

PowerTech Plus™ 4.5 & 6.8 L 4045HF485 and 6068HF485 Tier 3/Stage IIIA OEM Diesel Engines

OPERATOR'S MANUAL PowerTech Plus 4045HF485 and 6068HF485 OEM Diesel Engines

OMRG36852 Issue 28Apr05 (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.

Introduction

Foreword

THIS MANUAL CONTAINS INFORMATION to operate and service the following **Tier 3/Stage IIIA** 4.5 L and 6.8 L OEM emission-certified¹ engines:

Saran-built (France) Tier 3 Electronically Controlled Engines:

- CD4045HF485 (HPCR Fuel System; 4-Valve Head)
- CD6068HF485 (HPCR Fuel System; 4-Valve Head)

Torreon-built (Mexico) Tier 3 Electronically Controlled Engines:

- PE4045HF485 (HPCR Fuel System; 4-Valve Head)
- PE6068HF485 (HPCR Fuel System; 4-Valve Head)

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.

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.

IMPORTANT: This manual covers only the **PowerTech Plus™ Tier 3 emission-certified 4.5 and 6.8 L OEM engines listed. These engines meet Tier 3/Stage IIIA emission certification standards. (This is for both the U.S. EPA and European Union Council (EU) standards.) For the 4.5 L Tier 3 engine, full coverage will be added when engines are available in 2006. Engines with mechanical controls which are non-emission certified or Tier 1/Stage I emission certified (U.S. and EU) are covered in a separate operators manual, OMRG25204. Engines which are Tier 2/Stage II emission-certified are covered in another manual, OMRG33324.**

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

¹Emission certified for United States as EPA Tier 3 and for European Union as Stage IIIA.

Engine Owner

John Deere Engine Owner:

Don't wait until you need warranty or other service to meet your local John Deere Engine Distributor or Service Dealer. To register your engine for warranty via the Internet, use the following URL:

<http://www.johndeere.com/enginewarranty>

Learn who your dealer is and where he is. At your first convenience, go meet him. He'll want to get to know you and to learn what your needs might be.

Aux Utilisateurs De Moteurs John Deere:

N'attendez pas d'être obligé d'avoir recours à votre concessionnaire John Deere ou au point de service le plus proche pour vous adresser à lui. Pour enregistrer votre moteur pour la garantie via Internet, utilisez l'adresse suivante:

<http://www.johndeere.com/enginewarranty>

Renseignez-vous dès que possible pour l'identifier et le localiser. A la première occasion, prenez contact avec lui et faites-vous connaître. Il sera lui aussi heureux de faire votre connaissance et de vous proposer ses services le moment venu.

An Den Besitzer Des John Deere Motors:

Warten Sie nicht auf einen evt. Reparaturfall, um den nächstgelegenen John Deere Händler kennen zu lernen. Zur Registrierung Ihres Motors für die Garantie dient folgende Internet-Adresse:

<http://www.johndeere.com/enginewarranty>

Machen Sie sich bei ihm bekannt und nutzen Sie sein "Service Angebot".

Proprietario del motore John Deere:

Non aspetti fino al momento di far valere la garanzia o di chiedere assistenza per fare la conoscenza del

distributore dei motori John Deere o del concessionario che fornisce l'assistenza tecnica. Per registrare via Internet la garanzia del suo motore, si collegi al seguente sito URL:

<http://www.johndeere.com/enginewarranty>

Lo identifichi e si informi sulla sua ubicazione. Alla prima occasione utile lo contatti. Egli desidera fare la sua conoscenza e capire quali potrebbero essere le sue necessità.

Propietario De Equipo John Deere:

No espere hasta necesitar servicio de garantía o de otro tipo para conocer a su Distribuidor de Motores John Deere o al Concesionario de Servicio. Registre su motor para la garantía en la siguiente dirección de internet: <http://www.johndeere.com/enginewarranty>

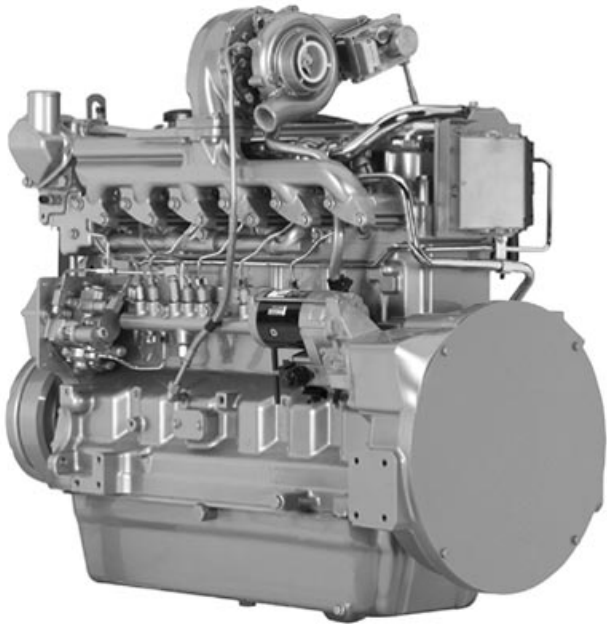
Entérese de quién es, y dónde está situado. Cuando tenga un momento, vaya a visitarlo. A él le gustará conocerlo, y saber cuáles podrían ser sus necesidades.

Till ägare av John Deere motorer:

Ta reda på vem din återförsäljare är och besök honom så snart tillfälle ges. Vänta inte tills det är dags för service eller eventuellt garantiarbete. Din motor garantiregistrerar Du via Internet på <http://www.johndeere.com/enginewarranty>

Din återförsäljare vill mycket gärna träffa dig för att lära känna dina behov och hur bäst han kan hjälpa dig.

PowerTech Plus™ 4.5/6.8 L Engines With Electronic Fuel Systems (Tier 3 Emission Certified) (Four-Valve Cylinder Head “485” Models)



RG13547 -UN-11NOV04

6068HF485 Engine Shown (Electronic Fuel System With Denso High Pressure Common Rail)



RG13546 -UN-11NOV04

6068HF485 Shown

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OURGP12,000007B -19-15SEP04-1/1

Contents

	Page		Page
Record Keeping		Main Menu Navigation	15-5
Engine Serial Number Plate	01-1	Engine Configuration Data	15-7
Record Engine Serial Number	01-1	Accessing Stored Trouble Codes	15-9
Engine Option Codes	01-2	Accessing Active Trouble Codes	15-11
Record High-Pressure Fuel Pump Model Number	01-4	Engine Shutdown Codes	15-13
Record Engine Control Unit (ECU) Serial Number	01-4	Adjusting Backlighting	15-14
Record Exhaust Gas Recirculating (EGR) Valve Serial Number	01-5	Adjusting Contrast	15-16
		Selecting Units Of Measurement	15-18
		Setup 1-Up Display	15-21
		Setup 4-Up Display	15-27
Safety	05-1	Engine Operation	
		Engine Break-In Service	20-1
Fuels, Lubricants, and Coolant		Starting the Engine	20-5
Diesel Fuel	10-1	Restarting Engine After Emergency Shutdown	20-8
Lubricity of Diesel Fuel	10-1	Normal Engine Operation	20-9
Handling and Storing Diesel Fuel	10-2	Warming Engine	20-10
Dieselscan Fuel Analysis	10-2	Cold Weather Operation	20-11
Bio-Diesel Fuel	10-3	Using a Booster Battery or Charger	20-13
Minimizing the Effect of Cold Weather on Diesel Engines	10-4	Avoid Excessive Engine Idling	20-14
Diesel Engine Break-In Oil	10-6	Changing Engine Speed	20-15
Diesel Engine Oil	10-7	Stopping The Engine	20-17
Diesel Engine Oil and Filter Service Intervals . . .	10-8	Auxiliary Gear Drive Limitations	20-18
Mixing of Lubricants	10-9	Generator Set (Standby) Applications	20-18
OILSCAN™ and COOLSCAN™	10-9		
Alternative and Synthetic Lubricants	10-10	Lubrication and Maintenance	
Lubricant Storage	10-10	Observe Service Intervals	25-1
Oil Filters	10-10	Use Correct Fuels, Lubricants, and Coolant . . .	25-1
Diesel Engine Coolant	10-11	Lubrication and Maintenance Service Interval Chart—Standard Industrial Engines . .	25-2
Drain Intervals for Diesel Engine Coolant	10-12	Lubrication and Maintenance Service Interval Chart—Generator (Standby) Applications	25-4
Additional Information About Diesel Engine Coolants and Supplemental Coolant Additives	10-13		
Supplemental Coolant Additives	10-14	Lubrication & Maintenance/Daily	
Testing Diesel Engine Coolant	10-15	Daily Prestarting Checks	30-1
Operating in Warm Temperature Climates . . .	10-15		
Disposing of Coolant	10-16	Lubrication & Maintenance/500 Hour/12 Month	
Instrument Panels		Servicing Fire Extinguisher	35-1
Instrument Panels	15-1	Checking Engine Mounts	35-1
Using Diagnostic Gauge to Access Engine Information	15-4		

Continued on next page

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Previous Editions
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Page	Page
Servicing Battery	35-2
Changing Engine Oil and Replacing Filter	35-4
Checking Crankcase Vent System	35-6
Checking Air Intake System	35-7
Replacing Fuel Filter Elements	35-8
Checking Belt Tensioner Spring Tension and Belt Wear (Automatic Tensioner)	35-10
Checking Engine Electrical Ground Connections	35-12
Checking Cooling System	35-12
Replenishing Supplemental Coolant Additives (SCAs) Between Coolant Changes	35-13
Testing Diesel Engine Coolant	35-15
Pressure Testing Cooling System	35-16
Checking and Adjusting Engine Speeds	35-17
Lubrication & Maint./2000 Hour/24 Month	
Checking Crankshaft Vibration Damper (6-Cylinder Engine Only)	40-1
Flushing and Refilling Cooling System	40-2
Testing Thermostats Opening Temperature	40-5
Checking and Adjusting Valve Clearance	40-9
Testing Glow Plugs for Continuity	40-11
Service as Required	
Additional Service Information	45-1
Do Not Modify Fuel System	45-2
Adding Coolant	45-3
Replacing Single Stage Air Cleaner	45-5
Replacing Axial Seal Air Cleaner Filter Element	45-6
Replacing Radial Seal Air Cleaner Filter Element	45-8
Replacing Fan and Alternator Belts	45-10
Checking Fuses	45-11
Checking Air Compressors	45-11
Bleeding Fuel System	45-12
Troubleshooting	
General Troubleshooting Information	50-1
Instrument Panel Method for Retrieving Diagnostic Trouble Codes	50-3
Displaying Of Diagnostic Trouble Codes (DTCs)	50-4
Listing of Diagnostic Trouble Codes (DTCs)	50-5
Intermittent Fault Diagnostics (With Electronic Controls)	50-9
Displaying Diagnostic Gauge Software	50-9
Engine Troubleshooting	50-11
Engine Wiring Layout	50-19
Precautions For Welding On Engines Equipped With Electronic Engine Control Unit (ECU)	50-20
Engine Wiring Diagram (Engines With Full-Featured Instrument Panel)	50-21
Engine Wiring Diagram (Engines With Full-Featured Instrument Panel) (Continued)	50-22
Storage	
Engine Storage Guidelines	55-1
Preparing Engine for Long Term Storage	55-2
Removing Engine from Long Term Storage	55-3
Specifications	
General OEM Engine Specifications	60-1
Engine Power Ratings And Fuel System Specifications	60-3
Engine Crankcase Oil Fill Quantities	60-4
Unified Inch Bolt and Screw Torque Values	60-5
Metric Bolt and Screw Torque Values	60-6
Lubrication and Maintenance Records	
Using Lubrication and Maintenance Records	65-1
Daily (Prestarting) Service	65-1
500 Hour/12 Month Service	65-2
2000 Hour/24 Month Service	65-3
Service as Required	65-4
Emission System Warranty	
U.S. EPA Emmission Control Warranty Statement	70-1
Emission Control System Certification Label	70-2

Record Keeping

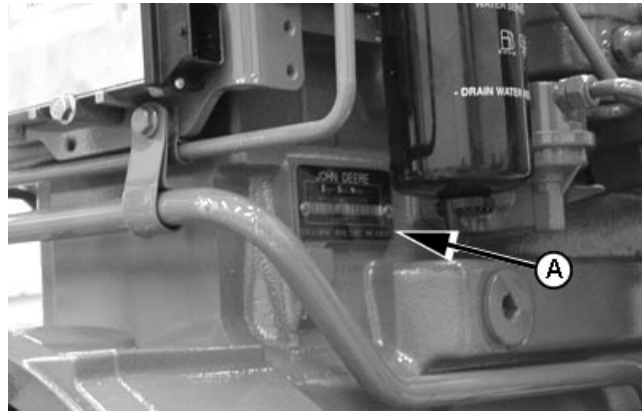
Engine Serial Number Plate

Each engine has a 13-digit John Deere engine serial number. The first two digits identify the factory that produced the engine:

- “CD” = Saran, France
- “PE” = Torreon, Mexico

The engine's serial number plate (A) is located on the right-hand side of cylinder block behind the fuel filter.

A—Serial Number Plate



13-Digit Engine Serial Number Plate

OURGP12,000007D -19-15SEP04-1/1

Record Engine Serial Number

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. Use all 13 digits when providing engine serial number.

Engine Serial Number (B)

Engine Model Number (C)



Saran Factory Engine Serial Number Plate



Torreon Factory Engine Serial Number Plate

OURGP12,00000FB -19-26APR05-1/1

Engine Option Codes



A—Engine Base Code (Shown
on Engine Option Code
Label)

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.

your engine option code label in the spaces provided on the following page.

The engine option code label includes an engine base code (A). This base code must also be recorded along with the option codes.

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 12-volt, 55-amp alternator.

NOTE: These option codes are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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 list on the next page 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

NOTE: 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.

An additional option code label may also be delivered with the engine. Place this sticker or tag, for reference, either on this page or in the engine owner's warranty booklet under **OPTION CODES** title.

Option Codes	Description	Option Codes	Description
11_____	Rocker Arm Cover	51_____	Cylinder Head With Valves
12_____	Oil Fill Inlet	52_____	Auxiliary Gear Drive
13_____	Crankshaft Pulley/Damper	53_____	Fuel Heater
14_____	Flywheel Housing	54_____	Air Intake for Turbocharger
15_____	Flywheel	55_____	Shipping Stand
16_____	Fuel Injection Pump	56_____	Paint Option
17_____	Air Inlet	57_____	Coolant Pump Inlet
18_____	Air Cleaner	59_____	Oil Cooler
19_____	Oil Pan	60_____	Add-on Auxiliary Drive Pulley
20_____	Coolant Pump	62_____	Alternator Mounting Bracket
21_____	Thermostat Cover	63_____	Low Pressure Fuel Line
22_____	Thermostat	64_____	Exhaust Elbow
23_____	Fan Drive	65_____	Turbocharger
24_____	Fan Belt	66_____	Coolant Temperature Switch
25_____	Fan	67_____	Electronic Sensors (Base Engine)
26_____	Engine Coolant Heater	68_____	Crankshaft Rear Damper
27_____	Radiator	69_____	Engine Serial Number Plate
28_____	Exhaust Manifold	71_____	Engine Oil Bypass Filter
29_____	Crankcase Ventilator System	72_____	ECU Electronic Software Option
30_____	Starter Motor	74_____	Air Conditioning (Freon) Compressor
31_____	Alternator	75_____	Air Restriction Indicator
32_____	Instrument Panel	76_____	Pressure Switches and Sensors
33_____	Tachometer	77_____	Timing Gear Cover
35_____	Fuel Filters	78_____	Air Compressor
36_____	Front Plate	79_____	Engine Certification
37_____	Fuel Transfer Pump	81_____	Primary Fuel Filter And Water Separator
39_____	Thermostat Housing	83_____	Electronic Software (Vehicle Option)
40_____	Oil Dipstick	84_____	Electrical Wiring Harness
41_____	Belt-Driven Front Auxiliary Drive	86_____	Fan Pulley
43_____	Starting Aid	87_____	Belt Tensioner
44_____	Timing Gear Cover With Gears	88_____	Oil Filter
45_____	Balancer Shafts	89_____	Exhaust Gas Recirculating (EGR) System
46_____	Cylinder Block With Liners and Camshaft	95_____	Special Equipment (Factory Installed)
47_____	Crankshaft and Bearings	96_____	Engine Installation Kit
48_____	Connecting Rods and Pistons	97_____	Special Equipment (Field Installed)
49_____	Valve Actuating Mechanism	98_____	Shipping (Engine Hanger Straps)
50_____	Oil Pump	99_____	Service Only Items

Engine Base Code (See "A" on previous page.)

Record High-Pressure Fuel Pump Model Number

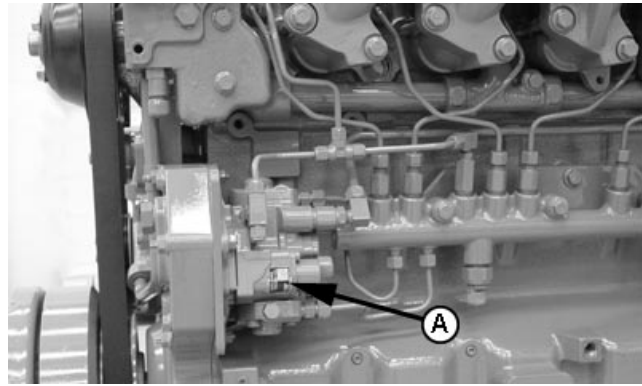
Record the high-pressure fuel pump model and serial number information found on the serial number plate (A).

Model No. _____ RPM _____

Manufacturer's No. _____

Serial No. _____

A—Serial Number Plate



Record High-Pressure Fuel Pump Serial Number

RG13718 -UN-11NOV04

OURGP12,0000080 -19-15SEP04-1/1

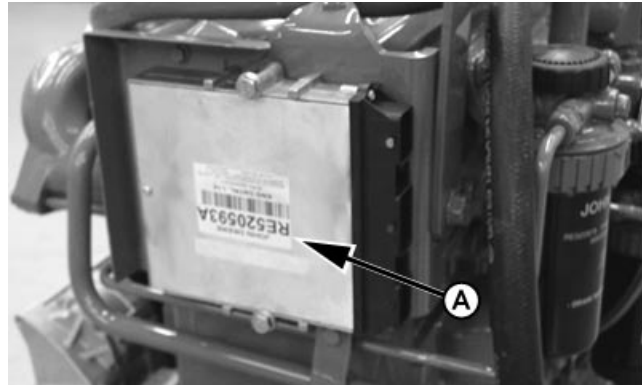
Record Engine Control Unit (ECU) Serial Number

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

Part No. _____

Serial No. _____

A—Serial Number Label



Record Engine Control Unit (ECU) Serial Number

RG13799 -UN-18NOV04

OURGP12,00000AD -19-16NOV04-1/1

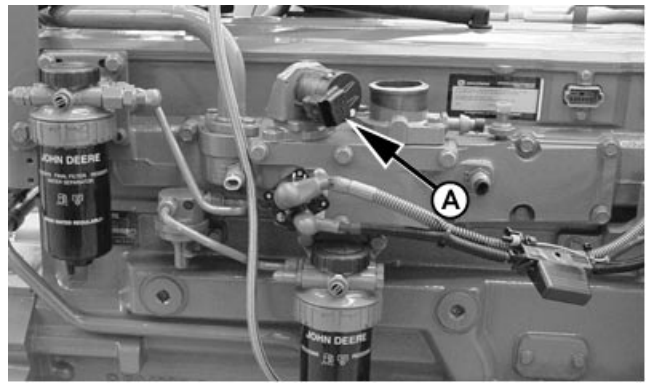
Record Exhaust Gas Recirculating (EGR) Valve Serial Number

Record the part number and serial number information found on the serial number label on the Exhaust Gas Recirculation (EGR) valve (A). The serial number is also imprinted on the EGR valve housing.

Part No. _____

Serial No. _____

A—Exhaust Gas Recirculation (EGR) Valve



Record Exhaust Gas Recirculation (EGR) Valve Serial Number

RG13805 -UN-02DEC04

OURGP12,00000BB -19-02DEC04-1/1

Safety

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.



Safety-alert symbol

T81389 -UN-07DEC88

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

Understand Signal Words

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.



Signal Words

TS187 -19-30SEP88

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

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.

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.

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



Safety Messages

TS201 -JUN-23AUG88

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

Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



TS201 -JUN-23AUG88

DX,SIGNS1 -19-04JUN90-1/1

Prevent Bypass Starting

Avoid possible injury or death from engine runaway.

Do not start engine by shorting across starter terminal. Engine will start with PTO engaged if normal circuitry is bypassed.

Start engine only from operator's station with PTO disengaged or in neutral.



Prevent Bypass Starting

RG5419 -UN-28FEB89

RG, RG34710, 7508 -19-30JUN97-1/1

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.



Avoid Fires

TS202 -UN-23AUG88

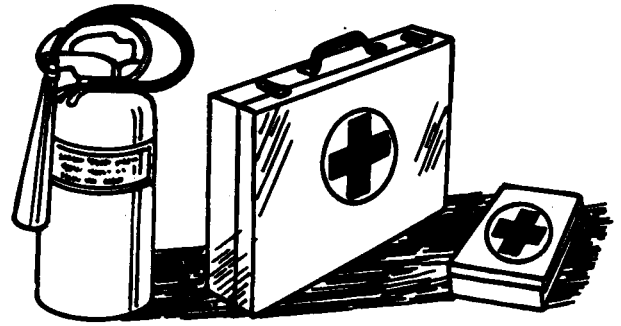
DX, FIRE1 -19-03MAR93-1/1

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.



First Aid Kit

TS291 -UN-23AUG88

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.



Store Safely

TS1356 -UN-18MAR92

DX,FIRE3 -19-16APR92-1/1

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.



Avoid Fires

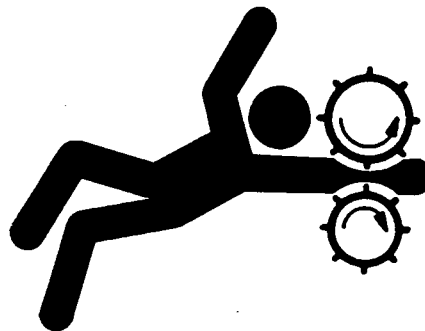
TS227 -JUN-23AUG88

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

Service Engines 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.



Moving Parts

TS228 -JUN-23AUG88

OURGP12,00001DA -19-25FEB03-1/1

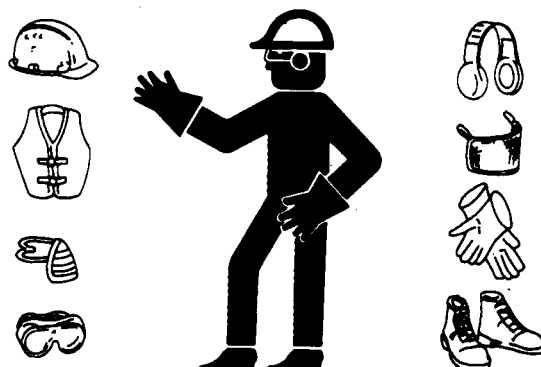
Wear Protective Clothing

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

Prolonged exposure to loud noise can cause impairment or loss of hearing.

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

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



Protective Clothing

TS206 -JUN-23AUG88

DX,WEAR -19-10SEP90-1/1

Protect Against Noise

Prolonged exposure to loud noise can cause impairment or loss of hearing.

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



Noise Exposure

TS207 -JUN-23AUG88

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

Handle Chemical Products Safely

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



Material Safety Data Sheet

TS1132 -UN-26NOV90

DX,MSDS,NA -19-03MAR93-1/1

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

Keep master shield and driveline shields in place at all times. Make sure rotating shields turn freely.

Wear close-fitting clothing. Stop the engine and be sure PTO driveline is stopped before making adjustments, connections, or performing any type of service on the engine or PTO-driven equipment.



Rotating Drivelines

TS1644 -UN-22AUG95

OUO1004,0000BD8 -19-03NOV00-1/1

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 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.



Keep Area Clean

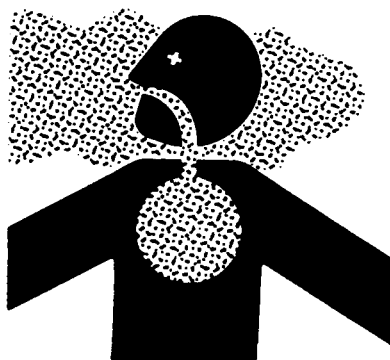
TS218 -UN-23AUG88

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

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



Engine exhaust fumes

TS220 -UN-23AUG88

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

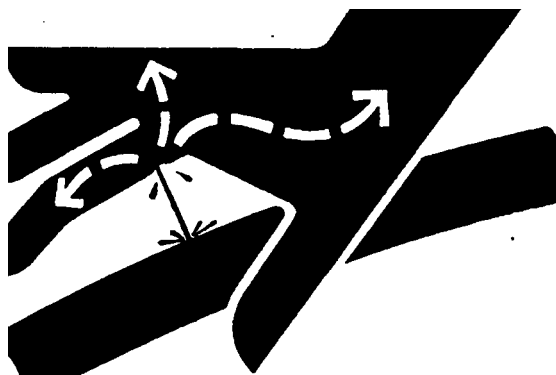
Avoid High-Pressure Fluids

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 from Deere & Company Medical Department in Moline, Illinois, U.S.A.



High-Pressure Fluids

X9811 -UN-23AUG88

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

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.



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

TS953 -UN-15MAY90

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.)



High-Pressure Fuel Lines

TS1343 -UN-18MAR92

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

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.

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

Dispose of paint and solvent properly.



Toxic Fumes

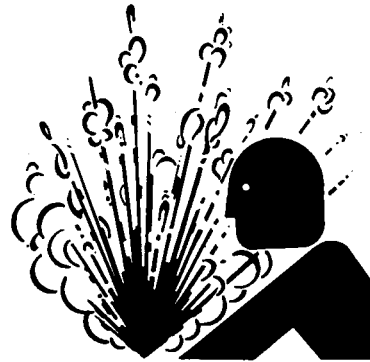
TS220 -UN-23AUG88

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

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.



Cooling System

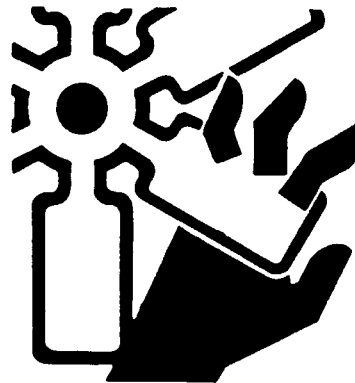
TS281 -JUN-23AUG88

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

Install Fan Guards

Rotating cooling system fans can cause serious injury.

Keep fan guards in place at all times during engine operation. Wear close fitting clothes. Stop the engine and be sure fan is stopped before making adjustments or connections, or cleaning near the front of the engine.



Rotating Fan

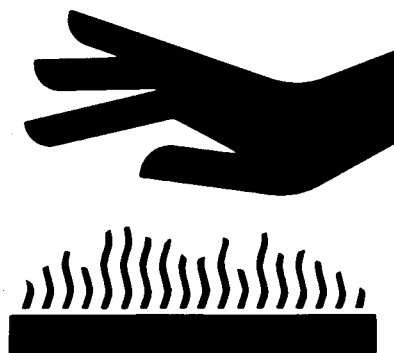
TS677 -JUN-21SEP89

OUOD006,000009D -19-04DEC02-1/1

Avoid Hot Parts

Avoid skin contact with exhaust manifolds, turbochargers and mufflers. Keep flammable materials clear of the turbocharger.

External dry exhaust parts become very hot during operation. Turbochargers may reach temperatures as high as 500°C (932°F) under full load, and naturally aspired exhaust manifolds may reach 600°C (1112°F) under full load. This may ignite paper, cloth or wooden materials. Parts on engines that have been at full load and reduced to no load idle will maintain approximately 150°C (302°F).



Hot Surface

TS271 -JUN-23AUG88

OUOD006,000009E -19-04DEC02-1/1

Avoid Harmful Asbestos Dust

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.

Keep bystanders away from the area.



Asbestos Dust

TS220 -JUN-23AUG88

DX,DUST -19-15MAR91-1/1

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).



Battery Explosions

TS204 -JUN-23AUG88

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

Handling Batteries Safely



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 (—) battery clamp first and replace it last.



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 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

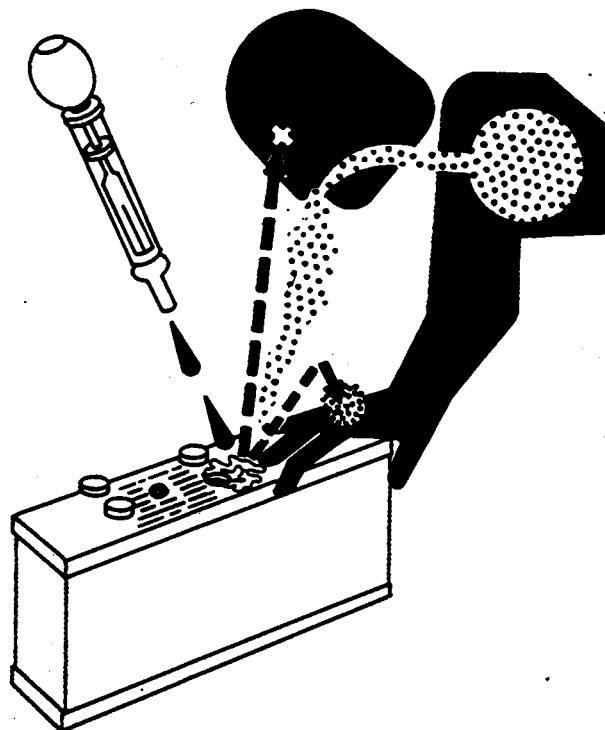
1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 qt.).
3. Get medical attention immediately.

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.**



Explosion

TS204 -JUN-23AUG88



Acid

TS203 -JUN-23AUG88

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.



High Pressure Spray

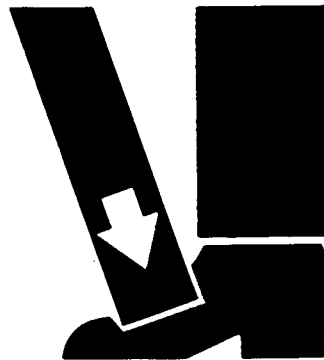
TS1343 -UN-18MAR92

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

Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



Proper Lifting Equipment

TS226 -UN-23AUG88

DX,LIFT -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.



Proper Tools

TS779 -UN-08NOV89

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

Dispose of Waste Properly

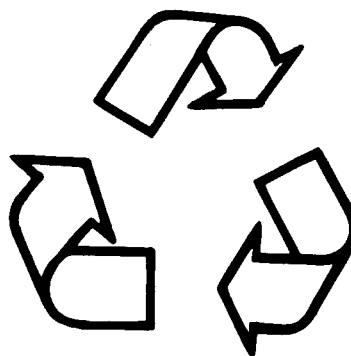
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

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



Recycle Waste

TS1133 -UN-26NOV90

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

Fuels, Lubricants, and Coolant

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.

Required fuel properties

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

Cetane number of 45 minimum. Cetane number greater than 50 is preferred, especially for temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft).

Cold Filter Plugging Point (CFPP) below the expected low temperature OR **Cloud Point** at least 5°C (9°F) below the expected low temperature.

Fuel lubricity should pass a minimum level of 3100 grams as measured by ASTM D6078 or maximum

scar diameter of 0.45 mm as measured by ASTM D6079 or ISO 12156-1.

Sulfur content:

- Diesel fuel quality and fuel sulfur content must comply with all existing emissions regulations for the area in which the engine operates.
- Use of diesel fuel with sulfur content less than 1000 ppm (0.10%) is strongly recommended.
- If diesel fuel with sulfur content greater than 1000 ppm (0.10%) is used, crankcase oil service intervals may be affected. (See recommendation for Diesel Engine Oil and Filter Service Intervals)
- Diesel fuel sulfur content greater than 5000 ppm (0.50%) is **NOT** recommended.
- **DO NOT** use diesel fuel with sulfur content greater than 10,000 ppm (1.00%).

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

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

OURGP12,00000F2 -19-22APR05-1/1

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 of the developing areas of the world may lack the necessary lubricity.

IMPORTANT: Make sure the diesel fuel used in your machine demonstrates good lubricity characteristics. Refer to “Diesel Fuels” in this section.

Fuel lubricity should pass a minimum load level of 3100 grams as measured by ASTM D6078 or a maximum scar diameter of 0.45 mm as measured by ASTM D6079 or ISO 12156-1.

If fuel of low or unknown lubricity is used, add John Deere PREMIUM DIESEL FUEL CONDITIONER (or equivalent) at the specified concentration.

OURGP12,00000FA -19-26APR05-1/1

Handling and Storing Diesel Fuel



CAUTION: 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 practicable 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 bio-diesel 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 and prevent water condensation. Contact your fuel supplier for recommendations.

DX,FUEL4 -19-19DEC03-1/1

Dieselscan Fuel Analysis

DIESELSCAN™ is a John Deere fuel analysis program that can be used to help monitor the quality of diesel fuel. The DIESELSCAN analysis verifies fuel type, cleanliness, water content, suitability for cold weather operation, and whether the fuel meets specifications.

Check with your John Deere dealer for availability of DIESELSCAN kits.

DIESELSCAN is a trademark of Deere & Company

DX,FUEL6 -19-06FEB04-1/1

Bio-Diesel Fuel

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

Bio-diesel fuels may be used **ONLY** if the bio-diesel fuel properties meet the latest edition of ASTM D6751, EN 14214, or equivalent specification.

The maximum allowable bio-diesel concentration is a 5% blend (also known as B5) in petroleum diesel fuel. It has been found that bio-diesel fuels may improve lubricity in concentrations up to this 5% blend.

When using a blend of bio-diesel fuel, the engine oil level must be checked daily when the air temperature is -10°C (14°F) or lower. If oil becomes diluted with fuel, shorten oil change intervals accordingly.

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

These oils do not burn completely, and will cause engine failure by leaving deposits on injectors and in the combustion chamber.

