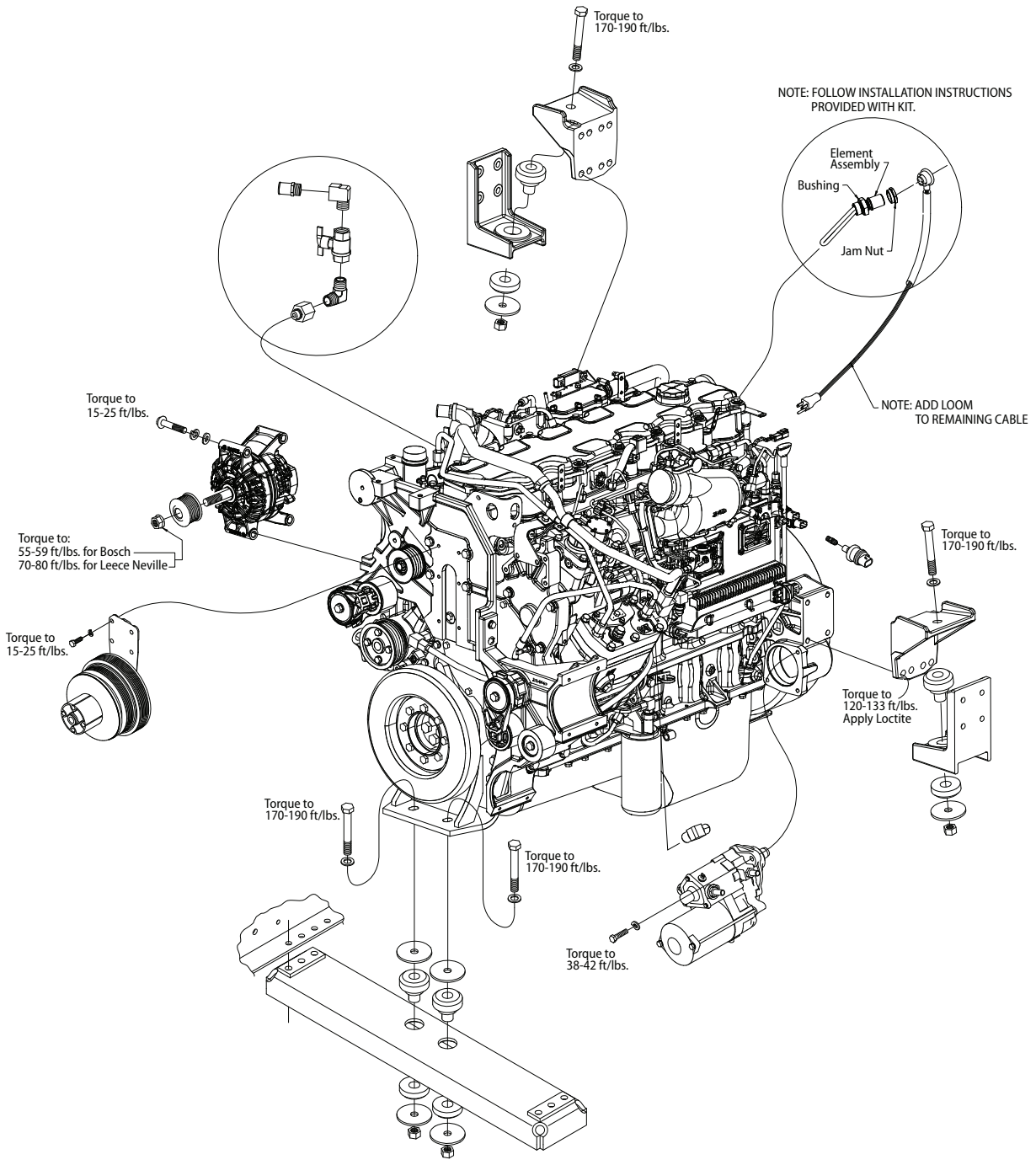
Overview

The Blue Bird All American engine/transmission package is a Caterpillar C7, Cummins ISB-07 or ISC-07 in-line six cylinder diesel engine mated to an Allison 2000 Series™ five-speed or Allison 3000 Series six-speed automatic transmission. Both engine and transmission have electronic control modules. For detailed instruction on engine maintenance and repair, please consult the appropriate Caterpillar or Cummins publication. Check with your Blue Bird Dealer or the nearest Caterpillar or Cummins Dealer to ensure you are working with the proper publication.



