Group Index, Alphabetical

Contents

List of Abbreviations

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

A ..... amperes
AAVA ..... auxiliary air valve assembly
ABS ..... antilock braking system
ABS ..... acrylonitrile-butadiene-styrene
A/C ..... air conditioner
AC ..... alternating current
acc ..... accessories
ACM ..... aftertreatment control module
ACPU ..... air conditioning protection unit
ADLO ..... auto-disengagement lockout
AGM ..... absorbed glass mat
AGS ..... automated gear shift
AG2 ..... Aluminum Generation 2
a.m. ..... *ante meridiem* (midnight to noon)
AM ..... amplitude modulation
amp(s) ..... ampere(s)
AMT ..... automated mechanical transmission
AMU ..... air management unit
ANSI ..... American National Standards Institute
API ..... American Petroleum Institute
API ..... application programming interface
ARI ..... Air Conditioning and Refrigeration Institute
ASA ..... American Standards Association
ASF ..... American Steel Foundries
ASR ..... automatic spin regulator
assy. ..... assembly
ASTM ..... American Society for Testing and Materials
ATC ..... automatic temperature control
ATC ..... automatic traction control
ATC ..... automatic transmission control
ATD ..... aftertreatment device
ATF ..... automatic transmission fluid
ATS ..... aftertreatment system
attn ..... attention
aux. ..... auxiliary
av ..... *avoirdupois* (British weight system)
AWD ..... all-wheel drive
AWG ..... American wire gauge
AWS ..... American Welding Society
BAT ..... battery
BBC ..... bumper-to-back-of-cab
BHM ..... bulkhead module
BOC ..... back-of-cab
BOM ..... bill of material
BTDC ..... before top dead center
Btu(s) ..... British thermal unit(s)
C ..... common (terminal)
CAC ..... charge air cooler
CAN ..... controller area network
CARB ..... California Air Resources Board
CAT ..... Caterpillar
CB ..... circuit breaker
CB ..... citizens' band
CBE ..... cab behind engine
CCA ..... cold cranking amperes
CD-ROM .. compact-disc/read-only memory
CDTC ..... constant discharge temperature control
CEL ..... check-engine light
CFC ..... chlorofluorocarbons (refrigerant-12)
cfm ..... cubic feet per minute
CFR ..... Code of Federal Regulations
CGI ..... clean gas induction
CGW ..... central gateway
CHM ..... chassis module
CIP ..... cold inflation pressure
CLS ..... coolant level sensor
cm ..... centimeters
cm^3 ..... cubic centimeters
CMVSS .... Canadian Motor Vehicle Safety Standard
Co. ..... company
COE ..... cab over engine
Corp. ..... corporation
CPC ..... common powertrain controller
CPU ..... central processing unit
CRT ..... cathode ray tube
cSt ..... centistokes (unit of measurement for describing the viscosity of general liquids)
cu ft ..... cubic feet
cu in ..... cubic inches
CUM ..... Cummins
CVSA ..... Commercial Vehicle Safety Alliance
CWS ..... collision warning system
DC ..... direct current
DCDL ..... driver-controlled differential lock
DDA ..... Detroit Diesel Allison (obs)
DDC ..... Detroit Diesel Corporation
DDDL ..... Detroit Diesel Diagnostic Link
DDE ..... Detroit Diesel Engines
DDEC ..... Detroit Diesel Electronic (engine) Control
DDR ..... diagnostic data reader
DDU ..... driver display unit
def ..... defrost
DEF ..... diesel exhaust fluid
DFI ..... direct fuel injection
DGPS ..... differential global positioning system
dia. ..... diameter
DIAG ..... diagnosis
DIP ..... dual inline package (switch)
DIU ..... driver interface unit
DLA ..... datalink adaptor
DLM ..... datalink monitor
DLU ..... data logging unit
DMM ..... digital multimeter
DOC ..... diesel oxidation catalyst
DOT ..... Department of Transportation
DPF ..... diesel particulate filter
DRL ..... daytime running lights
DRM ..... dryer reservoir module
DSM ..... district service manager
DTC ..... diagnostic trouble code
DTC ..... discharge temperature control
DTNA ..... Daimler Trucks North America
DVOM ..... digital volt/ohm meter
ea. ..... each
EBS ..... electronic braking system
ECA ..... electric clutch actuator
ECAP ..... electronic control analyzer programmer
ECAS ..... electronically controlled air suspension
ECI ..... electronically controlled injection
ECL ..... engine coolant level
ECM ..... electronic control module
ECT ..... engine coolant temperature
ECU ..... electronic control unit

List of Abbreviations

EDM ..... electronic data monitor
EEPROM .. electrically erasable programmable read-only memory
EFG ..... electric fuel gauge
EFPA ..... electronic foot pedal assembly
EGR ..... exhaust gas recirculation
ELC ..... extended-life coolant
EMC ..... electromagnetic compatibility
EMI ..... electromagnetic interference
EOA ..... electric over air
EP ..... extreme pressure (describes an antiwear agent added to some lubricants)
EPA ..... Environmental Protection Agency
EPS ..... engine position sensor
ESC ..... electronic stability control
ESC ..... enhanced stability control
ESD ..... electrostatic discharge
ESS ..... engine syncro shift (transmission)
etc. ..... *et cetera* (and so forth)
ETEC ..... electronic truck engine control
EUI ..... electronic unit (fuel) injectors
EVA ..... electronic vibration analyzer
EXM ..... (chassis) expansion module
E85 ..... 85% ethanol fuel
FAS ..... Freightliner air suspension
FCCC ..... Freightliner Custom Chassis Corporation
FET ..... field effect transistor
Fig. ..... figure
fl oz ..... fluid ounces
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
FLR ..... forward-looking radar
FM ..... frequency modulation
FMCSA .... Federal Motor Carrier Safety Administration
FMEA ..... failure mode effects analysis
FMI ..... failure mode indicator
FMSI ..... Friction Materials Standards Institute
FMVSS .... Federal Motor Vehicle Safety Standard
FRP ..... fiberglass reinforced plastic
FSA ..... field service authorization
FSM ..... fleet service manager
ft ..... feet
ft^3 ..... cubic feet
ft^3/min ..... cubic feet per minute
FTL ..... Freightliner
F.U.E.L. .... fuel usage efficiency level
g ..... grams
gal ..... gallons
GAWR ..... gross axle weight rating
GHG ..... greenhouse gas
GL ..... gear lubricant
GND ..... ground
gpm ..... gallons per minute
GPS ..... global positioning system
GVWR ..... gross vehicle weight rating
HBED ..... hard-braking event data
HCM ..... hybrid control module
HCOE ..... high cab over engine
HCU ..... hydraulic control unit
HD ..... heavy-duty
HDU ..... hybrid drive unit
HEPA ..... high-efficiency particulate air (filter)
HEST ..... high exhaust system temperature
HEV ..... hybrid electric vehicle
HFC ..... hydrogenated fluorocarbons (refrigerant-134a)
hp ..... horsepower
hp ..... high pressure
HRC ..... Rockwell "C" hardness
hr(s) ..... hour(s)
HSA ..... hill start aid
HSD ..... high-side driver
htr. ..... heater
HVAC ..... heating, ventilating, and air conditioning
HVLP ..... high velocity, low pressure
H/W ..... hardware
Hz ..... hertz
IAD ..... interaxle differential
ICS ..... integrated child seat
ICU ..... instrumentation control unit
i.d. ..... inside diameter
ID ..... identification
IFI ..... Industrial Fasteners Institute
IFS ..... independent front suspension
IGN ..... ignition
ILB ..... intelligent lightbar
ILO ..... *in lieu of* (in the place of)
in ..... inches
in^3 ..... cubic inches
Inc. ..... incorporated
inH_2O ..... inches of water
inHg ..... inches of mercury
I/O ..... input/output
IP ..... instrument panel
ISO ..... International Organization for Standardization
IVS ..... idle validation switch
k ..... kilo (1000)
kg ..... kilograms
km ..... kilometers
km/h ..... kilometers per hour
kPa ..... kilopascals
kW ..... kilowatts
L ..... liters
lb ..... pounds
LBCU ..... lightbar control unit
lbf·ft ..... pounds force feet
lbf·in ..... pounds force inches
LCD ..... liquid crystal display
LCOE ..... low cab over engine
LED ..... light-emitting diode
LH ..... left-hand
LH DR ..... left-hand drive
LHK ..... liters per hundred kilometers
LHS ..... low-hydrogen steel
LIN ..... Local Interconnect Network
LLC ..... limited liability company
L/min ..... liters per minute
LNG ..... liquefied natural gas
LPG ..... liquefied petroleum gas
LPR ..... low pressure reservoir
LSD ..... low-side driver
LVD ..... low-voltage disconnect
m ..... meters
max. ..... maximum
M-B ..... Mercedes-Benz
MCM ..... motor control module
MESA ..... Mining Enforcement Safety Act
mfr. ..... manufacturer
mi ..... miles