A major environmental benefit of bio-diesel fuel is its ability to biodegrade. This makes proper storage and handling of bio-diesel fuel especially important. Areas of concern include:

- Quality of new fuel
- Water content of the fuel
- Problems due to aging of the fuel

Potential problems resulting from deficiencies in the above areas when using bio-diesel fuel in concentrations above 5% may lead to the following symptoms:

- Power loss and deterioration of performance
- Fuel leakage
- Corrosion of fuel injection equipment
- Coked and/or blocked injector nozzles, resulting in engine misfire
- Filter plugging
- Lacquering and/or seizure of internal components
- Sludge and sediments
- Reduced service life of engine components

Consult your fuel supplier for additives to improve storage and performance of bio-diesel fuels.

DX,FUEL7 -19-08MAR04-1/1

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 information below outlines steps that can minimize the effect that cold weather may have on starting and operation of your engine. See your authorized engine distributor or servicing dealer for additional information and local availability of cold weather aids.

Use Grade No. 1-D Fuel

When temperatures fall below 5°C (40°F), Grade No. 1-D fuel is best suited for cold weather operation. Grade No. 1-D fuel has a lower cloud point and a lower pour point.

Cloud point is the temperature at which wax will begin to form in the fuel and this wax causes fuel filters to plug. **Pour point** is the temperature at which fuel begins to thicken and becomes more resistant to flow through fuel pumps and lines.

NOTE: On an average, Grade No. 1-D fuel has a lower BTU (heat content) rating than Grade No. 2-D fuel. When using Grade No. 1-D fuel you may notice a drop in power and fuel efficiency, but should not experience any other engine performance effects. Check the grade of fuel being used before troubleshooting for low power complaints in cold weather operation.

Fuel Heaters

Two options are available with fuel heaters: one location is at the inlet port of the primary fuel filter,

while the other location is at the inlet port of the final fuel filter.

Coolant Heaters

Engine block heaters (coolant) are an available option to aid cold weather starting.

Glow Plugs

Glow plugs are used to aid cold weather starting.

IMPORTANT: Do NOT use ether on engines with glow plugs.

Seasonal Viscosity Oil and Proper Coolant Concentration

Use seasonal grade viscosity engine oil based on 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 later in this section).

Diesel Fuel Flow Additive

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.

Use John Deere Premium Diesel Fuel Conditioner (Winter) or equivalent to treat fuel during the cold weather season. This winter formulation is a combination diesel fuel conditioner and anti-gel additive.

Continued on next page

OURGP12,00000AC -19-21OCT04-1/2

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 engine distributor or servicing dealer.

OURGP12,00000AC -19-21OCT04-2/2

Diesel Engine Break-In Oil

New engines are filled at the factory with John Deere ENGINE BREAK-IN OIL. During the break-in period, add John Deere ENGINE BREAK-IN OIL as needed to maintain the specified oil level.

Change the oil and filter after the first 100 hours of operation of a new or rebuilt engine.

After engine overhaul, fill the engine with John Deere ENGINE BREAK-IN OIL.

If John Deere ENGINE BREAK-IN OIL is not available, use a diesel engine oil meeting one of the following during the first 100 hours of operation:

- API Service Category CE
- API Service Category CD
- API Service Category CC
- ACEA Oil Sequence E2
- ACEA Oil Sequence E1

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

IMPORTANT: Do not use PLUS-50 oil or engine oils meeting any of the following during the first 100 hours of operation of a new or rebuilt engine:

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	
API CF	

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

PLUS-50 is a trademark of Deere & Company

OURGP12.00000B7 -19-19NOV04-1/1

Diesel Engine Oil

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

John Deere PLUS-50™ oil is preferred.

Oils meeting one of the following specifications are also recommended

- ACEA Oil Sequence E6
- ACEA Oil Sequence E7

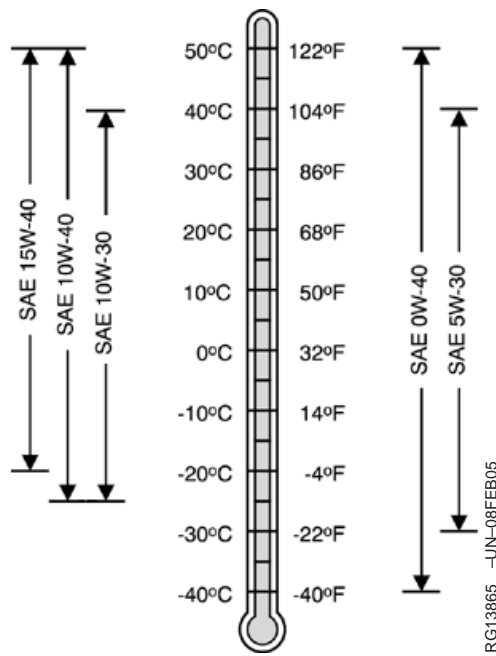
Extended service intervals may apply when John Deere PLUS-50, ACEA E6, or ACEA E7 engine oils are used. Consult table in following block for more information.

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

- John Deere TORQ-GARD SUPREME™
- API Service Category CI-4 PLUS or CI-4
- ACEA Oil Sequence E4 or E5

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.



Oil Viscosities for Various Air Temperatures

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 TORQ-GARD SUPREME is a trademark of Deere & Company

OURGP12,00000E3 -19-04FEB05-1/1

Diesel Engine Oil and Filter Service Intervals

The oil and filter service intervals in the table below should be used as guidelines because actual service intervals also depend on operation and maintenance practices. It is suggested that oil analysis be used prior to each oil change to be certain the proper oil and filter service interval is selected.

Oil and filter change intervals are based on oil pan capacity, type of oil and filter used, and sulfur content of the diesel fuel.

Refer to the following table for oil and filter service intervals.

Oil and Filter Service Intervals		
	Standard Oil Pan ^a	Extended Drain Oil Pan ^b
Fuel Sulfur Level	Less than 1000 ppm (0.10%)	
With Standard Oil	250 hours	250 hours
With Premium Oil	375 hours	500 hours
Fuel Sulfur Level	1000 to 5000 ppm (0.10 to 0.50%)	
With Standard Oil	150 hours	150 hours
With Premium Oil	250 hours	250 hours
Fuel Sulfur Level	5000 to 10,000 ppm (0.50 to 1.00%)	
With Standard Oil	100 hours	100 hours
With Premium Oil	150 hours	150 hours
^a Oil Pans with Option Codes 1908 or 1909 (6-Cylinder Engines Only)		
^b Oil Pans with Option Codes 1961 or 19AC (Larger Capacities) (6-Cylinder Engines Only)		

Fuel sulfur level will affect oil and filter service intervals. Higher fuel sulfur levels reduce oil service intervals as shown in the table.

- Use of diesel fuel with sulfur content less than 1000 ppm (0.10%) is strongly recommended.
- Use of diesel fuel with sulfur content greater than 5000 ppm (0.50%) is **NOT** recommended.
- **DO NOT** use diesel fuel with sulfur content greater than 10,000 ppm (1.00%).

Oil types (premium or standard) in table are as follows:

- “Premium Oils” include John Deere PLUS-50™, ACEA E6, or ACEA E7 oils, and assume the use of a specified John Deere oil filter.
- “Standard Oils” include John Deere TORQ-GARD SUPREME™, API CI-4 PLUS, API CI-4, ACEA E4, or ACEA E5 oils.

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TORQ-GARD SUPREME is a trademark of Deere & Company

OURGP12,00000E2 -19-18FEB05-1/1

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.

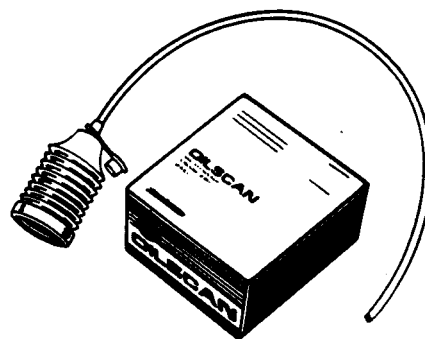
DX,LUBMIX -19-18MAR96-1/1

OILSCAN™ and COOLSCAN™

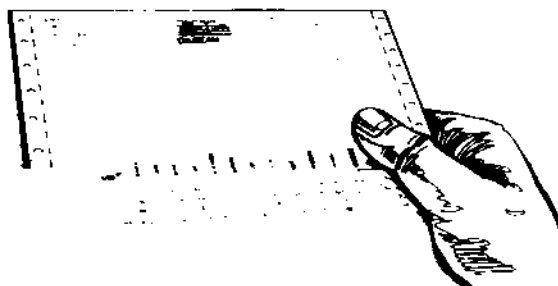
OILSCAN™ and COOLSCAN™ are John Deere sampling programs to help you monitor machine performance and identify potential problems before they cause serious damage.

Oil and coolant samples should be taken from each system prior to its recommended change interval.

Check with your John Deere dealer for the availability of OILSCAN™ and COOLSCAN™ kits.



T6828AB -UN-15JUN89



T6829AB -UN-18OCT88

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COOLSCAN is a trademark of Deere & Company.*

DX,OILSCAN -19-02DEC02-1/1

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 both conventional and synthetic oils.

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

DX,ALTER -19-15JUN00-1/1

Lubricant Storage

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

Use clean containers to handle all lubricants.

Whenever possible, 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 -19-18MAR96-1/1

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

The engine cooling system is filled to provide year-round protection against corrosion and cylinder liner pitting, and winter freeze protection to -37°C (-34°F). If protection at lower temperatures is required, consult your John Deere dealer for recommendations.

John Deere COOL-GARD™ Prediluted Coolant is preferred for service.

John Deere COOL-GARD Prediluted Coolant is available in a concentration of either 50% ethylene glycol or 55% propylene glycol.

Additional recommended coolants

The following engine coolant is also recommended:

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

John Deere COOL-GARD coolants do not require use of supplemental coolant additives, except for periodic replenishment of additives during the drain interval.

Other fully formulated coolants

Other fully formulated low silicate ethylene or propylene glycol base coolants for heavy-duty engines may be used if they meet one of the following specifications:

- ASTM D6210 prediluted (50%) coolant
- ASTM D6210 coolant concentrate in a 40% to 60% mixture of concentrate with quality water

Coolants meeting ASTM D6210 do not require use of supplemental coolant additives, except for periodic replenishment of additives during the drain interval.

Coolants requiring supplemental coolant additives

Other low silicate ethylene glycol base coolants for heavy-duty engines may also be used if they meet one of the following specifications:

- ASTM D4985 ethylene glycol base prediluted (50%) coolant
- ASTM D4985 ethylene glycol base coolant concentrate in a 40% to 60% mixture of concentrate with quality water

Coolants meeting ASTM D4985 require an initial charge of supplemental coolant additives, formulated for protection of heavy duty diesel engines against corrosion and cylinder liner erosion and pitting. They also require periodic replenishment of additives during the drain interval.

Other coolants

If a coolant known to meet the requirements of coolant specifications shown in this manual is not available, use either:

- ethylene glycol or propylene glycol base prediluted (40% to 60%) coolant
- ethylene glycol or propylene glycol base coolant concentrate in a 40% to 60% mixture of concentrate with quality water

The coolant concentrate or prediluted coolant shall be of a quality that provides cavitation protection to cast iron and aluminum parts in the cooling system.

Water quality

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

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

IMPORTANT: Do not mix ethylene glycol and propylene glycol base coolants.

DX,COOL3 -19-19DEC03-2/2

Drain Intervals for Diesel Engine Coolant

Drain the factory fill engine coolant, flush the cooling system, and refill with new coolant after the first 3 years or 3000 hours of operation.

Subsequent drain intervals are determined by the coolant used for service. At each interval, drain the coolant, flush the cooling system, and refill with new coolant.

When John Deere COOL-GARD™ is used, the drain interval may be extended to 5 years or 5000 hours of

operation, provided that the coolant is tested annually AND additives are replenished, as needed, by adding a supplemental coolant additive.

If John Deere COOL-GARD is used but the coolant is not tested OR additives are not replenished by adding a supplemental coolant additive, the drain interval is 3 years or 3000 hours of operation

If COOL-GARD is not used, the drain interval is reduced to 2 years or 2000 hours of operation.

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DX,COOL11 -19-19DEC03-1/1

Additional Information About Diesel Engine Coolants and Supplemental Coolant Additives

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

Coolant specifications

Some products, including John Deere COOL-GARD™ Prediluted Coolant, are fully formulated coolants that contain all three components in their correct concentrations. Do not add an initial charge of supplemental coolant additives to these fully formulated products.

Coolants meeting ASTM D6210 do not require an initial charge of supplemental coolant additives.

Some coolant concentrates, including John Deere COOL-GARD Coolant Concentrate, contain both glycol antifreeze and inhibiting coolant additives. Mix these products with quality water, but do not add an initial charge of supplemental coolant additives.

Coolants meeting ASTM D4985 require an initial charge of supplemental coolant additives.

Replenish coolant additives

The concentration of coolant additives is gradually depleted during engine operation. Periodic replenishment of inhibitors is required, even when John Deere COOL-GARD or another fully formulated coolant is used. Follow the recommendations in this manual for the use of supplemental coolant additives.

Why use supplemental coolant additives?

Operating without proper coolant additives will result in increased corrosion, cylinder liner erosion and pitting, and other damage to the engine and cooling system. A

simple mixture of ethylene glycol or propylene glycol and water will not give adequate protection.

Use of supplemental coolant additives reduces corrosion, erosion, and pitting. These chemicals reduce the number of vapor bubbles in the coolant and help form a protective film on cylinder liner surfaces. This film acts as a barrier against the harmful effects of collapsing vapor bubbles.

Avoid automotive-type coolants

Never use automotive-type coolants (such as those meeting ASTM D3306). These coolants do not contain the correct additives to protect heavy-duty diesel engines. They often contain a high concentration of silicates and may damage the engine or cooling system.

Water quality

Water quality is important to the performance of the cooling system. Distilled, 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 dissolved solids	<340 mg/L
Total hardness	<170 mg/L
pH	5.5 to 9.0

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,COOL7 -19-19DEC03-2/2

Supplemental Coolant Additives

The concentration of coolant additives is gradually depleted during engine operation. For all recommended coolants, replenish additives between drain intervals by adding a supplemental coolant additive every 12 months or as determined necessary by coolant testing.

John Deere COOLANT CONDITIONER is recommended as a supplemental coolant additive in John Deere engines.

IMPORTANT: Do not add a supplemental coolant additive when the cooling system is drained and refilled with John DeereCOOL-GARD™.

If other coolants are used, consult the coolant supplier and follow the manufacturer's recommendation for use of supplemental coolant additives.

The use of non-recommended supplemental coolant additives may result in additive drop-out and gelation of the coolant.

Add the manufacturer's recommended concentration of supplemental coolant additive. DO NOT add more than the recommended amount.

COOL-GARD is a trademark of Deere & Company

DX,COOL4 -19-07NOV03-1/1

Testing Diesel Engine Coolant

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.

Compare the results to the supplemental coolant additive (SCA) chart to determine the amount of inhibiting additives in your coolant and whether more John Deere COOLANT CONDITIONER should be added.

COOLSCAN™ and COOLSCAN PLUS™

For a more thorough evaluation of your coolant, perform a COOLSCAN or COOLSCAN PLUS analysis, where available. See your John Deere dealer for information.

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COOLSCAN PLUS is a trademark of Deere & Company*

DX,COOL9 -19-19DEC03-1/1

Operating in Warm Temperature Climates

John Deere engines are designed to operate using glycol base engine coolants.

Always use a recommended glycol base 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 will occur when water is used as the coolant, even when coolant conditioners are added.

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

DX,COOL6 -19-18MAR96-1/1

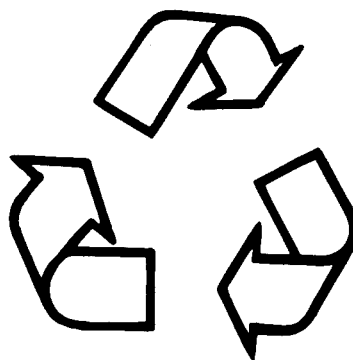
Disposing of Coolant

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.



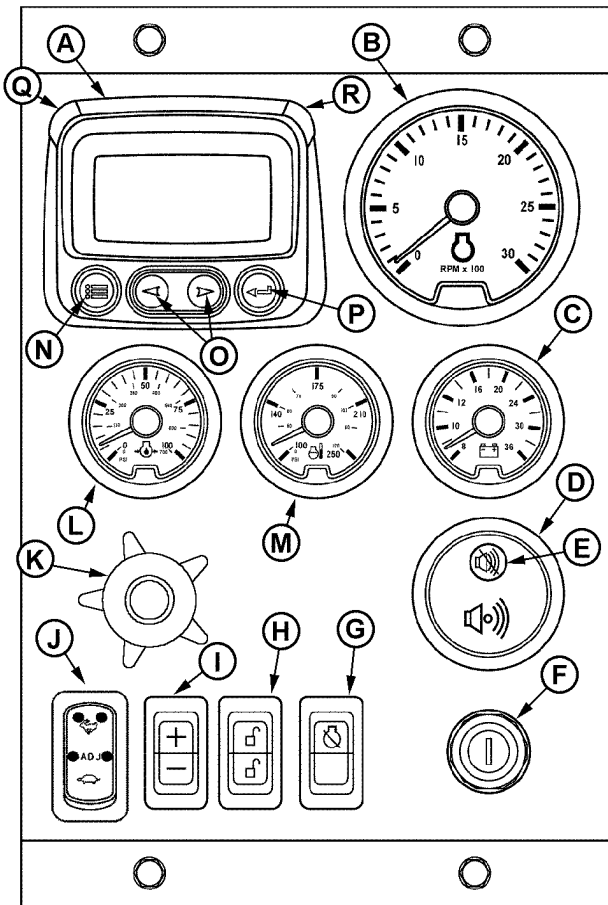
Recycle Waste

TS1133 -UN-26NOV90

RG, RG34710, 7543 -19-24JAN03-1/1

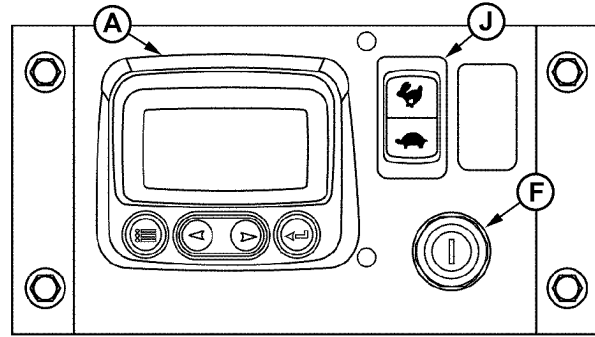
Instrument Panels

Instrument Panels



Full-Featured Instrument Panel

RG13276 -UN-28OCT03



Basic Instrument Panel

RG13277 -UN-22OCT03

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 Keys
P—Enter Key
Q—Amber “WARNING” Indicator Light
R—Red “STOP ENGINE” Indicator Light

Tier 3 John Deere PowerTech Plus™ 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: Section 20 following covers operation of engine with these controls.

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.

Instrument Panels (Continued)**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. 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

Switch will be present, but may not be active, depending on engine controller (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 engine shutdown for 30 seconds at a time to move vehicle to a safe location.

H—Bump Speed Enable Rocker Switch

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.

O—Arrow Keys

Use the arrow keys (O) to change the display on the window of the diagnostic gauge 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 story for accessing engine information on the diagnostic gauge using the touch keys.

P—Enter Key

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

Q—Amber "WARNING" Indicator Light

When light comes on, an abnormal condition exists. It is not necessary to shutdown engine immediately, but problem should be corrected as soon as possible.

R—Red "STOP ENGINE" Indicator Light

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

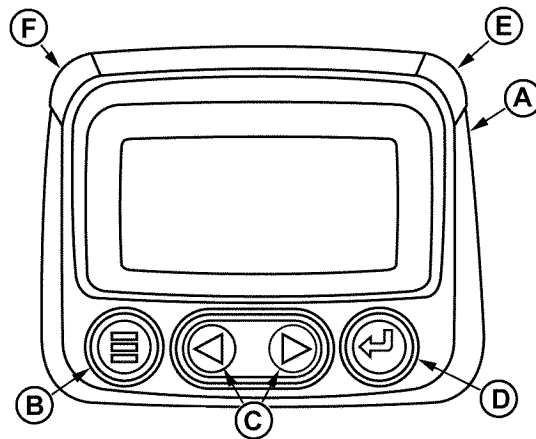
Using Diagnostic Gauge to Access Engine Information

The diagnostic gauge (A) allows the operator to view many readouts of engine functions and trouble codes (DTCs). The 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.

Press the menu key (B) to access the various engine functions in sequence. The displays can be selected as either customary English or metric units.

The following menu of engine parameters can be displayed on the diagnostic gauge window:

- Engine hours
- Engine rpm
- System voltage
- Percent engine load at the current rpm
- Coolant temperature
- Oil pressure
- Throttle position
- Intake manifold temperature
- Exhaust gas temperature
- Fuel temperature
- Current fuel consumption
- Active service (diagnostic) codes
- Stored service (diagnostic) codes from the engine
- Set the units for display
- View the engine configuration parameters



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

RG13132 -UN-09SEP03

Continued on next page

OURGP11,0000051 -19-28FEB05-1/2

NOTE: Engine parameters which can be accessed will vary with the engine application. Diagnostic gauge can be programmed for readouts in one of the following languages; English, French, German, Spanish and Portugese. Contact your engine distributor or dealer.

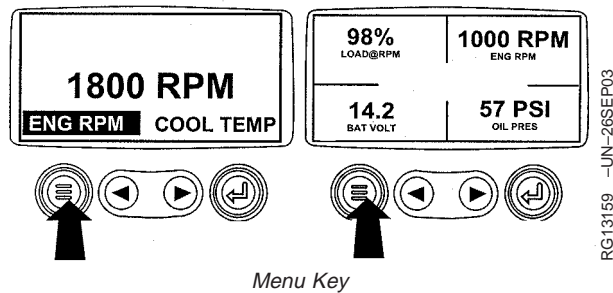
The diagnostic gauge includes a graphical backlit Liquid Crystal Display (LCD) screen. The display can show either a single parameter or a quadrant display showing four parameters simultaneously. The diagnostic gauge uses two arrow keys (C) for scrolling through the engine parameter list and viewing the menu list and an enter key (D) for selecting highlighted items. The red (E) and amber (F) lights are used to signal active trouble code received by the diagnostic gauge.

OURGP11,0000051 -19-28FEB05-2/2

Main Menu Navigation

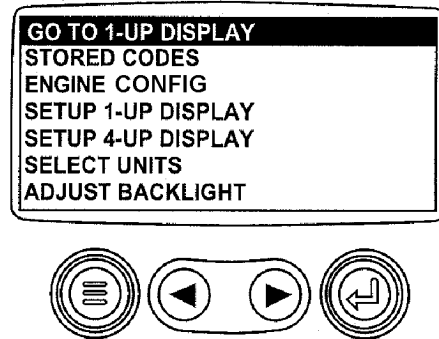
NOTE: The engine does not need to be running to navigate the diagnostic gauge screens. If engine start up is desired, See *Starting The Engine*. All of the engine values illustrated on the diagnostic gauge indicate the engine is running.

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



OURGP11,00000A9 -19-03SEP03-1/5

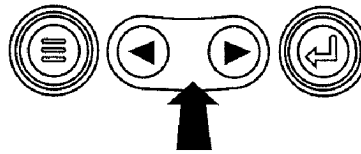
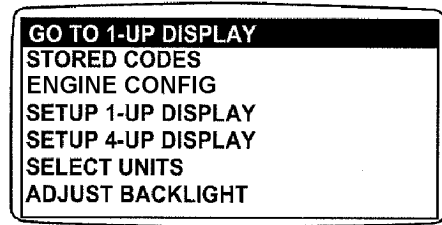
2. The first seven items of the "Main Menu" will be displayed.



Continued on next page

OURGP11,00000A9 -19-03SEP03-2/5

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

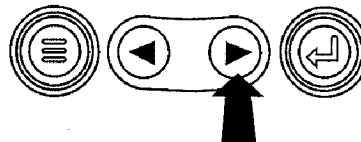
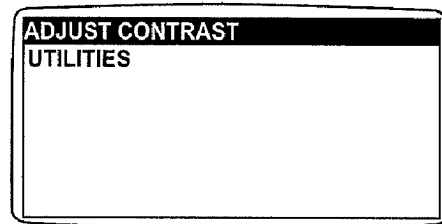


Main Menu Items

RG13161 -UN-02OCT03

OURGP11,00000A9 -19-03SEP03-3/5

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

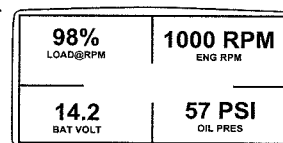
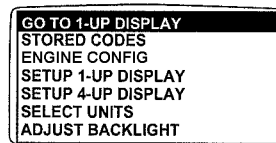


Last Items On Main Menu

RG13162 -UN-26SEP03

OURGP11,00000A9 -19-03SEP03-4/5

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.



Use Arrow Buttons To Scroll / Quadrant Display

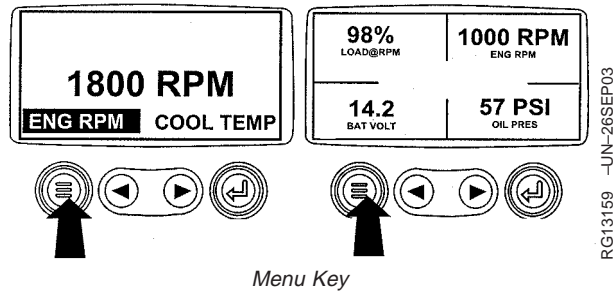
RG13163 -UN-02OCT03

OURGP11,00000A9 -19-03SEP03-5/5

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.

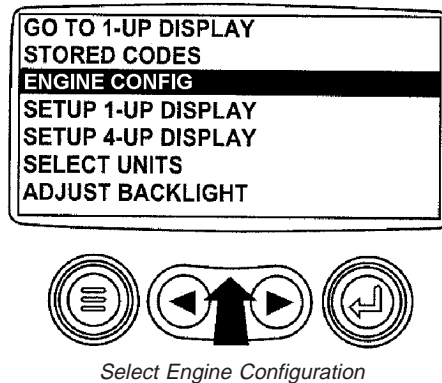


RG13159 -UN-26SEP03

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

OURGP11,00000AB -19-03SEP03-1/6

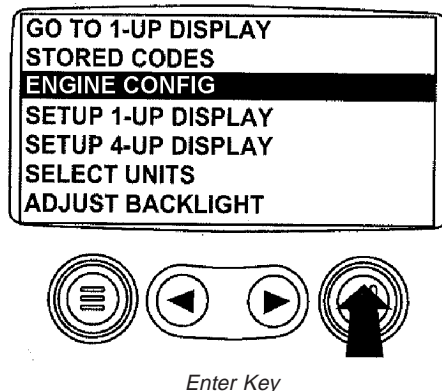
2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Engine Config" is highlighted.



RG13164 -UN-07OCT03

OURGP11,00000AB -19-03SEP03-2/6

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

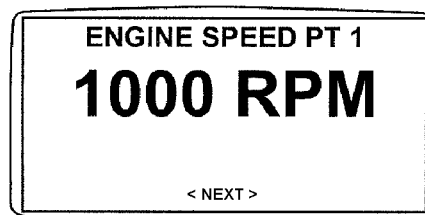


RG13165 -UN-02OCT03

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OURGP11,00000AB -19-03SEP03-3/6

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

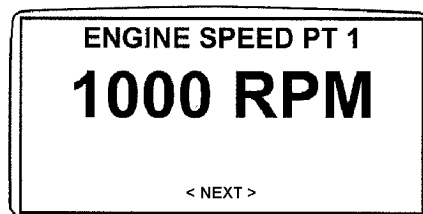


Use Arrow Keys To Scroll

RG13166 -UN-29SEP03

OURGP11,00000AB -19-03SEP03-4/6

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

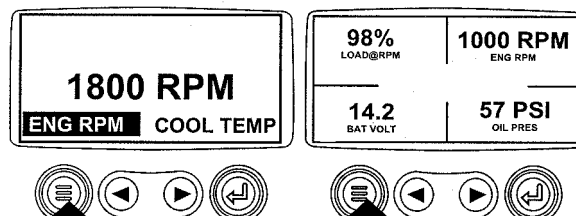


Return To Main Menu

RG13167 -UN-29SEP03

OURGP11,00000AB -19-03SEP03-5/6

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



Exit Main Menu

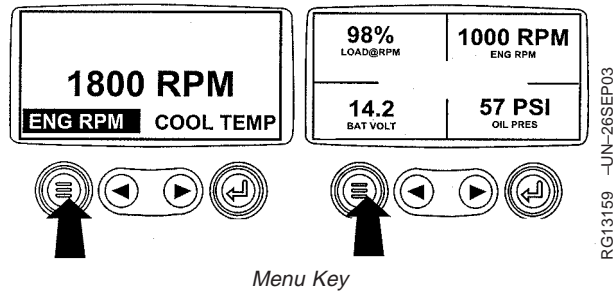
RG13159 -UN-26SEP03

OURGP11,00000AB -19-03SEP03-6/6

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.

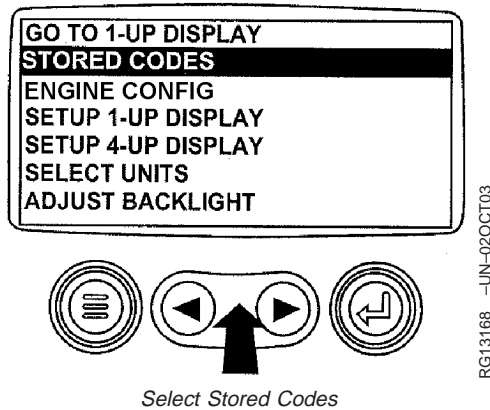
For description of trouble codes, see chart in *Troubleshooting Section*.



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

OURGP11,00000AC -19-03SEP03-1/6

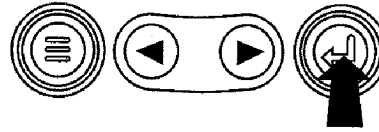
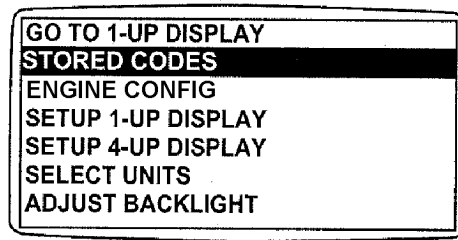
2. The main menu will be displayed. Use the "Arrow" keys to scroll through the menu until "Stored Codes" is highlighted.



Continued on next page

OURGP11,00000AC -19-03SEP03-2/6

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

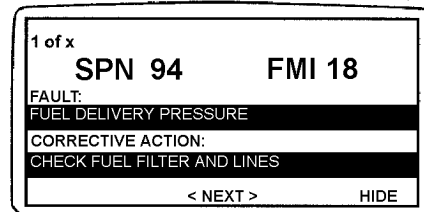


Enter Key

RG13169 -UN-02OCT03

OURGP11,00000AC -19-03SEP03-3/6

- 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.

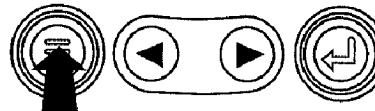
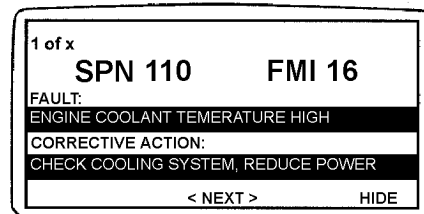


Use Arrow Keys To Scroll

RG13245 -UN-02OCT03

OURGP11,00000AC -19-03SEP03-4/6

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



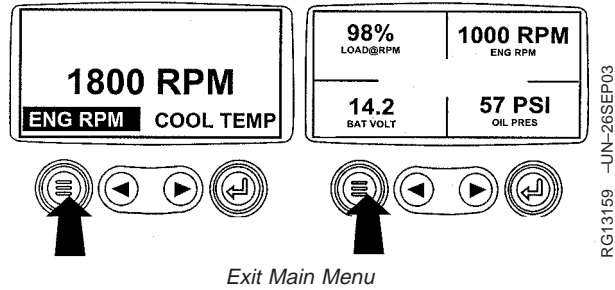
Return To Main Menu

RG13246 -UN-02OCT03

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OURGP11,00000AC -19-03SEP03-5/6

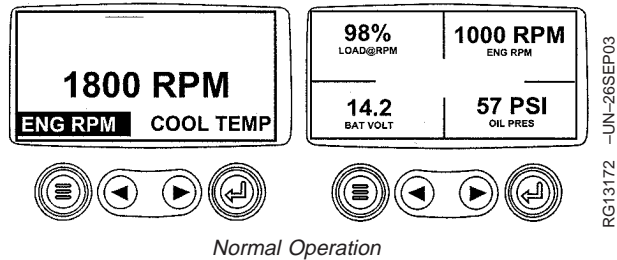
- Press the "Menu" key to exit the main menu and return to the engine parameter display.



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.

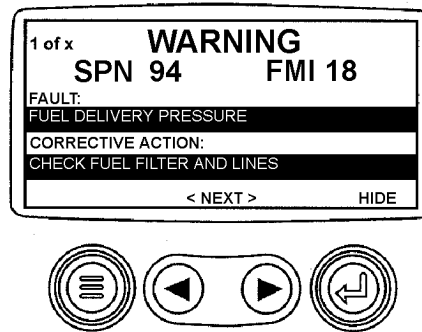
For description of trouble codes, see chart in Troubleshooting Section.



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

- 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.

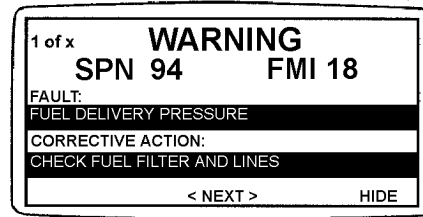


Active Trouble Codes Displayed

Continued on next page

OURGP11.00000AD -19-03SEP03-2/7

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.



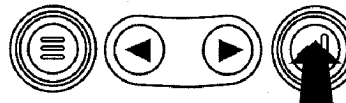
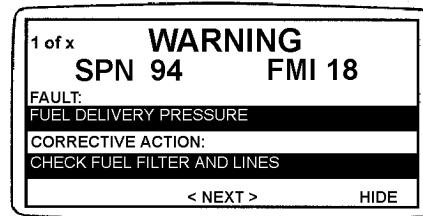
Use Arrow Keys To Scroll

RG13241 -UN-30SEP03

OURGP11,00000AD -19-03SEP03-3/7

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.

