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Description

The air compressor and power steering pump assemblies are optional on International® DT 466, DT 570 and HT 570 Diesel Engines. They can be configured individually or together depending on vehicle application requirements. A front cover mounted Power Take-off (PTO) devise can be used in conjunction with the air compressor.

AIR COMPRESSOR

Air for braking is supplied by an air compressor mounted on the lower left side of the engine. It is gear driven from the lower idler gear located within the front engine cover.

- Lubrication of the compressor is provided by a hose connected at the engine oil pressure sensor port with oil draining back to the crankcase through an elbow at the bottom of the compressor.
- Filtered air is furnished through an air hose connected to the air cleaner assembly, and compressed into a supply tank. When the air supply tank is full, compressed air is simply vented to the atmosphere.
- Coolant to the compressor is supplied and returned through two hoses to ports located on the left side of the engine crankcase.

POWER STEERING PUMP

The power steering pump assembly is mounted in one of two following configurations:

A. **Without** an air compressor, the power steering pump is mounted onto rear half of the front cover and is driven by the lower idler gear that would normally drive the air compressor.

B. **With** an air compressor, the power steering pump is mounted to the air compressor. The compressor is driven by the lower idler gear and power is transferred through the compressor crankshaft to drive the power steering pump.

NOTE: For component service procedures other than removal and installation refer to the **International Service Information Solutions - ISIS®** and then select manufacturer from suppliers tab.

POWER TAKE-OFF

A front cover mounted Power Take-off (PTO) devise can only be used in conjunction with an air compressor. See (1171813R1 Front Cover PTO Adaptation Kit, page487) .

Removal

GOVERNMENT REGULATION: Engine fluids (oil, fuel, and coolant) may be a hazard to human health and the environment. Handle all fluids and other contaminated materials (e.g. filters, rags) in accordance with applicable regulations. Recycle or dispose of engine fluids, filters, and other contaminated materials according to applicable regulations.

WARNING: To prevent personal injury or death, read all safety instructions in the "Safety Information" section of this manual.

WARNING: To prevent personal injury or death, shift transmission to park or neutral, set parking brake, and block wheels before doing diagnostic or service procedures.

WARNING: To prevent personal injury or death, wear safety glasses with side shields. Limit compressed air pressure to 207 kPa (30 psi).

WARNING: To prevent personal injury or death, do not let engine fluids stay on your skin. Clean skin and nails using hand cleaner and wash with soap and water. Wash or discard clothing and rags contaminated with engine fluids.

NOTE: Air compressor and power steering pump may be removed as an assembly depending on servicing circumstances.

Air Compressor

WARNING: To prevent serious personal injury, possible death, or damage to the engine or vehicle, do the following before removing the air compressor because of its heavy weight and possibly high temperature. Wait until the air compressor cools down. Also, it is advised to have two people remove the air compressor and power steering pump combination from the engine, especially in chassis.

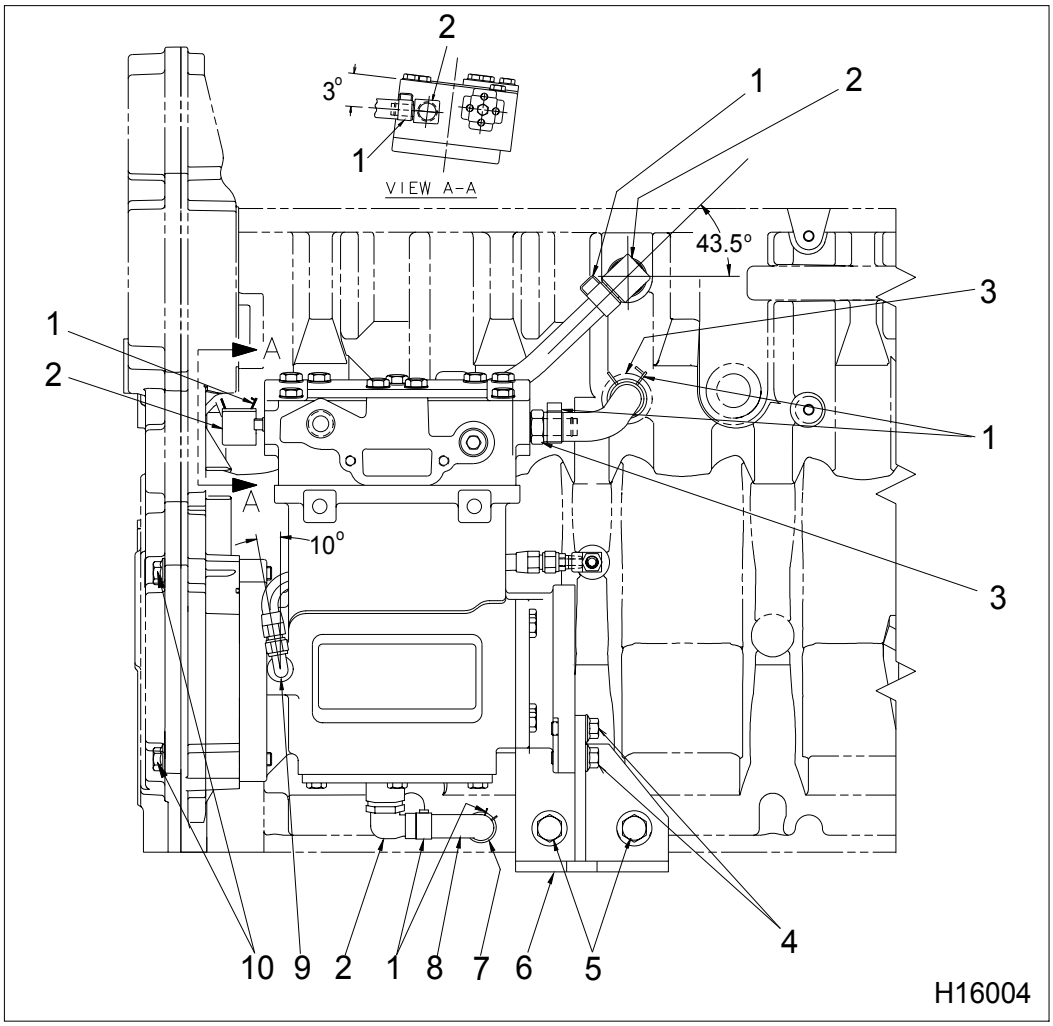

Figure 652 Air compressor mounting and connections

1. Hose clamps (6)
2. Elbow assembly, M18 (3)
3. Connector assembly, M18 (2)
4. Support bracket bolts (to compressor), M10 x 25 (2)
5. Support bracket bolts (to crankcase), M12 x 25 (2)
6. Air compressor support bracket assembly
7. Fitting (NPTF), 3/8 x 1/2
8. Drain hose elbow
9. Elbow assembly, M10 (oil supply)
10. Air compressor mounting bolts, M12 x 80 (2)

1. Place a coolant drain pan beneath air compressor bracket.
2. Loosen the coolant outlet hose clamp (from crankcase).
3. Loosen the coolant inlet hose clamp (to crankcase).
4. Remove hose ends from both crankcase fittings. Cap and plug open fittings and hose ends to keep clean.
5. Disconnect oil supply line at air compressor. Cap line and fitting.
6. Disconnect oil drain hose elbow and clamps.
7. Remove two bolts (M12 x 80) and nuts (M12) securing compressor to front cover.
8. Support weight of air compressor and remove two air compressor support bracket bolts (M12 x 25). Lift air compressor and bracket assembly from engine.
9. Place air compressor and bracket onto work bench.
10. Remove and discard air compressor gasket.
11. Remove remaining two bracket bolts attached to air compressor (M10 x 25) (Figure 652).

Power Steering Pump

1. Disconnect the high-pressure hose at power steering pump.
2. Disconnect the low-pressure hose at power steering pump.
3. Cap oil lines to eliminate contamination.
4. Depending on application, do one of the following:
   - For applications with power steering pump attached to the rear of air compressor, remove two bolts (M10 x 35).
   - For applications with power steering pump attached to rear of the front cover, remove two bolts (M12 x 90 and nuts).
5. Remove gasket and discard.

Installation

Air Compressor

WARNING: To prevent serious personal injury, possible death, or damage to the engine or vehicle, do not attempt to install the air compressor alone. It is advised to have two people install the air compressor onto the engine.

1. On work bench, loosely install air compressor support bracket assembly (Figure 652) to the air compressor with two bolts (M10 x 25). Thread finger tight but do not tighten.
2. Apply a small amount of assembly grease to the O-ring and install into groove on front cover.
3. Install the air compressor and support bracket assembly onto front cover with two bolts (M12 x 80) and nuts. Tighten, but do not torque.
4. Loosely install two bolts (M12 x 25) through air compressor bracket into crankcase.
5. Torque all air compressor bolts in the following order:

   CAUTION: To prevent engine damage, do not over torque the air compressor mounting bolts. Over torquing bolts will result in a fractured front cover.

   a. Torque two compressor to front cover bolts (M12 x 80) to the special torque value (Table 57).

   b. Torque two compressor to bracket assembly bolts (M12 x 25) to the special torque value (Table 57).

   c. Torque two bracket assembly to crankcase bolts (M12 x 10) to the special torque value (Table 57).
6. Uncap coolant hoses and install onto elbow assembly (M18) and connector assembly (M18) fittings with hose clamps.

NOTE: If these fittings were removed from the crankcase or air compressor for any reason, they will require standard torque values (General Torque Guidelines, page 445) and need to be oriented to the correct angle (Figure 652) upon installation.

7. Remove caps and install oil supply hose to elbow assembly (M10) (Figure 652). Tighten oil supply line fitting.
8. Install oil drain hose elbow and clamps.

Power Steering Pump with Air Compressor

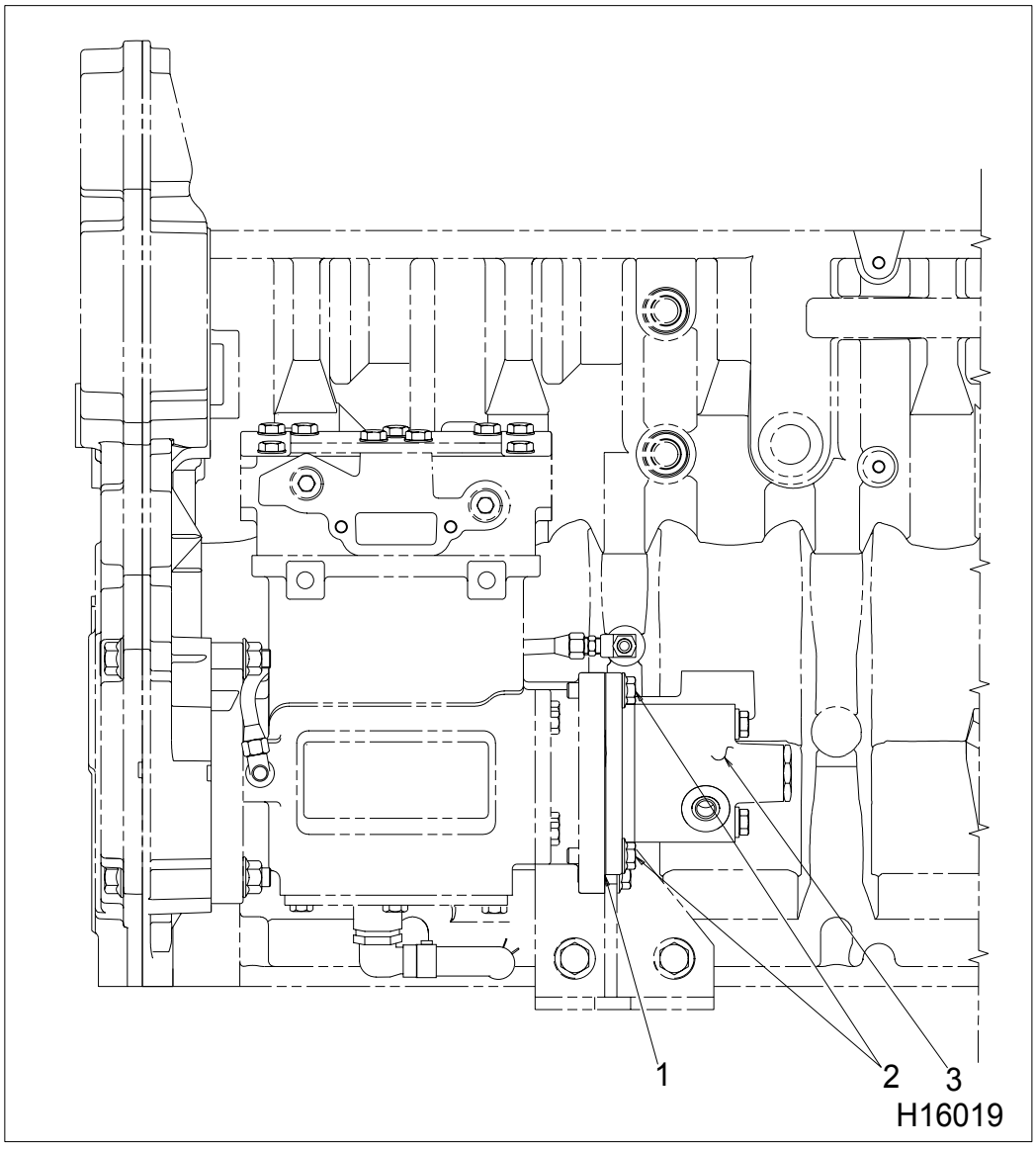

Figure 653 Power steering pump with air compressor

1. Power steering pump gasket
2. Hex flange bolt, M10 x 35
3. Power steering pump assembly

1. Apply a small amount of assembly grease to the O-ring and install into groove on backside of compressor.
2. Install two power steering pump mounting bolts (M10 x 35) and tighten to the special torque value (Table 57).
3. Install low-pressure hose.
4. Install high-pressure hose.

Power Steering Pump without Air Compressor

NOTE: The following steps are only for applications that are not equipped with an air compressor.

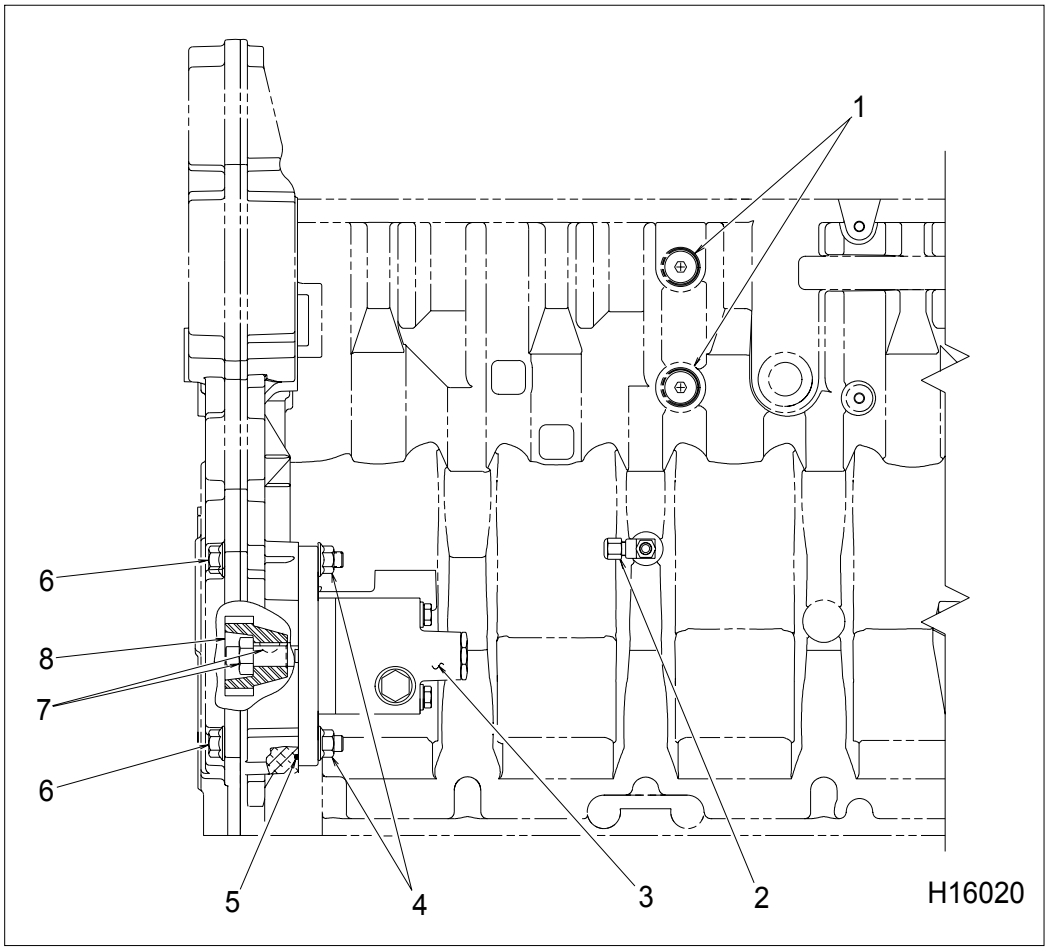

Figure 654 Power steering pump without air compressor

1. Plug assembly, M18 (standard torque) (General Torque Guidelines, page445)
2. Cap
3. Power steering pump assembly
4. Nut, M12 (2)
5. O-ring gasket
6. Bolt, M12 x 90 (2)
7. Power steering pump gear nut and shaft key (supplied with pump)
8. Drive gear (supplied with pump)

1. Apply a small amount of assembly grease to the O-ring and install into groove on front cover.
2. Install two power steering pump mounting bolts (M10 x 90) and nuts (M10) and tighten to the standard torque value (General Torque Guidelines, page445).
3. Install power steering low-pressure hose.
4. Install power steering high-pressure hose.

Special Torques

Table 57 TF 550 and TF 750 Air Compressor and Power Steering Pump Special Torques

Air compressor gear nut	150 N·m (110 lbf·ft)
Air compressor mounting bolts (through front cover), M12 x 80	83 N·m (61 lbf·ft)
Bracket bolt to air compressor, M10 x 25	67 N·m (49 lbf·ft)
Bracket bolt to crankcase, M12 x 25	115 N·m (85 lbf·ft)
Elbow assembly, M10	15-16 N·m (132-141lbf·in)
Elbow fitting assembly, M18	48 N·m (35 lbf·ft)
Hose connector assembly, M18	48 N·m (35 lbf·ft)
Power steering mounting bolts, M10 x 35	57 N·m (42 lbf·ft)
Power steering pump drive nut	90 N·m (66 lbf·ft)

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Abbreviations and Acronyms

ABS – Antilock Brake System
AC – Alternating Current
ACCEL – Accelerate
amp – Ampere
AMS – Air Management System
API – American Petroleum Institute
APS – Accelerator Position Sensor
ATA – American Trucking Association
AWA – Acoustic Wave Attenuator

BAP – Barometric Absolute Pressure
BCP – Brake Control Pressure
BDC – Bottom Dead Center
bhp – Brake horsepower

C – Celsius
CAC – Charge Air Cooler
CAN – Controller Area Network
CAN 1 – Controller Area Network (public)
CAN 2 – Controller Area Network (private)
CAP – Cold Ambient Protection
cc – Cubic centimeter
CDPF – Catalyzed Diesel Particulate Filter
cfs – Cubic feet per second
CKP – Crankshaft Position
CKPO – Crankshaft Position Output
cm – Centimeter
CMP – Camshaft Position
CMPO – Camshaft Position Output
CPU – Central Processing Unit
CTC – Coolant Temperature Compensation

DC – Direct Current
DDS – Driveline Disengagement Switch
DLC – Data Link Control
DMM – Digital Multimeter
DT – Diesel Turbocharged
DTC – Diagnostic Trouble Code

ECL – Engine Coolant Level
EBP – Exhaust Back Pressure
ECI – Engine Crank Inhibit
ECM – Electronic Control Module
ECT – Engine Coolant Temperature
EFAN – Engine Fan
EFRC – Engine Family Rating Code
EGR – Exhaust Gas Recirculating
EGRP – Exhaust Gas Recirculating Position
EOP – Engine Oil Pressure
EOT – Engine Oil Temperature
EPA – Environmental Protection Agency
EPR – Engine Pressure Regulator
ESC – Electronic System Controller
ESN – Engine Serial Number
EST – Electronic Service Tool
EURO – Eurpoean
EVRT™ – Electronic Variable Response Turbocharger
EWPS – Engine Warning Protection System

F – Fahrenheit
ft – Feet
FMI – Failure Mode Indicator

gal – Gallon
gph – Gallons Per Hour
GVW – Gross Vehicle Weight

H_2O – Water
Hg – Mercury
hp – Horsepower
HT – High Torque

IAT – Intake Air Temperature
ICP – Injector Control Pressure
IDM – Injector Drive Module
IGN – Ignition
in – Inch
in Hg – Inches of mercury
in H_2O – Inches of water
INJ – Injector drive
IPR – Injection Pressure Regulator
ISIS® – International® Service Information Solutions
IST – Idle Shutdown Timer
IVS – Idle Validation Switch

kg – Kilogram
km – Kilometer
KOEO – Key-On Engine-Off
KOER – Key-On Engine-Running
kPa – Kilopascal

L – Liter
lb – Pound
lbf – Pounds of force
lbf•ft – Pounds of force per foot
lbf•in – Pounds of force per inch

m – Meter
m/s – Meters per second
MAP – Manifold Absolute Pressure
MAT – Manifold Air Temperature
mm – Millimeter
mph – Miles per hour
MY – Model Year

N – Newton

NEG – Negative
NETS – Navistar Electronics Technical Support
N•m – Newton meter
NO – Nitrogen Oxide
NO_x – Nitrogen Oxides
NSBU – Netural Start Backup Switch

OCC – Output Circuit Check
OL – Over Limit

PID – Parameter Identifier
P/N – Part Number
POS – Positive
POSE – Positive On Shaft Excluder
PROM – Programmable Read Only Memory
psi – Pounds per square inch
pt – Pint
PTO – Power Take Off

RAM – Random Access Memory
rev – Revolution
rpm – Revolutions per minute
ROM – Read Only Memory
RSE – Radiator Shutter Enable

SAE – Society of Automotive Engineers
SCCS – Speed Control Command Switches
SID – Subsystem Identifier
SO_2 – Sulfur Dioxide
SYNC – Synchronization

TACH – Tachometer output signal
TCAPE – Truck Computer Analysis of Performance and Economy
TDC – Top Dead Center

UVC – Under Valve Cover

V – Volt
V_{BAT} – Battery Voltage
V_{IGN} – Ignition Voltage
V_{REF} – Reference Voltage
V_{REF} A – Reference Voltage (engine)
V_{REF} B – Reference Voltage (chassis)
VGT – Variable Geometry Turbocharger
VIN – Vehicle Identification Number
VOP – Valve Opening Pressure
VSS – Vehicle Speed Sensor

WIF – Water In Fuel
WTEC – World Transmission Electronically Controlled automatic transmissions (Allison)

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Terminology

Accelerator Position Sensor (APS) – A potentiometer sensor that indicates the position of the accelerator pedal.

Accessory work – The work per cycle required to drive engine accessories (normally, only those essential to engine operation).

Actuator – A device that performs work in response to an input signal.

Aeration – The entrainment of gas (air or combustion gas) in the coolant, lubricant, or fuel.

After cooler (Charge Air Cooler) – A heat exchanger mounted in the charge air path between the turbocharger and engine intake manifold. The after cooler reduces the charge air temperature by transferring heat from the charge air to a cooling medium (usually air).

Air Management System (AMS) – The AMS controls and directs air through the intake and exhaust which affects engine performance and controls emissions.

Alternating Current (AC) – An electric current that reverses its direction at regularly recurring intervals.

