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Major Component Manufacturers' Addresses

Maintenance and service publications are available by writing or calling the component manufacturers listed below. In some cases, there may be a small charge for the publication. **See Table 1.**

Component	Manufacturer and Address		
Air Compressor	Bendix Heavy Vehicle Systems Technical Service Department 901 Cleveland Street Elyria, OH 44036		Cummins Engine Company, Inc. Mail Code 41308 Box 3005 Columbus, IN 47202–3005
	Detroit Diesel Corporation 13400 Outer Drive, West Detroit, MI 48239–4001		Midland Brake, Inc. 490 South Chestnut Street Owosso, MI 48867
Alternator	Delco Remy Service Department P. O. Box 2439 Anderson, IN 46018		Leece-Neville Prestolite Electric Incorporated 400 Main Street Arcade, NY 14009
Clutch	Dana Corporation Spicer Clutch Division P. O. Box 191 Auburn, IN 46706	Eaton Valeo Clutch Fuller Transmission Division P. O. Box 4013 Kalamazoo, MI 49003	Rockwell International Corporation Rockwell Clutch Company 2135 West Maple Road Troy, MI 48084
Engine	Caterpillar, Incorporated Literature Orders Section 1335 S.W. Washington Peoria, IL 61602		Cummins Engine Company, Inc. Mail Code 41308 Box 3005 Columbus, IN 47202–3005
	Detroit Diesel Corporation 13400 Outer Drive, West Detroit, MI 48239–4001		Mercedes-Benz P. O. Box 3849 Portland, OR 97208–3849
Engine Brake	Jacobs Vehicle Equipment Company 22 East Dudley Town Road Bloomfield, CT 06002		Williams Air Controls 14100 S.W. 72nd Avenue Portland, OR 97223
Front Axle and Rear Axle	Eaton Corporation Axle and Brake Division P. O. Box 4008 Kalamazoo, MI 49003		Rockwell International Corporation Automotive Operations 2135 West Maple Road Troy, MI 48084
Hydraulic Brakes	Allied Signal Incorporated Training Center 105 Pawtucket Avenue East Providence, RI 02916		

Major Component Manufacturers' Addresses

Component	Manufacturer and Address		
Starter	Delco Remy Service Department P. O. Box 2439 Anderson, IN 46018		
Steering Gear	TRW Ross Gear Division 800 Heath Street Lafayette, IN 47902		
Suspension	Chalmers Suspensions International P. O. Box 1000 Brampton, Ontario, Canada L6V 2L9	Neway Corporation A Division of Lear Siegler Incorporated P. O. Box 425 Muskegon, MI 49443–0425	
	Hendrickson Suspension 800 South Frontage Road Woodridge, IL 60517–4904	Reyco Industries, Incorporated P. O. Box 2268 Springfield, MO 65801–2268	Watson & Chalin Mfg., Inc. 4820 Grisham Drive Rowlett, TX 75088
Transfer Case	Marmon-Herrington 2000 Plantside Drive Louisville, KY 40299		
Transmission	Allison Transmission P. O. Box 894 Indianapolis, IN 46206–0894	Eaton Corporation Fuller Transmission Division P. O. Box 4013 Kalamazoo, MI 49003	Rockwell International Corporation Automotive Operations 2135 West Maple Road Troy, MI 48084

Table 1, Major Component Manufacturers' Addresses

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Vehicle Receipt

Prior to signing for vehicle delivery from a transporter company, the dealer is responsible for checking for transporter-related shortages or damages, and noting these discrepancies on the transporter's delivery receipt.

The dealer is also responsible for ensuring that the vehicle was built according to the Truck Sales Order/ Invoice.

Refer to Section 3 of the Freightliner LLC *Warranty Manual* for details.

Vehicle Storage

There may be times when a vehicle is stored for long periods before customer delivery. To protect all vehicles from deterioration and weather, they must be properly maintained. Adequate protection and storage of new vehicles is the responsibility of the dealer.

Claims arising from loss and damage to improperly stored vehicles will not be reimbursed.

See Section 3 of the Freightliner LLC *Warranty Manual* for instructions on storage of new vehicles.

Pre-Delivery Information

All pre-delivery inspections and services must be performed at an authorized Freightliner LLC facility, assigned to fully qualified service personnel and recorded on the "New Vehicle Pre-Delivery Inspection" form.

Refer to Section 3 of the Freightliner LLC *Warranty Manual* for details.

It is recommended the pre-delivery inspection be performed within 30 days of vehicle receipt.

tanks. Then, shut down the engine and wait one minute to allow pressures to equalize.

a. With service brakes released and parking brakes applied, air pressure drop must not exceed a maximum of 2 psi (14 kPa) in one minute.

b. With parking brakes released and service brakes applied, air pressure drop must not exceed a maximum of 3 psi (21 kPa) in one minute.

c. Check for audible leakage from all air system components. Locate and correct all sources of leakage. Tightening fittings is included in the PDI reimbursement.

10. Hydraulic Brake Booster Warning System/ Electric Motor Backup

Check the brake booster warning system and electric motor backup operation:

With the engine off and the key off, press the brake pedal. The warning light and alarm should come on, and the electric motor should switch on to provide brake assistance.

Start the engine, then press the brake pedal again. No warning light or alarm should come on.

B. CAB EXTERIOR

Inspection

1. Cab Paint

Check cab paint for scratches, chips, or peeling. Cleaning and polishing are included in the PDI reimbursement. All paint repairs in excess of $600 require prior approval from the District Service Manager. Paint damages resulting from transporter operations should be filed as a transporter claim.

Operational Check

1. Lights: Head, Road, Daytime Running, Marker, Turn Signal, Stop, and Tail

Make sure all headlights, roadlights, daytime running lights, marker lights, turn signals, stoplights, and taillights operate and are properly adjusted.

C. UNDER HOOD OR CAB

Inspection

1. Engine Oil Leaks

Check for oil leaks. Tighten all fittings and fasteners as needed. Tightening fittings and fasteners is included in the PDI reimbursement.

2. Engine Oil Level

Check engine oil level. To deliver the vehicle to the customer, oil level should be halfway between the low and high marks. Do not add oil if the oil level is above the halfway point. Do not fill beyond the high mark.

If oil is added to a vehicle that was the lead vehicle of decked vehicles, a transporter claim should be submitted for the cost. On other vehicles, topping off oil is included in the PDI reimbursement.

3. Coolant Hoses

Check all radiator and heater hose connections for leakage. Tighten connections as needed. Tightening connections is included in the PDI reimbursement. If a hose routing deviation is found as part of the PDI, see **Subject 100**.

4. Coolant Level

Check coolant level in the radiator. Check antifreeze concentration; it should provide a minimum protection of –30°F (–34°C). If protected to a colder temperature, no change is required. Add coolant/antifreeze to bring the coolant to the correct level, or to the minimum antifreeze concentration, as needed.

5. Fuel Leaks

Check for fuel leaks. Tighten all fittings as needed. Tightening fittings is included in the PDI reimbursement.

6. Power Steering Fluid

Check for power steering fluid leaks. Tighten fittings as needed. Tightening fittings is included in the PDI reimbursement. Check reservoir fluid level. Add fluid as needed.

7. Drive Belts

If the vehicle was the lead vehicle of decked vehicles, check belt tension, and adjust as

needed. Submit a transporter claim for the cost.

8. Clutch Hydraulic Fluid

   Check for clutch hydraulic fluid leaks. Tighten fittings as needed. Tightening fittings is included in the PDI reimbursement. Check hydraulic fluid level in the clutch master cylinder; add fluid as needed.

9. Brake Hydraulic Fluid

   Check for brake fluid leaks. Tighten fittings as needed. Tightening fittings is included in the PDI reimbursement. Check brake fluid level in the brake master cylinder; add fluid as needed.

D. CHASSIS

Inspection

1. Tire Inflation

   Check tire air pressure and inflate tires to the correct pressure. Inflating tires is included in the PDI reimbursement.

2. Drive-Axle Flange Fasteners

   Tighten drive-axle flange fasteners to the correct torque. Tightening drive-axle flange fasteners is included in the PDI reimbursement.

3. Steering Linkage

   Check for Torque Seal on steering-driveline-yoke pinch bolts, pitman-arm pinch bolt, drag-link to pitman-arm ball stud, drag-link to steering-arm ball stud, and tie-rod-ends clamp bolts. Make sure that all cotter pins are installed and locked. If Torque Seal or cotter pins are missing, tighten to specifications; then apply white Torque Seal F-900®, or install and lock cotter pins. Tightening steering fasteners and applying Torque Seal or installing cotter pins is included in the PDI reimbursement.

4. Spring U-Bolts

   Tighten all U-bolts to the correct torque. Tightening U-bolts is included in the PDI reimbursement.

5. Brake Slack Adjusters

   Check brake adjustment. Adjust as needed.

6. Front Axle Hub Oil Seals

   If wheel bearings are oil-lubricated, check front axle hub oil seals for leaks. Some oil used in the assembly process may still be present on the components; do not confuse this with oil leaks. Repair leaks as needed. Check the hub oil levels, and add or remove oil as needed.

7. Rear Axle Hub Oil Seals

   Check all rear axle hub oil seals for leaks. Some oil used in the assembly process may still be present on the components; do not confuse this with oil leaks. Repair leaks as needed.

8. Rear Axle Differential Oil Level

   Check the differential for leaks, and repair as needed. Check oil level, and add oil as needed. Time to check and add oil is included in the PDI reimbursement.

9. Transmission Oil Level

   Check the transmission for oil leaks and repair as needed. Check oil level, and add oil as needed. Time to check and add oil is included in the PDI reimbursement.

10. Drain Plugs and Fill Plugs

    Check and tighten all drain plugs and fill plugs. Tightening plugs is included in the PDI reimbursement.

11. Chassis Hoses and Wires

    Check routing of all hoses and wires to be sure they are not unacceptably close to moving parts which could damage them. Add tie straps as needed to prevent rubbing and damage. Reroute hoses and wires only if needed. Time to add tie straps and reroute hoses and wires is included in the PDI reimbursement. If a hose or electrical wiring routing deviation is found as part of the PDI, see **Subject 100.**

12. Chassis Paint

    Check chassis paint for scratches, chips, or peeling. Claims for repair of scratches, chips, or paint lifting associated with the decking process should be filed with the transporter. All other paint claims should be filed with the Freightliner Warranty Department; all paint re-

pairs in excess of $600 require prior approval from the District Service Manager. Cleaning and polishing are included in the PDI reimbursement.

13. Battery Cable Routing and Connections

    Check all battery cables for correct routing and clamping. Make corrections as needed. Time to tighten connections and reroute cables or add tie straps is included in the PDI reimbursement. If an electrical wiring routing deviation is found as part of the PDI, see **Subject 100**.

14. Wheel Nuts

    On disc-type wheels, tighten all wheel nuts to the correct torque. On spoke-type wheels, check wheel rim and clamp nuts for the correct torque. Tightening wheel-nuts/rim-clamp-nuts is included in the PDI reimbursement.