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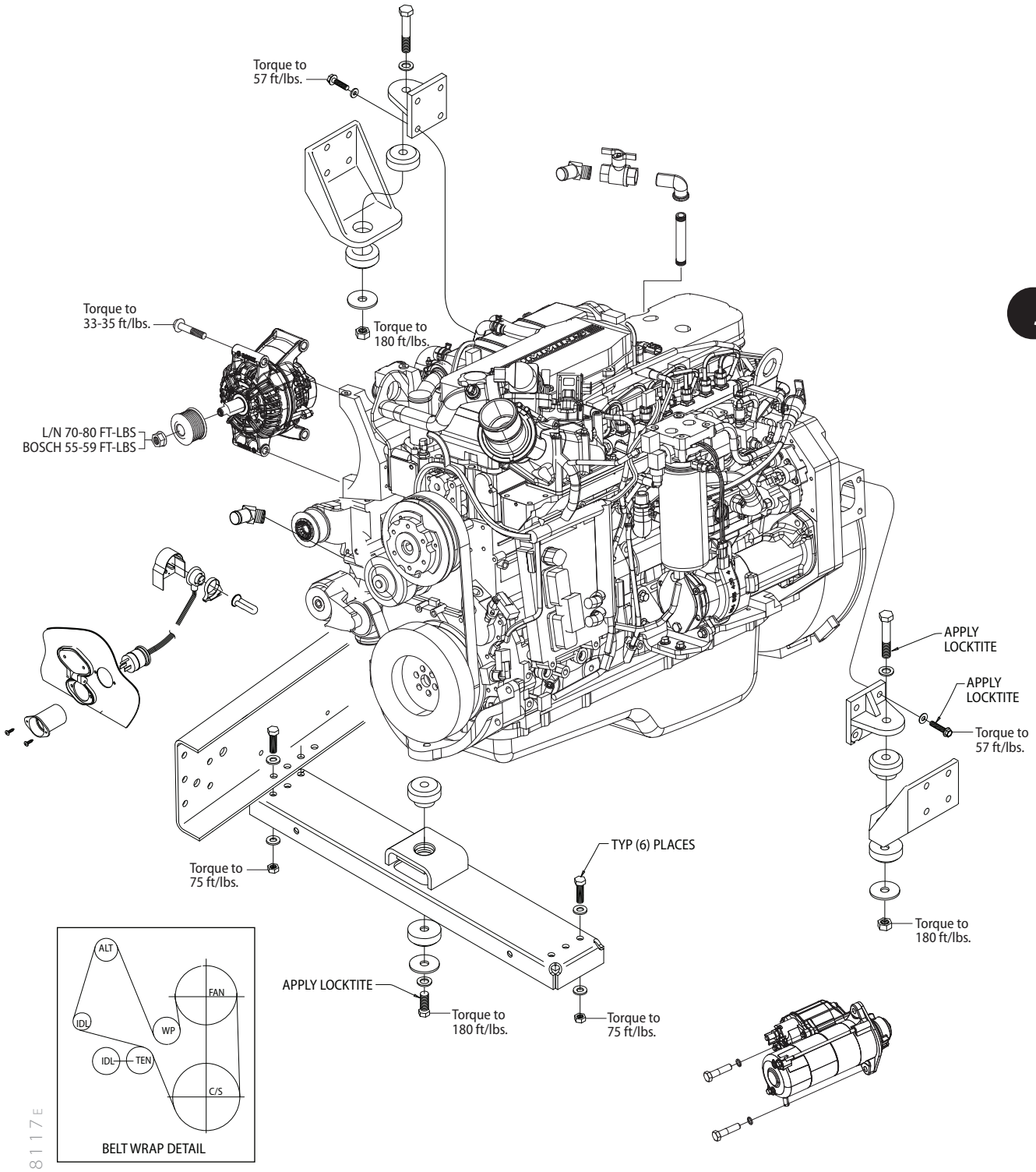
Engine Trim, Cat C7-07, Forward Engine