Ambient temperature – The environmental air temperature in which a unit is operating. In general, the temperature is measured in the shade (no solar radiation) and represents the air temperature for other engine cooling performance measurement purposes. Air entering the radiator may or may not be the same ambient due to possible heating from other sources or recirculation. (SAE J1004 SEP81)

Ampere (amp) – The standard unit for measuring the strength of an electrical current. The flow rate of a charge in a conductor or conducting medium of one coulomb per second. (SAE J1213 NOV82)

Analog – A continuously variable voltage.

Analog to digital converter (A/D) – A circuit in the ECM processing section that converts an analog signal (DC or AC) to a usable digital signal for the microprocessor.

American Trucking Association (ATA) Data link – A serial data link specified by the American Trucking Association and the SAE.

Acoustic Wave Attenuator – A component of the high-pressure oil rail designed to reduce hydraulic fluctuations resulting in a decrease of acoustic energy.

Barometric Absolute Pressure (BAP) sensor – A variable capacitance sensor which, when supplied with a 5 volt reference signal from the ECM, produces a linear analog voltage signal indicating atmospheric pressure.

Boost pressure – 1. The pressure of the charge air leaving the turbocharger.

2. Inlet manifold pressure that is greater than atmospheric pressure. Obtained by turbocharging.

Bottom Dead Center (BDC) – The lowest position of the piston during the stroke.

Brake Control Pressure (BCP) sensor – The BCP sensor is a variable capacitance sensor that senses the oil pressure in the brake gallery of the high-pressure oil rail.

Brake Horsepower (bhp) – The power output from an engine, not the indicated horsepower. The power output of an engine, sometimes called flywheel horsepower is less than the indicated horsepower by the amount of friction horsepower consumed in the engine.

Brake Horsepower (bhp) net – Net brake horsepower is measured with all engine components. The power of an engine when configured as a fully equipped engine. (SAE J1349 JUN90)

Calibration – The data values used by the strategy to solve equations and make decisions. Calibration values are stored in ROM and put into the processor during programming to allow the engine to operate within certain parameters.

Camshaft Position (CMP) sensor – The CMP sensor is a magnetic pickup sensor which indicates engine position. Speed is indicated by the number of vanes counted per revolution of the camshaft. Camshaft position is indicated by a single position peg that indicates Cylinder Number 1.

Catalyst – A substance that produces a chemical reaction without undergoing a chemical change itself.

Catalytic converter – An antipollution device in the exhaust system that contains a catalyst for chemically converting some pollutants in the exhaust gases (carbon monoxide, unburned hydrocarbons, and oxides of nitrogen) into harmless compounds.

Cavitation – A dynamic condition in a fluid system that forms gas-filled bubbles (cavities) in the fluid.

Cetane number – 1. The auto ignition quality of diesel fuel.

2. A rating applied to diesel fuel similar to octane rating for gasoline.

3. A measure of how readily diesel fuel starts to burn (autoignites) at high compression temperature.

Diesel fuel with a high cetane number autoignites shortly after injection into the combustion chamber. Therefore, it has a short ignition delay time. Diesel fuel with a low cetane number resists autoignition. Therefore, it has a longer ignition delay time.

Charge air – Dense, pressurized, heated air discharged from the turbocharger.

Charge Air Cooler (CAC) – See **After cooler**.

Closed crankcase – Crankcase ventilation system that recycles crankcase gases through a breather, then back to the clean air intake.

Closed loop operation – A system that uses a sensor to provide feedback to the ECM. The ECM uses the sensor to continuously monitor variables and it make adjustments to match engine requirements.

Cloud point – The point when wax crystals occur in fuel, making fuel cloudy or hazy. Usually below –12°C (10°F).

Cold cranking ampere rating (battery rating) – The sustained constant current (in amperes) needed to produce a minimum terminal voltage under a load of 7.2 volts per battery after 30 seconds.

Continuous Monitor Test – An ECM function that continuously monitors the inputs and outputs to ensure that readings are within set limits.

Controller Area Network (CAN) – This is a J1939 high speed communication link. **CAN 1** is a public drive train data link between the vehicle modules and ECM. **CAN 2** is a private link between the ECM and IDM.

Coolant – A fluid used to transport heat from one point to another.

Coolant level switch – A switch used to indicate coolant level.

Cooling system capacity (volume) – The amount of coolant that completely fills a cooling system to its designated cold level mark. (SAE J1004 SEP81)

Crankcase – The housing that encloses the crankshaft, connecting rods, and allied parts.

Crankcase breather – A vent for the crankcase to release excess interior air pressure.

Crankcase pressure – The force of air inside the crankcase against the crankcase housing.

Crankshaft (CKP) sensor – The CKP sensor is a magnetic pickup sensor that indicates crankshaft speed and position.

Current – The flow of electrons passing through a conductor. Measured in amperes.

Damper – A device that reduces the amplitude of torsional vibration. (SAE J1479 JAN85)

Deaeration – The removal or purging of gases (air or combustion gas) entrapped in coolant or lubricating oil.

Deaeration tank – A separate tank in the cooling system used for one or more of the following functions:

- Deaeration
- Coolant reservoir (fluid expansion and after boil)
- Coolant retention
- Filling
- Fluid level indication (visible)

Diagnostic Trouble Code (DTC) – Formerly called a Fault Code or Flash Code. A DTC is a three digit numeric code used for troubleshooting.

Diamond Logic™ Engine Brake – The Diamond logic™ Engine Brake is a compression release braking system that uses a high-pressure oil rail components together with the VGT for additional braking. The operator controls the engine brake for different operating conditions.

Diamond Logic™ Exhaust Brake – The Diamond Logic™ Exhaust Brake is an exhaust brake system that uses only the VGT to restrict exhaust flow for additional braking. The operator controls the exhaust brake for different operating conditions.

Digital Multimeter (DMM) – An electronic meter that uses a digital display to indicate a measured value. Preferred for use on microprocessor systems because it has a very high internal impedance and will not load down the circuit being measured.

Direct Current (DC) – An electric current flowing in one direction only and substantially constant in value.

Disable – A computer decision that deactivates a system and prevents operation of the system.

Displacement – The stroke of the piston multiplied by the area of the cylinder bore multiplied by the number of cylinders in the engine.

Driveline Disengagement Switch (DDS) – A switch that indicates when the driveline is disengaged from the engine.

Driver (high side) – A transistor in an electronic module that controls the power to an actuator circuit.

Driver (low side) – A transistor in an electronic module that controls the ground to an actuator circuit.

Drivetrain data link (CAN 1) J1939 – The primary communication link for the ECM, ESC, and instrument cluster.

Duty cycle – A control signal that has a controlled on/off time measurement from 0 to 100%. Normally used to control solenoids.

Elastomer – An elastic, rubber like substance such as natural or synthetic rubber material. (SAE J111 MAR85)

Electronic Control Module (ECM) – The Electronic Control Module is an electronic microprocessor that monitors and controls engine performance, exhaust emissions, and vehicle system performance (cruise control, transmission control, starter engagement, etc.). The ECM provides diagnostic information for engine and vehicle systems and can be programmed at different levels for engine protection, warning, and shutdown.

Electronic Service Tool (EST) – A computer diagnostic and programming tool for the ECM and ESC. The hardware is typically a laptop computer or notebook computer. The diagnostic and programming software includes International Master Diagnostics, ISIS on-line documentation, and NETS for factory programming.

Electronic System Controller (ESC) – An electronic module that provides multiple analog and switched input interfaces to monitor vehicle functions through solid state switches, relay driver outputs, and serial data communication.

Engine Control Module (ECM) power relay – An ECM controlled relay that supplies power to the ECM.

Engine Coolant Temperature (ECT) sensor – A thermistor sensor that senses engine coolant temperature.

Engine Fuel Pressure (EFP) sensor – A variable capacitance sensor that senses fuel pressure.

Engine Family Rating Code (EFRC) – A readable code in the calibration list of the EST that identifies engine horsepower and emission calibrations.

Engine lamp – An instrument panel lamp that comes on when DTCs are set. DTCs can be read as flash codes (red and amber instrument panel lamps).

Engine OFF tests – Tests that are done with the ignition key ON and the engine OFF.

Engine RUNNING tests – Tests done with the engine running.

Engine Oil Pressure (EOP) sensor – A variable capacitance sensor that senses engine oil pressure.

Engine Oil Temperature (EOT) sensor – A thermistor sensor that senses engine oil temperature.

Exhaust brake – A brake device using engine exhaust back pressure as a retarding medium.

Exhaust Gas Recirculation (EGR) – The Exhaust Gas Recirculation is a system that recycles a controlled portion of exhaust gas back into the combustion chamber to reduce Nitrogen Oxide exhaust emissions.

Exhaust Gas Recirculation (EGR) drive module – The EGR drive module controls the position of the EGR valve.

Exhaust Gas Recirculation (EGR) cooler – The exhaust gas is cooled in the EGR cooler and flows through the EGR control valve to the EGR mixer duct.

Exhaust Gas Recirculation (EGR) valve – The EGR valve, when open, will mix exhaust gas with filtered intake air which flows into the intake manifold. The EGR valve, when closed, only allows filtered air to flow into the intake manifold.

Exhaust manifold – Exhaust gases flow through the exhaust manifold to the turbocharger exhaust inlet and are directed to the EGR cooler or out the exhaust system.

EVRT® electronic controlled turbocharger – International's version of a Variable Geometry Turbocharger (VGT).

EZ-Tech® inerface cable – The EZ-Tech® inerface cable connects to the EST to communicate with the Electronic Controlled Module (ECM).

Fault detection and management – An alternate control strategy that reduces adverse effects that can be caused by a system failure. If a sensor fails, the ECM substitutes a good sensor signal or assumed sensor value in its place. A lit amber or red instrument panel lamp signals that the vehicle needs service.

Filter restriction – A blockage, usually from contaminants, that prevents the flow of fluid through a filter.

Flash code – See **Diagnostic Trouble Code (DTC)**.

Fuel inlet restriction – A blockage, usually from contaminants, that prevents the flow of fluid through the fuel inlet line.

Fuel pressure – The force that the fuel exerts on the fuel system as it is pumped through the fuel system.

Fuel strainer – A prefilter in the fuel system that keeps larger contaminants from entering the fuel system.

Fully equipped engine – A fully equipped engine is an engine equipped with only those accessories necessary to perform its intended service. A fully equipped engine does not include components that are used to power auxiliary systems. If these components are integral with the engine or for any reason are included on the test engine, the power absorbed may be determined and add to the net brake power. (SAE J1995 JUN90)

Fusible link (fuse link) – A fusible link is a special section of low tension cable designed to open the circuit when subjected to an extreme current overload. (SAE J1156 APR86)

Gradeability – The maximum percent grade which the vehicle can transverse for a specified time at a specified speed. The gradeability limit is the grade upon which the vehicle can just move forward. (SAE J227a)

Gross brake horsepower – The power of a complete basic engine, with air cleaner, without fan, and alternator and air compressor not charging.

Hall effect – The development of a transverse electric potential gradient in a current-carrying conductor or semiconductor when a magnetic field is applied.

Hall effect sensor – Generates a digital on or off signal that indicates speed or position.

High speed digital inputs – Inputs to the ECM from a sensor that generates varying frequencies (engine speed and vehicle speed sensors).

Horsepower (hp) – Horsepower is the unit of work done in a given period of time, equal to 33,000 pounds multiplied by one foot per minute. **1 hp = 33,000 lb x 1 ft /1 min**.

Hydrocarbons – Unburned or partially burned fuel molecules.

Idle speed – Low idle is the minimum engine speed. High idle is the maximum governed engine speed with no load.

Idle Validation Switch (IVS) – An On/Off switch that senses when the accelerator pedal is in the idle position. There is also a cold idle advance that increases low idle speed for a short period to aid in engine warm-up in cold temperatures.

Injector Drive Module (IDM) power relay – An IDM controlled relay that supplies power to the IDM.

Indicated horsepower – The theoretical power transmitted to the pistons by gas in the cylinders.

Injection Control Pressure (ICP) – High lube oil pressure generated by a high-pressure pump/pressure regulator used to hydraulically actuate the fuel injectors and the optional Diamond Logic™ engine brake.

Injection Pressure Regulator (IPR) – A Pulse Width Modulated (PWM) regulator valve, controlled by the ECM, that regulates injection control pressure.

Injection Control Pressure (ICP) sensor – A variable capacitance sensor that senses injection control pressure.

Intake Air Temperature (IAT) sensor – A thermistor sensor that senses intake air temperature.

Intake manifold – A plenum through which the air mixture flows from the charged air cooler piping to the intake passages of the cylinder head.

International NGV Tool Utilized for Next Generation Electronics (INTUNE) – The

diagnostics software for chassis related components and systems.

Low speed digital inputs – Switched sensor inputs that generate an on/off (high/low) signal to the ECM. The input to the ECM from the sensor could be from a high input source switch (usually 5 or 12 volts) or from a grounding switch that grounds the signal from a current limiting resistor in the ECM that creates a low signal (0 volts).

Lubricity – Lubricity is the ability of a substance to reduce friction between solid surfaces in relative motion under loaded conditions.

Lug (engine) – A condition when the engine is operating at or below maximum torque speed.

Manifold Absolute Pressure (MAP) – Intake manifold pressure (boost pressure).

Manifold Absolute Pressure (MAP) sensor – A variable capacitance sensor that senses intake manifold pressure.

Manometer – A double-leg liquid-column gauge, or a single inclined gauge, used to measure the difference between two fluid pressures. Typically, a manometer records in inches of water.

Master Diagnostics (MD) – The diagnostics software for engine related components and systems to use on the electronic service tool or personal computer.

Manifold Air Temperature (MAT) – Intake manifold air temperature

Manifold Air Temperature (MAT) sensor – A thermistor style sensor housed in the intake manifold used to indicate air temperature after passing through the charge air cooler.

Microprocessor – An integrated circuit in a microcomputer that controls information flow.

Nitrogen Oxides (NO_x) – Nitrogen oxides form by a reaction between nitrogen and oxygen at high temperatures and pressures in the combustion chamber.

Normally closed – Refers to a switch that remains closed when no control force is acting on it.

Normally open – Refers to a switch that remains open when no control force is acting on it.

Ohm (Ω) – The unit of resistance. One ohm is the value of resistance through which a potential of one volt will maintain a current of one ampere. (SAE J1213 NOV82)

On demand test – A self test that the technician initiates using the EST. It is run from a program in the processor.

Output Circuit Check (OCC) – An On demand test done during an Engine OFF self test to check the continuity of selected actuators.

Output State Check (OSC) – An On demand test that forces the processor to activate actuators (High or Low) for additional diagnostics.

pH – A measure of the acidity or alkalinity of a solution.

Particulate matter – Particulate matter includes mostly burned particles of fuel and engine oil.

Piezometer – An instrument for measuring fluid pressure.

Positive On Shaft Excluder (POSE) – It is a separate piece from the rest of the front or rear seal used to keep out dust / debris.

Potentiometer – A potentiometer is a variable voltage divider that senses the position of a mechanical component. A reference voltage is applied to one end of the potentiometer. Mechanical rotary or linear motion moves the wiper along the resistance material, changing voltage at each point along the resistive material. Voltage is proportional to the amount of mechanical movement.

Power – Power is a measure of the rate at which work is done. Compare with **Torque**.

Power Take Off (PTO) – Accessory output, usually from the transmission, used to power a hydraulic pump for a special auxiliary feature (garbage packing, lift equipment, etc.).

Pulse Width Modulation (PWM) – The time that an actuator, such as an injector, remains energized.

Random Access Memory (RAM) – Computer memory that stores information. Information can be written to and read from RAM. Input information (current engine speed or temperature) can be stored in RAM to be compared to values stored in Read Only Memory (ROM). All memory in RAM is lost when the ignition switch is turned off.

Rated gross horsepower – Engine gross horsepower at rated speed as declared by the manufacturer. (SAE J1995 JUN90)

Rated horsepower – Maximum brake horsepower output of an engine as certified by the engine manufacturer. The power of an engine when configured as a basic engine. (SAE J1995 JUN90)

Rated net horsepower – Engine net horsepower at rated speed as declared by the manufacturer. (SAE J1349 JUN90)

Rated speed – The speed, as determined by the manufacturer, at which the engine is rated. (SAE J1995 JUN90)

Rated torque – Maximum torque produced by an engine as certified by the manufacturer.

Read Only Memory (ROM) – Computer memory that stores permanent information for calibration tables and operating strategies. Permanently stored information in ROM cannot be changed or lost by turning the engine off or when ECM power is interrupted.

Reference voltage (V_{REF}) – A 5 volt reference supplied by the ECM to operate the engine and chassis sensors.

Reserve capacity – Time in minutes that a fully charged battery can be discharged to 10.5 volts at 25 amperes.

Signal ground – The common ground wire from the ECM for the sensors.

Speed Control Command Switches (SCCS) – A set of switches used for cruise control, Power Take Off (PTO), and remote hand throttle system.

Steady state condition – An engine operating at a constant speed and load and at stabilized temperatures and pressures. (SAE J215 JAN80)

Strategy – A plan or set of operating instructions that the microprocessor follows for a desired goal. Strategy is the computer program itself, including all equations and decision making logic. Strategy is always stored in ROM and cannot be changed during calibration.

Stroke – Stroke is the movement of the piston from Top Dead Center (TDC) to Bottom Dead Center (BDC).

Substrate – Material that supports the wash coating or catalytic materials.

Sulfur dioxide (SO_2) – Sulfur dioxide is caused by oxidation of sulfur contained in fuel.

Switch sensors – Switch sensors indicate position. They operate open or closed, allowing or preventing the flow of current. A switch sensor can be a voltage input switch or a grounding switch. A voltage input switch supplies the ECM with a voltage when it is closed. A grounding switch grounds the circuit closed, causing a zero voltage signal. Grounding switches are usually installed in series with a current limiting resistor.

System restriction (air) – The static pressure differential that occurs at a given air flow from air entrance through air exit in a system. Usually measured in inches (millimeters) of water. (SAE J1004 SEP81)

Tachometer output signal – Engine speed signal for remote tachometers.

Thermistor – A thermistor sensor changes its electrical resistance to temperature. Resistance in the thermistor decreases as temperature increases, and increases as temperature decreases. Thermistors works with a resistor that limits current in the ECM to form a voltage signal matched with a temperature value.

Thrust load – A thrust load pushes or reacts through a bearing in a direction parallel to the shaft.

Top Dead Center (TDC) – The highest position of the piston during the stroke.

Top Dead Center (compression) – Top Dead Center (compression) is when the piston is at the highest position and both intake and exhaust valves are closed.

Torque – Torque is a measure of force producing torsion and rotation around an axis. Torque is the product of the force, usually measured in pounds, and radius perpendicular to the axis of the force extending to the point where the force is applied or where it originates, usually measured in feet.

Truck Computer Analysis of Performance and Economy (TCAPE) – Truck Computer Analysis of Performance and Economy is a computer program that simulates the performance and fuel economy of trucks.

Turbocharger – A turbine driven compressor mounted to the exhaust manifold. The turbocharger increases the pressure, temperature and density of intake air to charge air.

Valve cover gasket – A valve cover gasket that contains the pass through electronic wiring harness connectors for the ICP and BCP sensors, the brake shutoff valve, and six fuel injectors.

Variable capacitance sensor – A variable capacitance sensor is a sensor that measures pressure. The pressure measured is applied to a ceramic material. The pressure forces the ceramic material closer to a thin metal disk. This action changes the capacitance of the sensor.

Variable Geometry Turbocharger (VGT) – The VGT is a turbocharger with actuated vanes inside the turbine housing. The vanes modify flow characteristics of exhaust gases through the turbine housing for boast pressure control at various engine speeds and load conditions.

(VGT) control module – The VGT control module is an electronic microprocessor that converts a pulse width modulated signal from the ECM to control a DC motor that controls the VGT vane position.

Vehicle Electronic System Programming System – The computer system used to program electronically controlled vehicles.

Vehicle Retarder Enable/Engage – Output from the ECM to a vehicle retarder.

Vehicle Speed Sensor (VSS) – A magnetic pickup sensor mounted in the tail shaft housing of the transmission, used to calculate ground speed.

Viscosity – The internal resistance to the flow of any fluid.

Viscous fan – A fan drive that is activated when a thermostat, sensing high air temperature, forces fluid through a special coupling. The fluid activates the fan.

Volt (v) – A unit of electromotive force that will move a current of one ampere through a resistance of one Ohm.

Voltage – Electrical potential expressed in volts.

Voltage drop – Reduction in applied voltage from the current flowing through a circuit or portion of the circuit current multiplied by resistance.

Voltage ignition – Voltage supplied by the ignition switch when the key is ON.

Water In Fuel (WIF) switch – The WIF switch detects water in the fuel.

Water supply housing (Freon bracket) – The water supply housing (Freon Bracket) is a coolant supply housing with a deaeration port and a connection for cab heat.

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Specifications

NOTE: The following sections of the manual do not require any specifications for service work:

- *Mounting Engine on Stand*
- *Engine Electrical*
- *Air Compressor and Power Steering Pump*

Table 58 VGT Specifications

Turbine shaft axial end play	0.05 - 0.13 mm (0.002-0.005 in)
Turbine shaft radial movement	0.52 - 0.74 mm (0.020-0.029 in)
VGT axial linkage shaft	Must strike open and closed stops in actuator, 90° rotation

Table 59 Exhaust Manifold Specifications

Allowable warpage (max.)	0.10 mm (0.004 in) overall
Flange thickness (min.)	21.59 mm (0.850 in)

Table 60 Valve Specifications

Camshaft lobe lift	**Intake:** 6.68 mm (0.263 in)
	Exhaust: 6.91 mm (0.272 in)
Valve face angle	**Intake:** 59.75- 60.00°
	Exhaust: 44.75-45.00°
Valve face margin (min.)	**Intake:** 1.32 mm (0.052 in)
	Exhaust: 1.16 mm (0.046 in)
Valve face-to-valve stem runout (max.)	0.038 mm (0.0015 in)
Valve lash (cold), intake and exhaust	0.48 mm (0.019 in)
Valve stem diameter (new condition)	**Intake:** 7.928 ± 0.0089 mm (0.3121 ± 0.00035 in)
	Exhaust: 7.908 ± 0.0089 mm (0.3113 ± 0.00035 in)
Valve stem-to-valve guide clearance (max.)	**Intake:** 0.10 mm (0.004 in)
	Exhaust: 0.11 mm (0.005 in)

Table 61 Valve Spring Specifications

Intake and Exhaust Valve Springs	
Free length	52.35 mm (2.061 in)
Solid height (max.)	27.43 mm (1.080 in)
Valve closed test length @ 410.1 ± 24.5 N (92.2 ± 5.5 lbf) test load	40 mm (1.575 in)
Valve closed test length @ 764.2 ± 48.9 N (171.8 ± 11.0 lbf) test load	29.3 mm (1.155 in)

Table 62 Cylinder Head Specifications

Cylinder head gasket surface flatness	0.10 mm (0.004 in.) per 229 mm (9.0 in)
Cylinder head thickness	**New:** 160.48 mm (6.318 in)
	Minimum: 159.97 mm (6.298 in)
Exhaust valve seat insert counterbore diameter	**Standard:** 37.503 ± 0.003 mm (1.477 ± 0.001 in)
	Oversize: 0.05 mm (0.002 in) 37.55 ± 0.03 mm (1.478 ± 0.001 in)
Exhaust valve seat outside diameter	**Standard:** 37.56 mm (1.479 in)
	Oversize: 0.05 mm (0.002 in) 37.61 mm (1.481 in)
Intake valve seat insert counterbore diameter	**Standard:** 33.50 ± 0.03 mm (1.319 ± 0.001 in)
	Oversize: 0.05 mm (0.002 in) 35.55± 0.03 mm (1.321 ± 0.001 in)
Intake valve seat outside diameter	**Standard:** 40.20 mm (1.583 in)
	Oversize: 0.05 mm (0.002 in) 40.25 mm (1.585 in)
Push rod runout (maximum)	0.508 mm (0.020 in)
Valve guide bore diameter	14.308 ± 0.017 mm (0.5633 ± 0.0007 in)
Valve guide bore out-of-round (max.)	0.005 mm (0.0002 in)
Valve guide bore taper (max.)	0.013 mm (0.0005 in)
Valve guide height from cylinder head spring pocket (intake)	16.53 ± 0.13 mm (0.651 ± 0.005 in)
Valve guide insert inside diameter (installed)	7.98 - 8.00 mm (0.314 - 0.315 in)
Valve guide insert interference fit dimension	0.043 mm (0.0017 in)
Valve guide insert outside diameter	14.351 ± 0.010 mm (0.5650 ± 0.0004 in)
Valve guide length (overall)	65.71 mm (2.587 in)
Valve recession	**Intake:** 1.02 mm (0.040 in)
	Exhaust: 1.40 mm (0.055 in)
Valve seat angles	**Intake:** 59.75 - 60°
	Exhaust: 44.75 - 45°

Table 62 Cylinder Head Specifications (cont.)

