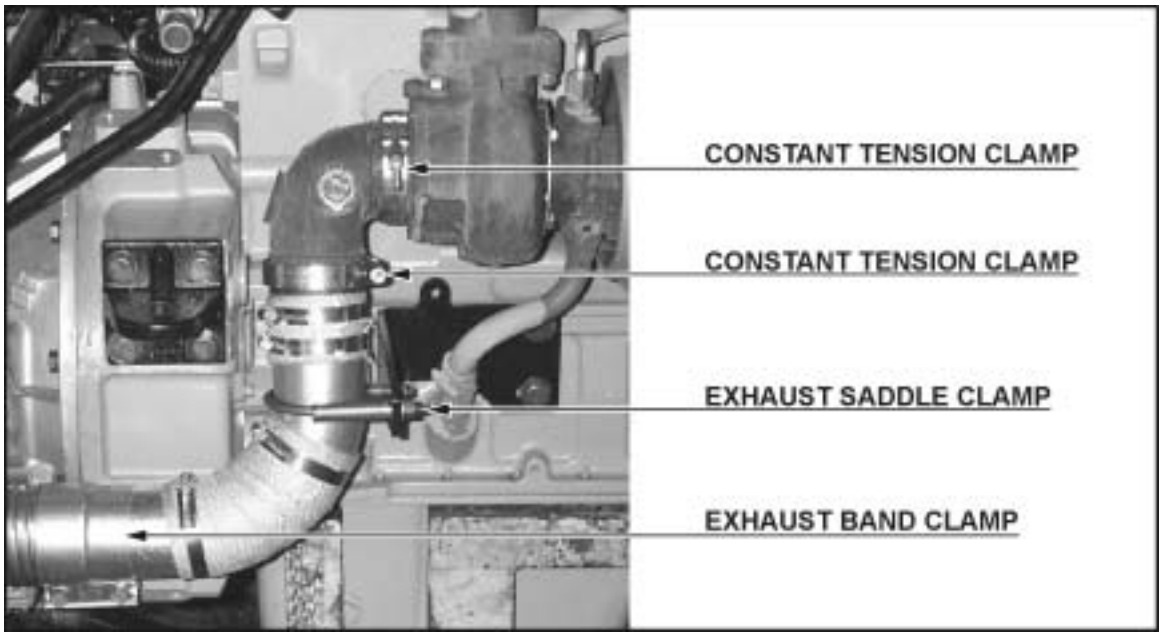

Figure 1A—Turbo Exhaust Detail

8. Remove the barring gear hole plug (1). Lay the plug aside for use during installation. **Figure 2.**
9. Remove the capscrews (1) to remove the access plate (3). Discard the gasket (2); lay the cover aside for reuse. **Figure 3.**
10. Disconnect back-up light switch (43). **Figure 4.**
11. Disconnect neutral sensor switch (57).
12. Disconnect speedometer sensor (58).
13. Remove the electronic shift modulator (59).

