

# JOHN DEERE

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## OPERATOR'S MANUAL

*POWERTECH*® 8.1 L 6081 OEM Diesel  
Engines ( —199,999)

OMRG24828 Issue 10Aug04 (ENGLISH)



***POWERTECH*<sup>®</sup> 8.1 L  
6081 OEM  
Diesel Engines  
( —199,999)**

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**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

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

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

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

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

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

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

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

**IMPORTANT:** This manual covers POWERTECH® 8.1 L OEM engines meeting Tier 1<sup>1</sup> emission standards. These engines, produced starting in the year 1996, include all engines up through engine serial number 199,999. Tier 2 engines were also produced after January 2001, and are redesigned to meet the 2001 emission standards. These newer engines, beginning with serial number 200,000, are covered in a separate operator's manual, OMRG34944.

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

*POWERTECH is a trademark of Deere & Company*

<sup>1</sup>Emission certified for United States as EPA Tier 1 and European Union as Stage 1.

OURGP11,000000F -19-28JUN04-1/1

## 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>

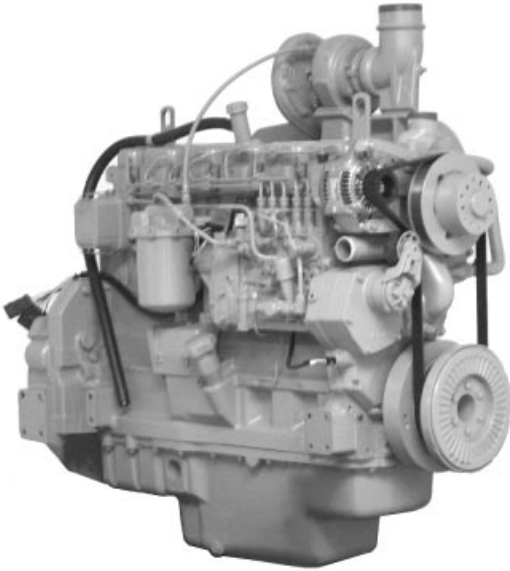
Entérese de quién es, y dónde está situado. Cuando tenga un momento, vaya a visitarlo. A él le gustará conocerlo, y saber cuáles podrían ser sus necesidades.

### 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>

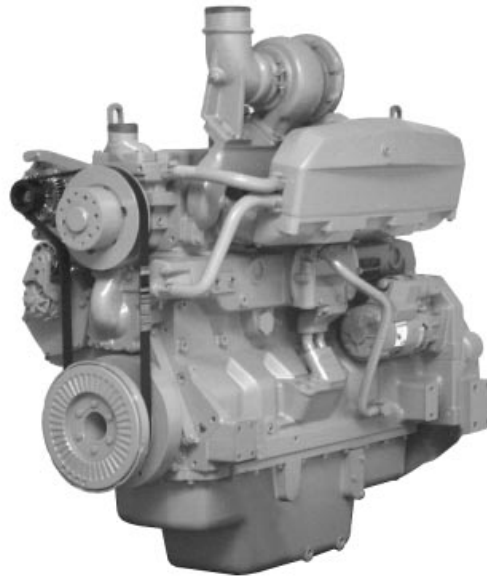
Din återförsäljare vill mycket gärna träffa dig för att lära känna dina behov och hur bäst han kan hjälpa dig.

## Identification Views— Engine Serial Number ( —199,999)



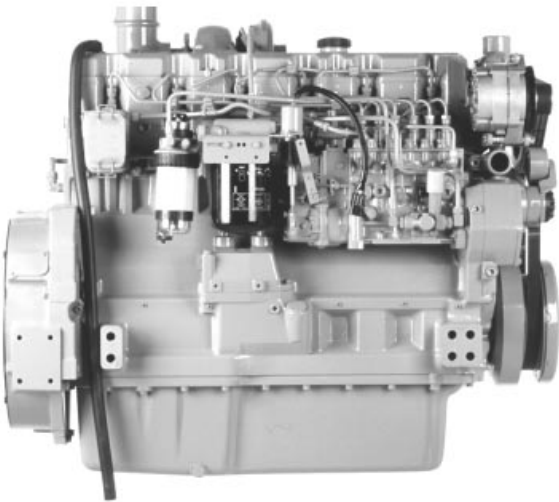
RG7362 —UN—05JAN98

*8.1 L Diesel Engine Right Front View*



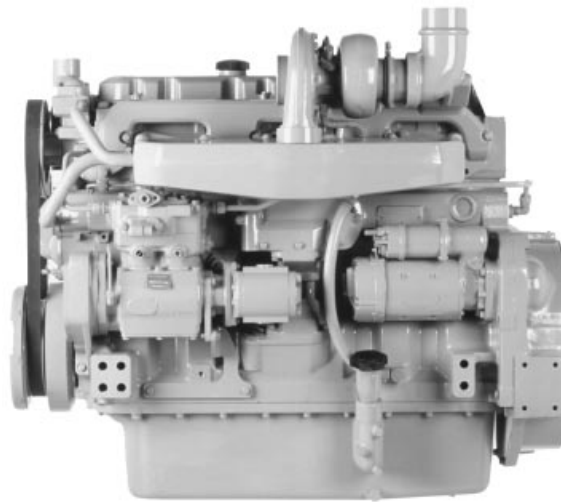
RG7363 —UN—05JAN98

*8.1 L Diesel Engines Left Front View*



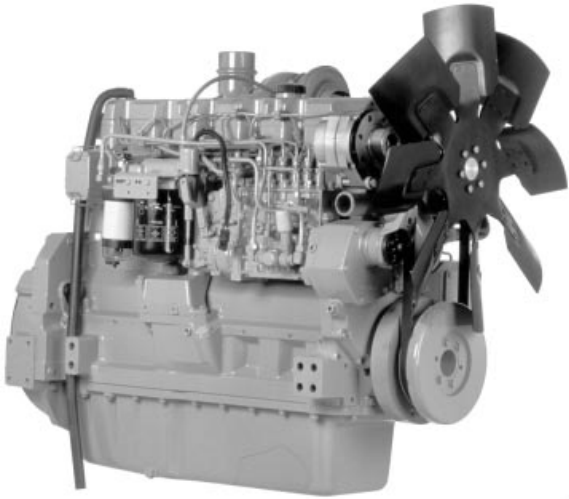
RG7385 —UN—05JAN98

*8.1 L Diesel Engines Right Side View*



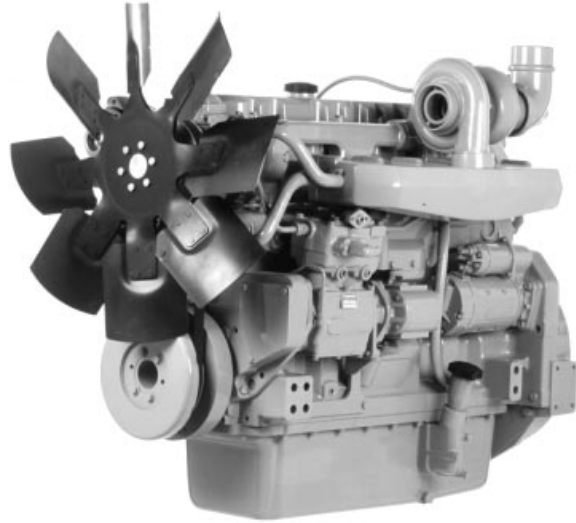
RG7387 —UN—05JAN98

*8.1 L Diesel Engines Left Side View*



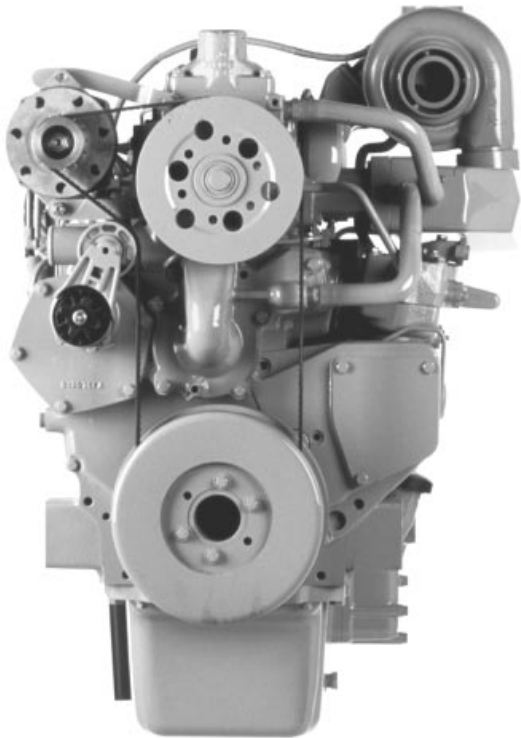
RG7388 -UN-20JUN00

8.1 L Diesel Engine Right Front View



RG7386 -UN-20JUN00

8.1 L Diesel Engine Left Front View



RG7383 -UN-05JAN98

8.1 L Diesel Engine Front View



RG7384 -UN-05JAN98

8.1 L Diesel Engine Rear View



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A John Deere ILLUSTRATION® Manual  
Previous Editions  
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# Record Keeping

