9.0 L OEM Diesel Engines (PowerTech™ Plus)

OPERATOR'S MANUAL

9.0 L OEM Diesel Engines (Tier 3/Stage III A Platform)

OMRG36864 ISSUE 18AUG22 (ENGLISH)

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

If this product contains a gasoline engine:

⚠ WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

The State of California requires the above two warnings.

John Deere Power Systems

Worldwide Edition

PRINTED IN U.S.A.

TP-6457 8/22

OEM Engine and Drivetrain Warranty Registration

RG24614 —UN—21OCT13

Scan this code to register your OEM engine or drivetrain product online. You can also visit us directly at http://jdpswarrantyreg.deere.com/WarrantyReg.

Why registering your OEM engine or drivetrain product is a really smart idea:

- **Get faster service.** Registering your engine or drivetrain product gives us the information we need to meet your service needs promptly and completely.
- **Protect your investment.** You'll be kept up-to-date on engine or drivetrain product updates.
- **Extend your warranty.** You'll be given the option to extend your coverage before your standard warranty term expires.
- **Stay informed.** Be the first to know about new products and money-saving offers from John Deere.

You're Covered

When you buy a John Deere engine or drivetrain product you aren't just buying pistons and crankshafts and gear drives. You're buying the ability to get work done. Without downtime, without worries, and without hassles. And you're buying the assurance that if you do need help, a strong support network will be there — ready to step in.

Confidence. That's what John Deere engines, John Deere drivetrains, and John Deere Warranties are all about.

Long durations. Warranties designed to give you confidence in your engine or drivetrain product.

Worldwide support. Get service when and where you need it. John Deere has 4,000+ service locations worldwide.

Genuine John Deere parts and service. Authorized service outlets will use only new or remanufactured parts or components furnished by John Deere.

Warranty Duration

Equipment operators can't afford downtime or unexpected repairs. That's why we offer comprehensive warranties on our OEM industrial engines, marine engines, and drivetrain products.

- **OEM Engines:** 2-year/2,000-hour warranty, with unlimited hours in the first year.
- **Drivetrain Products:** 12-month/2000-hour warranty. In the absence of a functional hour meter, hours of use will be determined on the basis of 12 hours of use per calendar day.

These warranties take effect the date the engine or drivetrain product is delivered to the first retail purchaser. Be sure to register your engine or drivetrain product and take full advantage of the John Deere service and support network.

In addition, engine extended warranties are available under certain conditions. John Deere offers a variety of purchased warranties to extend the warranty period for your engine. You'll be given the option to extend your coverage before your standard warranty term expires.

Obtaining Warranty Service

Warranty service must be requested through an authorized John Deere service outlet before the expiration of the warranty. Evidence of the engine's or drivetrain product's delivery date to the first retail purchaser must be presented when requesting warranty service. Authorized service outlets include:

- John Deere distributor
- John Deere OEM service dealer
- John Deere equipment dealer
- John Deere marine dealer

Worldwide Support Network

Visit https://dealerlocator.deere.com/ or https://dealerlocator.deere.ca/to find the authorized engine or drivetrain service location nearest you. For complete warranty details visit https://www.deere.com/en/parts-and-service/warranty-and-protection-plans/warranties/warranty-statements or https://www.deere.ca/en/parts-and-service/warranty-and-protection-plans/warranties/warranty-statementsto view, download, or print the warranty statement for your engine or drivetrain product.

GM52594,0000996 -19-26MAY22-1/1

Foreword

IMPORTANT: Some information contained within this manual refers to engines that are capable of running on aviation (jet) fuels. These engines are specifically ordered and outfitted with special hardened components and fuel dosing element(s) that make the engine capable of using these fuels.

CAUTION: Engines NOT ordered and outfitted with these special components are NOT capable of using aviation (jet) fuels. If you have any questions, please contact your local servicing dealer.

READ THIS MANUAL carefully to learn how to operate and service your engine correctly. Failure to do so could result in personal injury or equipment damage.

THIS MANUAL SHOULD BE CONSIDERED a permanent part of your engine and should remain with the engine when you sell it.

MEASUREMENTS IN THIS MANUAL are given in both metric and customary U.S. unit equivalents. Use only correct replacement parts and fasteners. Metric and inch fasteners may require a specific metric or inch wrench.

RIGHT-HAND AND LEFT-HAND sides are determined by standing at the drive or flywheel end (rear) of the engine and facing toward the front of the engine.

WRITE ENGINE SERIAL NUMBERS and option codes in the spaces indicated in the Record Keeping Section. Accurately record all the numbers. Your dealer also needs these numbers when you order parts. File the identification numbers in a secure place off the engine.

SETTING FUEL DELIVERY beyond published factory specifications or otherwise overpowering will result in loss of warranty protection for this engine.

CERTAIN ENGINE ACCESSORIES such as radiator, air cleaner, and instruments are optional equipment on John Deere OEM Engines. These accessories may be provided by the equipment manufacturer instead of John Deere. This operator's manual applies only to the engine and those options available through the John Deere distribution network.

NOTE: This operator's manual covers only engines provided to OEM (Original Equipment Manufacturers). For engines in Deere machines, refer to the machine operators manual.

DN28805,0001E6E -19-05MAR14-1/1

Engine Owner

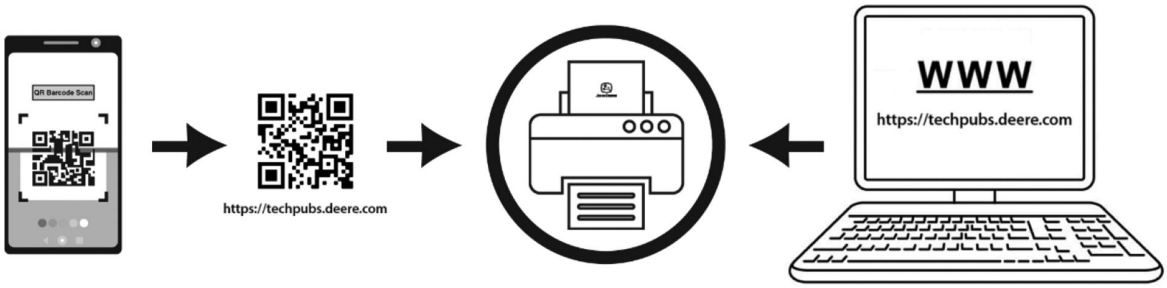
John Deere Engine Owner:

It is important for the new engine to be registered for factory warranty. Registering the engine will allow the Service Dealer to verify the warranty status should a repair be needed. The easiest way to register the engine is via the internet. To register the engine for warranty via the internet, please use the following URL: http://www.johndeere.com/enginewarranty

The John Deere Engine Distributor or local John Deere Service Dealer can also provide this service. Engine service can be done by all AG, C&F, and JDPS branded dealers. To view the John Deere Service Dealer network or locate the nearest Dealer, use the following URL: http://www.johndeere.com/dealer

JR74534,000026F -19-19AUG21-1/1

Download Instructions



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Istruzioni, manuali e altri documenti possono essere scaricati su www.techpubs.deere.com. La scansione del codice QR su un dispositivo portatile indirizza automaticamente al sito.
Anleitungen, Handbücher und andere Dokumente können unter www.techpubs.deere.com heruntergeladen werden. Durch Scannen des QR-Codes mit einem Mobilgerät wird man automatisch zur Webseite weitergeleitet.
Las instrucciones, los manuales y otros documentos se pueden descargar en www.techpubs.deere.com. Al escanear el código QR en un dispositivo móvil, se abrirá automáticamente el sitio web.
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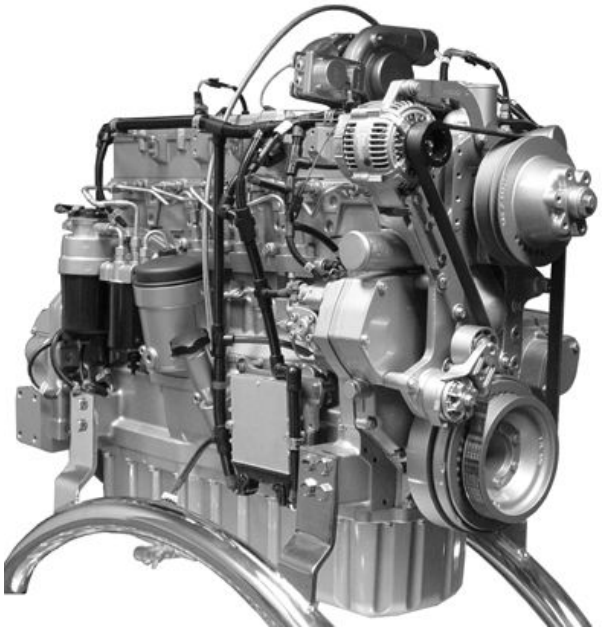
TS1746 —UN—26APR21

DX,DOWNLOADINSTRUCTIONS,AT -19-27APR21-1/1

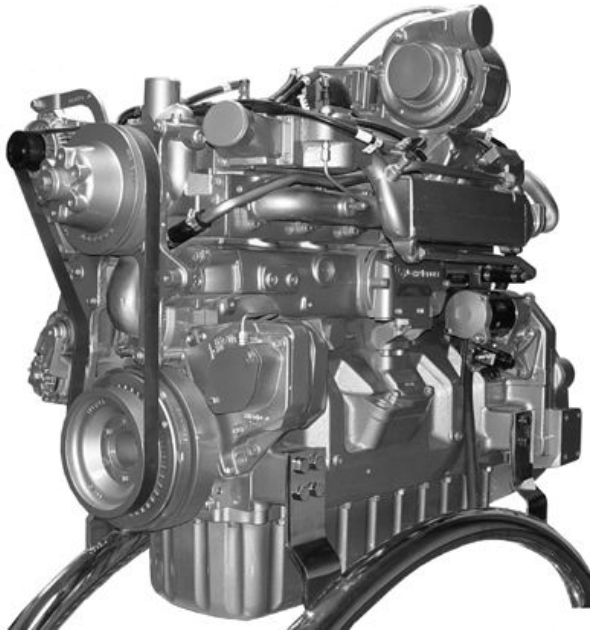
Identification Views—John Deere 9.0 L OEM Diesel Engine

NOTE: There are multiple engine configurations.
Base engine model shown.



RG13848 —UN—24JAN05

John Deere 9.0 L Diesel Base Engine



RG13847 —UN—24JAN05

John Deere 9.0 L Diesel Base Engine

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AMP®	AMP is a trademark of Tyco Electronics
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Contents

Continued on next page

Original Instructions. All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Record Engine Serial Number

The engine serial number plate (C) is located on the left-hand side of engine block between intake manifold and starter motor.

Record all of the numbers and letters found on your engine serial number plate in the spaces provided below.

This information is very important for repair parts or warranty information.

Engine Serial Number (A)

_____

Engine Model Number (B)

_____

NOTE: On engine serial number (A) the 7th digit shows the emission level as follows:

- *"B" for non-certified engines*
- *"C" for Tier 1 / Stage I engines*
- *"G" for Tier 2 / Stage II engines*
- *"L" for Tier 3 / Stage IIIA engines*

For identification of publications specific to engine model refer to the PowerAssist App or John Deere Technical Information Store.

A—Engine Serial Number
B—Engine Model Number
C—Serial Number Plate

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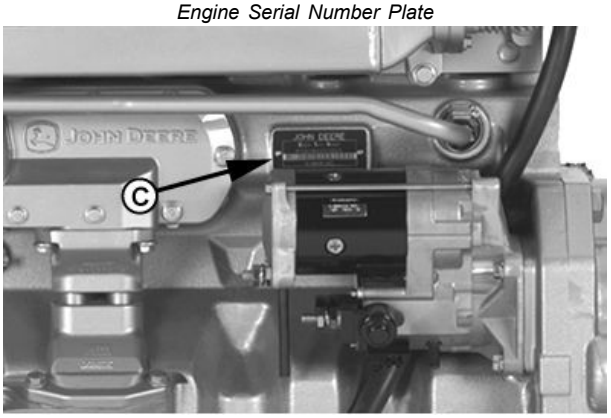
Engine Serial Number Plate



RG13813 —UN—11JAN05

Location of Engine Serial Number Plate

RG33180 —UN—18NOV20

https://techpubs.deere.com/https://techpubs.deere.com/

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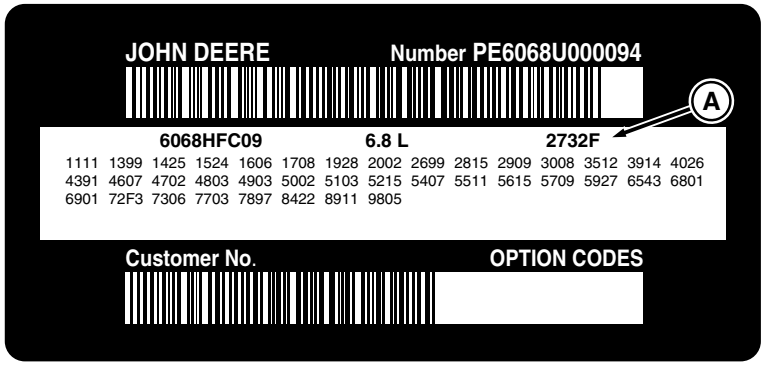
Engine Option Codes



RG24026 —UN—05AUG13

Option Code Label Example

A—Engine Base Code (example)

OEM engines have an engine option code label affixed to the rocker arm cover. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your authorized servicing dealer or engine distributor with these numbers.

The engine option code label includes an engine base code (A). This base code must also be recorded along with the option codes. At times it will be necessary to furnish this base code to differentiate two identical option codes for the same engine model.

The first two digits of each code identify a specific group, such as alternators. The last two digits of each code identify one specific option provided on your engine, such as a 24 volt, 120 amp alternator.

If an engine is ordered without a particular component, the last two digits of that functional group option code will be 99, 00, or XX. The following list shows only the first two digits of the code numbers. For future reference such as ordering repair parts, it is important to have these code numbers available. To ensure this availability, enter the third and fourth digits shown on your engine option code label in the spaces provided on the following page.

An additional option code label may also be delivered (in a plastic bag attached to the engine or inserted in the machine documentation). It is recommended to place this label either on this page of the operator's manual or in the Engine Owner's Warranty booklet under Option Codes.

The machine manufacturer may have placed the label in a specific accessible area (inside the enclosure or close to a maintenance area).

Your engine option code label may not contain all option codes if an option has been added after the engine left the producing factory.

If option code label is lost or destroyed, consult your servicing dealer or engine distributor selling the engine for a replacement.

Record your engine Base Code (A) in the spaces provided below for easy reference.

Engine Base Code (A):

_____

Option Codes	Description	Option Codes	Description
10_____	Paint Protection	56_____	Paint
11_____	Rocker Arm Cover	57_____	Water Pump Inlet
12_____	Oil Filler	58_____	Power Take Off
13_____	Crankshaft Pulley	59_____	Oil Cooler/Oil Filter
14_____	Flywheel Housing	60_____	Add-On Fan Drive Pulley
15_____	Flywheel	61_____	After Treatment Device/Muffler
16_____	Fuel Injection System	62_____	Alternator Mounting
17_____	Air Inlet	63_____	Low-Pressure Fuel Lines
18_____	Air Cleaner	64_____	Exhaust Elbow
19_____	Oil Pan	65_____	Turbocharger
20_____	Water Pump	66_____	Temperature Switch
21_____	Thermostat Cover	67_____	Engine Sensors

Continued on next page

RG,RG34710,5004 -19-16AUG21-1/2

Option Codes	Description	Option Codes	Description
22_____	Thermostat	68_____	Damper
23_____	Fan Drive	69_____	Engine Serial Number Plate
24_____	Fan Belt	70_____	Decomposition Tube (OEM)
25_____	Fan	71_____	SCR (OEM)
26_____	Block Heater	72_____	Performance Software and Labels
27_____	Radiator/Heat Exchanger	7A_____	Performance Software and Labels
28_____	Exhaust Manifold	73_____	After Treatment Dosing System
29_____	Ventilator System	74_____	Air Conditioning
30_____	Starting Motor	75_____	Restriction Indicator
31_____	Alternator	76_____	Oil Pressure Switch
32_____	DEF Lines, Pressure (OEM)	77_____	Timing Gear Cover (S450/S650)
33_____	DEF Lines, Supply/Return to Tank (OEM)	78_____	Air Compressor
34_____	DEF Tank and Header (OEM)	79_____	Certification
35_____	Final Fuel Filter	80_____	Sea Water Pump (Marine)
36_____	Front Plate and Idler Shafts	81_____	Primary Fuel Filter/Water Separator
37_____	Fuel Transfer Pump	82_____	Ignition System (Natural Gas)
38_____	Operator Manual	83_____	Vehicle Performance Software
39_____	Thermostat Housing	84_____	Wiring Harness
40_____	Dipstick and Tube	85_____	Fuel System (Natural Gas)
41_____	Belt Driven Auxiliary Drive (Add-On Crank Pulley)	86_____	Fan Pulley
42_____	DEF Line, Supply Module to Injector (OEM)	87_____	Belt Tensioner
43_____	Starting Aid	88_____	Oil Filter
44_____	Timing Gear Cover (S350)	89_____	EGR System
44_____	Tachometer Drive Sensors (S450/S650)	90_____	Trim Software (OEM)
45_____	Secondary Balancers	91_____	Engine Installation Kit (S350)
46_____	Cylinder Block with Camshaft	92_____	Engine Test Certificate/Engine Accessories (S350)
47_____	Crankshaft/Main Bearings	92_____	Engine Installation Kit (S450)
48_____	Connecting Rods/Pistons/Liners	93_____	Emission Label
49_____	Valve Actuating Mechanism	94_____	Custom Software
50_____	Oil Pump	95_____	Parts Installed at Factory
51_____	Cylinder Head with Valves	96_____	Engine Installation Kit/Ship With (S450/S650)
52_____	Gear Driven Auxiliary Drive	96_____	ECU Wiring Harness (6125/6135)
53_____	Fuel Heater	97_____	Field Installed Items
54_____	Turbo Air Intake	98_____	Engine Lift Strap
55_____	Shipping Stand	99_____	Service Only Parts

NOTE: This is a complete option code list based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice. Your engine will not contain all option codes listed.

RG,RG34710,5004 -19-16AUG21-2/2

Record High-Pressure Fuel Pump Model and Serial Numbers

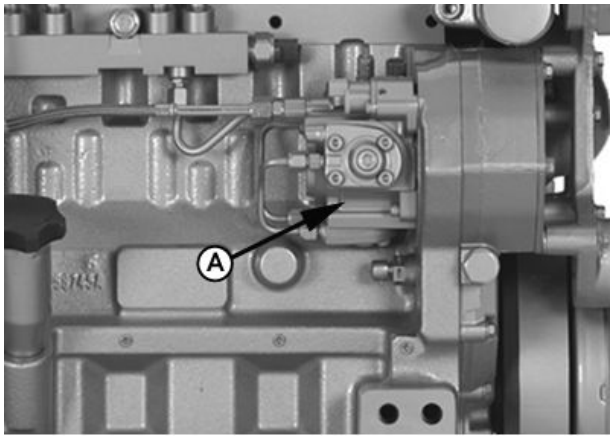
Record the fuel transfer pump model and serial information found on the serial number plate (A).

Model No._____ RPM_____

Manufacturer's No._____

Serial No._____

A—Serial Number Plate



RG13851 —UN—17JAN05

High Pressure Fuel Pump Serial Number Plate

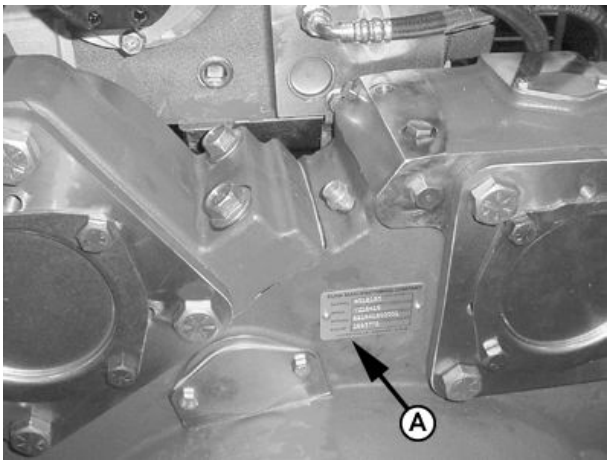
OURGP11,0000022 -19-11OCT06-1/1

Record Rear Power Take-Off (PTO) Serial Number (If Equipped)

Record the rear power take-off (PTO) serial number found on rear PTO serial number plate (A) (if equipped).

Rear PTO Serial Number

_____



RG12594 —UN—24SEP02

Rear PTO Serial Number Plate

RG,RG34710,4004 -19-11OCT06-1/1

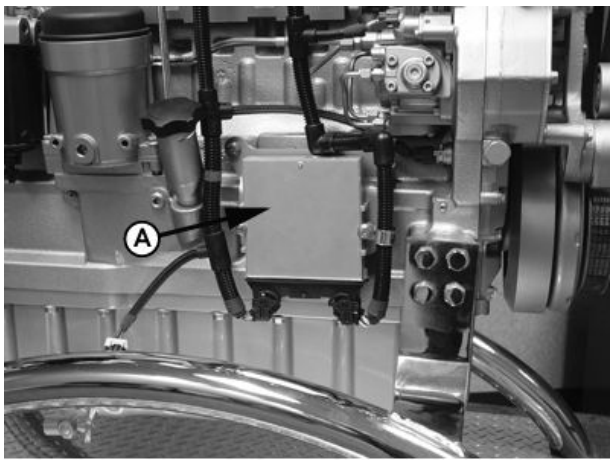
Record ECU Serial Number

Record the part number and serial number information found on the serial number label on the Engine Control Unit (ECU) (A) mounted on or near the engine.

Part No._____

Serial No._____

A—Serial Number Label



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Record Engine Control Unit (ECU) Serial Number

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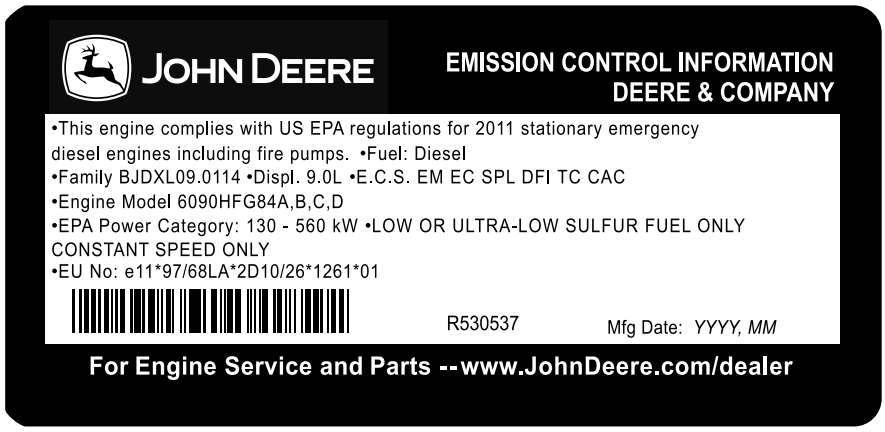
Emergency Stationary Engine Rule



RG19597 —UN—20OCT10

Emissions Label

Emissions Label

After Tier 4 standards take effect, engine manufacturers of emergency stationary engines that do not meet the standards for non-emergency engines must add to each such emergency engine a permanent label (such as the emission label as shown) which states that the engine is limited to stationary emergency use. On John Deere engines this is stated in the EPA emission label on each engine.

Fuel Requirements

Beginning 01 Oct 10, owners and operators of stationary engines that use diesel fuel must only use diesel fuel meeting the requirements of 40 CFR 80.510 (b), which requires that diesel fuel have a maximum sulfur content of 15 PPM and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

Operation, Maintenance and Testing

The operation of emergency engines is limited to emergency operations and required maintenance and testing.

There is no time limit on the use of emergency stationary engines in emergency situations.

Maintenance and testing is limited to 100 hours per year. The EPA has also included a provision that allows anyone to petition the Administrator for additional hours, beyond the allowed 100 hours per year, if such additional hours should prove to be necessary for maintenance and testing reasons. The EPA will not require a petition for additional hours if the hours beyond 100 hours per year for maintenance and testing purposes are mandated by regulation such as State or Local requirements.

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Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

T81389 —UN—28JUN13

DX,ALERT -19-29SEP98-1/1

Understand Signal Words

DANGER; The signal word DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING; The signal word WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION; The signal word CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION may also be used to alert against unsafe practices associated with events which could lead to personal injury.

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards. DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

TS187 —19—30SEP88

DX,SIGNAL -19-05OCT16-1/1

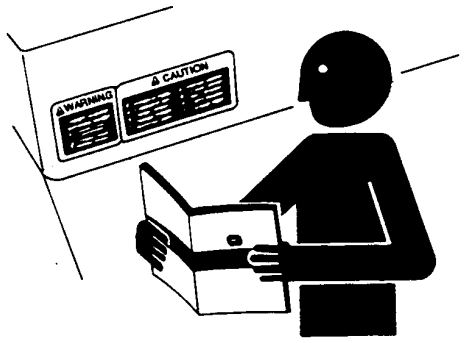
Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this operator's manual.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.



TS201 —UN—15APR13

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.

DX,READ -19-01AUG22-1/1

Replace Safety Signs

Replace missing or damaged safety signs. Use this operator's manual for correct safety sign placement.

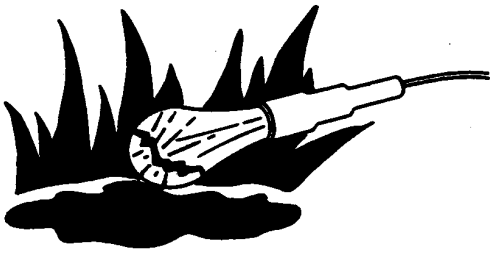
There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this operator's manual.

TS201 —UN—15APR13

DX,SIGNS -19-18AUG09-1/1

Illuminate Work Area Safely

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



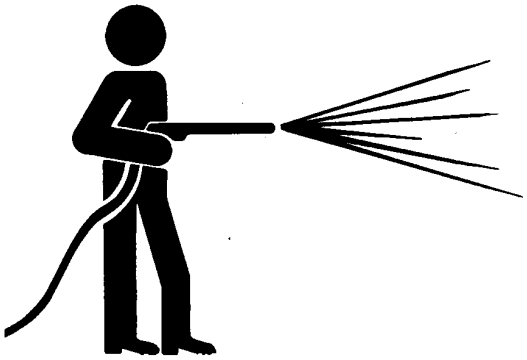
TS223 —UN—23AUG88

DX,LIGHT -19-04JUN90-1/1

Work in Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



T6642EJ —UN—18OCT88

DX,CLEAN -19-04JUN90-1/1

Use Proper Tools

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.

TS779 —UN—08NOV89

DX,REPAIR -19-17FEB99-1/1

Live With Safety

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

TS231 —19—07OCT88

DX,LIVE -19-25SEP92-1/1

Prevent Machine Runaway

Avoid possible injury or death from machinery runaway.

Do not start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park.

TS177 —UN—11JAN89

DX,BYPAS1 -19-29SEP98-1/1

Handle Fuel Safely—Avoid Fires

Handle fuel with care: it is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks.

Always stop engine before refueling machine. Fill fuel tank outdoors.

Prevent fires by keeping machine clean of accumulated trash, grease, and debris. Always clean up spilled fuel.

Use only an approved fuel container for transporting flammable liquids.

Never fill fuel container in pickup truck with plastic bed liner. Always place fuel container on ground before refueling. Touch fuel container with fuel dispenser nozzle before removing can lid. Keep fuel dispenser nozzle in contact with fuel container inlet when filling.

TS202 —UN—23AUG88

Do not store fuel container where there is an open flame, spark, or pilot light such as within a water heater or other appliance.

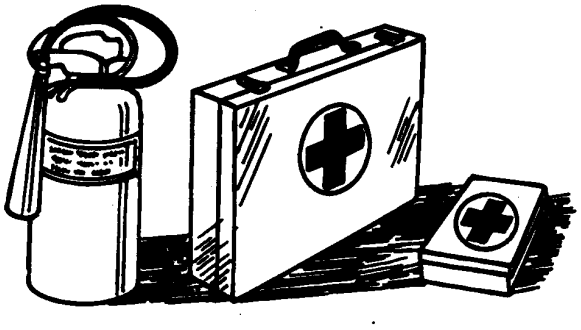
DX,FIRE1 -19-12OCT11-1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 —UN—15APR13

DX,FIRE2 -19-03MAR93-1/1

Handle Starting Fluid Safely

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.

Do not use starting fluid on an engine equipped with glow plugs or an air intake heater.

TS1356 —UN—18MAR92

DX,FIRE3 -19-14MAR14-1/1

In Case of Fire

CAUTION: Avoid personal injury.

Stop machine immediately at the first sign of fire. Fire may be identified by the smell of smoke or sight of flames. Because fire grows and spreads rapidly, get off the machine immediately and move safely away from the fire. Do not return to the machine! The number one priority is safety.

Call the fire department. A portable fire extinguisher can put out a small fire or contain it until the fire department arrives; but portable extinguishers have limitations. Always put the safety of the operator and bystanders first. If attempting to extinguish a fire, keep your back to the wind with an unobstructed escape path so you can move away quickly if the fire cannot be extinguished.

Read the fire extinguisher instructions and become familiar with their location, parts, and operation before a fire starts. Local fire departments or fire equipment distributors may offer fire extinguisher training and recommendations.

If your extinguisher does not have instructions, follow these general guidelines:

TS227 —UN—15APR13

1. Pull the pin. Hold the extinguisher with the nozzle pointing away from you, and release the locking mechanism.
2. Aim low. Point the extinguisher at the base of the fire.
3. Squeeze the lever slowly and evenly.
4. Sweep the nozzle from side-to-side.

DX,FIRE4 -19-22AUG13-1/1

Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.

TS227 —UN—15APR13

DX,FLAME -19-29SEP98-1/1

Avoid Static Electricity Risk When Refueling

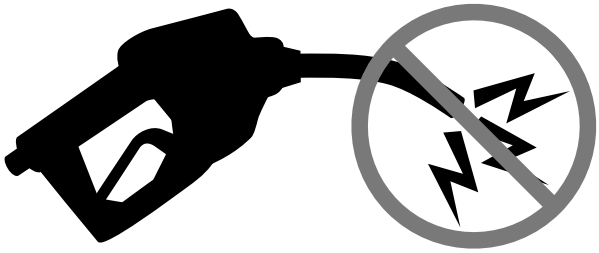
The removal of sulfur and other compounds in Ultra-Low Sulfur Diesel (ULSD) fuel decreases its conductivity and increases its ability to store a static charge.

Refineries may have treated the fuel with a static dissipating additive. However, there are many factors that can reduce the effectiveness of the additive over time.

Static charges can build up in ULSD fuel while it is flowing through fuel delivery systems. Static electricity discharge when combustible vapors are present could result in a fire or explosion.

Therefore, it is important to ensure that the entire system used to refuel your machine (fuel supply tank, transfer pump, transfer hose, nozzle, and others) is properly grounded and bonded. Consult with your fuel or fuel system supplier to ensure that the delivery system is in compliance with fueling standards for proper grounding and bonding practices.

RG22142 —UN—17MAR14



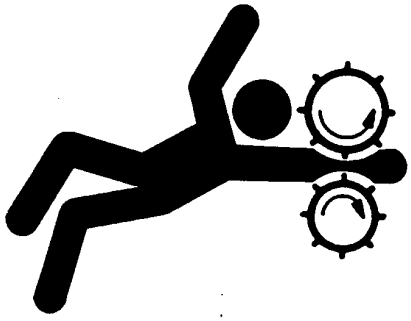
RG21992 —UN—21AUG13

DX,FUEL,STATIC,ELEC -19-12JUL13-1/1

Service Machines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



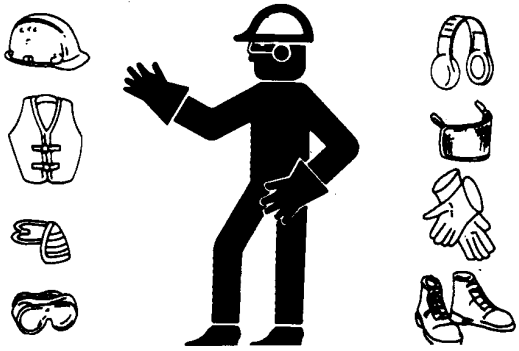
TS228 —UN—23AUG88

DX,LOOSE -19-04JUN90-1/1

Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



TS206 —UN—15APR13

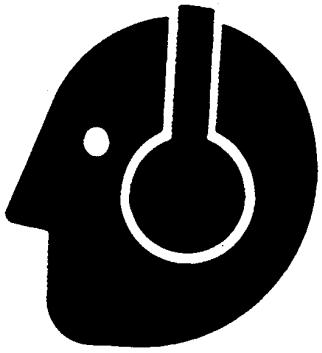
DX,WEAR2 -19-03MAR93-1/1

Protect Against Noise

There are many variables that affect the sound level range, including machine configuration, condition and maintenance level of the machine, ground surface, operating environmental, duty cycles, ambient noise, and attachments.

Exposure to loud noise can cause impairment or loss of hearing.

Always wear hearing protection. Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



TS207 —UN—23AUG88

DX,NOISE -19-03OCT17-1/1

Handling Batteries Safely

Battery gas can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Always remove grounded (-) battery clamp first and replace grounded clamp last.

Sulfuric acid in battery electrolyte is poisonous and strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid hazards by:

- Filling batteries in a well-ventilated area
- Wearing eye protection and rubber gloves
- Avoiding use of air pressure to clean batteries
- Avoiding breathing fumes when electrolyte is added
- Avoiding spilling or dripping electrolyte
- Using correct battery booster or charger procedure.

If acid is spilled on skin or in eyes:

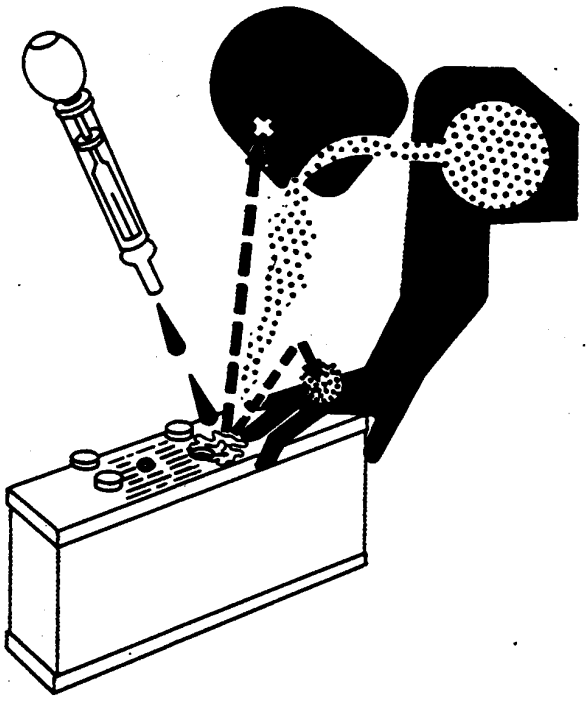
1. Flush skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 qt.).
3. Get medical attention immediately.

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**

TS204 —UN—15APR13



TS203 —UN—23AUG88

DX,WW,BATTERIES -19-02DEC10-1/1

Prevent Acid Burns

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

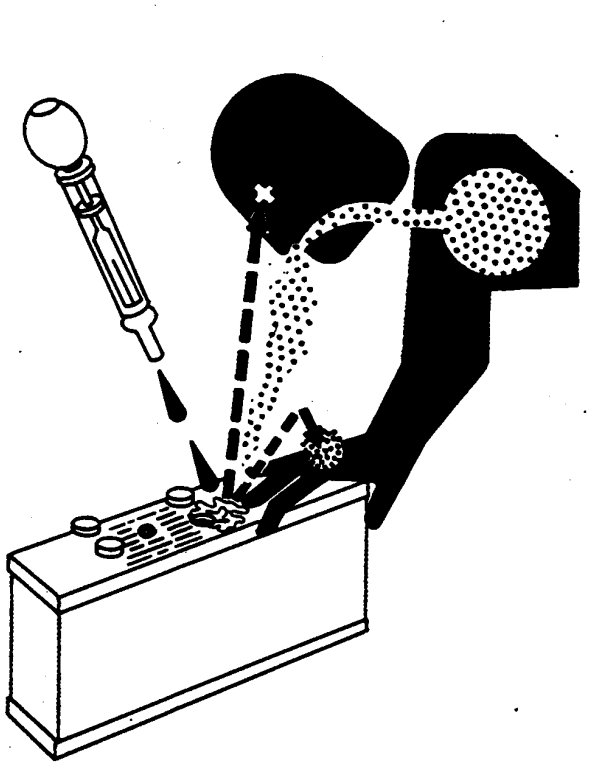
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 quarts).
3. Get medical attention immediately.



TS203 —UN—23AUG88

DX,POISON -19-21APR93-1/1

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

Keep all shields in place at all times. Make sure rotating shields turn freely.

Wear close-fitting clothing. Stop the engine and be sure that all rotating parts and drivelines are stopped before making adjustments, connections, or performing any type of service on engine or machine driven equipment.

TS1644 —UN—22AUG95

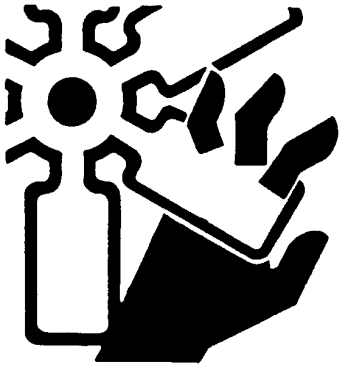
DX,ROTATING -19-18AUG09-1/1

Install All Guards

Rotating cooling system fans, belts, pulleys, and drives can cause serious injury.

Keep all guards in place at all times during engine operation.

Wear close-fitting clothes. Stop the engine and be sure fans, belts, pulleys, and drives are stopped before making adjustments, connections, or cleaning near fans and their drive components.



TS677 —UN—21SEP89

DX,GUARDS -19-18AUG09-1/1

Practice Safe Maintenance

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing away from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.

Falling while cleaning or working at height can cause serious injury. Use a ladder or platform to easily reach each location. Use sturdy and secure footholds and handholds.

TS218 —UN—23AUG88

DX,SERV -19-28FEB17-1/1

Remove Paint Before Welding or Heating

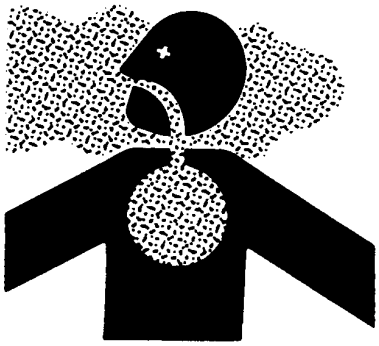
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Remove paint before heating:

- Remove paint a minimum of 100 mm (4 in.) from area to be affected by heating. If paint cannot be removed, wear an approved respirator before heating or welding.
- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

Do not use a chlorinated solvent in areas where welding will take place.



TS220 —UN—15APR13

Do all work in an area that is well ventilated to carry toxic fumes and dust away.

Dispose of paint and solvent properly.

DX,PAINT -19-24JUL02-1/1

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can accidentally burst when heat goes beyond the immediate flame area.

TS953 —UN—15MAY90

DX,TORCH -19-10DEC04-1/1

Avoid High-Pressure Fluids

Inspect hydraulic hoses periodically – at least once per year – for leakage, kinking, cuts, cracks, abrasion, blisters, corrosion, exposed wire braid or any other signs of wear or damage.

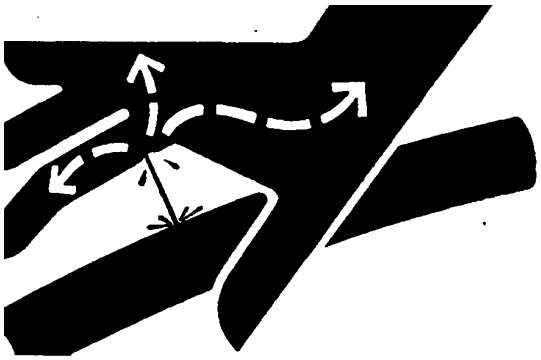
Replace worn or damaged hose assemblies immediately with John Deere approved replacement parts.

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available in English from Deere & Company Medical Department in Moline, Illinois, U.S.A., by calling 1-800-822-8262 or +1 309-748-5636.



X9811 —UN—23AUG88

DX,FLUID -19-12OCT11-1/1

Do Not Open High-Pressure Fuel System

High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair of fuel lines, sensors, or any other components between the high-pressure fuel pump and nozzles on engines with High Pressure Common Rail (HPCR) fuel system.

Only technicians familiar with this type of system can perform repairs. (See your John Deere dealer.)

TS1343 —UN—18MAR92

DX,WW,HPCR1 -19-07JAN03-1/1

Protect Against High Pressure Spray

Spray from high pressure nozzles can penetrate the skin and cause serious injury. Keep spray from contacting hands or body.

If an accident occurs, see a doctor immediately. Any high pressure spray injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

TS1343 —UN—18MAR92

DX,SPRAY -19-16APR92-1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

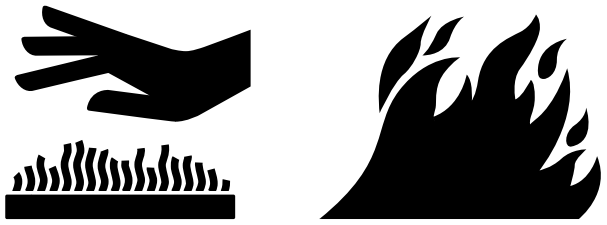
TS204 —UN—15APR13

DX,SPARKS -19-03MAR93-1/1

Avoid Hot Exhaust

Servicing machine or attachments with engine running can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.

Exhaust parts and streams become very hot during operation. Exhaust gases and components reach temperatures hot enough to burn people, ignite, or melt common materials.



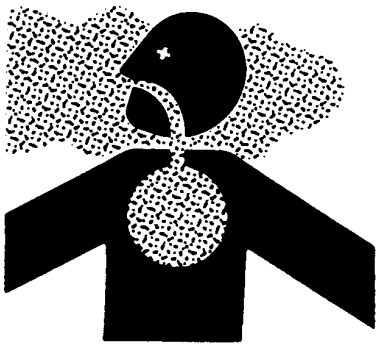
RG17488 —UN—21AUG09

DX,EXHAUST -19-20AUG09-1/1

Work In Ventilated Area

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.



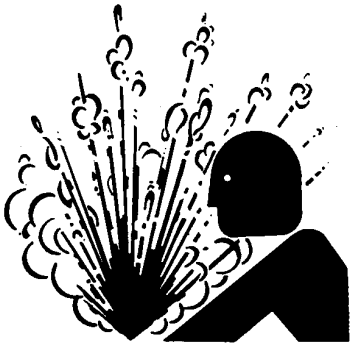
TS220 —UN—15APR13

DX,AIR -19-17FEB99-1/1

Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



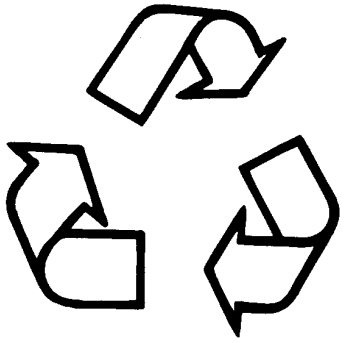
TS281 —UN—15APR13

DX,WW,COOLING -19-19AUG09-1/1

Decommissioning — Proper Recycling and Disposal of Fluids and Components

Safety and environmental stewardship measures must be taken into account when decommissioning a machine and/or component. These measures include the following:

- Use appropriate tools and personal protective equipment such as clothing, gloves, face shields or glasses, during the removal or handling of objects and materials.
- Follow instructions for specialized components.
- Release stored energy by lowering suspended machine elements, relaxing springs, disconnecting the battery or other electrical power, and releasing pressure in hydraulic components, accumulators, and other similar systems.
- Minimize exposure to components which may have residue from agricultural chemicals, such as fertilizers and pesticides. Handle and dispose of these components appropriately.
- Carefully drain engines, fuel tanks, radiators, hydraulic cylinders, reservoirs, and lines before recycling components. Use leak-proof containers when draining fluids. Do not use food or beverage containers.
- Do not pour waste fluids onto the ground, down a drain, or into any water source.
- Observe all national, state, and local laws, regulations, or ordinances governing the handling or disposal of waste fluids (example: oil, fuel, coolant, brake fluid); filters; batteries; and, other substances or parts. Burning of flammable fluids or components in other than specially designed incinerators may be prohibited by law and could result in exposure to harmful fumes or ashes.
- Service and dispose of air conditioning systems appropriately. Government regulations may require a certified service center to recover and recycle air conditioning refrigerants which could damage the atmosphere if allowed to escape.
- Evaluate recycling options for tires, metal, plastic, glass, rubber, and electronic components which may be recyclable, in part or completely.
- Contact your local environmental or recycling center, or your John Deere dealer for information on the proper way to recycle or dispose of waste.



TS1133 —UN—15APR13

DX,DRAIN -19-01JUN15-1/1

Diesel Fuel

Consult your local fuel distributor for properties of the diesel fuel available in your area.

In general, diesel fuels are blended to satisfy the low temperature requirements of the geographical area in which they are marketed.

Diesel fuels specified to EN 590 or ASTM D975 are recommended. Renewable diesel fuel produced by hydrotreating animal fats and vegetable oils is basically identical to petroleum diesel fuel. Renewable diesel that meets EN 590, ASTM D975, or EN 15940 is acceptable for use at all percentage mixture levels.

Required Fuel Properties

In all cases, the fuel shall meet the following properties:

Cetane number of 40 minimum. Cetane number greater than 47 is preferred, especially for temperatures below –20 °C (–4 °F) or elevations above 1675 m (5500 ft.).

Cloud Point should be below the expected lowest ambient temperature or **Cold Filter Plugging Point** (CFPP) should be a maximum 10°C (18°F) below the fuel cloud point.

Fuel lubricity should pass a maximum scar diameter of 0.52 mm as measured by ASTM D6079 or ISO 12156-1. A maximum scar diameter of 0.45 mm is preferred.

Diesel fuel quality and sulfur content must comply with all existing emissions regulations for the area in which the engine operates. DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

Materials such as copper, lead, zinc, tin, brass and bronze should be avoided in fuel handling, distribution and storage equipment as these metals can catalyze fuel oxidation reactions which can lead to fuel system deposits and plugged fuel filters.

E-Diesel fuel

DO NOT use E-Diesel (Diesel fuel and ethanol blend). Use of E-Diesel fuel in any John Deere machine may void the machine warranty.

CAUTION: Avoid severe injury or death due to the fire and explosion risk from using E-Diesel fuel.

[1]See DX,ENOIL12,OEM, DX,ENOIL12,T2,STD, or DX,ENOIL12,T2,EXT for more information on Engine Oil and Filter Service Intervals.

Sulfur Content for Interim Tier 4, Final Tier 4, Stage III A and B, Stage IV, and Stage V Engines Above 560 kW

- Use ONLY diesel fuel with a maximum of 500 mg/kg (500 ppm) sulfur content.

Sulfur Content for Interim Tier 4, Final Tier 4, Stage III B, Stage IV Engines, and Stage V Engines

- Use ONLY ultra low sulfur diesel (ULSD) fuel with a maximum of 15 mg/kg (15 ppm) sulfur content.

Sulfur Content for Tier 3 and Stage III A Engines

- Use of diesel fuel with sulfur content less than 1000 mg/kg (1000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content 1000—2000 mg/kg (1000—2000 ppm) REDUCES the oil and filter change interval.
- BEFORE using diesel fuel with sulfur content greater than 2000 mg/kg (2000 ppm), contact your John Deere dealer.

Sulfur Content for Tier 2 and Stage II Engines

- Use of diesel fuel with sulfur content less than 2000 mg/kg (2000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content 2000—5000 mg/kg (2000—5000 ppm) REDUCES the oil and filter change interval.[1]
- BEFORE using diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm), contact your John Deere dealer.

Sulfur Content for Other Engines

- Use of diesel fuel with sulfur content less than 5000 mg/kg (5000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm) REDUCES the oil and filter change interval.

IMPORTANT: Do not mix used diesel engine oil or any other type of lubricating oil with diesel fuel.

Improper fuel additive usage may cause damage on fuel injection equipment of diesel engines.

DX,FUEL1 -19-13JUL20-1/1

Supplemental Diesel Fuel Additives

Diesel fuel can be the source of performance or other operational problems for many reasons. Some causes include poor lubricity, contaminants, low cetane number, and a variety of properties that cause fuel system deposits. These and others are referenced in other sections of this Operator's Manual.

To optimize engine performance and reliability, closely follow recommendations on fuel quality, storage, and handling, which are found elsewhere in this Operator's Manual.

To further aid in maintaining performance and reliability of the engine's fuel system, John Deere has developed a family of fuel additive products for most global markets. The primary products include Fuel-Protect Diesel Fuel Conditioner (full feature conditioner in winter and summer formulas) and Fuel-Protect Keep Clean (fuel injector deposit removal and prevention). Availability of these and other products varies by market. See your local John Deere dealer for availability and additional information about fuel additives that might be right for your needs.

DX,FUEL13 -19-07FEB14-1/1

Lubricity of Diesel Fuel

Most diesel fuels manufactured in the United States, Canada, and the European Union have adequate lubricity to ensure proper operation and durability of fuel injection system components. However, diesel fuels manufactured in some areas of the world may lack the necessary lubricity.

IMPORTANT: Make sure the diesel fuel used in your machine demonstrates good lubricity characteristics.

Fuel lubricity should pass a maximum scar diameter of 0.52 mm as measured by ASTM D6079 or ISO 12156-1. A maximum scar diameter of 0.45 mm is preferred.

If fuel of low or unknown lubricity is used, add John Deere Fuel-Protect Diesel Fuel Conditioner (or equivalent) at the specified concentration.

Lubricity of BioDiesel Fuel

Fuel lubricity can improve significantly with BioDiesel blends up to B20 (20% BioDiesel). Further increase in lubricity is limited for BioDiesel blends greater than B20.

DX,FUEL5 -19-07FEB14-1/1

Handling and Storing Diesel Fuel

CAUTION: Reduce the risk of fire. Handle fuel carefully. DO NOT fill the fuel tank when engine is running. DO NOT smoke while you fill the fuel tank or service the fuel system.

Fill the fuel tank at the end of each day's operation to prevent water condensation and freezing during cold weather.

Keep all storage tanks as full as practical to minimize condensation.

Ensure that all fuel tank caps and covers are installed properly to prevent moisture from entering. Monitor water content of the fuel regularly.

When using biodiesel fuel, the fuel filter may require more frequent replacement due to premature plugging.

Check engine oil level daily prior to starting engine. A rising oil level may indicate fuel dilution of the engine oil.

IMPORTANT: The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

When fuel is stored for an extended period or if there is a slow turnover of fuel, add a fuel conditioner to stabilize the fuel. Keeping the free water drained and treating the bulk fuel storage tank quarterly with a maintenance dose of a biocide will prevent microbial growth. Contact your fuel supplier or John Deere dealer for recommendations.

DX,FUEL4 -19-13JAN18-1/1

Biodiesel Fuel

Biodiesel fuel is comprised of monoalkyl esters of long chain fatty acids derived from vegetable oils or animal fats. Biodiesel blends are biodiesel mixed with petroleum diesel fuel on a volume basis.

Before using fuel containing biodiesel, review the Biodiesel Use Requirements and Recommendations in this Operator's Manual.

Environmental laws and regulations can encourage or prohibit the use of biofuels. Operators should consult with appropriate governmental authorities prior to using biofuels.

John Deere Stage V Engines Operating in the European Union

Where the engine is to be operated within the Union on diesel or non-road gas-oil, a fuel with a FAME content not greater than 8% volume/volume (B8) shall be used.

John Deere Engines with Exhaust Filter Except Stage V Engines Operating in the European Union

Biodiesel blends up to B20 can be used ONLY if the biodiesel (100% biodiesel or B100) meets ASTM D6751, EN 14214, or equivalent specification. Expect a 2% reduction in power and a 3% reduction in fuel economy when using B20.

Biodiesel concentrations above B20 can harm the engine's emission control systems and should not be used. Risks include, but are not limited to, more frequent stationary regeneration, soot accumulation, and increased intervals for ash removal.

John Deere Fuel conditioners or equivalent, which contain detergent and dispersant additives, are required when using biodiesel blends from B10 to B20, and are recommended when using lower biodiesel blends.

John Deere Engines Without Exhaust Filter

Biodiesel blends up to B20 can be used ONLY if the biodiesel (100% biodiesel or B100) meets ASTM D6751, EN 14214, or equivalent specification. Expect a 2% reduction in power and a 3% reduction in fuel economy when using B20.

These John Deere engines can operate on biodiesel blends above B20 (up to 100% biodiesel). Operate at levels above B20 ONLY if the biodiesel is permitted by law and meets the EN 14214 specification (primarily available in Europe). Engines operating on biodiesel blends above B20 might not fully comply with or be permitted by all applicable emissions regulations. Expect up to a 12% reduction in power and an 18% reduction in fuel economy when using 100% biodiesel.

John Deere fuel conditioners or equivalent, which contain detergent and dispersant additives, are required when using biodiesel blends from B10 to B100, and are recommended when using lower biodiesel blends.

Biodiesel Use Requirements and Recommendations

The petroleum diesel portion of all biodiesel blends must meet the requirements of ASTM D975 (US) or EN 590 (EU) commercial standard.

Biodiesel users in the U.S. are strongly encouraged to purchase biodiesel blends from a BQ-9000 Certified Marketer and sourced from a BQ-9000 Accredited Producer (as certified by the National biodiesel Board). Certified Marketers and Accredited Producers can be found at the following website: http://www.bq9000.org.