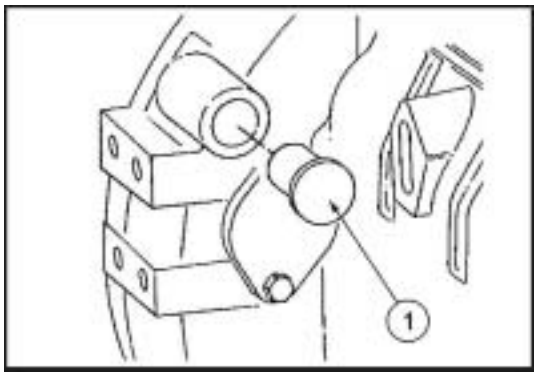

Figure 2—Plug

14. Remove fluid level dipstick tube assembly. **Figure 4—Detail A** and **Detail B.**

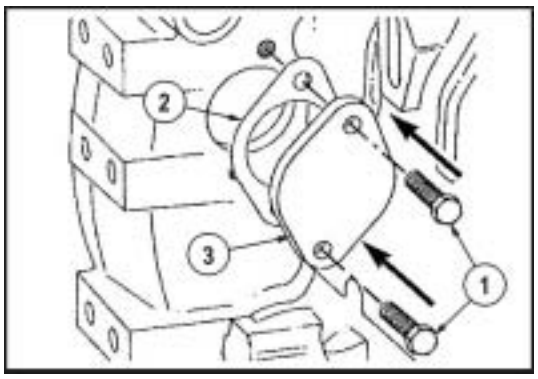

Figure 3—Cover

Note

Some transmission options offer a NSBU switch, and modulator attached at the shift selector arm. This device will replace many of the discrete devices listed in the steps above for transmission removal.

Be sure both the transmission and the selector are in the neutral position before continuing.