## Record Engine Serial Number

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

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

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

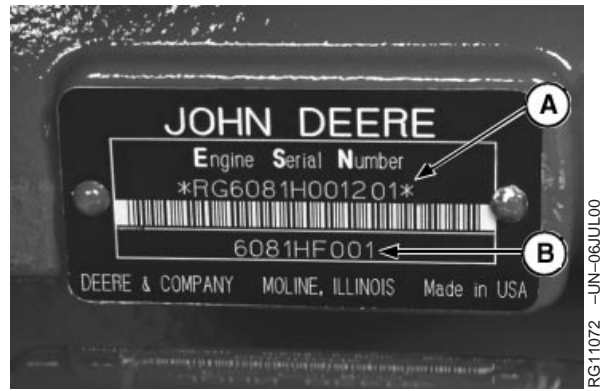
Engine Serial Number (A)

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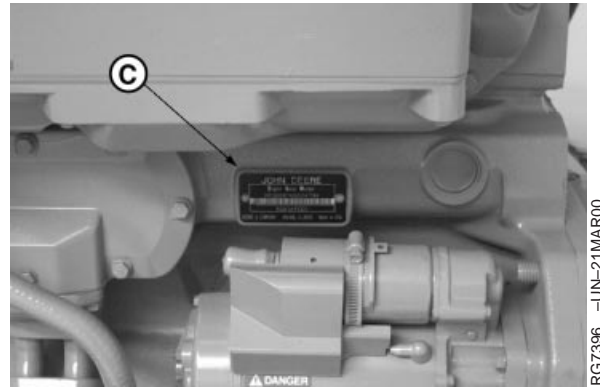
Application Data or Type (B)

---

A—Engine Serial Number  
B—Application Data or Type  
C—Serial Number Plate



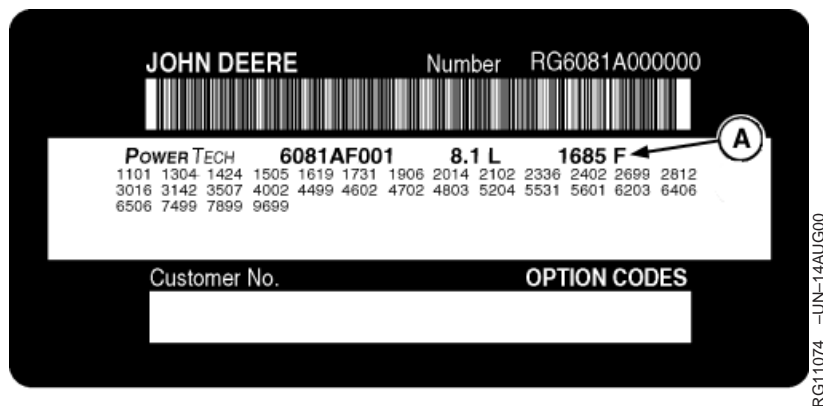
Engine Serial Number Plate



Location of Engine Serial Number Plate

RG, RG34710, 4001 -19-01JAN96-1/1

## Engine Option Codes



Option Code Label

### A—Engine Base Code

In addition to the serial number plate, OEM engines have an engine option code label affixed to the side of the cylinder block. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your authorized servicing dealer or engine distributor with these numbers.

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

The first two digits of each option code identify a specific group, such as alternators. The last two digits of each code identify one specific option provided on your engine, such as a 24-volt, 42-amp alternator.

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

Engine Base Code (A):

Continued on next page

RG, RG34710, 4002 -19-23OCT02-1/2

**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.

Option Codes	Description	Option Codes	Description
11_____	Rocker Arm Cover	48_____	Pistons and Connecting Rods
13_____	Crankshaft Pulley/Damper	49_____	Valve Actuating Mechanism
14_____	Flywheel Housing	50_____	Oil Pump
15_____	Flywheel	51_____	Cylinder Head
16_____	Fuel Injection Pump	52_____	Gear-Driven Auxiliary Drive
17_____	Air Intake	55_____	Transport Skid/Shipping Stand
19_____	Oil Pan	56_____	Paint
20_____	Coolant Pump	57_____	Coolant Pump Inlet
21_____	Thermostat Cover	59_____	Oil Cooler and Filter
22_____	Thermostats	62_____	Alternator Mounting
23_____	Fan Drive	64_____	Exhaust Elbow
24_____	Fan Belts	65_____	Turbocharger
26_____	Engine Coolant Heater	66_____	Coolant Temperature Sensor/Switch
28_____	Exhaust System	69_____	Engine Serial Number Plate
29_____	Ventilator System	74_____	Air Conditioning (A/C) Compressor (Optional)
30_____	Starter Motor	76_____	Oil Pressure Sensor/Switch
31_____	Alternator	77_____	Timing Gear Cover
35_____	Fuel Filter	78_____	Air Compressor (Optional)
38_____	Operator's Manual	92_____	Accessories (Factory Installed)
39_____	Outlet Manifold	93_____	Emissions Label
40_____	Oil Dipstick	96_____	Wiring Harness
44_____	Electronic Speed Sensor	97_____	Special Equipment (Field Installed)
46_____	Cylinder Block	98_____	Engine Lift Label
47_____	Crankshaft	99_____	Service Kits

**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.

## Record Fuel Injection Pump Model Number

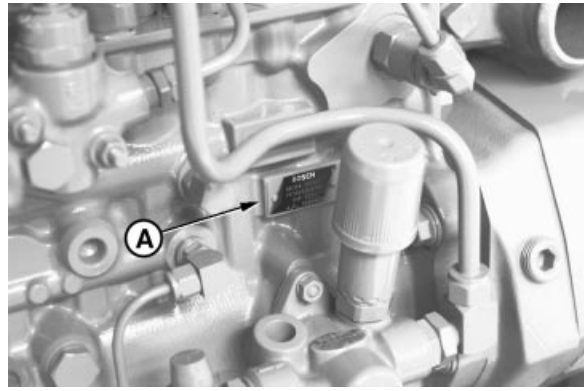
Record the fuel injection pump model and serial information found on the serial number plate (A).

Model No. \_\_\_\_\_ RPM \_\_\_\_\_

Manufacturer's No. \_\_\_\_\_

Serial No. \_\_\_\_\_

**A—Serial Number Plate**



*Fuel Injection Pump Serial Number Plate*

RG7393 -UN-20JUN00

RG, RG34710, 4005 -19-01JAN96-1/1

## Record PTO Serial Number (If Equipped)

Serial number and model number are located on cover plate of PTO housing. Record the numbers in the following spaces:

Serial Number \_\_\_\_\_

Model Number \_\_\_\_\_



*PTO Serial Number Plate (If Equipped)*

RG4622 -UN-15DEC88

RG, RG34710, 4004 -19-01JAN96-1/1

# 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.

 **DANGER**

 **WARNING**

 **CAUTION**

*Signal Words*

TS187 -19-30SEP88

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

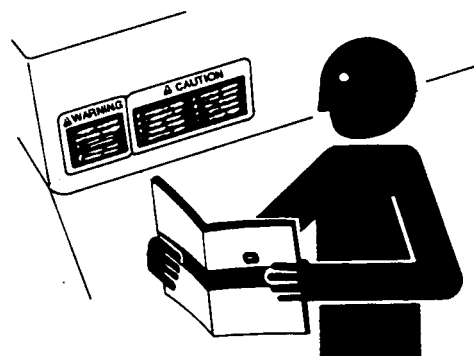
## Follow Safety Instructions

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

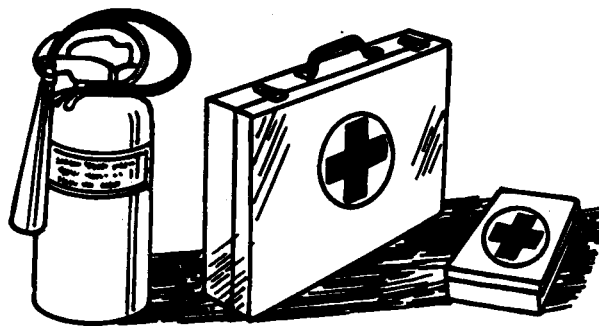
DX, FIRE1 -19-03MAR93-1/1

## 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*

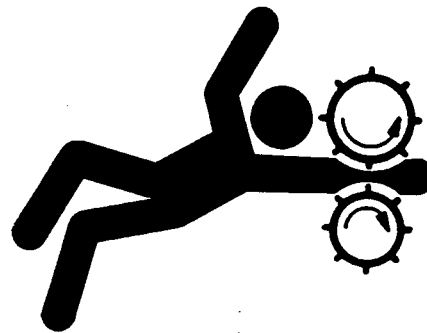
TS227 -JUN-23AUG88

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 engine 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