List of Abbreviations

MID ..... message identifier
MIL ..... malfunction indicator lamp (light)
MIL ..... military specification
min. ..... minutes
min. ..... minimum
misc. ..... miscellaneous
mL ..... milliliters
mm ..... millimeters
mod. ..... module
mpg ..... miles per gallon
mph ..... miles per hour
MSF ..... modular switch field
MMT ..... methylcyclopentadienyl manganese tricarbonyl
MSHA ..... Mining Safety and Health Administration
MVDA ..... Motor Vehicle Dealers Association
n ..... negative (front axle wheel alignment specification)
N ..... nitrogen
N/A ..... not applicable
N·cm ..... Newton-centimeters
NC ..... normally closed (terminal or switch)
NHTSA .... National Highway Traffic Safety Administration
NIOSH ..... National Institute for Occupational Safety and Health
NLGI ..... National Lubricating Grease Institute
N·m ..... Newton-meters
NO ..... normally open (terminal or switch)
NOAT ..... Nitrited Organic Acid Technology
NOx ..... nitrogen oxides
no. ..... number
NPT ..... national pipe thread
NPTF ..... national pipe thread fitting
NT ..... nylon tube or nylon tubing
NTSB ..... National Transportation Safety Board
OAT ..... Organic Acid Technology
OBD(s) .... on-board diagnostic(s)
obs ..... obsolete
OC ..... open circuit
OCV ..... open circuit voltage
o.d. ..... outside diameter
O.D. ..... overdrive
OEM ..... original equipment manufacturer
OSHA ..... Occupational Safety and Health Administration
oz ..... ounces
ozf·in ..... ounces force inches
p ..... positive (front axle wheel alignment specification)
PACE ..... programmable electronically controlled engine
PAG ..... polyalkylene glycol (oil)
parm ..... parameter
PAS ..... passenger advisory system
PC ..... personal computer
PCB ..... printed circuit board
PDC(s) .... parts distribution center(s)
PDM ..... power distribution module
PEC ..... power electronics carrier
PEEC ..... programmable electronic engine control
PID ..... parameter identifier
PLC ..... power line carrier
PLD ..... *Pumpe-Linie-Düse* (pump-line-nozzle)
PNDB ..... power-net distribution box
PM ..... particulate matter
p.m. ..... *post meridiem* (noon to midnight)
p/n ..... part number
PO ..... purchase order
PRD ..... product requirements document
PSA ..... pressure-sensitive adhesive
PSG ..... pressure sensor governor
psi ..... pounds per square inch
psia ..... pounds per square inch, atmosphere
psig ..... pounds per square inch, gauge
pt ..... pints
PTCM ..... pressure time control module
PTO ..... power takeoff
PTP ..... powertrain protection
pvc ..... polyvinyl chloride
PWM ..... pulse width modulation
pwr ..... power
qt ..... quarts
qty. ..... quantity
R & O ..... rust inhibitors and oxidants
R–12 ..... refrigerant-12 (CFC)
R–134a .... refrigerant-134a (HFC)
RAM ..... random access memory
RC ..... reserve capacity
recirc. ..... recirculation
Ref(s). ..... reference(s)
regen ..... regeneration
RELS ..... reduced engine load at stop
RFI ..... radio frequency interference
RH ..... right-hand
RH DR ..... right-hand drive
R/I ..... removal and installation
RMA ..... return material authorization
ROM ..... read-only memory
rpm ..... revolutions per minute
R/R ..... removal and replacement
RSA ..... roll-stability advisor
RSG ..... road speed governor
RSM ..... regional service manager
RTS ..... ready-to-spray
RTV ..... room temperature vulcanizing
RV ..... recreational vehicle
SA ..... source address
S-ABA ..... self-setting automatic brake adjusters
SAE ..... Society of Automotive Engineers
SB ..... service bulletin
SBT ..... seat back thickness
SCA(s) .... Supplemental Coolant Additive(s)
SCR ..... selective catalytic reduction
SCU ..... system control unit (speedometer)
SD ..... severe-duty
SDU ..... step deployment unit
SEL ..... shutdown engine light
SEM ..... switch expansion module
SEO ..... stop engine override
SHM ..... switch hub module
SI ..... service information
SI ..... *Système International*
SID ..... subsystem identifier
SM ..... system malfunction
SMC ..... sheet molded compound
S/N ..... serial number
SOC ..... state-of-charge
SPACE .... seat pretensioner activation for crash survival enhancement
SPG ..... special purpose grease

List of Abbreviations

SPN ..... suspect parameter number
sq in ..... square inches
SRP ..... seating reference point
SRS ..... supplemental restraint system
SRS ..... synchronous reference sensor
SRT ..... standard repair time
SSD ..... side sensor display
SSID ..... smart switch identification
SST ..... stainless steel
std. ..... standard
S/W ..... software
SW ..... switch
TAM ..... thermocouple amplifier module
TBB ..... Thomas Built Buses
TBS ..... turbo boost sensor
TCM ..... transmission control module
TCU ..... transmission control unit
TDC ..... top dead center
TDR ..... technician diagnostic routine
TEM ..... truck equipment manufacturer
temp ..... temperature
TIG ..... tungsten inert gas
TIR ..... total indicator reading
TPMS ..... tire pressure monitoring system
TPS ..... thermal protection switch
TPS ..... throttle position sensor
TRS ..... timing reference sensor
TSO ..... truck specification order
TSU ..... transmission shift unit
U.D. ..... underdrive
ULSD ..... ultralow-sulfur diesel
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 ..... volts
VCU ..... vehicle control unit
VDC ..... vehicle data computer
Vdc ..... volts, direct current
VIMS ..... vehicle information management system
VIN ..... vehicle identification number
VIP ..... vehicle instrumentation and protection (Kysor)
VIW ..... vehicle interface wiring (connector)
VOC ..... volatile organic compounds
VOM ..... volt-ohmmeter
VRS ..... variable resistance sensor
VSG ..... variable speed governor
VSS ..... vehicle speed sensor
VSU ..... vehicle security unit
WB ..... wire braid
WI ..... work instructions
WIF ..... water-in-fuel
WOT ..... wide open throttle
– ..... minus or negative
+ ..... plus or positive
± ..... plus-or-minus
> ..... greater than
< ..... less than
x ..... by (used in fastener size descriptions)
" ..... inches
° ..... degrees (of an angle)
°C ..... degrees Celsius (centigrade)
°F ..... degrees Fahrenheit
..... number
% ..... percent
& ..... and
© ..... copyright
™ ..... trademark
® ..... registered trademark

Contents

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 (mm^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	kilo Pascals (kPa)	0.29613		inches of mercury (inHg)
pounds per square inch (psi)	6.895	kilo Pascals (kPa)	0.14503		pounds per square inch (psi)

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

Contents

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 Daimler Trucks North America 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 Daimler Trucks North America 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 Daimler Trucks North America LLC facility, assigned to fully qualified service personnel and recorded on the "New Vehicle Pre-Delivery Inspection" form.