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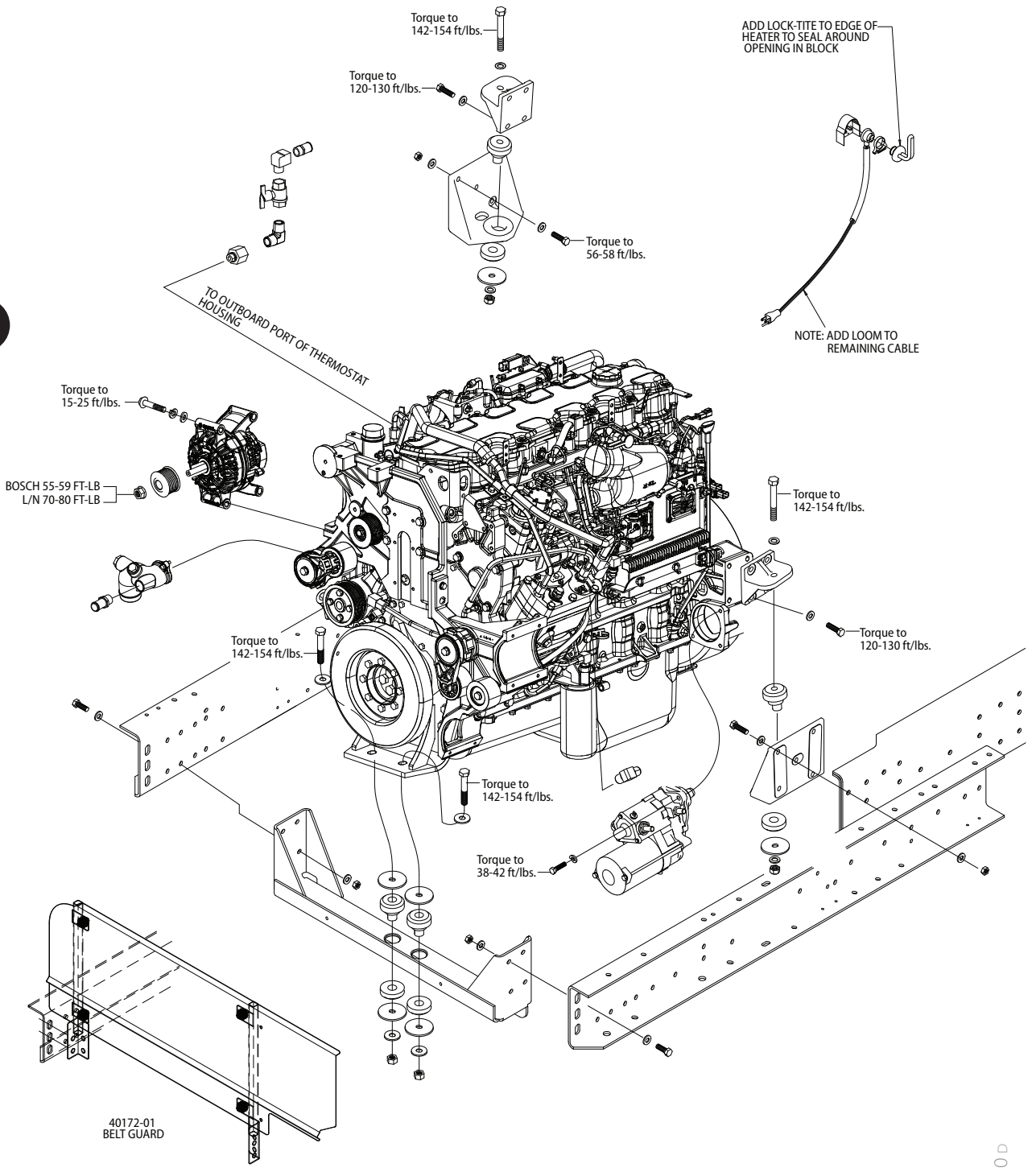
Engine Trim, ISB-07, Forward Engine



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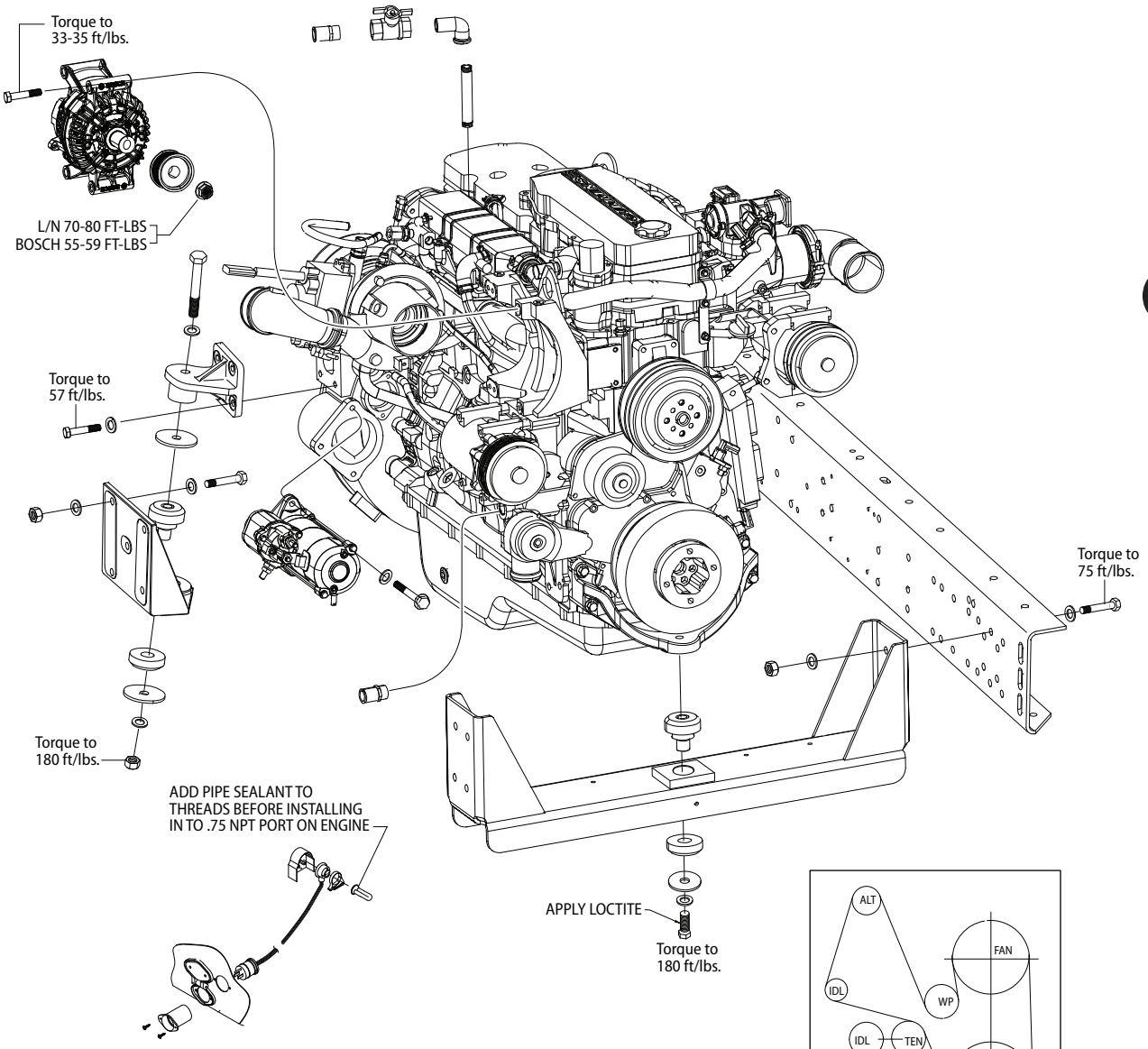
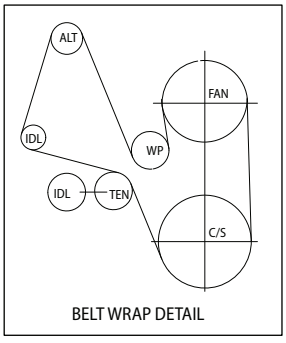
Engine Trim, Cat C7-07, Rear Engine