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

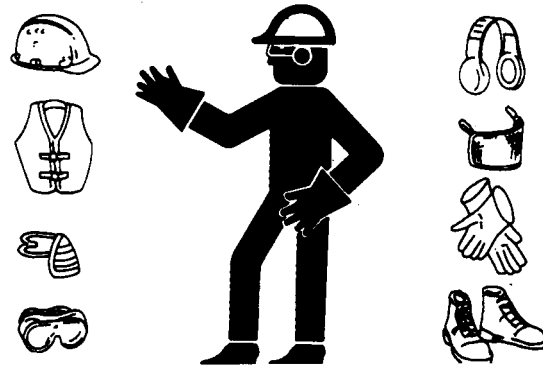
## Wear Protective Clothing

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

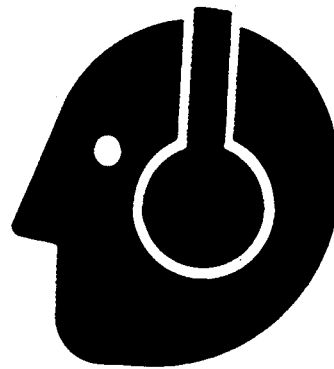
TS206 -JUN-23AUG88

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*

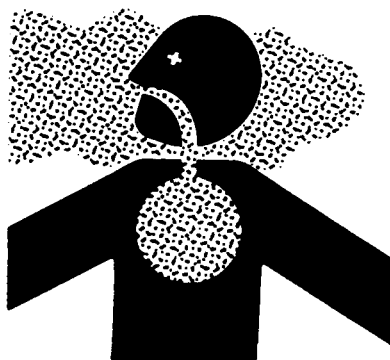
TS218 -UN-23AUG88

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

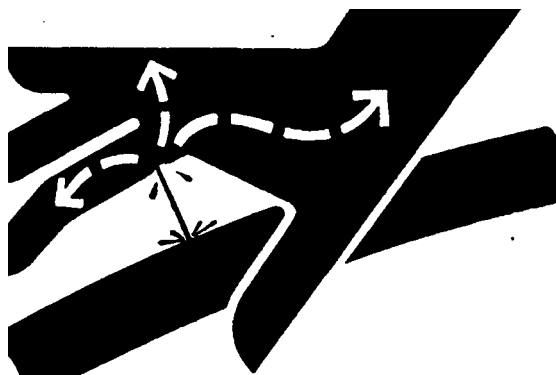
## Avoid High-Pressure Fluids

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 be accidentally cut when heat goes beyond the immediate flame area.



Flammable Spray

TS953 -UN-15MAY90

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

## 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*

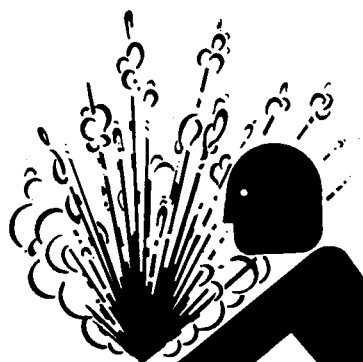
TS220 -UN-23AUG88

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*

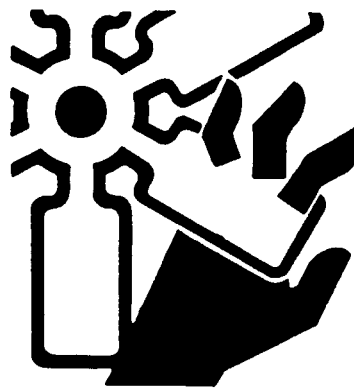
TS281 -UN-23AUG88

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*

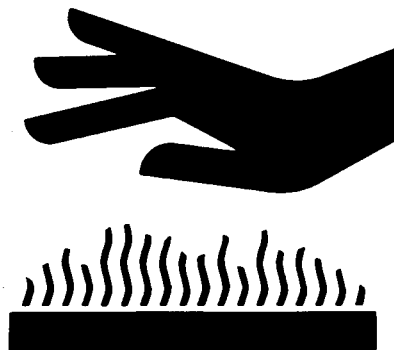
TS677 -JUN-21SEP89

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

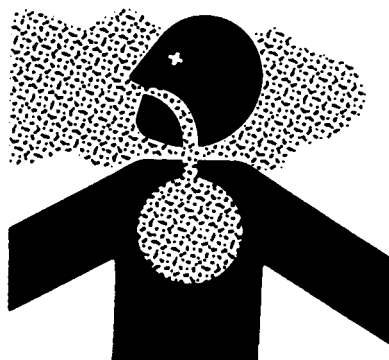
## Avoid Harmful Asbestos Dust

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:

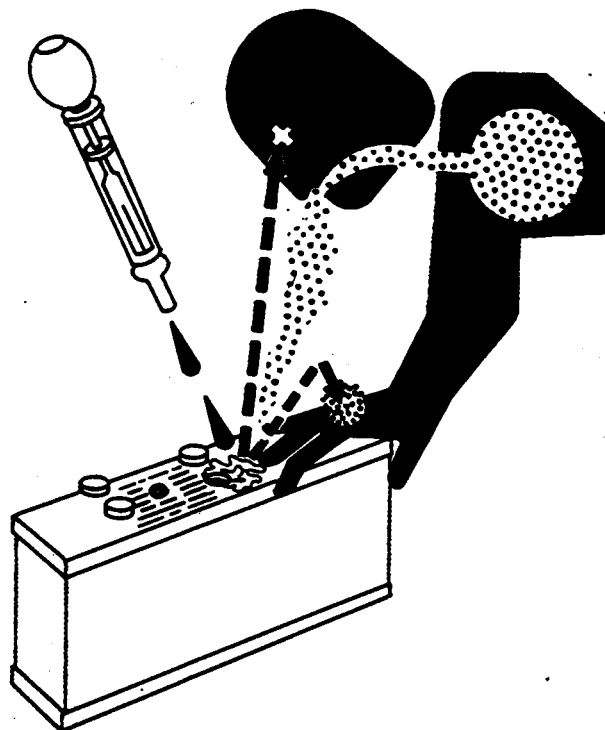
1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 qt.).
3. Get medical attention immediately.

**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*

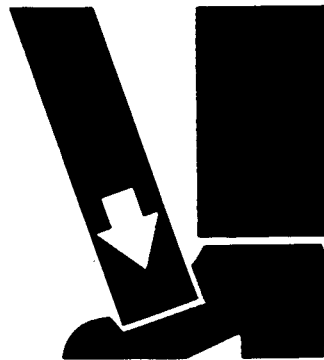
TS1343 -UN-18MAR92

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 -JUN-08NOV89

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

## Dispose of Waste Properly

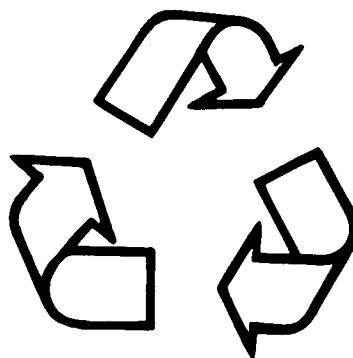
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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 -JUN-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.

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

**Cetane number of 40 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 of 3100 gram load level as measured by the BOCLE scuffing test.

### Sulfur content:

- Sulfur content should not exceed 0.5%. Sulfur content less than 0.05% is preferred.
- If diesel fuel with sulfur content greater than 0.5% sulfur content is used, reduce the service interval for engine oil and filter by 50%.
- DO NOT use diesel fuel with sulfur content greater than 1.0%.

Bio-diesel fuels may be used ONLY if the fuel properties meet DIN 51606 or equivalent specification.

DO NOT mix used engine oil or any other type of lubricant with diesel fuel.

DX,FUEL1 -19-19DEC03-1/1

## Lubricity of Diesel Fuel

Diesel fuel must have adequate lubricity to ensure proper operation and durability of fuel injection system components.

ASTM D975 and EN 590 specifications do not require fuels to pass a fuel lubricity test.

Sulfur content of diesel fuel for highway use is less than 0.05% (500 ppm) in the United States and Canada, and less than 0.035% (350 ppm) in the European Union.

Experience shows that some low sulfur diesel fuels may have inadequate lubricity and their use may reduce performance in fuel injection systems due to inadequate lubrication of injection pump components. The lower concentration of aromatic compounds in

these fuels also adversely affects injection pump seals and may result in leaks.

Use of low lubricity diesel fuels may also cause accelerated wear, injection nozzle erosion or corrosion, engine speed instability, hard starting, low power, and engine smoke.

Fuel lubricity should pass a minimum load 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.

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

DX,FUEL5 -19-19DEC03-1/1

## 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 sampling program to help you monitor the quality of your fuel source. It verifies fuel type, cleanliness, water content, suitability for cold weather operation, and if fuel is within ASTM specifications. Check with your John Deere dealer for availability of DIESELSCAN kits.

*DIESELSCAN is a trademark of Deere & Company*

DX,FUEL6 -19-06DEC00-1/1

## 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  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ) 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

## Aviation (Jet) Fuels

Aviation (jet) fuels may be used with the following restrictions.

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

OURGP12,000003F -19-07JUL04-1/1

## Burner Fuels

Burner fuels, like kerosene, may be used with the following restrictions.

Type	Comments
No.2	Higher density and specific gravity than base No. 2-D diesel fuel. Power increase up to 3% can be expected.
No.1	Lower viscosity than base No. 2-D diesel fuel. Power loss up to 2% can be expected.

