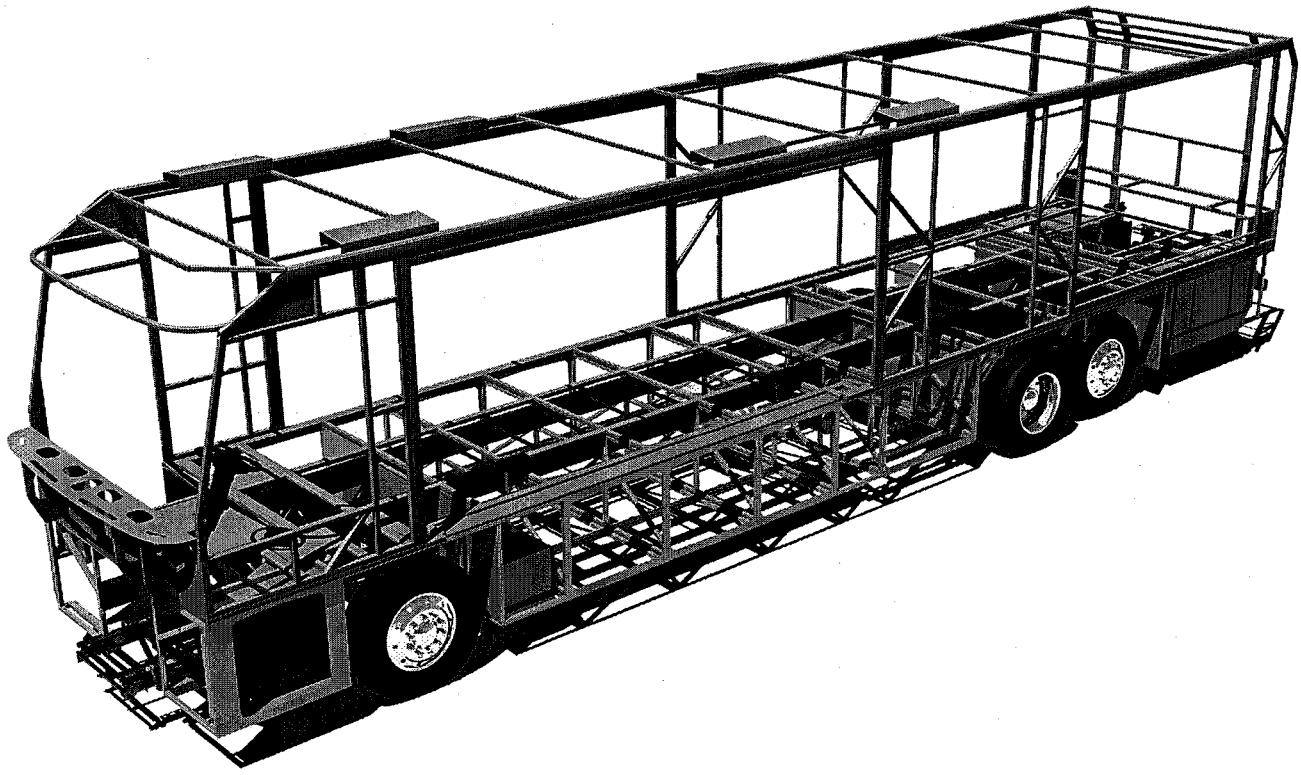
2008

Inspire 360

Owner's Guide: Chassis

Revision A



DynoMax®

Dyno-Tuned Chassis by COUNTRY COACH®

Foreword

Your Inspire motorcoach is built on a DynoMax chassis, designed and constructed by the Country Coach team. Prior to coach assembly, the completed chassis is thoroughly tested in our industry-leading DynoCenter to verify peak chassis performance.

This Owner's Guide chassis section has been developed to provide you with service information on the DynoMax chassis for the Inspire motorcoach. You receive a general overview of chassis components and systems along with maintenance, inspection, and diagnostic procedures.

Also, note that the Appendix includes maintenance intervals, fastener torque recommendations, troubleshooting information, chassis specifications, the maintenance schedule, and parts lists.

While information contained in this Owner's Guide is intended to establish proper maintenance and inspection procedures, there may be times when more detailed diagnostic and repair procedures will be required for chassis components or systems. Technical manuals (such as CAT and Allison), valuable engineering schematics, and the Heavy-Duty Tow Truck Directory are available in your Coach Information Kit. You can obtain further operation and service information by contacting Country Coach at 1-800-452-8015 or www.countrycoach.com. Your local repair facility may also be of assistance.

Due to constant product development and improvement, Country Coach reserves the right to make product or specification changes without notice. The components on your coach, their location, specifications, service or maintenance requirements, may differ from those identified in this guide. All information, illustrations, and specifications contained in this manual are based on the latest product information available at the time of publication.

COUNTRY COACH
THE WORLD'S FINEST MOTORCOACHES

135 East First Avenue • Junction City, Oregon 97448
541-998-9202 • 800-452-8015
www.countrycoach.com • service@countrycoach.com

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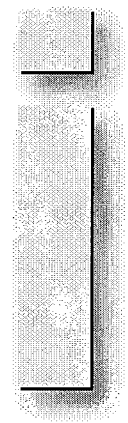
Introduction



INTRODUCTION

This **"Owner's Guide Chassis Section"** contains operation, maintenance, and parts identification information on the DynoMax motorcoach chassis for the Inspire motorcoach models. Information on standard installed equipment and common optional equipment is provided. Use this section when servicing and maintaining your motorcoach chassis. Country Coach recommends that only professional mechanics with motorcoach repair experience service your chassis.

Due to constant product development and improvement, Country Coach reserves the right to make product or specification changes without notice. The components on your coach, their location, specifications, service or maintenance requirements, may differ from those identified in this manual. All information, illustrations, and specifications contained in this manual are based upon the latest product information available at the time of publication.

Service bulletins and manual revisions may be published to supplement, supersede, or augment the information in this owner's guide. To keep your motorcoach in optimum running condition and to ensure coach longevity, follow the prescribed maintenance schedules.

Please read this owner's guide before operating or servicing your motorcoach. This manual contains important information about your chassis, such as safety precautions, operating instructions, component and system specifications, and scheduled maintenance requirements.

Important Safety Information

The service procedures recommended and described herein are effective methods for performing service operations. Some of these service operations require the use of tools designed specifically for that operation. Use these special tools when and as recommended.

Most accidents involving motorcoach operation and maintenance are caused by failure to observe basic safety rules or precautions. Accidents and malfunctions can be avoided by understanding and recognizing potentially hazardous situations at their beginning. Preventative maintenance is the best way to avoid an accident.

Improper operation, lubrication, or maintenance of your motorcoach is dangerous. Do not perform any lubrication or maintenance on the motorcoach until you read and understand the instructions in this manual and the manuals provided by the engine, transmission, and axle manufacturers.

Familiarize yourself with the warning, caution, and notice messages. These highlighted messages alert you to situations, conditions or misapplications which can result in personal injury, damage to equipment, or unsafe operating conditions. These messages are not exhaustive. Country Coach could not possibly know and evaluate all conceivable methods by which service might be done, and then advise the service trade of all possible consequences of each method. Therefore, Country Coach has not undertaken such a broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Country Coach must first be thoroughly satisfied that neither personal safety nor equipment integrity will be jeopardized by the service method selected. Proper service and repair is critical to the safe, reliable operation of your motorcoach.

! WARNING

Warns the driver or person performing service of certain operations or misapplications that can result in coach damage, serious bodily injury, or death.

! CAUTION

Cautions the driver or person performing the service of certain operations, functions, or misapplications that pose danger to themselves, their passengers, and/or the motorcoach.

! NOTICE

Highlights a procedure that is essential for proper and safe operation of the coach.

Service and Maintenance Safety Procedures

- Ensure the transmission is in neutral.
- Apply the parking brake and stop the engine.
- Ensure the protection locks or controls are applied.
- Block or restrain the coach before performing maintenance or service.
- Disconnect the batteries whenever performing any maintenance or before servicing the electrical system.
- When starting an engine after repairs have been made to the fuel system, make provisions for shutting off the engine's intake air and/or fuel supply (to stop the engine) in case there is an overspeed on start-up.
- Start the engine only from the driver's compartment. Never short across the starter terminals or the batteries, as this could bypass the engine neutral-start system and damage the electrical system.

DynoMax Chassis

The DynoMax motorcoach chassis (**see Figure i.1**) is a semi-monocoque construction that integrates the two main frame tubes, the top rail assembly, bulkheads, and the cab subassembly to lower the overall structural stress level throughout the coach. The chassis also includes the coach engine/transmission assembly, driving controls, and the suspensions.

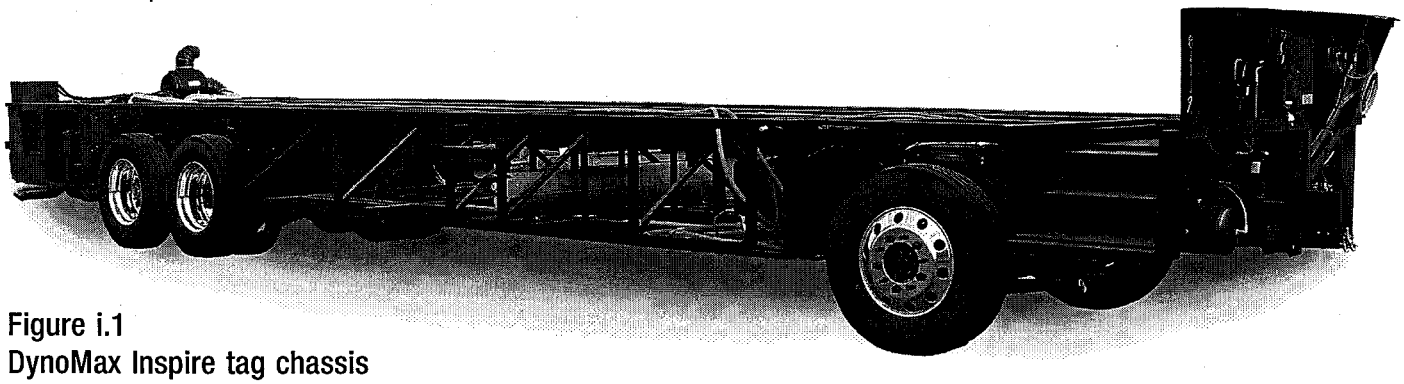


Figure i.1
DynoMax Inspire tag chassis

Highlights include independent front suspension (IFS) for superior ride and handling, heavy-duty rear and tag (optional) axles for maximum vehicle weight ratings, a powerful diesel engine for power on demand, and multiple storage bays.

Vehicle Identification Number

The Vehicle Identification Number (VIN) is the legal identification or serial number of the coach (**see Figure i.2**). This number appears on the vehicle certificate of the title, registration, and on a plate affixed to the outside of the driver-side frame just ahead of the front wheel.

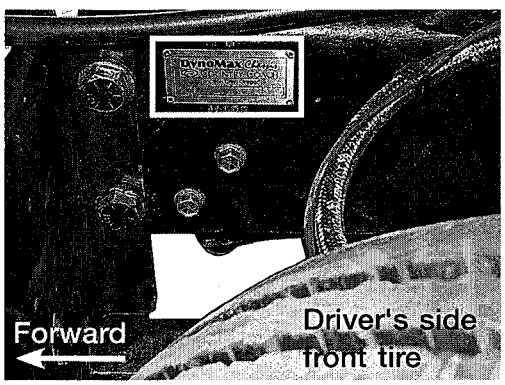


Figure i.2
Vehicle identification number

Maintenance Schedule

Maintenance schedules are provided in the Appendix. By following these maintenance schedules, you ensure optimum coach performance.

Chassis Inspection

For your safety and for the proper maintenance of your motorcoach, inspect the following items daily during periods of coach use and after periods of coach storage. These inspections are most effective when you perform them before operating your coach.

1 Visually check these items:

- Tires and wheels
- Wipers/washers
- Headlights
- Taillights

- Turn signals
- Brake lights
- Backup lights
- Latches on compartments and awnings

2 Look under the coach for signs of fluid leaks.

3 Check:

- **Engine oil:** Keep to full mark on dipstick.
- **Coolant:** Should be visible through surge tank sight glass.
- **Transmission fluid:** Keep to full mark on dipstick.
- **Hydraulic fluid:** Keep to full mark in reservoir.
- **Fuel filter/water separator:** Drain water out.
- **Air filter minder:** Check for air flow restriction.
- **Air tanks:** Drain condensation out of the air tanks.
- **Drive belts:** Inspect for proper tension and condition.
- **Inspect all hoses, lines, and fittings:** Hoses have a finite service life. They should be inspected thoroughly at least every 500 operating hours or annually. Look for cover damage or indications of twisted, worn, crimped, brittle, cracked, or leaking lines. Hoses with their outer cover worn through or with damaged metal reinforcement should be considered unfit for further service.

Safety and maintenance checks may also be described in the original equipment manufacturer's (OEM) manuals supplied with your coach. Consult these publications to develop a comprehensive inspection and maintenance program. Call the Country Coach service department at (541) 998-9202 or (800) 452-8015, 6:00 am to 5:00 pm Pacific Time (Monday-Friday) and 7:00 am to 4:00 pm Pacific Time (Saturday-Sunday) for further information.

Lubrication Specifications

Various components of the motorcoach chassis must have proper lubrication to operate as designed. Refer to **Tables 7.4** and **7.5** in the **Appendix** for lubrication capacities, and specifications. For chassis grease fitting locations refer to **Figure 7.1** and **Table 7.6**, and **pages 7.64** and **7.65**, in the **Appendix**.

In addition to the tables in the Appendix, refer to the manufacturers' manuals that accompany this manual (Caterpillar engine for example).

Fuel Specifications

The use of ultra low sulphur diesel (ULSD) No. 2D fuel will result in optimum engine performance. At operation temperatures below 32°F, acceptable performance can be obtained by using blends of No. 2D and No. 1D. Your original equipment manufacturer (OEM) engine manual can provide further fuel specification preference.

Starting Procedures

Different ambient temperatures and driving conditions dictate different procedures for starting the engine. The following inspection and starting procedures will preserve the performance and longevity of your motorcoach. Refer to your Caterpillar or Cummins OEM manual for detailed information and precautions.

Normal-Weather Starting

Follow these basic starting procedures under normal driving conditions:

1 Place the transmission is in neutral (N) and apply the parking brake.

2 Turn the ignition key switch to the start position. Release the ignition key as soon as the engine starts.

3 If the engine fails to start within 30 seconds, release the ignition key switch and wait two minutes to allow the starting motor to cool before attempting to start the engine again.

> **! CAUTION**
>
> **Do not increase engine speed unless the oil pressure gauge indicates normal. If oil pressure is not indicated on the gauge within 15 seconds, stop the engine, investigate, and correct the cause.**

4 Once a normal engine oil pressure and air pressure are reached, the coach may be operated at a light load and low speed. Check all gauges during this period.

Cold-Weather Starting

To start the engine under frigid conditions, refer to your engine manual. Also, see Chapter 2 in the **House** section for location of the engine heater switch.

Starting After Extended Shutdown or Oil Change

Complete the following after each oil change, or after the engine has been shut off for more than thirty days to make sure the engine receives the correct oil flow throughout the lubricating oil system.

- Start the engine using the normal procedure and idle until oil pressure is shown on the oil pressure gauge. If the oil pressure does not come up within 15 seconds, turn the engine off and repeat the normal start procedure until oil pressure is shown on the gauge.

Engine Shut-Down

1 Allow the engine to operate at low idle for 30 seconds following low load operation. Operate at low idle for at least three minutes if the engine has been operating at highway speeds or high loads. This will help reduce and stabilize internal engine temperature before shutting down.

2 Turn the ignition key to the off position.

Towing and Jacking

! WARNING

Motorcoach towing must be done in compliance with all state and local laws. This includes proper lighting and warning devices and maximum speed regulations. Safety chains must be used in conjunction with the primary lifting/towing equipment. Secure or remove all loose or protruding parts of a damaged coach.

! CAUTION

Do not go under a coach that is being lifted by the towing equipment unless the coach is properly blocked and supported with safety stands.

When towing or jacking your motorcoach, the recommended procedure must be observed. Use of improper procedures could result in structural damage to your motorcoach. Do not attempt a towing operation that may be hazardous for the towing vehicle, operator, bystanders, or other motorists.

Jacking Precautions

Country Coach strongly recommends that a tow service or trained mechanic be called to replace a flat tire. The owner should not attempt to replace a flat tire or make repairs requiring jacking. However, if it is necessary to jack the motorcoach, see the following steps.

! CAUTION

Raising your motorcoach with a jack is a potentially hazardous operation. The following precautions are a minimum safety requirement for this operation:

- **Position the coach on a hard, level surface before jacking.**
- **Shift the transmission to neutral (N), apply the parking brake, and turn the engine off.**
- **Block or chock the front and rear of the wheel on the opposite side of the coach being raised to help prevent the coach from moving. Do not rely entirely on the parking brakes to secure the wheels.**

- **Only use a floor jack for lifting the coach. Always support the frame after the coach has been raised.**
- **Jacking the coach can be done on the chassis frame tube near either the front suspension or the rear axle and rear axle housing.**
- **The floor jack must be located carefully to prevent the possibility of the jack sliding out from under the coach. A jack having a minimum rated capacity of 10 tons may be used at either front or rear jacking locations.**
- **If a flat tire is to be removed, raise the coach so an inflated spare tire will just clear the ground.**
- **Never go beneath the motorcoach when it is supported by a jack.**
- **Do not start the engine when the coach is supported by a jack.**

Towing Precautions

Country Coach recommends that your motorcoach be towed only by a qualified towing company with equipment designed to tow large motorcoaches such as yours.

Your motorcoach should never be towed without first removing the driveshaft.

! CAUTION

Never tow a coach over 35 mph.

Tow Truck Air Pressure Fitting

In the event that your coach requires towing, a tow truck air system can supply air pressure to your coach air system by the steering bay air pressure fitting (**see Figure i.3**). Once this auxiliary air supply is in operation, the coach air bags will inflate to proper ride-height and the parking brake will be operational. Release the parking brake prior to coach towing.

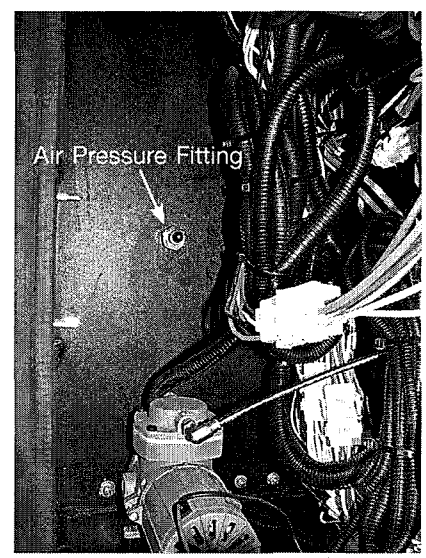


Figure i.3
Tow truck air pressure fitting in steering bay

Driveshaft Removal

Driveshaft removal is the most common and preferred method.

To remove the driveshaft:

1 Make sure the transmission is in neutral, apply the parking brake, and turn the ignition off.

2 Chock the front and rear of both front wheels to prevent the coach from rolling when the driveshaft is disconnected.

3 Loosen all four cap screws on each of the bearing retainer straps.

4 Remove the two top cap screws and swing the retainer straps down so that they hang free.

5 Repeat the process on the opposite end of the driveshaft.

6 Compress the driveshaft enough to clear the "cradle" of one of the yokes and remove the driveshaft.

7 Reinstall the retaining straps. Free swinging straps could result in strap loss or component damage.

Torque Values

Torque values **Tables 7.9** and **7.10** in the **Appendix** serve as general recommendations. Some parts or components may require special torque values which differ from those in the tables. Refer to the **Appendix** "Chassis Torque Values" **Table 7.8** or OEM manuals for specific torque requirements.

Before tightening, study each fastener carefully. Check the thread pitch of the fastener and determine its SAE grade (**see Figure i.4**). A grade five capscrew is distinguished by three marks on its head, while a grade eight capscrew has six marks on its head. Grade eight capscrews are stronger and, consequently, are able to sustain more torque. Capscrews with a metric grading of 8.8 or 10.9 are distinguished by 8.8 or 10.9 etched on the capscrew head (**see Figure i.5**).

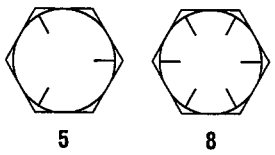


Figure i.4
SAE cap screw grade

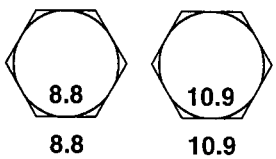


Figure i.5
Metric cap screw grade

Chassis Bays

Refer to Chapter 5 in the **House** section for chassis bay reference and locations.

! CAUTION

A warning label has been affixed inside several compartments not intended for use as storage areas (see Figure i.6). These areas include:

- **Engine bay**
- **Battery bay**
- **LP gas bay**
- **Generator bay**
- **Hydronic heater bay**
- **Fuel tank area**
- **Plumbing bay**
- **Steering bay**

Figure i.6
Storage warning label

! NOTICE

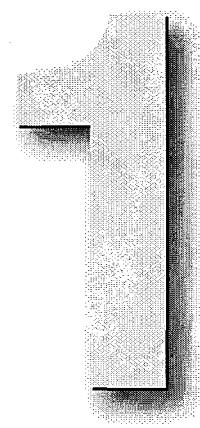
For optimum riding conditions, it is recommended that you distribute your cargo as evenly as possible throughout the storage areas. To verify the weight distribution, drive your coach to any certified weighing station equipped with wheel scales that can provide individual wheel weights. This procedure will also help avoid exceeding the Gross Vehicle Weight Rating (GVWR) of your coach.

Chassis Corrosion Control

The accumulation of road salts, grime and dirt are the most common causes for chassis corrosion. If the motorcoach is driven in areas where road salts are used, the chassis should be washed as soon as possible. Otherwise, hose off the chassis underside once a month to help minimize the corrosion process. High pressure washers or steam cleaners are the most effective cleaning tools. Also, contact your nearest service facility for protection options.

Notes:

Engine Group



ENGINE GROUP

Engine Description

Your motorcoach chassis is diesel powered and uses either the Caterpillar C9 425hp or the Cummins ISL 425hp engine. These engines are 6-cylinder, turbocharged, and equipped with fuel injection. Also, they are fully electronic with onboard electronic control modules (ECM) that regulate and monitor engine operation. Most photos or illustrations presented reflect the Cummins engine.

Location and Mounting

The engine is mounted at the rear of the chassis (**see Figure 1.1**). Two mounts support the engine on the sides and one mount supports the engine at the front (**see Figure 1.2**).

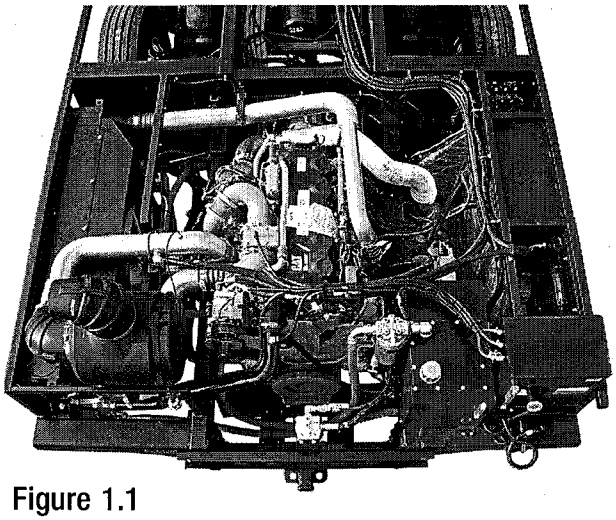


Figure 1.1
Engine location

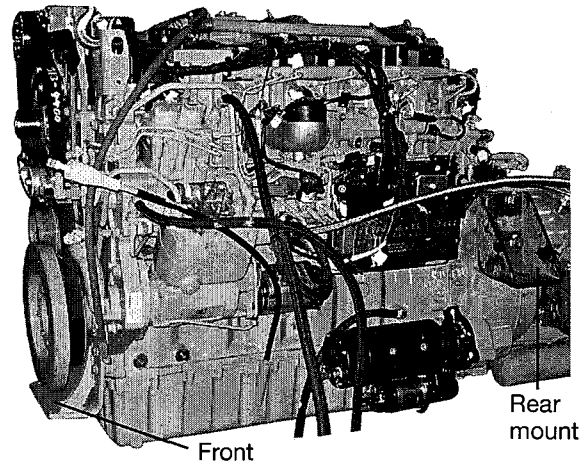


Figure 1.2
Engine mounts

Engine Data Plates

The engine serial and arrangement numbers are needed to facilitate parts information (**see Figure 1.3**, **page 1.2** and **Figure 1.4**, **page 1.3**). Refer to your Caterpillar or Cummins original equipment manufacturer (OEM) engine manual for more information.

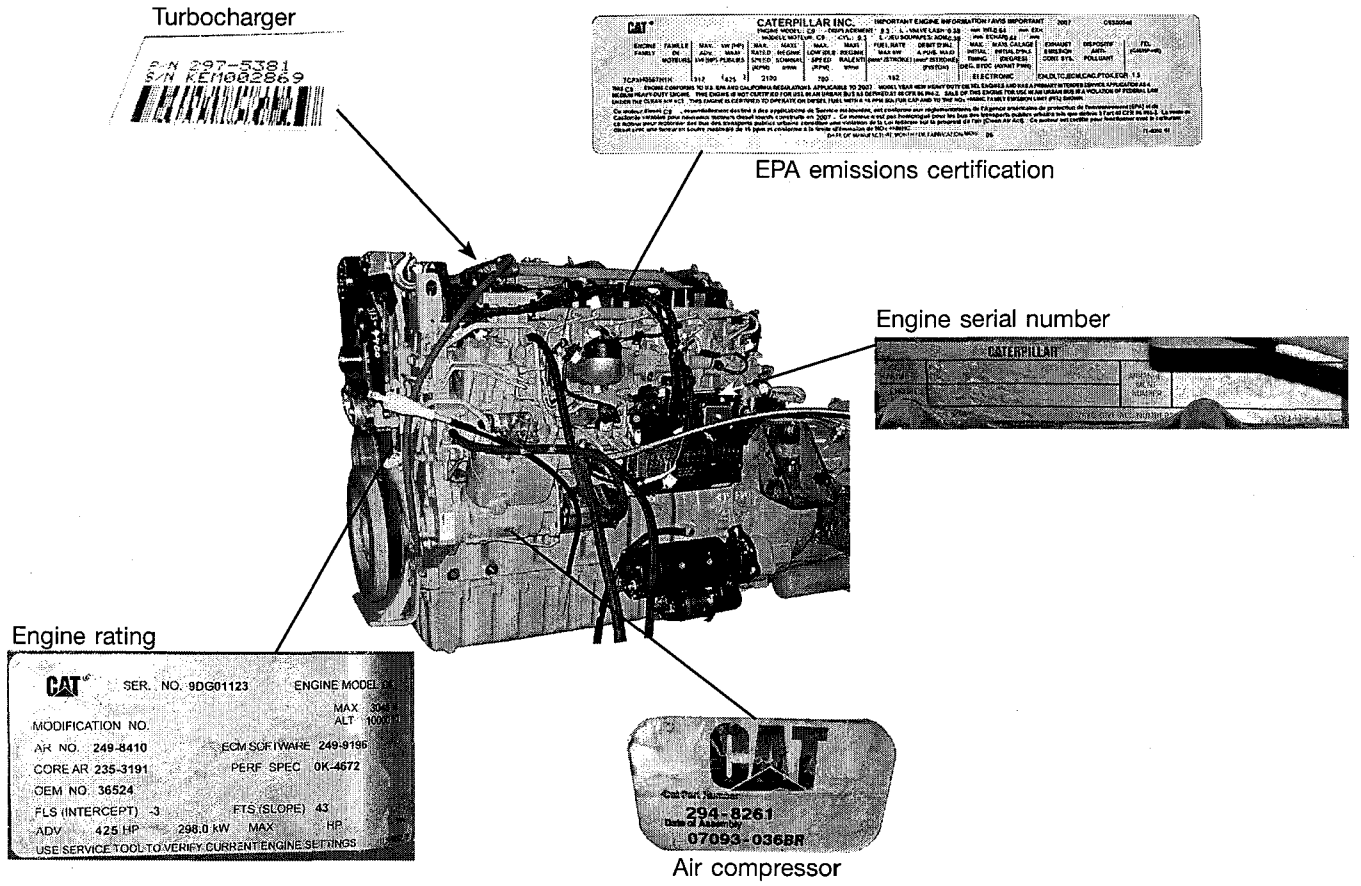


Figure 1.3
C9 data-plates

Operating the Engine

Proper care of your engine will result in longer engine life, better performance, and more economical operation. While operating your motorcoach, always monitor the indicator lights and gauges. A basic reference to starting and shutdown procedures can be found in "Starting Procedures" in the Introduction.

Engine Protection System

The Caterpillar and Cummins engines are equipped with an engine protection system that monitors engine operations. If the system detects a problem, it will log a diagnostic fault code and, if necessary, derate the engine. If this occurs, you will be alerted by a center dash check engine lamp. Find a safe place to pull over so you can evaluate the problem. Contact Country Coach at (800) 452-8015, Caterpillar at (877) 777-3126, or Cummins at (800) 343-7357 for diagnostic assistance. Also, the Caterpillar OEM manual offers a fault code table and a list of the Cummins ISL engine fault codes are included in the Appendix chapter of this guide.

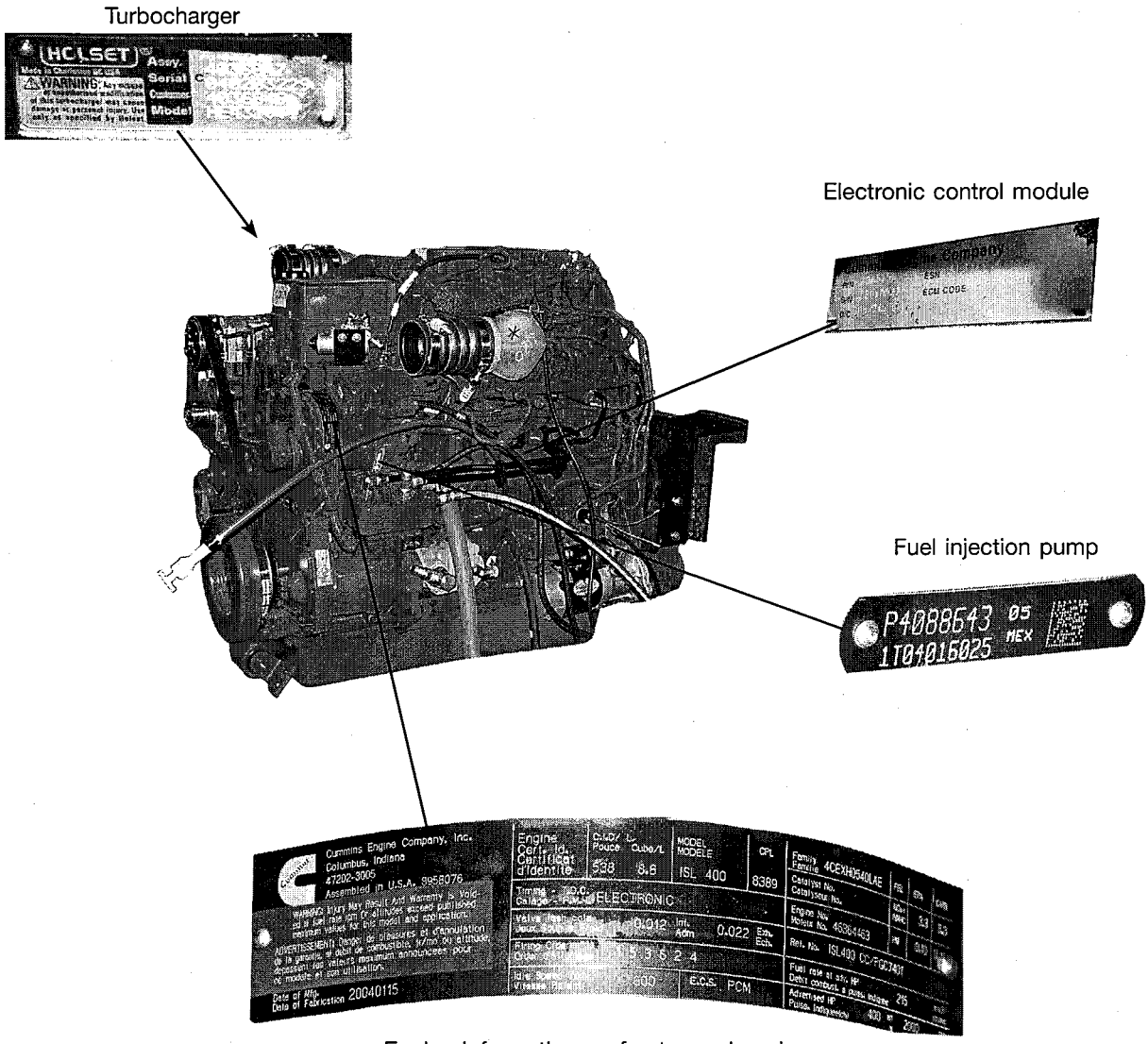


Figure 1.4
ISL data-plates

Most engine problems are indicated before the warning lamp illuminates. Always be perceptive to changes in performance, sound, or engine appearance. This may indicate that service or engine repair is needed.

Indications of possible engine problems:

- Vibration
- Excessive smoke
- Unusual engine noises
- Loss of power
- Fuel, oil, or coolant leaks

- Increase in oil consumption
- Increase in fuel consumption
- Sudden changes in engine operating temperature or oil pressure

If you are in need of assistance, contact the Caterpillar RV Engine Support Center by calling toll-free, (877) 777-3126. The Cummins Customer Assistance Center is available at (800) 343-7357.

! CAUTION

Do not exceed governed engine speed (2,100 rpm) under any circumstances. Operation beyond governed engine speed can cause severe engine damage. When descending a steep grade, use a combination of transmission downshifting, engine braking and service brakes to control the coach and engine speed.

Drive Belt Maintenance

Since belts and pulleys wear with use, look at all frictional surface areas for signs of wear. Normal wear can be recognized as even wear, both on the belt and the grooves of the pulley. Unusual signs of wear indicate some corrective action is necessary. When checking, remember that failed or partially failed belts may have been damaged by a bad pulley, an improperly aligned drive, or other faulty mechanical component. Have a qualified service facility check and replace belts as necessary.

Abnormal signs of belt wear are:

- Base cracking: Excessive cross-checking extending into the rubber on the base of a belt that shows little or no side wear
- Fabric rupture
- Cover tear: Chassis component interference
- Slip burn: Belt slips under load, and when it grabs, it could snap
- Gouged edge: Chassis component interference
- Worn sides
- Excessive stretch
- Lumpy belts
- Internal cord failure

Fuel System

The chassis fuel system controls the passage of diesel fuel to the engine. Pressure on the accelerator governs the amount of fuel delivered to the engine which, consequently, controls the speed of the engine.

Components of the fuel system:

- Fuel tank
- Primary fuel filter/water separator
- Secondary fuel filter
- Fuel transfer pump (C9), electronic lift pump (ISL)
- Necessary hoses and tubes

Fuel Requirements

The CAT and Cummins engines require the use of Ultra Low Sulphur Diesel (ULSD) fuel. Use of Low Sulphur Diesel (LSD) fuel clogs the diesel particulate filter (DPF). For more information about this new fuel, refer to www.exxon.com/USA-English/GFM/Products_Services/Fuels/Diesel_Fuels_FAQ.asp.

Country Coach has affixed ULSD requirement labels to the inside of each fuel fill door as a reminder.

! CAUTION

Use only ULSD fuel in this motorcoach.

! WARNING

Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.

! CAUTION

Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injectors.

The use of ultra low sulphur No. 2D diesel will result in optimum engine performance. At operating temperatures below 32°F, acceptable performance can be obtained by using blends of ultra low sulphur No. 2D and No. 1D. Your engine manual will provide further fuel reference.

Fuel Tank

Your motorcoach chassis is equipped with a 100-gallon fuel tank mounted rearward of the independent front suspension (IFS). A sender inside the tank measures the fuel level and sends this information to the fuel gauge on the dash center panel. Fuel fills are located on both sides of the tank, and have integral vents built into them.

The fuel feed and fuel return lines, located on top of the fuel tank, convey fuel to and from the engine. In addition to these main fuel lines, auxiliary lines supply fuel to the generator and diesel fired hydronic heater. Also located on top of the tank is a rollover valve that is installed to prevent fuel spillage in the event of a rollover.

Bacterial Contamination

The fuel system of any diesel engine is vulnerable to bacterial growth. This contamination spreads rapidly from the fuel tank, quickly clogs the fuel filters and stops fuel flow. To deter moisture condensation, keep your fuel tank full, especially if the coach will be parked for an extended time, and purchase your fuel from reputable dealers where there is a regular turnover and fuel does not stand for long periods of time.

If bacterial growth is discovered in the fuel system, commercial products to correct and prevent the problem are available from diesel fuel vendors.

Primary and Secondary Fuel Filters

The primary fuel filter with water separator and fuel heater, and the secondary fuel filter are located in the engine bay. The CAT secondary fuel filter and primer pump are located in the battery bay (**see Figure 1.5**). These two filters provide a clean fuel supply to the engine.

The primary and secondary fuel filter elements should be replaced at the same time. See **Table 7.1** in the **Appendix** for service intervals.

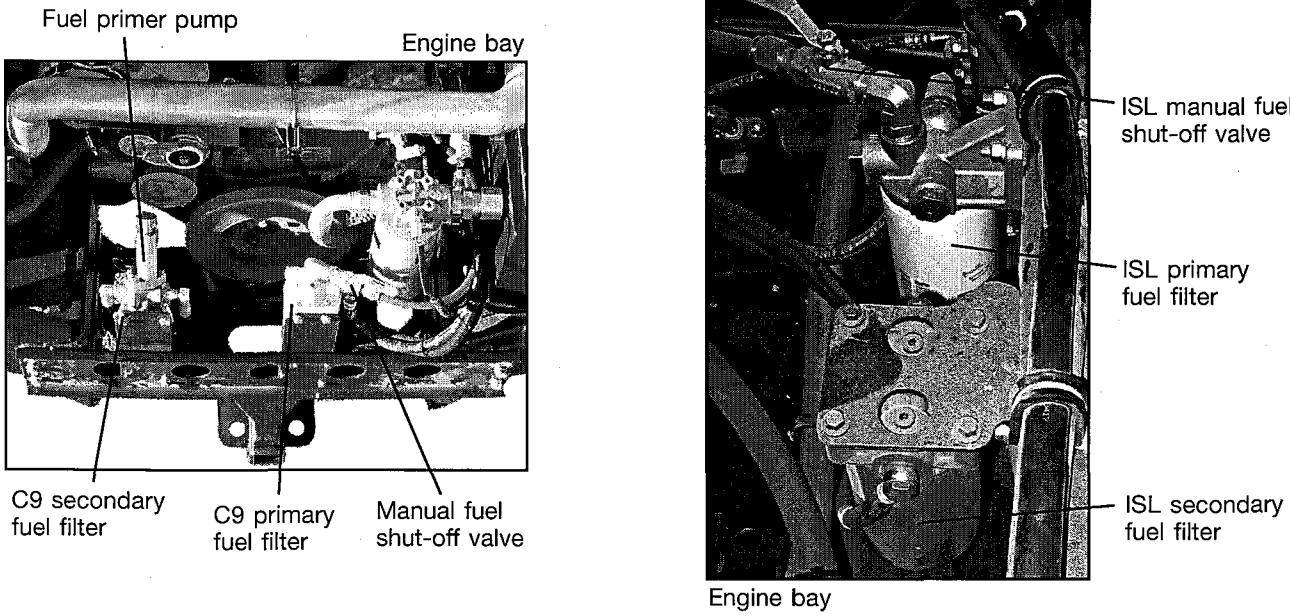


Figure 1.5
Primary and secondary fuel filters

Note: The Founders Edition C9 secondary fuel filter and fuel primer pump are located in the chassis battery bay.

To replace the fuel filter:

1 Be certain the transmission is in neutral, the parking brake is applied, and the engine is off.

2 Close the manual shut-off valve (if equipped).

3 Clean the area around the filter head.

4 Position a suitable container to catch any fuel that might spill.

5 Remove the filter and clean the gasket surface of the filter head.

6 Apply clean diesel fuel or clean engine oil to the new fuel filter gasket. Do not fill the fuel filter before installing. Unfiltered fuel could be contaminated and cause accelerated fuel system component wear.

7 Install the new fuel filter. Turn the filter onto the filter head until the gasket contacts the head. Then tighten one additional turn (360°) by hand.

! CAUTION

Do not overtighten. Overtightening can distort the threads or damage the filter element seal.

8 Open the manual fuel shut-off valve.

9 Residual fuel in the cylinder head should be sufficient to allow the engine to start without priming. Refer the engine OEM manual if priming is required.

10 Start the engine and inspect the fuel system for leaks.

! CAUTION

Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

To drain water and sediment from the primary fuel filter/water separator:

1 Be certain the transmission is in neutral, the parking brake is applied, and the engine is off.

2 If the engine has been running at normal operating temperature, allow the fuel filters and fuel lines to cool for 30 minutes.

3 Verify that the manual shut-off valve is open (if equipped).

4 Position a suitable container to catch drained water and fuel.

5 Open the petcock on the bottom of the fuel/water separator bowl.

6 Drain until clear fuel appears.

7 Close the petcock.

Fuel Transfer Pump (C9)

The fuel transfer pump is mounted directly to the fuel injector pump on the passenger side of the engine and it is mechanically operated. The transfer pump draws fuel from the fuel tank and provides a regulated fuel flow through the fuel filters and then back into the main fuel distribution manifold. This manifold sends the majority of fuel to the injector pump and a small portion to the CAT Regeneration System (CRS) manifold. The fuel injector pump increases the fuel pressure and pumps fuel to the common rail system. The common rail system supplies fuel into the engine head for the fuel injectors.

Fuel Lift Pump (ISL)

Air is flushed out automatically by the fuel lift pump. The engine electronic control module controls the fuel lift pump whenever the ignition key switch is turned on. The lift pump will be energized for 30 seconds to make sure that the low pressure fuel lines are primed and will not start again unless the ignition key switch is cycled. When air enters the fuel system, inspect the fuel connections, lines, fuel filters, and replace if necessary.

Air Intake System

The air intake system controls the passage of air used for the combustion of engine fuel. The air intake system consists of the following components in their functional order: air filter, turbocharger, and charge-air cooler.

Air Intake

Air is drawn into the engine through the air cleaner plenum, which is mounted at the rear of the coach. Upon entering the plenum, air passes through the air filter. Air entering at the engine must be free of dirt and debris. Therefore, it is important that the air filter minder in the engine bay be inspected daily before operating the motorcoach.

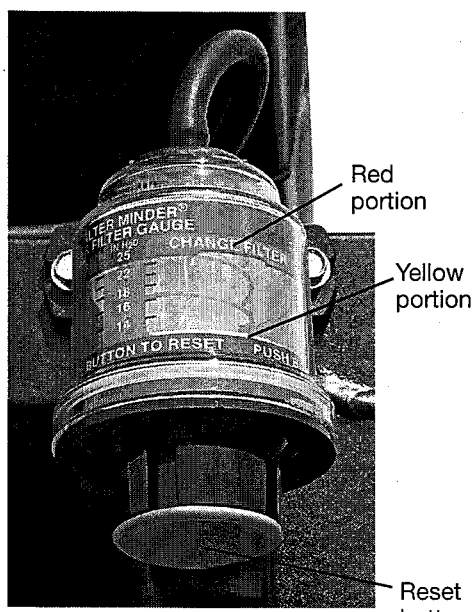


Figure 1.6
Air filter minder in engine bay

Check the air filter minder after the engine has been operating at full throttle (or up a hill or equivalent). If the yellow portion contacts the red portion of the gauge, the air filter may need to be replaced (**see Figure 1.6**).

To replace the air filter:

1 Turn off the engine.

2 Remove the cover at the end of the filter housing by twisting the thumb screws.

3 Remove the old filter and wipe out any debris in the housing.

4 Install new filter.

5 Reinstall the air filter cover and thumb screws.

6 Push the reset button at the bottom of the air filter minder.

! CAUTION

Do not operate the engine without a filter in the housing! Do not operate the engine without checking the air filter. Insufficiently filtered air can cause serious engine damage.

When checking the air filter, inspect all seals, clamps, and hoses of the air intake inlet. Immediately replace or retighten all damaged or loose components.

Turbocharger

After the air passes through the air filter it is drawn into the turbocharger and is compressed. This compression of air creates additional power, because the combustion chamber is provided with more air at a faster rate, thereby allowing the engine to burn additional fuel with greater efficiency. The turbocharger is driven by the engine exhaust gases. It is the force of these gases passing through the turbocharger and hitting the blades of the turbine wheel that causes the turbine and compressor wheels to turn.

Charge-Air Cooler

The compression process heats the intake air. In order to increase combustion efficiency, the air is directed to the charge-air cooler where it is cooled. Cooler air is denser, therefore, a greater volume is allowed to enter the combustion chamber. The result is lower fuel consumption and increased power output.

The charge-air cooler is a component of the radiator assembly. Ambient air is moved across the charge-air cooler by the fan, cooling the intake air.

Charge-Air Cooler Maintenance

Regular maintenance and inspection procedures for the charge-air cooler system must include a thorough inspection of the entire air intake system. Check the piping, clamps, and hoses in the system to ensure air tightness. Because rubber hoses deteriorate over time, carefully perform a regular inspection of hoses, so that any faulty hoses can be found and replaced prior to failure. The front of the charge-air cooler should be checked regularly for insects and debris. When needed, clean the front of the charge-air cooler with a soft brush and soapy water.

Engine Exhaust

Engine exhaust is passed from the turbocharger to the diesel particulate filter (DPF) (**see Figure 1.7**). The DPF acts as an engine muffler. Check the DPF and tail pipe periodically for loose or worn clamps.

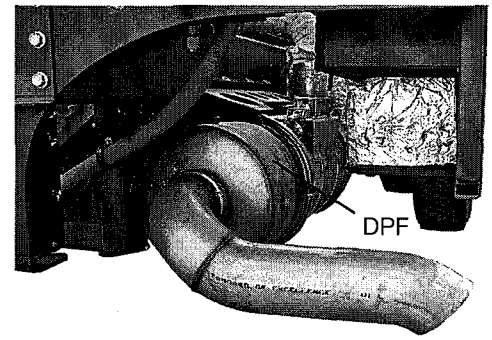


Figure 1.7
Diesel particulate filter (DPF) in engine bay

Diesel Particulate Filter (DPF)

This engine includes a diesel particulate filter (DPF) that cleans itself by regeneration. The DPF self-initiates regeneration to clear any accumulated particulates, requiring no driver interaction under normal driving conditions. However, you may need to deactivate regeneration manually under certain conditions.

To enable the coach for DPF regeneration:

1 Verify that the Regen switch, located on the driver-side console, is in the Off (center) position.

2 Travel above 30 mph for 60 minutes (or more).

3 Travel above 5 mph for 60 minutes (or more) when the DPF soot level is above 125%.

Conditions that may require manual regeneration:

- While the Regen switch is set in the disable position for an extended period.
  - Regen disable is recommended while driving in roadside 'fire' hazard areas (dry grass)
- Long periods of coach operation at low speeds
- Long periods while the engine idles

To perform a manual DPF regeneration:

- Press the Regen switch to service the DPF when the Regen dash light comes on.

DPF service is required following these indications:

- If an error occurs and does not initiate regeneration after pressing the Regen switch or if the Regen switch is not pressed, the Check Engine light comes on and the engine automatically reduces power.
- When the DPF becomes severely clogged (at 200% DPF soot level) and the Stop Engine light comes on.

Engine Brake

The Caterpillar C9 and Cummins ISL engines are equipped with an engine braking system for slowing your motorcoach (**see Figure 1.7, page 1.9**). The engine brake helps reduce service brake wear and provides greater overall brake efficiency. Proper use of the engine brake reduces service brake maintenance costs and helps ensure driver and motorcoach safety by preserving brake friction surfaces.

The engine brake is driver-controlled. The control switch is located on the driver-side console.

> **! WARNING**
> **The engine brake is not functional as a service brake. It cannot stop your coach or be used as a parking brake.**

Apply the engine brake during the following conditions:

- Descending a hill

- Exiting onto an off-ramp (use caution on turns)
- Approaching traffic lights or stop signs
- Approaching stopped or slow traffic

Using the engine brake in these situations allows your motorcoach to maintain a steady, controlled speed without having to use your service brakes.

For coaches with Caterpillar engines, the engine brake functions in either of the two following modes, depending on the cruise control setting:

- **Throttle assist:** The engine brake is on and cruise control is off. The brake engages every time the throttle pedal is released. Generally, the transmission also downshifts. This mode is preferred for highway driving, especially in hilly terrain.
- **Brake assist:** The engine brake is on and cruise control is on. The brake will not engage when the throttle pedal is released, but it does engage when the brakes are applied. This mode is preferable when driving in traffic.

  You do not need to enable the cruise control by pressing the Set button. Simply leave the cruise control On/Off switch in the On position.

The following additional features also apply to the engine brake:

- The brake lights turn on whenever the engine brake is engaged.
- The engine brake is always disabled when the coach is traveling at low speeds, specifically, when the transmission is in first or second gear with the engine below about 1100 rpm.
- The engine brake for Caterpillar engines engages at 5 to 9 mph over the cruise control setting.

For coaches with Cummins engines, the engine brake functions as follows:

- **Throttle assist:** With the engine brake switch pressed to the on position, the service brakes will engage every time the throttle pedal is released. Generally, the transmission also downshifts. This mode is preferred for highway driving, especially in hilly terrain.

The following additional features also apply to the engine brake:

- The brake lights turn on whenever the engine brake is engaged.
- The engine brake is always disabled when the coach is traveling at low speeds, specifically, when the transmission is in first or second gear with the engine below about 1100 rpm.
- The engine brake for the Cummins engine engages at 4 to 5 mph over the cruise control setting.

Precautions on Wet Pavement

! WARNING

Do not use the engine brake on slippery roads, as this can increase your stopping distance and may cause over-braking of the wheels, resulting in skidding, or inhibited coach control.

When driving in inclement weather, keep in mind that the first 10-15 minutes of a rainfall are the most dangerous, since road dirt and oil mix with the rain to create a slippery surface. If driving in cold weather, turn the engine brake off whenever approaching on-ramps, exit ramps, bridge decks, or tight corners. Always be sure to increase the following distance between the coach and the vehicle ahead during inclement weather conditions.

Descending a Grade

Before beginning the descent of a hill, determine if your engine brake is properly working. The engine brake is working properly if your coach starts to slow down when briefly lifting your foot from the accelerator pedal. Next, the coach operator should establish a "control speed". The "control speed" occurs when the force that pushes your coach is equal to the retarding that slows the coach. The "control speed" is obtained with little or no use of the service brakes. Use your engine brake to provide the braking power. When the engine brake is activated, your transmission automatically downshifts to 3rd gear. Adequate engine braking is accomplished without exceeding the rated engine speed. If the rated engine speed is exceeded, the transmission will up shift to avoid possible engine damage. Use the service brakes to slow the coach and the transmission will automatically downshift.

The longer or steeper the hill, the more important it is to use the engine brake. Make maximum use of the engine brake by gearing down and letting it do the work.

Cooling System

Your motorcoach uses a cooling system that prevents the engine from overheating by channeling coolant through the engine block and cylinder head. The cooling system also cools heated transmission fluid, hydraulic fluid, and supplies heat for the cab heater. Components of the cooling system includes surge tank, vent hoses, water pump, thermostat, radiator, charge-air cooler, transmission cooler, and hydraulic cooler.

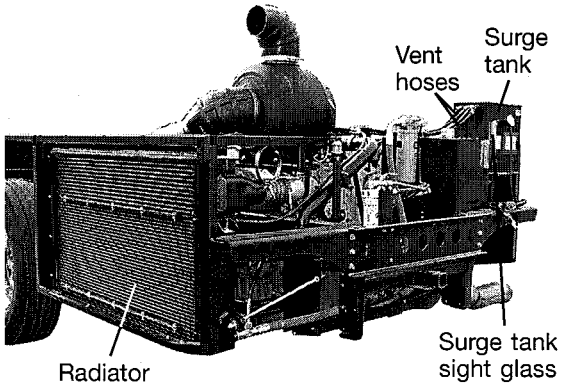


Figure 1.8
Surge tank, vent hoses, and radiator in engine bay

Vent Hoses

There are vent hoses attached to the surge tank (**see Figure 1.8**). These vent hoses are necessary to relieve trapped air in the coolant, as aerated coolant does not conduct heat effectively.

Water Pump
The water pump circulates coolant throughout the coolant system. It receives coolant from the inlet pipe and sends it to the block and cylinder head of the engine, through the thermostat and through the radiator.

Thermostat
The thermostat regulates the flow of coolant between the engine and the radiator. For proper engine operation, the thermostat must open or close to maintain the correct coolant temperature range.