Valve seat runout (max.)	0.05 mm (0.002 in)
Valve seat width	1.91 - 2.16 mm (0.075 - 0.085 in)

Table 63 Front Cover, Vibration Damper, Gerotor Oil Pump, Front Engine Mount, and Gear Train Specifications

Camshaft gear end play	0.33 mm (0.013 in)
Camshaft gear-to-upper idler gear backlash	0.46 mm (0.018 in)
High-pressure pump end play	0.45 - 1.22 mm (0.018-0.48 in)
Lower idler gear-to-air compressor gear backlash	0.508 mm (0.020 in)
Lower idler gear-to-crankshaft gear backlash	0.36 mm (0.014 in)
Oil pump end clearance	0.05 - 0.13 mm (0.002-0.005 in)
Oil pump side clearance	0.36 - 0.48 mm (0.014-0.019 in)
Upper idler gear-to-high-pressure oil pump gear backlash	0.48 mm (0.019 in)
Upper idler gear-to-lower idler gear backlash	0.48 mm (0.019 in)
Vibration damper face runout (max.)	1.52 mm (0.060 in)

Fan Drive Configurations Diameters and Ratios

Engine fan drive configuration	Fan CL to Crankshaft CL, mm (in)	Pulley Diameter OBD, mm (in)	Drive Ratio
466 high-mount, (Horton DriveMaster)	508 (20)	242.8 (9.56)	0.894 : 1
570 high-mount, (Horton DriveMaster)	508 (20)	242.8 (9.56)	1.08 : 1
570 high-mount, (Horton DriveMaster)	508 (20)	219.4 (8.636)	1.2 : 1
570 high-mount, (Horton DriveMaster)	465 (18.3)	201.2 (7.92)	1.3 : 1
570 high-mount, (Horton DriveMaster)	465 (18.3)	201.2 (7.92)	1.3 : 1
466 high-mount, (Horton DriveMaster)	465 (18.3)	219.4 (8.636)	1.2 : 1
466 high-mount, (Horton DriveMaster)	465 (18.3)	219.4 (8.636)	0.99 : 1
466 mid-mount, (Horton DriveMaster)	411 (16.2)	201.2 (7.92)	1.08 : 1
466 high-mount, (spin-on)	465 (18.3)	201.2 (7.92)	1.08 : 1

Table 63 Front Cover, Vibration Damper, Gerotor Oil Pump, Front Engine Mount, and Gear Train Specifications (cont.)

570 high-mount, (spin-on)	465 (18.3)	201.2 (7.92)	1.3 : 1
466 mid-mount, (spin-on)	411 (16.2)	201.2 (7.92)	1.08 : 1
466 low-mount, (spin-on)	310 (12.2)	201.2 (7.92)	1.08 : 1
466 low-mount, Horton DriveMaster)	310 (12.2)	201.2 (7.92)	1.08 : 1
570 low-mount, (spin-on)	310 (12.2)	201.2 (7.92)	1.3 : 1
570 low-mount, (Horton DriveMaster)	310 (12.2)	201.2 (7.92)	1.3 : 1
466 low-mount, (bolt-on)	310 (12.2)	201.2 (7.92)	1.08 : 1
570 low-mount, (bolt-on)	310 (12.2)	201.2 (7.92)	1.3 : 1

NOTE: The high-mount and mid-mount fan drives share the same part number, however the fan drive is inverted depending upon application.

Table 64 Oil Fill Specifications

Dry engine (after rebuild and new filter)	34 L (36 quarts US)
Wet engine (after oil drain and filter change)	28 L (30 quarts US)

Table 65 Connecting Rod Specifications

Bend (max.)	0.06 mm (0.003 in)
Center-to-center distance between connecting rod bearing bore and piston pin bushing bore	219.4 - 219.5 mm (8.638 - 8.642 in)
Connecting rod bearing bore inside diameter	85.130 - 85.156 mm (3.3516 - 3.3526 in)
Connecting rod bearing inside diameter (installed)	80.05 - 80.10 mm (3.1518 - 3.1536 in)
Connecting rod bearing bore out-of-round (max.)	0.02 mm (0.00078 in)
Connecting rod bearing bore taper (max.)	0.02 mm (0.00078 in)
Connecting rod bearing running clearance	0.030 - 0.107 mm (0.0012 - 0.0042 in)
Connecting rod side clearance on crankshaft	0.13 - 0.48 mm (0.005 - 0.019 in)
Piston pin bushing inside diameter	46.393 - 46.401 mm (1.8265 - 1.8268 in)
Twist (max.)	0.05 mm (0.002 in)

Table 66 Piston Specifications

466 piston configuration	
Piston material	Aluminum alloy

Table 66 Piston Specifications (cont.)

Piston rings	
225 bhp and below	Top ring - keystone cross section Intermediate - rectangular cross section
230 bhp and above	Top ring - keystone cross section Intermediate - keystone cross section
570 piston configuration	
Piston crown	Steel crown, two-piece articulated
Piston skirt	Aluminum alloy
Piston rings	
All 570 series engines	Top ring – keystone cross section Intermediate – rectangular cross section
466 and 570 piston specifications	
Running clearance between piston and cylinder sleeve	**466 piston:** 0.076 - 0.128 mm (0.0030 - 0.0050 in) **570 piston:** 0.063 - 0.115 mm (0.0025 - 0.0045 in)
Skirt diameter	**466 piston:** 116.44 - 116.49 mm (4.584 - 4.586 in) **570 piston:** 116.48 - 116.51 mm (4.586 - 4.587 in)
Top compression ring groove width, 466 measure over 0.122 gauge pins	115.90 - 115.68 mm (4.563 - 4.554 in)
Top compression ring groove width, 570 measure over 0.126 gauge pins	116.74 - 116.50 mm (4.596 - 4.587 in)
Intermediate compression ring groove width (keystone shaped ring) measure over 0.110 gauge pins	115.92 - 115.73 mm (4.564 - 4.556 in)
Intermediate compression ring groove width (rectangular shaped ring), 466	3.05 - 3.03 mm (0.120 - 0.119 in)
Intermediate compression ring groove width (rectangular shaped ring), 570	3.05 - 3.03 mm (0.120 - 0.119 in)
Oil control ring, side clearance, 466	0.076 - 0.026 mm (0.0030 - 0.0010 in)
Oil control ring, side clearance, 570	0.080 - 0.030 mm (0.0031 - 0.0012 in)

Table 67 Piston Ring Specifications

Intermediate compression ring end gap	1.65 - 1.90 mm (0.065 - 0.075 in)
Oil control ring end gap	0.35 - 0.66 mm (0.014 - 0.026 in)
Top compression ring end gap	0.35 - 0.66 mm (0.014 - 0.026 in)

Table 68 Piston Pin Specifications

Clearance in piston	**466 piston:** 0.0165 - 0.0292 mm (0.00065 - 0.00115 in)
	0.035 - 0.048 mm (0.0014 - 0.0019 in)
	570 skirt (vertical plane): 0.0165 - 0.0292 mm (0.00065 - 0.00115 in)
	570 skirt (horizontal plane): 0.0280 - 0.0574 mm (0.00114 - 0.00226 in)
	570 crown: 0.038 - 0.053 mm (0.0015 - 0.0021 in)
Diameter	46.352 - 46.357 mm (1.8249 - 1.8251 in)
Length	96.57 - 96.82 mm (3.802 - 3.812 in)

Table 69 Cylinder Sleeve Specifications

Allowable variation of counterbore depth between four points (max.)	0.03 mm (0.001 in)
Counterbore depth before adding shims (max.)	10.49 mm (0.413 in)
Counterbore depth (including shims- if any)	8.84 - 8.89 mm (0.348 - 0.350 in)
Cylinder sleeve protrusion	0.05 - 0.13 mm (0.002 - 0.005 in)
Cylinder sleeve taper, at top of ring travel (max.)	0.10 mm (0.004 in)
Flange thickness	8.94 - 8.96 mm (0.352 - 0.353 in)
Inside diameter	114.50 - 116.60 mm (4.590 - 4.591 in)

Table 70 Crankshaft Specifications

Type	Steel forged, induction hardened, grindable
Main Bearing journal diameter	
Standard size	107.95 ± 0.015 mm (4.250 ± 0.0006 in)
0.254 mm (0.010 in) undersized	107.70 ± 0.015 mm (4.240 ± 0.0006 in)
0.508 mm (0.020 in) undersized	107.44 ± 0.0152 mm (4.230 ± 0.0006 in)
0.762 mm (0.030 in) undersized	107.19 ± 0.0152 mm (4.220 ± 0.0006 in)
Damper mounting area runout (maximum)	0.03 mm (0.001 in)

Table 70 Crankshaft Specifications (cont.)

Flywheel mounting surface runout (maximum)	0.05 mm (0.002 in)
Main bearing journal maximum out-of-round	0.05 mm (0.002 in)
Main bearing journal taper (maximum per inch)	0.071 mm (0.0028 in)
Main bearing thrust face runout (TIR maximum)	0.03 mm (0.001 in)
Main bearing width (except rear thrust)	34.19 ± 0.13 mm (1.346 ± 0.005 in)
Number of main bearings	7
Rear oil seal journal runout (maximum)	0.08 mm (0.003 in)
Thrust taken by	No. 7 rear upper main bearing
Thrust bearing journal length	34.404 ± 0.038 mm (1.3545 ± 0.0015 in)
Connecting rod journal diameter	
Standard Size	80.0 ± 0.0152 mm (3.1500 ± 0.0006 in)
0.0254 mm (0.010 in) undersized	79.7 ± 0.0152 mm (3.1400 ± 0.0006 in)
0.508 mm (0.020 in) undersized	79.5 ± 0.0152 mm (3.1300 ± 0.0006 in)
0.762 mm (0.030 in) undersized	79.2 ± 0.0152 mm (3.1200 ± 0.0006 in)
Center line of main bearing bore to head deck	368.3 ± 0.05 mm (14.50 ± 0.002 in)
Connecting rod bearing to crankshaft running clearance	0.030 - 0.107 mm (0.0012 - 0.0042 in)
Connecting rod bearing width	40.01 mm (1.575 in)
Connecting rod journal maximum out-of-round	0.0064 mm (0.00025 in)
Connecting rod journal taper (maximum per inch)	0.0069 mm (0.00027 in)
Crankshaft end play	0.15-0.31 mm (0.006 - 0.012 in)
Crankshaft end play maximum wear limit	0.51 mm (0.020 in)
Crankshaft flange outside diameter	155.58 mm (6.125 in)
Crankshaft gear backlash	0.08-0.41 mm (0.003 - 0.016 in)
Main bearing to crankshaft running clearance	0.046 - 0.127 mm (0.0018 - 0.0050 in)
Connecting rod to crankshaft side clearance	0.30 ± 0.11 mm (0.012 ± 0.005 in)
Standard size to 0.51 mm (0.020 in) undersized	34.404 ± 0.03 mm (1.3545 ± 0.010 in)

Table 71 Crankcase Specifications

Cap attachment	2 bolts per cap
Coolant heater rating	1250 W, 120 V
Counterbore dimension in crankcase	8.865 ± 0.025 at 132 mm (0.349 ± 0.001 at 5.189 in)
Crankcase deck flatness	0.08 mm (0.003 in)
Cylinder sleeve counterbore maximum allowable depth	9.25 mm (0.364 in)
Main bearing type	Precision replaceable
Material	Steel-backed copper, lead, tin
Maximum allowable variation of counterbore depth (between four points)	0.025 mm (0.001 in)
Piston cooling tube dia. (spray hole) DT 466	1.91 - 2.06 mm (0.075 - 0.081 in)
Piston cooling tube dia. (spray hole) DT 570, HT 570	2.26 - 2.41 mm (0.089 - 0.095 in)
Roller tappet outside diameter	28.435 - 28.448 mm (1.1195 -1.1200 in)
Sleeve protrusion above crankcase	0.05 - 0.13 mm (0.002 - 0.005 in)
Tappet bore diameter	28.51 - 28.55 mm (1.123 - 1.124 in)
Thrust taken by	No. 7 rear upper main bearing
Camshaft	
Bushing I.D. (installed)	58.03 - 58.12 mm (2.285 - 2.288 in)
Cam lobe lift, exhaust	6.91 mm (0.272 in)
Cam lobe lift, intake	6.68 mm (0.263 in)
Camshaft end play	0.18 - 0.33 mm (0.007 - 0.013 in)
Camshaft journal diameter	57.95 - 58.98 mm (2.282 - 2.283 in)
Camshaft radial clearance	0.05- 0.17 mm (0.002 - 0.007 in)
Maximum permissible cam lobe wear	0.25 mm (0.010 in)
Service bushings furnished to size	Yes
Thrust plate thickness (new)	6.96 - 7.01 mm (0.274 - 0.276 in)
Camshaft Bushing Bore Diameter in Crankcase	
Front	65.51 - 63.55 mm (2.501 - 2.502 in)
Intermediate front	63.01 - 63.04 mm (2.481 - 2.482 in)
Intermediate rear	63.01 - 63.04 mm (2.481 - 2.482 in)
Rear	65.51 - 63.55 mm (2.501 - 2.502 in)

Table 72 Oil System Module and Secondary Filter Specifications

Cooler heat exchanger, DT 466	23 plates
Cooler heat exchanger, HT 570	33 plates
Cooler heat exchanger, all engines with front drive axle	33 plates
Oil pressure regulating valve, opening pressure	380 kPa (55 psi) @ 38° C (100° F)
Oil filter bypass valve, opening pressure	345 kPa (50 psi)
Oil thermal valve, opening temperature	111° C (232° F)

Table 73 Fuel System Specifications

Fuel heater switching points	**On**: 2 °C (36 °F)
	Off: 24 °C (75 °F)
Fuel pressure regulator assembly opening pressure	448 - 517 kPa (65-75 psi)
Fuel strainer	150 micron
High-pressure oil manifold, range	5 - 28 MPa (725 - 4,075 psi)

Table 74 Flywheel Resurfacing Specifications

Flat flywheel minimum thickness after resurfacing	36.32 mm (1.430 in)
Pot flywheel minimum thickness after resurfacing	39.37 mm (1.550 in)
Requires measurement from crankshaft mounting surface of flywheel to clutch surface of flywheel.	

Table 75 Engine Brake Specifications

Brake actuator lash (cold)	0.48 mm (0.019 in)
Engine exhaust valve lash (cold)	Refer to (Adjusting Valve Lash, page150)

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General Torque Guidelines

CAUTION: To prevent engine damage, do not substitute fasteners. Original equipment standard hardware is defined as Class 10.9 metric or Grade 8 standard coarse thread bolts (Rockwell "C" 33-39), all phosphate coated.

CAUTION: To prevent engine damage, do not use this standard torque chart with other International brand engines or engines made by other manufacturers.

The standard torque chart provides the tightening values for general purpose applications using original equipment standard hardware as listed in the Parts Catalog for the application involved.

Table 76 Standard Torque Values – Class 10.9 Metric Flange Head Bolts and Studs

Thread Diameter (mm)	Thread Pitch (mm)	Torque[1]
6	1	13 N·m (115 lbf·in)
8	1.25	31 N·m (23 lbf·ft)
10	1.5	62 N·m (45 lbf·ft)
12	1.75	107 N·m (79 lbf·ft)
14	2	172 N·m (127 lbf·ft)
15	2	216 N·m (159 lbf·ft)
16	2	266 N·m (196 lbf·ft)
18	2.5	368 N·m (272 lbf·ft)
20	2.5	520 N·m (384 lbf·ft)

[1] Values listed are 80% of proof load.

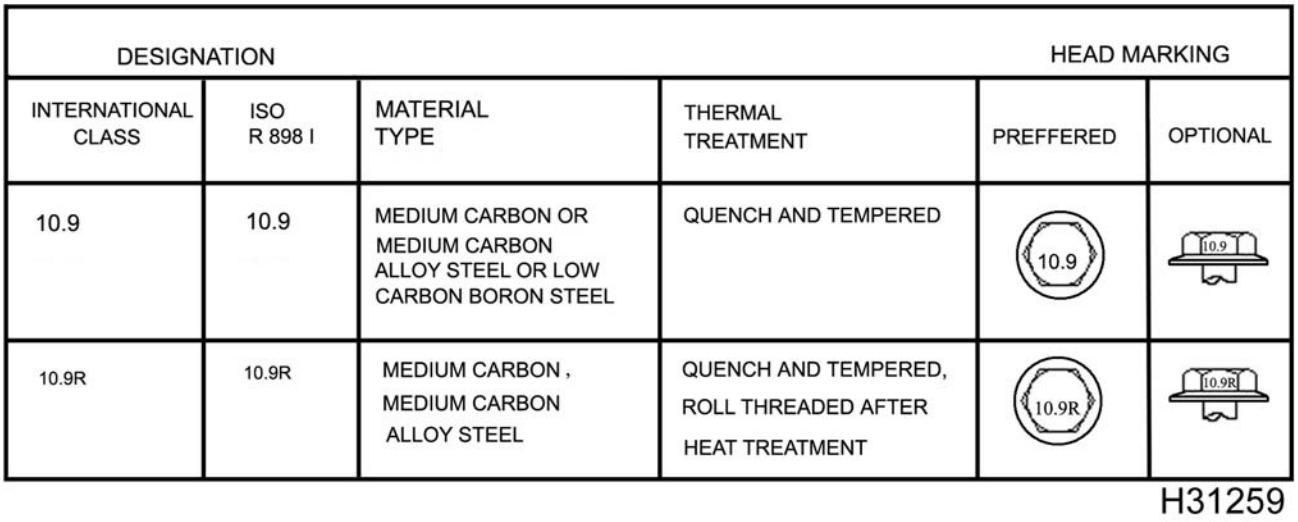

Figure 655 Classification and Identification – Metric and Special Use Fasteners

Many conditions affect torque and the results of torque applications. The major purpose in tightening a fastener to a specified torque is to obtain tension in the fastener (i.e., bolt, nut, etc.), which in turn develops a clamping load which exceeds any possible loading imposed on parts due to engine rpm or vibration.

Phosphate coated fasteners do not require oil lubrication during assembly and torque application. Reused fasteners, even if originally phosphate coated, do require a light film of engine oil lubrication to threads and under head area for proper torque application.

Threads that are dry, excessively rough, battered or filled with dirt require considerable effort just to rotate. Then when the clamping load is developed or the bolt tension is applied, the torque reading mounts rapidly (due to thread friction) to the specified torque value. However, the desired bolt tension and maximum clamping effect is not achieved. This condition can lead to failure of the fastener to maintain component integrity. The proper bolt tension and clamping effect can never be attained if the fastener is dry. The fastener threads must have a film of clean lubricant (engine oil) to be considered lubricated.

Using a Torque Wrench Extension

Occasionally the need will arise to use an extension, crowfoot, or other type of adapter with your torque wrench to torque a bolt or line fitting. Sometimes an extension or adapter is necessary to reach a bolt in a hard to reach location. Adding adapters or extensions will alter the actual clamping force at the fastener. By using the following formula you can determine what the torque wrench setting should be to achieve the known standard or special torque value.

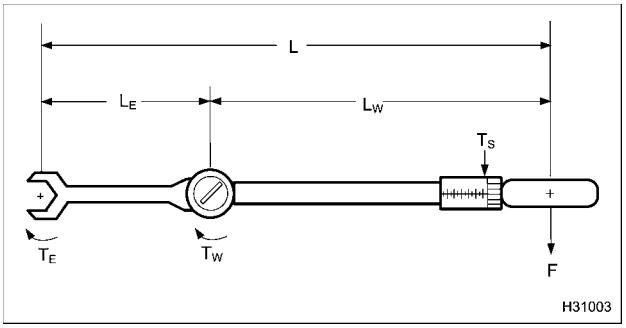

Figure 656 Torque wrench extension

- F – Force applied by service technician
- L – Length through which force is applied to fastener
- L_E – Length of extension
- L_W – Length of torque wrench
- T_E – Torque applied at fastener
- T_W – Torque applied at end of torque wrench
- T_S – Torque wrench setting

$T_S = T_E (L_W / (L_W + L_E)$

Example:

A component has a known torque value of 88 N·m (65 lbf·ft) and an extension is required to reach it. What will the torque wrench setting have to be in order to compensate for the additional extension?