E. ROAD TEST

Test

1. Parking Brakes

   Make sure parking brakes apply and release correctly.

2. Clutch Operation

   Make sure the clutch fully engages and releases.

3. Service Brakes

   Make sure service brakes operate correctly.

4. Steering

   Make sure the steering has complete left-to-right travel with no looseness, binding, or interference.

F. FINAL PREPARATION

Procedure

1. Clean the cab interior: vacuum the interior and clean the windows.
2. If the vehicle is equipped with a factory-installed fifth wheel, remove the warning label from the Customer Information Envelope in the vehicle cab, and attach the label to the fifth wheel operating (release) handle.
3. Instruct the customer on correct operation of the fifth wheel.

VEHICLE REGISTRATION

Enter the distance (odometer reading) for the lead truck on the "Pre-Delivery Service and Owner's Warranty Registration" Form WAR146. Complete and mail the form as instructed in Section 3 of the Freightliner *Warranty Manual.*

Hoses and Electrical Wiring Routing Standards

Cooling System

1. Cooling system hoses must clear all moving parts by a minimum of 1/4 inch (6 mm).
2. The 1-inch (25-mm) hose from the surge tank to the engine must be free of sumps and have allowance for engine torque.
3. Cooling system hoses should not be twisted or kinked.
4. Cooling system hoses must be routed at least six inches (152 mm) from a heat source if the heat source does not have a heat shield. If a heat shield is provided, the hose must be routed at least three inches (76 mm) from the heat source.

HVAC System

1. Cushion clamps are required to support all A/C lines. Butterfly or figure-8 clamps (two cushion clamps) may be used to prevent rubbing or chafing.
2. Tie straps may only be used to fasten together A/C lines that are parallel to each other.
3. Heater hoses that are protected with convoluted tubing may be fastened with tie straps. Otherwise, only cushion clamps or butterfly clamps may be used for heater hoses.
4. A/C lines cannot be secured to air lines, fuel lines, or electrical wires.
5. HVAC hoses should be protected from damage by routing them away from hazards of heat, wheel splash (water, gravel, ice), human traffic, and moving parts of the vehicle.
6. HVAC hoses should be routed away from sharp points and edges (such as nuts, bolts, brackets, and frame rail edges), moveable parts, and sources of abrasion, cutting, pinching, or crushing.

NOTE: If hoses are covered with convoluted tubing, they may touch any of the above.

7. Hoses that are protected with convoluted tubing may come in contact with the bends on frame rails and filters.
8. HVAC hoses must be routed at least six inches (152 mm) from a heat source if the heat source does not have a heat shield. If a heat shield is provided, the hose must be routed at least three inches (76 mm) from the heat source.
9. HVAC hoses should be clamped every 12 to 18 inches (305 to 457 mm).
10. All HVAC hoses must be routed so that regularly serviced components, such as fuel filters, fuel/water separators, oil filters, air filters, belts, and fill and drain plugs, are readily accessible for adjustment or replacement without the need to relocate or remove the hoses.

Engine Plumbing

The engine oil pressure line should not rub or chafe against the Teflon® discharge line.

Electrical Wiring

1. Wires that are bundled together should be fastened at 8- to 12-inch (203- to 305-mm) intervals. If anchor clamps are more than 12 inches (305 mm) apart, a tie strap must be used between the anchor clamps.
2. Bundles of wires that are located in an exposed area, such as under the cab or outside the frame rail, need to be fastened with heavy-duty cable ties.
3. Any wiring that will be exposed to water or heat must be covered with either loom or convoluted tubing. Loom or convoluted tubing need not butt up against Weather Pack® connectors.
4. Any wiring routed across the vehicle, on the engine crossmember, or across the rear of the engine, must be secured with a clamp or tie strap, and covered with either convoluted tubing or a loom.
5. Any wiring that may come into contact with sharp points and edges (such as nuts, bolts, brackets, and frame rail edges), moveable parts, and sources of abrasion, cutting, pinching, or crushing, must be protected by either a loom or convoluted tubing.
6. Unprotected breakouts (individual wires) of up to eight inches (203 mm) are acceptable as long as these wires are routed safely away from sharp

Hoses and Electrical Wiring Routing Standards

points and edges, moveable parts, and sources of abrasion, cutting, pinching, or crushing.

7. Gray, flame-retardant convoluted tubing may be used to protect wiring in the cab or the chassis. Black nylon convoluted tubing may only be used in the chassis.
8. All wiring must be routed so that regularly serviced components, such as fuel filters, fuel/water separators, oil filters, air filters, belts, and fill and drain plugs, are readily accessible for adjustment or replacement without the need to relocate or remove any wiring.
9. In exposed locations, such as the road light harness near the headlights, loose loops of wire must be secured with tie straps.
10. All wiring should be routed a minimum of four inches (102 mm) from the exhaust. In situations where the wiring is less than four inches (102 mm) from the exhaust, a heat shield must be placed between the wiring and the exhaust.

Battery Cables

1. Battery cables must be routed along an unobstructed path from the starter to the battery box. The cables must **not** rub or chafe on brackets, tanks, air lines or fuel lines.
2. Battery cables and electrical wiring cannot be tied or secured to fuel lines, discharge lines, or air lines.
3. Battery cables must have support brackets no more than 30 inches (762 mm) apart. Tie straps must be within six inches (152 mm) of both sides of the support brackets, and every 12 inches (305 mm) between the brackets.
4. Battery cables must have convoluted tubing from the frame bracket to the batteries, and from the frame bracket to the starter.

Fuel Lines

1. Fuel lines must not be clamped to A/C lines, battery cables, jumper cables, or any other electrical wiring.
2. Stand-off brackets or clamps may be used to prevent fuel lines from rubbing against the frame.
3. Fuel lines must be routed at least six inches (152 mm) from a heat source. If a heat shield is provided, the fuel line must be at least three inches (76 mm) from the heat source.
4. Fuel lines that are parallel may be fastened together. Fuel lines that cross or that rub on metal, plastic, or electrical parts, need to be separated with butterfly clamps.

Chassis Air Lines and Brake Hoses

1. Hoses may come in contact with each other if they are parallel, or if they are bundled together.
2. If the hoses lie on the curve or flat surface of a bracket or crossmember, they do not need convoluted tubing.
3. Brake hoses may be clamped at the top of the axle housing, and touch or lie against the axle housing in its path to the brake chamber as this assembly moves together.
4. Brake hoses must have slack between the last clamping point on the rail and brake chamber to allow for full range of suspension travel.
5. Brake hoses should have butterfly clamps at breakout points.
6. Air lines and brake hoses that are bundled together should be fastened at 8- to 12-inch (203- to 305-mm) intervals. If anchor clamps are more than 12 inches (305 mm) apart, a tie strap must be used between the anchor clamps. Tie straps may be closer than 12 inches (305 mm) apart.
7. Hoses or lines that may come into contact with the sharp edge of a bracket or frame rail are to be protected by convoluted tubing.
8. Air lines and brake hoses that are parallel may be fastened together. Air lines and brake hoses that cross or that rub on metal, plastic, or electrical parts need to be separated with butterfly clamps.
9. Nylon or STX (wire braid) chassis air lines may be fastened together to prevent rubbing, as long as the lines are stationary.

Metric/U.S. Customary Conversion Chart

Refer to tables in this subject for conversion factors.

U.S. Customary to Metric			Metric to U.S. Customary		
When You Know	**Multiply By**	**To Get**	**When You Know**	**Multiply By**	**To Get**
Length					
inches (in)	25.4	millimeters (mm)	0.03937		inches (in)
inches (in)	2.54	centimeters (cm)	0.3937		inches (in)
feet (ft)	0.3048	meters (m)	3.281		feet (ft)
yards (yd)	0.9144	meters (m)	1.094		yards (yd)
miles (mi)	1.609	kilometers (km)	0.6215		miles (mi)
Area					
square inches (in^2)	645.16	square millimeters (m^2)	0.00155		square inches (in^2)
square inches (in^2)	6.452	square centimeters (cm^2)	0.15		square inches (in^2)
square feet (ft^2)	0.0929	square meters (m^2)	10.764		square feet (ft^2)
Volume					
cubic inches (in^3)	16387.0	cubic millimeters (mm^3)	0.000061		cubic inches (in^3)
cubic inches (in^3)	16.387	cubic centimeters (cm^3)	0.06102		cubic inches (in^3)
cubic inches (in^3)	0.01639	liters (L)	61.024		cubic inches (in^3)
fluid ounces (fl oz)	29.54	milliliters (mL)	0.03381		fluid ounces (fl oz)
pints (pt)	0.47318	liters (L)	2.1134		pints (pt)
quarts (qt)	0.94635	liters (L)	1.0567		quarts (qt)
gallons (gal)	3.7854	liters (L)	0.2642		gallons (gal)
cubic feet (ft^3)	28.317	liters (L)	0.03531		cubic feet (ft^3)
cubic feet (ft^3)	0.02832	cubic meters (m^3)	35.315		cubic feet (ft^3)
Weight/Force					
ounces (av) (oz)	28.35	grams (g)	0.03527		ounces (av) (oz)
pounds (av) (lb)	0.454	kilograms (kg)	2.205		pounds (av) (lb)
U.S. tons (t)	907.18	kilograms (kg)	0.001102		U.S. tons (t)
U.S. tons (t)	0.90718	metric tons (t)	1.1023		U.S. tons (t)
Torque/Work Force					
inch-pounds (lbf·in)	11.298	Newton-centimeters (N·cm)	0.08851		inch-pounds (lbf·in)
foot-pounds (lbf·ft)	1.3558	Newton-meters (N·m)	0.7376		foot-pounds (lbf·ft)
Pressure/Vacuum					
inches of mercury (inHg)	3.37685	kiloPascals (kPa)	0.29613		inches of mercury (inHg)
pounds per square inch (psi)	6.895	kiloPascals (kPa)	0.14503		pounds per square inch (psi)

00.02 Metric/U.S. Customary Conversion Chart

General Information

When You Know	Subtract	Then Divide By	To Get	When You Know	Multiply By	Then Add	To Get
Temperature							
degrees Fahrenheit (°F)	32	1.8		degrees Celsius (°C)	1.8	32	degrees Fahrenheit (°F)

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VIN for Vehicles Built through April 30, 2000

IMPORTANT: See **Subject 060** for the vehicle identification numbering system for vehicles built May 1, 2000, or later.

Federal Motor Vehicle Safety Standard 115 specifies that all vehicles sold in the U.S. be assigned a 17-character Vehicle Identification Number (VIN). Using a combination of letters and numerals, the VIN defines the manufacturer, model, and major characteristics of the vehicle. See **Table 1** for the character positions of a typical Freightliner VIN, 1FUYSTEBXVPA99999.

The VIN can be found on the Vehicle Specification Decal (see the driver's manual for decal location) and stamped on the left frame rail over the front axle about 2 inches (50 mm) from the top of the web or on the top flange of the left frame rail at frame station 30.