Surge Tank
The surge tank is a coolant reservoir that allows for the expansion of the coolant as the engine temperature rises (**see Figure 1.8, page 1.12**). It is mounted in the engine bay and aids in venting the cooling system. Coolant should always be visible in the sight glass. Should it be necessary to add coolant, it should be added into the surge tank.

Radiator
Heated coolant is pumped into the radiator (**see Figure 1.8, page 1.12**). The coolant enters the radiator at the top rear and flows in a cross-flow pattern to the bottom front. As heated coolant flows through the radiator, the fan draws air through the radiator, thus cooling the coolant.

Cooling System Inspection and Maintenance
The cooling system should be inspected during the daily inspection. The surge tank cap, drain valves, and the radiator should be inspected for leaks. Also, the accessory drive belts should be inspected for cracks, breaks, or other damage. Replace damaged components.

Hoses
Inspect hoses regularly. If the hoses have become brittle, have cuts or abrasions, or show signs of cracking, they need to be replaced.

Coolant Checks and Replacement
Coolant level and appearance should be checked daily at the surge tank. The coolant should be replaced periodically to eliminate the buildup of harmful chemicals. Refer to the **Appendix Table 7.1** for service intervals.

Clean and flush the cooling system before the recommended maintenance interval if any of the following situations occur:

- **The coolant is heavily contaminated.**
- **Foaming is observed in the radiator.**
- **The oil cooler has failed, allowing oil to contaminate the coolant.**
- **Fuel has entered the cooling system and contaminated the coolant.**

Country Coach initially fills the coach with a commercial heavy duty coolant/ antifreeze that includes a supplemental coolant additive (SCA). SCA is effective in preventing corrosion, cavitation, mineral deposits, and foaming. Periodic testing for adequate concentration of SCA needs to be done at regular maintenance intervals. If coolant must be added, pre-mix the same type of coolant and distilled water (50/50) before adding to the system. Check the SCA concentration and adjust accordingly afterwards.

! CAUTION

Hot coolant can cause serious burns. Before opening the surge tank or radiator cap, stop the engine and wait until the cooling system components are cool. Then loosen the cap slowly to relieve system pressure.

Use of water alone for coolant will cause corrosion damage. When adding to existing coolant, replace the needed amount with the same type coolant.

Lubrication System

Maintaining a well-lubricated engine is essential for optimum performance and longevity. Proper maintenance includes the use of quality oil, checking the oil level daily, and following the prescribed oil and oil filter replacement intervals.

Engine Oil

Under normal driving conditions, use a high quality 15W-40 multigrade oil. Refer to the Caterpillar or Cummins engine manual for required American Petroleum Institute (API) performance requirements.

Checking the Oil Level

Check the oil with the engine oil dipstick (**see Figure 1.9, page 1.15**). Open the engine access door and remove the engine oil dipstick. The oil level is acceptable if it is between the add and the full mark of the dipstick. Checking the oil level while the engine is running or the coach is on an uneven surface will yield an inaccurate measurement. For accurate results, shut down the engine and wait 10 minutes for the oil to drain to the oil pan.

Check oil before the day's initial start. Cold oil will not drain back to the oil pan efficiently enough for an accurate reading. Prepare to check the oil level at cold start the preceding night by pulling the dipstick out slightly so the tube is not sealed. Unsealing the tube removes pressure from the lubrication system, allowing the oil to drain down to the oil pan.

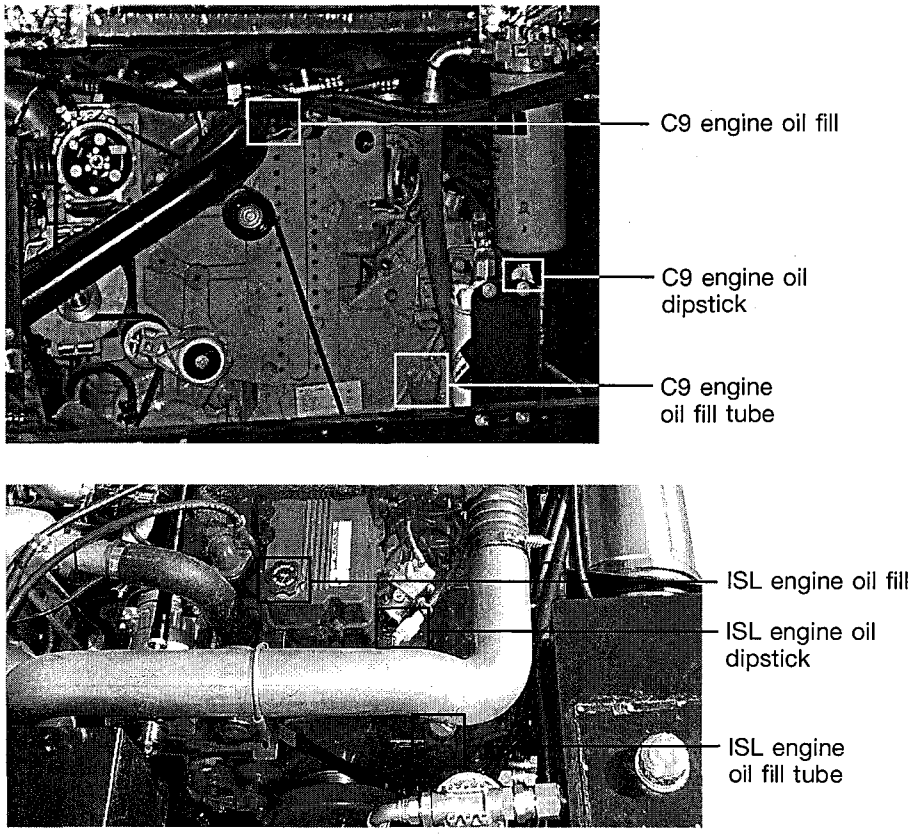


Figure 1.9
Engine oil dipstick and oil fill in engine bay

Adding Engine Oil

If the oil level is at or below the add mark on the dipstick, oil must be added. Add by means of the engine oil fills (**see Figure 1.9**). Bring the oil level to the full mark on the dipstick. Do not overfill.

After the oil has been added, wait approximately 10 minutes to let the oil drain from the upper parts of the engine to the oil pan. Check the level again.

Oil and Filter Change Intervals

Refer to the **Appendix Table 7.1** for the oil and filter change intervals. The Caterpillar or Cummins manual will also have the oil and filter changing procedures. Abnormal driving conditions, such as extreme (hot or cold) temperatures, warrant an increase in frequency of oil and filter change intervals.

Notes:

Transmission Group

TRANSMISSION GROUP

Your DynoMax motorcoach chassis uses either the Caterpillar (CAT) CX28 or an Allison 3000 MH automatic transmission with PTO. The CX28 and the 3000 MH are six-speed, fully-automatic, neutral-start transmissions that are electronically controlled (**see Figure 2.1** or **2.2**). The transmission nameplates provide the model, serial, and part numbers.

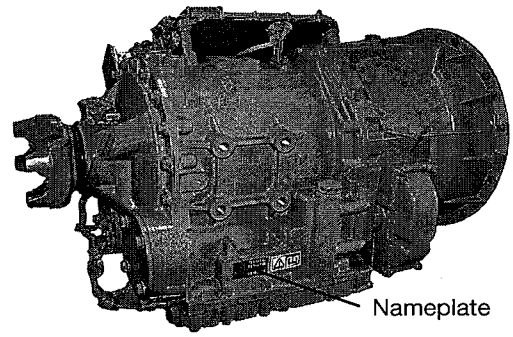


Figure 2.1
CAT CX28 transmission with PTO

The transmission joins the engine to the rear axle and transmits the power output of the engine to the drive wheels of the motorcoach. By activating different gears within the transmission, the speed at which the output shaft of the transmission turns in relation to the speed of the engine crankshaft can be changed to meet the driving and load conditions.

Information in this chapter covers routine maintenance and basic service instructions for your transmission. For complete coverage of transmission maintenance, refer to the transmission original equipment manufacturer (OEM) manual.

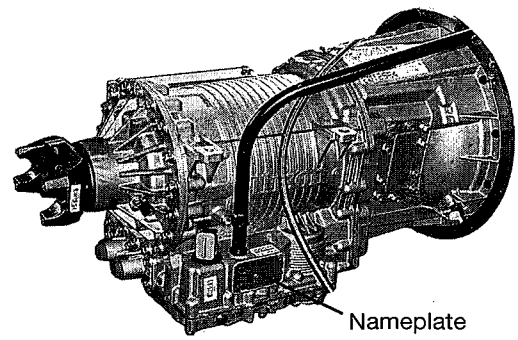


Figure 2.2
Allison 3000 MH transmission with PTO

Transmission Precautions

! CAUTION

The engine cannot be started by pushing or towing. Before towing or pushing a motorcoach equipped with a CX28 or 3000 MH transmission, the driveline must be removed regardless of distance or speed traveled. Also, refer to the "Towing and Jacking" section in the Introduction.

When replacing any component, attached equipment on the transmission, or driveshaft, use replacement parts of the same or equivalent quality. Using parts of lesser quality can result in damage to the transmission or driveshaft.

Do not allow the coach to coast in neutral. Coasting in neutral can result in severe transmission damage and eliminates engine braking action.

Observe the transmission maintenance schedule requirements provided in this chapter and the Appendix.

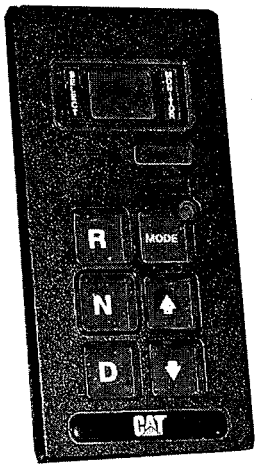


Figure 2.3
CAT transmission shifter

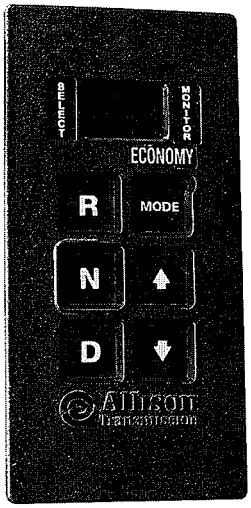


Figure 2.4
Allison Generation IV transmission shifter

Transmission Operation

The transmission shifter is an electronic controlled keypad with digital display. Gear selection is accomplished through the transmission shifter (**see Figure 2.3** or **2.4**). The LED display located at the top of the shifter displays two gear numbers. The Caterpillar CX28 shifter first number indicates the maximum requested gear and the second number indicates the actual gear. The Allison Generation IV shifter first number indicates the highest forward gear range available and the second number indicates the current selected gear.

Electronic Control Unit

The transmission contains an electronic control unit (ECU), which controls the upshifts, downshifts, and clutch lockup functions. It also monitors the system for conditions that could result in damage to the transmission or improper coach operation. When one of these conditions is detected, the ECU is programmed to respond automatically in a manner which will ensure safe operation of the motorcoach and transmission.

Reverse (R)

Select the key pad button designated with an **R** (**reverse**) for backing the motorcoach. Notice that an **R** appears on the display. Bring the motorcoach to a complete stop before selecting reverse or moving the shifter from reverse to a forward gear.

Neutral (N)

Use **N** (**neutral**) when the engine is started, to check coach accessories, and extended idle operation. Always select neutral before turning off the engine.

Drive (D)

Select **D** (**drive**) for normal driving conditions. When in this range, the transmission starts in first gear and automatically upshifts as necessary. Downshifting also occurs automatically.

Mode

The transmission mode switch activates special functions that may have been programmed into the ECU. Pressing the mode button will display each available function, and the indicator will be illuminated on the upper right corner of the mode button. Refer to the "Transmission Diagnostics" section of this chapter or to your transmission OEM manual for further information.

Directional Arrow Symbols

The transmission shifter enables the driver to select a lower or higher gear by depressing the down or up arrow, respectively.

Transmission Gear Recommendations

Certain driving conditions, such as ascending or descending a grade, road conditions, load, or traffic conditions, require the transmission to be set at a lower gear. First gear provides the coach with its maximum driving torque. When less demanding conditions exist, gears 2 through 6 are used. Lower gears provide greater auxiliary braking for going down grades.

> **! CAUTION**
>
> **When descending grades, use a combination of downshifting, the engine brake, and the service brakes. Also, pay close attention to the tachometer. Do not over-speed the engine (excessive rpm).**

Parking the Motorcoach

There is no Park (P) on the transmission shifter. Therefore, stop the coach by using the service brakes, select neutral (N), then apply the parking brake, and stop the engine. This prevents the coach from moving while shut down. Chock the tires if it is necessary to leave the coach while the engine is running.

3000 MH Transmission Diagnostics

The transmission incorporates diagnostic features that allow the coach operator to diagnose transmission problems if they should occur. When the ECU detects a transmission problem, gear shifting is restricted, the Check Trans indicator lamp on the dash illuminates, and the transmission shifter display flashes during coach operation. Then, the ECU stores a diagnostic code which can be retrieved through the transmission shifter or a diagnostic data reader.

Diagnostic codes are numerical indications relating to a malfunction in transmission operation. Each code consists of five characters. The first character is a letter followed by a four digit numeric string. Diagnostic codes are listed with the most severe or otherwise most recent code listed first. Since only 5 codes (numbered d1 to d5) are allowed in memory, the ECU prioritizes which ones to drop from memory.

The ECU stores two types of diagnostic codes: active and historic. An active code is any code that is current in the ECU decision-making process. Historic codes are those that are retained in the ECU memory and will not necessarily affect the ECU decision-making process. Historic codes are useful in determining if a problem is isolated, intermittent, or results from a previous malfunction.

3000 MH Diagnostic Code Display Procedure

Information in this section covers basic procedures for retrieving diagnostic codes from the ECU using the transmission shifter (**see Figure 2.4, page 2.2**). For more advanced procedures and diagnostic code interpretation, refer to your transmission owner's manual(s) or consult your nearest Allison transmission authorized service outlet.

To display the diagnostic code:

1 Bring the coach to a stop at a safe location.

2 Apply the parking brake.

3 Simultaneously press the up and down arrows once to display the transmission fluid level mode and press the arrows a second time to access the diagnostic display mode.

4 Codes appear on the digital display two digits at a time.

5 Press the mode button to see the next code. Repeat for subsequent codes.

Clearing Active Codes From Memory

Press and hold the mode button for approximately ten seconds to clear both active and inactive codes.

CX28 Transmission Diagnostics

Call Caterpillar at (877) 777-3126 if you need engine diagnostic assistance. In addition, there is reference for CAT engine diagnostic flash code interpretation in the C9 Caterpillar manual included in your Coach Information Kit.

When the ECU detects a transmission problem, gear shifting is restricted, and the Check Trans indicator lamp on the dash illuminates. Additionally, certain transmission errors will de-rate the engine. Then, the ECU stores a diagnostic number code which can be retrieved by a diagnostic data reader.

Oil level diagnostics and lost J1939 data link information can be accessed by the transmission shifter. Refer to the "Fluid Level Check with Transmission Shifter" section of this chapter or to your Caterpillar transmission manual for further transmission diagnostic reference.

The ECU stores two types of diagnostic codes: active and historic. An active code is any code that is current in the ECU decision-making process. Historic codes are those that are retained in the ECU memory and will not necessarily affect the ECU decision-making process. Historic codes are useful in determining if a problem is isolated, intermittent, or results from a previous malfunction.

Check Trans Light

The purpose of the Check Trans light is to inform the operator that there is a problem with the transmission system. The Check Trans light is located on the center dash panel.

! CAUTION

Be sure that the Check Trans light comes on momentarily at engine start-up. This is to show that the status lights are working properly. If the Check Trans light does not illuminate during ignition, or if the light remains on after engine start up, the system should be checked immediately.

A continuous Check Trans light will be accompanied by a flashing display from the transmission shifter. Diagnostic codes will be logged. Shifting will generally be restricted. The transmission may not respond to the transmission shifter and shifting may not occur.

Before turning the ignition off, the transmission may be operated for a short time in the selected range to reach service assistance. Service should be performed immediately to minimize the potential for damage to the transmission.

Once the ignition is turned off, the transmission will remain in neutral until the condition causing the Check Trans light to illuminate is corrected.

Transmission Maintenance and Inspection

Inspect and service the transmission at the intervals prescribed in **Table 7.1** in the **Appendix**. Check the transmission fluid level daily. If the motorcoach is subject to heavy use, decrease the time between maintenance intervals.

Clean and inspect the exterior of the transmission at regular intervals. The severity of service and operating conditions will determine the frequency of such inspections. Inspect the transmission for loose bolts, fluid leaks, loose electrical connections, and damaged or loose fluid lines. Pay special attention to the transmission fluid cooler unit and its piping. Fluid leaks require immediate attention.

! NOTICE

Transmission problems can be the result of poor engine performance. If the engine requires service, it should be done prior to servicing the transmission.

Use care when cleaning the transmission. Spraying steam, water, or cleaning solution directly at the breather can force the water or cleaning solution into the transmission.

Breather Maintenance

When performing transmission exterior inspection and cleaning as described previously, make sure the breather is free of dirt and dust. The breather prevents pressure buildup within the transmission, and its passage must be kept clean and open (**see Figure 2.5** or **2.6**, **page 2.6**). The amount of dust and dirt encountered will determine the frequency of breather cleaning.

Transmission Fluid

Transmission fluid plays a critical role in the function of the transmission. It provides lubrication and cooling throughout the transmission and operates the hydraulically applied clutches.

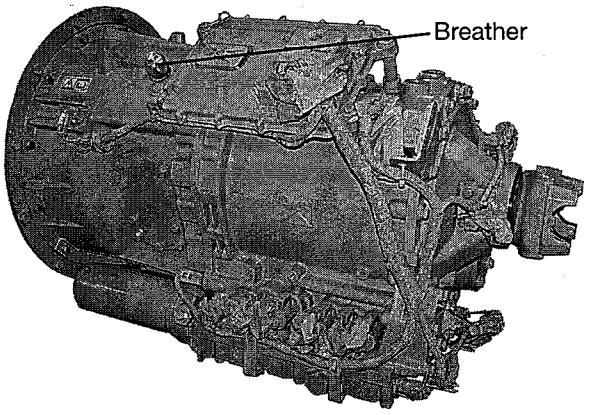


Figure 2.5
CAT CX28 breather

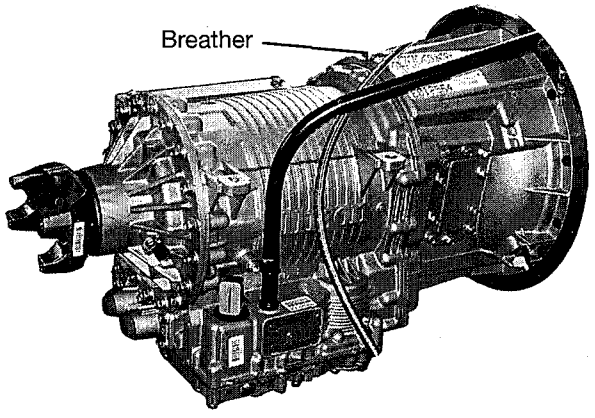


Figure 2.6
Allison 3000 MH breather

! NOTICE

Providing the proper type and amount of transmission fluid is the most critical aspect of transmission maintenance and must receive close attention.

Transmission Fluid Specifications

Transmission fluids have an important influence on performance, reliability, and durability. For your transmission, use TranSynd fluid. Use of other fluid types can effect your transmission warranty period. Refer to your transmission OEM manual for minimum fluid operating temperatures.

! CAUTION

Disregarding minimum fluid temperature limits can result in transmission malfunction or reduced transmission life. Transmission fluid requirements change as fluids are improved and upgraded; the technicians performing maintenance on the coach should be knowledgeable regarding the latest fluid requirements.

Fluid Contamination

Transmission fluid analysis is recommended on a scheduled basis.

The following are indications of contaminated transmission fluid:

- **Engine Coolant:** Engine coolant in the transmission hydraulic system requires immediate action to prevent malfunction and possible serious damage. First find and fix the leak. Then the transmission should be disassembled, cleaned, and the clutch plates replaced. All traces of the coolant and varnish deposits resulting from coolant contamination must be removed.

  Glycol test kits on the market can be used to detect antifreeze in the transmission fluid. While generally reliable, certain kits may produce positive test results because of additives used in some transmission fluids. The kit instructions should be followed closely. Routine fluid analysis services are available through your CAT or Allison transmission dealer at a nominal charge. Check with a CAT or Allison transmission dealer for details and prices.

! CAUTION

Do not use containers or fillers for transmission fluid that have been used for any antifreeze solution. Antifreeze and coolant solutions

contain glycol which, if introduced into the transmission, can cause the clutch plates to fail.

- **Dirt or Water:** At each fluid change interval, examine the drained fluid for evidence of dirt or water (a minimal amount of condensation in the fluid is normal). If there is evidence of water in the fluid, check the fluid cooler for leakage between the water and fluid circuits. Inspect and pressure-test the cooler to confirm the leak. Leaking coolers should be replaced. Any contaminates in the sump must be removed.
- **Metal Particles:** Metal particles in the fluid (after the pan has been cleaned for the first time) indicate damage has occurred within the transmission. Metal contamination will require disassembly of the transmission, close inspection to determine the source, and cleaning of all internal and external fluid circuits where the particles could lodge. If excessive metal contamination has occurred, replace the fluid cooler and all bearings in the transmission.
- **Aeration:** Aeration changes the viscosity and color of the fluid to a thin milky liquid. Aerated fluid drawn in by the input pump and directed to the clutches and converter causes converter cavitation noises and irregular shifting. The primary causes of aeration are improper fluid, a low fluid level in the sump, or too much fluid. Aeration can also be caused by defective or missing seal rings on transmission fluid filters, or a damaged or missing seal ring on the transmission fluid intake pipe of the internal suction screen in the fluid pan.

Checking the Fluid Level

Check the transmission fluid level (**see Figure 2.7**). When checking the fluid level, be sure to perform both a "cold" and "hot" check. The dipstick and transmission shifter reading are the two methods for measuring the transmission fluid level. Your coach is equipped with a fluid level sensor that enables a reading by using the transmission shifter. For this method, refer to your transmission operator's manual.

Check the cold fluid level to ensure there is enough fluid in the transmission to operate the coach until normal operating temperature is reached. Perform a hot (normal) check when the transmission fluid reaches a normal operating temperature to ensure the fluid is at the proper operating level. When checking hot and cold fluid levels, observe the "hot run" and "cold run" sections of the dipstick. Follow the procedures in the

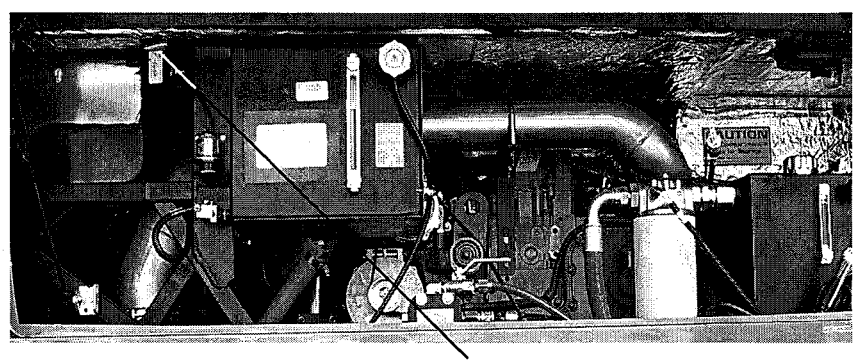


Figure 2.7
3000 MH transmission dipstick in engine bay

following "Cold Level Fluid Check" and "Hot Level Fluid Check" sections to check the fluid level of your transmission.

! WARNING

When checking the fluid level, be sure that the transmission is in neutral, the parking brake is properly engaged, and the wheels are chocked. Unexpected and possibly sudden coach movement may occur if these precautions are not taken.

Cold Level Fluid Check

! CAUTION

Do not start the engine until the presence of sufficient transmission fluid has been confirmed. Remove the transmission fluid dipstick and be sure that the static fluid level is near the Cold Full mark.

After the presence of transmission fluid has been confirmed and the coach is started, perform a cold fluid level check.

To perform a cold fluid check:

1 Park the motorcoach on a level surface.

2 Apply the parking brake.

3 Block the wheels.

4 Be sure the coach is in neutral and run the engine at idle for at least one minute.

5 Shift to drive.

6 Shift to reverse to clear the transmission's hydraulic system of air.

7 Shift to neutral and allow the engine to idle.

8 Clean all dirt from around the end of the fluid fill tube before removing the dipstick. Remove the dipstick and wipe clean.

! NOTICE

Do not allow dirt or foreign matter to enter the transmission. Dirt or foreign matter in the hydraulic system may cause undue wear of transmission parts, make valves stick, and clog passages. Check the fluid level using the following procedure and report any abnormal level to a qualified mechanic or a CAT or Allison service professional.

9 Insert the dipstick into the tube and remove. Check the fluid level reading. If the fluid on the dipstick is within the cold run band, the level is satisfactory. If the fluid level is not within this band, add or drain fluid as necessary to bring the level within the cold run band.

Hot Level Fluid Check

! CAUTION

Do not operate the transmission for extended periods of time until a hot check has verified proper fluid level. Transmission damage can result from extended operation at improper fluid levels.

Fluid level rises as temperature increases; the fluid must be hot to ensure an accurate check. Perform a hot check after the transmission reaches normal operating temperature.

To perform a hot fluid level check:

1 Park the motorcoach on a level surface.

2 Shift to neutral and apply the parking brake.

3 Chock the wheels.

4 Run the engine at low idle.

5 Remove the dipstick from the tube and wipe clean.

6 Insert the dipstick into the tube and remove. Check the fluid level reading. The safe operating level is anywhere within the hot run band on the dipstick. If the level is not within this band, add or drain fluid as necessary to bring the level within the hot run band. Transmission fluid is added through the dipstick tube.

7 Ensure that the fluid level checks are consistent. Check the level more than once and if readings are not consistent, check to be sure that the transmission breather is clean and not clogged. If readings are still not consistent, contact your nearest transmission distributor or dealer.

CX28 Fluid Level Check with Transmission Shifter

Information in this section covers basic procedures for initiating the fluid level check sequence from the ECU using the transmission shifter (**see Figure 2.3, page 2.2**). For more code interpretation contact the Country Coach service department at (800) 452-8015 or (541) 998-9202 or call Caterpillar at (877) 777-3126.

To initiate the oil level check sequence:

1 Bring the motorcoach to a stop at a safe location.

2 Apply the parking brake.

3 Simultaneously press and momentarily hold the up and down arrows.

4 The digital display will show the number 24 and count down by one every five seconds until zero is reached. If required conditions are met (engine at idle, transmission oil temperature at 176°F, transmission operating speed at 0 rpm, transmission in neutral, and oil level sensor is present with no diagnostics), an oil level message will display two characters at a time.

The following are examples of an oil level message:

- **OL-LO-## means the oil level is low by ## quarts.**
- **OL-HI-## means the oil level is high by ## quarts.**
- **OL-OK means the oil level is full.**

5 Exit the fluid level check mode by pressing N or up and down arrows.

Transmission Fluid Cooler

The transmission depends on a cooler to maintain a safe, operational transmission fluid temperature. The "tube and shell" fluid cooler is mounted under the main frame rail tube just inboard of the radiator and is a sealed, non-serviceable unit. If there is a leak or other service requirement, the unit must be replaced with a new or rebuilt unit.

The hoses and piping should be checked regularly to ensure there is no chafing, deterioration, leaking, or wear. Damaged or worn parts should be replaced immediately. Loose connections should be tightened. If replacement of parts is required, ensure that the correct replacement parts are used: either genuine OEM parts from Country Coach or approved equivalent items which meet the standards of the original equipment.

Driveshaft

The driveshaft is a steel tube that is used to transmit rotary power from the transmission output to the differential. A universal joint (U-joint) and end yokes are located at the transmission end of the shaft and bolted together. The U-joint allows the yokes to operate at an angle to each other. The slip yoke permits fore and aft movement of the driveshaft as the differential assembly moves up and down. An oil seal protects the slip yoke from dust, dirt, and other harmful debris. Since the driveshaft is a balanced unit, it should be kept completely free of undercoating and other foreign material, which would upset shaft balance.

! WARNING

Do not perform service on or near the driveshaft with the engine running. Rotating shafts can be dangerous.

Lubricating the Driveshaft and U-Joints

Among the most common causes of U-joint and slip spline failure is lack of proper lubrication. See **Table 7.1** in the **Appendix** for driveshaft lubrication interval.

U-joints that are adequately lubricated at recommended intervals normally meet or exceed operational requirements. Inadequate lubrication cycles and failure to lubricate the joints and slip spline properly cause joint failures and other problems such as slip spline seizures. Proper lubrication flushes the U-joints, removing abrasive contaminants from the U-joint bearings.

Axles, Steering, and Suspension Group

Axles, Steering, and Suspension Group

AXLES, STEERING, AND SUSPENSION GROUP

Axles

The most important maintenance performed on the axle is lubrication. Factory recommendations on lubrication intervals, methods of filling, lubricant levels, and type of lubricant must be followed to ensure long axle life and satisfactory performance. Refer to **Appendix Table 7.1** for axle maintenance.

Inspect the axle during scheduled service for lubricant leakage, especially around housing covers, the pinion oil seal retainer, and axle shaft flanges. Regularly examine the breather valve to ensure it is operational and free of road dirt or snow (**see Figure 3.1**).

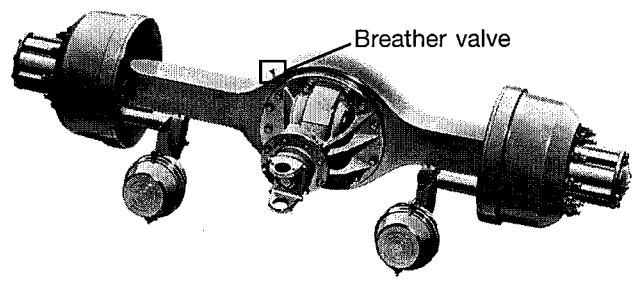


Figure 3.1
Breather valve

Brakes

The DynoMax chassis is equipped with a dual-circuit air brake system with an anti-lock braking system (ABS) and an automatic traction control (ATC) system. They fully comply with the applicable requirements of the Federal Motor Vehicle Safety Standard, Number 121 (fmvss 121). The brake system consists of an air compressor with governor, air dryer, reservoir tanks, a treadle valve, regulator valves, relay valves, control unit, and brake chambers.

The dual-circuit air brake system includes important safety features. If air pressure to the front brakes is lost, the rear service brakes continue to operate. If pressure is lost to the rear service brakes, the front brakes continue to operate. When air pressure is lost in both reservoirs, the emergency brake automatically applies.

The brake chambers are activated by compressed air. These components are potentially injurious. Country Coach strongly recommends that service or repair be performed only by trained service personnel. For service or repair of your ABS system, contact Country Coach.

Service Brakes

Depressing the brake pedal activates the brake treadle valve, which operates the service brakes. Compressed air is routed through front and rear brake relay valves to the individual brake chambers. To slow down or stop the motorcoach, a mechanical linkage from the brake chambers apply the brake shoes to the brake drums.

Parking Brake

Like the service brakes, the parking brakes are operated with compressed air. The parking brakes are operated through a separate set of chambers within the rear brake actuators and are controlled by the parking brake valve mounted on the transmission shifter panel to the left of the driver. Unlike the service brakes, which activate when pressurized air enters the service brake chambers, the parking brakes activate when air is exhausted from the parking brake chambers.

Brake Inspection and Maintenance

The various fittings and hoses are made specifically for air applications. If replacement parts are purchased from suppliers other than Country Coach, care must be taken to ensure that compatible air components are purchased.

! CAUTION

Hydraulic fittings are not interchangeable with air fittings.

All components in the system are subject to routine inspection and maintenance. Check all lines and fittings and tighten or replace them if any are loose. Check all lines for cracking, chafing, or rubbing. Worn or chafed lines should be replaced.

The air compressor is a key component of the air brake system. The compressor must receive a clean supply of air. Regular inspection should be made to ensure that the hoses and fittings are airtight and securely fastened. Refer to chapter 1, chapter 4, or to the "Engine Group" in the **Appendix** parts section for compressor information. Also, refer to your Coach Information Kit for pneumatic schematics.

Wheels and Tires

Factory-installed tires and wheels are designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures. Correct tire pressures and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration, unnecessarily abrupt braking, and failure to maintain correct suspension alignment contribute to increased tire wear and decreased tire life. This Country Coach has a maximum speed rating of 65 mph.

Contact the Country Coach service department at (541) 998-9202 or (800) 452-8015 for further tire care.

Tire Inspection and Maintenance

Front and rear tires perform different jobs and can wear differently, depending on the type of roads driven, individual driving habits, loads carried, etc. For maximum tire life, inspect tires regularly. If irregular tire wear is found, the tires should be inspected and rotated, and the cause of the uneven wear should be discovered and corrected. Due to their design, radial tires tend to wear faster in the shoulder area, particularly on the front. This makes regular rotation especially important to maximize tire life.

Wheel and Tire Balancing

It is important for tire wear, coach ride, and handling ease, to maintain proper balance of wheel and tire assemblies. This may be accomplished by either type of balancing system in current use: on vehicle or off vehicle. The on vehicle procedure is more desirable because all rolling components, such as brake drums, bearings, seals, hubs, etc., are included in the balancing process and any existing imbalance is corrected. Due to the specialized equipment required, wheel and tire balancing should be performed at a qualified service facility.

Tire Replacement

Country Coach recommends that wheel and tire replacement be done by a professional mechanic with the proper equipment.

The use of the incorrect size or type tire may affect load carrying capacity, ride, handling, speedometer/odometer calibration, motorcoach ground clearance, and tire clearance to the body and chassis components.

Front and Rear Suspension

The DynoMax chassis uses rolling-lobe, bellow-shaped air springs to support your motorcoach and maintain proper ride height. The non-tag chassis front suspension and the drive axle are equipped with two air springs each. The tag axle chassis has two front air springs and the combined drive and tag axle suspension has four.

The suspension system supports the coach body and chassis over the tires and wheels; it absorbs vibration and cushions the ride, while the shock absorbers dampen or control excess bounce caused by variations in the road surface.

Height Control Valves

The flow of air into the suspension system air springs are controlled by height control valves. These valves maintain motorcoach ride height by supplying or exhausting air to or from the air springs, as needed, to support the load being carried.

As the motorcoach is loaded, the actuating lever arm moves from the neutral position to the intake position. This opens the air valve allowing air to pass into the air springs. When the air fills the springs and the coach reaches normal ride height, the actuating lever arm returns to the neutral position.

As a load is removed from the coach, the actuating lever arm moves from its neutral position to the exhaust position. This opens the exhaust valve releasing air from the springs. When enough air is released to bring the coach to normal riding height, the actuation lever arm returns to the neutral position.

Suspension Air Pressure

The air pressure tanks must reach 85 psi or more before operating the coach. This provides the air brakes and the air springs with sufficient air pressure to operate properly. A protection valve, installed in the air line leading to the suspension system, automatically maintains air brake pressure should a sudden loss of air occur in the suspension system.

Front Suspension and Steering

The independent front suspension (IFS) incorporates air springs, upper and lower control arms, knuckle post assemblies, shocks, ABS front brakes, and an anti-sway bar (**see Figure 3.2**).

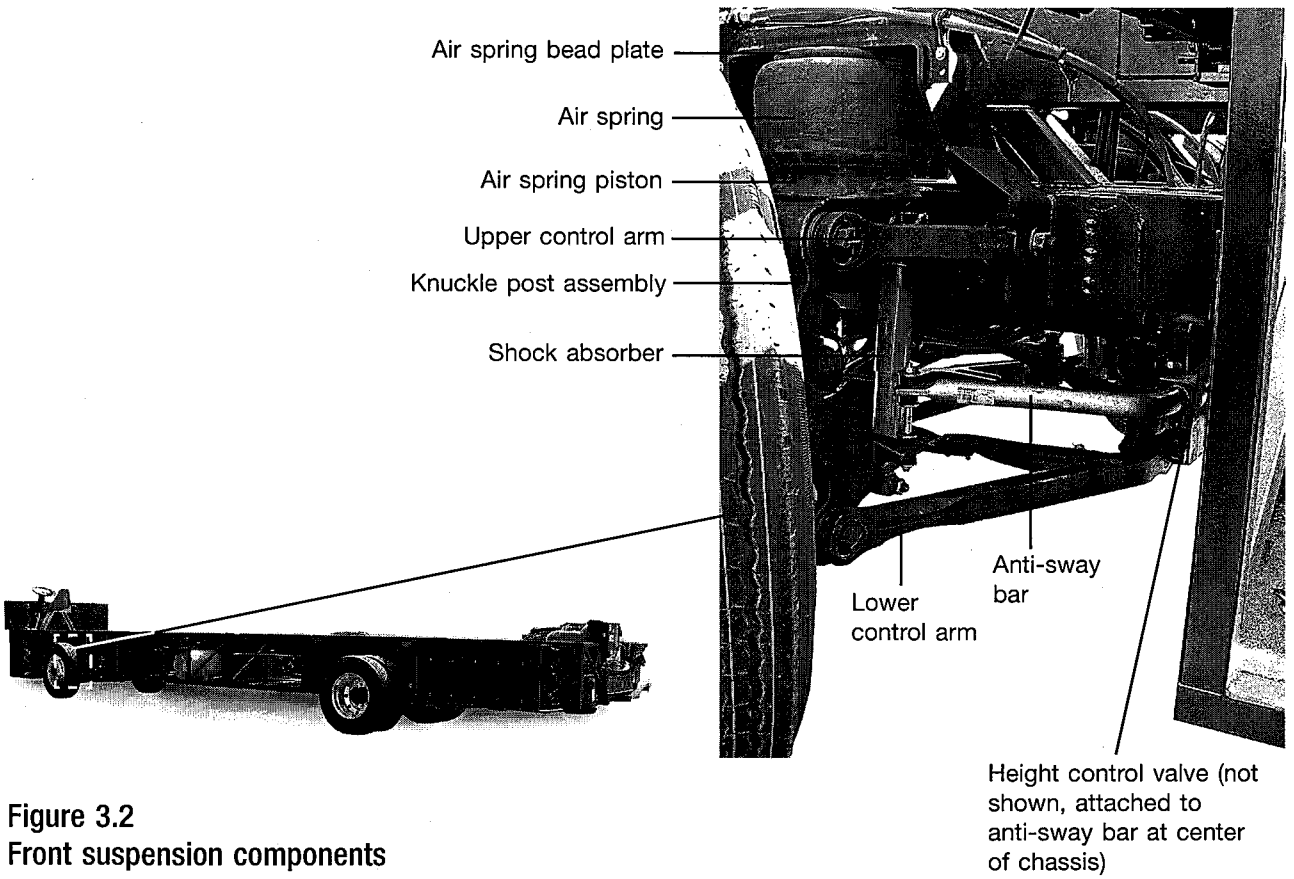


Figure 3.2
Front suspension components

Front Alignment

The term "front alignment" refers to the angular relationships between the front wheels, front suspension attaching points, and ground. The toe-in, camber, and caster of the wheel assemblies are the variables involved in front alignment. Proper front alignment must be maintained to ensure ease of steering and to prolong tire life. Consult with a qualified service representative about the need for realignment.

Front-End Inspection

Have a qualified technician inspect the following front-end components and specifications:

- Proper tire inflation
- Wheel installation
- Wheel bearing adjustment
- Fasteners in the IFS assembly

- Excessive play in the rotating joints
- Steering gear mounting
- Shock absorber operation (if leaking, replace the shock absorbers)
- Tire "lead" (deviation from a straight path on a level road without steering) caused by uneven tire wear or improperly manufactured tires
- Proper ride height

Rear Suspension

The DynoMax chassis is equipped with a Holland/Neway ADL-123 suspension (non-tag chassis) or the Ridewell RD-246 (tag chassis) (**see Figure 3.3** or **Figure 3.4**, **page 3.6**). These suspensions provide a smooth and stable ride. The ADL-123 is linked to a Dana drive axle and the RD-246 suspension is linked to an ArvinMeritor drive axle. These suspensions consist of support plates, air springs, shock absorbers, and control links.

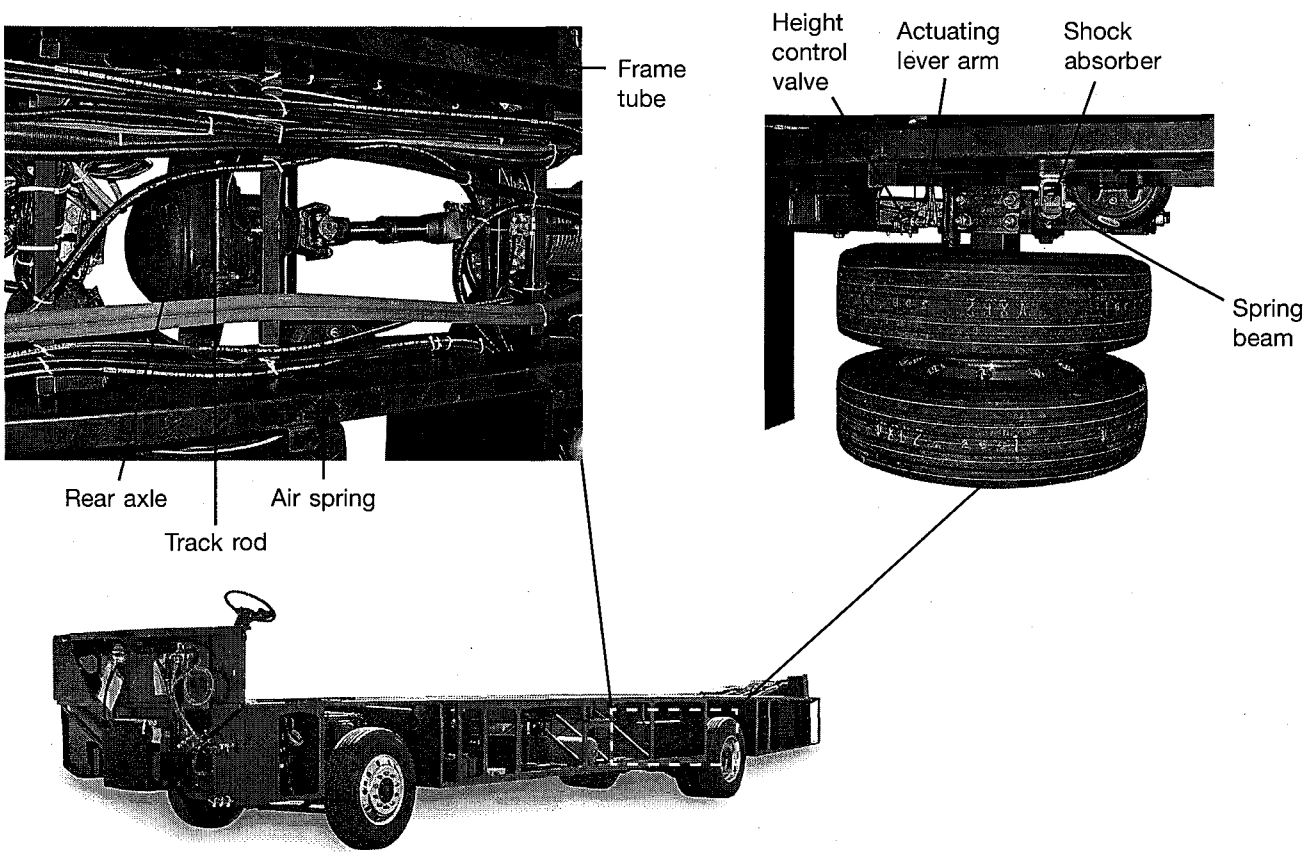


Figure 3.3
Rear ADL-123 suspension

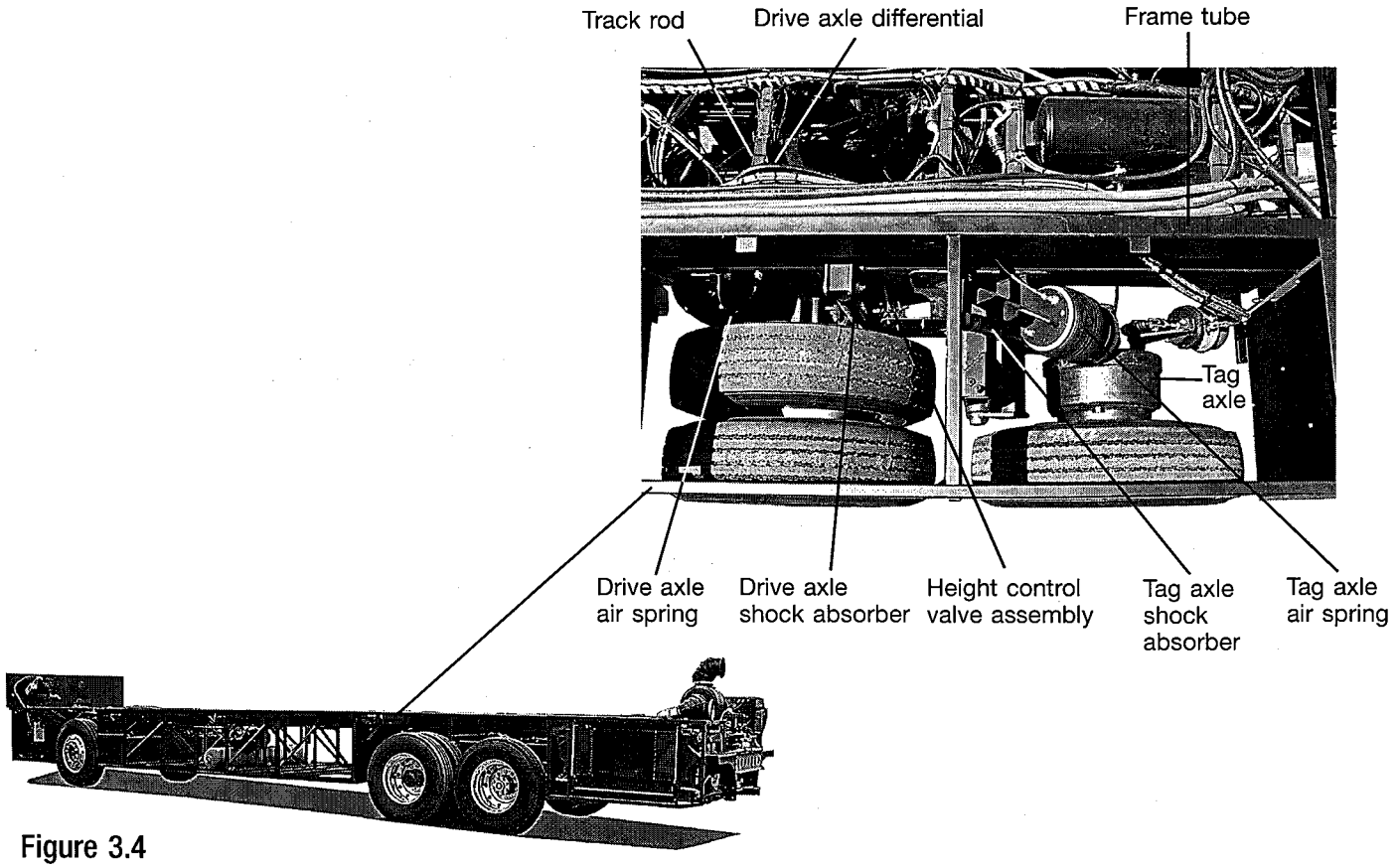


Figure 3.4
Rear RD-246 suspension

Rear-End Inspection

Have a qualified technician inspect the rear-end components and specifications.

To inspect the rear-end components:

1 Park the motorcoach on level ground and run the engine to maintain air pressure at 85 psi.

- Check all air springs for equal firmness.
- Check motorcoach ride height.

2 Shut off the engine and check the suspension air system for leaks.

3 Inspect for loose fasteners or broken components.

Front and Rear Suspension Inspection Checklist

30-Day Visual Inspection

! NOTICE

Country Coach recommends that a qualified technician inspect the front and rear suspension components.

A 30-day visual inspection is recommended of the following items, especially during periods of heavy use.

- Check all fasteners and air connections for tightness.
- Check air springs for equally inflated firmness.
- Check ride height.

1,000-Mile Inspection

After your coach has been in service for approximately 1,000 miles, all fasteners must be inspected for proper torque. This inspection should be repeated at 25,000-mile intervals. Follow the torque values for front and rear suspensions found in the **Appendix Table 7.8**.

To perform the 1,000-mile inspection:

1 Inspect for air leaks at all connections. Tighten or replace as required.

2 Ensure that the coach is on level ground and that air pressure is maintained at 85 psi.

3 Test the air springs for equal firmness and proper ride height. Adjust if necessary.

4 Inspect welds at the axle to sub-frame and at the sub-frame to frame connections for signs of cracking.

5 Inspect shock absorbers for fluid leaks.

6 Check mounting bolts for proper torque.

7 Re-torque all rear suspension fasteners.

5,000-Mile Inspection

After the suspensions have been in operation for approximately 5,000 miles, retighten all fasteners to the specifications in the **Appendix Table 7.8**. This process should be repeated every 25,000 miles.

25,000-Mile Inspection

To perform the 25,000-mile inspection:

1 Repeat all steps in 1,000-mile inspection.

2 Raise the frame tube and allow the suspension to relax and tires to hang.

3 Place blocks beneath the frame tube, and inspect the air springs for signs of chafing.

4 Inspect the tires for signs of abnormal wear patterns.

5 Check the alignment if uneven wear is apparent.

6 Remove one shock absorber and test its resistance level by pushing it in and out. If there is little resistance, replace all shock absorbers.

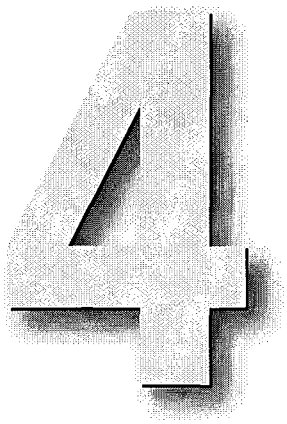
Note: Shocks compress much easier than they extend.

Suspension Troubleshooting

Refer to the **Appendix Table 7.14** or contact the Country Coach service department at (541) 998-9202 or (800) 452-8015 for assistance.

Notes:

Air System Group



AIR SYSTEM GROUP

The air system supplies air pressure to the suspension, the service brakes, and the parking brakes. The system consists of an air compressor, air governor, air dryer, air tanks, safety valves, overpressure valves, check valves, and the tubing, hoses and fittings necessary to connect all components. Refer to the pneumatic schematics in your Coach Information Kit for additional reference.

Air Compressor

The air compressor, mounted on the passenger-side of the engine, compresses filtered ambient air, thereby providing pressurized air to the air tanks (**see Figure 4.1**). The compressor is lubricated by engine oil and cooled by the engine cooling system.

It operates whenever the engine is running and is always capable of compressing air. Compressed air flows from the compressor to the air dryer, and then to the air tanks. From the tanks, the air goes directly to air-actuated components.

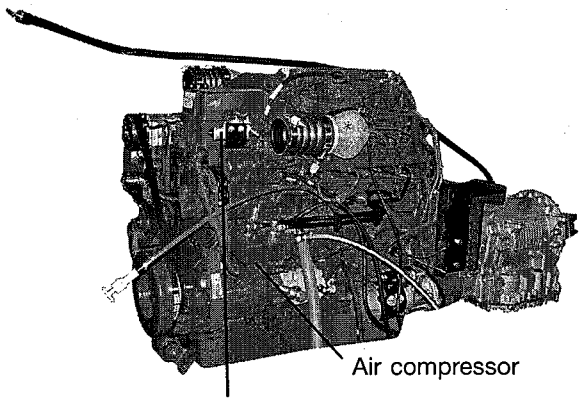


Figure 4.1
Air compressor and governor

Air Governor

The air governor, mounted on the engine, controls the load and unload (compress or non-compress) function of the compressor (**see Figure 4.1**). System pressure is controlled by the governor turning the compressor on or off. When air pressure is below the normal operating range, the governor signals the air compressor to fill the air tanks until the proper pressure is reached.

Air Tanks

Tag axle chassis' have six air reservoirs that are contained in five air tanks. The front brakes tank is located under the entry step and the wet tank/front and rear brake supply tank (one tank with two reservoirs) is found on the driver-side of the fuel tank. The rear brakes tank is installed above the drive axle and the suspension tanks are located forward of the drive axle (**see Figure 4.2**, **page 4.2**).

No-tag chassis' have four air reservoirs are contained in two tanks on your DynoMax chassis. These tanks are located at the front of the chassis. The first tank is between the frame rails above the independent front suspension (IFS) and the second tank in under the entry step.