OURGP12,0000040 -19-07JUL04-1/1

## 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.*

### Coolant Heaters

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

### 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.

### 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.

RG, RG34710, 7529 -19-30JUN97-2/2

## 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 Classification CE
- API Service Classification CD
- API Service Classification 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	API CF
API CH-4	ACEA E5
API CG-4	ACEA E4
API CF-4	ACEA E3
API CF-2	

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

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

DX, ENOIL4 -19-03NOV03-1/1

## 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 E5
- ACEA Oil Sequence E4

Extended service intervals may apply when John Deere PLUS-50, ACEA E5, or ACEA E4 engine oils are used. Consult your John Deere dealer for more information.

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

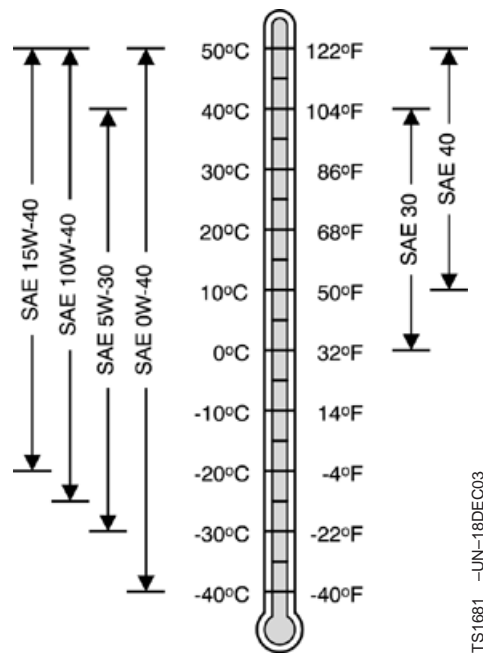
- John Deere TORQ-GARD SUPREME™
- API Service Category CI-4
- API Service Category CH-4
- API Service Category CG-4
- API Service Category CF-4
- ACEA Oil Sequence E3
- ACEA Oil Sequence E2

If oils meeting API CG-4, API CF-4, or ACEA E2 are used, reduce the service interval by 50%.

### Multi-viscosity diesel engine oils are preferred.

If diesel fuel with sulfur content greater than 0.5% (5000 ppm) is used, reduce the service interval by 50%.

DO NOT use diesel fuel with sulfur content greater than 1.0% (10 000 ppm).



PLUS-50 is a trademark of Deere & Company  
TORQ-GARD SUPREME is a trademark of Deere & Company

DX,ENOIL -19-05DEC03-1/1

## Extended Diesel Engine Oil Service Intervals

When John Deere PLUS-50® or ACEA E4 or E5 oil and the specified John Deere filter are used, the service interval for engine oil and filter changes may be increased by 50% or to every 375 hours.

If other than PLUS-50® oil and the specified John Deere filter are used, change the engine oil and filter at the normal service interval of every 250 hours.

*PLUS-50 is a trademark of Deere & Company  
PLUS-50 is a trademark of Deere & Company. In Europe, oils meeting  
ACEA E4 or E5 standard can also be used.*

OURGP12,0000047 -19-20JUL04-1/1

## 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.

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

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

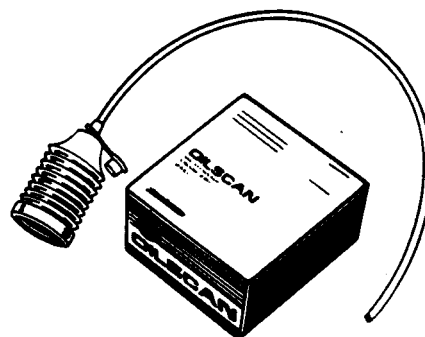
DX,LUBMIX -19-18MAR96-1/1

## OILSCAN™ and COOLSCAN™

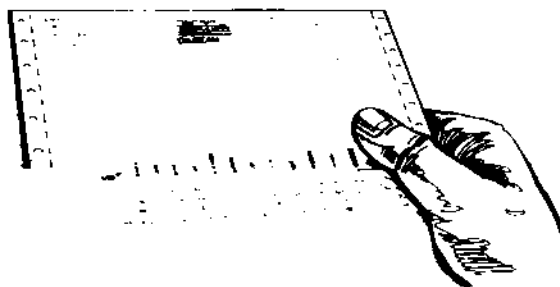
OILSCAN™ and COOLSCAN™ are John Deere sampling programs to help you monitor machine performance and identify potential problems before they cause serious damage.

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 -JUN-15JUN89



T6829AB -JUN-18OCT88

*OILSCAN is a registered trademark of Deere & Company.  
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

## Grease

Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

The following greases are preferred:

- John Deere SD POLYUREA GREASE

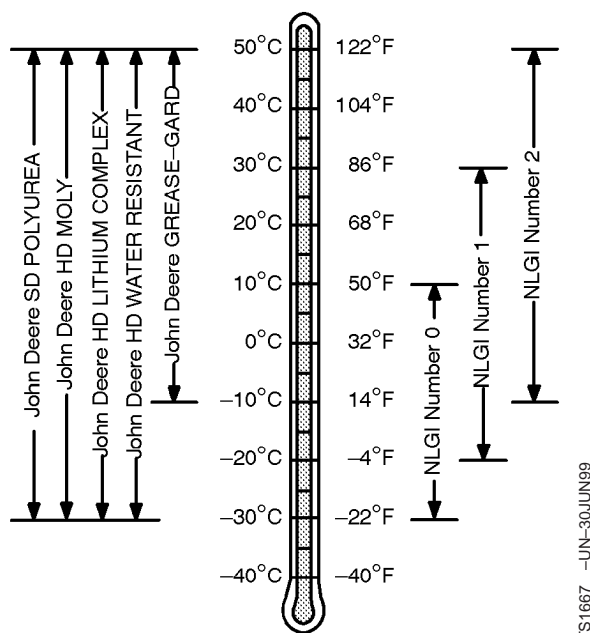
The following greases are also recommended:

- John Deere HD MOLY GREASE
- John Deere HD LITHIUM COMPLEX GREASE
- John Deere HD WATER RESISTANT GREASE
- John Deere GREASE-GARD

Other greases may be used if they meet the following:

- NLGI Performance Classification GC-LB

**IMPORTANT:** Some types of grease thickener are not compatible with others. Consult your grease supplier before mixing different types of grease.



DX,GREAI -19-14NOV03-1/1

## 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 either a concentration of 50% ethylene glycol or a 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

## 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.

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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.

COOLSCAN is a trademark of Deere & Company  
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

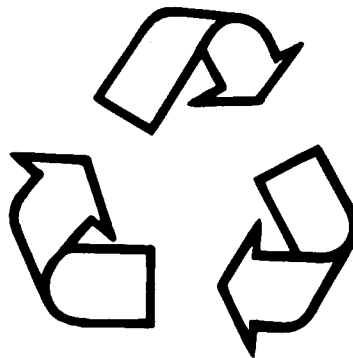
## Disposing of Coolant

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

# Engine Operating Guidelines

## Instrument (Gauge) Panel (Engines With Standard Instrument Panel)

All controls and gauges are optional equipment for John Deere OEM Engines. They may be provided by the equipment manufacturer instead of John Deere. The following information applies only to those controls and gauges provided by John Deere.

**IMPORTANT:** Any time an electric gauge or meter does not register correctly, replace it with a new one. Do not attempt to repair it.

Following is a brief description of the components on the John Deere instrument (gauge) panel:

**A—Oil Pressure Gauge** - Indicates engine oil pressure.

**B—Ammeter** - Indicates charging current within electrical system.

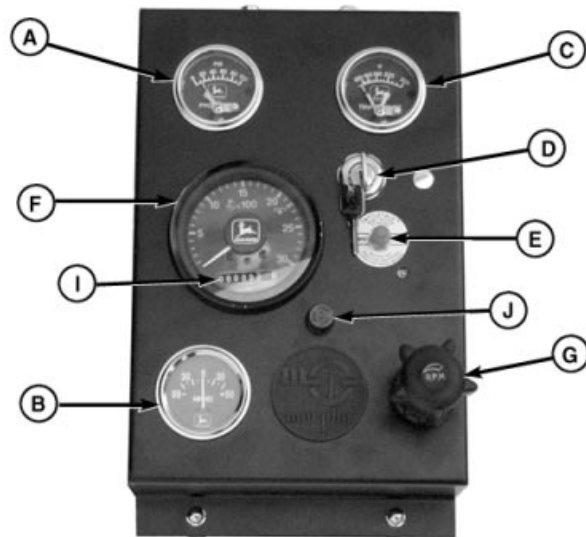
**C—Coolant Temperature Gauge** - Indicates the engine coolant temperature.

**D—Key Switch** - The four-position key switch controls the electrical system.

**E—Reset (Safety) Switch** - Overrides safety shutdown switch when depressed and held in during engine startup. Hold button in until engine oil pressure is at a safe operating level. Switch will shut engine down when oil pressure drops below or coolant temperature rises above a (preset) safe operating level.

**F—Tachometer (with Electric Hour Meter, Some Engines)** - Tachometer senses engine speed from a speed sensor in front timing gear cover and indicates engine speed in revolutions per minute (rpm). Hour meter indicates the operating hours of the engine while key switch is in the "ON" position. The hour meter should be used as a guide for scheduling periodic service.