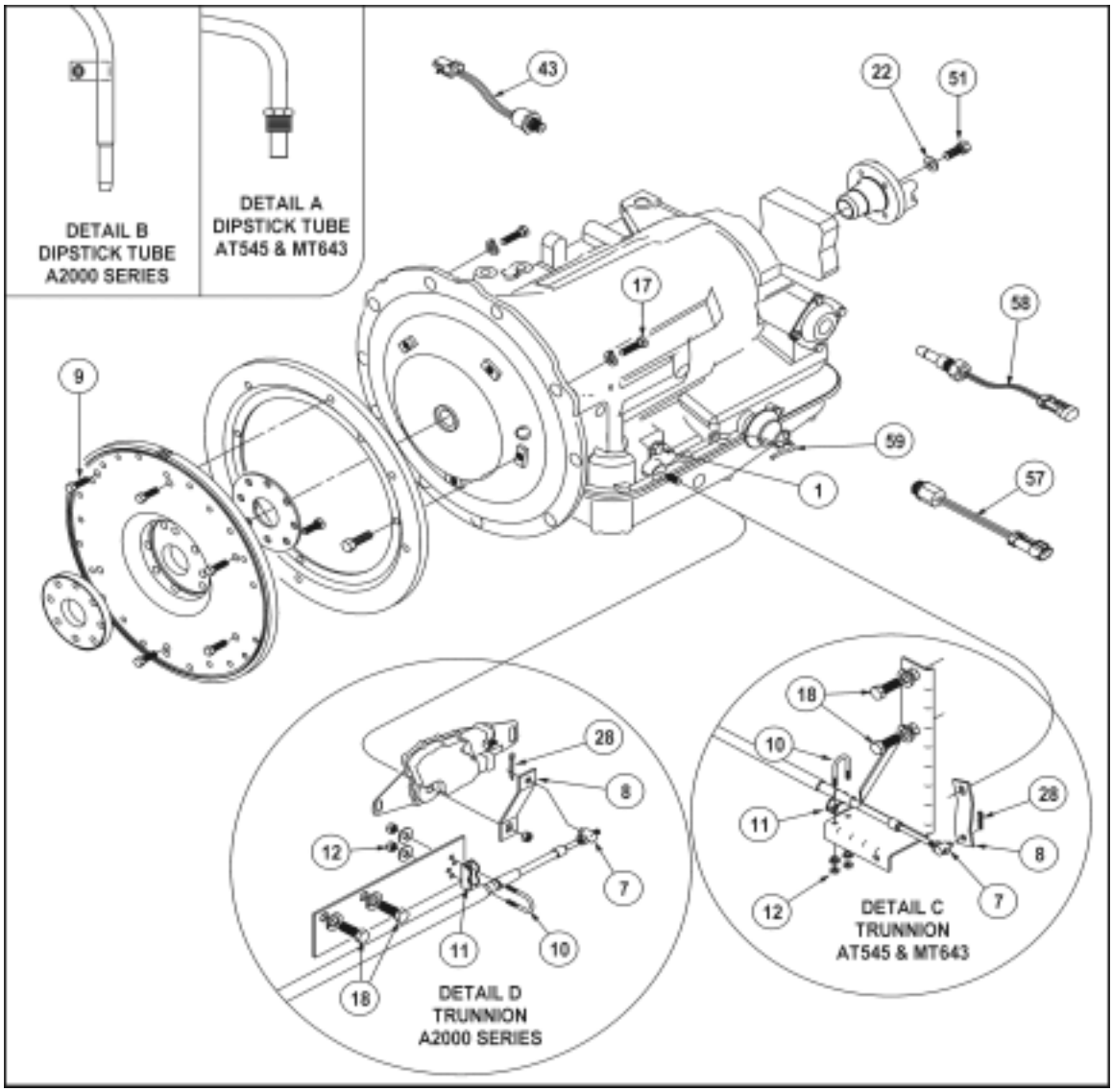

Figure 4—AT545 Transmission

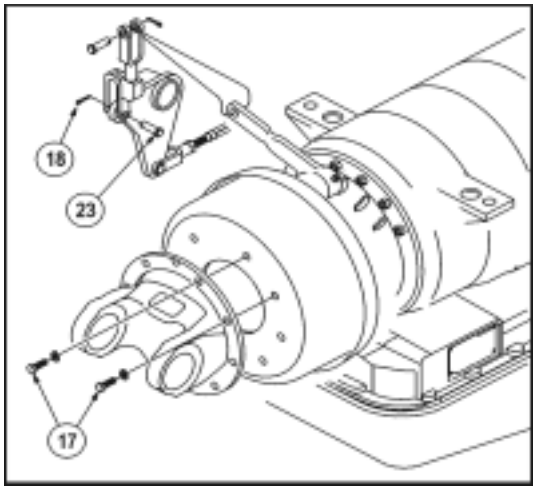

Figure 5—Mechanical Park Brake and Yoke Assembly

15. Remove cotter pin (28) from trunnion shaft, at the end of the selector cable. **Figure 4, Detail "C"** or **"D"**. Discard the cotter pin.
16. Remove trunnion (7) from selector arm (8).
17. Remove selector arm (8) from transmission.
18. Remove capscrews (18) and lockwashers from the shifter cable bracket. **Figure 4**.

For AT545 Transmission and Hydraulic Brakes

1. Remove cotter pin and clevis pin to disconnect the mechanical park brake.
2. Disconnect the mechanical park brake assembly.

Note

For detailed instruction of mechanical park brake service or disassembly, see Section 030.2—Mechanical Park Brake.

For MD3060 Transmission and Hydraulic Brakes

After removing the necessary hardware at the transmission/engine connection:

1. Remove capscrew (17) and lockwasher from eight places. Do not remove the yoke from the universal joint. **Figure 5**.
2. Remove cotter pin (18).
3. Remove Clevis pin (23).

Transmission Fluid Lines Removal

Be sure the transmission is empty of fluid before continuing.

1. Remove high-pressure hose assembly (18) from 45° elbow fitting (13). **Figure 5.**
2. Remove return hose assembly (19) from 90° fitting (14).

Transmission Removal

Insert the barring tool into the barring gear hole as described in Step 7 above, of Transmission Removal Preparatory Work.

1. Using the barring tool, rotate the engine clockwise to remove capscrew (9) through the access hole. **Figure 3** and **Figure 4**.
2. Continue to rotate the engine clockwise to remove each of six capscrews (9) from the flywheel.

Warning

Properly support the transmission before continuing. To hold and maneuver the transmission, use an appropriate wheeled jack or dolly fitted with a cradle.

3. Remove 12 capscrews (17) and lockwashers (7) from the torque converter adapter. **Figure 4**.
4. Move the transmission toward the rear, enough to clear the flywheel, then lower it and move toward the front, tipping the front of the transmission downward.
5. Remove the transmission from the chassis.

Installation of Transmission

Installation of the transmission is performed in the reverse order of the removal instructions above. Transmission installation is typical. There are some detail differences in hose routing, etc., depending on the power plant, transmission, and brake system options installed at the time of manufacture. Assuming the vehicle is lifted, the front axle is dropped, and the external filter and cooler lines are in place, the installation follows.