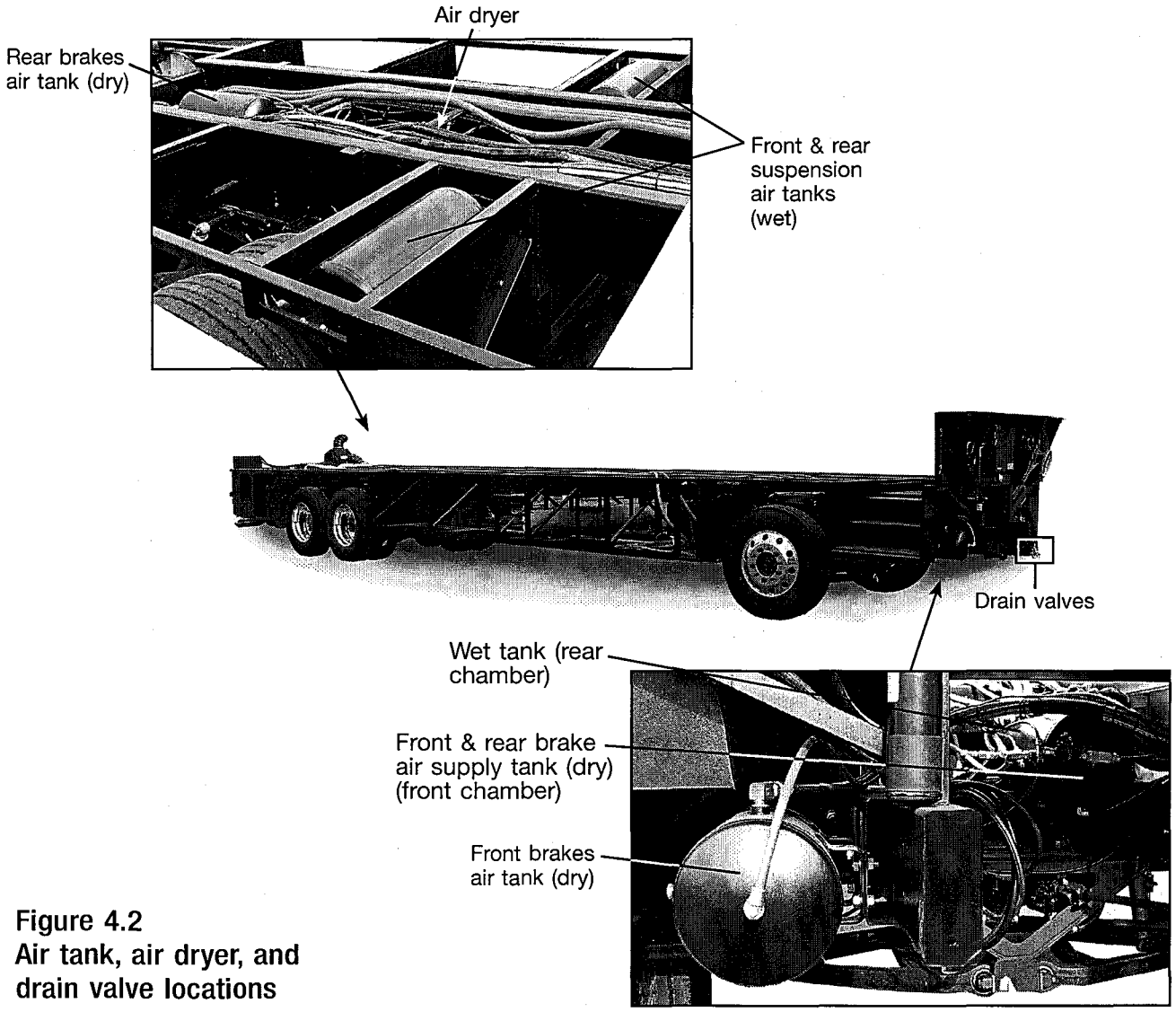


Figure 4.2
Air tank, air dryer, and drain valve locations

From the air dryer, air is delivered to the wet tank and distributed to the rear brakes, front brakes, and suspension tanks. Dry air leaves the wet tank and fills the front and rear brake air supply tanks. This air then travels to the rear brake air tank. When the rear brake tank is filled, air is then distributed equally to the front brake air tank and the front and rear suspension air tanks. The suspension tanks receive air directly from the wet tank.

To evacuate any moisture built up in the air system, open the manual drain valves. Three valves are located at the front driver-side corner of your chassis (**see Figure 4.2**). The tanks should be drained daily or following coach storage. Build coach air pressure to at least 90 psi, and then open each valve for two to three seconds or until no moisture is seen discharging.

Air Dryer

Air from the compressor is delivered to the air dryer where moisture is removed. Accumulated moisture is regularly expelled from the air dryer onto the ground beneath the coach. This accounts for the occasional sounds of discharging air heard (**see Figure 4.2, page 4.2**).

Air Dryer Inspection

Assess the effectiveness of air dryer operation daily by checking for moisture in the air brake system. Open the manual drains and look for the presence of water (**see Figure 4.2, page 4.2**). If excess moisture is present, the cartridge may require replacement. Have the desiccant cartridge replaced by experienced service technicians at a heavy-vehicle service facility.

The following conditions can also cause water accumulation and should be considered before replacing the desiccant cartridge:

- **An outside air source was used to charge the system and the air did not pass through the air dryer.**
- **Exceptionally high air usage. This may be due to accessory air demands or some unusual air requirement that does not allow the air compressor to load and unload normally. Check for air system leakage.**
- **In areas where more than a 30°F temperature range occurs in one day, small amounts of water can condense in the air brake system. Under these conditions the presence of small amounts of moisture is normal.**
- **The check valve in the end cover may not be operating properly.**
- **There may be excessive leakage at the purge valve. Check by coating the exhaust with a soap solution while the compressor is loaded (compressing air).**
- **Check all lines and fittings leading to and from the air dryer for excessive leakage.**

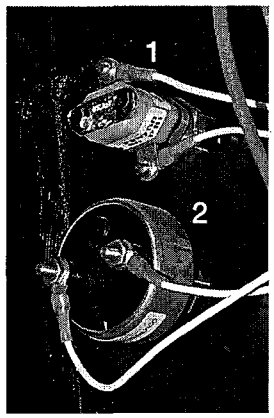


Figure 4.3
Air brake sending switches

Air Brake Sending Switches

The air system includes two switches mounted in the steering bay (**see Figure 4.3**). These electrical switches are linked with the brake lights and brake air pressure gauges. **Table 4.1** identifies the switches.

Air System Safety Equipment

The chassis air system uses regulator valves in the air tanks to control air pressure and to prevent pressure loss to the brake systems in the event of an air spring failure. The pressure protection valve is a pressure-controlled check valve that functions as a safety device. If auxiliary air pressure drops below 70-75 psi, the valve closes and isolates the auxiliary tanks from the rest of

Air Brake Sending Switches	
Item # in Figure 4.3	**Switch description**
1	Parking brake switch
2	Service brake switch (operates brake lights and service brake devices)

Table 4.1
Air brake sending switches

the air system. Consequently, loss of the brake system is prevented and the parking brakes are not automatically applied. However, if the brake system pressure should drop below 65 psi, the parking brakes automatically apply as a safety measure.

Each air tank has a check valve at the supply port to maintain pressure for that tank in case failure occurs in another. A dual air gauge is mounted in the dash center panel to monitor tank pressure in the primary and secondary braking systems. Physically inspect the auxiliary air system because tank pressure is not gauge displayed.

Air Line Color Code	
Color	**Function**
Red	Front Brakes
Green	Rear (Service) Brakes
Brown	Park Brake System
Black	Accessory Systems
Orange	Control Lines Ride Height Control
Blue	Left Suspension
Yellow	Right Suspension

Table 4.2
Air line color code

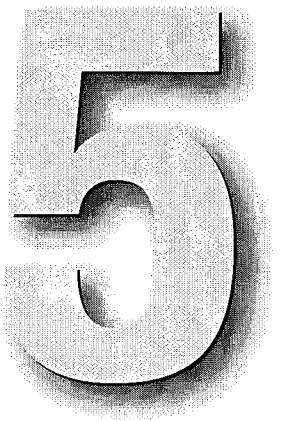
Air Line Color Code

The following system of color coding is used with air lines for troubleshooting and routine maintenance (**see Table 4.2**).

Air System Maintenance

All air system components including the tanks, fittings, valves, and hoses should be inspected regularly for leaks, chafing, or other damage and deterioration. Refer to **Appendix Table 7.1** for service intervals.

Hydraulic System Group



HYDRAULIC SYSTEM GROUP

System Operation Introduction

The hydraulic system generates, directs, and controls the pressure and flow of the hydraulic fluid used to operate the power steering gear and radiator fan. The system consists of a hydraulic fluid reservoir, filter, hydraulic pumps, steering gear, fan motor, control valves, hydraulic cooler, electronic fan controller, and interconnecting hoses and fittings. Hydraulic fluid is supplied by the reservoir. The hydraulic steering and fan pumps draw the fluid from the reservoir and directs it to the steering gear and fan motor. Some of the fluid is sent from the fan motor directly back to the hydraulic reservoir. The rest is returned to the hydraulic reservoir after passing through the hydraulic fluid cooler. Refer to the **Appendix** parts list for "Hydraulic System Group" for more information.

The fan speed (pump flow) is controlled by the electronic fan controller and the controller's response to engine coolant temperature. The variable displacement fan-drive pump delivers the necessary hydraulic fluid flow to cool the engine.

Hydraulic Fluid Reservoir

The hydraulic system reservoir is accessible from the engine bay (**see Figure 5.1**) and holds approximately 16 quarts of 10W-30 (CAT) or Dexron III (Cummins) fluid.

! CAUTION

Check the hydraulic fluid daily. Do not allow the hydraulic pump to operate without fluid in the hydraulic fluid reservoir.

Hydraulic fluid is hot. Make sure the engine is shut down prior to removing the reservoir cap.

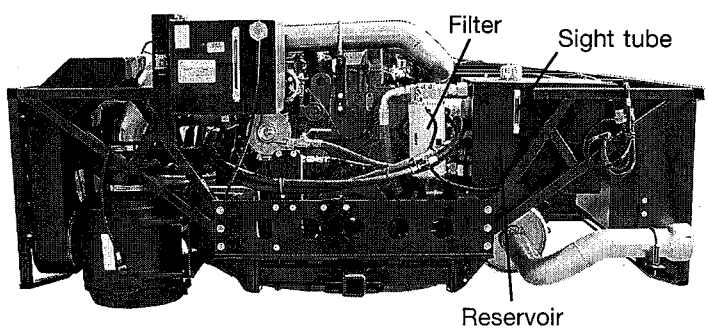


Figure 5.1
Hydraulic reservoir and filter

When filling, checking, or adjusting the fluid level in the system, be sure to thoroughly clean the hydraulic reservoir cap before removing it. This will prevent dirt from getting into the system. We recommend the use of unopened hydraulic fluid containers. Do not re-use drained fluid.

To accurately check the hydraulic fluid level, allow the engine and the hydraulic fluid to reach normal operating temperature because hydraulic fluid expands significantly when heated.

To check the hydraulic fluid level:

1 Allow the engine and the steering system to reach normal operating temperature.

2 Shut down the engine.

3 Check the hydraulic fluid level at the sight tube on the hydraulic fluid reservoir. When the check is complete, adjust the hydraulic fluid level approximately a half-inch below the top of the sight tube. Reservoir fluid is added through the top fill access beneath the reservoir fill cap/breather.

4 When filling an empty hydraulic system, allow sufficient time for the hydraulic fluid to fill the system. Any air remaining in the system is removed by the reservoir at engine start-up. As the fluid removes air from the reservoir, visible bubbles should dissipate. If the bubbles do not dissipate, this may be a sign that there is a leak or restriction in the pump inlet line.

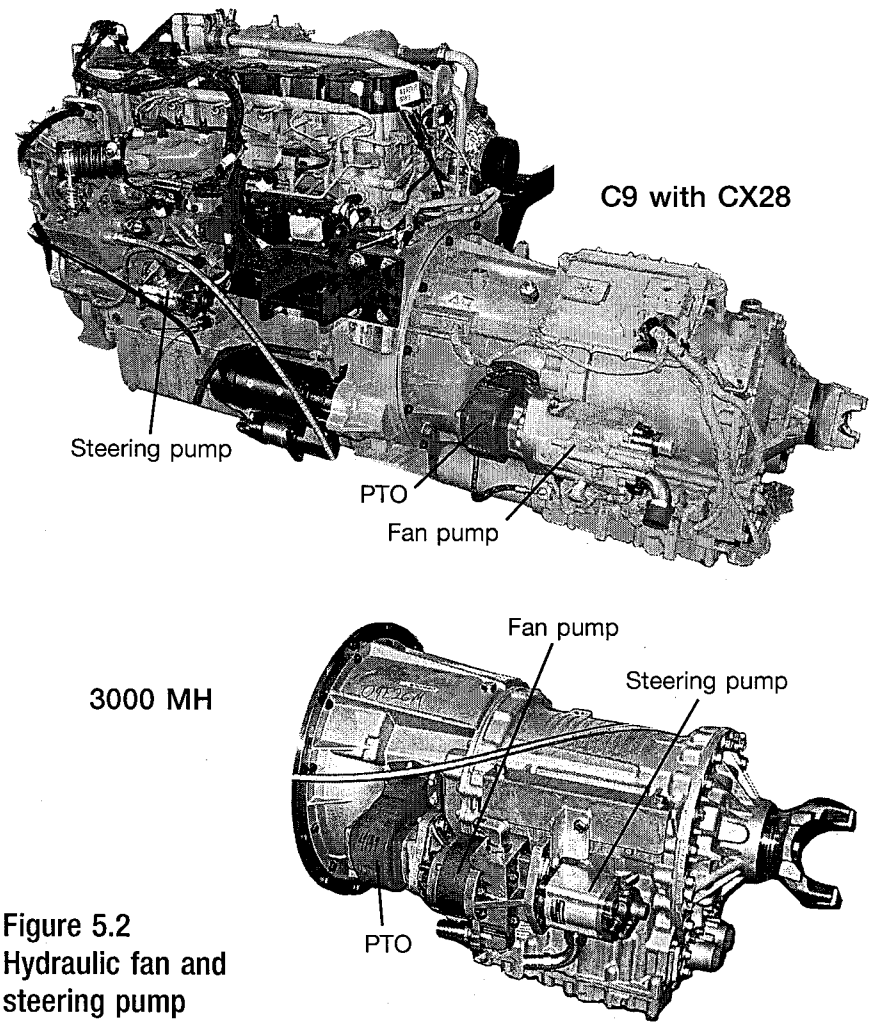


Figure 5.2
Hydraulic fan and steering pump

Hydraulic Pumps

The CAT chassis has two hydraulic pump locations. The steering pump is attached to the passenger side of the C9 engine and the fan pump is bolted to the CX28 transmission power take-off (PTO). The Cummins chassis hydraulic steering and fan pumps are attached to the 3000 MH transmission PTO (**see Figure 5.2**). The steering pump supplies hydraulic fluid to the power steering gear, and the fan pump supplies fluid to the hydraulic fan motor.

! CAUTION

Do not operate the hydraulic pumps without fluid in the hydraulic fluid reservoir.

Hydraulic Fluid Cooler

Hydraulic fluid flows from the fan motor and the steering gear to the hydraulic fluid cooler. Fluid that passes through the cooler unit is cooled by the radiator fan.

The hydraulic fluid cooler does not require servicing. However, it will not function efficiently if the fins accumulate dirt or any other foreign substance. Regularly check the hydraulic fluid cooler (**see Figure 5.3**). When needed, clean the fins of the hydraulic fluid cooler with a soft bristle brush and soapy water.

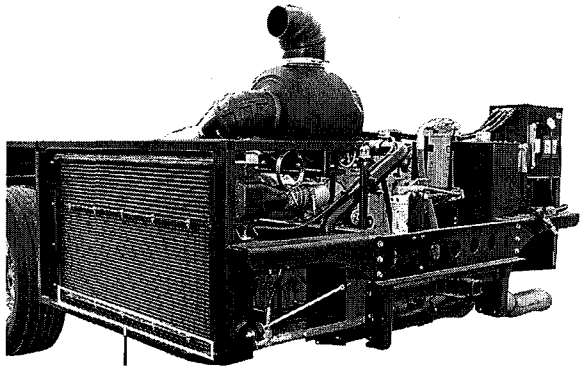


Figure 5.3
Hydraulic fluid cooler fins

Fan Motor

The fan motor assembly is bolted to the inboard side of the radiator shroud and is hydraulically driven. The speed of the fan motor is regulated by varying the flow of hydraulic fluid by means of an electronic fan-drive controller. The electronic fan-drive controller receives its input from three sensors. The water temperature sensor and an air temperature sensor are monitored by the engine electronic control module (ECM). The third is a trinary pressure switch located on the top of the air conditioning system receiver/dryer. Electronic signals from these sensors provide fan-drive controller input data to increase or decrease fan speed based on pre-programmed parameters.

! NOTICE

The hydraulic fan motor runs at varying speeds when the engine is running. This is normal operation and is not an indication of required maintenance.

! CAUTION

Approach an idling fan with caution, as the fan can increase speed unexpectedly.

Hydraulic System Maintenance

Maintenance of the hydraulic system includes checking and maintaining the fluid level in the reservoir, and performing routine inspections. All system hoses and fittings should be checked for leakage. Refer to the **Appendix Table 7.1** for hydraulic component service intervals.

The power steering gear, the hydraulic pumps, and fan motor should be periodically wiped clean and inspected for leaks. In some cases you will be able to locate the leak easily, but seepage leaks may be more difficult to find. Some leaks can be corrected easily (see the next section, "Hydraulic System Maintenance Tips"). If leaks are discovered that are not the result of loose or defective fittings, refer the problem to an authorized service facility for repair.

! WARNING

Hydraulic lines are pressurized. Use extreme caution to avoid burns or injury caused by broken or spewing lines.

Hydraulic System Maintenance Tips

Hydraulic fluid expands as it is heated during normal operation. If the system is overfilled, excess fluid may be forced through the filler cap hole and sprayed about the engine compartment by the fan air blast. Excessive smoking could result if coolant comes in contact with hot engine bay components. To diagnose and correct this problem, operate the engine and steering system until normal operating temperature is obtained. Then shut down the engine and check the graduated level on the sight tube. To drain the hydraulic fluid use the drain fitting on the bottom of the hydraulic reservoir.

Seepage at the hose connections may be due to loose connections. If leakage is observed at hose connections and the fitting is not cross-threaded, tighten the nut. If leaks are detected in the hoses themselves, replace the hose. After the source of a leak has been found and corrected, refill the system with proper fluid.

Lip seals, which seal rotating shafts, require special treatment. This type of seal is used on the steering gear at the input and output shafts, on the fan motor shaft, and on the driveshaft of the hydraulic pumps. When leaks occur in these areas, refer the problem to a qualified service facility for repair.

Power Steering System

The steering system consists of the steering wheel, steering column, an intermediate shaft (steering column to miter box), a miter box, an intermediate shaft (miter box to steering gear), and steering gear (**see Figure 5.4, page 5.5**).

Steering Gear

The steering gear is the primary component of the power steering system. The gear mounts to the independent front suspension (IFS) sub-frame and receives pressurized hydraulic fluid from the steering pump. The hydraulic pressure reduces the effort needed for steering.

Power Steering System Inspection

The power steering system is dependent on adequate fluid pressure and flow to operate as designed. Consider back pressure and operating temperature when diagnosing steering gear problems. Pinched lines and excessively high flow rates are possible causes of back pressure.

Conditions such as hard or loose steering, road shock, or vibrations are not always due to problems with the steering gear or power steering pump. Instead, they are often related to such factors as low tire pressure and poor front-end alignment. Check these conditions before making any adjustments to, or disassembly of, hydraulic system components.

High fluid temperatures caused by restricted flow or an inadequate fluid level reduce overall efficiency of the hydraulic system. For accurate results, check the power steering system fluid level after two hours of normal operation.

Visually check the hydraulic reservoir for presence of air mixed with fluid in the hydraulic system. Power steering fluid should be free of air bubbles. Any signs of frothing may indicate a system air leak.

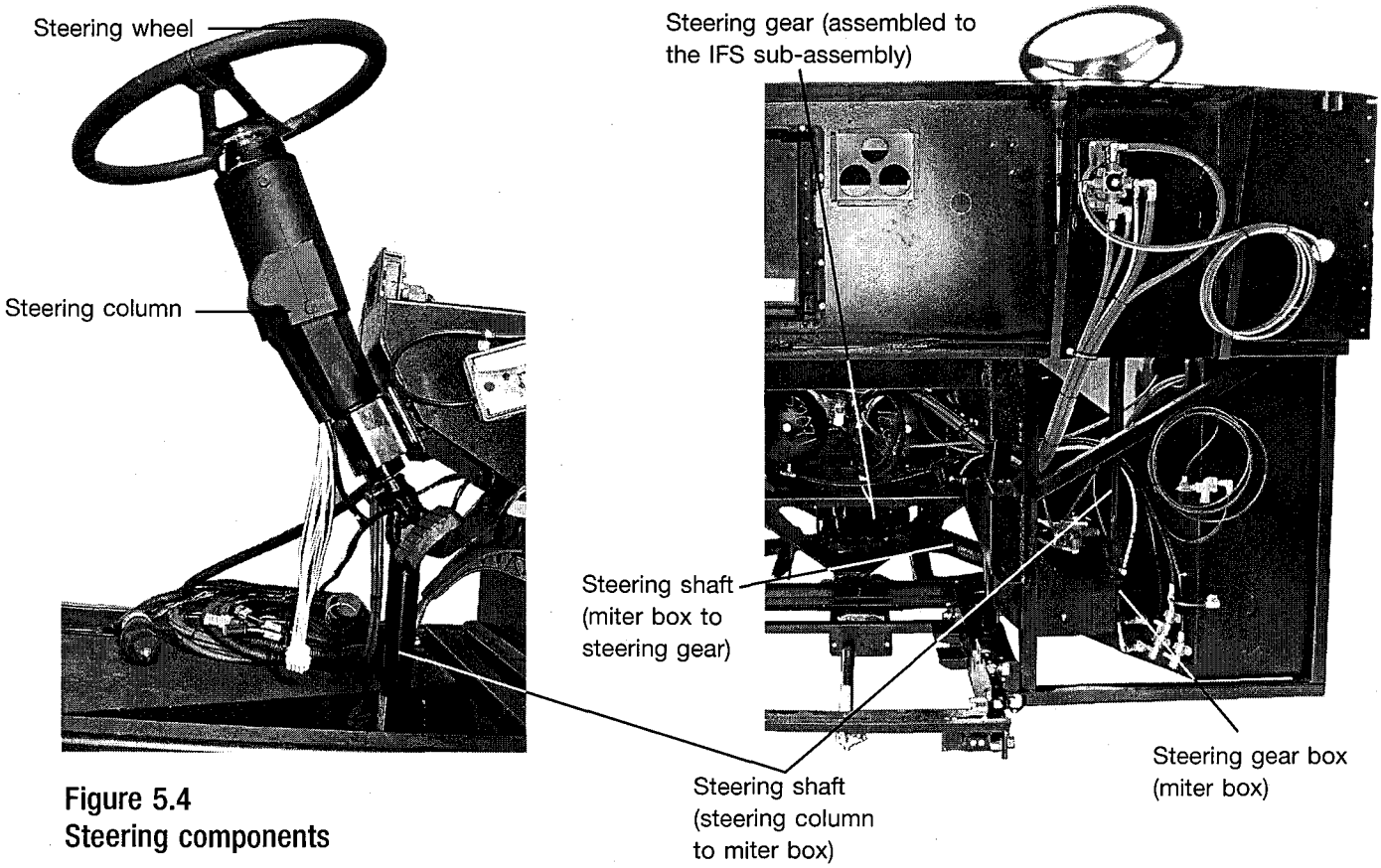


Figure 5.4
Steering components

After the source of the malfunction has been found, determine the cause. For example, if the reservoir fluid level is found to be low, refill the reservoir and check the entire hydraulic system for fluid leaks. Refilling the reservoir will not necessarily correct the problem, since low fluid may only be an indication of another problem. Symptoms and possible causes are provided in the "Power Steering System Troubleshooting" **Table 7.13** in the **Appendix**.

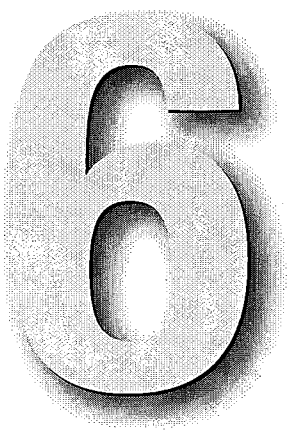
Power Steering System Maintenance

The power steering system requires minimal maintenance to keep the system functioning properly. For maximum performance, ensure that the system is kept clean and free of air leaks and debris.

The fluid level must be checked daily. Fluid must be added to the hydraulic fluid reservoir whenever the level is less than a half-inch below the top of the sight tube while the fluid is at operating temperature. If evidence of dirt, sludge, or water is discovered in the system, disconnect the fluid lines to the power steering gear and drain the system. Refill the system with approved hydraulic fluid.

Notes:

Electrical System Group



ELECTRICAL SYSTEM GROUP

The chassis 12-volt electrical system provides electrical power for the starter motor, running lights, horn, gauges, and electronic controls of the transmission and engine. This electrical system consists of batteries, the starting system, the charging system, gauges, wire harnesses, and various switches and senders. Note that the chassis electrical system is separate from the motorcoach domestic electrical system. See the "Electrical Systems" chapter in the **House** section of this Owner's Guide for more specific information on the domestic 12 VDC and 120 VAC systems.

Batteries

The batteries have three major functions in the chassis electrical system. First, they are a source of electrical energy for cranking the engine. Second, they act as a voltage stabilizer for the electrical system, and third, they can, for a limited time, provide energy when the load (demand) exceeds the output of the alternator.

Battery Precautions

! WARNING

Observe the following precautions to avoid personal injury when working near a battery:

• Always wear eye protection and gloves. Do not lean directly over a battery. Remove all metal jewelry, especially rings and chains.

• Never expose a battery to open flames or electric sparks. Do not smoke near a battery.

• Do not allow battery acid to contact eyes or skin. Flush any contacted area with water immediately.

• Do not allow metal tools to contact the positive (red, "+") battery terminal (or any metal connected to this terminal) and any other metal on the vehicle at the same time.

• Do not use a damaged or broken battery.

Battery Hazards

With proper care, your batteries will provide many years of trouble-free service.

There are four major hazards that can decrease the life of a battery:

- **Deep Cycling:** This occurs when the battery is drained of all useful current and then recharged. During this process, the heat and stresses generated can cause plate warping and loss of active material. The extent of damage depends on the severity of the discharging and charging and how often deep cycling occurs.
- **Sulfation:** Sulfation results when the battery stands in a discharged state for an extended period. The sulfate, which normally forms in the plates, becomes more dense and hard, eventually becoming impossible to remove through the process of recharging the battery.
- **Overcharging:** Overcharging is usually caused by high battery temperature, or by a voltage regulator setting that is too high for the operating conditions. High water consumption by the battery is an indication of overcharging.
- **Vibration:** Vibration tends to shake the active material out of the plate, crack plate grids, loosen terminals, and can even crack the battery case itself.

Battery Maintenance

The chassis batteries are a conventional, wet type (not sealed). Since the batteries are not sealed, regular maintenance is required to ensure the proper operation of the electrical system and the long life of the batteries.

Requirements for maintaining the batteries:

> **! WARNING**
>
> **Batteries produce explosive gasses, contain corrosive acid, and supply levels of electrical current high enough to cause burns. Precautions should be taken to protect yourself from injury.**

- The electrolyte level must be checked regularly, especially during periods of heavy use. The specific gravity of electrolyte can be detected with a hydrometer. A charged battery will have a specific gravity of 1.260-1.280 at 80°F.
- Each cell should have an electrolyte level within one inch of the bottom of the vent well (split ring). Do not let the electrolyte level fall below the top of the plates. Add distilled water to a low cell, being careful not to fill above the bottom of the vent well.

- If the motorcoach is to be placed into storage, or if it is to be left standing for extended periods of time, protect the electrical system by disconnecting the ground strap (negative [black, "-"] cable) from the battery.
- The external condition of the batteries should be checked periodically for damage in areas such as, but not exclusively, the cover and case. Also, check the terminal area for loose or broken parts.

Battery Troubleshooting

If, after checking with a hydrometer, the batteries test good but fail to perform satisfactorily in service, **the following are some of the more important factors which may indicate the cause of the problem:**

- Accessories left on overnight
- Slow average driving speeds for short periods.
- Coach electrical load greater than the alternator output. A major cause is the addition of aftermarket equipment (such as extra radio equipment, window defoggers, lighting systems, or voltage inverters).
- Defects in the charging system such as electrical shorts, slipping belts, a defective alternator, or a faulty voltage regulator.
- Failure to keep the battery cable terminals clean and tight.
- Batteries stored in a motorcoach for long periods of time becomes discharged and sulfated. This reduces it's capability to accept a charge.
- When operating in conditions of high ambient temperature, the electrolyte may become excessively hot, causing boil-over and electrolyte loss.

Jump-Starting Using a Booster Battery

Both the booster battery and the discharged battery should be treated carefully when using jumper cables. Be careful not to cause sparks.

> **! WARNING**
>
> **Departure from these conditions or instructions could result in serious personal injury (particularly to eyes), or property damage, from battery explosion, battery acid, electrical burns, and damage to electronic components of either vehicle.**

To jump-start using a booster battery:

1 Make sure that the electrolyte is not frozen (batteries can freeze at 14°F). Frozen batteries should be thawed before jump-starting. Do not use any type of flame to thaw out the battery.

2 Check the jumper cables for excessive wear or damage. Do not use cables that are damaged.

3 Check the battery fluid level. Do not check with an open flame. If low, fill to the proper level with distilled water. Clear drinking water may be used in an emergency. Replace all caps before jump-starting.

4 Do not route or attach cables to or near parts that will move when the engine is started.

5 Set the parking brakes firmly and place the automatic transmission in neutral (N). Turn off the ignition and all other electrical loads.

6 Only 12V batteries can be used to start the engine because the starting motor is a 12V motor.

7 Attach the end of one jumper cable to the positive [+] terminal of the booster battery and the other end of the same cable to the positive [+] terminal of the discharged battery. Do not permit the vehicles to touch as this may cause a ground connection which could cause sparks.

8 Attach one end of the remaining cable to the negative (-) terminal of the booster battery and the other end to a solid ground (such as the chassis frame or an outrigger) at least 18" away from the battery on the vehicle being started.

! WARNING

Do not connect the cable directly to the negative [-] terminal of the discharged battery.

9 Turn off all accessories and start the engine of the vehicle that is providing the jump-start. Then start the engine with the discharged battery.

10 Remove the jumper cables in reverse order of attachment. First, disconnect the negative [-] cable from the vehicle that was jump-started. Next, disconnect the negative [-] cable from the booster battery. Then disconnect the positive [+] cable from the discharged battery, and finally, disconnect the positive [+] cable from the booster battery.

Jump-Starting Using the Battery-Boost Switch

Another option for jump-starting the motorcoach engine or the domestic generator is to use the Battery Booster switch. Activating this switch directs current from the domestic batteries to the chassis batteries. Use this method for supplementing weak chassis batteries and for starting a cold engine.

To boost the chassis batteries with the domestic batteries:

1 Press and hold the Battery-Boost switch, located on the driver-side console, for about 5 to 15 seconds before cranking the engine. For weak chassis batteries, press the switch for about 30 seconds.

2 Continue to press the Battery-Boost switch while attempting to start the engine. Follow the normal engine starting procedure in the Introduction.

If the engine fails to start on the first attempt:

a Start the generator and run it for 3 minutes

b Repeat steps 1 and 2, except press the Battery-Boost switch for 2 minutes.

c Start the engine as usual.

d Confirm on the dash voltmeter that the alternator is charging the batteries.

Battery Removal and Replacement

When handling a battery, observe the previously stated battery safety precautions. To remove a battery, always disconnect the negative cable first, then the positive. When replacing a battery, reverse the procedure, connecting the positive first, then the negative. In most cases, the ground cable is marked with a negative sign (-) and is attached to the engine or coach body.

Charging System (Alternator)

The purpose of the charging system is to provide electrical power to the engine ignition system and the motorcoach chassis accessories, and to restore power used from the battery. The primary component of the charging system is the alternator, which is an air cooled, belt-driven unit designed for heavy-duty diesel engines. While the engine is running, the alternator recharges both the chassis and domestic batteries.

No periodic adjustments or maintenance of any kind are required on the entire alternator assembly. Belt tension, however, should be checked periodically and adjusted if necessary.

Noise from an alternator may be caused by a loose drive pulley or mounting bolts that should be tightened, as required. Other causes of alternator noise can be worn or dirty bearings, defective diodes, or a defective stator.

Charging System Troubleshooting

If there is a problem in the charging system, the first action should be to check the charge of the battery and condition of the wiring. An overcharged battery is indicated by excessive use of battery water. An undercharged battery is indicated by low specific gravity of the electrolyte and slow cranking speed of the starter motor. The following are possible reasons for overcharged and undercharged batteries.

Causes for overcharged batteries:

- Defective battery
- Defective or improperly adjusted regulator
- Poor sensing lead contact to regulator or rectifier assembly

Causes for undercharged batteries:

- Loose alternator drive belts. Ensure they are properly adjusted and are in good condition.
- Broken or undersized wiring, defective batteries, or corroded, broken, loose, or dirty terminals.
- Alternator field circuit malfunction, caused by one, or a combination of the following conditions:
  - Poor contacts between regulator and brushes
  - No residual magnetism in the rotor
  - Defective or improperly adjusted regulator
  - Damaged or worn brushes
  - Damaged or worn slip rings
  - Poor connection between the slip ring assembly and the field coil leads
  - Rotor coil shorted, open, or grounded

Starting System

The starter on your motorcoach does not require special maintenance. It will provide years of trouble-free service if proper cranking procedures are used. When starting the engine, never engage the starter longer than 30 seconds and allow two minutes between attempts. This prevents overheating, prolonging starter life. Also, to prevent excessive overrun, release the ignition key immediately after the engine starts.

While the cranking motor does not require routine maintenance, the system wiring should be inspected periodically for damage or corrosion. Inspect all connections to the cranking motor, solenoid, ignition switch, neutral start switch, starter relay, and batteries, including all ground connections. Clean and tighten all connections as necessary.

If there appears to be a problem with the cranking system, yet the engine is functioning properly and the batteries, wiring relays and switches are in satisfactory condition, the motorcoach should be taken to an authorized service facility for further diagnosis or testing.

Engine Wiring and Sensors

If any maintenance or operational difficulties are encountered in this area, have your coach wiring and sensors inspected by a qualified service technician.

Reader Ports

Service technicians use the reader ports to connect engine, transmission, or ABS diagnostic readers to troubleshoot or verify powertrain operation (**see Figure 6.1, page 6.7**).

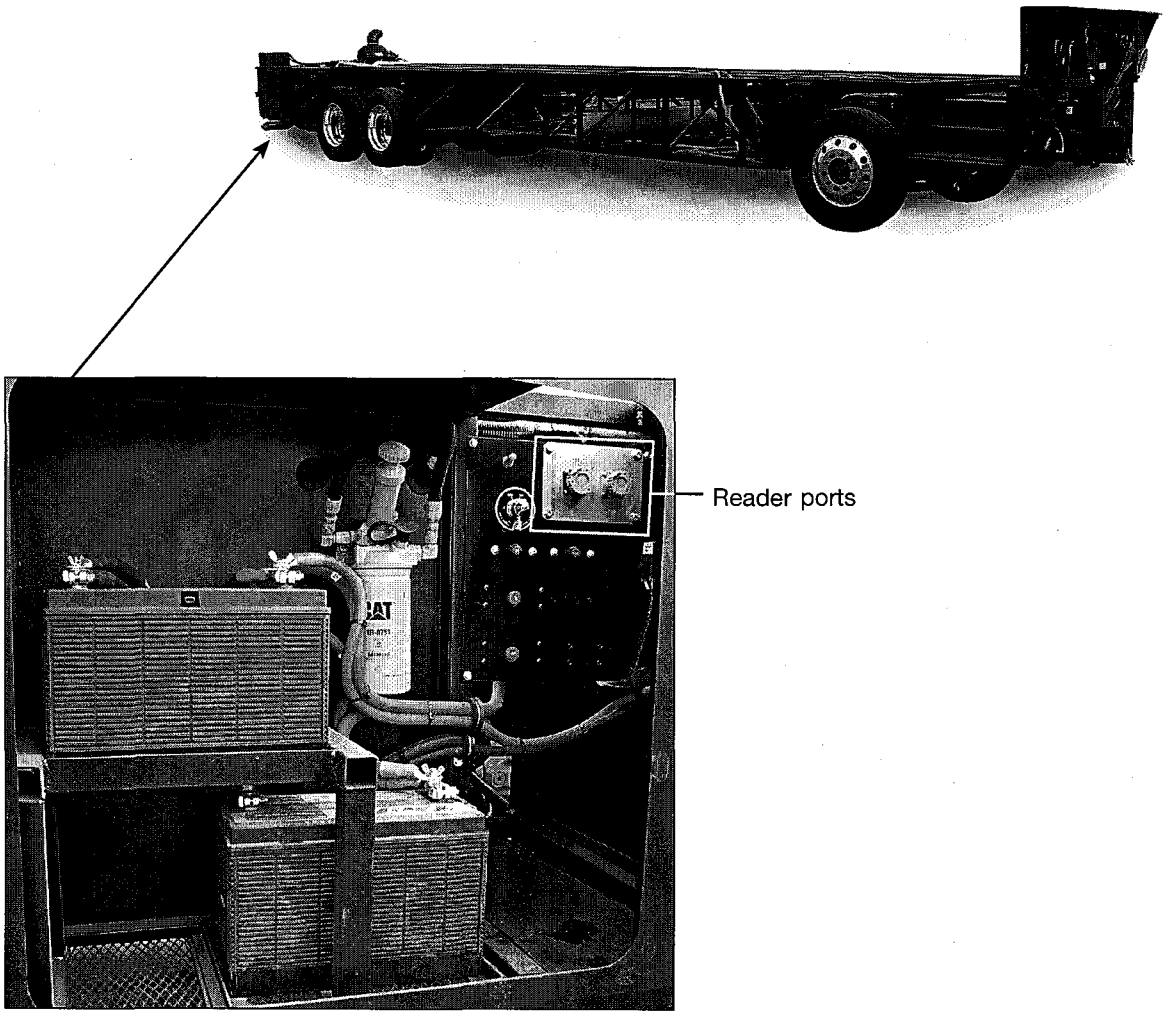


Figure 6.1
Reader ports in chassis battery bay

Notes:

Appendix

APPENDIX

Maintenance

The interval for each maintenance item does not change and is ongoing for the life of the coach. Some items in the maintenance schedule have a special initial service interval which are followed by regular intervals. Intervals on some items are subject to change (usually a shortening of the interval) if the coach is driven under extreme driving conditions.

Note: We strive to provide you with up-to-date maintenance information. Your coach maintenance may differ due to coach component improvements that are introduced after your manual was printed.

Periodic Maintenance Schedule

This schedule provides all of the required periodic maintenance intervals for your coach. See chassis lubrication for lubrication points and fluid specifications.

Periodic Maintenance Schedule	
Hourly	
Hydraulic and Steering System	
Hydraulic reservoir filter: C9 - 500 hours	Replace
Hydraulic reservoir fluid (10W30): C9 - 2,000 hours	Replace
Daily	
Air filter minder	Inspect
Air system tanks: Daily or following coach storage	Drain
Batteries	Inspect
Coolant level	Check
Crankcase breather tube: ISL	Inspect
Drive belt	Inspect
Engine oil level	Check
Hydraulic fluid level	Check
Leaks and loose connections @ engine	Inspect
Primary fuel filter/water separator	Inspect

Table 7.1
Periodic maintenance schedule

Periodic Maintenance Schedule	
Tire tread and air pressure	Inspect
Transmission fluid level	Check
Monthly	
Chassis corrosion control: Hose underside of chassis	Inspect/Clean
Suspensions: Fastener and air connection tightness, air spring firmness, and ride height	Inspect/Adjust
Every 1,000 miles	
Suspension	
IFS wheel-end fluid level	Inspect
Every 5,000 miles	
Engine	
Air cleaner and intake system	Inspect
Battery terminals	Lubricate
Cooling System	
Air recirculation baffles and seals	Inspect
Charge-air cooler	Inspect
Pipes, hoses, and clamps	Inspect
Radiator and fins	Inspect
Surge tank	Inspect
Transmission	
Transmission electrical harnesses	Inspect
Filter: CX28 - Initial transmission filter change at 5,000 miles or 200 service hours, whichever occurs first (Thereafter, replace the fluid and filter, and clean the magnetic screen every 25,000 miles, 1,000 hours, or 12 months, whichever occurs first)	Replace
Filter: 3000 MH - Initial transmission main filter change at 5,000 miles (Thereafter, main and lube/ auxiliary filters every 75,000 miles, 2,000 hours, or 24 months, whichever occurs first)	Replace
Transmission fluid: 3000 MH - Top off with fluid at 5,000 and 75,000 miles	Inspect
Transmission fluid cooler	Inspect
Transmission fluid lines and fittings	Inspect
Suspension	
Air Springs	Inspect
Shock absorbers	Inspect
Knuckle post assembly: Adding grease is not required for life of coach. Apply grease only after knuckle maintenance or replacing components.	Inspect
Suspension mounting	Inspect/Adjust
Front Brakes	
Brake shoes and linings	Inspect
Slack adjusters/camshafts	Inspect

Table 7.1 (continued)
Periodic maintenance schedule

Periodic Maintenance Schedule	
Air System	
Air brake lines	Inspect
Air dryer	Inspect
Air tanks	Inspect
Safety valves	Inspect
Suspension air system piping	Inspect
Hydraulic and Steering System	
Hydraulic fluid cooler	Inspect
Hydraulic pump	Inspect
Fan motor	Inspect
Fan motor valves	Inspect
Piping	Inspect
Steering arms	Inspect
Steering gear	Inspect
Tie rod ends (part of IFS)	Inspect
Every 10,000 miles	
Engine	
Engine oil and filter: C9 - 10,000 miles, 1,500 gallons, 250 service hours, or six months, whichever occurs first	Replace
Valve lash clearance: C9 - Initial inspect/adjust at 10,000 miles, 1,500 US gallons, 250 service hours, or six months, whichever occurs first. Then inspect/adjust every 100,000 miles, 15,000 US gallons, 2,000 service hours, or 24 months, whichever occurs first	Inspect/Adjust
Hydraulic and Steering System	
Hydraulic reservoir filter (Dexron III): ISL - 12,500 miles or 12 months, whichever occurs first	Replace
Steering column and shaft	Inspect
Steering column mounting	Inspect
Steering gear mounting bolt torque	Inspect
Every 15,000 miles	
Engine	
Alternator, fan, accessories, drive belts, and pulleys	Inspect
Engine oil and filter: ISL - 15,000 miles, 400 hours, or 12 months, whichever occurs first	Replace
Exhaust System	
Exhaust piping	Inspect
Diesel Particulate Filter (DPF)	Inspect
DPF bracket and hangers	Inspect
Transmission	
Driveshaft bolts	Inspect
Driveshaft u-joints and slip joint: 1710 Series - 15,000 miles or 3 months, whichever occurs first	Lubricate

Table 7.1 (continued)
Periodic maintenance schedule

Periodic Maintenance Schedule	
Every 20,000 miles	
Engine	
Belt and tension	Inspect
Crankcase breather: C9	Clean
Fan drive bearing: C9	Lubricate
Fuel System	
Fuel lines	Inspect/Replace
Fuel tank	Inspect
Primary fuel filter/water separator element: C9	Replace
Primary fuel filter/water separator element: ISL	Replace
Secondary fuel filter: C9	Replace
Secondary fuel filter: ISL	Replace
Cooling System	
Coolant/antifreeze: C9	Inspect
Coolant/antifreeze: ISL	Inspect
Supplemental coolant additive (SCA)	Test/Adjust
Air System	
Air compressor	Inspect
Every 25,000 miles	
Suspension	
Retorque fasteners	Inspect/Adjust
Ride height	Adjust
Ride height valves	Inspect
Air System	
Check valves	Inspect
Moisture ejector valve	Inspect
Pressure protection valve	Inspect
Pressure regulator valve	Inspect
Hydraulic and Steering System	
Hydraulic pump operation and mounting	Inspect
Hydraulic reservoir fluid (Dexron III): ISL - 25,000 miles or 24 months, whichever occurs first	Replace
Transmission	
Fluid and fluid filter: CX28 - 25,000 miles, 1,000 service hours, or 12 months, whichever occurs first (Initial filter change at 5,000 miles or 200 service hours)	Replace
Magnetic screen: CX28 - 25,000 miles, 1,000 service hours, or 12 months, whichever occurs first	Clean
Transmission mounting bolts	Inspect

Table 7.1 (continued)
Periodic maintenance schedule

Periodic Maintenance Schedule	
Every 40,000 miles	
Air System	
Air compressor at 48,000 miles	Inspect
Engine	
Belt tensioner: ISL	Inspect
Fan hub: ISL - 40,000 miles, 1,000 hours, or 12 months, whichever occurs first	Inspect
Every 50,000 miles	
Engine	
Alternator mounting	Inspect
Cooling System	
Radiator and fins	Inspect/ Clean
Surge tank pressure cap	Inspect
Front Brakes	
Brake rubber plunger boot	Inspect/Clean/ Lubricate
Front brake slack adjusters/camshafts: 50,000 miles, 12 months, or with brake reline, whichever occurs first	Lubricate
Air System	
Air dryer desiccant cartridge: 50,000 miles or 24 months, whichever occurs first	Replace
Moisture ejector valve	Inspect/ Clean
Quick release valve	Inspect
Relay valve	Inspect/Clean
Hydraulic and Steering System	
Engine cooling fan	Inspect
Tie rod ends (part of IFS): 50,000 miles, 12 months, or with brake reline, whichever occurs first	Inspect/Lubricate
Steering shaft seal	Inspect
Every 75,000 miles	
Transmission	
Transmission filters: 3000 mh - Main and lube/auxiliary filters every 75,000 miles, 2,000 hours, or 24 months, whichever occurs first (Initial transmission main filter change at 5,000 miles) and top off with fluid	Replace
Every 80,000 miles	
Cooling System	
Coolant/antifreeze: ISL - 80,000 miles, 2,000 hours, or 24 months, whichever occurs first	Replace
Every 100,000 miles	
Engine	
Belt tensioner: C9	Inspect
Valve lash clearance: C9 at 110,000 miles: Initial inspect/adjust at 10,000 miles, then every 100,000 miles, 15,000 US gallons, 2,000 service hours, or 24 months, whichever occurs first	Inspect/Adjust
Transmission	
Driveshaft U-joints: SPL170 - 100,000 miles or 6 months, whichever occurs first	Lubricate

Table 7.1 (continued)
Periodic maintenance schedule

Periodic Maintenance Schedule	
Cooling System	
Water pump: C9	Inspect
Suspension	
IFS wheel-end fluid: 100,000 miles, 12 months, with brake reline, or with seal replacement, whichever occurs first	Inspect
Every 150,000 miles	
Cooling System	
Coolant/antifreeze: C9	Replace
Exhaust	
Diesel Particulate Filter (DPF): CAT - 150,000 miles or 4,500 service hours, whichever occurs first	Inspect/Clean
Engine	
Valve lash clearance: ISL	Adjust
Transmission	
Transmission fluid: 3000 MH - 150,000 miles, 4,000 hours, or 48 months, whichever occurs first	Replace
Every 200,000 miles	
Exhaust	
Diesel particulate filter (DPF): Cummins - At 200,000 to 400,000 miles have the DPF serviced by a qualified facility	Inspect/Clean
Every 300,000 miles	
Cooling System	
Water temperature thermostat: C9	Replace
Air System	
Air compressor	Inspect
As required	
Engine	
Air cleaner and intake system	Clean
Air cleaner filter element	Replace
Cooling System	
Charge-air cooler	Clean
Water pump: ISL	Inspect
Water temperature thermostat: ISL	Replace
Transmission	
Transmission fluid cooler	Inspect/Clean
Suspension	
Front-end alignment	Inspect/Adjust
Front Brakes	
Brake shoes and linings	Replace
Air System	
Air compressor filter	Clean/Replace

Table 7.1 (continued)
Periodic maintenance schedule

Commonly Replaced Items

Commonly Replaced Items		
Belts	**Part Number**	**Location**
Serpentine	37340 88401-7	C9 425 engine ISL 425 engine
Filters		
Air cleaner	15469	Chassis (engine bay)
Air dryer	21499	Chassis (rearward of drive axle)
Air filter minder	20808	Chassis (engine bay)
Hydraulic reservoir	93772 90097 93772	C9 425 chassis (engine bay) ISL 425 no tag chassis (engine bay) ISL 425 tag chassis (engine bay)
Oil	86045-7 88401-11	C9 425 engine ISL 425 engine
Primary fuel filter/water separator	45169 37235	C9 425 chassis (engine bay) ISL 425 chassis (engine bay)
Secondary fuel filter	86045-13 88401-13	C9 425 engine ISL 425 engine
Transmission	82911-5 88327-5 16582	CX28 transmission (tag) CX28 transmission (no tag) 3000 MH transmission
Fluids		
Coolant antifreeze	26886	Coolant system
Diesel fuel (ultra low sulphur diesel)	ASTM No.2D	Fuel system
Engine oil	91228	C9 425 engine ISL 425 engine
Hydraulic	45408 01086	C9 425 hydraulic system ISL 425 hydraulic system
Independent front suspension (IFS)	82804	IFS wheel bearings
Drive and tag axle oil	82804	Rear axle housing and tag axle wheel bearings
Transmission	36903	CX28 transmisson 3000 MH transmission
Tires		
295/80R x 22.5	81816	Front and rear axles

Table 7.2
Commonly Replaced Items

Chassis Vendor List

Chassis Vendor List		
Component	**Vendor**	**Phone/Internet**
Axle, drive (no tag chassis)	Dana Corp.	(800) 826-4357/www.dana.com/www.roadranger.com
Axle: drive (tag chassis)	ArvinMeritor, Inc.	(800) 535-5560/www.arvinmeritor.com
Driveshaft	Dana Corp.	(800) 826-4357/www.dana.com/ www.spicerdriveshaft.com
Engine, transmission	Caterpillar	(800) 447-4986/www.caterpillar.com
Engine	Cummins	(800) 343-7357/ www.cummins.com
Steering column	Douglas Autotech Corp.	(517) 369-2315/www.douglasautotech.com
Steering shafts, steering gear box	TRW - Northrop Grumman	(765) 423-5377/ www.trwauto.com
Suspension: IFS, steering gear, pitman arm	Holland USA, Inc.	(888) 396-6501/www.hollandusa.com
Suspension: rear	Holland USA, Inc.	(888) 396-6501/www.hollandusa.com
Tires	Goodyear	(330) 796-2121/www.goodyear.com
Transmission	Allison	(800) 524-2303/www.allisontransmission.com

Table 7.3
Vendor List

Chassis Maintenance Log

Date	Mileage	Dealer Address	Service/Remarks
4/29/10	2028	Beaudry RV	New Purchase - oil changed. - Valve extender tires
.	-	.	: tow car air brake line : Traveler "Satilite TV system : Replaced LF Slide Awning
5/3/10	2516	CAT Empire Truck	. adjust Engine Brake . check Ecm codes.
7/27/10	3880	Terry's RV Buena Vista, CO	Install Freezer Remove W/D.
7/29/10		Coach RV Broomfield, CO	Replace motor OTD awning
4/28/11	11,537	Camp & World Fountain. CO	Oil Change & Filter Replaced motor OTD awning - again
5/23/11	11,703	Wagner CAT 18000 Smith Aurora, CO	Filters 2 Fuel 1 Transmission 1 Hydraulic update software check codes.