Biodiesel contains residual ash. Ash levels exceeding the maximums allowed in either ASTM D6751 or EN14214 can result in more rapid ash loading and require more frequent cleaning of the Exhaust Filter (if present).

The fuel filter can require more frequent replacement when using biodiesel fuel, particularly if switching from diesel. Check engine oil level daily prior to starting engine. A rising oil level can indicate fuel dilution of the engine oil. Biodiesel blends up to B20 must be used within 90 days of the date of biodiesel manufacture. Biodiesel blends above B20 must be used within 45 days from the date of biodiesel manufacture.

When using biodiesel blends up to B20, the following must be considered:

- Cold-weather flow degradation
- Stability and storage issues (moisture absorption, microbial growth)
- Possible filter restriction and plugging (usually a problem when first switching to biodiesel on used engines)
- Possible fuel leakage through seals and hoses (primarily an issue with older engines)
- Possible reduction of service life of engine components

Request a certificate of analysis from your fuel distributor to ensure that the fuel is compliant with the specifications provided in this Operator's Manual.

Consult your John Deere dealer for John Deere fuel products to improve storage and performance with biodiesel fuels.

The following must also be considered if using biodiesel blends above B20:

- Possible coking or blocked injector nozzles, resulting in power loss and engine misfire if John Deere fuel additives and conditioners or equivalent containing detergent/dispersants are not used
- Possible crankcase oil dilution (requiring more frequent oil changes)
- Possible lacquering or seizure of internal components
- Possible formation of sludge and sediments
- Possible thermal oxidation of fuel at elevated temperatures

Continued on next page

DX,FUEL7 -19-13JAN18-1/2

- Possible compatibility issues with other materials (including copper, lead, zinc, tin, brass, and bronze) used in fuel handling, distribution, and storage equipment
- Possible reduction in water separator efficiency
- Possible damage to paint if exposed to biodiesel
- Possible corrosion of fuel injection equipment
- Possible elastomeric seal and gasket material degradation (primarily an issue with older engines)
- Possible high acid levels within fuel system
- Because biodiesel blends above B20 contain more ash, using blends above B20 can result in more rapid ash loading and require more frequent cleaning of the Exhaust Filter (if present)

IMPORTANT: Raw pressed vegetable oils are NOT acceptable for use as fuel in any concentration in John Deere engines. Their use could cause engine failure.

DX,FUEL7 -19-13JAN18-2/2

Testing Diesel Fuel

A fuel analysis program can help to monitor the quality of diesel fuel. The fuel analysis can provide critical data such as calculated cetane index, fuel type, sulfur content, water content, appearance, suitability for cold weather operations, bacteria, cloud point, acid number, particulate contamination, and whether the fuel meets ASTM D975 or equivalent specification.

Contact your John Deere dealer for more information on diesel fuel analysis.

DX,FUEL6 -19-13JAN18-1/1

Aviation (Jet) Fuels

Aviation (jet) fuels may be used in jet fuel capable engines with the following restrictions.

Type	Comments
Jet A	Lower viscosity and density than base No. 2-D diesel fuel. Power loss up to 10% can be expected.
Jet A-1	Lower viscosity and density than base No. 2-D diesel fuel. Power loss up to 10% can be expected.
Jet B	**Not Recommended.**Lower density and extremely low viscosity compared to base No. 2-D diesel fuel. Power loss up to 14% can be expected.
JP-4	**Not Recommended.**Lower density and extremely low viscosity compared to base No. 2-D diesel fuel. Power loss up to 12% can be expected.
JP-5	Lower viscosity and density than base No. 2-D diesel fuel. Power loss up to 9% can be expected.
JP-7	Lower viscosity and density than base No. 2-D diesel fuel. Power loss up to 10% can be expected.
JP-8	Lower viscosity and density than base No. 2-D diesel fuel. Power loss up to 10% can be expected.

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Fuel Filters

The importance of fuel filtration cannot be overemphasized with modern fuel systems. The combination of increasingly restrictive emission regulations and more efficient engines requires fuel system to operate at much higher pressures. Higher pressures can only be achieved using fuel injection components with very close tolerances. These close manufacturing tolerances have significantly reduced capacities for debris and water.

John Deere brand fuel filters have been designed and produced specifically for John Deere engines.

To protect the engine from debris and water, always change engine fuel filters as specified in this manual.

DX,FILT2 -19-14APR11-1/1

Minimizing the Effect of Cold Weather on Diesel Engines

John Deere diesel engines are designed to operate effectively in cold weather.

However, for effective starting and cold-weather operation, a little extra care is necessary. The following information outlines steps that can minimize the effect that cold weather may have on starting and operation of your engine. See your John Deere dealer for additional information and local availability of cold-weather aids.

Use Winter Grade Fuel

When temperatures fall below 0°C (32°F), winter grade fuel (No. 1-D in North America) is best suited for cold-weather operation. Winter grade fuel has a lower cloud point and a lower pour point.

Cloud point is the temperature at which wax begins to form in the fuel. This wax causes fuel filters to plug. **Pour point** is the lowest temperature at which movement of the fuel is observed.

NOTE: On average, winter grade diesel fuel has a lower Btu (heat content) rating. Using winter grade fuel may reduce power and fuel efficiency, but should not cause any other engine performance effects. Check the grade of fuel being used before troubleshooting for low-power complaints in cold-weather operation.

Air Intake Heater

An air intake heater is an available option for some engines to aid cold weather starting.

Ether

An ether port on the intake is available to aid cold weather starting.

CAUTION: Ether is highly flammable. Do not use ether when starting an engine equipped with glow plugs or an air intake heater.

Coolant Heater

An engine block heater (coolant heater) is an available option to aid cold weather starting.

Seasonal Viscosity Oil and Proper Coolant Concentration

Use seasonal grade viscosity engine oil based on the expected air temperature range between oil changes and a proper concentration of low silicate antifreeze as recommended. (See DIESEL ENGINE OIL and ENGINE COOLANT requirements in this section.)

Diesel Fuel Cold Flow Additive

Use John Deere Fuel-Protect Diesel Fuel Conditioner (winter formula), which contains anti-gel chemistry, or equivalent fuel conditioner to treat non-winter grade fuel (No. 2-D in North America) during the cold-weather season. This generally extends operability to about 10°C (18°F) below the fuel cloud point. For operability at even lower temperatures, use winter grade fuel.

IMPORTANT: Treat fuel when outside temperature drops below 0°C (32°F). For best results, use with untreated fuel. Follow all recommended instructions on label.

Biodiesel

When operating with biodiesel blends, wax formation can occur at warmer temperatures. Begin using John Deere Fuel-Protect Diesel Fuel Conditioner (winter formula) or equivalent at 5°C (41°F) to treat biodiesel fuels during the cold-weather season. Use B5 or lower blends at temperatures below 0°C (32°F). Use only winter grade petroleum diesel fuel at temperatures below -10°C (14°F).

Winterfronts

Use of fabric, cardboard, or solid winterfronts is not recommended with any John Deere engine. Their use can result in excessive engine coolant, oil, and charge air temperatures. This can lead to reduced engine life, loss of power and poor fuel economy. Winterfronts may also put abnormal stress on fan and fan drive components potentially causing premature failures.

If winterfronts are used, they should never totally close off the grill frontal area. Approximately 25% area in the center of the grill should remain open at all times. At no time should the air blockage device be applied directly to the radiator core.

Radiator Shutters

If equipped with a thermostatically controlled radiator shutter system, this system should be regulated in such a way that the shutters are completely open by the time the coolant reaches 93°C (200°F) to prevent excessive intake manifold temperatures. Manually controlled systems are not recommended.

If air-to-air aftercooling is used, the shutters must be completely open by the time the intake manifold air temperature reaches the maximum allowable temperature out of the charge air cooler.

For more information, see your John Deere dealer.

DX,FUEL10 -19-13JAN18-1/1

Diesel Engine Break-In Oil — Non-Emissions Certified and Certified Tier 1, Tier 2, Tier 3, Stage I, Stage II, and Stage III

New engines are filled at the factory with either John Deere Break-In™ or John Deere Break-In Plus™ Engine Oil. During the break-in period, add John Deere Break-In™ or Break-In Plus™ Engine Oil, respectively, as needed to maintain the specified oil level.

Operate the engine under various conditions, particularly heavy loads with minimal idling, to help seat engine components properly.

If John Deere Break-In™ Engine Oil is used during the initial operation of a new or rebuilt engine, change the oil and filter at a maximum of 100 hours.

If John Deere Break-In Plus™ Engine Oil is used, change the oil and filter at a minimum of 100 hours and a maximum equal to the interval specified for John Deere Plus-50™ II or Plus-50™ oil.

After engine overhaul, fill the engine with either John Deere Break-In™ or Break-In Plus™ Engine Oil.

If John Deere Break-In™ or Break-In Plus™ Engine Oil is not available, use an SAE 10W-30 viscosity grade diesel engine oil meeting one of the following and change the oil and filter at a maximum of 100 hours of operation:

- API Service Classification CE
- API Service Classification CD
- API Service Classification CC
- ACEA Oil Sequence E2

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Break-In Plus is a trademark of Deere & Company
Plus-50 is a trademark of Deere & Company.

- ACEA Oil Sequence E1

IMPORTANT: Do not use Plus-50™ II, Plus-50™, or engine oils meeting any of the following for the initial break-in of a new or rebuilt engine:

API CK-4	**ACEA E9**
API CJ-4	**ACEA E7**
API CI-4 PLUS	**ACEA E6**
API CI-4	**ACEA E5**
API CH-4	**ACEA E4**
API CG-4	**ACEA E3**
API CF-4	
API CF-2	
API CF	

These oils do not allow the engine to break in properly.

John Deere Break-In Plus™ Engine Oil can be used for all John Deere diesel engines at all emission certification levels.

After the break-in period, use John Deere Plus-50™ II, John Deere Plus-50™, or other diesel engine oil as recommended in this manual.

DX,ENOIL4 -19-02NOV16-1/1

Diesel Engine Oil — Tier 3 and Stage IIIA

Failure to follow applicable oil standards and drain intervals can result in severe engine damage that might not be covered under warranty. Warranties, including the emissions warranty, are not conditioned on the use of John Deere oils, parts, or service.

Use oil viscosity based on the expected air temperature range during the period between oil changes.

John Deere Plus-50™ II oil is preferred.

John Deere Plus-50™ is also recommended.

John Deere Torq-Gard™ is also allowed.

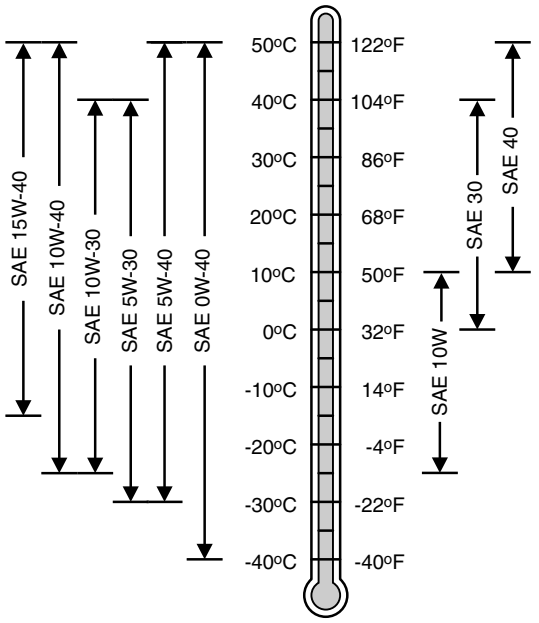
Other oils may be used if they meet one or more of the following standards:

- API Service Category CK-4
- API Service Category CJ-4
- API Service Category CI-4 PLUS
- API Service Category CI-4
- ACEA Oil Sequence E9
- ACEA Oil Sequence E7
- ACEA Oil Sequence E6
- ACEA Oil Sequence E5
- ACEA Oil Sequence E4

Multi-viscosity diesel engine oils are preferred.

Diesel fuel quality and fuel sulfur content must comply with all existing emissions regulations for the area in which the engine operates.

Plus-50 is a trademark of Deere & Company
Torq-Gard is a trademark of Deere & Company



Oil Viscosities for Air Temperature Ranges

DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

DX,ENOIL11 -19-23APR19-1/1

Engine Oil and Filter Service Intervals — Tier 3 and Stage IIIA — OEM Applications

Recommended oil and filter service intervals are based on a combination of oil pan capacity, type of engine oil and filter used, and sulfur content of the diesel fuel. Actual service intervals also depend on operation and maintenance practices.

Approved Oil Types:

- "Plus-50 Oils" include John Deere Plus-50™ II and John Deere Plus-50™
- "Other Oils" include John Deere Torq-Gard™, API CK-4, API CJ-4, API CI-4 PLUS, API CI-4, ACEA E9, ACEA E7, ACEA E6, ACEA E5, and ACEA E4

Use oil analysis to evaluate the condition of the oil and to aid in selection of the proper oil and filter service interval. Contact your John Deere dealer or other qualified service provider for more information on engine oil analysis.

Change the oil and oil filter at least once every 12 months even if the hours of operation are fewer than the otherwise recommended service interval.

Diesel fuel sulfur content affects engine oil and filter service intervals.

- Use of diesel fuel with sulfur content less than 1000 mg/kg (1000 ppm) is RECOMMENDED
- Use of diesel fuel with sulfur content 1000—2000 mg/kg (1000—2000 ppm) REDUCES the oil and filter service interval
- BEFORE using diesel fuel with sulfur content greater than 2000 mg/kg (2000 ppm), contact your John Deere dealer or qualified service provider
- DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm)

NOTE: The 500-hour extended oil and filter change interval is only allowed if all of the following conditions are met:

- *Engine equipped with an extended drain interval oil pan*
- *Use of diesel fuel with sulfur content less than 2000 mg/kg (2000 ppm) for PowerTech™ Plus engines or 5000 mg/kg (5000 ppm) for PowerTech™ engine*
- *Use of John Deere Plus-50™ II or John Deere Plus-50™ oil*
- *Use of an approved John Deere oil filter*

IMPORTANT: To avoid engine damage:

- **Reduce oil and filter service intervals by 50% when using biodiesel blends greater than B20. Oil analysis may allow longer service intervals**
- **Use only approved oil types**

	Tier 3 and Stage IIIA —PowerTech™ Plus				Tier 3 and Stage IIIA —PowerTech™		
	Oil Pan Size (L/kW)				Oil Pan Size (L/kW)		
Oil pan capacity	Greater than or equal to 0.10	Greater than or equal to 0.12	Greater than or equal to 0.14	Greater than or equal to 0.22	Greater than or equal to 0.10	Greater than or equal to 0.12	Greater than or equal to 0.14
Fuel Sulfur	Less than 1000 mg/kg (1000 ppm)				Less than 1000 mg/kg (1000 ppm)		
Plus-50 Oils	375 hours	500 hours	500 hours	500 hours	375 hours	500 hours	500 hours
Other Oils	250 hours	250 hours	250 hours	250 hours	250 hours	250 hours	250 hours
Fuel Sulfur	1000—2000 mg/kg (1000—2000 ppm)				1000—2000 mg/kg (1000—2000 ppm)		
Plus-50 Oils	300 hours	300 hours	500 hours	500 hours	300 hours	400 hours	500 hours
Other Oils	200 hours	200 hours	250 hours	250 hours	200 hours	200 hours	250 hours
Fuel Sulfur	2000—5000 mg/kg (2000—5000 ppm)				2000—5000 mg/kg (2000—5000 ppm)		
Plus-50 Oils	Not Recommended Contact John Deere dealer (dealer refers to DTAC solution)				275 hours	350 hours	500 hours
Other Oils	Not Recommended Contact John Deere dealer (dealer refers to DTAC solution)				150 hours	175 hours	250 hours
Fuel Sulfur	5000—10 000 mg/kg (5000—10 000 ppm)				5000—10 000 mg/kg (5000—10000 ppm)		
Plus-50 Oils	Not Recommended Contact John Deere dealer (dealer refers to DTAC solution)				187 hours	250 hours	250 hours
Other Oils	Not Recommended Contact John Deere dealer (dealer refers to DTAC solution)				125 hours	125 hours	125 hours
Oil analysis may extend the service interval of "Other Oils", to a maximum not to exceed the interval for Plus-50 Oils. Oil analysis means taking a series of oil samples at 50-hour increments beyond the normal service interval until either the data indicates the end of useful oil life or the maximum service interval of John Deere Plus-50 oils is reached.							

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DX,ENOIL13,T3,OEM -19-13JAN18-1/2

Torq-Gard is a trademark of Deere & Company
PowerTech is a trademark of Deere & Company

DX,ENOIL13,T3,OEM -19-13JAN18-2/2

Diesel Engine Oil and Filter Service Intervals

6090HF485 (9.0 L) Engine Oil and Filter Service Intervals in Hours of Operation											
Power Rating		**Oil Pan Option Codes**									
kW (hp)	**Fuel Sulfur Content [a]**	**1909**		**1915**		**1914**		**1916**		**1911**	
		Interval		**Interval**		**Interval**		**Interval**		**Interval**	
		Other Oils	**Plus-50 Oils**	**Other Oils**	**Plus-50 Oils**	**Other Oils**	**Plus-50 Oils**	**Other Oils**	**Plus-50 Oils**	**Other Oils**	**Plus-50 Oils**
168-187 (225-250)	Less Than 0.10% (1000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.20% - 0.50% (2000 - 5000 ppm)	200	300	200	300	200	300	200	300	200	300
205 (275)	Less Than 0.10% (1000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	250	500	250	500	250	500
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	200	300	200	300	200	300
224-229 (300-307)	Less Than 0.10% (1000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	200	300	250	500	250	500
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	150	250	200	300	200	300
242 (325)	Less Than 0.10% (1000 ppm)	250	375	250	375	250	500	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	200	300	250	500	250	500
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	150	250	200	300	200	300
258 (346)	Less Than 0.10% (1000 ppm)	250	375	250	375	250	375	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	200	300	250	500	200	300
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	150	250	200	300	150	250
261-287 (350-385)	Less Than 0.10% (1000 ppm)	250	375	250	375	250	375	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	200	300	200	300	200	300
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	150	250	150	250	150	250
298 (400)	Less Than 0.10% (1000 ppm)	250	375	250	375	250	375	250	500	250	375
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	200	300	200	300	200	300
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	150	250	150	250	150	250
315 (422)	Less Than 0.10% (1000 ppm)	250	375	250	375	250	375	250	375	250	375
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300	200	300	200	300	200	300
	0.20% - 0.50% (2000 - 5000 ppm)	150	250	150	250	150	250	150	250	150	250
Perform engine oil analysis to determine the actual extended service life of ACEA E7 and ACEA E6 oils.											

[a] BEFORE using diesel fuel with sulfur content greater than 0.50% (5000 ppm), contact your John Deere dealer. (Dealer to reference DTAC Solution 73203)

6090HF484 (9.0 L) Engine Oil and Filter Service Intervals in Hours of Operation					
Power Rating					
kW (hp)	**Fuel Sulfur Content**	**1916**		**1911**	
		Interval		**Interval**	
		Other Oils	**Plus-50 Oils**	**Other Oils**	**Plus-50 Oils**
229 (307)	Less Than 0.10% (1000 ppm)	250	500	250	500

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6090HF484 (9.0 L) Engine Oil and Filter Service Intervals in Hours of Operation					
Power Rating					
kW (hp)	**Fuel Sulfur Content**	**1916**		**1911**	
		Interval		**Interval**	
	0.10% - 0.20% (1000 - 2000 ppm)	250	500	250	500
	0.20% - 0.50% (2000 - 5000 ppm)	250	500	250	500
	0.50% - 1.00% (5000 - 10000 ppm)	125	250	125	250
258 (346)	Less Than 0.10% (1000 ppm)	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	250	500	200	400
	0.20% - 0.50% (2000 - 5000 ppm)	250	500	175	350
	0.50% - 1.00% (5000 - 10000 ppm)	125	250	125	250
287 (385)	Less Than 0.10% (1000 ppm)	250	500	250	500
	0.10% - 0.20% (1000 - 2000 ppm)	200	400	200	400
	0.20% - 0.50% (2000 - 5000 ppm)	175	350	175	350
	0.50% - 1.00% (5000 - 10000 ppm)	125	250	125	250
315 (422)	Less Than 0.10% (1000 ppm)	250	375	250	375
	0.10% - 0.20% (1000 - 2000 ppm)	200	300	200	300
	0.20% - 0.50% (2000 - 5000 ppm)	150	275	150	275
	0.50% - 1.00% (5000 - 10000 ppm)	125	187	125	187
Perform engine oil analysis to determine the actual extended service life of ACEA E7 and ACEA E6 oils.					

DN28805,0001E70 -19-05MAR14-2/2

Engine Oil and Filter Service Intervals (Jet Fuel Capable Engines Only)

The oil and filter service interval information in the following chart should be used as a guideline. Actual service intervals depend on operation and maintenance practices. Use oil analysis to determine the actual useful life of the oil and to aid in selection of the proper oil and filter service interval. Oil and filter service intervals are based on a combination of oil pan capacity, type of engine oil and filter used, and sulfur content of the fuel.

6090HF485 (9.0 L) Engine Oil and Filter Service Intervals in Hours of Operation

Power Rating		Oil Pan Option Codes									
kW (hp)	Fuel Sulfur Content [a]	1909		1915		1914		1916		1911	
		Interval		Interval		Interval		Interval		Interval	
		Other Oils	Plus-50 Oils	Other Oils	Plus-50 Oils	Other Oils	Plus-50 Oils	Other Oils	Plus-50 Oils	Other Oils	Plus-50 Oils
212 (285)	Aviation (Jet) Fuels	250	250	250	250	250	250	250	250	250	250
	Less Than 0.10% (1000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.10% - 0.20% (1000—2000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.20% - 0.50% (2000—5000 ppm)	200	300	200	300	200	300	200	300	200	300
269 (359)	Aviation (Jet) Fuels	250	250	250	250	250	250	250	250	250	250
	Less Than 0.10% (1000 ppm)	250	500	250	500	250	500	250	500	250	500
	0.10% - 0.20% (1000—2000 ppm)	200	300	200	300	250	500	250	500	250	500
	0.20% - 0.50% (2000—5000 ppm)	150	250	150	250	200	300	200	300	200	300
Perform engine oil analysis to determine the actual extended service life of ACEA E7 and ACEA E6 oils.											

[a] BEFORE using diesel fuel with sulfur content greater than 0.50% (5000 ppm), contact your John Deere dealer. (Dealer to reference DTAC Solution 73203)

DN28805,0001E6F -19-06MAR14-1/1

Mixing of Lubricants

In general, avoid mixing different brands or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements.

Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

Consult your John Deere dealer to obtain specific information and recommendations.

DX,LUBMIX -19-18MAR96-1/1

Alternative and Synthetic Lubricants

Conditions in certain geographical areas may require lubricant recommendations different from those printed in this manual.

Some John Deere brand coolants and lubricants may not be available in your location.

Consult your John Deere dealer to obtain information and recommendations.

Synthetic lubricants may be used if they meet the performance requirements as shown in this manual.

The temperature limits and service intervals shown in this manual apply to John Deere branded fluids or fluids that have been tested and/or approved for use in John Deere equipment.

Re-refined base stock products may be used if the finished lubricant meets the performance requirements.

DX,ALTER -19-13JAN18-1/1

Lubricant Storage

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

DX,LUBST -19-11APR11-1/1

Oil Filters

Filtration of oils is critical to proper operation and lubrication.

Always change filters regularly as specified in this manual.

Use filters meeting John Deere performance specifications.

DX,FILT -19-18MAR96-1/1

Diesel Engine Coolant (engine with wet sleeve cylinder liners)

Failure to follow applicable coolant standards and drain intervals can result in severe engine damage that may not be covered under warranty. Warranties, including the emissions warranty, are not conditioned on the use of John Deere coolants, parts, or service.

Preferred Coolants

The following pre-mix engine coolants are preferred:

- **John Deere COOL-GARD™II**
- **John Deere COOL-GARD II PG**

COOL-GARD II pre-mix coolant is available in several concentrations with different freeze protection limits as shown in the following table.

COOL-GARD II Pre-Mix	Freeze Protection Limit
COOL-GARD II 20/80	-9°C (16°F)
COOL-GARD II 30/70	-16°C (3°F)
COOL-GARD II 50/50	-37°C (-34°F)
COOL-GARD II 55/45	-45°C (-49°F)
COOL-GARD II PG 60/40	-49°C (-56°F)
COOL-GARD II 60/40	-52°C (-62°F)

Not all COOL-GARD II pre-mix products are available in all countries.

Use COOL-GARD II PG when a non-toxic coolant formulation is required.

Additional Recommended Coolants

The following engine coolant is also recommended:

- John Deere COOL-GARD II Concentrate in a 40—60% mixture of concentrate with quality water.

IMPORTANT: When mixing coolant concentrate with water, do not use less than 40% or greater than 60% concentration of coolant. Less than 40% gives inadequate additives for corrosion protection. Greater than 60% can result in coolant gelation and cooling system problems.

Other Coolants

Other ethylene glycol or propylene glycol base coolants may be used if they meet the following specification:

- Pre-mix coolant meeting ASTM D6210 requirements
- Is formulated with a 2-ethylhexanoic acid (2-EHA) free additive package
- Coolant concentrate meeting ASTM D6210 requirements in a 40—60% mixture of concentrate with quality water

If coolant meeting one of these specifications is unavailable, use a coolant concentrate or pre-mix coolant that has a minimum of the following chemical and physical properties:

- Provides cylinder liner cavitation protection according to either the John Deere Cavitation Test Method or a fleet study run at or above 60% load capacity
- Is formulated with a nitrite-free additive package
- Is formulated with a 2-ethylhexanoic acid (2-EHA) free additive package
- Protects the cooling system metals (cast iron, aluminum alloys, and copper alloys such as brass) from corrosion

Water Quality

Water quality is important to the performance of the cooling system. Deionized or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

Coolant Drain Intervals

Drain and flush the cooling system and refill with fresh coolant at the indicated interval, which varies with the coolant used.

When COOL-GARD II or COOL-GARD II PG is used, the drain interval is 6 years or 6000 hours of operation.

If a coolant other than COOL-GARD II or COOL-GARD II PG is used, reduce the drain interval to 2 years or 2000 hours of operation.[1]

IMPORTANT: Do not use cooling system sealing additives or antifreeze that contains sealing additives.

Do not mix ethylene glycol and propylene glycol base coolants.

Do not use coolants that contain nitrites.

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[1]Coolant analysis may extend the service interval of other "Coolants" to a maximum not to exceed the interval of Cool-Gard II coolants. Coolant analysis means taking a series of coolant samples at 1000 hour increments beyond the normal service interval until either the data indicate the end of useful coolant life or the maximum service interval of Cool-Gard II is reached.

DX,COOL3 -19-25AUG20-1/1

Water Quality for Mixing with Coolant Concentrate

Engine coolants are a combination of three chemical components: ethylene glycol (EG) or propylene glycol (PG) antifreeze, inhibiting coolant additives, and quality water.

Water quality is important to the performance of the cooling system. Deionized or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

All water used in the cooling system should meet the following minimum specifications for quality:

Chlorides	<40 mg/L
Sulfates	<100 mg/L
Total solids	<340 mg/L
Total dissolved I hardness	<170 mg/L
pH	5.5—9.0

IMPORTANT: Do not use bottled drinking water because it often contains higher concentrations of total dissolved solids.

Freeze Protection

The relative concentrations of glycol and water in the engine coolant determine its freeze protection limit.

Ethylene Glycol	Freeze Protection Limit
40%	-24°C (-12°F)
50%	-37°C (-34°F)
60%	-52°C (-62°F)
Propylene Glycol	**Freeze Protection Limit**
40%	-21°C (-6°F)
50%	-33°C (-27°F)
60%	-49°C (-56°F)

DO NOT use a coolant-water mixture greater than 60% ethylene glycol or 60% propylene glycol.

DX,COOL19 -19-13JAN18-1/1

Operating in Warm Temperature Climates

John Deere engines are designed to operate using recommended engine coolants.

Always use a recommended engine coolant, even when operating in geographical areas where freeze protection is not required.

IMPORTANT: Water may be used as coolant *in emergency situations only.*

Foaming, hot surface aluminum and iron corrosion, scaling, and cavitation occur when water is used as the coolant, even when coolant conditioners are added.

Drain cooling system and refill with recommended engine coolant as soon as possible.

DX,COOL6 -19-17FEB20-1/1

Testing Coolant Freeze Point

The use of a handheld coolant refractometer is the quickest, easiest, and most accurate method to determine coolant freeze point. This method is more accurate than a test strip or a float-type hydrometer which can produce poor results.

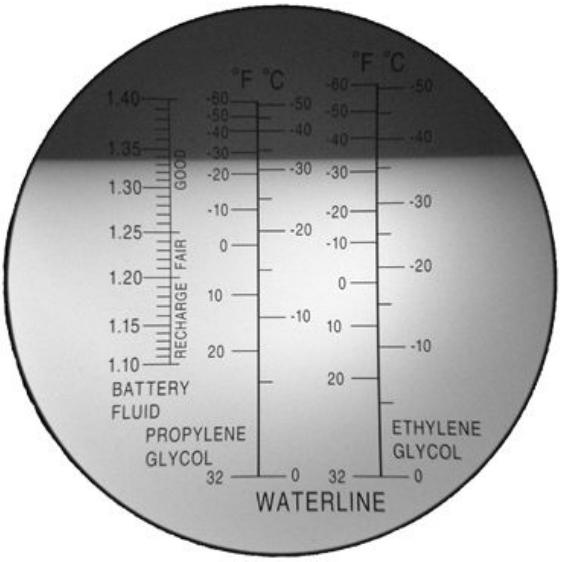
A coolant refractometer is available through your John Deere dealer under the SERVICEGARD™ tool program. Part number 75240 provides an economical solution to accurate freeze point determination in the field.

To use this tool:

1. Allow cooling system to cool to ambient temperatures.
2. Open radiator cap to expose coolant.
3. With the included dropper, collect a small coolant sample.
4. Open the lid of the refractometer, place one drop of coolant on the window and close the lid.
5. Look through the eyepiece and focus as necessary.
6. Record the listed freeze point for the type of coolant (ethylene glycol coolant or propylene glycol) being tested.

TS1732 —UN—04SEP13

SERVICEGARD™ Part Number 75240



TS1733 —UN—04SEP13

Image with a Drop of 50/50 Coolant Placed on the Refractometer Window

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DX,COOL,TEST -19-13JUN13-1/1

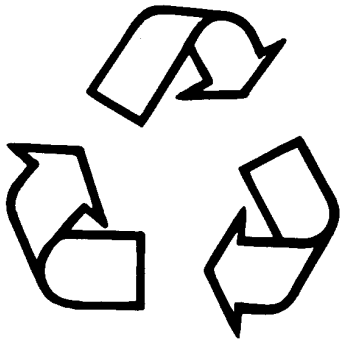
Disposing of Coolant

Improperly disposing of engine coolant can threaten the environment and ecology.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere engine distributor or servicing dealer.



TS1133 —UN—15APR13

Recycle Waste

RG,RG34710,7543 -19-26APR18-1/1

PV101 Instrument Panels

Interim tier 4 / Stage III B John Deere PowerTech OEM Engines have an electronic control system, which has the following controls and gauges as shown. The following information applies only to those controls and gauges supplied by John Deere. Refer to your engine application manual for specific guidelines if John Deere-sourced controls and instrumentation are not used.

NOTE: This manual only covers operation of engine with a John Deere control system.

Following is a brief description of the available optional electronic controls and gauges found on John Deere provided instrument panels. Refer to manufacturer's literature for information on controls not provided by Deere.

A—Diagnostic Gauge/Hour Meter

The diagnostic gauge (A) displays diagnostic trouble codes (DTCs) as they are accessed. Other information on the engine can be accessed using the touch keys (N, O, and P). The hour meter feature shows the operating hours of the engine and should be used as a guide for scheduling periodic maintenance. If the diagnostic gauge receives a trouble code from an engine control unit, the current display will switch to a warning or shutdown (depending on the severity of the code) screen that will display the trouble code number, the description of the code and the corrective action needed.

B—Tachometer

The tachometer (B) indicates engine speed in hundreds of revolutions per minute (rpm).**C—Voltmeter (Optional)**

The voltmeter (C) indicates system battery voltage. The amber "Warning" light (Q) will illuminate when battery voltage is too low for proper operation of the fuel injection system.

D—Audible Alarm (Optional)

The audible alarm (D) will sound whenever low oil pressure, high coolant temperature, or water-in-fuel conditions exist. This includes all signals that light up the amber "WARNING" indicator (intermittent alarm) or the red "STOP ENGINE" indicator (steady alarm).

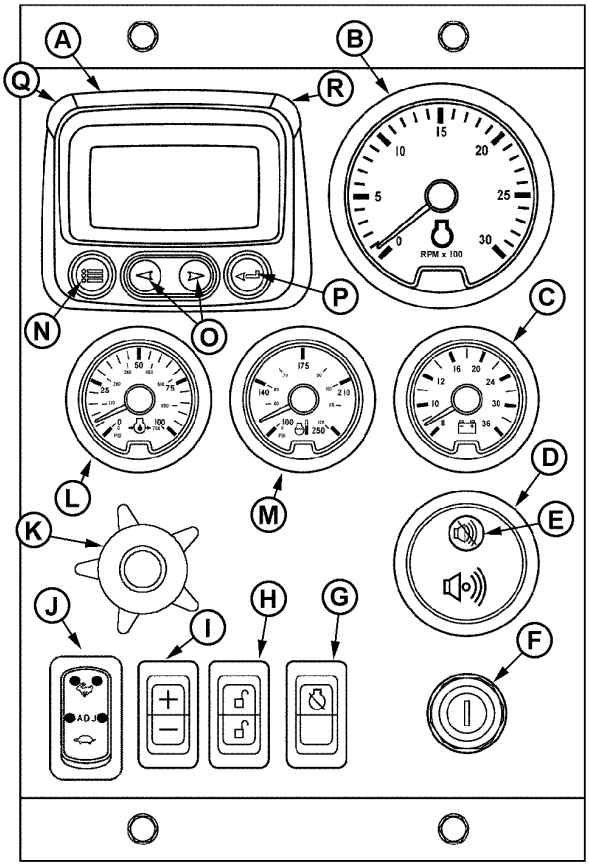
E—Audible Alarm Override Button

The optional audible alarm has an override button (E) that silences the audible alarm for approximately two minutes when pressed.

F—Key Start Switch

The three-position key start switch (F) controls the engine electrical system. From the "OFF" position when the key switch is turned clockwise to "START", the engine will crank. When the engine starts, the key is released and returns to the "ON" (RUN) position.

G—Override Shutdown Rocker Switch



RG13276 —UN—28OCT03

Full-Featured Instrument Panel

A—Diagnostic Gauge/Hour Meter
B—Tachometer
C—Voltmeter (Optional)
D—Audible Alarm (Optional)
E—Audible Alarm Override Button
F—Key Switch
G—Override Shutdown Rocker Switch
H—Bump Enable Rocker Switch
I— Speed Select Rocker Switch
J— High-Low Speed Select Rocker Switch
K—Analog Throttle Control (Optional)
L— Oil Pressure Gauge
M—Coolant Temperature Gauge
N—Menu Key
O—Arrow Key (2 used)
P—Enter Key
Q—Amber "WARNING" Indicator Light
R—Red "STOP ENGINE" Indicator Light

Switch will be present, but may not be active, depending on engine control unit (ECU) options originally selected. If switch is active, pressing the upper half of the override shutdown switch (G) will override an engine shutdown signal. The switch must be pressed within 30 seconds to prevent undesired shutdown of engine. Pressing this switch will override the ECU engine shutdown command for 30 seconds at a time to move vehicle to a safe location.

H—Bump Speed Enable Rocker Switch

Continued on next page

This is a three-position switch (H) with the center position as “OFF” (locked). With this switch in the “OFF” position, the speed select switch (I) is also locked, to prevent accidental changes in operating speed. Pressing upper or lower half of switch (H) will unlock or enable the bump speed switch to take effect using speed select switch (I).

I—Speed Select Rocker Switch

The speed select switch (I) is used to bump engine speed up (+) or down (-) in small increments during operation. This switch must be used with the bump speed enable switch (H) in the unlocked position (top or bottom half of button depressed).

J—High-Low Speed Select Rocker Switch

The high-low speed select switch (J) is used to set the engine operating speeds at slow (turtle) or fast (rabbit). Factory preset idle speeds can also be adjusted using bump speed enable switch (H) with speed select switch (I).

The basic instrument panel will have the high-low speed select switch only. Press and hold up (+) or down (-) to adjust engine speed as desired. The engine speed selected will not be held in the memory. To adjust engine speeds, See Changing Engine Speeds in Section 20.

How To Select Preset Operating Speeds (Bump Speeds)

First select “Turtle” (slow) or “Adj” by pressing speed select switch (J) to “Turtle” (slow) or “Adj”(center). Then you can press either the upper or lower portion of the bump speed enable switch (H) to unlock the setting. The bump speed enable must be held down as the speed select switch (J) is used to change the setting by pressing (+) to increase speed or (-) to decrease speed.

Once the slow idle speed has been set, the bump speed enable **switch must be pressed and released three times within two seconds to commit the new operating speed to memory.** If not done, the engine's new speed will only be effective until the key switch is shut off. Then the speed will revert back to the previous setting.

The fast idle speed is not adjustable. It will always go back to the factory preset fast idle speed.

K—Analog Throttle Control (Optional)

The throttle control (K) is used to control engine speed. This control is available only on engines with analog throttle.

L—Engine Oil Pressure Gauge

The oil pressure gauge (L) indicates engine oil pressure. An audible alarm (D) warns the operator if engine oil pressure falls below a safe operating pressure.

M—Engine Coolant Temperature Gauge

The engine coolant temperature gauge (M) indicates engine coolant temperature. An audible alarm (D) warns the operator if coolant temperature rises above the preset safe operating temperature.

N—Menu Key

The menu key is pressed to either enter or exit the menu screens on the diagnostic gauge (A).

O—Arrow Keys

Use the arrow keys (O) to change the display on the window of the diagnostic gauge (A) and to access engine performance data.

Pressing the left arrow to scroll to the left or upward or the right arrow to scroll to the right or downward. This will allow you to view various engine parameters and any diagnostic trouble codes that occur.

Refer to the following procedure for accessing engine information on the diagnostic gauge using the touch keys.

P—Enter Key

The enter key (P) is pressed to select the parameter that is highlighted on the screen.

Q—Amber “WARNING” Indicator Light

When light is illuminated, an abnormal condition exists. It is not necessary to shut down the engine immediately, but the problem should be corrected as soon as possible.

R—Red “STOP ENGINE” Indicator Light

When light is illuminated, stop engine immediately or as soon as safely possible to prevent engine damage. Correct problem before restarting.

JR74534,00002C7 -19-16AUG21-2/2

PV101 Diagnostic Gauge — Using

The diagnostic gauge (A) allows the operator to monitor engine functions, view diagnostic trouble codes (DTCs), and perform preliminary diagnostics. The gauge is linked to the electronic control system and sensors.

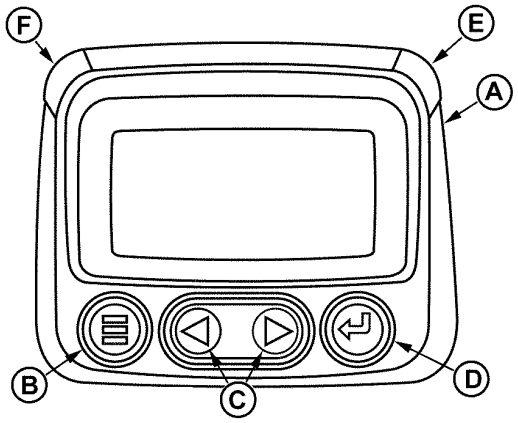
The menu key (B) allows the operator to access the main menu of the diagnostic gauge. For more information see PV101 Diagnostic Gauge — Main Menu in Section 15. This key also allows the operator to cancel an option and go back to the previous menu or home menu.

The arrow keys (C) allows the operator to scroll between menu items. The arrow keys automatically change from up and down, to left and right depending on the menu item to be selected.

The enter key (D) allows the operator to access menu items selected by the arrow keys (C) and confirm changes made by the operator.

The red “STOP ENGINE” indicator light (E) allows the operator to visually see when a condition exists which requires immediate operator action and service.

The amber “WARNING” indicator light (F) allows the operator to visually see when a condition exists which requires operator action.



RG13132 —UN—09SEP03

Diagnostic Gauge

A—Diagnostic Gauge
B—Menu Key
C—Arrow Keys
D—Enter Key
E—Red “STOP ENGINE” Indicator Light
F—Amber “WARNING” Indicator Light

BL90236,000002A -19-16AUG21-1/1

PV101 Diagnostic Gauge — Main Menu

NOTE: The engine does not need to be running to navigate the diagnostic gauge screens.

The main menu is the starting point in accessing engine information and configuring the diagnostic gauge. Press the menu key (B) to access the main menu.

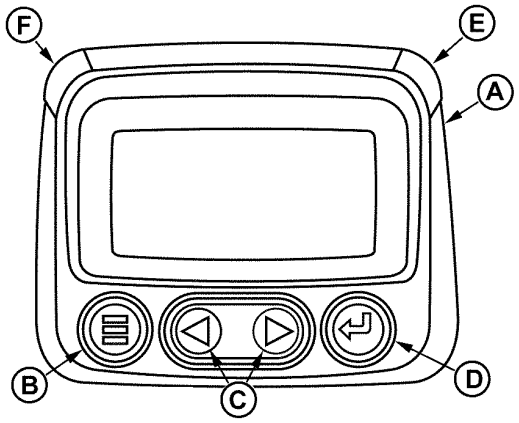
Use the arrow keys (C) and enter key (D) to view menu items displayed:

- Go to 4-up dislpay
- Exhaust filter
- Engine speed control
- Languages
- Stored codes
- Engine configuration
- Setup 1-up display
- Setup 4-up display
- Select units
- Adjust backlight
- Adjust contrast
- Utilities

Listed are examples of features available in main menu items.

In Utilities:

- Gauge data
- Remove all gauges
- Software version
- Modbus setup
- Fault conversion
- Select engine ECU
- Clear machine hours
- Performance data
- Interactive tests
- Reset trip
- Set function instance
- ECU software update



RG13132 —UN—09SEP03

Diagnostic Gauge

A—Diagnostic Gauge
B—Menu Key
C—Arrow Key (2 used)
D—Enter Key
E—Red "STOP ENGINE" Indicator Light
F—Amber "WARNING" Indicator Light

JR74534,00002C8 -19-16AUG21-1/1

PV101 Diagnostic Gauge — Essential Menus

Automatic Exhaust Filter Cleaning

To enable auto exhaust filter cleaning mode:
1. Press menu key on diagnostic gauge
2. Press arrow keys to scroll up or down to EXHAUST FILTER
3. Press select key
4. Press arrow keys to scroll up or down to AUTO EXH FLT CLEAN
5. Press select key to enable auto exhaust filter cleaning

Manual/Parked Exhaust Filter Cleaning

To request a manual/parked exhaust filter cleaning:
1. Reduce engine speed to slow idle
2. Press menu key
3. Press arrow keys to scroll up or down to EXHAUST FILTER
4. Press select key
5. Press arrow keys to scroll up or down to REQUEST EXH FLT CLEAN
6. Press select key to request a manual/parked exhaust filter cleaning
7. Follow directions on display and ensure all conditions are met
8. Press select key to CONFIRM all conditions are met

Disable Exhaust Filter Cleaning

To disable the auto exhaust filter cleaning mode:
1. Press menu key on diagnostic gauge
2. Press arrow keys to scroll up or down to EXHAUST FILTER
3. Press select key
4. Press arrow keys to scroll up or down to DISABLE EXH FLT CLEAN
5. Press select key to disable exhaust filter cleaning

Fault Codes — Active

To view active fault code information:
1. Press menu key on diagnostic gauge
2. Press arrow keys to scroll up or down to FAULTS
3. Press select key
4. Press arrow keys to scroll up or down to ACTIVE FAULTS
5. Press select key
6. Press arrow keys to scroll through available faults

Fault Codes — Stored

To view stored fault code information:
1. Press menu key on diagnostic gauge
2. Press arrow keys to scroll up or down to FAULTS
3. Press select key
4. Press arrow keys to scroll up or down to STORED FAULTS
5. Press select key
6. Press arrow keys to scroll up or down to VIEW
7. Press select key
8. Press arrow keys to scroll through available faults

BL90236,0000025 -19-02JUN16-1/1

DG14 Diagnostic Gauge — Using

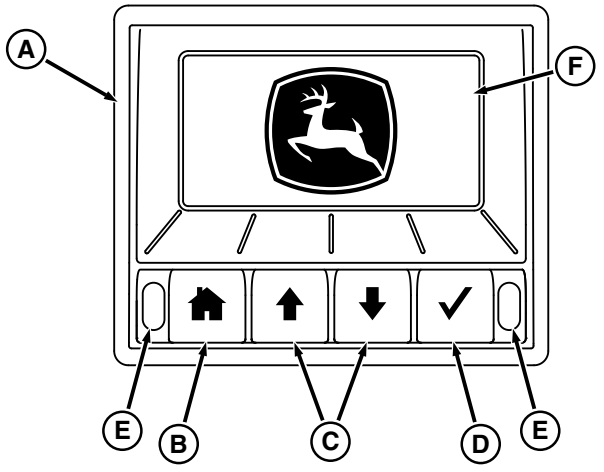
The diagnostic gauge (A) allows the operator to monitor engine functions, view diagnostic trouble codes (DTCs), and perform preliminary diagnostics. The gauge is linked to the electronic control system and sensors.

The home menu key (B) allows the operator to access the main menu of the diagnostic gauge. For more information, see DG14 Diagnostic Gauge — Main Menu in Section 15. This key also allows the operator to cancel an option and go back to the previous menu or home menu.

The arrow keys (C) allows the operator to scroll between menu items. The arrow keys automatically change from up and down, to left and right depending on the menu item to be selected.

The check mark select key (D) allows the operator to access menu items selected by the arrow keys (C) and confirm changes made by the operator.

The indicator lights (E) allows the operator to visually see the presence of an active DTC.



DG14 Diagnostic Gauge

A—Diagnostic Gauge
B—Home Menu Key
C—Arrow Key (2 used)
D—Check Mark Select Key
E—Indicator Light (2 used)
F—Display

BL90236,0000028 -19-19AUG21-1/1

DG14 Diagnostic Gauge — Main Menu

NOTE: The engine does not need to be running to navigate the diagnostic gauge menu screens.

The main menu is the starting point in accessing engine information and configuring the diagnostic gauge. Press the home menu key (B) to access the main menu.

Use the arrow keys (C) and select key (D) to view menu items displayed:
- Function
- Display
- Utility
- Setup

Listed are examples of features available in main menu items.

In Function:

- View DTC
- Reset trip (FT4 Only)
- Exhaust regeneration (IT4 & FT4 Only)
- ECU software updates

In Display:

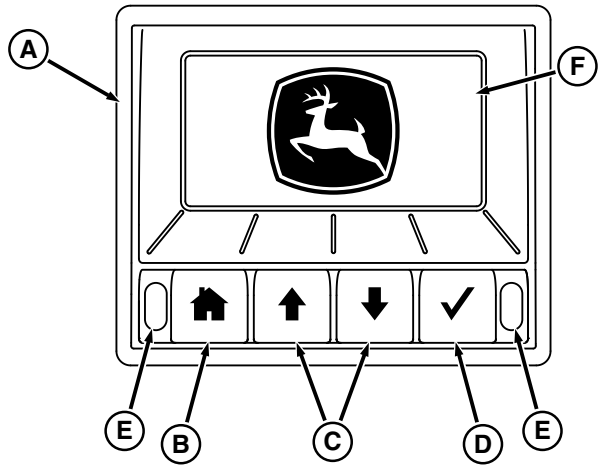
- Adjust backlight
- Adjust indicator brightness
- Display option setup

In Utility:

- Full parameter list
- Software data
- Select units
- Select language

In Setup:

- Select analog input
- Select digital input
- Select digital output



Diagnostic Gauge

A—Diagnostic Gauge
B—Home Menu Key
C—Arrow Key (2 used)
D—Check Mark Select Key
E—Indicator Light (2 used)
F—Display

- Alarm functionality
- Add J1939 gauge
- Set RS485 messaging
- Set engine source address
- Set function instance
- Harness diagnostics
- TSC control (password protected)

Key Code for Password Protected Screens

Numeric values are assigned to keys on diagnostic gauge as identified below:

- 1 — Home Menu Key
- 2 — Up Arrow Key
- 3 — Down Arrow Key
- 4 — Check Mark Select Key

BL90236,0000029 -19-19AUG21-1/1

DG14 Diagnostic Gauge — Essential Menus

Automatic Exhaust Filter Cleaning

To enable auto exhaust filter cleaning mode:
1. Press home menu key on diagnostic gauge.
2. Press arrow keys to scroll up or down to FUNCTION.
3. Press check mark select key.
4. Press arrow keys to scroll up or down to EXHAUST REGENERATION.
5. Press check mark select key.
6. Press arrow keys to scroll up or down to AUTOMATIC.
7. Press check mark select key to enable auto exhaust filter cleaning.

Manual/Parked Exhaust Filter Cleaning

To request a manual/parked exhaust filter cleaning:
1. Reduce engine speed to slow idle.
2. Press home menu key on diagnostic gauge.
3. Press arrow keys to scroll up or down to FUNCTION.
4. Press check mark select key.
5. Press arrow keys to scroll up or down to EXHAUST REGENERATION.
6. Press check mark select key.
7. Press arrow keys to scroll up or down to FORCED.
8. Press check mark select key to request a manual/parked exhaust filter cleaning.
9. Follow directions on display and ensure all conditions are met.
10. Press check mark select key to CONFIRM all conditions are met.

Disable Exhaust Filter Cleaning

To disable the auto exhaust filter cleaning mode:
1. Press home menu key on diagnostic gauge.
2. Press arrow keys to scroll up or down to FUNCTION.
3. Press check mark select key.
4. Press arrow keys to scroll up or down to EXHAUST REGENERATION.
5. Press check mark select key.
6. Press arrow keys to scroll up or down to INHIBIT.
7. Press check mark select key to disable exhaust filter cleaning.
8. Press check mark select key to continue after the warning has been acknowledged.

Fault Codes — Active

To view active fault code information:
1. Press home menu key on diagnostic gauge.
2. Press arrow keys to scroll up or down to FUNCTION.
3. Press check mark select key.
4. Press arrow keys to scroll up or down to VIEW FAULT CODES.
5. Press check mark select key.
6. Press arrow keys to scroll up or down to ACTIVATE.
7. Press check mark select key.
8. Press arrow keys to scroll through available faults.

Fault Codes — Stored

To view stored fault code information:
1. Press (home) menu key on diagnostic gauge.
2. Press arrow keys to scroll up or down to FUNCTION.
3. Press (check mark) select key.
4. Press Arrow keys to scroll up or down to VIEW FAULT CODES.
5. Press (check mark) select key.
6. Press arrow keys to scroll up or down to STORED.
7. Press (check mark) select key.
8. Press Arrow keys to scroll through available faults.

BL90236,0000026 -19-19AUG21-1/1

PV480 Instrument Panel

John Deere PowerTech™ OEM engines have an electronic control system, which has controls and gauges as shown. The following information applies only to those controls and gauges supplied by John Deere. Refer to your engine application manual for specific guidelines if John Deere-sourced controls and instrumentation are not used.

The following is a brief description of the available optional electronic controls and gauges found on John Deere provided instrument panels. Refer to manufacturer's literature for information on controls not provided by John Deere.

Instrument Panel

A — Diagnostic Gauge

The diagnostic gauge (A) allows the operator to view fuel level, DEF level, engine parameters, diagnostic trouble codes (DTCs), and other engine functions. Gauge is linked to the electronic control system and its sensors. This allows the operator to monitor engine functions and to troubleshoot the engine systems when needed.

B — Arrow Keys

The arrow keys (B) allow the operator to select menu items.

C — Menu Key

The menu key (C) allows the operator to access the main menu of the diagnostic gauge.

D — Select Key

The select key (D) allows the operator to access menu items selected by the arrow keys (B) and confirm changes made by the operator.

E — Exit Key

The exit key (E) allows the operator to cancel an option and to go back to the previous menu.

F — Key Switch

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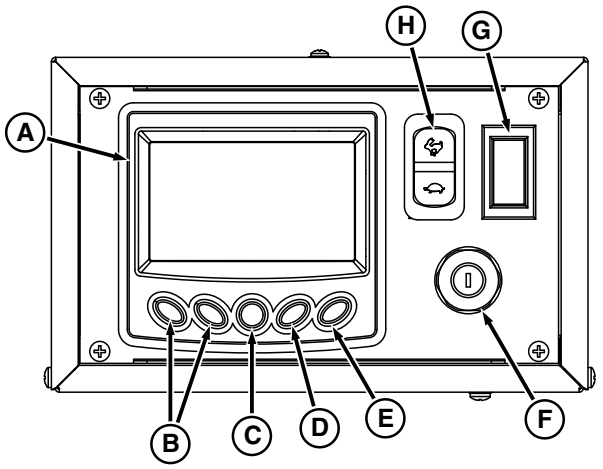


PV480 Instrument Panel

A—Diagnostic Gauge
B—Arrow Key (2 used)
C—Menu Key
D—Select Key
E—Exit Key
F—Key Switch
G—Cover
H—Speed Select Rocker Switch

The three-position key switch (F) controls the engine electrical system. When the key switch is turned clockwise to "START", the engine cranks. When the engine starts, the key switch is released and returns to the "ON" (RUN) position.

G — Cover

The cover (G) hides an expansion slot for an additional switch.

H — Speed Select Rocker Switch

The speed select rocker switch (H) is used to bump engine speed up (+) or down (-) in small increments during operation.