NOTE: For Freightliner vehicles assembled and sold in Mexico, the VIN appears on a plate or label attached to the driver's door. Also, a data card placed in the glove box shows the Mexican VIN as the "CHASSIS" number. The "CABIN" number is part of the Freightliner VIN, the last six digits of which are the Freightliner serial number.

IMPORTANT: A new VIN-code structure will be used for all vehicles built after April 30, 2000. Character positions 1 through 4 and 9 through 17 are nearly the same in both versions, but positions 5 through 8 have been assigned slightly different parameters. As a result, the build date of a vehicle must be determined before the VIN can be decoded.

For all vehicles, a check digit (9th character) is determined by assignment of weighted values to the other 16 characters. These weighted values are processed through a series of equations designed to check validity of the VIN and to detect VIN alteration.

NOTE: Always specify the VIN when ordering parts.

Seventeen-Character Vehicle Identification Number (VIN)									
Typical VIN	**1 F U**	**Y**	**S**	**T E**	**B**	**X**	**V**	**P**	**A 9 9 9 9 9**
Character Position	**1, 2, 3**	**4**	**5**	**6, 7**	**8**	**9**	**10**	**11**	**12 thru 17**
Decoding Table*	**Table 2**	**Table 3**	**Table 4**	**Table 5**	**Table 6**	**—**	**Table 7**	**Table 8**	**—**
Code Description									
Manufacturer, Make, Vehicle Type									
Chassis, Front Axle Position, Brakes									
Vehicle Model Series, Cab									
Engine Model, Horsepower Range									
Gross Vehicle Weight Rating (GVWR)									
Check Digit									
Vehicle Model Year									
Plant of Manufacture									
Production Number									

* For corresponding decoding information, see the applicable tables in this subject.

Table 1, Seventeen-Character Vehicle Identification Number (VIN)

VIN Positions 1, 2, and 3 (Manufacturer, Make, Vehicle Type)			
Code	**Vehicle Manufacturer**	**Vehicle Make**	**Vehicle Type**
1FU	Freightliner, U.S.A.	Freightliner	Truck-Tractor
1FV	Freightliner, U.S.A.	Freightliner	Incomplete Vehicle
2FU	Freightliner, Canada	Freightliner	Truck-Tractor
2FV	Freightliner, Canada	Freightliner	Incomplete Vehicle

VIN for Vehicles Built through April 30, 2000

VIN Positions 1, 2, and 3 (Manufacturer, Make, Vehicle Type)			
Code	**Vehicle Manufacturer**	**Vehicle Make**	**Vehicle Type**
3FE	M-B, Mexico (before April 1996)	Freightliner	Truck-Tractor
3FF	M-B, Mexico (before April 1996)	Freightliner	Incomplete Vehicle
3AK	M-B, Mexico (after April 1996)	Freightliner	Truck-Tractor
3AL	M-B, Mexico (after April 1996)	Freightliner	Incomplete Vehicle
AFV	M-B, South Africa	Freightliner	Truck
KFB	AIL, Israel	Freightliner	Truck
RSA	NAI, Saudi Arabia	Freightliner	Incomplete Vehicle
RSB	NAI, Saudi Arabia	Freightliner	Truck-Tractor

Table 2, VIN Positions 1, 2, and 3 (Manufacturer, Make, Vehicle Type)

VIN Position 4 (Chassis, Front Axle Position, Brakes)			
Code	**Chassis**	**Front Axle Position**	**Brakes**
A	4 x 2 Truck	Forward	Hydraulic
B	8 x 4 Truck-Tractor	Setback	Air
C	6 x 6 Truck-Tractor	Setback	Air
D	4 x 4 Truck	Setback	Hydraulic
E	4 x 4 Truck	Setback	Air
F	8 x 4 Truck	Forward	Air
G	8 x 4 Truck-Tractor	Forward	Air
H	4 x 2 Truck	Forward	Air
J	10 x 4 Truck	All	Air
K	4 x 2 Truck-Tractor	Forward	Air
L	6 x 2 Truck	Forward	Air
M	6 x 2 Truck-Tractor	Forward	Air
N	6 x 4 Truck	Forward	Air
P	6 x 4 Truck-Tractor	Forward	Air
R	10 x 6 Truck	Forward	Air
S	10 x 6 Truck-Tractor	Forward	Air
T	6 x 6 Truck	Setback	Air
U	8 x 6 Truck	All	Air
V	8 x 6 Truck-Tractor	All	Air
W	4 x 2 Truck-Tractor	Setback	Air
X	6 x 4 Truck	Setback	Air
Y	6 x 4 Truck-Tractor	Setback	Air
Z	6 x 2 Truck	Setback	Air

VIN Position 4 (Chassis, Front Axle Position, Brakes)			
Code	**Chassis**	**Front Axle Position**	**Brakes**
1	4 x 2 Truck*	Forward	Air/Hydraulic
	10 x 6 Truck†	Setback	Air
2	4 x 4 Truck	Setback	Air
3	4 x 2 Truck	Setback	Hydraulic
4	8 x 4 Truck	Setback	Air
5	6 x 2 Truck-Tractor	Setback	Air
6	4 x 2 Truck	Setback	Air
7	Glider	Setback	Air
8	Glider	Forward	Air
9	4 x 2 Truck	Setback	Air/Hydraulic
0	Glider	Setback	Air

* Starting August 1998.
† Through July 1998; included in code R starting August 1998.

Table 3, VIN Position 4 (Chassis, Front Axle Position, Brakes), January 18,1988 through April 30, 2000

VIN Position 5 (Model Series, Cab)	
Code	**Vehicle Model, Cab**
A	FLA High COE
B	FLB High COE
C	120 Conventional XL
D	FLD120 Conventional, Highway
E	FL50 Short Conventional
F	FLD120SD Conventional, Construction

VIN for Vehicles Built through April 30, 2000

VIN Position 5 (Model Series, Cab)	
Code	**Vehicle Model, Cab**
G	FL60 Short Conventional
H	FL70 Short Conventional
J	FL80 Short Conventional
L	112 Conv., Alum. Cab, Hwy., 48RR94MY*
	Argosy High COE
M	120 Conventional, Military
N	Century Class 112 Conventional
P	120 Conv., Alum. Cab, Hwy., 48RR94MY
	Columbia 120 Conventional
R	112 Conventional, Steel Cab, Hwy., RH Drive
S	Century Class 120 Conventional
T	High COE (through 88MY)
	FL112 Conventional
U	120 Conventional XL, 48RR94MY
V	MB60 Short Conventional (to 95MY)
	Legacy FL112 (00MY)

VIN Position 5 (Model Series, Cab)	
Code	**Vehicle Model, Cab**
W	FC80 Freightliner Cargo COE
X	MB70 Short Conventional (to 97MY)
	Legacy FLD120 (00MY)
Y	MB80 Short Conventional (through 98MY)
Z	112 Conventional, Steel Cab, Highway
1	FLC112 Conv., Steel Cab, Constr. (to 98MY)
2	FLC120 Conventional (to 91MY)
	FC60 Freightliner Cargo COE
3	FLD112 Conventional, Alum. Cab, Highway
4	Low COE, Aluminum Cab
5	MB50 Short Conventional
6	FLD112SD Conv., Alum. Cab, Construction
7	FLD120 Conventional, SilverAero (91MY)
	FC70 Freightliner Cargo COE
8	FL106 Short Conventional
9	RIV

* MY = Model Year

Table 4, VIN Position 5 (Model Series, Cab)

VIN Positions 6 and 7 (Engine Manufacturer, Model, Horsepower Range)			
Code	**Engine Manufacturer**	**Engine Model**	**HP Range**
AY	Cummins	NTC / N14	207–251
BD	Mercedes-Benz	MBE4000	353–407
BE	Mercedes-Benz	MBE4000	408–495
BX	Mercedes-Benz	MBE4000	288–352
BY	Cummins	NTC / N14	254–310
CX	Detroit Diesel	S-60, 11.1 L	331–402
CY	Cummins	N14	315–385
DY	Cummins	NTC / N14	389–475
DZ	Cummins	N14	476–580
EB	Caterpillar	C10 / 3176J	225–275
EC	Caterpillar	C10 / 3176J	276–335
ED	Caterpillar	C10 / 3176	336–407
F4	Cummins	B5.9 (propane)	185–224
FA	Cummins	6BT 5.9 (diesel) / ISB	185–224
FB	Cummins	6BT 5.9 (diesel) / ISB	225–275

VIN for Vehicles Built through April 30, 2000

VIN Positions 6 and 7 (Engine Manufacturer, Model, Horsepower Range)			
Code	**Engine Manufacturer**	**Engine Model**	**HP Range**
FF	Cummins	6BT 5.9 / ISB	153–184
FH	Cummins	6BT 5.9–195G (natural gas)	185–224
FV	Cummins	6BT 5.9–195G (natural gas)	126–152
GA	Mercedes-Benz	OM 366LA	185–224
GB	Mercedes-Benz	OM 366LA	225–275
GF	Mercedes-Benz	OM 366LA	153–184
HB	Detroit Diesel	S–50	225–275
HC	Detroit Diesel	S–50	276–335
HD	Detroit Diesel	S–50	336–407
JA	Caterpillar	CFE / 3126 (diesel)	185–224
JB	Caterpillar	CFE / 3126 (diesel)	225–275
JC	Caterpillar	CFE / 3126 (diesel)	276–335
JF	Caterpillar	CFE / 3126 (diesel)	153–184
KY	Cummins	L10	225–275
LA	Cummins	6C 8.3 (diesel) / ISC	185–224
LB	Cummins	6C 8.3 (diesel) / ISC	225–275
LC	Cummins	6C 8.3 (diesel) / ISC	276–335
LD	Cummins	L10	336–407
LE	Cummins	ISC	336–407
LL	Cummins	C 8.3 (natural gas) / ISC	225–276
LY	Cummins	L10	276–330
MC	Cummins	M11 / ISM	276–335
MD	Cummins	M11 / ISM	336–407
ME	Cummins	M11 / ISM	408–495
MW	Cummins	ISM	496–605
NT	Cummins	4B 3.9–130 hp (diesel)	126–152
PY	Detroit Diesel	S-60, 11.1 L	275–330
RY	Caterpillar	3406	270–330
SE	Detroit Diesel	S-60, 12.7 L	408–495
SM	Detroit Diesel	S-60, 12.7 L	276–335
SY	Caterpillar	3406	333–407
SZ	Detroit Diesel	S-60, 12.7 L	496–605
TD	Detroit Diesel	S-55	336–407
TE	Detroit Diesel	S-55	408–495
TJ	Dodge	Magnum V8 (gasoline)	207–253
TR	Dodge	Magnum V10 (gasoline)	270–330