1. Using a wheeled jack or dolly fitted with an appropriate cradle, roll the transmission into place just behind the engine.
2. Carefully raise the transmission to align the mounting holes in the torque converter cover.
3. Install a drift of sufficient length to align the holes in the torque converter to the flywheel, through the access hole. **Figure 3**.
4. If necessary, install the yoke onto the transmission output shaft. Install washer (22). Torque the capscrew (51) to 102-121 ft-lbs. (11.5 – 13.7 Nm). **Figure 4**.
5. Install capscrews (17) and lock washers. **Figure 4**. Snug up all the capscrews to make certain of the alignment.
6. Torque the capscrews in progressive order to 50 ft-lbs. (5.65 Nm).
7. Insert barring tool (Cummins part number 3824591) into the barring hole.
8. Turn the engine clockwise to align the torque converter and flywheel to install capscrew (9) in six places, through the access hole. Torque the capscrews as you go to 50 ft-lbs. (5.65 Nm). **Figure 3.**
9. Install the access hole cover (3) using a new gasket. (2). Torque the capscrews (1) to 18 ft-lbs. (24 Nm).
10. Remove the barring tool and install the plug (1) into the barring hole. **Figure 2**.

Install Fluid Lines

The routing of the fluid lines will vary, depending on the transmission option installed. Refer to the appropriate illustration for the transmission in the vehicle on which you are working.

1. Connect the fluid hose assembly (18) to the 45° fitting (13). See **Figure 6** for AT 545 and MT 643 transmission. For MD3060 and B300 transmissions, see **Figure 6A**.
2. Connect the return hose assembly (19) to 90° elbow (14). See **Figure 6** for AT 545 and MT 643 transmissions. See **Figure 6A** for MD3060 and B300 transmissions.