Date	Mileage	Dealer Address	Service/Remarks

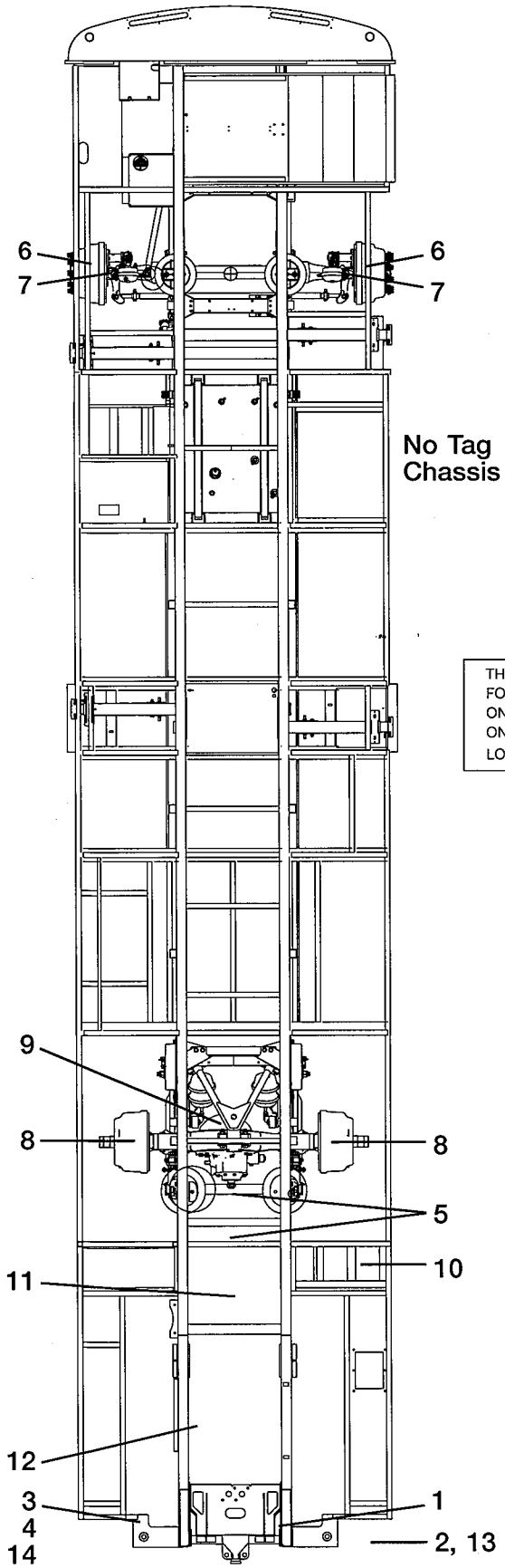
Chassis Lubrication

Chassis Lubrication Points and Intervals

Item No.*	Item Description	Requirement	Interval
1, 12	Engine oil	Keep dipstick to FULL mark	Daily
2, 13	Hydraulic reservoir	Maintain appropriate fill level	Daily
3, 14	Surge tank (engine coolant)	Maintain appropriate fill level	Daily
4, 11	Transmission fluid	Keep dipstick to FULL mark	Daily
5	Driveshaft slip joint (1710 only) and U-joints	Grease fittings	1710 Series: 15,000 miles or 3 months - SPL170: 100,000 miles or 6 months, whichever occurs first
6	Front wheel bearings	Keep oil level aligned with hub cap face markings	Check fluid level at 1,000 miles. Change fluid every 100,000 miles, 12 months, with brake reline, or with seal replacement, whichever occurs first
7	IFS knuckle post assembly	Grease fittings	Not required for life of coach. Apply grease only after knuckle maintenance or replacing components
	Front brake slack adjusters/ camshafts	Grease fittings	50,000 miles, 12 months, or with brake reline, whichever occurs first
8	Rear wheel bearings	Contact the Country Coach service department at (541) 998-9202 or (800) 452-8015, 6:00 am to 5:00 pm Pacific Time (Monday-Friday) and 7:00 am to 4:00 pm Pacific Time (Saturday-Sunday) for further information	
9, 15	Rear drive and tag (optional) axle assembly	Contact the Country Coach service department at (541) 998-9202 or (800) 452-8015, 6:00 am to 5:00 pm Pacific Time (Monday-Friday) and 7:00 am to 4:00 pm Pacific Time (Saturday-Sunday) for further information	
10	Battery terminals	Apply coating	5,000
11	Transmission filter/fluid change: CX28	Replace filter and fill to FULL mark	Initial filter change at 5,000 or 200 service hours, thereafter, fluid and filter every 25,000, 1,000 service hours, or 12 months, whichever occurs first
	Transmission magnetic screen: CX28	Clean magnetic screen	25,000, 1,000 service hours, or 12 months, whichever occurs first
11	Transmission filter/fluid change: 3000 MH	Replace filter and fill to FULL mark	Change main filter at 5,000 miles and top off with fluid. Thereafter, change main and lube/auxiliary filters every 75,000 miles, 2,000 hours, or 24 months and fluid every 150,000 miles, 4,000 hours, or 48 months, whichever occurs first
12	Engine filter/oil change	Replace filter and fill to FULL mark	C9: 10,000 miles, 1,500 gallons, 250 service hours, or six months, whichever occurs first ISL: 15,000 miles, 400 hours, or 12 months, whichever occurs first
13	Hydraulic filter/fluid change: C9 (10W30)	Replace filter and fill to FULL mark	Filter every 500 hours and fluid every 2,000 hours
13	Hydraulic filter/fluid change: ISL (Dexron III)	Replace filter and fill to FULL mark	Filter every 12,500 miles or 12 months and fluid every 25,000 or 24 months, whichever occurs first
14	Engine coolant change	Replace and fill to FULL mark	C9: Every 150,000 miles ISL: Every 80,000 miles, 2,000 hours, or 24 months, whichever occurs first

* These item numbers refer to Figure 7.1

Table 7.4
Lubrication points and intervals



No Tag Chassis

THIS ILLUSTRATION IS FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.

Tag Chassis

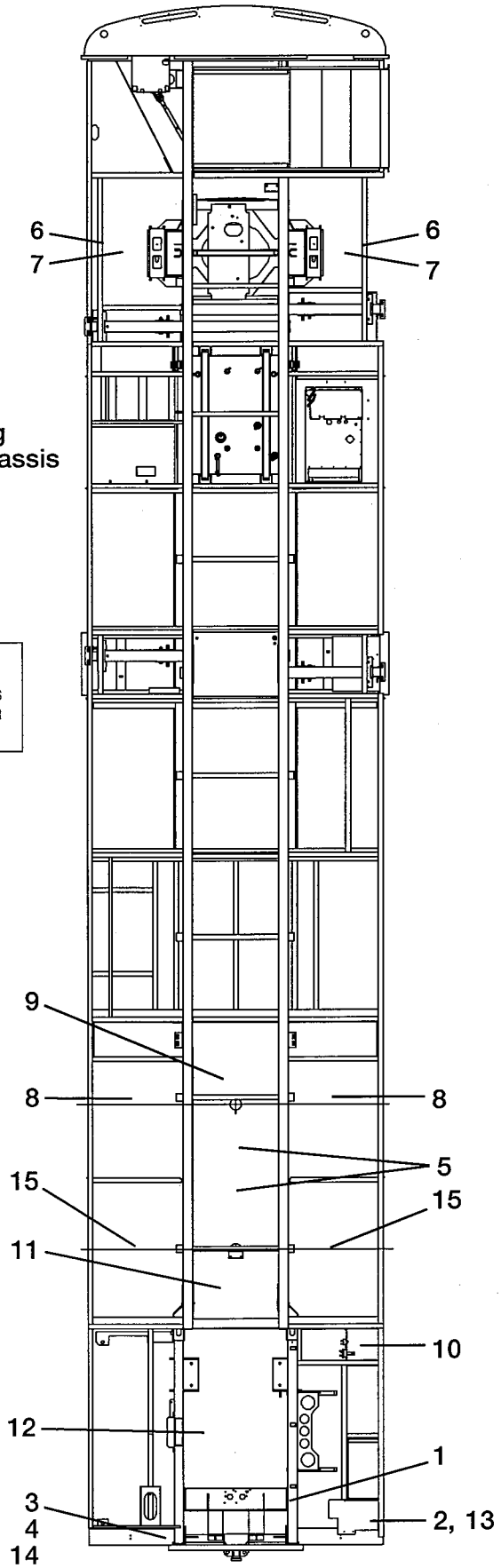


Figure 7.1
Lubrication points

Chassis Lubrication Fluid Specifications

Item No.*	Component	Quantity	Fluid/Lubricant
3, 14	Coolant capacities Engine only Complete system	Approx. 19.3 qt (C9) 11.7 qt (ISL) 24.5 gal (C9) 22.6 gal (ISL)	Mixture of 50% propylene glycol antifreeze and 50% water. The glycol must be a low silicate formula. An additional 1.5 units/gal of supplemental coolant additive (SCA) is needed.
5, 7	Driveshaft, IFS knuckle assembly, front brake slack adjusters/ camshafts	As required	Lithium multi-purpose grease meeting the requirements of NLGI Grade 2 grease.
1, 12	Engine oil C9 ISL	Approx. 37 qt 29 qt	15W-40 multi-viscosity
6, 8, 9, 15	Front wheel bearings	Fill as required	Country Coach uses 80W-140 Pennzoil long-life EW. Gear lubricants must meet MIL-L-2105D, MIL-PRF-210-E or API GL5 specifications.
	Rear drive and tag (optional) axle assembly	Contact the Country Coach service department at (541) 998-9202 or (800) 452-8015	
10	Battery terminals	As required	Anti-corrosion grease
4, 11	Transmission fluid Initial fill Refill Initial fill Refill	 36 qt (CX28) 18 qt (CX28) 26 qt (3000 MH) 17 qt (3000 MH)	TranSynd, ATF
2, 13	Hydraulic fluid (complete system)	Approx. 80 qt (C9) Approx. 80 qt (ISL)	10W-30 oil (C9) or Dexron III (ISL)

* These item numbers refer to the chassis Figure 7.1

Table 7.5
Fluid specifications

Chassis Grease Fitting Locations

Item No.*	Location†	Number of Grease Fittings
7	Front brake camshaft tube, left and right	2
7	Front brake slack adjuster, left and right	2
7	Front independent suspension (IFS) knuckle post assembly, left and right	8
7	Drag links (part of independent front suspension)	4
8	Drive axle: Rear brake camshaft tube, left and right (Dana and ArvinMeritor)	2
8	Drive axle: Rear brake slack adjuster, left and right (Dana and ArvinMeritor)	2
15	Tag Axle (option): Rear brake camshaft tube, left and right	2
15	Tag Axle (option): Rear brake slack adjuster, left and right	2
5	Driveshaft slip joint (1710 Series only)	1
5	Driveshaft universal joints, front and rear	4
* These item numbers refer to the chassis Figure 7.1		
† The locations and number of grease fittings may vary due to component updates and modifications		

Table 7.6
Grease fitting locations

Chassis Torque Values

12 Volt Breaker Terminal Torque

Follow the specifications in **Table 7.7** for proper breaker terminal torque.

Breaker Terminal	Torque
200 amp	200 in-lb
120 amp	90 in-lb
105 amp	90 in-lb
60 amp	90 in-lb

Table 7.7
Breaker terminal torque

Chassis Torque Values

Chassis Group	Qty.	Torque
Receiver to motor mount stanchions and front motor mount using 1/2" -20 x 1-1/2" flange head bolts and flange locknuts	10	72 ft-lb
Front motor mount to motor mount stanchions using 1/2" -20 x 1-1/2" flange head bolts and flange locknuts	8	72 ft-lb
Closing crossmember to motor mount stanchions using 1/2" -20 x 1-1/2" flange head bolts and flange nuts	6	72 ft-lb
LP tank mount to chassis using 1/2" -20 x 1-1/2" flange head bolts and flange locknuts	4	72 ft-lb
Fuel tank mounts: Attach with 5/8" -18 flange locknuts Note: tighten only until washers contact shock mount inner sleeve	4	See Note
Chassis ground stud using 1/2" -13 with Nylock locknut with 5/8" and 1/2" flatwasher (for engine batteries and engine)	1	25 ft-lb
Engine Group - C9	**Qty.**	**Torque**
Engine mount bracket to bell housing using 3/4" -10 x 1-1/4" flange head bolts and SAE hardened flat washers	8	200 ft-lb
Engine isolator to rear engine mount bracket using M20 x 2.5 x 60mm bolts and USS hardened flat washers	2	110 ft-lb
Engine isolator to frame engine mount support using 5/8" -18 x 1-3/4" hex head bolts and hex locknuts with hardened flat washers	4	144 ft-lb
Alternator pulley to driveshaft using 5/8" -18 locknut	1	70 ft-lb
Alternator to engine mount using M10 x 1.5 x 100mm, grade 8.8 bolts	4	30 ft-lb
A/C compressor to engine mount using M8 x 1.5 x 100mm flange head bolts	4	145 **in-lb**†
PTO to transmission using M10 x 1.5 x 40mm 12pt head bolts	8	42 ft-lb
Hydraulic pump to PTO using 1/2" x 20 x 1-1/2" flange head bolts and hex locknuts	2	45 ft-lb
Engine isolators (2) to front motor mount bracket using 9/16" -12 x 1-1/2" flange head bolts and flange head locknuts	4	120 ft-lb
Engine isolators (2) to engine bracket using 5/8" -18 x 4" flange head bolts and flange locknuts with sleeves and rebound washers	2	30 ft-lb
Engine Group - ISL	**Qty.**	**Torque**
Alternator pulley to driveshaft using 5/8" -18 locknut	1	70 ft-lb
Alternator to bracket using M10 x 1.5 x 100mm bolt	1	35 ft-lb
A/C compressor to bracket using existing M8 x 1.5 x 100mm bolt	1	145 **in-lb**†
Starter to engine block - check tightness of existing bolts	3	30 ft-lb
PTO to transmission using M10 x 1.5 x 40mm 12pt bolts	8	42 ft-lb
Hydraulic pump to PTO using 1/2" x 20 x 1-1/2" flange head bolts and hex locknuts	2	45 ft-lb
Pump support bracket to transmission using 1/2" -20 x 1-1/2" bolts an locknuts	2	45 ft-lb
Bracket from angle to existing split flange clamp using 3/8" -16 x 1-1/4" bolt and locknut	1	25 ft-lb

† Note **Inch Pounds**, NOT Foot Pounds

Table 7.8
Torque values

Engine mount to bell housing using M12 x 1.75 x 22mm flange head bolts	8	40 ft-lb
Metallastic mount to engine mount using M20 x 2.5 x 60mm flange head bolts	2	110 ft-lb
Metallastic mount to chassis motor mount using 5/8" 18 x 1-3/4" flange head bolts and flange locknuts	4	144 ft-lb
Tighten bolt and nut on barrel mount until bracket sides clamp sleeve, then torque	1	55 ft-lb
Barrel mount to motor mount using M12 x 1.25 x 30mm bolts and locknuts	4	55 ft-lb
Powertrain Group	**Qty.**	**Torque**
Fan to fan hub using 3/8" 16 x 1" bolts and locknuts (ISL only, 2 places for MHT and 1 place for MTT)	6	26 ft-lb
Fan hub to fan motor shaft using locknuts (ISL only, 1/2" -20 for MHT)	2	40 ft-lb
Fan hub to fan motor shaft using locknuts (ISL only, 5/8" -18 for MTT)	1	70 ft-lb
Fan motor to motor mount using 1/2" -20 x 2" bolts and locknuts (ISL only, 2 places for MHT and 1 place for MTT)	2	51 ft-lb
Fan motor mount to radiator shroud using 1/2" -20 x 1" flange head bolts and flange locknuts (ISL only, 2 places for MHT and 1 place for MTT)	2	51 ft-lb
Radiator to radiator mount using 1/2" -20 x 2" bolts and locknuts	2	51 ft-lb
Radiator to chassis bracket using 1/2" -13 all-thread rod and nuts, lockwashers and flat washers	8	45 ft-lb
T-bolt for heavy duty charge-air hose clamp using 1/4" -20 locknuts	8	100 **in-lb**†
U-joint strap to yolk for using 1/2" -20 x 1-1/2", 12 point head bolts, MHT only (1710 U-joints/driveshaft only)	8	72 ft-lb
U-joint strap to yolk for using 1/2" -20 x 1-1/2", 12 point head bolts, MTT only (SPL-170 U-joints/driveshaft only)	8	72 ft-lb
Exhaust pipe to turbo outlet using v-band clamp with 5/16" -24 locknut for C9 only	1	180 **in-lb**†
Exhaust pipe to turbo outlet using v-band clamp with 1/4" -28 locknut for ISL only	1	100 **in-lb**†
Exhaust pipe clamp band to DPF inlet and outlet using v-band clamp with 1/4" -28 locknuts for C9 only	2	100 **in-lb**†
Exhaust pipe clamp band to DPF inlet and outlet using v-band clamp with 5/16" -24 locknut for ISL only	1	180 **in-lb**†
Exhaust pipe clamp band to muffler inlet and outlet using 3/8" -16 locknut for ISL only (use fasteners supplied with bands)	1	45 ft-lb
CGI pipe to DPF and engine with v-band clamp using 1/4" -28 nuts for C9 only	2	100 **in-lb**†
Steering	**Qty.**	**Torque**
Steering miter box to mount using 3/8" -16 x 3-1/2" flange head bolts and flange locknuts	4	26 ft-lb
Shaft from miter box to steering gear using 7/16" -20 x 2" flange head bolts and flange locknuts	2	26 ft-lb

† Note **Inch Pounds**, NOT Foot Pounds

Table 7.8 (continued)
Torque values

Front Suspension (IFS)	Qty.	Torque
Front wheel using outer cap nuts on 3/4" -16 studs	20	450 ft-lb Dry
Brake chamber mounting using 5/8" -11 studs, nuts, and lockwashers (Use existing fasteners)	4	120 ft-lb
Brake rod clevis using 5/8" -18 jam nuts, grade 5 (Use existing fasteners)	2	25 ft-lb
Attach shock absorbers using existing fasteners on both ends	4	160 ft-lb
Rear Suspension - No Tag (ADL-123)	**Qty.**	**Torque**
Tower bracket and cross member to rear sub-frame using 3/4" -16 x 5-1/2" flange head bolts and flange locknuts	12	225 ft-lb
Beam assembly to tower using 1-1/8" -7 locknut for driver-side only (Tighten snug and turn nut 1/8 turn for passenger side)	1	800 ft-lb
Axle pivot mounting to equalizer beam using 1-1/8" -7 locknuts	2	800 ft-lb
Transverse beam mounting to equalizer beam using 1-1/8" -7 locknuts	4	800 ft-lb
Air spring to upper mount using 1/2" -13 locknuts	2	25 ft-lb
Air spring to lower mount using 1/2" -13 locknuts	2	25 ft-lb
Shock absorber to upper mount using 3/4" -10 locknuts	2	160 ft-lb
Shock absorber to lower mount using 3/4" -10 locknuts	2	160 ft-lb
Track bar to frame rail using 5/8" -18 bolts and locknuts (4 are 1-1/4" long and 2 are 1-1/2" long)	6	144 ft-lb
Track rod and cross member using 5/8" -18 bolts and locknuts (4 are 1-1/4" long and 2 are 1-1/2" long)	6	144 ft-lb
Torque rod and track bar ends to mountings using 7/8" -9 bolts and locknuts (Use existing bolts)	4	400 ft-lb
Clamp bolts to torque rod and track bar using 5/8" -18 locknuts	4	50 ft-lb
S-camshaft housing to mount tab using 5/8" -18 x 2" bolts and locknuts	2	144 ft-lb
Brake chamber to mount using 5/8" 11 studs and locknuts	4	90 ft-lb
Brake actuator clevis, adjust and clamp clevis using 5/8" -18 jam-nuts	2	25 ft-lb
Inner cap nuts to attach inner rear wheel using 3/4" -16 studs	20	450 ft-lb Dry
Outer cap nuts to attach outer rear wheel using 1-1/8" -16 inner nuts	20	450 ft-lb Dry
Rear Suspension - Tag (RD-246)	**Qty.**	**Torque**
Beam assembly to hanger with eccentric bolt and 1-1/4" -7 locknut	2	See Note
Axle mount to beam assembly using existing fasteners	4	525 ft-lb
Torque rod shim mounting and axle mounting using 5/8" -11 bolts and locknuts	4	160 ft-lb
Track rod shim mounting using 5/8" 11 x 8" bolts and locknuts	2	160 ft-lb
Track rod to axle housing using 1-1/4" -7 Nylock jam nut	1	300 ft-lb
S-camshaft housing to mount tab using 5/8" -18 x 2" bolts and locknuts	2	144 ft-lb
Brake chamber band clamp using 3/8" -16 nuts	4	180 **in-lb**†
Shock absorber, both ends, using existing fasteners	4	160 ft-lb
Brake chamber to mount using 5/8" -18 x 2" bolts and locknuts	4	100 ft-lb

† Note **Inch Pounds**, NOT Foot Pounds

Table 7.8 (continued)
Torque values

Brake actuator clevis, adjust and clamp clevis using 5/8" -18 jam-nuts	2	25 ft-lb
Air spring to upper mount using 3/4" -16 nuts and lockwashers	2	40 ft-lb
Air spring to upper mount using 1/2" -13 locknuts	4	25 ft-lb
Air spring to lower mount using 1/2" -13 bolts and lockwashers	6	25 ft-lb
Inner cap nuts to attach inner rear wheel using 3/4" -16 studs	20	450 ft-lb Dry
Outer cap nuts to attach outer rear wheel using 1-1/8" -16 inner nuts	20	450 ft-lb Dry
Tag Axle	**Qty.**	**Torque**
Lift spring upper end to frame using 1/2" -13 locknuts	2	25 ft-lb
Lift spring lower end to frame using 1/2" -13 locknuts	2	25 ft-lb
Lift spring lower end to frame using 3/4" -16 jam nuts (Air inlet)	2	40 ft-lb
Tag spring upper end to frame using 1/2" -13 locknuts	2	25 ft-lb
Tag spring upper end to frame using 3/4" 16 jam nuts (Air inlet)	2	40 ft-lb
Tag spring lower end to frame using 1/2" -13 locknuts	2	25 ft-lb
Shock absorbers to mounts using existing fasteners	4	160 ft-lb
Brake chamber to mount using 5/8" -11 studs and locknuts	4	90 ft-lb
Brake actuator clevis, adjust and clamp clevis using 5/8" -18 jam-nuts	2	25 ft-lb
Tag axle beam assembly to bolster hanger using 5/8" -11 x 2" flange head bolts and flange locknuts	8	160 ft-lb
Outer cap nuts to attach tag wheel using 1-1/8" -16 studs	20	450 ft-lb Dry

† Note **Inch Pounds**, NOT Foot Pounds

Table 7.8 (continued)
Torque values

SAE Bolt Torque Values

! NOTICE

Follow the table only if no specific value is specified in documentation provided by the component being serviced. For example, when servicing the engine, refer to the engine manufacturer's manual for engine torque values before applying the values given in Table 7.9.

SAE BOLTS TORQUE VALUES			
Size of Fastener	**Thread Pitch**	**Torque Value (Grade 8)**	
		Dry	**Lubricated**
1/4"	20 28	12 ft-lb 14 ft-lb	7 ft-lb 9 ft-lb
5/16"	18 24	25 ft-lb 27 ft-lb	15 ft-lb 17 ft-lb
3/8"	16 24	44 ft-lb 49 ft-lb	26 ft-lb 30 ft-lb
7/16"	14 20	70 ft-lb 78 ft-lb	42 ft-lb 47 ft-lb
1/2"	13 20	108 ft-lb 120 ft-lb	64 ft-lb 72 ft-lb
9/16"	12 18	154 ft-lb 172 ft-lb	92 ft-lb 104 ft-lb
5/8"	11 18	212 ft-lb 240 ft-lb	128 ft-lb 144 ft-lb
3/4"	10 16	375 ft-lb 420 ft-lb	226 ft-lb 250 ft-lb
7/8"	9 14	606 ft-lb 674 ft-lb	365 ft-lb 405 ft-lb
1"	8 14	909 ft-lb 1020 ft-lb	545 ft-lb 610 ft-lb

Reference: Barnes Distribution

Table 7.9
SAE torque values

Metric Bolt Torque Values

! NOTICE

Follow the table only if no specific value is specified in documentation provided by the component being serviced. For example, when servicing the engine, refer to the engine manufacturer's manual for engine torque values before applying the values given in Table 7.10.

METRIC BOLTS TORQUE VALUES			
Size of Fastener	**Size**	**Torque Value (Grade 10.9)**	
		Dry	**Lubricated**
M6	20 28	132 **in-lb**†	79 **in-lb**†
M8	18 24	27 ft-lb	16 ft-lb
M10	16 24	53 ft-lb	32 ft-lb
M12	14 20	92 ft-lb	55 ft-lb
M14	13 20	148 ft-lb	89 ft-lb
M16	11 18	230 ft-lb	138 ft-lb
M20	10 16	449 ft-lb	269 ft-lb
M24	9 14	775 ft-lb	465 ft-lb
† Note **Inch Pounds**, NOT Foot Pounds			

Reference: Barnes Distribution

Table 7.10
Metric torque values

Chassis Systems Troubleshooting

Wheel Troubleshooting

Wheel Troubleshooting			
Problem	**Appearance**	**Causes**	**Repair**
Bolt hole cracks	Cracks start at the bolt hole and radiate outward, usually in a 45° angle	Loose wheel nuts; improper installation; use of improper attachment parts; mounting area of wheel not flat	Do not return to service; review installation and service procedures; inspect attachment parts for proper size and type, and for wear
Bolt hole-to-bolt hole cracks	Cracks run circumferentially from one bolt hole to adjacent hole	Loose wheel nuts; insufficient wheel support; improper mounting procedures; mounting area of wheel not flat; use of improper attachment parts	Do not return to service; review installation and service procedures; inspect attachment parts for proper size and type, and for wear
Bolt hole-to-center hole cracks	Cracks run from a bolt hole to the center hole of the disc	Loose inner cap nuts contacting outer dual wheel; foreign material between wheel mounting surface and hub or drum preventing flush contact	Do not return to service; loosen outer cap nut first, torque inner cap nut; make sure mating surfaces are flat and clean
Bolt hole-to-nave cracks	Cracks run from a bolt hole and progress toward nave of the disc	Exceeding wheel load capacity	Do not return to service; check load rating of wheel vs. actual service load
Bolt hole-to-hand hole cracks	Cracks start in a bolt hole and progress toward a hand hole	Exceeding wheel load capacity	Do not return to service; check load rating of wheel vs. actual service load
Hand hole cracks	Cracks start at hand hole	Wheel load capacity exceeded	Do not return to service; check load rating vs. actual service load
Wallowed or elongated bolt holes	A gross distortion of the bolt hole, typified by bolt-hole elongation and extrusion of metal from chamfer surface	Loose wheel nuts; improper torque; use of previously damaged wheel; buildup of dirt, rust, or paint	Do not return to service; review installation/service procedures and torque levels, making sure mating surfaces are clean and flat; do not use previously damaged wheels

Table 7.11
Wheel troubleshooting

Wheel Troubleshooting			
Problem	**Appearance**	**Causes**	**Repair**
Worn bolt hole chamfers	A general worn condition in bolt-hole chamfers	Over torque; rust; extended use	If chamfer contour mates with nut, clean wheel and place it back in service; if wear is severe, so that area between chamfers is worn away to less than 1/16" (about thickness of a dime), wheel should be replaced; review torque program
Circumferential cracks between bolt holes	Cracks start between bolt holes and progress toward them, but do not extend from one bolt hole to next	Improper installation; insufficient drum or hub backup; improper identification stamping; worn mating surface; corrosion and/or abrasive environments exaggerate this condition	Do not return to service; review torque program; check for correct mating surfaces and hub backup; review service application of wheel
Circumferential cracks on mounting area of hub-piloted wheels	Cracks start at the edge of the flange nut	Exceeding wheel load capacity; improper attachment hardware; insufficient hub or drum backup	Do not return to service; review torque program; check for correct, worn, damaged hardware; check for proper hub backup; check load rating of wheel vs. actual service load
Distorted bolt hole chamfers	Distortion or step in bolt-hole chamfer	Improper or worn attachment hardware; over-torque of inner cap nut; improper installation; loose inner cap nuts contacting outer dual wheel	Do not return to service; check torque program, torque levels, and attachment hardware; loosen outer cap nut, before retorque of inner cap nut
Burrs around bolt hole	Raised metal around bolt hole	Over-torque of outer cap nut; improper attachment hardware	If chamfer contour mates with nut, clean wheel, remove burrs, and place back in service; if chamfer is worn away, replace wheel; review torque program
Excessive wear or corrosion on disc face	Abrasive wear, pitting, and corrosion on disc mounting surface	Improper installation; insufficient hub or drum backup; worn mating surface; corrosion and/or abrasive environments exaggerate condition	Do not return to service; review torque program; check mating surfaces and hub backup; review service application of wheel

Table 7.11 (continued)
Wheel troubleshooting

Brake Component Troubleshooting

Brake Component Troubleshooting		
Condition	**Cause**	**Correction**
Brakes do not apply or not enough braking force	Worn or damaged camshaft	Remove and replace camshaft
	Air chamber improperly installed	Correct the installation
	Leak or restriction in air lines or valves	Repair air lines or valves
	Air chamber air diaphragm damaged	Repair or replace air chamber
	Brakes not adjusted correctly	Replace linings
	Grease or other contamination on brake linings	Replace linings
	Automatic slack adjuster not operating satisfactorily	Check automatic slack adjuster operation
Braking force not equal or lining wear not even	Air chamber diaphragm damaged	Repair or replace air chamber
	Damaged or worn camshaft	Remove and replace camshaft
	Broken return springs	Replace return springs
	Brakes not adjusted correctly	Adjust brakes
	Grease or other contamination on brake linings	Replace linings
	Brake linings installed backward	Install brake shoes correctly
	Brake linings installed in wrong positions on shoes	Install linings in correct positions
	Wheel bearings not adjusted correctly	Adjust wheel bearings
	Linings that are not the specified kind are installed	Replace with the specified linings
Parking brake does not apply when air pressure is released	Power spring in air chamber not fully released (spring is caged)	Release power spring in air chamber (uncage spring)
	Air pressure that holds springs in the compressed position is not fully released	Repair air system
	Brakes not adjusted correctly	Adjust brakes
	Power springs in brake chamber weak or broken	Replace air chamber
	Grease or other contamination on brake linings	Replace linings

Table 7.12
Brake component troubleshooting

Brake Component Troubleshooting		
Condition	**Cause**	**Correction**
Brakes dragging	Not enough air pressure to hold off power spring	Repair air system
	Air lines connected to wrong ports	Connect lines to correct ports
	Leaks in air lines	Repair or replace air lines
	Leaks in spring brake assembly	Repair or replace spring brake
	Wheel bearings not adjusted correctly.	Adjust wheel bearings.
	Drum has runout of more than 0.010 inch (0.25mm)	Repair or replace drums
	Shoe return springs are weak, damaged or missing	Replace shoe return springs
	Valve does not permit complete release of system pressure when brake is released	Repair or replace valves
	Damaged camshaft	Remove, replace, and lubricate camshaft
	Damaged rollers	Remove and replace rollers
	Automatic slack adjuster over adjusting	Check clevis installation

Table 7.12 (continued)
Brake component troubleshooting

Power Steering Troubleshooting

! CAUTION

If the hydraulic system fluid becomes overheated, the seals in the steering gear and pump may shrink, harden, or crack, losing their ability to seal.

Power Steering System Troubleshooting	
Symptoms	**Possible Causes**
Road wander	Tire pressure incorrect or unequal left to right
	Front-end out of alignment
	Components in steering linkage loose or worn
	Wheel bearings improperly adjusted or worn
	Steering gear mounting bolts loose on mount
No recovery	Tire pressure low
	Front-end alignment incorrect
	Tight front axle king pins
	Steering column binding
	Pump flow insufficient
	Steering gear control valve sleeve sticking
Shimmy	Badly worn or unevenly worn tires
	Improperly mounted tire or wheel
	Wheel bearings improperly adjusted or worn
	Components in steering linkage loose or worn
	Wheels or brake drums out of balance
	Front-end alignment incorrect
	Air in hydraulic system
	Road wheel assembly run-out excessive
Over steering	Front-end components binding or loose
	Steering column binding
	U-joint wrong or non-lubricated
High steering effort in one direction	Unequal tire pressure
	King pin thrust bearings damaged

Table 7.13
Power steering troubleshooting

Power Steering System Troubleshooting	
Symptoms	**Possible Causes**
High steering effort in both directions	Low tire pressure
	Vehicle overloaded
	Low hydraulic fluid level
	Low pressure or flow from pump
	Steering system components binding
	Restriction in return line
Lost motion at the steering wheel	Steering wheel loose in shaft
	Steering gear loose on frame
	Pitman arm loose on output shaft
	Components in steering linkage loose or worn
Excessive heat	Excessive pump flow (pump flow = 3.0 min. to 8.0 max. gpm)
	Vehicle overload
	Undersized replacement hose or line
	Restricted hose or line
Steering effort varies	Low pump flow

Table 7.13 (continued)
Power steering troubleshooting

Suspension Troubleshooting

Suspension Troubleshooting		
Problem	**Possible Cause**	**Remedy**
Air spring is flat or slow to fill	Inadequate air pressure to suspension	Check the air pressure gauge. Build air pressure to 85 psi. Check all connections.
	Clogged air filter	Repair or replace
	Defective pressure protection valve	Replace
	Height control valve clogged or not functioning	Repair or replace
	Air leakage from the suspension air system or the air brake system	Listen for leakage due to loose fittings, or damaged air lines, air springs, brake actuators or control valves. Tighten loose fittings and/or replace worn or damaged parts.
	Air leakage between the height control valve and the air springs	Listen for leakage due to loose or damaged air lines. Tighten loose fittings and/or replace damaged air lines.
	Air springs leaking air	Visually inspect the air springs for leaks resulting from damage, wear, or deterioration. Replace any leaking air spring.
Shock absorber failures	Over-extension/compression	Verify correct shock absorber installation
	Shock brackets were installed in the wrong location	Install shock absorber brackets in proper locations
	Improper ride height	Ride height correction
	Improper shocks installed	Install proper shocks
Excessive tire wear	Axles or steering improperly aligned	Align wheels
	Worn pivot connection	Install new bushing and bolt
Air spring is flat on one side of the coach only	Bent, broken, or disconnected height control valve linkage	Visually inspect the linkage for damaged or loose parts. Reconnect loose linkage parts and replace defective parts.
	Height control valve out of adjustment	Disconnect the height control valve actuating lever from its linkage. Move the lever upward. If the air spring then inflates, the height control valves need adjustment.
	Inoperative height control valve	If movement of the actuating lever in the above step fails to inflate the air spring or continually leaks air through the exhaust port in the neutral position, the height control valve is defective and needs to be replaced.
	Damaged height control valve	Visually inspect for damage to the height control valve linkage and actuating levers. Repair or replace damaged linkage parts.

Table 7.14
Suspension troubleshooting

Suspension Troubleshooting		
Problem	**Possible Cause**	**Remedy**
Motorcoach leans due to unequal inflation of air springs	Loose or missing height control valve bolts	Visually inspect for loose or missing height control valve mounting bolts and adjustment lock nuts. Replace any missing bolts or nuts. Then adjust the height control valves and tighten all connections.
	Height control valve out of adjustment	Adjust the height control valve
Air springs deflate rapidly when motorcoach is parked	Air leakage from the suspension air system or the air spring	Check for leakage due to loose fittings or damaged air lines. Tighten loose fittings and/or replace worn or damaged parts.
Motorcoach rides too high or low	Incorrect height adjustment	Adjust the height control valves
Motorcoach pulls to right or left	Improper tire pressure	Inflate to specifications
	Axle out of alignment	Align axle
	Bushings in torque arms are worn	Replace bushings
	Air spring is under-inflated on one side	Adjust height control valve
Motorcoach experiencing excessive sway	Height control valve is clogged or not functioning	Repair or replace height control valve
	Air spring is punctured	Install a new air spring
Air spring is blown out	Tires, rims or chains rubbing the air spring	Check the clearance between the air spring and the tire
Air spring failure due to fatigue	Continual or repeated over-extension of the air spring	Visually inspect the shock absorber mountings and bracket. Reconnect loose parts and replace any defective parts. Check the adjustment of the height control valves.

Table 7.14 (continued)
Suspension troubleshooting

Caterpillar C9 Engine Diagnostics

Call Caterpillar at (877) 777-3126 if you need engine diagnostic assistance. Or, use the reference for CAT engine diagnostic flash code interpretation in the C9 Caterpillar manual included in your Coach Information Kit.

Cummins ISL Engine Diagnostics

Engine diagnostic information appears as a blink code on the dash instrument panel. The engine diagnostic key (**Figure 7.2**), located to the driver's left, below the console, controls whether the blink code appears.

To display and interpret the diagnostic blink code:

1. Turn on the ignition without starting the engine.
2. Turn on the diagnostic key (clockwise).
3. View the three-digit blink code on the engine warning light located on the dash instrument panel. Codes appear with short pauses between the three digits and a slightly longer pause before the next 3-digit code begins.
4. To interpret the codes, see "Cummins ISL Engine Fault Codes" on page 7.30.
5. To view additional codes, press the cruise control **On/Off** button, located on the steering wheel, to the **On** position.
6. Press the cruise control **Set** button to view the next fault code.
7. Press the cruise control **Res** button to view the previous fault code.

   If there is only one fault code, pressing the Set or Res buttons will continue to display the same fault code.

8. Turn off the engine diagnostic key and the ignition key after reading the fault codes.

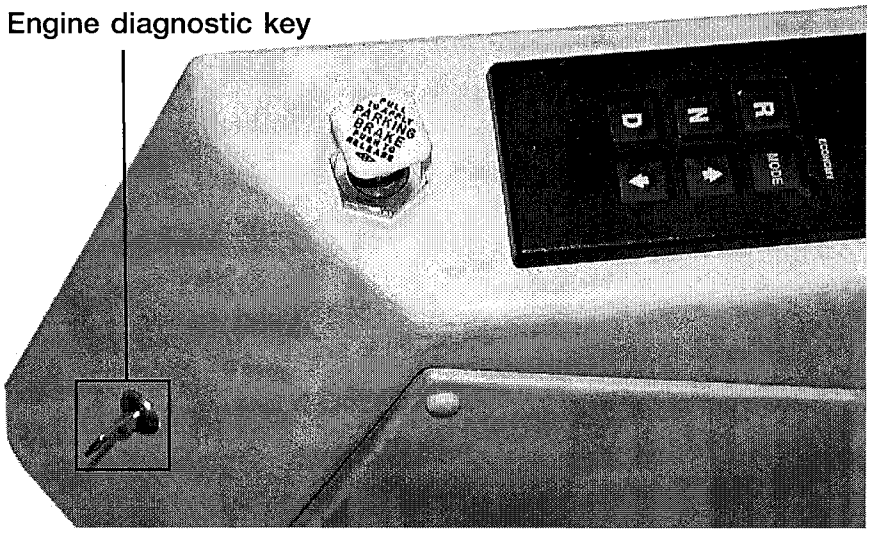


Figure 7.2
Diagnostics key

ISL Troubleshooting Procedures and Techniques

⚠ WARNING ⚠

This diagram is provided as a diagnostic tool for trained, experienced technicians only. Improper troubleshooting or repair can result in severe personal injury or death or property damage. See important instructions in Service Manual.

ELECTRICAL SPECIFICATIONS

DATA LINK
Positive wire to chassis ground (J1587)
- 4.0 to 5.0 volts

Negative wire to chassis ground (J1587)
- 0.0 to 2.5 volts

ALL CONTINUITY CHECKS
- OK (no open circuit) if < 10 Ω

ALL SHORTS TO GROUND
VSS circuits
- OK (no short circuit) if > 10 MΩ

All other circuits
- OK (no short circuit) if > 10 MΩ

SHORT CIRCUIT TO EXTERNAL VOLTAGE
- OK if < 1.5 volts

5 V POWER SUPPLY (Sensor and Switch)
@ ECM
- 4.75 to 5.25 volts

@ Harness
- 4.50 to 5.25 volts

SOLENOIDS
Priming Pump
- Resistance = 1.0 to 1.2Ω

Pumping Control Valve
- Resistance = 0.5 to 1.5 Ω

Injection Control Valve
- Resistance = 0.08 to 0.12 Ω

ECM CONNECTOR
Retaining Cap Screw Torque = 2.8 N•m [25 in-lb]

SENSOR SPECIFICATIONS

OIL PRESSURE SENSOR
Torque (Threaded style) = 40 N•m [30 ft-lb]

Pressure (kPa)	Pressure [psi]	Voltage (V)
0	0	0.42 to 0.58
172.37	25	1.42 to 1.58
344.74	50	2.42 to 2.58
517.11	75	3.42 to 3.58
689.48	100	4.42 to 4.58

ALL TEMPERATURE SENSORS
Torque = 14 N•m [10 ft-lb]

Temperature (°C)	Temperature [°F]	Resistance (Ω)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

CAPS FUEL PRESSURE SENSOR
Torque (Threaded style) = 81 N•m [60 ft-lb]

Pressure (MPa)	Pressure [psi]	Voltage (V)
0	0	0.31 to 0.69
35.84	5000	1.19 to 1.47
57.34	8000	1.69 to 1.97
78.84	11000	2.19 to 2.47
107.51	15000	2.92 to 3.08

BOOST PRESSURE SENSOR
Torque (Threaded style) = 40 N•m [30 in-lb]

Pressure (mmHg)	Pressure [inHg]	Voltage (V)
0	0	0.44 to 0.56
646.48	25.45	1.44 to 1.56
1292.88	50.90	2.44 to 2.56
1939.36	75.35	3.44 to 3.56
2585.76	101.80	4.44 to 4.56

ACCELERATOR PEDAL (IVS, ISS, & APS)
Idle Validation Circuit Resistance:
For ON and OFF-IDLE states
ISS - MAX Closed Circuit Resistance < 125 Ω
ISS - MIN Open Circuit Resistance > 100 kΩ

Accelerator Position Sensor coil Resistance:
Between supply and return wires
- 2000 to 3000 ohms

Between supply and signal wires (released pedal)
- 1500 to 3000 ohms

Between supply and signal wires (depressed pedal)
- 200 to 1500 ohms

NOTE: Released resistance minus depressed resistance **must** be > 1000 ohms.

VEHICLE SPEED SENSOR
Torque = 47 N•m [35 ft-lb]
Coil Resistance:
First Coil Resistance = 750 to 1100 Ω
Second Coil Resistance = 1100 to 1500 Ω

ISL Engine Fault Code Information

FAULT CODE LAMP	PID(P) SID(S) FMI	SPN(S) FMI	REASON	EFFECT (Only when fault code is active)
111 Yellow	S254 12	629 12	ECM internal hardware error.	Possible no effect or engine may run rough or not start.
115 Yellow	P190 2	190 2	No engine speed or position signal detected at pin 17 of the engine harness.	Engine power derate. Possible white smoke.
121 Yellow	P190 2	190 2	No engine speed or position detected at pin 9 of the engine harness.	No engine speed and position backup for main speed/position sensor.
122 Yellow	P102 3	102 3	High voltage detected at the boost pressure sensor signal pin 45 of the engine harness.	Engine will derate to no-boost fueling.
123 Yellow	P102 4	102 4	Low voltage detected at boost pressure sensor signal pin 45 of the engine harness.	Engine will derate to no-boost fueling.
124 Yellow	P102 0	102	Boost Pressure signal indicates boost pressure has exceeded the maximum limit for the given engine rating.	Engine will derate to no-boost fueling.
131 Yellow	P091 3	091 3	High voltage detected at throttle position signal pin 30 of the OEM harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when the idle validation switch indicates off-idle.
132 Yellow	P091 4	091 4	Low voltage detected at throttle position signal pin 30 of the OEM harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when idle validation switch indicates off-idle.
135 Yellow	P100 3	100 3	High voltage detected at oil pressure signal pin 33 of the engine harness.	Default value used for oil pressure. No engine protection for oil pressure.
141 Yellow	P100 4	100 4	Low voltage detected at oil pressure signal pin 33 of the engine harness.	Default value used for oil pressure. No engine protection for oil pressure.
143 Engine Protection	P100 1	100 1	Oil pressure signal indicates oil pressure below the low engine protection limit.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
144 Yellow	P110 3	110 3	High voltage detected at coolant temperature signal pin 23 of the engine harness.	Default value used for coolant temperature. No engine protection for coolant temperature.
145 Yellow	P110 4	110 4	Low voltage detected at coolant temperature signal pin 23 of the engine harness.	Default value used for coolant temperature. No engine protection for coolant temperature.
146 Yellow	P110 0	110 0	Coolant temperature signal indicates coolant temperature has exceeded the engine protection limit.	Power derate and possible engine shutdown feature is enabled.
151 Engine Protection	P110 0	110 0	Coolant temperature signal indicates coolant temperature has exceeded the engine protection limit.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
153 Yellow	P105 3	105 3	High voltage detected at intake manifold temperature signal pin 34 of the engine harness.	Default value used for intake manifold temperature. No engine protection for intake manifold temperature.
154 Yellow	P105 4	105 4	Low voltage detected at intake manifold temperature signal pin 34 of the engine harness.	Default value used for intake manifold temperature. No engine protection for intake manifold temperature.
155 Red	P105 0	105 0	Intake manifold air temperature signal indicates intake manifold air temperature is above the engine protection limit.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
221 Yellow	P108 3	108 3	High voltage detected at intake manifold temperature signal pin 32 of the engine harness.	Engine power derate.
222 Yellow	P108 4	108 4	Low voltage detected at intake manifold temperature signal pin 32 of the engine harness.	Engine power derate.
234 Red	P190 0	190 0	Engine speed signal indicates engine speed has exceeded the overspeed limit.	Fuel to injectors disabled until engine speed falls below the overspeed limit.
235 Engine Protection	P111 1	111 1	Coolant level signal at pin 37 of the engine harness indicates coolant level is low.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
241 Yellow	P084 2	084 2	Vehicle speed signal on pins 8 and 18 of the OEM harness has been lost.	Engine speed limited to "Max. Engine Speed without VSS". Cruise control, gear-down protection and the road speed governor will **not** work. Trip information data that is based on mileage will be incorrect.
242 Yellow	P084 10	084 10	Tampering has been detected on the vehicle speed circuit pins 8 and 18 of the OEM harness.	Engine speed limited to "Max. Engine Speed without VSS". Cruise control, gear-down protection and the road speed governor will **not** work. Trip information data that is based on mileage will be incorrect.
243	P121 4	513 4	Error detected in the exhaust brake relay enable circuit at pin 42 of the engine harness.	Exhaust brake will not work.
245	S533 4	641 4	Error detected in fan clutch relay enable circuit at pin 41 of the engine harness.	Electronic control; module (ECM) **cannot** control the engine cooling fan. Fan will remain on or off.

FAULT CODE LAMP	PID(P) SID(S) FMI	SPN(S) FMI	REASON	EFFECT (Only when fault code is active)
263 Yellow	P174 3	174 3	High voltage detected at the fuel temperature sensor signal pin 35 of the engine harness.	Default value used for fuel temperature. Possible low power and no protection for fuel temperature.
265 Yellow	P174 4	174 4	Low voltage detected at the fuel temperature sensor signal pin 35 of the engine harness.	Default value used for fuel temperature. Possible low power and no protection for fuel temperature.
268 Yellow	P094 2	94 2	Fuel pressure in the accumulator is not changing with engine operating conditions.	Power and/or speed derate. Engine may run rough.
271 Yellow	S151 5	1347 5	Low or no current detected on front pumping control valve return pin 21.	Engine power derate.
272 Yellow	S151 6	1347 6	High current detected on front pumping control valve return pin 21.	Possible no effect or engine may run rough.
273 Yellow	S152 5	1348 5	Low or no current detected on rear pumping control valve return pin 15.	Engine power derate.
274 Yellow	S152 6	1348 6	High current detected on rear pumping control valve return pin 15.	Possible no effect or engine may run rough.
275 Yellow	S151 7	1347 7	Engine ECM has detected a failure in the front pumping element.	Engine power derate. Possible engine dies.
276 Yellow	P018 5	633 5	Low or no current detected on injection control valve return pin 7.	Fueling to injectors disabled. Engine dies.
277 Yellow	P018 7	633 7	Engine ECM has detected a failure in the injection control valve.	Engine power derate. Engine possibly dies.
278 Yellow	P073 11	1075 11	Error detected in lift pump circuit at pin 11 of the engine harness.	Possible low power, engine may die, run rough or be difficult to start.
279 Yellow	P018 6	633 6	High current detected on injection control valve return pin 7.	Engine power derate.
281 Yellow	S151 7	1347 7	Engine ECM has detected a failure in the front pumping element.	Possible no effect or engine power derate.
282 Yellow	S152 7	1348 7	Engine ECM has detected a failure in the rear pumping element.	Possible no effect or engine power derate.
283 Yellow	P190 3	190 3	High voltage detected at main engine speed/position sensor voltage supply pin 8 of the engine harness.	ECM will use the engine speed signal as a backup. Possible white smoke.
284 Yellow	P190 4	190 4	Low voltage detected at main engine speed/position sensor voltage supply pin 8 of the engine harness.	ECM will use the engine position signal as a backup. Possible white smoke.
328 Yellow	S152 7	1348 7	Engine ECM has detected a failure in the rear pumping element.	Engine power derate. Possible engine dies.
329 Red	S233 7	1077 7	The ECM has detected an overpumping failure in the CAPS pump.	Engine power derate. Possible engine dies.
352 Yellow	S232 4	620 4	Low voltage detected at engine position sensor +5 volt supply, pin 10 of the engine harness.	Default value used for sensors connected to this +5 volt supply. Engine will derate to no-boost fueling and loss of engine protection for oil pressure, intake manifold pressure, ambient air pressure, and fuel pressure.
381 Yellow	S237 11	626 11	Error detected in cold start aid relay 2 enable circuit at pin 31 of the OEM harness.	Intake air heater cannot be fully energized by the ECM. Possible white smoke and/or hard starting.
382 Yellow	S237 11	626 11	Error detected in cold start aid relay 2 enable circuit at pin 31 of the OEM harness.	Intake air heater cannot be fully energized by the ECM. Possible white smoke and/or hard starting.
385 Yellow	S232 3	620 3	High voltage detected at OEM harness sensor +5 VDC supply pin 10 of the OEM harness.	Sensors connected to this +5 VDC supply (i.e. remote throttle position sensor) will not function.
386 Yellow	S232 3	620 3	High voltage detected at the engine harness sensor +5 VDC supply pin 10 of the engine harness.	Default value used for sensors connected to this +5 volts supply. Engine will derate to no-boost fueling and loss of engine protection for oil pressure, intake manifold temperature, and coolant temperature.
387 Yellow	P091 3	091 3	High voltage detected at the throttle position sensor +5 VDC supply pin 29 of the OEM harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when idle validation switch indicates off-idle.
415 Red	P100 1	100 1	Oil pressure signal indicates oil pressure below the very low engine protection limit.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
418 WIF	P097 0	097 0	Water-in-fuel signal indicates the water in the fuel filter needs to be drained.	Excessive water in the fuel can lead to severe fuel system damage.
422 Yellow	P111 2	111 2	Voltage detected simultaneously on both the coolant level high and low signal pins 27 and 37 of the engine harness...OR...no voltage detected on either pin.	No engine protection for coolant level.
429 Yellow	P097 4	097 4	Low voltage detected at water-in-fuel signal pin 40 of the OEM harness.	No water-in-fuel protection.

FAULT CODE LAMP	PID(P) SID(S) FMI	SPN(S) FMI	REASON	EFFECT (Only when fault code is active)
431 Yellow	P091 2	091 2	Idle validation signals on pins 25 and 26 of the OEM harness indicate voltage detected simultaneously on both pins...OR...no voltage detected on either pin.	No effect on performance, but loss of idle validation.
432 Yellow	P091 13	091 13	Idle validation signal at pin 26 of the OEM harness indicates the throttle is at the idle position when the throttle position signal at pin 30 of the OEM harness indicates the throttle is not at the idle position...OR...Idle validation signal at pin 26 of the OEM harness indicates the throttle is not at the idle position when the throttle position signal at pin 30 of the OEM harness indicates the throttle is at the idle position.	Engine will only idle.
433 Yellow	P102 2	102 2	Boost pressure signal indicates boost pressure is high when other engine parameters (i.e. speed and load) indicate boost pressure should be low...OR...boost pressure is low when other engine parameters indicate it should be high.	Engine will derate to no-boost fueling.
434 Yellow	S251 2	627 2	All data gathered by the ECM since the last key on (i.e. faults, trip information data, etc.) was not stored to permanent memory at the last key off.	None on performance. Fault code table, trip information data and maintenance monitor data may be inaccurate.
441 Yellow	P168 1	168 1	Voltage detected at ECM power supply pins 38, 39, and 40 of the engine harness indicates the ECM supply voltage fell below 6 VDC.	Engine will die or run rough.
442 Yellow	P168 0	168 0	Voltage detected at ECM power supply pins 38, 39, and 40 of the engine harness indicates the ECM supply voltage is above the maximum system voltage level.	None on performance.
443 Yellow	S232 1	620 1	Low voltage detected at throttle position sensor +5 volts supply pin 29 of the OEM harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when idle validation switch indicates off-idle.
444 Yellow	S232 1	620 1	Low voltage detected at OEM harness sensor +5 volts supply pin 10 of the OEM harness.	Sensors connected to this +5 volts supply (i.e. remote throttle position sensor) will not function.
449 Yellow	P094 0	094 0	Fuel pressure signal indicates that fuel pressure has exceeded the maximum limit for the given engine rating.	Power and/or speed derate. Engine may die.
451 Yellow	P094 3	94 3	High voltage detected at fuel pressure sensor signal pin 46 of the engine harness.	Power and/or speed derate.
452 Yellow	P094 4	94 4	Low voltage detected at fuel pressure sensor signal pin 46 of the engine harness.	Power and/or speed derate.
488 Yellow	P105 0	105 0	Intake manifold temperature signal indicates intake manifold temperature is above the engine protection limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
493	S018 13	1076 13	ECM has detected a circuit failure on the Injection Control Valve Identifier circuit.	None on performance.
515 Yellow	S232 3	S620 3	High voltage detected at the auxiliary +5 VDC sensor supply voltage pin 49 of the engine harness.	Auxiliary device will not function.
516 Yellow	S232 4	S620 4	Low voltage detected at the auxiliary +5 VDC sensor supply voltage pin 49 of the engine harness.	Auxiliary device will not function.
551 Yellow	P091 4	091 4	Idle validation signals on pins 25 and 26 of the OEM harness indicate voltage detected simultaneously on both pins.	Engine will only idle.

Tire Inflation Pressure

The Federal Tire Label provides the proper coach tire inflation values. Refer to the **House** "Before Leaving" chapter for label location and further tire safety information.

The tire manufacturer's booklet in your coach information kit can also provide tire inflation procedures and tire warranty information. Improper tire inflation pressures for the load the motorcoach is carrying can adversely affect tire life and motorcoach performance characteristics. Country Coach recommends that the coach be taken to a service center to ensure proper tire inflation pressure.