VIN for Vehicles Built through April 30, 2000

VIN Positions 6 and 7 (Engine Manufacturer, Model, Horsepower Range)			
Code	**Engine Manufacturer**	**Engine Model**	**HP Range**
TY	Caterpillar	3408	383–467
UY	Caterpillar	3306	225–275
VY	Caterpillar	3406	225–269
WC	Caterpillar	C12	276–335
WD	Caterpillar	C12 / 3176L	336–407
WE	Caterpillar	C12 / 3176L	408–495
WY	Caterpillar	3306	276–335
XY	Caterpillar	3406	408–495
XZ	Caterpillar	3406	496–605
YY	Detroit Diesel	S-60, 11.1 L	225–274
ZY	Detroit Diesel	S-60, 12.7 L	333–407
1B	Detroit Diesel	6L–71	225–275
1C	Detroit Diesel	6L–71	276–335
2W	Detroit Diesel	S-60, 14.0L	496–605
3A	Mercedes-Benz	MB904	185–224
4Y	Detroit Diesel	6V–92	239–287
5Y	Detroit Diesel	6V–92	288–352
6A	Mercedes-Benz	MB906	185–224
6B	Mercedes-Benz	MB906	225–275
6C	Mercedes-Benz	MB906	276–335
6Y	Detroit Diesel	8V–92	365–446
7D	Cummins	ISX Signature	336–407
7E	Cummins	ISX Signature	408–495
7W	Cummins	ISX Signature	496–605
8Y	Detroit Diesel	8V–92	302–364
9Y	Detroit Diesel	8V–92	447–522
0Y	No Engine	—	—

Table 5, VIN Positions 6 and 7 (Engine Manufacturer, Model, Horsepower Range)

VIN Position 8 (Gross Vehicle Weight Rating)		
Code	**lb**	**kg**
A	26,001–33,000	11 794–14 968
B	33,001 or over	14 969 or over
C	19,501–26,000	8846–11 793
D	16,001–19,500	7258–8845

VIN for Vehicles Built through April 30, 2000

VIN Position 8 (Gross Vehicle Weight Rating)		
Code	**lb**	**kg**
2	6001–10,000	2722–4536
3	10,001–14,000	4537–6350
4	14,001–16,000	6351–7257
9	N/A: Incomplete Vehicle or Glider	

Table 6, VIN Position 8 (Gross Vehicle Weight Rating)

VIN Position 10 (Vehicle Model Year)	
Code	**Model Year**
J	1988
K	1989
L	1990
M	1991
N	1992
P	1993
R	1994
S	1995
T	1996
V	1997
W	1998
X	1999
Y	2000
1	2001
2	2002

Table 7, VIN Position 10 (Vehicle Model Year)

VIN Position 11 (Plant of Manufacture)	
Code	**Plant of Manufacture**
A	St. Thomas, Ontario
B	Mercedes-Benz, South Africa
C	Gaffney, South Carolina
D	Mercedes-Benz, Mexico, Santiago
F	AIL, Israel
H	Mt. Holly, North Carolina
L	Cleveland, North Carolina
M	Mercedes-Benz, Monterrey
N	Mercedes-Benz, Australia
P	Portland, Oregon

VIN Position 11 (Plant of Manufacture)	
Code	**Plant of Manufacture**
R	American LaFrance, Cleveland, NC
V	Burnaby, British Columbia
W	NAI, Saudi Arabia

Table 8, VIN Position 11 (Plant of Manufacture)

VIN for Vehicles Built from May 1, 2000

IMPORTANT: See **Subject 050** for the vehicle identification numbering system for vehicles built before May 1, 2000.

Federal Motor Vehicle Safety Standard 115 specifies that all vehicles sold in the U.S. be assigned a 17-character Vehicle Identification Number (VIN). Using a combination of letters and numerals, the VIN defines the manufacturer, model, and major characteristics of the vehicle. See **Table 1** for the character positions of a typical Freightliner VIN, 1FUPABAV11PA12345.

The VIN can be found on the Vehicle Specification Decal (see the driver's manual for decal location) and stamped on the left frame rail over the front axle about 2 inches (50 mm) from the top of the web or on the top flange of the left frame rail at frame station 30.

NOTE: For Freightliner vehicles assembled and sold in Mexico, the VIN appears on a plate or label attached to the driver's door. Also, a data card placed in the glove box shows the Mexican VIN as the "CHASSIS" number. The "CABIN" number is part of the Freightliner VIN, the last six digits of which are the Freightliner serial number.

IMPORTANT: A new VIN-code structure will be used for all vehicles built after April 30, 2000. As a result, the build date of a vehicle must be determined before the VIN can be decoded.

Character positions 1 through 4 and 9 through 17 are nearly the same in both versions, but positions 5 through 8 have been assigned slightly different parameters.

Another new feature is that each product line has its own model list; that is, positions 5 and 6 are will be product-specific in the new system. For example, the code AB in positions 5 and 6 for a Freightliner vehicle indicates an FLD112. Code AB in the same position for a Sterling vehicle represents an SC7000 Cargo.

For all vehicles, a check digit (9th character) is determined by assignment of weighted values to the other 16 characters. These weighted values are processed through a series of equations designed to check validity of the VIN and to detect VIN alteration.

NOTE: Always specify the VIN when ordering parts.

Seventeen-Character Vehicle Identification Number (VIN)								
Typical VIN	**1 F U**	**P**	**AB**	**AV**	**1**	**1**	**P**	**A 1 2 3 4 5**
Character Position	1, 2, 3	4	5, 6	7, 8	9	10	11	12–17
Code Description	World Manufacturer Identification	Chassis Configuration	Model, Cab, GVWR	Engine, Brakes	Check Digit Calculation	Model Year	Build Location	Production Serial Number
Decoding Table*	**Table 2**	**Table 3**	**Table 4**	**Table 5**	—	**Table 6**	**Table 7**	—

* For corresponding decoding information, see the applicable tables in this subject.

Table 1, Seventeen-Character Vehicle Identification Number (VIN)

VIN Positions 1, 2, and 3 (World Manufacturer Identification)			
Code	**Vehicle Manufacturer**	**Vehicle Make**	**Vehicle Type**
1FU	Freightliner, U.S.A.	Freightliner	Truck-Tractor
1FV	Freightliner, U.S.A.	Freightliner	Incomplete Vehicle
3AK	M-B, Mexico (after April 1996)	Freightliner	Truck-Tractor
3AL	M-B, Mexico (after April 1996)	Freightliner	Incomplete Vehicle
RSA	NAI, Saudi Arabia	Freightliner	Incomplete Vehicle
RSB	NAI, Saudi Arabia	Freightliner	Truck-Tractor

Table 2, VIN Positions 1, 2, and 3 (World Manufacturer Identification)

VIN for Vehicles Built from May 1, 2000

VIN Position 4 (Chassis Configuration)	
Code	**Chassis**
A	4 x 2 Truck
B	4 x 2 Truck-Tractor
D	4 x 4 Truck
E	4 x 4 Truck-Tractor
F	6 x 2 Truck
G	6 x 2 Truck-Tractor
H	6 x 4 Truck
J	6 x 4 Truck-Tractor
K	6 x 6 Truck
L	6 x 6 Truck-Tractor
M	8 x 4 Truck
N	8 x 4 Truck-Tractor
P	8 x 6 Truck
R	8 x 6 Truck-Tractor
S	10 x 4 Truck
T	10 x 4 Truck-Tractor
U	10 x 6 Truck-Tractor
V	10 x 6 Truck-Tractor
X	Glider

Table 3, VIN Position 4 (Chassis Configuration)

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**Class (GVWR)**
AA	FLB Glider	COE	Glider
AB	FLD112	Conventional	Class 7*
AC	FLD112	Conventional	Class 8†
AD	FLD112 Glider	Conventional	Glider
AE	FLD112 SD	Conventional	Class 8
AF	FLD112 SD Glider	Conventional	Glider
AG	FLD120	Conventional	Class 7
AH	FLD120	Conventional	Class 8
AJ	FLD120 Glider	Conventional	Glider
AK	FLD120 SD	Conventional	Class 7
AL	FLD120 SD	Conventional	Class 8
AM	FLD120 SD Glider	Conventional	Glider

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**Class (GVWR)**
AN	FLD132 XL Classic	Conventional	Class 7
AP	FLD132 XL Classic	Conventional	Class 8
AR	FLD132 XL Classic Glider	Conventional	Glider
AS	FLD120 Military	Conventional	Class 7
AT	FLD120 Military	Conventional	Class 8
AU	FLD120 Mil Glider	Conventional	Glider
AV	Argosy	COE	Class 7
AW	Argosy	COE	Class 8
AX	Argosy Glider	COE	Glider
AY	C112 (Century Class)	Conventional	Class 7
AZ	C112	Conventional	Class 8
A1	C112 Glider	Conventional	Glider
A2	C120 (Century Class)	Conventional	Class 7
A3	C120	Conventional	Class 8
A4	C120 Glider	Conventional	Glider
A5	Columbia 120	Conventional	Class 7
A6	Columbia 120	Conventional	Class 8
A7	Columbia 120 Glider	Conventional	Glider
A8	ST112 (Century Class)	Conventional	Class 7
A9	ST112	Conventional	Class 8
A0	ST112 Glider	Conventional	Glider
BA	ST120 (Century Class)	Conventional	Class 7
BB	ST120	Conventional	Class 8
BC	ST120 Glider	Conventional	Glider
BD	FLD120 Classic Legacy	Conventional	Class 8
BE	FLS112 Legacy	Conventional	Class 8
BF	FL112	Conventional	Class 7
BG	FL112	Conventional	Class 8
BH	FL112 Glider	Conventional	Glider
BJ	FL50	Conventional	Class 4‡
BK	FL50	Conventional	Class 5§
BL	FL50	Conventional	Class 6¶
BM	FL50	Conventional	Class 7

VIN for Vehicles Built from May 1, 2000

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**Class (GVWR)**
BN	FL60	Conventional	Class 5
BP	FL60	Conventional	Class 6
BR	FL60	Conventional	Class 7
BS	FC70	Conventional	Class 6
BT	FC70	Conventional	Class 7
BU	FC70	Conventional	Class 8
BV	FC80	Conventional	Class 6
BW	FC80	Conventional	Class 7
BX	FC80	Conventional	Class 8
BY	FL106	Conventional	Class 6
BZ	FL106	Conventional	Class 7
B1	FL106	Conventional	Class 8
B2	FC70 Cargo	COE	Class 6
B3	FC70 Cargo	COE	Class 7
B4	FC70 Cargo	COE	Class 8
B5	FC80 Cargo	COE	Class 6
B6	FC80 Cargo	COE	Class 7
B7	FC80 Cargo	COE	Class 8
B8	RIV	None	Class 8
B9	Sport Chassis	Conventional	Class 6
B0	Sport Chassis	Conventional	Class 7
CA	FL106 Glider	Conventional	Glider
CB	FL60 Glider	Conventional	Glider
CC	FL70 Glider	Conventional	Glider
CD	FL80 Glider	Conventional	Glider
CE	T-2	COE	Class 7
CF	T-2	COE	Class 8

* Class 7 GVWR is 26,001–33,000 lb.
† Class 8 GVWR is 33,001 lb and over.
‡ Class 4 GVWR is 14,001–16,000 lb.
§ Class 5 GVWR is 16,001–19,500 lb.
¶ Class 6 GVWR is 19,501–26,000 lb.