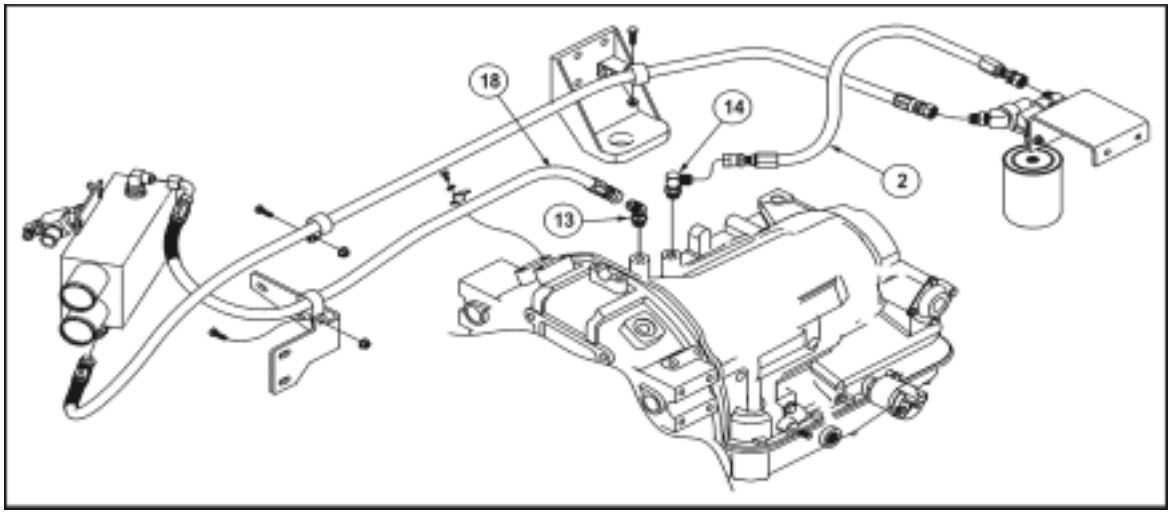

Figure 6—AT545 and MT643 Cooler Hose Routing

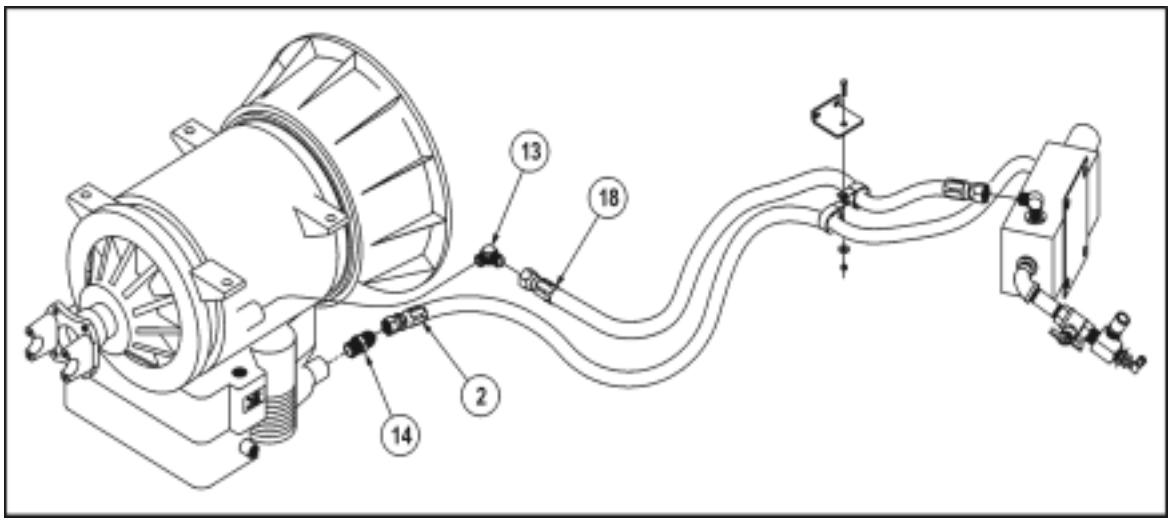

Figure 6A—MD3060 and B300 Cooler Hose Routing

Install Driveline

To install the driveline, carefully place the universal joint cross journals into the saddles on the transmission yoke. Install straps (2) and capscrews (1) in two places. Torque to 40 - 48 ft-lbs. (54 - 65 Nm). **Figure 1**.

Note

For units equipped with hydraulic brake systems and the MD 3060 or B300 World™ transmission, install capscrews (17) and lock washers (18) in eight places. Figure 6A. Torque to 81 - 97 ft-lbs. (9.15 – 10.95 Nm).

If mid-ship bearing hangers have been loosened or removed, they should be installed at this time. See Section 050—Drivelines for details.

Refer to Section 050—Drivelines for more detailed instruction concerning driveline installation and maintenance.

Install Mechanical Park Brake

Warning

The proper installation of the park brake is critical to the continued safe operation of the vehicle. See Section 030.2—Mechanical Park Brake for detailed instructions of the mechanical park brake system.

Install Electrical Controls

The precise order of the next instructions is a matter of personal choice. Install the components in the order that seems most convenient to you.

1. Install transmission oil temperature sender (1), if so equipped. **Figure 4**.
2. Install neutral switch (57).
3. Install Electronic Shift Modulator (59).
4. Install speed sensor (58).
5. Install backup light switch (43).
6. Install shift selector arm (8). Torque nut (8) to 15 – 20 ft-lbs. (1.7 – 2.25 Nm). Tighten jam nut.

7. Install fluid level dip stick tube. **Figure 4**, **Detail A** or **Detail B**.
8. Install drain plug. For AT545 and MD643 transmissions, torque to 15-20 ft-lbs. (20.33-27.11 Nm). For B300 and 3060 World™ Transmissions, torque to 18-24 ft-lbs (24.4-32.5 Nm). For 2000 Series and 2400 Series, torque to 22-30 ft-lbs (29.8-40.7 Nm).

Note

Some transmission options feature a NSBU (Neutral, Start, Back Up light) switch and modulator, built as a unit and installed at the shifter arm. This option eliminates several of the steps above.

Caution

Be certain both the selector arm on the transmission and the shifter selector on the coach dash are in neutral, before continuing.

9. Install trunnion shaft (7) into the shifter arm (8). **Figure 4**.
10. Install cotter pin (28).
11. Install capscrews (18) and lock washers to mount the shifter cable bracket. Torque to non-designated torque value as listed in Section 005—Introduction.