BL90236,0000003 -19-19AUG21-1/1

PV480 Diagnostic Gauge — Using

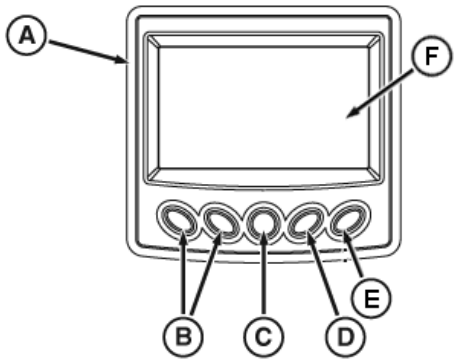
The diagnostic gauge (A) allow the operator to monitor engine functions, view diagnostic trouble codes (DTCs), and perform preliminary diagnostics. The gauge is linked to the electronic control system and sensors.

The arrow keys (B) allows the operator to scroll between menu items. The arrow keys automatically change from up and down, to left and right depending on the menu item to be selected.

The menu key (C) allows the operator to access the main menu of the diagnostic gauge. For more information, see PV480 Diagnostic Gauge — Main Menu in Section 15.

The select key (D) allows the operator to access menu items selected by the arrow keys (B) and confirm changes made by the operator.

The exit key (E) allows the operator to cancel an option and to go back to the previous menu.



RG23474 —UN—06JUN13

PV480 Diagnostic Gauge

A—Diagnostic Gauge
B—Arrow Key (2 used)
C—Menu Key
D—Select Key
E—Exit Key
F—Display

BL90236,0000006 -19-19AUG21-1/1

PV480 Diagnostic Gauge — Main Menu

NOTE: The engine does not need to be running to navigate the diagnostic gauge screens.

The main menu is the starting point in accessing engine information and configuring the diagnostic gauge. Press the menu key (C) to access the main menu.

Use the arrow keys (B) and select key (D) to view menu items displayed:
- User Settings
- Faults
- Exhaust Filter
- Start Options
- Service
- Utilities

Listed are examples of features available in main menu items.

In User Settings:

- Date
- Time
- Language
- Units
- Brightness
- Ambient Light

In Check Faults:

- ActiveDTCs
- Stored DTCs

In Exhaust Filter:

- Status
- Auto exhaust filter clean
- Disable exhaust filter clean
- Request exhaust filter clean

In Start Options:

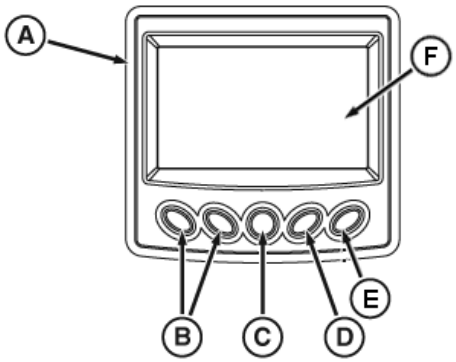
- Auto features
- Manual features
- Clock start
- Temperature start

In Service:

- Data list screens
- Engine hours
- Data logger
- Service reminders
- Harness diagnostics
- Component identification

In Utilities:

- System settings
- Pressure governing
- ECU software update
- Advanced settings (password protected)



RG23474 —UN—06JUN13

PV480 Diagnostic Gauge

A—Diagnostic Gauge
B—Arrow Key (2 used)
C—Menu Key
D—Select Key
E—Exit Key
F—Display

BL90236,0000001 -19-19AUG21-1/1

PV480 Diagnostic Gauge — Essential Menus

Automatic Exhaust Filter Cleaning

To enable auto exhaust filter cleaning mode:
1. Press Menu key on diagnostic gauge.
2. Press Arrow keys to scroll up or down to EXHAUST FILTER.
3. Press Select key.
4. Press Arrow keys to scroll up or down to AUTO EXH FLT CLEAN.
5. Press Select key to enable auto exhaust filter cleaning.

Manual/Parked Exhaust Filter Cleaning

To request a manual/parked exhaust filter cleaning:
1. Reduce engine speed to slow idle.
2. Press Menu key.
3. Press Arrow keys to scroll up or down to EXHAUST FILTER.
4. Press Select key.
5. Press Arrow keys to scroll up or down to REQUEST EXH FLT CLEAN.
6. Press Select key to request a manual/parked exhaust filter cleaning.
7. Follow directions on display and ensure all conditions are met.
8. Press Select key to CONFIRM all conditions are met.

Disable Exhaust Filter Cleaning

To disable the auto exhaust filter cleaning mode:
1. Press Menu key on diagnostic gauge.
2. Press Arrow keys to scroll up or down to EXHAUST FILTER.
3. Press Select key.
4. Press Arrow keys to scroll up or down to DISABLE EXH FLT CLEAN.
5. Press Select key to disable exhaust filter cleaning.

Fault Codes — Active

To view active fault code information:
1. Press Menu key on diagnostic gauge.
2. Press Arrow keys to scroll up or down to FAULTS.
3. Press Select key.
4. Press Arrow keys to scroll up or down to ACTIVE FAULTS.
5. Press Select key.
6. Press Arrow keys to scroll through available faults.

Fault Codes — Stored

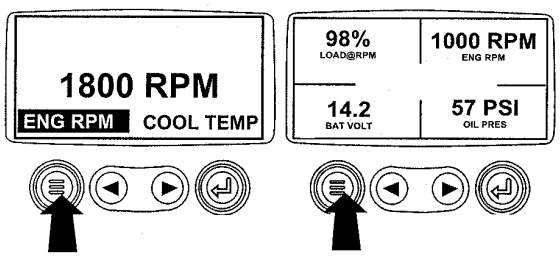
To view stored fault code information:
1. Press Menu key on diagnostic gauge.
2. Press Arrow keys to scroll up or down to FAULTS.
3. Press Select key.
4. Press Arrow keys to scroll up or down to STORED FAULTS.
5. Press Select key.
6. Press Arrow keys to scroll up or down to VIEW.
7. Press Select key.
8. Press Arrow keys to scroll through available faults.

BL90236,0000024 -19-19AUG21-1/1

Main Menu Navigation

NOTE: The engine does not need to be running to navigate the diagnostic gauge screens. If engine start up is desired, See Starting The Engine. All of the engine values illustrated on the diagnostic gauge indicate the engine is running.

1. Turn the key switch to the ON position. Starting at the single or four engine parameter display, press the "Menu" key.

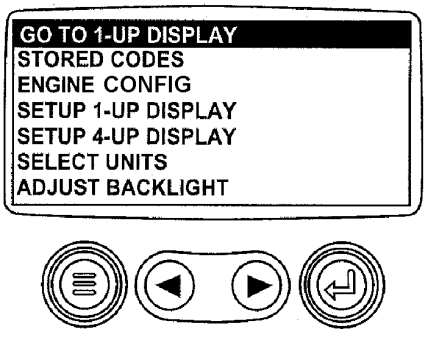


Menu Key

RG13159 —UN—26SEP03

OURGP11,00000A9 -19-27MAY16-1/5

2. The first seven items of the "Main Menu" will be displayed.



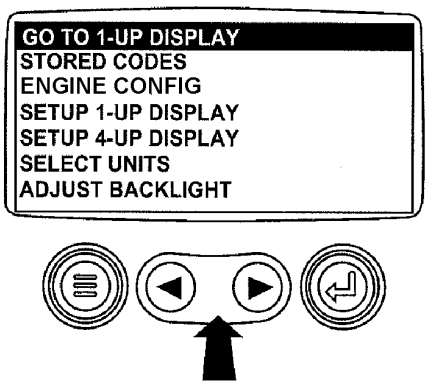
Menu Display

RG13160 —UN—02OCT03

Continued on next page

OURGP11,00000A9 -19-27MAY16-2/5

3. Pressing the "Arrow" keys will scroll through the menu selections.

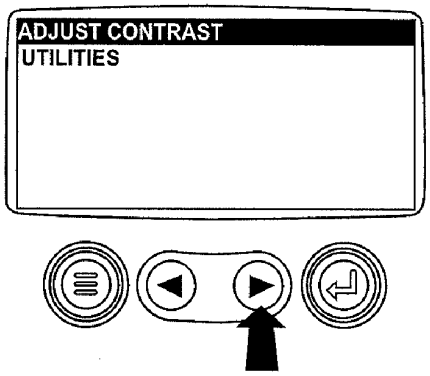


RG13161 —UN—02OCT03

Main Menu Items

OURGP11,00000A9 -19-27MAY16-3/5

4. Pressing the right arrow key will scroll down to reveal the last items of "Main Menu" screen, highlighting the next item down.

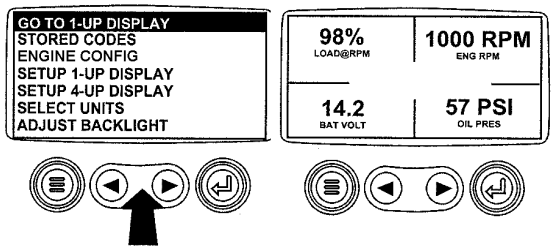


RG13162 —UN—26SEP03

Last Items On Main Menu

OURGP11,00000A9 -19-27MAY16-4/5

5. Use the arrow keys to scroll to the desired menu item or press the "Menu Button" to exit the main menu and return to the engine parameter display.



RG13163 —UN—02OCT03

Use Arrow Buttons To Scroll / Quadrant Display

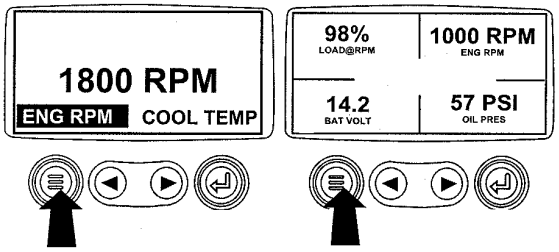
OURGP11,00000A9 -19-27MAY16-5/5

Engine Configuration Data

NOTE: The engine configuration data is a read only function.

NOTE: The engine does not need to be running to navigate the diagnostic gauge screens. If engine start up is desired, See Starting The Engine. All of the engine values illustrated on the diagnostic gauge indicate the engine is running.

1. Turn the key switch to the ON position. Starting at the single or four engine parameter display, press the "Menu" key.

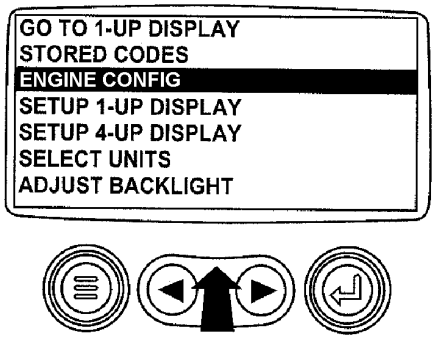


Menu Key

RG13159 —UN—26SEP03

OURGP11,00000AB -19-27MAY16-1/6

2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Engine Config" is highlighted.

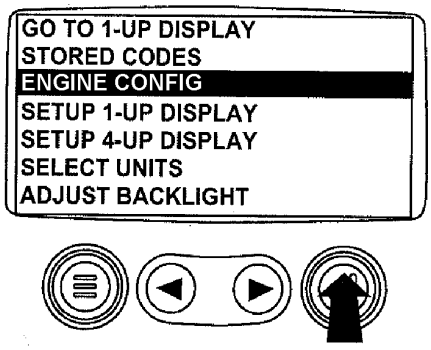


Select Engine Configuration

RG13164 —UN—07OCT03

OURGP11,00000AB -19-27MAY16-2/6

3. Once "Engine Config" menu item has been highlighted, press the "Enter" key to view the engine configuration data.



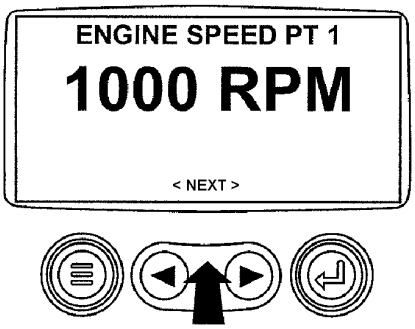
Enter Key

RG13165 —UN—02OCT03

Continued on next page

OURGP11,00000AB -19-27MAY16-3/6

4. Use the "Arrow" keys to scroll through the engine configuration data.

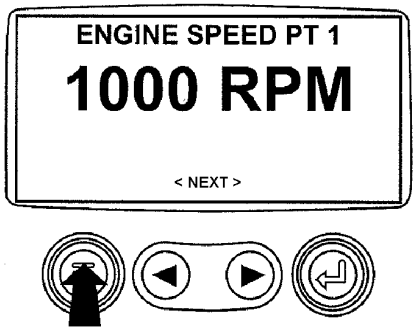


RG13166 —UN—29SEP03

Use Arrow Keys To Scroll

OURGP11,00000AB -19-27MAY16-4/6

5. Press the "Menu" key to return to the main menu.

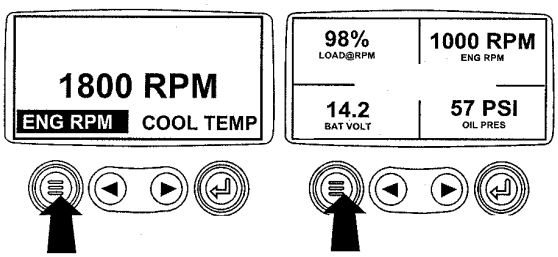


RG13167 —UN—29SEP03

Return To Main Menu

OURGP11,00000AB -19-27MAY16-5/6

6. Press the "Menu" key to exit the main menu and return to the engine parameter display.



RG13159 —UN—26SEP03

Exit Main Menu

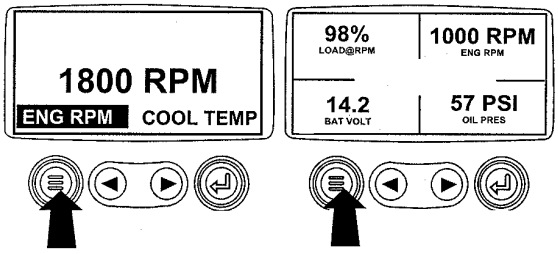
OURGP11,00000AB -19-27MAY16-6/6

Accessing Stored Trouble Codes

NOTE: The engine does not need to be running to navigate the diagnostic gauge screens. If engine start up is desired, See Starting The Engine. All of the engine values illustrated on the diagnostic gauge indicate the engine is running.

For description of trouble codes, see chart in Troubleshooting Section.

1. Turn the key switch to the ON position. Starting at the single or four engine parameter display, press the "Menu" key.



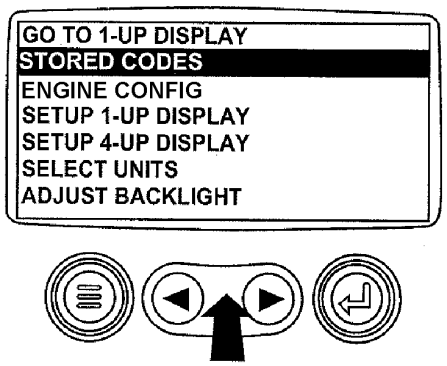
RG13159 —UN—26SEP03

Menu Key

Continued on next page

OURGP11,00000AC -19-27MAY16-1/6

2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Stored Codes" is highlighted.

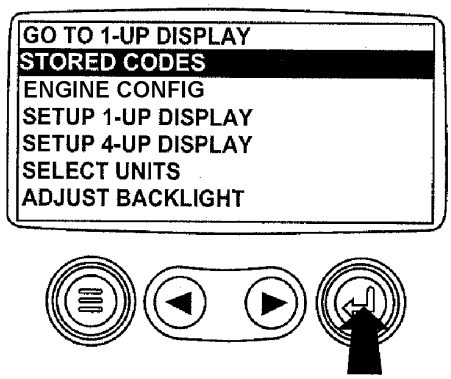


RG13168 —UN—02OCT03

Select Stored Codes

OURGP11,00000AC -19-27MAY16-2/6

3. Once the "Stored Codes" menu item has been highlighted press the "Enter" key to view the stored codes.

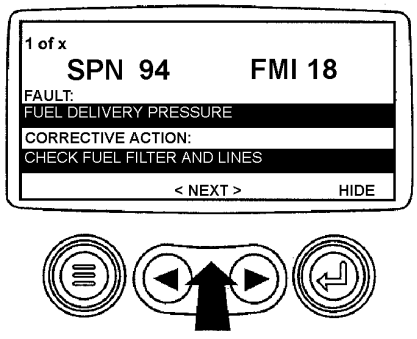


RG13169 —UN—02OCT03

Enter Key

OURGP11,00000AC -19-27MAY16-3/6

4. If the word "Next" appears above the "Arrow" keys, there are more stored codes that may be viewed. Use the "Arrow" key to scroll to the next stored code.



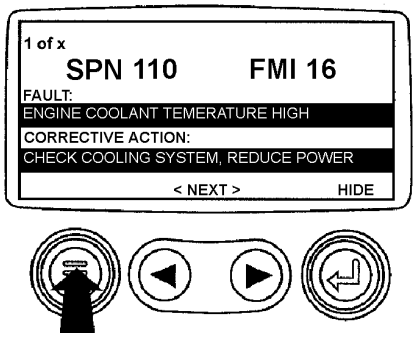
RG13245 —UN—02OCT03

Use Arrow Keys To Scroll

Continued on next page

OURGP11,00000AC -19-27MAY16-4/6

5. Press the "Menu" key to return to the main menu.

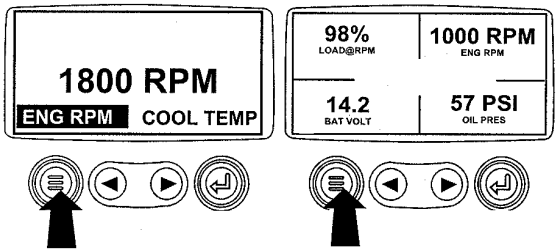


RG13246 —UN—02OCT03

Return To Main Menu

OURGP11,00000AC -19-27MAY16-5/6

6. Press the "Menu" key to exit the main menu and return to the engine parameter display.



RG13159 —UN—26SEP03

Exit Main Menu

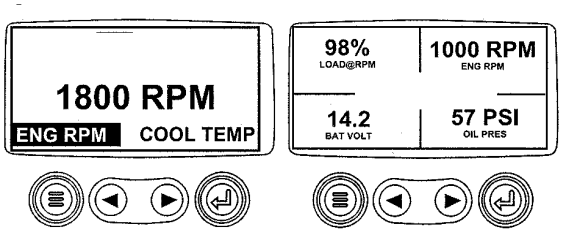
OURGP11,00000AC -19-27MAY16-6/6

Accessing Active Trouble Codes

NOTE: The engine does not need to be running to navigate the diagnostic gauge screens. If engine start up is desired, See Starting The Engine. All of the engine values illustrated on the diagnostic gauge indicate the engine is running.

For description of trouble codes, see chart in Troubleshooting Section.

1. During normal operation the single or four parameter screen will be displayed.



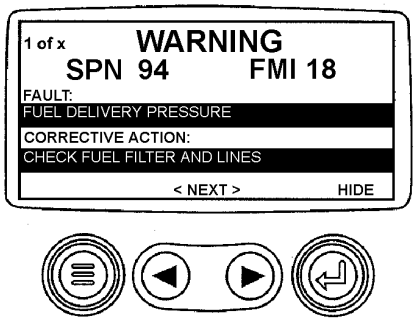
RG13172 —UN—26SEP03

Normal Operation

OURGP11,00000AD -19-27MAY16-1/7

2. When the diagnostic gauge receives a trouble code from an engine control unit, the single or four parameter screen will be replaced with the "Warning" message. The SPN and FMI number will be displayed along with a description of the problem and the corrective action needed.

IMPORTANT: Ignoring active trouble codes can result in severe engine damage.



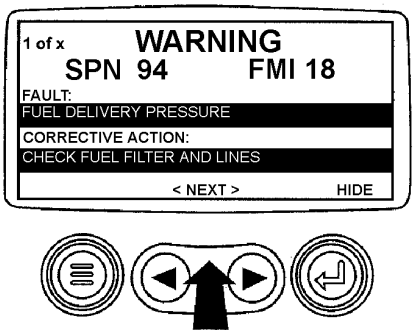
RG13240 —UN—30SEP03

Active Trouble Codes Displayed

Continued on next page

OURGP11,00000AD -19-27MAY16-2/7

3. If the word "Next" appears above the arrow keys, there are more trouble codes that can be viewed by using the arrow keys to scroll to the next trouble code.



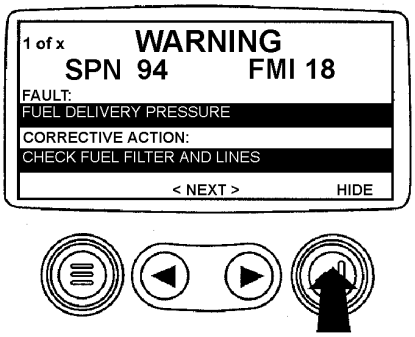
RG13241 —UN—30SEP03

Use Arrow Keys To Scroll

OURGP11,00000AD -19-27MAY16-3/7

IMPORTANT: Ignoring active trouble codes can result in severe engine damage.

4. To acknowledge and hide the code and return to the single or four parameter display, press the "Enter" Key.

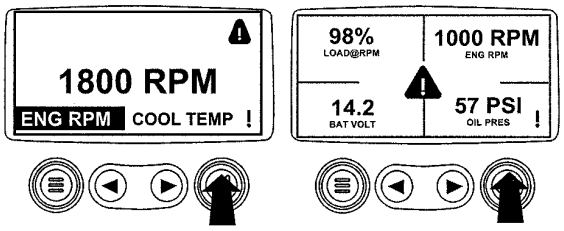


RG13242 —UN—30SEP03

Hide Trouble Codes

OURGP11,00000AD -19-27MAY16-4/7

5. The display will return to the single or four parameter display, but the display will contain the warning icon. Pressing the "Enter" key will redisplay the hidden trouble code.



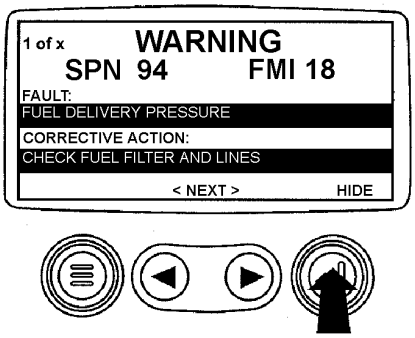
RG13176 —UN—26SEP03

Active Trouble Code Icon

OURGP11,00000AD -19-27MAY16-5/7

IMPORTANT: Ignoring active trouble codes can result in severe engine damage.

6. Pressing the "Enter" key once again will hide the trouble code and return the screen to the single or four parameter display.



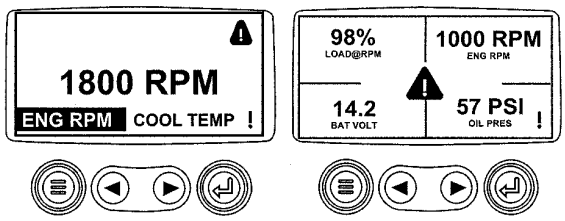
RG13242 —UN—30SEP03

Enter Key

Continued on next page

OURGP11,00000AD -19-27MAY16-6/7

7. The single or four parameter screen will display the warning icon until the trouble code condition is corrected.



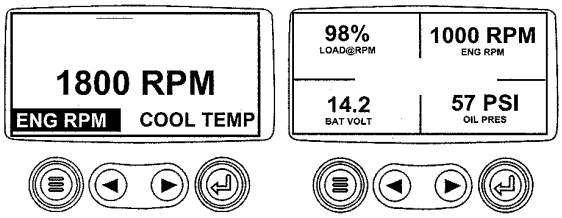
RG13243 —UN—01OCT03

Active Trouble Code Condition

OURGP11,00000AD -19-27MAY16-7/7

Engine Shutdown Codes

1. During normal operation the single or four parameter screen will be displayed.



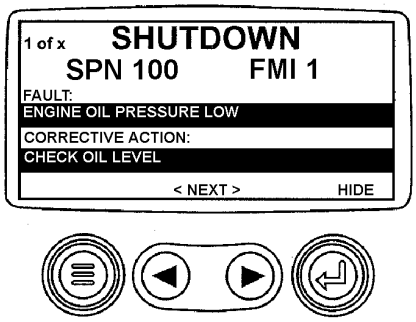
RG13172 —UN—26SEP03

Normal Operation

OURGP11,00000AE -19-27MAY16-1/6

2. When the diagnostic gauge receives a severe trouble code from an engine control unit, the single or four parameter screen will be replaced with the "Shutdown" message. The SPN and FMI number will be displayed along with a description of the problem and the corrective action needed.

   If the word "Next" appears above the arrow keys, there are more trouble codes that can be viewed by using the arrow keys to scroll to the next trouble code.



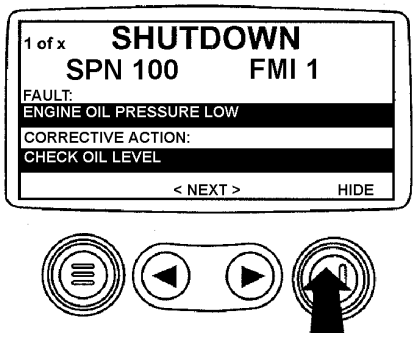
RG13238 —UN—29SEP03

Shutdown Message

OURGP11,00000AE -19-27MAY16-2/6

3. To acknowledge and hide the trouble code and return to the single or four parameter display, press the "Enter" key".

IMPORTANT: Ignoring the shutdown message can result in severe engine damage.



RG13239 —UN—29SEP03

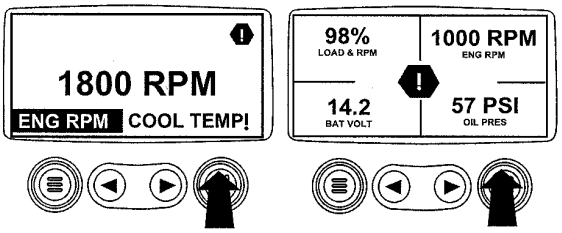
Hide Trouble Code

Continued on next page

OURGP11,00000AE -19-27MAY16-3/6

4. The display will return to the single or four parameter display, but the display will contain the "Shutdown" icon. Pressing the "Enter" key will redisplay the hidden trouble code.

IMPORTANT: Ignoring the shutdown message can result in severe engine damage.

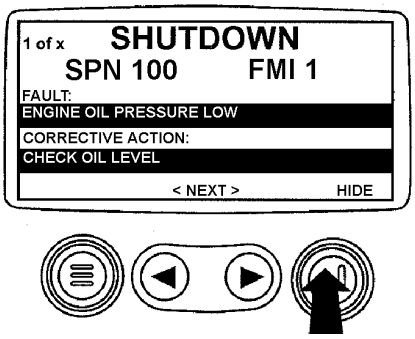


RG13179 —UN—26SEP03

Flashing Shutdown Icon

OURGP11,00000AE -19-27MAY16-4/6

5. Pressing the "Enter" key once again will hide the trouble code and return the screen to the single or four parameter display.



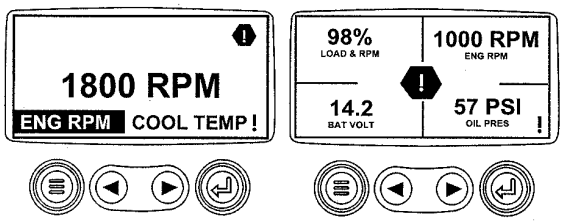
RG13239 —UN—29SEP03

Redisplay Trouble Code

OURGP11,00000AE -19-27MAY16-5/6

6. The single or four parameter screen will display the shutdown icon until the trouble code condition is corrected.

IMPORTANT: Ignoring the shutdown message can result in severe engine damage.



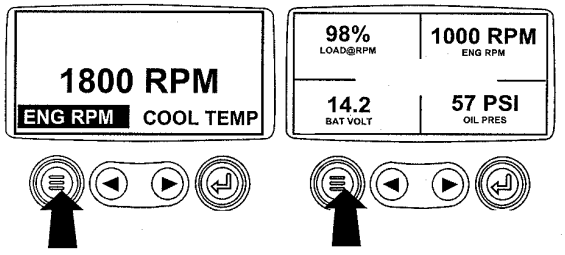
RG13180 —UN—26SEP03

Shutdown Icon

OURGP11,00000AE -19-27MAY16-6/6

Adjusting Backlighting

1. Turn the key switch to the ON position. Starting at the single or four engine parameter display, press the "Menu" key.



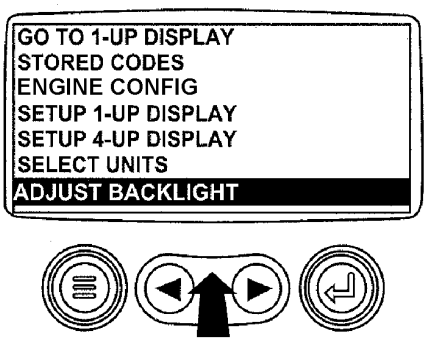
RG13159 —UN—26SEP03

Menu Key

Continued on next page

OURGP11,0000237 -19-23AUG10-1/6

2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Adjust Backlight" is highlighted.

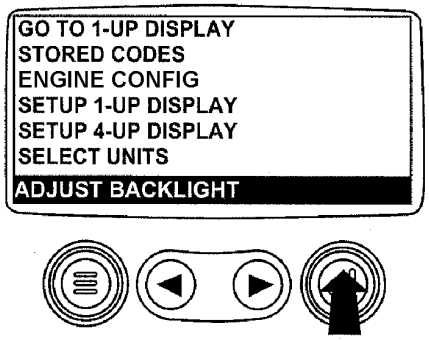


RG13181 —UN—02OCT03

Select Adjust Backlight

OURGP11,0000237 -19-23AUG10-2/6

3. Once the "Adjust Backlight" menu item has been highlighted, press the "Enter" key to activate the "Adjust Backlight" function.

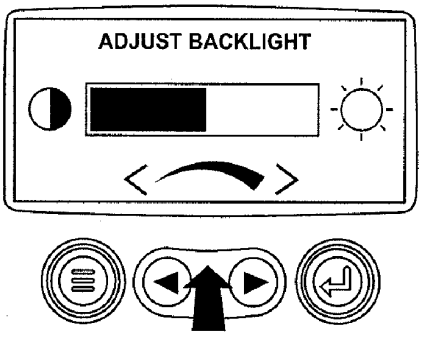


RG13182 —UN—02OCT03

Press Enter Key

OURGP11,0000237 -19-23AUG10-3/6

4. Use the "Arrow" keys to select the desired backlight intensity.



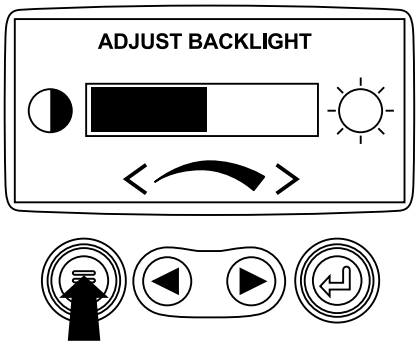
RG13183 —UN—29SEP03

Adjust Backlight Intensity

Continued on next page

OURGP11,0000237 -19-23AUG10-4/6

5. Press the "Menu" key to return to the main menu.

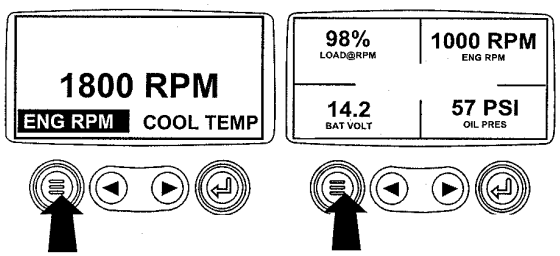


RG19048 —UN—23AUG10

Return to Main Menu

OURGP11,0000237 -19-23AUG10-5/6

6. Press the "Menu" key to exit the main menu and return to the engine parameter display.



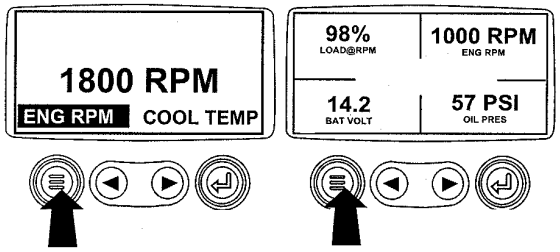
RG13159 —UN—26SEP03

Exit Main Menu

OURGP11,0000237 -19-23AUG10-6/6

Adjusting Contrast

1. Turn the key switch to the ON position. Starting at the single or four engine parameter display press the "Menu" key.

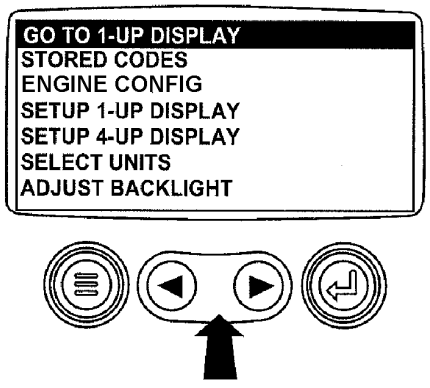


RG13159 —UN—26SEP03

Menu Key

OURGP11,00000AF -19-27MAY16-1/6

2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Adjust Contrast" is highlighted.



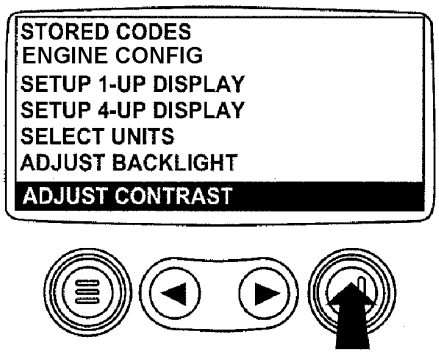
RG13161 —UN—02OCT03

Select Adjust Contrast

Continued on next page

OURGP11,00000AF -19-27MAY16-2/6

3. Once the "Adjust Contrast" menu item has been highlighted, press the "Enter" key to activate the "Adjust Contrast" function.

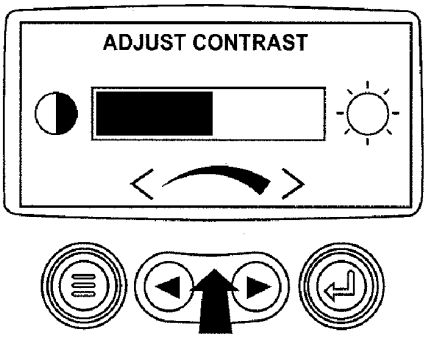


RG13185 —UN—02OCT03

Press Enter Key

OURGP11,00000AF -19-27MAY16-3/6

4. Use the "Arrow" keys to select the desired contrast intensity.

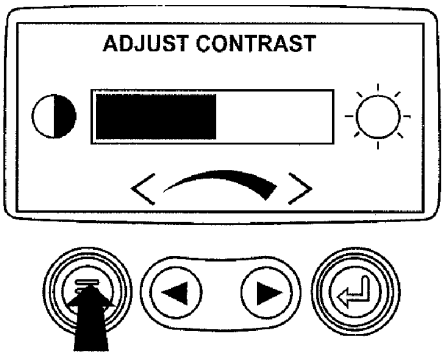


RG13186 —UN—29SEP03

Adjust Contrast Intensity

OURGP11,00000AF -19-27MAY16-4/6

5. Press the "Menu" key to return to the main menu.



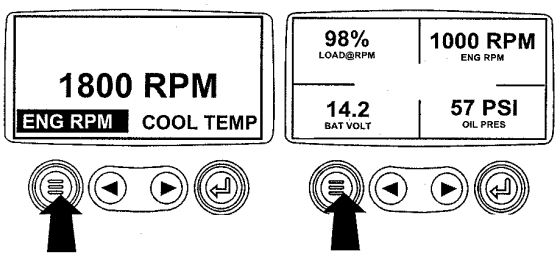
RG13187 —UN—26SEP03

Return To Main Menu

Continued on next page

OURGP11,00000AF -19-27MAY16-5/6

6. Press the "Menu" key to exit the main menu and return to the engine parameter display.



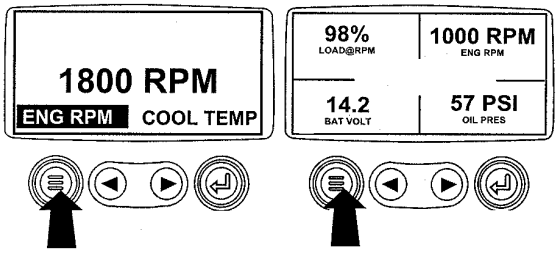
RG13159 —UN—26SEP03

Exit Main Menu

OURGP11,00000AF -19-27MAY16-6/6

Selecting Units Of Measurement

1. Turn the key switch to the ON position. Starting at the single or four engine parameter display, press the "Menu" key.

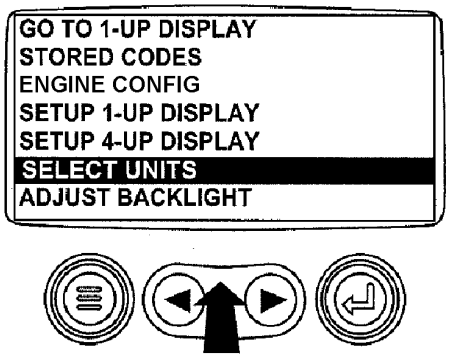


RG13159 —UN—26SEP03

Menu Key

OURGP11,00000B0 -19-27MAY16-1/7

2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Select Units" is highlighted.

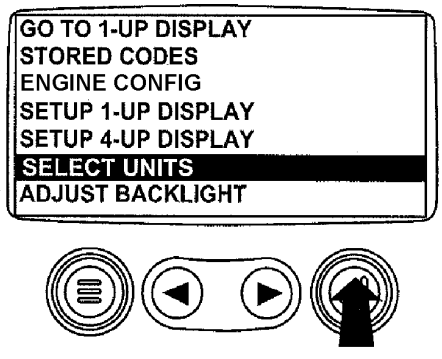


RG13188 —UN—02OCT03

Select Units

OURGP11,00000B0 -19-27MAY16-2/7

3. Once the "Select Units" menu item has been highlighted press the "Enter" key to access the "Select Units" function.



RG13189 —UN—02OCT03

Press Enter Key

Continued on next page

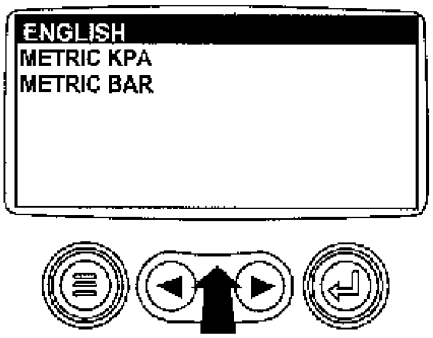
OURGP11,00000B0 -19-27MAY16-3/7

4. There are three choices for units of measurement, English, Metric kPa or Metric Bar.

   English is for Imperial units, with pressures displayed in PSI and temperatures in °F.

   Metric kPa and Metric bar are for IS units, with pressures displayed in kPa and bar respectively, and temperatures in °C.

   Use the "Arrow" keys to highlight the desired units of measurement.

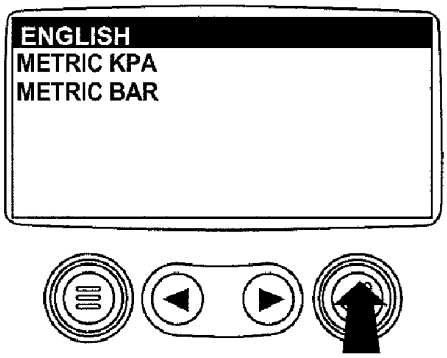


Select Desired Units

RG13190 —UN—26SEP03

OURGP11,00000B0 -19-27MAY16-4/7

5. Press the "Enter" key to select the highlighted units.

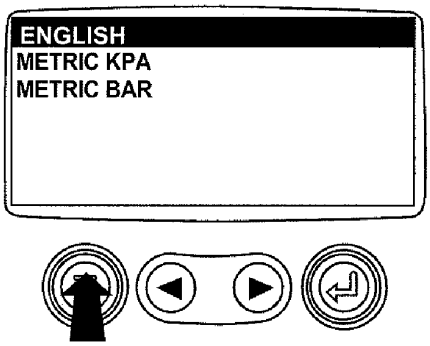


Press Enter Key to Select

RG13191 —UN—30SEP03

OURGP11,00000B0 -19-27MAY16-5/7

6. Press the "Menu" key to return to the main menu.



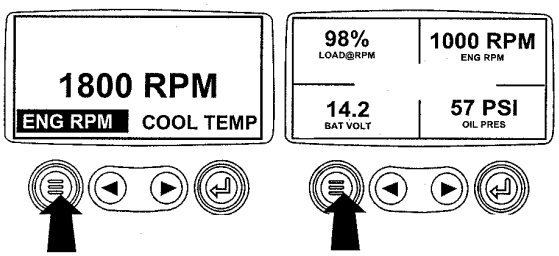
Return To Main Menu

RG13192 —UN—26SEP03

Continued on next page

OURGP11,00000B0 -19-27MAY16-6/7

7. Press the "Menu" key to return to the engine parameter display.



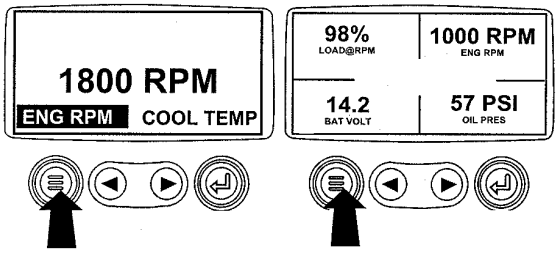
RG13159 —UN—26SEP03

Press Menu Key

OURGP11,00000B0 -19-27MAY16-7/7

Setup 1-Up Display

1. Turn the key switch to the ON position. Starting at the single engine parameter display, press the "Menu" key.

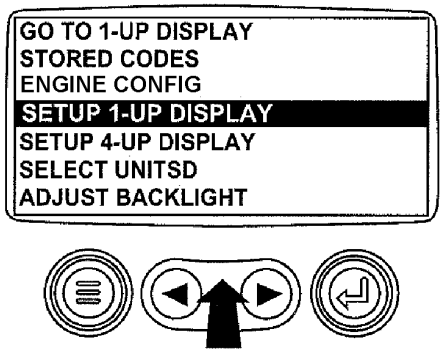


RG13159 —UN—26SEP03

Menu Key

OURGP11,00000B1 -19-27MAY16-1/18

2. Use the "Arrow" keys to scroll through the menu until "Setup 1-Up Display" is highlighted.

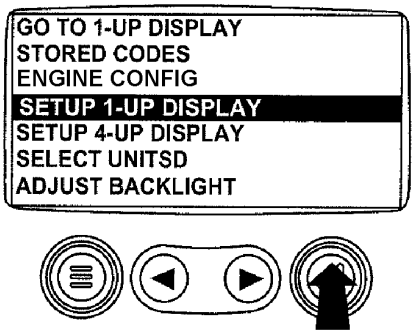


RG13193 —UN—02OCT03

Setup 1-Up Display

OURGP11,00000B1 -19-27MAY16-2/18

3. Once "Setup 1-Up Display" menu item has been highlighted press the "Enter" key to access the "Setup 1-Up Display" function.



RG13194 —UN—02OCT03

Press Enter Key

Continued on next page

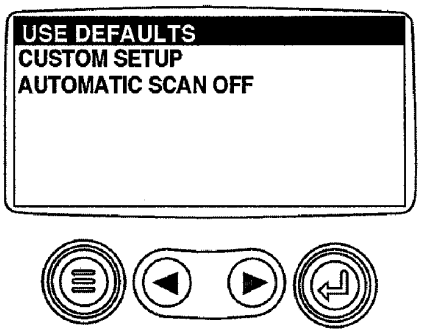
OURGP11,00000B1 -19-27MAY16-3/18

4. Three options are available for modification of the 1-Up Display.

   a. **Use Defaults** – This option contains the following engine parameters for display: Engine Hours, Engine Speed, Battery Voltage, % Load, Coolant Temperature and Oil Pressure.

   b. **Custom Setup** – This option contains a list of engine parameters. Engine parameters from this list can be selected to replace any or all of the default parameters. This option can be used to add parameters available for scrolling in the 1-Up Display.

   c. **Automatic Scan** – Selecting the scan function will allow the 1-Up Display to scroll through the selected set of parameters one at a time, momentarily pausing at each.

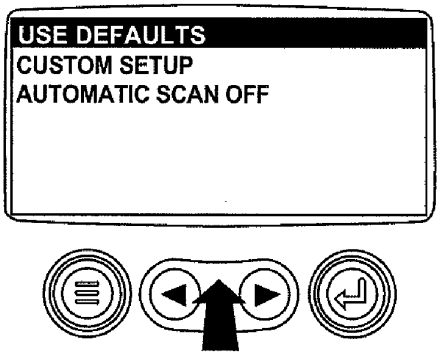


RG13196 —UN—26SEP03

1-Up Display Options

OURGP11,00000B1 -19-27MAY16-4/18

5. **Use Defaults** - To select "Use Defaults" use the Arrow keys to scroll to and highlight "Use Defaults" in the menu display.

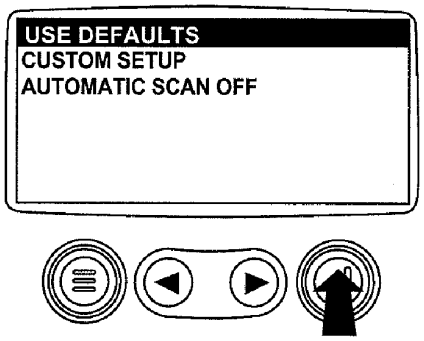


RG13195 —UN—26SEP03

Select Defaults

OURGP11,00000B1 -19-27MAY16-5/18

6. Press the "Enter" key to activate the "Use Defaults" function.



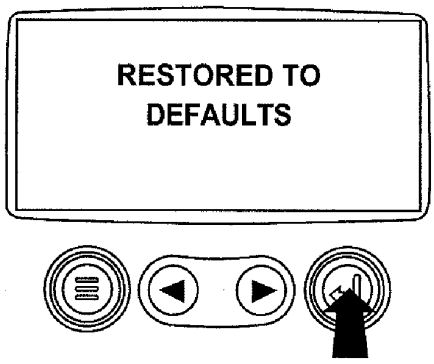
RG13197 —UN—29SEP03

Defaults Selected

Continued on next page

OURGP11,00000B1 -19-27MAY16-6/18

7. The display parameters are reset to the factory defaults, then the display will return to the "Setup 1-Up Display" menu.

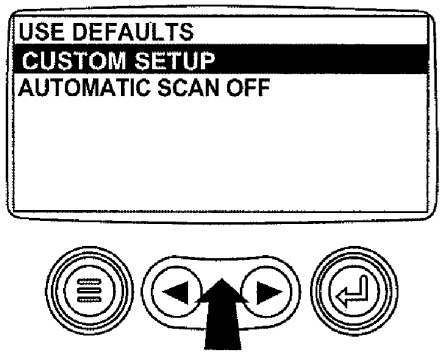


RG13149 —UN—24SEP03

Restored To Defaults

OURGP11,00000B1 -19-27MAY16-7/18

8. **Custom Setup** - To perform a custom setup of the 1-Up Display, use the arrow buttons to scroll to and highlight "Custom Setup" on the display.

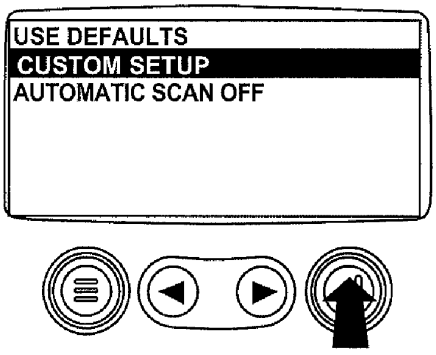


RG13198 —UN—26SEP03

Select Custom Setup

OURGP11,00000B1 -19-27MAY16-8/18

9. Press the "Enter" key to display a list of engine parameters.



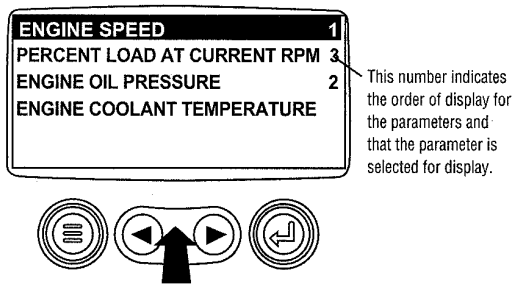
RG13199 —UN—26SEP03

Engine Parameters

Continued on next page

OURGP11,00000B1 -19-27MAY16-9/18

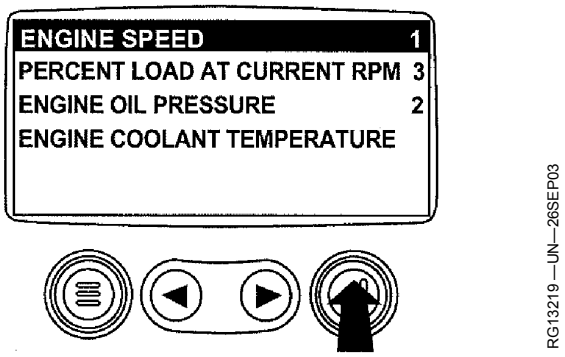
10. Use the "Arrow" keys to scroll to and highlight a selected parameter (parameter with a number to right of it).



Select Parameters

OURGP11,00000B1 -19-27MAY16-10/18

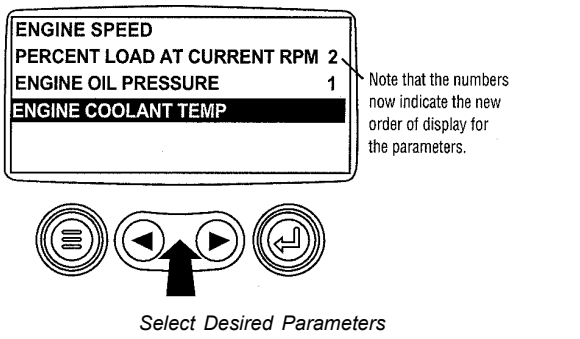
11. Press the "Enter" key to deselect the selected parameter, removing it from the list of parameters being displayed on the 1-Up Display.



Deselect Parameters

OURGP11,00000B1 -19-27MAY16-11/18

12. Use the "Arrow" keys to scroll and highlight the desired parameter that has not been selected for display (parameter without a number to right of it).

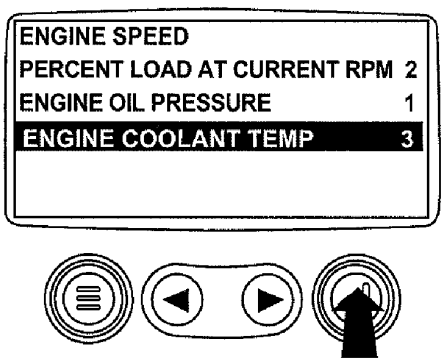


Select Desired Parameters

Continued on next page

OURGP11,00000B1 -19-27MAY16-12/18

13. Press the "Enter" key to select the parameter for inclusion in the Single Engine Parameter Display.
14. Continue to scroll through and select additional parameters for the custom 1-Up Display. Press the "Menu" key at any time to return to the "Custom Setup" menu.

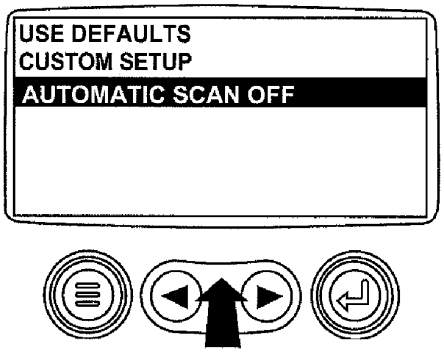


RG13220 —UN—26SEP03

Select Parameters For Display

OURGP11,00000B1 -19-27MAY16-13/18

15. **Automatic Scan** - Selecting the scan function will allow the 1- Up Display to scroll through the selected set of parameters one at a time. Use the "Arrow" keys to scroll to the "Automatic Scan" function.

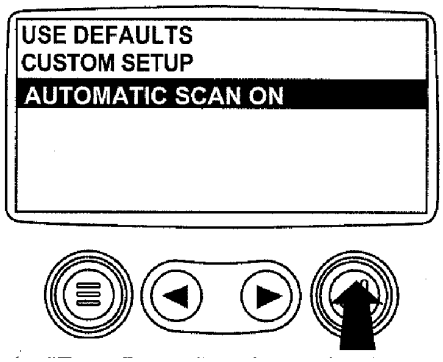


RG13221 —UN—26SEP03

Automatic Scan Off

OURGP11,00000B1 -19-27MAY16-14/18

16. Press the "Enter" key to toggle the "Automatic Scan" function on.



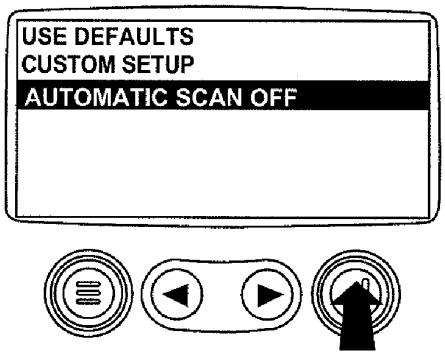
RG13222 —UN—26SEP03

Automatic Scan On

Continued on next page

OURGP11,00000B1 -19-27MAY16-15/18

17. Press the "Enter" key again to toggle the "Automatic Scan" function off.

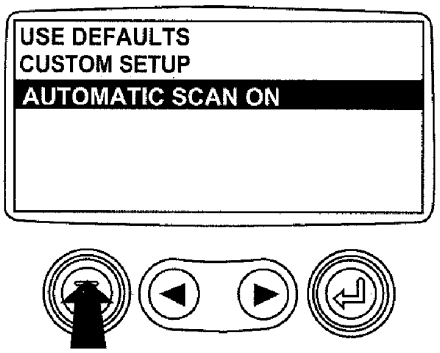


RG13223 —UN—26SEP03

Automatic Scan Off

OURGP11,00000B1 -19-27MAY16-16/18

18. Once the "Use Defaults", "Custom Setup" and "Automatic Scan" functions have been set, press the "Menu" key to return to the main menu.