Chassis Winterization

Winterizing your motorcoach generally consists of maintaining the proper coolant/water ratio, proper oil weight, and fuel level. **Here are some guidelines to follow for coaches that will be operated and stored in colder climates:**

- **Coolant:** Inhibited propylene glycol, commonly known as antifreeze, contains chemicals to provide protection against corrosion and freeze-up. For normal climate temperatures as well as freezing temperatures above -25°F, it is recommended that a 50/50 ratio of inhibited glycol and distilled/deionized water be used.

  Glycol/water ratio should be tested at normal servicing. Any truck service center should be able to test the mixture ratio.

  In the event of a spill, replace with either a 50/50 mixture of good quality water and fully-formulated antifreeze, or fully-formulated coolant when filling the coolant system. The fully-formulated antifreeze or coolant must meet ASTM D4985 or ASTM D6210 specifications. For customer assistance, contact Country Coach at 1-800-452-8015.

- **Oil Weight:** Use a multi-viscosity oil meeting API CJ-4 specifications for colder climates. Refer to your Caterpillar engine manual for more information such as type, oil weight, and operating temperatures.

- **Fuel:** The fuel tank should be topped off if the motorcoach is to be stored or parked for an extended time and add an algicide to protect against bacterial growth.

  At operating temperatures below 32°F, acceptable performance can be obtained by using blends of ultra low sulphur #2 Diesel (2D) and #1 Diesel (1D) fuels.

- **Fuel Additives:** Fuel additives are not recommended.

For more information about cold weather starting, refer to the "Cold Weather Starting" section in the Introduction, or to your Caterpillar or Cummins OEM manual.

Chassis Specifications

Note: We try to provide you with up-to-date specification information. Your coach specifications may differ due to coach component improvements more recent than your manual print date.

Chassis Specifications					
Inspire Coach Models	**34'**	**36'**	**40' DaVinci**	**40' Genoa**	**43'**
WHEEL BASE: Front axle to drive axle	205"	229"	265"	277"	279"
FRONT OVERHANG: Front of the chassis rail to center of front axle	71"	71"	71"	71"	71"
REAR OVERHANG: Rear of chassis rail to center of rear axle	122-1/2"	122-1/2"	122-1/2"	122-1/2"	149"
OVERALL CHASSIS LENGTH	398-1/2"	422-1/2"	458-1/2"	470-1/2"	499"
OVERALL COACH LENGTH	418"	442"	478"	490"	514"
TURNING DIAMETER: Calculated at outside edge of the outside wheel	52'-8"	58'-1"	66'-2"	68'-10"	TBD
IFS WHEEL CUT ANGLE	50°	50°	50°	50°	50°
GVWR	37,200 lb	37,200 lb	37,200 lb	37,200 lb	45,200 lb
GCWR	47,200 lb	47,200 lb	47,200 lb	47,200 lb	55,200 lb
Steering axle suspension GAWR	14,200 lb	14,200 lb	14,200 lb	14,200 lb	14,200 lb
Drive axle GAWR	23,000 lb	23,000 lb	23,000 lb	23,000 lb	20,000 lb
Tag axle GAWR	N/A	N/A	N/A	N/A	11,000 lb
HITCH RATING: Maximum gross trailer weight (trailer hitch has a 600 lb tongue weight at 8" max. with a 7 prong electric receptacle)	10,000 lb	10,000 lb	10,000 lb	10,000 lb	10,000 lb

Table 7.15
Chassis specifications

CHASSIS PARTS SECTION

This Parts Section provides our customers with detailed drawings and photos of the various assemblies and parts of your DynoMax chassis. As part of the Country Coach dedication to customer service, this section has been prepared for your DynoMax chassis to help you procure replacement parts should your motorcoach need them. Whenever possible, we have created Illustrative Parts Breakdowns of all chassis-related assemblies and have assigned a Country Coach part number to each part to expedite the ordering of replacement parts for your motorcoach. Items followed by an asterisk (*) are either part of a kit or available only with the purchase of a kit.

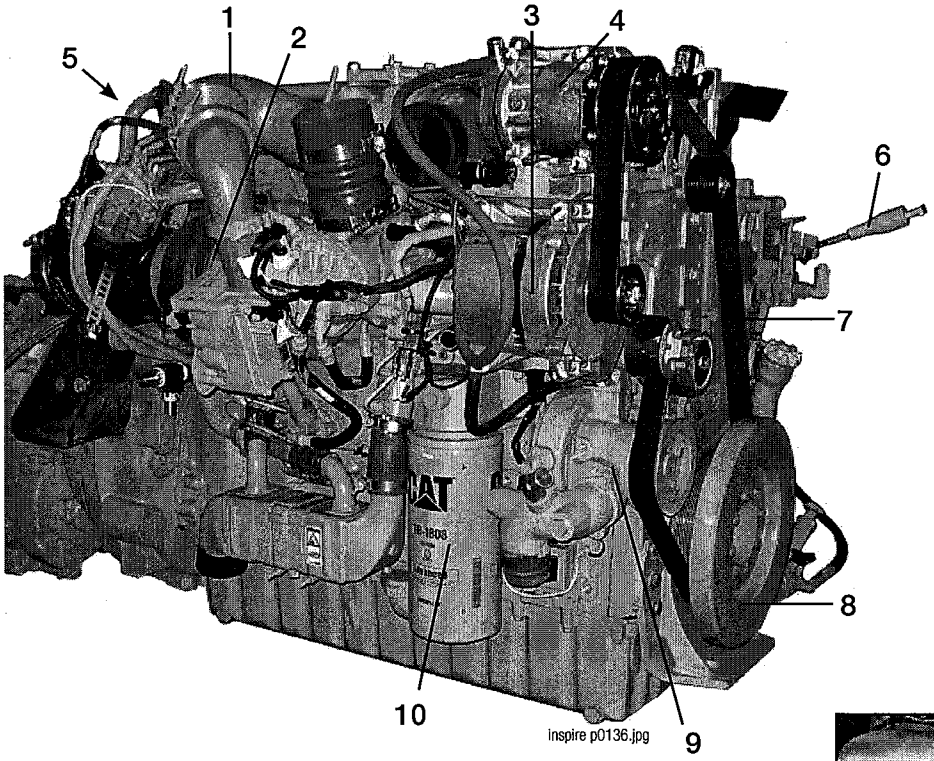
Our layout is set up with all diagrams or pictures on the left side and part numbers/ descriptions/quantities on the right side of the manual. The "item numbers" on the right side of the manual correspond to the numbers in the illustration on the left side of the manual that are matched to arrows or lines pointing to particular parts. In addition, most of the illustrative pages have a small chassis drawing in the upper right corner. This "reference coach" has one or more gray "locator balls" to aid in the location of the chassis' various assemblies for that page.

This parts section can be invaluable when working with our parts and service department. Since this section contains so much information on parts, Country Coach assumes no liability or responsibility for typographical errors or omissions, incorrect part numbers or descriptions.

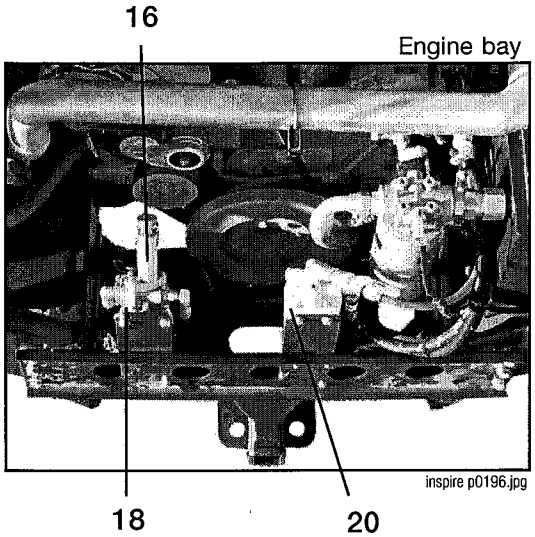
Use the following table of contents to locate a group of parts.

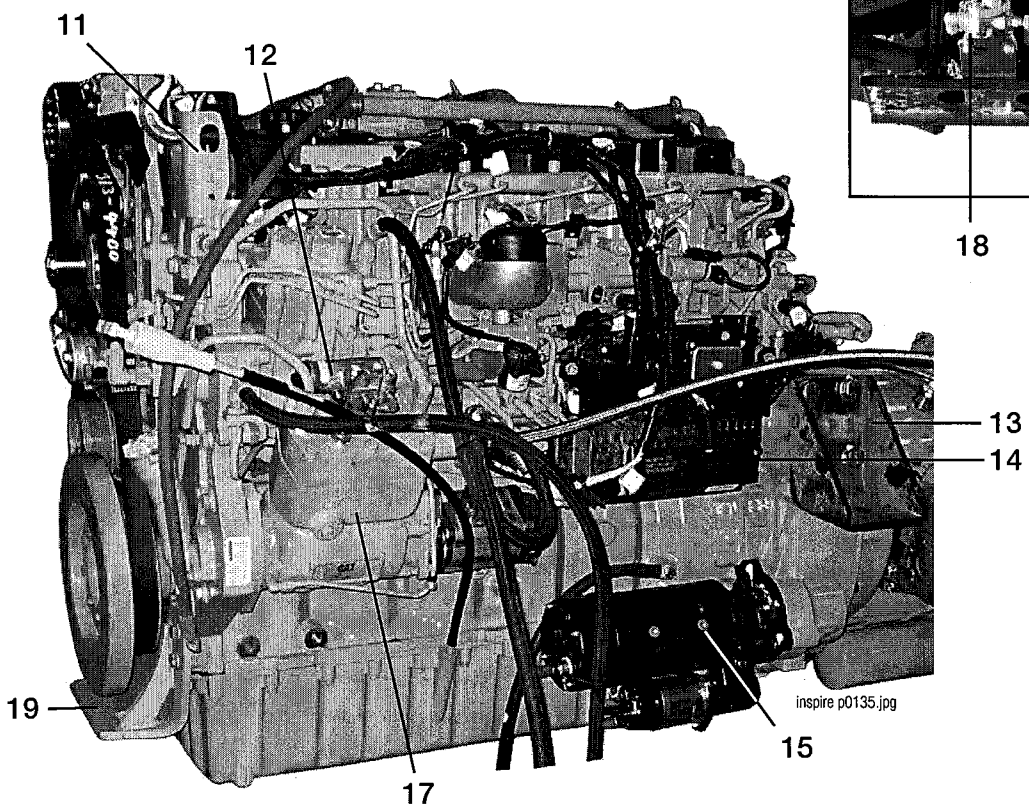
Chassis Parts Section

Engine Group



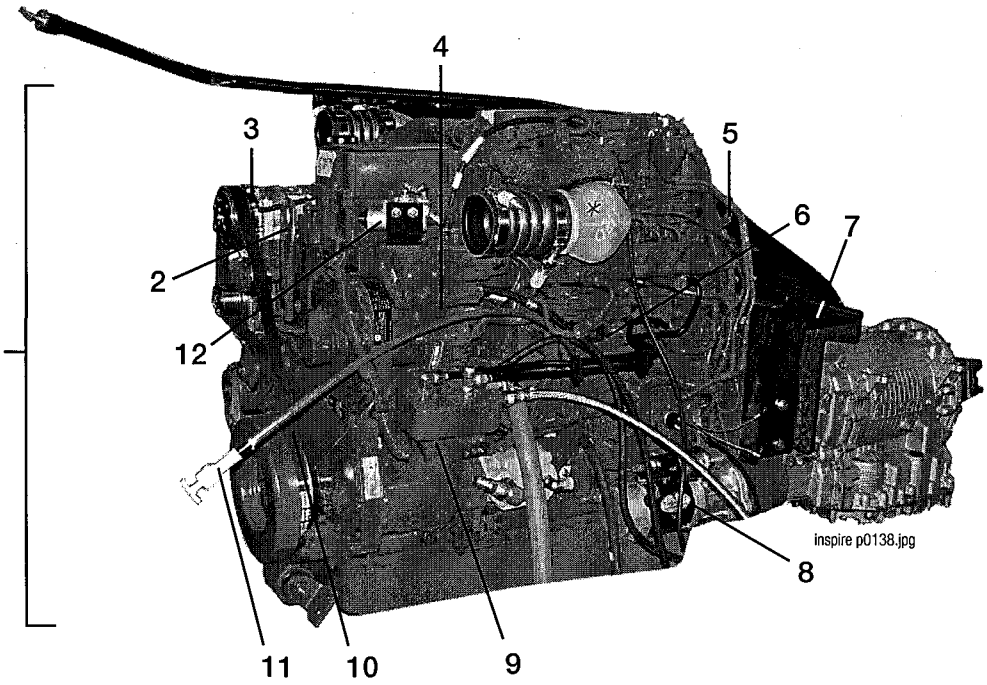
Note: The Founders Edition C9 secondary fuel filter and fuel primer pump are located in the chassis battery bay.





Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	86045	engine, caterpillar c9: 425hp, 1350 ft-lbs torque at 1400 rpm (all parts starting with 86045)	1
2	86045-1	turbocharger	1
3	36859	alternator: 160 amp, 12 volt	1
4	90202	compressor, air conditioner	1
5	86045-2	bracket, lifting: rear	1
6	86045-3	dipstick assembly, engine oil	1
7	86045-4	belt, serpentine	1
8	86045-5	damper, vibration	1
9	86045-6	pump, water	1
10	86045-7	filter, oil	1
11	86045-8	bracket, lifting: front	1
12	15429	governor: d-2, 105-125 psi	1
13	37392	supports, rear engine: left and right (set)	1
14	86045-9	electronic control module (ecm)	1
15	86045-10	motor, starting	1
16	86045-11	pump, fuel priming	1
17	86045-12	compressor, air	1
18	86045-13	filter, fuel: secondary, located in engine bay	1
19	86045-14	support, front engine	1
20	45169	filter, fuel: primary, located in engine bay	1

inspire p1-01.xls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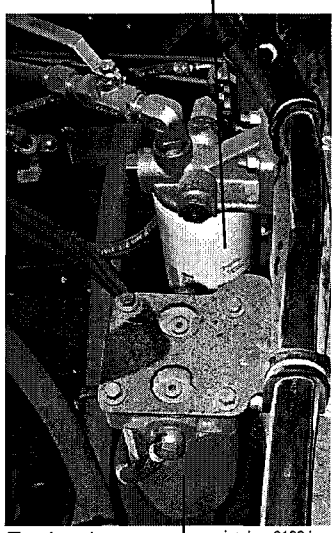
inspire p0138.jpg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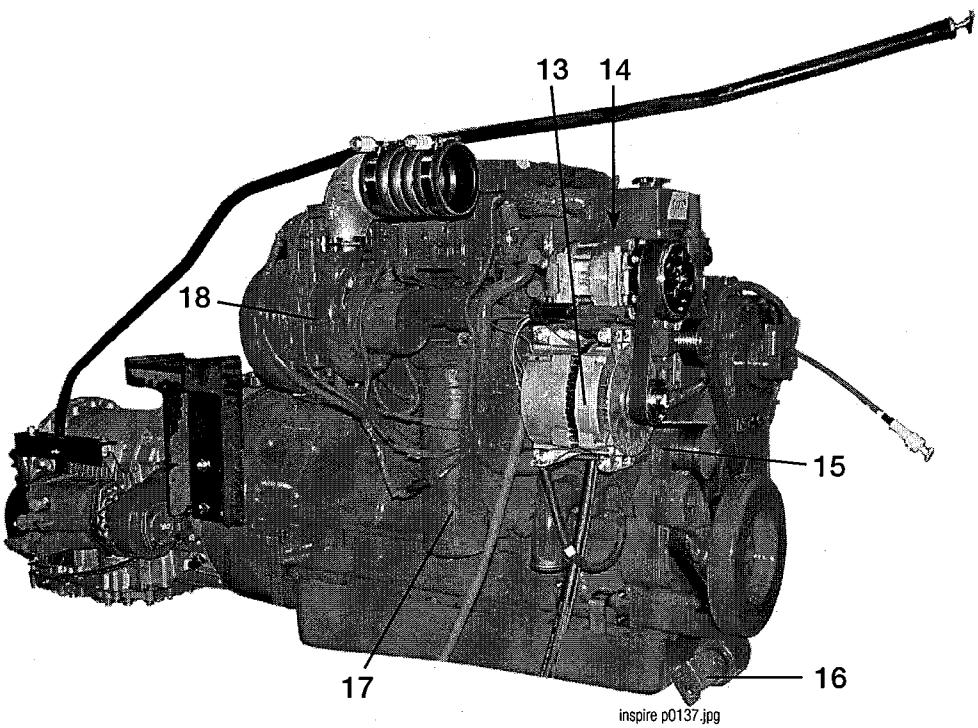
Engine bay
inspire p0139.jpg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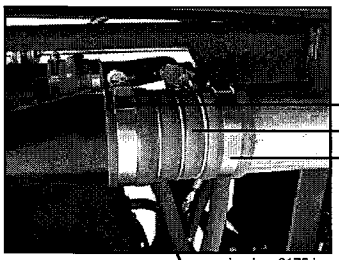
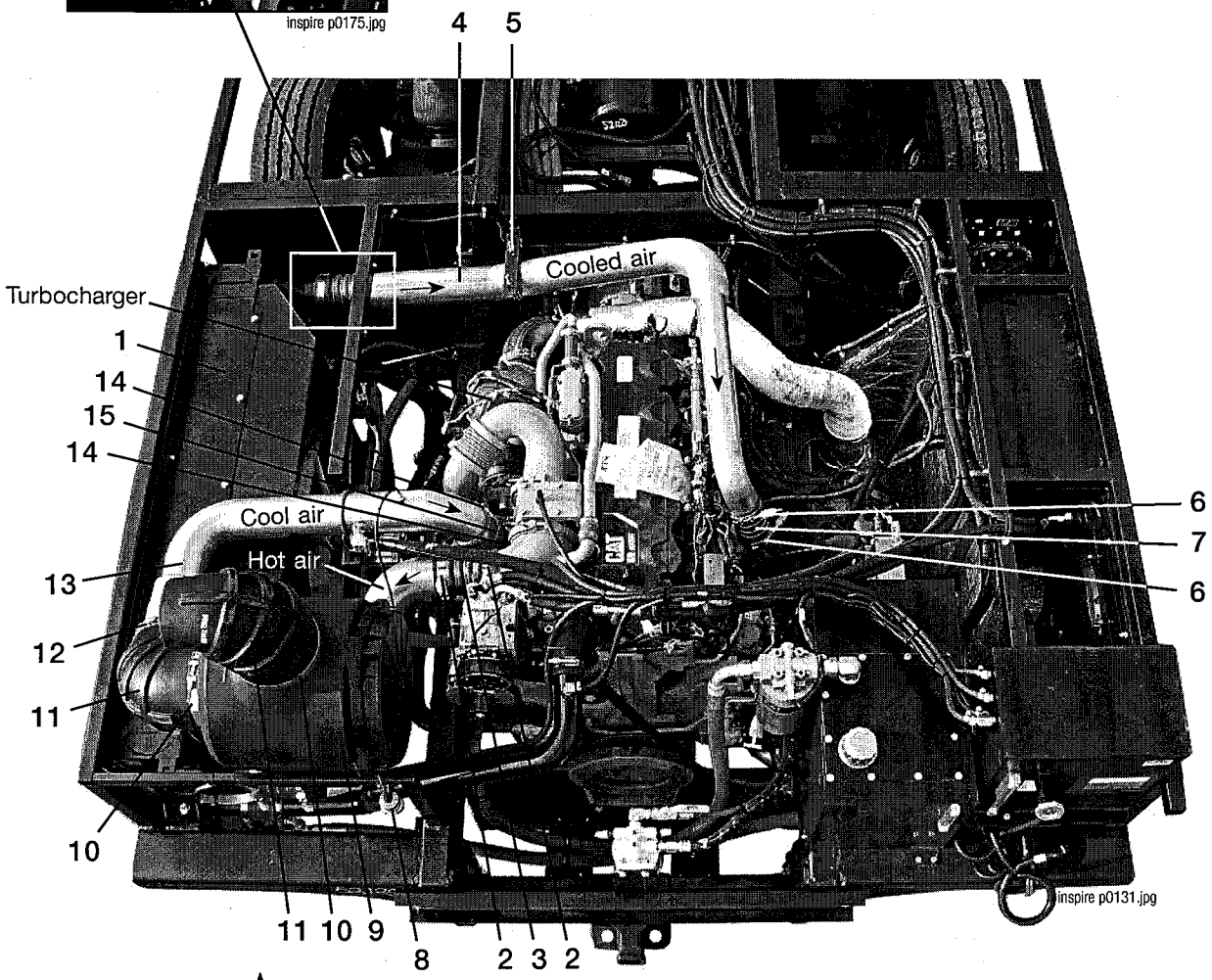
inspire p0137.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	88401	engine, cummins isl 425: 1200 ft-lbs at 1300 rpm (all parts that start with 88401)	1
2	88401-1	bracket, lifting	1
3	35542	compressor, air conditioner	1
4	88401-2	pump, fuel injection	1
5	88401-3	bracket, lifting	1
6	88401-4	electronic control module (ecm)	1
7	38547	mount, motor flywheel	1
8	88401-5	motor, starting	1
9	88401-6	compressor, air	1
10	88401-7	belt, serpentine	1
11	27874	dipstick assembly, engine oil: snap cap	1
12	37059	governor, air compressor	1
13	36859	alternator: 160 amp, 12 volt	1
14	88401-8	thermostat	1
15	88401-9	pump, water	1
16	88401-10	support assembly, front engine	1
17	88401-11	element, filter: lubrication oil	1
18	88401-12	turbocharger	1
19	37235	filter, fuel: primary, located in engine bay	1
20	88401-13	filter, fuel: secondary, located in engine bay	1

inspire p1-02.xls



inspire p0175.jpg



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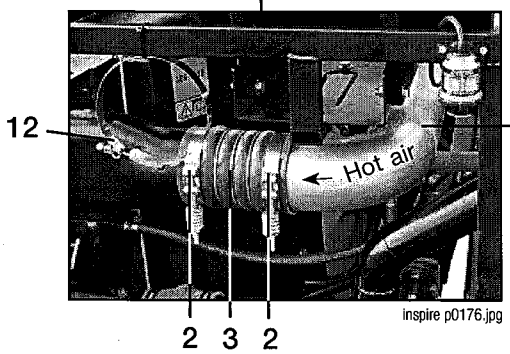
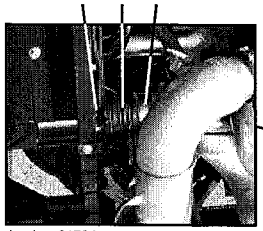


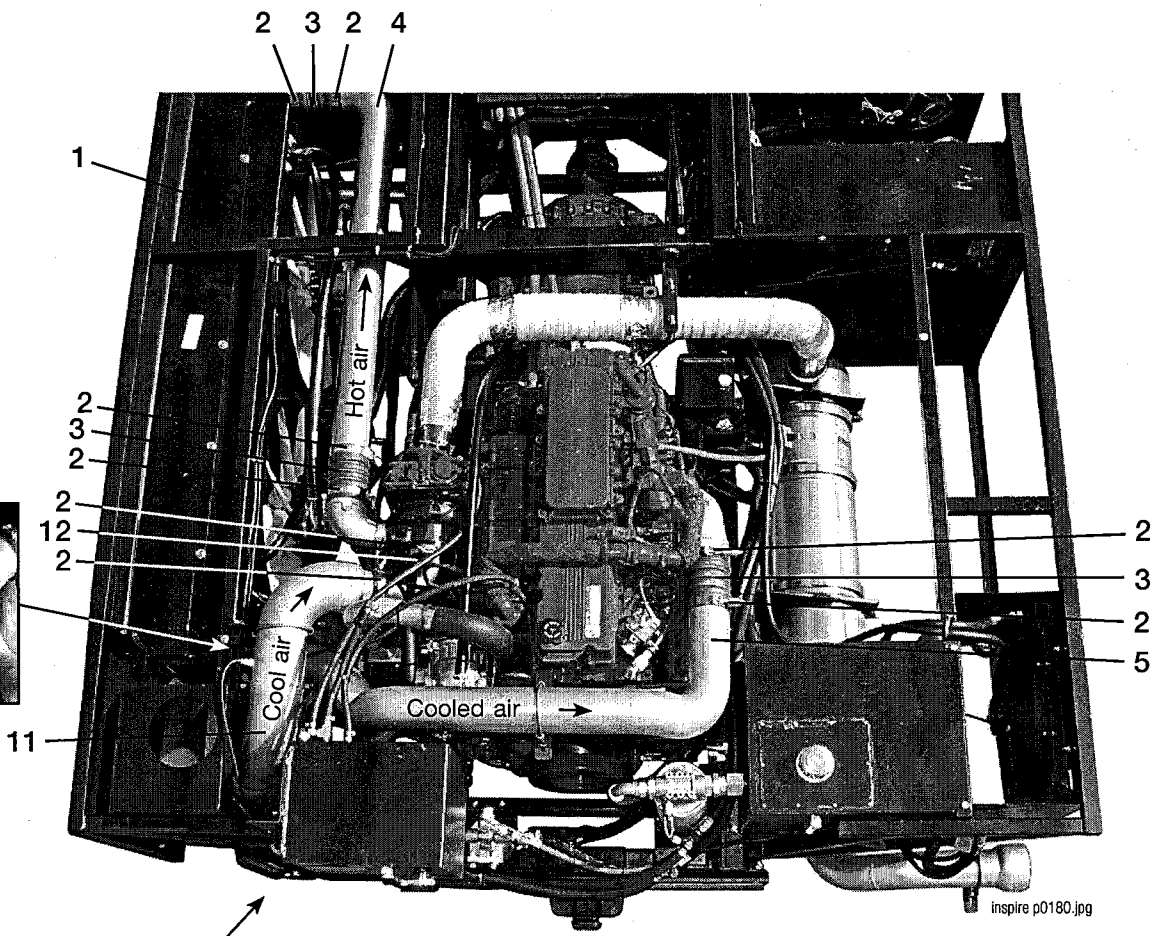
inspire p0176.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	88331	cooler assembly, charge-air: included with radiator	1
2	36589	clamp, t-bolt: 4.06" minimum spring loaded	6
3	90219	tube, charge-air intake: 4" inner diameter x 6"	3
4	45325	tube, engine: cac to intake manifold	1
5	31793	clamp, muffler: 4"	1
6	36951	clamp, t-bolt: 3.06" minimum spring loaded	2
7	36878	tube, charge-air intake manifold: 3" inner diameter x 6" cold	1
8	20808	gauge assembly, filter minder	1
9	15469	air cleaner assembly	1
10	15481	clamp, t-bolt: 7-1/4" minimum diameter	2
11	34697	tube, air intake: 7" id to 5" id reducer, 90° rubber elbow	2
12	18726	clamp, t-bolt: 5-1/4" to 5-9/16" diameter	2
13	45323	tube, engine: air cleaner to turbo	1
14	15482	clamp, t-bolt: 4.25" minimum diameter	2
15	15466	tube, air intake: 4" inner diameter x 6" cold	1
16	45324	tube, engine: engine turbo to cac	1

inspire p1-03.xls



inspire p0179.jpg



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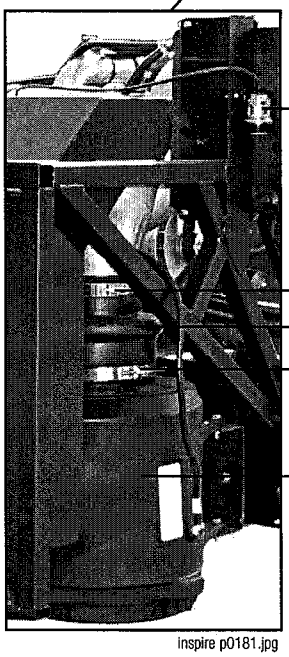
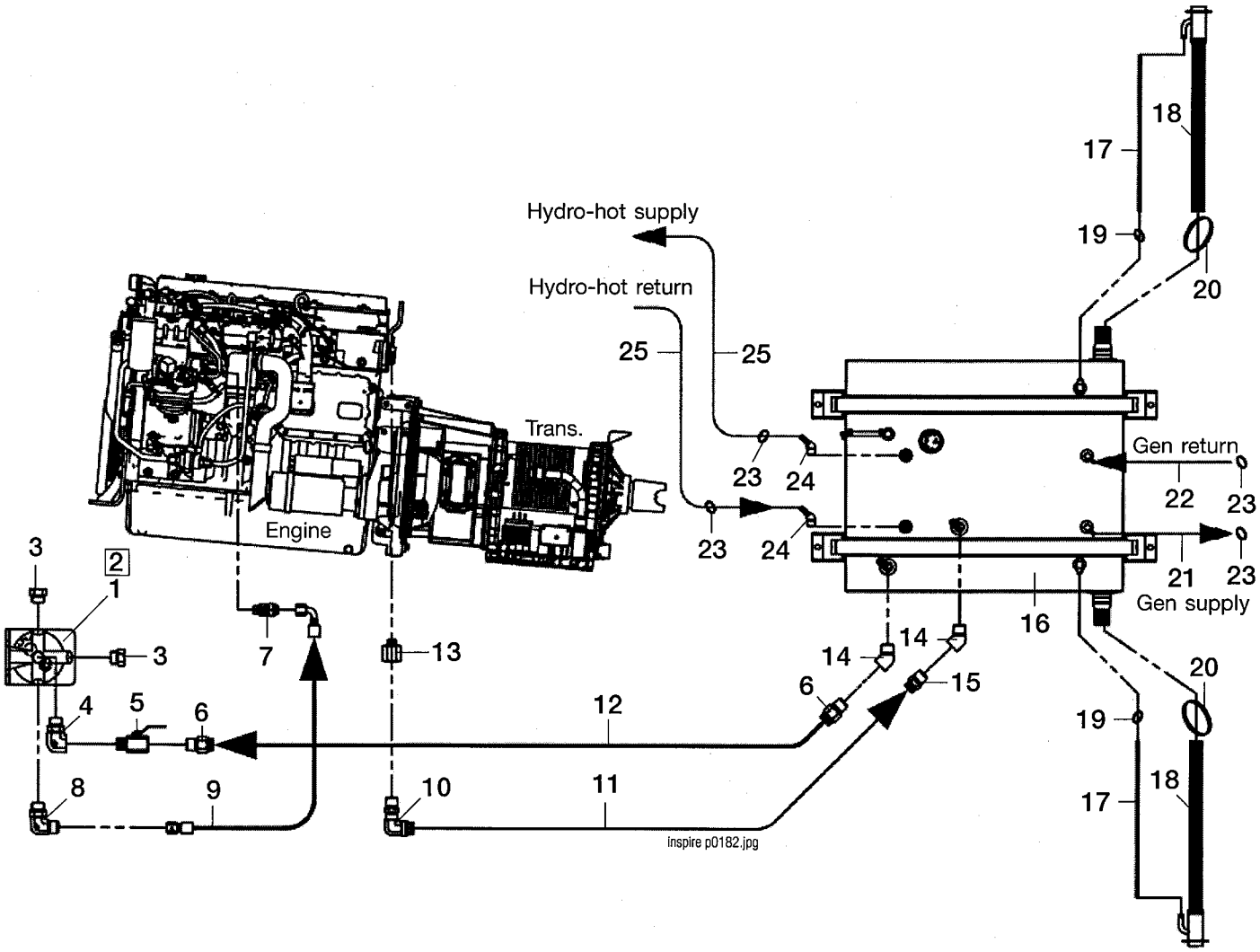


inspire p0181.jpg

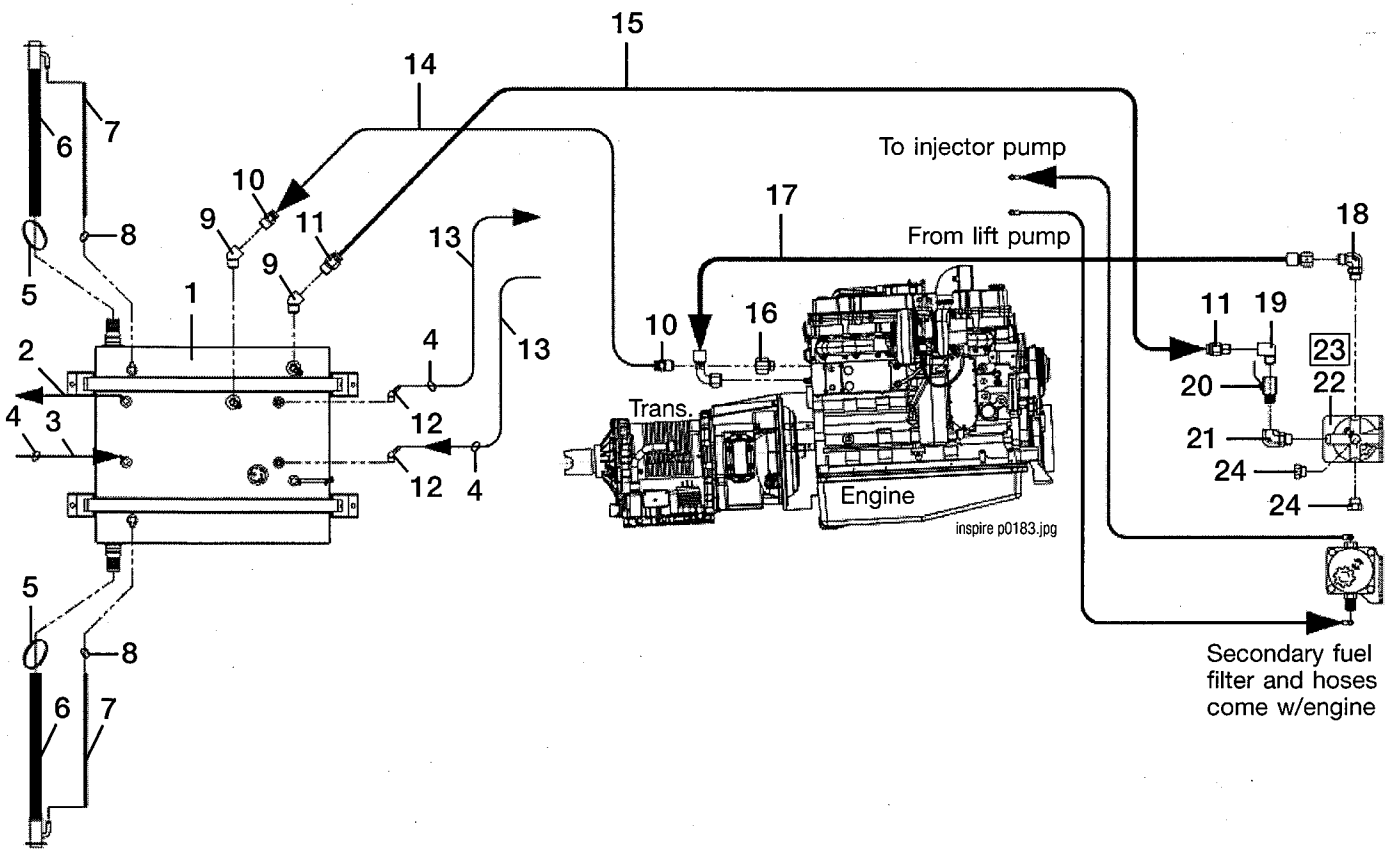
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	89815	cooler assembly, charge-air: included with radiator	1
2	36589	clamp, t-bolt: 4.06" minimum spring loaded	10
3	90219	tube, charge-air : 4" inner diameter x 6"	4
4	89272	tube, engine to cac	1
5	89271	tube, cac to engine	1
6	20808	gauge assembly, filter minder (not shown)	1
7	18726	clamp, t-bolt: 5-1/4" to 5-9/16" diameter	1
8	37356	hose: 7" to 5" rubber reducer	1
9	15481	clamp, t-bolt: 7-1/4" minimum diameter	1
10	15469	air cleaner assembly	1
11	89266	tube, air cleaner to turbo	1
12	15532	elbow, air intake: 4" rubber, 90°	1

tribute p1-04.xls


Hydro-hot supply
Hydro-hot return
Trans.
Engine
Gen return
Gen supply
inspire p0182.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	15694	head, fuel filter	1
2	37235	filter, fuel	1
3	15820	fitting: 5/8" 37° flare o-ring plug	2
4	36595	fitting: 5/8" o-ring x 1/2" fp, 90° elbow	1
5	84560	valve, mini ball: 1/2" mp x 1/2" fp, brass	1
6	36151	fitting: 5/8" pft hose x 1/2" mpt	2
7	37178	fitting: #6 o-ring x #10 mf adapter	1
8	15817	fitting: 5/8" x 5/8" 37° flare o-ring, 90° elbow	1
9	20566	hose, fuel supply: primer filter to engine	1
10	36566	fitting: 1/2" pft x 1/2" mp, 90° elbow	1
11	36153	tubing, diesel fuel: #8, 1/2" inner diameter	1
12	36152	tubing, diesel fuel: #10, 5/8" inner diameter	1
13	36149	fitting: #6 o-ring x 1/2" fpt	1
14	28204	fitting: 1/2" fp x 1/2" mp, 45° street elbow	2
15	36155	fitting: 1/2" pft x 1/2" mpt	1
16	82930	tank, fuel system: 100 gallon with frame and straps	1
17	29538	hose, fuel tank vent: 5/8" diameter	2
18	01308	hose, fuel: 2" inner diameter	2
19	38204	clamp: 1/2" to 29/32"	2
20	01301	clamp: 1-9/16" to 2-1/2"	2
21	17557	hose, fuel: 3/8" inner diameter generator supply	1
22	01311	hose, fuel: 5/16" inner diameter generator return	1
23	02935	clamp: 7/32" to 5/8"	4
24	82383	fitting: 1/4" hb x 1/4" mpt, 45° elbow	2
25	01310	hose, fuel: 1/4" inner diameter generator return	2

inspire p1-05.xls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To injector pump
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From lift pump
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Trans.
Engine
inspire p0183.jpg
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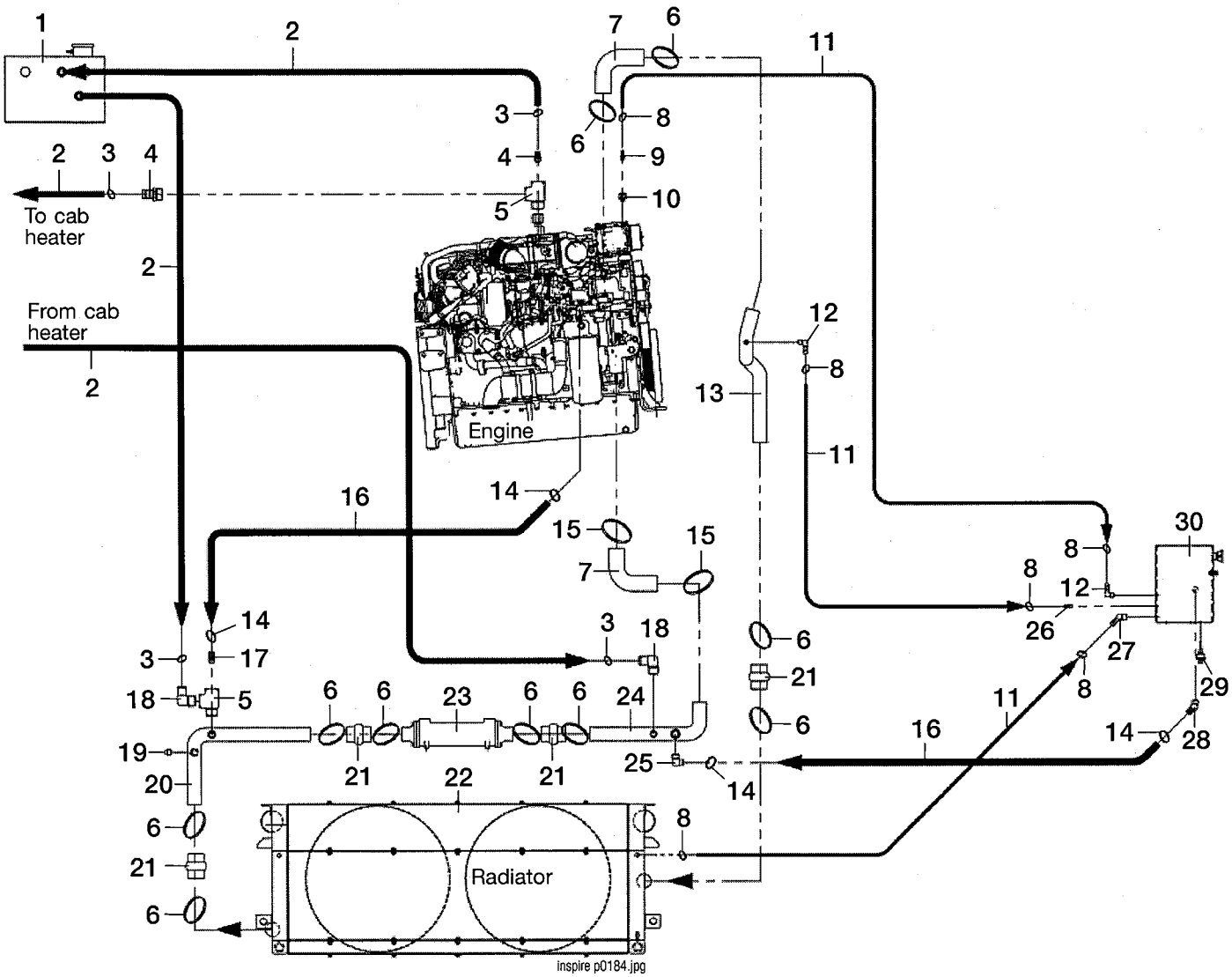
Secondary fuel
filter and hoses
come w/engine

Item No.	Country Coach	Description of Part	Qty. Req.
1	82930	tank, fuel system: 100 gallon with frame and straps	1
2	17557	hose, fuel: generator supply	1
3	01311	hose, fuel: generator return	1
4	02935	clamp, hose: #4 (7/32" to 5/8")	3
5	01301	clamp, hose: #32 (1-9/16" to 2-1/2")	2
6	01308	hose, fuel: 2" inner diameter	2
7	29538	hose, fuel tank vent: 5/8" diameter	2
8	38204	clamp, hose: #8 (1/2" to 29/32")	2
9	28204	fitting: 1/2" fp x 1/2" mp, 45° street elbow	2
10	36155	fitting: 1/2" pft x 1/2" mpt connector	2
11	36151	fitting, fuel: 5/8" pft hose x 1/2" mpt	2
12	82383	fitting: 1/4" hb x 1/4" mpt, 45° street elbow	2
13	01310	hose, fuel: hydronic supply and return	2
14	36153	tubing, diesel fuel: #8, 1/2" inner diameter	1
15	36152	tubing, diesel fuel: #10, 5/8" inner diameter	1
16	37018	fitting: 1/2" fp x 1/2" o-ring adapter	1
17	28146	hose, fuel supply: primary filter to engine	1
18	15817	fitting: 5/8" x 5/8" 37° flare o-ring, 90° elbow	1
19	00965	fitting: 1/2" fp x 1/2" mp, 90° street elbow	1
20	84560	valve, ball: 1/2" mp x 1/2" fp, brass	1
21	36595	fitting: 1/2" fp x 5/8" o-ring, 90° elbow	1
22	15694	head, fuel filter	1
23	37236	filter, fuel (not shown)	1
24	15820	fitting: 5/8" 37° flare o-ring plug	2

inspire p1-06.xls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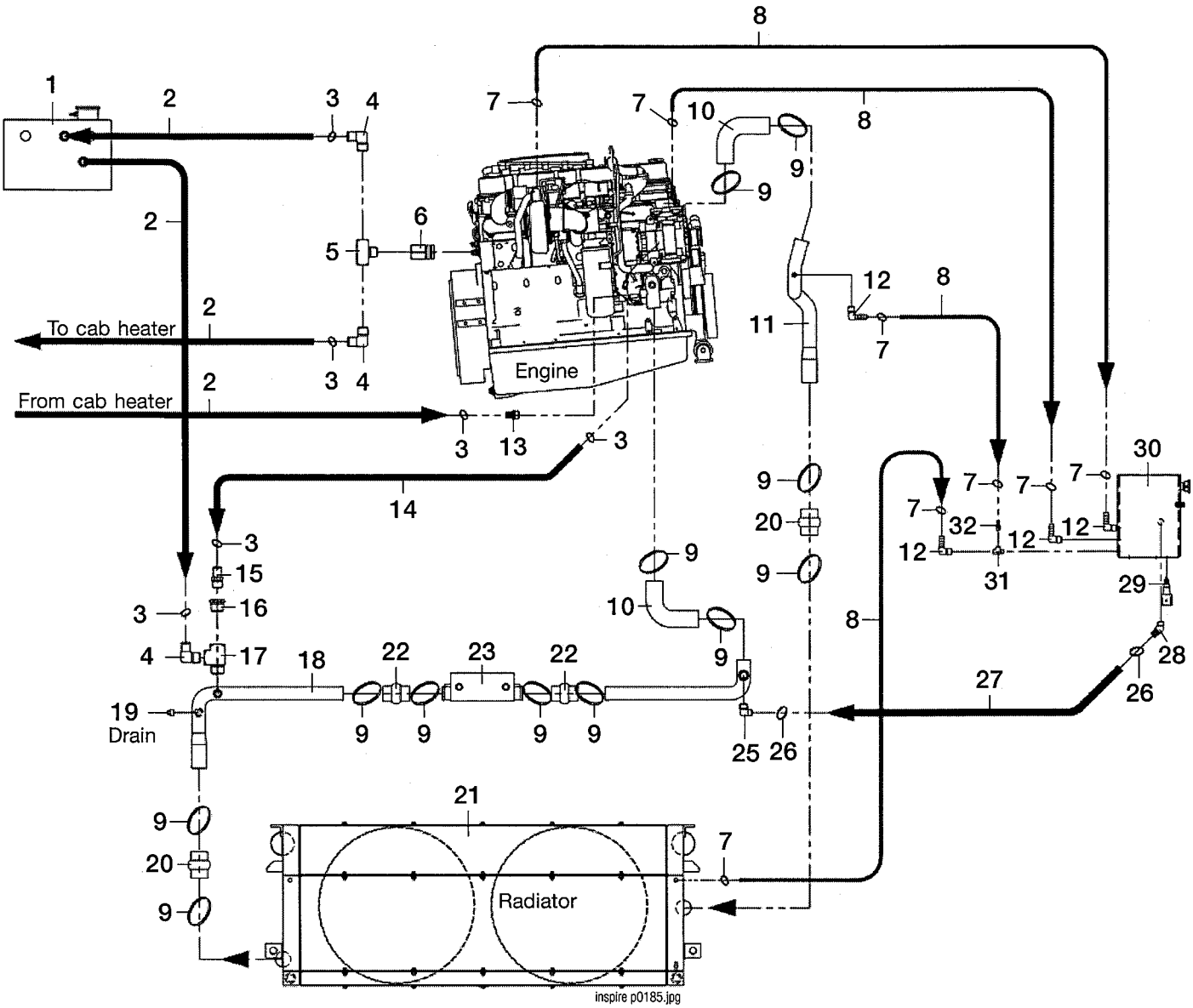
To cab heater
From cab heater
Engine
Radiator
inspire p0184.jpg