Installation of Front Axle

For complete and detailed instructions on the installation of the front axle, refer to Section 130—Suspension.

The instructions for the installation of the front axle on units equipped with Hendrickson Front Air Suspension are:

1. Lift the frame rails enough to get the axle under the chassis.
2. Carefully align the axle mounting pads, at each end of the axle, to match the axle fastener mounting holes in the air bag bracket. See Suspension Section for illustrations. Be careful to mount the bolt on the inside/rearward position with the nut up and the capscrew head near the ground. The other three capscrews are mounted opposite, in each axle pad.
3. Install Wheel End components.
4. Install draglink.
5. Install the special cross member at the front of the assembly.

The instructions for installation of the front axle equipped with spring suspension are:

1. Lower the frame rails to install the front shackle pins. Refer to Section 130—Suspension for detailed illustrations.
2. Install draglink.
3. Install front shocks.
4. Install Wheel End components.

Installation of Turbo Exhaust

For detailed instructions on the turbo exhaust system, see Section 070—Exhaust Systems.

1. Install flex pipe and wide clamps to exhaust pipe. **Figure 1A**.
2. Install exhaust elbow and hanger brackets.
3. Install constant tension clamp to turbo exhaust/elbow.

Shifter Removal

To remove the operator end of the shifter cable assembly:

1. Remove four Phillips head screws (30) from the shifter lever cover. **Figure 7**.
2. Turn cover as necessary to remove it over the shifter "T" handle.
3. Remove capscrews (26) and lock washers (25) from two places. **Figure 7**.
4. Pull shifter selector assembly (1) forward and to the side to remove the cotter pin (not shown) from the trunnion (7) at the end of the shifter cable.

Note
The following steps are for work to be performed under the chassis.

5. Remove cotter pin (28) from trunnion at the shift selector arm on the transmission.
6. Remove the trunnion shaft from the selector arm (8).
7. Remove lock nut (21) from capscrew (20) at the bracket (10), and from the frame rail.
8. Remove nut (15) and lockwasher (14) from U-bolt (12) in two places.
9. Remove U-bolt (12) and saddle clamp (13) from the shifter cable and the mounting bracket (9).
10. Remove capscrews (17) and lock washers from two places, to remove the mounting bracket.

Note
From inside the coach, spray the shifter cable lightly with silicon lubricant to facilitate the removal through the grommet.

11. Pull the shifter cable through the grommet from the bottom.

Shifter Cable Installation

1. Spray the grommet (4) lightly with silicon lubricant to facilitate the insertion of the shifter cable housing. **Figure 7**.
2. From under the chassis, install the shifter cable through the grommet.
3. Carefully route the new shifter cable assembly as shown in **Figure 7**.
4. Loosely install the shifter cable holders (11).
5. Install shifter cable assembly bracket (9) with lockwashers (16) and capscrews (17). Torque to non-specified torque as listed in Section 005—Introduction.

Note
Be certain the shift selector arm on the transmission is in the neutral position before continuing.

6. Install the trunnion (7) on the shifter cable. Run the trunnion down the threads until approximately 1/4 inch protrudes.
7. Install the trunnion shaft into the shifter arm (8).
8. Install a new cotter pin (28).
9. Install U-bolt (12) and saddle clamp (13) into the holding bracket (9). Torque the lock washers (14) and nuts (15) to non-specified torque values located in Section 005—Introduction.
10. Tighten jam nut (6).
11. Tighten nuts (21) on cable hangers

Note
The following steps are inside the vehicle.

1. Install the trunnion (7) until approximately 1/4 inch (at least 3 threads) protrudes.
2. Tighten the jam nut (6).

Caution
Be certain the shift selector assembly is in the neutral position before continuing.

3. Install the trunnion (not shown) into the shift selector assembly (1). **Figure 7**.
4. Install the cotter pin (not shown) to secure the trunnion into the shift selector.
5. Install capscrews (26) and lock washers (25) in two places to install the shifter assembly into the dash mount.
6. Turn the shift selector face plate as necessary to go over the "T" handle.
7. Install four Phillips head screws (30).