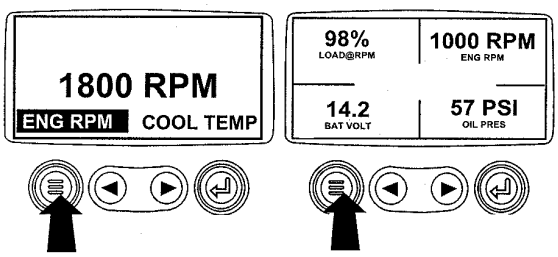


RG13224 —UN—26SEP03

Menu Key

OURGP11,00000B1 -19-27MAY16-17/18

19. Press the "Menu" key to exit the main menu and return to the engine parameter display.



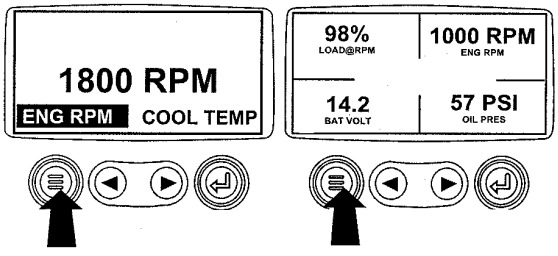
RG13159 —UN—26SEP03

Exit Main Menu

OURGP11,00000B1 -19-27MAY16-18/18

Setup 4-Up Display

1. Turn the key switch to the ON position. From the single or four engine parameter display, press the "Menu" key.



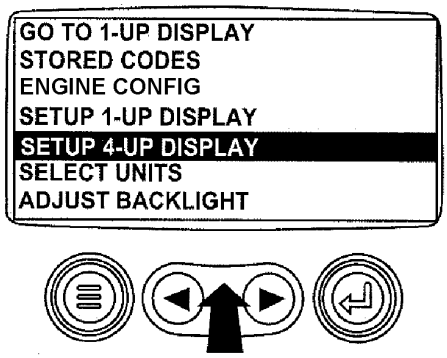
RG13159 —UN—26SEP03

Menu Key

Continued on next page

OURGP11,00000B2 -19-27MAY16-1/14

2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Setup 4-Up Display" is highlighted.

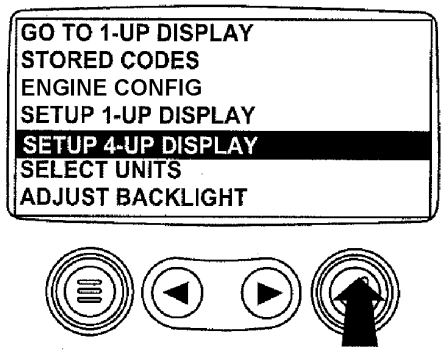


RG13225 —UN—02OCT03

Select Setup 4-Up Display

OURGP11,00000B2 -19-27MAY16-2/14

3. Once the "Setup 4-Up Display" menu item has been highlighted, press the "Enter" key to activate the "Setup 4-Up Display" menu.

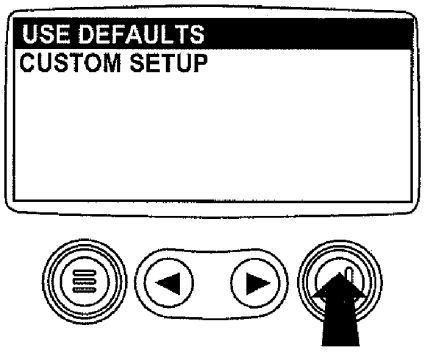


RG13226 —UN—02OCT03

Press Enter Key

OURGP11,00000B2 -19-27MAY16-3/14

4. Two options are available for the 4-Up Display.
   a. **Use Defaults** – This option contains the following engine parameters for display: Engine Speed, Battery Voltage, Coolant Temperature and Oil Pressure.
   b. **Custom Setup** – This option contains a list of engine parameters. Engine parameters from this list can be selected to replace any or all of the default parameters.



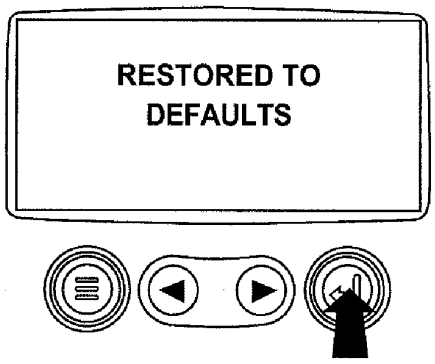
RG13244 —UN—02OCT03

Select Factory Defaults

Continued on next page

OURGP11,00000B2 -19-27MAY16-4/14

5. To reset the display parameters to the factory defaults, scroll to and highlight "Use Defaults". Press the "Enter" key to activate the "Use Defaults" function. A message indicating the display parameters are reset to the factory defaults will be displayed, then the display will return to the "Setup 4-Up Display" menu.

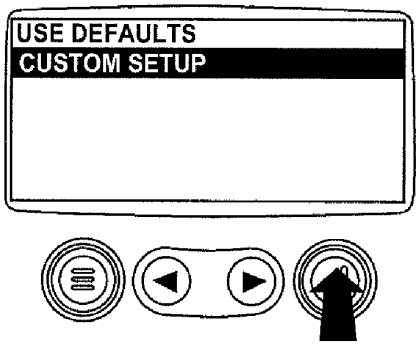


RG13149 —UN—24SEP03

Restored To Defaults

OURGP11,00000B2 -19-27MAY16-5/14

6. **Custom Setup** - To perform a custom setup of the 4-Up Display, use the arrow buttons to scroll to and highlight "Custom Setup" on the display.

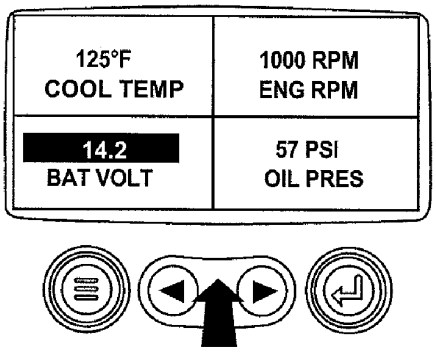


RG13227 —UN—26SEP03

Custom Setup

OURGP11,00000B2 -19-27MAY16-6/14

7. The quadrant with the highlighted parameter value is the current selected parameter. Use the "Arrow" keys to highlight the value in the quadrant you wish to change to a new parameter.



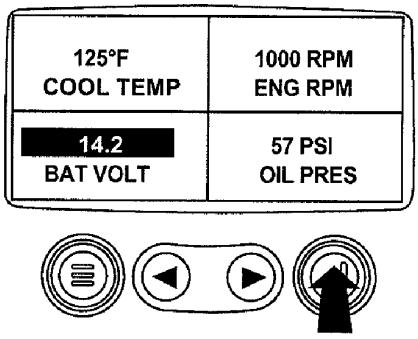
RG13228 —UN—26SEP03

Select Parameters

Continued on next page

OURGP11,00000B2 -19-27MAY16-7/14

8. Press the "Enter" key and a list of engine parameters will be displayed.

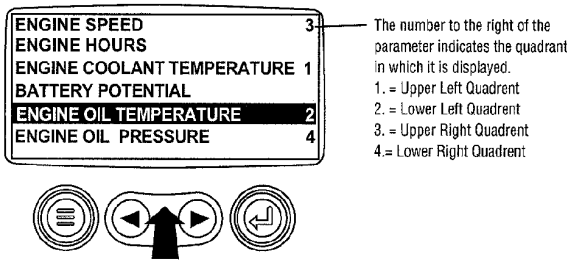


RG13229 —UN—26SEP03

List Of Engine Parameters

OURGP11,00000B2 -19-27MAY16-8/14

9. The parameter that is highlighted is the selected parameter for the screen. Use the "arrow" keys to highlight the new parameter to be placed in the "4-Up Display".

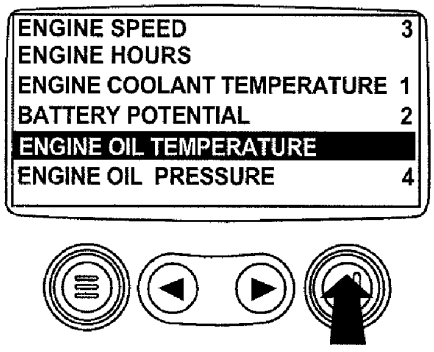


RG13230 —UN—26SEP03

Select Desired Engine Parameter

OURGP11,00000B2 -19-27MAY16-9/14

10. Press the "Enter" key to change the selected parameter in the quadrant to the new parameter.

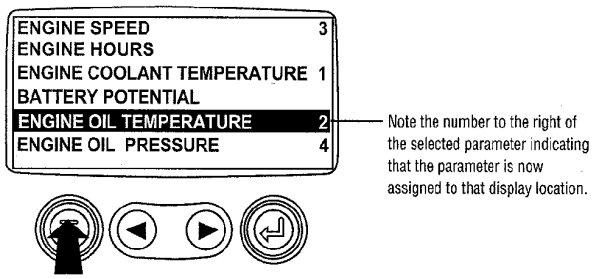


RG13231 —UN—26SEP03

Enter Selected Parameter

OURGP11,00000B2 -19-27MAY16-10/14

11. Use the "Menu" keys to return to the "4-Up Custom Setup" screen.



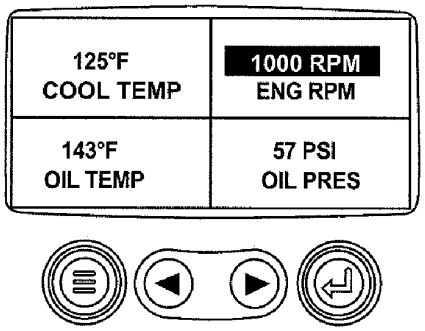
RG13232 —UN—26SEP03

Return To 4-Up Custom Setup

Continued on next page

OURGP11,00000B2 -19-27MAY16-11/14

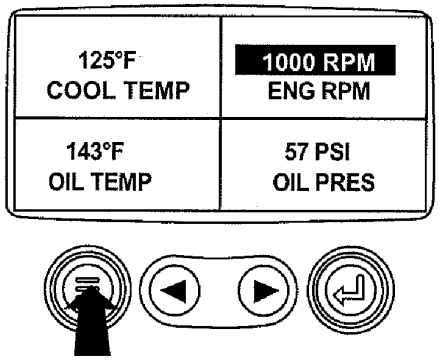
12. The selected quadrant has now changed to the new selected parameter.



4-Up Display

OURGP11,00000B2 -19-27MAY16-12/14

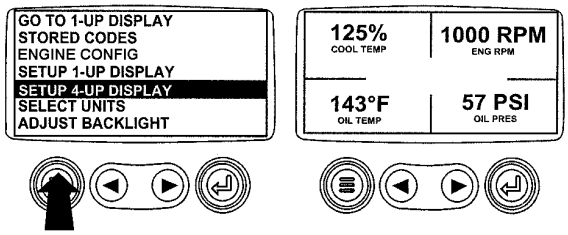
13. Repeat the parameter selection process until all spaces are as desired.
14. Press the "Menu" key to return to the main menu.



Return To Main Menu

OURGP11,00000B2 -19-27MAY16-13/14

15. Press the "Menu" key to exit the main menu and return to the engine parameter display.



Select Remaining Parameters

OURGP11,00000B2 -19-27MAY16-14/14

John Deere PowerSight

John Deere PowerSight is a web based service that allows remote access to machine data. John Deere PowerSight is accessible from a laptop, desktop or mobile device.

John Deere PowerSight works by combining a controller that includes cellular communication and GPS antennas. Machine data is collected by the controller and wirelessly transferred to a data server, where it is made available on a website.

John Deere PowerSight allows you to:

- Stay informed on machine location and hours
- Protect assets with Geofence and Curfew alerts
- Keep assets running with maintenance tracking and preventive maintenance plans
- Track and analyze machine and fuel usage
- Conduct remote machine diagnostics and programming

For more information and availability, contact an authorized John Deere dealer or servicing dealer.

BL90236,0000031 -19-13FEB14-1/1

Break-In Service

The engine is ready for normal operation. However, extra care during the initial break-in period will result in more satisfactory long-term engine performance and life.

During the initial operation of a new or rebuilt engine, change the oil and filter between a minimum of 100 hours and a maximum equal to the specified John Deere Plus 50 or John Deere Plus 50 II engine oil.

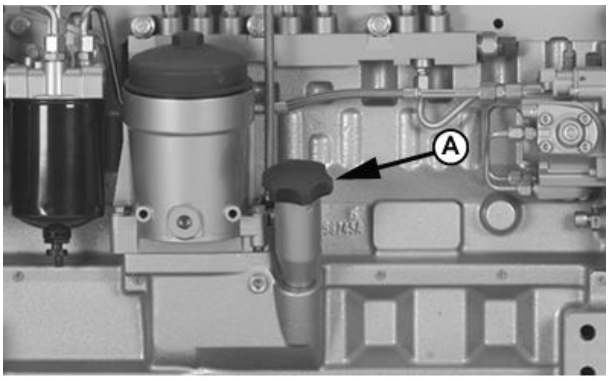
NOTE: In applications with extremely low annual hours (such as emergency generator sets), do not exceed oil usage of two years (24 months) when using Break-in Plus oil. In this circumstance, drain Break-In Plus oil at 24 months if it has not reached 100 hours of initial engine break-in, and refill with fresh Break-In Plus oil to accomplish at least 100 hours of accumulative break-in.

1. This engine is factory-filled with John Deere Engine Break-In Plus oil. Operate the engine at various conditions during the initial 100 hours with at least 15% of the time under heavy loads to achieve adequate engine break-in.
2. If the engine has too much operating time at idle, constant speeds, and/or light load usage, or make-up oil is required during the first 100-hour period, a longer break-in period may be needed without changing Break-In Plus oil until 500 hours.

IMPORTANT: Do not add make-up oil until the oil level is BELOW the ADD mark on dipstick. If make-up oil is required during the break-in period, John Deere Engine Break-In Plus oil should be used whenever possible.

IMPORTANT: If John Deere Engine Break-In Plus oil is not available for whatever reason, please use 10W-30 viscosity grade of John Deere Plus-50 II (CJ-4) as the make-up oil. If 10W-30 Plus-50 II (CJ-4) is also not available, then use 15W-40 viscosity grade of Plus-50 II (CJ-4) as the make-up oil.

API CJ-4	**API CF**
API CI-4 PLUS	**ACEA E7**
API CI-4	**ACEA E6**
API CH-4	**ACEA E5**
API CG-4	**ACEA E4**
API CF-4	**ACEA E3**
API CF-2	



RG13815 —UN—11JAN05

Check Engine Oil Level

RG5895 —UN—13AUG91

Engine Oil Level Dipstick

A—Oil Fill Cap/Dipstick

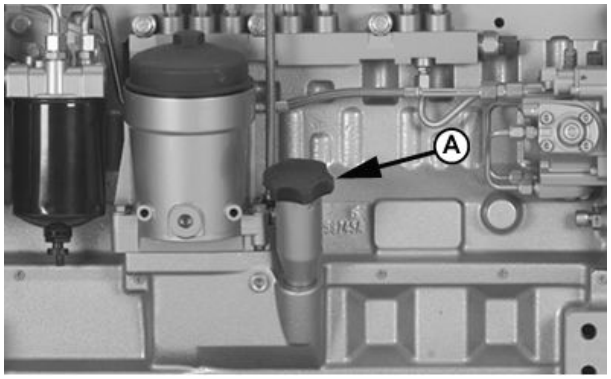
These oils will not allow the engine to break-in properly.

Continued on next page

3. Check oil by unscrewing and pulling out oil fill cap/dipstick (A). Oil fill cap/dipstick may be located on left or right side of engine, depending on application. Check oil more frequently during engine break-in period. If oil must be added during this period, John Deere Engine Break-In Plus oil is preferred. See ENGINE BREAK-IN OIL, in Fuels, Lubricants, and Coolant Section for other oils allowed.

IMPORTANT: DO NOT fill above the top of the crosshatch pattern or the FULL mark, whichever is present. Oil levels anywhere within crosshatch are considered in the acceptable operating range.

4. During the first 20 hours, avoid prolonged periods of engine idling or sustained maximum load operation.



RG13815 —UN—11JAN05

Oil Fill Cap/Dipstick

A—Oil Fill Cap/Dipstick

Continued on next page

5. If engine will idle longer than 5 minutes, stop engine.

6. Break-In Plus may be changed any time between 100 and 500 hours (or 24 months in the case of low annual usage such as emergency generator sets). (Top-load oil filter illustrated.)(See CHANGING ENGINE OIL AND REPLACING FILTER in Lubrication and Maintenance/500 Hour Section.) Fill crankcase with seasonal viscosity grade oil. (See DIESEL ENGINE OIL, in Fuels, Lubricants, and Coolant Section.)

NOTE: Some increase in oil consumption may be expected when low viscosity oils are used. Check oil levels more frequently.

If temperature is below 0°C (32°F), it may be necessary to use cold weather starting aids (See COLD WEATHER OPERATION, later in this section).

If air temperature is below 0° C (32° F), use an engine block heater.

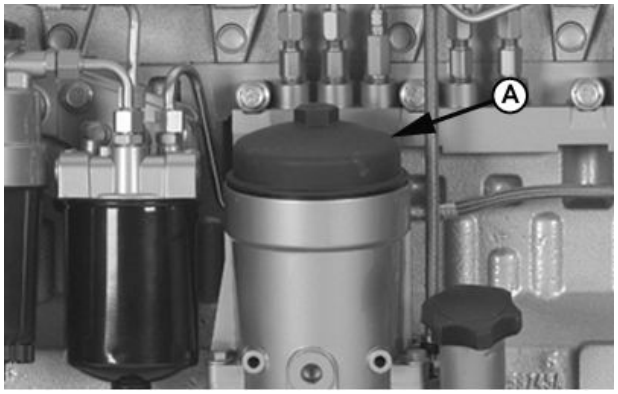
7. Watch coolant temperature gauge (A) closely during engine operation. Normal temperature range at full load rated speed is 82—94° C (180—202° F). If coolant temperature rises above 111° C (231° F), the engine will reduce power automatically. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

Watch oil pressure gauge (B) for pressure within specification.

Specification	
Engine[1]—Oil Pressure at	
Full Load Rated Speed	290 ± 103 kPa (2.9 ± 1.03 bar) (42 ± 15 psi)
Minimum Oil Pressure at	
Low Idle	138 kPa (1.4 bar) (20 psi)
Coolant Temperature	
Range	82°–94°C (180°–202°F)

8. Check belt for proper alignment and seating in pulley grooves.

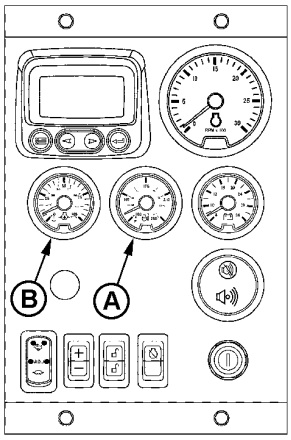
[1]At normal operating temperature of 115°C (240°F) oil sump.



RG13854 —UN—17JAN05

Replacing Engine Oil Filter

A—Oil Filter



RG13720 —UN—11NOV04

Watch Coolant Temperature and Oil Pressure on Panel

A—Engine Coolant Temperature Gauge

B—Oil Pressure Gauge

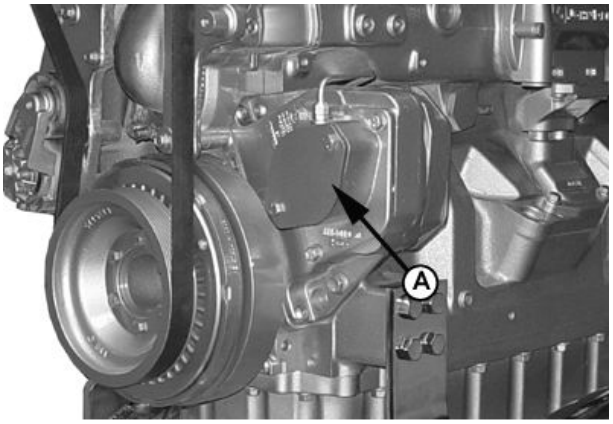
OURGP11,0000043 -19-20DEC10-3/3

Auxiliary Gear Drive Limitations

IMPORTANT: When attaching an air compressor, hydraulic pump, or other accessory to be driven by the auxiliary gear drive (engine timing gear train at front of engine), power requirements of the accessory must be limited to values listed below:

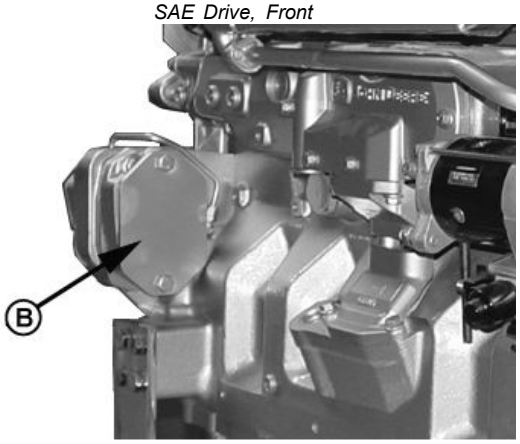
SAE Drive	Continuous Power (Maximum)	Intermittent Power (Maximum)
A.....	19 kW (25 hp)	22.5 kW (30 hp)
B or (A + B).....	37 kW (50 hp)	45 kW (60 hp)

A—SAE Drive, Front **B—SAE Drive, Rear**



RG13855 —UN—17JAN05

SAE Drive, Front



RG13856 —UN—17JAN05

SAE Drive, Rear

RG,RG34710,4051 -19-11OCT06-1/1

Generator Set (Standby) And All Other OEM Engine Applications

To assure that your engine will deliver efficient standby generator operation when needed, start engine and run at rated speed (with 50%—70% load) for 30 minutes every 2 weeks. DO NOT allow engine to run for an extended period of time with no load.

Biodiesel fuel is not recommended for standby equipment that can have minimal fuel consumption (such as standby generators, fire protection, etc.). For standby applications, use only petroleum based diesel fuel with John Deere approved fuel conditioners and additives. For fuel conditioners and additives, check with your local John Deere dealer.

Petroleum diesel fuel should not be stored in service tanks longer than two years even when using fuel additives. See your fuel distributor or John Deere dealer for more information.

RK80614,0000559 -19-24FEB15-1/1

Starting the Engine

The following instructions apply to the optional controls and instruments available through the John Deere Parts Distribution Network. The controls and instruments for your engine may be different from those shown here; always follow manufacturer's instructions.

CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment. Always use safety approved fuel storage and piping.

NOTE: If temperature is below 0°C (32°F), it may be necessary to use cold weather starting aids. (See COLD WEATHER OPERATION in this group.)

1. Perform all prestarting checks outlined in Lubrication and Maintenance/Daily section later in this manual.

TS220 —UN—15APR13

Use Proper Ventilation

2. Open the fuel supply shutoff valve, if equipped.
3. Disengage power to any engine drivelines.

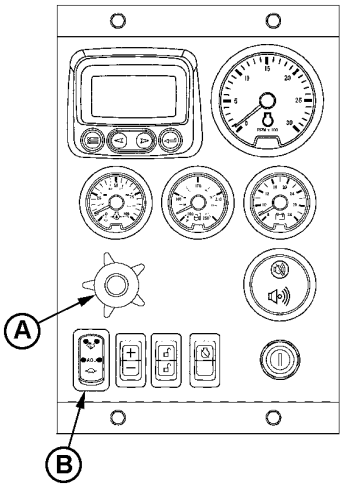
OURGP11,0000024 -19-17DEC09-1/3

4. Set slow idle as follows:

   Panels with high-low speed select rocker switch (B) only: Set slow speed by pressing lower half of switch.

   Panels with optional analog throttle(s) (A) : Set high-low speed select rocker switch to slow (turtle), then push in on analog throttle handle or turn full counterclockwise to set analog throttle(s) to slow speed.

IMPORTANT: Do not operate the starter for more than 30 seconds at a time. To do so may overheat the starter. If the engine does not start the first time, wait at least 2 minutes before trying again. If engine does not start after four attempts, see Troubleshooting section.



RG13722 —UN—11NOV04

Analog Throttle Control and Speed Select Switch

A—Analog Throttle Control (Optional)

B—Speed Select Rocker Switch

Continued on next page

OURGP11,0000024 -19-17DEC09-2/3

5. Turn key start switch (A) to the ON position. The "Wait To Start Preheating" message will be displayed when ambient temperatures require preheating (for engines with preheating options). The timer will display minutes and seconds, counting down to zero. Once the timer has reached 0:00 and the "Wait to Start" message is no longer displayed, you may start the engine.

   Turn key start switch (A) clockwise to the START position to crank the engine. When the engine starts, release the key switch so it returns to the ON position.

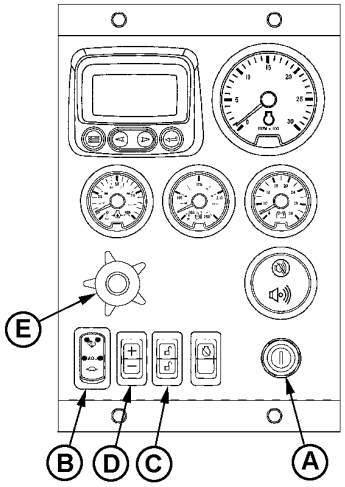
IMPORTANT: If the key switch is released before the engine starts, wait until the starter and the engine stop turning before trying again. This will possibly prevent damage to the starter and/or flywheel.

6. After engine starts, idle engine at not more than 1200 rpm until warm. (See WARMING ENGINE later in this section).

   Panels with high-low speed select rocker switch (B) only: Set rpm using bump speed enable switch (C) with speed select rocker switch (D).

   Panels with optional analog throttle (E): Set either high-low speed select switch (B) or analog throttle (E) to slow speed, and set desired speed with remaining control.

NOTE: Engine control unit (ECU) reads the higher of the high-low speed select rocker switch or the analog throttle speed settings.



RG13723 —UN—11NOV04

Start And Idle Engine Controls On Instrument Panel

A—Key Start Switch
B—High-Low Speed Select Rocker Switch
C—Bump Speed Enable Rocker Switch
D—Speed Select Rocker Switch
E—Analog Throttle Control (Optional)

7. Check all gauges for normal engine operation. If operation is not normal, stop the engine and determine the cause. (For normal gauge pressures and temperatures, see BREAK-IN SERVICE earlier in this section.)

OURGP11,0000024 -19-17DEC09-3/3

Normal Engine Operation

Observe engine coolant temperature and engine oil pressure. Temperatures and pressures will vary between engines and with changing operating conditions, temperatures, and loads.

Normal engine coolant operating temperature range is 82°–94° C (180°–202° F). If coolant temperature rises above 111° C (231° F), engine will reduce power automatically. Unless temperature drops quickly, stop engine and determine cause before resuming operation.

Operate the engine under a lighter load and at slower than normal speed for first 15 minutes after start-up. DO NOT run engine at slow idle.

Stop engine immediately if there are any signs of part failure. Symptoms that may be early signs of engine problems are:

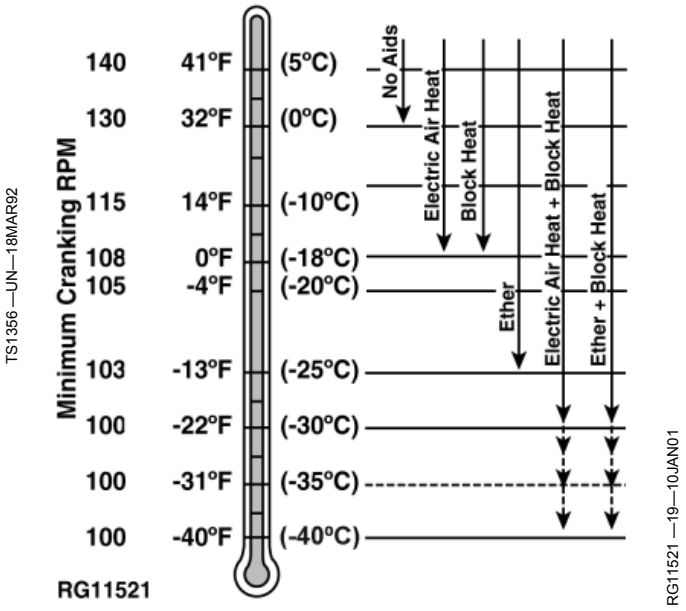
- Sudden drop in oil pressure
- Abnormal coolant temperatures
- Unusual noise or vibration
- Sudden loss of power
- Excessive black exhaust
- Excessive fuel consumption
- Excessive oil consumption
- Fluid leaks

NOTE: These engines meet emission standards with an exhaust gas recirculation system and a variable geometry turbocharger. A revving sound may be heard for an instant after starting, as the variable geometry turbocharger recycles. This is normal.

OURGP11,0000018 -19-11OCT06-1/1

Cold Weather Operation

Starting Fluid is Flammable



Cold Weather Starting Guidelines

⚠ CAUTION: Ether injector starting fluid is highly flammable. DO NOT use starting fluid on engines equipped with air intake heaters.

DO NOT use starting fluid near fire, sparks, or flames. DO NOT incinerate or puncture a starting fluid container.

IMPORTANT: Engines with Rear PTO- Turn off or unload all pumps, auxiliary drives, and compressors before cold weather starting to reduce drag on engine.

Engines may be equipped with a block heater, coolant heater or fuel heater as cold weather starting aids.

Starting aids are required below 0°C (32°F). They will enhance starting performance above these temperatures and may be needed to start applications that have high parasitic loads during cranking and/or start acceleration to idle.

Using correct grade oil (per engine and machine operators manual) is critical to achieving adequate cold weather cranking speed. Synthetic oils have improved flow at low temperatures

Other cold weather starting aids are required at temperatures below -25°C (-13°F) or at altitudes above 1500 m (5000 ft).

1. Follow steps 1—4 as listed under STARTING THE ENGINE, earlier in this section, then proceed as follows according to the instrument (control) panel on your engine.

2. Use cold weather starting aids as needed. Follow supplier instructions for starting aid provided on your engine. A booster battery can be connected if needed (see USING A BOOSTER BATTERY OR CHARGER, later in this section).

3. Engines With Air Intake Heaters: Turn key ON but do not crank engine until Engine Preheat Indicator goes off.

4. Follow remaining steps 5—7 as listed under STARTING THE ENGINE earlier in this section.

Additional information on cold weather operation is available from your authorized servicing dealer.

OURGP11,0000019 -19-11OCT06-1/1

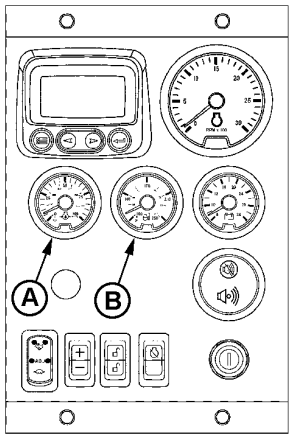
Warming Engine

IMPORTANT: To assure proper lubrication, operate engine at or below 1200 rpm with no load for 1–2 minutes. Extend this period 2–4 minutes when operating at temperatures below freezing.

Engines used in generator set applications where the governor is locked at a specified speed may not have a slow idle function. Operate these engines at high idle for 1 to 2 minutes before applying the load. This procedure does not apply to standby generator sets where the engine is loaded immediately upon reaching rated speed.

1. Check oil pressure gauge (A) as soon as engine starts. If gauge needle does not rise above minimum oil pressure specification of 200 kPa (2.0 bar) (29 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is 290 ± 103 kPa (2.9 ± 1.03 bar) (42 ± 15 psi) at rated full load speed (1800–2500 rpm) with oil at normal operating temperature of 115° C (240° F).
2. Watch coolant temperature gauge (B). Do not place engine under full load until it is properly warmed up. The normal engine coolant temperature range is 82°–94° C (180°–202° F).

NOTE: It is a good practice to operate the engine under a lighter load and at lower speeds than normal for the first few minutes after start-up.



RG13724 —UN—11NOV04

Oil Pressure and Coolant Temperature Gauges On Panel

A—Engine Oil Pressure Gauge
B—Engine Coolant Temperature Gauge

OURGP12,00000C2 -19-11OCT06-1/1

Idling Engine

Avoid excessive engine idling. Prolonged idling may cause the engine coolant temperature to fall below its normal range. This, in turn, causes crankcase oil dilution, due to incomplete fuel combustion, and permits formation of gummy deposits on valves, pistons, and piston rings. It also promotes rapid accumulation of engine sludge and unburned fuel in the exhaust system.

Once an engine is warmed to normal operating temperatures, engine should be idled at slow idle speed.

Slow idle speed for this engine is set at the factory at 800 rpm for standard industrial engines and at 850 rpm for generator sets. If an engine will be idling for more than 5 minutes, stop and restart later.

NOTE: Generator set applications where the governor is locked at a specified speed may not have a slow idle function. These engines will idle at no load governed speed (high idle).

RG,RG34710,4058 -19-11OCT06-1/1

Changing Engine Speed

NOTE: On engines with **2-position** *throttles, speeds are not adjustable. These throttles allows operation only at the preset rated speed or at idle using the single switch (A).*

Changing from slow to fast speed using Standard High-Low Speed Select Rocker Switch (A) (If Equipped):

- For slow speed, press lower half of switch (indicated by turtle symbol).
- For fast speed, press upper half of switch (indicated by rabbit symbol).

NOTE: To adjust preset fast or slow speeds for High-Low Speed Select Rocker Switch:

1. *Select fast (rabbit) or slow (turtle) position on High-Low Speed Select Rocker Switch (A).*
2. *Press and hold top or bottom half of Bump Speed Enable Rocker Switch (B) while using Speed Select Rocker Switch (C).*
3. *Use Speed Select Rocker Switch (C) to bump engine speed up (+) or down (-).*

NOTE: Once the speed has been set, the Bump Speed Enable Switch (B) must be pressed and released three times within two seconds to commit the new slow or fast speed to memory. If not done, the engine's new slow or fast speed will only be effective until the key switch is shut off. Then the speed will revert to its previous setting.

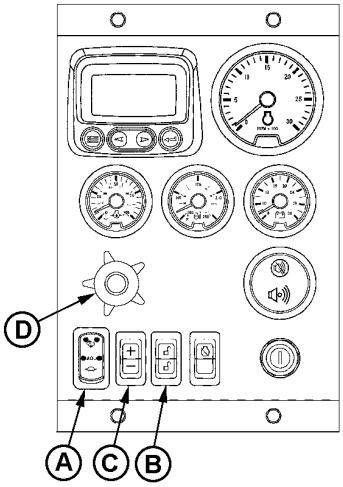
Changing from slow to fast speed using Adjustable High-Low Speed Select Rocker Switch (A) (If Equipped):

Panels have an adjustable **three-position** rocker switch (A) that can be used to select slow idle, fast idle, or an adjustable (“ADJ”) intermediate speed.

- For slow speed, press lower half of rocker switch (indicated by turtle symbol).
- For fast speed, press upper half of rocker switch (indicated by rabbit symbol).

NOTE: To adjust preset fast or slow speeds with adjustable High-Low Speed Select Rocker Switch:

1. *Select middle position (ADJ) or slow (turtle) position on the optional Adjustable Three-State Speed Select Rocker Switch (A).*
2. *Press and hold top or bottom half of Bump Speed Enable Rocker Switch (B) while using Speed Select Rocker Switch (C).*
3. *Use Speed Select Rocker Switch (C) to bump engine speed up (+) or down (-).*



RG13725 —UN—11NOV04

Changing Engine Speed On Panel

A—High-Low Speed Select Rocker Switch
B—Bump Speed Enable Rocker Switch
C—Speed Select Rocker Switch
D—Analog Throttle Control (Optional)

NOTE: Slow (turtle) position is factory preset at low engine idle, while middle (ADJ) position is factory set at high engine idle.

NOTE: Once the speed has been set, the Bump Speed Enable Switch (B) must be pressed and released three times within two seconds to commit the new slow or fast speed to memory. If not done, the engine's new slow or fast speed will only be effective until the key is shut off. Then the speed will revert to its previous setting.

Changing engine speed using optional analog throttle (D)

NOTE: Pushing in on analog throttle will immediately take engine to slow idle speed.

1. Set High-Low Speed Select Rocker Switch (A) to low speed “turtle” position.

2. Turn analog throttle (D) clockwise to increase speed or counterclockwise to decrease speed.

NOTE: Engine Control Unit (ECU) reads the higher of the High-Low Speed Select Rocker Switch or the Analog Throttle(s) Speed Settings. With High-Low switch at low speed, Analog Throttle(s) will control speed higher than low idle setting.

Continued on next page

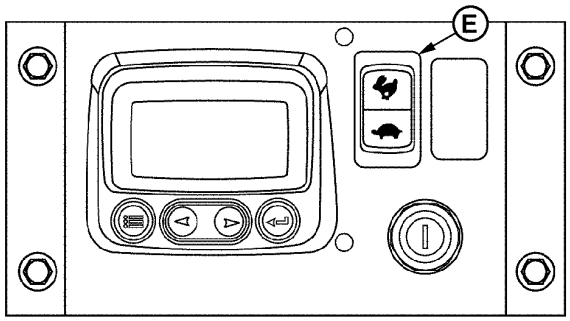
Changing engine speeds on engines equipped with the Basic Instrument Panel

The basic instrument panel has a “ramp” throttle switch (E) with a spring loaded return to the center rest position (Off).

To increase the engine speed, press and hold upper half of rocker switch (E) (indicated by rabbit symbol) to increase or ramp up the engine speed to desired speed. Release the rocker switch.

Press lower half of rocker switch (indicated by turtle symbol) to decrease or ramp down the engine speed to desired speed. Release the rocker switch.

The settings will not be stored, so steps above must be repeated for each speed change.



RG13289 —UN—30OCT03

Changing Engine Speed With Basic Panel

E—High-Low Speed Select Rocker Switch

OURGP12,00000C1 -19-11OCT06-2/2

Stopping the Engine

1. Pull PTO clutch lever rearward (away from engine) to disengage clutch, if equipped.

IMPORTANT: Before stopping an engine that has been operating at working load, idle engine at least 2 minutes at 1000—1200 rpm to cool hot engine parts.

Engines in generator set applications where the ECU is locked at a specified speed and no slow idle function is available, run engine for at least 2 minutes at fast idle and no load. This procedure does not apply to some standby generator sets where the engine is shut down immediately and has no idle speed option.

2. Run engine at 1000—1200 rpm for at least 2 minutes to cool.

   Panels with high-low speed select rocker switch (B) only: Set rpm using bump speed enable switch (C) with speed select rocker switch (D).

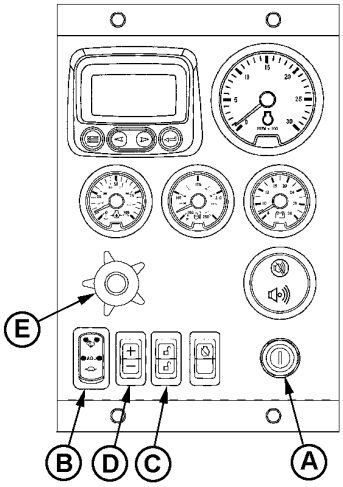
   Panels with optional analog throttle (E): Set either high-low speed select switch (B) or analog throttle control (E) to slow idle, and set desired speed with remaining control.

NOTE: Engine control unit (ECU) reads the higher of the high-low speed select rocker switch or the analog throttle speed settings.

3. Push in on analog throttle control handle (if equipped) so that engine goes to slow idle, or set slow speed with high-low speed select rocker switch.

4. Turn key start switch (A) to “OFF” position to stop the engine. Remove ignition key.

IMPORTANT: Make sure that exhaust stack rain cap (F) is installed when engine is not running. This will prevent water and dirt from entering engine.



RG13723 —UN—11NOV04

Stopping the Engine Using Panel Controls (Full-Featured Panel Shown)

RG9933 —UN—18NOV99

Exhaust Stack Rain Cap

A—Key Start Switch
B—High-Low Speed Select Rocker Switch
C—Bump Speed Enable Rocker Switch
D—Speed Select Rocker Switch
E—Analog Throttle Control (Optional)
F—Exhaust Stack Rain Cap

JR74534,00002E7 -19-02DEC10-1/1

Using a Booster Battery or Charger

A 12 volt booster battery can be connected in parallel (B) with battery(ies) on the unit to aid in cold weather starting. ALWAYS use heavy-duty jumper cables.

Series:

- Amps = Same as single battery
- Volts = Twice as a single battery

Parallel:

- Amps = Twice as a single battery
- Volts = Same as a single battery

CAUTION: Gas given off by battery is explosive. Keep sparks and flames away from battery. Before connecting or disconnecting a battery charger, turn charger off. Make last connection and first disconnection at a point away from battery. Always connect NEGATIVE (–) cable last and disconnect this cable first.

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**

IMPORTANT: Be sure that polarity is correct before making connections. Reversed polarity will damage electrical system. Always connect positive to positive and negative to ground. Always use 12 volt booster battery for 12 volt electrical systems and 24 volt booster battery(ies) for 24 volt electrical systems.

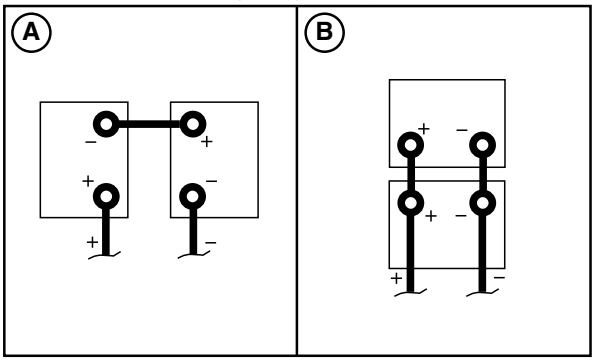
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

NOTE: To avoid sparks, DO NOT allow the free ends of jumper cables to touch the engine.

2. Connect one end of jumper cable to the POSITIVE (+) post of the booster battery.
3. Connect the other end of the jumper cable to the POSITIVE (+) post of battery connected to starter.

TS204 —UN—15APR13

Exploding Battery



RG24885 —UN—17DEC13

A—Series **B—Parallel**

4. Connect one end of the other jumper cable to the NEGATIVE (–) post of the booster battery.
5. ALWAYS complete the hookup by making the last connection of the NEGATIVE (–) cable to a good ground on the engine frame and away from the battery(ies).
6. Start the engine. Disconnect jumper cables immediately after engine starts. Always disconnect NEGATIVE (–) cable first.

RG,RG34710,4060 -19-17DEC13-1/1

Required Emission-Related Information

Service Provider

A qualified repair shop or person of the owner's choosing may maintain, replace, or repair emission control devices and systems with original or equivalent replacement parts. However, warranty, recall, and all other services paid for by John Deere must be performed at an authorized John Deere service center.

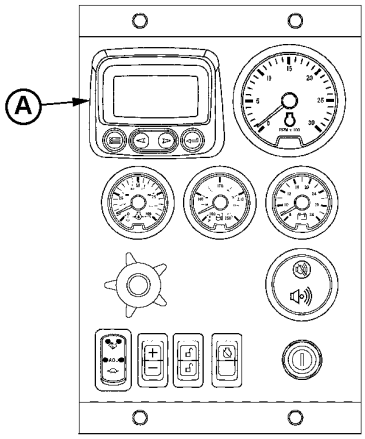
DX,EMISSIONS,REQINFO -19-12JUN15-1/1

Observe Service Intervals

Using hour meter (A) on diagnostic gauge as a guide, perform all services at the hourly intervals indicated on following pages. At each scheduled maintenance interval, perform all previous maintenance operations in addition to the ones specified. Keep a record of hourly intervals and services performed, using charts provided in Lubrication and Maintenance Records section.

IMPORTANT: Recommended service intervals are for normal operating conditions. Perform maintenance at interval which occurs first, for example, either at 500 hours of operation OR every 12 months. Service MORE OFTEN if engine is operated under adverse conditions. Neglecting maintenance can result in failures or permanent damage to the engine.

A—Hour Meter



Hour Meter On Panel

RG13728 —UN—11NOV04

OURGP12,0000136 -19-11OCT06-1/1

Use Correct Fuels, Lubricants, and Coolant

IMPORTANT: Use only fuels, lubricants, and coolants meeting specifications outlined in Fuels, Lubricants, and Coolant Section when servicing your John Deere Engine.

Consult your John Deere Servicing Distributor or your nearest John Deere Parts Network for recommended fuels, lubricants, and coolant. Also available are necessary additives for use when operating engines in tropical, arctic, or any other adverse conditions.

RG17133 —UN—18MAY09

JR74534,000027F -19-18MAY09-1/1

Lubrication and Maintenance Service Interval Chart

	Lubrication and Maintenance Service Intervals				
Item	Daily[a]	500 Hours/ 12 Month	1500 Hours	2000 Hours/ 24 Month	As Required
Operate Engine at Rated Speed and 50%-70% Load a Minimum of 30 Minutes	•				
Check Engine Oil and Coolant Level	•				
Check Fuel Filter/Water Bowl	•				
Check Air Cleaner Dust Unloader Valve & Restriction Indicator Gauge [b]	•				
Visual Walk Around Inspection	•				
Service Fire Extinguisher		•			
Check Engine Mounts		•			
Service Battery		•			
Change Engine Oil And Replace Oil Filter [c ,d]		•			
Check Crankcase Vent System		•			
Check Air Intake Hoses, Connections, and System		•			
Replace Fuel Filter Elements		•			
Check Automatic Belt Tensioner and Belt Wear		•			
Check Engine Electrical Ground Connection		•			
Coolant Solution Analysis-Add SCAs as required		•			
Pressure Test Cooling System		•			
Check Engine Speeds		•			
Check Cooling System		•			
Test Thermostats				•	
Check Crankshaft Vibration Damper [e]				•	
Flush and Refill Cooling System [f]				•	
Check and Adjust Engine Valve Clearance				•	
Add Coolant					•
Replace Air Cleaner Elements					•
Replace Fan and Alternator Belts					•
Check Fuses					•
Check Air Compressor (If Equipped)					•
Bleed Fuel System					•

[a]Standby generator applications may allow intervals up to every 2 weeks.
[b]Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in) H2O.
[c]During engine break in, change the oil and filter for the first time before 100 hours of operation.
[d]Service intervals depend on sulfur content of the diesel fuel, oil pan capacity, and the oil and filter used, which means that intervals may be REDUCED. (See DIESEL ENGINE OIL AND FILTER SERVICE INTERVALS in Fuels, Lubricants, and Coolant Section.)
[e]Replace crankshaft damper every 4500 hours or 60 months, whichever occurs first.
[f]If John Deere Cool-Gard is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere Cool-Gard is used and the coolant is tested annually AND additives are replenished as needed by adding a supplemental coolant additive, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

AK08008,00000EA -19-23AUG22-1/1

Lubrication and Maintenance Service Interval Chart—Jet Fuel Capable Engines

	Lubrication and Maintenance Service Intervals				
Item	Daily	250 Hours of Operation/or Every 12 Months	500 Hours of Operation/or Every 12 Months	2000 Hours of Operation/or Every 24 Months	As Required
Check Engine Oil and Coolant Level	•				
Check Fuel Filter/Water Bowl	•				
Check Air Cleaner Dust Unloader Valve & Restriction Indicator Gauge [a]	•				
Visual Walk Around Inspection	•				
Replace Fuel Filter Elements		•			
Replace Dosing Element		•			
Change Engine Oil And Replace Oil Filter [b,c]		•			
Service Fire Extinguisher			•		
Check Engine Mounts			•		
Service Battery			•		
Check Crankcase Vent System			•		
Check Air Intake Hoses, Connections, and System			•		
Check Automatic Belt Tensioner and Belt Wear			•		
Check Engine Electrical Ground Connection			•		
Coolant Solution Analysis-Add SCAs as required			•		
Pressure Test Cooling System			•		
Check Engine Speeds			•		
Check Cooling System			•		
Test Thermostats				•	
Flush and Refill Cooling System [d]				•	
Check and Adjust Engine Valve Clearance				•	
Check Crankshaft Vibration Damper [e]				•	
Test Glow Plugs (If Equipped)				•	
Add Coolant					•
Replace Air Cleaner Elements					•
Replace Fan and Alternator Belts					•
Check Fuses					•
Check Air Compressor (If Equipped)					•
Bleed Fuel System					•

[a] Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in) H2O. If not equipped with indicator, replace air cleaner elements at 500 hours or 12 months, whichever occurs first.
[b] During engine break-in, change the oil and filter for the first time after 100 hours of operation (maximum).
[c] Service intervals depend on sulfur content of the fuel, oil pan capacity, and the oil and filter used. (See ENGINE OIL AND FILTER SERVICE INTERVALS (JET FUEL CAPABLE ENGINES ONLY) earlier in this manual.)
[d] If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished as needed by adding a supplemental coolant additive, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.
[e] Crankshaft vibration damper is not repairable. Replace crankshaft vibration damper every 4500 hours or 60 months, whichever occurs first.

DN28805,0001E71 -19-03NOV15-1/1

Daily Prestarting Checks

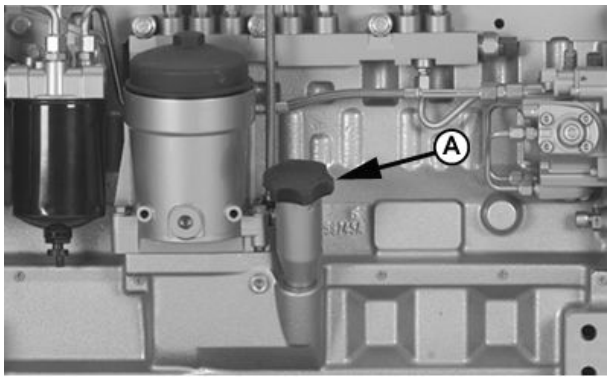
Do the following BEFORE STARTING THE ENGINE for the first time each day:

IMPORTANT: DO NOT add makeup oil until the oil level is BELOW the "ADD" mark on the dipstick.

1. Check engine oil level on dipstick by unscrewing and pulling out oil fill cap/dipstick (A). Fill cap/dipstick may be located on left or right side, depending on application. Add as required, using seasonal viscosity grade oil. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for oil specifications.)

IMPORTANT: DO NOT fill above the top mark on the dipstick. Oil levels anywhere within crosshatch are considered in the acceptable operating range.

   Oil may be added at dipstick tube or rocker arm cover filler cap locations.



RG13815 —UN—11JAN05

Checking Engine Oil Level

A—Oil Fill Cap/Dipstick

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OURGP12,000012D -19-11OCT06-1/4

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Only remove filler cap when engine is cold or when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

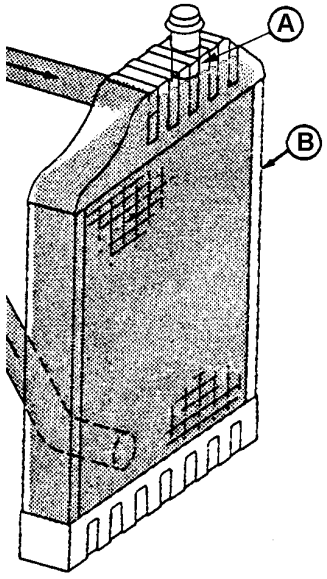
2. Check the coolant level when engine is cold. Coolant level should be at bottom of the radiator filler neck (A). Fill radiator (B) with proper coolant solution if level is low. (See ADDING COOLANT in Service As Required Section.) Check overall cooling system for leaks.

   Refer to your vehicle's operator's manual for recommendations for non-John Deere supplied accessories.

A—Radiator Filler Neck **B—Radiator**

TS281 —UN—15APR13

High Pressure Fluids



RG13295 —UN—20NOV03

Radiator and Coolant

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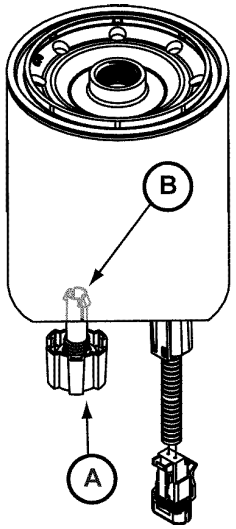
OURGP12,000012D -19-11OCT06-2/4

3. Loosen drain valve (A) on each fuel filter all the way so that the valve opens to the hold tabs (B) and drain water and debris as needed. Retighten valves securely.

NOTE: Any water in fuel is drained into the bottom of the fuel filters. The operator is signaled by an amber indicator on the instrument panel. To service, see DRAIN WATER FROM FUEL FILTERS in Service as Required.

A—Drain Valve **B—Hold Tabs**



RG13353 —UN—24DEC03

Drain Water From Fuel Filters

OURGP12,000012D -19-11OCT06-3/4

4. If the air cleaner has an automatic dust unloader valve (A), squeeze the unloader valve on air cleaner assembly to clear away any dust buildup.

IMPORTANT: Do not exceed maximum air intake restriction. A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.

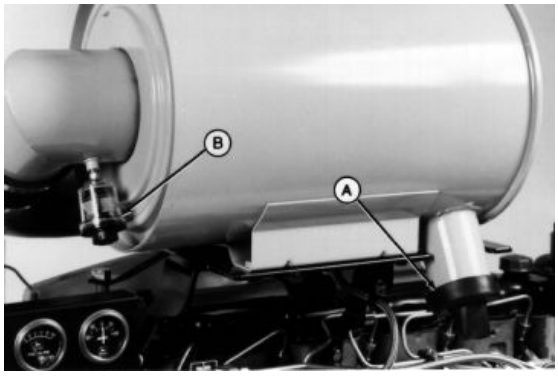
If equipped with air intake restriction indicator gauge (B), check gauge and service air cleaner if air intake restriction exceeds specifications.