Table 4, VIN Positions 5 and 6 (Model, Cab, Class/GVWR)

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement (L)**	**Configuration**	**Brakes**
AA	Caterpillar 3176	Diesel	10.3	I–6	Air
AB	Caterpillar 3176	Diesel	10.3	I–6	Hydraulic
AC	Caterpillar 3176	Diesel	10.3	I–6	Air/Hydraulic
AD	Caterpillar 3406	Diesel	14.6	I–6	Air
AE	Caterpillar 3406	Diesel	14.6	I–6	Hydraulic
AF	Caterpillar 3406	Diesel	14.6	I–6	Air/Hydraulic
AG	Caterpillar 3406E	Diesel	15.8	I–6	Air
AH	Caterpillar 3406E	Diesel	15.8	I–6	Hydraulic
AJ	Caterpillar 3406E	Diesel	15.8	I–6	Air/Hydraulic
AK	Caterpillar 3126/CFE	Diesel	7.2	I–6	Air
AL	Caterpillar 3126/CFE	Diesel	7.2	I–6	Hydraulic
AM	Caterpillar 3126/CFE	Diesel	7.2	I–6	Air/Hydraulic

VIN for Vehicles Built from May 1, 2000

VIN Positions 7 and 8 (Engine, Brakes)					
Code	Engine	Fuel	Displacement (L)	Configuration	Brakes
AN	Caterpillar C10	Diesel	10.3	I–6	Air
AP	Caterpillar C10	Diesel	10.3	I–6	Hydraulic
AR	Caterpillar C10	Diesel	10.3	I–6	Air/Hydraulic
AS	Caterpillar C12	Diesel	12.0	I–6	Air
AT	Caterpillar C12	Diesel	12.0	I–6	Hydraulic
AU	Caterpillar C12	Diesel	12.0	I–6	Air/Hydraulic
AV	Caterpillar C15	Diesel	14.6	I–6	Air
AW	Caterpillar C15	Diesel	14.6	I–6	Hydraulic
AX	Caterpillar C15	Diesel	14.6	I–6	Air/Hydraulic
AY	Caterpillar C16	Diesel	15.8	I–6	Air
AZ	Caterpillar C16	Diesel	15.8	I–6	Hydraulic
A1	Caterpillar C16	Diesel	15.8	I–6	Air/Hydraulic
A2	Cummins L10	Diesel	10.8	I–6	Air
A3	Cummins L10	Diesel	10.8	I–6	Hydraulic
A4	Cummins L10	Diesel	10.8	I–6	Air/Hydraulic
A5	Cummins M11	Diesel	10.8	I–6	Air
A6	Cummins M11	Diesel	10.8	I–6	Hydraulic
A7	Cummins M11	Diesel	10.8	I–6	Air/Hydraulic
A8	Cummins ISM	Diesel	10.8	I–6	Air
A9	Cummins ISM	Diesel	10.8	I–6	Hydraulic
A0	Cummins ISM	Diesel	10.8	I–6	Air/Hydraulic
BA	Cummins NTC	Diesel	14.0	I–6	Air
BB	Cummins NTC	Diesel	14.0	I–6	Hydraulic
BC	Cummins NTC	Diesel	14.0	I–6	Air/Hydraulic
BD	Cummins N14	Diesel	14.0	I–6	Air
BE	Cummins N14	Diesel	14.0	I–6	Hydraulic
BF	Cummins N14	Diesel	14.0	I–6	Air/Hydraulic
BG	Cummins ISX/Signature	Diesel	14.9	I–6	Air
BH	Cummins ISX/Signature	Diesel	14.9	I–6	Hydraulic
BJ	Cummins ISX/Signature	Diesel	14.9	I–6	Air/Hydraulic
BK	Cummins C8.3	Diesel	8.3	I–6	Air
BL	Cummins C8.3	Diesel	8.3	I–6	Hydraulic
BM	Cummins C8.3	Diesel	8.3	I–6	Air/Hydraulic

VIN for Vehicles Built from May 1, 2000

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement (L)**	**Configuration**	**Brakes**
BN	Cummins B5.9	Diesel	5.9	I–6	Air
BP	Cummins B5.9	Diesel	5.9	I–6	Hydraulic
BR	Cummins B5.9	Diesel	5.9	I–6	Air/Hydraulic
BS	Cummins ISC	Diesel	8.3	I–6	Air
BT	Cummins ISC	Diesel	8.3	I–6	Hydraulic
BU	Cummins ISC	Diesel	8.3	I–6	Air/Hydraulic
BV	Cummins ISB	Diesel	5.9	I–6	Air
BW	Cummins ISB	Diesel	5.9	I–6	Hydraulic
BX	Cummins ISB	Diesel	5.9	I–6	Air/Hydraulic
BY	Cummins B5.9	Propane	5.9	I–6	Air
BZ	Cummins B5.9	Propane	5.9	I–6	Hydraulic
B1	Cummins B5.9	Propane	5.9	I–6	Air/Hydraulic
B2	Cummins B5.9	Natural Gas	5.9	I–6	Air
B3	Cummins B5.9	Natural Gas	5.9	I–6	Hydraulic
B4	Cummins B5.9	Natural Gas	5.9	I–6	Air/Hydraulic
B5	Cummins C8.3	Natural Gas	8.3	I–6	Air
B6	Cummins C8.3	Natural Gas	8.3	I–6	Hydraulic
B7	Cummins C8.3	Natural Gas	8.3	I–6	Air/Hydraulic
B8	Detroit Series 50	Diesel	8.5	I–4	Air
B9	Detroit Series 50	Diesel	8.5	I–4	Hydraulic
B0	Detroit Series 50	Diesel	8.5	I–4	Air/Hydraulic
CA	Detroit Series 55	Diesel	12.0	I–6	Air
CB	Detroit Series 55	Diesel	12.0	I–6	Hydraulic
CC	Detroit Series 55	Diesel	12.0	I–6	Air/Hydraulic
CD	Detroit Series 60	Diesel	11.1	I–6	Air
CE	Detroit Series 60	Diesel	11.1	I–6	Hydraulic
CF	Detroit Series 60	Diesel	11.1	I–6	Air/Hydraulic
CG	Detroit Series 60	Diesel	12.7	I–6	Air
CH	Detroit Series 60	Diesel	12.7	I–6	Hydraulic
CJ	Detroit Series 60	Diesel	12.7	I–6	Air/Hydraulic
CK	Detroit Series 60	Diesel	14.0	I–6	Air
CL	Detroit Series 60	Diesel	14.0	I–6	Hydraulic
CM	Detroit Series 60	Diesel	14.0	I–6	Air/Hydraulic

VIN for Vehicles Built from May 1, 2000

VIN Positions 7 and 8 (Engine, Brakes)					
Code	Engine	Fuel	Displacement (L)	Configuration	Brakes
CN	Mercedes-Benz MBE900	Diesel	4.3	I–4	Air
CP	Mercedes-Benz MBE900	Diesel	4.3	I–4	Hydraulic
CR	Mercedes-Benz MBE900	Diesel	4.3	I–4	Air/Hydraulic
CS	Mercedes-Benz MBE900	Diesel	6.4	I–6	Air
CT	Mercedes-Benz MBE900	Diesel	6.4	I–6	Hydraulic
CU	Mercedes-Benz MBE900	Diesel	6.4	I–6	Air/Hydraulic
CV	Mercedes-Benz MBE4000	Diesel	12.0	I–6	Air
CW	Mercedes-Benz MBE4000	Diesel	12.0	I–6	Hydraulic
CX	Mercedes-Benz MBE4000	Diesel	12.0	I–6	Air/Hydraulic
CY	Cummins ISL	Diesel	8.3	I–6	Air
CZ	Cummins ISL	Diesel	8.3	I–6	Hydraulic
C1	Cummins ISL	Diesel	8.3	I–6	Air/Hydraulic
C2	Cummins B3.9	Diesel	3.9	I–4	Air
C3	Cummins B3.9	Diesel	3.9	I–4	Hydraulic
C4	Cummins B3.9	Diesel	3.9	I–4	Air/Hydraulic
C5	Cummins ISB 3.9	Diesel	3.9	I–4	Air
C6	Cummins ISB 3.9	Diesel	3.9	I–4	Hydraulic
C7	Cummins ISB 3.9	Diesel	3.9	I–4	Air/Hydraulic
00	No Engine	—	—	—	—

Table 5, VIN Positions 7 and 8 (Engine and Brakes)

VIN Position 10 (Model Year)	
Code	Model Year
Y	2000
1	2001
2	2002
3	2003
4	2004
5	2005
6	2006
7	2007

Table 6, VIN Position 10 (Model Year)

VIN Position 11 (Build Location)	
Code	Build Location
D	Mercedes-Benz, Mexico, Santiago
H	Mt. Holly, North Carolina
L	Cleveland, North Carolina
P	Portland, Oregon

Table 7, VIN Position 11 (Build Location)

Contents

Subject	Subject Number
General Information	050
Service Operations	
General Instructions	100
Specifications	400

General Information

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

Most fasteners used on the vehicle that are 1/2-inch diameter or larger are plain hex-type fasteners (non-flanged); *all* metric fasteners are non-flanged. Special hardened flatwashers are used under the bolt head, and between the part being attached and the hexnut, to distribute

the load, and to prevent localized overstressing of the parts. The washers are cadmium-or zinc-plated, and have a hardness rating of 38 to 45 HRC.

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

FASTENER GRADES AND CLASSES

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

Fasteners with metric threads are divided into classes adopted by the American National Standards Institute (ANSI). The higher the class number, the stronger the fastener. Bolt classes can be identified by the numbers forged on the head of the bolt. **Refer to Fig. 4.** Hexnut (and locknut) classes can be identified by the marks or numbers on various surfaces of the nut. **Refer to Fig. 5.** Class 8 hexnuts are always used with class 8.8 bolts; class 10 hexnuts with class 10.9 bolts.