- Torque wrench = 12 inches
- Extension = 6 inches

T_S = 65 lbf·ft (12 in / (12 in + 6 in)

T_S = 65 lbf·ft (12 in / 18 in)

T_S = 65 lbf·ft (0.666)

T_S = **43.3 lbf·ft or 58.9 N·m**

Special Torque

Table 77 Engine Mounting Special Torques

Oil pan drain plug (M25)	68 N·m (50 lbf·ft)

Table 78 VGT Special Torques

VGT Spiralock® nuts (M10)	71 N·m (52 lbf·ft)

Table 79 Intake Manifold, Inlet and EGR Mixer, and Exhaust Manifold Special Torques

Exhaust manifold mounting torque and sequence.	See “Exhaust manifold torque sequence” (page 85).
Fuel assembly valve	15 N·m (132 lbf·in)
Intake manifold mounting bolts	40 N·m (30 lbf·ft)
Intake plug assembly	25 N·m (18 lbf·ft)

Table 80 EGR Cooler Special Torques

Constant tension EGR hose clamps (if equipped)	3.4 N·m (30 lbf·in)
EGR cooler mounting bracket lower bolt, M12 x 120	116 N·m (85 lbf·ft)
EGR cooler mounting bracket	116 N·m (85 lbf·ft)
EGR cooler supply tube retaining bolt	15-22 N·m (11.3-6.2 lbf·ft)

Table 81 Cylinder Head and Valve Train Special Torques

BCP sensor	20-30 N·m (15-22 lbf·ft)
Cylinder head mounting bolts torque and sequence	
Fuel injector mounting bolt	41 N·m (30 lbf·ft)
High-pressure oil hose fitting	46 N·m (34 lbf·ft)
ICP sensor	20-30 N·m (15-22 lbf·ft)
Rocker arm bolts torque and sequence	(Installing Rocker Arms, page148)
Valve adjustment locknut	27 N·m (20 lbf·ft)

Table 82 Front Cover, Vibration Damper, Gerotor Oil Pump, Front Engine Mount, and Gear Train Special Torques

Automatic belt tensioner assembly	50 N·m (37 lbf·ft)
Damper retaining plate bolts	163 N·m (120 lbf·ft) Retorque all bolts until no movement
End cover adapter (PTO equipped engines only)	52 N·m (38 lbf·ft)
Fan drive, high-mount, Horton DriveMaster (20, 18.3 in.)	26 N·m (19 lbf·ft)
Fan drive, mid-mount, Horton DriveMaster (16.2 in.)	26 N·m (19 lbf·ft)
Fan drive, low-mount, Horton DriveMaster (12.2 in.)	26 N·m (19 lbf·ft)
Fan spacer retaining bolt, M10 x 20 (bolt-on drive only)	52 N·m (38 lbf·ft)
Front cover mounting bolts (rear half)	26 N·m (19 lbf·ft)
Front engine mounting bracket bolts (4)	386 N·m (284 lbf·ft)
Horton DriveMaster bearing retainer nut	177 N·m (130 lbf·ft)
Lower idler gear mounting bolt	639 N·m (470 lbf·ft)
Oil pump and rotor housing M8 bolts	25 N·m (18 lbf·ft)
Upper idler gear mounting bolt	326 N·m (240 lbf·ft)
Viscous or rubber vibration damper mounting bolts	54 N·m (40 lbf·ft)
Water outlet tube assembly at cylinder head	33 N·m (24 lbf·ft)
Water outlet tube assembly at front cover	33 N·m (24 lbf·ft)
Wear plate (water pump)	7 N·m (60 lbf·in)

Table 83 Oil Pan and Oil Suction Tube Special Torques

Oil pan drain plug	68 N·m (50 lbf·ft)
Oil heating element assembly (optional)	68 N·m (50 lbf·ft)
Oil pan heater plug	68 N·m (50 lbf·ft)
Oil pan mounting bolts	32 N·m (24 lbf·ft)
Oil suction tube bracket, M10 x 25	63 N·m (46 lbf·ft)
Oil suction tube, M8 x 35	27 N·m (20 lbf·ft)

Table 84 Power Cylinder Special Torque

Connecting rod bolts (verify connecting rod type)	See Torque Procedures for Connecting Rod with M12 Bolts (page241) or M11 Bolts (page241).
Piston cooling tube bolts, M6 x 12	13 N·m (115 lbf·in)
Piston cooling tube bolts, M6 x 16	13 N·m (115 lbf·in)

Table 85 Crankcase, Crankshaft and Camshaft Special Torques

Camshaft thrust plate bolts	26 N·m (19 lbf·ft)
Crankcase ladder, M12 x 35	122 N·m (90 lbf·ft)
Coolant heater bolt	4.5-5.1 N·m (40-45 lbf·in)
Crankcase ladder, M10 x 25	63 N·m (46 lbf·ft)
Crankshaft main bearing cap bolt torque and sequence	(Torque Procedure for Torque-to-Yield Main Bearing Bolts, page271)

Table 86 Oil System Module and Secondary Filter Special Torques

Coolant drain plug, M18	24 N·m (18 lbf·ft)
Lube adapter bolts	29 N·m (21 lbf·ft)
Oil system module mounting bolts	26 N·m (19 lbf·ft)
Oil pressure regulator valve	68 N·m (50 lbf·ft)
Oil thermal valve assembly	29 N·m (21 lbf·ft)
Cooler heat exchanger mounting bolts, M8	29 N·m (21 lbf·ft)
Oil cooler drain tube bracket bolt	26 N·m (19 lbf·ft)
Oil supply tube fitting (turbocharger)	24-26 N·m (17-19 lbf·ft)
Plug assembly, M12	5 N·m (46 lbf·in)
Secondary filter mounting bolts	26 N·m (19 lbf·ft)
Secondary filter stud assembly	20 N·m (15 lbf·ft)

Table 87 Engine Electrical Special Torques

ECM / IDM mounting bolts (2), M8 x 45	20 N·m (15 lbf·ft)
ECM / IDM mounting stud bolts (2), M8 x 45/19	20 N·m (15 lbf·ft)
Engine coolant temperature (ECT) sensor	15-20 N·m (11-15 lbf·ft)
Engine oil pressure (EOP) sensor	9-14 N·m (79-124 lbf·in)
Engine oil temperature (EOT) sensor	15-20 N·m (11-15 lbf·ft)
Injection control pressure (ICP) sensor and Brake Control (BCP) sensor	20-30 N·m (15-22 lbf·ft)
Intake Manifold Air Pressure (MAP) sensor	10-20 N·m (88-176 lbf·in)
Intake Manifold Air Temperature (MAT) sensor	10-20 N·m (88-176 lbf·in)

Table 88 Fuel System Special Torques

Bolt, M8 x 20	29 N·m (21 lbf·ft)
Drain valve	0.5 - 1 N·m (5-10 lbf·in)
Elbow jam nut	88 N·m (65 lbf·ft)
End plug assembly (AWA) or attenuator	204 N·m (150 lbf·ft)
Fitting assembly, 3/8 tube	27 N·m (20 lbf·ft)
Fuel bowl	39 N·m (29 lbf·ft)
Fuel drain plug	24 N·m (18 lbf·ft)
Fuel fitting	27 N·m (20 lbf·ft)
Fuel filter header mounting bolts, M8 x 100	27 N·m (20 lbf·ft)
Fuel filter housing cover	25 N·m (18 lbf·ft)
Fuel pressure regulator	1-1.7 N·m (10-15 lbf·in)
Fuel valve assembly (air bleed and pressure test port)	15 N·m (132 lbf·in)
High-pressure oil hose fitting, M18 (at head)	54 N·m (40 lbf·ft)
High-pressure oil hose (swivel nuts)	46 N·m (34 lbf·ft)
High-pressure oil manifold bolts, M8 x 90	27 N·m (20 lbf·ft)
High-pressure oil pump assembly bolts	30 N·m (22 lbf·ft)
High-pressure oil pump assembly (gear)	231-279 N·m (170-205 lbf·ft)
Injector hold down clamp assembly	41 N·m (30 lbf·ft)
IPR valve assembly	50 N·m (37 lbf·ft)
Low-pressure fuel supply pump bolts, M6 x 16	15-18 N·m (132-160 lbf·in)
Low-pressure fuel pump tube coupling nuts	18 N·m (155 lbf·in)
Plug assembly, M12 (intake manifold fuel rail)	24 N·m (18 lbf·ft)
Post	8 N·m (72 lbf·in)
Self tapping screw	5 N·m (41 lbf·in)
Water In Fuel (WIF) sensor	1.7 N·m (15 lbf·in)

Table 89 Flywheel and Flywheel Housing Special Torques

Engine mounting bracket bolts	108 N·m (80 lbf·ft)
Flexplate mounting bolts	136 N·m (100 lbf·ft)
Flywheel housing mounting bolts	108 N·m (80 lbf·ft)
Flywheel mounting bolts	136 N·m (100 lbf·ft)
Rear engine mounting bracket bolts	108 N·m (80 lbf·ft)

Table 90 Engine Brake Special Torques

Brake Control Pressure (BCP) sensor	20-30 N·m (15-22 lbf·ft)
Brake piston adjustment locknut	27 N·m (20 lbf·ft)
Brake shutoff solenoid Tinnermann nut	7-11 N·m (5-8 lbf·lb)
Brake shutoff valve	24-30 N·m (18-22 lbf·ft)
High-pressure oil rail bolts (M8 x 90)	27 N·m (20 lbf·ft)
Plug assembly, M10	12 N·m (108 lbf·in)
Plug assembly, M12	12 N·m (108 lbf·in)
Injection Control Pressure (ICP) sensor	20-30 N·m (15-22 lbf·ft)
Oil pressure relief valve	41-48 N·m (30-35 lbf·ft)
Rail End Plug Assembly or attenuator	204 N·m (150 lbf·ft)

Table 91 TF 550 and TF 750 Air Compressor and Power Steering Pump Special Torques

Air compressor gear nut	150 N·m (110 lbf·ft)
Air compressor mounting bolts (through front cover), M12 x 80	83 N·m (61 lbf·ft)
Bracket bolt to air compressor, M10 x 25	67 N·m (49 lbf·ft)
Bracket bolt to crankcase, M12 x 25	115 N·m (85 lbf·ft)
Elbow assembly, M10	15-16 N·m (132-141 lbf·in)
Elbow fitting assembly, M18	48 N·m (35 lbf·ft)
Hose connector assembly, M18	48 N·m (35 lbf·ft)
Power steering mounting bolts, M10 x 35	57 N·m (42 lbf·ft)
Power steering pump drive nut	90 N·m (66 lbf·ft)

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Description

Special service tools for the DT 466, DT 570 and HT 570 series engines can be ordered from the **SPX Corporation, 1-800-520-2584**.

NOTE: The following sections of the manual do not require any special tools for service work:

- *Intake, Inlet, and Exhaust Manifolds*
- *Oil Pan and Oil Suction Tube*
- *Engine Electrical*
- *Air Compressor and Power Steering Pump*

Table 92 Special Tools

Engine mounting plate	ZTSE4649
Engine stand	OTC1750A

Table 93 EGR System Special Service Tools

EGR cooler pressure test plates	ZTSE4636

Table 94 Cylinder Head Special Service Tools

Cylinder head test plate	ZTSE4289A
Dye penetrant kit	Obtain locally
Feeler gauge	Obtain locally
Head bolt thread gauge	ZTSE4667
Injector sleeve brush set (set of 2)	ZTSE4304
Injector sleeve installer	ZTSE4642
Injector sleeve remover	ZTSE4643
Pressure regulator	Obtain locally
Slide hammer puller set	ZTSE1879
Small hole gauge set	Obtain locally
Straightedge	Obtain locally
Thermostat opening pressure adapter	ZTSE4647
Valve guide deburring tool	ZTSE4393
Valve guide installer	ZTSE1943
Valve guide remover	ZTSE4377
Valve seat extractor kit (universal)	ZTSE1951C
Valve seat grinder	ZTSE1631A
Valve seat grinding stones 45° (exhaust)	Obtain locally
Valve seat grinding stones 60° (intake)	Obtain locally
Valve seat installer	ZTSE4641
Valve seat remover (collet)	ZTSE4640
Valve spring compressor	ZTSE1846
Valve spring compressor jaws	ZTSE4652
Water supply housing pressure adapter	ZTSE4648

Table 95 Front Cover, Vibration Damper, Gerotor Oil Pump, Front Engine Mounts, and Gear Train Special Service Tools

Dial indicator set	Obtain locally
Feeler gauge	Obtain locally
Front seal and wear sleeve installer	ZTSE3004B
H-bar	Obtain locally
Hot plate	Obtain locally
Loctite® 569 Hydraulic Sealant	Obtain locally
Lower Idler Gear Socket	ZTSE4383
Slide hammer puller set	ZTSE1879
Straightedge	Obtain locally
Thermo-melt crayon, 100 °C (212 °F)	Obtain locally
16 mm 12 point impact socket	Obtain locally

Table 96 Oil Pan and Oil Suction Tube

Wacker T – 442 RTV sealant	Obtain locally

Table 97 Piston, Piston Ring, and Connecting Rod Special Service Tools

Counterbore cutting head	ZTSE25144A
Cylinder bore gauge	Obtain locally
Cylinder sleeve counterbore tool kit	ZTSE2514
Cylinder sleeve holding adapters (set of 3)	ZTSE4672
Cylinder sleeve puller	ZTSE2536
Dial indicator set	Obtain locally
EGR water coolant supply plate	ZTSE4648
Piston ring compressor tool	ZTSE4396
Piston ring expander	Obtain locally
Piston ring gauge pins (set of 3)	ZTSE4653
Telescoping gauge set	Obtain locally

Table 98 Crankcase, Crankshaft and Camshaft Special Service Tools

Cam gear puller	ZTSE4411
Camshaft bushing puller	ZTSE2893B
Hot plate	Obtain locally
Nylon brush	ZTSE4389
Tap, cylinder head bolt holes	ZTSE4671
Tap set	ZTSE4386
Stiff nylon brush	ZTSE4392

Table 99 Oil System Module and Secondary Filter Special Tools

Air Pressure Regulator	Obtain locally
Oil CoolerTest Plate	ZTSE4654
Oil Filter Wrench	ZTSE1879
Slide Hammer Puller Set	Obtain locally

Table 100 Fuel System Special Service Tools

Cap kit, injectors	ZTSE4660
Fuel injector rack cups	ZTSE4645
Fuel injector remover tool (#40 Torx®)	ZTSE4524
IPR removal / installation tool	ZTSE4666
Loctite® 246 Threadlocker	Obtain locally

Table 101 Flywheel and Flywheel Housing Special Service Tools

Crankshaft timing disk puller (H-bar)	Obtain locally
Dial indicator with magnetic base	Obtain locally
Guide pins	Obtain locally
Rear seal installer	ZTSE4637
Slide hammer puller set	ZTSE1879

Table 102 Engine Brake Special Service Tools

Feeler gauge (long)	Obtain locally

Photos of Essential Tools

Figure 657 EGR cooler pressure test plates, ZTSE4636

Figure 658 Rear seal installer, ZTSE4637

Figure 659 Valve seat remover (collet), ZTSE4640

Figure 660 Valve seat installer, ZTSE4641

Figure 661 Injector sleeve installer, ZTSE4642

Figure 662 Injector sleeve remover, ZTSE4643

Figure 663 Injector rack – ZTSE4299B, Injector rack cups – ZTSE4645

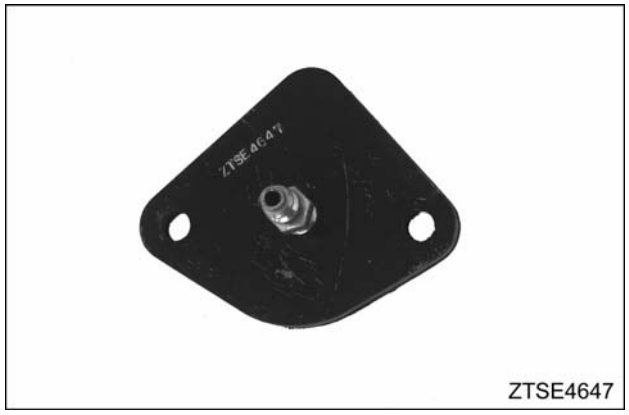

Figure 664 Thermostat opening pressure adapter– cylinder head, ZTSE4647

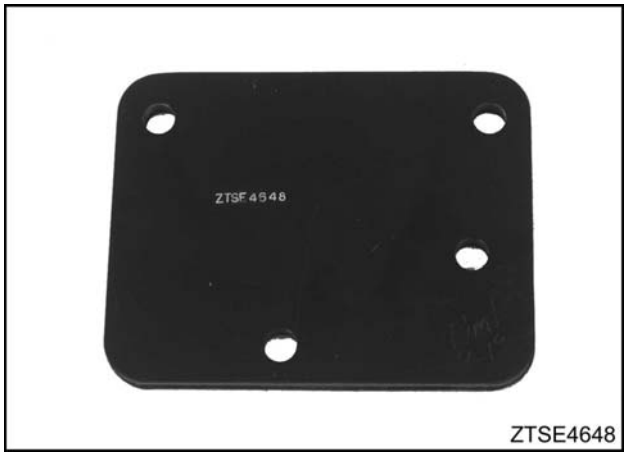

Figure 665 Water supply housing pressure adapter-cylinder head, ZTSE4648

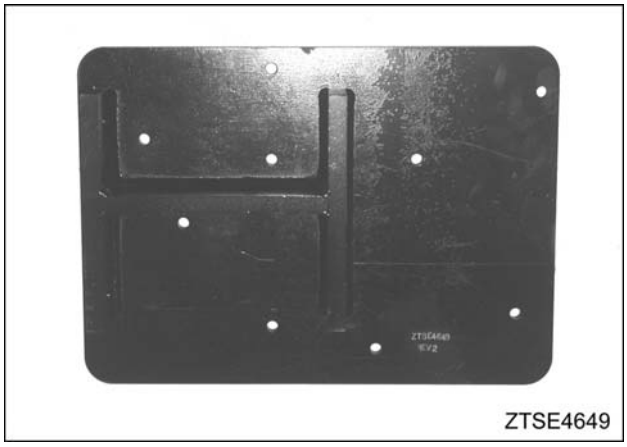

Figure 666 Engine mounting plate, ZTSE4649

Figure 667 Valve spring compressor jaws, ZTSE4652

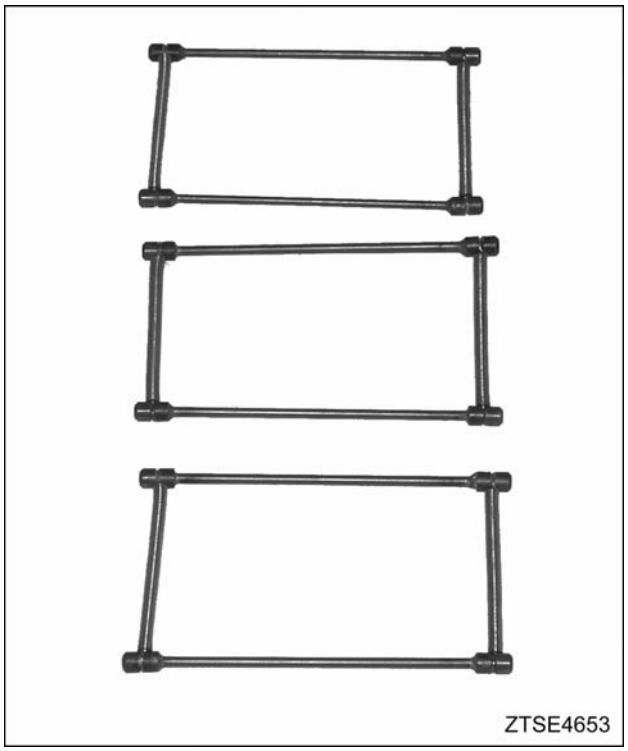

Figure 668 Piston gauge pins (set of three), ZTSE4653

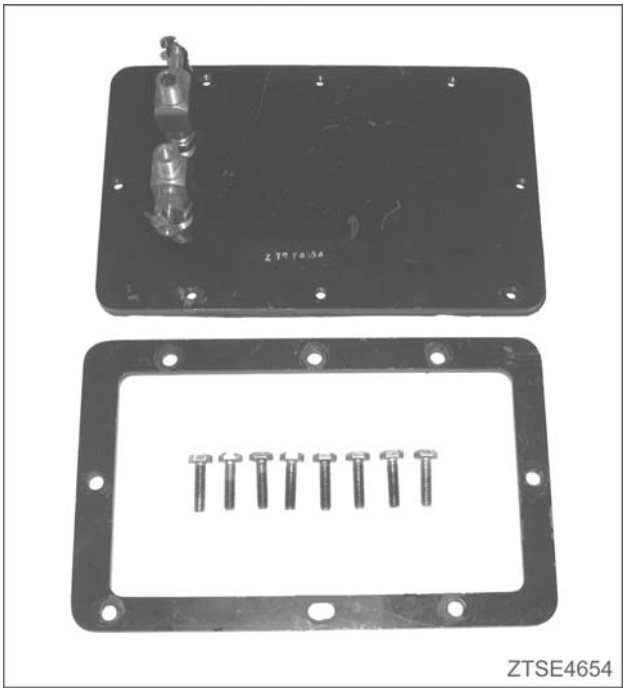

Figure 669 Oil cooler test plate, ZTSE4654

Figure 670 Head bolt and main bolt thread gauge, ZTSE4667

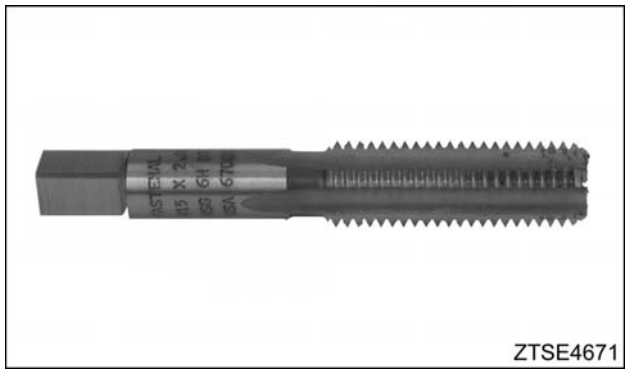

Figure 671 Head bolt bottoming tap, ZTSE4671

Figure 672 Sleeve protrusion hold down clamps, ZTSE4672

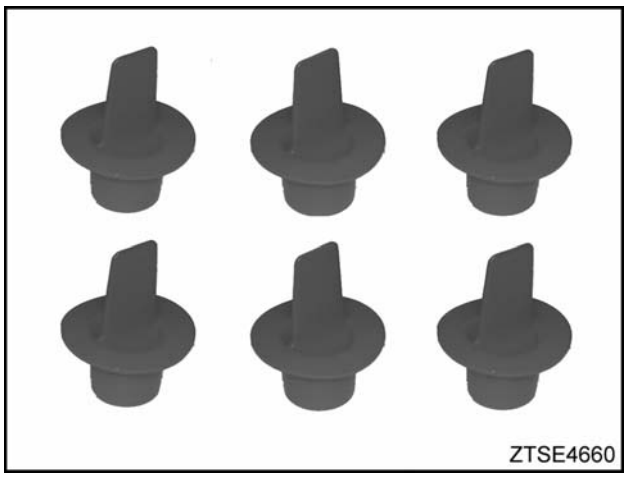

Figure 673 Cap kit– Injector, ZTSE4660

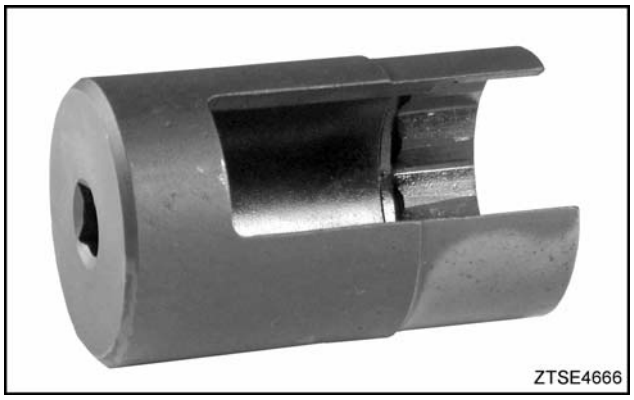

Figure 674 IPR valve removal and installation tool, ZTSE4666

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TSI-05-12-28 New High-pressure Oil Rails

Technical Service Information

TSI–05–12–28

Date: July 2005

Subject File: Engine

Subject: New High-pressure Oil Rails

Engine Family: International® DT 466, DT 570, and HT 570 Diesel Engines – all applications
SN Range: 2,000,001 and up

Description

New high-pressure oil rails are a direct replacement for the old and have casting and machining changes which remove internal clearance depths for attenuator assemblies. New high-pressure oil rails can only use oil rail plug assemblies (1, Figure 1). Identify new high-pressure oil rails by the part number cast into the rail (Table 1).

Old high-pressure oil rails can use either oil rail plug assemblies or attenuator assemblies (Figure 1).

Table 1 New High-pressure Oil Rails

Description	Part Number
High pressure oil rail	1847778C1
High pressure oil rail (w/o brake)	1848234C1
High pressure oil rail assembly (w/o brake)	1847785C91 or 1848235C91
Brake specific high pressure oil rail assembly	1847786C91

CAUTION: Installing an attenuator assembly in a new high-pressure oil rail may result in a high-pressure oil leak and a loss of oil pressure.