Refer to Section 3 of the Daimler Trucks North America LLC *Warranty Manual* for details.

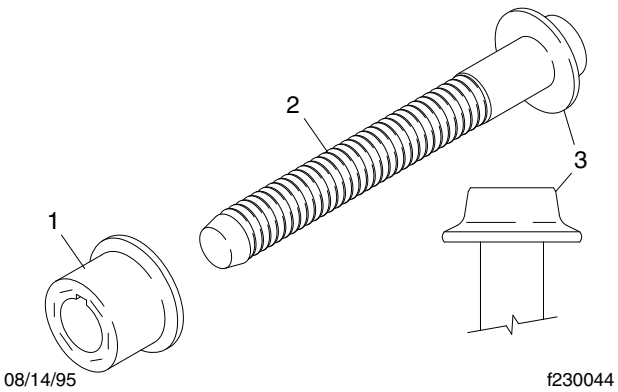
It is recommended the pre-delivery inspection be performed within 30 days of vehicle receipt.

Contents

Threaded Fastener Types

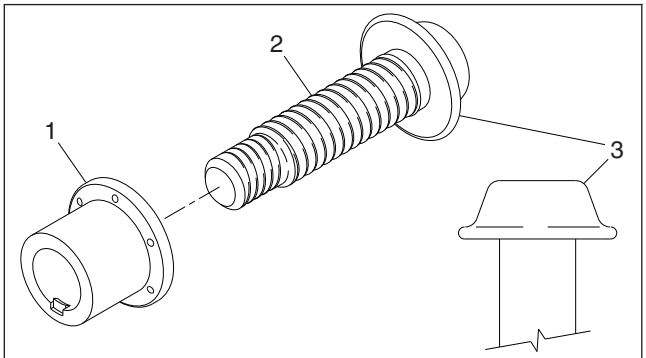
Three types of threaded fastener are generally used throughout the vehicle: plain hex-type, Huck-Spin®, and flanged.

Huck-spin® or Huck-spin 2® fasteners are standard for the frame assembly and other components attached to the frame. See **Fig. 1** and **Fig. 2**. The swaged collar of these lockbolts prevents loosening from vibration, and requires no torque checks or retorquing. These fasteners cannot be reused.



1. Spin Collar
2. Lock Pin
3. Round Head

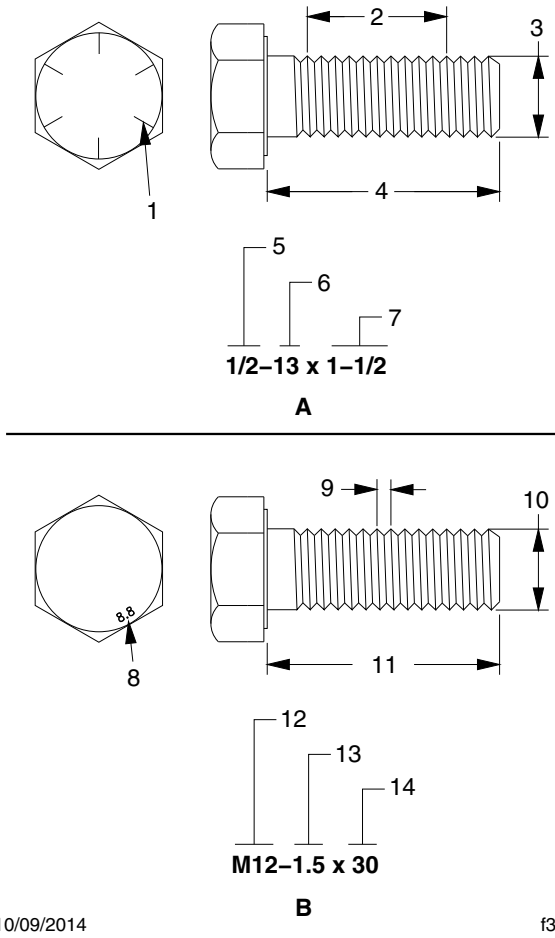
Fig. 1, Huck-Spin Fastener



1. Spin Collar
2. Lock Pin
3. Round Head

Fig. 2, Huck-Spin 2 Fastener

The majority of threaded fasteners used throughout the rest of the vehicle have U.S. customary threads (diameter and pitch are measured in inches). See **Fig. 3**. However, the engine and some items attached to the cab use metric fasteners (diameter and pitch are measured in millimeters).



A. Hexbolt with U.S. Customary Threads
B. Hexbolt with Metric Threads

1. SAE Grade Marking
2. Thread Pitch
3. Nominal Diameter
4. Hexbolt Length
5. Nominal Diameter in Inches
6. Threads Per Inch (TPI)
7. Hexbolt Length in Inches
8. Metric Class Marking
9. Thread Pitch
10. Nominal Diameter
11. Hexbolt Length
12. Nominal Diameter in Millimeters
13. Thread Pitch (thread width from crest to crest in millimeters)
14. Hexbolt Length in Millimeters

Fig. 3, Fastener Size and Thread Identification

General Information

Most threaded fasteners used on the vehicle that are 1/2-inch diameter or larger are plain hex-type fasteners (non-flanged).

Special hardened flatwashers are used under the hexbolt 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 zinc or zinc-aluminum coated, or stainless if paired with a stainless fastener, 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.

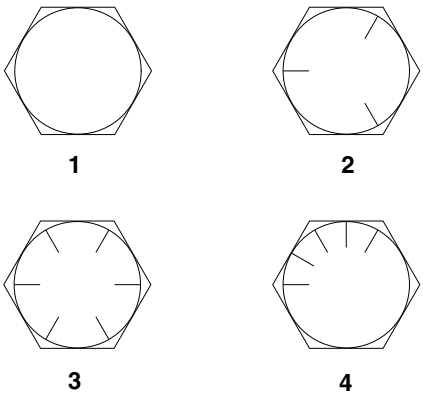
Fastener Grades and Classes

U.S. Customary

Fasteners with U.S. customary threads are divided into grades established by the Society of Automotive Engineers (SAE) or the Industrial 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. Fastener grades can be identified by the number and pattern of radial lines forged on the fastener head. See **Fig. 4**. Hexnut (and locknut) grades can be identified by the number and pattern of lines and dots on various surfaces of the nut. See **Fig. 5**. Most of the fasteners used on the vehicle are grades 5, 8, and 8.2. Matching grades of fasteners are always used: grade 5 or grade B hexnuts are used with grade 5 hexbolts; grade 8, grade C, or grade G (flanged) hexnuts are used with grade 8 or 8.2 hexbolts.