**G—Hand Throttle** - Controls engine speed.



Standard Instrument Panel

- A—Oil Pressure Gauge
- B—Ammeter
- C—Coolant Temperature Gauge
- D—Key Switch
- E—Reset (Safety) Switch
- F—Tachometer (With Hour Meter, Some Engines)
- G—Hand Throttle
- H—Tachometer Binary Code
- I—Hour Meter (Separate on Some Engines)
- J—Fuse Holder (14 Amp)

RG11299C -UN-21AUG00

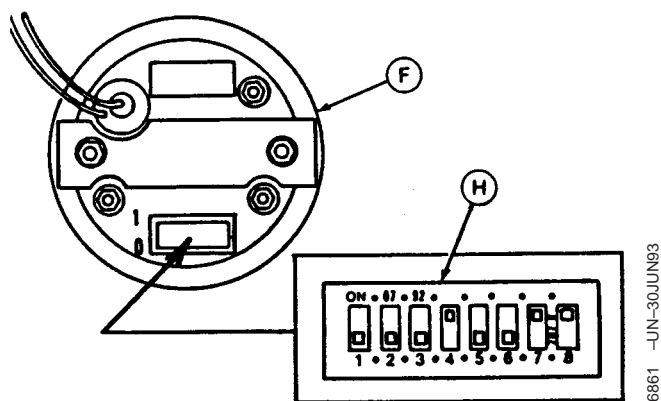
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RG, RG34710, 4046 -19-10OCT02-1/2

**H— Tachometer Binary Code** - Located in back of tachometer and must be set at “00010011” to operate at 27 pulses per revolution as shown.

**I— Hour Meter (Separate on Some Engines)** - On some instrument panels, the hour meter is a separate gauge from the tachometer. This electric hour meter shows the accumulated hours of engine service. The hour meter operates when the engine is operating, or when the reset button is manually held in while the key switch is in the ON Position. The accumulated hours are displayed in hours and tenths of hours.

**J— Fuse Holder (14 Amp Fuse)** - The fuse holder is located on the panel. See “Checking Fuses” in “Service as Required” section later in this manual.



Setting Code for Tachometer

RG6861 -UN-30JUN93

RG, RG34710, 4046 -19-10OCT02-2/2



## Instrument (Gauge) Panel (Engines With Electronic Instrument Panel)

This electronic instrument panel was introduced in 1999. It is linked to the John Deere engine control unit (ECU).

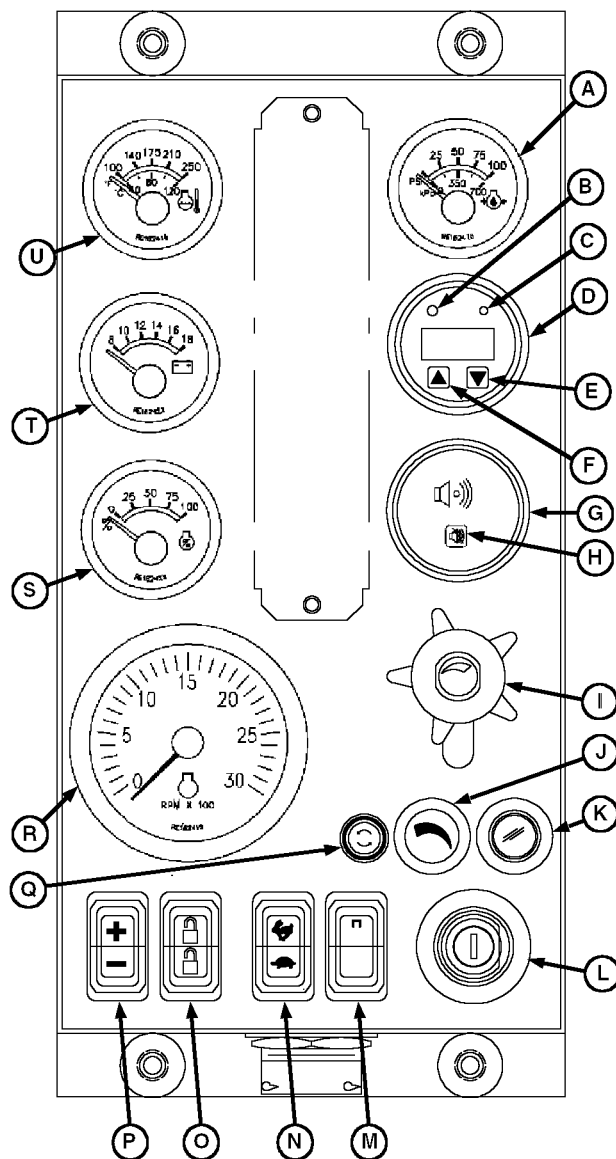
This allows the operator to monitor engine performance as well as to diagnose any troubles during engine operation.

**IMPORTANT:** Any time an electric gauge or meter does not register correctly, replace with a new one. Do not attempt to repair it. All gauges are plug-in type.

Refer to manufacturers literature for information on controls not provided by Deere.

Following is a brief description of the gauges and controls on the John Deere electronic instrument panel.

- A—Engine Oil Pressure Gauge
- B—Amber “WARNING” Indicator
- C—Red “STOP ENGINE” Indicator
- D—Diagnostic Gauge/Hour Meter
- E—Touch Switch
- F—Touch Switch
- G—Audible Alarm
- H—Audible Alarm Override Switch (Optional)
- I—Throttle Control (Optional)
- J—Dimmer Control (Optional)
- K—Engine Preheater Indicator (Optional)
- L—Key Start Switch
- M—Override Shutdown Rocker Switch (Optional)
- N—High-Low Speed Select Rocker Switch (Optional)
- O—Bump Speed Enable Rocker Switch (Optional)
- P—Speed Select Rocker Switch (Optional)
- Q—Fuse Holder (5-Amp Fuse)
- R—Tachometer
- S—Power Meter (Percent Load) (Optional)
- T—Voltmeter
- U—Engine Coolant Temperature Gauge



RG9547 -UN-14AUG00

Instrument Panel (Engines With Electronic Instrument Panel)

## Instrument (Gauge) Panel (Engines With Electronic Instrument Panel)— Continued

### ENGINE OIL PRESSURE GAUGE

The engine oil pressure gauge (A) indicates engine oil pressure in pounds per square inch (psi). It is connected to an audible alarm (G) to warn the operator if oil pressure drops below the preset safe operating pressure set for the engine.

### AMBER “WARNING” INDICATOR

The amber “WARNING” indicator (B) signals an abnormal condition such as low oil pressure, high coolant temperature, water in fuel, low battery voltage, etc. Use the Service Code menu of the diagnostic gauge (D) to identify the trouble.

### RED “STOP ENGINE” INDICATOR

The red “STOP ENGINE” indicator (C) signals operator to stop engine immediately or as soon as safely possible. A condition exists that could cause damage to engine.

### DIAGNOSTIC GAUGE/HOUR METER

The diagnostic gauge (D) displays diagnostic trouble codes (DTCs) as they occur. Other information on the engine can be accessed using the touch switches (E and F). The hour meter shows the operating hours of the engine. Normally, the gauge will alternately flash from the displayed parameters to the message “SvrcCode”. (See following in this section for operating the diagnostic gauge switches to access engine

information. Also see TROUBLESHOOTING section for a list of diagnostic trouble codes (DTCs) and corresponding engine problems.)

### TOUCH SWITCHES

The touch switches are used to change the display on the window of the diagnostic gauge to access engine performance data. Pressing the DOWN switch (E) or UP switch (F) scrolls through various engine parameters and diagnostic fault codes.

### AUDIBLE ALARM

The audible alarm (G) sounds whenever a low oil pressure or high coolant temperature condition exists.

### AUDIBLE ALARM OVERRIDE SWITCH (OPTIONAL)

The audible alarm override switch (H) can be pressed to silence the alarm for approximately 2-1/2 minutes.

### THROTTLE CONTROL (OPTIONAL)

The throttle control (I) is used to control engine speed. This control is available as part of the panel only on engines with analog throttle.

### DIMMER CONTROL (OPTIONAL)

The dimmer control (J) is used to control illumination of the instrument panel gauges.

DPSG,OUOD002,1572 -19-09OCT02-1/1

## Instrument (Gauge) Panel (Engines With Electronic Instrument Panel)— Continued

### ENGINE PREHEATER INDICATOR (OPTIONAL)

The engine preheater indicator (K) lights up while the engine is being preheated for cold weather starting. When the engine is warmed up, the light goes off, indicating the engine can now be started.

### KEY START SWITCH

The three-position key switch (L) 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.