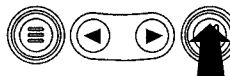
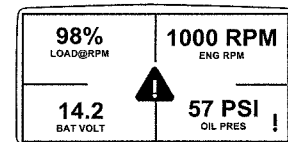
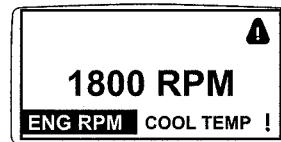


Hide Trouble Codes

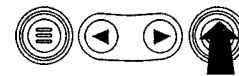
RG13242 -UN-30SEP03

OURGP11,00000AD -19-03SEP03-4/7

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.



Active Trouble Code Icon

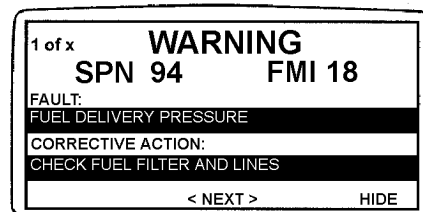


RG13176 -UN-26SEP03

OURGP11,00000AD -19-03SEP03-5/7

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.



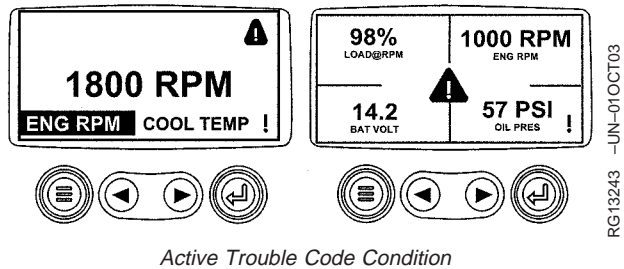
Enter Key

RG13242 -UN-30SEP03

Continued on next page

OURGP11,00000AD -19-03SEP03-6/7

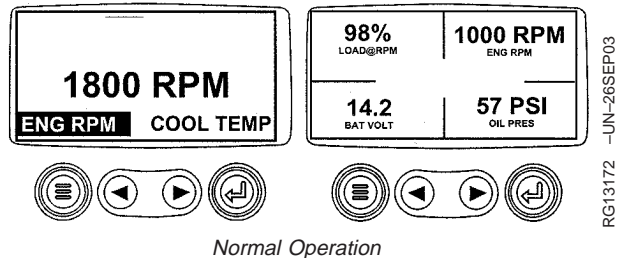
7. The single or four parameter screen will display the warning icon until the trouble code condition is corrected.



OURGP11.00000AD -19-03SEP03-7/7

Engine Shutdown Codes

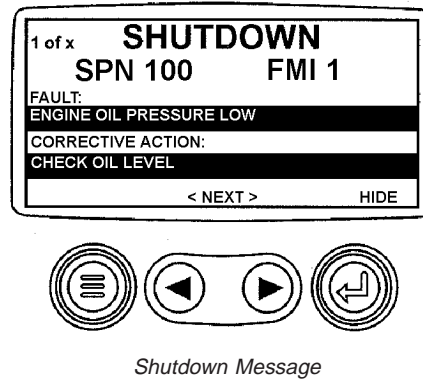
1. During normal operation the single or four parameter screen will be displayed.



OURGP11.00000AE -19-03SEP03-1/6

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.

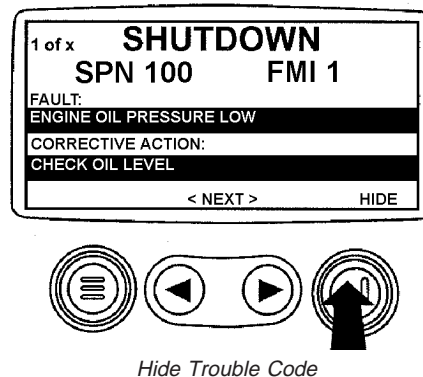
If the word "Next" appears above the arrow keys, there are more trouble codes that can be viewed by using the arrow keys to scroll to the next trouble code.



OURGP11.00000AE -19-03SEP03-2/6

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.

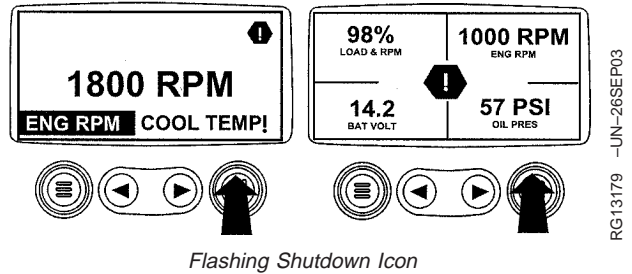


Continued on next page

OURGP11.00000AE -19-03SEP03-3/6

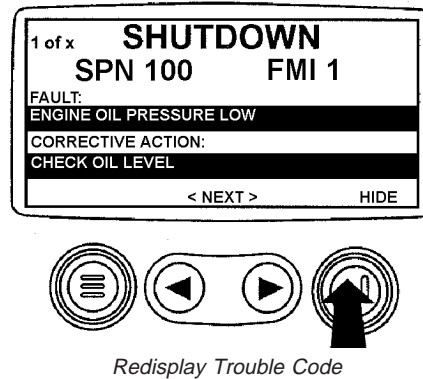
4. The display will return to the single or four parameter display, but the display will contain the "Shutdown" icon. Pressing the "Enter" key will redisplay the hidden trouble code.

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



OURGP11,00000AE -19-03SEP03-4/6

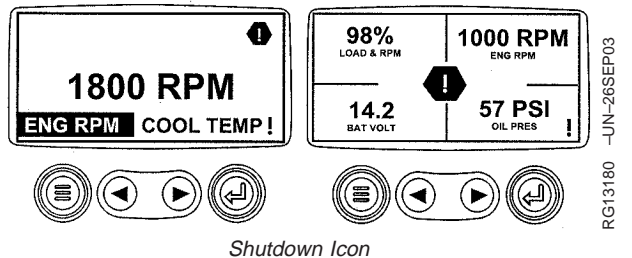
5. Pressing the "Enter" key once again will hide the trouble code and return the screen to the single or four parameter display.



OURGP11,00000AE -19-03SEP03-5/6

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

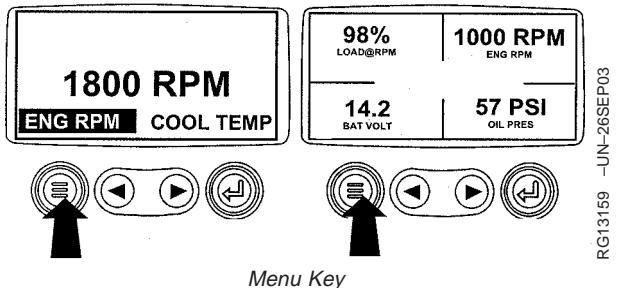
IMPORTANT: Ignoring the shutdown message can result in severe engine damage.



OURGP11,00000AE -19-03SEP03-6/6

Adjusting Backlighting

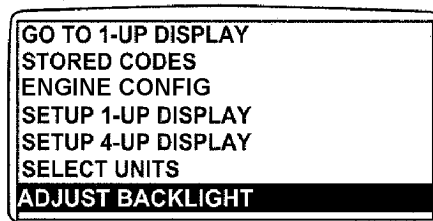
1. Turn the key switch to the ON position. Starting at the single or four engine parameter display, press the "Menu" key.



Continued on next page

OURGP11,0000237 -19-21OCT03-1/6

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

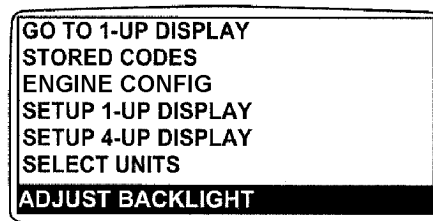


Select Adjust Backlight

RG13181 -UN-02OCT03

OURGP11,0000237 -19-21OCT03-2/6

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

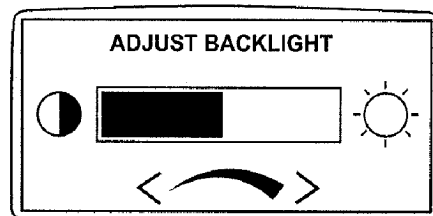


Press Enter Key

RG13182 -UN-02OCT03

OURGP11,0000237 -19-21OCT03-3/6

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



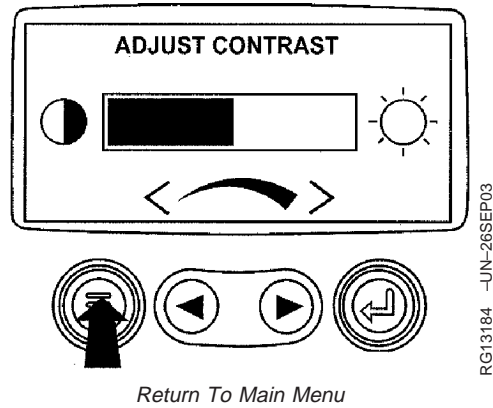
Adjust Backlight Intensity

RG13183 -UN-29SEP03

Continued on next page

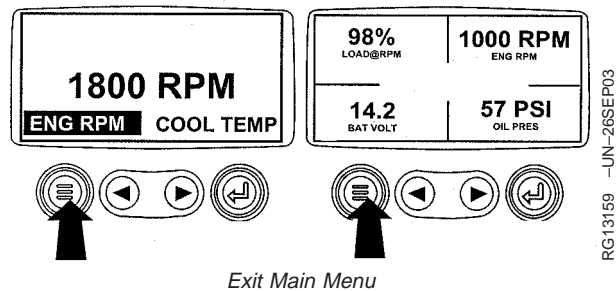
OURGP11,0000237 -19-21OCT03-4/6

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



OURGP11,0000237 -19-21OCT03-5/6

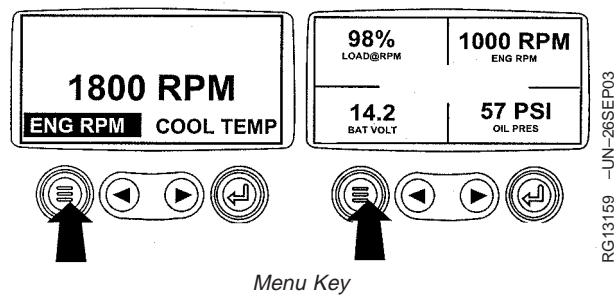
6. Press the "Menu" key to exit the main menu and return to the engine parameter display.



OURGP11,0000237 -19-21OCT03-6/6

Adjusting Contrast

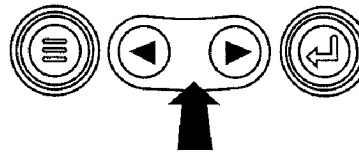
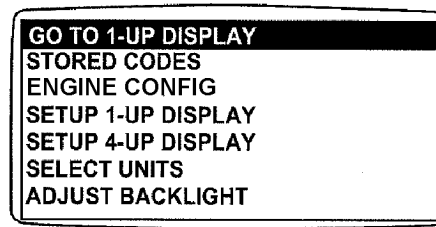
1. Turn the key switch to the ON position. Starting at the single or four engine parameter display press the "Menu" key.



Continued on next page

OURGP11,00000AF -19-03SEP03-1/6

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

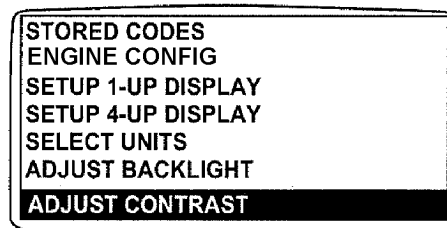


Select Adjust Contrast

RG13161 -UN-02OCT03

OURGP11,00000AF -19-03SEP03-2/6

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

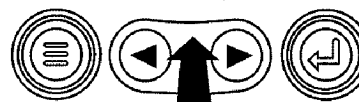
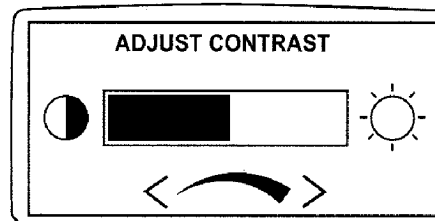


Press Enter Key

RG13185 -UN-02OCT03

OURGP11,00000AF -19-03SEP03-3/6

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



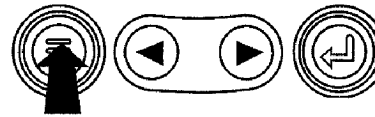
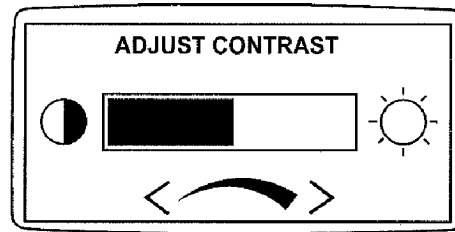
Adjust Contrast Intensity

Continued on next page

RG13186 -UN-29SEP03

OURGP11,00000AF -19-03SEP03-4/6

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

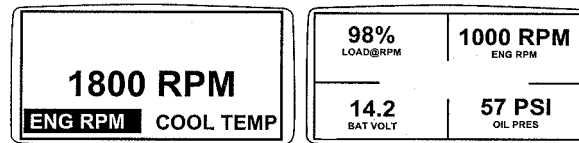


Return To Main Menu

RG13187 -UN-26SEP03

OURGP11,00000AF -19-03SEP03-5/6

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



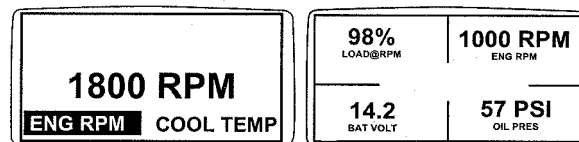
Exit Main Menu

RG13159 -UN-26SEP03

OURGP11,00000AF -19-03SEP03-6/6

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.



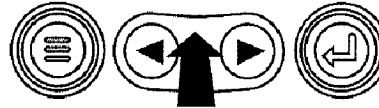
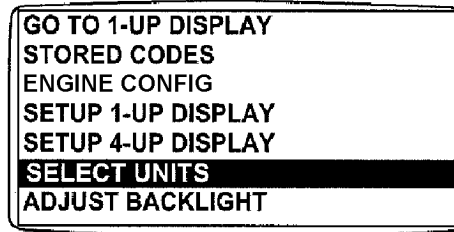
Menu Key

RG13159 -UN-26SEP03

Continued on next page

OURGP11,00000B0 -19-03SEP03-1/7

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

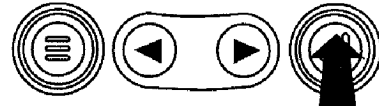
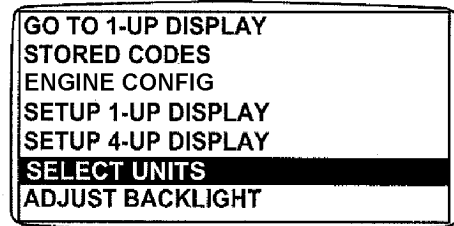


Select Units

RG13188 -UN-02OCT03

OURGP11,00000B0 -19-03SEP03-2/7

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



Press Enter Key

RG13188 -UN-02OCT03

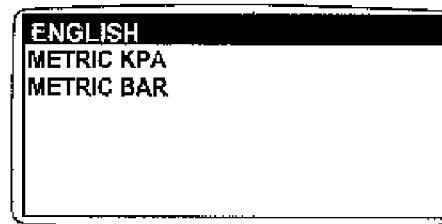
OURGP11,00000B0 -19-03SEP03-3/7

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.



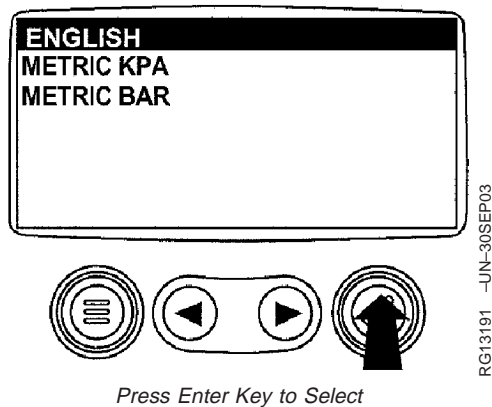
Select Desired Units

RG13190 -UN-26SEP03

Continued on next page

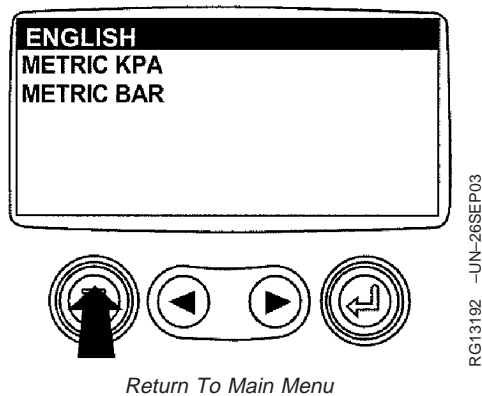
OURGP11,00000B0 -19-03SEP03-4/7

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



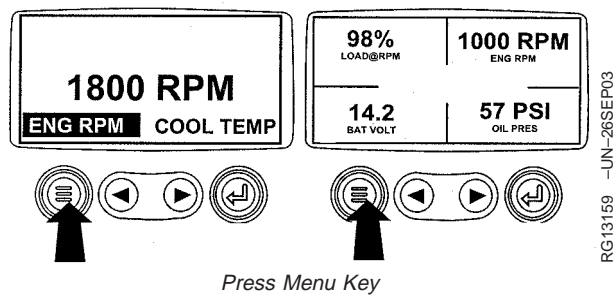
OURGP11,00000B0 -19-03SEP03-5/7

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



OURGP11,00000B0 -19-03SEP03-6/7

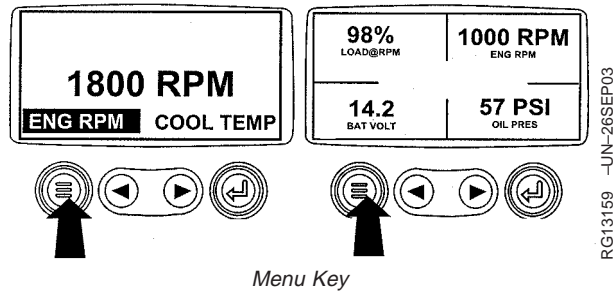
7. Press the "Menu" key to return to the engine parameter display.



OURGP11,00000B0 -19-03SEP03-7/7

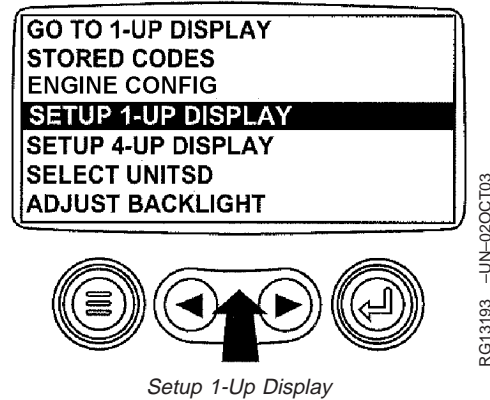
Setup 1-Up Display

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



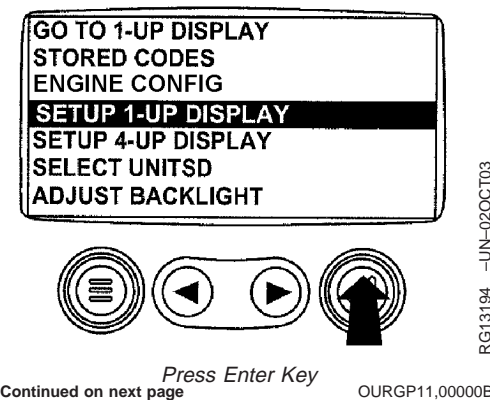
OURGP11,00000B1 -19-03SEP03-1/18

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



OURGP11,00000B1 -19-03SEP03-2/18

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

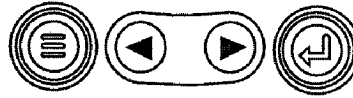
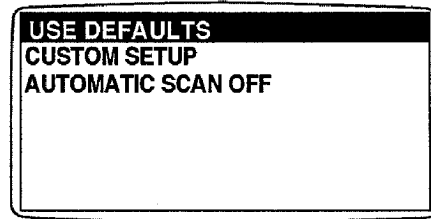


Press Enter Key
Continued on next page

OURGP11,00000B1 -19-03SEP03-3/18

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.

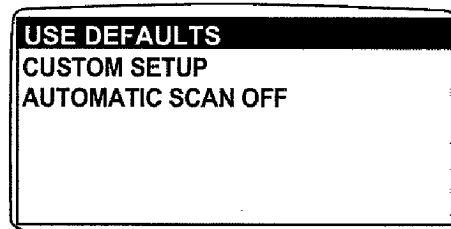


1-Up Display Options

RG13196 -UN-26SEP03

OURGP11,00000B1 -19-03SEP03-4/18

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



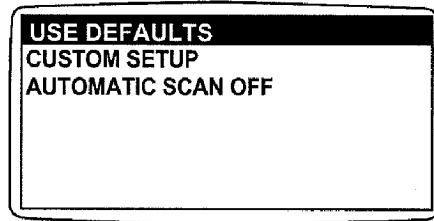
Select Defaults

RG13195 -UN-26SEP03

Continued on next page

OURGP11,00000B1 -19-03SEP03-5/18

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

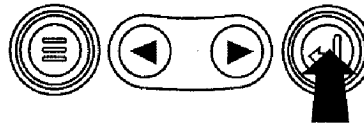
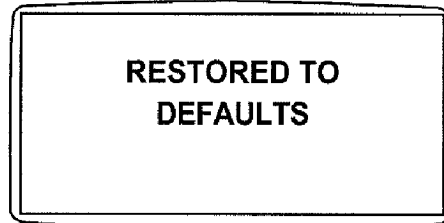


Defaults Selected

RG13197 -UN-29SEP03

OURGP11,00000B1 -19-03SEP03-6/18

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

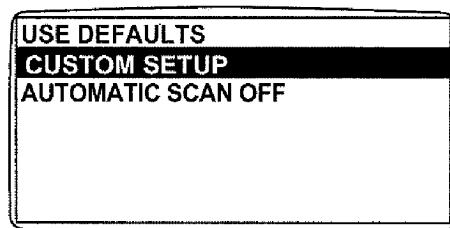


Restored To Defaults

RG13149 -UN-24SEP03

OURGP11,00000B1 -19-03SEP03-7/18

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.



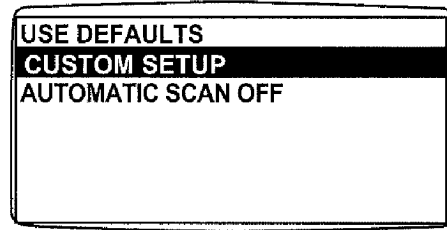
Select Custom Setup

RG13198 -UN-26SEP03

Continued on next page

OURGP11,00000B1 -19-03SEP03-8/18

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

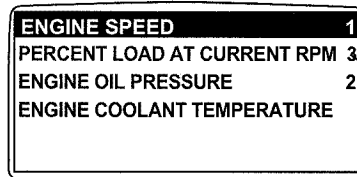


Engine Parameters

RG13199 -UN-26SEP03

OURGP11,00000B1 -19-03SEP03-9/18

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



This number indicates the order of display for the parameters and that the parameter is selected for display.

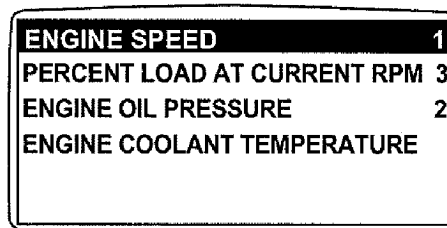


Select Parameters

RG13150 -UN-24SEP03

OURGP11,00000B1 -19-03SEP03-10/18

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



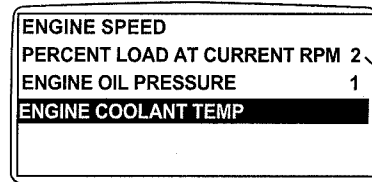
Deselect Parameters

RG13219 -UN-26SEP03

Continued on next page

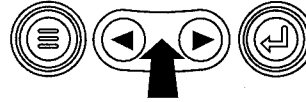
OURGP11,00000B1 -19-03SEP03-11/18

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).



Note that the numbers now indicate the new order of display for the parameters.

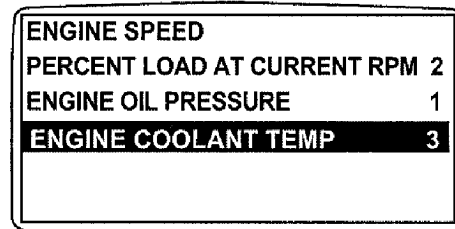
RG13151 -UN-24SEP03



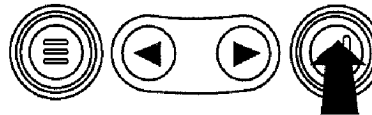
Select Desired Parameters

OURGP11.00000B1 -19-03SEP03-12/18

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.



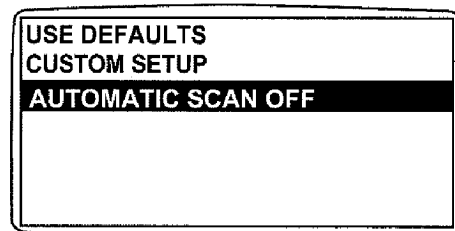
RG13220 -UN-26SEP03



Select Parameters For Display

OURGP11.00000B1 -19-03SEP03-13/18

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

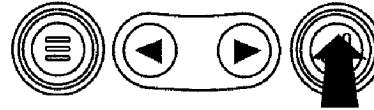
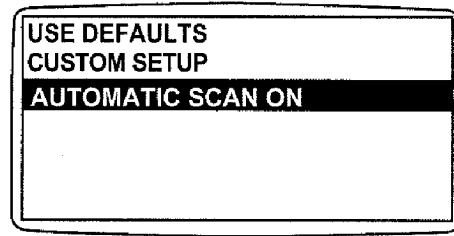


Automatic Scan Off

Continued on next page

OURGP11.00000B1 -19-03SEP03-14/18

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

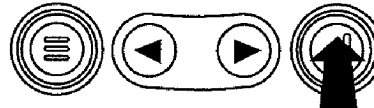
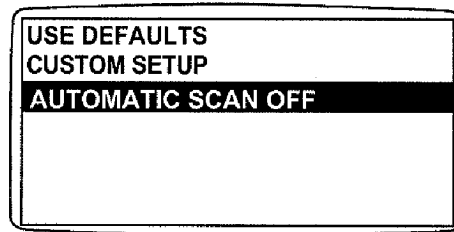


Automatic Scan On

RG13222 -UN-26SEP03

OURGP11,00000B1 -19-03SEP03-15/18

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



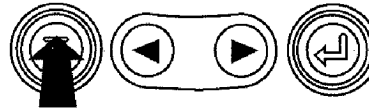
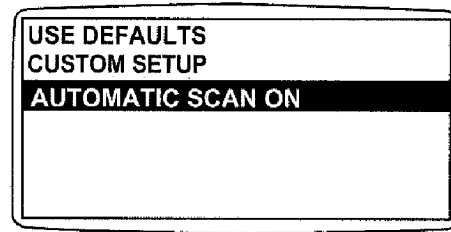
Automatic Scan Off

RG13223 -UN-26SEP03

Continued on next page

OURGP11,00000B1 -19-03SEP03-16/18

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

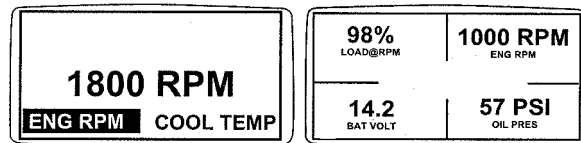


Menu Key

RG13224 -UN-26SEP03

OURGP11,00000B1 -19-03SEP03-17/18

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



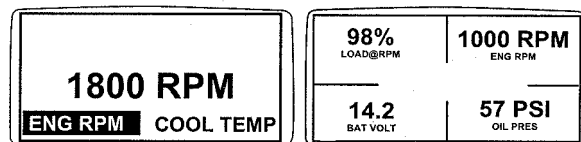
Exit Main Menu

RG13159 -UN-26SEP03

OURGP11,00000B1 -19-03SEP03-18/18

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.



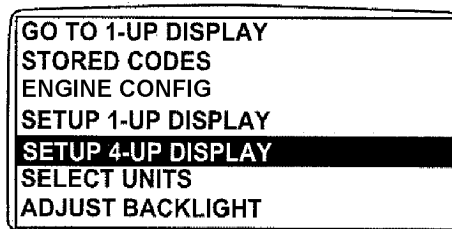
Menu Key

RG13159 -UN-26SEP03

Continued on next page

OURGP11,00000B2 -19-03SEP03-1/14

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

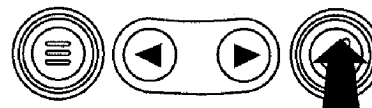
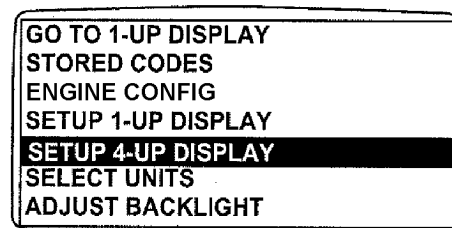


Select Setup 4-Up Display

RG13225 -UN-02OCT03

OURGP11,00000B2 -19-03SEP03-2/14

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



Press Enter Key

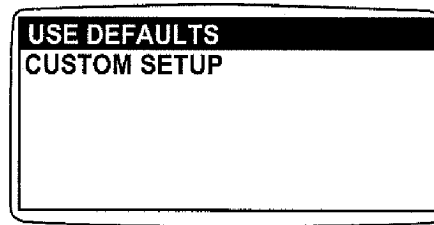
RG13226 -UN-02OCT03

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OURGP11,00000B2 -19-03SEP03-3/14

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.

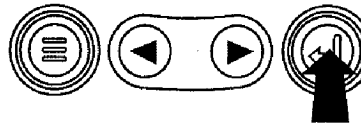
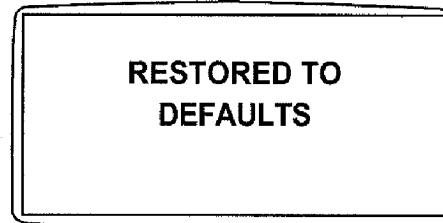


Select Factory Defaults

RG13244 –UN-02OCT03

OURGP11,00000B2 –19-03SEP03-4/14

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.

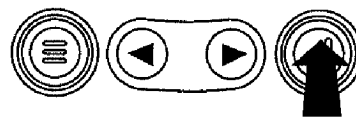
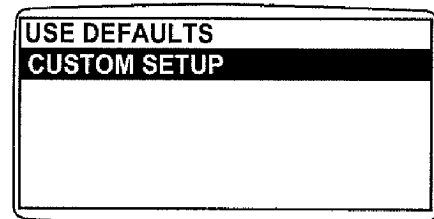


Restored To Defaults

RG13149 –UN-24SEP03

OURGP11,00000B2 –19-03SEP03-5/14

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.



Custom Setup

RG13227 –UN-26SEP03

Continued on next page

OURGP11,00000B2 –19-03SEP03-6/14

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.

125°F COOL TEMP	1000 RPM ENG RPM
14.2 BAT VOLT	57 PSI OIL PRES



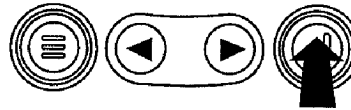
Select Parameters

RG13228 -UN-26SEP03

OURGP11,00000B2 -19-03SEP03-7/14

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

125°F COOL TEMP	1000 RPM ENG RPM
14.2 BAT VOLT	57 PSI OIL PRES



List Of Engine Parameters

RG13229 -UN-26SEP03

OURGP11,00000B2 -19-03SEP03-8/14

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".

ENGINE SPEED	3
ENGINE HOURS	
ENGINE COOLANT TEMPERATURE	1
BATTERY POTENTIAL	
ENGINE OIL TEMPERATURE	2
ENGINE OIL PRESSURE	4

The number to the right of the parameter indicates the quadrant in which it is displayed.
1. = Upper Left Quadrant
2. = Lower Left Quadrant
3. = Upper Right Quadrant
4. = Lower Right Quadrant



Select Desired Engine Parameter

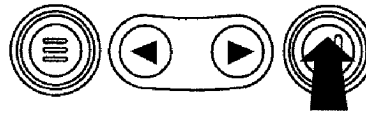
RG13230 -UN-26SEP03

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OURGP11,00000B2 -19-03SEP03-9/14

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

ENGINE SPEED	3
ENGINE HOURS	
ENGINE COOLANT TEMPERATURE	1
BATTERY POTENTIAL	2
ENGINE OIL TEMPERATURE	
ENGINE OIL PRESSURE	4



Enter Selected Parameter

OURGP11,00000B2 -19-03SEP03-10/14

RG13231 -UN-26SEP03

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

ENGINE SPEED	3
ENGINE HOURS	
ENGINE COOLANT TEMPERATURE	1
BATTERY POTENTIAL	
ENGINE OIL TEMPERATURE	2
ENGINE OIL PRESSURE	4

Note the number to the right of the selected parameter indicating that the parameter is now assigned to that display location.