Metric

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. Hexbolt classes can be identified by the numbers forged on the head of the hexbolt. See **Fig. 6**. Hexnut (and locknut) classes can be identified by the marks or numbers on various surfaces of the nut. See **Fig. 7**. Class 8 hexnuts are always used with class 8.8 hexbolts; class 10 hexnuts with class 10.9 hexbolts.



NOTE: Grade 2 hexbolts have no grade marking; grade 2 hexbolts are rarely used by Freightliner. These grade markings are used on plain hex-type and flanged hexbolts. In addition to the grade markings, the hexbolt head must also carry the manufacturer's trademark or identification.

1. Grade 2
2. Grade 5
3. Grade 8
4. Grade 8.2

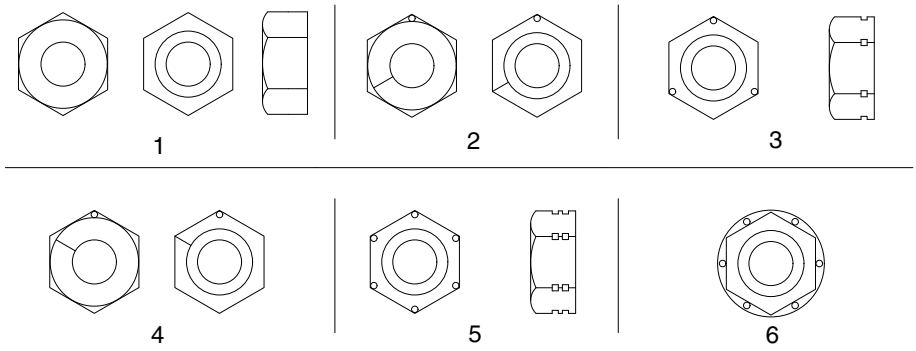
Fig. 4, Hexbolt Grades

Frame Fasteners

Huck-Spin or Huck-Spin 2 fasteners are standard for the frame assembly and components attached to the frame, but for some other components attached to the frame, grade 8 and 8.2 phosphate-and-oil coated or zinc-aluminum coated hexbolts, and grade C zinc or zinc-aluminum 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 hexbolts and grade C prevailing torque locknuts are used. See **Fig. 8**.

When hexbolts and locknuts are used on an attached part, a hardened flatwasher is required to prevent the hexbolt head or nut from embedding in the part, and distributes the load, preventing localized overstressing of the frame rails, brackets, and other parts. They are placed directly against the part, under the nut or hexbolt head. The washers are zinc or zinc-aluminum coated, or stainless if paired with a stainless fastener, and have a hardness rating of 38 to 45 HRC.

IMPORTANT: Always tighten the nut, not the hexbolt head.



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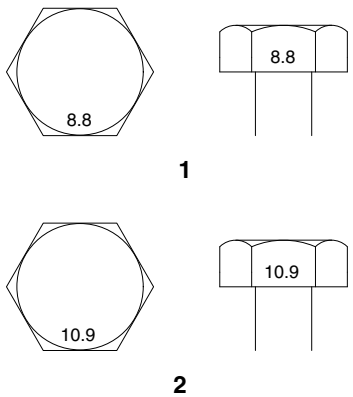
NOTE: Grade 2 (SAE) and grade A (I.F.I.) nuts have no identification marks or notches; they are rarely used by Freightliner. Grade B (I.F.I.) nuts have three identification marks at 120 degrees, or 6 notches. Grade C (I.F.I.) nuts have six identification marks at 60 degrees, or 12 notches. Grade G (I.F.I.) 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.

1. SAE Grade 2 or I.F.I. Grade A Nut (strength compatible with grade 2 hexbolt)
2. SAE Grade 5 Nut (strength compatible with grade 5 hexbolt)
3. I.F.I. Grade B Nut (strength compatible with grade 5 hexbolt)
4. SAE Grade 8 Nut (strength compatible with grade 8 or grade 8.2 hexbolt)
5. I.F.I. Grade C Nut (strength compatible with grade 8 or grade 8.2 hexbolt)
6. I.F.I. Grade G Nut (flanged locknut; strength compatible with grade 8 or grade 8.2 hexbolt)

Fig. 5, Nut Grades



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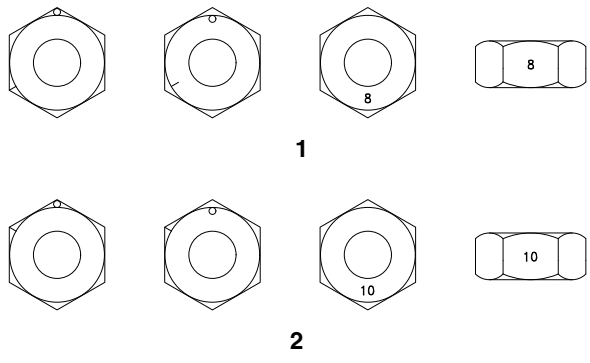
NOTE: In addition to the class markings, the hexbolt head must also carry the manufacturer's trademark or identification.

1. Class 8.8
2. Class 10.9

Fig. 6, Hexbolt Classes



05/03/91 f310227a

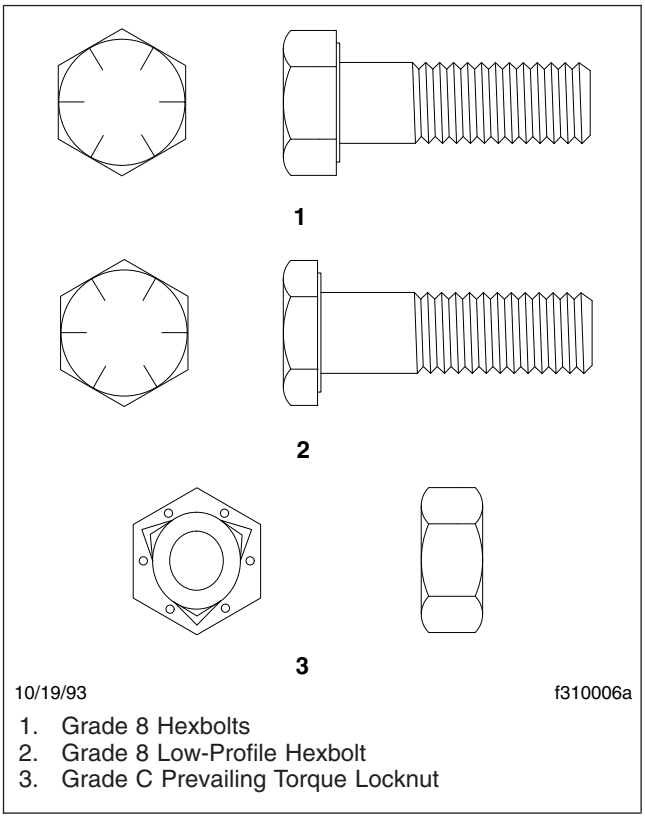
1. Class 8 Nut
2. Class 10 Nut

Fig. 7, Nut Classes

Fastener Mechanics

Tensioning

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



1. Grade 8 Hexbolts
2. Grade 8 Low-Profile Hexbolt
3. Grade C Prevailing Torque Locknut

Fig. 8, Frame Fastener Identification

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

Torque and Friction

Use of a torque wrench to tighten fasteners will help prevent overtensioning them. Overtensioning causes permanent stretching (plastic deformation) 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 hexbolt. About 40 to 50 percent of the turning force is needed to overcome the friction between the underside of the hexbolt head or nut and the washer. Another 30 to 40 percent is needed to overcome the friction between the threads of the hexbolt and the threaded hole, or the friction between the threads of the nut and hexbolt.