### OVERRIDE SHUTDOWN ROCKER SWITCH (OPTIONAL)

*NOTE: This switch may be present, but not active, depending on panel options originally selected.*

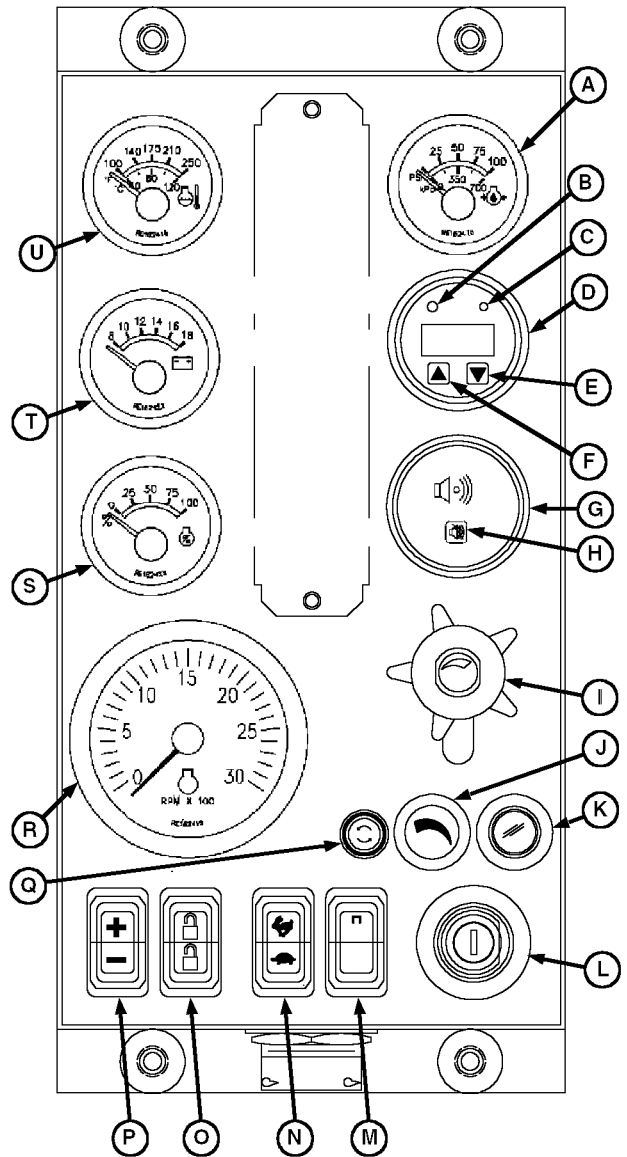
Pressing the upper half of the override shutdown switch (M) will override an engine shutdown signal. The switch must be pressed within 30 seconds to prevent undesired shutdown of engine.

### HIGH-LOW SPEED SELECT ROCKER SWITCH (OPTIONAL)

The high-low speed select switch (N) is used to set the engine at operating speeds of slow (turtle) or fast (rabbit). Factory preset idle speeds can then be adjusted using the Bump Enable Switch (O) with the Speed Select Switch (P).

### BUMP SPEED ENABLE ROCKER SWITCH

The bump speed enable switch (O) has a center position which locks the speed select switch (P) to prevent accidental changes in operating speed. To unlock the speed select switch, press and hold either the upper or lower half of the speed enable switch (O).



RG9547 -UN-14AUG00

Instrument Panel (Engines With Electronic Instrument Panel)

## Instrument (Gauge) Panel (Engines With Electronic Instrument Panel)— Continued

### SPEED SELECT ROCKER SWITCH

The speed select switch (P) 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 (O) in the unlocked position (top or bottom half of button depressed).

### HOW TO SELECT PRESET OPERATING SPEEDS (BUMP SPEEDS)

First select slow or fast speed option by pressing speed select switch (N) to “turtle” (slow) or “rabbit” (fast). Then you can press either the upper or lower portion of the bump speed enable switch (O) to unlock the high or low speed setting. The bump enable must be held down as the speed select rocker (P) is used to change the high or low speed setting by pressing (+) to increase speed or (-) to decrease speed.

Once the speed has been set, the bump speed enable rocker **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 operating speed will revert back to the previous setting.

The fast idle speed cannot be locked into memory. It will always go back to the factory preset fast idle speed.

### FUSE HOLDER

The fuse holder (Q) contains a 5-amp fuse for power to the instrument panel.

### TACHOMETER

The tachometer (R) indicates engine speed in hundreds of revolutions per minute (rpm).

### POWER (PERCENT LOAD) METER (OPTIONAL)

The power meter (S) shows percent of available power being used by the engine.

### VOLTMETER

The voltmeter (T) indicates system battery voltage. The amber “WARNING” light (B) will illuminate when battery voltage is too low for proper operation of the fuel injection system.

### ENGINE COOLANT TEMPERATURE GAUGE

The coolant temperature gauge (U) indicates engine coolant temperature in degrees Centigrade or Fahrenheit. It is connected to an audible alarm (G) to warn the operator if coolant temperature rises above the preset safe operating temperature.

### CRUISE CONTROL (OPTIONAL)

Engine ECUs are available with the cruise control function. The cruise control is an off-road type that maintains a constant engine rpm under varying load conditions.

The cruise cancel/resume function is a one-button cancel, then resume, function. The first time contact is made with the cruise control active, the cruise control will disengage and the engine speed will drop to idle. If the contact is made again within one minute and with the engine speed above 1300 rpm, the cruise control will “resume”. This feature allows the placement of the cancel/resume button in a convenient location in the vehicle cab and does not require the use of the normal cruise controls for momentary interruptions in cruise operation.

The cancel/resume function is intended for applications like agricultural tractors and sprayers that turn around at the end of each row in a field. This allows the operator to use the throttle and/or brake to turn the vehicle around. When ready to resume field operations, the operator brings the engine speed above 1300 rpm and activates the cancel/resume function again to resume cruise speed. An internal timer gives the operator one minute to complete the turnaround maneuver.

The cruise control has the normal functions of:

- Cruise control power “ON” or “OFF”.
- “Set” or “bump up” engine speed.
- “Resume” or “bump down” engine speed.
- Use vehicle brake or clutch pedal to disengage cruise control.

speed changes can be made by “bumping” the control switch. Holding the “bump up” or “bump down” switch will result in greater engine rpm changes until the engine reaches either full speed or idle. The cruise control cannot operate beyond the normal min/max engine speeds.

The “bump up” and “bump down” speed controls allow the operator to change the set speed. Small engine

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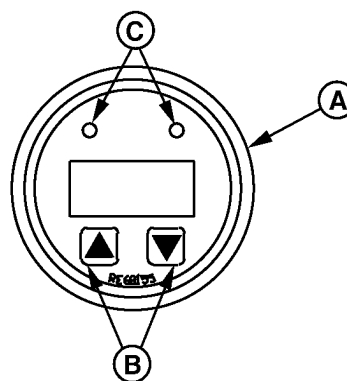
## Using Diagnostic Gauge To Access Engine Information

The diagnostic gauge (A) allows the operator to view many readouts of engine functions and diagnostic 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 two touch switches (B) to view 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
- Current fuel consumption
- Active service (diagnostic) codes
- Stored service (diagnostic) codes from the engine
- Set the units for display
- View the engine configuration parameters
- Accelerator pedal position
- Percentage load at current speed
- Actual engine percent torque
- Engine speed
- Trip distance
- Total vehicle distance
- Engine hours
- Trip fuel
- Total fuel used
- Coolant temperature
- Fuel temperature
- Engine oil temperature
- Engine intercooler temperature
- Fuel delivery pressure
- Engine oil level
- Engine oil pressure
- Coolant pressure



Diagnostic Gauge

A—Diagnostic Gauge  
B—Touch Switches  
C—Amber and Red Lights

RG10031 -JUN-28OCT99

- Coolant level
- Wheel base vehicle speed
- Fuel rate
- Barometric pressure
- Air inlet temperature
- Boost pressure
- Intake manifold temperature
- Air filter differential pressure
- Exhaust gas temperature
- Electrical potential (voltage)
- Battery potential (voltage), switched
- Transmission oil pressure
- Transmission oil temperature
- Injector metering rail No. 1 pressure
- Injector metering rail No. 2 pressure
- Estimated percent fan speed