BELT WRAP DETAIL

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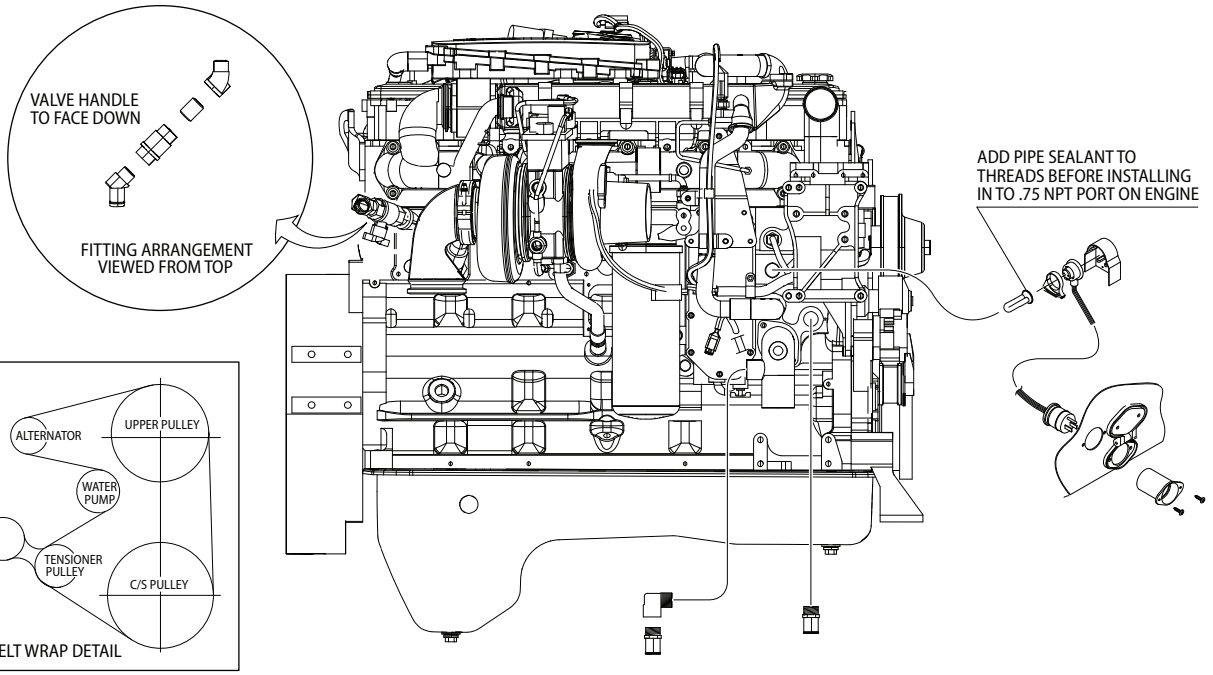
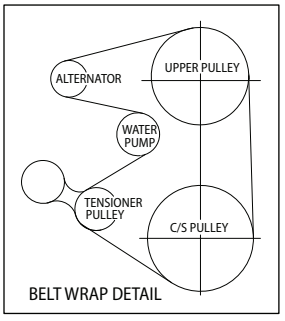
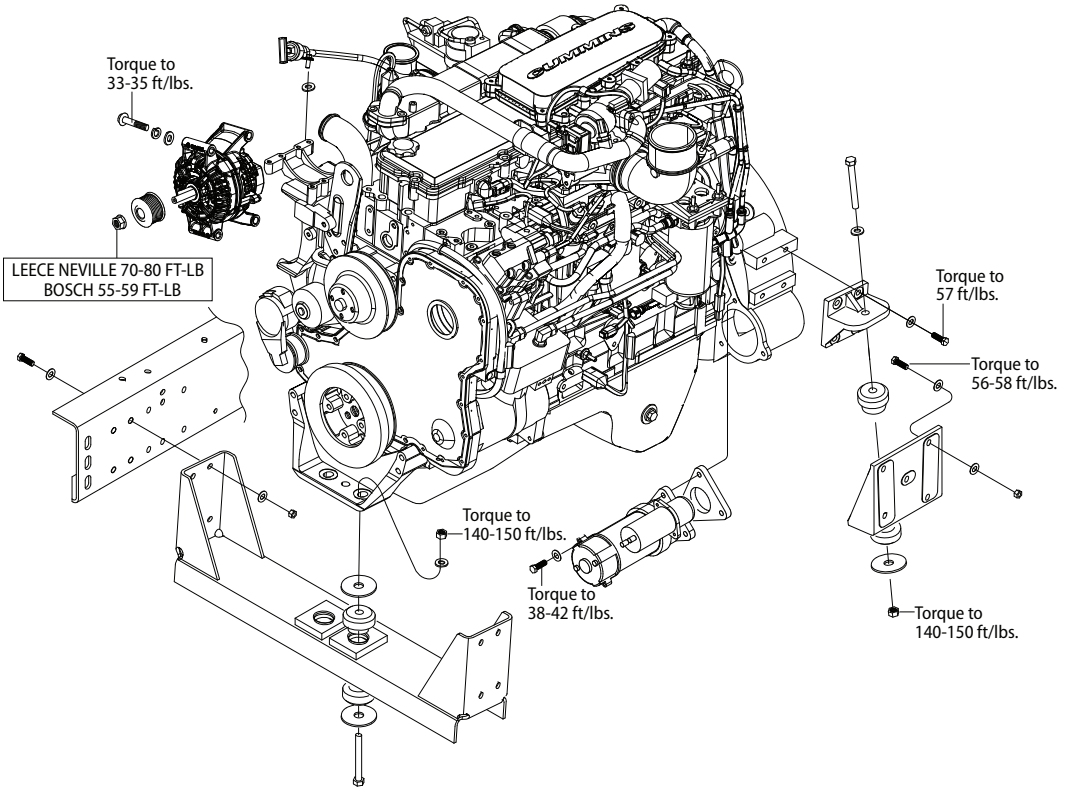
Engine Trim, Cummins ISB-07, Rear Engine