Coating and Lubrication

The amount of torque required to tighten a fastener is reduced when friction is reduced. If a fastener is dry (unlubricated) and plain (unplated), friction is high. If a fastener is wax-coated or oiled, or has another coating, friction is reduced.

To ensure fasteners are tensioned correctly, use new fasteners per vehicle specifications, then tighten to the values given in the torque tables in **Specifications 400**.

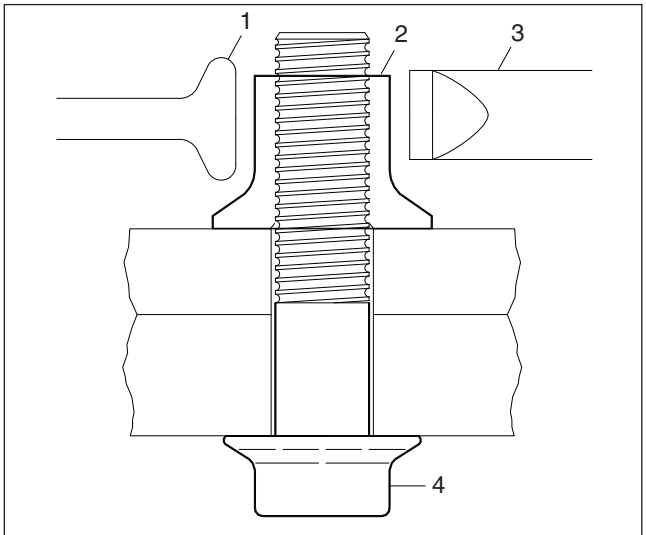
Fastener Replacement

When replacing fasteners, use only identical hexbolts, washers, and nuts; unless otherwise required, they must be the same size, finish, and grade/strength (or stronger) as originally specified. See PartsPro® for part-specific fastener specifications.

When replacing graded (or metric class) hexbolts, use only fasteners that have the manufacturer's trademark or identification on the hexbolt head; do not use substandard fasteners. Inferior, counterfeit fasteners are difficult to identify; buy your fasteners from a reputable supplier.

Huck-Spin® Fastener Removal

The collar for a Huck-Spin fastener is spun on when it is installed, but cannot be unscrewed. Use a Huck® SpinCutter™ to remove Huck-Spin and Huck-Spin 2 fasteners. If a collar cutter is not available, split the collar with an air chisel while supporting the opposite side of the collar with an anvil. See **Fig. 1**. Then, drive out the lock pin with a punch.



1. Anvil
2. Spin Collar
3. Chisel
4. Lock Pin

Fig. 1, Huck-Spin® Fastener Removal with a Chisel

Discard the fastener after removing it. If equivalent Huck-Spin fasteners are not available, install standard Grade 8 threaded fasteners.

Hex-head Fastener Replacement

Replace hexbolts with identical fasteners.

Never hammer or screw hexbolts into place. Align the holes of the frame and the part being attached to it, so that the nut and bolt surfaces are flush against the frame and the part. Make sure the length of the bolt threads that extend beyond the tightened locknuts are as specified in **Table 1**.

Thread Extension Specifications		
Bolt Length: in (mm)	Thread Extension*	
	Minimum	Maximum
4 (102) or Less	1-1/2 Threads	5/8 in (16 mm)
Longer than 4 (102)	3 Threads	3/4 in (19 mm)

* Length of bolt thread extending beyond tightened locknut.

Table 1, Thread Extension Specifications

Fastener Selection

Fastener Material

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

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

Hexbolt Length

For hexbolts 4 inches (102 mm) or less in length, make sure that at least 1-1/2 threads and no more than 5/8-inch (16-mm) hexbolt length extends through the nut after it has been tightened. For hexbolts longer than 4 inches (102 mm), allow a minimum of 1-1/2 threads and a maximum of 3/4-inch (19-mm) hexbolt length.

Washers

When installing non-flanged fasteners, use hardened steel flat washers under the hexbolt head, and under the hexnut or locknut.

Do not use lockwashers and flat washers in combination unless it was part of the original application.

Fastener Use

Parts to be Fastened

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.

Do not use lockwashers (split or toothed) next to aluminum surfaces.

Studs

When installing studs that do not 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. Do not use locknuts, because they tend to loosen the studs during removal. Do not use plain washers (flat washers).

Fastener Installation

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

IMPORTANT: Always tighten the nut, not the hexbolt head.

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

   Use a slow, smooth, even pull on the wrench to tighten the nut, not the hexbolt head. This will give a truer torque reading by eliminating hexbolt body friction. Tighten to the values for lubricated and plated-thread fasteners, unless otherwise specified. See **Specifications 400**

IMPORTANT: Always use a torque wrench to tighten fasteners, and do not overtorque fasteners; overtightening causes permanent stretching of the fasteners, which can result in breakage of the parts or fasteners. Always follow the torque sequence or torque interval when provided, to ensure that clamping forces are even, and parts and fasteners are not distorted.

NOTE: If specific torque values are not given for countersunk hexbolts, use the torque value for the corresponding size and grade of regular hexbolt, as given in **Specifications 400**.

Thread-Locking Compound Application

When the use of thread-locking compound is recommended or desired for studs or hexbolts with a thread diameter of 1 inch (25 mm) or less, use Loctite® 271 or Perma-Lok® HM-128. For thread diameters over 1 inch (25 mm), use Loctite 277.

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

1. Select new fasteners meeting or exceeding the specification of the current fasteners.

   If new fasteners cannot be used, 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 three or four 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 tighten 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 400°F (200°C) before removing the nut. Every time the fasteners are disassembled, replace them. If any parts are damaged by overheating, replace the parts.

Frame Fasteners

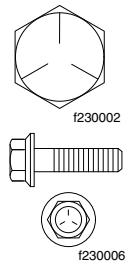
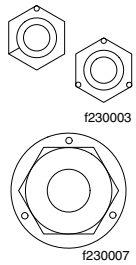
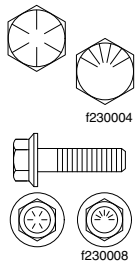
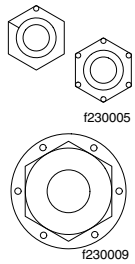
Huck-Spin fasteners do not require periodic tightening or torque checks.

Tighten hexbolts and locknuts periodically to offset the effects of "bedding in" (seating). Refer to the vehicle maintenance manual for Group 31 procedures and intervals.

When tightening the fasteners, tighten the nut, not the hexbolt head. This will give a better torque reading by eliminating hexbolt body friction.

NOTICE

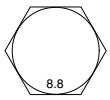
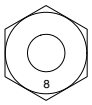
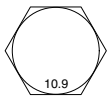
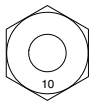
Tighten standard (non-Huck-Spin) frame fasteners periodically. Continued vehicle operation with loose fasteners could result in component, bracket, and frame damage.