	Specification
Maximum Air Intake Restriction—Vacuum	25 in. (625 mm) H_2O (6.25 kPa) (0.06 bar) (1.0 psi)

5. Make a thorough inspection of the engine compartment. Look for oil or coolant leaks, worn fan and accessory drive belts, loose connections and trash build-up. Remove trash build-up and have repairs made as needed if leaks are found.

NOTE: Wipe all fittings, caps, and plugs before performing any maintenance to reduce the chance of system contamination.

Inspect:
- Radiator for leaks and trash build-up.
- Air intake system hoses and connections for cracks and loose clamps.



RG7332 —UN—06JAN99

Air Cleaner

A—Unloader Valve **B—Restriction Indicator Gauge**

- Fan, alternator, and accessory drive belts for cracks, breaks or other damage.
- Coolant pump for coolant leaks.

NOTE: It is normal for a small amount of leakage to occur as the engine cools down and parts contract. Excessive coolant leakage may indicated the need to replace the coolant pump seal. Contact your engine distributor or servicing dealer for repairs.

OURGP12,000012D -19-11OCT06-4/4

Servicing Fire Extinguisher

A fire extinguisher (A) is available from your authorized servicing dealer or engine distributor.

Read and follow the instructions which are packaged with it. The extinguisher should be inspected at least every 500 hours of engine operation or every 12 months. Once extinguisher is operated, no matter how long, it must be recharged. Keep record of inspections on the tag which comes with the extinguisher instruction booklet.

A—Fire Extinguisher

RW4918 —UN—15DEC88

Fire Extinguisher

OURGP12,00000B9 -19-11OCT06-1/1

Servicing Battery

CAUTION: Battery gas can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Always remove grounded NEGATIVE (—) battery clamp first and replace it last.

TS204 —UN—15APR13

Exploding Battery

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**

1. On regular batteries, check electrolyte level. Fill each cell to bottom of filler neck with distilled water.

NOTE: Low-maintenance or maintenance-free batteries should require little additional service. However, electrolyte level can be checked by cutting the center section of decal on dash-line, and removing cell plugs. Fill each cell to bottom of filler neck with distilled water.

2. Keep batteries clean by wiping them with a damp cloth. Keep all connections clean and tight. Remove any corrosion, and wash terminals with a solution of 1 part baking soda and 4 parts water. Tighten all connections securely.

NOTE: Coat battery terminals and connectors with a mixture of petroleum jelly and baking soda to retard corrosion.

3. Keep battery fully charged, especially during cold weather. If a battery charger is used, turn charger off before connecting charger to battery(ies). Attach POSITIVE (+) battery charger lead to POSITIVE (+) battery post. Then attach NEGATIVE (—) battery charger lead to a good ground.

Continued on next page

OURGP11,000001C -19-11OCT06-1/2

CAUTION: Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

1. **Filling batteries in a well-ventilated area.**
2. **Wearing eye protection and rubber gloves.**
3. **Avoiding breathing fumes when electrolyte is added.**
4. **Avoiding spilling or dripping electrolyte.**
5. **Using proper jump start procedure.**

If you spill acid on yourself:

1. **Flush your skin with water.**
2. **Apply baking soda or lime to help neutralize the acid.**
3. **Flush your eyes with water for 10—15 minutes. Get medical attention immediately.**

If acid is swallowed:

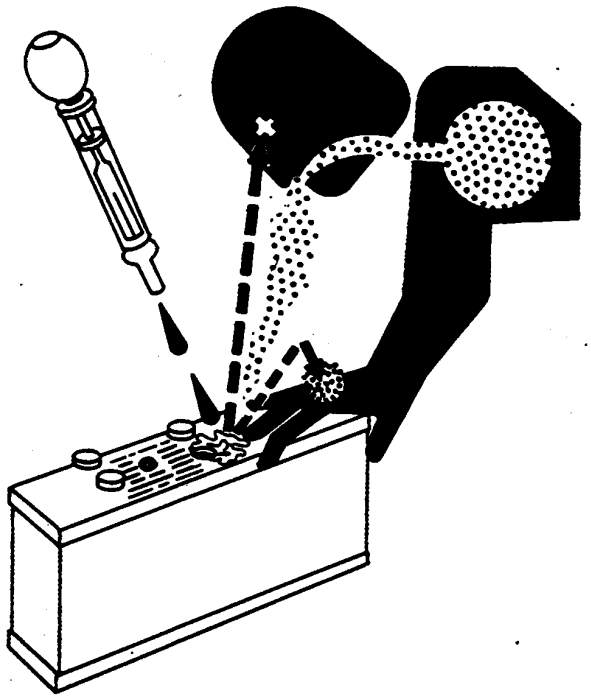
1. **Drink large amounts of water or milk.**
2. **Then drink milk of magnesia, beaten eggs, or vegetable oil.**
3. **Get medical attention immediately.**

In freezing weather, run engine at least 30 minutes to ensure thorough mixing after adding water to battery.

Replacement battery(ies) must meet or exceed the following recommended capacities[1] at —18°C (0°F):

Specification	
12-Volt System—Minimum Battery Capacity—Cold Cranking Amps	1100 Minimum
Reserve Capacity (Minutes)	350 Minimum
24-Volt System—Minimum Battery Capacity—Cold Cranking Amps	750 Minimum
Reserve Capacity (Minutes)	275 Minimum

[1] Total recommended capacity based on batteries connected in series or parallel.



TS203 —UN—23AUG88

Sulfuric Acid

OURGP11,000001C -19-11OCT06-2/2

Changing Engine Oil and Replacing Oil Filter

IMPORTANT: Changing engine oil and filter every 250 hours (Jet Fuel Capable Engines) or 500 hours (Diesel Fuel Engines) or 12 months depends on the following requirements:

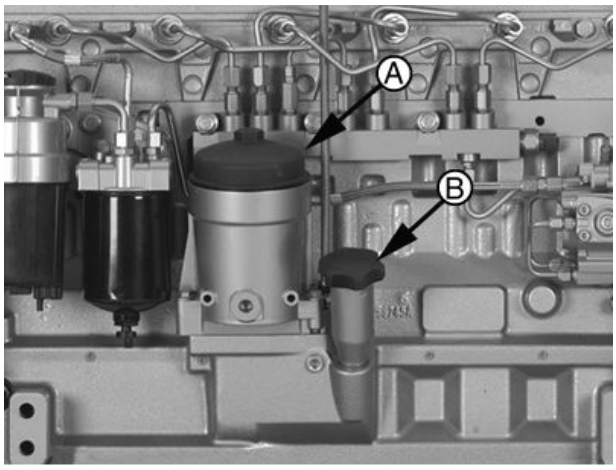
- **Engine equipped with an oil pan that allows capacity for this extended drain interval.**
- **Use of premium oil John Deere PLUS-50, ACEA E7 or ACEA E6.**
- **Perform engine oil analysis to determine the actual extended service life of ACEA E7 and ACEA E6 oils.**
- **Use of the approved John Deere oil filter.**
- **Use of diesel fuel with sulfur content less than 0.50% (5000 ppm) is strongly recommended.**

The oil and filter change interval is reduced if ANY of the above listed requirements are not followed.

NOTE: During **break-in***, change engine oil and filter for the first time before* **100** *hours maximum of operation.*

NOTE: Service intervals depend on sulfur content of the diesel fuel, oil pan capacity, and the oil and filter used. (See DIESEL ENGINE OIL AND FILTER SERVICE INTERVALS, in Fuels, Lubricants, and Coolant Section.)

OILSCAN™ or OILSCAN PLUS™ is a John Deere sampling program to help you monitor machine performance and identify potential problems before they cause serious damage. OILSCAN™ and OILSCAN PLUS™ kits are available from your John Deere engine distributor or servicing dealer. Oil samples should be taken prior to the oil change. Refer to instructions provided with kit.



RG13866 —UN—07FEB05

Changing Engine Oil and Replacing Oil Filter

A—Oil Filter **B—Oil Fill Cap/Dipstick**

⚠ CAUTION: Engine oil and metal surfaces of engine may be hot to the touch after shutdown. Use care to prevent burns.

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OILSCAN PLUS is a trademark of Deere & Company.

DN28805,0001E72 -19-15JUN17-1/4

Change engine oil as follows:

1. Run engine approximately 5 minutes to warm up oil. Shut off engine.

NOTE: Drain plug location may vary, depending on the application.

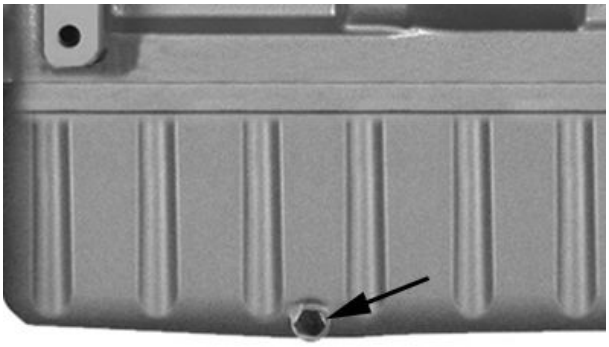
2. Remove oil pan drain plug.

3. Drain crankcase oil from engine while warm.

NOTE: For more complete draining of oil, wait to install oil pan drain plug until filter oil is drained back (see following procedure).

4. Install oil pan drain plug with a new O-ring and tighten to specifications.

Specification	
Oil Pan Drain Plug—Torque	81 N·m (60 lb·ft)



RG13816 —UN—11JAN05

Oil Pan Drain Plug

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DN28805,0001E72 -19-15JUN17-2/4

Replacing Oil Filter

IMPORTANT: Filtration of oils is critical to proper lubrication. Always change filter regularly. Use filter meeting John Deere performance specifications.

NOTE: Two types of engine oil filters are available. For engines equipped with spin on style engine oil filters, follow the instructions printed on the engine oil filter. For engines equipped with cartridge style engine oil filters, follow instructions below.

NOTE: Do NOT remove plug (B). Plug (B) is not an oil drain. Oil in filter will drain down automatically as filter cap is loosened.

5. Loosen filter cap (A) one-half turn with wrench. Wait 30 seconds to allow oil filter housing to drain. Remove cap and filter assembly.

6. While holding cap, strike filter element against solid surface as shown to unfasten filter from cap. Discard used filter.

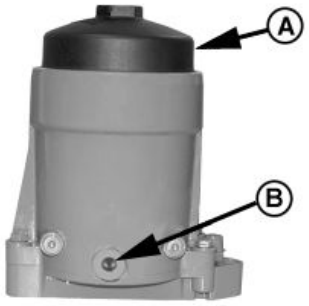
7. Remove O-ring seal and replace with new O-ring provided with new filter element.

8. Lubricate the new O-ring with clean engine oil prior to installing cap and filter back into oil filter housing.

9. Press new filter element into cap until it snaps into place.

10. Insert cap and filter assembly into oil filter housing. Screw cap into place.

11. Tighten cap to specifications.



RG13817A —UN—01APR05

Remove Oil Filter Cap

RG11628 —UN—01FEB01

Remove Filter Element from Cap

A—Oil Filter Cap **B—Plug (DO NOT REMOVE)**

Specification

Top-Load Oil Filter
Cap—Torque..... 45 N·m (33 lb·ft)

DN28805,0001E72 -19-15JUN17-3/4

Filling Engine Crankcase with Oil

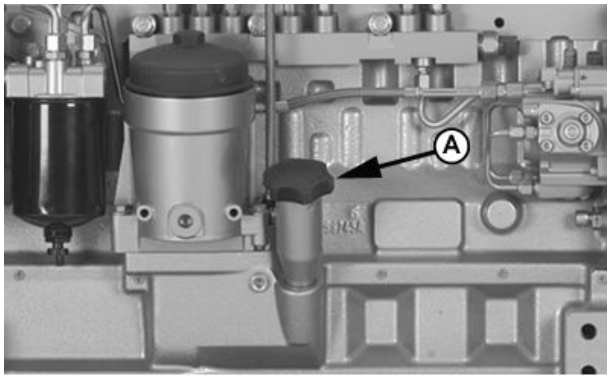
1.Remove oil fill cap/dipstick (A) and fill engine crankcase with correct John Deere engine oil. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

NOTE: Crankcase oil capacity may vary slightly. ALWAYS fill crankcase to full mark or within crosshatch on dipstick, whichever is present. DO NOT overfill.

To determine the correct oil fill quantity for your engine, see ENGINE CRANKCASE OIL FILL QUANTITIES in the Specifications Section.

IMPORTANT: Immediately after completing any oil change, crank engine for 30 seconds without permitting engine to start. This will help insure adequate lubrication to engine components before engine starts.

2. Start engine and run to check for possible leaks.



RG13815 —UN—11JAN05

Filling Engine Crankcase With Oil

A—Oil Fill Cap/Dipstick

3. Stop engine and check oil level after 10 minutes. Oil level reading should be on upper mark of dipstick.

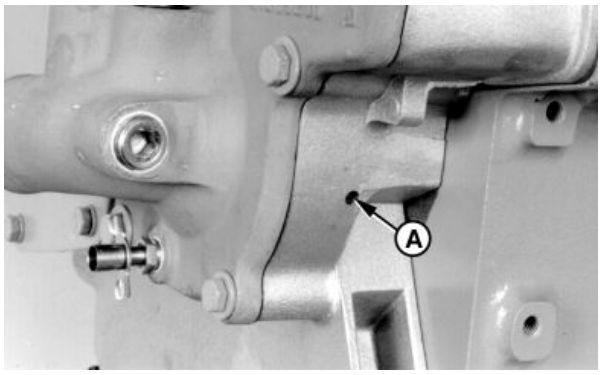
DN28805,0001E72 -19-15JUN17-4/4

Visually Inspecting Coolant Pump

Inspect Weep Hole

1. Inspect weep hole (A) for oil or coolant leakage.
   - Oil leakage indicates a damaged rear seal.
   - Coolant leakage indicates a damaged front seal.
2. Replace complete coolant pump assembly if leakage is detected: individual repair parts are not available.

A—Weep Hole



RG7061 —UN—26NOV97

Coolant Pump Weep Hole

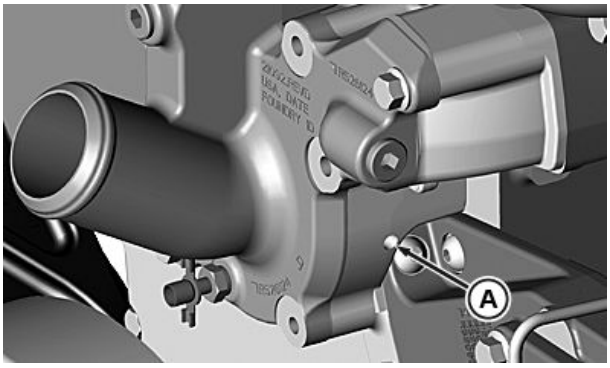
OURGP11,000003D -19-02DEC10-1/2

Inspect Weep Hole 6090HFG86

1. Inspect weep hole (A) for oil or coolant leakage.
   - Oil leakage indicates a damaged rear seal.
   - Coolant leakage indicates a damaged front seal.
2. Replace complete coolant pump assembly if leakage is detected: individual repair parts are not available.

Inspect for Impeller Contact with Cover

1. Remove radiator-to-coolant pump hose from coolant pump inlet elbow.
2. Using a flashlight, inspect ID of coolant pump cover for internal impeller contact.
   - Impeller contact with cover usually indicates that impeller has moved on shaft or there is a damaged bearing.



RG17151 —UN—26MAY09

Coolant Pump Weep Hole

A—Weep Hole

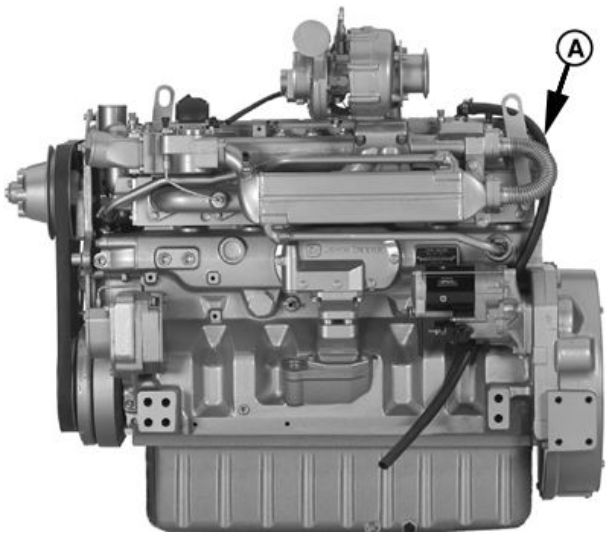
Replace coolant pump assembly and cover as necessary if impeller contact is detected.

OURGP11,000003D -19-02DEC10-2/2

Checking Crankcase Vent Hose and Valve

1. Loosen clamp on crankcase vent hose (A).
2. Remove crankcase vent valve (not shown) from rocker arm cover.
3. Remove valve from crankcase vent hose and clean hose. Ensure hose is not plugged.
4. Shake crankcase valve. If free movement of valve is heard while shaking, valve can be reused. Replace valve if rattle is not heard.
5. Install the valve and vent hose. Attach valve to bracket with two screws provided. Tighten hose clamp securely.

A—Vent Tube



RG13818 —UN—11JAN05

Clean Crankcase Vent Tube

OURGP11,000001F -19-11OCT06-1/1

Checking Air Intake System

IMPORTANT: The air intake system must not leak. Any leak, no matter how small, may result in internal engine damage due to abrasive dirt and dust entering the intake system.

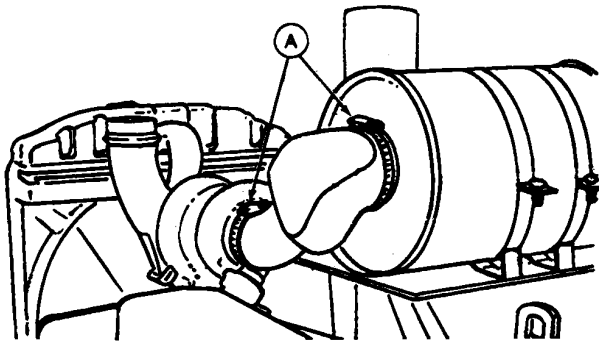
1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps (A) on piping which connect the air cleaner to the engine. Tighten clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.
3. If engine has a rubber dust unloader valve (B), inspect the valve on bottom of air cleaner for cracks or plugging. Replace as necessary.

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H_2O, is torn, or visibly dirty.

4. Test air restriction indicator gauge (C) for proper operation. Replace indicator as necessary.

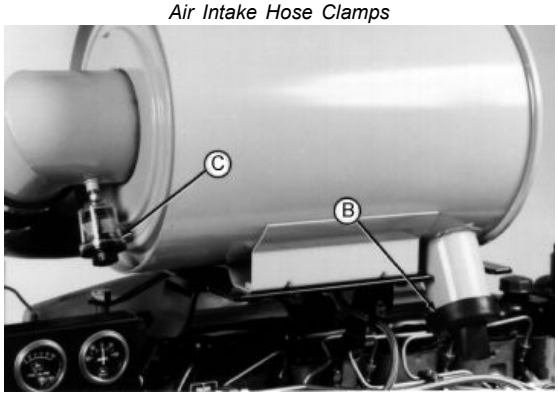
IMPORTANT: If not equipped with air restriction indicator, replace air cleaner elements at 250 Hours for jet fuel applications, 500 Hours for diesel applications, or at 12 Months, whichever occurs first.

5. Remove and inspect primary air cleaner element. Service as necessary. (See REPLACING AIR CLEANER ELEMENTS in Service As Required Section.)



RG4689 —UN—20DEC88

Air Intake Hose Clamps



RG11067 —UN—05JUN00

Air Cleaner

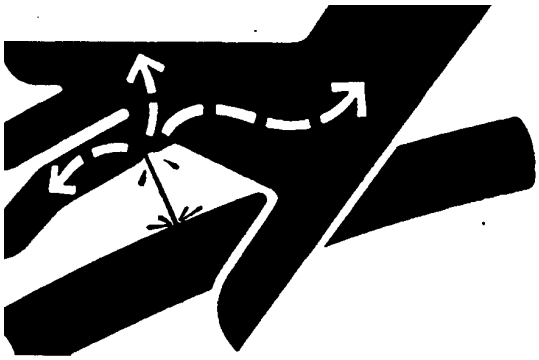
A—Clamps
B—Unloader Valve
C—Restriction Indicator Gauge

DN28805,0001E73 -19-05MAR14-1/1

Replacing Fuel Filter Elements (Diesel Fuel)

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.



X9811 —UN—23AUG88

High Pressure Fluids

CAUTION: Due to High Pressure Common Rail system design, fuel in filter is likely to be under high pressure. To avoid possible personal harm, open valves (B) and (J) on bottom of filters to relieve pressure prior to removing each filter.

IMPORTANT: Replace fuel filter elements anytime audible alarm sounds and trouble codes indicate plugged fuel filters (low fuel pressure). If no alarm sounds during the 12 month service interval, replace elements at that time, or after 500 hours operation, whichever comes first.

Both Primary and Final filters must be replaced at the same time.

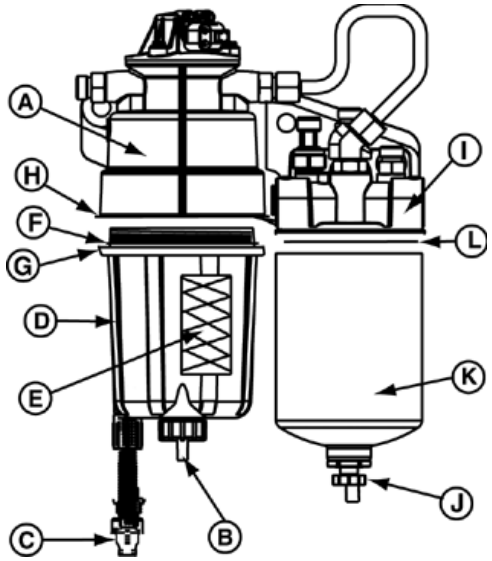
Continued on next page

DN28805,0001E74 -19-05MAR14-1/3

Remove and Install Primary Fuel Filter Element

IMPORTANT: Do NOT pre-fill filter with fuel. This may introduce debris into the fuel system.

1. Thoroughly clean primary filter header (A) and surrounding area to keep from getting dirt and debris into fuel system.
2. Connect a fuel drain line to primary filter drain valve (B) on bottom of filter and drain all fuel from the primary filter canister (D).
3. Disconnect water-in-fuel sensor connector (C).
4. Turn primary filter canister (D) counterclockwise (CCW) to remove.
5. Once primary filter canister (D) is removed, pull primary filter element (E) down to remove from primary filter header (A).
6. Inspect primary filter header (A) and primary filter canister (D) sealing surfaces. Clean as required.
7. Place new packing (F) on primary filter canister (D).
8. Place thin film of fuel on primary filter packing (F).
9. Place new primary filter element (E) in canister (D) with tangs on bottom going into canister.
10. Screw canister (D) into filter header (A), turn clockwise (CW). Tighten until canister lip (G) snugly mates with header lip (H).
11. Turn filter additional 3/4 turn after seal contact with header.
12. Connect water-in-fuel sensor connector (C).



RG14250 —UN—06JUN05

A—Primary Filter Header
B—Primary Filter Canister Drain Valve
C—Water-In-Fuel Sensor Connector
D—Primary Filter Canister
E—Primary Filter Element
F—Primary Filter Packing
G—Primary Filter Canister Lip
H—Primary Filter Header Lip
I— Final Fuel Filter Header
J— Final Filter Drain Valve
K—Final Fuel Filter
L—Final Filter Packing

NOTE: Be sure to also replace final fuel filter and then prime system (see following).

Continued on next page

DN28805,0001E74 -19-05MAR14-2/3

Remove and Install Final Fuel Filter

IMPORTANT: Do NOT pre-fill filter with fuel. This may introduce debris into the fuel system.

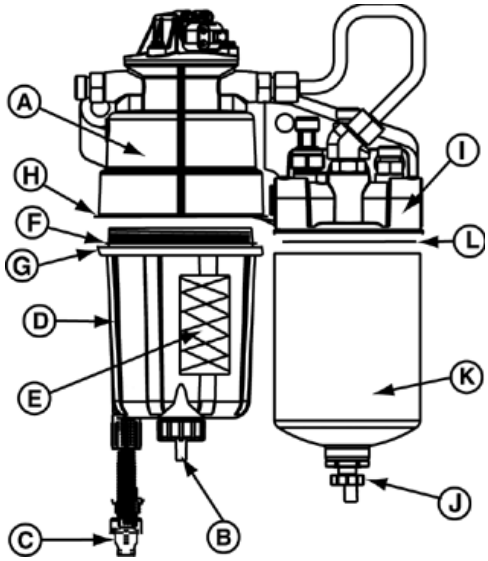
NOTE: Final filter replacement instructions are printed on the new filter.

1. Thoroughly clean final filter header (I) and surrounding area to keep from getting dirt and debris into fuel system.
2. Connect a fuel drain line to final filter drain valve (J) on bottom of filter and drain all fuel from the filter.
3. Turn final filter (K) counterclockwise (CCW) to remove.
4. Inspect final filter header (I) sealing surface. Clean as required.
5. Install new final filter fuel drain valve (J), tighten to specification.

Specification	
Final Fuel Filter Drain Valve—Torque	3.4—4 Nm (30—35 lb-in)

6. Place new final filter packing (L) on filter.
7. Place thin film of fuel on packing (L).
8. Screw final fuel filter (K) into secondary fuel filter header (I), turn clockwise (CW). Tighten until final fuel filter (K) snugly mates with final fuel filer header (I).
9. Turn filter additional 3/4 turn after seal contact with header.

NOTE: Turn ignition Key to ON for 60 seconds to prime the fuel system before starting engine. It may be necessary to turn key off and on again to reprime the system before starting.



RG14250 —UN—06JUN05

A—Primary Filter Header
B—Primary Filter Canister Drain Valve
C—Water-In-Fuel Sensor Connector
D—Primary Filter Canister
E—Primary Filter Element
F—Primary Filter Packing
G—Primary Filter Canister Lip
H—Primary Filter Header Lip
I— Final Fuel Filter Header
J— Final Filter Drain Valve
K—Final Fuel Filter
L—Final Filter Packing

DN28805,0001E74 -19-05MAR14-3/3

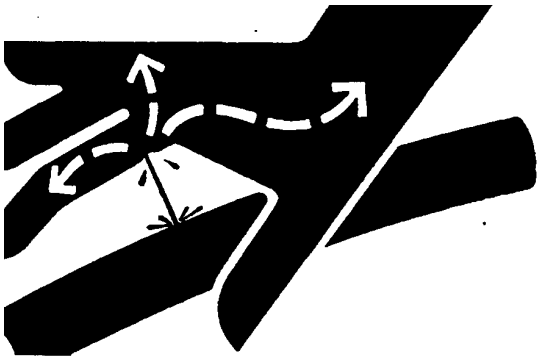
Replacing Fuel Filter and Dosing Elements (Jet Fuel Capable Engines)

CAUTION: Before performing any maintenance to fuel system related components, be sure that machine is in the Key OFF position AND that the electric fuel transfer (lift) pump or battery is disconnected. Whenever the machine is in the Key ON position, power is applied to the electric fuel transfer (lift) pump.

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

IMPORTANT: Replace fuel filter elements anytime audible alarm sounds and trouble codes indicate plugged fuel filters (low fuel pressure). If no alarm sounds during the 12 month service interval, replace elements at that time, or after 250 hours operation, whichever comes first.



X9811 —UN—23AUG88

High-Pressure Fluids

Engines are equipped with dual fuel filters: a primary filter with water separator bowl, and a final filter. Both filters and the dosing element are replaced at the same 250—hour interval or every 12 months.

Remove and Install Primary Fuel Filter Element

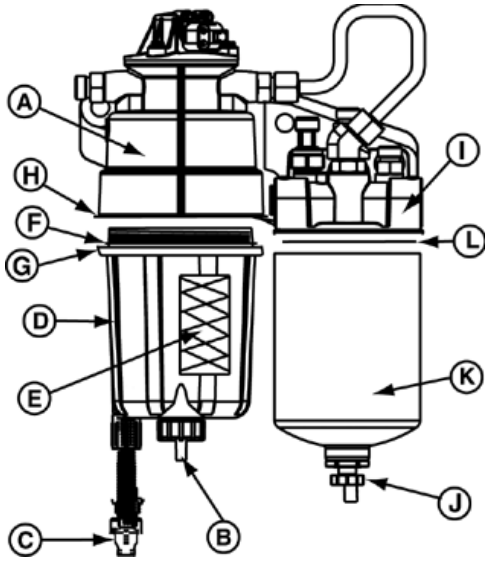
IMPORTANT: Do NOT pre-fill filter with fuel. This may introduce debris into the fuel system.

1. Close fuel shutoff valve, if equipped.

Continued on next page

2. Thoroughly clean primary filter header (A) and surrounding area to keep from getting dirt and debris into fuel system.
3. Connect a fuel drain line to primary filter drain valve (B) on bottom of filter and drain all fuel from the primary filter canister (D).
4. Disconnect water-in-fuel sensor connector (C).
5. Turn primary filter canister (D) counterclockwise (CCW) to remove.
6. Once primary filter canister (D) is removed, pull primary filter element (E) down to remove from primary filter header (A).
7. Inspect primary filter header (A) and primary filter canister (D) sealing surfaces. Clean as required. Replace if necessary.
8. Place new packing (F) on primary filter canister (D).
9. Place thin film of fuel on primary filter packing (F).
10. Place new primary filter element (E) in canister (D) with tangs on bottom going into canister.
11. Screw canister (D) clockwise (CW) into filter header (A). Tighten until canister lip (G) snugly mates with header lip (H).
12. Turn filter additional 3/4 turn after seal contact with header.
13. Connect water-in-fuel sensor connector (C).

NOTE: Be sure to replace final fuel filter and dosing elements.



RG14250 —UN—06JUN05

A—Primary Filter Header
B—Primary Filter Canister Drain Valve
C—Water-In-Fuel Sensor Connector
D—Primary Filter Canister
E—Primary Filter Element
F—Primary Filter Packing
G—Primary Filter Canister Lip
H—Primary Filter Header Lip
I— Final Fuel Filter Header
J— Final Filter Drain Valve
K—Final Fuel Filter
L— Final Filter Packing

Continued on next page

DN28805,0001E75 -19-28APR14-2/4

Remove and Install Final Fuel Filter

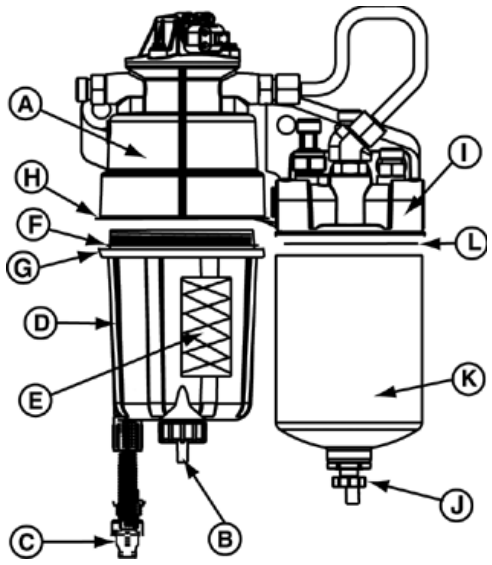
IMPORTANT: Do NOT pre-fill filter with fuel. This may introduce debris into the fuel system.

NOTE: Final filter replacement instructions are printed on the new filter.

1. Thoroughly clean final filter header (I) and surrounding area to keep from getting dirt and debris into fuel system.
2. Connect a fuel drain line to final filter drain valve (J) on bottom of filter and drain all fuel from the filter. Remove drain valve.
3. Turn final filter (K) counterclockwise (CCW) to remove.
4. Inspect final filter header (I) sealing surface. Clean as required. Replace if necessary.
5. Install new final filter fuel drain valve (J), tighten to specification.

Specification	
Final Fuel Filter Drain Valve—Torque	3.4—4 N·m (30—35 lb.-in.)

6. Place new final filter packing (L) on filter.
7. Place thin film of fuel on packing (L).
8. Screw final fuel filter (K) clockwise (CW) into secondary fuel filter header (I). Tighten until final fuel filter (K) snugly mates with final fuel filer header (I).
9. Turn filter additional 3/4 turn after seal contact with header.



RG14250 —UN—06JUN05

A—Primary Filter Header
B—Primary Filter Canister Drain Valve
C—Water-In-Fuel Sensor Connector
D—Primary Filter Canister
E—Primary Filter Element
F—Primary Filter Packing
G—Primary Filter Canister Lip
H—Primary Filter Header Lip
I— Final Fuel Filter Header
J— Final Filter Drain Valve
K—Final Fuel Filter
L—Final Filter Packing

NOTE: Be sure to replace fuel dosing elements.

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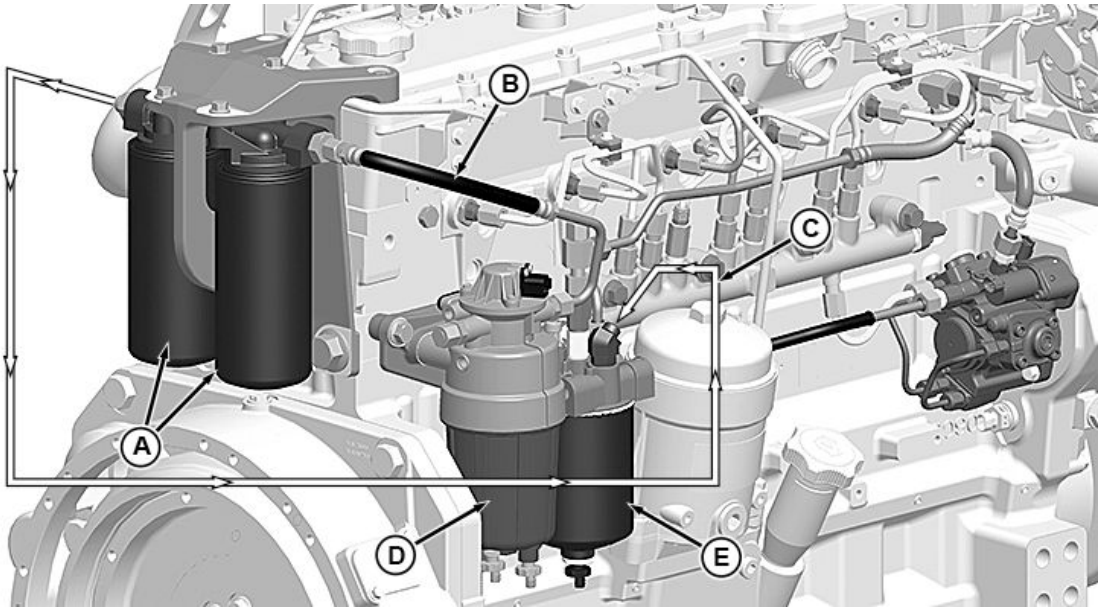
DN28805,0001E75 -19-28APR14-3/4

Remove and Install Lubricity Dosing Elements



RG25602 —UN—02MAY14

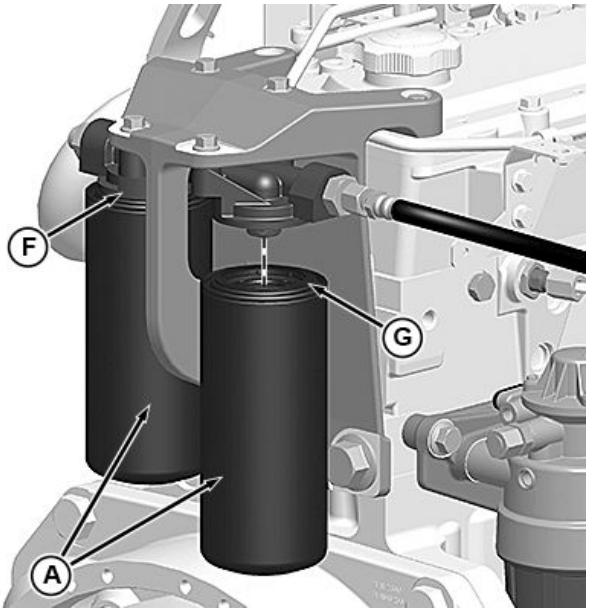
Jet Fuel Capable Fuel System

1. Thoroughly clean fuel filter assemblies and surrounding areas.
2. Replace secondary fuel filter (E) and primary fuel filter (D).
3. Using a suitable filter or strap wrench, remove dosing elements (A). Drain dosing elements into appropriated container and discard.
4. Inspect dosing element header (F) for cleanliness or damage. Clean as required. Replace if necessary.
5. Remove cap from new dosing element canister.

NOTE: New dosing element canister are approximately 3/4 full of lubricating additive. Be sure that when removing cap, that the canister is held upright so as not to spill the fluid.

6. Wipe the sealing surfaces of the header with a clean rag.
7. Apply a thin film of fuel on seal (G) of both dosing elements (A).
8. Install and tighten both dosing elements (A) by hand until firmly against the header. Apply an extra 3/4 turn after gasket contact is made.
9. Open fuel shutoff valve, if equipped.
10. Key to ON for 60 seconds to prime fuel system, then start engine and check for possible leaks.

NOTE: Turn ignition Key to ON for 60 seconds to prime the fuel system before starting the engine. It may be necessary to turn the key off and on again to re-prime the system before starting.



RG25603 —UN—02MAY14

Lubricity Dosing Element Replacement

A—Dosing Element
B—Primary Fuel Filter-to-Dosing Element Header Fuel Line
C—Dosing Element Header-to-Secondary Fuel Filter Fuel Line
D—Primary Fuel Filter
E—Secondary Fuel Filter
F—Dosing Element Header
G—Seal

DN28805,0001E75 -19-28APR14-4/4

Checking Belt Tensioner Spring Tension and Belt Wear

Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

DPSG,OUOD002,1917 -19-11OCT06-1/1

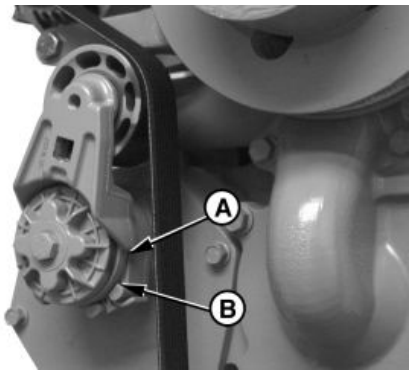
Checking Belt Wear

NOTE: While belt is loosened, inspect pulleys and bearings. Rotate and feel for hard turning or any unusual sounds. If pulleys or bearings need replacement, see your John Deere dealer.

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops (A and B) when correct belt length and geometry is used.

Visually inspect cast stops (A and B) on belt tensioner assembly.

If the tensioner stop (A) on swing arm is hitting the fixed stop (B), check mounting brackets (alternator, belt tensioner, idler pulley, etc.) and the belt length. Replace belt as needed (see REPLACING FAN / ALTERNATOR BELT in Service As Required Section).



RG7380 —UN—28NOV97

Belt Tensioner

A—Tensioner Stop **B—Fixed Stop**

OURGP11,0000288 -19-11OCT06-1/1

Checking Tensioner Spring Tension

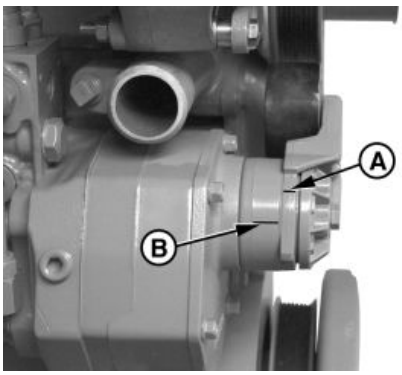
A belt tension gauge will not give an accurate measure of the belt tension when automatic spring tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below:

1. Release tension on belt using a long-handled 1/2 inch drive tool in tensioner arm. Remove belt from pulleys.

2. Release tension on tensioner arm and remove drive tool.

3. Put a mark (A) on swing arm of tensioner as shown.

4. Measure 21 mm (0.83 in.) from mark (A) and put a mark (B) on tensioner mounting base.



RG7382 —UN—28NOV97

Checking Belt Tension Spring

A—Mark **B—Mark**

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OURGP12,000012F -19-11OCT06-1/2

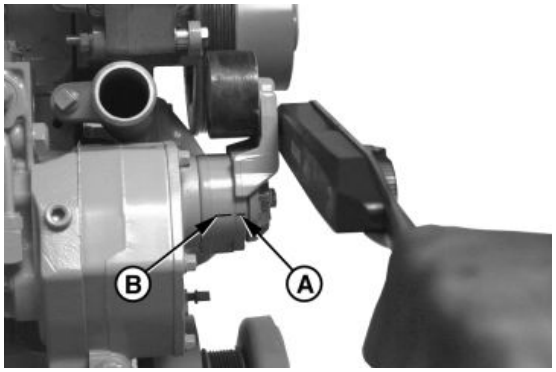
5. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.

6. Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.

Specification

Spring—Tension.....24-28 N·m (17-21 lb-ft)

A—Mark **B—Mark**



RG7381 —UN—28NOV97

Checking Belt Tensioner Spring Tension

OURGP12,000012F -19-11OCT06-2/2

Checking Cooling System

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled. Cooling system must be free of air by time engine coolant temperature reaches 80°C (176°F) or damage to EGR cooler (if equipped) may result.

1. Check entire cooling system for leaks. Tighten all clamps securely.

TS281 —UN—15APR13

High Pressure Fluids

2. Thoroughly inspect all cooling system hoses for hard, flimsy, or cracked conditions. Replace hoses if any of the above conditions are found.

OURGP11,0000021 -19-07NOV08-1/1

Testing Diesel Engine Coolant

Maintaining adequate concentrations of glycol and inhibiting additives in the coolant is critical to protect the engine and cooling system against freezing, corrosion, and cylinder liner erosion and pitting.

Test the coolant solution at intervals of 12 months or less and whenever excessive coolant is lost through leaks or overheating.

Coolant Test Strips

Coolant test strips are available from your John Deere dealer. These test strips provide a simple, effective method to check the freeze point and additive levels of your engine coolant.

When Using John Deere COOL-GARD II

John Deere COOL-GARD II Premix™ , COOL-GARD II PG Premix and COOL-GARD II Concentrate are maintenance free coolants for up to six years or 6000 hours of operation, provided that the cooling system is topped off using only John Deere COOL-GARD II Premix or COOL-GARD II PG premix. Test the coolant condition annually with coolant test strips designed for use with John Deere COOL-GARD II coolants. If the test strip chart indicates that additive is required, add John Deere COOL-GARD II Coolant Extender as directed.

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Add only the recommended concentration of John Deere COOL-GARD II Coolant Extender. DO NOT add more than the recommended amount.

When Using Nitrite-Containing Coolants

Compare the test strip results to the supplemental coolant additive (SCA) chart to determine the amount of inhibiting additives in your coolant and whether more John Deere Liquid Coolant Conditioner should be added.

Add only the recommended concentration of John Deere Liquid Coolant Conditioner. DO NOT add more than the recommended amount.

Coolant Analysis

For a more thorough evaluation of your coolant, perform a coolant analysis. The coolant analysis can provide critical data such as freezing point, antifreeze level, pH, alkalinity, nitrite content (cavitation control additive), molybdate content (rust inhibitor additive), silicate content, corrosion metals, and visual assessment.

Contact your John Deere dealer for more information on coolant analysis.

DX,COOL9 -19-11APR11-1/1

Replenishing Supplemental Coolant Additives (SCAs) Between Coolant Changes

IMPORTANT: Do not add supplemental coolant additives when the cooling system is drained and refilled with John Deere COOL-GARD™

NOTE: If system is to be filled with coolant that does not contain SCAs, the coolant must be precharged. Determine the total system capacity and premix with 3% John Deere Coolant Conditioner.

Through time and use, the concentration of coolant additives is gradually depleted during engine operation. Periodic replenishment of inhibitors is required, even when John Deere COOL-GARD™ is used. The cooling system must be recharged with additional supplemental coolant additives available in the form of liquid coolant conditioner.

Maintaining the correct coolant conditioner concentration (SCAs) and freeze point is essential in your cooling system to protect against rust, liner pitting and corrosion, and freeze-ups due to incorrect coolant dilution.

John Deere LIQUID COOLANT CONDITIONER is recommended as a supplemental coolant additive in John Deere engines.

DO NOT mix one brand of SCA with a different brand.

Test the coolant solution at 500 hours or 12 months of operation using either John Deere coolant test strips or a COOLSCAN™ or COOLSCAN PLUS™ analysis. If a COOLSCAN™ or COOLSCAN PLUS™ analysis is not available, recharge the system per instructions printed on label of John Deere Liquid Coolant Conditioner.

IMPORTANT: ALWAYS maintain coolant at correct level and concentration. DO NOT operate engine without coolant even for a few minutes as this can severely damage the EGR cooler tank (if equipped).

If frequent coolant makeup is required, the glycol concentration should be checked with JT07298 Coolant/Battery Tester to ensure that the desired freeze point is maintained. Follow manufacturer's instructions provided with Coolant/Battery Tester.

Add the manufacturer's recommended concentration of supplemental coolant additive. DO NOT add more than the recommended amount.

The use of non-recommended supplemental coolant additives may result in additive drop-out and gelation of the coolant.

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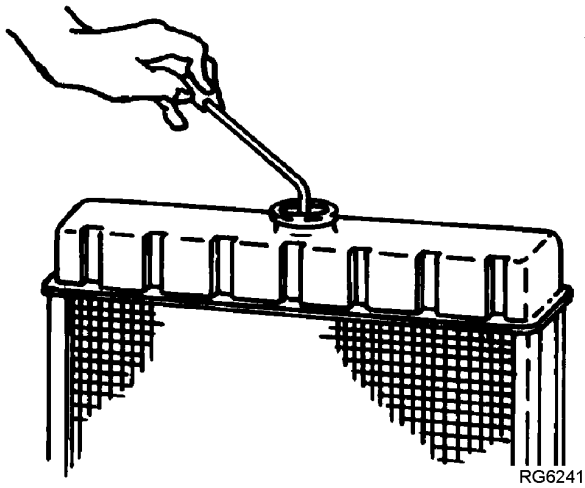
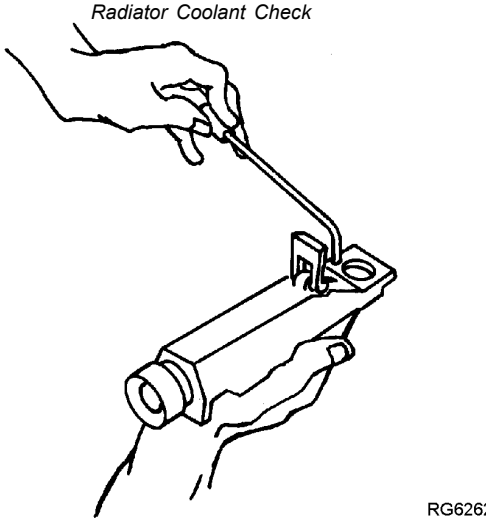
COOLSCAN is a trademark of Deere & Company
COOLSCAN PLUS is a trademark of Deere & Company
COOLSCAN PLUS is a trademark of Deere & Company



Radiator Coolant Check



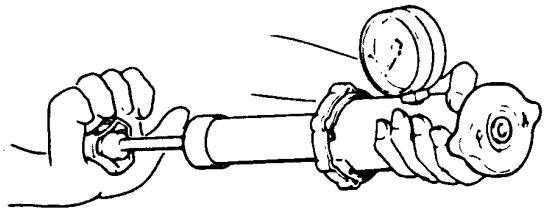
JT07298 Coolant/Battery Tester

If other coolants are used, consult the coolant supplier and follow the manufacturer's recommendation for use of supplemental coolant additives.

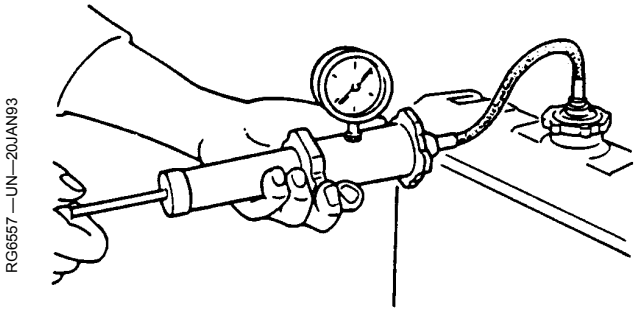
See DIESEL ENGINE COOLANTS AND SUPPLEMENTAL ADDITIVE INFORMATION for proper mixing of coolant ingredients before adding to the cooling system.

OURGP11,000004C -19-07NOV08-1/1

Pressure Testing Cooling System



Test Radiator Cap



RG6557 —UN—20JAN93

RG6558 —UN—20JAN93

Test Cooling System

⚠ CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

Test Radiator Cap

1. Remove radiator cap and attach to D05104ST Tester as shown.
2. Pressurize cap to following specifications.[1]. Gauge should hold pressure for 10 seconds within the normal range if cap is acceptable.

Specification	
Radiator Cap—Minimum Test Pressure	100 kPa (1.00 bar) (14.5 psi)

   If gauge does not hold pressure, replace radiator cap.
3. Remove the cap from gauge, turn it 180°, and retest cap. This will verify that the first measurement was accurate.

Test Cooling System for Leaks

NOTE: Engine should be warmed up to test overall cooling system for leaks.

[1]Test pressures recommended are for all Deere OEM cooling systems. On specific vehicle applications, test cooling system and pressure cap according to the recommended pressure for that vehicle.

1. Allow engine to cool, then carefully remove radiator cap.
2. Fill radiator with coolant to the normal operating level.

IMPORTANT: DO NOT apply excessive pressure to cooling system; doing so may damage radiator and hoses.

3. Connect gauge and adapter to radiator filler neck. Pressurize cooling system to the following specifications[1].

Specification	
Cooling System—Minimum Test Pressure	100 kPa (1.00 bar) (14.5 psi)

4. With pressure applied, check all cooling system hose connections, radiator, and overall engine for leaks.

   If leakage is detected, correct as necessary and pressure test system again.

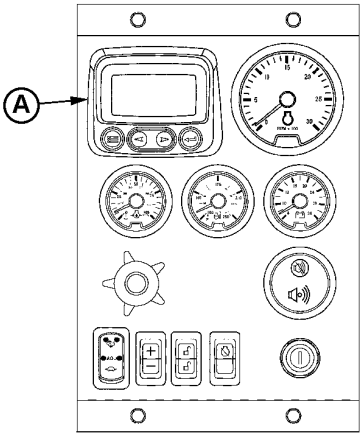
   If no leakage is detected, but the gauge indicated a drop in pressure, coolant may be leaking internally within the system or at the block-to-head gasket. Have your servicing dealer or distributor correct this problem immediately.

OURGP12,00000CA -19-11OCT06-1/1

Checking and Adjusting Engine Speeds

Use tachometer on the diagnostic gauge (A) to verify engine speeds. (Refer to ENGINE POWER RATINGS AND FUEL SYSTEM SPECIFICATIONS in Specifications Section later in this manual for engine speed specifications.) If engine speed adjustment is required, see your authorized servicing dealer or engine distributor.

A—Tachometer



RG13728 —UN—11NOV04

Using Tachometer to Check Engine Speeds

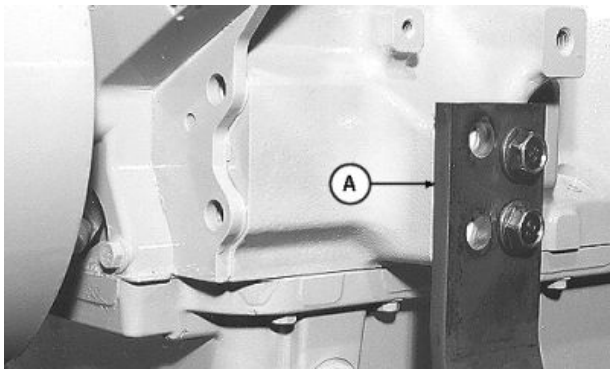
OURGP12,0000090 -19-11OCT06-1/1

Checking Engine Mounts

Engine mounting is the responsibility of the vehicle or generator manufacturer. Follow manufacturer's guidelines for mounting specifications.

IMPORTANT: Use only Grade SAE 8 or higher grade of hardware for engine mounting.

1. Check the engine mounting brackets (A), vibration isolators, and mounting bolts on support frame and engine block for tightness. Tighten as necessary.
2. Inspect overall condition of vibration isolators, if equipped. Replace isolators, as necessary, if rubber has deteriorated or mounts have collapsed.



RG9905 —UN—06JAN99

Engine Mounting

A—Mounting Bracket

OURGP11,0000110 -19-11OCT06-1/1

Checking Engine Ground Connection

Check engine ground connection to be sure it is secure and clean. This will prevent electrical arcing which can damage engine.

DPSG,OUOD002,1920 -19-11OCT06-1/1

Flushing And Refilling Cooling System

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

NOTE: Drain the initial factory fill engine coolant after the first 3000 hours or 36 months of operation. Subsequent drain intervals are determined by the coolant used for service.

When John Deere COOL-GARD is used, the drain interval is 3000 hours or 36 months. The drain interval may be extended to 5000 hours or 60 months of operation **provided that the coolant is tested annually AND additives are replenished as needed, by adding a supplemental cooling additive (SCA).**

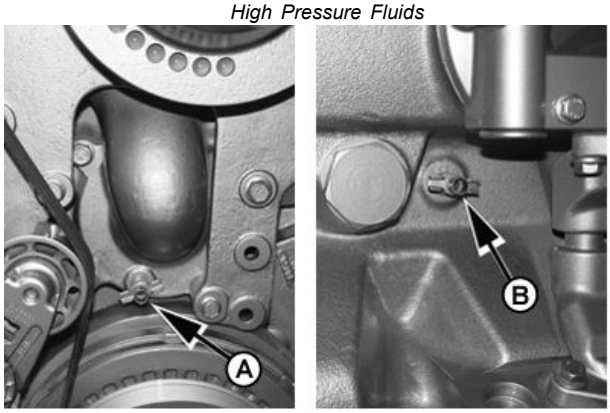
If COOL-GARD is not used, the drain interval is reduced to 2000 hours or 24 months of operation.