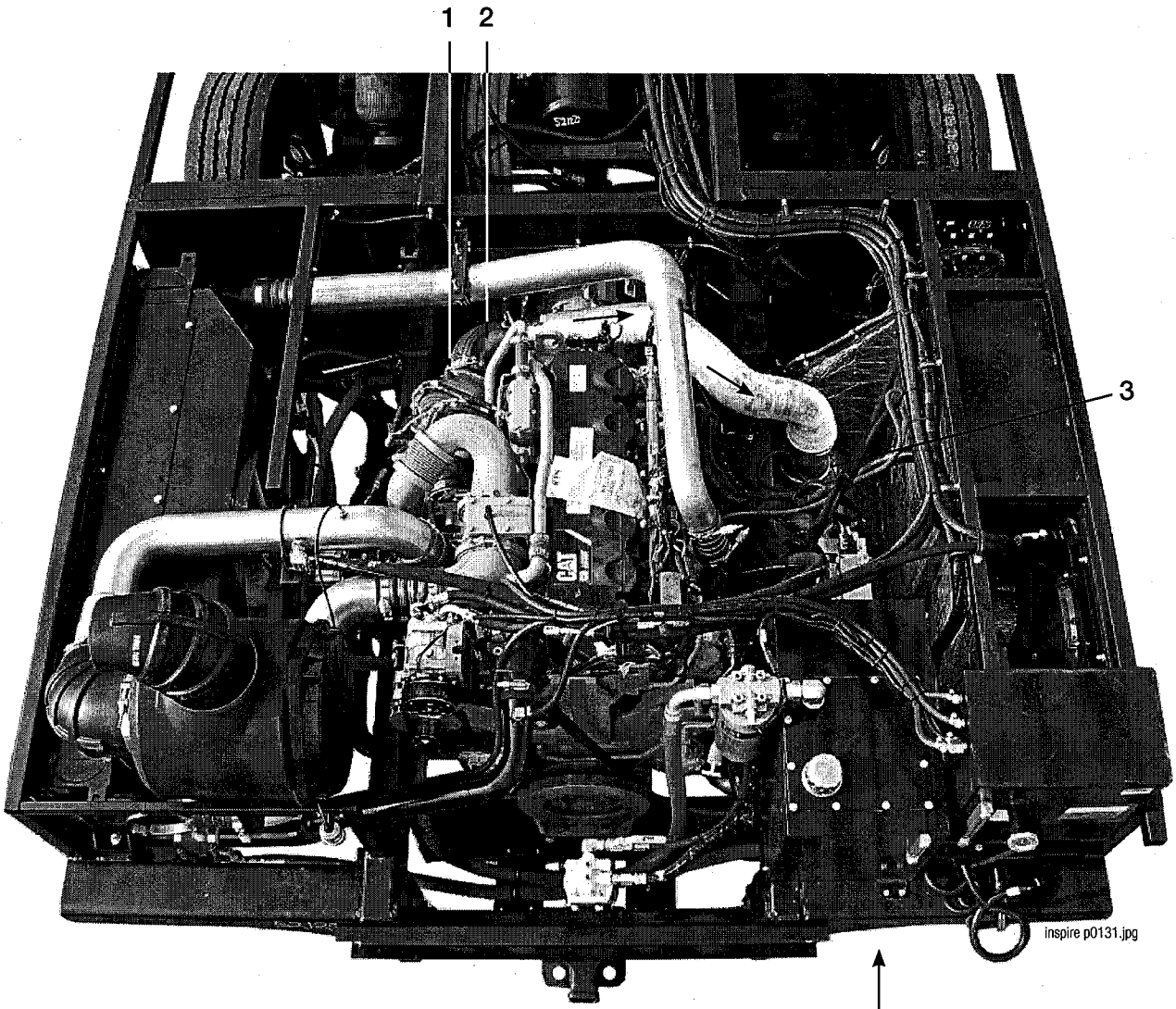
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	34454	furnace, aqua-hot: 450-D	1
2	15780	hose, heater: 3/4" inner diameter	4
3	28489	clamp, hose: 11/16" to 1-1/4" constant torque	4
4	19829	fitting: 3/4" barb x 3/4" male pipe	2
5	83400	fitting: 3/4" mpt street tee	2
6	28340	clamp, hose: 2-1/4" to 3-1/8" dia. constant torque	10
7	18447	hose, radiator: 2-1/2" inner diameter, 6-1/2" x 7-1/2", 90° elbow	2
8	02935	clamp, hose: #4 (7/32" to 5/8")	6
9	16143	fitting: 3/8" mpt x 3/8" b	1
10	82469	fitting: 3/8" fpt x 1/2" o-ring adapter	1
11	17557	hose, fuel: 3/8" inner diameter	3
12	18746	fitting: 3/8" barb x 1/4" mpt, 90° elbow	2
13	90496	tube, engine: upper radiator	1
14	28490	clamp, hose: 1" to 1-3/4" constant torque	4
15	27751	clamp, hose: 2-3/4" to 3-5/8" dia. constant torque	2
16	16126	hose, heater: 1" red	2
17	18093	fitting: 1" b x 3/4" mp connector	1
18	21251	fitting: 3/4" b x 3/4" mp, 90° elbow	2
19	15805	fitting: 3/4" mp square head plug	1
20	90492	tube, engine: radiator to transmission cooler	1
21	17554	hose, hump: 2-1/2"	4
22	88331	radiator cooling assembly	1
23	83552	radiator: auxiliary transmission cooler	1
24	90494	tube, engine: transmission cooler to engine	1
25	38173	fitting: 1" hb x 1" mp, 90° elbow	1
26	09910	fitting: 3/8" b x 1/4" mp, straight	1
27	38243	fitting: 3/8" hb x 1/4" mpt, 45° elbow	1
28	38174	fitting: 1" hb x 3/4" mpt, 45° elbow	1
29	18594	sensor, surge tank: low coolant	1
30	86686	tank, surge: 5.6 gallons	1

inspire p1-07.xls


To cab heater
From cab heater
Engine
Radiator
Drain
inspire p0185.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	34454	furnace, hydro-hot: with engine preheat (option)	1
2	15780	hose, heater: 3/4" inner diameter	4
3	28489	clamp, hose: 11/16" to 1-1/4" constant torque	6
4	21251	fitting: 3/4" x 3/4" elbow, brass	3
5	21228	fitting: 3/4" branch tee, brass	1
6	21281	fitting: 3/4" fpt heater supply	1
7	02935	clamp, hose: 7/32" to 5/8" constant torque	8
8	17557	hose, fuel: 3/8" inner diameter	4
9	28340	clamp: 2-1/4" to 3-1/8" diameter constant torque	12
10	15477	tube, radiator inlet: 2-1/4" id, 90° elbow	2
11	89267	tube, engine to radiator	1
12	18746	fitting: 3/8" barb x 1/4" mpt, 90° elbow	4
13	20343	fitting: 1" mp x 1" b hex nipple, brass	1
14	32110	hose, heater: 5/8" id	1
15	00847	fitting: 1/2" mp x 5/8" hose bib	1
16	00469	fitting: 1/2" fpt x 3/4" mpt bushing	1
17	83400	fitting: 3/4" mpt street tee	1
18	89268	tube, radiator to transmission cooler	1
19	15805	fitting: 3/4" mp square-head plug	1
20	17554	hose, hump: 2-1/2"	2
21	89815	radiator assembly	1
22	15428	hose, hump: 2-1/4"	2
23	83552	radiator: auxiliary transmission cooler	1
24	89269	tube, transmission cooler to engine	1
25	38173	fitting: 1" hb x 1" mpt, 90° elbow	1
26	28490	clamp, hose: 1" to 1-3/4" constant torque	2
27	16126	hose, heater: 1" red	1
28	38174	fitting: 1" hb x 3/4" mpt, 45° elbow	1
29	37033	sensor, low coolant	1
30	86686	tank, surge: steel with cap, 5.6-gallon	1
31	00973	fitting: 1/4" mp street tee	1
32	09910	fitting: 3/8" b x 1/4" mp connector	1

inspire p1-08.xls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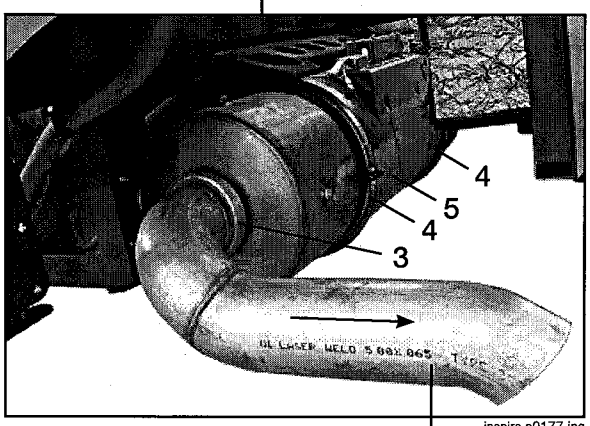
inspire p0131.jpg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inspire p0177.jpg
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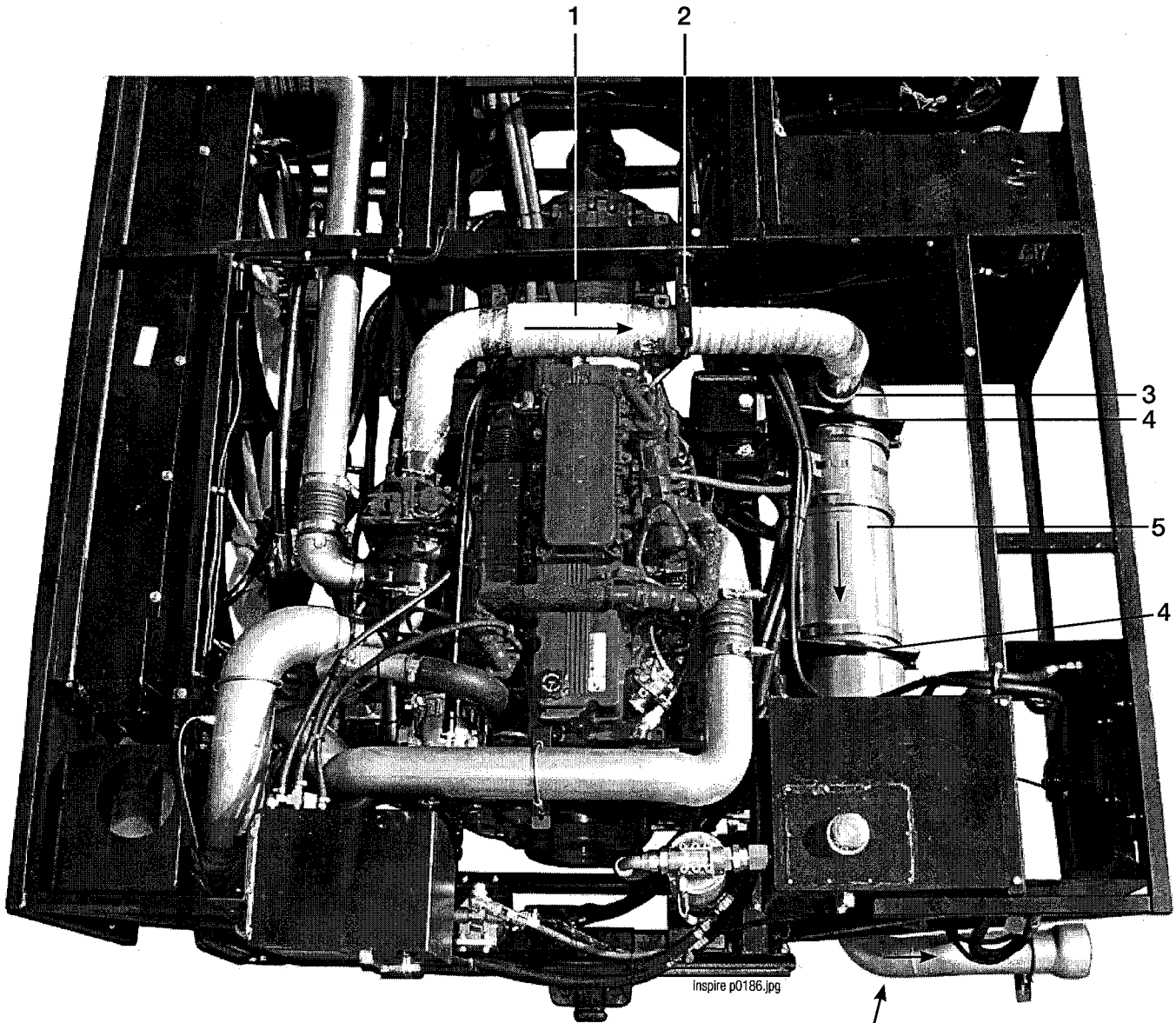
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	93951	tube, exhaust: turbo to muffler	1
2	45794	clamp, exhaust: 4" v-band	1
3	89278	mount, dpf	1
4	90288	diesel particulate filter (dpf)	1
5	35767	clamp, exhaust: 5" v-band	2
6	90503	tube, exhaust: muffler to exhaust tip	1
7	22914	tip, engine exhaust (not shown)	1

inspire p1-09.xls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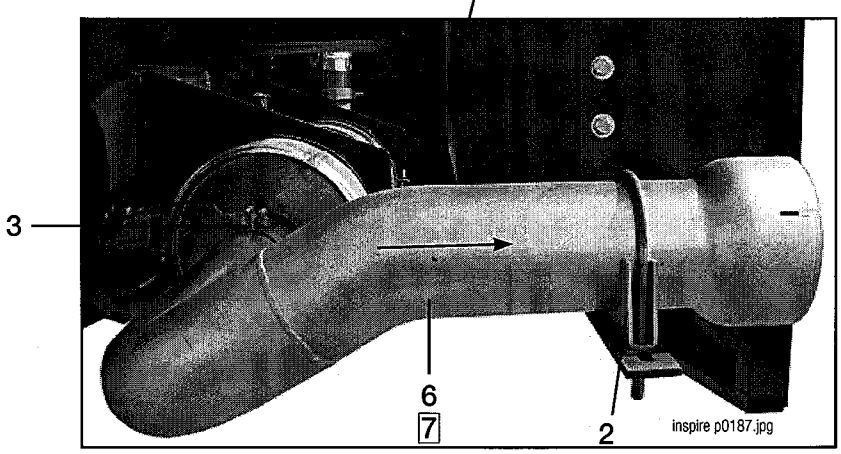
inspire p0186.jpg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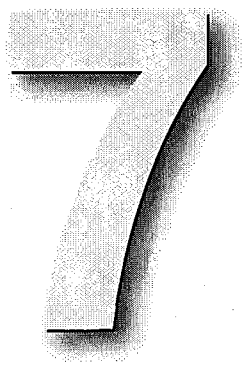
inspire p0187.jpg

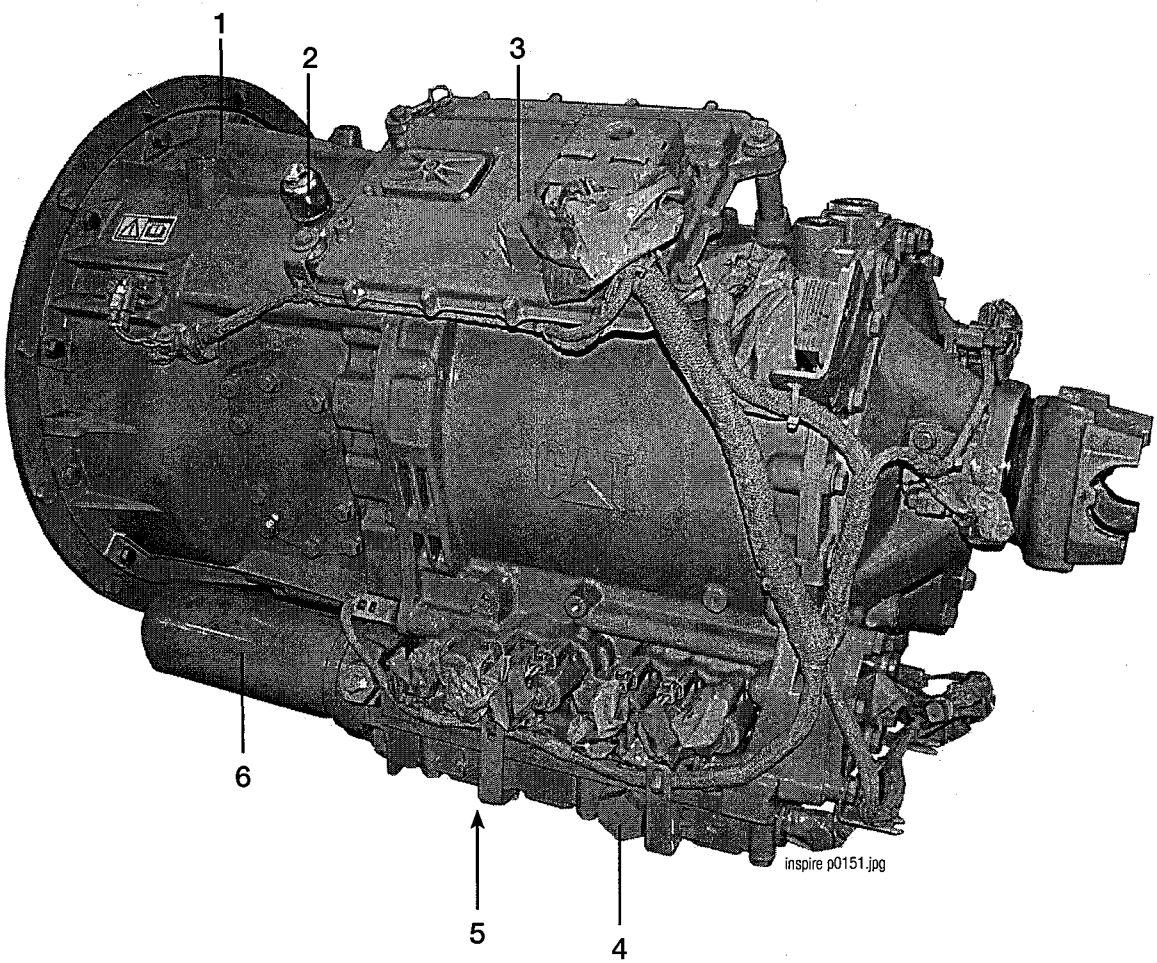
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	93951	tube, exhaust: turbo to dpf	1
2	31793	clamp, exhaust: 4" guillotine, 3/8" u-bolt	2
3	15456	clamp, exhaust: 4"	2
4	89279	mounting band, dpf	2
5	88401-14	dpf, engine exhaust	1
6	89277	tube, exhaust: pdf to exhaust tip	1
7	22914	tip, engine exhaust (not shown)	1

inspire p1-10.xls

Notes:

Transmission Group

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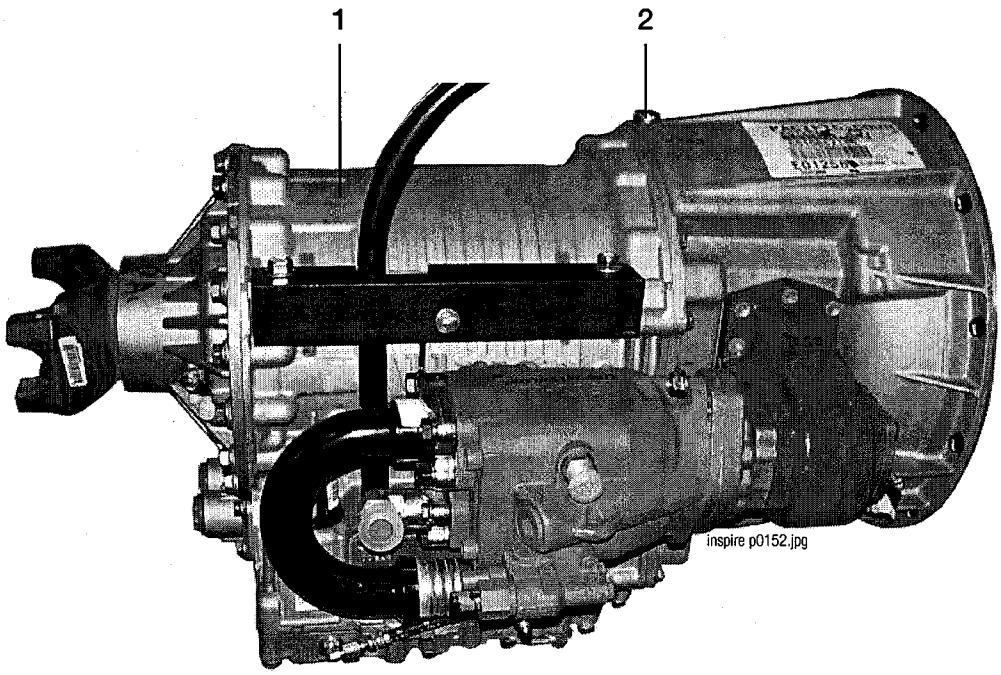
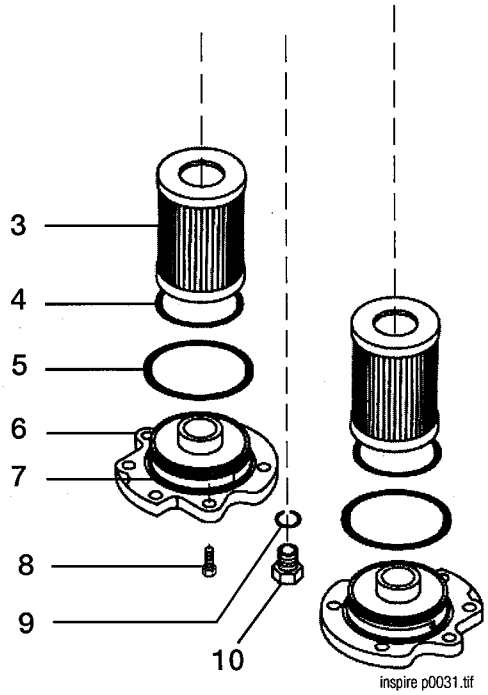
inspire p0151.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	82911	transmission, cx28 (tag): with pto (c9) (all parts starting with 82911)	1
1	88327	transmission, cx28 (no tag): with pto (c9) (all parts starting with 88327)	1
2	82911-1	breather	1
2	88327-1	breather	1
3	82911-2	electronic control unit (ecu)	1
3	88327-2	electronic control unit (ecu)	1
4	82911-3	plug, oil: drain	1
4	88327-3	plug, oil: drain	1
5	82911-4	filter and screen, magnetic (not shown)	1
5	88327-4	filter and screen, magnetic (not shown)	1
6	82911-5	filter, fluid	1
6	88327-5	filter, fluid	1

inspire p2-01.xls



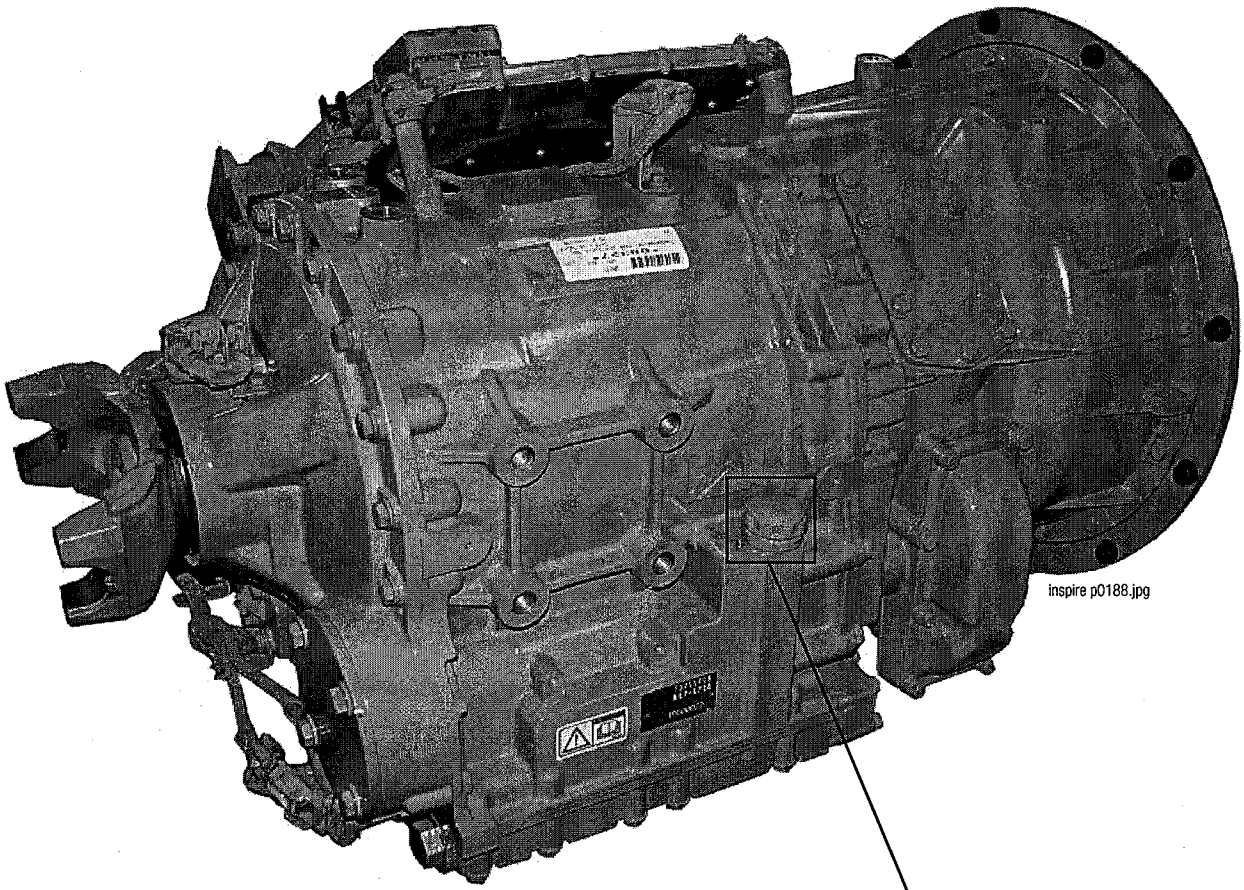


THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.

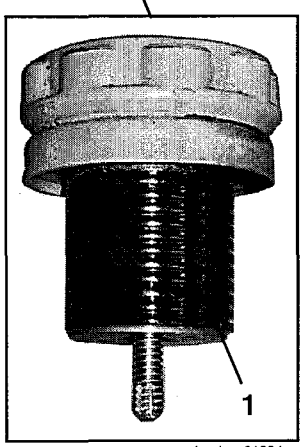
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	90129	transmission, 3000 mh (no tag): with pto (isl) (all parts starting with 90129)	1
1	90350	transmission, 3000 mh (tag): with pto (isl) (all parts starting with 90350)	1
2	90129-1	breather	2
2	90350-1	breather	2
3	16582	filters kit: 2 filters	1
4	90129-2	seal, packing	2
4	90350-2	seal, packing	2
5	90129-3	seal, packing (see note 1)	2
5	90350-3	seal, packing (see note 1)	2
6	90129-4	cover, filter	2
6	90350-4	cover, filter	2
7	90129-5	gasket (see note 2)	2
7	90350-5	gasket (see note 2)	2
8	90129-6	bolt: m10 x 1-1/2 x 55mm	12
8	90350-6	bolt: m10 x 1-1/2 x 55mm	12
9	90129-7	o-ring: packing	1
9	90350-7	o-ring: packing	1
10	90129-8	plug, oil: drain	1
10	90350-8	plug, oil: drain	1

Note 1: Seals are either o-rings or square cut seals - replace with identical seals
Note 2: Gaskets are not used on all transmissions - use gaskets only if removed

inspire p2-02.xls



inspire p0188.jpg

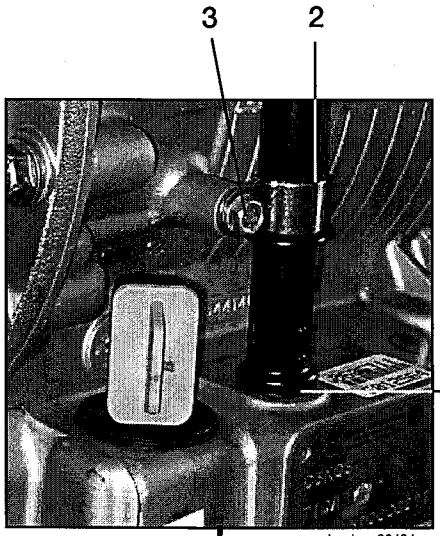


inspire p0189.jpg

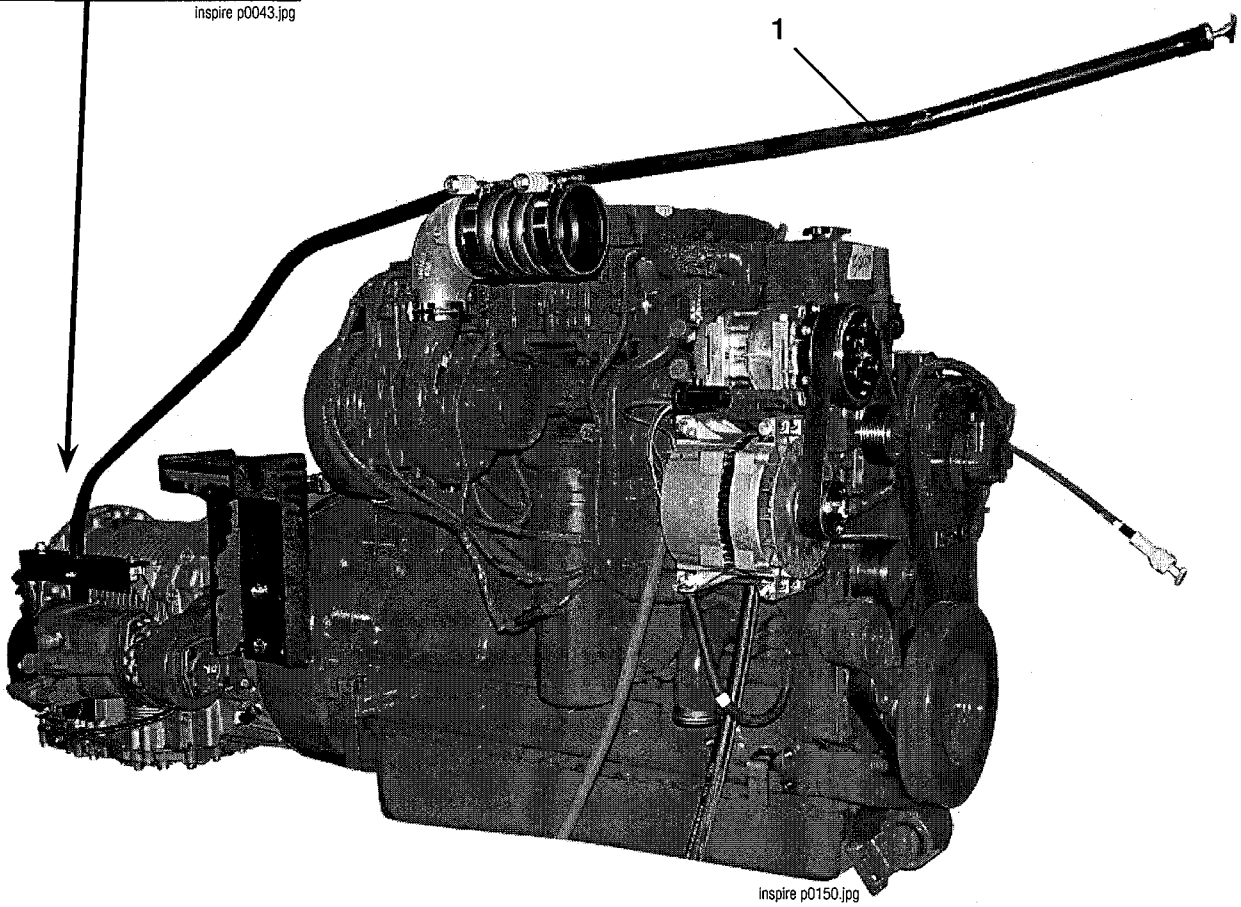
CX28 Transmission Dipstick Blade/Tube

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	82911-6	dipstick	1
1	88327-6	dipstick	1

inspire p2-03.xls



inspire p0043.jpg

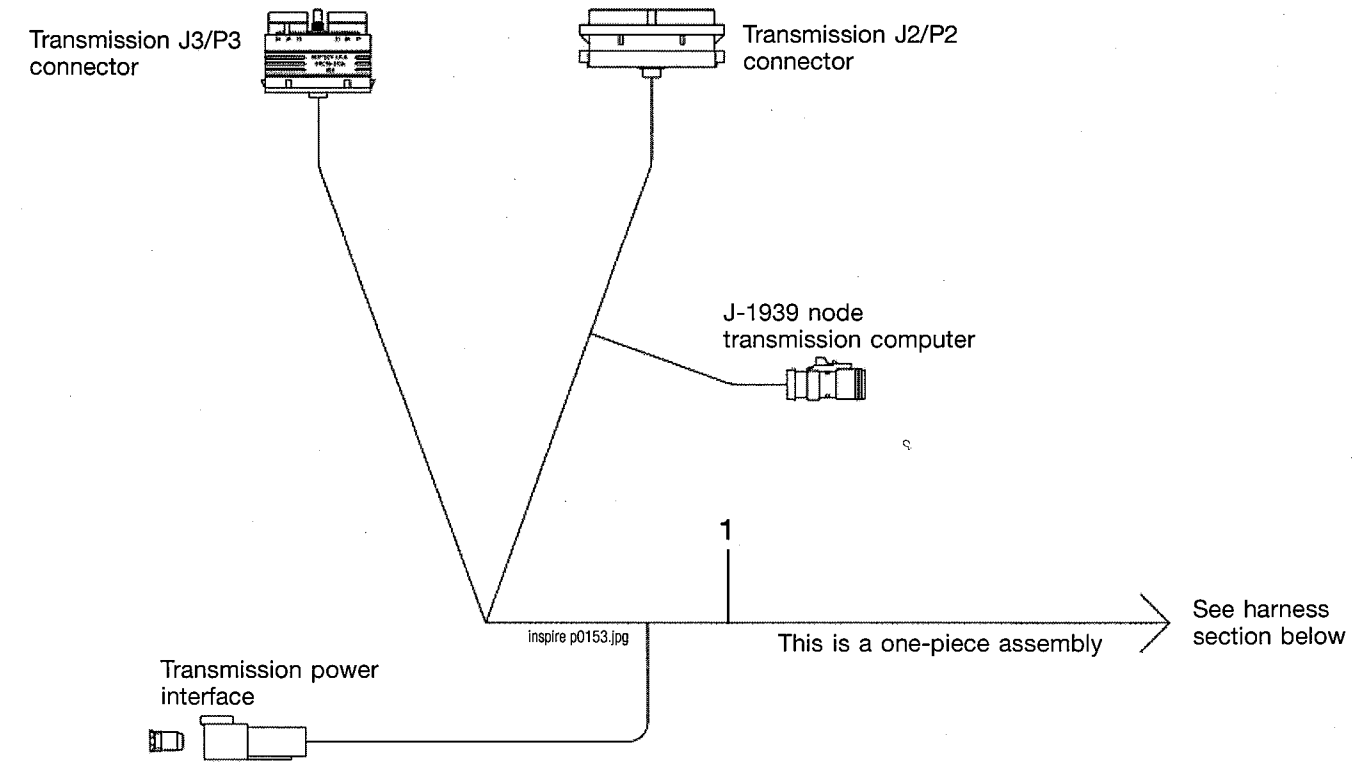


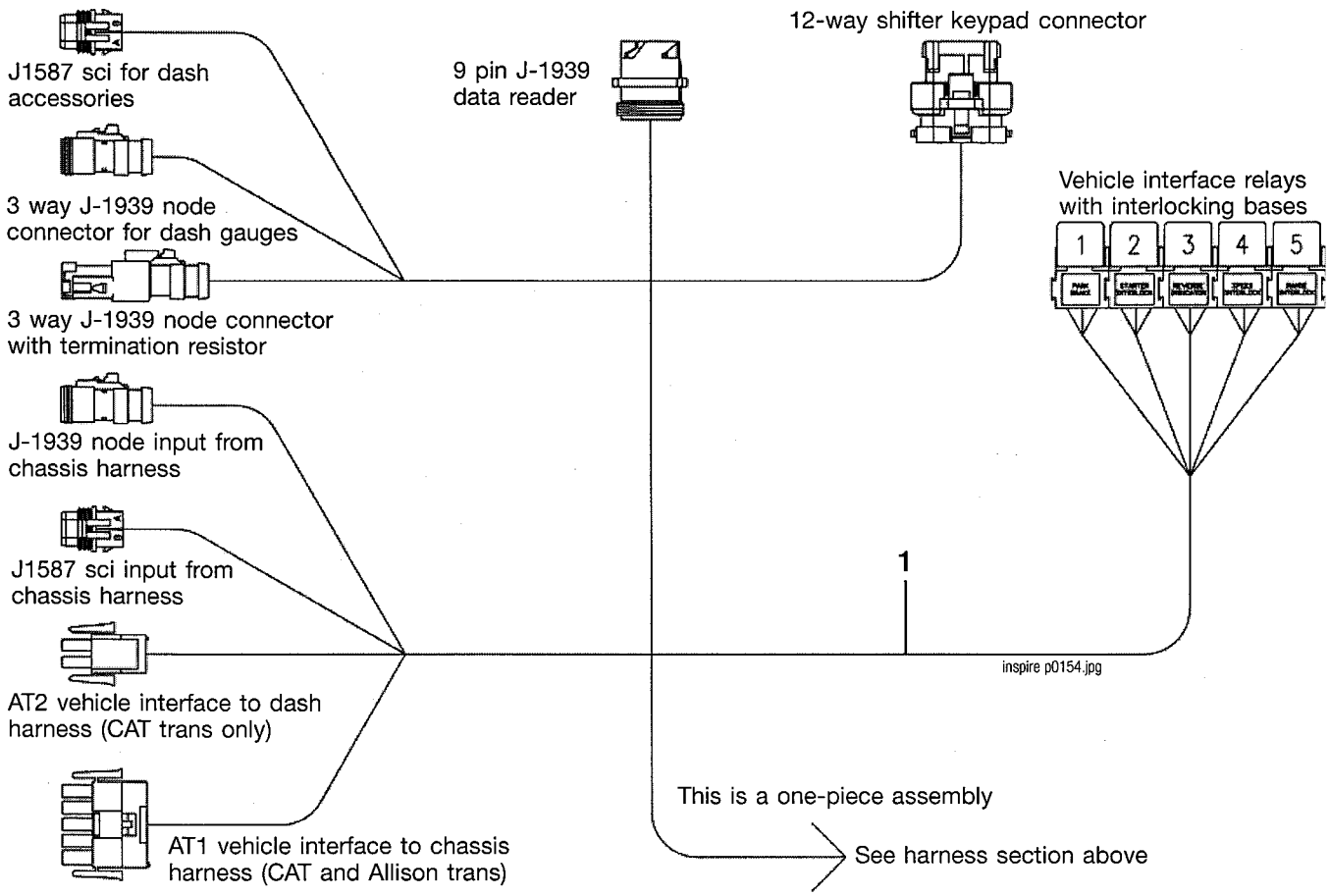
inspire p0150.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	20638	dipstick and tube assembly	1
2*	ref.	clamp (see kits 90129-10 and 90350-10)	1
3*	ref.	bolt (see kits 90129-10 and 90350-10)	1
4	90129-9	seal	1
4	90350-9	seal	1
kit	90129-10	mounting-kit (items 2, 3)	1
kit	90350-10	mounting-kit (items 2, 3)	1

*part of a kit

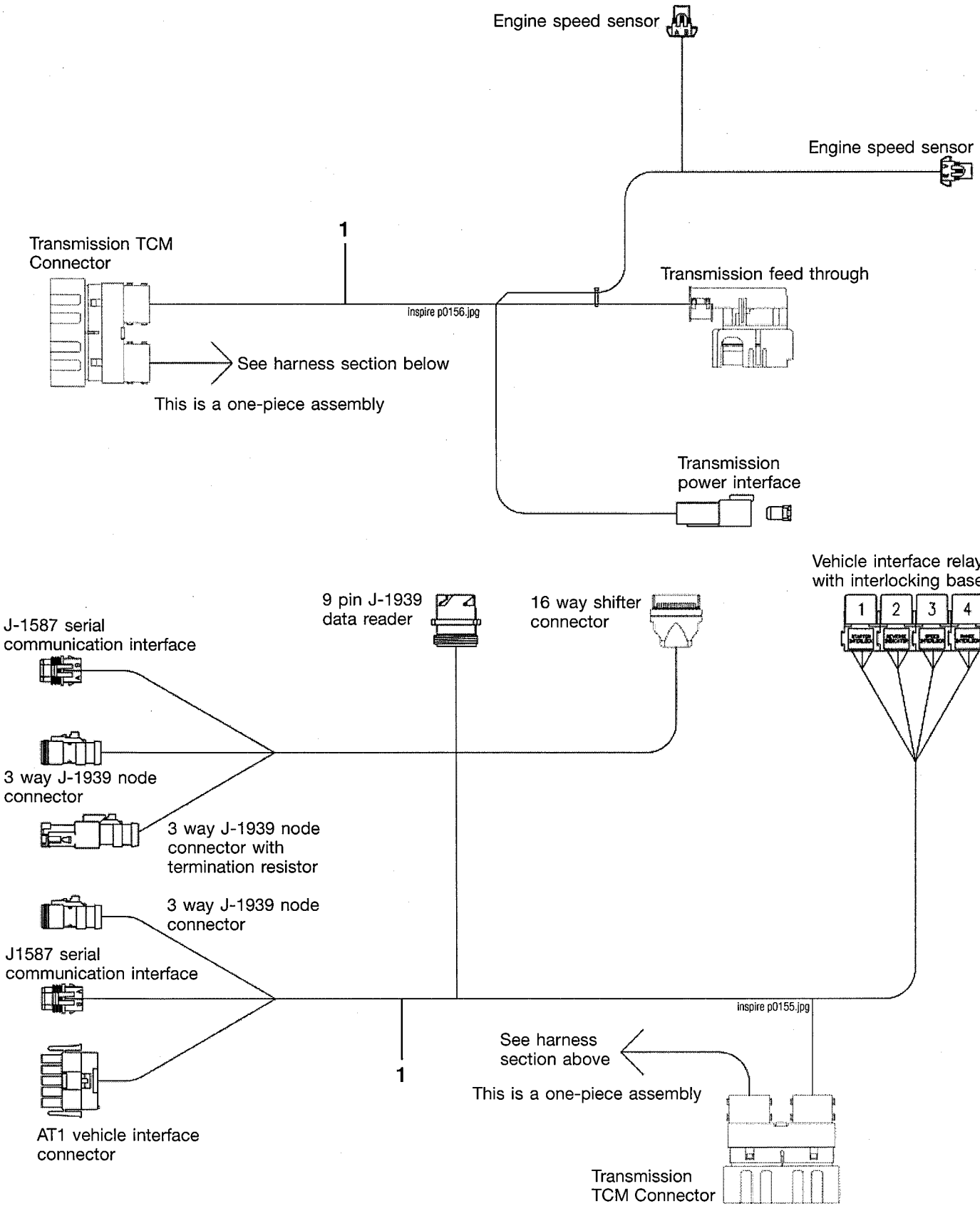
inspire p2-04.xls


Transmission J3/P3 connector
Transmission J2/P2 connector
J-1939 node transmission computer
1
inspire p0153.jpg
This is a one-piece assembly
See harness section below
Transmission power interface


J1587 sci for dash accessories
9 pin J-1939 data reader
12-way shifter keypad connector
Vehicle interface relays with interlocking bases
1
2
3
4
5
3 way J-1939 node connector for dash gauges
3 way J-1939 node connector with termination resistor
J-1939 node input from chassis harness
J1587 sci input from chassis harness
1
inspire p0154.jpg
AT2 vehicle interface to dash harness (CAT trans only)
This is a one-piece assembly
See harness section above
AT1 vehicle interface to chassis harness (CAT and Allison trans)

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	45160	harness, cx28 transmission (no tag cx28/isl and tag cx28)	1

inspire p2-05.xls


Engine speed sensor
Engine speed sensor
1
Transmission TCM Connector
Transmission feed through
inspire p0156.jpg
See harness section below
This is a one-piece assembly
Transmission power interface
Vehicle interface relays with interlocking bases
1
2
3
4
9 pin J-1939 data reader
16 way shifter connector
J-1587 serial communication interface
3 way J-1939 node connector
3 way J-1939 node connector with termination resistor
3 way J-1939 node connector
J1587 serial communication interface
inspire p0155.jpg
See harness section above
This is a one-piece assembly
1
AT1 vehicle interface connector
Transmission TCM Connector

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	45407	harness, transmission (isl tag)	1

inspire p2-06.xls

inspire p0048.jpg

1

Shifter pads are on the driver-side console

inspire p0157.jpg

2

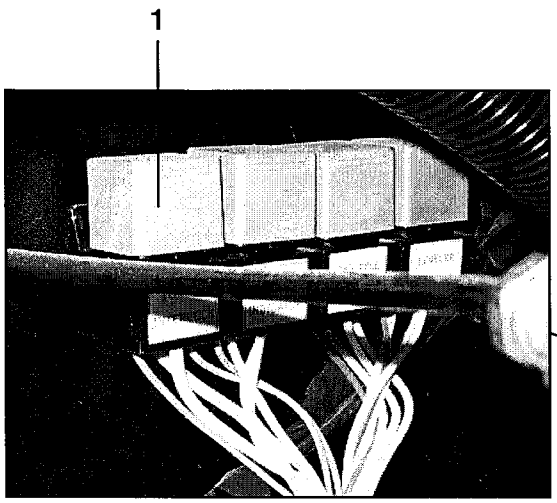
Located in steering bay

inspire p0165.jpg

THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.

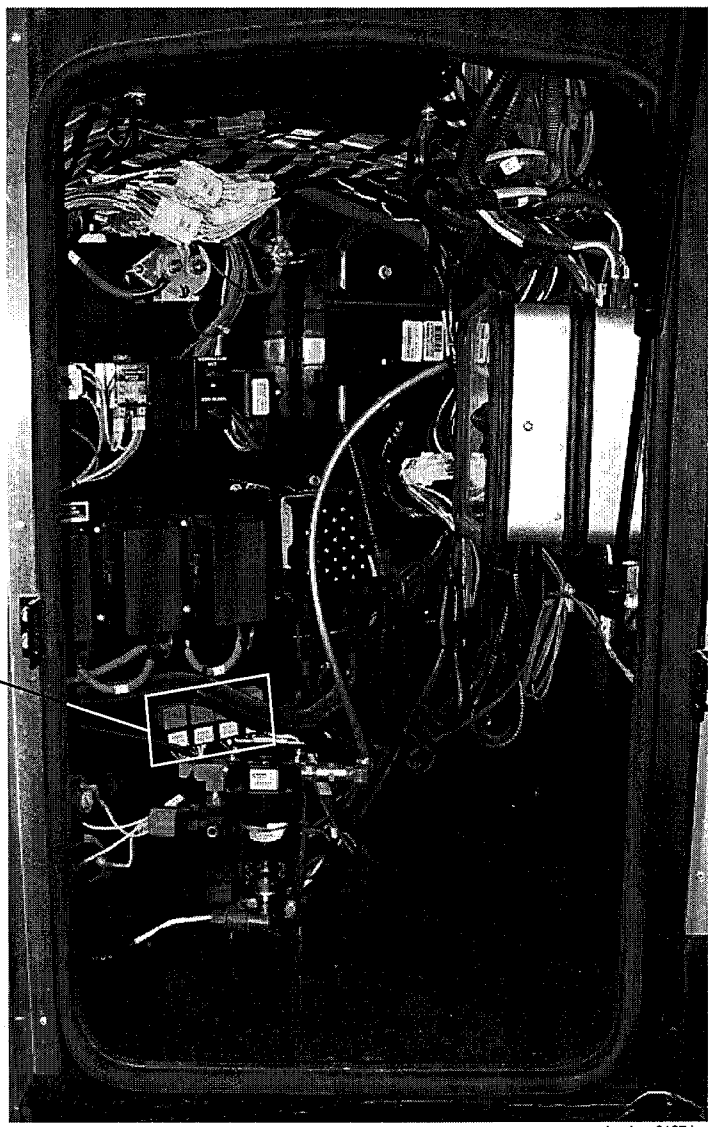
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	82911-7	shifter, cx28 transmission: with pto and cat remote button selector	1
1	88327-7	shifter, cx28 transmission: with pto and cat remote button selector	1
1	90129-11	shifter, 3000 mh transmission: with pto and generation iv remote button selector	1
1	90350-11	shifter, 3000 mh transmission: with pto and generation iv remote button selector	1
2	82911-8	ecu, cx28 transmission: electronic control unit	1
2	88327-8	ecu, cx28 transmission: electronic control unit	1
2	90129-12	ecu, 3000 mh transmission: with pto and electronic control unit for generation iv	1
2	90350-12	ecu, 3000 mh transmission: with pto and electronic control unit for generation iv	1

inspire p2-07.xls



3000 MH relays

inspire p0166.jpg



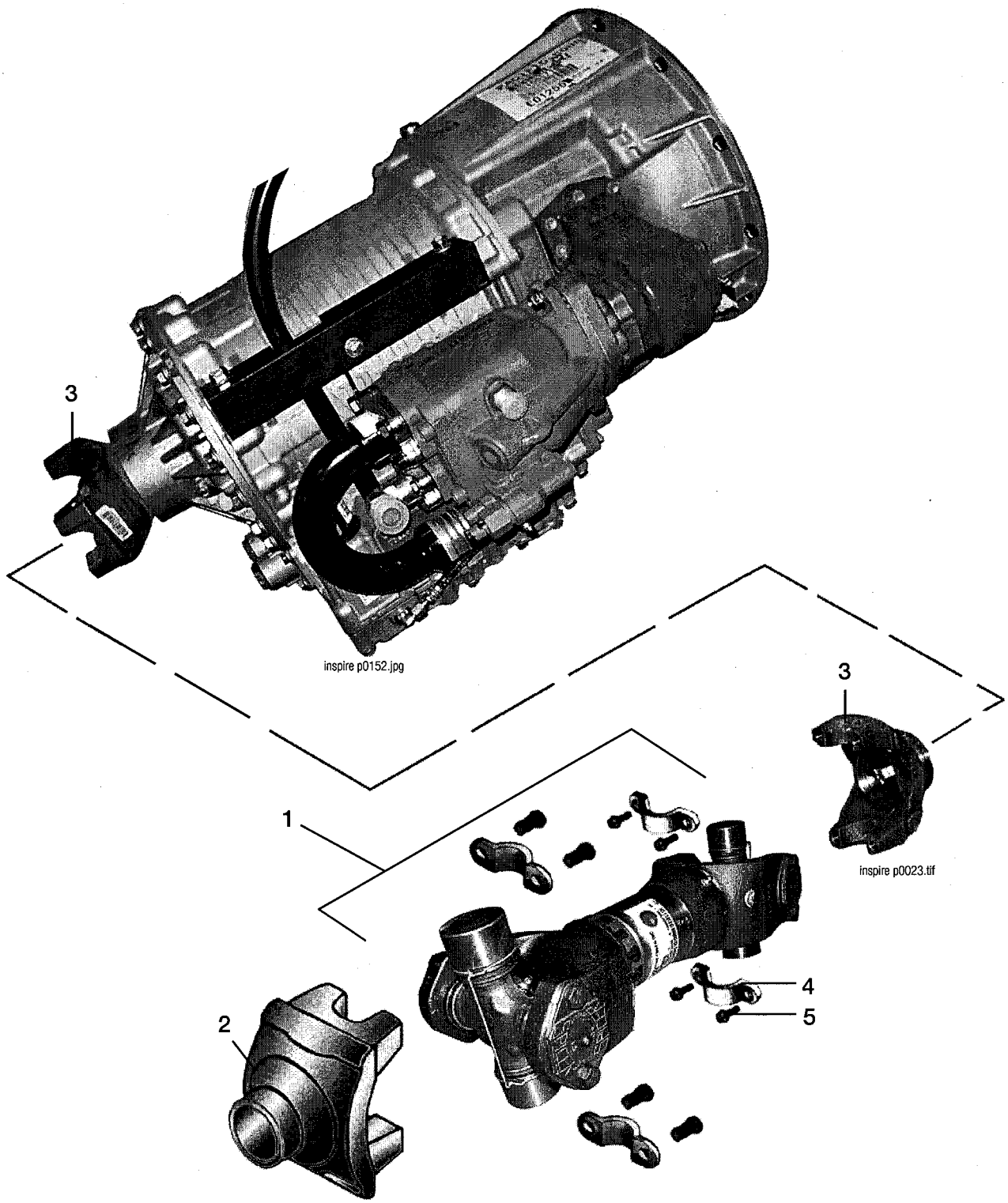
Steering bay

inspire p0167.jpg

THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.