FRAME FASTENERS

For most components attached to the frame, grade 8 and 8.2 phosphate-and oil-coated hexhead bolts and grade C cadmium-plated and wax-coated prevailing torque locknuts are used. The prevailing torque locknuts have distorted sections of threads to provide torque retention. For attachments where clearance is minimal, low-profile hexhead bolts and grade C prevailing torque locknuts are used. **See Fig. 6.**

TIGHTENING FASTENERS

When a capscrew is tightened to its torque value in a threaded hole, or a nut is tightened to its torque value on a bolt, the shank of the capscrew or bolt is stretched slightly. This stretching (tensioning) results

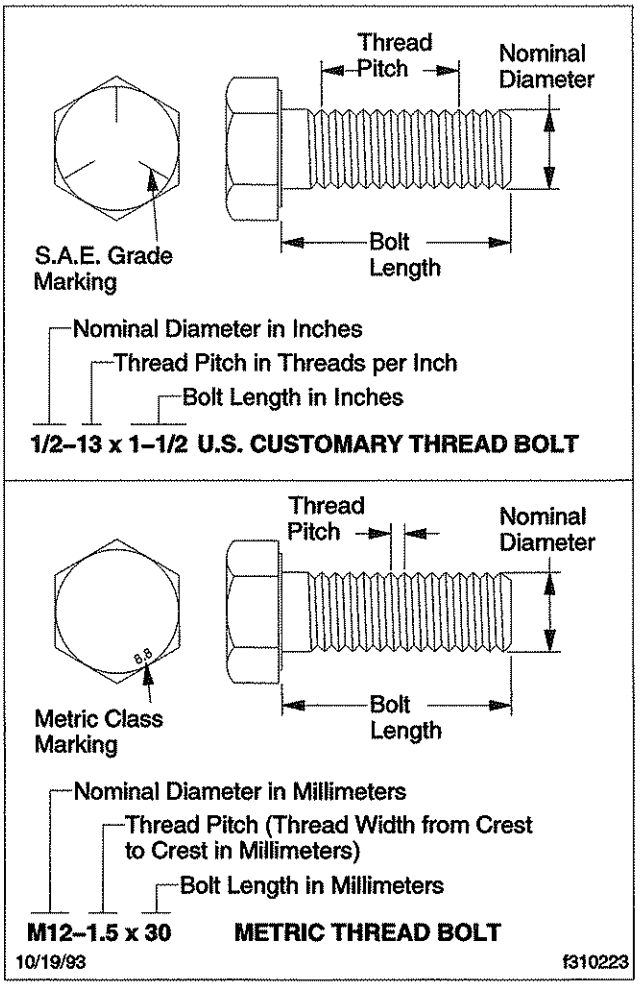
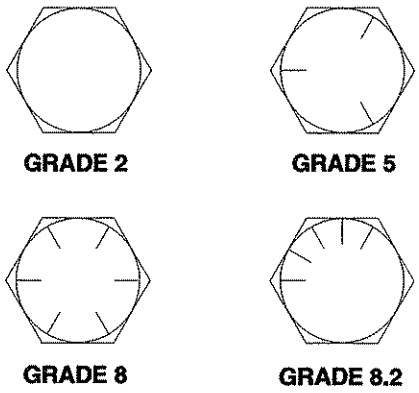


Fig. 1

General Information



NOTE: Grade 2 bolts have no grade marking; grade 2 bolts are rarely used by Freightliner.

These grade markings are used on plain hex--type and flanged bolts (capscrews). In additon to the grade markings, the bolt head must also carry the manufacturer's trademark or identification.

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Fig. 2

in a preload that reduces fatigue of the fasteners. The torque values given in the tables in Subject 400 have been calculated to provide enough clamping force on the parts being fastened, and the correct tensioning of the bolt to maintain the clamping force.

Use of a torque wrench to tighten fasteners will help prevent overtensioning them. Overtensioning causes permanent stretching of the fasteners, which can result in breakage of the parts or fasteners.

When torquing a fastener, typically 80 to 90 percent of the turning force is used to overcome friction; only 10 to 20 percent is used to stretch the capscrew or bolt. About 40 to 50 percent of the turning force is needed to overcome the friction between the underside of the capscrew head or nut and the washer. Another 30 to 40 percent is needed to overcome the friction between the threads of the capscrew and the threaded hole, or the friction between the threads of the nut and bolt.

The amount of torque required to tighten a fastener is reduced when the amount of friction is reduced. If a fastener is dry (unlubricated) and plain (unplated), the amount of friction is high. If a fastener is wax-coated or oiled, or has a zinc phosphate coating or cadmium plating, the amount of friction is reduced. Each of these coatings and combinations of coatings has a different effect. Using zinc-plated hardened flatwashers under the bolt (capscrew) head and nut reduces the amount of friction. Dirt or other foreign material on the threads or clamping surfaces of the fastener or clamped part also changes the amount of friction.

Even though each different condition affects the amount of friction, a different torque value cannot be given for each different condition. To ensure they are always torqued accurately, Freightliner recommends that all fasteners be lubricated with oil (unless specifically instructed to install them dry), then torqued to the values for lubricated-and plated-thread fasteners. When locking compound or anti-seize compound is recommended for a fastener, the compound acts as a lubricant, and oil is not needed.

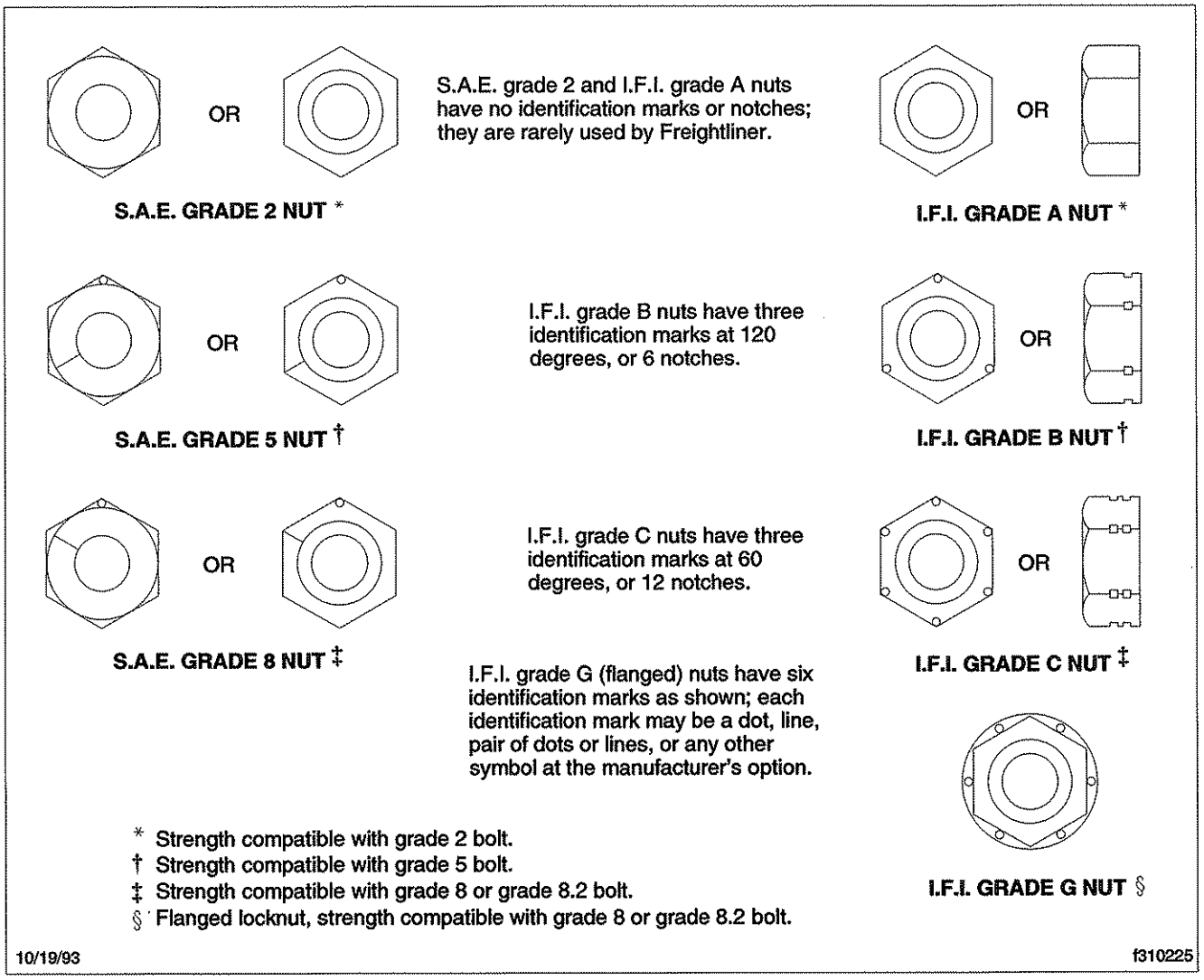

OR
S.A.E. grade 2 and I.F.I. grade A nuts have no identification marks or notches; they are rarely used by Freightliner.
OR
S.A.E. GRADE 2 NUT *
I.F.I. GRADE A NUT *
OR
I.F.I. grade B nuts have three identification marks at 120 degrees, or 6 notches.
OR
S.A.E. GRADE 5 NUT †
I.F.I. GRADE B NUT †
OR
I.F.I. grade C nuts have three identification marks at 60 degrees, or 12 notches.
OR
S.A.E. GRADE 8 NUT ‡
I.F.I. GRADE C NUT ‡
I.F.I. grade G (flanged) nuts have six identification marks as shown; each identification mark may be a dot, line, pair of dots or lines, or any other symbol at the manufacturer's option.
I.F.I. GRADE G NUT §
* Strength compatible with grade 2 bolt.
† Strength compatible with grade 5 bolt.
‡ Strength compatible with grade 8 or grade 8.2 bolt.
§ Flanged locknut, strength compatible with grade 8 or grade 8.2 bolt.
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Fig. 3