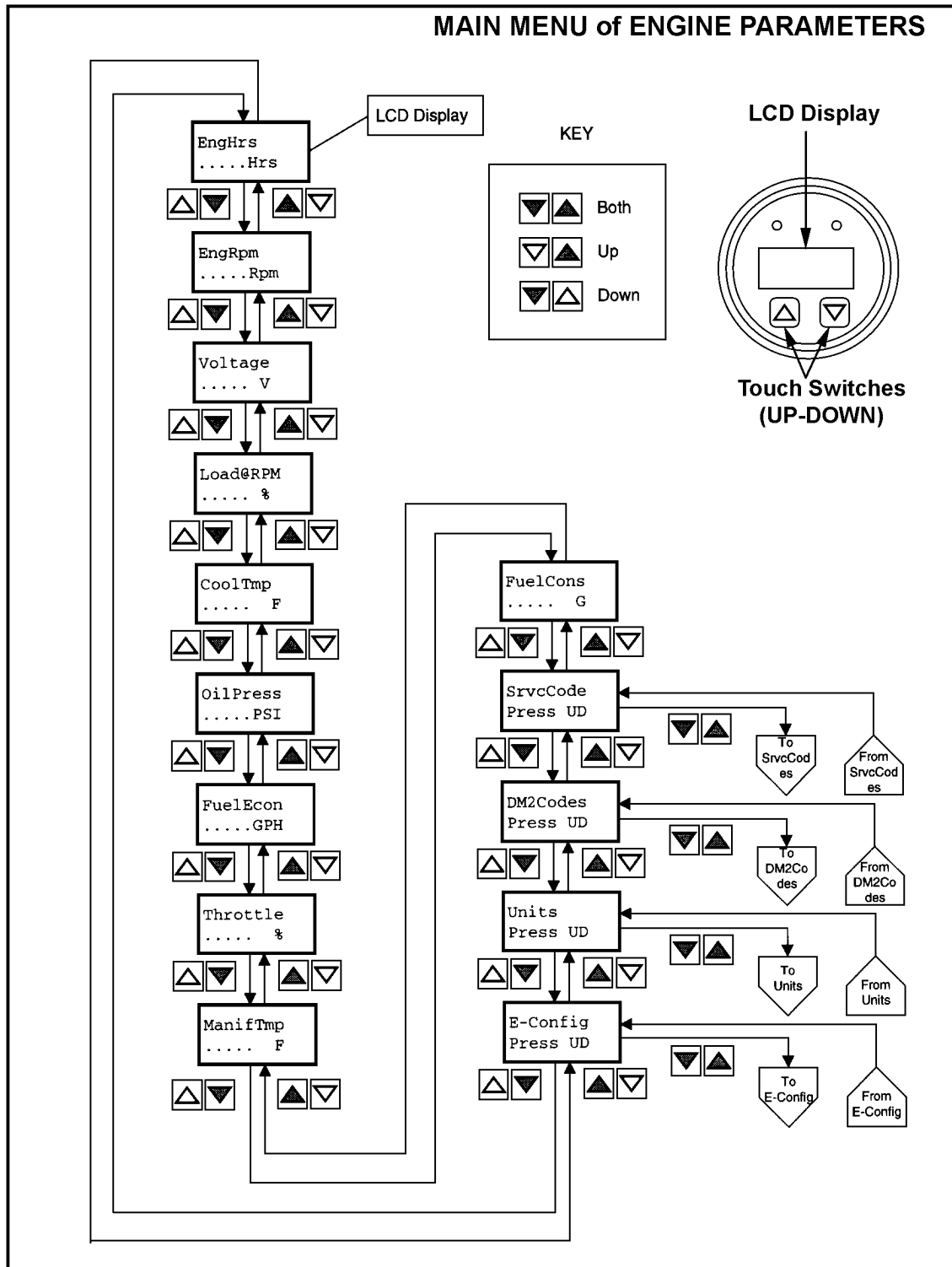
*NOTE: Engine parameters which can be accessed will vary with the engine application.*

The diagnostic gauge includes a two-line by eight-character backlit Liquid Crystal Display (LCD). The top line displays the data label, i.e. "EngHrs" and the bottom line displays the matching unit information, i.e. "1200 Hrs". The diagnostic gauge uses two touch switches (UP and DOWN) for scrolling through the engine parameter list and viewing the menu list. Two lights (C) (amber and red) are used to signal active trouble messages received by the diagnostic gauge.

OURGP11,0000010 -19-28JUN04-2/2



## Using Touch Switches to Display Information



RG9947 -19-09DEC99

Using Touch Switches

Continued on next page

DPSG.OUOD007,2841 -19-21OCT99-1/2

The touch switches on the diagnostic gauge allow quick and easy navigation through the menu to find the information needed. The diagram on the previous page is a typical Main Menu of Engine Parameters. The Main Menu has 14 entries; the first 10 are engine data parameters, and the last four are sub-menu entry points. The following two rules are used for accessing the various items on the menus:

1. To scroll through the parameter list, press **either** the UP or DOWN touch switches.
2. To select or exit a sub-menu, **simultaneously** press the UP and DOWN switches.

### Selecting Engine Data Parameters

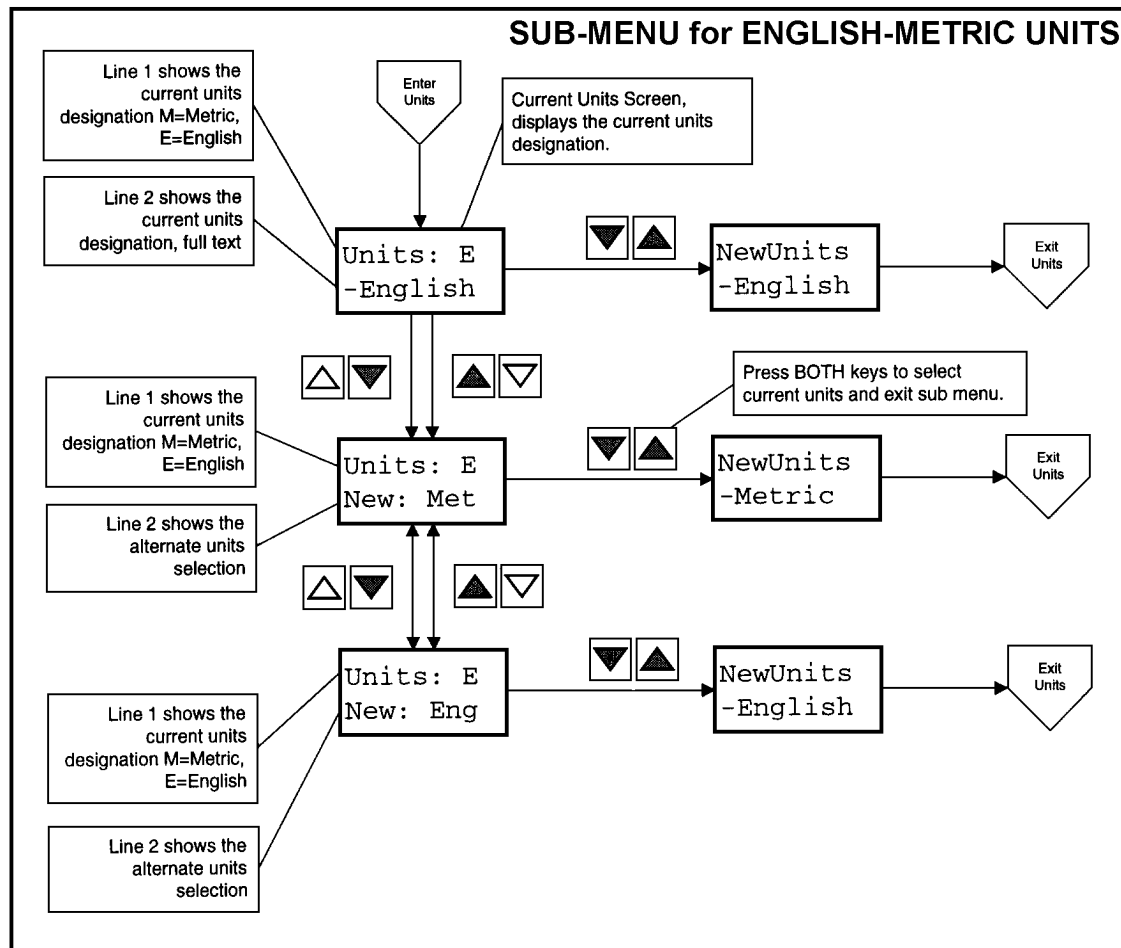
To read any of the engine parameters, press either UP or DOWN switches (as shown on diagram) until the top line of the display shows the desired information.

### Selecting Sub-Menus

Press either the UP or DOWN switches until the top line of the display shows the label of the desired sub-menu. Then press **BOTH** the UP and DOWN switches at the same time. This action will select the sub-menu and the next screen on the display will list the Sub-Menu items. This is also the way to access Diagnostic Trouble Codes (DTCs).

DPSG,OUOD007,2841 -19-21OCT99-2/2

## Changing Units of Measure (English or Metric)



RG10018 -19-28OCT99

### Changing Units Of Measure

The diagnostic gauge can display engine data in either English or Metric units. To toggle between these, the *Units Sub-Menu*, must be selected.

To select the *Units Sub-Menu*, press the UP or DOWN switches until the top line of the display reads "UNITS". Then press BOTH the UP and DOWN switches at the same time to select the *Units Sub-Menu*. The above

diagram shows the steps for selecting the desired units of measure. Two options are available:

1. Press both the switches to retain the current units designation.
2. Press either UP or DOWN switch to toggle the units selection, then press both switches to select the desired unit of measure.