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Engine Trim, Cummins ISC-07, Rear Engine

Transmission

The Allison 2000 Series™ transmission is fully automatic, torque converter driven, and electronically controlled. The transmission offers 5 forward speeds and 1 reverse gear. All the clutches in the transmission are hydraulically actuated and spring released, and feature automatic compensation for wear. The gearing is of the helical type, arranged in planetary sets. Electronic control signals provide automatic gear selection in each drive range and automatic engagement of the torque converter (lockup) clutch.

The transmission has 4 major control systems, connected by the Blue Bird wiring harness: The Transmission Control Module (TCM), engine throttle position sensor (accelerator), 3 separate speed sensors and a control valve module which contains solenoid valves and a pressure switch module. The accelerator, speed sensors, and pressure switch module transmit information to the TCM. The TCM processes this information and then sends signals to actuate specific solenoids on the control valve module in the transmission. These solenoids control both oncoming and offgoing clutch pressures to provide closed loop shift control. This is accomplished by matching RPM during a shift to a previously established profile that is programmed into the TCM.

The 2000 Series™ electronic control system has an "adaptive shifting" feature which helps optimize shift quality. The feature monitors critical characteristics of clutch engagement and makes continuous adjustments to improve the next shifting sequence. The transmission shift calibration is based on several different types of shifts, (full throttle, partial throttle, closed throttle, upshifts, downshifts, etc.). Each shift is associated with specific speed and throttle positions. To optimize each type of shift for normal driving, the shift controls need to experience operation and shifting in a wide variety of conditions. A "drive in" period under varying driving conditions is required for the Adaptive Controls to begin to optimize shifting under all conditions. It may take as many as 5 shifts of each type to establish the automatic optimization sequence.

Torque Converter

The torque converter has 4 main elements: a pump, the turbine, and the stator and torque converter lockup clutch. The pump is the input component; it is driven directly by the engine. The turbine provides the output of the transmission; the pump hydraulically drives it. The stator multiplies the torque. When the pump is turning faster than the turbine, the torque converter is multiplying the torque. As the turbine reaches the speed of the pump, the stator starts to rotate and torque multiplication stops. The torque converter then acts as a fluid coupling device.

Series 2000™ torque converters have a torque converter clutch (a lockup clutch). When this lockup clutch is engaged, it causes the pump and turbine to be "locked" together so they rotate in unison, at engine speed. This provides direct drive through the transmission. This type of operation maximizes engine braking and fuel economy. The lockup clutch is regulated by the shift controls and operates automatically. The lockup clutch releases at lower speeds or when the TCM senses conditions requiring it to be released. The torque converter clutch features a damping mechanism, which reduces the transmittal of engine induced torsion vibration through the transmission.