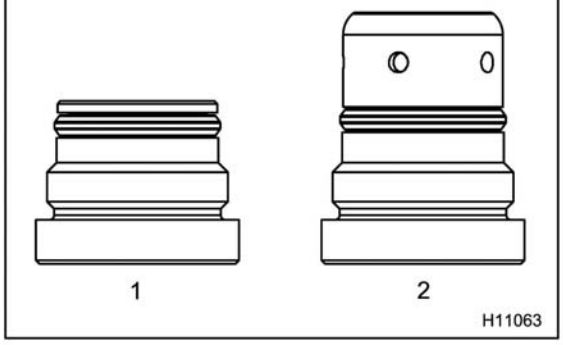


Figure 1 Oil rail plug and attenuator assemblies

1. Oil rail plug assembly 1854685C91
2. Attenuator assembly 1846058C91 (for use with old high-pressure oil rail only)

TSI-05-12-35 New 1500 Watt Single Grid Intake Air Heater Production Option

Technical Service Information

TSI–05–12–35

Date: November 2005

Subject File: Engine

Subject: New 1500 Watt single grid intake air heater production option

Engine Family: International® DT 466, DT 570, and HT 570 Diesel Engines (2005 Model Year and up).

Description

A new 1500 Watt single grid intake air heater is being released for production.

This new intake air heater uses an inlet and EGR mixer duct which has machining to accept a single heater grid (1, Figure 1). No other intake duct features have changed.

The new single grid intake air heater harness assembly (2, Figure 1) uses a single circuit for one heater grid and one high current relay (3, Figure 1).

Table 1 1500 Watt single grid intake air heater components

Description	Part number
Inlet and EGR mixer with heater duct assembly	1858634C1
Inlet and EGR mixer duct	1832264C1
Intake air heater assembly	1858537C1
Intake air heater harness assembly	1850214C91
High current relay	1845347C1

The new 1500 Watt single grid intake air heater is now the standard intake air heater option. The 3000 Watt dual grid intake air heater is still available as a production option and parts will be available for service.

Refer to figures 1 and 2 for views of single and dual grid intake air heater production options installed.

NOTE: If an intake air heater is needed on a vehicle that is not equipped with one, 3000 Watt add-on inlet air heater kit (1858201C91) may be installed on certain vehicles. This add-on inlet air heater fits between the Charge Air Cooler (CAC) and the original inlet and EGR mixer duct. It may not fit on some vehicles due to clearance problems .

WARNING: To avoid personal injury, death, including damage to the engine or vehicle, do not install an add-on intake air heater kit on a vehicle that already has an intake air heater.

NOTE: Reprogramming of the Electronic Control Module (ECM) will be required if installing an intake air heater on a vehicle that was not originally equipped with one.

Description (cont.)

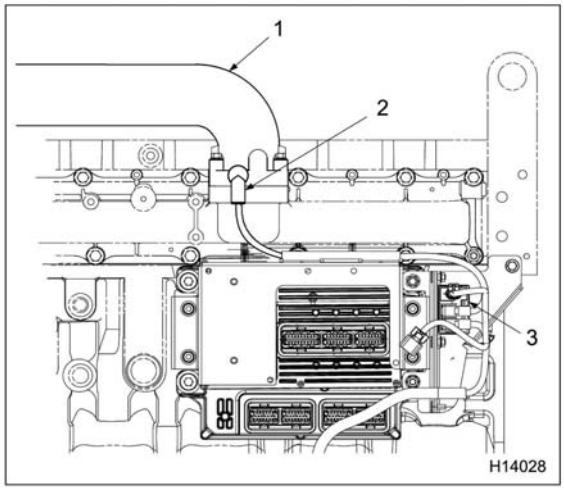


Figure 1 1500 Watt single grid intake air heater production option

1. Inlet and EGR mixer with heater duct assembly (1858634C1)
2. Intake air heater harness assembly (1850214C91)
3. High current relay (1)

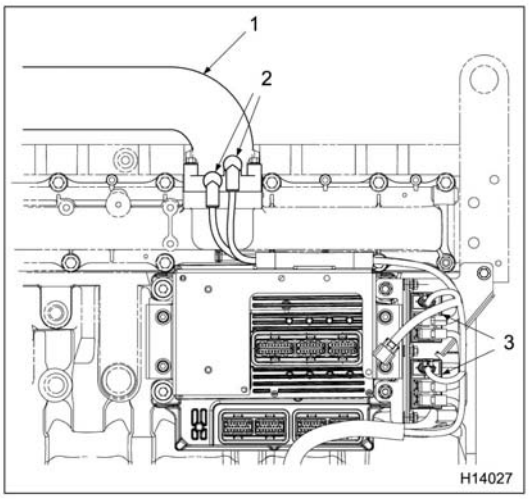


Figure 2 3000 Watt dual grid intake air heater production option

1. Inlet and EGR mixer with heater duct assembly (1845068C3)
2. Intake air heater harness assembly (1846241C95)
3. High current relay (2)

TSI-06-12-15 Sensor O-ring Kit for CMP or CKP Applications

Technical Service Information

TSI–06-12-15

Date: August 2006

Subject File: Engine

Subject: Sensor O-ring Kit for CMP or CKP Applications

Engine Family: INTERNATIONAL® VT 365 Diesel Engines

Engine Family: INTERNATIONAL® VT 275 Diesel Engines

Engine Family: INTERNATIONAL® DT 466, DT 570, and HT 570 Diesel Engines

Description

A sensor O-ring Kit 1871132C1 has been released. Sensor O-rings 1836505C1 and 1837889C1, in this kit, are no longer available separately.

O-ring Installation for CMP or CKP Applications

⚠ WARNING: To prevent personal injury or death, put transmission in neutral or park, set parking brake, and block wheels before doing diagnostic or service procedures on the engine or vehicle. Read all safety instructions in the "Safety Information" section of the *Engine Service* manual or the *Engine Diagnostic* manual.

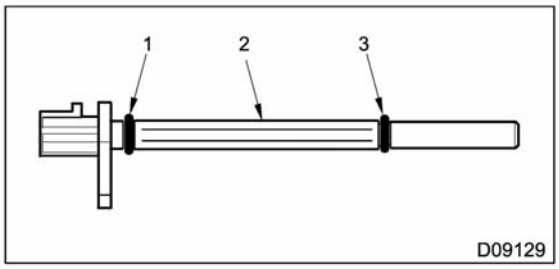


Figure 1 O-rings for CMP or CKP sensor applications

1. Sensor O-ring 1836505C1 (Blue)
2. Sensor
3. Sensor O-ring 1837889C1 (Red)

NOTE: The sensor shown measures camshaft position for INTERNATIONAL® VT 365 and VT 275 diesel engines; However, for INTERNATIONAL® DT 466, DT 570, and HT 570 diesel engines, this sensor measures crankshaft position, not camshaft position.

1. Remove both O-rings from sensor.
2. Install new O-rings.

TSI-06-12-14 Update Valve Train Components – Push Rod and Tappet Compatibility

Technical Service Information

TSI–06-12-14

This TSI replaces TSI-05-12-38

Date: May 2006

Subject File: Engine

Subject: Update Valve Train Components

Engine Family: International® DT 408, DT 466, and 530

Engine Family: International® DT 466E and 530E

Engine Family: International® DT 466, DT 530, and HT 530

Engine Family: International® 530E with Green Diesel Technology

Engine Family: International® DT 466 with Green Diesel Technology

Engine Family: International® DT 466, DT 570, and HT 570

Description

Engine valve train load carrying requirements have resulted in the release of several different push rod and tappet configurations. The main differences are noted by improved geometry designs and materials.

The tables included in this TSI provide service technicians with information on push rod and tappet compatibility for different engine model year configurations.

CAUTION: To prevent engine damage, follow push rod and tappet compatibility tables in this TSI when servicing components.

The following tables show the different types of push rod and tappet configurations service technicians may encounter.

Inline Six Cylinder Diesel Engines without Electronics and ECM (1994 to 1999) - See Table 1

ESN	Push Rod PN	Description	Tappet PN	Description
85000 to 120000	1809589C2	10.4658 in. long with small ball	1809570C3[1]	Small cup

[1] Production used 1809570C1. Use 1809570C3 for service.

Inline Six Cylinder Diesel Engines with Electronics and Truck and Engine Mounted ECM (1995 to Current) - See Table 2 (except where noted)

ESN	Push Rod PN	Description	Tappet PN	Description
931164 to 1460269	1821962C2	10.6510 in. long with small ball	1809570C3[1]	Small cup
1460270 to 1493052[2]	1850010C1	10.6510 in. long with small ball	1809570C3	Small cup
1493053 and up[3]	1872746C1	10.5370 in. long with large ball	1850160C1	Large cup

[1] Production used 1809570C1. Use 1809570C3 for service.

[2] Excluding ESN 1492338 to 1492390, 1492392, 1492394 to 1492412, and 1492414 to 1492420 large geometry valve train components, see Table 4.

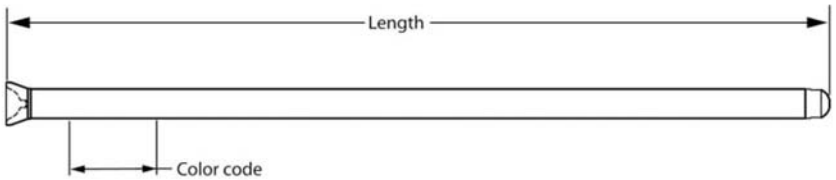
[3] See Table 4

Inline Six Cylinder Diesel Engines with EGR System (2004 to Current) - See Table 3

ESN	Push Rod PN	Description	Tappet PN	Description
2000001 to 2072379	1833122C3	10.9420 in. long with small ball	1809570C3	Small cup
2072380 and up	1854756C1	10.9110 in. long with large ball	1850160C1	Large cup

Table 1 - ESN 85000 to 120000 (Model Year 1994-1999)

International® DT 408, DT 466, and 530 Applications

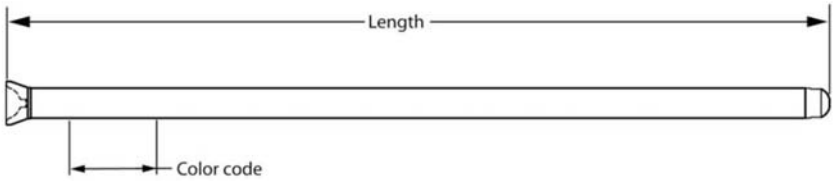


Engine Serial Number	Push Rod	Tappet	Color Code	Length
85000 to 120000	1809589C2	1809570C3[1]	Yellow	(10.4658 in.)

1 Production used 1809570C1. Use 1809570C3 for service.

Table 2 - ESN 931164 and 1493052 (see footnote)

International® DT 466E, DT 530E, 530E, DT 466, DT 530, HT 530, and 530E with Green Diesel Technology Applications



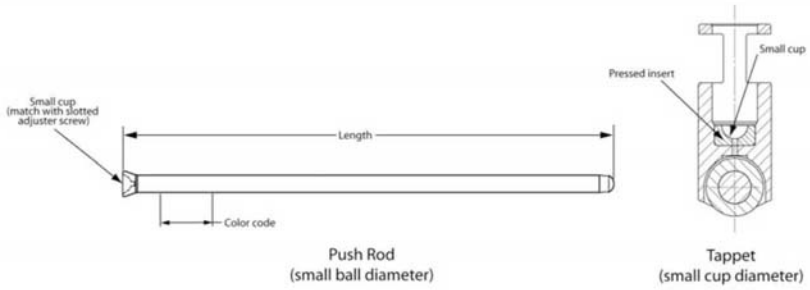
Engine Serial Number	Push Rod	Tappet	Color Code	Length
931164 to 1460269	1821962C2	1809570C3[1]	None	(10.6510 in.)
1460270 to 1493052[2]	1850010C1	1809570C3	Pink	(10.6510 in.)

1 Production used 1809570C1. Use 1809570C3 for service.

2 Excluding ESN 1492338 to 1492390, 1492392, 1492394 to 1492412, and 1492414 to 1492420 large geometry valve train components, see Table 4.

Table 3 - ESN 2000001 and Up

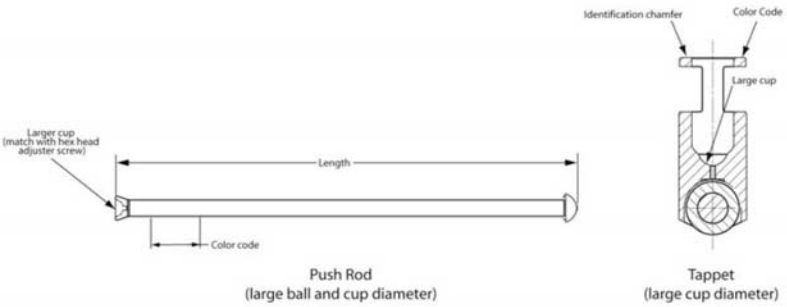
International® DT 466, DT 570, HT 570, and DT 466 with Green Diesel Technology Applications



NOTE: The following components are not compatible with applications below ESN 2000001.

Engine Serial Number	Push Rod	Tappet	Color Code	Length
2000001[1] to 2072379	1833122C3	1809570C3	Orange	(10.9420 in.)

CAUTION: To avoid engine damage, do not interchange the push rod and tappet configurations. The push rod and tappet configurations are a matched set and are only interchangeable as a matched set.



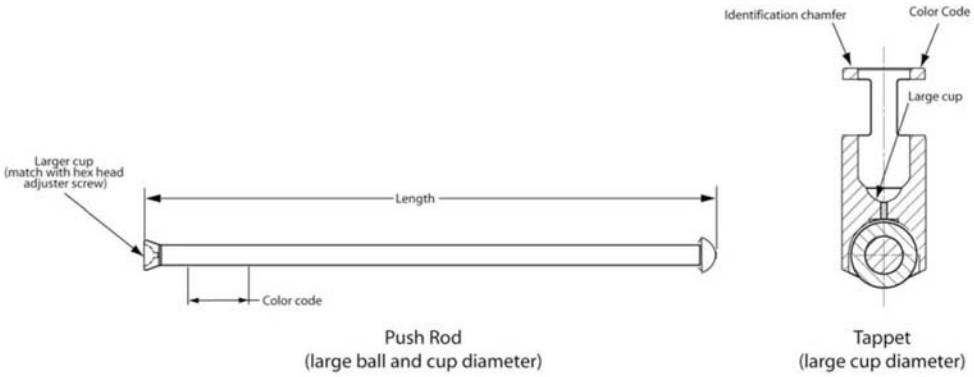
Engine Serial Number	Push Rod	Tappet	Color Code	Length
2072380 and up	1854756C1	1850160C1	Fluorescent- yellow (Rod and tappet)	(10.9110 in.)

NOTE: In addition to the fluorescent-yellow paint identifier, the adjuster screw is unique and can aid as a supplemental identifier. The new adjuster screw has a hex head instead of the typical slot found on all other inline six adjuster screws.

1 A small number of 2004 MY International® DT 466 were built with ESN below 2000001. These can be identified by checking the Engine Family designation on the emission label. Use the ESN 2000001 to 2072379 table for these engines.

Table 4 - ESN 1493053 and Up (see footnote)

International® DT 466, DT 530, HT 530 Applications



CAUTION: To prevent possible engine damage, do not install large geometry valve train components in engines produced with small geometry valve train components.

Engine Serial Number	Push Rod	Tappet	Color Code	Length
1493053 and up[1]	1872746C1	1850160C1	Blue	(10.5370 in.)

1 Refers to engines below ESN 2000001.

TSI-06-12-21 Update Valve Train Components – Adjuster Screws

Technical Service Information

TSI–06-12-21

Date: September 2006

Subject File: Engine

Subject: Update Valve Train Components

Engine Family: International® DT 466, DT 570, and HT 570 Diesel Engines
SN Range: 2000001 to 2072379

Description

International® DT 466, DT 570, and HT 570 Diesel Engines with serial numbers between 2000001 and 2072379 were produced with small geometry valve train components.

NOTE: A small number of 2004 MY International® DT 466 diesel engines were built with an ESN below 2000001. These can be identified by checking the Engine Family designation on the emission label.

The small geometry support and rocker shaft assembly will be discontinued from service.

A Small Geometry Adjuster Kit (1876798C91) provides a replacement large geometry rocker shaft assembly with small geometry adjuster screws that can be used with existing small geometry push rods and tappets.

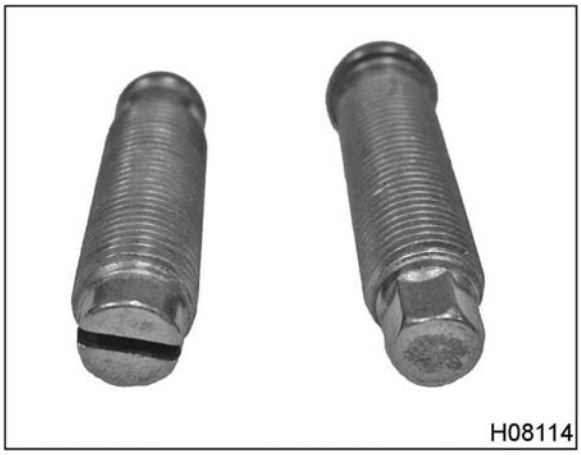


Figure 1 Adjuster screws (small geometry on the left)

NOTE: The large geometry adjuster screws have a hex head, larger diameter ball, and are longer. The small geometry adjuster screws have a slotted head, smaller diameter ball, and are shorter.

TSI-06-12-27 New Piston and Piston Ring Assemblies

Technical Service Information

TSI–06-12-27

Date: December, 2006

Subject File: Engine

Subject: New piston and piston ring assemblies

Engine Family: International® DT 466 diesel engines (210 to 245 horsepower applications)
SN Range: 2148234 and up

Description

Description	New Style Service Part	Old Style Service Part
Engine Overhaul Kit	1871003C95	1871003C94
Piston Ring Kit	1876098C91	1830724C92
Piston Sleeve and Ring Kit	1876100C91	1850401C92

NOTE: Engine Overhaul Kit contains six Piston Sleeve and Ring kits.

CAUTION: To prevent damage to the engine, old and new style pistons and rings must not be mixed. Old style pistons must be used with old style piston rings. New style pistons must be used with new style piston rings.

CAUTION: To prevent damage to the engine, all six piston assemblies must match. If one piston assembly needs to be replaced, it must be replaced with a matching piston assembly. If a matching piston assembly is not available, all six piston assemblies must be replaced.

New style piston and piston rings are being used in 210 to 245 horsepower applications starting with engine serial number 2148234 and up. Old style piston and piston rings will continue as service parts until stock is exhausted.

When replacing piston and ring assemblies, engines with serial number 2148234 and up, replace with new style piston sleeve and ring kit (1876100C91).

When replacing an old style piston assembly, on engines with serial number between 2000001 and 2148234, replace with an old style piston sleeve and ring kit (1850401C92). If an old style piston sleeve and ring kit is not available, all six old style piston assemblies must be replaced using new style engine overhaul kit (1871003C95).

Description (cont.)

Figure 1 New style piston - 1847682C2

Figure 2 Old style piston - 1858120C1

TSI-07-12-12 EGR Coolant Return Kit

Technical Service Information

TSI–07-12-12

Date: July 2007

Subject File: Engine

Subject: EGR Coolant Return Kits

Engine Family: International® DT 466 Diesel Engine
SN Range: 2000001-2030022

Engine Family: International® DT 570 Diesel Engine
SN Range: 2000001-2030022

Engine Family: International® HT 570 Diesel Engine
SN Range: 2000001-2030022

Description

New Exhaust Gas Recirculation (EGR) Coolant Return Kits are available for truck and bus applications. Installation of an EGR Coolant Return Kit prevents coolant leaks from the return circuit of the EGR cooler. The selection and application of a kit is based on the length of the EGR cooler and the installation of the EGR cooler return elbow in the EGR coolant return port.

Description (cont.)

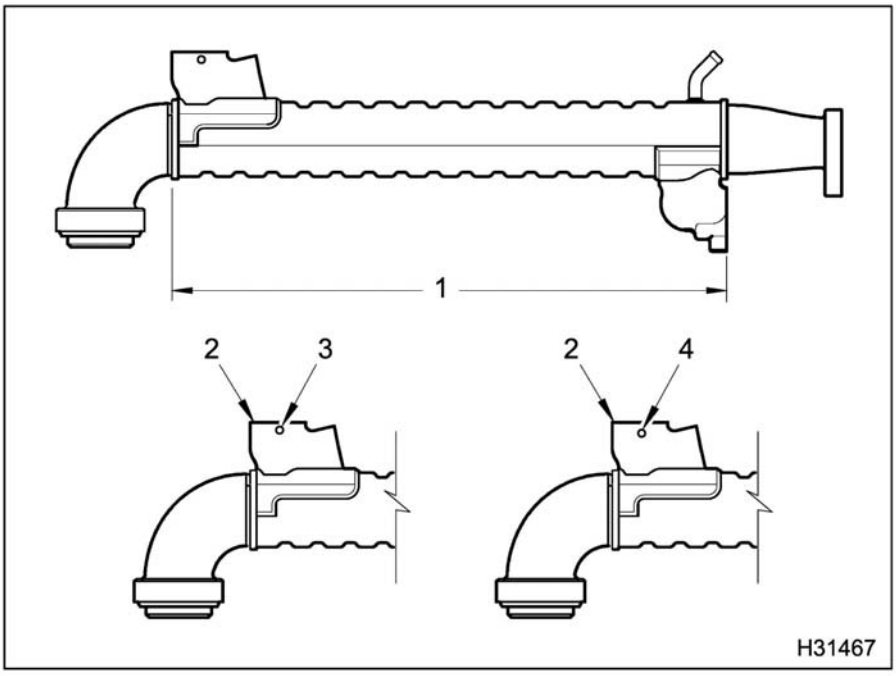


Figure 1 EGR cooler assembly

1. Reference length: 11.5, 17, or 21 inches
2. EGR coolant return port
3. Untapped hole (2) for spring clip
4. Tapped hole (2) for set screws

Selection of EGR Coolant Return Kit

NOTE: If the return elbow in the coolant return port is secured with a spring clip, order the correct length kit from Chart 1. If the return elbow is secured with two set screws, order the correct length kit from Chart 2.

Chart 1 Untapped Spring Clip Holes in Coolant Return Port of EGR Cooler

Length	Part Number	Table Number
EGR cooler	EGR Coolant Return Kit	Kit contents
11.5 inches	1880270C91	1
17 inches	1880271C91	2
21 inches	1880271C91	2

Chart 2 Tapped Set Screw Holes in Coolant Return Port of EGR Cooler

Length	Part Number	Table Number
EGR cooler	EGR Coolant Return Kit	Kit contents
11.5 inches	1880272C91	3
17 inches	1880273C91	4
21 inches	1880273C91	4

Selection of EGR Coolant Return Kit (cont.)

Table 1 EGR Coolant Return Kit 1880270C91

Description	Qty.	Part Number
EGR coolant return adapter tube	1	1855632C1
EGR coolant return hose	1	1855571C1
EGR coolant return elbow	1	1880020C1
EGR elbow retaining clip	1	1850250C1
EGR tube bracket	1	1858107C3
Hose clamp	2	1850645C1
O-ring seal	2	1844447C1
Bolt, M10 x 1.5 x 25 mm	1	1817965C1
Flat Washer, 3/8 in	1	25724R1
Instruction sheet	1	1171924R1

Table 2 EGR Coolant Return Kit 1880271C91

Description	Qty.	Part Number
EGR coolant return adapter tube	1	1855632C1
EGR coolant return hose	1	1855592C1
EGR coolant return elbow	1	1880020C1
EGR elbow retaining clip	1	1850250C1
EGR tube bracket	1	1858107C3
Hose clamp	2	1850645C1
O-ring seal	2	1844447C1
Bolt, M10 x 1.5 x 25 mm	1	1817965C1
Flat Washer, 3/8 in	1	25724R1
Instruction sheet	1	1171924R1

Table 3 EGR Coolant Return Kit 1880272C91

Description	Qty.	Part Number
EGR coolant return adapter tube	1	1855632C1
EGR coolant return hose	1	1855571C1
EGR coolant return elbow	1	1880319C1
EGR elbow retaining clip	1	1850250C1
EGR tube bracket	1	1858107C3
Hose clamp	2	1850645C1
O-ring seal	2	1844447C1
Bolt, M10 x 1.5 x 25 mm	1	1817965C1
Flat Washer, 3/8 in	1	25724R1
Instruction sheet	1	1171924R1

Table 4 EGR Coolant Return Kit 1880273C91

Description	Qty.	Part Number
EGR coolant return adapter tube	1	1855632C1
EGR coolant return hose	1	1855592C1
EGR coolant return elbow	1	1880319C1
EGR elbow retaining clip	1	1850250C1
EGR tube bracket	1	1858107C3
Hose clamp	2	1850645C1
O-ring seal	2	1844447C1
Bolt, M10 x 1.5 x 25 mm	1	1817965C1
Flat Washer, 3/8 in	1	25724R1
Instruction sheet	1	1171924R1

TSI-08-12-20 Rubber Vibration Damper Replacement Kits

Technical Service Information

A NAVISTAR COMPANY

TSI–08–12–20

This TSI replaces TSI-06-12-26 and TSI-07-12-02 and clarifies the use of the new smaller rubber vibration damper in the Vibration Damper Replacement kits.