General Information

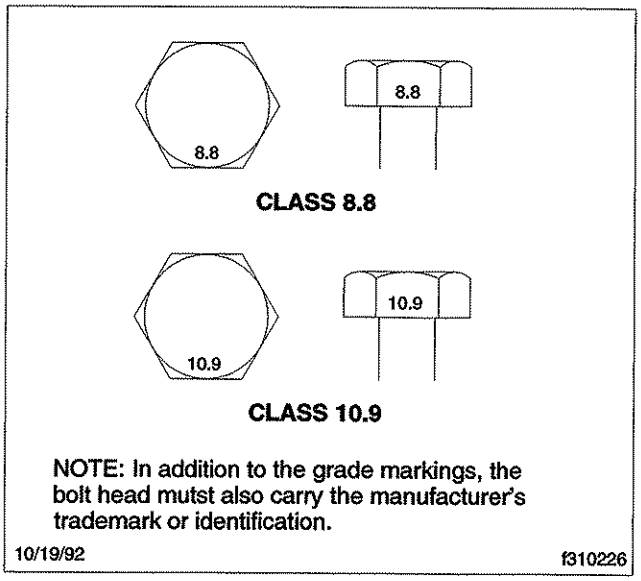


Fig. 4

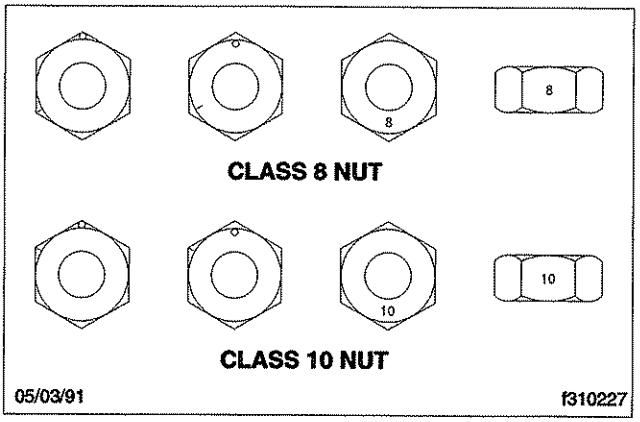


Fig. 5

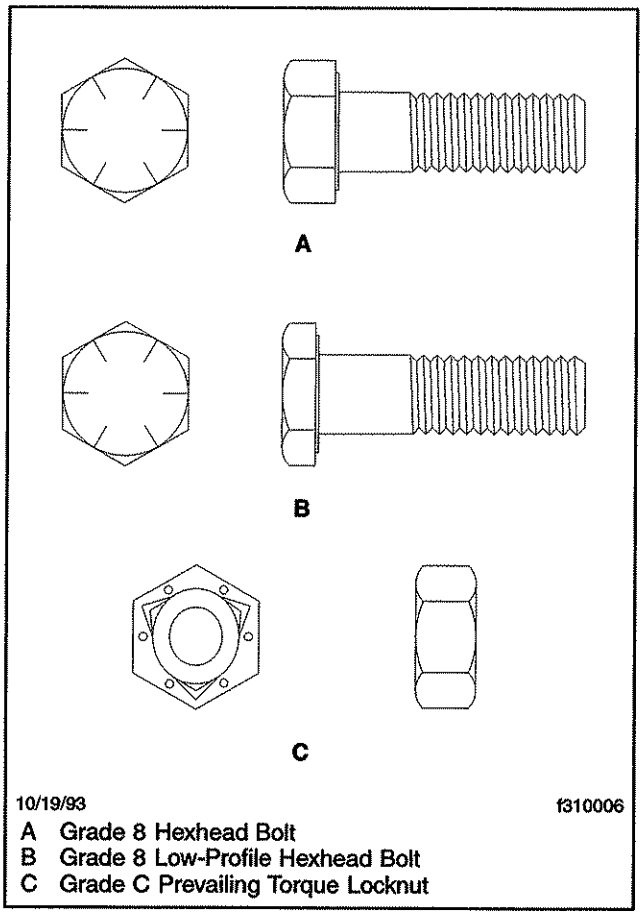


Fig. 6

Fastener Replacement

When replacing fasteners, use only identical bolts, washers, and nuts; they must be the same size, strength, and finish as originally specified. Refer to the Freightliner *Service Parts Catalog* for fastener specifications.

When replacing graded (or metric class) bolts and capscrews, use only fasteners that have the manufacturer's trademark or identification on the bolt head; don't use substandard bolts. Inferior, counterfeit fasteners are difficult to identify; buy your fasteners from a reputable supplier.

Fastener Selection and Installation

When using nuts with bolts, use a grade (or class) of nut that matches the bolt.

When installing non-flanged fasteners, use hardened steel flatwashers under the bolt (capscrew) head, and under the hexnut or locknut.

For bolts 100 mm (4 inches) or less in length, make sure that at least 1-1/2 threads and no more than 16-mm (5/8-inch) bolt length extends through the nut after it has been tightened. For bolts longer than 100 mm (4 inches), allow a minimum of 1-1/2 threads and a maximum of 19-mm (3/4-inch) bolt length.

Never hammer or screw bolts into place. Align the holes of the parts being attached, so that the nut and bolt surfaces are flush against the washers, and the washers are flush against the parts.

When installing fasteners in aluminum or plastic parts with threaded holes, start the fasteners by hand, to ensure straight starting and to prevent damaged threads.

Don't use lockwashers (split or toothed) next to aluminum surfaces.

When installing studs that don't have an interference fit, install them with thread locking compound, as instructed in this subject.

When installing parts that are mounted on studs, use free-spinning (non-locking) nuts and helical-spring (split) lockwashers or internal-tooth lockwashers. Don't use locknuts, because they tend to loosen the studs during removal. Don't use plain washers (flatwashers).

Don't use lockwashers and flatwashers in combination (against each other); each defeats the other's purpose.

Use stainless steel fasteners against chrome plating, unpainted aluminum, or stainless steel.

Fastener Tightening

Before installing fasteners, clean all fastener (and parts) threads, and all surfaces being clamped.

To ensure they are always torqued accurately, Freightliner recommends that *all* fasteners be lubricated with oil (unless specifically instructed to install them dry), then torqued to the values for lubricated-and plated-thread fasteners. When locking compound or anti-seize compound is recommended for a fastener, the compound acts as a lubricant, and oil is not needed.

Bring parts and fasteners into contact, with no gaps between them, before using a torque wrench to tighten fasteners to their final torque values.

Tighten the nut, not the bolt head. This will give a truer torque reading by eliminating bolt body friction.

Always use a torque wrench to tighten fasteners, and use a slow, smooth, even pull on the wrench. Don't overtorque fasteners; overtightening causes permanent stretching of the fasteners, which can result in breakage of the parts or fasteners.

If specific torque values aren't given for countersunk bolts, use the torque value for the corresponding size and grade of regular bolt, as given in Subject 400.

Always follow the torque sequence or torque interval when provided, to ensure that clamping forces are even, and parts and fasteners aren't distorted.

Tighten frame fasteners periodically to offset the effects of "bedding in" (seating). Continued vehicle operation with loose frame fasteners could result in component, bracket, and frame damage. Refer to the Maintenance Schedule and Group 31 of the vehicle maintenance manual for intervals.

Thread Locking Compound Application

When the use of thread locking compound is recommended or desired, for studs, capscrews, and bolts

General Instructions

with a thread diameter of 25 mm (1 inch) or less, use Loctite® 271 or Perma-Lok® HM-128.

For thread diameters over 25 mm (1 inch), use Loctite 277.

NOTE: Follow the safety precautions given on the locking compound container.

1. Clean the male and female threads of the fasteners, removing all dirt, oil, and other foreign material. If parts are contaminated, use Stoddard solvent for cleaning; then allow the fasteners to air dry for 10 minutes. Be sure solvent is completely gone before applying adhesive.
2. Transfer a small amount of the locking compound from the container to a paper cup or small non-metal dish.
3. Using a plastic brush (a metal brush will contaminate the compound), apply a small amount of compound to the entire circumference of 3 or 4 of the male threads that will be covered by the nut after it has been tightened. Be sure enough compound is applied to fill the inside of the nut threads, with a slight excess.
4. Install and torque the nut. Readjustment of the nut position is not possible after installation is complete, without destroying the locking effect.

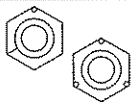
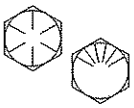
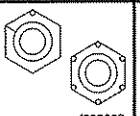
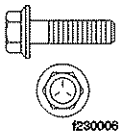
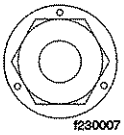
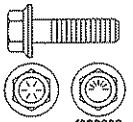
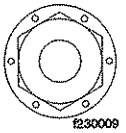
NOTE: To disassemble the fasteners, heat the bond line to 200°C (400°F) before removing the nut. Every time the fasteners are disassembled, replace them. If any parts are damaged by overheating, replace the parts.

Specifications

This subject contains the following tables:

- Torque Values for U.S. Customary Thread Fasteners with Lubricated or Plated Threads
- Torque Values for U.S. Customary Thread Fasteners with Dry (Unlubricated) or Plain (Unplated) Threads
- Torque Values for Metric Thread Fasteners with Lubricated or Plated Threads

TORQUE VALUES FOR U.S. CUSTOMARY THREAD FASTENERS WITH LUBRICATED* OR PLATED THREADS†

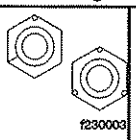
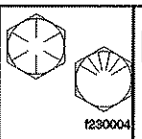
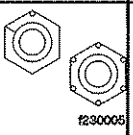
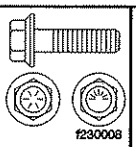
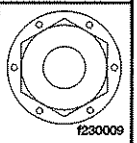
Thread Diameter-Pitch	Regular Hex				Flanged			
	 f230002 Grade 5 Bolt	 f230003 Grade 5 or B Nut	 f230004 Grade 8 or 8.2 Bolt	 f230005 Grade 8 or C Nut	 f230006 Grade 5 Bolt	 f230007 Grade B Nut	 f230008 Grade 8 or 8.2 Bolt	 f230009 Grade G Nut
	Torque: N·m (lbf·ft)		Torque: N·m (lbf·ft)		Torque: N·m (lbf·ft)		Torque: N·m (lbf·ft)	
1/4–20	9 (7)		11 (8)		8 (6)		14 (10)	
1/4–28	11 (8)		12 (9)		9 (7)		16 (12)	
5/16–18	20 (15)		22 (16)		18 (13)		28 (21)	
5/16–24	22 (16)		23 (17)		19 (14)		31 (23)	
3/8–16	35 (26)		38 (28)		31 (23)		50 (37)	
3/8–24	41 (30)		43 (32)		34 (25)		57 (42)	
7/16–14	57 (42)		61 (45)		47 (35)		81 (60)	
7/16–20	64 (47)		68 (50)		54 (40)		89 (66)	
1/2–13	87 (64)		92 (68)		75 (55)		123 (91)	
1/2–20	98 (72)		104 (77)		88 (65)		138 (102)	
9/16–12	125 (92)		133 (98)		108 (80)		176 (130)	
9/16–18	140 (103)		149 (110)		122 (90)		198 (146)	
5/8–11	173 (128)		184 (136)		149 (110)		244 (180)	
5/8–18	197 (145)		209 (154)		176 (130)		277 (204)	
3/4–10	306 (226)		327 (241)		271 (200)		434 (320)	
3/4–16	343 (253)		365 (269)		298 (220)		484 (357)	
7/8–9	495 (365)		526 (388)		434 (320)		698 (515)	
7/8–14	545 (402)		579 (427)		475 (350)		770 (568)	
1–8	—		789 (582)		—		—	
1–12	—		863 (637)		—		—	
1–14	—		884 (652)		—		—	

† Freightliner recommends that all plated and unplated fasteners be coated with oil before installation.
‡ Use these torque values if either the bolt or nut is lubricated or plated (zinc-phosphate conversion-coated, cadmium-plated, or waxed).

Table 1

Specifications

TORQUE VALUES FOR U.S. CUSTOMARY THREAD FASTENERS WITH DRY (UNLUBRICATED)* PLAIN (UNPLATED) THREADS†

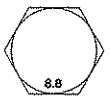
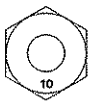
Thread Diameter-Pitch	Regular Hex				Flanged	
	 f230002	 f230003	 f230004	 f230005	 f230008	 f230009
	Grade 5 Bolt	Grade 5 or B Nut	Grade 8 or 8.2 Bolt	Grade 8 or C Nut	Grade 8 or 8.2 Bolt	Grade G Nut
	Torque: N·m (lbf·ft)		Torque: N·m (lbf·ft)		Torque: N·m (lbf·ft)	
1/4–20	11 (8)		14 (10)		—	
1/4–28	12 (9)		16 (12)		—	
5/16–18	20 (15)		30 (22)		30 (22)	
5/16–24	23 (17)		34 (25)		—	
3/8–16	38 (28)		54 (40)		54 (40)	
3/8–24	42 (31)		61 (45)		—	
7/16–14	61 (45)		88 (65)		88 (65)	
7/16–20	68 (50)		95 (70)		—	
1/2–13	95 (70)		129 (95)		129 (95)	
1/2–20	102 (75)		149 (110)		—	
9/16–12	136 (100)		190 (140)		190 (140)	
9/16–18	149 (110)		210 (155)		—	
5/8–11	183 (135)		258 (190)		258 (190)	
5/8–18	210 (155)		292 (215)		—	
3/4–10	325 (240)		461 (340)		461 (340)	
3/4–16	366 (270)		515 (380)		—	
7/8–9	522 (385)		732 (540)		—	
7/8–14	576 (425)		813 (600)		—	
1–8	786 (580)		1112 (820)		—	
1–12	861 (635)		1220 (900)		—	
1–14	881 (650)		1241 (915)		—	

† Threads may have residual oil, but will be dry to the touch.