Drain old coolant, flush the entire cooling system, replace thermostats, and fill with recommended clean coolant as follows:

1. Pressure test entire cooling system and pressure cap if not previously done. (See PRESSURE TESTING COOLING SYSTEM, in Lubrication and Maintenance/500 Hour/12 Month - Jet Fuel 250 Hour).
2. Slowly open the engine cooling system filler cap or radiator cap (C) to relieve pressure and allow coolant to drain faster.
3. Open coolant pump drain valve (A) and engine block drain valve (B) on left side of engine. Drain all coolant from engine block.
4. Open radiator drain valve and drain coolant from radiator.

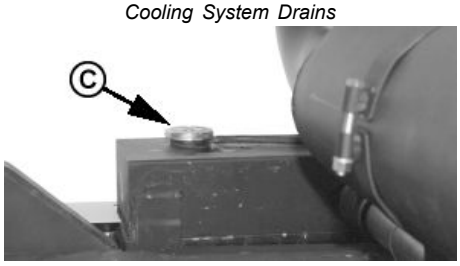
High Pressure Fluids

TS281 —UN—15APR13



Cooling System Drains

RG13858 —UN—17JAN05



Radiator Cap

RG13293 —UN—20NOV03

A—Pump Drain Valve
B—Block Drain Valve
C—Radiator Cap

Continued on next page

DN28805,0001E76 -19-05MAR14-1/3

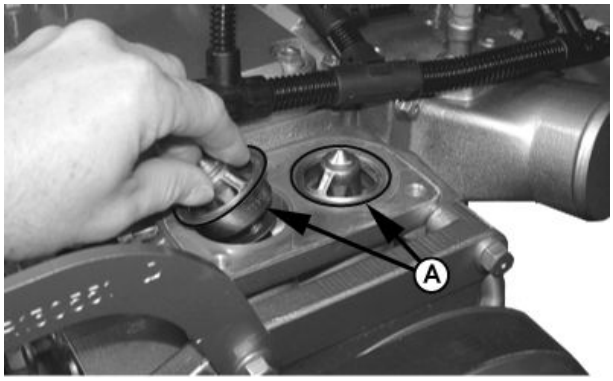
5. Remove thermostats (A) at this time, if not previously done. Install cover (without thermostats) and tighten cap screws to specifications.

Specification	
Cast Iron Thermostat Cover Cap Screws—Torque	45 N·m (33 lb-ft)

6. Test thermostat opening temperature. (See Testing Thermostat Opening Temperature in this section.)

CAUTION: Do not run engine longer than 10 minutes. Doing so may cause engine to overheat which may cause burns when radiator water is draining.

7. Close all drain valves after coolant has drained.
8. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
9. Stop engine and immediately drain the water from system before rust and sediment settle.
10. After draining water, close drain valves and fill the cooling system with clean water and a heavy duty cooling system cleaner such as FLEETGUARD® RESTORE™ or RESTORE PLUS™. Follow manufacturer's directions on label.
11. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run the engine about 10 minutes, then drain out flushing water.



RG13859 —UN—12APR05

Thermostats

FLEETGUARD is a trademark of Cummins Engine Company, Inc.
RESTORE is a trademark of Fleetguard Inc.
RESTORE PLUS is a trademark of Fleetguard Inc.

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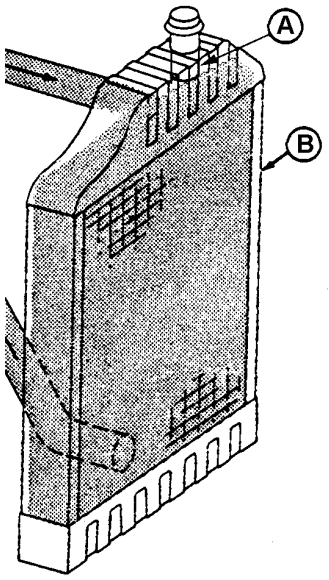
DN28805,0001E76 -19-05MAR14-2/3

12. Close all drain valves on engine and radiator. Install new rubber seal on each thermostat and install thermostats. Install cover and tighten cap screws to specifications.

Specification	
Cast Iron Thermostat Cover Cap Screws—Torque	45 N·m (33 lb-ft)

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting in cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled. Cooling system must be free of air by time engine coolant temperature reaches 80°C (176°F) or damage to EGR cooler (if equipped) may result. See Bleeding Air From Cooling System in this section.

13. Refill radiator (B) with fresh coolant until coolant touches bottom of the radiator filler neck (A). (See ADDING COOLANT in Service As Required Section.)
14. Run engine until it reaches operating temperature. This mixes the solution uniformly and circulates it through the entire system. The normal engine coolant temperature range is 82°- 94°C (180° - 202°F).
15. After running the engine, check coolant level and entire cooling system for leaks.



RG13295 —UN—20NOV03

Radiator and Coolant Level

A—Radiator Filler Neck **B—Radiator**

16. Inspect fan belt for wear and check belt tension. See Checking Belt Tensioner in (Lubrication And Maintenance/500 Hour/12 Month - Jet Fuel 250 Hour).

DN28805,0001E76 -19-05MAR14-3/3

Bleeding Air From Cooling System

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

TS281 —UN—15APR13

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OURGP11,0000022 -19-07NOV08-1/2

IMPORTANT: Use coolant as specified in Fuel, Lubricants and Coolant section.

1. Remove cap from top tank (de-aeration tank) of cooling system.
2. Remove EGR cooler (if equipped) vent plug (A) from rear of cooler.
3. Fill high pressure coolant circuit at top tank.
4. Begin filling coolant recovery tank (if equipped).
5. When air is purged and coolant is visible coming out of vent hole on EGR cooler (if equipped), reinstall EGR cooler vent plug and tighten to specification.

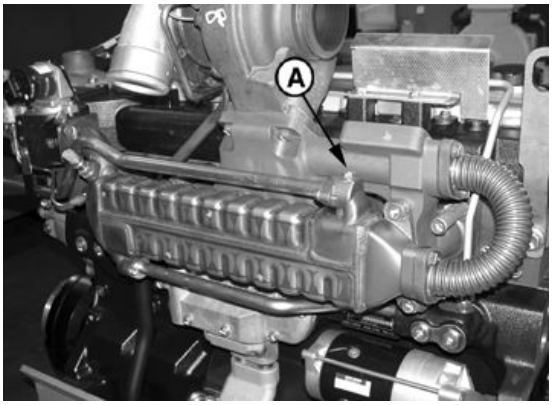
Specification	
EGR Cooler (if equipped) Vent Plug to Cooler—Torque	20 N•m (15 lb-ft)

6. Complete filling coolant recovery tank (if equipped) to **Full Hot** mark.

NOTE: Coolant level in recovery tank will drop the first few cycles unless there is a leak.

7. Install top tank (de-aeration) cap. Start engine and run at idle for 1 to 5 minutes.
8. Shut off and remove top tank cap. Fill high pressure circuit tank and reinstall cap.
9. Start engine and warm up for 15 minutes. If coolant recovery tank loses coolant to ground, repeat previous step and top off top tank until coolant loss stops. Loosing coolant to ground indicates air in high pressure system is being discharged through coolant recovery tank.

IMPORTANT: If coolant level does not drop below Full Hot, there is a leak in cooling system. Engine damage may result.



RG14831 —UN—05APR06

EGR CoolerVent Plug

A—Plug to Bleed Air from EGR Cooler (if equipped)

10. Shut off engine and allow to cool. Observe coolant level dropped below **Full Hot** in recovery tank (if equipped).

NOTE: It is normal for coolant level to go down with first few cycles and then range between **Full Hot** *and* **Full Cold***.*

IMPORTANT: It is normal for top (de-aeration) tank to be partially full of air when cap is removed and system completely de-aerated. When inspecting top tank, if it is at least 1/2 full, do not add additional coolant. Topping off tank may cause coolant to be expelled onto the ground and may cause coolant pump cavitation.

11. Monitor coolant recovery (if equipped) tank for two days. Refill recovery tank or top tank as required.

OURGP11,0000022 -19-07NOV08-2/2

Testing Thermostats

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns. Do not drain coolant until coolant temperature is below operating temperature. Always loosen cooling system filler cap, radiator cap or drain valve slowly to relieve pressure.

1. Visually inspect the area around the coolant manifold for leaks. Partially drain coolant from the cooling system.
2. Remove thermostat cover (A).

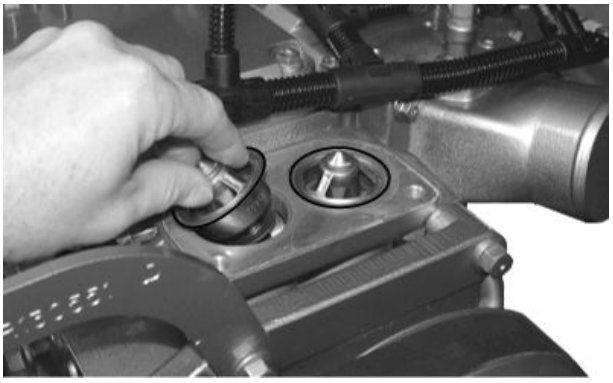
A—Thermostat Cover

RG13860 —UN—17JAN05

Remove Thermostat Cover

OURGP11,00000DA -19-07NOV08-1/4

3. Inspect thermostats.
4. Test each thermostat for proper opening temperature.



RG13861 —UN—12APR05

Removing Thermostats

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OURGP11,00000DA -19-07NOV08-2/4

Testing Thermostats Opening Temperature

1. Visually inspect thermostats for corrosion or damage. Replace thermostats as a matched set as necessary.
2. Inspect thermostat with wiggle wire in vent notch. If wire movement is restricted, replace thermostat if cleaning does not free movement.

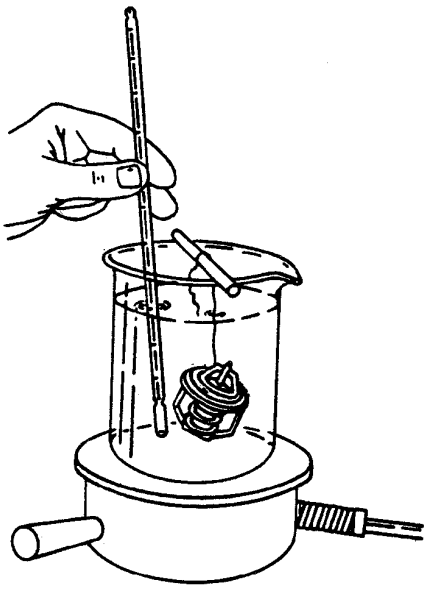
CAUTION: DO NOT allow thermostat or thermometer to rest against the side or bottom of container when heating water. Either may rupture if overheated.

3. Suspend thermostat and a thermometer in a container of water.
4. Stir the water as it heats. Observe opening action of thermostat and compare temperatures with specification given in chart below.

NOTE: Due to varying tolerances of different supplies, initial opening and full open temperatures may vary slightly from specified temperatures.

THERMOSTAT TEST SPECIFICATIONS

Rating	Initial Opening (Range)	Full Open (Nominal)
82°C (180°F)	80—84°C (175—182°F)	94°C (202°F)



RG5971 —UN—23NOV97

Thermostats and Thermometer in Water

5. Remove thermostat and observe its closing action as it cools. In ambient air the thermostat should close completely. Closing action should be smooth and slow.
6. If any one thermostat is defective, replace both thermostats.

OURGP11,00000DA -19-07NOV08-3/4

Installing Thermostats

1. Install new rubber seal on each thermostat and install thermostats.
2. Install cover and tighten cap screws to specifications.

Specification	
Cast Iron Thermostat Cover Cap Screws—Torque	45 N·m (33 lb-ft)

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting when all air has been expelled. Damage to EGR cooler (if equipped) could result if cooling system is not bled properly.

3. Pressure test the cooling system a second time to be sure the thermostat cover is sealed (See Pressure Testing Cooling System , in Lubrication And Maintenance 500 Hour/12 Months).

RG13861 —UN—12APR05

Installing Thermostats

OURGP11,00000DA -19-07NOV08-4/4

Adjusting Valve Clearance

CAUTION: To prevent accidental starting of engine while performing valve adjustments, always disconnect NEGATIVE (—) battery terminal.

IMPORTANT: Valve clearance MUST BE adjusted with engine COLD. Accurate valve adjustment is critical for maximum engine performance.

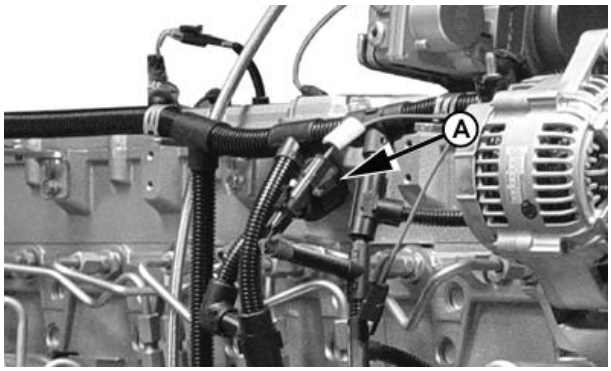
1. Disconnect wiring harness (A).
2. Remove rocker arm cover (B) with vent tube.

IMPORTANT: Visually inspect contact surfaces of valve tips and rocker arm wear pads. Check all parts for excessive wear, breakage, or cracks. Replace parts that show visible damage.

Rocker arms that exhibit excessive valve clearance should be inspected more thoroughly to identify damaged parts.

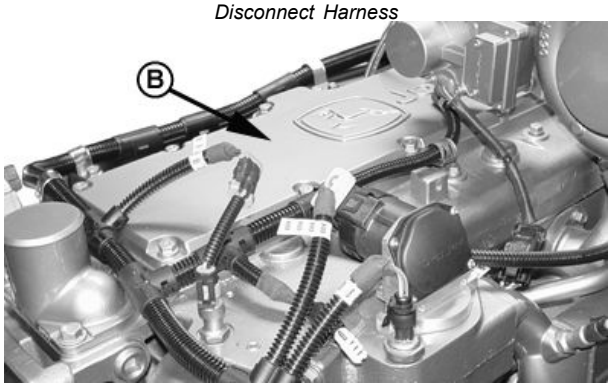
3. Remove plastic plugs from cylinder block bores and install JDG820 Flywheel Turning Tool (C) and JDE81-4 Timing Pin (D).

A—Wiring Harness
B—Rocker Arm Cover
C—JDG820 Flywheel Turning Tool
D—JDE81-4 Timing Pin



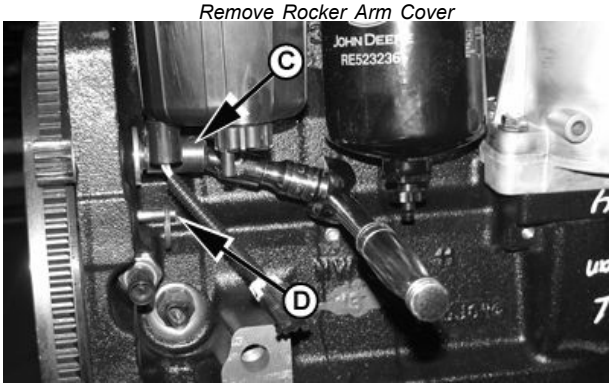
RG13869 —UN—07FEB05

Disconnect Harness



RG13870 —UN—07FEB05

Remove Rocker Arm Cover



RG13871 —UN—07FEB05

Flywheel Turning Tool and Timing Pin

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KP41357,000002A -19-21OCT19-1/4

4. Rotate engine with the flywheel turning tool until timing pin engages timing hole in flywheel.
5. If the rocker arms for No. 1 (front) cylinder are loose, the engine is at No. 1 TDC-Compression.
6. If the rocker arms for No. 6 (rear) cylinder are loose, the engine is at No. 6 TDC-Compression. Rotate the engine one full revolution (360 degrees) to No. 1 TDC-Compression.

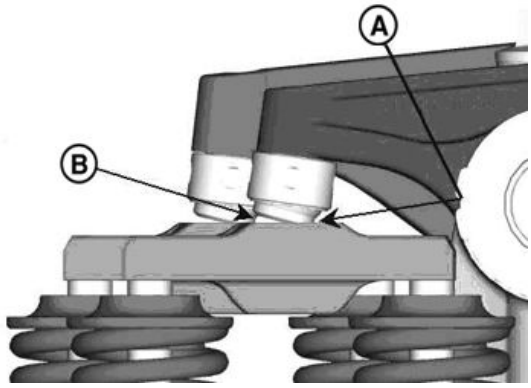
NOTE: To assist in adjusting valve clearance, push the rocker arm foot forward (A) for easier feeler gauge access (B)

7. With engine lock-pinned at “TDC” of No. 1 piston's compression stroke, use a bent feeler gauge to check valve clearance on Nos. 1, 3, and 5 exhaust valves and Nos. 1, 2, and 4 intake valves. If out of specification, loosen lock nut on rocker arm adjusting screw. Turn adjusting screw until feeler gauge slips with a slight drag. Hold the adjusting screw from turning with screwdriver and tighten lock nut to specifications.

Specification	
Intake Valve Clearance (Rocker Arm-to-Valve Tip With Engine Cold)—Clearance	0.35 mm (0.014 in.)
Exhaust Valve Clearance (Rocker Arm-to-Valve Tip With Engine Cold)—Clearance	0.63 mm (0.025 in.)
Valve Adjusting Screw Lock Nut—Torque	27 N•m (20 lb-ft)

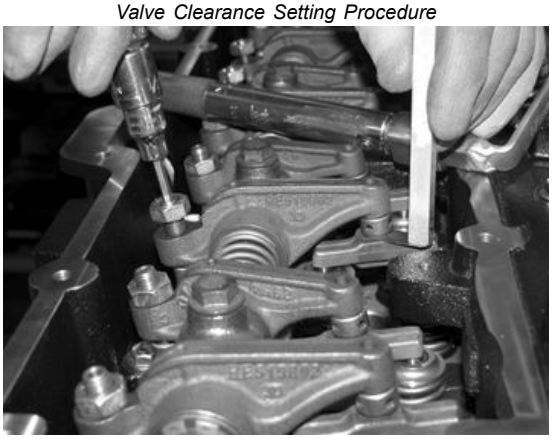
Recheck clearance again after tightening lock nut. Readjust clearance as necessary.

A—Rocker Arm Foot
B—Feeler Gauge Access
C—Front of Engine



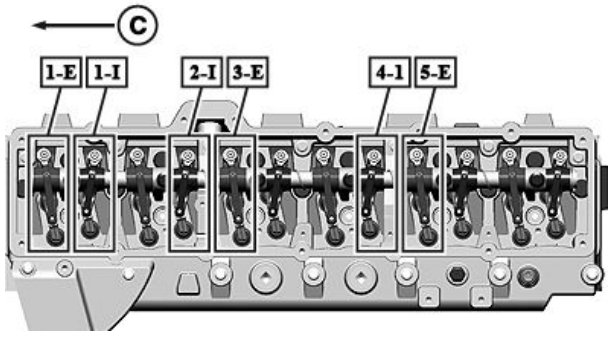
RG13842 —UN—07JAN05

Valve Clearance Setting Procedure



RG13946 —UN—04FEB05

Checking Valve Clearance Using Bent Feeler Gauge



RG13840 —UN—04APR08

Valve Adjusting Sequence - No. 1 Cylinder at TDC

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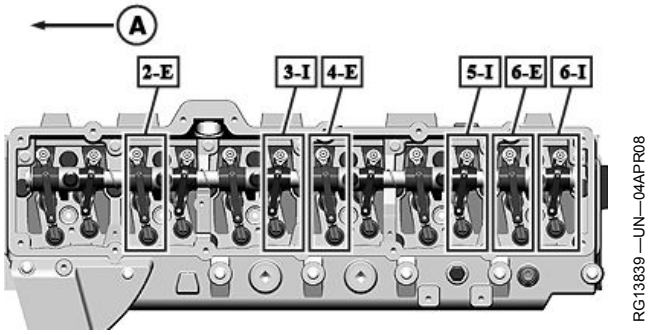
KP41357,000002A -19-21OCT19-2/4

8. Remove timing pin and rotate flywheel 360° and install timing pin. No. 6 piston is now at “TDC” of its compression stroke. Rocker arms for No. 6 piston should be loose.
9. Check and adjust valve clearance to the same specifications on Nos. 2, 4, and 6 exhaust and Nos. 3, 5, and 6 intake valves.

IMPORTANT: Replace rocker arm cover gasket whenever rocker arm cover is removed.

10. Install new rocker arm cover gasket.



Valve Adjusting Sequence - No. 6 Cylinder at TDC

A—Front of Engine

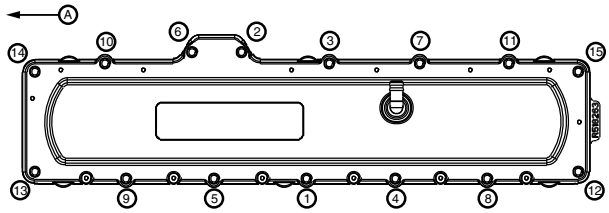
KP41357,000002A -19-21OCT19-3/4

11. Install rocker arm cover with vent tube and tighten cap screws finger tight in sequence shown. Then tighten screws in same sequence to specification.

Specification	
Rocker Arm Cover Cap Screws—Torque	35 N•m (26 lb-ft)

12. Connect wiring harness.
13. Remove timing pin and flywheel turning tool. Install plastic plugs in block.

RG13907 —UN—14JAN05



Rocker Arm Cover Torque Sequence

A—Front of Engine

KP41357,000002A -19-21OCT19-4/4

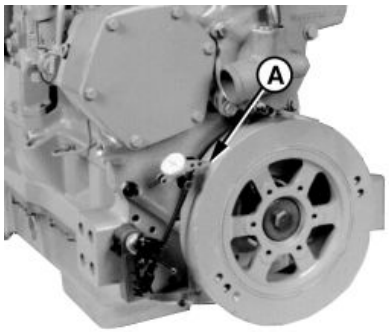
Checking Crankshaft Vibration Damper

IMPORTANT: Crankshaft vibration damper assembly is not repairable. For engines equipped with elastomeric crankshaft vibration damper replace every 4500 hours or 60 months, whichever comes first. For engines equipped with viscous crankshaft vibration damper replace at major engine overhaul. Also replace viscous crankshaft vibration damper when short block, complete block, or remanufactured basic engine is installed.

NOTE: On engines equipped with dual crankshaft vibration dampers, ALWAYS replace both crankshaft vibration dampers as a matched set.

NOTE: Checking procedure only applies to elastomeric crankshaft vibration damper.

1. Remove belts (shown removed).
2. Grasp crankshaft vibration damper with both hands and attempt to turn it in both directions. If rotation is felt, crankshaft vibration damper is defective and should be replaced.



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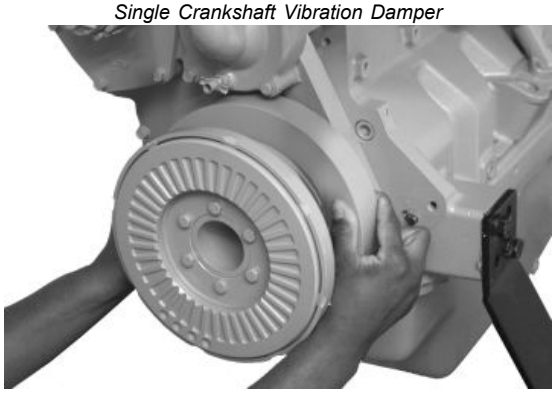
Single Crankshaft Vibration Damper



RG7369 —UN—05JAN98

Dual Crankshaft Vibration Damper

AT89373,0000E93 -19-02NOV15-1/2

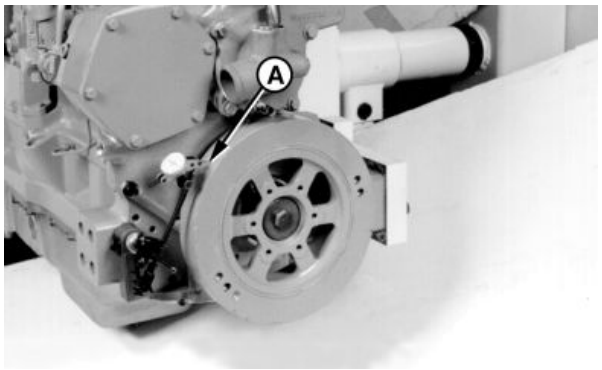
3. Check crankshaft vibration damper radial runout by positioning dial indicator (A) so probe contacts crankshaft vibration damper outer diameter.
4. Rotate crankshaft using JDG820 flywheel turning tool.
5. Note dial indicator reading.

Specification

Crankshaft Vibration Damper—Maximum Radial Runout..... 1.02 mm (0.040 in)

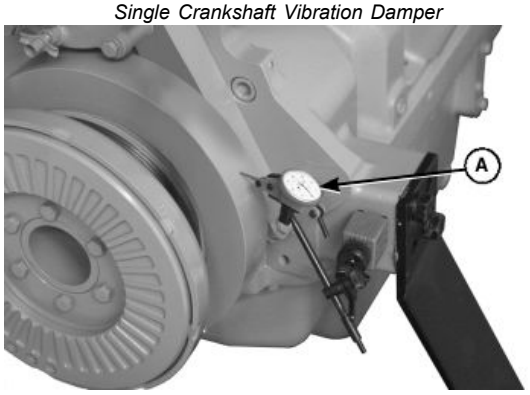
If runout exceeds specification, replace crankshaft vibration damper.

A—Dial Indicator



RG7065 —UN—26NOV97

Single Crankshaft Vibration Damper



RG11601 —UN—11DEC00

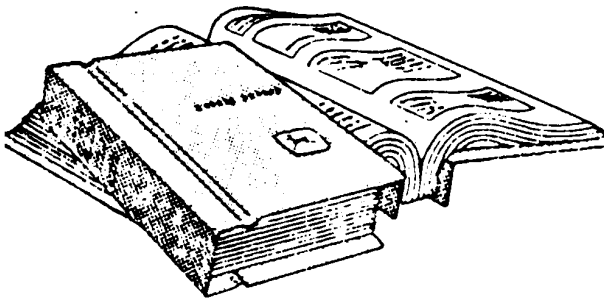
Dual Crankshaft Vibration Damper

AT89373,0000E93 -19-02NOV15-2/2

Service As Required

Additional Service Information

This is not a detailed service manual. If you want more detailed service information, contact your John Deere dealer or engine distributor.



RG4624 —UN—15DEC88

Component Technical Manuals

OURGP11,0000048 -19-23AUG10-1/1

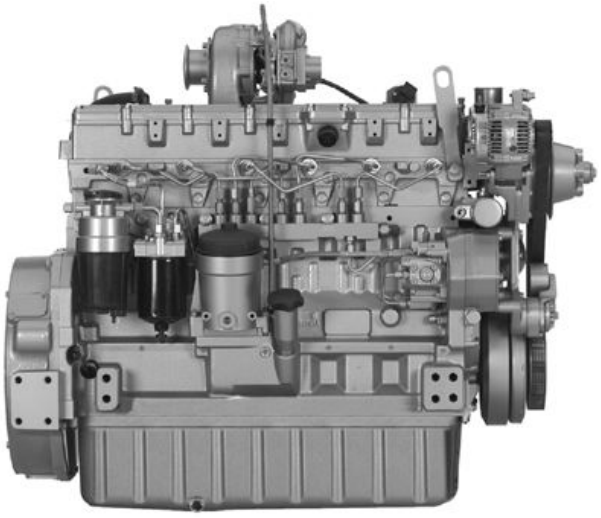
Do Not Modify Fuel System

IMPORTANT: Modification or alteration of the high-pressure fuel pump, the injection timing, or the fuel injectors in ways not recommended by the manufacturer will terminate the warranty obligation to the purchaser.

In addition, tampering with fuel system which alters emission-related equipment on engines may result in fines or other penalties, per EPA regulations or other local emission laws.

Do not attempt to service fuel pump, fuel rail, or fuel injectors yourself. Special training and special tools are required. (See your authorized servicing dealer or engine distributor.)

Avoid seizure of internal precision parts in high-pressure fuel pump or fuel injection rail. Never steam clean or pour cold water on pump or rail while these components are suntil warm.



RG13868 —UN—07FEB05

Fuel System

OURGP12,00000CB -19-11OCT06-1/1

Drain Water From Fuel Filters

NOTE: Always perform regular fuel filter changes at 500 Hours/12 Months.

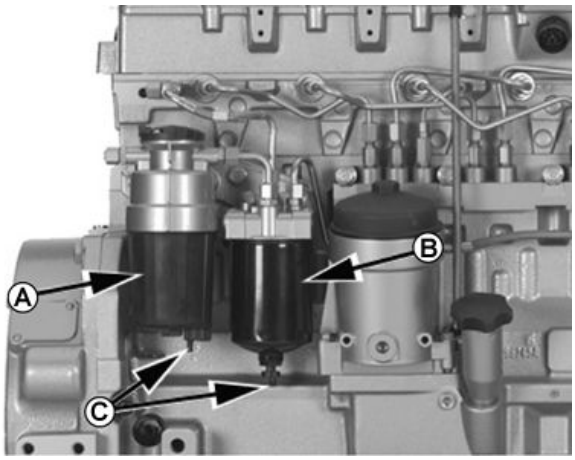
The primary fuel filter is equipped with a sensor that detects the presence of water in the fuel filter element. This sensor will illuminate the red “STOP ENGINE” warning light on the diagnostic gauge and also sound an audible alarm. A Diagnostic Trouble Code (DTC), a description of the trouble code and the corrective action needed will be displayed on the diagnostic gauge.

ALWAYS STOP ENGINE IMMEDIATELY and drain water from the primary (A) and final fuel filter (B) when these warnings occur.

1. Loosen drain valves (C) to drain water and debris as needed.

2. Retighten valves securely.

NOTE: Also replace fuel filter elements when amber indicator on instrument panel lights up AND Diagnostic Trouble Code (DTC) in diagnostic gauge window indicates plugged fuel filters (“low fuel pressure”). To replace fuel filter elements, see Replacing Fuel Filters in Lubrication and Maintenance, 500 Hour/12 Month.



RG13845 —UN—11JAN05

Drain Water From Fuel Filters

A—Primary Fuel Filter
B—Final Fuel Filter
C—Drain Valves

OURGP12,0000131 -19-11OCT06-1/1

Adding Coolant

TS281 —UN—15APR13

High Pressure Fluids

⚠ CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

IMPORTANT: Never pour cold liquid into a hot engine, as it may crack cylinder head or block. DO NOT operate engine without coolant for even a few minutes.

John Deere Cooling System Sealer may be added to the radiator to stop leaks on a temporary or emergency basis only. DO NOT use any other stop-leak additives in the cooling system. Leaks should be permanently repaired as quickly as possible.

Air must be expelled from cooling system when coolant is added. Cooling system must be free of air by time engine coolant temperature reaches 80°C (176°F) or damage to EGR cooler (if equipped) may result.

Continued on next page

OURGP11,0000025 -19-07NOV08-1/2

Coolant level should be kept even with the bottom of the filler neck (A). Add coolant as follows:

1. Loosen temperature sending unit fitting at rear of cylinder head to relieve pressure when filling system.

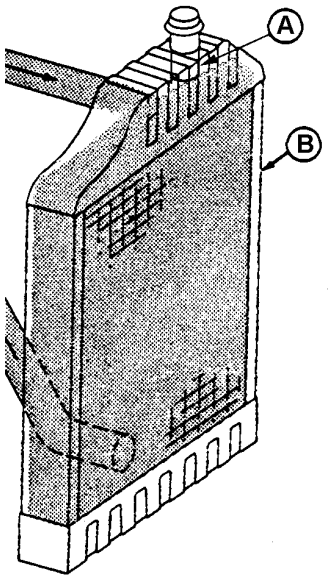
IMPORTANT: When adding coolant to the system, use the appropriate coolant solution. (See DIESEL ENGINE COOLANTS AND SUPPLEMENTAL ADDITIVE INFORMATION in Fuels, Lubricants, and Coolant Section for mixing of coolant ingredients before adding to system.)

Do not overfill cooling system. A pressurized system needs space for heat expansion without overflowing at top of radiator.

2. Fill radiator (B) until coolant level touches bottom of filler neck (A) or to “FULL HOT” mark on coolant recovery tank.
3. Tighten fitting when air has been expelled from system.

A—Coolant Level At Bottom Of Filler Neck

B—Radiator



RG13295 —UN—20NOV03

Radiator and Coolant

OURGP11,0000025 -19-07NOV08-2/2

Pre-Start Cleaning Guide

CAUTION: Avoid injury. Before cleaning machine, allow ample time for hot surfaces to cool.

IMPORTANT: Avoid machine damage. Do not direct high-pressure spray from hose output directly at or close to electrical connections and sensors.

Cleaning as needed is recommended. Clean more frequently during heavy machine use, and when weather conditions are dry.

- Check enclosed areas daily. Clean the engine and other enclosed areas of equipment to remove debris and any buildup of oil and grease. Keep the engine and engine compartment free of combustible material.
- Check for debris buildup daily on and around intake systems, exhaust systems, and intercooler piping systems. Verify that there are no holes or leaks in intake or exhaust systems. Do not allow debris to build up near hot exhaust components. Verify that hot exhaust components are cleaned as often as environmental conditions require.
- Inspect cooling system daily to determine whether cooling system needs cleaning. Visible buildup of residue that blocks airflow may degrade machine performance and requires more frequent cleaning depending on environmental conditions.
- Inspect difficult to observe areas daily as conditions may require additional cleaning care to remove debris.
- Check for oil and fuel leaks daily. Replace or repair sources of leaks, including gaskets, seals, breather tubes, fittings, and fluid lines.

Maintenance and Service Reminders

- Keep surfaces free of grease and oil.
- Clean up hydraulic and other fluid leaks.
- Fuel Lines — Check for leaks, cracks, and kinks.
- Fuel Pumps — Check fittings, especially compression ring couplings, for cracks and leaks.
- Fuel Injectors — Check pressure and return lines for signs of leaks.
- When servicing fuel filter or draining water separator, avoid fuel spills. Immediately clean up any fuel spill.
- Check for transmission case venting system seepage, transmission case leakage, power steering cylinder leakage, or power steering line leakage.
- Check for loose electrical connectors, damaged wiring, corrosion, or poor connections.

ZE59858,0000009 -19-07JUL20-1/1

Replacing Air Cleaner Filter Elements

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H_2O, is torn, or visibly dirty.

NOTE: This procedure applies to John Deere air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.

1. Remove wing nut and remove canister cover shown in small illustration inset.

2. Remove wing nut (A) and remove primary element (B) from canister.

3. Thoroughly clean all dirt from inside canister.

NOTE: Some engines may have a dust unloader valve (C) on the air cleaner. If equipped, squeeze valve tip to release any trapped dirt particles.

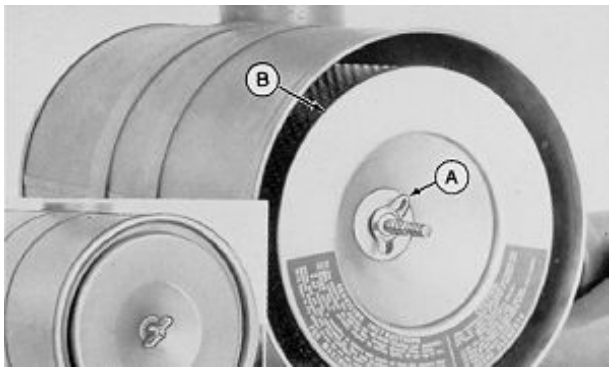
IMPORTANT: Remove secondary (safety) element (E) ONLY for replacement. DO NOT attempt to clean, wash, or reuse secondary element. Replacement of secondary element is usually necessary ONLY when primary element has a hole in it or when the element is not properly seated.

4. To replace secondary element, remove retaining nut (D) and secondary element (E). Immediately replace secondary element with new element to prevent dust from entering air intake system.

5. Install new primary element and tighten wing nut securely. Install cover assembly and tighten retaining wing nut securely.

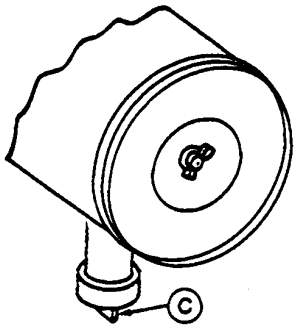
IMPORTANT: Whenever the air cleaner has been serviced or had cover removed, ALWAYS fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

6. If equipped, fully depress air restriction indicator reset button and release to reset indicator.



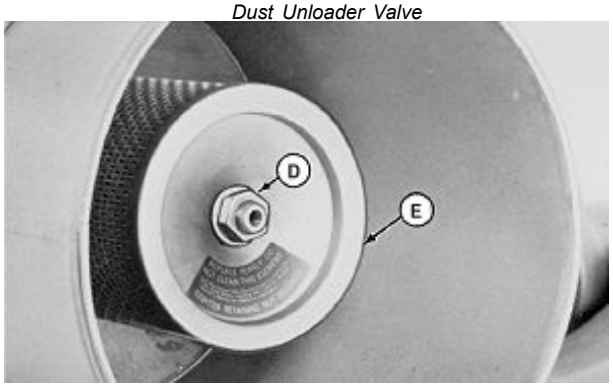
RG4686 —UN—20DEC88

Air Cleaner Primary Element



RG4687 —UN—20DEC88

Dust Unloader Valve



RG11068 —UN—26JUN00

Air Cleaner Secondary Element

A—Wing Nut
B—Primary Element
C—Unloader Valve
D—Retaining Nut
E—Secondary Element

DPSG,OUOD002,1580 -19-11OCT06-1/1

Inspecting Primary Filter Element

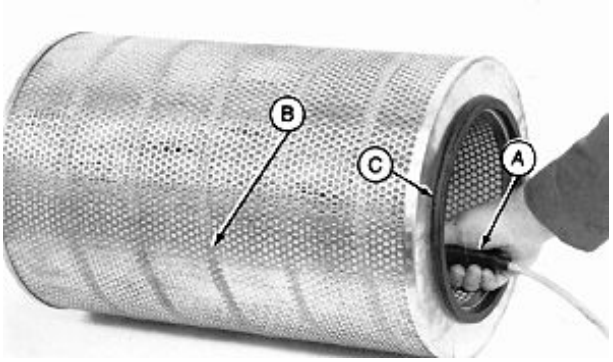
IMPORTANT: Do not wash primary filter element. Clean with dry air only (see procedure on following pages).

Inspect filter to determine if it is practical to clean or for damage after cleaning filter.

1. Hold a bright light (A) inside element and check carefully for holes. Discard any element which shows the smallest hole or rupture.
2. Be sure outer screen (B) is not dented. Vibration would quickly wear a hole in filter.
3. Be sure filter gasket (C) is in good condition. If gasket is damaged or missing, replace element.

IMPORTANT: Air cleaner MUST BE DRY before storing in plastic bag.

If the filter is to be stored for later use, place it in a plastic bag to protect it from dust and damage.



RW4768 —UN—15DEC88

Inspecting Primary Air Filter Element

A—Light
B—Outer Screen
C—Gasket

RG,RG34710,3598 -19-11OCT06-1/1

Cleaning Primary Filter Element

IMPORTANT: This procedure only applies to air cleaners provided by John Deere.

Always replace secondary (safety) filter elements. DO NOT attempt to clean them.

Do not blow air from outside portion of filter with air nozzle. Wear safety glasses and remove bystanders.

1. Gently pat sides of element with palm of hand to loosen dirt. DO NOT tap element against a hard surface.

CAUTION: Only a special air cleaning gun (A) should be used. Concentrated air pressure from an ordinary air nozzle may severely damage filter element. Do not exceed 210 kPa (2.1 bar) (30 psi) when cleaning filter element.

2. Insert the cleaning gun into element, hold air nozzle about 25.4 mm (1.0 in.) from perforated metal retainer. Force air through filter from inside to outside and move air gun up and down pleats to remove as much dirt as possible.

RG11065 —UN—26JUN00

Cleaning Primary Element

A—Air Cleaning Gun

3. Repeat steps 1 and 2 to remove additional dirt.
4. Inspect element for damage after cleaning (see previous instructions). Replace element if any damage is found.

OURGP12,00000EE -19-11OCT06-1/1

Element Storage

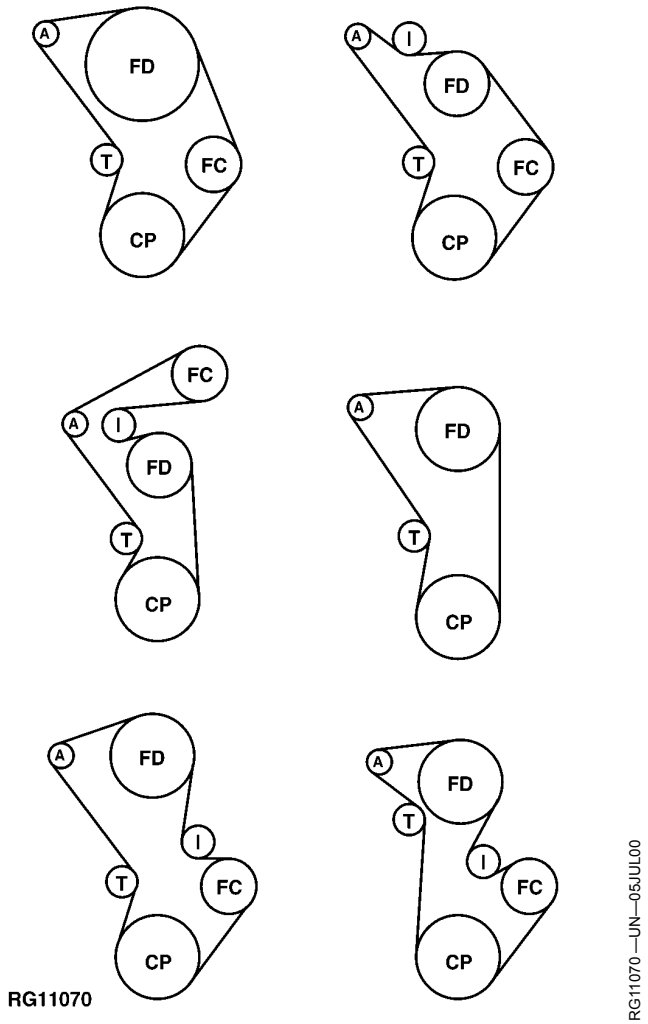
IMPORTANT: Air cleaner element MUST BE DRY before storing in plastic bag.

Seal element in a plastic bag and store in shipping container to protect against dust and damage.

RG,RG34710,3601 -19-11OCT06-1/1

Replacing Fan/Alternator Belt

A—Alternator
CP—Crankshaft Pulley
FC—Freon (A/C) Compressor (Optional)
FD—Fan Drive
I— Idler
T—Tensioner



RG11070

RG11070 —UN—05JUL00

Belt Routing Options

Continued on next page

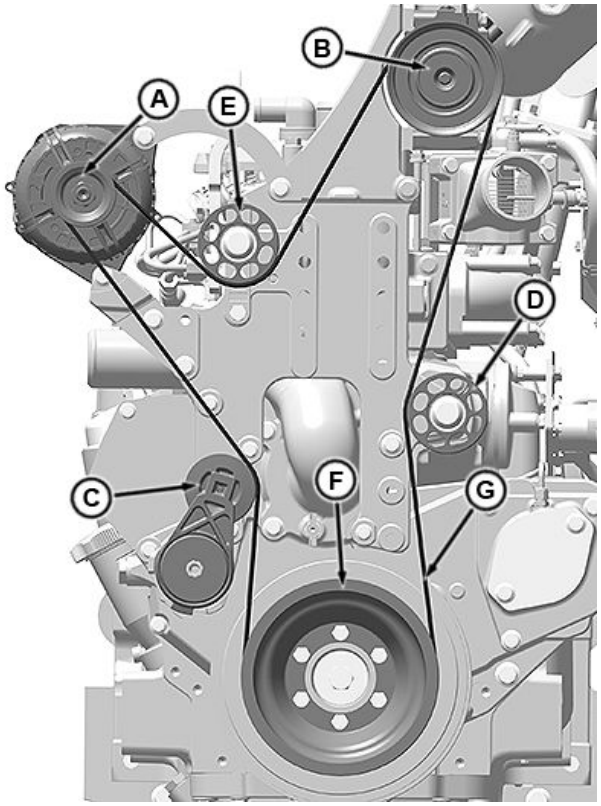
OURGP12,0000132 -19-25JAN22-1/2

NOTE: While belt is removed, inspect pulleys and bearings. Rotate and feel for hard turning or any unusual sounds. If pulleys or bearings need replacement, see your John Deere dealer.

Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/500 Hour/12 Month section to determine if belt needs replacing.

1. Release tension on belt using a long-handled 1/2 in. drive tool in square hole on end of tensioner arm.
2. Remove belt from pulleys and discard belt.
3. Install new belt, be sure that belt is correctly seated in all pulley grooves.
4. Apply tension to belt with tensioner. Remove drive tool.
5. Start engine and check belt alignment.

A—Alternator
B—AC Compressor
C—Belt Tensioner
D—Lower Idler Pulley
E—Upper Idler Pulley
F—Crankshaft Pulley
G—Belt



Belt Routing Option

OURGP12,0000132 -19-25JAN22-2/2

Checking Fuses

Check the following fuses located in the control panel wiring harness. Replace defective fuses.

- Main system fuse- 30 amp
- ECU fuse- 20 amp
- Fuel filter fuse- 15 amp

Refer to ENGINE WIRING DIAGRAM later in Troubleshooting section.

OURGP12,00000CD -19-11OCT06-1/1

Checking Electrical Wiring And Connections

Check for loose or corroded wiring and connectors. Tighten connections or replace wiring as needed. See your authorized servicing dealer for repairs.

OURGP11,0000264 -19-08NOV10-1/1

Bleeding Fuel System

NOTE: Normally the fuel system on these engines is self-priming and self-bleeding, and does not require a bleeding procedure by the operator.

If engine will not start after filter changes, turn ignition key ON for 60 seconds to prime the fuel system. It may be necessary to turn the key off and on again to reprime the system before starting.

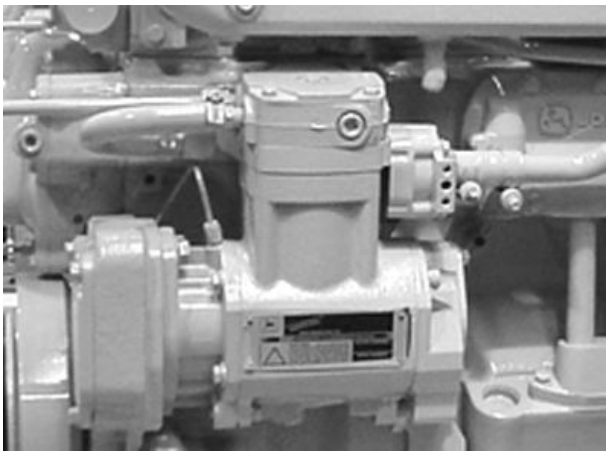
OURGP11,0000026 -19-13OCT06-1/1

Checking Air Compressors (If Equipped)

Air compressors are offered as options with John Deere OEM engines to provide compressed air to operate air-powered devices like vehicle air brakes.

Air compressors are engine-driven piston types. They are either air cooled or cooled with engine coolant. The compressors are lubricated with engine oil. The compressor runs continuously as gear or spline driven by the auxiliary drive of the engine but has “loaded” and “unloaded” operating modes. This is controlled by the vehicle's air system (refer to vehicle technical manual for complete air system checks and services).

See your John Deere engine distributor or servicing dealer for diagnostic and troubleshooting information. If diagnosis leads to an internal fault in the compressor, replace the complete compressor as a new or remanufactured unit.



RG12738 —UN—07NOV02

Air Compressor (Optional)

OUOD006,0000080 -19-11OCT06-1/1

Checking Freon (A/C) Compressor (If Equipped)

Contact your authorized servicing dealer for any service or repairs to the air conditioning system.

OURGP11,0000266 -19-11OCT06-1/1

Checking Rear Power Take-Off (PTO)

CAUTION: Entanglement in rotating driveline can cause serious injury or death. Keep shield on PTO drive shaft between clutch housing and the engine driven equipment at all times during engine operation. Wear close fitting clothing. Stop the engine and be sure PTO driveline is stopped before making adjustments.

If option 9201 or 9207 is ordered to make the rear PTO compatible with other manufacturer's drivelines, be sure that proper shielding is in place before operation.

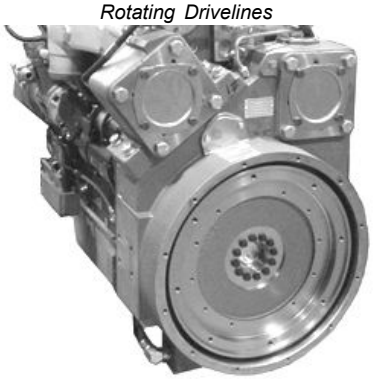
Rotating Drivelines

TS1644 —UN—22AUG95

CAUTION: Metal surfaces of PTO housing may be hot to the touch during operation or at shutdown.

The optional rear power take-off (PTO) from John Deere transfers engine power to auxiliary equipment or moving components which may be mounted on the vehicle or trailed behind. It is an engine-driven PTO which operates whenever the engine is running.

IMPORTANT: An additional 4.0 L (4.2 qt.) of oil must be added to the crankcase for lubrication of the rear PTO option. (See ENGINE CRANKCASE OIL FILL QUANTITIES in the Specifications section.)



John Deere Rear PTO (Optional)

RG12745 —UN—07NOV02

Proper performance of the power take-off unit will be related to the care it is given. Periodically check for any oil leaks that may occur.

If the power take-off does not work properly, contact your authorized servicing dealer or engine distributor.

OUOD006,000008A -19-11OCT06-1/1

General Troubleshooting Information

Troubleshooting engine problems can be difficult. An engine wiring diagram is provided in this section to help isolate electrical problems on power units using John Deere wiring harness and instrument (gauge) panel.

Later in this section is a list of possible engine problems that may be encountered accompanied by possible causes and corrections. The illustrated diagrams and troubleshooting information are of a general nature; final design of the overall system for your engine application may be different. See your engine distributor or servicing dealer if you are in doubt.

A reliable program for troubleshooting engine problems should include the following basic diagnostic thought process:

- Know the engine and all related systems.
- Study the problem thoroughly.
- Relate the symptoms to your knowledge of engine and systems.
- Diagnose the problem starting with the easiest things first.
- Double-check before beginning the disassembly.
- Determine cause and make a thorough repair.
- After making repairs, operate the engine under normal conditions to verify that the problem and cause was corrected.

NOTE: All engines have electronic control systems which may send diagnostic trouble codes to signal problems (see Displaying Of Diagnostic Trouble Codes (DTCs), later in this section).

1. *If fault codes are present, perform the suggested corrective actions.*
2. *If this does not correct the engine problem, contact your servicing dealer.*
3. *If engine has problems but no fault codes are displayed, refer to ENGINE TROUBLESHOOTING later in this section for problems and solutions.*

OURGP12,00000EF -19-27MAY16-1/1

Instrument Panel Method for Retrieving Diagnostic Trouble Codes

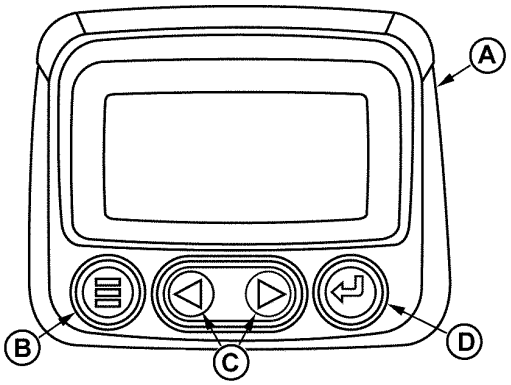
IMPORTANT: Care should be used during diagnostic procedures to avoid damaging the terminals of connectors, sensors, and actuators. Probes should not be poked into or around the terminals or damage will result. Probes should only be touched against the terminals to make measurements.

Diagnosis of the Deere electronic control system on engines with Deere electronic instrument panel should be performed as follows:

1. Make sure all engine mechanical and other systems not related to the electronic control system are operating properly. (See ENGINE TROUBLESHOOTING later in this section.)

NOTE: Diagnostic gauge (A) uses the menu key (B) to access various engine functions, two arrow keys (C) to scroll through the engine parameter list and view the menu list, and an enter key (D) for selecting highlighted items.

2. Read and record DTC(s) displayed on LCD of diagnostic gauge (A). For procedure to access diagnostic trouble codes, refer to “Using Diagnostic Gauge to Access Engine Information”, earlier in this manual.



RG13740 —UN—11NOV04

Trouble Code Display On Instrument Panel

A—Diagnostic Gauge
B—Menu Key
C—Arrow Keys
D—Enter Key

3. Go to the LISTING OF DIAGNOSTIC TROUBLE CODES (DTCs) later in this section, to interpret to the DTC(s) present.

4. Contact your nearest engine distributor or servicing dealer with a list of DTC(s) so that necessary repairs can be made.

OURGP11,0000027 -19-11OCT06-1/1

Displaying Of Diagnostic Trouble Codes (DTCs)

SPN/FMI CODES

Stored and active diagnostic trouble codes are output on the diagnostic gauge on the Deere electronic instrument panel according to the J1939 standard as a two-part code as shown on the tables on the following pages.

The first part is a Suspect Parameter Number (SPN) followed by a Failure Mode Identifier (FMI) code. In order to determine the exact failure, both parts (SPN and FMI) of the code are needed.