Return To 4-Up Custom Setup

OURGP11,00000B2 -19-03SEP03-11/14

RG13232 -UN-26SEP03

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

125°F COOL TEMP	1000 RPM ENG RPM
143°F OIL TEMP	57 PSI OIL PRES



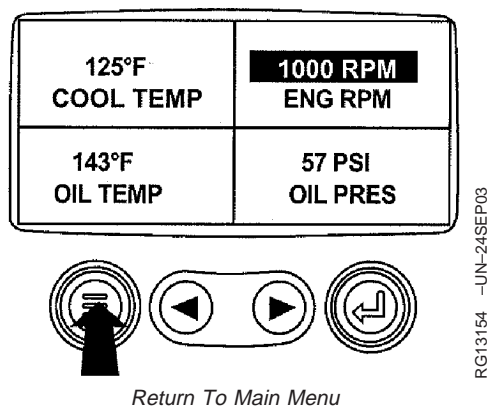
4-Up Display

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OURGP11,00000B2 -19-03SEP03-12/14

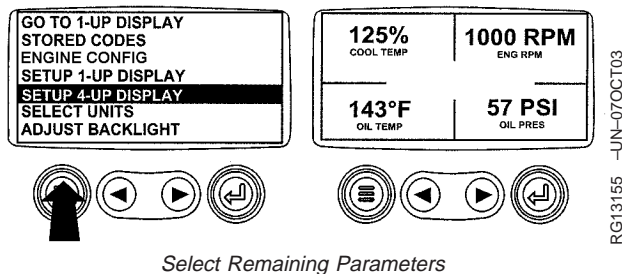
RG13153 -UN-24SEP03

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



OURGP11,00000B2 -19-03SEP03-13/14

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



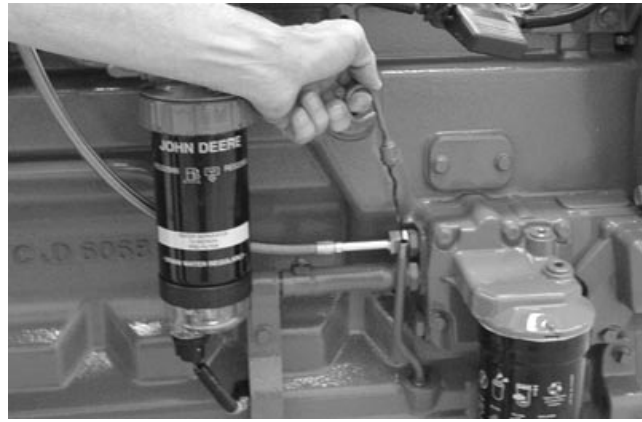
OURGP11,00000B2 -19-03SEP03-14/14

Engine Operation

Engine Break-In Service

The engine is ready for normal operation. However, extra care during the first 100 hours of operation will result in more satisfactory long-term engine performance and life. DO NOT exceed 100 hours of operation with break-in oil.

1. This engine is factory-filled with John Deere DIESEL ENGINE BREAK-IN OIL (SAE 10W-30). Operate the engine at heavy loads with minimal idling during the break-in period.
2. If the engine has significant operating time at idle, constant speeds, and/or light load usage, or makeup oil is required in the first 100 hour period, a longer break-in period may be required. In these situations, an additional 100 hour break-in period is recommended using a new change of John Deere DIESEL ENGINE BREAK-IN OIL and a new John Deere oil filter.



Check Engine Oil

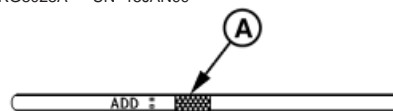
RG13719 -JUN-11NOV04

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OURGP12,0000084 -19-22SEP04-1/4

RG8028A —UN—15JAN99

IMPORTANT: DO NOT add makeup oil until the oil level is BELOW the ADD mark on dipstick. John Deere ENGINE BREAK-IN OIL (TY22041) should be used to make up any oil consumed during the break-in period.



Crosshatch Pattern On Dipstick

A—Crosshatch Pattern On Dipstick

3. Check engine oil level more frequently during engine break-in period. If oil must be added during this period, John Deere DIESEL ENGINE BREAK-IN OIL is preferred. See DIESEL ENGINE BREAK-IN OIL, in Fuels, Lubricants, and Coolant Section for other oils allowed.

IMPORTANT: Do not use PLUS-50 oil or engine oils meeting any of the following during the first 100 hours of operation of a new or rebuilt engine:

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	
API CF	

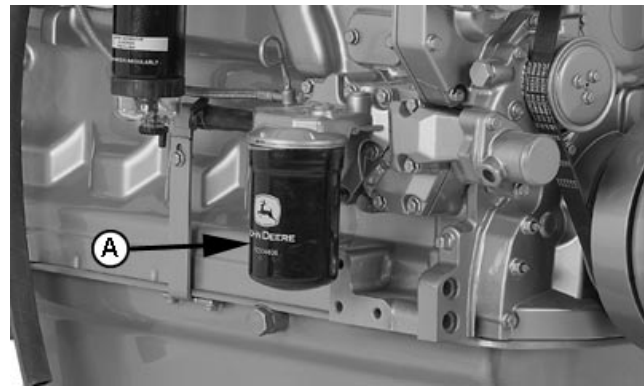
These oils will not allow the engine to break-in properly.

DO NOT fill above the crosshatch pattern (A) or the FULL mark, whichever is present. Oil levels anywhere within the crosshatch are considered in the acceptable operating range.

Continued on next page

OURGP12,0000084 —19—22SEP04—2/4

4. During the first 20 hours, avoid prolonged periods of engine idling or sustained maximum load operation. If engine will idle longer than 5 minutes, stop engine.
5. Before the first 100 hours (maximum), change engine oil and replace engine oil filter (A). (See CHANGING ENGINE OIL AND REPLACING FILTER in Lubrication and Maintenance/500 Hour/12 Month Section.) Fill crankcase with the normal seasonal viscosity grade oil. (See DIESEL ENGINE OIL, in Fuels, Lubricants, and Coolant Section.)



Engine Oil Filter

A—Engine Oil Filter

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 -10°C (14°F), use an engine block heater.

Continued on next page

OURGP12,0000084 -19-22SEP04-3/4

6. Watch coolant temperature gauge (A) closely. If coolant temperature rises above 112°C (234°F), reduce load on engine. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

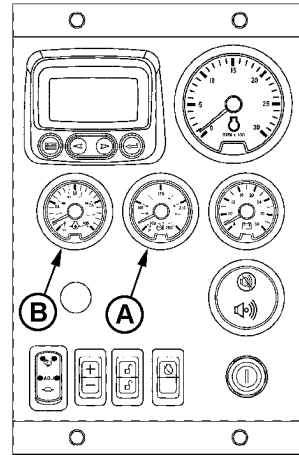
NOTE: When the coolant temperature gauge reads approximately 115°C (239°F), the engine will shutdown automatically, if equipped with safety controls.

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

Specification

Engine ¹ —Oil Pressure at Full	
Load Rated Speed	345 ± 103 kPa (3.45 ± 1.03 bar) (50 ± 15 psi)
Minimum Oil Pressure at Slow	
Idle	105 kPa (1.05 bar) (15 psi)
Coolant Temperature Range	82°–94°C (180°–202°F)

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



Watch Coolant Temperature and Oil Pressure on Panel

A—Engine Coolant Temperature Gauge
B—Oil Pressure Gauge

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

Starting the Engine

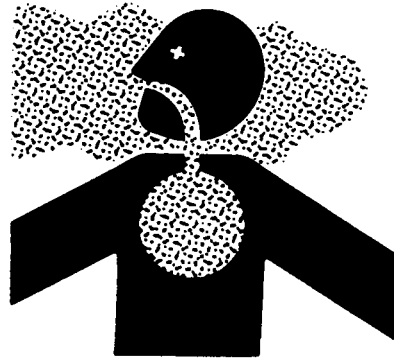
The following instructions apply to the optional controls and instruments available through the John Deere Parts Distribution Network. The controls and instruments for your engine may be different from those shown here; always follow manufacturer's instructions.



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*, later in this section).

1. Perform all prestarting checks outlined in Lubrication & Maintenance/Daily Section later in this manual.
2. Open the fuel supply shut-off valve, if equipped.
3. Disengage clutch (if equipped) controlling any engine drivelines.



Use Proper Ventilation

TS220 -JUN-23AUG88

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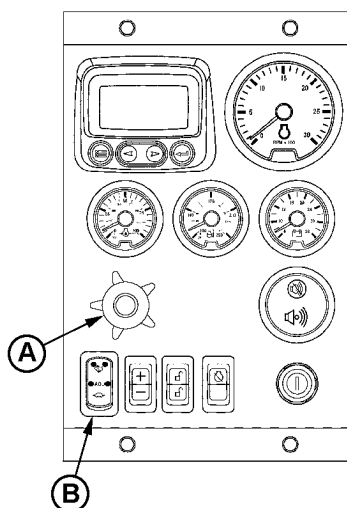
OURGP12,0000086 -19-22SEP04-1/3

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.



Analog Throttle Control and Speed Select Switch

A—Analog Throttle Control (Optional)
B—Speed Select Rocker Switch

RG13722 -UN-11NOV04

Continued on next page

OURGP12,0000086 -19-22SEP04-2/3

5. Turn the key start switch (A) clockwise to the "ON" position. Wait until the Engine Preheater Indicator light turns off, then turn the key start switch clockwise "START" position to crank the engine. (In cold weather, preheater indicator light remains on longer while engine is warmed. See COLD WEATHER OPERATION later in this section.) When the engine starts, release the key switch so that 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 prevent possible damage to the starter and/or flywheel.

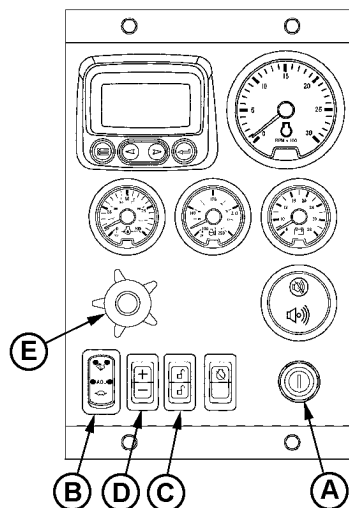
6. After engine starts, idle engine at not more than 1200 rpm until warm. (See WARMING ENGINE later in this section).

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. (See "Changing Engine Speeds" later in this section).

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

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.)



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)

RG13723 -UN-11NOV04

OURGP12,0000086 -19-22SEP04-3/3

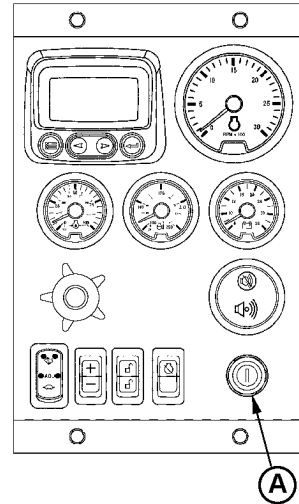
Restarting Engine After Emergency Shutdown

In the event of an emergency engine shutdown, the following procedures are required to restart the engine.

1. Correct the condition causing the emergency shutdown.
2. Perform initial restarting procedures, as required. See STARTING THE ENGINE, steps 1 through 4, earlier in this section.

NOTE: For ALL emergency shutdowns, the controller must be reset before the engine can be restarted. Recycle the key switch to reset the controller.

3. Recycle the key start switch (A) as follows:
 - a. Turn key switch OFF.
 - b. Wait 15 seconds.
 - c. Turn key switch clockwise to crank the engine.
4. Perform final restarting procedures, as required. See STARTING THE ENGINE, steps 6 and 7, earlier in this section.



Restarting the Engine

A—Key Start Switch

RG13738 -UN-11NOV04

OURGP12,0000085 -19-22SEP04-1/1

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 112°C (234°F), reduce load on engine. Unless temperature drops quickly, stop engine and determine cause before resuming operation.

Normal engine oil pressure at slow idle should be at least 105 kPa (15 psi) and should rise to 240- 450 kPa (35-65 psi) at rated speed.

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.

IMPORTANT: Should the engine die while operating under load, immediately remove load and restart the engine. Overheating of the turbocharger parts may occur when oil flow is stopped.

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. Also, the exhaust gas recirculation valve will cycle periodically with a momentary loss of engine rpm. This is also normal.

OURGP12,0000087 -19-22SEP04-1/1

Warming Engine

The electronically-controlled engines will operate at an accelerated slow idle of 1050 rpm until the engine coolant warms up to 20° C (68° F).

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.

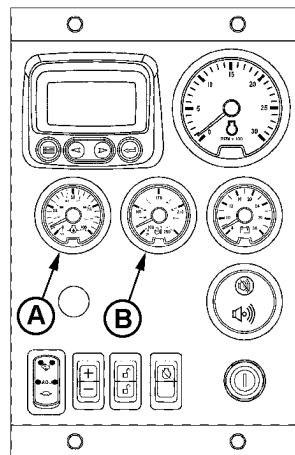
Engines used in generator set applications where the governor is locked at a specified speed may not have a slow idle function. Operate these engines at high idle for 1 to 2 minutes before applying the load. This procedure does not apply to standby generator sets where the engine is loaded immediately 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 105 kPa (1.05 bar) (15.0 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is 345 ± 103 kPa (3.45 ± 1.03 bar) (50 ± 15 psi) at rated full load speed (1800–2500 rpm) with oil at normal operating temperature of 115°C (240°F).

NOTE: On certain engines, the oil pressure and coolant temperature gauges are replaced by indicator warning lights. The lights must be "OFF" when engine is running.

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.



Oil Pressure and Coolant Temperature Gauges On Panel

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

RG13724 –UN–11NOV04

Cold Weather Operation

CAUTION: DO NOT use starting fluid on engines equipped with glow plugs. Ether injector starting fluid is highly flammable and may explode, causing serious injury.

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

Engines may be equipped with a block heater, coolant heater or fuel heater as cold weather starting aids. The PowerTech Plus™ engines are equipped with glow plugs as an automatic cold weather starting aid.

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.

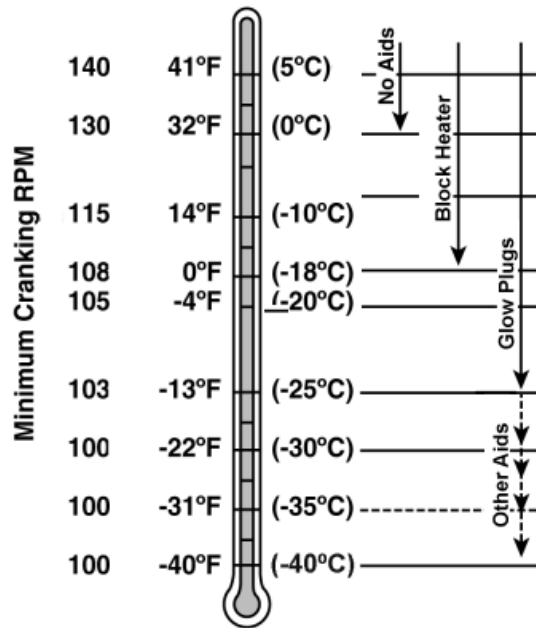
Using correct grade of oil (per engine and machine operator's manual) is critical to achieving adequate cold weather cranking speed.

If air temperature is below -10°C (14°F), use an engine block heater.

Other cold weather starting aids are required at temperatures below -25°C (-13°F) or at altitudes above 1500 m (5000 ft). (See "Using a Booster Battery or Charger" later in this section.)



Handle Starting Fluid with Care



Cold Weather Starting Guidelines

TS1356 -UN-18MAR92

RG13804 -19-24NOV04

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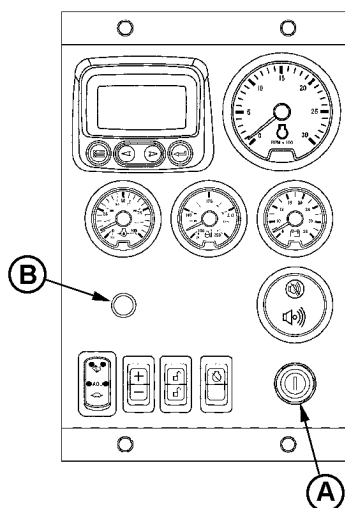
OURGP12,0000089 -19-22SEP04-1/2

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

NOTE: Glow plugs operate automatically through the ECU. The Engine Preheater Indicator light (B) on these engines, should always illuminate when the switch is turned ON. In warm weather, the light illuminates briefly as a light check. In cold weather, the light remains on during the automatic operation of the glow plugs. Operating time depends on temperature. Do not crank engine until light turns off.

2. Turn key start switch (A) ON to activate glow plugs, but DO NOT crank engine until Engine Preheater Indicator light (B) turns off.
3. Follow remaining steps 5—7 as listed earlier in “Starting Engine” section.

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



Activating Glow Plugs with Key Start Switch

A—Key Start Switch

RG13864 —UN—28JAN05

OURGP12,0000089 —19—22SEP04—2/2

Using a Booster Battery or Charger

A 12-volt booster battery can be connected in parallel with battery (ies) on the unit to aid in cold weather starting. ALWAYS use heavy duty jumper cables.

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 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.

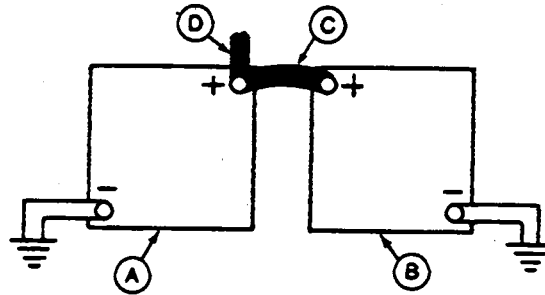
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

NOTE: To avoid sparks, **DO NOT** allow the free ends of jumper cables to touch the engine.

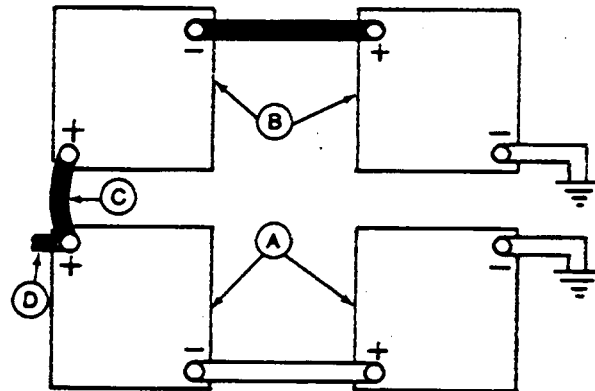
2. Connect one end of jumper cable to the **POSITIVE (+)** post of the booster battery.
3. Connect the other end of the jumper cable to the **POSITIVE (+)** post of battery connected to starter.
4. Connect one end of the other jumper cable to the **NEGATIVE (-)** post of the booster battery.
5. ALWAYS 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).



Exploding Battery



12-Volt System



24-Volt System

A—12-Volt Machine Battery (ies)
 B—12-Volt Booster Battery (ies)
 C—Booster Cable
 D—Cable to Starting Motor

TS204 -JUN-23AUG88

RG4678 -JUN-14DEC88

RG4698 -JUN-14DEC88

6. Start the engine. Disconnect jumper cables immediately after engine starts. Disconnect NEGATIVE (–) cable first.

RG, RG34710, 5564 –19–20MAY96–2/2

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 800 rpm at factory. 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).

OURGP12,00000AE –19–16NOV04–1/1

Changing Engine Speed

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

Engine 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 (-).

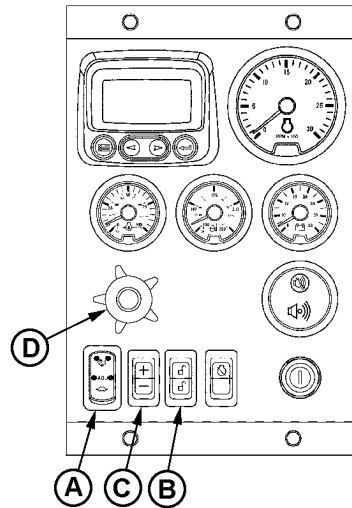
NOTE: Slow (turtle) position is factory preset at low engine idle, while middle (ADJ) position is factory set at high engine idle.

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.



Changing Engine Speed with Full-Featured Panel

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

RG13725 -JUN-11NOV04

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.*

OURGP12,000008A -19-22SEP04-2/3

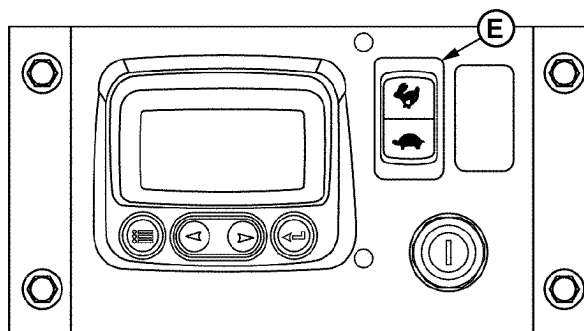
Changing engine speeds on engines equipped with the Basic Instrument Panel

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 above steps must be repeated for each speed change.



RG13289 -UN-30OCT03

Changing Engine Speed With Basic Panel

E—High-Low Speed Select Rocker Switch

OURGP12,000008A -19-22SEP04-3/3

Stopping The Engine

1. Disengage clutch, if equipped, controlling engine power driveline.

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.

2. Run engine at 1000—1200 rpm for at least 2 minutes to cool.

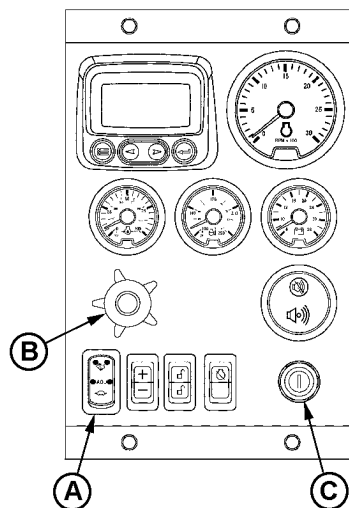
3. Set either High-Low Speed Select Rocker Switch (A) or Analog Throttle (B) to low idle, and set desired speed with remaining control.

NOTE: Engine Control Unit (ECU) reads the higher of the High-Low Speed Select Rocker Switch or the Analog Throttle(s) Speed settings.

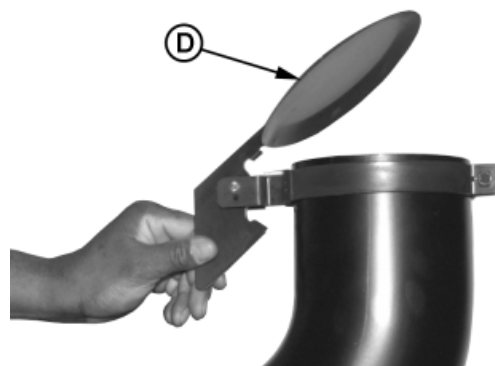
4. Push in on analog throttle potentiometer handle (if equipped) so that engine goes to slow idle, or set slow speed with High-Low Speed Select Rocker Switch.

5. Turn key switch (C) to "OFF" position to stop the engine. Remove ignition key.

IMPORTANT: Make sure that exhaust stack rain cap (D) is installed when engine is not running. This will prevent water and dirt from entering engine.



Stopping the Engine



Exhaust Stack Rain Cap

- A—High-Low Speed Select Rocker Switch
- B—Analog Throttle (Optional)
- C—Key Switch
- D—Exhaust Stack Rain Cap

RG13726 -UN-11NOV04

RG13727 -UN-11NOV04

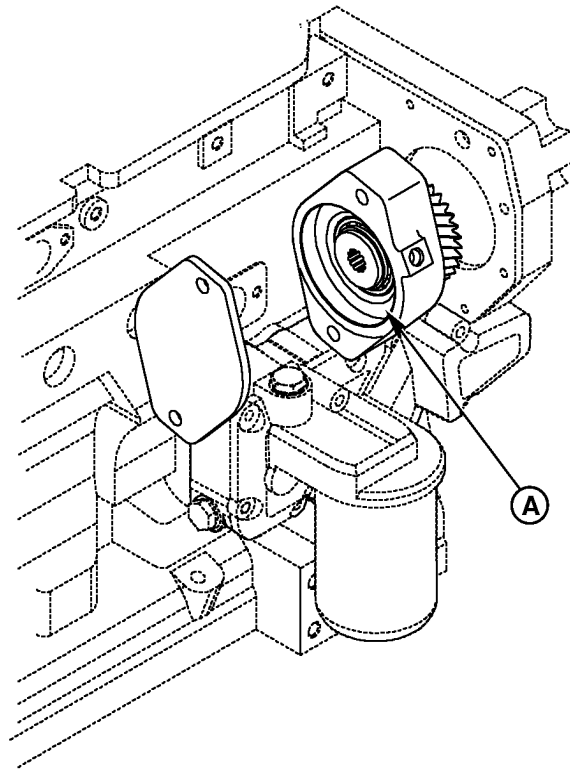
OURGP12,000008B -19-22SEP04-1/1

Auxiliary Gear Drive Limitations

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

- 30 kW (40 hp) Continuous Operation at 2500 rpm
- 37 kW (50 hp) Intermittent Operation at 2500 rpm

A—Auxiliary Gear Drive



Auxiliary Gear Drive

RG7634A -JUN-22JAN99

RG, RG34710, 5555 -19-20MAY96-1/1

Generator Set (Standby) Applications

To assure that your engine will deliver efficient standby 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 extended period of time with no load.

RG, RG34710, 5556 -19-20MAY96-1/1

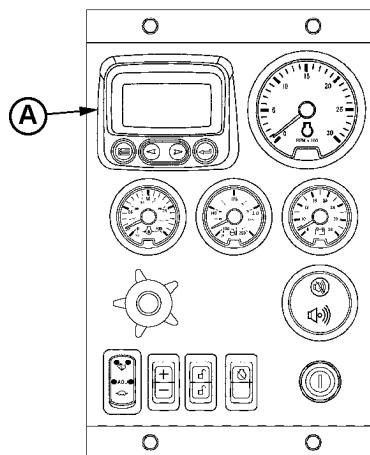
Lubrication and Maintenance

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. 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 Instrument Panel

RG13728 —UN-11NOV04

OURGP12,000008C —19-24SEP04-1/1

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 engine distributor, servicing dealer 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.



John Deere Parts Network

TS100 —UN-23AUG88

DPSG,OUOE003,20 —19-06JAN99-1/1

Lubrication and Maintenance Service Interval Chart—Standard Industrial Engines

NOTE: The service intervals below are for standard industrial engines. See details in Sections which follow these charts.

Item	Lubrication and Maintenance Service Intervals			
	Daily	500 Hour/ 12 Month	2000 Hour/ 24 Month	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	•			
Service Fire Extinguisher		•		
Check Engine Mounts		•		
Service Battery		•		
Change Engine Oil And Replace Oil Filter ^{b, c}		•		
Check Crankcase Vent System		•		
Check Air Intake Hoses, Connections, & System		•		
Replace Fuel Filter Elements		•		
Check Automatic Belt Tensioner and Belt Wear		•		
Check Engine Electrical Ground Connection		•		
Check Cooling System		•		
Coolant Solution Analysis-Add SCAs as required		•		
Pressure Test Cooling System		•		
Check Engine Speeds		•		
Check Crankshaft Vibration Damper (6.8 L Engines) ^d			•	
Flush and Refill Cooling System ^e			•	
Test Thermostats			•	
Check and Adjust Engine Valve Clearance			•	
Test Glow Plugs			•	
Add Coolant				•
Replace Air Cleaner Elements				•
Replace Fan and Alternator Belts				•

^aReplace 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.

^bDuring engine break-in, change the oil and filter for the first time after 100 hours of operation (maximum).

^cService 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.)

^dReplace crankshaft damper every 4500 hours or 60 months, whichever occurs first.

^eIf 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.

Lubrication and Maintenance

	Lubrication and Maintenance Service Intervals			
Item	Daily	500 Hour/ 12 Month	2000 Hour/ 24 Month	As Required
Check Fuses				•
Check Air Compressor (If Equipped)				•
Bleed Fuel System				•

OURGP12,00000F3 -19-22APR05-2/2

Lubrication and Maintenance Service Interval Chart—Generator (Standby) Applications

NOTE: Use service intervals listed below for generator (standby) applications. Match service items

below to titles in Lubrication and Maintenance Sections for procedures.

Item	Lubrication and Maintenance Service Intervals			
	Every 2 Weeks	500 Hours or 12 Months	2000 Hours or 24 Months	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 ^a	•			
Visual Walk Around Inspection	•			
Service Fire Extinguisher		•		
Check Engine Mounts		•		
Service Battery		•		
Change Engine Oil And Replace Oil Filter ^{b, c}		•		
Check Crankcase Vent System		•		
Check Air Intake Hoses, Connections, & System		•		
Replace Fuel Filter Elements		•		
Check Automatic Belt Tensioner and Belt Wear		•		
Check Engine Electrical Ground Connection		•		
Check Cooling System		•		
Coolant Solution Analysis-Add SCAs as required		•		
Pressure Test Cooling System		•		
Check Engine Speeds		•		
Check Crankshaft Vibration Damper (6.8 L Engines) ^d			•	
Flush and Refill Cooling System ^e			•	
Test Thermostats			•	
Check and Adjust Engine Valve Clearance			•	
Test Glow Plugs			•	
Add Coolant				•
Replace Air Cleaner Elements				•

^aReplace 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.

^bDuring engine break-in, change the oil and filter for the first time after 100 hours of operation (maximum).

^cService 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.)

^dReplace crankshaft damper every 4500 hours or 60 months, whichever occurs first.

^eIf 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.

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OURGP12,00000F4 -19-22APR05-1/2

Lubrication and Maintenance

Item	Lubrication and Maintenance Service Intervals			
	Every 2 Weeks	500 Hours or 12 Months	2000 Hours or 24 Months	As Required
Replace Fan and Alternator Belts				•
Check Fuses				•
Check Air Compressor (If Equipped)				•
Bleed Fuel System				•

OURGP12,0000F4 -19-22APR05-2/2

Lubrication & Maintenance/Daily

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 crosshatch marks (B) on the dipstick.

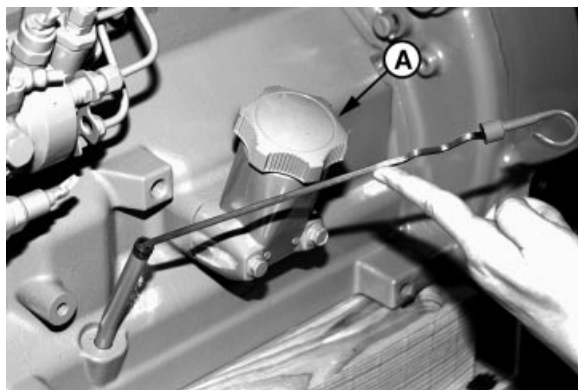
1. Check engine oil level on dipstick. Add as required, using seasonal viscosity grade oil. (See **DIESEL ENGINE OIL** in Fuels, Lubricants, and Coolant Section for oil specifications.)

Depending on application, oil may be added at oil filler cap (A) on left side of engine, right side of engine (not shown), or rocker arm cover location.

IMPORTANT: DO NOT fill above the top mark on the dipstick. Oil levels anywhere within crosshatch marks (B) are considered in the acceptable operating range.

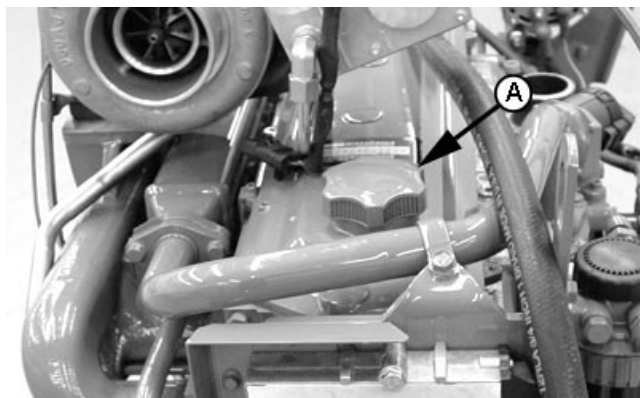
A—Oil Filler Cap

B—Crosshatch Marks On Dipstick



RG8009A -UN-16JUN00

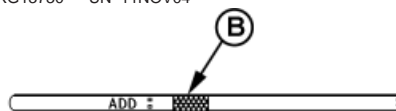
Oil Filler Cap (Left Side)



RG13731 -UN-11NOV04

Oil Filler Cap (Rocker Arm Cover)

RG13730 -UN-11NOV04



Crosshatch on Dipstick

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OURGP12,000008F -19-24SEP04-1/4

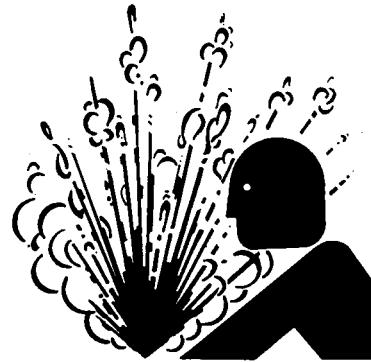
CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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.

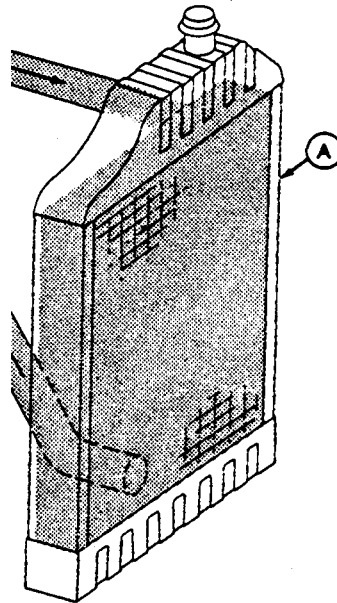
2. Check the coolant level when engine is cold. Coolant level should be at bottom of filler neck. Fill radiator (A) with proper coolant solution if level is low. (See **ADDING COOLANT** in Service As Required Section.) Check overall cooling system for leaks.

NOTE: Refer to your vehicle's operator's manual for recommendations for non-John Deere supplied accessories.

A—Fill Radiator



High-Pressure Fluids



Fill Radiator

RG4675 -UN-14DEC88

TS281 -UN-23AUG88

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OURGP12,000008F -19-24SEP04-2/4

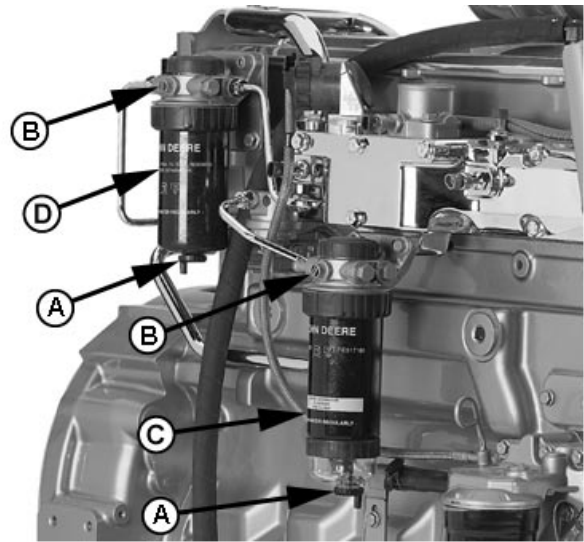
NOTE: Engine is equipped with a water-in-fuel sensor at the primary fuel filter (C). Indicator light will signal the operator that water should be drained from the filter bowl.