‡ Male and female threads (bolt and nut) must both be unlubricated and unplated; if either is plated or lubricated, use the table for Lubricated Threads. Freightliner recommends that all plated and unplated fasteners be coated with oil before installation.

Table 2

TORQUE VALUES FOR METRIC THREAD FASTENERS WITH LUBRICATED* OR PLATED THREADS†

Thread Diameter-Pitch	 f230010 Class 8.8 Bolt	 f230011 Class 8 Nut	 f230012 Class 10.9 Bolt	 f230013 Class 10 Nut
	Torque: N·m (lbf·ft)		Torque: N·m (lbf·ft)	
M6	7 (5)		9 (7)	
M8	16 (12)		23 (17)	
M8 x 1	18 (13)		24 (18)	
M10	33 (24)		46 (34)	
M10 x 1.25	37 (27)		52 (38)	
M12	57 (42)		81 (60)	
M12 x 1.5	58 (43)		84 (62)	
M14	89 (66)		129 (95)	
M14 x 1.5	98 (72)		140 (103)	
M16	140 (103)		201 (148)	
M16 x 1.5	149 (110)		213 (157)	
M18	199 (147)		275 (203)	
M18 x 1.5	224 (165)		310 (229)	
M20	282 (208)		390 (288)	
M20 x 1.5	313 (231)		434 (320)	
M22	384 (283)		531 (392)	
M22 x 1.5	427 (315)		584 (431)	
M24	488 (360)		675 (498)	
M24 x 2	531 (392)		735 (542)	
M27	715 (527)		988 (729)	
M27 x 2	771 (569)		1068 (788)	
M30	969 (715)		1342 (990)	
M30 x 2	1074 (792)		1486 (1096)	

† Freightliner recommends that all plated and unplated fasteners be coated with oil before installation.

‡ Use these torque values if either the bolt or nut is lubricated or plated (zinc-phosphate conversion-coated, cadmium-plated, or waxed).

Table 3

List of Abbreviations

The following is a list of definitions for abbreviations and symbols used in Freightliner publications.

A ..... ampere(s)
ABS ..... acrylonitrile-butadiene-styrene, or antilock braking system (WABCO)
ac or AC .. alternating current
A/C ..... air conditioner or air conditioning
ADLO .... Auto-Disengagement Lockout
A.M. ..... ante meridiem (midnight to noon)
AM ..... amplitude modulation
amp(s) ... ampere(s)
ANSI ..... American National Standards Institute
API ..... American Petroleum Institute
ARI ..... Air Conditioning and Refrigeration Institute
ASA ..... American Standards Association
ASF ..... American Steel Foundries
assy. or ASSY .... assembly
ASTM ... American Society for Testing and Materials
ATF ..... automatic transmission fluid
attn. ..... attention
aux. ..... auxiliary
AWG ..... American Wire Gauge
AWS ..... American Welding Society
BAT ..... battery (terminal)
BTDC .... before top dead center
Btu ..... British thermal unit
C ..... common (terminal)
°C ..... degrees Celsius (centigrade)
CAC ..... charge air cooler
CARB .... California Air Resources Board
CAT ..... Caterpillar Engine Company
CCA ..... cold cranking amperes
CD-ROM .. compact-disc/read-only memory
CEL ..... check-engine light
CFC ..... chlorofluorocarbons (refrigerant-12)
cfm ..... cubic feet per minute
CFR ..... Code of Federal Regulations
CL ..... centerline
CLS ..... coolant level sensor
cm ..... centimeter(s)
cm^3 ..... cubic centimeters
CMVSS ... Canadian Motor Vehicle Safety Standard
Co. ..... Company
COE ..... cab over engine
Corp. ..... Corporation
cpu ..... central processing unit
cSt ..... Centistoke(s) (unit of measurement for describing the viscosity of general liquids)
cu ft ..... cubic foot (feet)
cu in ..... cubic inch(es)
dc or DC .. direct current
DDA ..... Detroit Diesel Allison
DDC ..... Detroit Diesel Corporation
DDE ..... Detroit Diesel Engines
DDEC .... Detroit Diesel Electronic (Engine) Control
DDR ..... diagnostic data reader
def. ..... defrost
dia. ..... diameter
DIP ..... dual inline pin (switch)
DOT ..... Department of Transportation
ea. ..... each
EDM ..... electronic data monitor
EEPROM .. electronically erasable programmable read only memory
EP ..... extreme pressure (describes an anti-wear agent added to some lubricants)
EPA ..... Environmental Protection Agency
etc. ..... et cetera (and so forth)
ETEC ..... Electronic Truck Engine Control
EUI ..... electronic unit (fuel) injectors
°F ..... degrees Fahrenheit
FAS ..... Freightliner Air Suspension
Fig. ..... Figure
FL ..... Freightliner
fl oz ..... fluid ounce(s)
FLA ..... (post-1984 Advancements Freightliner COE)
FLB ..... (enhanced Freightliner FLA COE)
FLC ..... (steel-cab Freightliner 112 Conventional)
FLD ..... (post-1984 Advancements Freightliner 112/120 aluminum-cab Conventional)
FM ..... frequency modulation
FMSI ..... Friction Materials Standards Institute
FMVSS ... Federal Motor Vehicle Safety Standard
FRP ..... Fiberglass Reinforced Plastic
ft ..... foot (feet)
ft^3 ..... cubic feet
ft^3/min .... cubic feet per minute
g ..... gram(s)
gal ..... gallon(s)
GAWR .... Gross Axle Weight Rating
GL ..... gear lubricant
gnd. ..... ground (terminal)
gpm ..... gallons per minute
GVWR .... Gross Vehicle Weight Rating
HD ..... heavy-duty
HEPA ..... high-efficiency particulate air (filter)
HFC ..... hydrogenated florocarbons (refrigerant-134a)
hp ..... horsepower
HP ..... high pressure
hr ..... hour
HRC ..... Rockwell "C" Hardness
hrs ..... hours
htr ..... heater
i.d. ..... inside diameter
ID ..... identification
IFI ..... Industrial Fasteners Institute
IGN ..... ignition (terminal)
ILO ..... in lieu of
in ..... inch(s)
in^3 ..... cubic inches
Inc. ..... Incorporated
inHg ..... inches of mercury
inH_2O .... inches of water
inter. ..... intermediate
ISO ..... International Organization for Standardization
K ..... kilo (1000) or kilos
kg ..... kilogram(s)
km ..... kilometer(s)
km/h ..... kilometers per hour

List of Abbreviations

kPa ..... kilopascals
kW..... kilowatt(s)
L ..... liter(s)
lb..... pound(s)
lbf·ft ..... pound force feet
lbf·in ..... pound force inches
LED..... light-emitting diode
LH ..... left-hand
LHD..... left-hand drive
LHS..... low hydrogen steel
L/min..... liters per minute
LPG..... liquefied petroleum gas
m..... meter(s)
max. ..... maximum
MESA .... Mining Enforcement Safety Act
mfr. ..... manufacturer
MIL ..... military specification
mi ..... mile(s)
min...... minimum
misc...... miscellaneous
mL..... milliliter(s)
mm ..... millimeter(s)
mph..... miles per hour
MSHA .... Mine Safety and Health Administration
MVDA .... Motor Vehicle Dealers Association
n ..... negative (front axle wheel alignment specification)
N ..... nitrogen
NA..... not applicable
NC..... normally closed (terminal or switch)
N·cm ..... Newton-centimeters
NHTSA ... National Highway Traffic Safety Administration
NIOSH.... National Institute for Occupational Safety and Health
NLGI ..... National Lubricating Grease Institute
N·m ..... Newton-meters
no...... number
NO..... normally open (terminal or switch)
nos...... numbers
NPT..... National Pipe Thread
NPTF..... National Pipe Thread Fitting
NT..... nylon tube or nylon tubing
o.d. ..... outside diameter
O.D...... overdrive
OEM ..... original equipment manufacturer
OSHA .... Occupational Safety and Health Act
oz ..... ounce(s)
ozf·in..... ounce force inches
p ..... positive (front axle wheel alignment specification)
PACE..... Programmable Electonically Controlled Engine (governing)
PEEC .... Programmable Electonic Engine Control
P.M...... post meridiem (noon to midnight)
PN..... part number
psi..... pounds per square inch
psia..... pounds per square inch, atmosphere
psig..... pounds per square inch, gauge
pt ..... pint(s)
PTO..... power take-off
pvc ..... polyvinyl chloride
qt..... quart(s)
qty. ..... quantity
R–12 ..... refrigerant-12 (CFC)
R–134a ... refrigerant-134a (HFC)
R & O .... rust inhibitors and oxidants
recirc .... recirculation
Ref. ..... Reference
Refs...... References
RH..... right-hand
RHD ..... right-hand drive
rpm ..... revolutions per minute
RSG ..... road speed governor
SAE ..... Society of Automotive Engineers, Inc
SB..... Service Bulletin
SD..... severe duty
SEL..... shutdown engine light
SI..... System International
SMC ..... sheet molded compound
S/N ..... serial number
SRT..... standard repair time
SST..... stainless steel tank
std. ..... standard
SW ..... switch
TBS..... turbo boost sensor
TDC..... top dead center
temp ..... temperature
TIG ..... tungsten inert gas
TRS..... timing reference sensor
TRW ..... Thompson, Ramo, Wooldridge
TSO..... truck specification order
U.D...... underdrive
U.L...... Underwriters Laboratories
UNC ..... Unified National Coarse
UNF..... Unified National Fine
U.S...... United States
U.S.A. .... United States of America
USC..... United States Customary (measures)
V ..... volt(s)
Vdc ..... volts, direct current
VIN ..... vehicle identification number
VIP ..... Vehicle Instrumentation and Protection (Kysor)
VSG..... variable speed governor
WB ..... wire braid
WI..... Work Instructions
WOT ..... wide open throttle
..... number
+ ..... plus or positive
– ..... minus or negative
± ..... plus-or-minus
x ..... by (used in fastener size descriptions)
%..... percent
& ..... and
© ..... copyright
™ ..... trademark
® ..... registered trademark