Date: November 2008

Subject File: Engine

Subject: Rubber Vibration Damper Replacement Kits

Engine Family: International® DT 570 and HT 570 diesel engines
SN Range: 2000001 through 2999999

Description

Three Rubber Vibration Damper Replacement Kits were released to eliminate premature belt wear. Starting 11/03/2006, DT 570 and HT 570 diesel engines were produced with a smaller, rubber vibration damper. The same smaller, rubber vibration damper in the replacement kits is usable on all DT 570 and HT 570 diesel engines, including those manufactured with the larger viscous vibration damper.

Description (cont.)

Table 1 Rubber Vibration Damper Replacement Kits and Drive Belts

Rubber Vibration Damper Replacement Kit	Vehicle DT570 and HT 570 only	A/C	Special Alternator Ratio (Fire and Rescue Only)	Belt Part Number
1875872C91 Horton 1.2	7000 Series	No	No	1842460C1
		Yes	No	1874774C1
		Yes	Yes	1874773C1
1875871C91 Horton 1.3	7000 Series	No	No	1841755C1
		Yes	No	1874773C1
		Yes	Yes	1876008C1
	4000/8000 Series	No	No	1842456C1
		Yes	No	1842596C1
		Yes	Yes	1876006C1
1875873C91 Borg-Warner 1.3	4000/8000 Series	No	No	1842456C1
		Yes	No	1842596C1
		Yes	Yes	1876006C1

CAUTION: To prevent engine damage, use the correct Rubber Vibration Damper Replacement Kit and drive belt specified for the vehicle/engine application.

Horton Drivemaster Kits

To determine which Horton kit to order, remove the drive belt and put a tape measure around the center ribs of the pulley, not around the outer most flanges of the pulley, and record the measurement. Select a kit as specified below:

- Use the Horton 1.2:1 ratio kit 1875872C91, if the measurement is approximately 686 mm (27 inches).
- Use the Horton 1.3:1 ratio kit 1875871C91, if the measurement is approximately 610 mm (24 inches).

NOTE: If the vehicle being refitted with a rubber damper has a Front End PTO, discard the original FEPTO adapter and order FEPTO adapter 3588711C4.

Description (cont.)

NOTE: The components in each kit are identical with the exception of the fan pulley.

Table 2 Rubber Vibration Damper Replacement Kit Components

Description	Quantity	Part Number
Rubber vibration damper assembly	1	1836434C2
Water pump pulley	1	1817629C1
Fan pulley assembly	1	Horton 1.2:1 1874597C91
		Horton 1.3:1 1874596C91
		Borg Warner 1.3:1 1820309C1
M10 x 16 hex bolt	6	1823283C1
Service Kit Blank Label	2	1876229C1
Instruction Sheet	1	1171894R1

Two identical blank labels are in the Rubber Vibration Damper Replacement Kit. Write the part number of the drive belt, vibration damper, water pump, and fan pulley on both blank labels.

Put one label on the air cleaner lid and other label on the driver's side door jam.

TSI-09-12-02 High-pressure Pump Assembly Inlet Filter Service Kit

Technical Service Information

A NAVISTAR COMPANY

TSI–09-12-02

Date: March 2009

Subject File: Engine

Subject: High-pressure Pump Assembly Inlet Filter Service Kit

Engine Family: International® DT 466, DT 570, and HT 570 Diesel Engines
SN Range: 2,000,000 and up

Engine Family: International® MaxxForce® DT, 9, and 10 Diesel Engines
SN Range: 3,000,000 and up

Description

A high-pressure pump inlet filter service kit 1886397C91 (Table 1) has been released for use with high-pressure pump kits listed in Tables 2, 3, and 4. The high-pressure pump in these kits has a stepped inlet throttle spring retainer.

NOTE: High-pressure pumps (serial numbers P07J02154 and up) have the stepped inlet throttle spring retainer.

The inlet filter can only be used with pumps having the stepped inlet throttle spring retainer.

NOTE: There is no service interval for the inlet filter. The inlet filter should be replaced only if damaged.

Description (cont.)

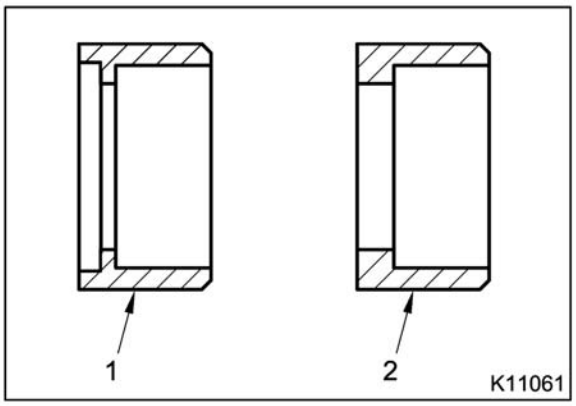


Figure 1 Cross-section of inlet throttle spring retainers (stepped and nonstepped)

1. Inlet throttle spring retainer (stepped)
2. Inlet throttle spring retainer (nonstepped)

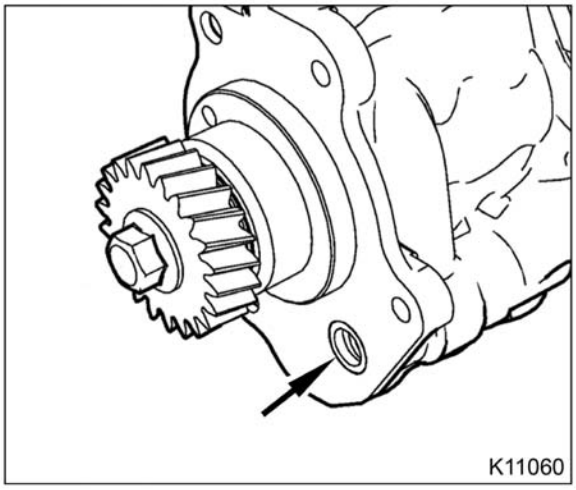


Figure 2 Stepped inlet throttle spring retainer in high-pressure pump

Table 1 High-pressure Pump Assembly Inlet Filter Service Kit (1886397C91)

Description	Qty.	Part Number
Inlet filter	1	1879441C1
3/8 Tube sleeve	4	1812348C1
O-ring seal (No. 12)	1	1839026C1
High-pressure pump gasket	1	1836005C1
O-ring seal (No. 112)	1	1879755C1
O-ring seal (No. 14)	2	1842105C1

High-pressure Pump Kits with Stepped Inlet Throttle Spring Retainer

Table 2 International® DT 466, DT 570, and HT 570 Diesel Engines (Engine serial numbers 2000001 and up)

Description	Part Number
High-pressure pump kit (12cc)	1883888C91
High-pressure pump kit (16cc)	1885000C91

Table 3 International® MaxxForce® DT, 9, and 10 Diesel Engines (Engine serial numbers 3000001 through 3040000)

Description	Part Number
High-pressure pump kit (12cc)	1876105C93
High-pressure pump kit (16cc)	1876106C93

Table 4 International® MaxxForce® DT, 9, and 10 Diesel Engines (Engine serial numbers 3040001 and up)

Description	Part Number
High-pressure pump kit (12cc)	1882258C91
High-pressure pump kit (16cc)	1882259C91

Table of Contents

1171813R1 Front Cover PTO Adaptation Kit

Instruction Sheet
Front Cover PTO Adaptation Kit

Instruction 1171813R1

APPLICATION: International® DT 466, DT 570, and HT 570 Diesel Engines

S/N: 2,000,001 and Above, 2004 Model Year,

PURPOSE: This instruction sheet contains the procedure for the vehicle owner to attach a front cover mounted Power Take-off (PTO) device to the engine. The PTO device is mounted opposite the air compressor on the front cover, getting power from the air compressor gear.

KIT CONTENTS:

Front Cover PTO Adaptation Kit

- PTO spline adapter assembly (Consisting of:)
  - PTO spline adapter
  - Retaining ring (installed in spline adapter)
- O-ring seal (#235)
- Instruction sheet

WARNING: To avoid serious personal injury, possible death, or damage to the engine or vehicle, make sure the transmission is in neutral, parking brake is set, and wheels are blocked before doing diagnostic or service procedures on engine or vehicle. Read all safety instructions in the "Safety Information" section of the service manual for this engine.

NOTE: This feature may be used alone or with any other PTO options available through your International Truck and Engine Corporation service center.

PROCEDURE:

Your engine is equipped with an air compressor having an internal spline drive gear. The front cover mounted PTO device can only be used in conjunction with the air compressor.

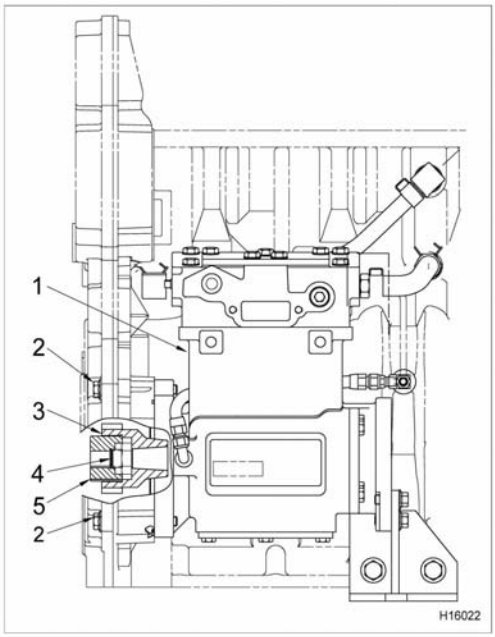


Figure 1. PTO spline adapter installed onto air compressor drive gear.

1. Air compressor
2. PTO flange cover mounting bolts
3. Air compressor drive gear
4. Spline adapter retaining ring
5. PTO spline adapter

1. Remove the two mounting bolts securing the PTO flange cover from the front cover.

CAUTION: To insure proper installation of the spline adapter assembly, be sure the internal spline is pointing outward from the engine (Figures 1 and 2).

2. Install the PTO spline adapter assembly into the air compressor drive gear. The PTO spline adapter has both internal and external teeth. The external teeth slide into the air compressor drive gear.

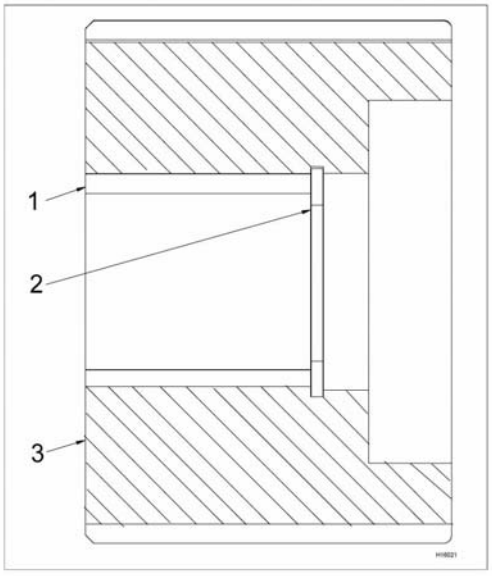


Figure 2. Correct position of PTO spline adapter assembly

1. Internal spline facing outward from engine
2. Retaining ring
3. PTO spline adapter

The PTO spline adapter assembly floats on the drive shaft between the air compressor drive gear and the auxiliary PTO device. The retaining ring properly locates the PTO spline adapter to the auxiliary PTO device.

3. Install the O-ring (#235) onto the PTO pilot hub.

CAUTION: To avoid engine damage, be sure the PTO shaft protrusion (dimension 'A', Figure 4) does not exceed 34mm (1.345 in.).

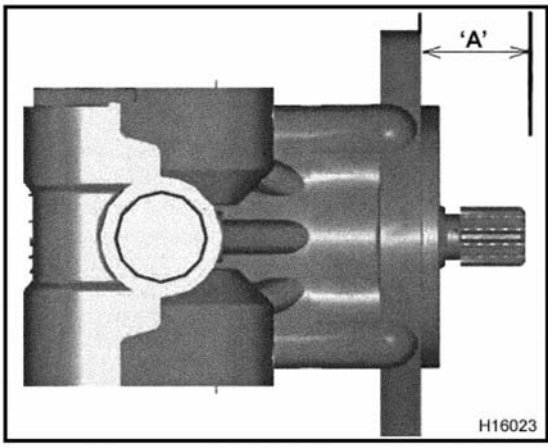


Figure 4. Maximum PTO shaft protrusion

4. Install the desired auxiliary PTO device. Be sure to engage the spline of the PTO device into the PTO spline adapter assembly.

5. Install and finger-tighten the PTO mounting bolts to the front cover. Tighten to the standard torque value of 50 N·m (37 lbf-ft).

1171836R1 Air Compressor Bracket Kit

Instruction Sheet
Air Compressor Bracket Kit

1171836R1

Application

International® DT 466E, DT 530E, DT 466, DT 530, DT 570, and HT 570 Diesel Engines

Purpose

A new, air compressor bracket kit is used for the following applications:

- Replacement and service for the steel air compressor bracket
- Service parts for an aluminum air compressor bracket

Kit Contents

Table 1 Air Compressor Bracket Kit

Description	Quantity.
Air compressor bracket	1
Bolt, M12 x 50	2
Bolt, M10 x 30	2
Instruction sheet	1

NOTE: The following torque sequence is critical during installation of the new air compressor bracket:

1. Initially, torque M10 X 30 bolts to 6 N·m (50 in·ft).
2. Single torque M12 X 50 bolts to 115 N·m (85 lbf·ft).
3. Finally, torque M10 X 30 bolts to 66 N·m (49 lbf·ft).

WARNING: To avoid serious personal injury, possible death, or damage to the engine or vehicle, make sure the transmission is in neutral, parking brake is set, and wheels are blocked before doing diagnostic or service procedures on engine or vehicle. Read all safety instructions in the "Safety Information" section of the service manual for this engine.

Procedure

Removal and installation

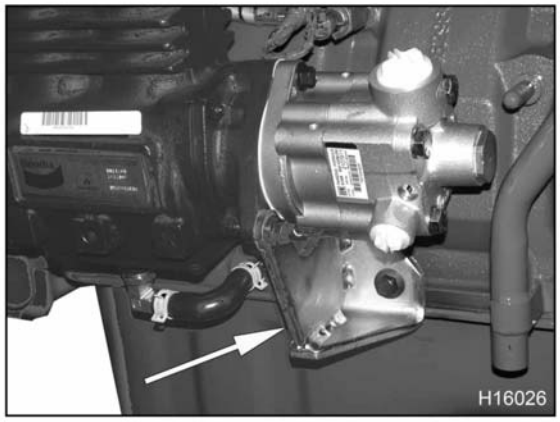


Figure 1 Old air compressor bracket

Removal and installation (cont.)

Figure 2 Old air compressor bracket

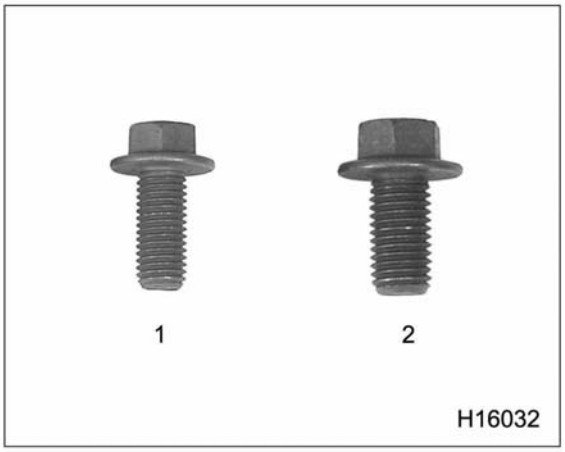


Figure 3 Old mounting bolts

1. Bolt, M10 X 25 (2)
2. Bolt, M12 X 25 (2)

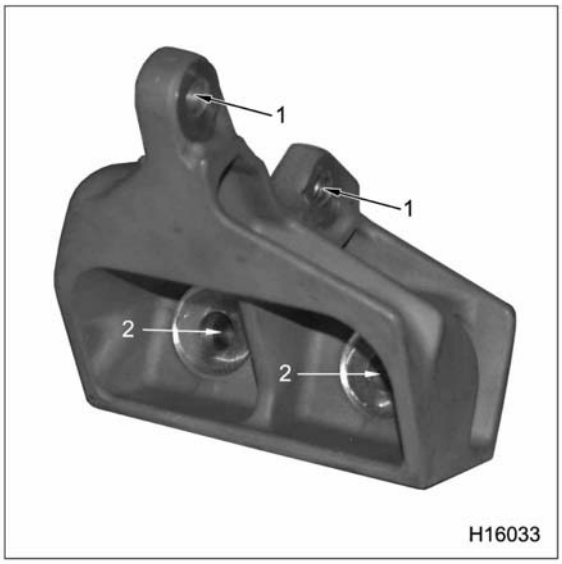


Figure 4 New air compressor bracket

1. Bolt holes for M10 X 30 Bolt
2. Bolt holes for M12 X 50 Bolt

Figure 5 Bolts for new air compressor bracket

1. Bolt, M10 X 30 (2)
2. Bolt, M12 X 50 (2)

Removal and installation (cont.)

NOTE: The following procedure and torque sequence are critical:

1. Remove old air compressor bracket.
2. Position new air compressor bracket, and install M10 X 30 bolts to attach bracket to air compressor.
3. Initially, torque M10 X 30 bolts to 6 N·m (50 in·ft).
4. Install M12 X 50 bolts to attach bracket to engine block.
5. Single torque M12 X 50 bolts to115 N·m (85 lbf·ft).
6. Finally, torque M10 X 30 bolts to 66 N·m (49 lbf·ft).

1171846R1 Aluminum Air Inlet Adapter

Instruction Sheet
Aluminum Air Inlet Adapter

1171846R1

Application

International® DT 466, DT 570, and HT 570

Purpose

A new, aluminum inlet adapter kit is used for the following applications:

- Replacement of the old, plastic inlet adapter and seal
- Service parts for an aluminum inlet adapter
- Service parts for an aluminum inlet adapter used with the inlet air heater

Kit Contents

Aluminum Inlet Adapter Kit

Description	Quantity
Inlet adapter	1
Inlet adapter gasket	2
Instruction sheet	1

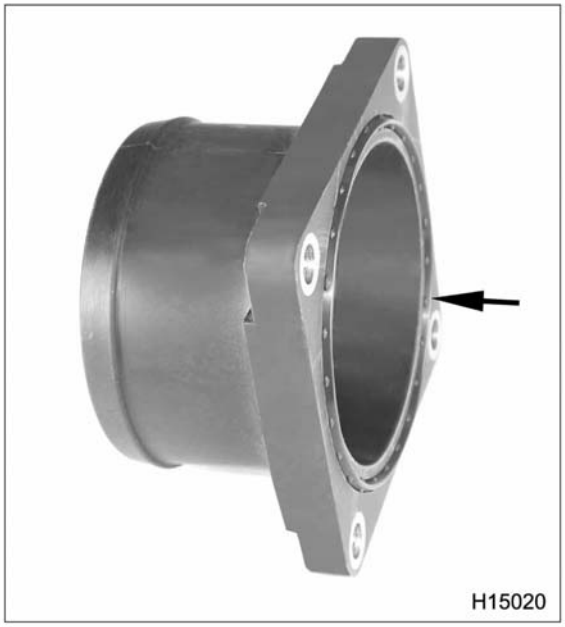


Figure 1 Plastic inlet adapter with seal

Procedure

WARNING: To avoid serious personal injury, possible death or damage to the engine or vehicle, make sure the transmission is in neutral, parking brake is set, and wheels are blocked before doing diagnostic procedures. Read all safety instructions in the "Safety Information" section of the service manual for this engine.

Procedure (cont.)

Figure 2 Aluminum inlet adapter

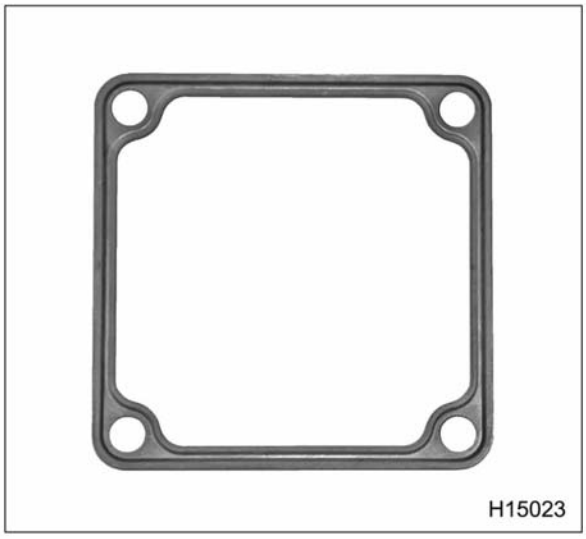


Figure 3 Inlet adapter gasket

Replacement of plastic inlet adapter or service for aluminum inlet adapter

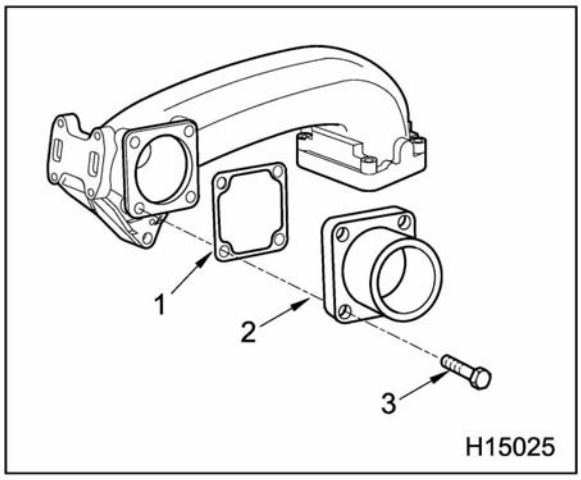


Figure 4 Installation of aluminum inlet adapter without air inlet heater

1. Inlet adapter gasket
2. Aluminum inlet adapter
3. Bolt, M8 X 35 (4)

1. Remove plastic inlet adapter and seal or aluminum inlet adapter and gasket.
2. Save the four M8 X 35 bolts.
3. Install one new gasket, inlet adapter, and four M8 X 35 bolts.
4. Torque bolts, in a criss-cross pattern, to 31 N·m (23 lbf·ft).