The SPN identifies the system or the component that has the failure; for example SPN 000110 indicates a failure in the engine coolant temperature circuit.

The FMI identifies the type of failure that has occurred; for example FMI 03 indicates value above normal. Combining SPN 000110 with FMI 03 yields a fault code “engine coolant temperature input voltage too high”. A corrective action will also be displayed, “check sensor and wiring”. If this check does not solve the engine fault, contact your servicing dealer.

Always contact your servicing dealer for help in correcting unsolved diagnostic trouble codes which are displayed for your engine.

OURGP12,00000F0 -19-24AUG10-1/1

Listing of Diagnostic Trouble Codes (DTCs)

NOTE: Not all of these codes are used in all engine applications.

NOTE: If the corrective actions below do not solve the engine fault, contact your servicing dealer.

SPN	FMI	Fault	Corrective Action
000028	03	Throttle #3 Voltage Out of Range High	Check Sensor and Wiring
	04	Throttle #3 Voltage Out of Range Low	Check Sensor and Wiring
000029	03	Throttle #2 Voltage Out of Range High	Check Sensor and Wiring
	04	Throttle #2 Voltage Out of Range Low	Check Sensor and Wiring
000091	03	Throttle Voltage Out of Range High	Check Switch and Wiring
	04	Throttle Voltage Out of Range Low	Check Switch and Wiring
	09	Throttle Voltage Out of Range	Check Switch and Wiring
	14	Throttle Voltage Out of Range	Check Switch and Wiring
000094	01	Fuel Delivery Pressure Very Low	Check Sensor and Wiring
	03	Fuel Pressure Voltage Out of Range High	Check Sensor and Wiring
	04	Fuel Pressure Voltage Out of Range Low	Check Sensor and Wiring
	10	Fuel Pressure Voltage Dropping Fast	Check Sensor and Wiring
	13	Fuel Pressure Voltage Fuel Pressure-Not Calibrated	Check Sensor and Wiring
	16	Fuel Delivery Pressure High	Check Sensor and Wiring
	17	Fuel Pressure Low-Most Severe	Check Fuel Supply and Prime System
	18	Fuel Pressure Low-Least Severe	Check Fuel Supply and Prime System
000097	00	Water in Fuel	Check Sensor and Wiring
	03	Water in Fuel Voltage Out of Range High	Check Sensor and Wiring
	04	Water in Fuel Voltage Out of Range Low	Check Sensor and Wiring
	16	Water in Fuel Detected	Stop and Drain Water Separator
	31	Water in Fuel Detected	Stop and Drain Water Separator
000100	01	Engine Oil Pressure Low-Most Severe	Check Oil Level
	03	Engine Oil Pressure Voltage Out of Range High	Check Sensor and Wiring
	04	Engine Oil Pressure Voltage Out of Range Low	Check Sensor and Wiring
	16	Engine Oil Pressure Out of Range	Check Sensor and Wiring
	18	Engine Oil Pressure Low-Moderately Severe	Check Oil Level
000105	00	Manifold Air Temperature High-Most Severe	Check Air Cleaner, Aftercooler, or Ambient Temperature
	03	Manifold Air Temperature Input Voltage High	Check Sensor and Wiring
	04	Manifold Air Temperature Input Voltage Low	Check Sensor and Wiring
	15	Manifold Air Temperature High-Least Severe	Contact Servicing Dealer
	16	Manifold Air Temperature High-Moderately Severe	Check Air Cleaner, Aftercooler, or Ambient Temperature
000108	02	Barometric Air Pressure Sensor Signal Invalid	Contact Servicing Dealer
000107	00	Air Filter Restriction High	Check for Plugged Air Filter

Continued on next page

SPN	FMI	Fault	Corrective Action
	31	Air Filter Restriction	Check for Plugged Air Filter
00010	00	Engine Coolant Temperature High-Most Severe.....	Check Cooling System, Reduce Power
	03	Engine Coolant Temperature Input Voltage High	Check Sensor and Wiring
	04	Engine Coolant Temperature Input Voltage Low.....	Check Sensor and Wiring
	16	Engine Coolant Temperature High-Moderately Severe.....	Check Cooling System, Reduce Power
	17	Engine Coolant Temperature Low-Least Severe.....	Check Cooling System
00011	01	Coolant Level Low-Most Severe.....	Check Operator's Manual
00058	02	Keyswitch Intermittent	Check Service Manual
	17	Keyswitch Circuit Problem.....	Check Service Manual
00074	00	Fuel Temperature High-Most Severe	Add Fuel or Switch Fuel Tanks
	03	Fuel Temperature Voltage Out of Range High.....	Check Sensor and Wiring
	04	Fuel Temperature Voltage Out of Range Low	Check Sensor and Wiring
	15	Fuel Temperature High	Add Fuel or Switch Fuel Tanks
	16	Fuel Temperature High-Moderately Severe	Add Fuel or Switch Fuel Tanks
	31	Fuel Temperature Voltage Out Of Range.....	Check Sensor and Wiring
00089	31	Engine Speed Derate.....	Contact Servicing Dealer
00090	00	Engine Speed High-Most Severe	Reduce Engine Speed
	01	Engine Speed Low	Reduce Engine Speed
	02	Engine Speed Out Of Range.....	Reduce Engine Speed
	03	Engine Speed High or Short	Reduce Engine Speed
	04	Engine Speed Low or Short	Reduce Engine Speed
	05	Engine Speed Open	Reduce Engine Speed
	16	Engine Speed Overspeed	Reduce Engine Speed
	18	Engine Speed Low	Reduce Engine Speed
00237	02	VIN Data Doesn't Match Controllers in VIN Network.....	Contact Servicing Dealer
	13	Option Code Of VIN Data Doesn't Match Controllers in VIN Network.....	Contact Servicing Dealer
	31	VIN Messages Missing or Controllers in VIN Network Not in Time	Contact Servicing Dealer
00611	03	Electronic Injector Wiring Shorted to Power Source.....	Check Wiring
	04	Electronic Injector Wiring Shorted to Ground	Check Wiring
00620	03	5V Sensor Supply Voltage Out of Range High	Check Wiring
	04	5V Sensor Supply Voltage Out of Range Low.....	Check Wiring
00627	01	Power Supply Voltage- Low	Check Battery Voltage and Wiring
	04	Power Supply Voltage- Interrupted	Contact Servicing Dealer
	16	Power Supply Voltage- High	Contact Servicing Dealer

Continued on next page

SPN	FMI	Fault	Corrective Action
000629	13	ECU Programming Error	Contact Servicing Dealer
	19	ECU Failure	Contact Servicing Dealer
000632	02	Fuel Shutoff Valve Error	Check Sensor and Wiring
	05	Fuel Shutoff Valve Failure	Check Sensor and Wiring
	11	Fuel Shutoff Valve Open or Shorted	Check Sensor and Wiring
000636	02	Engine Position Sensor Noise	Check Sensor and Wiring
	08	Engine Position Sensor Input Missing	Check Sensor and Wiring
	10	Engine Position Sensor Pattern Error	Check Sensor and Wiring
000637	02	Timing Sensor (Crank) Noise	Check Sensor and Wiring
	07	Crank/Camshaft Positions Out of Sync	Check Sensor and Wiring
	08	Crank Position Input Missing	Check Sensor and Wiring
	10	Crank Position Input Pattern Error	Check Sensor and Wiring
000639	13	CAN Bus Failure	Check Sensor and Wiring
000644	02	External Speed Command Output	Check Sensor and Wiring
000651	05	Cylinder #1 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #1 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #1 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000652	05	Cylinder #2 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #2 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #2 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000653	05	Cylinder #3 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #3 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #3 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000654	05	Cylinder #4 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #4 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #4 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000655	05	Cylinder #5 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #5 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #5 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000656	05	Cylinder #6 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #6 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #6 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000676	03	Glow Plug Relay	Contact Servicing Dealer
	05	Glow Plug Relay	Contact Servicing Dealer

Continued on next page

SPN	FMI	Fault	Corrective Action
000729	03	Inlet Air Heater #1 Error	Contact Servicing Dealer
	05	Inlet Air Heater #1 Failure	Contact Servicing Dealer
000833	02	Rack Position Sensor Error	Contact Servicing Dealer
	03	Rack Position Sensor Voltage High	Contact Servicing Dealer
	04	Rack Position Sensor Voltage Low	Contact Servicing Dealer
000834	02	Rack Actuator Error	Contact Servicing Dealer
	03	Rack Actuator Voltage High	Contact Servicing Dealer
	05	Rack Actuator Open	Contact Servicing Dealer
	06	Rack Actuator Grounded	Contact Servicing Dealer
	07	Rack Actuator Position Error	Contact Servicing Dealer
000970	02	Auxiliary Engine Shutdown Switch Signal Invalid	Check Switch And Wiring
	11	External Engine Protection Shutdown Switch Signal Active	Check Switch And Wiring
	31	Auxiliary Engine Shutdown Switch Signal Invalid	Check Switch And Wiring
000971	31	Engine Derate Switch Signal Active	Check Switch And Wiring
001041	02	Start Signal Indicator Failure	Check Switch And Wiring
	03	Start Signal Indicator Active	Check Switch And Wiring
001075	06	Fuel Transfer Pump Current High or Grounded Circuit (Racor Fuel Pump Only)	Contact Servicing Dealer
	12	Fuel Transfer Pump Failure (Racor Fuel Pump Only)	Contact Servicing Dealer
001076	00	Fuel Injection Pump Control Error	Contact Servicing Dealer
	01	Fuel Injection Pump Control Error	Contact Servicing Dealer
	02	Fuel Injection Pump Control Error	Contact Servicing Dealer
	03	Fuel Injection Pump Control Error	Contact Servicing Dealer
	05	Fuel Injection Pump Control Error	Contact Servicing Dealer
	06	Fuel Injection Pump Control Error	Contact Servicing Dealer
	07	Fuel Injection Pump Control Error	Contact Servicing Dealer
	10	Fuel Injection Pump Control Error	Contact Servicing Dealer
	13	Fuel Injection Pump Control Error	Contact Servicing Dealer
001077	07	Fuel Injection Pump Controller	Contact Servicing Dealer
	11	Fuel Injection Pump Controller	Contact Servicing Dealer
	12	Fuel Injection Pump Controller	Contact Servicing Dealer
	19	Fuel Injection Pump Controller	Contact Servicing Dealer
	31	Fuel Injection Pump Controller	Contact Servicing Dealer
001078	07	Fuel Injection Pump Speed/Position Sensor Error	Contact Servicing Dealer
	11	Fuel Injection Pump Speed/Position Sensor Error	Contact Servicing Dealer
	31	Fuel Injection Pump Speed/Position Sensor Failure	Contact Servicing Dealer

Continued on next page

SPN	FMI	Fault	Corrective Action
001079	03	Sensor Supply Voltage 3 Out of Range High	Check Wiring
	04	Sensor Supply Voltage 3 Out of Range Low	Check Wiring
001080	03	Fuel Rail Pressure Sensor Supply Voltage 2 Out of Range High	Check Wiring
	04	Fuel Rail Pressure Sensor Supply Voltage 2 Out of Range Low	Check Wiring
001109	31	Engine Not Available or Condition Exists	Check Fault Codes
001110	31	Engine Not Available or Condition Exists	Check Fault Codes
001347	05	Fuel Pump Pressurizing Assembly #1 Sensor Circuit Open, Shorted to Ground, or Overloaded	Check Pump Wiring
	07	Fuel Pump Assembly #1 Rail Pressure Control Mismatch	Check Fuel Filter and Lines
	10	Fuel Pump Assembly #1 Fuel Flow Low	Check Fuel Filter and Lines
001348	05	Fuel Pump Pressurizing Assembly #2 Sensor Circuit Open, Shorted to Ground, or Overloaded	Contact Servicing Dealer
	10	Fuel Pump Assembly #2 Fuel Flow Low	Check Fuel Filter and Lines
001485	02	ECU Main Relay Pump Error	Contact Servicing Dealer
001569	31	Engine Protection Derate	Check Fault Codes
001639	01	ECU Detects Zero Fan Speed	Contact Servicing Dealer
	16	ECU Detects High Fan Speed	Contact Servicing Dealer
	18	ECU Detects Low Fan Speed	Contact Servicing Dealer
002000	06	Fuel Injection Pump Control Valve Error	Contact Servicing Dealer
	13	Security Violation Controller Not Installed	Contact Servicing Dealer
002005	09	No CAN Message From Source 5	Contact Servicing Dealer
002030	09	No CAN Message From Source 49	Contact Servicing Dealer
002071	09	No CAN Message From Source 71	Contact Servicing Dealer
003509	03	Sensor Supply Voltage 1 High	Check Wiring
	04	Sensor Supply Voltage 1 Low	Check Wiring

Fault Code Listing in Ascending SPN/FMI Codes

NOTE: Diagnostic gauge on instrument panel may also display text for communication faults, such as “CAN BUS FAILURE”. Contact your servicing dealer.

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Intermittent Fault Diagnostics

Intermittent faults are problems that periodically “go away”. A problem such as a terminal that intermittently doesn't make contact can cause an intermittent fault. Other intermittent faults may be set only under certain operating conditions such as heavy load, extended idle, etc. When diagnosing intermittent faults, take special note of the condition of wiring and connectors, since a high percentage of intermittent problems originate here. Check for loose, dirty or disconnected connectors. Inspect the wiring routing, looking for possible shorts caused by contact with external parts (for example, rubbing against sharp sheet metal edges). Inspect the connector vicinity, looking for wires that have pulled out of connector terminals, damaged connectors, poorly positioned terminals, and corroded or damaged splices and terminals. Look for broken wires, damaged splices, and wire-to-wire shorts. Use good judgement if component replacement is thought to be required.

NOTE: The engine control unit (ECU) is the component LEAST likely to fail.

Suggestions for diagnosing intermittent faults:

- If diagnostic charts on preceding pages indicate that the problem is intermittent, try to reproduce the operating conditions that were present when the diagnostic trouble code (DTC) set.
- If a faulty connection or wire is suspected to be the cause of the intermittent problem: clear DTCs, then check the connection or wire by wiggling it while watching the diagnostic gauge to see if the fault resets.

Possible causes of intermittent faults:

- Faulty connection between sensor or actuator harness.
- Faulty contact between terminals in connector.
- Faulty terminal/wire connection.
- Electromagnetic interference (EMI) from an improperly installed 2-way radio, etc., can cause faulty signals to be sent to the ECU.

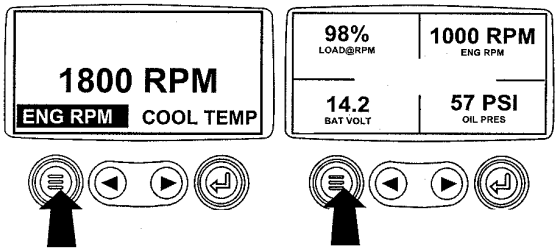
NOTE: Refer to wiring diagrams later in this section as a guide to connections and wiring.

OURGP12,000013A -19-11OCT06-1/1

Displaying Diagnostic Gauge Software

NOTE: The following steps can be used to display the software version of the diagnostic gauge if needed by your dealer for troubleshooting. This is a read only function.

1. Starting at the single or four engine parameter display, press the "Menu" key.

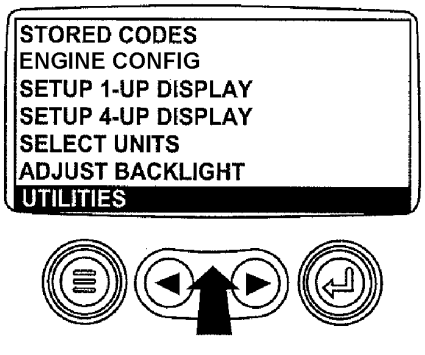


RG13159 —UN—26SEP03

Menu Key

OURGP12,00000D5 -19-11OCT06-1/4

2. The main menu will be displayed. Use the "Arrow" key to scroll through the menu until "Utilities" is highlighted.



RG13234 —UN—22OCT03

Select Utilities

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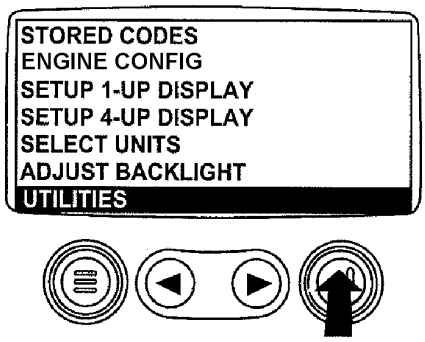
OURGP12,00000D5 -19-11OCT06-2/4

3. Once "Utilities" is highlighted, press "Enter" to activate the utilities function.



RG13237 —UN—22OCT03

Select Utilities

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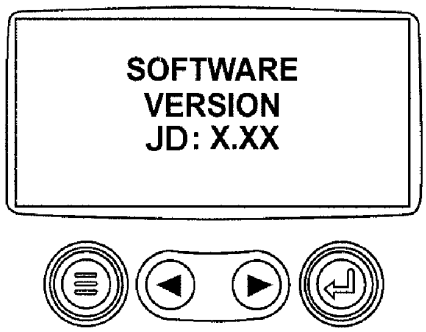
4. Scroll to the "Software Version". Press "Enter" to view the software version. Press the menu button twice to return to the main menu.



RG13236 —UN—13OCT03

Software Version

OURGP12,00000D5 -19-11OCT06-4/4

Engine Troubleshooting

NOTE: Before troubleshooting the engine, first retrieve any fault codes on the diagnostic gauge display and perform the corrective actions. (See earlier in this section.) If any problems remain, use the following charts to solve engine problems.

Symptom	Problem	Solution
Engine Will Not Crank	Weak battery	Replace battery.
	Corroded or loose battery connections	Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.
Hard to Start or Will Not Start	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Slow cranking speed	Check for problem in the charging/starting system.
	Too high viscosity crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic Control System Problem or Basic Engine Problem	See your John Deere engine distributor or servicing dealer.
Engine Misfiring or Runs Irregularly	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Lack of Engine Power	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Plugged fuel filter	Replace fuel filters.
	Engine overloaded	Reduce engine load.
	Improper crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Black or Gray Exhaust Smoke	Engine overloaded	Reduce engine load.
	Engine burning oil	See LUBRICATION SYSTEM TROUBLESHOOTING, later in this section.

Continued on next page

OURGP11,0000029 -19-11OCT06-1/5

Symptom	Problem	Solution
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Defective muffler/exhaust piping (causing back-pressure)	Replace muffler or defective piping.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
White Exhaust Smoke	Engine compression too low	Determine cause of low compression and repair as required. See your John Deere engine distributor or servicing dealer.
	Defective thermostat(s) (does not close)	Test thermostats; replace thermostats as required.
	Coolant entering combustion chamber (failed cylinder head gasket or cracked cylinder head)	Repair or replace as required. See your John Deere engine distributor or servicing dealer.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Engine Idles Poorly	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Air leak on suction side of air intake system.	Check hose and pipe connections for tightness; repair as required.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Excessive Fuel Consumption	Engine overloaded	Reduce engine load.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Compression too low	Determine cause of low compression and repair as required.
	Leaks in fuel supply system	Locate source of leak and repair as required.
	Improper type of fuel.	Use proper type of fuel.
	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.

Continued on next page

Symptom	Problem	Solution
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Fuel injectors defective.	See your authorized servicing dealer or engine distributor.
	High pressure fuel pump out of time.	See your authorized servicing dealer or engine distributor.
	Improper turbocharger operation.	Inspect turbocharger. See your authorized servicing dealer or engine distributor.
	Low engine temperature.	Check thermostats.
Fuel in Oil	Cracked cylinder head	Locate crack, repair/replace components as required. See your John Deere engine distributor or servicing dealer.
Low-Pressure System - Fuel Pressure Low	Plugged fuel filter	Replace fuel filter.
	Restricted fuel line	Locate restriction, repair as required.
	Faulty high-pressure fuel pump	Remove fuel pump, repair/replace pump as required. See your John Deere engine distributor or servicing dealer.
Abnormal Engine Noise *NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.* *Do not confuse the whine heard during turbocharger run down with noise which indicates a bearing failure. The whine heard during turbocharger run down is normal.*	Worn main or connecting rod bearings	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Excessive crankshaft end play	Check crankshaft end play. See your John Deere engine distributor or servicing dealer.
	Loose main bearing caps	Check bearing clearance; replace bearings and bearing cap screws as required. See your John Deere engine distributor or servicing dealer.

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Symptom	Problem	Solution
	Worn connecting rod bushings and piston pins	Inspect piston pins and bushings. See your John Deere engine distributor or servicing dealer.
	Scored pistons	Inspect pistons. See your John Deere engine distributor or servicing dealer.
	Worn timing gears or excess backlash	Check timing gear back lash. See your John Deere engine distributor or servicing dealer.
	Excessive valve clearance	Check and adjust valve clearance. See your John Deere engine distributor or servicing dealer.
	Worn camshaft lobes	Inspect camshaft. See your John Deere engine distributor or servicing dealer.
	Worn rocker arm shaft(s)	Inspect rocker arm shafts. See your John Deere engine distributor or servicing dealer.
	Insufficient engine lubrication	See LUBRICATION SYSTEM TROUBLESHOOTING, later in this section.
	Turbocharger noise	See AIR INTAKE SYSTEM TROUBLESHOOTING, later in this section.
Engine emits white smoke	Improper type of fuel.	Use proper fuel.
	Low engine temperature.	Warm up engine to normal operating temperature.
	Defective thermostat.	Remove and check thermostat.
	Defective fuel injectors.	See your authorized servicing dealer or engine distributor.
	High pressure fuel pump out of time.	See your authorized servicing dealer or engine distributor.
Engine emits black or gray exhaust smoke	Improper type of fuel.	Use proper fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
	Engine overloaded.	Reduce load.

Continued on next page

Symptom	Problem	Solution
	Fuel injectors dirty.	See your authorized servicing dealer or engine distributor.
	High pressure fuel pump out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.
Engine Overheats	Engine overloaded.	Reduce load.
	Low coolant level.	Fill radiator to proper level, check radiator and hoses for loose connections or leaks.
	Faulty radiator cap.	Have technician check.
	Stretched poly V-belt or defective belt tensioner.	Check automatic belt tensioner and check belts for stretching. Replace as required.
	Low engine oil level.	Check oil level. Add oil as required.
	Cooling system needs flushing.	Flush cooling system.
	Defective or wrong type of thermostats.	Remove and check thermostats.
	Defective temperature gauge or sender.	Check coolant temperature with thermometer and replace, if necessary.
	Incorrect grade of fuel.	Use correct grade of fuel.

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Electrical Troubleshooting

Symptom	Problem	Solution
Undercharged system	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter, or alternator.	Inspect and clean as necessary.
	Defective battery.	Test batteries.
	Defective alternator.	Test charging system.
Battery used too much water	Cracked battery case.	Check for moisture and replace as necessary.
	Battery charging rate too high.	Test charging system.
Batteries will not charge	Loose or corroded connections.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Stretched belt or defective belt tensioner.	Adjust belt tension or replace belts.
Starter will not crank	Engine drivelines engaged.	Disengage engine drivelines.
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output voltage or discharged battery.	Charge or replace batteries.
	Faulty start circuit relay.	See your authorized servicing dealer or engine distributor.
	Blown fuse.	Replace fuse.
		Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.

Continued on next page

Symptom	Problem	Solution
Starter cranks slowly	Low battery output.	Charge batteries.
	Crankcase oil too heavy.	Use proper viscosity oil.
	Loose or corroded connections.	Clean and tighten loose connections.
Starter and hour meter functions; rest of electrical system does not function	Blown fuse on magnetic switch.	Replace fuse.
Entire electrical system does not function	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries.	Replace batteries.
	Blown fuse.	Replace fuse.

OURGP11,000006A -19-11OCT06-2/2

Lubrication System Troubleshooting

Symptom	Problem	Solution
Low Oil Pressure	Low crankcase oil level	Fill crankcase to proper oil level.
	Faulty pressure sensor	Replace sensor. See your John Deere engine distributor or servicing dealer.
	Clogged oil cooler or filter	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Excessive oil temperature	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Defective oil pump	Remove and inspect oil pump. See your John Deere engine distributor or servicing dealer.
	Incorrect oil	Drain crankcase and refill with correct oil.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Clogged oil pump screen or cracked pick-up tube	Remove oil pan and clean screen/replace pick-up tube.
	Excessive main or connecting rod bearing clearance	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
High Oil Pressure	Improper oil classification	Drain crankcase and refill with correct oil.
	Faulty pressure sensor	Replace sensor. See your John Deere engine distributor or servicing dealer.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged filter bypass valve	Remove and inspect filter bypass valve. See your John Deere engine distributor or servicing dealer.

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Symptom	Problem	Solution
	Stuck or damaged oil cooler bypass valve	Remove and inspect oil cooler bypass valve. See your John Deere engine distributor or servicing dealer.
Excessive Oil Consumption	Too low viscosity crankcase oil	Drain crankcase and refill with correct viscosity oil.
	Crankcase oil level too high	Drain oil until oil level is correct.
	External oil leak(s)	Determine source of oil leak(s) and repair as required.
	Oil control rings not seated	See your John Deere engine distributor or servicing dealer.
	Oil control rings worn or broken	Replace piston rings. See your John Deere engine distributor or servicing dealer.
	Scored cylinder liners or pistons	Remove and inspect cylinders and liners; replace as required. See your John Deere engine distributor or servicing dealer.
	Worn valve guides or stems	Inspect and measure valve stems and valve guides; repair as required. See your John Deere engine distributor or servicing dealer.
	Excessive oil pressure	See High Oil Pressure.
	Piston ring grooves excessively worn	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston rings sticking in ring grooves	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Insufficient piston ring tension	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston ring gaps not staggered	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Front and/or rear crankshaft oil seal faulty	Replace oil seals. See your John Deere engine distributor or servicing dealer.

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Symptom	Problem	Solution
		See LOW PRESSURE SYSTEM-FUEL PRESSURE LOW TROUBLESHOOTING earlier in this section.
Fuel in Oil		See FUEL IN OIL TROUBLESHOOTING earlier in this section.
Coolant in Oil		See COOLING SYSTEM TROUBLESHOOTING later in this section.

OURGP11,000006E -19-11OCT06-3/3

Cooling System Troubleshooting

Symptom	Problem	Solution
Engine Overheats	Lack of coolant in cooling system	Fill cooling system to proper level.
	Radiator core dirty	Clean radiator as required.
	Engine overloaded	Reduce engine load.
	Too low crankcase oil level	Fill crankcase to proper oil level.
	Loose or defective fan belt	Replace fan belt as required. Check belt tensioner. (See Lubrication and Maintenance 500 Hour/12 Month Section.)
	Defective thermostat(s)	Test thermostat opening temperature; replace thermostats as required.
	Damaged cylinder head gasket	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Defective coolant pump	Replace coolant pump. See your John Deere engine distributor or servicing dealer.
	Defective radiator cap	Replace radiator cap as required.
Coolant in Crankcase	Cylinder head gasket defective	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Cylinder head or block cracked	Locate crack, repair/replace components as required.
	Cylinder liner seals leaking	Remove and inspect cylinder liners. See your John Deere engine distributor or servicing dealer.
	Leaking oil cooler	Pressure test oil cooler; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Defective oil cooler O-rings	Remove and inspect oil cooler O-rings; replace as required. See your John Deere engine distributor or servicing dealer.

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RG,RG34710,7601 -19-11OCT06-1/2

Symptom	Problem	Solution
	Faulty coolant pump seal; weep hole plugged; coolant leaking through bearing	Replace coolant pump seals. See your John Deere engine distributor or servicing dealer.
Coolant Temperature Below Normal	Defective thermostat(s)	Test thermostats; replace thermostats as required.

RG,RG34710,7601 -19-11OCT06-2/2

Air Intake and Exhaust System Troubleshooting

Symptom	Problem	Solution
Hard to Start or Will Not Start		See ENGINE TROUBLESHOOTING earlier in this section.
Engine Misfiring or Runs Irregularly		See ENGINE TROUBLESHOOTING earlier in this section.
Black or Grey Exhaust Smoke		See ENGINE TROUBLESHOOTING earlier in this section.
Lack of Engine Power		See ENGINE TROUBLESHOOTING earlier in this section.
Turbocharger "Screams"	Air leak in intake manifold.	Check intake manifold gasket and manifold; repair as required. See your John Deere engine distributor or servicing dealer.
Turbocharger Noise or Vibration *NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.* *Do not confuse the whine heard during run down with noise which indicates a bearing failure.*	Bearings not lubricated (insufficient oil pressure)	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
	Air leak in engine intake or exhaust manifold	Check intake and exhaust manifold gaskets and manifolds; repair as required. See your John Deere engine distributor or servicing dealer.
	Improper clearance between turbine wheel and turbine housing	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Broken blades (or other wheel failures)	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

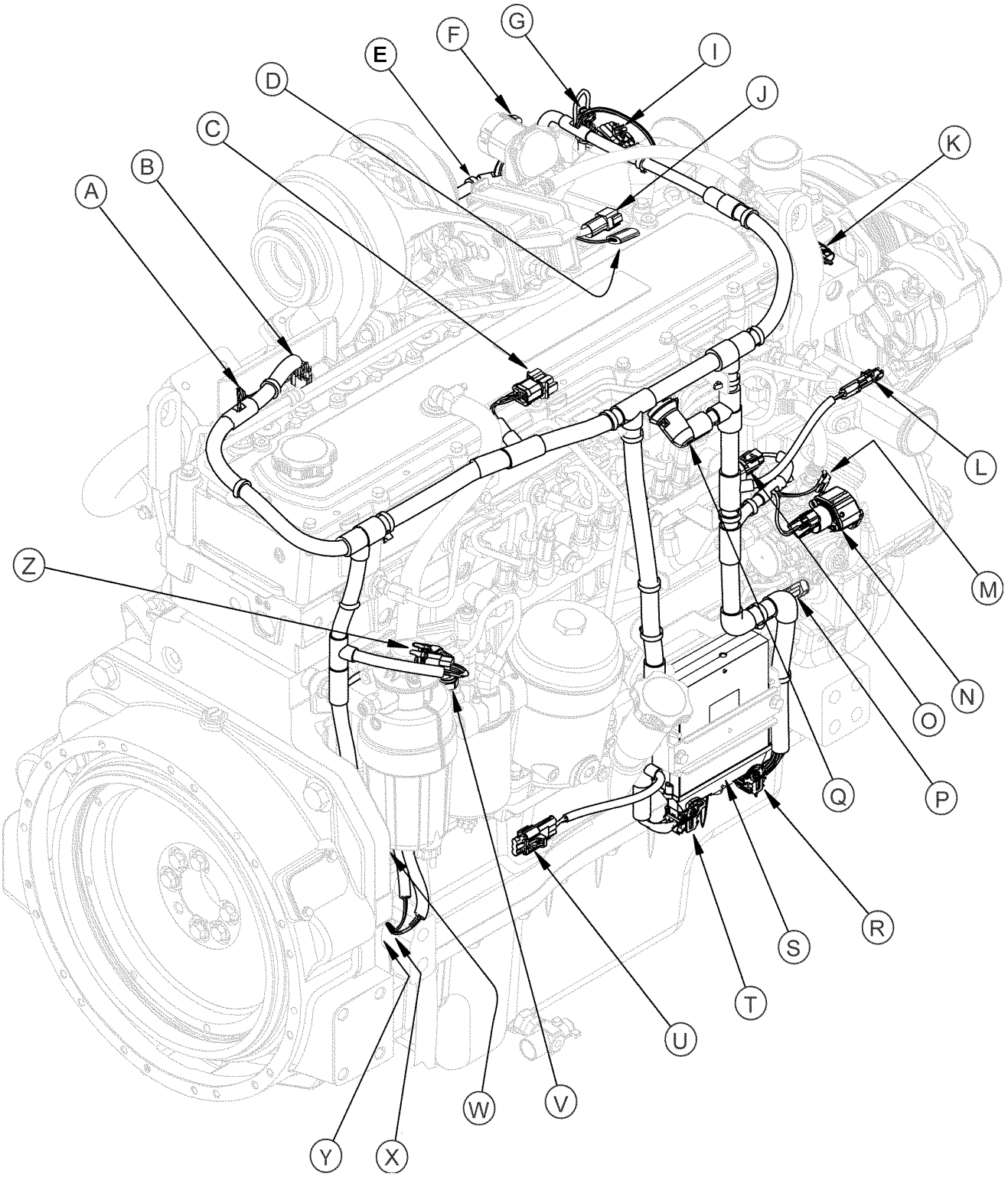
OURGP11,000006B -19-11OCT06-1/1

Precautions for Electrical System When Steam Cleaning Engine

IMPORTANT: Do not steam clean any electrical or electronic components while steam cleaning the engine as it could damage sensitive parts.

OURGP11,000012A -19-24AUG10-1/1

Engine Wiring Harness Layout



Electrical Wiring Harness Layout

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OURGP11,000002A -19-11OCT06-1/2

A—Manifold Air Pressure (MAP) Sensor Connector
B—Exhaust Gas Recirculation (EGR) Mixed Air Temperature Sensor Connector
C—Turbocharger Sensor Jumper Connector
D—VGT Turbocharger Connector
E—Exhaust Gas Recirculation (EGR) Exhaust Temperature Sensor Connector
F—Exhaust Gas Recirculation (EGR) Valve Sensor Connector
G—Exhaust Pressure Sensor Connector
H—Exhaust Gas Recirculation (EGR) Fresh Air Sensor Connector
I— Air Heater Jumper Connection
J—VGT Turbocharger Connector
K—Coolant Temperature Sensor Connector
L—Alternator Excitation Connector
M—Fuel Temperature Sensor Connector
N—Fuel Pump Control Valve Connector
O—Fuel Rail Pressure Sensor Connector
P—Camshaft Sensor Connector
Q—Fuel Injector Connector
R—ECU Connector
S—ECU
T—ECU Engine
U—Auxiliary Power Connector
V—Fuel Pressure Sensor
W—Water In Fuel Sensor
X—Crankshaft Speed/Position Sensor
Y—Oil Pressure Sensor
Z—Fuel Transfer Pump Sensor

OURGP11,000002A -19-11OCT06-2/2

Precautions For Welding

IMPORTANT: Welding on an engine is not recommended. If welding must be performed, follow the following precautions.

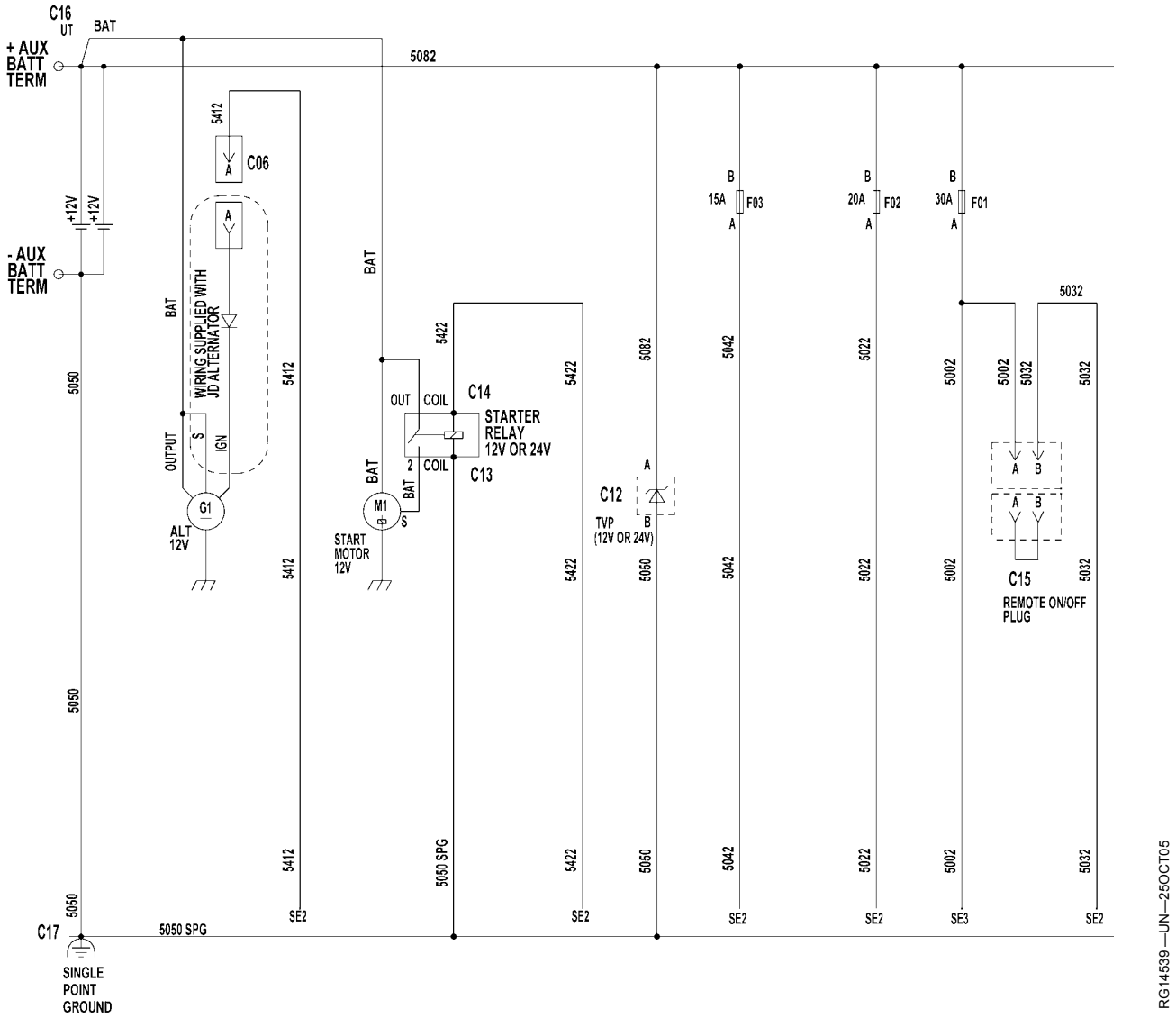
IMPORTANT: ALWAYS disconnect Engine Control Unit (ECU) connectors and battery before welding on engine or machine. High currents or electro-static discharge in electronic components from welding may cause permanent damage. Remove battery or flammable liquid lines if welding near those items.

TS953 —UN—15MAY90

1. Disconnect connectors from ECU.
2. Disconnect battery cables from battery.
3. If necessary, disconnect flammable liquid lines or battery.
4. Connect welder ground to same engine component as the welding point and be sure ECU or other electronic components are not in ground path.
5. Never connect welder ground to crankshaft damper or pulley, engine flywheel, or any driveline components. Be sure that engine bearings are not in ground path, as this can create bearing damage.

OUOD002,000016B -19-01SEP10-1/1

Engine Wiring Diagram (Engines With Full-Featured Instrument Panel)

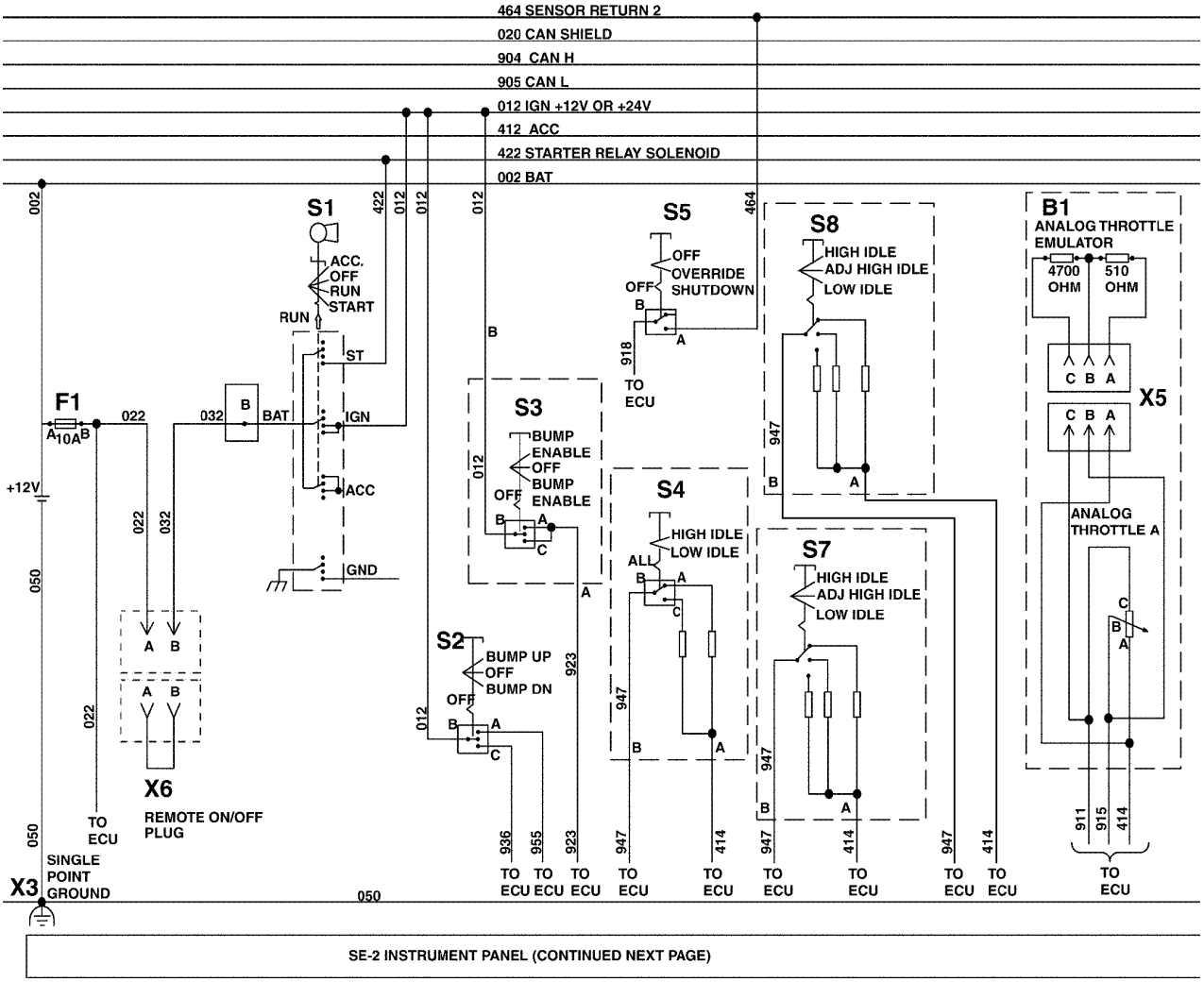


Start Components Schematic

ALT— Alternator
BATT— Battery
C06— Alternator Connector
C13, C14—Starter Relay Coil
C15— Remote On/Off Plug
C16— Battery
C17— Single Point Ground
SE2— See SE1, ECU/Engine Wiring Schematic
5002— Unswitched Battery
5022— Unswitched Battery
5032— Unswitched Battery
5042— Unswitched Battery
5050— Ground
5082— Unswitched Battery
5412— Key Switch, Accessory Position
5422— Start

OURGP11,0000078 -19-20SEP06-1/1

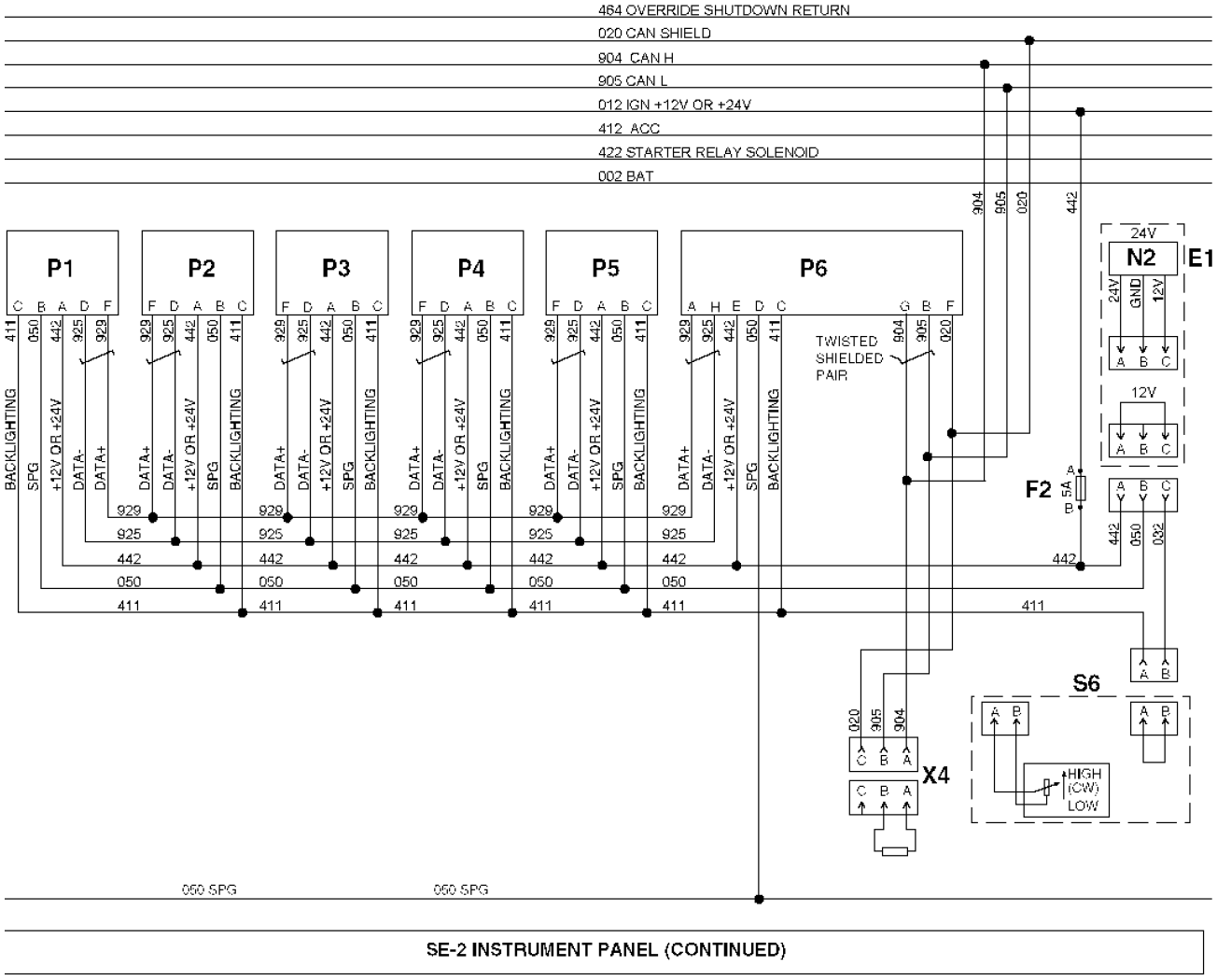
Engine Wiring Diagram (Engines With Full-Featured Instrument Panel) (Continued)



B1—Analog Throttle Emulator
F1—Fuse (10 Amp)
F2—Fuse (5 Amp)
S1—Ignition Key Switch
S2—Speed Select Switch (Momentary)
S3—Bump Enable Switch (Momentary
S4—Dual State Throttle Switch
S5—Override Shutdown Switch (Momentary)
S6—Dimmer Control or Jumper Plug
S7—Tri-state Throttle Switch
S8—Ramp Throttle Switch
X3—Single Point Ground
X5—Analog Throttle Connector
X6—Remote On/Off Plug

OURGP11,0000076 -19-11OCT06-1/1

Engine Wiring Diagram (Engines With Full-Featured Instrument Panel) (Continued)



E1— Back Light Regulator (24V) or Plug (12V)
N2— Voltage Regulator (for 24V Operation)
P1— Optional Gauge
P2— Optional Gauge
P3— Oil Pressure Gauge
P4— Coolant Temperature Gauge
P5— Tachometer Display
P6— Hourmeter/Diagnostic Meter
S5— Override Shutdown Switch (Momentary)
S6— Dimmer Control or Jumper Plug
X4— CAN Terminator

OURGP11,0000077 -19-11OCT06-1/1

Storage

Engine Storage Guidelines

IMPORTANT: Special considerations should be taken prior to storage when using BioDiesel. See BioDiesel Fuel in the Fuels, Lubricants, and Coolant Section.

1. John Deere engines can be stored outside for up to three months with no long-term preparation if covered by a waterproof covering. No outside storage is recommended without a waterproof covering.
2. John Deere engines can be stored in a standard overseas shipping container for up to three months with no long-term preparation.
3. John Deere engines can be stored inside for up to six months with no long-term preparation.
4. John Deere engines expected to be stored more than six months **must** have long-term storage preparation. See Preparing Engine for Long-Term Storage in the Storage Section.

OURGP12,00000DF -19-04FEB15-1/1

Preparing Engine for Long Term Storage

IMPORTANT: Any time your engine will not be used for over six months, the following recommendations for storing it and removing it from storage will help to minimize corrosion and deterioration.

IMPORTANT: Long-term storage is not advised when using BioDiesel. For storage longer than one year, use straight hydrocarbon fuel.

If BioDiesel must be used it is recommended the blend not exceed B7 and a high-quality fuel stabilizer be used. Storage should not exceed one year.

For more information see BioDiesel Fuel in the Fuels, Lubricants, and Coolants Section.

NOTE: The following storage preparations are used for long-term engine storage up to one year. After that, the engine should be started, warmed up, and retreated for an extended storage period.

1. Change engine oil and replace filter. See Changing Engine Oil and Replacing Oil Filter in the Lubrication and Maintenance/500 Hour Section. Used oil will not give adequate protection. Add one ounce of rust preventive oil to the engine crankcase for every quart of oil. This rust preventive oil should be an SAE 10W oil with 1-4 percent morpholine or equivalent vapor corrosion inhibitor, such as NOX RUST VCI-10 OIL from Daubert Chemical Company, Inc.
2. Service air cleaner. See Replacing Air Cleaner Filter Elements in the Service As Required Section.

IMPORTANT: Avoid damage to the engine cooling system components. Engine cooling system must be drained, flushed, and refilled for prolong storage of more than one year.

3. Draining and flushing of cooling system is not necessary if engine is to be stored only for several months. However, for extended storage periods of a year or longer, it is recommended that the cooling system be drained, flushed, and refilled. Refill with appropriate coolant. See Adding Coolant in the Service As Required Section.
4. Prepare a tank with a solution of diesel fuel and rust preventive oil, at ten ounces of rust preventive oil per gallon of diesel fuel.
5. Remove existing lines/plugs as required, and run a temporary line from the tank to the engine fuel intake, and another temporary line from the fuel return to the tank, so rust preventive oil solution is circulated through the injection system during cranking.
6. Crank the engine several revolutions with starter (do not allow the engine to start). This will allow rust preventive oil solution to circulate.

Effects of Prolong Storage of Coolant — More Than One Year

7. Remove temporary lines installed in Step 5 above, and replace any lines/plugs previously removed.

NOTE: One gallon of fuel/oil solution can be used to treat 100 engines; two gallons to treat 200 engines, etc. The oil could then be replenished by adding an additional five ounces of rust preventive oil per gallon of solution. However, starting over with a new solution is recommended to dispose of any water or other impurities.

Continued on next page

8. Loosen, or remove and store, fan/alternator poly-vee belt.
9. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
10. Disengage the clutch for any driveline.
11. Clean the exterior of the engine with salt-free water and touch up any scratched or chipped painted surfaces with a good quality paint.
12. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
13. Seal all openings on engine with plastic bags and tape.
14. Store the engine in a dry protected place. If engine must be stored outside, cover it with a waterproof canvas or other suitable protective material and use a strong waterproof tape.

OURGP11,000002B -19-23MAR22-2/2

Removing Engine from Long Term Storage

Refer to the appropriate section for detailed services listed below or have your authorized servicing dealer or engine distributor perform services that you may not be familiar with.

1. Remove all protective coverings from engine. Unseal all openings in engine and remove covering from electrical systems.
2. Remove the batteries from storage. Install batteries (fully charged) and connect the terminals.
3. Install fan/alternator poly-vee belt if removed.
4. Fill fuel tank.
5. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS in Lubrication and Maintenance/Daily Section.)

IMPORTANT: DO NOT operate starter more than 30 seconds at a time. Wait at least 2 minutes for starter to cool before trying again.

6. Crank engine for 20 seconds with starter (do not allow the engine to start). Wait 2 minutes and crank engine an additional 20 seconds to assure bearing surfaces are adequately lubricated.
7. Start engine and run at low idle and no load for several minutes. Warm up carefully and check all gauges before placing engine under load.
8. On the first day of operation after storage, check overall engine for leaks and check all gauges for correct operation.

NOTE: If using BIODIESEL blends after long term storage, frequency of fuel filter plugging may increase initially.

OUOD006,00000FD -19-02OCT07-1/1

General OEM Engine Specifications

NOTE: For John Deere vehicle engines, see Machine Technical Manual.