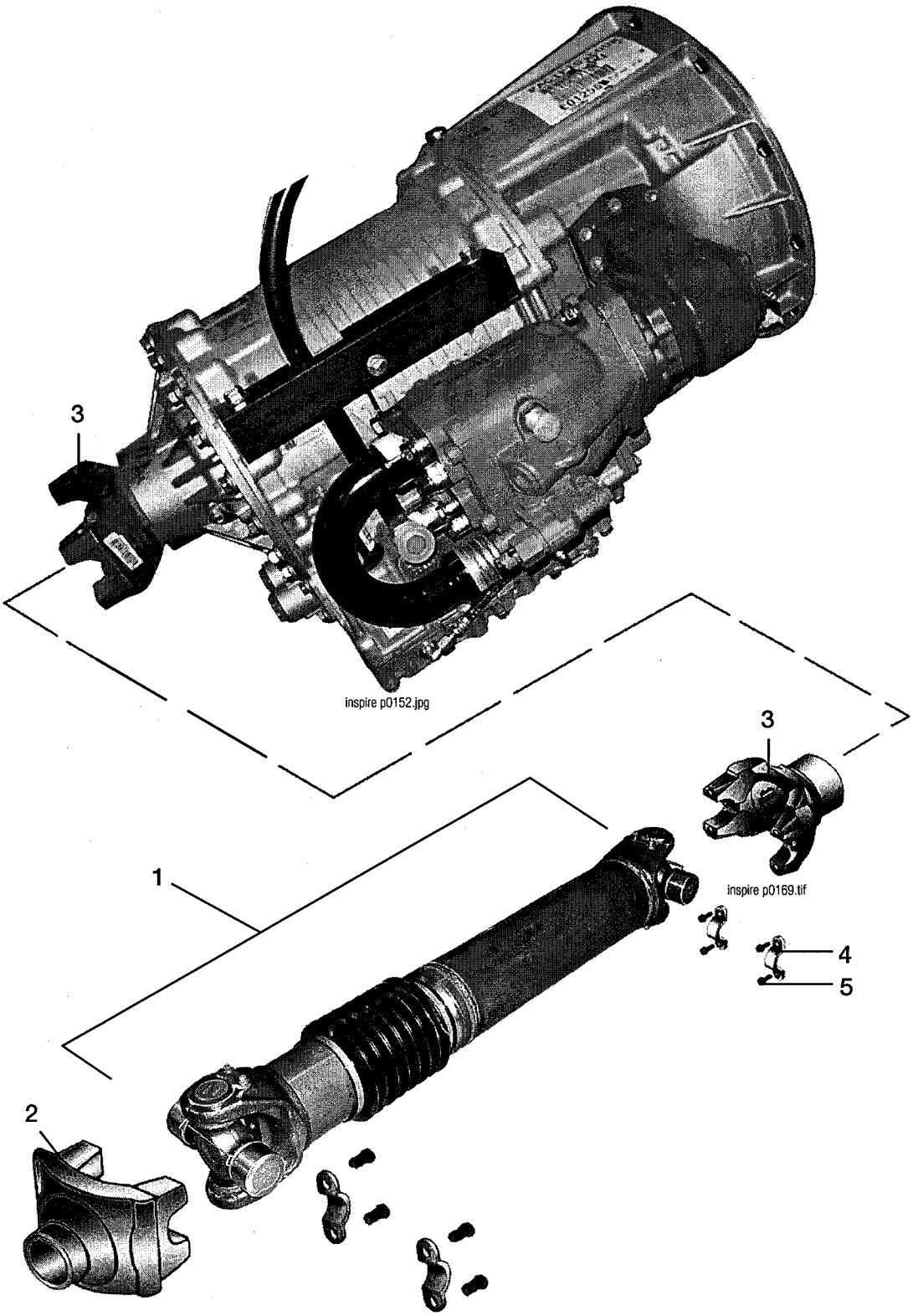
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	02932	relay, 12v: 5 are assembled with the cx28/isl no tag and cx28 tag transmission harness 45160	5
1	02932	relay, 12v: 4 are assembled with the isl tag transmission harness 45407	4

inspire p2-08.xls


3
inspire p0152.jpg
3
inspire p0023.tif
1
2
4
5

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	31543	driveshaft: #1710-series, with u-joints	1
2	45500-7	yoke assembly, 1/2 round: axle end input	1
3	88327-9	yoke assembly, 1/2 round: transmission end, cx28 no tag chassis	1
3	90129-13	yoke assembly: 1/2 round transmission end, 3000 mh no tag chassis	1
4	26776	retainer, bearing	4
5	26777	bolt, driveshaft retainer	8

inspire p2-09.xls

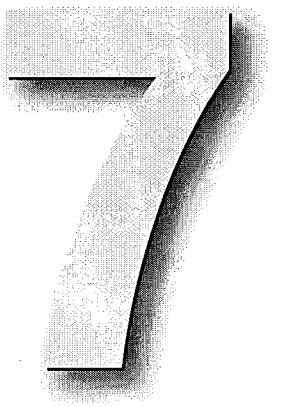

3
inspire p0152.jpg
3
inspire p0169.tif
1
4
5
2

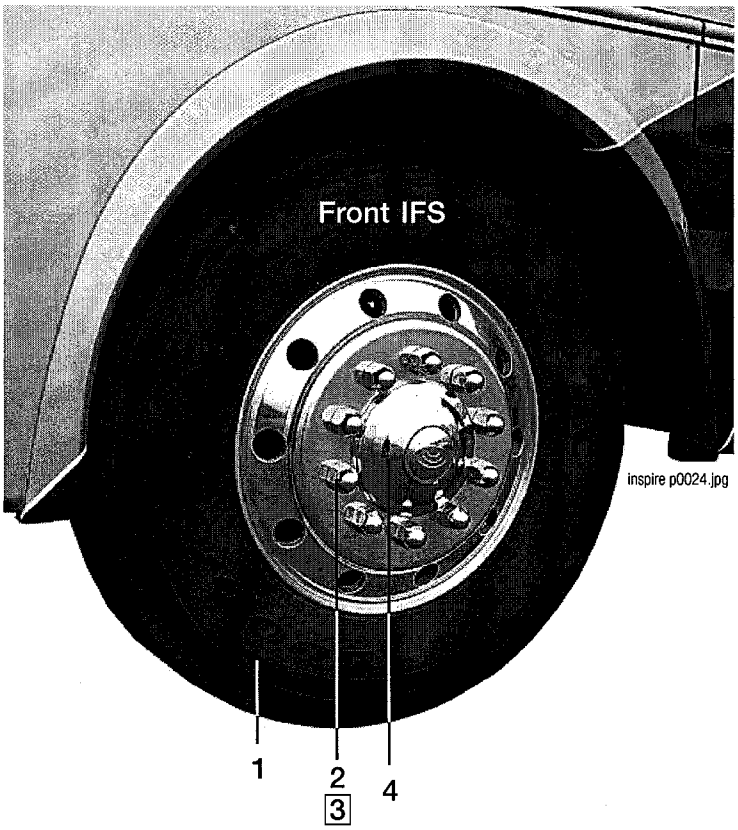
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	45525	driveshaft, cx28: spl 170 series	1
1	26461	driveshaft, 3000 mh: spl 170 series	1
2	93173-7	yoke assembly, 1/2 round: axle end input	1
3	82911-9	yoke assembly: 1/2 round transmission end, cx28 tag chassis	1
3	90350-13	yoke assembly, 1/2 round: transmission end, 3000 mh tag chassis	1
4	26776	retainer, bearing	4
5	26777	bolt, driveshaft retainer	8

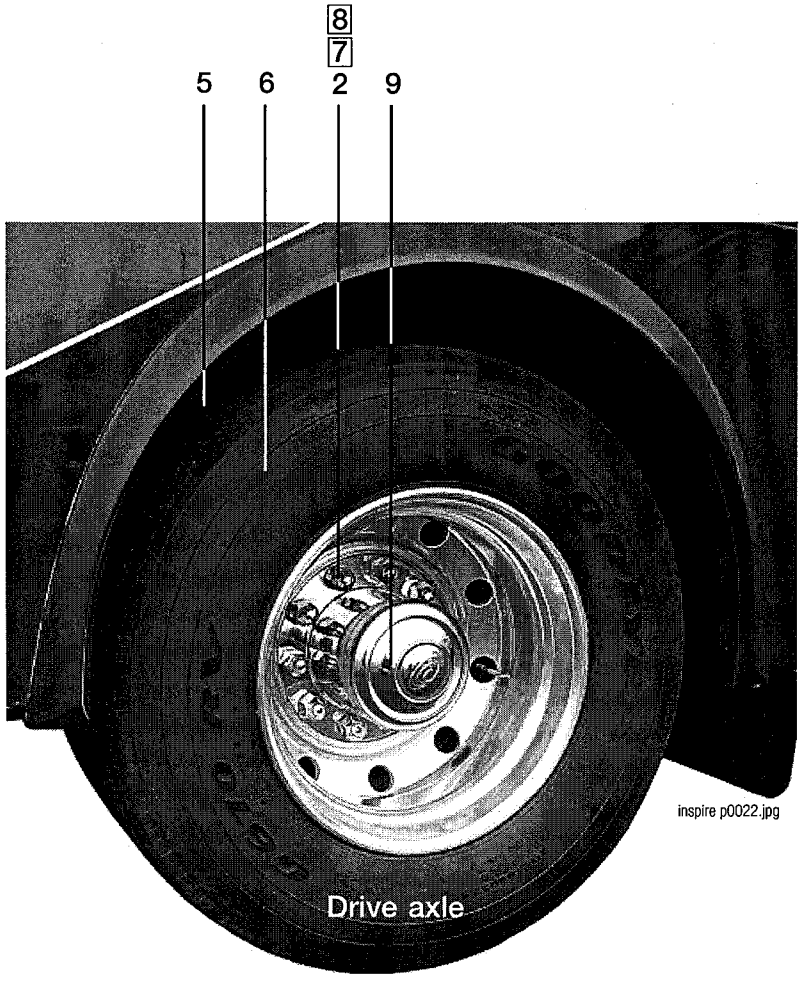
inspire p2-10.xls

Notes:

Axles, Steering, and Suspension Group



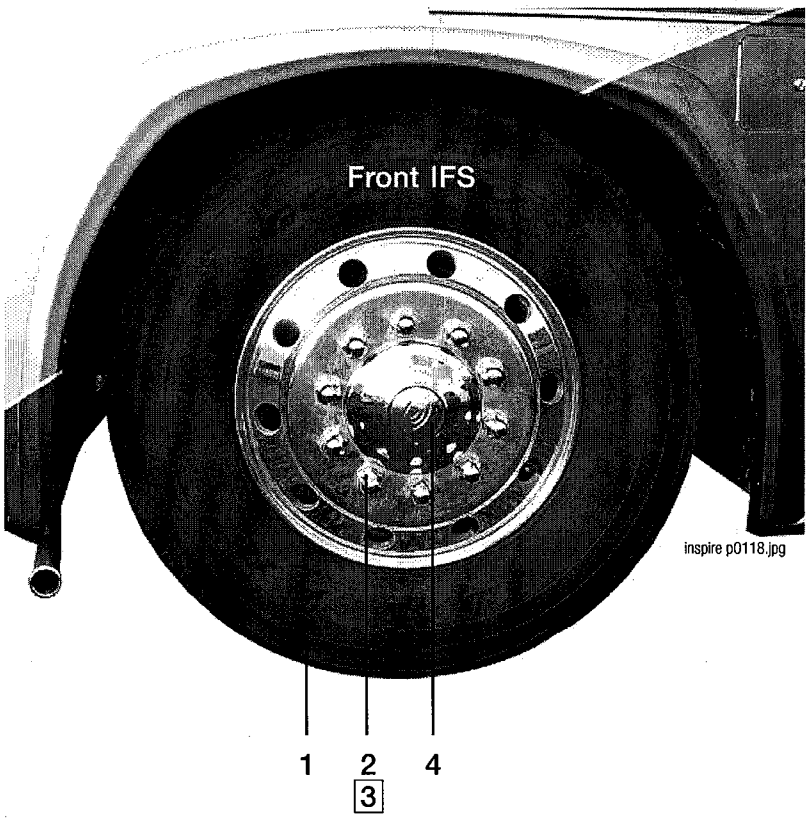

Front IFS
inspire p0024.jpg
1
2
3
4

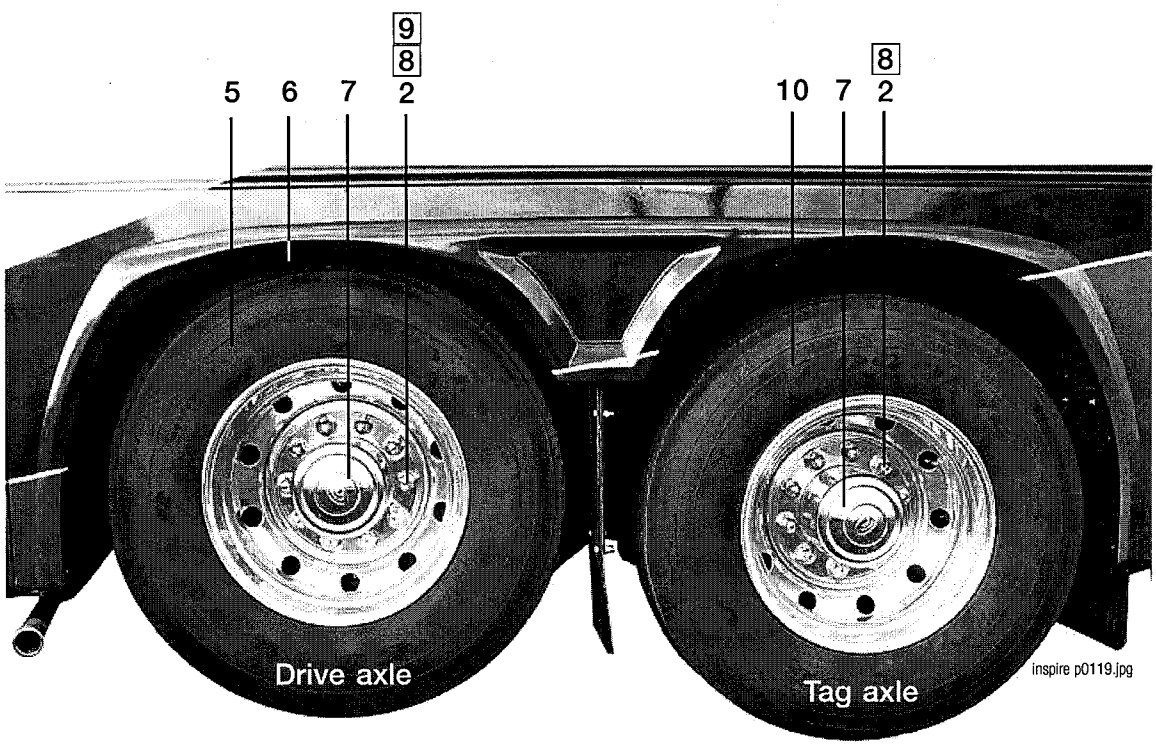

8
7
5
6
2
9
inspire p0022.jpg
Drive axle

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	84170	tire assembly: front polished aluminum wheel, 295/80r x 22.5 tire, valve stem (see note 1)	2
2	16498	cover, lug nut: 1-1/2"	40
3	21494	nut, lug: wheel, left hand (not shown)	10
3	21493	nut, lug: wheel, right hand (not shown)	10
4	81947	hubcap: front steering axle	2
5	83222	tire assembly: rear inner steel, 295/80r tire, valve stem (see note 2)	2
6	83223	tire assembly: outer polished aluminum, 295/80r tire, valve stem (see note 3)	2
7	16502	nut, inner drive wheel: left hand, for aluminum (not shown)	10
7	16503	nut, inner drive wheel: right hand, for aluminum (not shown)	10
8	21189	nut, lug: outer wheel, left hand thread (not shown)	10
8	21188	nut, lug: outer wheel, right hand thread (not shown)	10
9	81948	hubcap: drive axle	2

Note 1: SmarTire II option uses cc#81818
Note 2: SmarTire II option uses cc#46150
Note 3: SmarTire II option uses cc#45161

inspire p3-01.xls

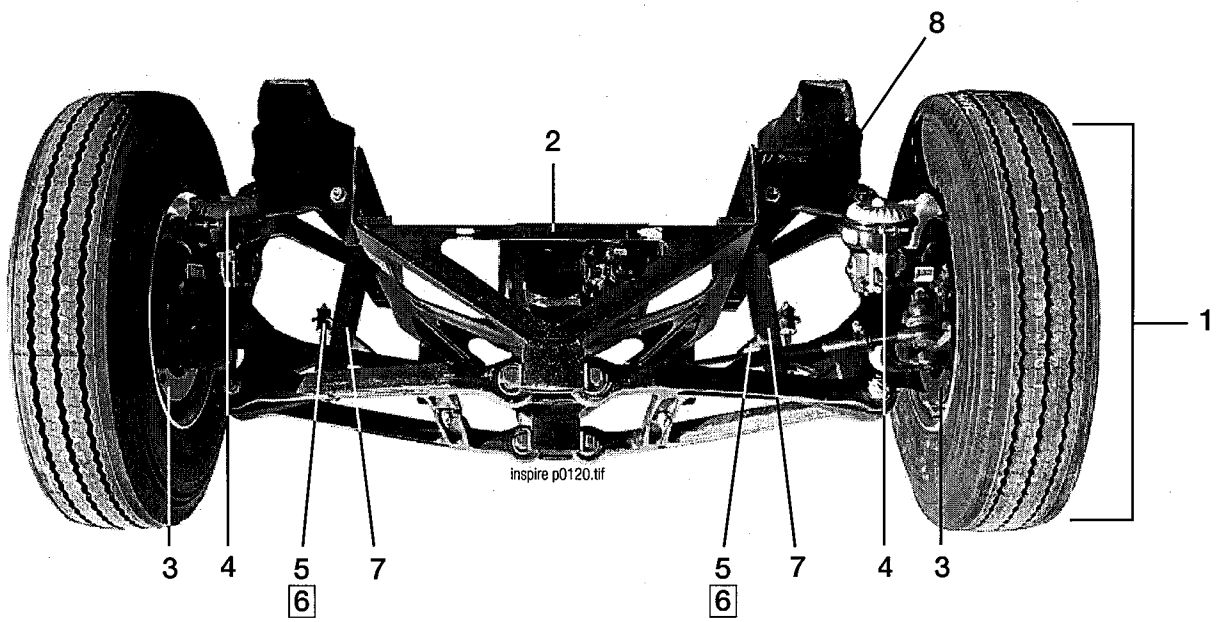

Front IFS
inspire p0118.jpg
1
2
3
4


9
8
5
6
7
2
8
10
7
2
Drive axle
Tag axle
inspire p0119.jpg

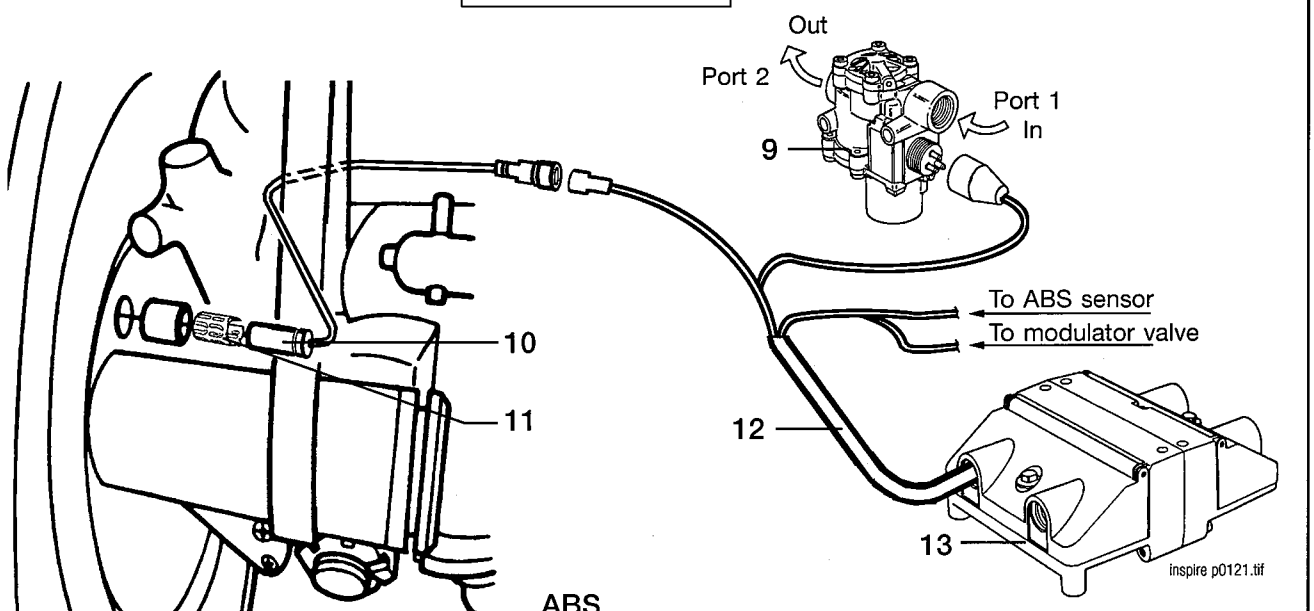
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	84170	tire assembly, front: polished aluminum wheel, 295/80r x 22.5 tire, valve stem (see note 1)	2
2	16498	cover, lug nut: 1-1/2"	60
3	21493	nut, lug: wheel, left hand (not shown)	10
3	21494	nut, lug: wheel, right hand (not shown)	10
4	81947	hubcap, front steering axle	2
5	83223	tire assembly, rear outer: polished aluminum wheel, 295/80r x 22.5, valve stem (see note 2)	2
6	83222	tire assembly, rear inner: steel wheel, 295/80r x 22.5 tire, valve stem (see note 3)	2
7	81948	hubcap, rear drive/tag axle	4
8	19849	nut, flanged: 33mm (hub piloted lug nuts) (not shown)	20
9	16502	nut, inner drive wheel: left hand, for aluminum (not shown)	10
9	16503	nut, inner drive wheel: right hand, for aluminum (not shown)	10
10	81825	tire assembly, rear tag: polished aluminum wheel, 295/80r x 22.5 tire, valve stem (see note 4)	2

Note 1: SmarTire II option uses cc#81818
Note 2: SmarTire II option uses cc#46151
Note 3: SmarTire II option uses cc#46150
Note 4: SmarTire II option uses cc#81826

inspire p3-02.xls



THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.

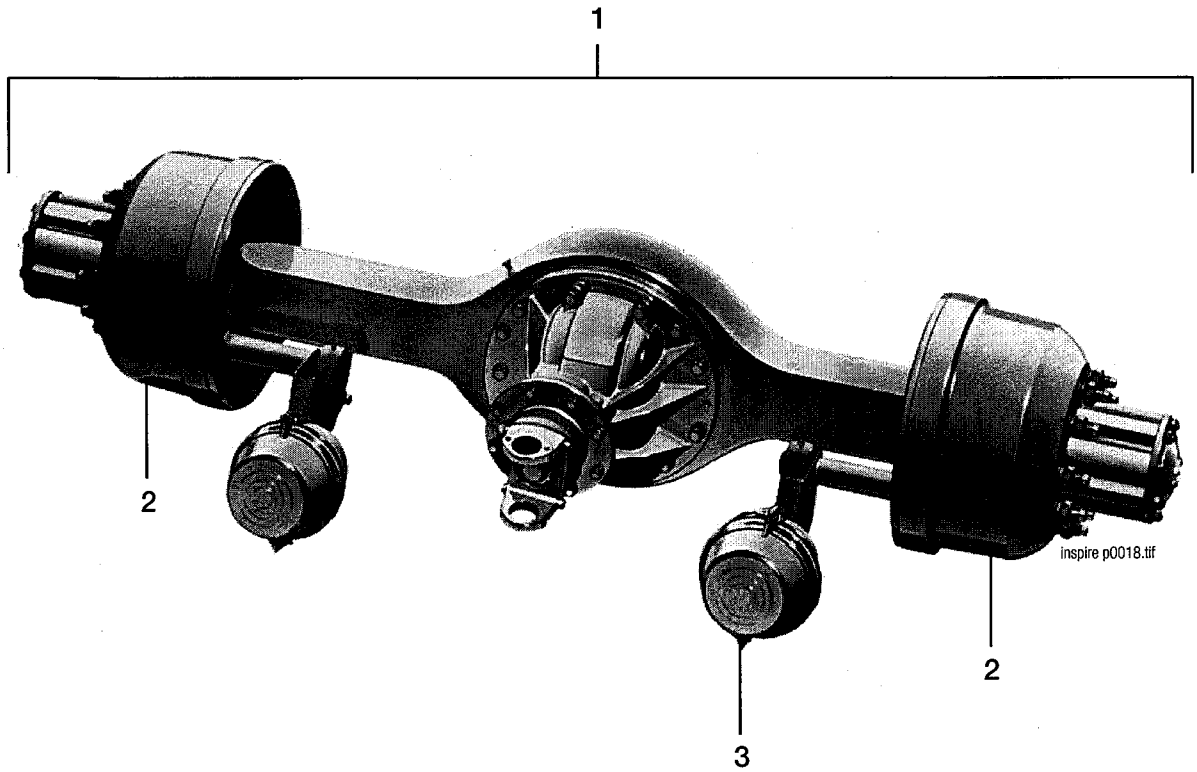


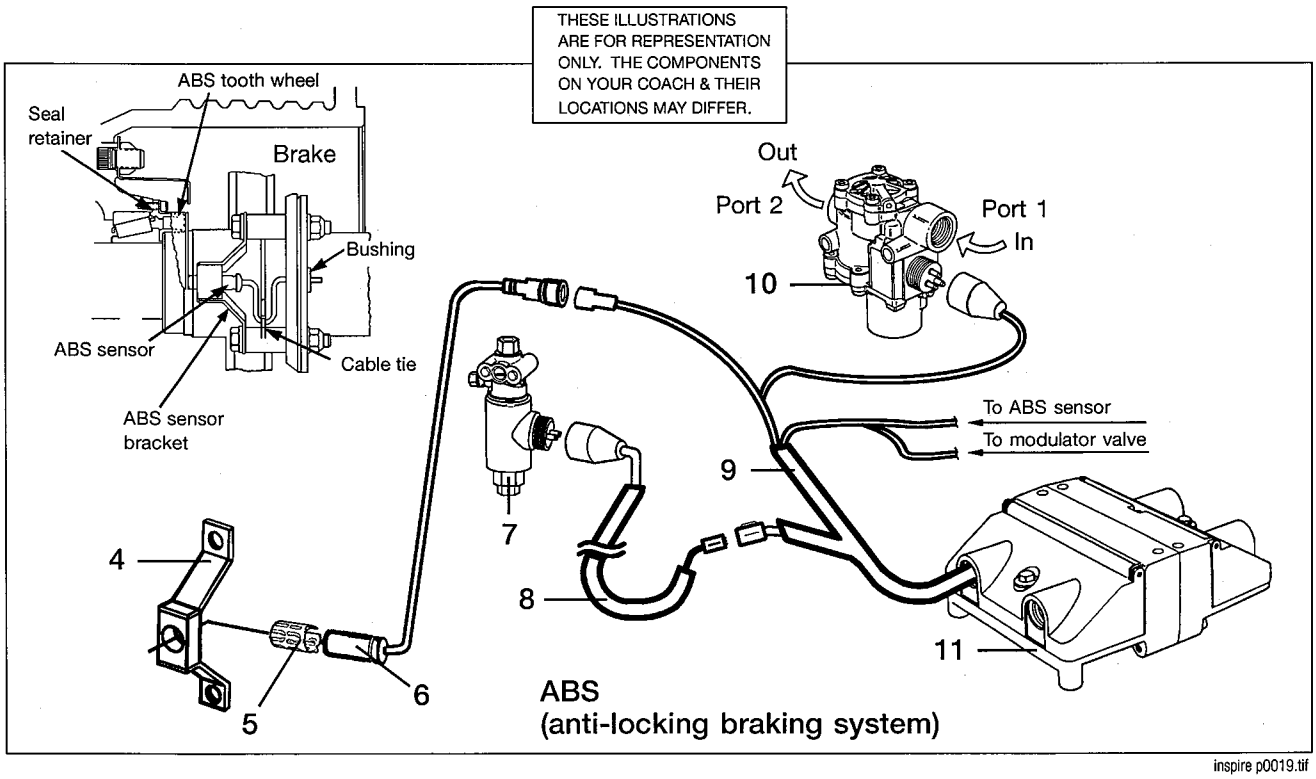
ABS
(anti-locking braking system)

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	93989	suspension, independent front (all parts starting with 93989)	1
2	93989-1	sub-frame assembly	1
3	93989-2	hub and drum assembly, right hand: 16.5 x 5	1
3	93989-3	hub and drum assembly, left hand: 16.5 x 5	1
4	93989-4	brake chamber, front: 20, s-cam	2
5	93989-5	anti-sway bar	1
6	93989-6	anti-sway bar assemby kit	1
7	82899	shock absorber	2
8	93989-7	spring, air	2
9	83295	valve, abs modulator: 12v din (see note 1)	2
10	18989	sensor, abs: with socket	2
11	18988	clip, abs sensor	1
12	84698	harness, abs: front axle, din connector (see note 1)	1
13	27947	ecu (electronic control unit), abs e frame: 4s4m, 12v (see note 1)	1

Note 1: All axles use a common atc valve harness, atc valve, rear axle harness and front axle harness. Each axle has two abs modulator valves (6 total).

inspire p3-03.xls

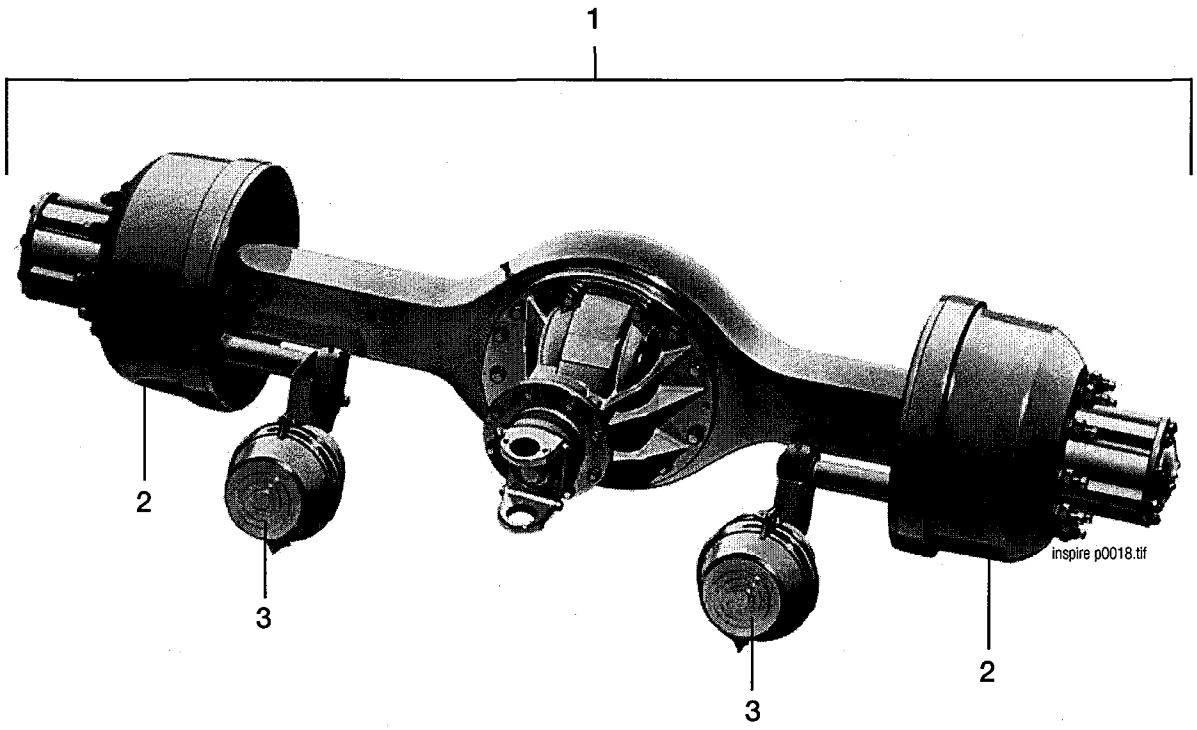

1
2
2
3
inspire p0018.tif

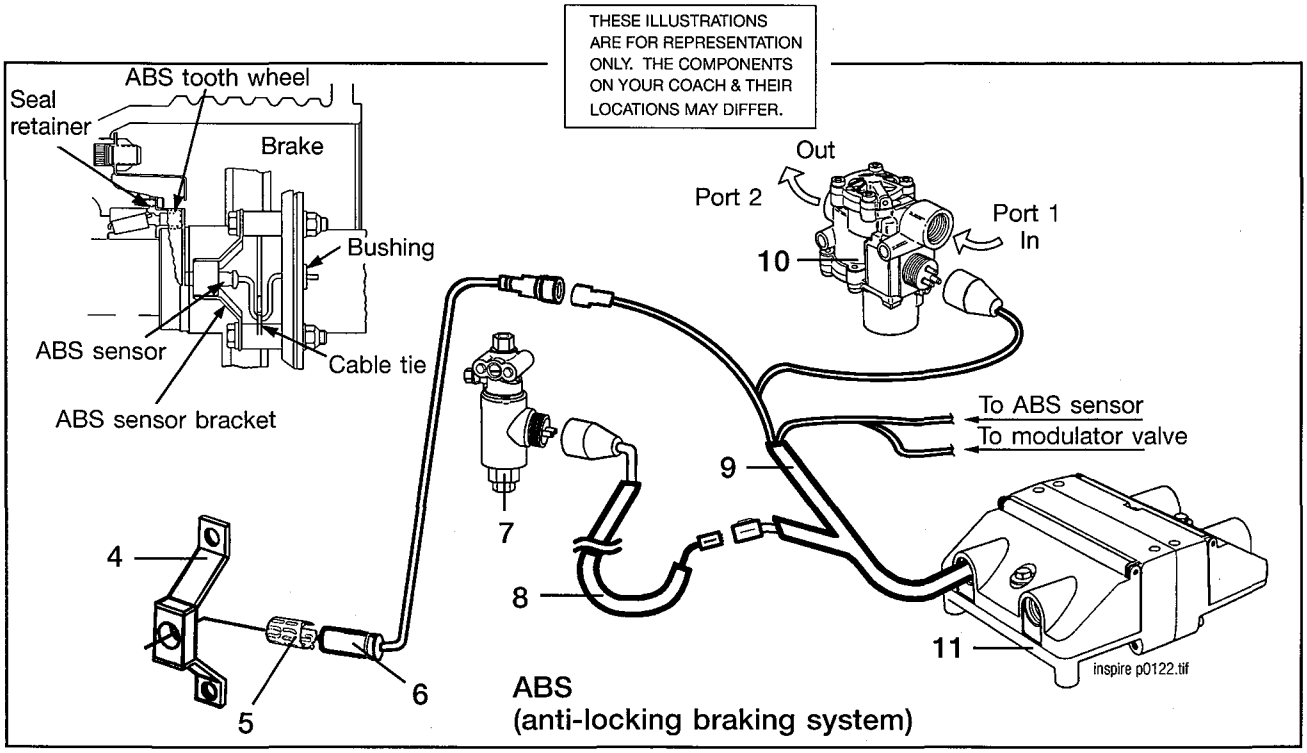

THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.
ABS tooth wheel
Seal retainer
Brake
Bushing
ABS sensor
Cable tie
ABS sensor bracket
Out
Port 2
Port 1
In
10
To ABS sensor
To modulator valve
9
7
8
11
4
5
6
ABS
(anti-locking braking system)
inspire p0019.tif

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	45500	axle assembly, rear (all parts starting with 45500)	1
2	45500-1	hub and drum assembly: left hand	1
2	45500-2	hub and drum assembly: right hand	1
3	45500-3	brake chamber, rear: 30/36	2
4	45500-4	bracket, abs sensor	2
5	45500-5	clip, abs sensor	2
6	45500-6	sensor, abs: with socket	2
7	83296	valve, abs atc: 12v din (see note 1)	1
8	84700	harness, abs: atc valve, din connector (see note 1)	1
9	84699	harness, abs: rear axle, din connector (see note 1)	1
10	83295	valve, abs modulator: 12v din (see note 1)	2
11	27947	ecu (electronic control unit), abs e-frame: 4s4m, 12v (see note 1)	1

Note 1: The two axles use a common atc valve harness, atc valve, and ecu.
Each axle has two abs modulator valves (4 total).

inspire p3-04.xls

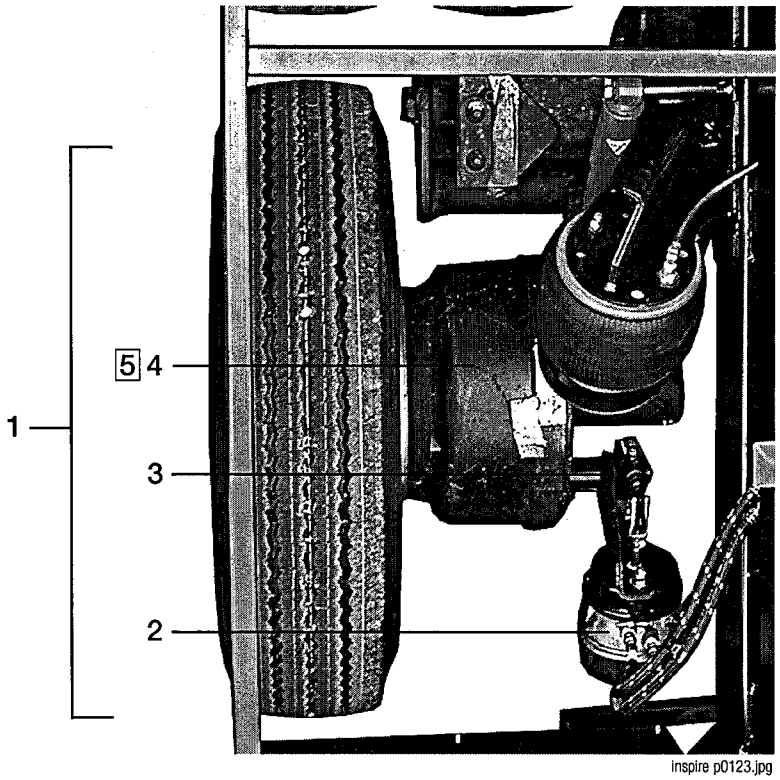

1
2
3
2
3
inspire p0018.tif


THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.
ABS tooth wheel
Seal retainer
Brake
Bushing
ABS sensor
Cable tie
ABS sensor bracket
Out
Port 2
Port 1
In
10
To ABS sensor
To modulator valve
9
7
8
4
5
6
11
inspire p0122.tif
ABS
(anti-locking braking system)

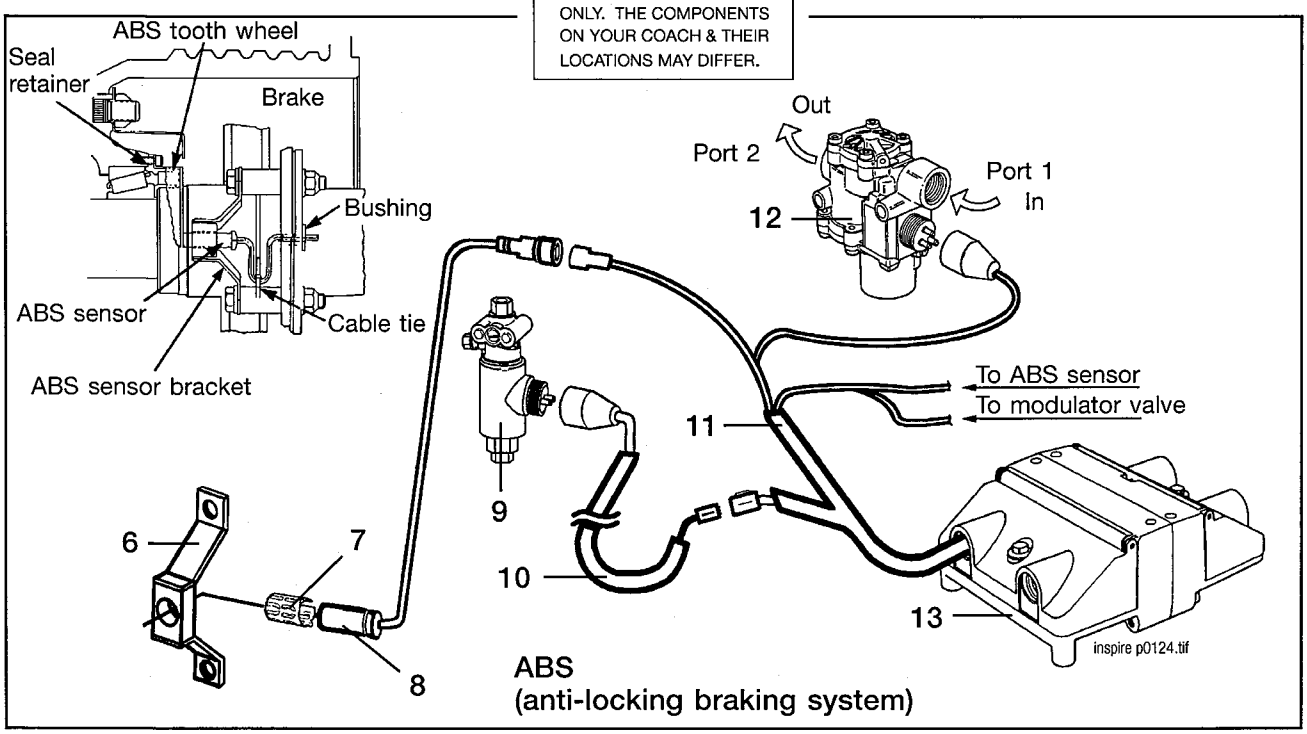
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	93173	axle assembly, rear (all parts starting with 93173)	1
2	93173-1	hub and drum assembly: left hand	1
2	93173-2	hub and drum assembly: right hand	1
3	93173-6	brake chamber, rear: 30/36	2
4	93173-3	bracket, abs sensor	2
5	93173-4	clip, abs sensor	2
6	93173-5	sensor, abs: with socket	2
7	83296	valve, abs atc: 12v din (see note 1)	1
8	84700	harness, abs atc valve: din connector (see note 1)	1
9	84701	harness, abs: rear axle, din connector, 6s/6m (see note 1)	1
10	83295	valve, abs modulator: 12v din (see note 1)	2
11	27948	ecu (electronic control unit): abs e-frame, 6s/6m, 12v, j1939 (see note 1)	1

Note 1: All axles use a common atc valve harness, atc valve, rear axle harness and front axle harness.
Each axle has two abs modulator valves (6 total).

inspire p3-05.xls



THESE ILLUSTRATIONS ARE FOR REPRESENTATION ONLY. THE COMPONENTS ON YOUR COACH & THEIR LOCATIONS MAY DIFFER.

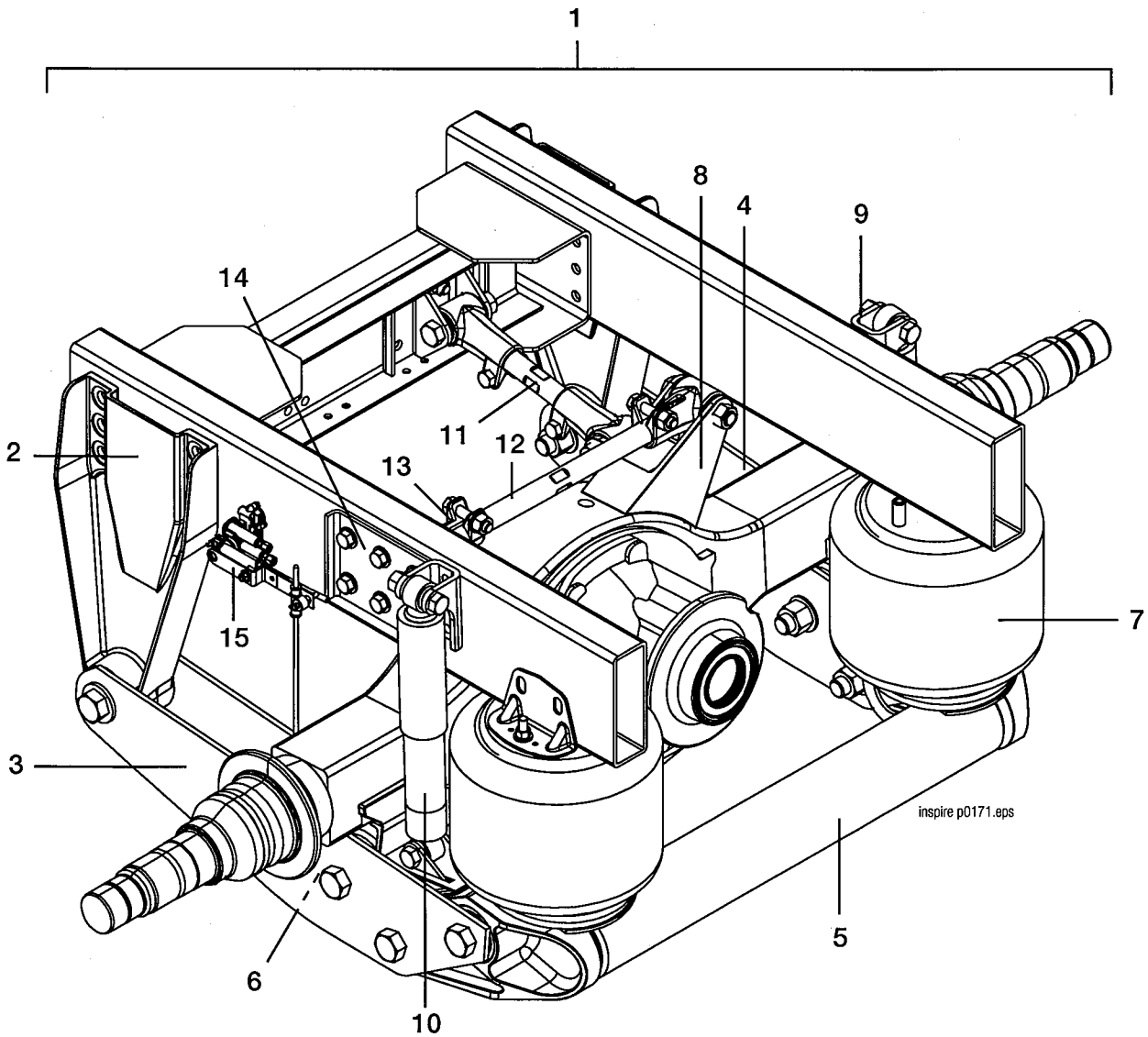


ABS
(anti-locking braking system)

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	37817	axle, tag (all parts starting with 37817)	1
2	20635	brake chamber, tag: 20/24	2
3	37817-1	adjuster, slack: left and right	2
4	37817-2	hub assembly: left and right	2
5	37817-3	brake assembly: left and right (not shown)	2
6	37817-4	bracket, abs sensor	2
7	37817-5	clip, abs sensor	2
8	37817-6	sensor with socket, abs	2
9	83296	valve, abs atc: 12v din (see note 1)	1
10	84700	harness, abs atc valve: din connector (see note 1)	1
11	84702	harness: abs tag axle, din connector (see note 1)	1
12	83295	valve, abs modulator: 12v din (see note 1)	2
13	27948	ecu (electronic control unit): abs e-frame, 6s/6m, 12v, j1939 (see note 1)	1

Note 1: All axles use a common atc valve harness, atc valve, rear axle harness and front axle harness. Each axle has two abs modulator valves (6 total).

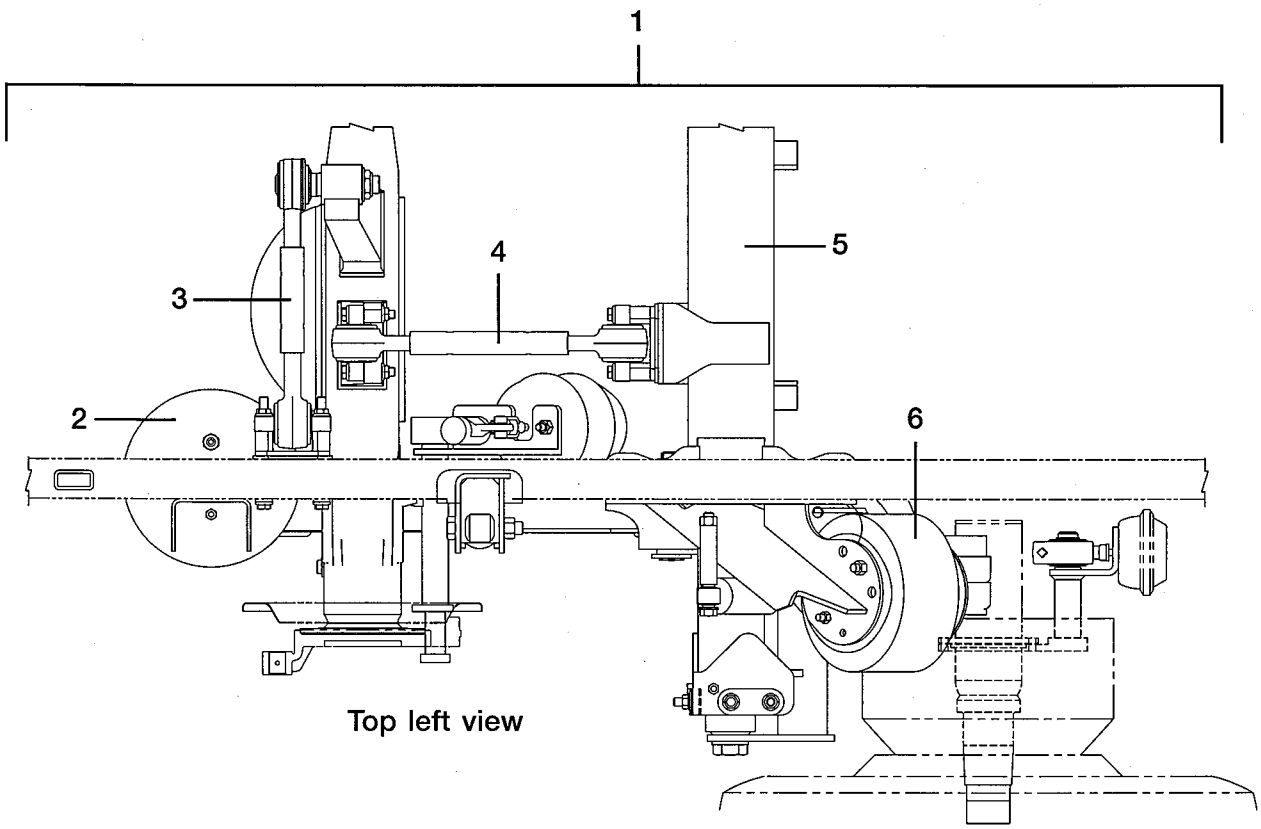
inspire p3-06.xls



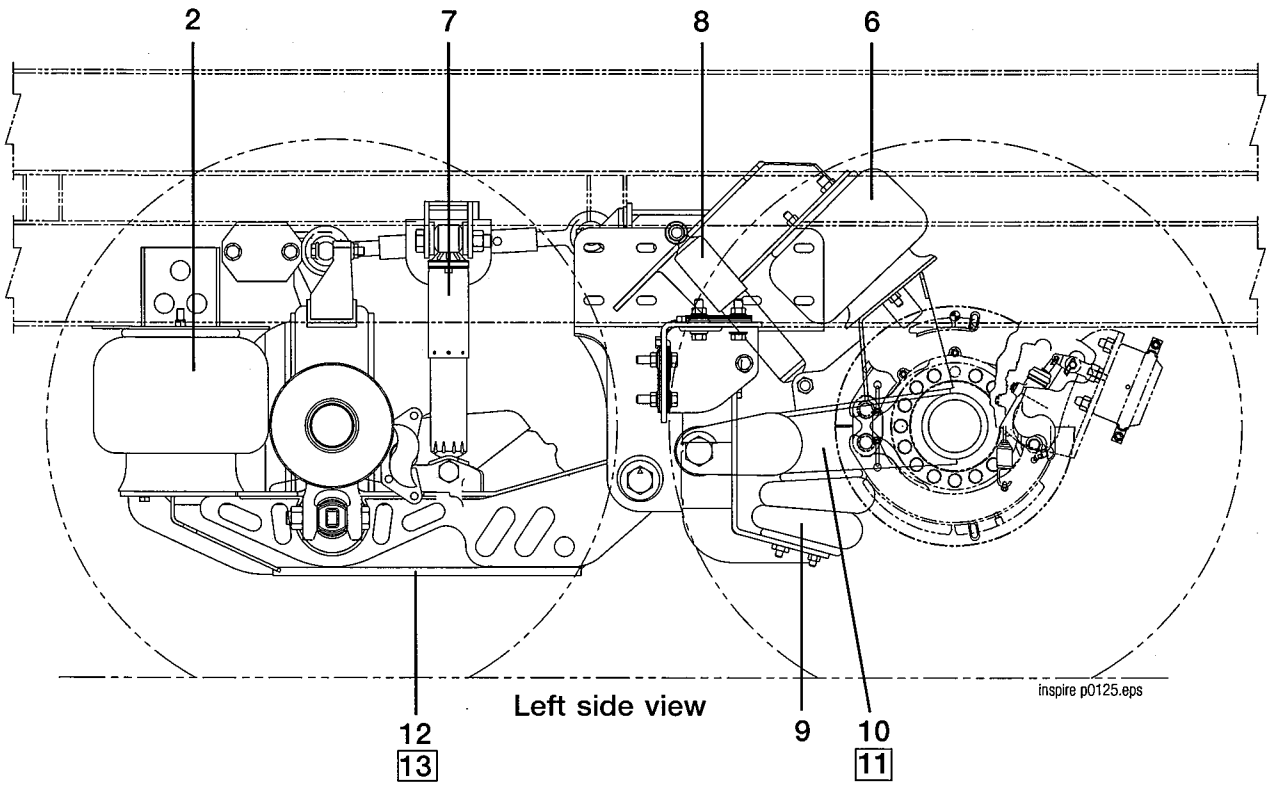
Rear Suspension Components: No Tag

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	89053	suspension, rear, air control assembly, adl-123	1
2	89053-1	bracket, frame assembly	2
3	89053-2	beam, equalizing: adjustable	2
4	89053-3	beam, equalizing: fixed	2
5	89053-4	beam, transverse	1
6	89053-5	adapter axle (not shown)	2
7	89053-6	spring, air	2
8	89053-7	control arm, axle bracket	1
9	89053-8	bracket, upper shock	2
10	89053-9	shock absorber	2
11	89053-10	rod, track: adjustable	1
12	89053-11	rod, torque: adjustable	1
13	89053-12	bracket, track bar frame	2
14	89053-13	plate, reinforcement	1
15	82850	valve, height control	1

inspire p3-03.xls



Top left view

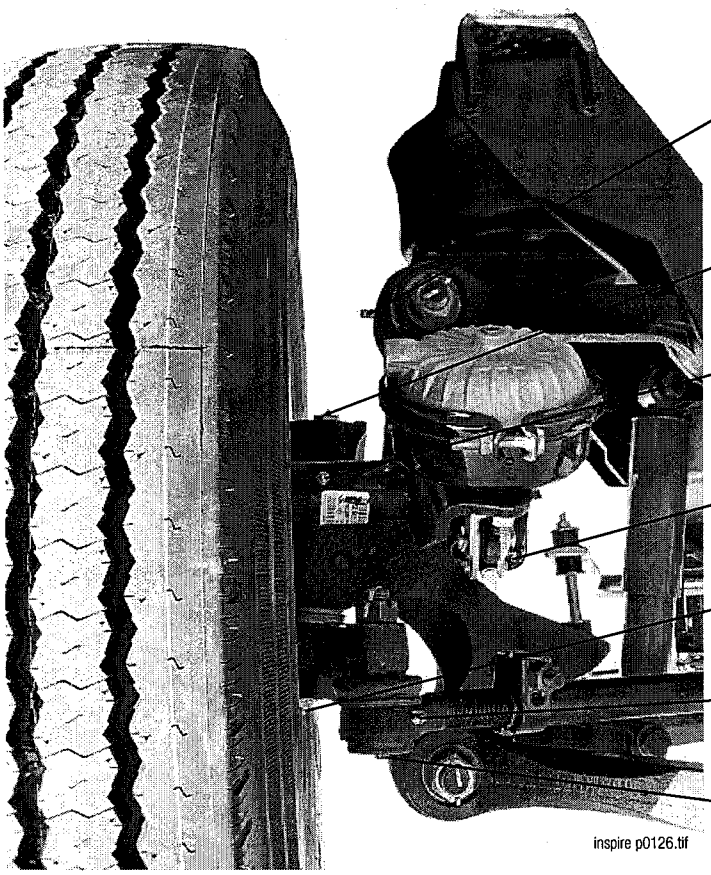


Left side view

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	93176	suspension, air assembly: radt-246 (all parts starting with 93176)	1
2	93176-1	spring, air	2
3	93176-2	pin, anti-sway bar	1
4	93176-3	pin, torque rod	1
5	93176-4	bolster assembly	1
6	93176-5	spring, air	2
7	82905	shock absorber: drive axle	2
8	82902	shock absorber: tag axle	2
9	93176-6	spring, air	2
10	93176-7	axle, stub: left lower beam assembly	1
11	93176-8	axle, stub: right lower beam assembly (not shown)	1
12	93176-9	beam assembly: lower left half	1
13	93176-10	beam assembly: lower right half (not shown)	1

inspire p3-08.xls

Independent front suspension



1 Part of knuckle assembly

1 Part of knuckle assembly

1 Camshaft tube

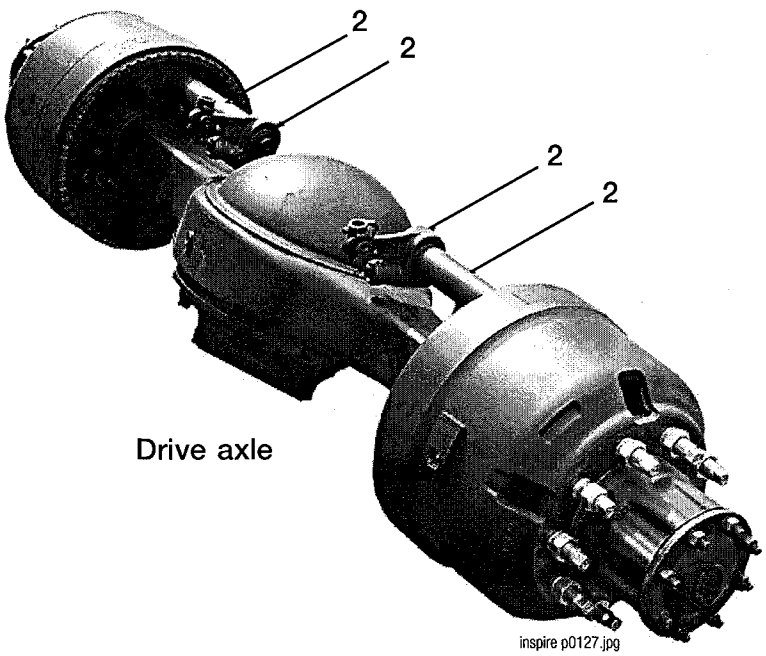
1 Brake slack adjuster/camshaft tube

1 Part of knuckle assembly

1 Drag link (one on each end)

1 Part of knuckle assembly

Front view passenger side

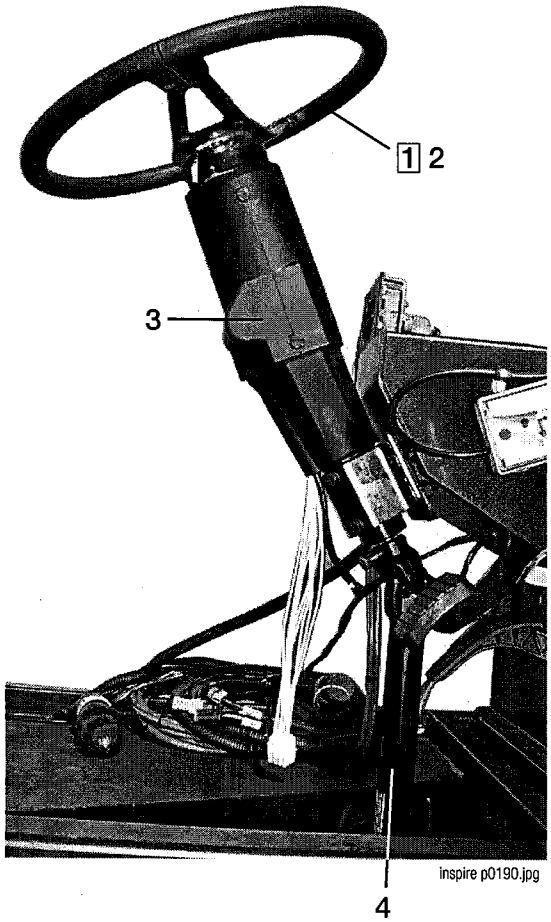


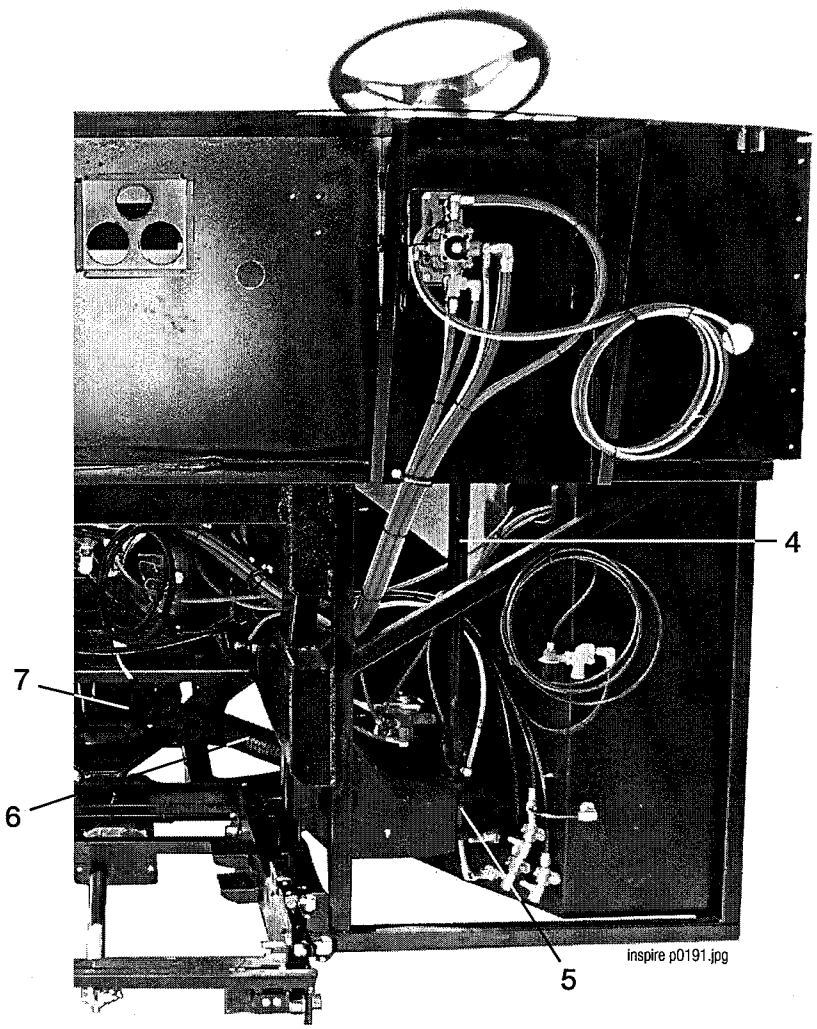
Drive axle

Note: Tag axle grease fitting locations are same as the rear axle

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	16325	fitting, grease: 1/8" pipe thread, 90°, independent front suspension	16
2	16325	fitting, grease: 1/8" pipe thread, 90°, rear axle	4
2	16325	fitting, grease: 1/8" pipe thread, 90°, tag axle (not shown, same as rear axle)	4

inspire p3-09.xls





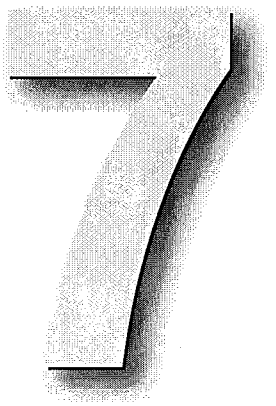
Steering Components

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	40497	hub, steering wheel (not shown)	1
2	40495	wheel, steering: without hub, 18" leather wrapped	1
3	25576	steering column: tilt and telescopic, with clock spring	1
4	20442	shaft, steering (steering column to mitre box)	1
5	34157	gear box, steering (mitre box)	1
6	87823	shaft, steering (mitre box to steering gear)	1
7	93989-8	steering gear assembly	1