Installation of service parts for aluminum inlet adapter used with air inlet heater

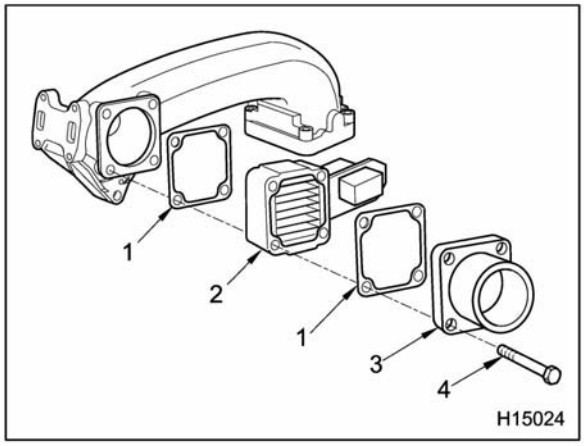


Figure 5 Installation of aluminum inlet adapter with air inlet heater

1. Inlet adapter gasket
2. Air heater module
3. Aluminum inlet adapter
4. Bolt, M8 X 80 (4)

1. Remove aluminum inlet adapter, gasket, air heater module, and gasket.
2. Save air heater module and four M8 X 80 bolts.
3. Install new gasket, air heater module, new gasket, new inlet adapter, and four M8 X 80 bolts.
4. Torque bolts, in a criss-cross pattern, to 31 N·m (23 lbf·ft).

1171848R1 300 Watt Oil Pan Heater Kit

Instruction Sheet
300 Watt Oil Pan Heater Kit

1171848R1

Application

International® DT 466, DT 570, and HT 570 diesel engines.

Purpose

Provide procedure to install 300 watt oil pan heater to improve cold startability.

Kit Contents

NOTE: Installation of this kit requires two plug style oil pan. The bottom plug is for draining oil. The corner plug is for installation of the oil pan heater element. If the two plug style pan is not currently on the engine, it must be changed before installing the heater.

300 Watt Oil Pan Heater Kit

Description	Quantity
Oil heating element assembly	1
Y-cord cable assembly	1
Instruction sheet	1

Procedure

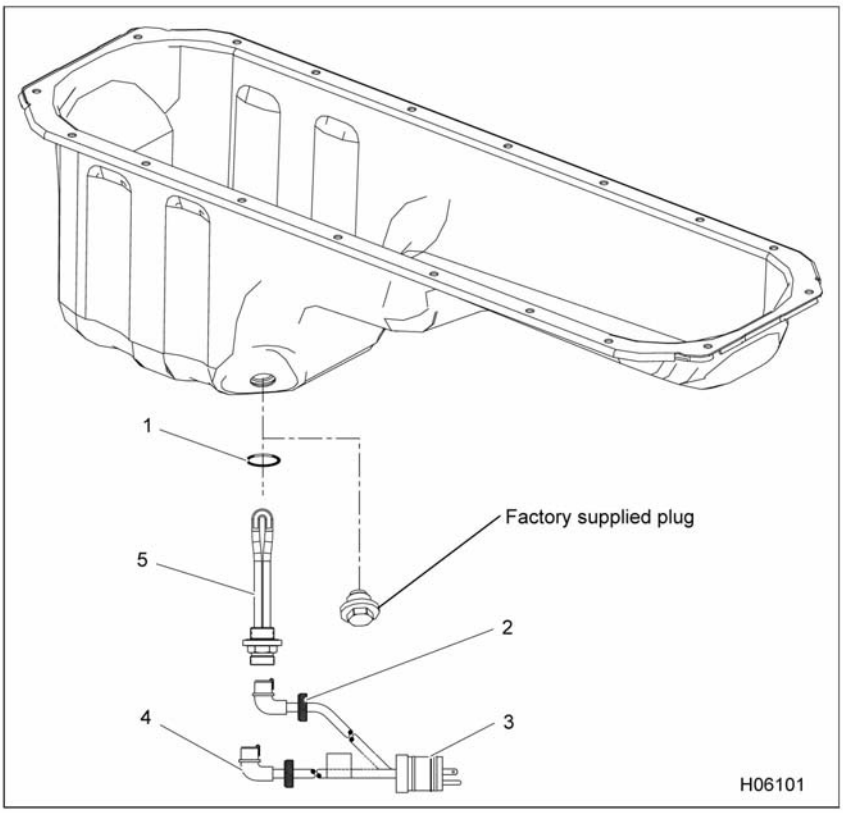


Figure 1 300 Watt oil pan heater

1. O-ring (included on oil heating element assembly)
2. Cordnut
3. Y-cord cable assembly
4. To block heater assembly (shorter cable section)
5. Oil heating element assembly

WARNING: To avoid serious personal injury, possible death, or damage to the engine or vehicle, make sure the transmission is in neutral, parking brake is set, and wheels are blocked before doing diagnostic or service procedures on engine or vehicle. Read all safety instructions in the "Safety Information" section of the service manual for this engine.

1. Remove factory supplied plug from oil pan.
2. Install oil heating element assembly, with O-ring, into oil pan and torque to 68 N·m (50 lbf·ft).
3. Plug Y-cord cable assembly (longer cable section) into oil heating element assembly and hand tighten cordnut.
4. If equipped with block heater assembly, plug Y-cord cable assembly (shorter cable section) into block heater assembly and hand tighten cordnut. If not equipped with block heater assembly, securely tie off Y-cord cable assembly (shorter cable section).
5. Route and secure Y-cord cable assembly to vehicle. Avoid routing close to rotating parts or belt drives.

1171855R1 Turbo Actuator Service Kit (SRA)

Instruction Sheet
Turbo Actuator Service Kit (SRA)

1171855R1

Application

International® DT 466, DT 570, and HT 570 Diesel Engines.

Purpose

Removal and installation of turbocharger actuator.

Kit Contents

Turbo Actuator kit

Description	Quantity
Actuator, 12V I-6	1
Serrated lock nut, M6 x 1.0	4
Nord-lock washer assembly	2
Fork lever bolt	2
Instruction sheet	1

NOTE: Kit comes with one extra fork lever bolt and nord-lock washer assembly.

Procedure

WARNING: To avoid serious personal injury, possible death, or damage to the engine or vehicle, make sure transmission is in neutral, parking brake is set, and wheels are blocked before doing diagnostic or service procedures on engine or vehicle. Read all safety instructions in the "Safety Information" section of the *Engine Service Manual* for this engine.

WARNING: To avoid serious personal injury or possible death, disconnect the main battery negative terminal before disconnecting or connecting electrical components. See "Safety Information" in *Engine Service Manual.*

WARNING: To avoid serious personal injury or possible death, make sure engine has cooled down before removing components. See "Safety Information" in *Engine Service Manual.*

Procedure (cont.)

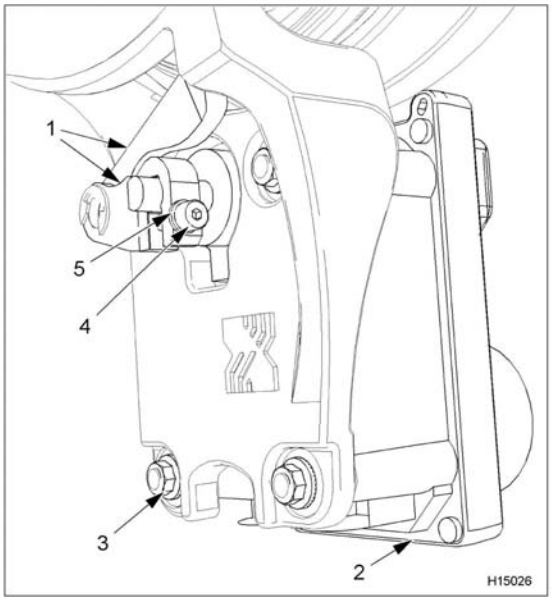


Figure 1 Turbocharger Actuator

1. Actuator linkage
2. Actuator
3. Serrated lock nut (4)
4. Fork lever bolt
5. Nord-lock washer assembly

NOTE: Removal of turbocharger assembly from engine is not required to perform this repair.

Removal

1. Unplug turbocharger wiring harness from engine wiring harness.
2. Remove fork lever bolt and nord-lock washer assembly from actuator linkage, using a long 4 mm (5/32 in) allen wrench. Do not remove other end of linkage from turbocharger.
3. Pivot actuator linkage out of the way, against spring pressure, to access blocked serrated lock nut. Linkage can be held in place using a tie strap against spring tension.
4. Remove four serrated lock nuts.
5. Pull actuator away from its mounting bracket. Actuator shaft is notched and may require rotation or rocking motion to remove.
6. Move turbocharger linkage through its normal operating motion. If turbocharger linkage or vanes are sticking, do not proceed with actuator installation steps below, turbocharger assembly should be replaced.

Installation

1. Hold turbocharger linkage above actuator shaft before installing actuator on mounting bracket.
2. Slide actuator studs into mounting bracket holes. Install four serrated lock nuts on studs. Torque nuts to 13.6 N·m (120 lbf·in). (Cut tie strap holding actuator linkage, if used.)
3. Push turbocharger linkage onto actuator shaft; rotation of shaft or linkage may be required.
4. Install nord-lock washer assembly on fork lever bolt and screw into lever arm. Torque bolt to 6.8 N·m (60 lbf·in).
5. Perform bounce test to check actuator linkage for binding. Hold actuator linkage toward frame rail and then release. If linkage is not binding it will fall back towards the engine, bounce once, and then stay toward engine.

   If actuator linkage is binding, use a long 4 mm (5/32 in) allen wrench to carefully twist the fork lever bolt counter-clockwise to free linkage binding, while not untorquing fork lever bolt.
6. Reconnect turbocharger wiring harness connector to engine wiring harness.

1171908R1 Turbocharger VGT Linkage Kit

Instruction Sheet
Turbocharger VGT Linkage Kit

1171908R1

Application

International® DT 466, DT 570, and HT 570 Diesel Engines

SN Range: 2000001 and up

Purpose

Removal and installation of turbocharger actuator linkage.

Kit Contents

Description	Quantity
Linkage, Turbo Assembly	1
Instruction Sheet	1

Procedure

Remove

WARNING: To prevent personal injury or death, read all safety instructions in the "Safety Information" section of EGES 265-1 *Service Manual*.

WARNING: To prevent personal injury or death, shift transmission to park or neutral, set parking brake, and block wheels before doing diagnostic or service procedures.

WARNING: To prevent personal injury or death, make sure the engine has cooled before removing components.

WARNING: To prevent personal injury or death, remove ground cable from negative terminal of main battery before disconnecting or connecting electrical components. Always connect ground cable last.

CAUTION: To prevent damage to the engine or turbocharger, the area of the turbocharger adjacent to the housing on both the turbocharger and the control module shafts must be clean and function freely.

Remove (cont.)

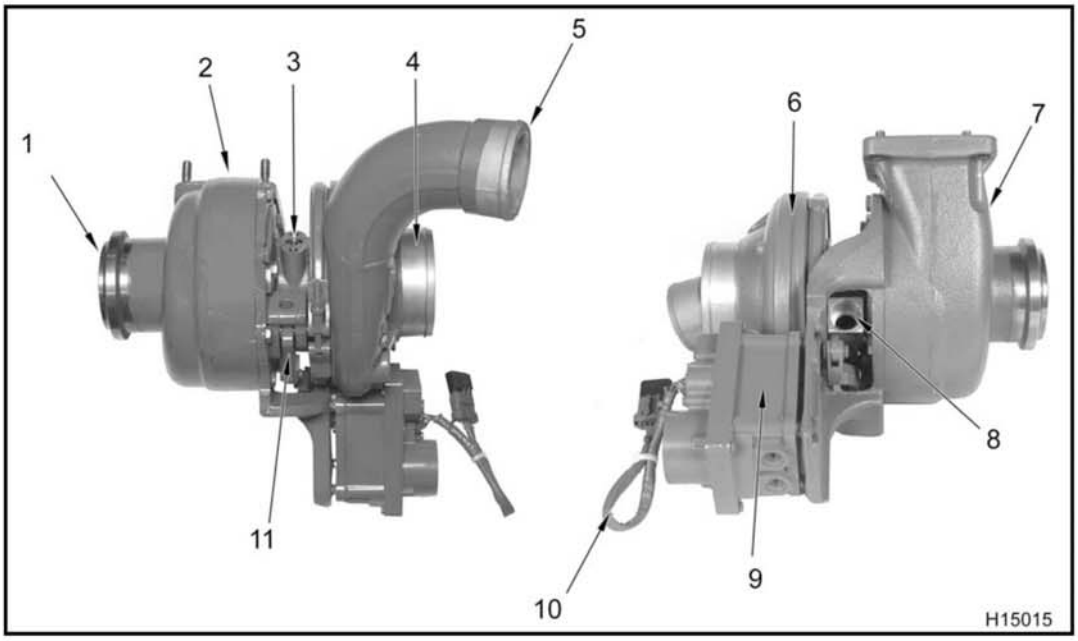


Figure 1 VGT Turbocharger component locations

1. Turbine outlet
2. Turbine inlet
3. Oil supply port
4. Compressor inlet
5. Compressor outlet
6. Compressor housing
7. Turbine housing
8. Oil drain port
9. Turbocharger control module (SRA - Smart Remote Actuator)
10. Electrical connector
11. VGT linkage

1. Remove inner fender from the vehicle.
2. Turn the ignition switch to OFF and disconnect the engine harness electrical connector from the SRA.

Remove (cont.)

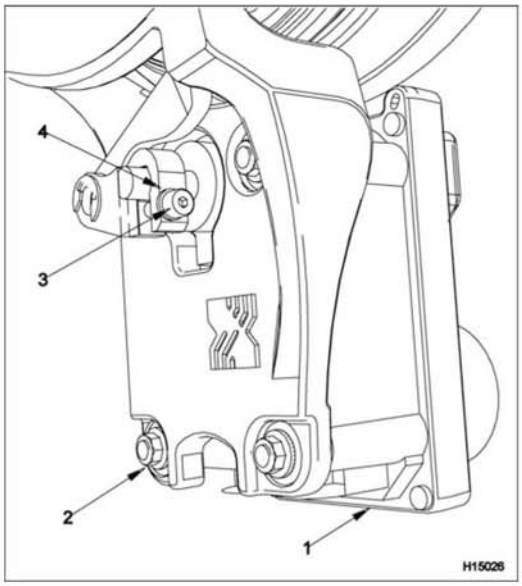


Figure 2 Turbocharger control module

1. Turbocharger control module (SRA - Smart Remote Actuator)
2. Serrated lock nut (4)
3. Fork lever bolt and Nord-Lock® washer assembly
4. Actuator linkage

CAUTION: To prevent engine damage, carefully remove the fork lever bolts. The Nord-Lock® washer assembly may fall off when the top fork lever bolt (turbocharger side) is removed.

NOTE: The fork lever bolts and Nord-Lock® washers are stainless steel. Magnets cannot be used to retrieve dropped parts.

3. Remove both fork lever bolts and Nord-Lock® washer assemblies on each end of the linkage.
4. Remove the linkage from the turbocharger and then from the SRA. If needed, remove the SRA to allow removal of a sticking or stuck linkage.

Clean

NOTE: Corrosion on the turbocharger or SRA shafts may impede the motion of the turbocharger vane mechanism.

1. Clean the area adjacent to the housing on both the turbocharger and the SRA shafts and ensure both shafts turn freely. Use suitable corrosion removal product to clean the shafts of corrosion.
2. If the turbocharger shaft cannot move freely, or cannot be positioned against its internal stop, replace the turbocharger.
3. If the SRA shaft cannot move freely, or cannot be positioned against its internal stop, replace the SRA.

Install

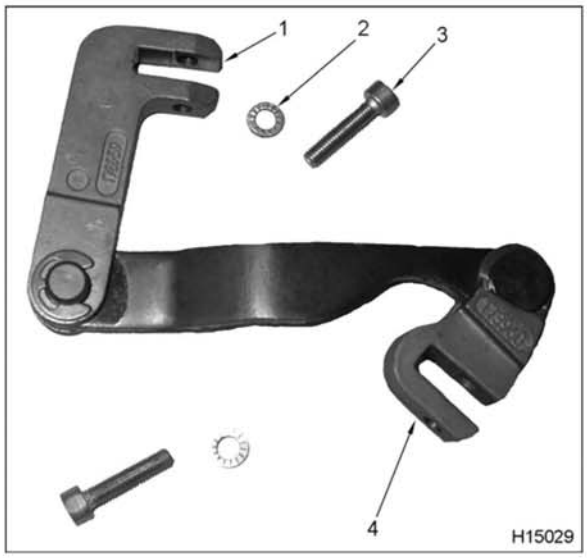


Figure 3 Actuator linkage

1. Turbocharger side of linkage
2. Nord-Lock® washer assemblies (2 sets of 2)
3. Fork lever bolts (2)
4. SRA side of linkage

1. Install the linkage with the SRA side, item 4 (Figure 3), tucked under the intermediate (center) linkage.

CAUTION: To prevent engine damage, carefully install the fork lever bolts. The Nord-Lock® washer assembly may fall off when the top fork lever bolt (turbocharger side) is installed.

NOTE: The fork lever bolts and Nord-Lock® washers are stainless steel. Magnets cannot be used to retrieve dropped parts.

Install (cont.)

2. Install the Nord-Lock® washer assemblies, item 2 (Figure 3), on each of the fork lever bolts, item 3 (Figure 3), and screw into the lever arms. Tighten each fork lever bolt on the linkage to 6.8 N·m (60 lbf·in).

CAUTION: To prevent engine damage, do not loosen the fork lever bolt when ensuring the fork lever and fork lever bolt are free to move.

3. Carefully twist the fork lever and fork lever bolt counter-clockwise to free the linkage.
4. Test to make sure the new linkage is properly installed. Move the linkage up and away from the engine, in the direction of the frame rail, several inches until movement stops. Release the linkage, it should fall back towards the engine, bounce once, and then stay in towards the engine.
5. If the linkage fails the test, repeat steps 3 and 4.
6. Connect the engine harness electrical connector to the SRA.
7. Install inner fender on the vehicle.

1171913R1 Turbine Vane Assembly Cleaning Kit

Instruction Sheet
Turbine Vane Assembly Cleaning Kit

1171913R1

Kit Contents

Table 1 Turbine Vane Assembly Cleaning Kit

Description	Quantity
Oil drain plug	1
Turbine wheel / compressor outlet cap	2
Oil inlet cap	1
Turbo oil inlet gasket	1
Oil drain O-ring seal	2
M8x30 HFH (None locking) bolt	3
M6x20mm bolt	1
O-ring #206 (0.484x0.623)	1
Yellow compressor inlet cap	1
Instruction sheet	1

Procedure

REMOVAL

NOTE: Use this cleaning procedure when the turbocharger vanes are stuck due to excessive oil deposits. If corrosion is found, the turbocharger cannot be cleaned.

WARNING: To prevent personal injury or death, read all safety instructions in the "Safety Information" section of the service manual.

WARNING: To prevent personal injury or death, shift transmission to park or neutral, set parking brake, and block wheels before doing diagnostic or service procedures.

WARNING: To prevent personal injury or death, make sure the engine and turbocharger have cooled before removing the turbocharger.

WARNING: To prevent personal injury or death, remove ground cable from negative terminal of main battery before disconnecting or connecting electrical components. Always connect ground cable last.

WARNING: To prevent personal injury or death, do not let engine fluids stay on your skin. Clean skin and nails using hand cleaner and wash with soap and water. Wash or discard clothing and rags contaminated with engine fluids.

See appropriate *Service Manual* for removal of the turbocharger.

INSPECTION AND CLEANING

NOTE: If the turbine blades are found not to be damaged during inspection, but the turbine V-clamp and nut are worn, bent, or damaged, it is necessary to obtain a Turbine V-Clamp and Nut Kit to complete the installation procedure.

1. Place the turbocharger on a work bench and inspect the compressor and turbine blades for damage.

- If the blades are damaged, the turbocharger should be replaced.
- If the blades are not damaged, continue with the inspection.

Procedure (cont.)

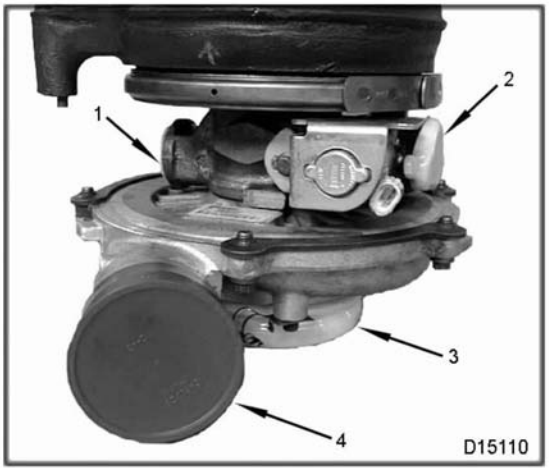


Figure 1 Turbocharger covers

1. Turbocharger oil drain outlet
2. Turbocharger oil supply inlet
3. Turbocharger outlet to Charge Air Cooler (CAC)
4. Turbocharger compressor inlet

2. Cover the compressor and turbine outlets with the red caps provided in the kit.

3. Cover the compressor inlet with the yellow cap provided in the kit.

4. Clean the oil supply line mounting surface and cover with the oil inlet cap.

5. Clean the oil drain passage and insert the oil drain plug.

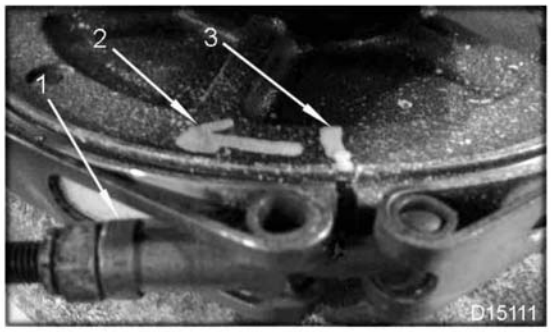


Figure 2 V-clamp location and direction

1. V-clamp
2. Direction of V-clamp locknut
3. Paint mark

6. Using a paint pen, mark the location of the V-clamp and direction of the V-clamp locknut (Figure 2).

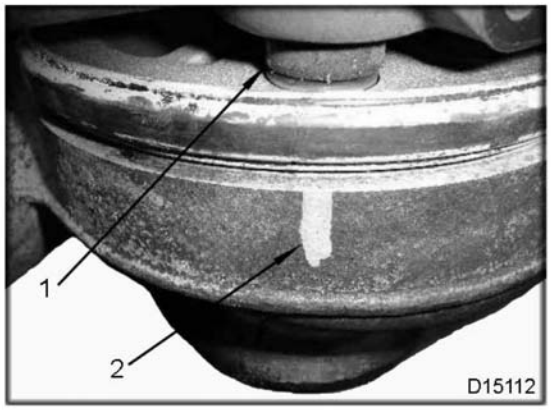


Figure 3 Unison ring cam

1. Unison ring cam
2. Paint mark

7. Using a paint pen, mark the location of the unison ring cam (Figure 3).

8. Remove the locknut nut completely from the V-clamp assembly, then remove the V-clamp from the turbocharger.

9. Carefully separate the turbine housing from the center section by using a hammer and brass drift.

Procedure (cont.)

Figure 4 Unison ring cam

10. Inspect the unison ring cam for wear (Figure 4). If excessive wear is found on the unison ring cam, the turbocharger cannot be cleaned.

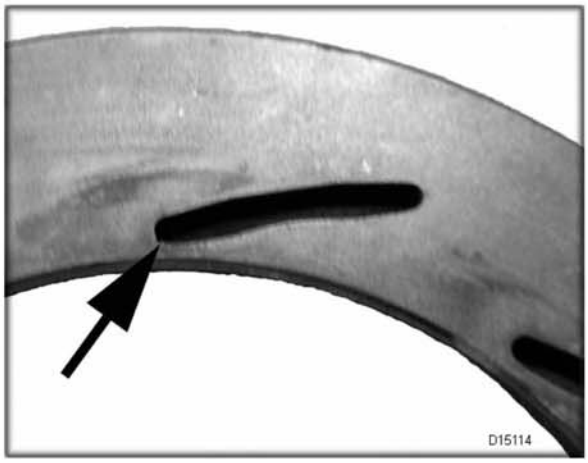


Figure 5 Damaged unison ring

11. Inspect the unison ring for cracks, excessive wear, and signs of corrosion. If any of these conditions are found the turbocharger cannot be cleaned (Figure 5).