Torque Values for U.S. Customary Threaded Fasteners*				
Thread Diameter–Pitch	Grade 5 and Stainless Hexbolt	Grade 5, B, or Stainless Nut	Grade 8 or 8.2 Hexbolt	Grade 8, C, or G Nut
	Torque: lbf·ft (N·m)		Torque: lbf·ft (N·m)	
	 f230002 f230006	 f230003 f230007	 f230004 f230008	 f230005 f230009
1/4-20 1/4-28	5 (7)		–	
5/16-18 5/16-24	11 (15)		–	
3/8-16 3/8-24	19 (26)		26 (35)	
7/16-14 7/16-20	31 (42)		42 (57)	
1/2-13 1/2-20	46 (62)		64 (87)	
9/16-12 9/16-18	–		86 (117)	
5/8-11 5/8-18	–		128 (174)	
3/4-10 3/4-16	–		200 (271)	
7/8-9 7/8-14	–		323 (438)	
1-8 1-12 1-14	–		433 (587)	
1-1/8-7	–		657 (891)	

* Installation speeds should be below 300 RPM.

Table 1, Torque Values for U.S. Customary Threaded Fasteners

Specifications

Torque Values for Metric Threaded Fasteners*				
Thread Diameter–Pitch	Class 8.8 Hexbolt	Class 8 Nut	Class 10.9 Hexbolt	Class 10 Nut
	Torque: lbf·ft (N·m)		Torque: lbf·ft (N·m)	
	 f230010	 f230011	 f230012	 f230013
M6	5 (7)		–	
M8 M8 x 1	11 (15)		–	
M10 M10 x 1.25 M10 x 1.5	22 (30)		33 (45)	
M12 M12 x 1.5	39 (53)		50 (68)	
M14 M14 x 1.5	–		90 (122)	
M16 M16 x 1.5	–		128 (174)	
M18 M18 x 1.5	–		180 (244)	
M20 M20 x 1.5	–		245 (332)	
M22 M22 x 1.5	–		320 (434)	
M24 M24 x 2	–		400 (542)	
M27 M27 x 2	–		560 (759)	
M30 M30 x 2	–		720 (976)	

* Installation speeds should be below 300 RPM.

Table 2, Torque Values for Metric Threaded Fasteners

Contents

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 vehicle driver's manual for decal location), and the last six digits (designating the chassis serial number) are stamped into the metal frame.

Each product line has its own model list; that is, positions 5 and 6 are product-specific. For example, the code AB in positions 5 and 6 for a Freightliner vehicle indicates an FLD112 conventional truck. Code AB in the same position for a FCCC chassis vehicle represents an MB45 chassis.

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**	**A B**	**A V**	**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	Daimler AG, Mexico	Freightliner	Truck-Tractor
3AL	Daimler AG, Mexico	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 Position 4 (Chassis Configuration)	
Code	**Chassis**
A	4 x 2 Truck
B	4 x 2 Truck-Tractor
C	8 x 8 Truck
D	4 x 4 Truck
E	4 x 4 Truck-Tractor

VIN Position 4 (Chassis Configuration)	
Code	**Chassis**
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

VIN Information

VIN Position 4 (Chassis Configuration)	
Code	**Chassis**
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
V	10 x 6 Truck-Tractor

VIN Position 4 (Chassis Configuration)	
Code	**Chassis**
W	12 x 4 Truck
X	Glider
Y	8 x 2 Truck
Z	14 x 4 Truck
1	12 x 6 Truck
2	10 x 8 Truck

Table 3, VIN Position 4 (Chassis Configuration)

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**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
AN	FLD132 XL Classic	Conventional	Class 7
AP	FLD132 XL Classic	Conventional	Class 8
AR	FLD132 XL Glider	Conventional	Glider
AS	FLD120 Military	Conventional	Class 7
AT	FLD120 Military	Conventional	Class 8
AU	FLD120 Military Glider	Conventional	Glider
AV	Argosy	COE	Class 7
AW	Argosy	COE	Class 8
AX	Argosy Glider	COE	Glider
AY	C112	Conventional	Class 7
AZ	C112	Conventional	Class 8
A1	C112 Glider	Conventional	Glider

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**GVWR**
A2	C120	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	CST112	Conventional	Class 7
A9	CST112	Conventional	Class 8
A0	CST112 Glider	Conventional	Glider
BA	CST120	Conventional	Class 7
BB	CST120	Conventional	Class 8
BC	CST120 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
BN	FL60	Conventional	Class 5
BP	FL60	Conventional	Class 6
BR	FL60	Conventional	Class 7
BS	FL70	Conventional	Class 6
BT	FL70	Conventional	Class 7
BU	FL70	Conventional	Class 8
BV	FL80	Conventional	Class 6
BW	FL80	Conventional	Class 7
BX	FL80	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

VIN Information

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**GVWR**
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	Condor	COE	Class 7
CF	Condor	COE	Class 8
CG	FLD120/84" Sleeper MY2001	Conventional	Class 7
CH	FLD120/84" Sleeper MY2001	Conventional	Class 8
CJ	FLD120 Glider/84" Sleeper MY2001	Conventional	Glider
CK	FLD132 XL Classic/84" Sleeper MY2001	Conventional	Class 7
CL	FLD132 XL Classic/84" Sleeper MY2001	Conventional	Class 8
CM	FLD 132 XL Glider/84" Sleeper	Conventional	Glider
CN	FL112	Conventional	Class 6
CP	FLD120 Military Reman	Conventional	Class 8
CR	Coronado CC132	Conventional	Class 8
CS	M2 100	Conventional	Class 4
CT	M2 100	Conventional	Class 5
CU	M2 100	Conventional	Class 6
CV	M2 106 Medium Duty	Conventional	Class 5
CW	M2 106 Medium Duty	Conventional	Class 6
CX	M2 106 Medium Duty	Conventional	Class 7
CY	M2 106 Medium Duty	Conventional	Class 8
CZ	M2 106V Heavy Duty	Conventional	Class 5
C1	M2 106V Heavy Duty	Conventional	Class 6
C2	M2 106V Heavy Duty	Conventional	Class 7
C3	M2 106V Heavy Duty	Conventional	Class 8
C4	M2 112 Medium Duty	Conventional	Class 7
C5	M2 112 Medium Duty	Conventional	Class 8
C6	M2 112V Heavy Duty	Conventional	Class 7
C7	M2 112V Heavy Duty	Conventional	Class 8

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**GVWR**
C8	M2 106 Medium Duty	Conventional	Class 4
C9	Sport Chassis	Conventional	Class 5
F1	Sport Chassis 112	Conventional	Class 6
F2	FLB High COE	COE	Class 8
F3	Sport Chassis 112	Conventional	Class 7
F4	Coronado CC132	Conventional	Class 7
F5	Classic 120	Conventional	Class 7
F6	Classic 120	Conventional	Class 8
F7	Condor Glider	Conventional	Glider
F8	M2 106 Medium Glider	Conventional	Glider
F9	Columbia 112	Conventional	Class 7
F0	Columbia 112	Conventional	Class 8
FA	Columbia 112	Conventional	Glider
FB	Coronado CC132 Glider	Conventional	Glider
FC	M2 106 Sport Chassis	Conventional	Class 5
FD	M2 106 Sport Chassis	Conventional	Class 6
FE	M2 106 Sport Chassis	Conventional	Class 7
FF	M2 112 Sport Chassis	Conventional	Class 5
FG	M2 112 Sport Chassis	Conventional	Class 6
FH	M2 112 Sport Chassis	Conventional	Class 7
FJ	Classic 120	Conventional	Glider
GA	Cascadia 113 Day Cab	Conventional	Class 7
GB	Cascadia 113 Day Cab	Conventional	Class 8
GC	Cascadia 113 Sleeper Cab	Conventional	Glider
GD	Cascadia 125 Day Cab	Conventional	Class 7
GE	Cascadia 125 Day Cab	Conventional	Class 8
GF	Cascadia 125 Sleeper Cab	Conventional	Glider
GG	Cascadia 113 Sleeper Cab	Conventional	Class 7
GH	Cascadia 113 Sleeper Cab	Conventional	Class 8
GJ	Cascadia 132	Conventional	Glider
GK	Cascadia 125 Sleeper Cab	Conventional	Class 7
GL	Cascadia 125 Sleeper Cab	Conventional	Class 8
GM	Coronado 132	Conventional	Class 8
GN	122SD (Coronado SD 122)	Conventional	Class 8
GP	Coronado 122	Conventional	Class 8
GR	Coronado 122	Conventional	Glider