3. Check the primary fuel filter (C) and the final fuel filter (D) for water or debris. If filter is fitted with a see-through bowl, drain as needed based on a daily visual inspection.

IMPORTANT: Drain water into a suitable container and dispose of properly.

- a. Loosen drain plugs (A) at bottom of fuel filters or bowls, if equipped, half turn to one turn.
- b. Loosen air bleed plugs (B) two full turns on fuel filter mounting and drain water from bottom until fuel starts to drain out.
- c. When fuel starts to drain out, tighten drain plugs securely.

After draining water from the fuel filters, the filters must be primed by bleeding all air from the fuel system. See BLEEDING FUEL SYSTEM in Service As Required Section, later in this manual



Drain Fuel Filters

- A—Drain Plug
- B—Air Bleed Plug
- C—Primary Fuel Filter
- D—Final Fuel Filter

RG13808 -JN-07DEC04

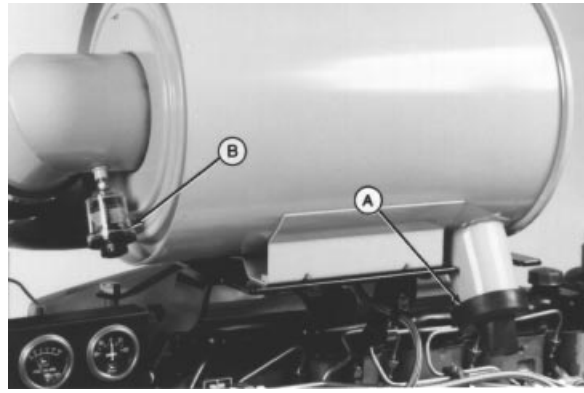
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OURGP12,000008F -19-24SEP04-3/4

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.

If equipped with air intake restriction indicator gauge (B), check gauge to determine if air cleaner needs to be serviced.

IMPORTANT: Maximum air intake restriction is 6.25 kPa (0.06 bar) (1.0 psi) (25 in. H₂O). A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.



RG7332A -UN-22JAN99

Dust Unloader Valve and Indicator Gauge

A—Dust Unloader Valve
B—Air Restriction Indicator

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 buildup 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.
- 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 indicate the need to replace the coolant pump seal. Contact your engine distributor or servicing dealer for repairs.

OURGP12,000008F -19-24SEP04-4/4

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



Fire Extinguisher

OURGP12,00000B9 -19-19NOV04-1/1

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, 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.

OURGP11,0000110 -19-16OCT03-1/1

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.



Exploding Battery

TS204 -JUN-23AUG88

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

OURGP12,00000DE -19-04JAN05-1/2

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:

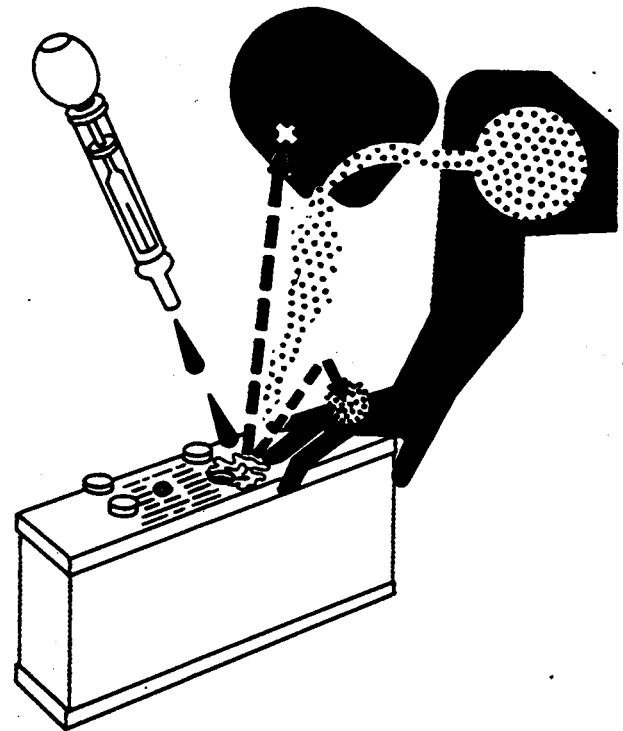
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

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 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.



Sulfuric Acid

TS203 -UN-23AUG88

In freezing weather, run engine at least 30 minutes to assure thorough mixing after adding water to battery.

If necessary to replace battery(ies), replacements must meet or exceed the following recommended capacities at -18°C (0°F):

Specification

12 Volt Standard Duty Starter—	
Cold Cranking Amps	640
12 Volt Heavy Duty Starter—Cold	
Cranking Amps	800
24 Volt Standard Duty Starter—	
Cold Cranking Amps	570

Changing Engine Oil and Replacing Filter

IMPORTANT: Changing engine oil and filter every 500 hours or 12 months depends on the following requirements:

- Use of John Deere PLUS-50™ or ACEA-E6/E7 oil;
- Use of an approved John Deere oil filter;
- Use of diesel fuel with sulfur content less than 1000 ppm (0.10%);
- Engine equipped with an extended drain interval oil pan.

The oil and filter change interval is reduced if **ANY** of the above listed requirements are not followed. (Refer to **DIESEL ENGINE OIL AND FILTER SERVICE INTERVALS**, in **Fuels, Lubricants, and Coolant Section**.)

NOTE: During **break-in**, change engine oil and filter for the first time before **100** hours maximum of operation.

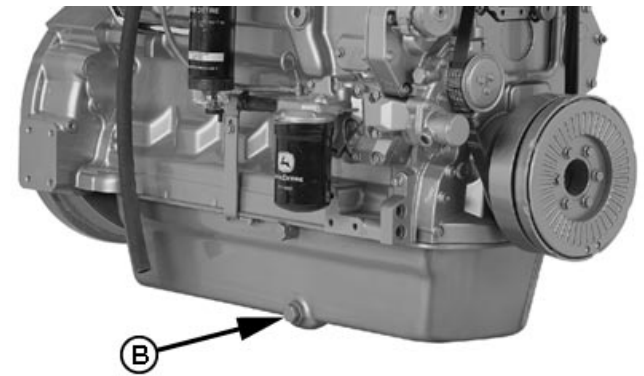
OILSCAN™ or OILSCAN PLUS™ is a John Deere sampling program to help you monitor machine performance and identify potential problems before they cause serious damage. OILSCAN™ and OILSCAN PLUS™ kits are available from your John Deere engine distributor or servicing dealer. Oil samples should be taken prior to the oil change. Refer to instructions provided with kit.

To change engine oil and oil filter:

1. Run engine approximately 5 minutes to warm up oil. Shut engine off.
2. Remove oil pan drain plug (B).
3. Drain crankcase oil from engine while warm.



Special Oil Filter



Oil Pan Drain Plug

A—Oil Filter
B—Oil Pan Drain Plug

PLUS-50 is a trademark of Deere & Company.
OILSCAN is a trademark of Deere & Company.
OILSCAN PLUS is a trademark of Deere & Company.

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OURGP12,00000FC -19-26APR05-1/4

NOTE: Drain plug location may vary, depending on the application.

OURGP12,00000FC -19-26APR05-2/4

4. Turn filter element (A) using a suitable filter wrench to remove. Discard oil filter element.

NOTE: Depending on engine application, oil filter may be located on either side of the engine in a high- or low-mount location.

IMPORTANT: Filtration of oils is critical to proper lubrication. Always change filter regularly. Use filter meeting John Deere performance specifications.

5. Apply clean engine oil to the new filter at the inner (B) and outer (C) seals and to filter threads.

6. Wipe both sealing surfaces of the header (D, E) with a clean rag. Ensure notches in dust seal (F) are properly installed in the slots in the housing. Replace dust seal if damaged.

IMPORTANT: When installing filter element, **HAND TIGHTEN** only. A filter wrench may be used for **REMOVAL ONLY**. Be sure notches in dust seal (F) are properly installed in the slots in the housing.

7. Install and tighten oil filter by hand until firmly against dust seal (F). DO NOT apply an extra 3/4 to 1-1/4 turn after gasket contact as done with standard filters.

8. Tighten drain plug to specifications.

Specification

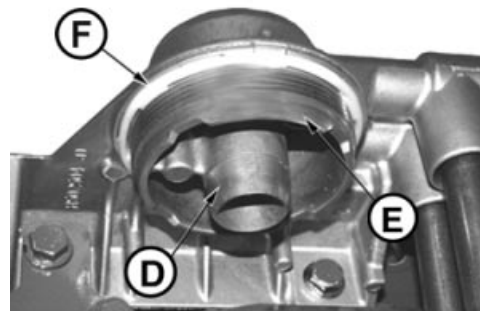
Oil Pan Drain Plug With Copper Washer—Torque	70 N•m (52 lb ft)
Oil Pan Drain Plug With O-Ring—Torque	50 N•m (37 lb ft)
Oil Pan Drain Plug With Packing (6068 Engine Code 1961, Steel Oil Pan)—Torque.....	40 N•m (29 lb ft)
Bi-Material Oil Pan Drain Plug—Torque	30 Nm (22 lb ft)



Oil Filter And Mounting Header



Oil Filter Seals



Filter And Mounting Header

- A—Oil Filter Element
- B—Inner Seal
- C—Outer Seal
- D—Sealing Surface On Header
- E—Sealing Surface On Header
- F—Dust Seal

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OURGP12,00000FC -19-26APR05-3/4

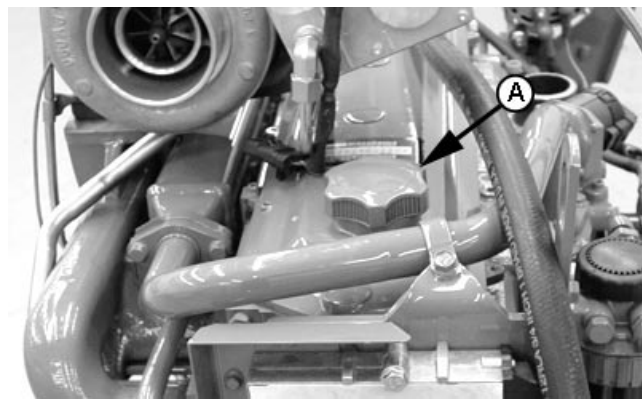
9. Fill engine crankcase with correct John Deere engine oil through rocker arm cover oil filler cap (A) or oil filler cap on either side of engine depending on engine application. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

To determine the correct oil fill quantity for your engine, see ENGINE CRANKCASE OIL FILL QUANTITIES in the Specifications Section of this manual.

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.

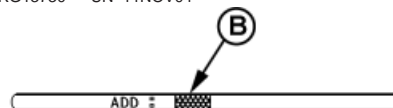
NOTE: Crankcase oil capacity may vary slightly. ALWAYS fill crankcase within crosshatch marks on dipstick. DO NOT overfill.

10. Start engine and run to check for possible leaks.
11. Stop engine and check oil level after 10 minutes. Oil level reading should be within crosshatch marks (B) on dipstick.



Rocker Arm Cover Oil Filler

RG13730 -UN-11NOV04



Side Oil Filler

A—Rocker Arm Cover Oil Filler Cap
B—Crosshatch Marks

OURGP12.00000FC -19-26APR05-4/4

Checking Crankcase Vent System

Crankcase Vent Tube (If Equipped)

If you operate the engine in dusty conditions, check the system at shorter intervals.

1. If equipped, remove and clean crankcase vent tube (A).
2. Install the vent tube. Be sure the O-ring fits correctly in the rocker arm cover for elbow adapter. Tighten hose clamp securely.

A—Crankcase Vent Tube



Crankcase Vent Tube

OURGP12.00000A8 -19-30SEP04-1/1

Checking Air Intake System

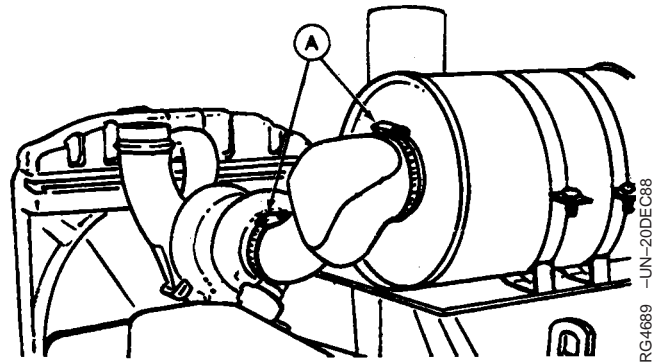
IMPORTANT: The air intake system must not leak. Any leak, no matter how small, may result in internal engine damage due to abrasive dirt and dust entering the intake system.

1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps (A) on piping which connect the air cleaner, engine and, if present, turbocharger. 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.

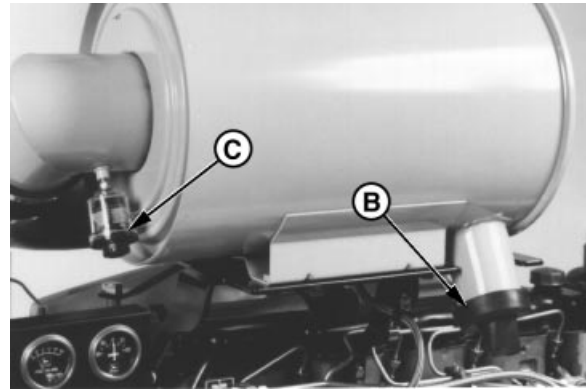
IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

4. Test air restriction indicator (C) for proper operation. Replace indicator as necessary.

IMPORTANT: If not equipped with air restriction indicator, replace air cleaner elements at 500 Hours or 12 Months, whichever occurs first.



Check Clamps



Unloader Valve and Air Restriction Indicator

A—Clamps
B—Dust Unloader Valve
C—Air Restriction Indicator

OURGP12,00000BA -19-19NOV04-1/1

Replacing Fuel Filter Elements

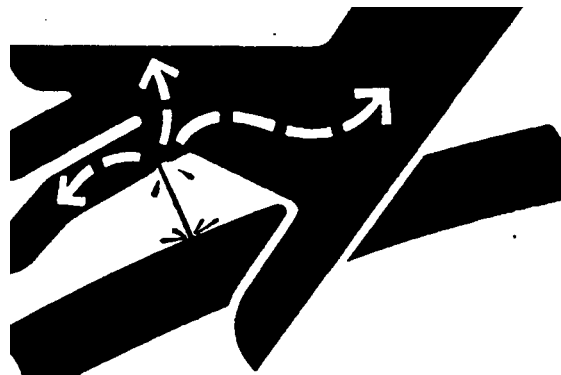
Engines may be equipped with dual fuel filters: a primary filter (F) with water bowl, and a final filter (B). Both filters are replaced at the same 500-hour interval or every 12 months.

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.

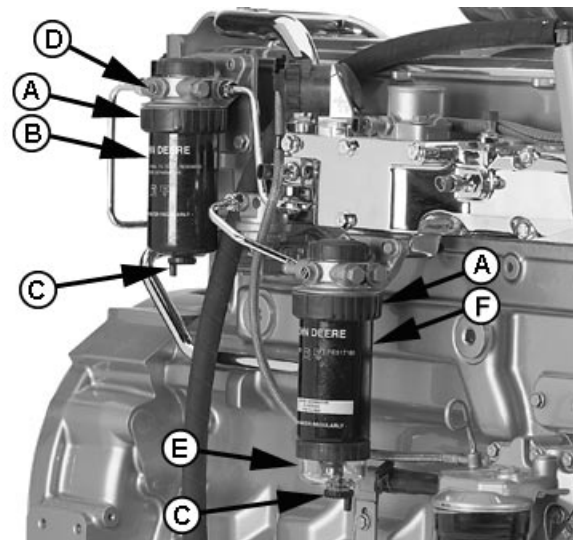
If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

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 500 hours operation, whichever comes first.

1. Close fuel shut-off valve, if equipped.
2. Thoroughly clean fuel filter assemblies and surrounding areas.
3. Disconnect water sensor wiring from primary fuel filter.
4. Loosen drain plugs (C) and drain fuel into a suitable container.



High-Pressure Fluids



Fuel Filters

- A—Retaining Ring
- B—Final Fuel Filter Element
- C—Drain Plug
- D—Bleed Plug
- E—Water Separator Bowl
- F—Primary Fuel Filter Element

X9811 -UN-23AUG88

RG13807 -UN-02DEC04

NOTE: Lifting up on retaining rings (A) as they are rotated helps to get them past raised locators.

5. Firmly grasp the retaining rings (A) and rotate them clockwise 1/4 turn (when viewed from the top). Remove ring with final fuel filter element (B) and with primary fuel filter element (F).
6. Loosen ring and remove water separator bowl (E) with primary fuel filter element. Drain and clean bowl. Dry bowl with compressed air.
7. Inspect filter mounting base for cleanliness. Clean as required.

NOTE: Raised locators on fuel filter canisters must be indexed properly with slots in mounting base for correct installation.

8. Install new filter elements onto mounting bases. Be sure elements are properly indexed and firmly seated on bases. It may be necessary to rotate filters for correct alignment.
9. Align keys on filter element with slots in filter base.
10. Install retaining ring onto mounting base making certain dust seal is in place on filter base. Hand tighten ring counterclockwise (about 1/3 turn) until it "snaps" into the detent. DO NOT overtighten retaining ring.

NOTE: The proper installation is indicated when a "click" is heard and a release of the retaining ring is felt.

A plug is provided with the new element for plugging the used element.

11. Install water separator bowl on primary fuel filter and tighten ring.
12. Reconnect water sensor wiring.
13. Open fuel shut-off valve and bleed the fuel system. (See BLEEDING FUEL SYSTEM in Service As Required Section.) Tighten bleed plug (D).

Checking Belt Tensioner Spring Tension and Belt Wear (Automatic Tensioner)

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.

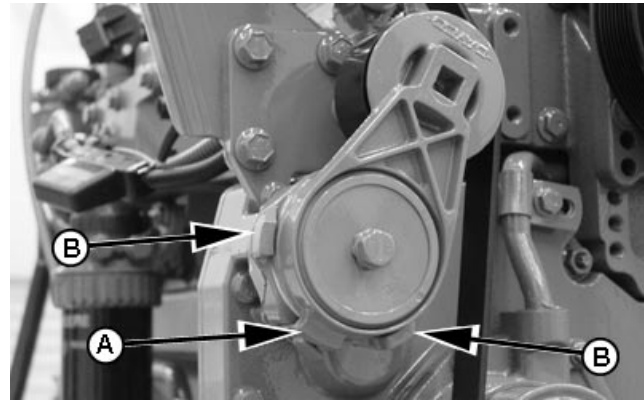
OURGP12.00000AA -19-30SEP04-1/3

Checking Belt Wear

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 cast stop (A) on swing arm is hitting either fixed cast stop (B), check mounting brackets (alternator, belt tensioner, idler pulley, etc.) and the belt length. Replace belt as needed (see REPLACING FAN AND ALTERNATOR BELTS in Service As Required Section).



Cast Stops

A—Tensioner Cast Stop
B—Fixed Cast Stop

Continued on next page

OURGP12.00000AA -19-30SEP04-2/3

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 breaker bar in square hole in tension arm. Remove belt from pulleys.

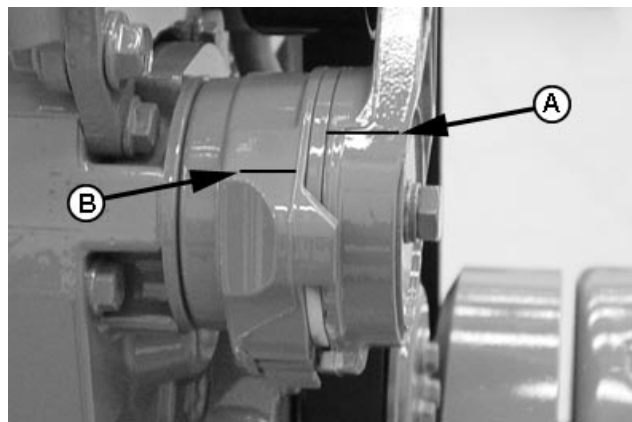
NOTE: While belt is removed, inspect pulleys and bearings. Rotate and feel for hard turning or any unusual sounds. If pulleys or bearings need replacement, see your John Deere dealer.

2. Release tension on tension arm and remove breaker bar.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 21 mm (0.83 in.) from (A) and put a mark (B) on tensioner mounting base.
5. Install torque wrench (C) so that it is aligned with centers of pulley and tensioner. 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.

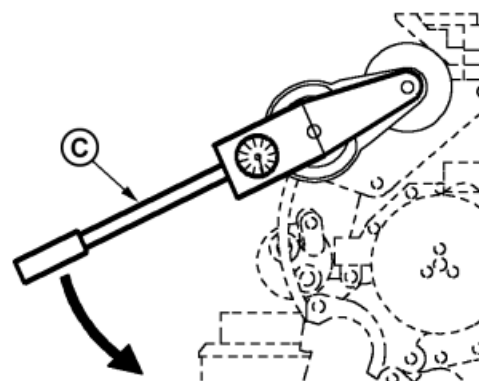
Specification

Spring Tension—Torque 18-22 N•m (13-16 lb-ft)

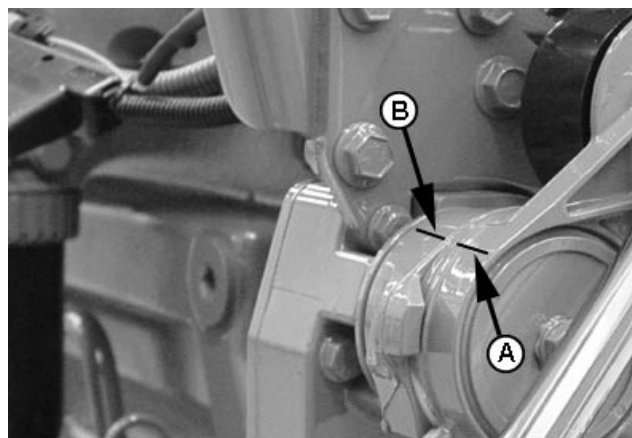
NOTE: Threads on belt tensioner roller cap screw are **LEFT-HAND** threads



Marks on Tensioner



Align Torque Wrench With Pulley and Tensioner



Align Marks

A—Mark On Swing Arm
B—Mark On Tensioner Mounting Base
C—Torque Wrench

OURGP12,00000AA -19-30SEP04-3/3

Checking Engine Electrical Ground Connections

Keep all engine ground connections clean and tight to prevent electrical arcing which can damage electronic components.

Also see precautions in Troubleshooting Section when welding on engine or machine.

OUOD002,0000169 -19-23NOV01-1/1

Checking Cooling System

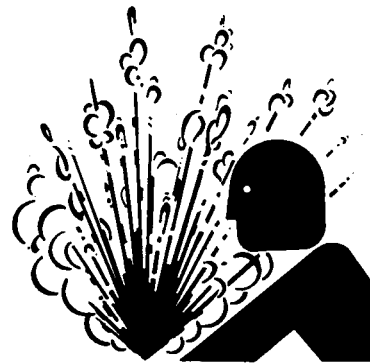


CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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.

1. Visually check entire cooling system for leaks. Tighten all clamps securely.
2. Thoroughly inspect all cooling system hoses for hard, flimsy, or cracked condition. Replace hoses if any of the above conditions are found.
3. Inspect the coolant pump for wear or leakage.



High-Pressure Fluids

TS281 -UN-23AUG88

OURGP11,0000151 -19-06JAN04-1/1

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.

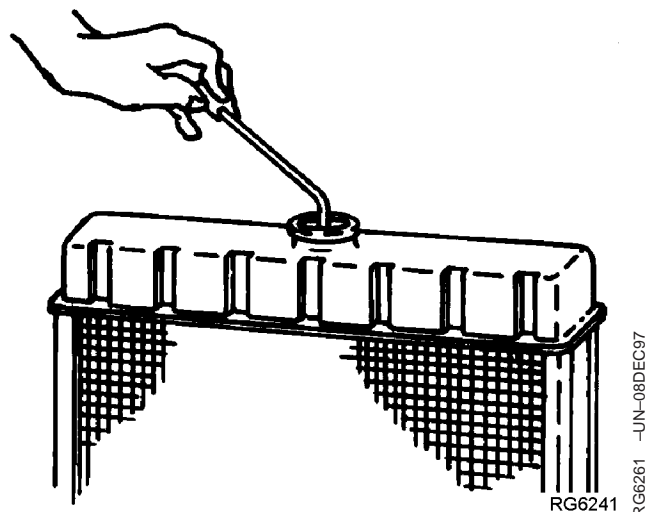
Through time and use, the concentration of coolant additives is gradually depleted during engine operation. Periodic replenishment of inhibitors is required, even when John Deere COOL-GARD™ is used. The cooling system must be recharged with additional supplemental coolant additives available in the form 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.

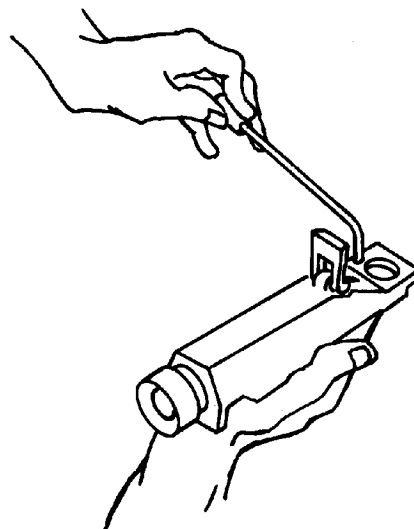
John Deere LIQUID COOLANT CONDITIONER is recommended as a supplemental coolant additive in John Deere engines.

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.



Radiator Coolant Check



JT07298 Coolant/Battery Tester

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COOLSCAN is a trademark of Deere & Company
COOLSCAN PLUS is a trademark of Deere & Company

Continued on next page

OURGP11,000004C -19-22FEB05-1/2

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 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.

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 -19-22FEB05-2/2

Testing Diesel Engine Coolant

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.

Compare the results to the supplemental coolant additive (SCA) chart to determine the amount of inhibiting additives in your coolant and whether more John Deere COOLANT CONDITIONER should be added.

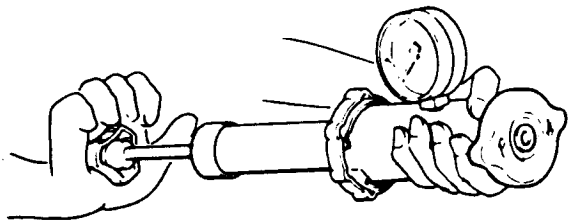
COOLSCAN™ and COOLSCAN PLUS™

For a more thorough evaluation of your coolant, perform a COOLSCAN or COOLSCAN PLUS analysis, where available. See your John Deere dealer for information.

COOLSCAN is a trademark of Deere & Company
COOLSCAN PLUS is a trademark of Deere & Company

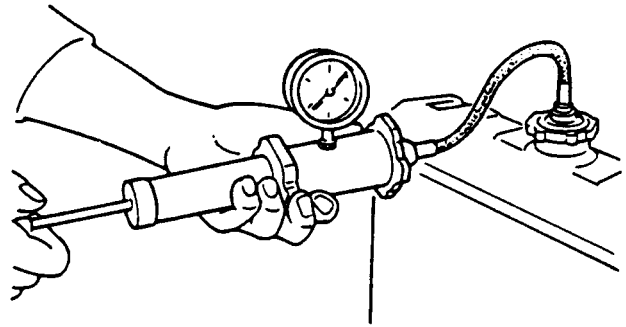
DX,COOL9 -19-19DEC03-1/1

Pressure Testing Cooling System



Test Radiator Cap

RG6557 -JUN-20JAN93



Test Cooling System

RG6558 -JUN-20JAN93

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: These tests apply only to John Deere radiators. For other brands, see manufacturers literature.

Test Radiator Cap

1. Remove radiator cap and attach to D05104ST Tester as shown.
2. Pressurize cap to specification listed. Gauge should hold pressure for 10 seconds at least to pressure listed if cap is acceptable.

If gauge does not hold pressure, replace radiator cap.

Specification

Radiator Cap Holding Pressure
(Not Opening For 10
Seconds)—Pressure..... 100 kPa (1.0 bar) (14.5 psi)

3. Remove the cap from gauge, turn it 180°, and retest cap. This will verify that the first measurement was accurate.

Test Cooling System

NOTE: Engine should be warmed up to test overall cooling system.

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 specification listed for radiator cap.
4. With pressure applied, check all cooling system hose connections, radiator, and overall engine for leaks.

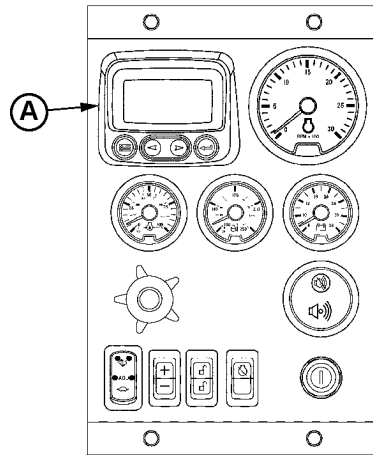
If leakage is detected, correct as necessary and pressure test system again.

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 engine distributor or servicing dealer correct this problem immediately.

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



Using Tachometer to Check Engine Speeds

RG13728 -UN-11NOV04

OURGP12,0000090 -19-28SEP04-1/1

Checking Crankshaft Vibration Damper (6-Cylinder Engine Only)

1. Remove belts (shown removed).
2. Grasp vibration damper with both hands and attempt to turn it in both directions. If rotation is felt, damper is defective and should be replaced.

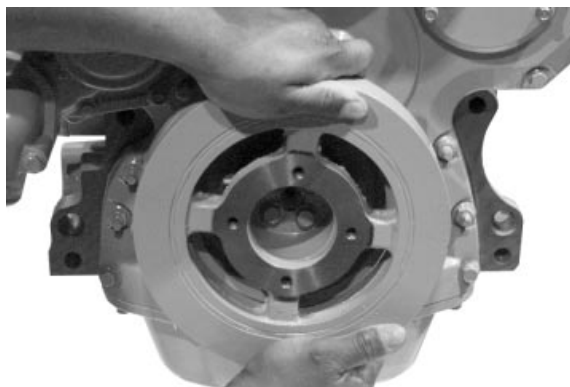
IMPORTANT: The vibration damper assembly is not repairable and should be replaced every 4500 hours or 60 months, whichever occurs first.

3. Check vibration damper radial runout by positioning a dial indicator (A) so probe contacts damper outer diameter.
4. With engine at operating temperature, rotate crankshaft using either JD281A, JDE81-4, or JDE83 Flywheel Turning Tool.
5. Note dial indicator reading. If runout exceeds specifications given below, replace vibration damper.

Specification

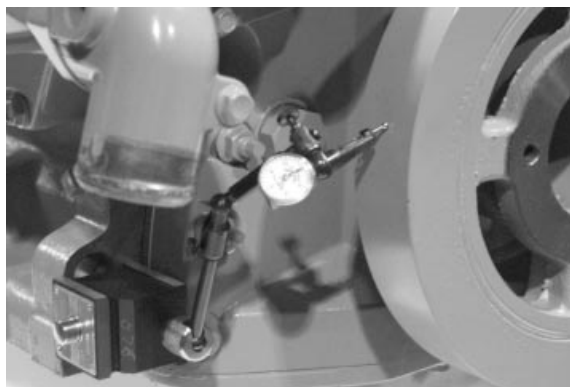
Vibration Damper—Maximum

Radial Runout..... 1.50 mm (0.060 in.)



Grasp Vibration Damper

RG8018 -UN-15JAN99



Check Runout

RG7508 -UN-23NOV97

RG, RG34710, 5585 -19-12NOV01-1/1

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: 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 coolant additive (SCA).**

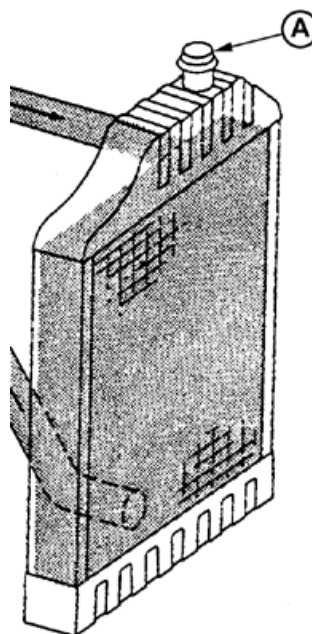
If COOL-GARD is not used, the flushing interval is 2000 hours or 24 months of operation.

Drain old coolant, flush the entire cooling system, test thermostats, and fill with recommended clean coolant per the following procedure.

1. Pressure test entire cooling system and pressure cap if not previously done. (See PRESSURE TESTING COOLING SYSTEM, in the Lubrication and Maintenance/500 Hour/12 Month Section.)
2. Slowly open the engine cooling system filler cap or radiator cap (A) to relieve pressure and allow coolant to drain faster.



High-Pressure Fluids



Radiator Cap

RG12833 -UN-13FEB03

TS281 -UN-23AUG88

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OURGP12,0000091 -19-28SEP04-1/3

NOTE: Oil cooler housing coolant drain plug (A) is normally preferred, as it is the lowest drain location. Engine block drain plug (B), located behind the fuel rail, is not easily accessible. Block heater ports (C) are another option for draining. These engines use several different oil filter adapters. Use either drain plug (A) or (B), or block heater ports (C), to drain coolant, whichever is more accessible for the oil filter adapter on your engine.

3. Open oil cooler housing coolant drain plug (A), engine block drain plug (B), or block heater ports (C). Drain all coolant from engine block.
4. Open radiator drain valve. Drain all coolant from radiator.
5. Remove thermostats at this time, if not previously done. Install cover (without thermostats and seals) and tighten cap screws to specifications.