CAUTION: To prevent engine damage and damage to the turbocharger, use an oil solvent or carburetor cleaner with a non-abrasive scrubbing pad. Clean surfaces until all carbon has been removed. Do not damage or gouge the machined surfaces of the turbine housing or unison ring cam.

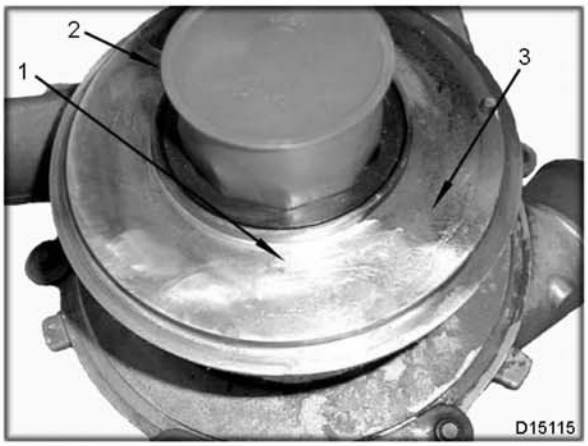


Figure 6 Oil deposit surface of center housing

1. Cleaned area
2. Protective cap
3. Oil deposit area

12. Use the protective cap from the compressor outlet and place this cap over the backplate hub. Clean the center section with an oil solvent or carburetor cleaner and a non-abrasive scrubbing pad (Figure 6). Do not damage or gouge the machined surfaces of the turbine housing or unison ring cam.

Procedure (cont.)

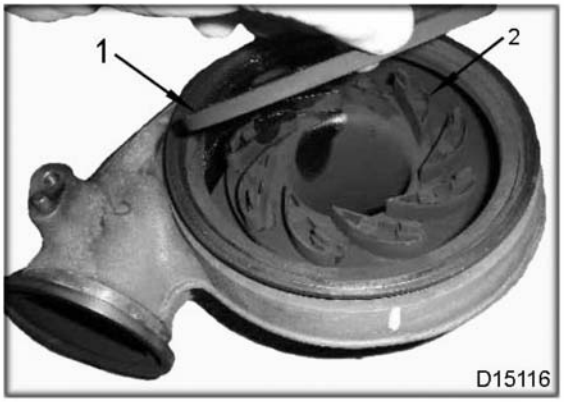


Figure 7 Unison ring and vanes

1. Unison ring
2. Vanes

13. Clean the pilot area of the center section that contacts the unison ring. Remove debris from the housing with an oil solvent or carburetor cleaner and compressed air (Figure 7).

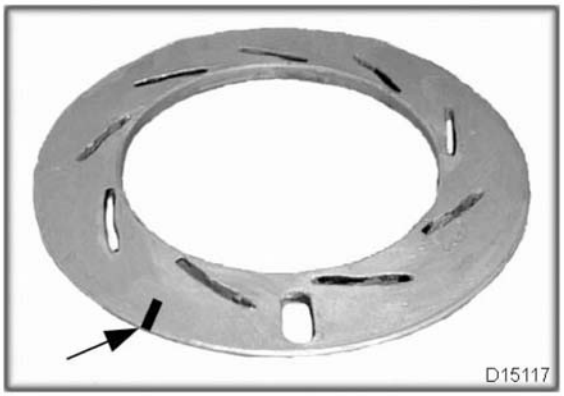


Figure 8 Unison ring

CAUTION: To prevent engine damage, mark the top of the unison ring with a paint pen. This will insure the correct position for installation of the unison ring.

14. Place a mark on the top side of the unison ring with a paint pen. Remove the unison ring and vanes from the turbine housing (Figure 8).

NOTE: If excessive corrosion is found on the unison ring, the turbocharger cannot be cleaned.

15. Clean the unison ring with an oil solvent or carburetor cleaner and a non-abrasive scrubbing pad.

Figure 9 Clean areas

1. Clean surface of disc
2. Turbine vane posts

NOTE: Do not damage machined surfaces and vane posts when cleaning.

16. Clean the surface of the disc and turbine vane posts using an oil solvent or carburetor cleaner with a non-abrasive scrubbing pad (Figure 9).

17. Clean debris from the turbine housing with an oil solvent or carburetor cleaner and compressed air.

Procedure (cont.)

INSTALLATION

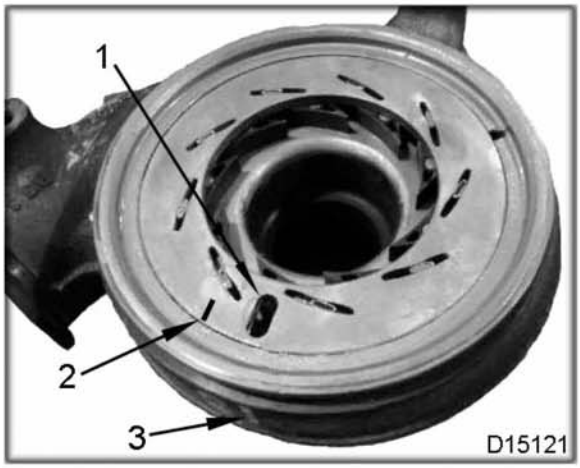


Figure 10 Vanes into turbine housing

1. Unison ring cam slot
2. Paint mark indicating top side of unison ring
3. Alignment mark

CAUTION: To prevent engine damage, place the unison ring into the turbine housing with the paint mark facing up.

1. Install vanes into the turbine housing as follows (Figure 10):

    1. With the paint mark on the unison ring facing up, index the unison ring onto the vanes.
    2. Turn the unison ring and vanes to ensure free movement.
    3. Align the painted mark on the turbine housing and the unison ring cam slot.

NOTE: Replace the V-clamp if it is worn, bent, or damaged. Use Turbine V-clamp and Nut Kit which consists of a V-clamp and locknut.

2. Check the condition of the V-clamp bolt. Place the V-clamp in the correct direction and position the V-clamp onto the turbine housing.

Figure 11 Center section onto the turbine housing

3. Lower the center section onto the turbine housing, aligning the unison ring cam first, then the housing dowel (Figure 11).

4. Align the V-clamp with the paint marks. Coat the threads with Anti-Sieze lubricant. Install the lock nut onto the V-clamp bolt. Tighten the lock nut to 141 to 176 lbf-in (16 to 20 Nm).

5. Loosen the locknut to 44 to 53 lbf-in (5 to 6 Nm), then retighten to 132 to 141 lbf-in (15 to 16 Nm).

6. Install the turbocharger. Use the appropriate *Service Manual*.

1171915R2 Turbocharger Actuator Flange and Pivot Shaft Kit

Instruction Sheet
Turbocharger Actuator Flange and Pivot Shaft Kit

1171915R2

Application

International® DT 466, DT 570, and HT 570 Diesel Engines

Kit Contents

Turbocharger Actuator Flange and Pivot Shaft Kit

Description	Quantity
Flange assembly, actuator pivot shaft and bolts	1
Turbocharger mounting kit	1
Instruction sheet	1

WARNING: To prevent personal injury or death, read all safety instructions in the "Safety Information" section of EGES 265-1 *Service Manual*.

WARNING: To prevent personal injury or death, shift transmission to park or neutral, set parking brake, and block wheels before doing diagnostic or service procedures.

WARNING: To prevent personal injury or death, make sure the engine has cooled before removing components.

WARNING: To prevent personal injury or death, remove ground cable from negative terminal of main battery before disconnecting or connecting electrical components. Always connect ground cable last.

CAUTION: To prevent engine damage, an anti-seize compound should only be used on linkage assembly.

Procedure

Removal

1. See the "EVRT Electronically Controlled Turbocharger" section in *Engine Service Manual*
2. Remove turbocharger assembly.
3. Set turbocharger assembly on a clean workbench.

Disassembly

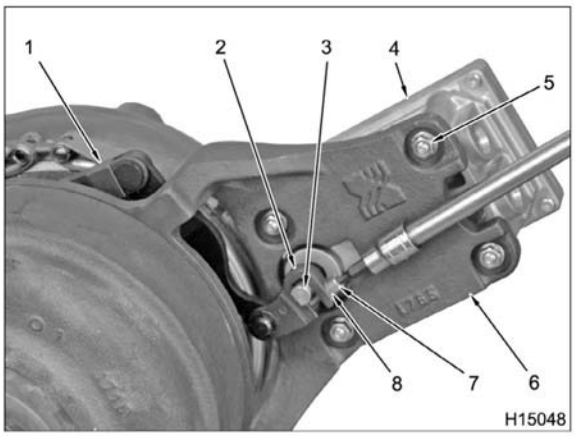


Figure 1 Removal of actuator linkage and actuator

1. Actuator linkage
2. Actuator shaft fork
3. Actuator shaft
4. Actuator
5. Serrated locknut (4)
6. Actuator flange
7. Fork lever bolt (2)
8. Nord-Lock® washer assembly (2)

1. Remove bolt and Nord-Lock® washer assembly from fork on linkage to pivot shaft and actuator shaft.
2. Remove linkage from pivot shaft and actuator shaft.
3. Remove locknuts from turbocharger actuator studs.
4. Remove turbocharger actuator from actuator flange.

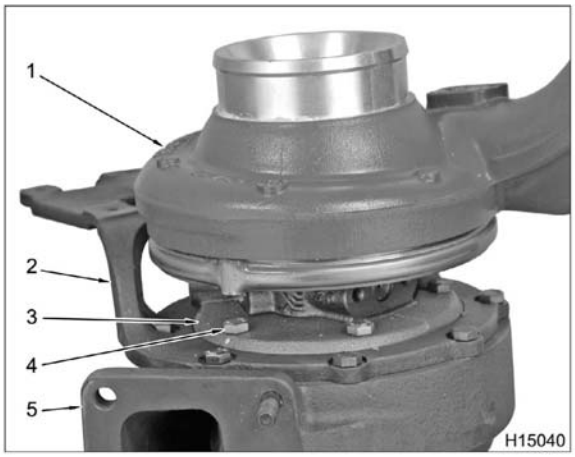


Figure 2 Removal of center section bolts

1. Compressor housing
2. Actuator flange
3. Center section
4. Bolt - center section (4)
5. Turbine housing

5. Remove four bolts from center section of the turbocharger. Discard bolts.

CAUTION: To prevent engine damage, do not damage turbine wheel. If the turbine wheel is damaged, new turbocharger must be installed.

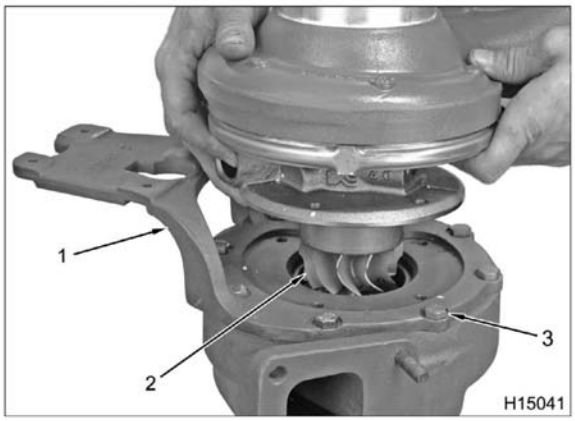


Figure 3 Separation of center section

1. Actuator flange
2. Turbine wheel
3. Bolts – actuator flange (8)

6. Separate the center section from actuator flange.

Disassembly (cont.)

7. Set compressor housing on work bench with center section and turbine wheel up.

Figure 4 Plastic cap plug

CAUTION: To prevent engine damage, protect turbine wheel.

NOTE: A plastic cap plug RC-40 should be put over turbine wheel.

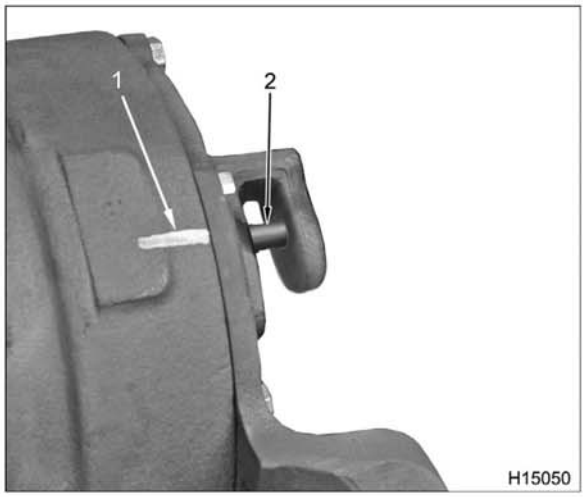


Figure 5 Paint mark on turbine housing

1. Paint mark
2. Pivot shaft

8. Paint a mark on turbine housing for the position of the pivot shaft.
9. Apply penetrating oil to actuator flange bolts and wait 5 minutes.

CAUTION: To prevent engine damage, do not use an impact wrench to remove bolts from actuator flange. If a bolt is broken, a new turbocharger may need to be installed.

10. Remove eight bolts from actuator flange. Discard bolts.

Figure 6 Removal of actuator flange

11. Tap the actuator flange with a hammer to remove from turbine housing.

NOTE: If the pivot shaft was not seized in the actuator flange, remove pivot shaft from unison ring.

Cleaning and Inspection

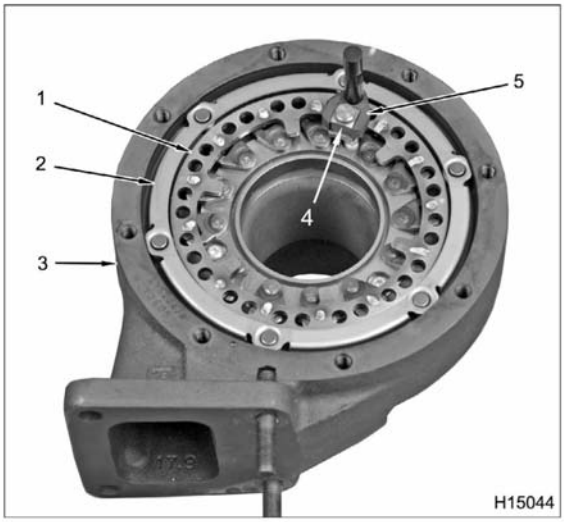


Figure 7 Removal of pivot shaft, outer ring, and unison ring

1. Unison ring
2. Outer ring and six rollers
3. Turbine housing
4. Main pivot block
5. Pivot shaft

1. Remove the outer ring and six rollers.
2. Remove the unison ring.
3. Use a 2 inch cleaning pad (3M® or equivalent) to remove rust from roller surfaces.

CAUTION: To prevent engine damage, do not use an anti-seize compound on inside surfaces of the turbocharger.

4. Turn the turbine housing over and remove loose debris with a brush.

Assembly

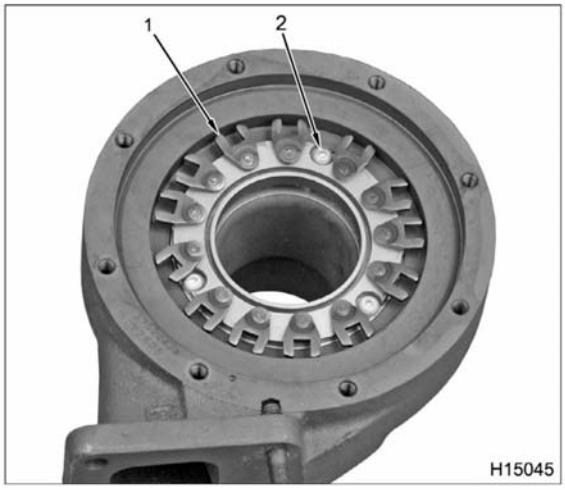


Figure 8 Vane levers

1. Vane lever
2. Torx® screw (3)

1. Center vane levers in the turbine housing.

NOTE: The unison ring only fits one way. The main pivot block on top of the unison ring must line up with the Torx® screw (Item 2, Figure 8) opposite the exhaust flange of turbine housing.

2. Position the main pivot block on top of the unison ring with the Torx® screw opposite the exhaust flange of the turbine housing.
3. Use a small screwdriver or pick to line up vanes with the small pivot blocks under the unison ring. The unison ring will drop in place when the small pivot blocks line up with the vanes.
4. Install six rollers and outer ring.

CAUTION: To prevent engine damage, do not rotate the unison ring too far clockwise. The unison ring will detach from the vanes.

5. Test movement of vane levers and make sure they move freely.

Assembly (cont.)

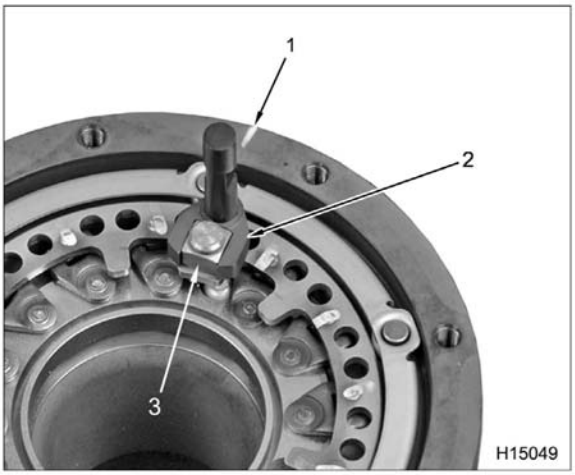


Figure 9 Paint mark, pivot shaft, and main pivot block

1. Paint mark
2. Pivot shaft
3. Main pivot block

6. Install new pivot shaft on main pivot block.
7. Align main pivot block with the line painted on the turbine housing.

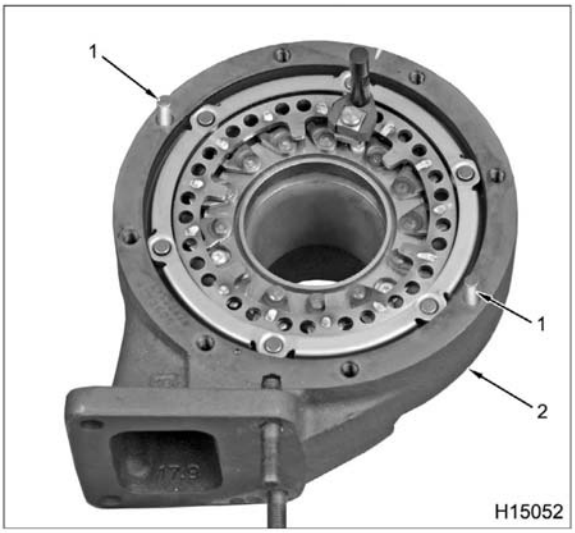


Figure 10 Guide pins

1. Guide pins
2. Turbine housing

8. Install two M8 x 1.25 guide studs in turbine housing.

NOTE: Guide studs are available locally or can be made from the removed bolts.

9. Hold the new actuator flange an inch or two over the turbine housing, making sure the pivot shaft is positioned correctly with the main pivot block on the unison ring.
10. Position the actuator flange on the turbine housing and install six new bolts, finger tight.
11. Remove guide studs and install two new bolts, finger tight.
12. Tighten all bolts to 29 N·m (21 lbf·ft).

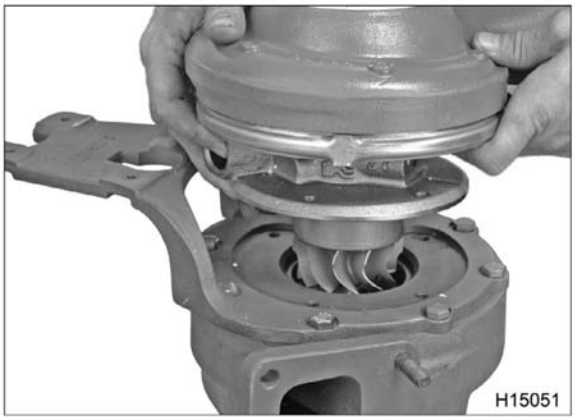


Figure 11 Alignment of center section

CAUTION: To prevent engine damage, do not damage turbine wheel. If the turbine wheel is damaged, new turbocharger must be installed.

13. Align center section with turbine housing and install four new center section bolts.
14. Use a torque adapter to tighten center section bolts. See “Using a Torque Wrench Extension” in “Appendix B” of *Service Manual* EGES-265-1.

- Tighten to 11 N·m (97 lbf·in). Make sure the turbine shaft spins freely.
- Tighten to 25 N·m (18 lbf·ft). Make sure the turbine shaft spins freely.

NOTE: If the actuator is stamped A, B, C, or D, install a new actuator.

Assembly (cont.)

15. Install actuator and four locknuts.
16. Torque locknuts to 14 N·m (124 lbf·in).
17. Position fork lever on pivot shaft.
18. Position fork lever on actuator shaft.
19. Put Nord-Lock® washer assemblies on each fork lever bolt and screw into fork levers.
20. Tighten fork lever bolts to 7 N·m (62 lbf·in).

CAUTION: To prevent engine damage, do not loosen fork lever bolts when testing free movement of fork lever and bolt.

21. Move the pivot shaft linkage to make sure the vanes move freely.

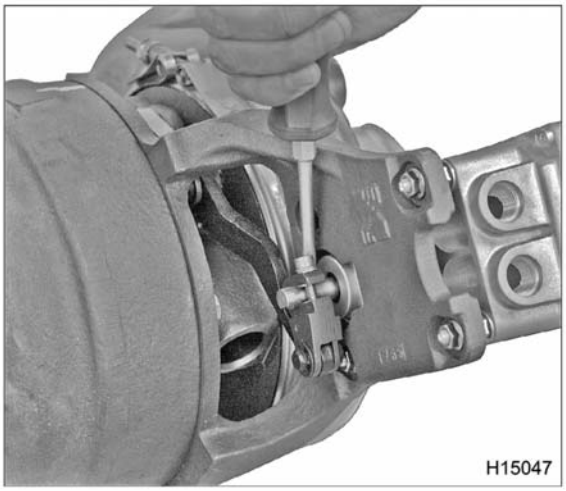


Figure 12 Actuator shaft adjustment

22. Use a screw driver to square linkage fork on actuator shaft.

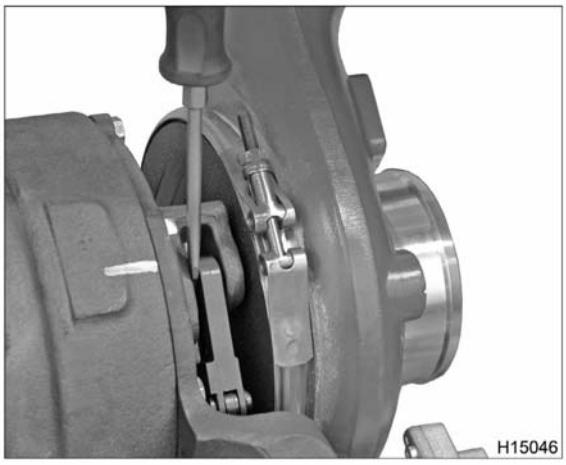


Figure 13 Pivot shaft adjustment

23. Use a screw driver to square linkage fork on pivot shaft.
24. Position turbocharger on workbench with actuator facing down (as mounted on the engine).
25. Move fork lever on actuator shaft until it stops. Release the fork lever; the actuator linkage should fall, bounce once, and stop. Repeats steps 22, 23, and 25 if necessary.

Installation

1. See "EVRT Electronically Controlled Turbocharger" section in Engine *Service Manual* EGES-265-1.
2. Install turbocharger assembly.

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