ITEM	6090 (9.0L)
Number of Cylinders	6
Bore	118.4 mm (4.66 in.)
Stroke	136 mm (5.4 in.)
Displacement	9.0 L (548 cu in.)
Compression Ratio	16.0:1
Aspiration	Air-To-Air Aftercooled, Turbocharged
Engine Firing Order	1-5-3-6-2-4
Valves Per Cylinder	2 Intake 2 Exhaust
Battery 12-Volt System Capacity 12-Volt System Reserve 24-Volt System Capacity 24-Volt System Reserve	 1100 CCA 250 Minutes 750 CCA 275 CCA
Thermostat Start To Open Temperature	82°C (180°F)
Thermostat Fully Open Temperature	94°C (202°F)
Coolant Capacity[a]	16 L (16.9 qt)
Recommended Radiator Pressure Cap	100 kPa (15 psi)
Crankcase Oil Fill Capacity	See “Engine Crankcase Oil Fill Quantities” later in this section.
Oil Pressure At Rated Speed With Oil Warmed to 105°C (220°F)	290 kPa (2.9 bar) (42 psi)
Oil Pressure At Low Idle (Minimum)	138 kPa (1.4 bar) (20 psi)
Length[b]	1208 mm (47.6 in.)
Width[b]	630 mm (24.8 in.)
Height[b]	1113 mm (43.8 in.)
Weight (dry)[b]	901 kg (1986 lb)

[a] *Coolant capacity may vary with different engine applications.*
[b] *Measurement may vary depending on installed options*

OURGP11,000006C -19-21FEB22-1/1

Engine Power and Speed Rating Specifications [1]

FUEL SYSTEM OPTION CODES	ELECTRONIC SOFTWARE OPTION CODES	POWER RATING @RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED [2] (rpm)	SLOW IDLE (rpm)	FAST IDLE [3] (rpm)
1601	7205, 7206	280 (375)	2200	800	2380
	7207, 7208	261 (350)	2200	800	2380
	7209, 7210	261 (350) [4]	2200	800	2380
	7211, 7212	261 (350) [4]	2000	800	2180
	7213, 7214	242 (325)	2200	800	2380
	7215, 7216	242 (325) [4]	2200	800	2380
	7217, 7218	242 (325) [4]	2000	800	2180
	7219, 7220	224 (300)	2200	800	2380
	7221, 7222	224 (300) [4]	2200	800	2380
	7223, 7224	224 (300) [4]	2000	800	2180
	7243, 7244	315 (422)	1800	—	1935
	7245, 7246	287 (385)	1800	—	1935
	7247, 7248	258 (346)	1800	—	1935
	7249, 7250	229 (307)	1800	—	1935
	7260, 7261	298 (400)	2200	800	2380
	7280, 7281	248 (333)	1500	1000	N/A
	7282, 7283	298 (399)	1500	1000	N/A
	72B1, 72B2	315 (422)	1800	—	1935
	72B3, 72B4	287 (385)	1800	—	1935
	72B5, 72B6	258 (345)	1800	—	1935
	72B7, 72B8	229 (307)	1800	—	1935
	72V8 (12 Volt)	345 (456)	1800	N/A	N/A
	72V9 (24 Volt)	345 (456)	1800	N/A	N/A
1602, 1603	7225, 7226	205 (275)	2200	800	2380
	7227, 7228	205 (275) [4]	2200	800	2380
	7229, 7230	205 (275) [4]	2000	800	2180
	7231, 7232	187 (250)	2200	800	2380
	7233, 7234	187 (250) [4]	2200	800	2380
	7235, 7236	187 (250) [4]	2000	800	2180
	7237, 7238	168 (225)	2200	800	2380
	7239, 7240	168 (225) [4]	2200	800	2380
	7241, 7242	168 (225) [4]	2000	800	2180
1613	72L4 (Dual Frequency)	269 (359); 212 (285)	1800; 1500	1400	1870
16A6	72P9 (Dual Frequency)	153(205)	1500	—	—
	72Q1 (Dual Frequency)	153(205)	1500	—	—

Continued on next page

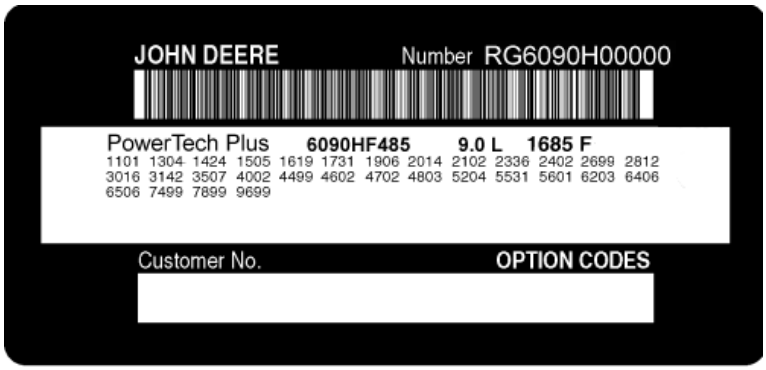
JR74534,0000278 -19-21AUG15-1/2

FUEL SYSTEM OPTION CODES	ELECTRONIC SOFTWARE OPTION CODES	POWER RATING @RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED [2] (rpm)	SLOW IDLE (rpm)	FAST IDLE [3] (rpm)
16AX	72AM, 72AN	202(271)	—	—	—

[1] Engine speeds listed are preset to factory specification for application. Therefore, speeds may vary depending upon specific vehicle application requirements. Refer to your machine operator's manual for engine speeds that are different from those preset at the factory.
[2] Generator set engines usually run at 1500 rpm (50 Hz) or 1800 (60 Hz) when operating under load depending on cycles of AC current.
[3] For industrial engines, fast idle is 7-10% above rated speed. For generator set engines, fast idle is 5-7% above rated speed.
[4] These industrial engines have a power bulge which allows for INTERMITTENT operation above rated power.

JR74534,0000278 -19-21AUG15-2/2

Engine Crankcase Oil Fill Quantities



RG13819 —UN—11JAN05

Option Code Label

Each engine has a 13-digit John Deere engine serial number. The first two digits identify the factory that produced the engine:

“RG” indicates the engine was built in Waterloo, Iowa.

In addition to the serial number plate, OEM engines have an engine option code label affixed to the rocker arm cover. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your authorized servicing dealer or engine distributor with these numbers.

To determine the option code for the oil fill quantity of your engine, refer to the engine option code label affixed to the rocker arm cover. The first two digits of the code (19) identify the oil pan group. The last two digits of each code identify the specific oil pan on your engine.

Listed below are engine crankcase oil fill quantities:

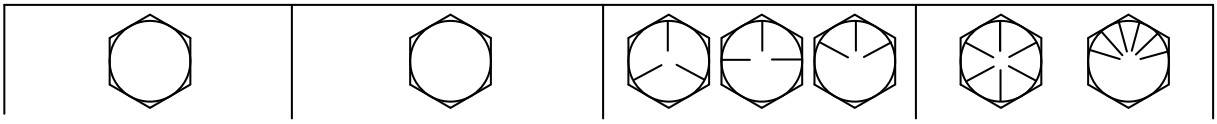
Engine Model 6090HF	
Oil Pan Option Code(s)	**Crankcase Oil Capacity**
1909	27 L (28.5 qt)
1911	34 L (35.9 qt)
1914	28 L (29.6 qt)
1915	27 L (28.5 qt)
1916	31 L (32.8 qt)

NOTE: Add an additional 4 L (4.2 qts) of oil for engines equipped with a John Deere rear PTO.

DS68560,0000004 -19-06MAY14-1/1

Unified Inch Bolt and Screw Torque Values

TS1671 —UN—01MAY03



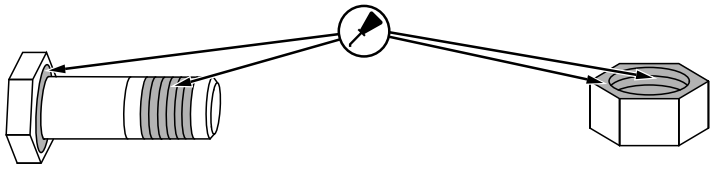
Bolt or Screw Size	SAE Grade 1[a]				SAE Grade 2[b]				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Hex Head[c]		Flange Head[d]		Hex Head[c]		Flange Head[d]		Hex Head[c]		Flange Head[d]		Hex Head[c]		Flange Head[d]	
	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in
1/4	3.1	27.3	3.2	28.4	5.1	45.5	5.3	47.3	7.9	70.2	8.3	73.1	11.2	99.2	11.6	103
													N·m	lb·ft	N·m	lb·ft
5/16	6.1	54.1	6.5	57.7	10.2	90.2	10.9	96.2	15.7	139	16.8	149	22.2	16.4	23.7	17.5
									N·m	lb·ft	N·m	lb·ft				
3/8	10.5	93.6	11.5	102	17.6	156	19.2	170	27.3	20.1	29.7	21.9	38.5	28.4	41.9	30.9
					N·m	lb·ft	N·m	lb·ft								
7/16	16.7	148	18.4	163	27.8	20.5	30.6	22.6	43	31.7	47.3	34.9	60.6	44.7	66.8	49.3
	N·m	lb·ft	N·m	lb·ft												
1/2	25.9	19.1	28.2	20.8	43.1	31.8	47	34.7	66.6	49.1	72.8	53.7	94	69.3	103	75.8
9/16	36.7	27.1	40.5	29.9	61.1	45.1	67.5	49.8	94.6	69.8	104	77	134	98.5	148	109
5/8	51	37.6	55.9	41.2	85	62.7	93.1	68.7	131	96.9	144	106	186	137	203	150
3/4	89.5	66	98	72.3	149	110	164	121	230	170	252	186	325	240	357	263
7/8	144	106	157	116	144	106	157	116	370	273	405	299	522	385	572	422
1	216	159	236	174	216	159	236	174	556	410	609	449	785	579	860	634
1-1/8	305	225	335	247	305	225	335	247	685	505	751	554	1110	819	1218	898
1-1/4	427	315	469	346	427	315	469	346	957	706	1051	775	1552	1145	1703	1256
1-3/8	564	416	618	456	564	416	618	456	1264	932	1386	1022	2050	1512	2248	1658
1-1/2	743	548	815	601	743	548	815	601	1665	1228	1826	1347	2699	1991	2962	2185

The nominal torque values listed are for general use only with the assumed wrenching accuracy of 20%, such as a manual torque wrench.
DO NOT use these values if a different torque value or tightening procedure is given for a specific application.
For lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application.

Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original.

- Make sure that fastener threads are clean.
- Apply a thin coat of Hy-Gard™ or equivalent oil under the head and on the threads of the fastener, as shown in the following image.
- Be conservative with the amount of oil to reduce the potential for hydraulic lockup in blind holes due to excessive oil.
- Properly start thread engagement.

TS1741 —UN—22MAY18

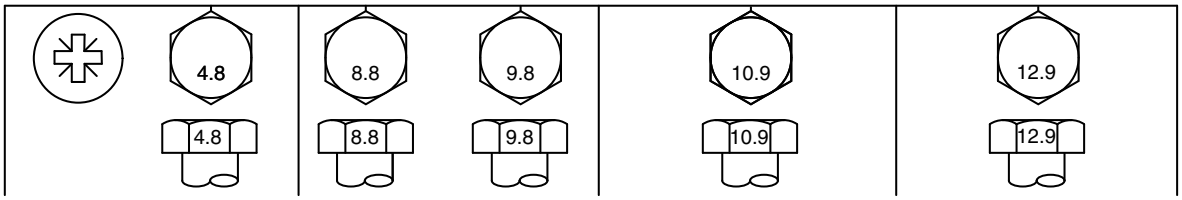


[a] Grade 1 applies for hex cap screws over 6 in (152 mm) long, and for all other types of bolts and screws of any length.
[b] Grade 2 applies for hex cap screws (not hex bolts) up to 6 in (152 mm) long.
[c] Hex head column values are valid for ISO 4014 and ISO 4017 hex head, ISO 4162 hex socket head, and ISO 4032 hex nuts.
[d] Hex flange column values are valid for ASME B18.2.3.9M, ISO 4161, or EN 1665 hex flange products.

DX,TORQ1 -19-09MAY22-1/1

Metric Bolt and Screw Torque Values

TS1742 —UN—31MAY18



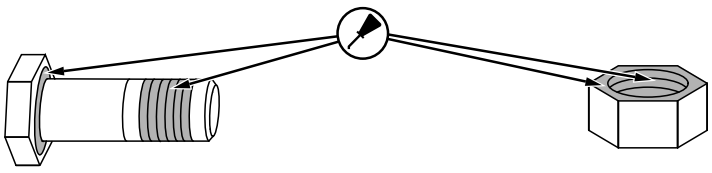
Bolt or Screw Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Hex Head[a]		Flange Head[b]		Hex Head[a]		Flange Head[b]		Hex Head[a]		Flange Head[b]		Hex Head[a]		Flange Head[b]	
	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in
M6	3.6	31.9	3.9	34.5	6.7	59.3	7.3	64.6	9.8	86.7	10.8	95.6	11.5	102	12.6	112
									N·m	lb·ft	N·m	lb·ft	N·m	lb·ft	N·m	lb·ft
M8	8.6	76.1	9.4	83.2	16.2	143	17.6	156	23.8	17.6	25.9	19.1	27.8	20.5	30.3	22.3
			N·m	lb·ft	N·m	lb·ft	N·m	lb·ft								
M10	16.9	150	18.4	13.6	31.9	23.5	34.7	25.6	46.8	34.5	51	37.6	55	40.6	60	44.3
	N·m	lb·ft														
M12	—	—	—	—	55	40.6	61	45	81	59.7	89	65.6	95	70.1	105	77.4
M14	—	—	—	—	87	64.2	96	70.8	128	94.4	141	104	150	111	165	122
M16	—	—	—	—	135	99.6	149	110	198	146	219	162	232	171	257	190
M18	—	—	—	—	193	142	214	158	275	203	304	224	322	245	356	263
M20	—	—	—	—	272	201	301	222	387	285	428	316	453	334	501	370
M22	—	—	—	—	365	263	405	299	520	384	576	425	608	448	674	497
M24	—	—	—	—	468	345	518	382	666	491	738	544	780	575	864	637
M27	—	—	—	—	683	504	758	559	973	718	1080	797	1139	840	1263	932
M30	—	—	—	—	932	687	1029	759	1327	979	1466	1081	1553	1145	1715	1265
M33	—	—	—	—	1258	928	1398	1031	1788	1319	1986	1465	2092	1543	2324	1714
M36	—	—	—	—	1617	1193	1789	1319	2303	1699	2548	1879	2695	1988	2982	2199

The nominal torque values listed are for general use only with the assumed wrenching accuracy of 20%, such as a manual torque wrench.
DO NOT use these values if a different torque value or tightening procedure is given for a specific application.
For lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application.

Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original.

- Make sure that fastener threads are clean.
- Apply a thin coat of Hy-Gard™ or equivalent oil under the head and on the threads of the fastener, as shown in the following image.
- Be conservative with the amount of oil to reduce the potential for hydraulic lockup in blind holes due to excessive oil.
- Properly start thread engagement.

TS1741 —UN—22MAY18



[a]Hex head column values are valid for ISO 4014 and ISO 4017 hex head, ISO 4162 hex socket head, and ISO 4032 hex nuts.
[b]Hex flange column values are valid for ASME B18.2.3.9M, ISO 4161, or EN 1665 hex flange products.

DX,TORQ2 -19-09MAY22-1/1

Lubrication and Maintenance Records

Using Lubrication and Maintenance Records

Refer to specific Lubrication and Maintenance Section for detailed service procedures.

1. Keep a record of the number of hours you operate your engine by regular observation of hour meter.
2. Check your record regularly to learn when your engine needs service.
3. DO ALL the services within an interval section. Write the number of hours (from your service records) and the date in the spaces provided. For a complete listing of all items to be performed and the service intervals required, refer to the quick-reference chart near the front of the Lubrication and Maintenance Section.

IMPORTANT: The service recommendations covered in this manual are for the accessories that are provided by John Deere. Follow manufacturer's service recommendations for servicing engine driven equipment not supplied by Deere.

RG,RG34710,4100 -19-11OCT06-1/1

Daily (Prestarting) Service

NOTE: Refer to DAILY PRESTARTING CHECKS in Engine Operating Guidelines Section for detailed procedures.

Check engine oil level.

Check coolant level.

Drain water from fuel filters.

Check air cleaner dust unloader valve and air restriction indicator, if equipped.

Perform visual walkaround inspection.

OURGP11,0000049 -19-11OCT06-1/1

250 Hour/12 Month Service (Jet Fuel Capable Engines)

- Change engine oil and filter.[1]
- Replace fuel filter elements.
- Replace dosing element

Hours									
Date									
Hours									
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[1]*Service intervals depend on sulfur content of the fuel, oil pan capacity, and the oil and filter used. (See ENGINE OIL AND FILTER SERVICE INTERVALS (JET FUEL CAPABLE ENGINES ONLY), in Fuels, Lubricants, and Coolant Section.)*

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500 Hours of Operation/or Every 12 Months Service

Service fire extinguisher.

Change engine oil and filter. [12]

Service fire extinguisher

Service battery.

Check coolant pump weep hole.

Check crankcase vent hose and valve.

Check air intake hoses, connections, and system.

Remove and replace fuel filters.

Check automatic belt tensioner and belt wear.

Check cooling system

Coolant solution analysis - add SCA's as needed.

Pressure test cooling system.

Check engine speeds.

Check engine mounts

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

[1]During engine break-in, change the oil and filter for the first time after 100 hours of operation (maximum).
[2]Service intervals depend on sulfur content of the diesel fuel, oil pan capacity, and the oil and filter used. (See DIESEL ENGINE OIL AND FILTER SERVICE INTERVALS, in Fuels, Lubricants, and Coolant Section.)

OURGP11,0000063 -19-29OCT15-1/1

2000 Hours of Operation/or Every 24 Months Service

Flush cooling system. [1]

Adjust valve clearance.

Test Thermostats.

Check crankshaft vibration damper.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

[1] If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished by adding supplemental coolant additives (SCA's), the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

OURGP11,0000064 -19-29OCT15-1/1

Service as Required

Drain water from fuel filters when alarm sounds.

Add coolant.

Service air cleaner.

Replace fan-alternator belt.

Check fuses.

Check electrical wiring and connectors.

Check air compressor (if equipped). (See your John Deere dealer.)

Check freon (A/C) compressor (if equipped). (See your John Deere dealer.)

Check rear PTO (if equipped). (See your John Deere dealer.)

Hours									
Date									
Hours									
Date									
Hours									
Date									

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John Deere Warranty in OEM Applications

Overview

This section focuses on John Deere engines marketed in products manufactured by companies other than John Deere or its affiliates, and on John Deere repower engines in all applications. Herein appears the original warranty applicable to the engine as delivered to the retail purchaser on or after 1 May 2010. The following is information about the warranty and warranty service.

NOTE: "John Deere" means John Deere Power Systems with respect to users in the United States, John Deere Canada ULC with respect to users in Canada, and Deere & Company or its subsidiary responsible for making John Deere equipment in other countries where the user is located.

Promptly register the engine online at https://warrantyregistration.deere.com/WarrantyReg/web/WarrantyReg.

When Warranty Service Is Needed

The nearest dealer stands ready with genuine parts and trained and equipped personnel should the need arise. If following the Operator's Manual delivered with the engine/machine are not adequate to correct an engine problem, contact the nearest John Deere service dealer for assistance. Authorized engine service dealers can be found at: https://www.deere.com/or https://www.deere.ca/ (click on "Find a Dealer").

NOTE: When requesting warranty service, the purchaser must be prepared to provide proof that the engine is within the warranty period.

The following information is always required: Engine serial number, date of delivery, engine owner, name and location of dealer and specific person contacted, date of contact, nature of engine problem, and outcome of the service dealer contact.

Given that normally it is the dealer contacted who in the end provides the service required, maintaining a purchaser-dealer relationship of mutual respect from the beginning is always helpful.

Privacy Notice

At John Deere privacy is important. We collect, use, and disclose personal information in accordance with the John Deere privacy statement. For instance, we collect, use, and disclose personal information to provide the products and services requested; to communicate with the customer (examples include warranty and product improvement programs) and to meet safety and legal requirements; and for marketing and promotional purposes. Sometimes, we may ask our John Deere affiliates, dealers, or business partners to do work for us, which involves personal information. For complete details on privacy rights and to obtain a copy of the John Deere Privacy Statement, visit our website at https://www.deere.com/or https://www.deere.ca/.

Warranty Duration

Unless otherwise provided in writing by John Deere, John Deere makes the following warranty to the first retail purchaser and each subsequent purchaser (if purchase is made prior to the expiration of applicable warranty) of each John Deere new off-highway engine marketed as part of a product manufactured by a company other than John Deere or its affiliates and on each John Deere engine used in an off-highway repower application:

- 12 months, unlimited hours of use, or
- 24 months and before the accumulation of 2000 hours of use

NOTE: In the absence of a functional hourmeter, hours of use are determined on the basis of 12 hours of use per calendar day.

Warranty Coverage

This warranty applies to the engine and to integral components and accessories sold by John Deere, and delivered to the first retail purchaser on or after 1 May 2010.

All John Deere-warranted parts and components of John Deere engines which, as delivered to the purchaser, are defective in materials and/or workmanship will be repaired or replaced, as John Deere elects. Warrantable repairs will be made without charge for parts or engine repair labor, including reasonable labor costs to remove and reinstall non-engine parts or components of the equipment in which the engine is installed. If necessary, reasonable labor costs for engine removal and reinstallation will also be included. All coverage is based on the defect appearing within the warranty period as measured from the date of delivery to the first retail purchaser.

Obtaining Warranty Service

Warranty service must be requested of the nearest authorized John Deere engine service outlet before the expiration of the warranty. An *authorized* service outlet is a John Deere engine distributor, a John Deere engine service dealer, or a John Deere equipment dealer selling and servicing equipment with an engine of the type covered by this warranty. (See When Warranty Service is Needed.)

Authorized service outlets will use only new or remanufactured parts or components furnished or approved by John Deere.

NOTE: Authorized engine service locations are listed on the Internet at https://www.deere.com/or https://www.deere.ca/ (click on "Find a Dealer").

At the time of requesting warranty service, the purchaser must be prepared to present evidence of the date of delivery of the engine.

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John Deere reimburses authorized service outlets for limited travel expenses incurred in making warranty service repairs in non-John Deere applications when travel is performed. The limit, as of the date of publication of this booklet, is US$400.00 (US$500.00 if engine is marine) or equivalent. **If distances and travel times are greater than reimbursed by John Deere, the service outlet will charge the purchaser for the difference.**

Warranty Exclusions

John Deere's obligations will not apply to components and accessories that are not furnished or installed by John Deere, nor to failures caused by such items, except as required by law.

Purchaser's Responsibilities

The cost of normal maintenance and depreciation.

Consequences of negligence, misuse, or accident involving the product, or improper application, installation, or storage.

Consequences of service performed by someone other than an authorized John Deere engine service outlet.

Consequences of any product modification or alteration not approved by John Deere, including, but not limited to, tampering with engine fuel and air delivery systems.

Consequences of failure of non-product components.

Consequences of fuels, lubricants, or coolants that fail to meet the specifications and requirements listed in the Operator's Manual.

The effects of cooling system neglect as manifested in cylinder liner or cylinder block cavitation ("pitting, "erosion", "electrolysis").

Any premium for overtime labor requested by the purchaser.

Costs of transporting the product or the equipment in which it is installed to and from the location at which the warranty service is performed, if such costs are in excess of the travel reimbursement payable to the dealer had the warranty service been performed at the product's location.

Costs incurred in gaining access; for example, overcoming physical barriers such as walls, fences, floors, decks, or similar structures impeding access to the product, rental of cranes or similar, or construction of ramps or lifts or protective structures for product removal and reinstallation.

Incidental travel costs including meals, lodging, and similar, and any travel time or mileage costs in excess of the maximum allowance.

Service outlet costs incurred in solving or attempting to solve non-warrantable problems.

Services performed by a party other than an authorized John Deere service dealer.

Charges by dealers for initial start-up and inspection deemed unnecessary by John Deere when an Operator's Manual is supplied with the product are followed.

Costs related to interpretation or translation services.

No Representations or Implied Warranty

Where permitted by law, neither John Deere nor any company affiliated with it makes any guaranties, warranties, conditions, representations or promises, express or implied, oral or written, as to the nonoccurrence of any defect or the quality of performance of its engines other than those set forth in this booklet, and DOES NOT MAKE ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY OR FITNESS otherwise provided for in the Uniform Commercial Code or required by any Sale of Goods Act or any other statute. This exclusion includes fundamental terms. In no event will a John Deere engine distributor or engine service dealer, John Deere equipment dealer, or John Deere or any company affiliated with John Deere be liable for incidental or consequential damages or injuries including, but not limited to, loss of profits, loss of crops, rental of substitute equipment or other commercial loss, damage to the equipment in which the engine is installed or for damage suffered by purchaser as a result of fundamental breaches of contract or breach of fundamental terms, unless such damages or injuries are caused by the gross negligence or intentional acts of the foregoing parties.

Remedy Limitation

The remedies set forth in this warranty are the purchaser's exclusive remedies in connection with the performance of, or any breach of guaranty, condition, or warranty in respect of new John Deere engines. In the event the warranty fails to correct purchaser's performance problems caused by defects in workmanship and/or materials, purchaser's exclusive remedy shall be limited to payment by John Deere of actual damages in an amount not to exceed the cost of the engine.

No Seller's Warranty

No person or entity, other than John Deere, who sells the engine or product in which the engine has been installed makes any guaranty or warranty of its own on any engine warranted by John Deere unless it delivers to the purchaser a separate written guaranty certificate specifically guaranteeing the engine, in which case John Deere shall have no obligation to the purchaser. Neither original equipment manufacturers, engine or equipment distributors, engine or equipment dealers, nor any other person or entity, has any authority to make any representation or promise on behalf of John Deere or to modify the terms or limitations of this warranty in any way.

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Replacement Parts Warranty

John Deere and John Deere Reman parts and components (excluding replacement engines) installed during engine warranty service are warranted for the remaining warranty period of the engine or the applicable warranty term for the installed service part, whichever is greater. A new or remanufactured engine replacing a failed engine under warranty is warranted for 90 days or the remaining warranty period of the original engine, whichever is greater.

Warranty Transfer

The remainder of the original engine warranty and the emissions control-related warranty may be transferred to a subsequent owner of the engine. The Engine Warranty Transfer card should be used to report the transfer to John Deere. If a card is not available, contact your Dealer or simply send the following Information to JDPS Warranty Administration at Diesel-US@JohnDeere.com.

1. The complete 13-character engine serial number.
2. The name and mailing address of the original purchaser.
3. Delivery date to the original purchaser.
4. Hours at the time of transfer.
5. Date of transfer to the new owner.
6. Name and mailing address of the new owner.
7. How the engine/drivetrain being used, that is, what equipment it powers, by manufacturer and model.
8. Equipment it powers, by manufacturer and model.

Purchased Extended Warranty

Extended warranty may be purchased on most engines in many areas of the world. John Deere engine distributors and equipment dealers, and dealers of manufacturers using John Deere engines in their products, have details. John Deere may also be contacted at U.S.A. fax number 1-309-749-0816, or in Europe fax number 33.2.38.84.62.66.

Emissions Warranties

Emissions warranties appear in the Operator's Manual furnished with the engine/machine. **(Warning: Statutes providing severe penalties for tampering with emissions controls may apply at the user's location.)** John Deere may also be contacted at U.S.A. fax number 1-309-749-0816; or in Europe fax number 33.2.38.84.62.66.

Local Warranty Requirements

Warranties required by local statutes will be furnished by the seller.

Option Codes (Engine Manufacturing Configuration)

When in need of engine replacement parts, your authorized John Deere service dealer will must know the corresponding "Option Codes" for your engine. The option code label on the engine rocker arm cover may become damaged over time. By recording the four-digit codes when the engine is new, and storing this manual where it can be found when parts are needed, fast, accurate parts ordering and service will be assured. See Engine Option Codes in Section 01.

Should there be a question about an engine option code, note the engine serial number and call 1-800-JDENGINE from the U.S.A. or Canada, or fax U.S.A. number 1-309-749-0816; or E-mail at diesel-us@johndeere.com, Attention: Warranty Administration; or in Europe fax number 33.2.38.84.62.66, or E-mail at saranservice@johndeere.com.

Registering the Engine for Warranty

Completion and submission of the John Deere Engine Warranty Registration form (cut out sheet found in this manual) is important. John Deere will not deny warranty service on an engine within its warranty period if the engine has not been registered. However, registering your engine will assure your servicing dealer that the engine is within the warranty period.

The easiest way to register your engine is via the Internet. Go to website https://www.johndeere.com/enginewarranty You can use the sheet in this manual to gather the information needed to register the warranty.

NOTE: Information provided on the form must be legible!

Typing is preferred, but legible handwritten reports are acceptable. "Block" numbers and Roman alphabet letters should be used. For example: 1,2,3,4 and A, B, C, D.

All requested information should be given. Much of it contributes to reports, including those required by governments.

The purchaser's telephone number or E-mail address allows John Deere to make contact should there be questions concerning the registration. The purchaser should sign and date the form.

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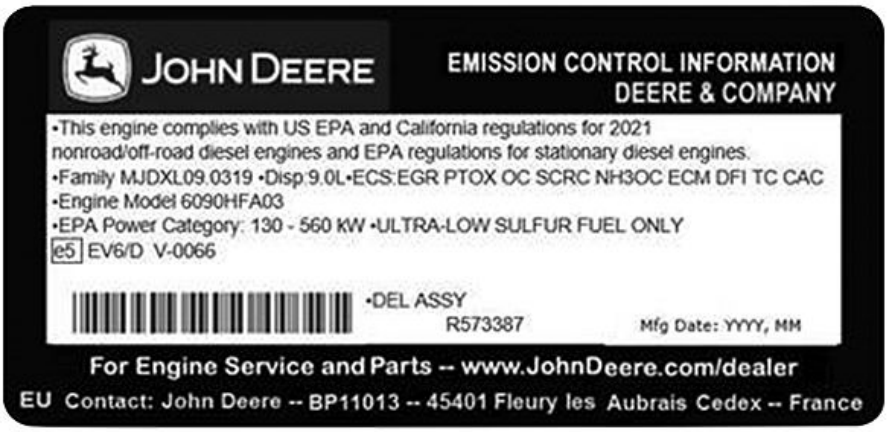
Emissions Control System Certification Label



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Engine Emissions Label

CAUTION: Statutes providing severe penalties for tampering with emissions controls may apply to the user or dealer.

The emissions warranty applies to those engines marketed by John Deere that have been certified by the United States Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB); and used in the United States and Canada in Non-road equipment. The presence of an emissions label like the one shown signifies that the engine has been certified with the EPA and/or CARB. The EPA and CARB warranties only apply to new engines having the certification label affixed to the engine and sold as stated above in the geographic areas. The presence of an EU number signifies that the engine has been certified with the European Union countries per Regulation (EU) 2016/1628 and supplementing legislation. The EPA and/or CARB emissions warranties do not apply to the EU countries.

The emissions label has applicable US EPA and/or CARB regulatory year. The regulatory year determines which warranty statement is applicable to engine. See “EPA Non-road Emissions Control Warranty Statement—Compression Ignition” and “CARB Non-road Emissions Control Warranty Statement—Compression Ignition”. For additional regulatory year warranty statements, see www.JohnDeere.com or contact the nearest John Deere service dealer for assistance.

Emission Control System(s) Laws

The U.S. EPA and California ARB prohibit the removal or rendering inoperative of any device or element of design installed on or in engines/equipment in compliance with applicable emission regulations prior to or after the sale and delivery of the engines/equipment to the ultimate purchaser.

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CARB Non-road Emissions Control Warranty Statement—Compression Ignition

Emissions Control Warranty Statement 2019 through 2021

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JOHN DEERE

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the “Emission Control Information” label located on the engine. If the engine is operated in the United States or Canada and the engine label states: “This engine complies with US EPA regulations for nonroad and stationary diesel engines”, or “This engine complies with US EPA regulations for stationary emergency diesel engines”, refer to the “U.S. and Canada Emission Control Warranty Statement.” If the engine is operated in California, and the engine label states: “This engine complies with US EPA and CARB regulations for nonroad diesel engines” also refer to the “California Emissions Control Warranty Statement.”

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emission-related parts and components, is provided separately. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT:

The California Air Resources Board (CARB) is pleased to explain the emission-control system warranty on 2019 through 2021 off-road diesel engines. In California, new off-road engines must be designed, built and equipped to meet the State’s stringent anti-smog standards. John Deere must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this off-road diesel engine was designed, built, and equipped so as to conform at the time of sale with all applicable regulations adopted by CARB and is free from defects in materials and workmanship which would cause the failure of a warranted part to be identical in all material respects to the part as described in John Deere's application for certification for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first for all engines rated at 19 kW and greater. In the absence of a device to measure hours of use, the engine shall be warranted for a period of five years.

EMISSIONS WARRANTY EXCLUSIONS:

John Deere may deny warranty claims for failures caused by the use of an add-on or modified part which has not been exempted by the CARB. A modified part is an aftermarket part intended to replace an original emission-related part which is not functionally identical in all respects and which in any way affects emissions. An add-on part is any aftermarket part which is not a modified part or a replacement part.

In no event will John Deere, any authorized engine distributor, dealer, or repair facility, or any company affiliated with John Deere be liable for incidental or consequential damage.

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JOHN DEERE'S WARRANTY RESPONSIBILITY:

Where a warrantable condition exists, John Deere will repair or replace, as it elects, your off-road diesel engine at no cost to you, including diagnosis, parts or labor. Warranty coverage is subject to the limitations and exclusions set forth herein. The off-road diesel engine is warranted for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first. The following are emissions-related parts:

Air Induction System

- Intake manifold
- Turbocharger
- Charge air cooler

Fuel Metering system

- Fuel injection system

Exhaust Gas Recirculation

- EGR valve

Catalyst or Thermal Reactor Systems

- Catalytic converter
- Exhaust manifold

Emission control labels

Particulate Controls

- Any device used to capture particulate emissions
- Any device used in the regeneration of the capturing system
- Enclosures and manifolding
- Smoke Puff Limiters

Positive Crankcase Ventilation (PCV) System

- PCV valve
- Oil filler cap

Advanced Oxides of Nitrogen (NOx) Controls

- NOx absorbers and catalysts

SCR systems and urea containers/dispensing systems

Miscellaneous Items used in Above Systems

- Electronic control units, sensors, actuators, wiring harnesses, hoses, connectors, clamps, fittings, gasket, mounting hardware

Any warranted emissions-related part scheduled for replacement as required maintenance is warranted by John Deere for the period of time prior to the first scheduled replacement point for the part. Any warranted emissions-related part not scheduled for replacement as required maintenance or scheduled only for regular inspection is warranted by John Deere for the stated warranty period.

OWNER'S WARRANTY RESPONSIBILITIES:

As the off-road diesel engine owner you are responsible for the performance of the required maintenance listed in your Operator's Manual. John Deere recommends that the owner retain all receipts covering maintenance on the off-road diesel engine, but John Deere cannot deny warranty solely for the lack of receipts or for the owner's failure to ensure the performance of all scheduled maintenance. However, as the off-road diesel engine owner, you should be aware that John Deere may deny you warranty coverage if your off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

The off-road diesel engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel may result in the engine no longer operating in compliance with applicable emissions requirements.

The owner is responsible for initiating the warranty process, and should present the machine to the nearest authorized John Deere dealer as soon as a problem is suspected. The warranty repairs should be completed by the authorized John Deere dealer as quickly as possible.

Emissions regulations require the customer to bring the unit to an authorized servicing dealer when warranty service is required. As a result, John Deere is NOT liable for travel or mileage on emissions warranty service calls.

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Emissions Control Warranty Statement 2019 through 2021

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JOHN DEERE

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the “Emission Control Information” label located on the engine. If the engine is operated in the United States or Canada and the engine label states: “This engine complies with US EPA regulations for nonroad and stationary diesel engines”, or “This engine complies with US EPA regulations for stationary emergency diesel engines”, refer to the “U.S. and Canada Emission Control Warranty Statement.” If the engine is operated in California, and the engine label states: “This engine complies with US EPA and CARB regulations for nonroad diesel engines” also refer to the “California Emissions Control Warranty Statement.”

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emission-related parts and components, is provided separately. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT:

The California Air Resources Board (CARB) is pleased to explain the emission-control system warranty on 2019 through 2021 off-road diesel engines. In California, new off-road engines must be designed, built and equipped to meet the State’s stringent anti-smog standards. John Deere must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this off-road diesel engine was designed, built, and equipped so as to conform at the time of sale with all applicable regulations adopted by CARB and is free from defects in materials and workmanship which would cause the failure of a warranted part to be identical in all material respects to the part as described in John Deere's application for certification for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first for all engines rated at 19 kW and greater. In the absence of a device to measure hours of use, the engine shall be warranted for a period of five years.

EMISSIONS WARRANTY EXCLUSIONS:

John Deere may deny warranty claims for failures caused by the use of an add-on or modified part which has not been exempted by the CARB. A modified part is an aftermarket part intended to replace an original emission-related part which is not functionally identical in all respects and which in any way affects emissions. An add-on part is any aftermarket part which is not a modified part or a replacement part.

In no event will John Deere, any authorized engine distributor, dealer, or repair facility, or any company affiliated with John Deere be liable for incidental or consequential damage.

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JOHN DEERE'S WARRANTY RESPONSIBILITY:

Where a warrantable condition exists, John Deere will repair or replace, as it elects, your off-road diesel engine at no cost to you, including diagnosis, parts or labor. Warranty coverage is subject to the limitations and exclusions set forth herein. The off-road diesel engine is warranted for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first. The following are emissions-related parts:

Air Induction System

- Intake manifold
- Turbocharger
- Charge air cooler

Fuel Metering system

- Fuel injection system

Exhaust Gas Recirculation

- EGR valve

Catalyst or Thermal Reactor Systems

- Catalytic converter
- Exhaust manifold

Emission control labels

Particulate Controls

- Any device used to capture particulate emissions
- Any device used in the regeneration of the capturing system
- Enclosures and manifolding
- Smoke Puff Limiters

Positive Crankcase Ventilation (PCV) System

- PCV valve
- Oil filler cap

Advanced Oxides of Nitrogen (NOx) Controls

- NOx absorbers and catalysts

SCR systems and urea containers/dispensing systems

Miscellaneous Items used in Above Systems

- Electronic control units, sensors, actuators, wiring harnesses, hoses, connectors, clamps, fittings, gasket, mounting hardware

Any warranted emissions-related part scheduled for replacement as required maintenance is warranted by John Deere for the period of time prior to the first scheduled replacement point for the part. Any warranted emissions-related part not scheduled for replacement as required maintenance or scheduled only for regular inspection is warranted by John Deere for the stated warranty period.

OWNER'S WARRANTY RESPONSIBILITIES:

As the off-road diesel engine owner you are responsible for the performance of the required maintenance listed in your Operator's Manual. John Deere recommends that the owner retain all receipts covering maintenance on the off-road diesel engine, but John Deere cannot deny warranty solely for the lack of receipts or for the owner's failure to ensure the performance of all scheduled maintenance. However, as the off-road diesel engine owner, you should be aware that John Deere may deny you warranty coverage if your off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

The off-road diesel engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel may result in the engine no longer operating in compliance with applicable emissions requirements.

The owner is responsible for initiating the warranty process, and should present the machine to the nearest authorized John Deere dealer as soon as a problem is suspected. The warranty repairs should be completed by the authorized John Deere dealer as quickly as possible.

Emissions regulations require the customer to bring the unit to an authorized servicing dealer when warranty service is required. As a result, John Deere is NOT liable for travel or mileage on emissions warranty service calls.

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Emissions Control Warranty Statement 2022 through 2024

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JOHN DEERE

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the “Emission Control Information” label located on the engine. If the engine is operated in the United States or Canada and the engine label states: “This engine complies with US EPA regulations for nonroad and stationary diesel engines”, or “This engine complies with US EPA regulations for stationary emergency diesel engines”, refer to the “U.S. and Canada Emission Control Warranty Statement.” If the engine is operated in California, and the engine label states: “This engine complies with US EPA and California regulations for nonroad/off-road diesel engines” also refer to the “California Emissions Control Warranty Statement.”

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emission-related parts and components, is provided separately. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT:

The California Air Resources Board (CARB) is pleased to explain the emission-control system warranty on 2022 through 2024 off-road diesel engines. In California, new off-road engines must be designed, built and equipped to meet the State’s stringent anti-smog standards. John Deere must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this off-road diesel engine was designed, built, and equipped so as to conform at the time of sale with all applicable regulations adopted by CARB. John Deere warrants that this engine is free from defects in materials and workmanship which would cause the failure of emissions warrantied parts to be identical in all material respects to the part as described in John Deere's application for certification for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first. This applies to all engines rated at 19 kW and greater. In the absence of a device to measure hours of use, the engine shall be warranted for a period of five years.

EMISSIONS WARRANTY EXCLUSIONS:

John Deere may deny warranty claims for failures caused by the use of an add-on or modified part which has not been exempted by the CARB. A modified part is an aftermarket part intended to replace an original emission-related part which is not functionally identical in all respects and which in any way affects emissions. An add-on part is any aftermarket part which is not a modified part or a replacement part.

In no event will John Deere, any authorized engine distributor, dealer, or repair facility, or any company affiliated with John Deere be liable for incidental or consequential damage.

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DX,EMISSIONS,CARB -19-26AUG20-5/8

JOHN DEERE'S WARRANTY RESPONSIBILITY:

Where a warrantable condition exists, John Deere will repair or replace, as it elects, your off-road diesel engine at no cost to you, including diagnosis, parts or labor. Warranty coverage is subject to the limitations and exclusions set forth herein. The off-road diesel engine is warranted for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first. The following are emissions-related parts:

Air Induction System

- Intake manifold
- Turbocharger
- Charge air cooler

Fuel Metering system

- Fuel injection system

Exhaust Gas Recirculation

- EGR valve

Catalyst or Thermal Reactor Systems

- Catalytic converter
- Exhaust manifold

Emission control labels

Particulate Controls

- Any device used to capture particulate emissions
- Any device used in the regeneration of the capturing system
- Enclosures and manifolding
- Smoke Puff Limiters

Positive Crankcase Ventilation (PCV) System

- PCV valve
- Oil filler cap

Advanced Oxides of Nitrogen (NOx) Controls

- NOx absorbers and catalysts

SCR systems and urea containers/dispensing systems

Miscellaneous Items used in Above Systems

- Electronic control units, sensors, actuators, wiring harnesses, hoses, connectors, clamps, fittings, gasket, mounting hardware

Any warranted emissions-related part scheduled for replacement as required maintenance is warranted by John Deere for the period of time prior to the first scheduled replacement point for the part. Any warranted emissions-related part not scheduled for replacement as required maintenance or scheduled only for regular inspection is warranted by John Deere for the stated warranty period.

OWNER'S WARRANTY RESPONSIBILITIES:

As the off-road diesel engine owner you are responsible for the performance of the required maintenance listed in your Operator's Manual. John Deere recommends that the owner retain all receipts covering maintenance on the off-road diesel engine, but John Deere cannot deny warranty solely for the lack of receipts or for the owner's failure to ensure the performance of all scheduled maintenance. However, as the off-road diesel engine owner, you should be aware that John Deere may deny you warranty coverage if your off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

The off-road diesel engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel may result in the engine no longer operating in compliance with applicable emissions requirements.

The owner is responsible for initiating the warranty process, and should present the machine to the nearest authorized John Deere dealer as soon as a problem is suspected. The warranty repairs should be completed by the authorized John Deere dealer as quickly as possible.

Emissions regulations require the customer to bring the unit to an authorized servicing dealer when warranty service is required. As a result, John Deere is NOT liable for travel or mileage on emissions warranty service calls.

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DX,EMISSIONS,CARB -19-26AUG20-6/8

Emissions Control Warranty Statement 2022 through 2024

DXLOGOV1 —UN—28APR09

JOHN DEERE

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the "Emission Control Information" label located on the engine. If the engine is operated in the United States or Canada and the engine label states: "This engine complies with US EPA regulations for nonroad and stationary diesel engines", or "This engine complies with US EPA regulations for stationary emergency diesel engines", refer to the "U.S. and Canada Emission Control Warranty Statement." If the engine is operated in California, and the engine label states: "This engine complies with US EPA and California regulations for nonroad/off-road diesel engines" also refer to the "California Emissions Control Warranty Statement."

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emission-related parts and components, is provided separately. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT:

The California Air Resources Board (CARB) is pleased to explain the emission-control system warranty on 2022 through 2024 off-road diesel engines. In California, new off-road engines must be designed, built and equipped to meet the State's stringent anti-smog standards. John Deere must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this off-road diesel engine was designed, built, and equipped so as to conform at the time of sale with all applicable regulations adopted by CARB. John Deere warrants that this engine is free from defects in materials and workmanship which would cause the failure of emissions warrantied parts to be identical in all material respects to the part as described in John Deere's application for certification for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first. This applies to all engines rated at 19 kW and greater. In the absence of a device to measure hours of use, the engine shall be warranted for a period of five years.

EMISSIONS WARRANTY EXCLUSIONS:

John Deere may deny warranty claims for failures caused by the use of an add-on or modified part which has not been exempted by the CARB. A modified part is an aftermarket part intended to replace an original emission-related part which is not functionally identical in all respects and which in any way affects emissions. An add-on part is any aftermarket part which is not a modified part or a replacement part.

In no event will John Deere, any authorized engine distributor, dealer, or repair facility, or any company affiliated with John Deere be liable for incidental or consequential damage.

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JOHN DEERE'S WARRANTY RESPONSIBILITY:

Where a warrantable condition exists, John Deere will repair or replace, as it elects, your off-road diesel engine at no cost to you, including diagnosis, parts or labor. Warranty coverage is subject to the limitations and exclusions set forth herein. The off-road diesel engine is warranted for a period of five years from the date the engine is delivered to an ultimate purchaser or 3,000 hours of operation, whichever occurs first. The following are emissions-related parts:

Air Induction System

- Intake manifold
- Turbocharger
- Charge air cooler

Fuel Metering system

- Fuel injection system

Exhaust Gas Recirculation

- EGR valve

Catalyst or Thermal Reactor Systems

- Catalytic converter
- Exhaust manifold

Emission control labels

Particulate Controls

- Any device used to capture particulate emissions
- Any device used in the regeneration of the capturing system
- Enclosures and manifolding
- Smoke Puff Limiters

Positive Crankcase Ventilation (PCV) System

- PCV valve
- Oil filler cap

Advanced Oxides of Nitrogen (NOx) Controls

- NOx absorbers and catalysts

SCR systems and urea containers/dispensing systems

Miscellaneous Items used in Above Systems

- Electronic control units, sensors, actuators, wiring harnesses, hoses, connectors, clamps, fittings, gasket, mounting hardware

Any warranted emissions-related part scheduled for replacement as required maintenance is warranted by John Deere for the period of time prior to the first scheduled replacement point for the part. Any warranted emissions-related part not scheduled for replacement as required maintenance or scheduled only for regular inspection is warranted by John Deere for the stated warranty period.

OWNER'S WARRANTY RESPONSIBILITIES:

As the off-road diesel engine owner you are responsible for the performance of the required maintenance listed in your Operator's Manual. John Deere recommends that the owner retain all receipts covering maintenance on the off-road diesel engine, but John Deere cannot deny warranty solely for the lack of receipts or for the owner's failure to ensure the performance of all scheduled maintenance. However, as the off-road diesel engine owner, you should be aware that John Deere may deny you warranty coverage if your off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

The off-road diesel engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel may result in the engine no longer operating in compliance with applicable emissions requirements.

The owner is responsible for initiating the warranty process, and should present the machine to the nearest authorized John Deere dealer as soon as a problem is suspected. The warranty repairs should be completed by the authorized John Deere dealer as quickly as possible.

Emissions regulations require the customer to bring the unit to an authorized servicing dealer when warranty service is required. As a result, John Deere is NOT liable for travel or mileage on emissions warranty service calls.

Emission_CI_CARB (14Apr20)

RG32759 —UN—19AUG20

DX,EMISSIONS,CARB -19-26AUG20-8/8

EPA Non-road Emissions Control Warranty Statement—Compression Ignition

DXLOGOV1 —UN—28APR09

JOHN DEERE

U.S. AND CANADA EMISSION CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the "Emissions Control Information" label located on the engine. If the engine is operated in the United States or Canada and the Emissions Control information label states: "This engine complies with US EPA regulations for nonroad and stationary diesel engines", or "This engine conforms to US EPA nonroad compression-ignition regulations", refer to the "U.S. and Canada Emission Control Warranty Statement." If the engine is operated in California, and the label states: "This engine complies with US EPA and CARB regulations for nonroad diesel engines", or "This engine conforms to US EPA and California nonroad compression-ignition emission regulations", also refer to the "California Emission Control Warranty Statement."

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emissions-related parts and components, is provided separately. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

JOHN DEERE'S WARRANTY RESPONSIBILITY

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this off-road diesel engine including all parts of its emission-control system was designed, built and equipped so as to conform at the time of the sale with Section 213 of the Clean Air Act and is free from defects in materials and workmanship which would cause the engine to fail to conform with applicable US EPA regulations for a period of five years from the date the engine is placed into service or 3,000 hours of operation, whichever first occurs.

Where a warrantable condition exists, John Deere will repair or replace, as it elects, any part or component with a defect in materials or workmanship that would increase the engine's emissions of any regulated pollutant within the stated warranty period at no cost to you, including expenses related to diagnosing and repairing or replacing emission-related parts. Warranty coverage is subject to the limitations and exclusions set forth herein. Emission- related components include engine parts developed to control emissions related to the following:

Air-Induction System
Fuel System
Ignition System
Exhaust Gas Recirculation Systems
Aftertreatment Devices
Crankcase Ventilation Valves
Sensors
Engine Electronic Control Units

EMISSION WARRANTY EXCLUSIONS

John Deere may deny warranty claims for malfunctions or failures caused by:

- Non-performance of maintenance requirements listed in the Operator's Manual
- The use of the engine/equipment in a manner for which it was not designed
- Abuse, neglect, improper maintenance or unapproved modifications or alterations
- Accidents for which it does not have responsibility or by acts of God

The off-road diesel engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel can harm the emissions control system of the engine/equipment and is not approved for use.

To the extent permitted by law John Deere is not liable for damage to other engine components caused by a failure of an emission-related part, unless otherwise covered by standard warranty.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISIONS OF MATERIAL AND SERVICES AS SPECIFIED HEREIN. WHERE PERMITTED BY LAW, NEITHER JOHN DEERE NOR ANY AUTHORIZED JOHN DEERE ENGINE DISTRIBUTOR, DEALER, OR REPAIR FACILITY OR ANY COMPANY AFFILIATED WITH JOHN DEERE WILL BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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JOHN DEERE

U.S. AND CANADA EMISSION CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the "Emissions Control Information" label located on the engine. If the engine is operated in the United States or Canada and the Emissions Control information label states: "This engine complies with US EPA regulations for nonroad and stationary diesel engines", or "This engine conforms to US EPA nonroad compression-ignition regulations", refer to the "U.S. and Canada Emission Control Warranty Statement." If the engine is operated in California, and the label states: "This engine complies with US EPA and CARB regulations for nonroad diesel engines", or "This engine conforms to US EPA and California nonroad compression-ignition emission regulations", also refer to the "California Emission Control Warranty Statement."

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emissions-related parts and components, is provided separately. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

JOHN DEERE'S WARRANTY RESPONSIBILITY

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this off-road diesel engine including all parts of its emission-control system was designed, built and equipped so as to conform at the time of the sale with Section 213 of the Clean Air Act and is free from defects in materials and workmanship which would cause the engine to fail to conform with applicable US EPA regulations for a period of five years from the date the engine is placed into service or 3,000 hours of operation, whichever first occurs.

Where a warrantable condition exists, John Deere will repair or replace, as it elects, any part or component with a defect in materials or workmanship that would increase the engine's emissions of any regulated pollutant within the stated warranty period at no cost to you, including expenses related to diagnosing and repairing or replacing emission-related parts. Warranty coverage is subject to the limitations and exclusions set forth herein. Emission- related components include engine parts developed to control emissions related to the following:

Air-Induction System
Fuel System
Ignition System
Exhaust Gas Recirculation Systems
Aftertreatment Devices
Crankcase Ventilation Valves
Sensors
Engine Electronic Control Units

EMISSION WARRANTY EXCLUSIONS

John Deere may deny warranty claims for malfunctions or failures caused by:

- Non-performance of maintenance requirements listed in the Operator's Manual
- The use of the engine/equipment in a manner for which it was not designed
- Abuse, neglect, improper maintenance or unapproved modifications or alterations
- Accidents for which it does not have responsibility or by acts of God

The off-road diesel engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel can harm the emissions control system of the engine/equipment and is not approved for use.

To the extent permitted by law John Deere is not liable for damage to other engine components caused by a failure of an emission-related part, unless otherwise covered by standard warranty.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISIONS OF MATERIAL AND SERVICES AS SPECIFIED HEREIN. WHERE PERMITTED BY LAW, NEITHER JOHN DEERE NOR ANY AUTHORIZED JOHN DEERE ENGINE DISTRIBUTOR, DEALER, OR REPAIR FACILITY OR ANY COMPANY AFFILIATED WITH JOHN DEERE WILL BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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Service Literature

Technical Information

Technical information can be purchased from John Deere. Publications are available in print or CD-ROM format.

Orders can be made using one of the following:

- John Deere Technical Information Store: **www.JohnDeere.com/TechInfoStore**
- Call 1-800-522-7448
- Contact your John Deere dealer

Available information includes:

PARTS CATALOGS list service parts available for your machine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.

TS189 —UN—17JAN89

DX,SERVLIT -19-07DEC16-1/4

OPERATOR'S MANUALS providing safety, operating, maintenance, and service information.

TS191 —UN—02DEC88

DX,SERVLIT -19-07DEC16-2/4

TECHNICAL MANUALS outlining service information for your machine. Included are specifications, illustrated assembly and disassembly procedures, hydraulic oil flow diagrams, and wiring diagrams. Some products have separate manuals for repair and diagnostic information. Some components, such as engines, are available in a separate component technical manual.

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EDUCATIONAL CURRICULUM including five comprehensive series of books detailing basic information regardless of manufacturer:

- Agricultural Primer series covers technology in farming and ranching.
- Farm Business Management series examines “real-world” problems and offers practical solutions in the areas of marketing, financing, equipment selection, and compliance.
- Fundamentals of Services manuals show you how to repair and maintain off-road equipment.
- Fundamentals of Machine Operation manuals explain machine capacities and adjustments, how to improve machine performance, and how to eliminate unnecessary field operations.
- Fundamentals of Compact Equipment manuals provide instruction in servicing and maintaining equipment up to 40 PTO horsepower.

TS1663 —UN—10OCT97

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