Specification

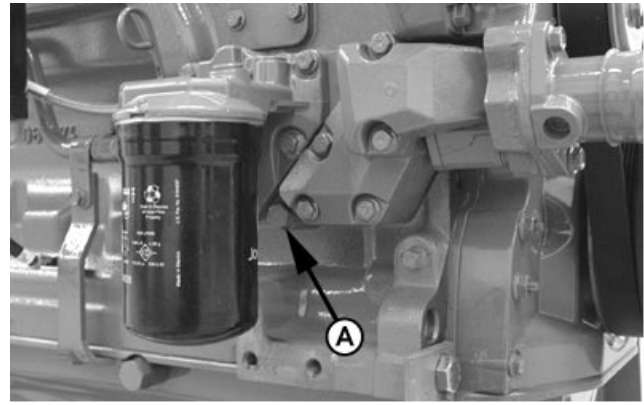
Thermostat Cover Cap Screw—

Torque 66—80 N•m (49—59 lb-ft)

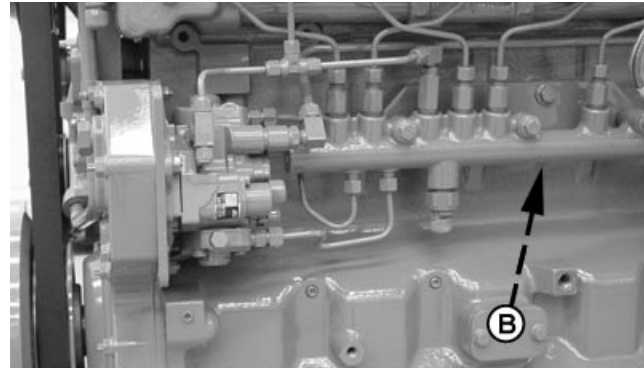
6. Test thermostat opening temperature. (See Inspecting Thermostats And Testing Opening Temperature in Service As Required Section.)
7. Close all drain valves after coolant has drained.

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.

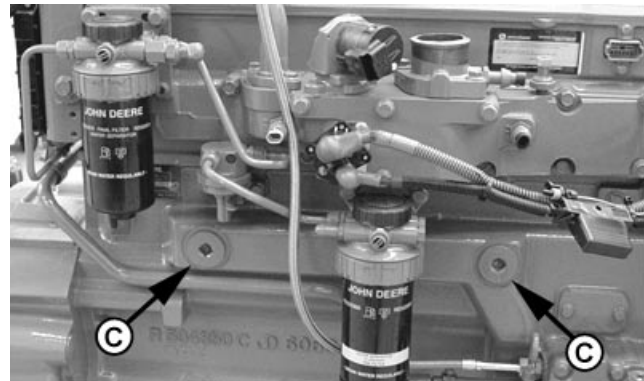
8. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
9. Stop engine, pull off lower radiator hose and remove radiator cap. Immediately drain the water from system before rust and sediment settle.



Oil Cooler Housing Coolant Drain Plug



Engine Block Coolant Drain Plug



Block Heater Ports

A—Oil Cooler Housing Coolant Drain Plug
B—Engine Block Drain Plug
C—Block Heater Ports

10. After draining water, close drain valves. Reinstall radiator cap and radiator hose and clamp. Fill the cooling system with clean water and a heavy duty cooling system cleaner such as Fleetguard® RESTORE™ and 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, remove radiator cap and pull off lower radiator hose to drain out flushing water.
12. Close all drain valves on engine and radiator. Reinstall radiator hose and tighten clamps securely. Install thermostats using a new gasket. (See TESTING THERMOSTATS OPENING TEMPERATURE later in this section.)

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head to allow air to escape when filling system. Retighten fitting or plug after filling cooling system.

13. Add coolant to radiator until coolant touches bottom of filler neck. (See specification for capacity, which can vary with application.) Install radiator cap.

Specification

4.5 L Engine—Coolant Capacity	8.5 L (9 qt)
6.8 L Engine—Coolant Capacity	11.8 L (12.5 qt)

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 engine, check coolant level and entire cooling system for leaks.
16. Inspect the fan belt for wear and check belt tension. (See Checking Belt Tensioner Spring Tension and Belt Wear in Lubrication and Maintenance 500 Hour/12 Month section.

*Fleetguard is a trademark of Cummins Engine Company, Inc.
RESTORE is a trademark of Fleetguard.
RESTORE PLUS is a trademark of Fleetguard.*

OURGP12,0000091 -19-28SEP04-3/3

Testing Thermostats Opening Temperature

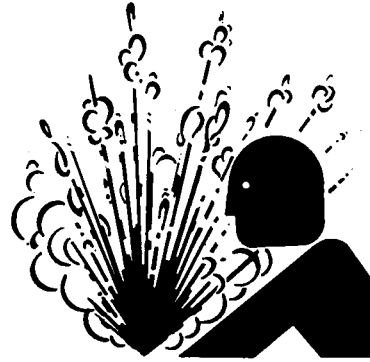
To Remove Thermostats



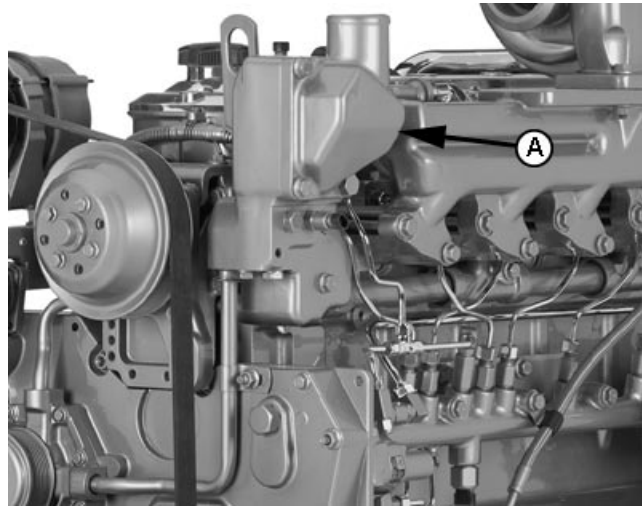
CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns. **DO NOT** drain coolant until it has cooled below operating temperature. Always loosen radiator pressure cap or drain valve slowly to relieve pressure.

1. Visually inspect area around thermostat housing for leaks.
2. Remove radiator pressure cap and partially drain cooling system.
3. Remove thermostat cover (A). Clean and check cover for cracks or damage

A —Thermostat Cover



High Pressure Fluids



Thermostat Cover

TS281 -JUN-23AUG88

RG13737 -JUN-11NOV04

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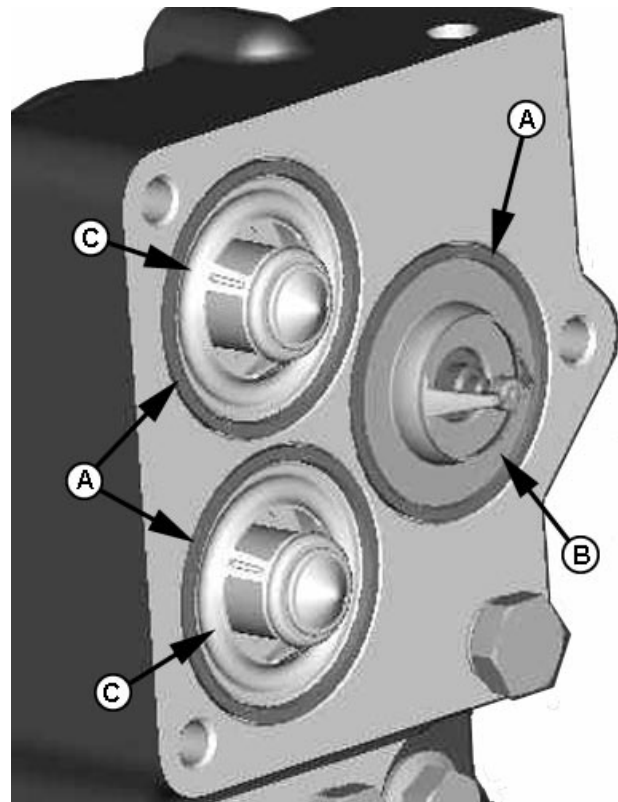
OURGP12,00000F6 -19-22APR05-1/4

IMPORTANT: Thermostat type and location may vary. Carefully note the location and position of each thermostat before removing it from the housing for installation purposes

NOTE: Thermostat housing shown has one non-blocking thermostat (B) and two blocking thermostats (C). Thermostats on your engine may be different.

4. Remove all three thermostats from the housing.
5. Remove and discard rubber seal (A) from each of the three thermostats.

A—Rubber Seal
B—Non-Blocking Thermostat
C—Blocking Thermostat



RG-13729 -UN-11NOV04

Thermostats

Continued on next page

OURGP12,00000F6 -19-22APR05-2/4

Testing Thermostats Opening Temperature

NOTE: Perform the following test for the two blocking thermostats as well as for the non-blocking thermostat.

1. Remove thermostats.
2. Visually inspect thermostats for corrosion or damage. Replace as a matched set as necessary.

CAUTION: DO NOT allow thermostat or thermometer to rest against the side or bottom of container when heating water. Either may rupture if overheated.

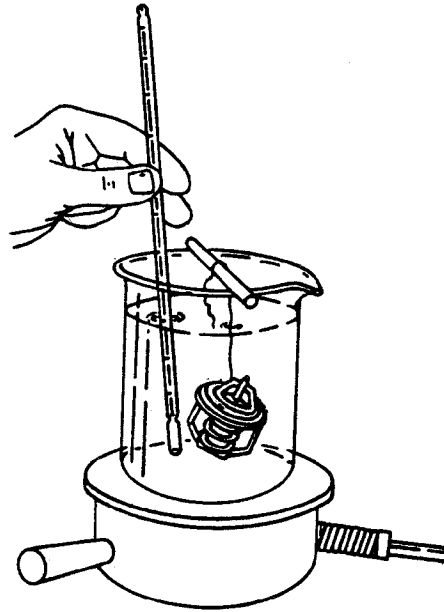
3. Suspend thermostat and a thermometer in a container of water.
4. Stir the water as it heats. Observe opening action of thermostat and compare temperatures with the specification given in chart below.

NOTE: Due to varying tolerances of different suppliers, initial opening and full open temperatures may vary slightly from specified temperatures.

THERMOSTAT TEST SPECIFICATIONS

Rating	Initial Opening (Range)	Full Open (Nominal)
71°C (160°F)	69—72°C (156—162°F)	84°C (182°F)
77°C (170°F)	74—78°C (166—172°F)	89°C (192°F)
82°C (180°F)	80—84°C (175—182°F)	94°C (202°F)
89°C (192°F)	86—90°C (187—194°F)	101°C (214°F)
90°C (195°F)	89—93°C (192—199°F)	103°C (218°F)
92°C (197°F)	89—93°C (193—200°F)	105°C (221°F)
96°C (205°F)	94—97°C (201—207°F)	100°C (213°F)
99°C (210°F)	96—100°C (205—212°F)	111°C (232°F)

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 thermostat is defective, replace all three thermostats.



Testing Thermostat Opening Temperature

RG5971 -UN-23NOV97

Continued on next page

OURGP12,00000F6 -19-22APR05-3/4

To Install Thermostats

1. Install new rubber seal (A) for each thermostat.

IMPORTANT: Install each thermostat in the same location from which it was removed.

NOTE: Thermostat housing shown has one non-blocking thermostat (B) and two blocking thermostats (C). Thermostats on your engine may be different.

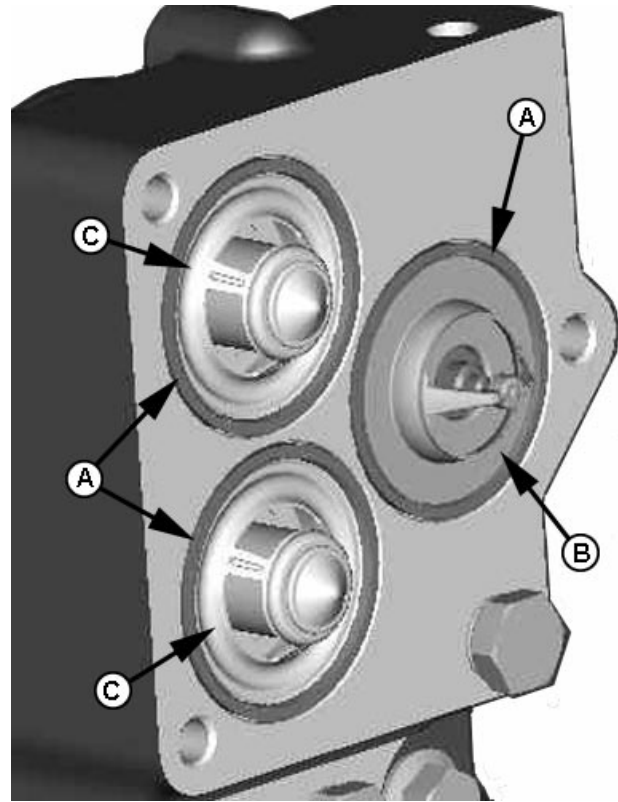
2. Install thermostats into housing **with vent notch or jiggle pin** (whichever is present) in the 12 o'clock position.
3. Install thermostat cover and tighten thermostat cover cap screws to specifications.

Specification

Thermostat Cover Cap Screw—
Torque 73 N•m (55 lb-ft)

4. If not already done, fill cooling system and check for leaks.

IMPORTANT: Air must be expelled from cooling system when filling. Loosen temperature sending unit fitting at rear of cylinder head to allow air to escape when filling system. Tighten fitting or plug when all air has been expelled. Damage to exhaust gas cooler could result if cooling system is not bled properly.



Installing Thermostats

A—Rubber Seal
B—Non-Blocking Thermostat
C—Blocking Thermostat

RG-13729 -UN-11NOV04

OURGP12,00000F6 -19-22APR05-4/4

Checking and Adjusting Valve Clearance



CAUTION: To prevent accidental starting of engine while performing valve adjustments, always disconnect **NEGATIVE (—)** battery terminal.

IMPORTANT: Valve clearance **MUST BE** checked and adjusted with engine **COLD**.

1. Remove rocker arm cover and crankcase ventilator tube.

IMPORTANT: Visually inspect contact surfaces of valve tips, bridges 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.

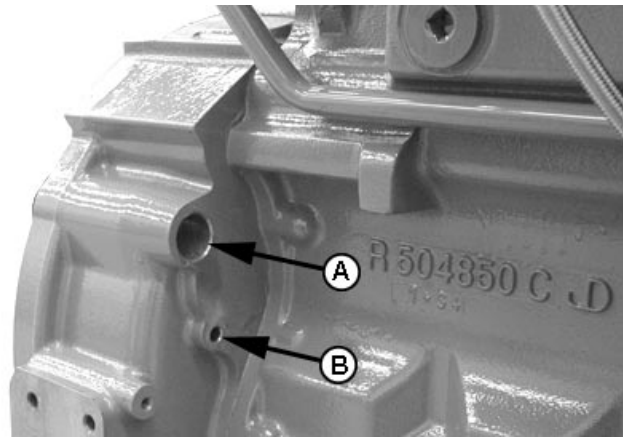
2. Remove plastic plugs or cover plate from engine timing/rotation hole (A) and timing pin hole (B).

NOTE: Some engines are equipped with flywheel housings which do not allow use of an engine flywheel rotation tool. These engines with straight nose crankshafts may be rotated from front nose of engine, using JDG966 Crankshaft Front/Rear Rotation Adapter.

3. Using JDE83 or JDG820 Flywheel Turning Tool, rotate engine flywheel in running direction (clockwise viewed from front) until No. 1 (front) cylinder is at TDC compression stroke. Insert JDG1571 or JDE81-4 Timing Pin in flywheel.

If No. 1 cylinder rocker arms are loose, the engine is at No. 1 TDC compression.

If No. 1 cylinder rocker arms are not loose, rotate engine one full revolution (360°) to No. 1 TDC compression.



RG13749 -UN-11NOV04

Flywheel Housing Timing Holes

A—Timing/Rotation Hole
B—Timing Pin Hole

Continued on next page

OURGP12,0000092 -19-28SEP04-1/4

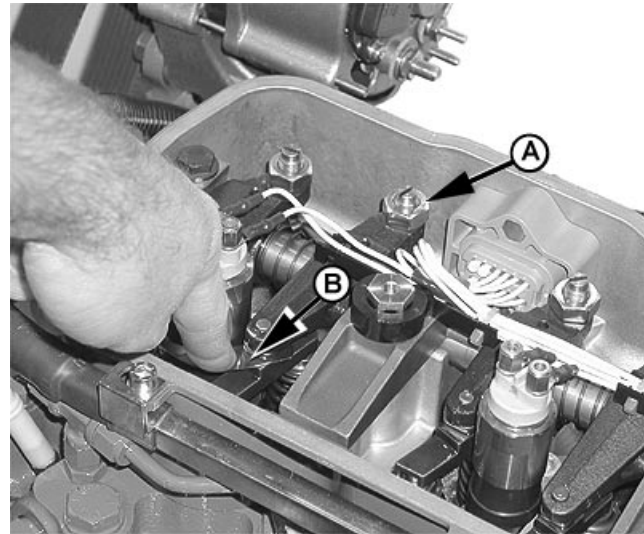
- Adjust valves to specifications below using the appropriate valve clearance adjustment procedure for 4-cylinder or 6-cylinder engines as outlined in the following blocks. Loosen the jam nut (A) on rocker arm adjusting screw. Turn adjusting screw until feeler gauge (B) slips with a slight drag. Hold the adjusting screw from turning with screwdriver and tighten jam nut to specifications. Recheck clearance again after tightening jam nut. Readjust clearance as necessary.

Specification

Intake Valve Clearance	
Adjustment (Rocker	
Arm-to-Bridge) (Engine Cold)—	
Clearance	0.36 mm (0.014 in.)
Exhaust Valve Clearance	
Adjustment (Rocker	
Arm-to-Bridge) (Engine Cold)—	
Clearance	0.46 mm (0.018 in.)
Rocker Arm Adjusting Screw Jam	
Nut—Torque	27 N•m (20 lb-ft)

NOTE: While rocker arm cover is removed, test glow plugs. (See following procedure.)

- Install rocker arm cover and crankcase ventilator tube.
- Reconnect battery terminal.



Adjusting Valves

A—Adjusting Screw Jam Nut
B—Feeler Gauge

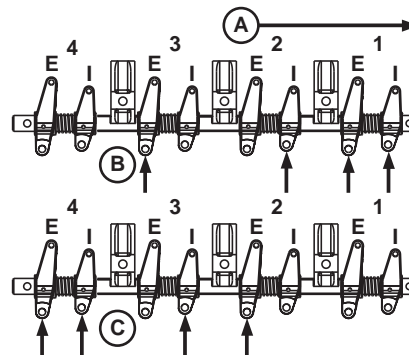
RG13809 -UN-07DEC04

OURGP12,0000092 -19-28SEP04-2/4

4-Cylinder Engine:

NOTE: Firing order is 1-3-4-2.

- Using JDG1571 or JDE81-4 Timing Pin, lock No. 1 piston at TDC compression stroke (B).
- Adjust valve clearance on No. 1 and 3 exhaust valves and No. 1 and 2 intake valves.
- Turn crankshaft 360°. Lock No. 4 piston at TDC compression stroke (C).
- Adjust valve clearance on No. 2 and 4 exhaust valves and No. 3 and 4 intake valves.



4-Cylinder Valve Adjustment

A—Front of Engine
B—No. 1 Piston TDC Compression
C—No. 4 Piston TDC Compression
E—Exhaust Valve
I—Intake Valve

RG12357 -UN-29MAY02

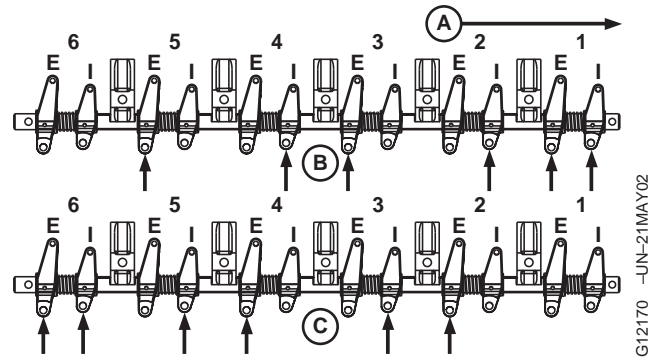
Continued on next page

OURGP12,0000092 -19-28SEP04-3/4

6-Cylinder Engine:

NOTE: Firing order is 1-5-3-6-2-4.

1. Lock No. 1 piston at TDC compression stroke (B).
2. Adjust valve clearance on No. 1, 3 and 5 exhaust valves and No. 1, 2, and 4 intake valves.
3. Turn crankshaft 360°. Lock No. 6 piston at TDC compression stroke (C).
4. Adjust valve clearance on No. 2, 4 and 6 exhaust valves and No. 3, 5, and 6 intake valves.



6-Cylinder Valve Adjustment

A—Front of Engine
B—No. 1 Piston TDC Compression
C—No. 6 Piston TDC Compression
E—Exhaust Valve
I—Intake Valve

OURGP12,0000092 -19-28SEP04-4/4

Testing Glow Plugs for Continuity

CAUTION: To prevent accidental starting of engine while performing this test, always disconnect **NEGATIVE (—)** battery terminal.

While checking valve clearance with rocker arm cover removed, check each glow plug (A) for continuity using a multimeter.

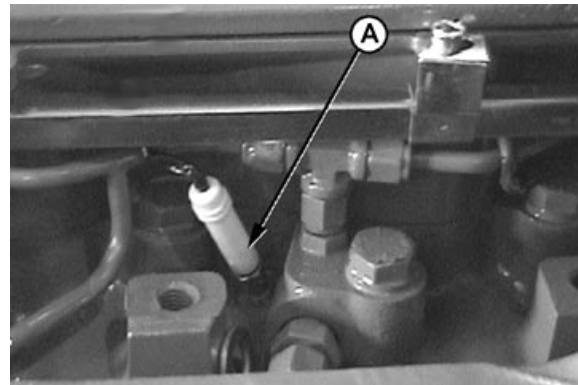
Check continuity between glow plug and ground on cylinder head. If resistance is infinite (no current), the glow plug is damaged and must be replaced.

Install new glow plugs and torque to specifications.

Specification

Glow Plug—Torque 15 N•m (11 lb-ft)

Reinstall rocker arm cover and crankcase ventilator tube.



Testing Glow Plugs for Continuity

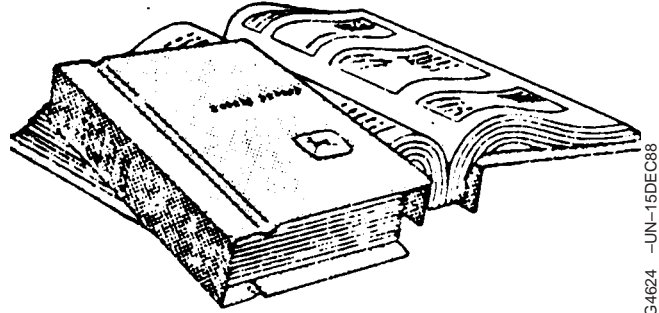
A—Glow Plug

OURGP12,0000093 -19-28SEP04-1/1

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.



Component Technical Manuals

OURGP11,0000048 -19-07FEB05-1/1

Do Not Modify Fuel System



CAUTION: 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.)

IMPORTANT: Never steam clean or pour cold water on a high-pressure fuel pump while it is still warm. To do so may cause seizure of pump parts.

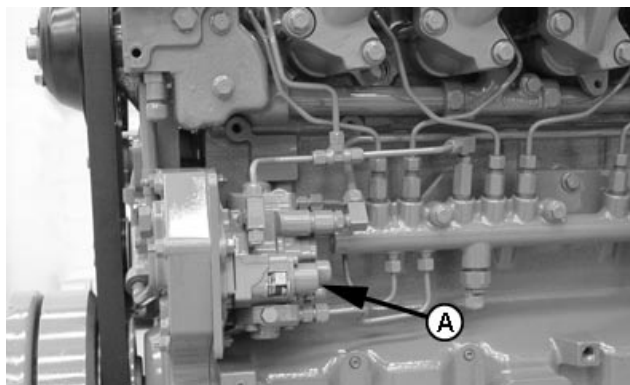
Modification or alteration of the high-pressure fuel pump (A), the injection timing, or the fuel injectors in ways not recommended by the manufacturer will terminate the warranty obligation to the purchaser.

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.)



High-Pressure Fuel Lines



High-Pressure Fuel Pump

A—High-Pressure Fuel Pump

TS1343 -UN-18MAR92

RG13735 -UN-11NOV04

OURGP12,0000095 -19-28SEP04-1/1

Adding Coolant

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 TY15161 Cooling System Sealer may be added to the radiator to stop leaks. DO NOT use any other stop-leak additives in the cooling system.

Air must be expelled from cooling system when coolant is added.

Coolant level should be maintained to the bottom of the radiator filler neck (A). If needed, as coolant as follows.

1. Loosen temperature sending unit fitting at rear of cylinder head to allow air to escape when filling system.

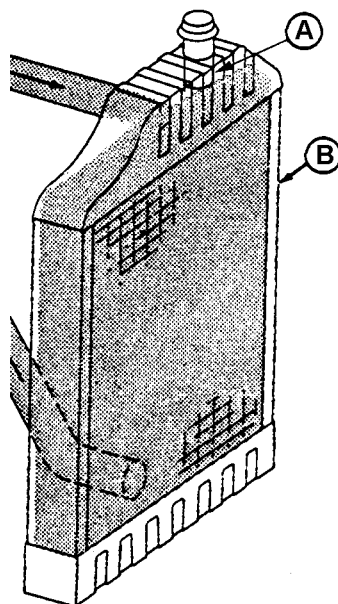
IMPORTANT: When adding coolant to the system, use the appropriate coolant solution. (See **ENGINE COOLANT SPECIFICATIONS** in **Fuels, Lubricants, and Coolant Section** for mixing of coolant ingredients before adding to cooling system.)

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 radiator filler neck (A).



High-Pressure Fluids



Radiator and Coolant

A—Radiator Filler Neck
B—Radiator

RG13295 -UN-20NOV03

TS281 -UN-23AUG88

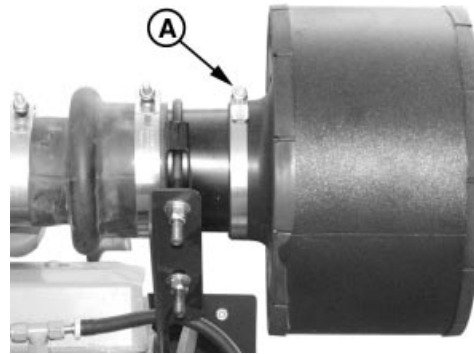
3. Tighten plugs and fittings when air has been expelled from system.
4. Run engine until it reaches operating temperature.

OURGP12,00000B0 -19-17NOV04-2/2

Replacing Single Stage Air Cleaner

IMPORTANT: ALWAYS REPLACE air cleaner when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

NOTE: This procedure applies to John Deere single stage air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.



Single Stage Air Filter

1. If equipped, loosen body clamp.
2. Loosen clamp around outlet neck (A).
3. Remove air cleaner.
4. Install new filter so that overlap (B) of air cleaner outlet neck and engine intake pipe is to specification below.

Specification

Air Cleaner Neck to Engine
Intake—Overlap..... 38 mm (1.5 in)

5. Tighten neck clamp (A) to specification below.

Specification

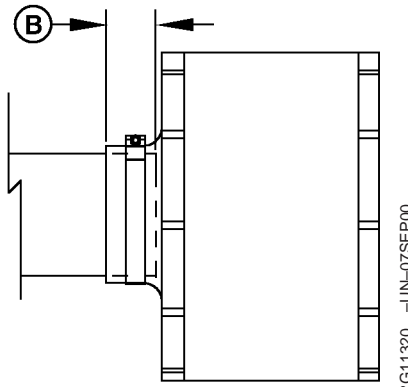
Air Cleaner Neck Clamp—Torque..... 6.8 N•m (60 lb-in.)

IMPORTANT: Do NOT overtighten body clamp. Overtightening may cause crushing of air cleaner body. Tighten body clamp only until snug.

6. If equipped, tighten body clamp until snug.

IMPORTANT: Whenever the air cleaner has been serviced or removed, ALWAYS fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

7. If equipped, fully depress air restriction indicator reset button and release to reset indicator.



Installation of Single Stage Air Cleaner

A—Outlet Neck Clamp
B—Filter to Engine Overlap

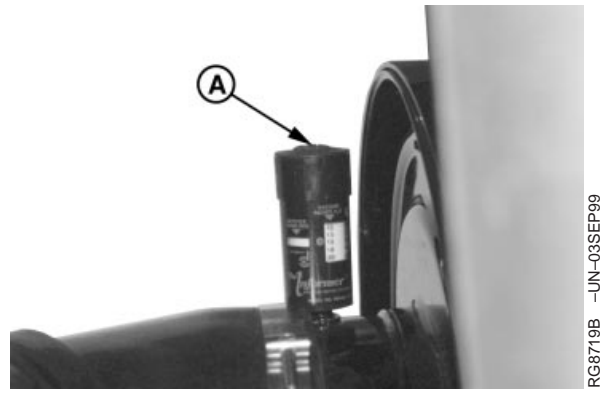
RG11319A -UN-06SEP00

RG11320 -UN-07SEP00

Replacing Axial Seal Air Cleaner Filter Element

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator (A) shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

NOTE: This procedure applies to John Deere 2-stage axial seal air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.



Air restriction Indicator

RG8719B -UN-03SEP99

Continued on next page

OURGP11,000013A -19-21NOV03-1/2

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.

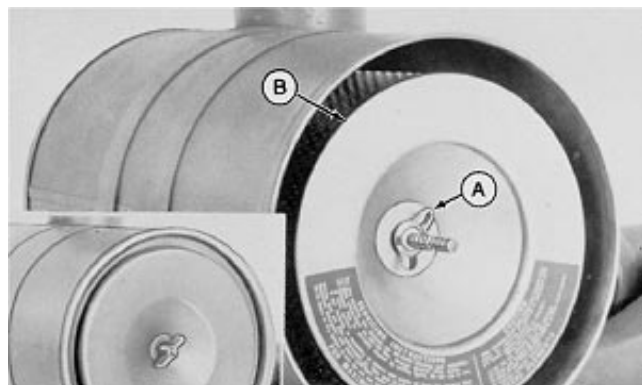
NOTE: Some engines may have a dust unloader valve (C) on the air cleaner. If equipped, squeeze valve tip to release any trapped dirt particles.

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.

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.

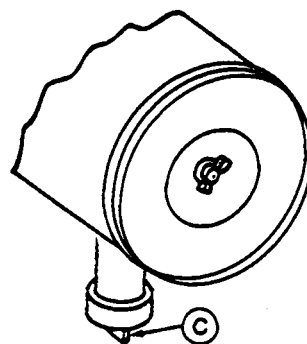
IMPORTANT: Whenever the air cleaner has been serviced or had cover removed, **ALWAYS** fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

6. If equipped, fully depress air restriction indicator reset button and release to reset indicator.



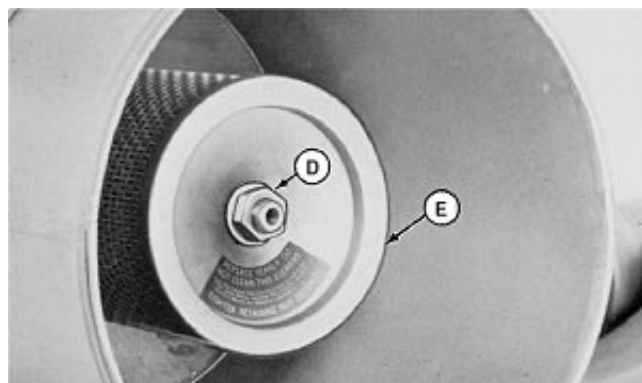
RG4686 -UN-20DEC88

Wing Nut and Primary Element



RG4687 -UN-20DEC88

Dust Unloader Valve and Restriction Indicator



RG11068 -UN-26JUN00

Retaining Nut and Secondary Element

- A—Wing Nut
- B—Primary Element
- C—Dust Unloader Valve
- D—Retaining Nut
- E—Secondary Element

OURGP11,000013A -19-21NOV03-2/2

Replacing Radial Seal Air Cleaner Filter Element

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

NOTE: This procedure applies to John Deere 2-stage radial seal air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.

1. Unlatch and remove dust cup/cover (A) of air cleaner.
2. Move end of filter (B) back and forth gently to break seal.
3. Pull filter (B) off outlet tube and out of housing.
4. Thoroughly clean all dirt from inside housing and from outlet bore.

IMPORTANT: Remove secondary (safety) element (C) **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.

5. To replace secondary element (C), pull filter element out gently. Immediately replace secondary element with new element to prevent dust from entering air intake system.
6. Install new primary filter element. Apply pressure by hand at outer rim of filter.

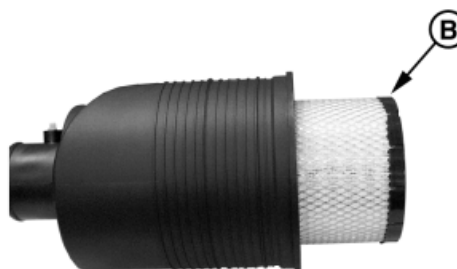
IMPORTANT: Do NOT use latches on cover to force filter into air cleaner. Using cover to force filter will damage cleaner housing.

7. Close housing with dust unloader valve aimed down and latch latches.



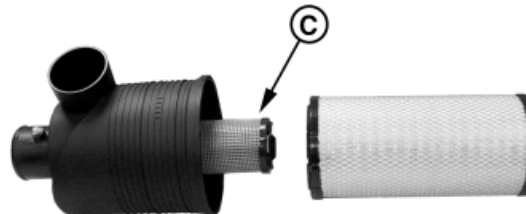
Dust Cup/Cover

RG11321A -UN-08SEP00



Primary Filter Element

RG11322A -UN-08SEP00



Secondary Filter Element

RG11327A -UN-08SEP00

A—Dust Cap/Cover
B—Primary Filter Element
C—Secondary Filter Element

Continued on next page

RG41165,000008B -19-06SEP00-1/2

IMPORTANT: Whenever the air cleaner has been serviced or cover has been removed, **ALWAYS** fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

8. If equipped, fully depress air restriction indicator reset button and release to reset indicator.

RG41165,000008B -19-06SEP00-2/2

Replacing Fan and Alternator Belts

Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/500 Hour/12 Month Section for additional information on the belt tensioner.

1. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary.
2. To replace belt with automatic tensioner, release tension on belt using a breaker bar on tension arm.

To replace belt with manual tensioner, release tension at belt tensioner (See MANUAL BELT TENSIONER ADJUSTMENT in Lubrication and Maintenance/500 Hour/12 Month Section.)