Planetary Gears and Clutches

A series of 3 helical planetary gear sets and shafts provide the mechanical gear ratios and direction of travel necessary for the bus. These planetary gear sets are controlled by 5 multiple clutches that work in pairs to produce 5 forward speeds and 1 reverse gear. The clutches are controlled hydraulically in response to electronic signals from the TCM to the individual solenoids.

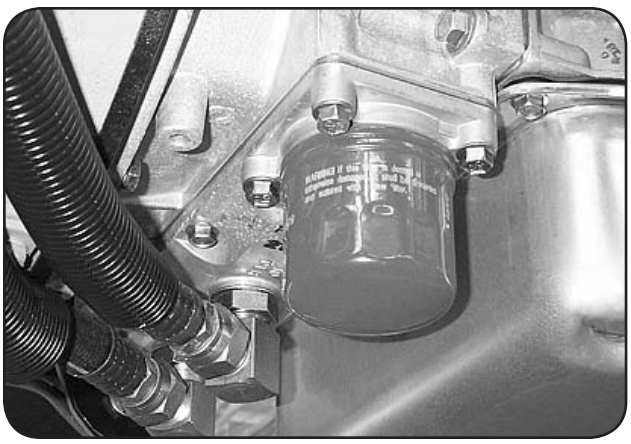
Cooler

Excessive heat in the transmission is dissipated by circulating the transmission fluid through a section of the radiator. The transmission cooler lines connect directly to the bottom of the radiator.

Filters

An outboard filter is located near the front of the transmission on the driver's side. This spin-off canister type filter must be replaced after the first 5,000 miles (8000 km) and thereafter, at 50,000 miles (80000 km) or 24 months intervals, whichever is the first to occur. Use only Transynd™ synthetic transmission fluid or TES 295 equivalent.

The internal filter needs to be changed only during transmission overhaul.



Transmission Maintenance

Daily

- Check that the engine will not start with the shifter lever in any position other than "N" neutral.
- Before the trip; check the transmission fluid level. See the "cold fluid level check" below for instructions.
- Check the transmission fluid level at the end of the trip to accomplish the "hot level check", below.
- Notice if there is a burned odor to the transmission fluid.
- Notice if the transmission shifts rough or fails to shift.

5,000 miles (8000 km) or 6 months

- Clean and inspect the linkage; look for missing cotter pins, locknuts, etc.
- Carefully inspect the transmission and all hoses; look for signs of leaks, wear and abrasion.
- Check for worn or frayed electrical connectors or wires.
- Check the throttle wiring for loose or frayed wires or connectors.
- Check the breather (vent) screen at the top rear of the transmission. See Transmission Removal illustration.
- Obtain fluid analysis for maximum efficiency. Refer to the Technician's Guide for Automatic Transmission Fluid, publication number SA2055, for more details.

Fluid Oxidation Measurement Limits	
Viscosity	± 25% change from new fluid
Total Acid Number	+ 0.3 change from new fluid
Solids	2% by volume maximum

100,000 miles (160,000 km) or 48 months

- Ascertain the oil vent (breather) is clean and free of dirt. Do not spray the vent with steam or cleaning solvents.
- Change both the filter and the transmission fluid. Use only Transynd™ synthetic transmission fluid, or TES295 equivalent. Use Blue Bird spin-on filter cartridge number BB 0033381. Observe all applicable, environmental, health and safety regulations. See the Introduction section of this service manual. Drain the fluid while the transmission is at normal operating temperature; 160°–200° F (71°–93° C). Use caution to avoid serious burns. Hot oil flows more quickly and drains more completely.

1. Remove the drain plug from the oil pan and allow the fluid to drain into a suitable container.
2. Examine the fluid to determine if there are metal fragments in it.
3. Remove the canister filter.

4. Remove the magnet from the top of the filter or the filter attachment tube.
5. Clean any metal debris from the magnet; anything larger than dust sized particles is cause for serious concern.
6. Install the magnet onto the filter attachment tube.
7. Lubricate the gasket of the new filter with new transmission fluid.
8. Install the spin on filter, by hand, until the gasket touches the converter housing.