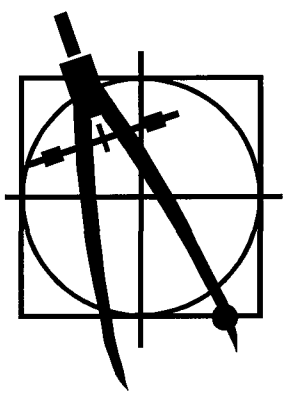
inspire p3-10.xls

Notes:

Air System Group



See the Coach Information Kit for schematics of the air (pneumatic) system



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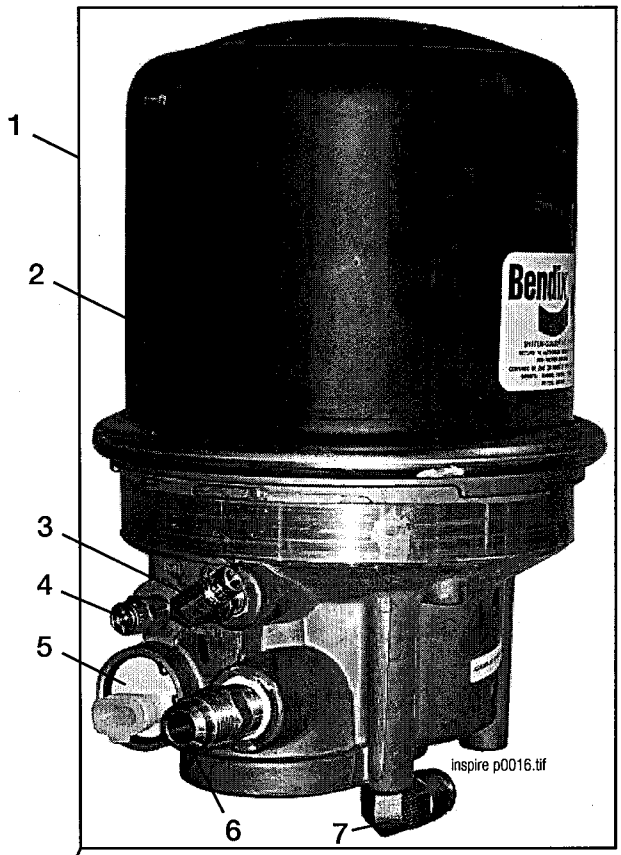
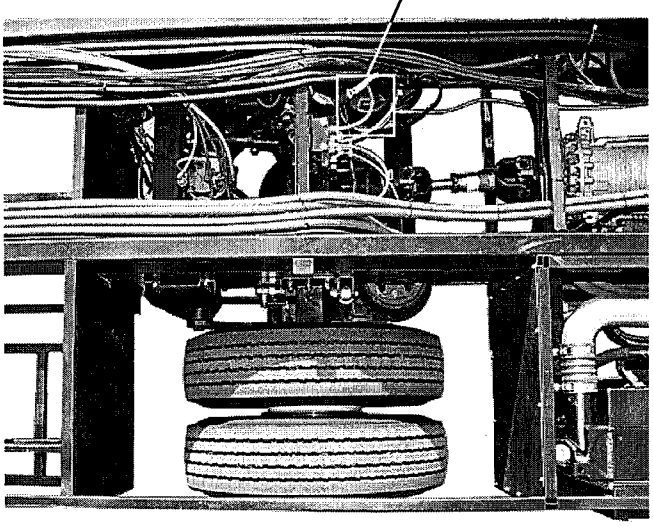
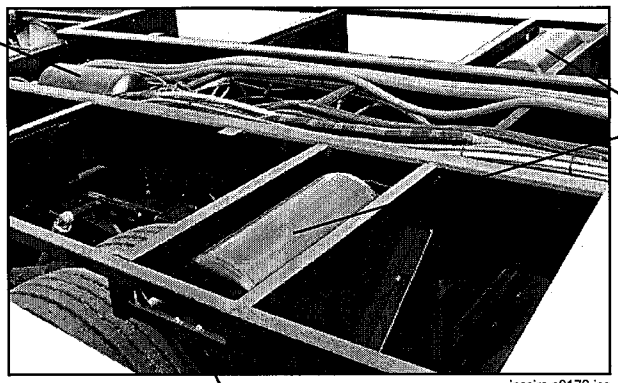



tribute p0160.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	21499	air dryer assembly: 12 volt, 75 watt	1
2	21499-1	cartridge, desiccant	1
3	24315	fitting: 1/4" tbx x 1/4" mp, 90° elbow pmt	1
4	21499-2	valve, safety	1
5	21499-3	element, heater	1
6	15823	fitting: 5/8" x 1/2" straight male flared sae	1
7	27224	fitting: 5/8" tb x 1/2" mp, 90° elbow pmtns	1

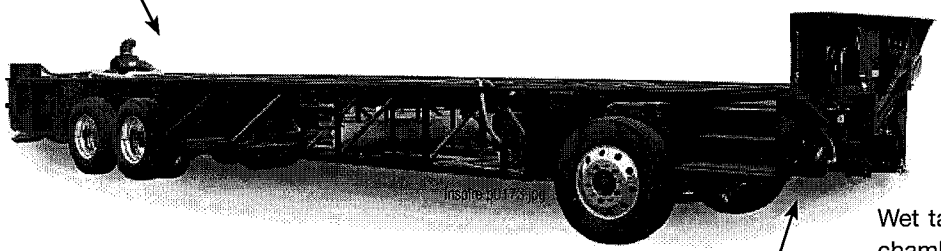
inspire p4-02.xls

2
Rear brakes air tank (dry)

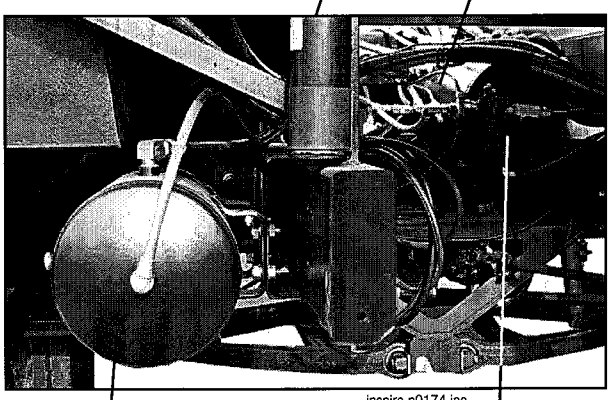


inspire p0172.jpg

3
Front & rear suspension air tanks (wet)



Wet tank (rear chamber)



inspire p0174.jpg

2
Front brakes air tank (dry)

1
Front & rear brake air supply tank (dry) (front chamber)

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	33523	tank, air reservoir: dual chamber, 9.66" diameter	1
2	33524	tank, air reservoir: 9.66" diameter	2
3	27618	tank, air reservoir: single 9.5" diameter	2

inspire p4-03.xls

Notes:

Hydraulic System Group

Not available at this time

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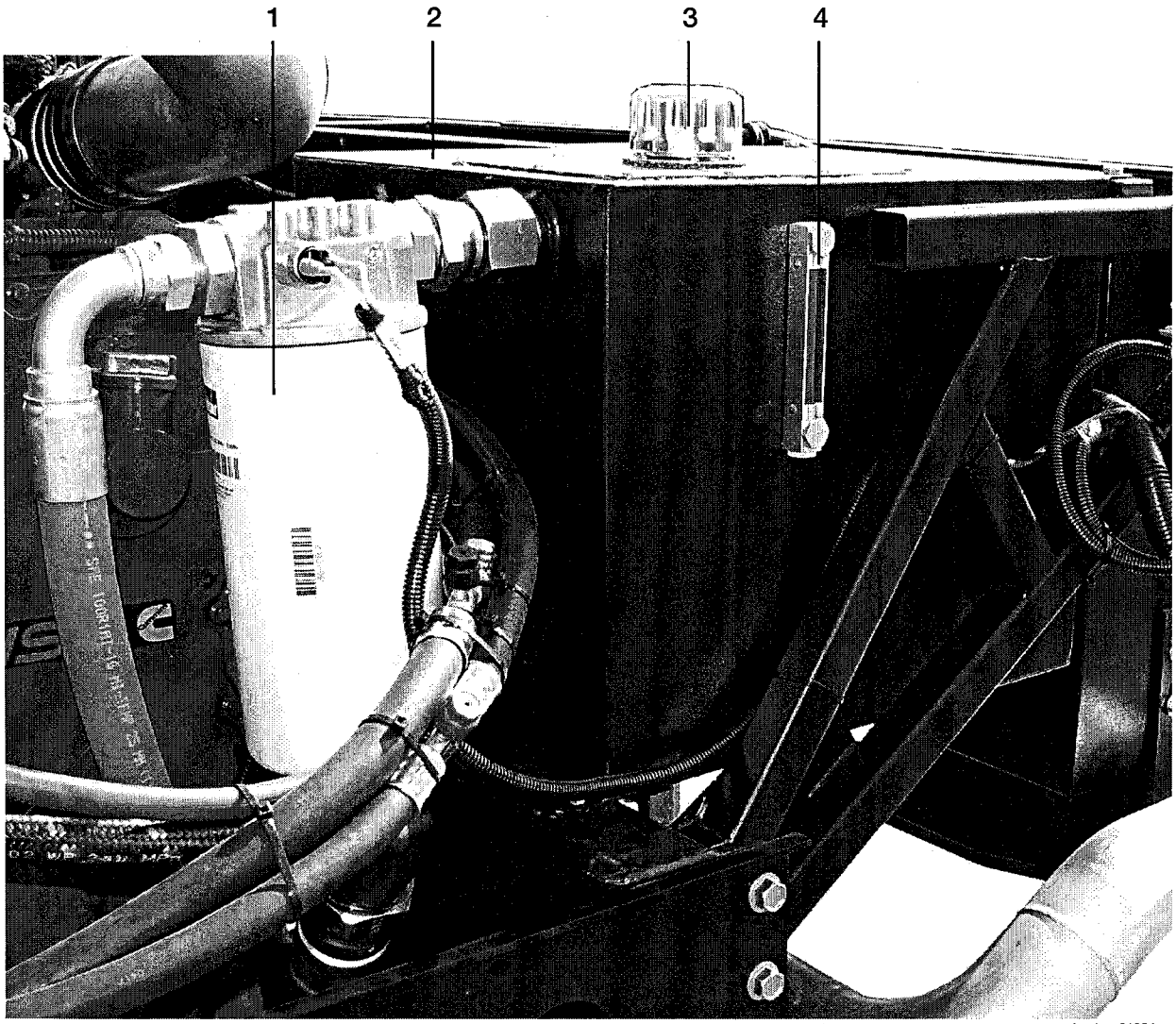


inspire p0195.jpg

Located in engine bay

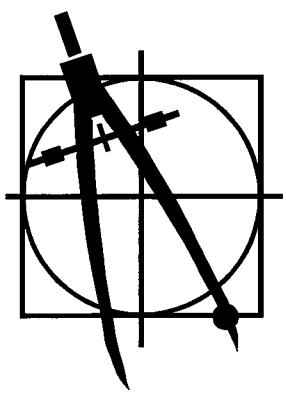
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	90097	filter, hydraulic fluid	1
2	89689	reservoir, hydraulic	1
3	82028	filler breather: top mount assembly	1
4	82029	sight glass level assembly	1

inspire p5-03.xls

Notes:

Electrical System Group

See the Coach Information Kit for schematics of the electrical system



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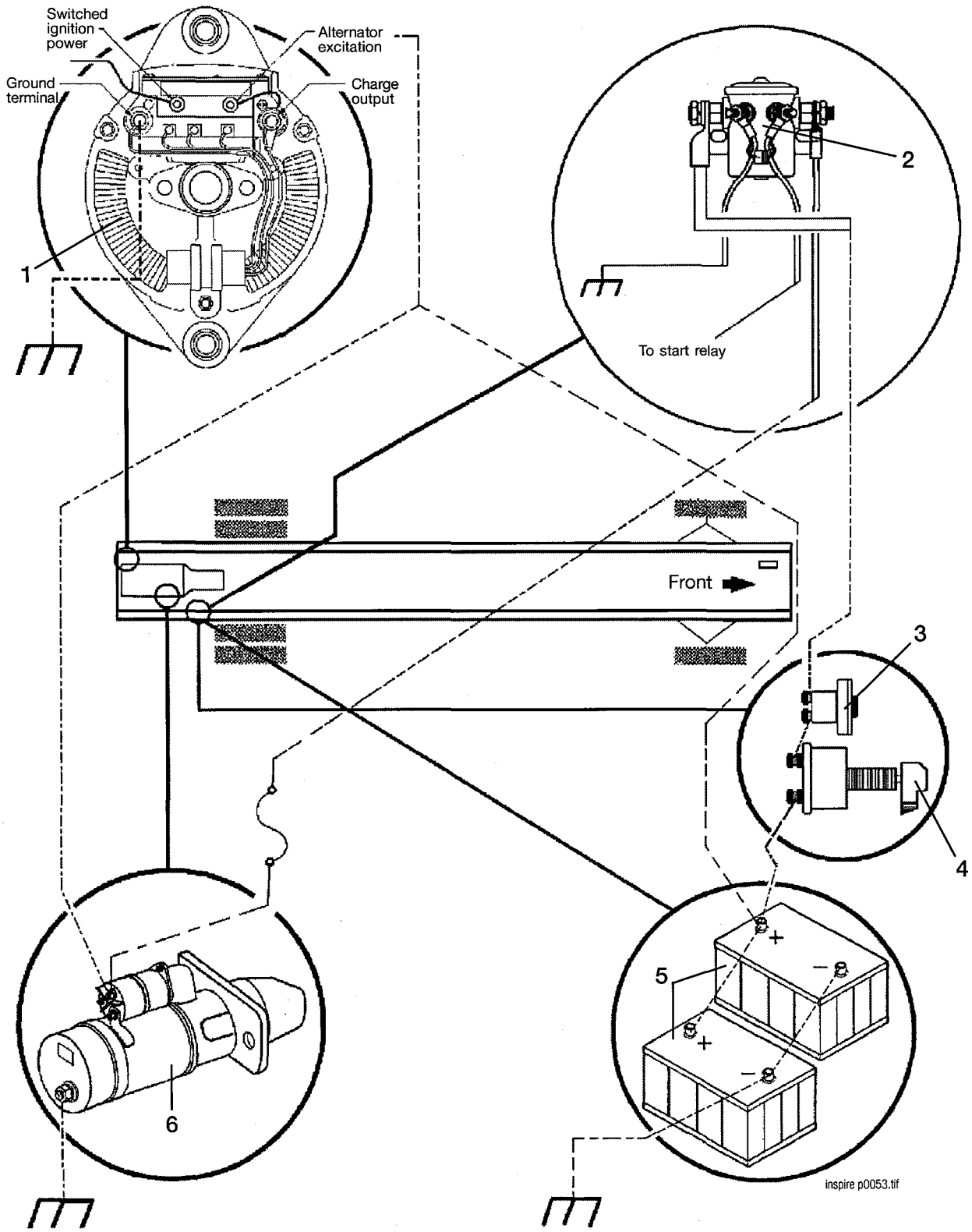
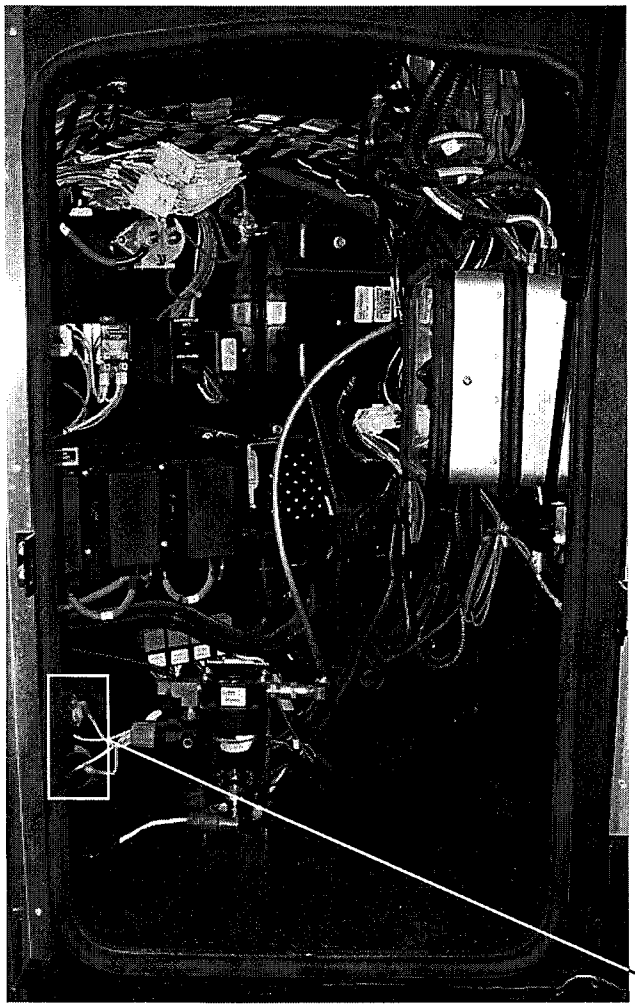

Switched ignition power
Alternator excitation
Ground terminal
Charge output
1
2
To start relay
Front
3
4
5
6
inspire p0053.tif

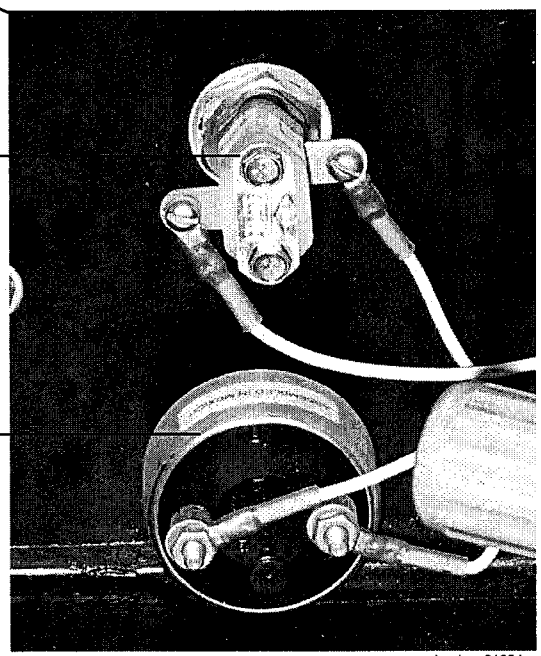
Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	36859	alternator: 160 amp, 12 volt	1
2	33464	solenoid, battery boost: 100 amp, 12 volt	1
3	17756	breaker, circuit: starter solenoid, manual reset, 60 amp, 12 volt	1
4	02559	switch, master disconnect	1
5	38560	battery, group 31: 12v, 925 cold crank amps	2
6	86045-10	motor, starting	1
6	88401-5	motor, starting	1

inspire p6-01.xls



Steering bay

inspire p0167.jpg



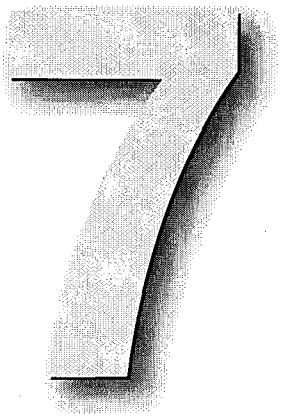
inspire p0168.jpg

Item No.	Country Coach Part No.	Description of Part	Qty. Req.
1	15430	indicator, low pressure: lp-3	1
2	15431	switch, stop light: sl-5	1

inspire p6-02.xls

Notes:

Parts Reference



Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.95	6	89053-5	adapter axle (not shown)	2
7.93	3	37817-1	adjuster, slack: left and right	2
7.43	9	15469	air cleaner assembly	1
7.45	10	15469	air cleaner assembly	1
7.107	1	21499	air dryer assembly: 12 volt, 75 watt	1
7.127	1	36859	alternator: 160 amp, 12 volt	1
7.39	3	36859	alternator: 160 amp, 12 volt	1
7.41	13	36859	alternator: 160 amp, 12 volt	1
7.87	5	93989-5	anti-sway bar	1
7.87	6	93989-6	anti-sway bar assemby kit	1
7.89	1	45500	axle assembly, rear (all parts starting with 45500)	1
7.91	1	93173	axle assembly, rear (all parts starting with 93173)	1
7.97	10	93176-7	axle, stub: left lower beam assembly	1
7.97	11	93176-8	axle, stub: right lower beam assembly (not shown)	1
7.93	1	37817	axle, tag (all parts starting with 37817)	1
7.127	5	38560	battery, group 31: 12v, 925 cold crank amps	2
7.97	12	93176-9	beam assembly: lower left half	1
7.97	13	93176-10	beam assembly: lower right half (not shown)	1
7.95	3	89053-2	beam, equalizing: adjustable	2
7.95	4	89053-3	beam, equalizing: fixed	2
7.95	5	89053-4	beam, transverse	1
7.39	7	86045-4	belt, serpentine	1
7.41	10	88401-7	belt, serpentine	1
7.97	5	93176-4	bolster assembly	1
7.67	3*	ref.	bolt (see kits 90129-10 and 90350-10)	1
7.77	5	26777	bolt, driveshaft retainer	8
7.79	5	26777	bolt, driveshaft retainer	8
7.63	8	90129-6	bolt: m10 x 1-1/2 x 55mm	12
7.63	8	90350-6	bolt: m10 x 1-1/2 x 55mm	12
7.89	4	45500-4	bracket, abs sensor	2
7.91	4	93173-3	bracket, abs sensor	2
7.93	6	37817-4	bracket, abs sensor	2
7.95	2	89053-1	bracket, frame assembly	2
7.41	2	88401-1	bracket, lifting	1
7.41	5	88401-3	bracket, lifting	1
7.39	11	86045-8	bracket, lifting: front	1
7.39	5	86045-2	bracket, lifting: rear	1
7.95	13	89053-12	bracket, track bar frame	2
7.95	9	89053-8	bracket, upper shock	2

*part of a kit

Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.93	5	37817-3	brake assembly: left and right (not shown)	2
7.87	4	93989-4	brake chamber, front: 20, s-cam	2
7.89	3	45500-3	brake chamber, rear: 30/36	2
7.91	3	93173-6	brake chamber, rear: 30/36	2
7.93	2	20635	brake chamber, tag: 20/24	2
7.127	3	17756	breaker, circuit: starter solenoid, manual reset, 60 amp, 12 volt	1
7.61	2	82911-1	breather	1
7.61	2	88327-1	breather	1
7.63	2	90129-1	breather	2
7.63	2	90350-1	breather	2
7.107	2	21499-1	cartridge, desiccant	1
7.67	2*	ref.	clamp (see kits 90129-10 and 90350-10)	1
7.57	3	15456	clamp, exhaust: 4"	2
7.57	2	31793	clamp, exhaust: 4" guillotine, 3/8" u-bolt	2
7.55	2	45794	clamp, exhaust: 4" v-band	1
7.55	5	35767	clamp, exhaust: 5" v-band	2
7.49	5	01301	clamp, hose: #32 (1-9/16" to 2-1/2")	2
7.49	4	02935	clamp, hose: #4 (7/32" to 5/8")	3
7.51	8	02935	clamp, hose: #4 (7/32" to 5/8")	6
7.49	8	38204	clamp, hose: #8 (1/2" to 29/32")	2
7.51	14	28490	clamp, hose: 1" to 1-3/4" constant torque	4
7.53	26	28490	clamp, hose: 1" to 1-3/4" constant torque	2
7.51	3	28489	clamp, hose: 11/16" to 1-1/4" constant torque	4
7.53	3	28489	clamp, hose: 11/16" to 1-1/4" constant torque	6
7.51	6	28340	clamp, hose: 2-1/4" to 3-1/8" dia. constant torque	10
7.51	15	27751	clamp, hose: 2-3/4" to 3-5/8" dia. constant torque	2
7.53	7	02935	clamp, hose: 7/32" to 5/8" constant torque	8
7.43	5	31793	clamp, muffler: 4"	1
7.43	6	36951	clamp, t-bolt: 3.06" minimum spring loaded	2
7.43	2	36589	clamp, t-bolt: 4.06" minimum spring loaded	6
7.45	2	36589	clamp, t-bolt: 4.06" minimum spring loaded	10
7.43	14	15482	clamp, t-bolt: 4.25" minimum diameter	2
7.43	12	18726	clamp, t-bolt: 5-1/4" to 5-9/16" diameter	2
7.45	7	18726	clamp, t-bolt: 5-1/4" to 5-9/16" diameter	1
7.43	10	15481	clamp, t-bolt: 7-1/4" minimum diameter	2
7.45	9	15481	clamp, t-bolt: 7-1/4" minimum diameter	1
7.47	19	38204	clamp: 1/2" to 29/32"	2
7.47	20	01301	clamp: 1-9/16" to 2-1/2"	2
7.53	9	28340	clamp: 2-1/4" to 3-1/8" diameter constant torque	12

*part of a kit

Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.47	23	02935	clamp: 7/32" to 5/8"	4
7.87	11	18988	clip, abs sensor	1
7.89	5	45500-5	clip, abs sensor	2
7.91	5	93173-4	clip, abs sensor	2
7.93	7	37817-5	clip, abs sensor	2
7.39	17	86045-12	compressor, air	1
7.41	9	88401-6	compressor, air	1
7.39	4	90202	compressor, air conditioner	1
7.41	3	35542	compressor, air conditioner	1
7.95	8	89053-7	control arm, axle bracket	1
7.43	1	88331	cooler assembly, charge-air: included with radiator	1
7.45	1	89815	cooler assembly, charge-air: included with radiator	1
7.63	6	90129-4	cover, filter	2
7.63	6	90350-4	cover, filter	2
7.83	2	16498	cover, lug nut: 1-1/2"	40
7.85	2	16498	cover, lug nut: 1-1/2"	60
7.39	8	86045-5	damper, vibration	1
7.55	4	90288	diesel particulate filter (dpf)	1
7.65	1	82911-6	dipstick	1
7.65	1	88327-6	dipstick	1
7.67	1	20638	dipstick and tube assembly	1
7.39	6	86045-3	dipstick assembly, engine oil	1
7.41	11	27874	dipstick assembly, engine oil: snap cap	1
7.57	5	88401-14	dpf, engine exhaust	1
7.79	1	26461	driveshaft, 3000 mh: spl 170 series	1
7.79	1	45525	driveshaft, cx28: spl 170 series	1
7.77	1	31543	driveshaft: #1710-series, with u-joints	1
7.87	13	27947	ecu (electronic control unit), abs e frame: 4s4m, 12v (see note 1)	1
7.89	11	27947	ecu (electronic control unit), abs e-frame: 4s4m, 12v (see note 1)	1
7.91	11	27948	ecu (electronic control unit): abs e-frame, 6s/6m, 12v, j1939 (see note 1)	1
7.93	13	27948	ecu (electronic control unit): abs e-frame, 6s/6m, 12v, j1939 (see note 1)	1
7.73	2	90129-12	ecu, 3000 mh transmission: with pto and electronic control unit for generation iv	1
7.73	2	90350-12	ecu, 3000 mh transmission: with pto and electronic control unit for generation iv	1
7.73	2	82911-8	ecu, cx28 transmission: electronic control unit	1
7.73	2	88327-8	ecu, cx28 transmission: electronic control unit	1
7.45	12	15532	elbow, air intake: 4" rubber, 90°	1
7.39	14	86045-9	electronic control module (ecm)	1

*part of a kit

Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.41	6	88401-4	electronic control module (ecm)	1
7.61	3	82911-2	electronic control unit (ecu)	1
7.61	3	88327-2	electronic control unit (ecu)	1
7.41	17	88401-11	element, filter: lubrication oil	1
7.107	5	21499-3	element, heater	1
7.39	1	86045	engine, caterpillar c9: 425hp, 1350 ft-lbs torque at 1400 rpm (all parts starting with 86045)	1
7.41	1	88401	engine, cummins isl 425: 1200 ft-lbs at 1300 rpm (all parts that start with 88401)	1
7.121	3	82028	filler breather: top mount assembly	1
7.61	5	82911-4	filter and screen, magnetic (not shown)	1
7.61	5	88327-4	filter and screen, magnetic (not shown)	1
7.61	6	82911-5	filter, fluid	1
7.61	6	88327-5	filter, fluid	1
7.47	2	37235	filter, fuel	1
7.49	23	37236	filter, fuel (not shown)	1
7.39	20	45169	filter, fuel: primary, located in engine bay	1
7.41	19	37235	filter, fuel: primary, located in engine bay	1
7.39	18	86045-13	filter, fuel: secondary, located in battery bay	1
7.41	20	88401-13	filter, fuel: secondary, located in engine bay	1
7.121	1	90097	filter, hydraulic fluid	1
7.39	10	86045-7	filter, oil	1
7.63	3	16582	filters kit: 2 filters	1
7.49	11	36151	fitting, fuel: 5/8" pft hose x 1/2" mpt	2
7.99	1	16325	fitting, grease: 1/8" pipe thread, 90°, independent front suspension	16
7.99	2	16325	fitting, grease: 1/8" pipe thread, 90°, rear axle	4
7.99	2	16325	fitting, grease: 1/8" pipe thread, 90°, tag axle (not shown, same as rear axle)	4
7.47	7	37178	fitting: #6 o-ring x #10 mf adapter	1
7.47	13	36149	fitting: #6 o-ring x 1/2" fpt	1
7.51	17	18093	fitting: 1" b x 3/4" mp connector	1
7.51	25	38173	fitting: 1" hb x 1" mp, 90° elbow	1
7.53	25	38173	fitting: 1" hb x 1" mpt, 90° elbow	1
7.51	28	38174	fitting: 1" hb x 3/4" mpt, 45° elbow	1
7.53	28	38174	fitting: 1" hb x 3/4" mpt, 45° elbow	1
7.53	13	20343	fitting: 1" mp x 1" b hex nipple, brass	1
7.47	14	28204	fitting: 1/2" fp x 1/2" mp, 45° street elbow	2
7.49	9	28204	fitting: 1/2" fp x 1/2" mp, 45° street elbow	2
7.49	19	00965	fitting: 1/2" fp x 1/2" mp, 90° street elbow	1
7.49	16	37018	fitting: 1/2" fp x 1/2" o-ring adapter	1

*part of a kit

Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.49	21	36595	fitting: 1/2" fp x 5/8" o-ring, 90° elbow	1
7.53	16	00469	fitting: 1/2" fpt x 3/4" mpt bushing	1
7.53	15	00847	fitting: 1/2" mp x 5/8" hose bib	1
7.47	10	36566	fitting: 1/2" pft x 1/2" mp, 90° elbow	1
7.47	15	36155	fitting: 1/2" pft x 1/2" mpt	1
7.49	10	36155	fitting: 1/2" pft x 1/2" mpt connector	2
7.47	24	82383	fitting: 1/4" hb x 1/4" mpt, 45° elbow	2
7.49	12	82383	fitting: 1/4" hb x 1/4" mpt, 45° street elbow	2
7.53	31	00973	fitting: 1/4" mp street tee	1
7.107	3	24315	fitting: 1/4" tbx x 1/4" mp, 90° elbow pmt	1
7.51	18	21251	fitting: 3/4" b x 3/4" mp, 90° elbow	2
7.51	4	19829	fitting: 3/4" barb x 3/4" male pipe	2
7.53	5	21228	fitting: 3/4" branch tee, brass	1
7.53	6	21281	fitting: 3/4" fpt heater supply	1
7.51	19	15805	fitting: 3/4" mp square head plug	1
7.53	19	15805	fitting: 3/4" mp square-head plug	1
7.51	5	83400	fitting: 3/4" mpt street tee	2
7.53	17	83400	fitting: 3/4" mpt street tee	1
7.53	4	21251	fitting: 3/4" x 3/4" elbow, brass	3
7.53	32	09910	fitting: 3/8" b x 1/4" mp connector	1
7.51	26	09910	fitting: 3/8" b x 1/4" mp, straight	1
7.51	12	18746	fitting: 3/8" barb x 1/4" mpt, 90° elbow	2
7.53	12	18746	fitting: 3/8" barb x 1/4" mpt, 90° elbow	4
7.51	10	82469	fitting: 3/8" fpt x 1/2" o-ring adapter	1
7.51	27	38243	fitting: 3/8" hb x 1/4" mpt, 45° elbow	1
7.51	9	16143	fitting: 3/8" mpt x 3/8" b	1
7.47	3	15820	fitting: 5/8" 37° flare o-ring plug	2
7.49	24	15820	fitting: 5/8" 37° flare o-ring plug	2
7.47	4	36595	fitting: 5/8" o-ring x 1/2" fp, 90° elbow	1
7.47	6	36151	fitting: 5/8" pft hose x 1/2" mpt	2
7.107	7	27224	fitting: 5/8" tb x 1/2" mp, 90° elbow pmtns	1
7.107	6	15823	fitting: 5/8" x 1/2" straight male flared sae	1
7.47	8	15817	fitting: 5/8" x 5/8" 37° flare o-ring, 90° elbow	1
7.49	18	15817	fitting: 5/8" x 5/8" 37° flare o-ring, 90° elbow	1
7.51	1	34454	furnace, aqua-hot: 450-D	1
7.53	1	34454	furnace, hydro-hot: with engine preheat (option)	1
7.63	7	90129-5	gasket (see note 2)	2
7.63	7	90350-5	gasket (see note 2)	2
7.43	8	20808	gauge assembly, filter minder	1

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Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.45	6	20808	gauge assembly, filter minder (not shown)	1
7.101	5	34157	gear box, steering (mitre box)	1
7.41	12	37059	governor, air compressor	1
7.39	12	15429	governor: d-2, 105-125 psi	1
7.91	8	84700	harness, abs atc valve: din connector (see note 1)	1
7.93	10	84700	harness, abs atc valve: din connector (see note 1)	1
7.89	8	84700	harness, abs: atc valve, din connector (see note 1)	1
7.87	12	84698	harness, abs: front axle, din connector (see note 1)	1
7.89	9	84699	harness, abs: rear axle, din connector (see note 1)	1
7.91	9	84701	harness, abs: rear axle, din connector, 6s/6m (see note 1)	1
7.69	1	45160	harness, cx28 transmission (no tag cx28/isl and tag cx28)	1
7.71	1	45407	harness, transmission (isl tag)	1
7.93	11	84702	harness: abs tag axle, din connector (see note 1)	1
7.47	1	15694	head, fuel filter	1
7.49	22	15694	head, fuel filter	1
7.49	17	28146	hose, fuel supply: primary filter to engine	1
7.47	9	20566	hose, fuel supply: primer filter to engine	1
7.47	17	29538	hose, fuel tank vent: 5/8" diameter	2
7.49	7	29538	hose, fuel tank vent: 5/8" diameter	2
7.47	25	01310	hose, fuel: 1/4" inner diameter generator return	2
7.47	18	01308	hose, fuel: 2" inner diameter	2
7.49	6	01308	hose, fuel: 2" inner diameter	2
7.51	11	17557	hose, fuel: 3/8" inner diameter	3
7.53	8	17557	hose, fuel: 3/8" inner diameter	4
7.47	21	17557	hose, fuel: 3/8" inner diameter generator supply	1
7.47	22	01311	hose, fuel: 5/16" inner diameter generator return	1
7.49	3	01311	hose, fuel: generator return	1
7.49	2	17557	hose, fuel: generator supply	1
7.49	13	01310	hose, fuel: hydronic supply and return	2
7.51	16	16126	hose, heater: 1" red	2
7.53	27	16126	hose, heater: 1" red	1
7.51	2	15780	hose, heater: 3/4" inner diameter	4
7.53	2	15780	hose, heater: 3/4" inner diameter	4
7.53	14	32110	hose, heater: 5/8" id	1
7.51	21	17554	hose, hump: 2-1/2"	4
7.53	20	17554	hose, hump: 2-1/2"	2
7.53	22	15428	hose, hump: 2-1/4"	2
7.51	7	18447	hose, radiator: 2-1/2" inner diameter, 6-1/2" x 7-1/2", 90° elbow	2
7.45	8	37356	hose: 7" to 5" rubber reducer	1

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Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.87	3	93989-3	hub and drum assembly, left hand: 16.5 x 5	1
7.87	3	93989-2	hub and drum assembly, right hand: 16.5 x 5	1
7.89	2	45500-1	hub and drum assembly: left hand	1
7.91	2	93173-1	hub and drum assembly: left hand	1
7.89	2	45500-2	hub and drum assembly: right hand	1
7.91	2	93173-2	hub and drum assembly: right hand	1
7.93	4	37817-2	hub assembly: left and right	2
7.101	1	40497	hub, steering wheel (not shown)	1
7.83	4	81947	hubcap, front steering axle	2
7.85	4	81947	hubcap, front steering axle	2
7.85	7	81948	hubcap, rear drive/tag axle	4
7.83	9	81948	hubcap: drive axle	2
7.129	1	15430	indicator, low pressure: lp-3	1
7.127	6	86045-10	motor, starting	1
7.127	6	88401-5	motor, starting	1
7.39	15	86045-10	motor, starting	1
7.41	8	88401-5	motor, starting	1
7.55	3	89278	mount, dpf	1
7.41	7	38547	mount, motor flywheel	1
7.57	4	89279	mounting band, dpf	2
7.67	kit	90129-10	mounting-kit (items 2, 3)	1
7.67	kit	90350-10	mounting-kit (items 2, 3)	1
7.85	8	19849	nut, flanged: 33mm (hub piloted lug nuts) (not shown)	20
7.83	7	16502	nut, inner drive wheel: left hand, for aluminum (not shown)	10
7.85	9	16502	nut, inner drive wheel: left hand, for aluminum (not shown)	10
7.83	7	16503	nut, inner drive wheel: right hand, for aluminum (not shown)	10
7.85	9	16503	nut, inner drive wheel: right hand, for aluminum (not shown)	10
7.83	8	21189	nut, lug: outer wheel, left hand thread (not shown)	10
7.83	8	21188	nut, lug: outer wheel, right hand thread (not shown)	10
7.83	3	21494	nut, lug: wheel, left hand (not shown)	10
7.85	3	21493	nut, lug: wheel, left hand (not shown)	10
7.83	3	21493	nut, lug: wheel, right hand (not shown)	10
7.85	3	21494	nut, lug: wheel, right hand (not shown)	10
7.63	9	90129-7	o-ring: packing	1
7.63	9	90350-7	o-ring: packing	1
7.97	3	93176-2	pin, anti-sway bar	1
7.97	4	93176-3	pin, torque rod	1
7.95	14	89053-13	plate, reinforcement	1
7.61	4	82911-3	plug, oil: drain	1

*part of a kit

Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.61	4	88327-3	plug, oil: drain	1
7.63	10	90129-8	plug, oil: drain	1
7.63	10	90350-8	plug, oil: drain	1
7.41	4	88401-2	pump, fuel injection	1
7.39	16	86045-11	pump, fuel priming	1
7.39	9	86045-6	pump, water	1
7.41	15	88401-9	pump, water	1
7.53	21	89815	radiator assembly	1
7.51	22	88331	radiator cooling assembly	1
7.51	23	83552	radiator: auxiliary transmission cooler	1
7.53	23	83552	radiator: auxiliary transmission cooler	1
7.75	1	02932	relay, 12v: 4 are assembled with the isl tag transmission harness 45407	4
7.75	1	02932	relay, 12v: 5 are assembled with the cx28/isl no tag and cx28 tag transmission harness 45160	5
7.121	2	89689	reservoir, hydraulic	1
7.77	4	26776	retainer, bearing	4
7.79	4	26776	retainer, bearing	4
7.95	12	89053-11	rod, torque: adjustable	1
7.95	11	89053-10	rod, track: adjustable	1
7.67	4	90129-9	seal	1
7.67	4	90350-9	seal	1
7.63	4	90129-2	seal, packing	2
7.63	4	90350-2	seal, packing	2
7.63	5	90129-3	seal, packing (see note 1)	2
7.63	5	90350-3	seal, packing (see note 1)	2
7.93	8	37817-6	sensor with socket, abs	2
7.87	10	18989	sensor, abs: with socket	2
7.89	6	45500-6	sensor, abs: with socket	2
7.91	6	93173-5	sensor, abs: with socket	2
7.53	29	37033	sensor, low coolant	1
7.51	29	18594	sensor, surge tank: low coolant	1
7.101	6	87823	shaft, steering (mitre box to steering gear)	1
7.101	4	20442	shaft, steering (steering column to mitre box)	1
7.73	1	90129-11	shifter, 3000 mh transmission: with pto and generation iv remote button selector	1
7.73	1	90350-11	shifter, 3000 mh transmission: with pto and generation iv remote button selector	1
7.73	1	82911-7	shifter, cx28 transmission: with pto and cat remote button selector	1
7.73	1	88327-7	shifter, cx28 transmission: with pto and cat remote button selector	1
7.87	7	82899	shock absorber	2

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Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.95	10	89053-9	shock absorber	2
7.97	7	82905	shock absorber: drive axle	2
7.97	8	82902	shock absorber: tag axle	2
7.121	4	82029	sight glass level assembly	1
7.127	2	33464	solenoid, battery boost: 100 amp, 12 volt	1
7.87	8	93989-7	spring, air	2
7.95	7	89053-6	spring, air	2
7.97	2	93176-1	spring, air	2
7.97	6	93176-5	spring, air	2
7.97	9	93176-6	spring, air	2
7.101	3	25576	steering column: tilt and telescopic, with clock spring	1
7.101	7	93989-8	steering gear assembly	1
7.87	2	93989-1	sub-frame assembly	1
7.41	16	88401-10	support assembly, front engine	1
7.39	19	86045-14	support, front engine	1
7.39	13	37392	supports, rear engine: left and right (set)	1
7.97	1	93176	suspension, air assembly: radt-246 (all parts starting with 93176)	1
7.87	1	93989	suspension, independent front (all parts starting with 93989)	1
7.95	1	89053	suspension, rear, air control assembly, adl-123	1
7.127	4	02559	switch, master disconnect	1
7.129	2	15431	switch, stop light: sl-5	1
7.109	2	33524	tank, air reservoir: 9.66" diameter	2
7.109	1	33523	tank, air reservoir: dual chamber, 9.66" diameter	1
7.109	3	27618	tank, air reservoir: single 9.5" diameter	2
7.47	16	82930	tank, fuel system: 100 gallon with frame and straps	1
7.49	1	82930	tank, fuel system: 100 gallon with frame and straps	1
7.51	30	86686	tank, surge: 5.6 gallons	1
7.53	30	86686	tank, surge: steel with cap, 5.6-gallon	1
7.41	14	88401-8	thermostat	1
7.55	7	22914	tip, engine exhaust (not shown)	1
7.57	7	22914	tip, engine exhaust (not shown)	1
7.85	1	84170	tire assembly, front: polished aluminum wheel, 295/80r x 22.5 tire, valve stem (see note 1)	2
7.85	6	83222	tire assembly, rear inner: steel wheel, 295/80r x 22.5 tire, valve stem (see note 3)	2
7.85	5	83223	tire assembly, rear outer: polished aluminum wheel, 295/80r x 22.5, valve stem (see note 2)	2
7.85	10	81825	tire assembly, rear tag: polished aluminum wheel, 295/80r x 22.5 tire, valve stem (see note 4)	2

*part of a kit

Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.83	1	84170	tire assembly: front polished aluminum wheel, 295/80r x 22.5 tire, valve stem (see note 1)	2
7.83	6	83223	tire assembly: outer polished aluminum, 295/80r tire, valve stem (see note 3)	2
7.83	5	83222	tire assembly: rear inner steel, 295/80r tire, valve stem (see note 2)	2
7.63	1	90129	transmission, 3000 mh (no tag): with pto (isl) (all parts starting with 90129)	1
7.63	1	90350	transmission, 3000 mh (tag): with pto (isl) (all parts starting with 90350)	1
7.61	1	88327	transmission, cx28 (no tag): with pto (c9) (all parts starting with 88327)	1
7.61	1	82911	transmission, cx28 (tag): with pto (c9) (all parts starting with 82911)	1
7.45	11	89266	tube, air cleaner to turbo	1
7.43	15	15466	tube, air intake: 4" inner diameter x 6" cold	1
7.43	11	34697	tube, air intake: 7" id to 5" id reducer, 90° rubber elbow	2
7.45	5	89271	tube, cac to engine	1
7.45	3	90219	tube, charge-air : 4" inner diameter x 6"	4
7.43	7	36878	tube, charge-air intake manifold: 3" inner diameter x 6" cold	1
7.43	3	90219	tube, charge-air intake: 4" inner diameter x 6"	3
7.45	4	89272	tube, engine to cac	1
7.53	11	89267	tube, engine to radiator	1
7.43	13	45323	tube, engine: air cleaner to turbo	1
7.43	4	45325	tube, engine: cac to intake manifold	1
7.43	16	45324	tube, engine: engine turbo to cac	1
7.51	20	90492	tube, engine: radiator to transmission cooler	1
7.51	24	90494	tube, engine: transmission cooler to engine	1
7.51	13	90496	tube, engine: upper radiator	1
7.55	6	90503	tube, exhaust: muffler to exhaust tip	1
7.57	6	89277	tube, exhaust: pdf to exhaust tip	1
7.57	1	93951	tube, exhaust: turbo to dpf	1
7.55	1	93951	tube, exhaust: turbo to muffler	1
7.53	10	15477	tube, radiator inlet: 2-1/4" id, 90° elbow	2
7.53	18	89268	tube, radiator to transmission cooler	1
7.53	24	89269	tube, transmission cooler to engine	1
7.47	12	36152	tubing, diesel fuel: #10, 5/8" inner diameter	1
7.49	15	36152	tubing, diesel fuel: #10, 5/8" inner diameter	1
7.47	11	36153	tubing, diesel fuel: #8, 1/2" inner diameter	1
7.49	14	36153	tubing, diesel fuel: #8, 1/2" inner diameter	1
7.39	2	86045-1	turbocharger	1
7.41	18	88401-12	turbocharger	1
7.89	7	83296	valve, abs atc: 12v din (see note 1)	1
7.91	7	83296	valve, abs atc: 12v din (see note 1)	1
7.93	9	83296	valve, abs atc: 12v din (see note 1)	1

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Page No.	Item No.	Country Coach Part No.	Description of Part	Qty. Req.
7.87	9	83295	valve, abs modulator: 12v din (see note 1)	2
7.89	10	83295	valve, abs modulator: 12v din (see note 1)	2
7.91	10	83295	valve, abs modulator: 12v din (see note 1)	2
7.93	12	83295	valve, abs modulator: 12v din (see note 1)	2
7.49	20	84560	valve, ball: 1/2" mp x 1/2" fp, brass	1
7.95	15	82850	valve, height control	1
7.47	5	84560	valve, mini ball: 1/2" mp x 1/2" fp, brass	1
7.107	4	21499-2	valve, safety	1
7.101	2	40495	wheel, steering: without hub, 18" leather wrapped	1
7.77	2	45500-7	yoke assembly, 1/2 round: axle end input	1
7.79	2	93173-7	yoke assembly, 1/2 round: axle end input	1
7.79	3	90350-13	yoke assembly, 1/2 round: transmission end, 3000 mh tag chassis	1
7.77	3	88327-9	yoke assembly, 1/2 round: transmission end, cx28 no tag chassis	1
7.77	3	90129-13	yoke assembly: 1/2 round transmission end, 3000 mh no tag chassis	1
7.79	3	82911-9	yoke assembly: 1/2 round transmission end, cx28 tag chassis	1

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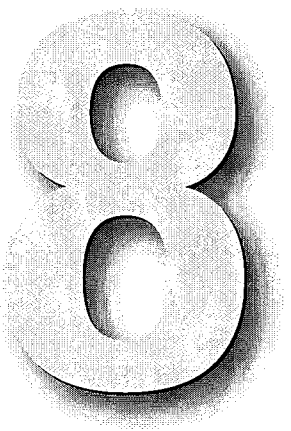

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