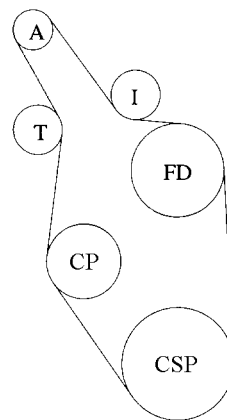
3. Remove poly-vee belt from pulleys and discard belt.

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.

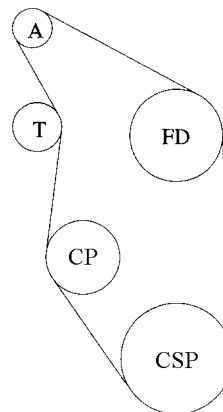
4. Install new belt, making sure belt is correctly seated in all pulley grooves. Refer to belt routing at right for your application.
5. Apply tension to belt with tensioner. Remove socket.
6. Install fan guard if removed.
7. Start engine and check belt alignment.

*Measured from crank centerline to fan drive center.

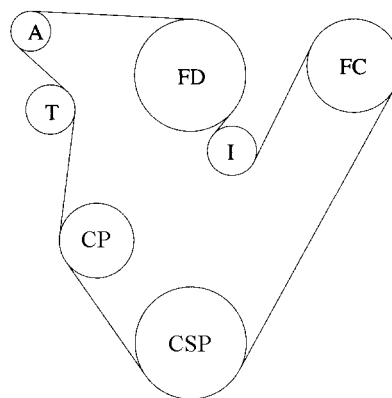
A—Alternator
CSP—Crankshaft Pulley
FC—Freon (A/C) Compressor
FD—Fan Drive
I—Idler Pulley
T—Tensioner
CP—Coolant Pump



290 mm (11.4 in.) Fan Height and Lower*



338 mm (13.3 in.) Fan Height and Higher Without Freon Compressor*



402 mm (15.8 in.) Fan Height With Freon Compressor*

RG11950 -UN-07NOV01

RG11951 -UN-07NOV01

RG11952 -UN-07NOV01

Checking Fuses

A separate wiring harness fuse (10 amp) and a main system fuse (20 amp) are shown in the Wiring Diagrams in the Troubleshooting Section.

A separate wiring harness for glow plugs has fuse protection. To replace fuse, remove cap from holder on jumper cable and replace with a 50-amp fuse.

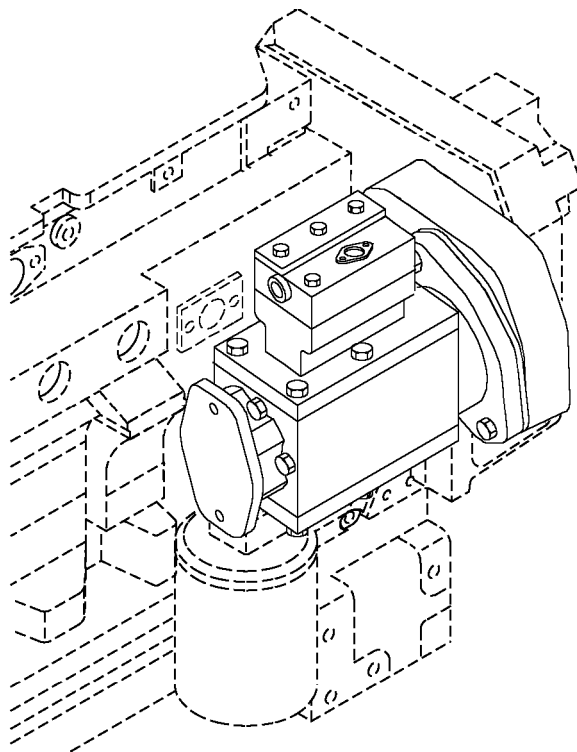
OURGP12,0000097 -19-28SEP04-1/1

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.



RG12836 -UN-27FEB03

Air Compressor (Optional)

OURGP12,00001E0 -19-26FEB03-1/1

Bleeding Fuel System

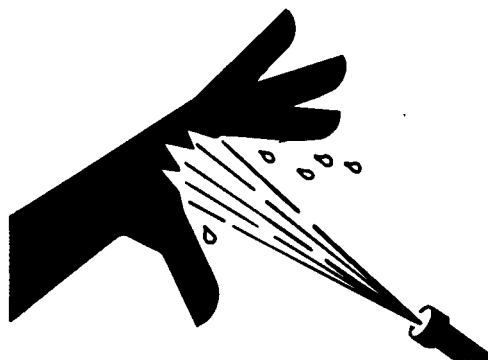


CAUTION: High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair of fuel lines, sensors, or any other components between the high-pressure fuel pump and nozzles on engines with High Pressure Common Rail (HPCR) fuel system. Only technicians familiar with this type of system can perform repairs. (See your John Deere dealer.)

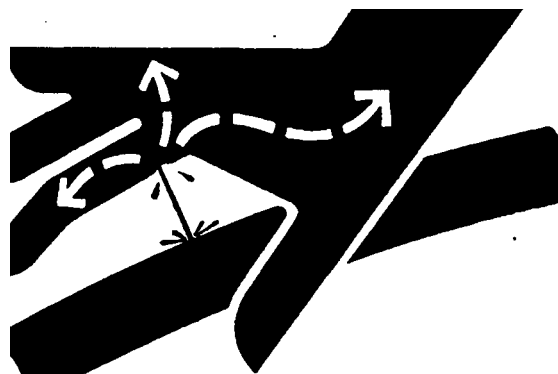
Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid hazards by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

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 may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

Any time the fuel system has been opened up for service (lines disconnected or filters removed), it will be necessary to bleed air from the system.



High-Pressure Fuel Lines



High Pressure Fluids

TS1343 -UN-18MAR92

X9811 -UN-23AUG88

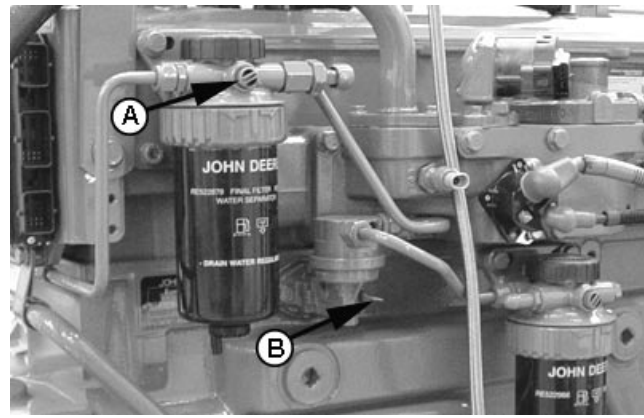
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OURGP12,0000098 -19-28SEP04-1/2

IMPORTANT: Four-valve cylinder head engines are especially sensitive to fuel contamination. Do not crack any fuel lines to bleed the fuel system.

1. Loosen the air bleed vent screw (A) on fuel filter base two full turns by hand .
2. Operate fuel supply pump primer lever (B), or primer button on fuel filter base (if equipped), until fuel flows out of bleed vent screw.
3. Tighten bleed vent screw securely. Continue operating primer until pumping action is not felt.
4. Start engine and check for leaks.

If engine will not start, repeat steps 1-4.



Bleeding Fuel System

A—Bleed Vent Screw
B—Primer Lever

OURGP12,0000098 -19-28SEP04-2/2

Troubleshooting

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, 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 -19-21APR05-1/1

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:

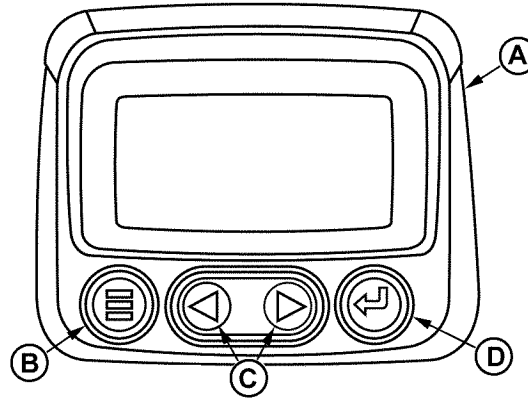
1. Make sure all engine mechanical and other systems not related to the electronic control system are operating properly.

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.

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.



Trouble Code Display On Instrument Panel

- A—Diagnostic Gauge
- B—Menu Key
- C—Arrow Keys
- D—Enter Key

RG13740 -UN-11NOV04

OURGP12,000009D -19-28SEP04-1/1

Displaying Of Diagnostic Trouble Codes (DTCs)

There are several different methods for displaying both stored and active DTCs from the n via a fault lamp or a diagnostic gauge on the electronic instrument panel.

2-DIGIT CODES

Some engines display Service Codes or DTCs as 2-digit codes read from a fault lamp which gives blink codes.

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 six-digit Suspect Parameter Number (SPN) followed by a two-digit 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", or the equivalent of 2-digit fault code 18.

If diagnosing an application that shows DTCs as SPNs and FMIs, using the following list, determine the equivalent 2-digit code and have your dealer use the diagnostic procedure in the component technical manual for that 2-digit code. 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.

Listing of Diagnostic Trouble Codes (DTCs)

NOTE: Not all of these codes are used on all OEM engine applications

NOTE: If the corrective actions below do not solve the engine fault, contact your servicing dealer.

Fault Codes

Fault Code Listing in Ascending SPN/FMI Codes

SPN	FMI	Description of 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
	14	Throttle #3 Voltage Out of Range	Not Available
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
	14	Throttle #2 Voltage Out of Range	Not Available
000091	03	Throttle Voltage Out of Range High	Check Sensor and Wiring
	04	Throttle Voltage Out of Range Low	Check Sensor and Wiring
	14	Throttle Voltage Out of Range	Check Sensor and Wiring
00094	04	Fuel Pressure Voltage Out of Range Low	Check Sensor and Wiring
000097	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
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
	18	Engine Oil Pressure Low-Moderately Severe	Check Oil Level
	31	Oil Pressure Detected with Zero Engine Speed	Not Available
000102	02	Boost Pressure Sensor In-Range Failure	Not Available
	03	Boost Pressure Voltage Out of Range High	Not Available
	04	Boost Pressure Voltage Out of Range Low	Not Available
	05	Boost Pressure Voltage Out of Range	Not Available
000103	00	Turbocharger Speed High-Most Severe	Not Available
	02	Turbocharger Speed Data Incorrect	Not Available
	05	Turbocharger Harness Open Circuit	Not Available
	06	Turbocharger Harness Shorted To Ground	Not Available
	08	Turbocharger Speed Signal In-Range Failure	Not Available
	31	Turbocharger Speed Signal Missing	Not Available
000105	00	Manifold Air Temperature High-Most Severe	Check Air Cleaner, Aftercooler, or Room Temperature
	03	Manifold Air Temperature Input Voltage Out of Range High	Check Sensor and Wiring
	04	Manifold Air Temperature Input Voltage Out of Range Low	Check Sensor and Wiring
	15	Manifold Air Temperature High-Least Severe	Not Available
	16	Manifold Air Temperature High-Moderately Severe	Check Air Cleaner, Aftercooler, or Room Temperature
	31	Barometric Air Pressure Sensor Signal Invalid	Not Available
000108	02	Barometric Air Pressure Sensor Signal Invalid	Not Available
	31	Barometric Air Pressure Sensor Signal Invalid	Not Available
000110	00	Engine Coolant Temperature High-Most Severe	Check Cooling System, Reduce Power
	03	Engine Coolant Temperature Input Voltage Out of Range High	Check Sensor and Wiring
	04	Engine Coolant Temperature Input Voltage Out of Range Low	Check Sensor and Wiring
	15	Engine Coolant Temperature High-Least Severe	Check Cooling System, Reduce Power
	31	Engine Coolant Temperature High-Moderately Severe	Check Cooling System, Reduce Power

Continued on next page

OURGP12,00000F9 -19-22APR05-1/4

SPN	FMI	Description of Fault	Corrective Action
	16	Engine Coolant Temperature High-Moderately Severe	Check Cooling System, Reduce Power
000111	01	Coolant Level Low-Most Severe	Check Operator's Manual
000157	03	Fuel Rail Pressure Voltage Out of Range High	Not Available
	04	Fuel Rail Pressure Voltage Out of Range Low	Not Available
	10	Fuel Rail Pressure Drops Too Fast	Not Available
	17	Fuel Rail Pressure Not Developed	Not Available
000158	17	Keyswitch Circuit Problem	Check Service Manual
000174	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
	16	Fuel Temperature High-Moderately Severe	Add Fuel or Switch Fuel Tanks
000189	00	Engine Speed Derate	Not Available
000190	00	Engine Speed High-Most Severe	Reduce Engine Speed
	16	Engine Speed High-Moderately Severe	Reduce Engine Speed
000412	00	Exhaust Gas Recirculation Temperature Input Voltage High-Most Severe	Not Available
	03	Exhaust Gas Recirculation Temperature Voltage Out of Range High	Not Available
	04	Exhaust Gas Recirculation Temperature Voltage Out of Range Low	Not Available
	16	Exhaust Gas Recirculation Temperature Moderately Severe	Not Available
000611	03	Electronic Injector Wiring Shorted to Power Source	Check Wiring
	04	Electronic Injector Wiring Shorted to Ground	Check Wiring
000620	03	5V Sensor Supply Voltage Out of Range High	Check Wiring
	04	5V Sensor Supply Voltage Out of Range Low	Check Wiring
000627	01	Injector Pull-In Current Low or Hold Current Incorrect	Check Battery Voltage and Wiring
000628	12	ECU Programming Error	Not Available
000629	12	ECU Programming Error	Not Available
	13	ECU Failure	Contact Service Dealer
000636	02	Engine Position Sensor Noise	Check Sensor and Wiring
	05	Engine Position Sensor Current Low or Open Circuit	Not Available
	06	Engine Position Sensor Current High or Grounded Circuit	Not Available
	08	Engine Position Sensor Input Missing	Check Sensor and Wiring
	10	Engine Position Sensor Pattern Error	Check Sensor and Wiring
000637	02	Timing (Crank) Position Sensor Noise	Check Sensor and Wiring
	05	Timing (Crank) Position Sensor Current Low or Open Circuit	Not Available
	06	Timing (Crank) Position Sensor Current High or Grounded Circuit	Not Available
	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
000640	31	Engine Not Available or Condition Exists	Not Available
000641	04	Turbocharger Actuator Disabled	Not Available
	05	Turbocharger Actuator Current Low or Open Circuit	Not Available
	12	Turbocharger Actuator Communication Error	Not Available
	13	Turbocharger Learn Error	Not Available
	16	Turbocharger Temperature High-Moderately Severe	Not Available
000651	02	Cylinder #1 Injector Part Number Not Recognized	Not Available
	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
	13	Cylinder #1 Injector QR Code String Error	Not Available

Continued on next page

OURGP12,00000F9 -19-22APR05-2/4

SPN	FMI	Description of Fault	Corrective Action
000652	02	Cylinder #2 Injector Part Number Not Recognized	Not Available
	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	13	Cylinder #2 Injector QR Code String Error	Not Available
	02	Cylinder #3 Injector Part Number Not Recognized	Not Available
	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
000654	07	Cylinder #3 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
	13	Cylinder #3 Injector QR Code String Error	Not Available
	02	Cylinder #4 Injector Part Number Not Recognized	Not Available
	05	Cylinder #4 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
000655	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
	13	Cylinder #4 Injector QR Code String Error	Not Available
	02	Cylinder #5 Injector Part Number Not Recognized	Not Available
000656	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
	13	Cylinder #5 Injector QR Code String Error	Not Available
000898	02	Cylinder #6 Injector Part Number Not Recognized	Not Available
	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
000970	13	Cylinder #6 Injector QR Code String Error	Not Available
	09	TSC1 Message Not Received or Timeout	Not Available
	31	Engine Not Available or Condition Exists	Non Engine Fault. Check Other Shutdown Devices
	03	Sensor Supply Voltage 3 Out of Range High	Check Wiring
001079	04	Sensor Supply Voltage 3 Out of Range Low	Check Wiring
	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
	03	Engine Not Available or Condition Exists	Check Fault Codes
001109	31	Engine Not Available or Condition Exists	Check Fault Codes
	00	ECU Temperature High-Most Severe	Not Available
	16	ECU Temperature High-Moderately Severe	Not Available
	03	Compressor Inlet Temperature Input Voltage Out of Range High	Not Available
001172	04	Compressor Inlet Temperature Input Voltage Out of Range Low	Not Available
	16	Compressor Inlet Temperature High-Moderately Severe	Not Available
	00	Turbine Inlet Temperature High-Most Severe	Not Available
	16	Turbine Inlet Temperature High-Moderately Severe	Not Available
001209	02	Exhaust Pressure Incorrect	Not Available
	03	Exhaust Pressure Sensor Voltage Out of Range High	Not Available
	04	Exhaust Pressure Sensor Voltage Out of Range Low	Not Available
	03	Fuel Pump Pressurizing Assembly #1 Sensor Voltage High	Not Available
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
	31	Engine Protection Derate	Check Fault Codes
	00	Charge Air Cooler Temperature High-Most Severe	Not Available

Continued on next page

OURGP12,00000F9 -19-22APR05-3/4

SPN	FMI	Description of Fault	Corrective Action
	03	Charge Air Cooler Sensor Voltage Out of Range High	Not Available
	04	Charge Air Cooler Sensor Voltage Out of Range Low	Not Available
	15	Charge Air Cooler Temperature High-Least Severe	Not Available
	16	Charge Air Cooler Temperature High-Moderately Severe	Not Available
002659	02	Exhaust Gas Recirculation Flow/Temperature Mismatch	Not Available
	15	Exhaust Gas Recirculation Flow Rate Above Normal	Not Available
	17	Exhaust Gas Recirculation Flow Rate Below Normal	Not Available
002790	16	Turbocharger Compressor Outlet Temperature High-Most Severe	Not Available
002791	02	Exhaust Gas Recirculation Valve Sensor Voltage Mismatch	Not Available
	03	Exhaust Gas Recirculation Valve Sensor Voltage Out of Range High	Not Available
	04	Exhaust Gas Recirculation Valve Sensor Voltage Out of Range Low	Not Available
	05	Exhaust Gas Recirculation Valve Current Low or Open Circuit	Not Available
	06	Exhaust Gas Recirculation Valve Current High or Grounded Circuit	Not Available
	07	Exhaust Gas Recirculation Valve Not Responding or Out of Adjustment	Not Available
	13	Exhaust Gas Recirculation Valve Out of Calibration	Not Available
	14	Exhaust Gas Recirculation Valve Off	Not Available
	31	Exhaust Gas Recirculation Valve Position Error	Not Available
002795	07	Turbocharger Actuator Not Responding or Out Of Adjustment	Not Available
	12	Turbocharger Actuator Bad Intelligent Device Or Component	Not Available
523229	03	Sensor Supply Voltage 4 Out of Range High	Not Available
	04	Sensor Supply Voltage 4 Out of Range Low	Not Available
TBD	03	Sensor Supply Voltage 1 Out of Range High	Not Available
	04	Sensor Supply Voltage 1 Out of Range Low	Not Available

OURGP12,00000F9 -19-22APR05-4/4

Intermittent Fault Diagnostics (With Electronic Controls)

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 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 connectors, poorly positioned terminals, damaged connectors 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 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.

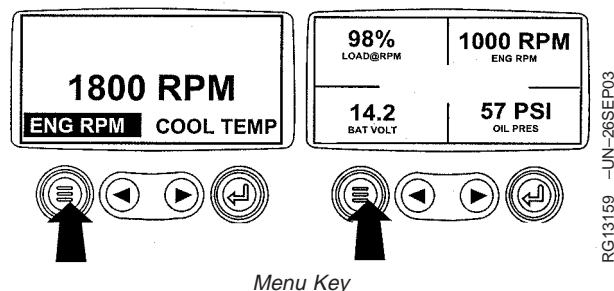
NOTE: Refer to wiring diagrams earlier in this section as a guide to connection and wiring.

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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.

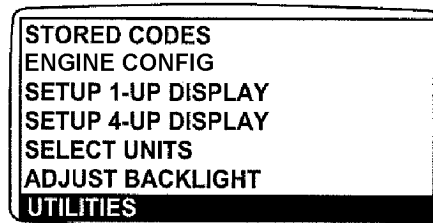
1. Starting at the single or four engine parameter display, press the "Menu" key.



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OURGP12,000009F –19-28SEP04-1/4

2. The main menu will be displayed. Use the "Arrow" key to scroll through the menu until "Utilities" is highlighted.

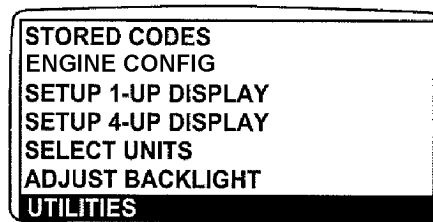


Select Utilities

RG13234 -UN-22OCT03

OURGP12,000009F -19-28SEP04-2/4

3. Once "Utilities" is highlighted, press "Enter" to activate the utilities function.



Select Utilities

RG13237 -UN-22OCT03

OURGP12,000009F -19-28SEP04-3/4

4. Scroll to the "Software Version". Press "Enter" to view the software version. Press the menu button twice to return to the main menu.



Software Version

RG13236 -UN-13OCT03

OURGP12,000009F -19-28SEP04-4/4

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 cranks but will not start	Incorrect starting procedure.	Verify correct starting procedure.
	No fuel.	Check fuel in tank.
	Exhaust restricted.	Check and correct exhaust restriction.
	Fuel filter plugged or full of water.	Replace fuel filter or drain water from filter.
	Injection pump not getting fuel or air in fuel system.	Check fuel flow at supply pump or bleed fuel system.
	Faulty injection pump or nozzles.	Consult authorized diesel repair station for repair or replacement.
Engine hard to start or will not start	Engine starting under load.	Disengage PTO.
	Improper starting procedure.	Review starting procedure.
	No fuel.	Check fuel tank.
	Air in fuel line.	Bleed fuel line.
	Cold weather.	Use cold weather starting aids.
	Slow starter speed.	See "Starter Cranks Slowly".
	Crankcase oil too heavy.	Use oil of proper viscosity.
	Improper type of fuel.	Consult fuel supplier; use proper type fuel for operating conditions.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
	Clogged fuel filter.	Replace filter element.

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OURGP12,00000F7 -19-22APR05-1/8

Symptom	Problem	Solution
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Defective glow plugs (Cold weather starting)	Test glow plugs (See 2000 hour/24 month maintenance section)
	Electronic fuel system problem (if equipped)	See your John Deere distributor or servicing dealer.
Engine knocks	Low engine oil level.	Add oil to engine crankcase.
	Low coolant temperature.	Remove and check thermostat.
	Engine overheating.	See "Engine Overheats".
	Engine cold	Wrong or defective thermostat. Remove and check thermostat.
Abnormal Engine Noise	Worn main or connecting rod bearings	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
<p><i>NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.</i></p> <p><i>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.</i></p>		
	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.

Continued on next page

OURGP12,00000F7 -19-22APR05-2/8

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 CHECKING AND ADJUSTING VALVE CLEARANCE in the "Lubrication and Maintenance/2000 Hour/24 Month" section earlier in this manual.
	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.
	Turbocharger bearings not lubricated (insufficient oil pressure)	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
Engine runs irregularly or stalls frequently	Low coolant temperature.	Remove and check thermostat.
	Clogged fuel filter.	Replace fuel filter element.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Electronic fuel system problem	See your John Deere distributor or servicing dealer.

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OURGP12,00000F7 -19-22APR05-3/8

Symptom	Problem	Solution
Below normal engine temperature	Defective thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check gauge, sender, and connections.
Lack of power	Engine overloaded.	Reduce load.
NOTE: Exhaust gas recirculating valve will recycle occasionally, causing a momentary loss of speed. This is normal.		
	Intake air restriction.	Service air cleaner.
	Clogged fuel filter.	Replace filter elements.
	Improper type of fuel.	Use proper fuel.
	Overheated engine.	See "Engine Overheats".
	Below normal engine temperature.	Remove and check thermostat.
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Electronic fuel system problem	See your John Deere distributor or servicing dealer.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.
	Leaking exhaust manifold gasket.	See your authorized servicing dealer or engine distributor.
	Restricted fuel hose.	Clean or replace fuel hose.
	Low fast idle speed.	See your authorized servicing dealer or engine distributor.

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OURGP12,00000F7 -19-22APR05-4/8

Symptom	Problem	Solution
Low oil pressure	Low oil level.	Add oil.
	Improper type of oil.	Drain, fill crankcase with oil of proper viscosity and quality.
High oil consumption	Crankcase oil too light.	Use proper viscosity oil.
	Oil leaks.	Check for leaks in lines, gaskets, and drain plug.
	Restricted crankcase vent tube.	Clean vent tube.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
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 injection nozzles.	See your authorized servicing dealer or engine distributor.
	Defective glow plugs.	Test glow plugs. (See 2000 hour/24 month maintenance section.)
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.
	Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.
	Electronic fuel system problem	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.

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OURGP12,00000F7 -19-22APR05-5/8

Symptom	Problem	Solution
	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-vee 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 thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check coolant temperature with thermometer and replace, if necessary.
	Incorrect grade of fuel.	Use correct grade of fuel.
	Improper type of fuel.	Use proper type of fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
High fuel consumption	Engine overloaded.	Reduce load.
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.
	Electronic fuel system problem	See your authorized servicing dealer or engine distributor.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
Undercharged electrical system	Low engine temperature.	Check thermostat.
	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.

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OURGP12,00000F7 -19-22APR05-6/8

Symptom	Problem	Solution
Battery uses too much water	Poor electrical connections on battery, ground strap, starter, or alternator.	Inspect and clean as necessary.
	Defective battery.	Test battery.
	Defective alternator.	Test charging system.
	Cracked battery case.	Check for moisture and replace as necessary.
	Defective battery.	Test battery.
Batteries will not charge	Battery charging rate too high.	Test charging system.
	Loose or corroded connections.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
Starter will not crank	Stretched poly-vee belt or defective belt tensioner.	Adjust belt tension or replace belts.
	PTO engaged (if equipped).	Disengage PTO.
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output voltage.	See your authorized servicing dealer or engine distributor.
	Faulty start circuit relay.	See your authorized servicing dealer or engine distributor.
Starter cranks slowly	Blown main system fuse.	Replace fuse.
	Low battery output.	See your authorized servicing dealer or engine distributor.
	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.	Replace fuse.

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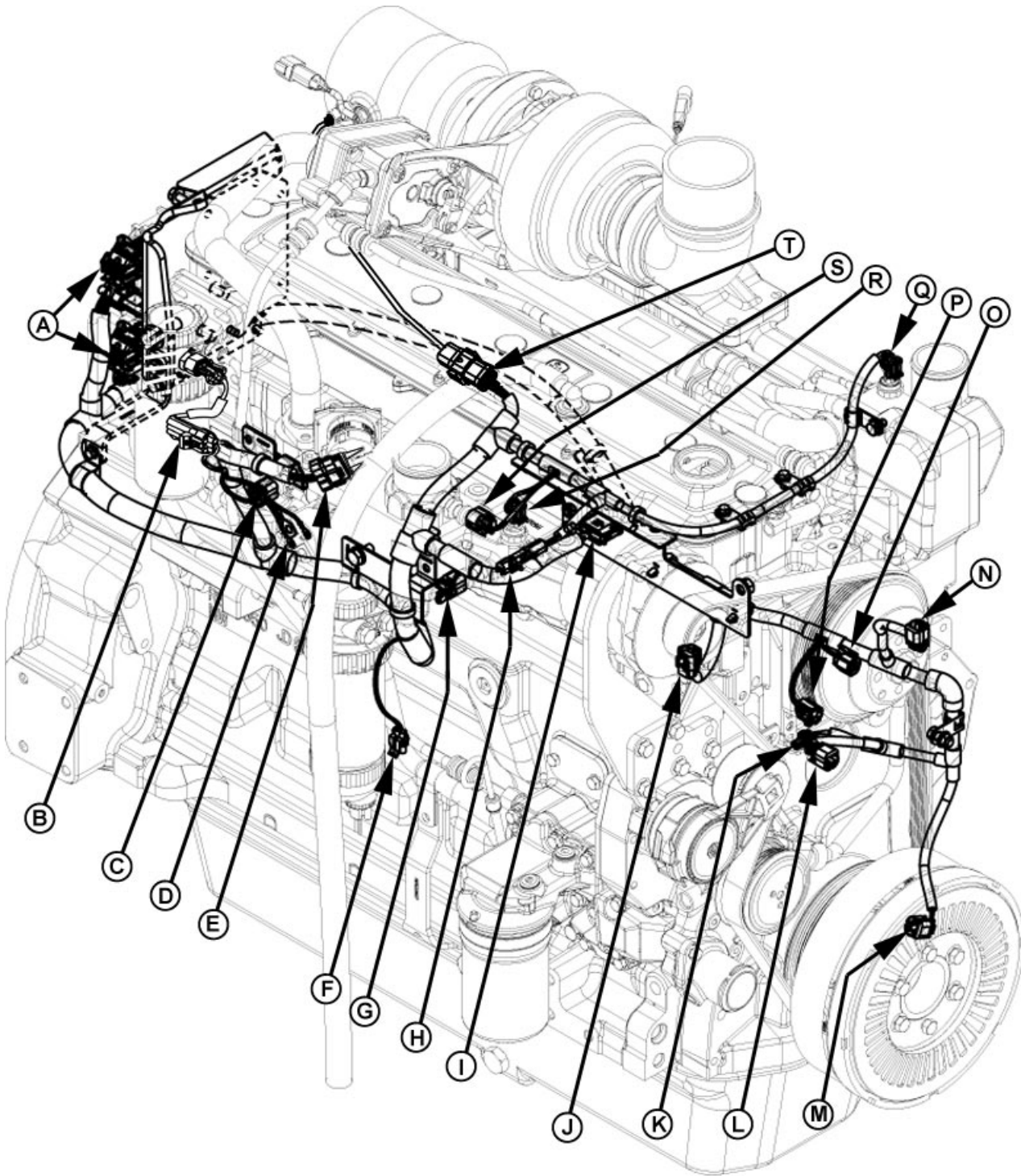
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Troubleshooting

Symptom	Problem	Solution
Entire electrical system does not function	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Blown main system fuse.	Replace fuse.

OURGP12,00000F7 -19-22APR05-8/8

Engine Wiring Layout



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Engine Wiring Layout

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OURGP12,0000099 -19-28SEP04-1/2

A—Engine Control Unit (ECU) Connector	F—Water-In-Fuel Sensor Connector	K—Oil Pressure Sensor Connector	Q—Exhaust Pressure Sensor Connector
B—Fuel Pressure Sensor Jumper Connector	G—Exhaust Gas Recirculation (EGR) Mixed Air Temperature Sensor Connector	L—Camshaft Position Sensor Connector	R—Manifold Air Pressure Sensor Connector
C—Exhaust Gas Recirculation (EGR) Exhaust Temperature Sensor Connector	H—Alternator Excitation Connector	M—Crankshaft Speed Sensor Connector	S—Exhaust Gas Recirculation (EGR) Fresh Air Sensor Connector
D—Glow Plug Relay Connectors (3)	I—Fuel Injector Connector	N—Coolant Temperature Sensor Connector	T—Turbocharger Sensor Jumper Connector
E—Exhaust Gas Recirculation (EGR) Valve Sensor Connector	J—Rail Pressure Sensor Connector	O—Pump Control Valve Connector	
		P—Fuel Temperature Sensor Connector	

OURGP12,0000099 -19-28SEP04-2/2

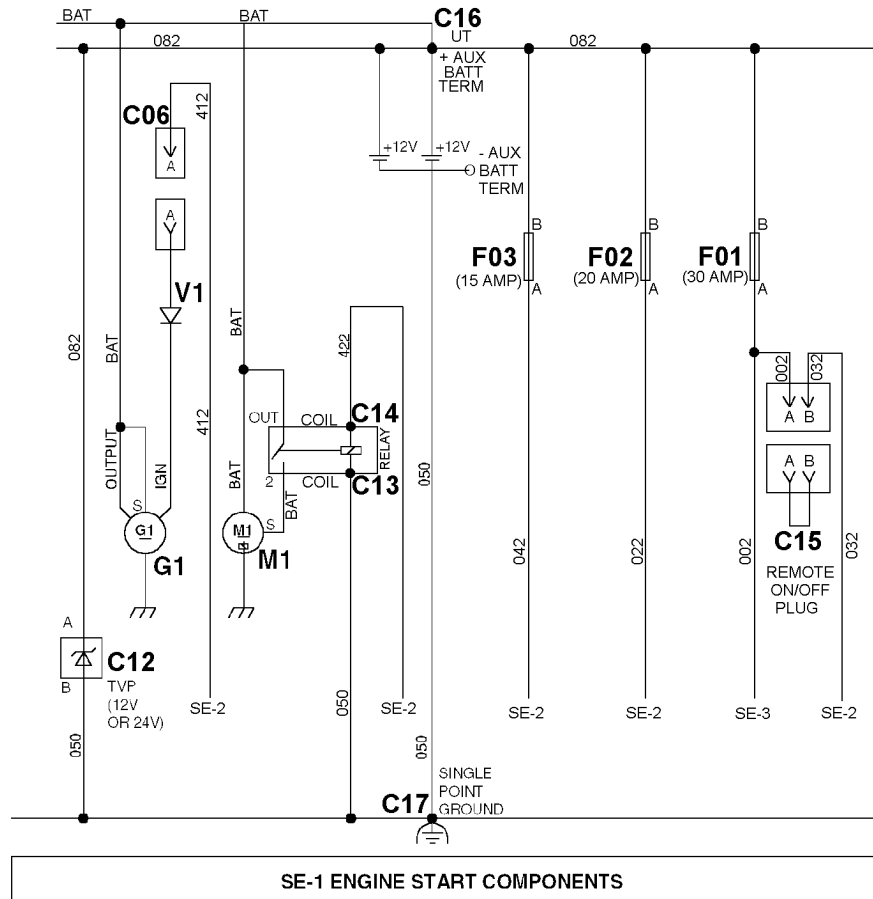
Precautions For Welding On Engines Equipped With Electronic Engine Control Unit (ECU)

IMPORTANT: ALWAYS disconnect Electronic Control Unit (ECU) connectors and engine control system-to-machine ground before welding on engine or machine. High currents or electro-static discharge in electronic components from welding may cause permanent damage.