9. Tighten the filter ONE FULL TURN, ONLY AFTER THE GASKET MAKES CONTACT WITH THE CONVERTER.
10. Install the drain plug and sealing washer. Torque the drain plug to 22–30 ft lb (30–40 Nm).
11. Refill the transmission. The capacity is approximately 7.4 quarts (7 L). The transmission refill capacity is substantially less than the initial fill because a large amount of fluid remains in the transmission cavities after draining.
12. After filling the transmission to the cold check level on the dip stick, start the engine and allow it to idle for about a minute.
13. With the service brakes applied, shift to "R" for a few seconds, back to "N" for a few seconds, to "D" for a few seconds and then back to "N".
14. Allow the engine to idle at about 500–800 RPM and slowly release the service brakes.
15. With the engine running, remove the dipstick and wipe it clean.
16. Insert the dipstick into the tube and remove it. Check the fluid level indicated on the dipstick. Repeat at least twice for accuracy.
17. If the fluid level is still within the cold check band, the transmission may be operated until the fluid is up to operating temperature.
18. If the fluid level is not within the cold check band, you must drain or add fluid until it is before operating long enough to reach normal temperature.
19. Perform the hot check at the first opportunity after the transmission has been operated for about an hour and reached the normal operating temperature of 160°–200° F (71°–93° C)

For more information refer to the Allision Transmission Operator's Manual (BusSeries) for proper transmission operation, driver tips, scheduled maintenance and maintenance tips. This manual should be located in the bus when the bus is delivered to the customer.

For more technical information, consult the appropriate Allison publication or visit the Allison web site: www.allisontransmission.com.

Refer to the following resource for service literature:

SGI, Inc.
Attn: Allison Literature Fulfillment
8350 Allison Avenue
Indianapolis, IN 46268
Toll Free: 888.666.5799
International: 317.471.4995

Shift Cable Adjustment

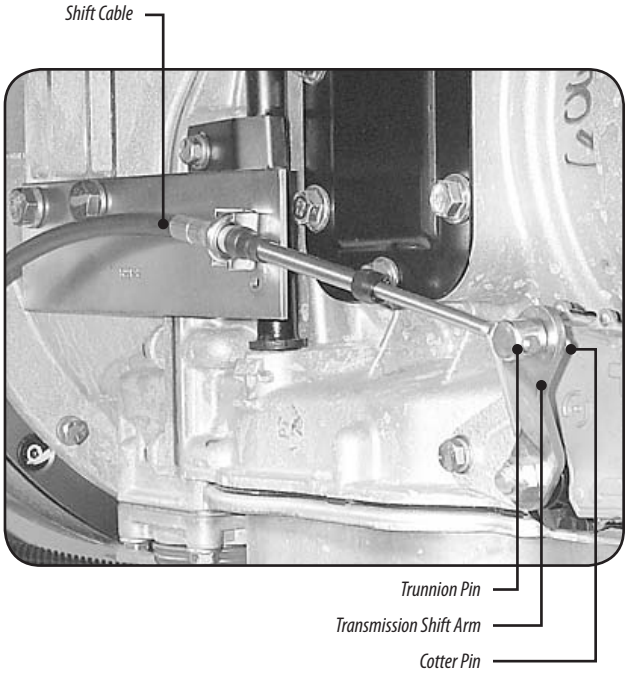
Improper adjustment of the shift cable can result in serious damage to the transmission. When the Driver's shift control lever is squarely in Neutral, the properly adjusted shift cable trunnion pin does not apply any force against the transmission shift arm. Rather, the trunnion pin is relaxed in the transmission shift arm and the shift arm is held firmly in the Neutral position from force applied by the detent.

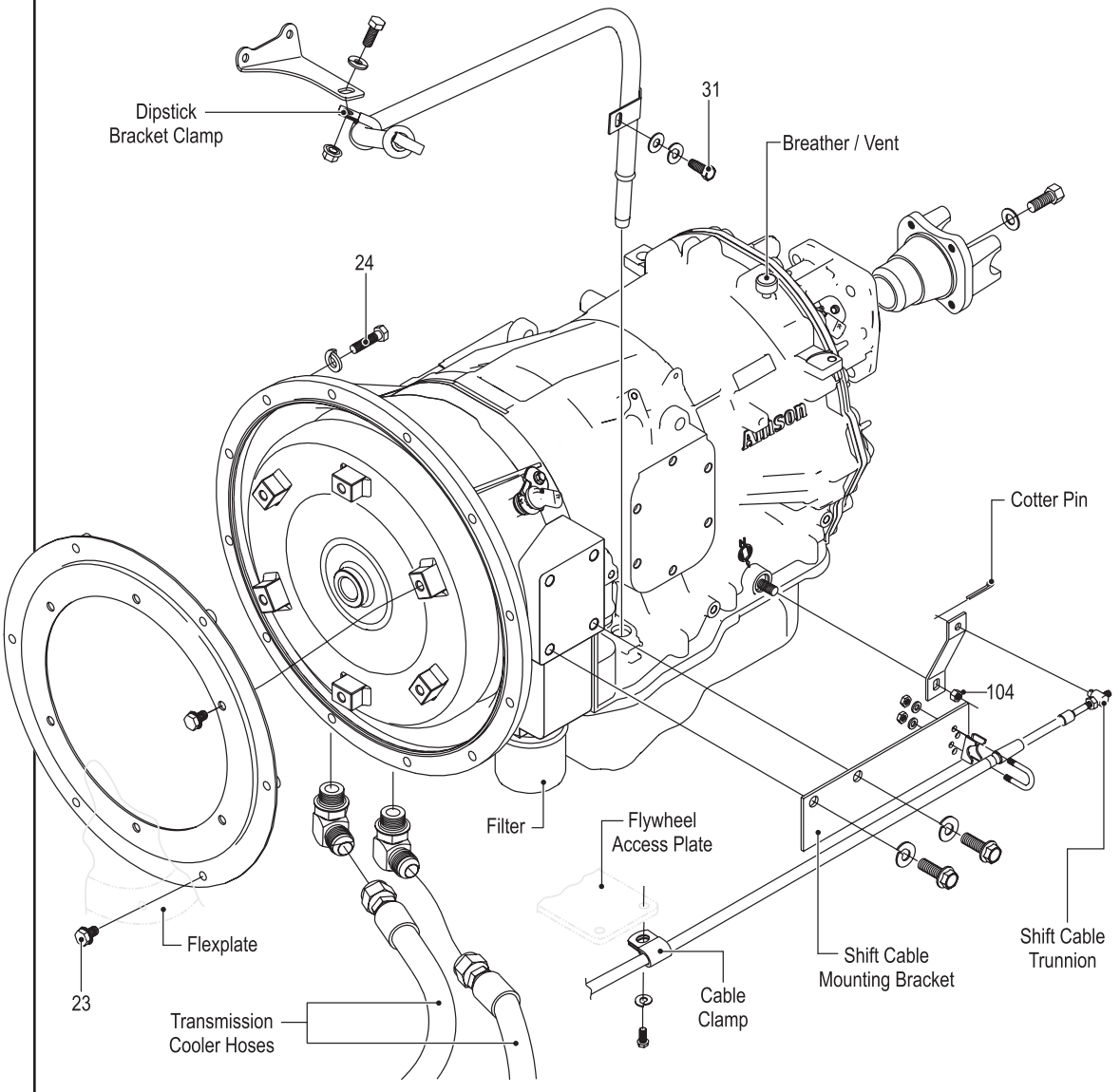
1. With the Driver's shift control lever in Neutral, manually wiggle the transmission's shift cable trunnion slightly to ensure it is not under pressure from the shift arm. If the shift arm is pressing the trunnion in either direction of its travel, adjust it as follows:

2. Remove the cotter pin from the trunnion which connects the cable to the transmission's shift arm. Then remove the trunnion from the shift arm. Confirm that the shift arm is being held firmly in the Neutral position by the detent.

3. Turn the trunnion pin on the threads of the cable so that it aligns with the relaxed shift arm. Then reattach the trunnion to the shift arm and secure it with a new cotter pin.

4. Recheck the shifting by operating the Driver's shift control lever.

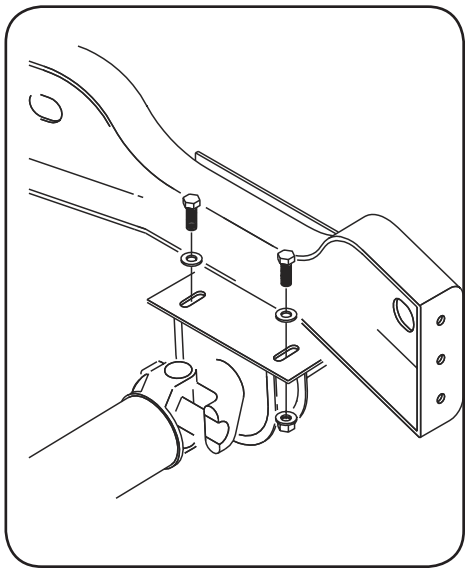




Transmission

Drive Line

The purpose of the driveline is to transmit torque from the transmission to the drive wheels of the vehicle.



WARNING ***Before continuing with these instructions, please refer to the safety instructions in the Introduction Section of this Service Manual.***

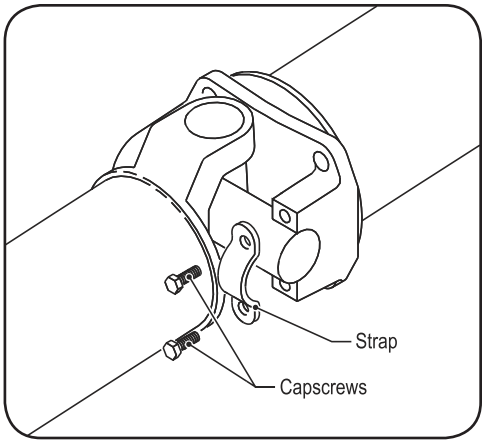
Removal

To remove the driveline from the transmission:

1. Mark the driveline section to be removed, to show the installation orientation. The driveline must be replaced correctly to avoid out-of-phase problems.

2. Carefully support any driveline components that will be left without the normal operational support members (hanger bearings).

3. Remove and discard the capscrews and straps at the universal joints necessary to remove the desired driveline section.



Reinstallation

1. Carefully position the driveline components while observing the previously marked phase indications.

2. Install new straps and hardware at the universal joints. Torque the capscrews to 45–50 ft lb (61.01–67.79 Nm).

3. Lube all grease fittings with NLGI number 2 EP lubricant.

4. Ensure all driveline guards are securely in place before starting the engine.

5. Never work under a bus with the engine running.