VIN Information

VIN Positions 5 and 6 (Model, Cab, Class/GVWR)			
Code	**Model**	**Cab**	**GVWR**
GS	Coronado SD 122 Glider	Conventional	Glider
GT	Coronado 132	Conventional	Glider
GU	M2 106V Glider	Conventional	Glider
GV	Coronado 122 RHD	Conventional	Class 8
GW	Coronado 122 RHD Glider	Conventional	Glider
GX	Coronado 132	Conventional	Class 7
GY	122SD (Coronado SD 122)	Conventional	Class 7
GZ	Coronado 122	Conventional	Class 7
G1	M2 112 Glider	Conventional	Glider
G2	MD109 Military	Conventional	Class 8
G3	114SD	Conventional	Class 8
G4	114SD	Conventional	Glider
G5	108SD	Conventional	Class 8
G6	108SD	Conventional	Glider
G7	Coronado 114 RHD	Conventional	Class 8
G8	Coronado 114 RHD	Conventional	Glider
G9	114SD	Conventional	Class 7
G0	108SD	Conventional	Class 7
HA	Cascadia 113 Day Cab	Conventional	Glider
HB	Cascadia 125 Day Cab	Conventional	Glider
HC	108SD	Conventional	Class 6
HD	M2 100	Conventional	Class 7
HE	M2 112V Glider	Conventional	Glider
HF	M2 112 Medium Duty	Conventional	Class 6

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

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement**	**Configuration**	**Brakes**
AA	Caterpillar 3176	Diesel	10.3 Liter	I-6	Air
AB	Caterpillar 3176	Diesel	10.3 Liter	I-6	Hydraulic
AC	Caterpillar 3176	Diesel	10.3 Liter	I-6	Air/Hydraulic
AD	Caterpillar 3406	Diesel	14.6 Liter	I-6	Air
AE	Caterpillar 3406	Diesel	14.6 Liter	I-6	Hydraulic
AF	Caterpillar 3406	Diesel	14.6 Liter	I-6	Air/Hydraulic
AG	Caterpillar 3406 E	Diesel	15.8 Liter	I-6	Air
AH	Caterpillar 3406 E	Diesel	15.8 Liter	I-6	Hydraulic

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement**	**Configuration**	**Brakes**
AJ	Caterpillar 3406 E	Diesel	15.8 Liter	I-6	Air/Hydraulic
AK	Caterpillar 3126/CFE	Diesel	7.2 Liter	I-6	Air
AL	Caterpillar 3126/CFE	Diesel	7.2 Liter	I-6	Hydraulic
AM	Caterpillar 3126/CFE	Diesel	7.2 Liter	I-6	Air/Hydraulic
AN	Caterpillar C10	Diesel	10.3 Liter	I-6	Air
AP	Caterpillar C10	Diesel	10.3 Liter	I-6	Hydraulic
AR	Caterpillar C10	Diesel	10.3 Liter	I-6	Air/Hydraulic
AS	Caterpillar C12	Diesel	12.0 Liter	I-6	Air
AT	Caterpillar C12	Diesel	12.0 Liter	I-6	Hydraulic
AU	Caterpillar C12	Diesel	12.0 Liter	I-6	Air/Hydraulic
AV	Caterpillar C15	Diesel	14.6 Liter pre 2008/15.2 Liter	I-6	Air
AW	Caterpillar C15	Diesel	14.6 Liter pre 2008/15.2 Liter	I-6	Hydraulic
AX	Caterpillar C15	Diesel	14.6 Liter pre 2008/15.2 Liter	I-6	Air/Hydraulic
AY	Caterpillar C16	Diesel	15.8 Liter	I-6	Air
AZ	Caterpillar C16	Diesel	15.8 Liter	I-6	Hydraulic
A1	Caterpillar C16	Diesel	15.8 Liter	I-6	Air/Hydraulic
A2	Cummins L10	Diesel	10.8 Liter	I-6	Air
A3	Cummins L10	Diesel	10.8 Liter	I-6	Hydraulic
A4	Cummins L10	Diesel	10.8 Liter	I-6	Air/Hydraulic
A5	Cummins M11	Diesel	10.8 Liter	I-6	Air
A6	Cummins M11	Diesel	10.8 Liter	I-6	Hydraulic
A7	Cummins M11	Diesel	10.8 Liter	I-6	Air/Hydraulic
A8	Cummins ISM	Diesel	10.8 Liter	I-6	Air
A9	Cummins ISM	Diesel	10.8 Liter	I-6	Hydraulic
A0	Cummins ISM	Diesel	10.8 Liter	I-6	Air/Hydraulic
BA	Cummins NTC	Diesel	14 Liter	I-6	Air
BB	Cummins NTC	Diesel	14 Liter	I-6	Hydraulic
BC	Cummins NTC	Diesel	14 Liter	I-6	Air/Hydraulic
BD	Cummins N14	Diesel	14 Liter	I-6	Air
BE	Cummins N14	Diesel	14 Liter	I-6	Hydraulic
BF	Cummins N14	Diesel	14 Liter	I-6	Air/Hydraulic
BG	Cummins ISX	Diesel	14.9 Liter	I-6	Air
BH	Cummins ISX	Diesel	14.9 Liter	I-6	Hydraulic
BJ	Cummins ISX	Diesel	14.9 Liter	I-6	Air/Hydraulic