1. Remove the ground connection for the engine control system-to-machine frame.
2. Disconnect the connectors from the ECU.
3. Connect the welder ground close to the welding point and be sure ECU or other electronic components are not in the ground path.

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Engine Wiring Diagram (Engines With Full-Featured Instrument Panel)

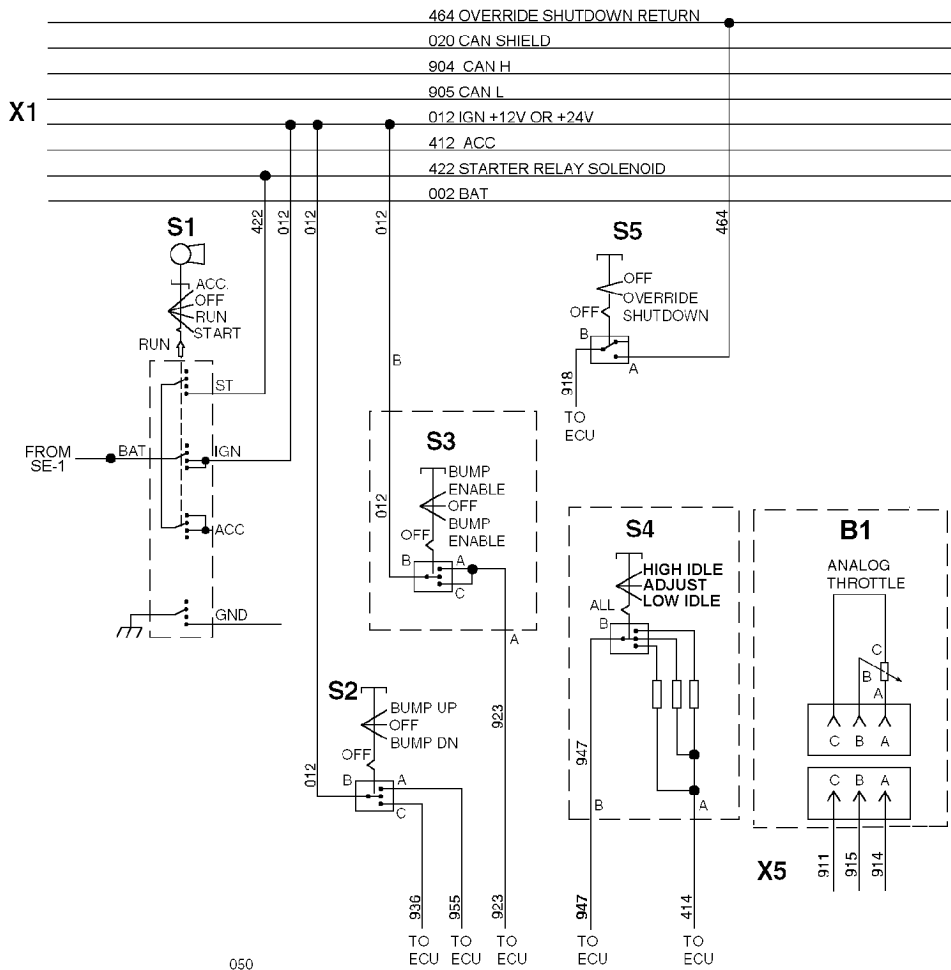


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- | | | | |
|----------------------------------|--------------------------------|------------------------------------|---|
| B1—Analog Throttle | F01—Fuse (30 Amp)(System) | P5—Tachometer Display | S5—Override Shutdown Switch (Momentary) |
| C06—Alternator Harness Connector | F02—Fuse (20 Amp)(ECU) | P6—Hour Meter/Diagnostic Gauge | V1—Diode |
| C12—Transient Voltage Protector | F03—Fuse (15 Amp)(Fuel Filter) | S1—Ignition Key Switch | X1—Vehicle Harness Connector |
| C13—Starter Relay | G1—Alternator | S2—Speed Select Switch (Momentary) | X4—CAN Terminator |
| C14—Starter Relay | M1—Starter Motor | S3—Bump Enable Switch (Momentary) | X5—Analog Throttle Connector |
| C15—Remote On/Off | P1—Optional Gauge | S4—High-Low Speed Select Switch | |
| C16—Battery | P2—Optional Gauge | | |
| C17—Single Point Ground | P3—Oil Pressure Gauge | | |
| | P4—Coolant Temperature Gauge | | |

OURGP12,00000EC -19-08APR05-1/1

Engine Wiring Diagram (Engines With Full-Featured Instrument Panel) (Continued)



SE-2 INSTRUMENT PANEL (CONTINUED NEXT PAGE)

B1—Analog Throttle
C06—Alternator Harness Connector
C12—Transient Voltage Protector
C13—Starter Relay
C14—Starter Relay
C15—Remote On/Off
C16—Battery
C17—Single Point Ground

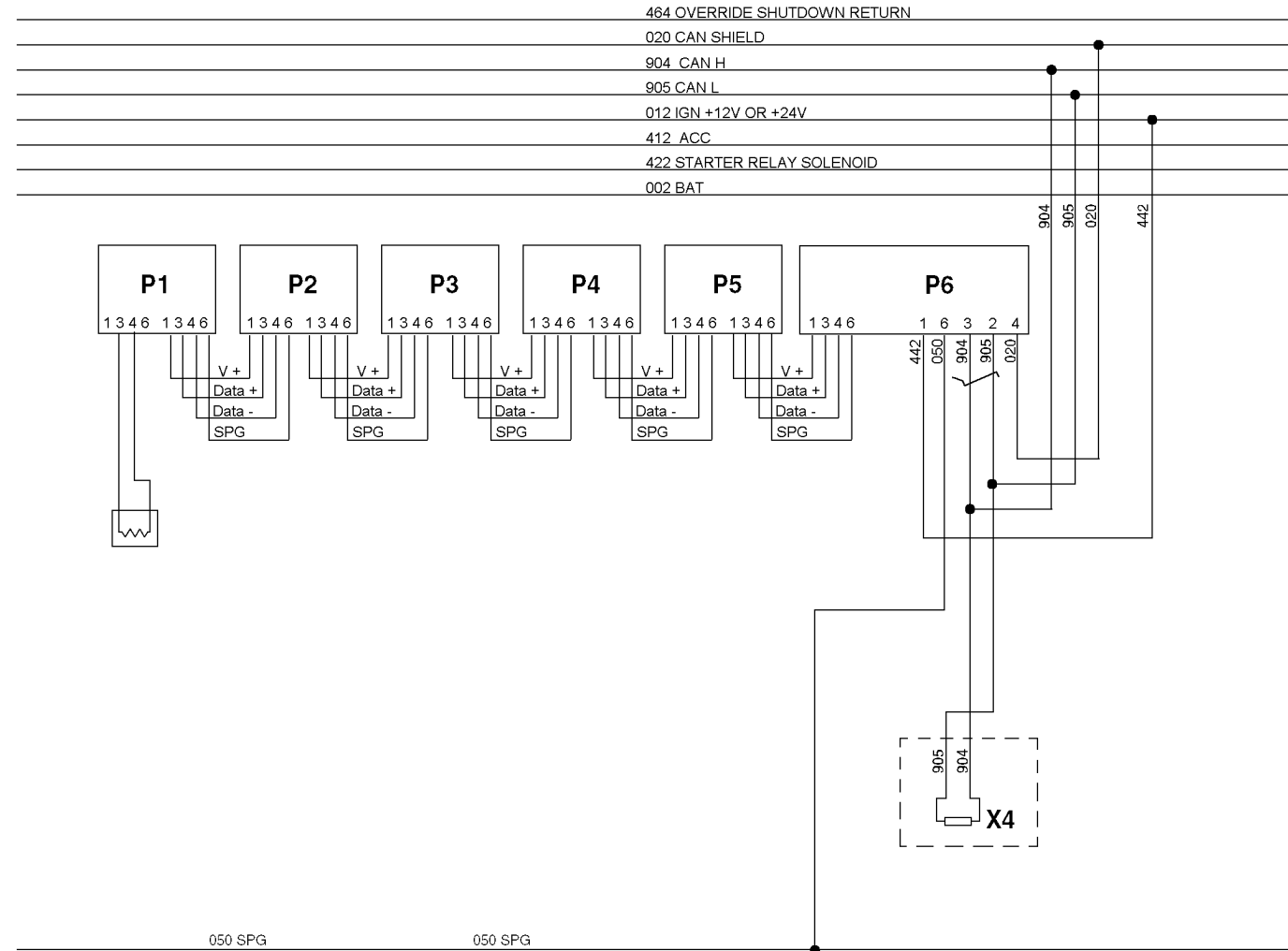
F01—Fuse (30 Amp)(System)
F02—Fuse (20 Amp)(ECU)
F03—Fuse (15 Amp)(Fuel Filter)
G1—Alternator
M1—Starter Motor
P1—Optional Gauge
P2—Optional Gauge
P3—Oil Pressure Gauge
P4—Coolant Temperature Gauge

P5—Tachometer Display
P6—Hour Meter/Diagnostic Gauge
S1—Ignition Key Switch
S2—Speed Select Switch (Momentary)
S3—Bump Enable Switch (Momentary)
S4—High-Low Speed Select Switch

S5—Override Shutdown Switch (Momentary)
V1—Diode
X1—Vehicle Harness Connector
X4—CAN Terminator
X5—Analog Throttle Connector

RG13873 -UN-08APR05

OURGP12,00000ED -19-08APR05-1/1



SE-2 INSTRUMENT PANEL (CONTINUED)

- | | | | |
|-------------------------|---------------------------|--------------------------|----------------------|
| B1—Analog Throttle | F01—Fuse (30 Amp)(System) | P5—Tachometer Display | S5—Override Shutdown |
| C06—Alternator Harness | F02—Fuse (20 Amp)(ECU) | P6—Hour Meter/Diagnostic | Switch (Momentary) |
| Connector | F03—Fuse (15 Amp)(Fuel | Gauge | V1—Diode |
| C12—Transient Voltage | Filter) | S1—Ignition Key Switch | X1—Vehicle Harness |
| Protector | G1—Alternator | S2—Speed Select Switch | Connector |
| C13—Starter Relay | M1—Starter Motor | (Momentary) | X4—CAN Terminator |
| C14—Starter Relay | P1—Optional Gauge | S3—Bump Enable Switch | X5—Analog Throttle |
| C15—Remote On/Off | P2—Optional Gauge | (Momentary) | Connector |
| C16—Battery | P3—Oil Pressure Gauge | S4—High-Low Speed Select | |
| C17—Single Point Ground | P4—Coolant Temperature | Switch | |
| | Gauge | | |

Storage

Engine Storage Guidelines

1. John Deere engines can be stored outside for up to three (3) months with no long term preparation IF COVERED BY 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 (3) months with no long term preparation.
3. John Deere engines can be stored inside for up to six (6) months with no long term preparation.
4. John Deere engines expected to be stored more than six (6) months MUST have long term storage preparation. (See PREPARING ENGINE FOR LONG TERM STORAGE, later in this section.)
5. Long term storage includes the use of a stabilized rust preventive oil to protect internal metal components of the engine. This oil should be an SAE 10 oil with 1-4 percent morpholine or equivalent vapor corrosion inhibitor. These rust preventive oils are available from area distributors.

OURGP12,00000DF -19-07JAN05-1/1

Preparing Engine for Long Term Storage

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.

IMPORTANT: Any time your engine will not be used for over six (6) months, the following recommendations for storing it and removing it from storage will help to minimize corrosion and deterioration.

1. Change engine oil and replace filter. (See CHANGE ENGINE OIL AND FILTER in Lubrication and Maintenance/500 Hour Section.) Used oil will not give adequate protection. Add one (1) ounce of rust preventive oil to the engine crankcase for every quart of oil. This rust preventive oil should be an SAE 10 oil with 1-4 percent morpholine or equivalent vapor corrosion inhibitor.
2. Service air cleaner. (See REPLACING AIR CLEANER FILTER ELEMENTS in Service As Required Section.)
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 RECOMMENDED ENGINE COOLANT in Fuels, Lubricants, and Coolant Section and ADDING COOLANT in Service As Required Section.)
4. Pour three (3) ounces of rust preventive oil into the turbocharger intake. (It may be necessary to temporarily install a short intake elbow on the turbocharger inlet to receive the oil.)
5. Prepare a tank with a solution of diesel fuel and rust preventive oil, at ten (10) ounces of rust preventive oil per gallon of diesel fuel.

6. Remove existing lines/plugs as required, and run a temporary line from the tank to the fuel transfer pump intake, and another temporary line from the fuel return manifold to the tank, so rust preventive oil solution is circulated through the injection system during cranking.
7. Crank the engine several revolutions with starter (do not allow the engine to start). This will allow rust preventive oil solution to circulate.
8. Remove temporary lines installed in Step 6 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 (5) 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.

9. Loosen, or remove and store, fan/alternator poly-vee belt.
10. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
11. Disengage the clutch for any driveline.
12. Clean the exterior of the engine with salt-free water and touch up any scratched or chipped painted surfaces with a good quality paint.
13. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
14. Seal all openings on engine with plastic bags and tape.

Continued on next page

OURGP12,00000E0 -19-07JAN05-1/2

15. 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.

OURGP12,00000E0 -19-07JAN05-2/2

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.

RG,RG34710,5613 -19-20MAY96-1/1

Specifications

General OEM Engine Specifications

ITEM	4045HF485	6068HF485
Number of Cylinders	4	6
Bore	106 mm (4.19 in.)	106 mm (4.19 in.)
Stroke	127 mm (5.0 in.)	127 mm (5.0 in.)
Displacement	4.5 L (276 cu in.)	6.8 L (414 cu in.)
Compression Ratio	17.0:1	17.0:1
Aspiration	Air-To-Air Intercooled, Turbocharged	
Engine Firing Order	1-3-4-2	1-5-3-6-2-4
Valves Per Cylinder	2 Intake 2 Exhaust	2 Intake 2 Exhaust
Valve Clearance (Cold)		
Intake Valves	0.36 mm (0.014 in.)	0.36 mm (0.014 in.)
Exhaust Valves	0.46 mm (0.018 in.)	0.46 mm (0.018 in.)
Max. Crank Pressure	0.5 kPa (2 H ₂ O)	0.5 kPa (2 H ₂ O)
Vibration Damper Maximum Radial Runout	1.50 mm (0.060 in.)	1.50 mm (0.060 in.)
Battery Capacities (CCA)		
12-Volt System	800	800
24-Volt System	570	570
Governor Regulation (Industrial)	7—10 %	7—10 %
Governor Regulation (Generator)	5%	5%
Thermostat Start To Open Temperature	82°C (180°F)	82°C (180°F)
Thermostat Fully Open Temperature	94°C (202°F)	94°C (202°F)
Coolant Capacity ^a	8.5 L (9 qt)	11.8 L (12.5 qt)
Recommended Radiator Pressure Cap	100 kPa (14.5 psi)	100 kPa (14.5 psi)
Crankcase Oil Fill Capacity	See "Engine Crankcase Oil Fill Quantities" later in this section.	
Oil Pressure At Rated Speed, Full Load (± 105 kPa, 15 psi)	345 kPa (50 psi)	345 kPa (50 psi)
Oil Pressure At Low Idle (Minimum)	105 kPa (15 psi)	105 kPa (15 psi)
Length	860 mm (33.9 in.)	1165 mm (45.9 in.)
^a Coolant capacity may vary with different engine applications.		

Continued on next page

OURGP12,00000A0 -19-28SEP04-1/2

Specifications

ITEM	4045HF485	6068HF485
Width	612 mm (24.1 in.)	597 mm (23.5 in.)
Height	994 mm (39.1 in.)	1046 mm (41.2 in.)
Weight	451 kg (993 lb)	678 kg (1495 lb)

OURGP12,00000A0 -19-28SEP04-2/2

Engine Power Ratings¹ And Fuel System Specifications²

Engine Model	Fuel System Option Codes	Electronic Software Option Codes	System Voltage	Power Rating @ Rated Speed kW (hp)	Rated Speed (rpm)	Slow Idle (rpm)	Fast Idle (rpm)
4045HF485 (4-Valve Head)	(To be available by 2006.)			116 (155)	2400	800	2600
				129 (173)	2400	800	2600
				138 (185)	2400	800	2600
6068HF485 4-Valve Head)	167W	72JJ	12V	134 (180) ...	2200	800	2400
	167W	72JK	24V	134 (180) ...	2200	800	2400
	167W	72JC	12V	138 (185)	2400	800	2600
	167W	72JD	24V	138 (185)	2400	800	2600
	167W	72JE	12V	138 (185)	2200	800	2400
	167W	72JF	24V	138 (185)	2200	800	2400
	167W	72JG	12V	138 (185)	2200	800	2400
	167W	72JH	24V	138 (185)	2200	800	2400
	167W	72HY	12V	144 (193)	2000	800	2100
	167W	72HZ	24V	144 (193)	2000	800	2100
	167W	72JA	12V	144 (193)	2000	800	2100
	167W	72JB	24V	144 (193)	2000	800	2100
	167W	72HS	12V	149 (200)	2400	800	2600
	167W	72HT	24V	149 (200)	2400	800	2600
	167W	72HU	12V	149 (200)	2200	800	2400
	167W	72HV	24V	149 (200)	2200	800	2400
	167W	72HW	12V	149 (200)	2200	800	2400
	167W	72HX	24V	149 (200)	2200	800	2400
	167W	72HN	12V	162 (217)	2000	800	2100
	167W	72HP	24V	162 (217)	2000	800	2100
	167W	72HQ	12V	162 (217)	2000	800	2100
	167W	72HR	24V	162 (217)	2000	800	2100
	167W	72HG	12V	168 (225)	2400	800	2600
	167W	72HH	24V	168 (225)	2400	800	2600
	167W	72HJ	12V	168 (225)	2200	800	2400
	167W	72HK	24V	168 (225)	2200	800	2400
	167W	72HL	12V	168 (225)	2200	800	2400
	167W	72HM	24V	168 (225)	2200	800	2400
	167W	72HE	12V	181 (243)	2000	800	2100
	167W	72HF	24V	181 (243)	2000	800	2100
	167W	72HA	12V	187 (250)	2400	800	2600
	167W	72HB	24V	187 (250)	2400	800	2600
	167W	72HC	12V	187 (250)	2200	800	2400

¹Power ratings are for bare engines without drag effect of cooling fan or accessories like air compressors.

²Engine speeds listed are preset to factory specification. Slow idle speed may be reset 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.

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OURGP12,00000A1 -19-28SEP04-1/2

Engine Model	Fuel System Option Codes	Electronic Software Option Codes	System Voltage	Power Rating @ Rated Speed kW (hp)	Rated Speed (rpm)	Slow Idle (rpm)	Fast Idle (rpm)
167W	167W	72HD	24V	187 (250)	2200	800	2400
167W	167W	72GY	12V	205 (275)	2400	800	2600
167W	167W	72GZ	24V	205 (275)	2400	800	2600
167W	167W	72JN	12V	175 (235)	1800	1400	1870
167W	167W	72JP	24V	175 (235)	1800	1400	1870
167W	167W	72JL	12V	234 (314)	1800	1400	1870
167W	167W	72JM	24V	234 (314)	1800	1400	1870

OURGP12,00000A1 -19-28SEP04-2/2

Engine Crankcase Oil Fill Quantities

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 option group. The last two digits of each code identify the specific oil pan on your engine.

NOTE: Crankcase oil capacity may vary slightly from amount shown. ALWAYS fill crankcase to within crosshatch on dipstick. DO NOT overfill.

The following table lists engine crankcase oil fill quantities:

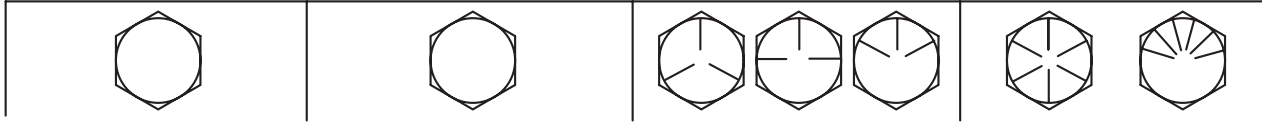
Engine Model	Oil Pan Option Code(s)	Crankcase Oil Capacity L (qt)
4045HF485 ^a	1923	15.0 (15.8)
	1976	20.5 (21.6)
6068HF485	1908	19.0 (20.1)
	1909	19.0 (20.1)
	1961	32.5 (34.3)
	19AC	27.0 (28.5)

^a4045HF485 information will be updated in 2006.

OURGP12,00000A2 -19-29SEP04-1/1

Unified Inch Bolt and Screw Torque Values

TS1671 –UN-01MAY03



Bolt or Screw	SAE Grade 1				SAE Grade 2 ^a				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c	
Size	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	3.7	33	4.7	42	6	53	7.5	66	9.5	84	12	106	13.5	120	17	150
													N•m	lb-ft	N•m	lb-ft
5/16	7.7	68	9.8	86	12	106	15.5	137	19.5	172	25	221	28	20.5	35	26
									N•m	lb-ft	N•m	lb-ft				
3/8	13.5	120	17.5	155	22	194	27	240	35	26	44	32.5	49	36	63	46
			N•m	lb-ft	N•m	lb-ft	N•m	lb-ft								
7/16	22	194	28	20.5	35	26	44	32.5	56	41	70	52	80	59	100	74
	N•m	lb-ft														
1/2	34	25	42	31	53	39	67	49	85	63	110	80	120	88	155	115
9/16	48	35.5	60	45	76	56	95	70	125	92	155	115	175	130	220	165
5/8	67	49	85	63	105	77	135	100	170	125	215	160	240	175	305	225
3/4	120	88	150	110	190	140	240	175	300	220	380	280	425	315	540	400
7/8	190	140	240	175	190	140	240	175	490	360	615	455	690	510	870	640
1	285	210	360	265	285	210	360	265	730	540	920	680	1030	760	1300	960
1-1/8	400	300	510	375	400	300	510	375	910	670	1150	850	1450	1075	1850	1350
1-1/4	570	420	725	535	570	420	725	535	1280	945	1630	1200	2050	1500	2600	1920
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2140	1580	2700	2000	3400	2500
1-1/2	990	730	1250	930	990	730	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For plastic insert or crimped steel type lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application. Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

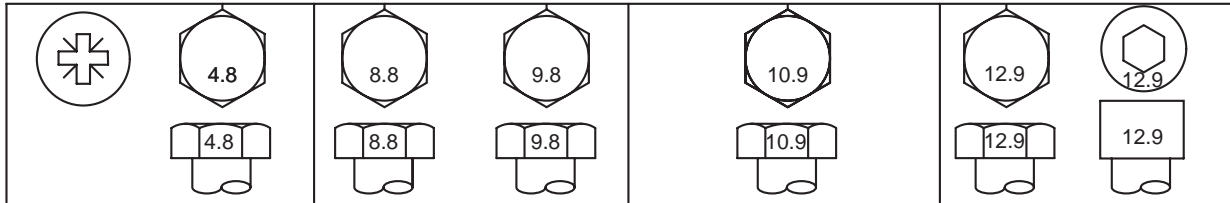
Replace fasteners with the same or higher grade. If higher grade fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

^aGrade 2 applies for hex cap screws (not hex bolts) up to 6 in. (152 mm) long. 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"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or 7/8 in. and larger fasteners with JDM F13C zinc flake coating.

^c"Dry" means plain or zinc plated without any lubrication, or 1/4 to 3/4 in. fasteners with JDM F13B zinc flake coating.

Metric Bolt and Screw Torque Values



TS1670 -UN-01MAY03

Bolt or	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
Screw	Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b	
Size	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	4.7	42	6	53	8.9	79	11.3	100	13	115	16.5	146	15.5	137	19.5	172
									N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
M8	11.5	102	14.5	128	22	194	27.5	243	32	23.5	40	29.5	37	27.5	47	35
			N•m	lb-ft	N•m	lb-ft	N•m	lb-ft								
M10	23	204	29	21	43	32	55	40	63	46	80	59	75	55	95	70
	N•m	lb-ft														
M12	40	29.5	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	46	80	59	120	88	150	110	175	130	220	165	205	150	260	190
M16	100	74	125	92	190	140	240	175	275	200	350	255	320	235	400	300
M18	135	100	170	125	265	195	330	245	375	275	475	350	440	325	560	410
M20	190	140	245	180	375	275	475	350	530	390	675	500	625	460	790	580
M22	265	195	330	245	510	375	650	480	725	535	920	680	850	625	1080	800
M24	330	245	425	315	650	480	820	600	920	680	1150	850	1080	800	1350	1000
M27	490	360	625	460	950	700	1200	885	1350	1000	1700	1250	1580	1160	2000	1475
M30	660	490	850	625	1290	950	1630	1200	1850	1350	2300	1700	2140	1580	2700	2000
M33	900	665	1150	850	1750	1300	2200	1625	2500	1850	3150	2325	2900	2150	3700	2730
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2770	4750	3500

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For stainless steel fasteners or for nuts on U-bolts, see the tightening instructions for the specific application. Tighten plastic insert or crimped steel type lock nuts by turning the nut to the dry torque shown in the chart, unless different instructions are given for the specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class. 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 fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

^a"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C zinc flake coating.

^b"Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B zinc flake coating.

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, 5620 -19-20MAY96-1/1

Daily (Prestarting) Service

- Check engine oil level.
- Check coolant level.
- Check fuel filters/water bowls.
- Check air cleaner dust unloader valve and air restriction indicator, if equipped.
- Perform visual walkaround inspection.

RG, RG34710, 5621 -19-11JUN02-1/1

500 Hour/12 Month Service

- Service fire extinguisher.
- Check engine mounts.
- Service battery.
- Change engine oil and filter.¹
- 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.
- Check cooling system.
- Coolant solution analysis – add SCAs as needed.
- Pressure test cooling system.
- Check engine speeds.

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¹Service 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.)

2000 Hour/24 Month Service

- Check crankshaft vibration damper (6-cylinder only).
- Flush and refill cooling system.¹
- Test thermostats.
- Check and adjust valve clearance.
- Test glow plugs

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¹If 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.

OURGP12,00000A4 -19-29SEP04-1/1

Service as Required

- Add coolant
- Service air cleaner.
- Replace poly-vee belts.
- Check fuses
- Check air compressor (if equipped)
- Bleed fuel system

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RG, RG34710, 5627 -19-11MAR03-1/1

Emission System Warranty

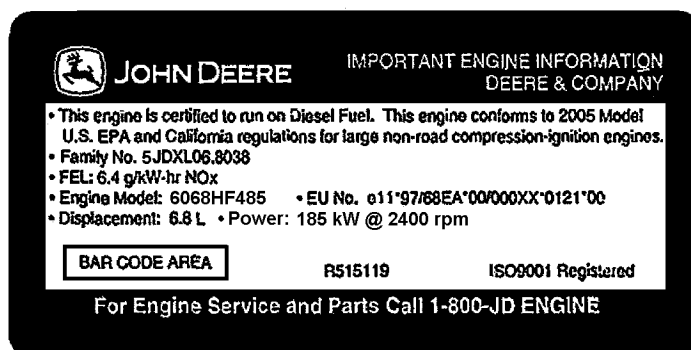
U.S. EPA Emissions Control Warranty Statement

Emissions control-related parts and components are warranted by John Deere for five years or 3000 hours of operation, whichever occurs first. John Deere further warrants that the engine covered by this warranty was designed, built, and equipped so as to conform at the time of sale with all U.S. emissions standards at the time of manufacture, and that it is free of defects in materials and workmanship which would cause it not to meet these standards within the period of five years or 3000 hours of operation, whichever occurs first.

Warranties stated in this manual refer only to emissions-related parts and components of your engine. The complete engine warranty, less emissions-related parts and components, is provided separately as the "John Deere New Off-Highway Engine Warranty".

RG, RG34710, 7629 -19-30JUN97-1/1

Emissions Control System Certification Label



RG13549 -JUN-11NOV04

Emissions Label



CAUTION: Statutes providing severe penalties for tampering with emissions controls may apply to the user or dealer.

The emissions warranty described above applies only 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 mobile (self-propelled or portable/transportable¹) 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 in the third line of the label signifies that the engine has been certified with the European Union countries per Directive 97/68/EC. The emissions warranty does not apply to the EU countries.

NOTE: The hp/kW rating on the engine emissions certification label specifies the gross engine hp/kW, which is flywheel power without fan. In most applications this will not be the same rating as the advertised vehicle hp/kW rating.

¹Equipment moved at least once every 12 months.

Index

Page

Page

A

Acid burns	35-2
Air cleaner	
Air intake restriction indicator	30-1
Dust unloader valve	30-1
Replace single stage element	45-5
Air compressor	45-11
Air intake system, check	35-7
Alternator belts	45-10
Auxiliary gear drive, limitations	20-18

B

Batteries	
Charge/Boost	20-13
Service	35-2
Battery acid burns	35-2
Battery explosion	35-2
Belt tensioner, automatic	35-10
Belts, fan and alternator	
Replacing	45-10
Bleeding fuel system	45-12
Break-in engine oil	10-6
Break-in, engine	20-1

C

Chart, service interval	25-2, 25-4
Check and adjust	
Valves	40-9
Check engine electrical ground	35-12
Cold weather aids	10-4, 20-11, 40-11
Compressor, air	45-11
Configuration data, viewing	15-7
Coolant	
Adding	45-3
Additional information	10-13
Diesel engine	10-11
Disposing	10-16
Replenishing supplemental additives	35-13
Supplemental additives	10-14
Testing	10-15, 35-15
Warm temperature climates	10-15
Cooling system	
Adding coolant	45-3
Check	35-12
Flush	40-2
Pressure test	35-16

Pressure test radiator cap	35-16
Refill	40-2
Crankcase vent system, check	35-6
Crankshaft vibration damper	40-1

D

Damper, checking	40-1
Diagnostic gauge	
Software version	50-9
Diagnostic procedure	50-3
Using diagnostic gauge	15-4
Diagnostic Trouble Codes (DTCs)	50-5
Active engine service codes, viewing	15-11
Instrument panel	50-3
Stored service codes, viewing	15-9
Diesel engine oil	10-7
Diesel fuel	10-1, 10-3
DTCs (Diagnostic Trouble Codes)	
View active service codes	15-11
View stored service codes	15-9

E

Emissions	
EPA Statement	70-1
Engine	
Adjust speed	35-17
Break-in	20-1
Changing speed	20-15
Check electrical ground	35-12
Idling	20-14
Operation	20-9
Option codes	01-2
Restarting	20-8
Serial number	01-1
Starting	20-5
Stopping	20-17
Troubleshooting	50-11
Warming	20-10
Engine Control Unit (ECU) serial number	01-4
Engine coolant	
Disposing of	10-16
Engine mounts, check	35-1
Engine oil	
Break-In	10-6
Change	35-4
Diesel	10-7
Service Intervals	10-8

	Page		Page
Engine speed		Viewing active service codes	15-11
Changing	20-15	Viewing configuration data	15-7
Engine wiring layout	50-19	Viewing stored service codes	15-9
Exhaust Gas Recirculating (EGR) valve serial		Intermittent fault diagnostics	50-9
number	01-5		
		L	
F		Listing of DTCs.	50-5
Fan belts	45-10	Lubricant	
Filter, replace		Mixing	10-9
Fuel	35-8	Storage	10-10
Oil	35-4	Lubrication and maintenance	
Fire extinguisher, service	35-1	Service as required	45-1
Fuel		Lubrication and Maintenance	
Diesel	10-1, 10-3	Service Interval Chart	25-2, 25-4
Handling and storing	10-2	Lubricity of diesel fuel	10-1
Lubricity	10-1		
Fuel filter		M	
Checking	30-1	Maintenance interval chart	
Draining water	30-1	Generator (Standby) applications	25-4
Replace	35-8	Standard industrial applications	25-2
Fuel pump model number	01-4	Mixing lubricants	10-9
Fuel system			
Bleeding	45-12		
Fuses, checking	45-11		
		O	
G		Oil	
Gauges	20-10	Dipstick	30-1
Generator (Standby) Applications	25-4	Fill quantity	60-4
Glow plugs		Filler locations	30-1
Cold weather use	10-4	Oil filter, change	35-4
Test	40-11	Oil filters	10-10
I		Operating engine	
Idling engine	20-14	Break-in	20-1
Instrument panels		Cold weather	10-4, 20-11
Adjust backlighting	15-14	Normal operation	20-9
Adjust contrast	15-16	Option codes	01-2
Changing units of measure	15-18		
Component function	15-1	P	
Main menu navigation	15-5	Poly-vee belts	
Setup 1-up display	15-21	Replace	45-10
Setup 4-up display	15-27	Power ratings	60-3
Shutdown codes	15-13	Precautions for welding on engines equipped	
Using diagnostic gauge	15-4	w/ECU	50-20

Page

Page

R

Radiator cap testing	35-16
Radiator shutters	10-4
Recordkeeping	
Engine Control Unit (ECU) serial number	01-4
Engine option codes	01-2
Engine serial number	01-1
Exhaust Gas Recirculating (EGR) valve serial number	01-5
Fuel pump model number	01-4
Restarting engine	20-8

S

Serial number	
Engine	01-1
Engine Control Unit (ECU)	01-4
Exhaust Gas Recirculating (EGR) valve	01-5
High-pressure fuel pump	01-4
Service	
As required	45-1
Battery	35-2
Fire extinguisher	35-1
Intervals	25-2, 25-4
Service intervals	
Engine oil and filter	10-8
General information	25-1
Specifications	
Battery capabilities	35-2
Belt tensioner	35-10
Damper	40-1
Engine crankcase oil fill	60-4
Fuel injection pump and power ratings	60-3
General OEM	60-1
Standby power units	20-18
Starting engine	20-5
Stopping engine	20-17
Storage	
Guidelines	55-1
Long term	55-2
Removing from	55-3
Storing fuel	10-2
Storing lubricants	10-10
Supplemental coolant additives	
Replenishing	35-13

T

Tensioner, belt	
Automatic	35-10

Thermostat	
Install	40-5
Remove	40-5
Test opening temperature	40-5
Trouble codes	50-5
Troubleshooting	
General information	50-1
General, engine	50-11

U

Units of measure, changing	15-18
----------------------------------	-------

V

Valves	
Clearance, check and adjust	40-9
Vibration damper	40-1

W

Warming engine	20-10
Warranty	
Emission System	70-2
Winterfronts	10-4
Wiring harness	50-19