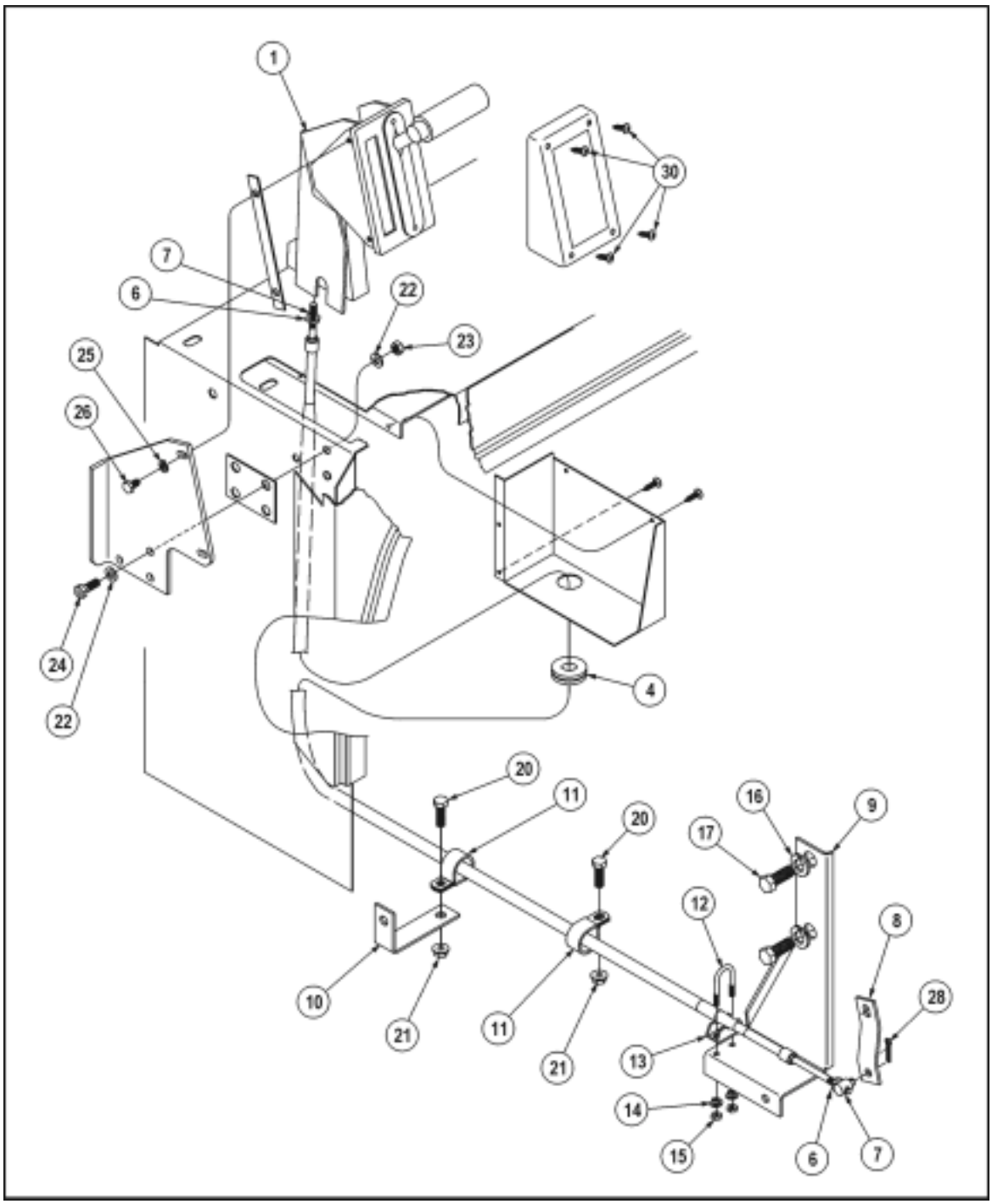

Figure 7—Shifter Cable

Back to Top