VIN Information

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement**	**Configuration**	**Brakes**
BK	Cummins C 8.3	Diesel	8.3 Liter	I-6	Air
BL	Cummins C 8.3	Diesel	8.3 Liter	I-6	Hydraulic
BM	Cummins C 8.3	Diesel	8.3 Liter	I-6	Air/Hydraulic
BN	Cummins B5.9	Diesel	5.9 Liter	I-6	Air
BP	Cummins B5.9	Diesel	5.9 Liter	I-6	Hydraulic
BR	Cummins B5.9	Diesel	5.9 Liter	I-6	Air/Hydraulic
BS	Cummins ISC	Diesel	8.3 Liter	I-6	Air
BT	Cummins ISC	Diesel	8.3 Liter	I-6	Hydraulic
BU	Cummins ISC	Diesel	8.3 Liter	I-6	Air/Hydraulic
BV	Cummins ISB	Diesel	5.9 Liter	I-6	Air
BW	Cummins ISB	Diesel	5.9 Liter	I-6	Hydraulic
BX	Cummins ISB	Diesel	5.9 Liter	I-6	Air/Hydraulic
BY	Cummins B5.9	Propane	5.9 Liter	I-6	Air
BZ	Cummins B5.9	Propane	5.9 Liter	I-6	Hydraulic
B1	Cummins B5.9	Propane	5.9 Liter	I-6	Air/Hydraulic
B2	Cummins B5.9	Natural Gas	5.9 Liter	I-6	Air
B3	Cummins B5.9	Natural Gas	5.9 Liter	I-6	Hydraulic
B4	Cummins B5.9	Natural Gas	5.9 Liter	I-6	Air/Hydraulic
B5	Cummins C8.3	Natural Gas	8.3 liter	I-6	Air
B6	Cummins C8.3	Natural Gas	8.3 liter	I-6	Hydraulic
B7	Cummins C8.3	Natural Gas	8.3 liter	I-6	Air/Hydraulic
B8	Detroit Series 50	Diesel	8.5 liter	I-4	Air
B9	Detroit Series 50	Diesel	8.5 liter	I-4	Hydraulic
B0	Detroit Series 50	Diesel	8.5 liter	I-4	Air/Hydraulic
CA	Detroit Series 55	Diesel	12.Liter	I-6	Air
CB	Detroit Series 55	Diesel	12.Liter	I-6	Hydraulic
CC	Detroit Series 55	Diesel	12.Liter	I-6	Air/Hydraulic
CD	Detroit Series 60	Diesel	11.1 Liter	I-6	Air
CE	Detroit Series 60	Diesel	11.1 Liter	I-6	Hydraulic
CF	Detroit Series 60	Diesel	11.1 Liter	I-6	Air/Hydraulic
CG	Detroit Series 60	Diesel	12.7 Liter	I-6	Air
CH	Detroit Series 60	Diesel	12.7 Liter	I-6	Hydraulic
CJ	Detroit Series 60	Diesel	12.7 Liter	I-6	Air/Hydraulic
CK	Detroit Series 60	Diesel	14.0 Liter	I-6	Air
CL	Detroit Series 60	Diesel	14.0 Liter	I-6	Hydraulic
CN	Mercedes-Benz MBE-900	Diesel	4.3 liter	I-4	Air

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement**	**Configuration**	**Brakes**
CP	Mercedes-Benz MBE-900	Diesel	4.3 liter	I-4	Hydraulic
CR	Mercedes-Benz MBE-900	Diesel	4.3 liter	I-4	Air/Hydraulic
CS	Mercedes-Benz MBE-900	Diesel	6.4 liter	I-6	Air
CT	Mercedes-Benz MBE-900	Diesel	6.4 liter	I-6	Hydraulic
CU	Mercedes-Benz MBE-900	Diesel	6.4 liter	I-6	Air/Hydraulic
CV	Mercedes-Benz MBE4000	Diesel	12.8 Liter	I-6	Air
CW	Mercedes-Benz MBE4000	Diesel	12.8 Liter	I-6	Hydraulic
CX	Mercedes-Benz MBE4000	Diesel	12.8 Liter	I-6	Air/Hydraulic
CY	Cummins ISL	Diesel	8.9 Liter	I-6	Air
CZ	Cummins ISL	Diesel	8.9 Liter	I-6	Hydraulic
C1	Cummins ISL	Diesel	8.9 Liter	I-6	Air/Hydraulic
C2	Cummins B 3.9	Diesel	3.9 Liter	I-4	Air
C3	Cummins B 3.9	Diesel	3.9 Liter	I-4	Hydraulic
C4	Cummins B 3.9	Diesel	3.9 Liter	I-4	Air/Hydraulic
C5	Cummins ISB 3.9	Diesel	3.9 Liter	I-4	Air
C6	Cummins ISB 3.9	Diesel	3.9 Liter	I-4	Hydraulic
C7	Cummins ISB 3.9	Diesel	3.9 Liter	I-4	Air/Hydraulic
C8	John Deere 6081H	CNG	8.1 Liter	I-6	Air
C9	John Deere 6081H	CNG	8.1 Liter	I-6	Hydraulic
DA	Caterpillar C9	Diesel	8.8 Liter	I-6	Air
DB	Caterpillar C9	Diesel	8.8 Liter	I-6	Hydraulic
DC	Caterpillar C7	Diesel	7.2 Liter	I-6	Air
DD	Caterpillar C7	Diesel	7.2 Liter	I-6	Hydraulic
DE	Caterpillar C13	Diesel	12.5 Liter	I-6	Air
DF	Caterpillar C13	Diesel	12.5 Liter	I-6	Hydraulic
DG	Mercedes-Benz MBE-900	Diesel	4.8 Liter	I-4	Air
DH	Mercedes-Benz MBE-900	Diesel	4.8 Liter	I-4	Hydraulic
DJ	Mercedes-Benz MBE-900	Diesel	7.2 Liter	I-6	Air
DK	Mercedes-Benz MBE-900	Diesel	7.2 Liter	I-6	Hydraulic
DL	Caterpillar C11	Diesel	11.1 Liter	I-6	Air
DM	Caterpillar C11	Diesel	11.1 Liter	I-6	Hydraulic
DN	Cummins L Gas Plus	Natural Gas	8.9 Liter	I-6	Air
DP	Cummins L Gas Plus	Natural Gas	8.9 Liter	I-6	Hydraulic
DR	Detroit DD15	Diesel	14.8 Liter	I-6	Air
DS	Detroit DD15	Diesel	14.8 Liter	I-6	Hydraulic
DT	Cummins ISB	Diesel	6.7 Liter	I-6	Air

VIN Information

VIN Positions 7 and 8 (Engine, Brakes)					
Code	**Engine**	**Fuel**	**Displacement**	**Configuration**	**Brakes**
DU	Cummins ISB	Diesel	6.7 Liter	I-6	Hydraulic
DV	Detroit DD13	Diesel	12.8 Liter	I-6	Air
DW	Detroit DD13	Diesel	12.8 Liter	I-6	Hydraulic
DX	Cummins ISL G	Natural Gas	8.9 Liter	I-6	Air
DY	Cummins ISL G	Natural Gas	8.9 Liter	I-6	Hydraulic
D1	Detroit DD16	Diesel	15.6 Liter	I-6	Air
D2	MDEG 7.7	Diesel	7.7 Liter	I-6	Air
D3	MDEG 7.7	Diesel	7.7 Liter	I-6	Hydraulic
D4	Cummins ISX12	Diesel	11.9 Liter	I-6	Air
D5	Detroit DD15 EV	Diesel	14.8 Liter	I-6	Air
D6	Detroit DD15 STD	Diesel	14.8 Liter	I-6	Air
D7	Detroit DD15 EV	Diesel	14.8 Liter	I-6	Hydraulic
D8	Detroit DD15 STD	Diesel	14.8 Liter	I-6	Hydraulic
D9	Cummins ISX12	Natural Gas	11.9 Liter	I-6	Air
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
8	2008
9	2009
A	2010
B	2011
C	2012
D	2013
E	2014
F	2015

VIN Position 10 (Model Year)	
Code	**Model Year**
G	2016

Table 6, VIN Position 10 (Model Year)

VIN Position 11 (Build Location)	
Code	**Plant of Manufacture**
L	Cleveland, North Carolina
P	Portland, Oregon
D	Daimler AG, Santiago, Mexico
S	Daimler AG, Saltillo, Coahuila Mexico
H	Mt. Holly, North Carolina

Table 7, VIN Position 11 (Build Location)