DPSG,OUOD007,2842 -19-21OCT99-1/1



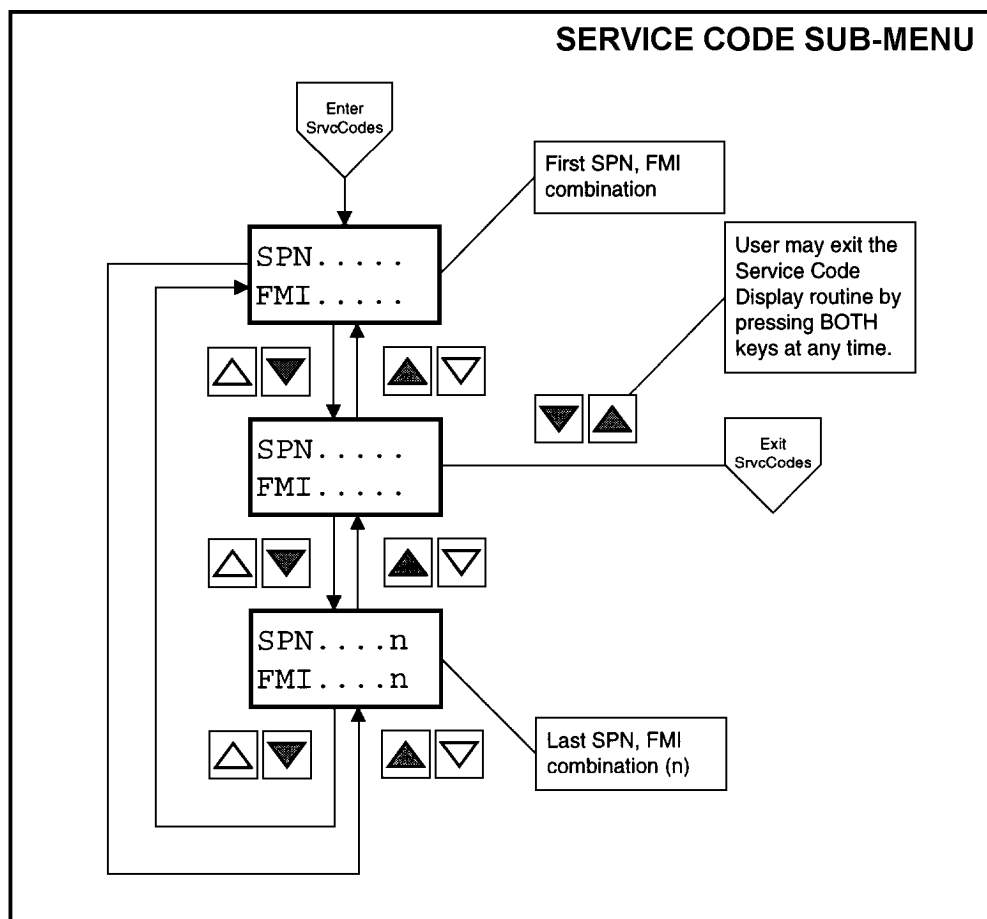


The diagnostic gauge can display the engine configuration data stored in the Engine Control Unit (ECU). To select the *Engine Configuration Sub-Menu* (see diagram on previous page), press the UP or DOWN switches until the top line of the display reads

“E-Config”. Then press BOTH the UP and DOWN switches at the same time to select the *Engine Configuration Sub-Menu* . The diagnostic gauge will display the engine configuration data as shown in the diagram.

DPSG,OUOD002,1927 -19-19DEC00-2/2

## Viewing Active Engine Service Codes/Diagnostic Trouble Codes (DTCs)



*Viewing Active Service Codes/Diagnostic Trouble Codes (DTCs)*

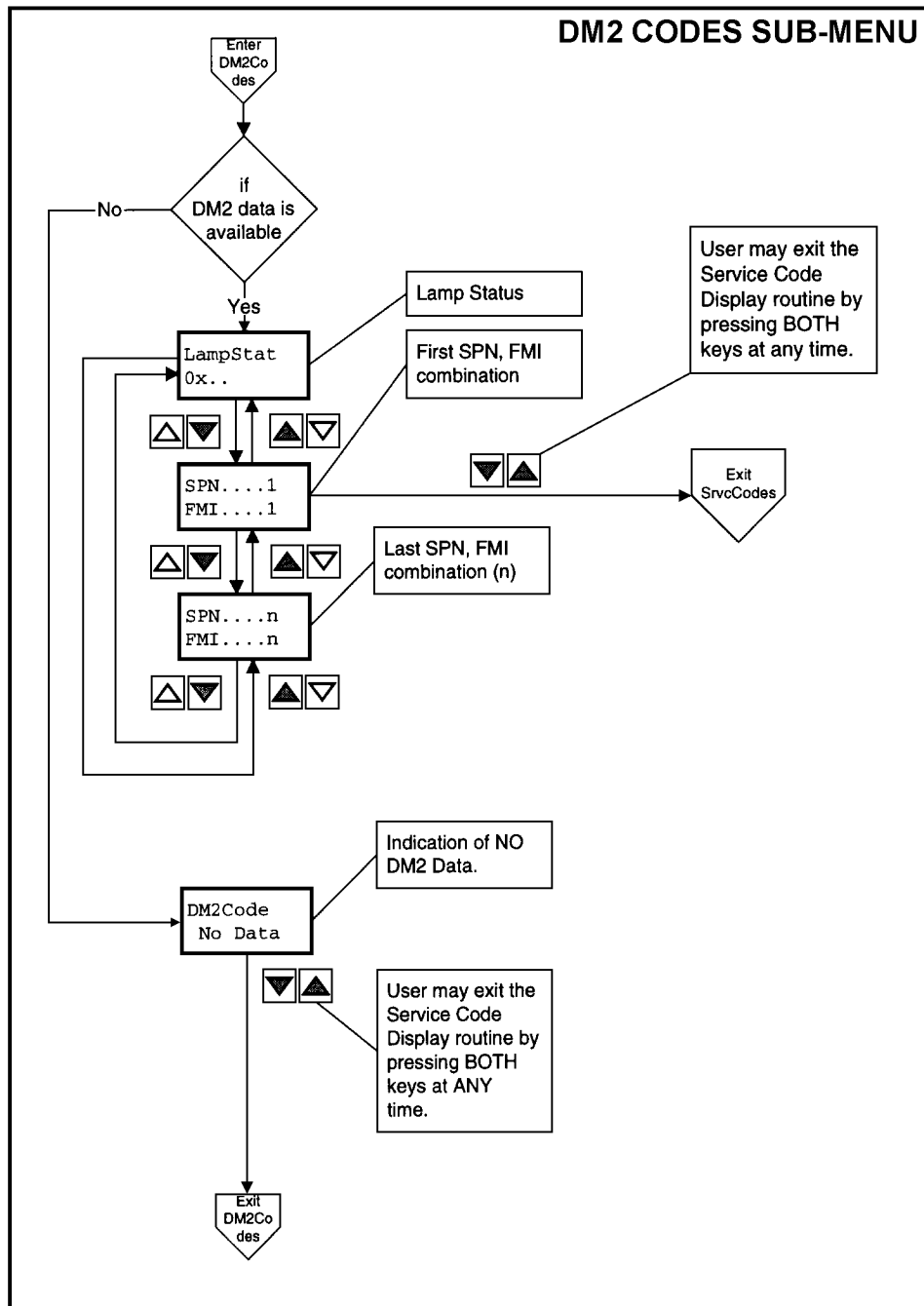
The diagnostic gauge continuously monitors all messages broadcast over the Control Area Network (CAN) and displays all active service codes /diagnostic trouble codes (DTCs) at the time the message is broadcast. The word “SrvcCode” is displayed on the second line. The display will cycle every 5 seconds between the currently displayed parameter and the “SrvcCode” message until the active service code (DTC) clears. To view the active codes, select the *Service Code Sub-Menu* by pressing the UP or DOWN switch until the top line of the display reads

“SrvcCode”. Then press BOTH the UP and DOWN switches at the same time to select the Service Code (DTC) Sub-Menu. The diagnostic gauge has the ability to display all active service codes (DTCs) received. The diagram above titled *Service Code (DTC) Sub-Menu* shows the process for selecting active service codes (DTCs) and their values.

**NOTE:** For a list of service codes/diagnostic trouble codes (DTCs), refer to the *Troubleshooting* section later in this manual.

OUOD006,000006A -19-24SEP02-1/1

## Viewing Stored Service Codes/Diagnostic Trouble Codes (DTCs) in the Engine ECU



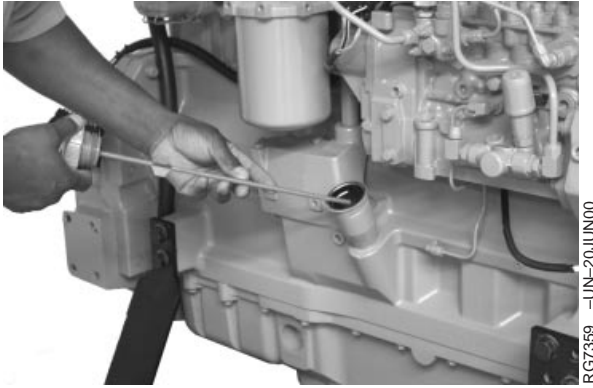
RG10021 -19-28OCT99

Viewing Stored Service Codes/Diagnostic Trouble Codes (DTCs)

The diagnostic gauge can request stored service codes (DTCs) from the engine. The stored service codes may be used for diagnostic and service needs. To view the stored service codes, it is necessary to select the *DM2 Codes Sub-Menu* by pressing the UP

or DOWN switch until the top line of the display reads “DM2 Codes”. Then press BOTH the UP and DOWN switches at the same time to select the *DM2 Codes Sub-Menu*. The gauge will display the stored service codes according to the menus shown in the diagram.

## Break-In Service



Check Engine Oil Level



Engine Oil Level Dipstick

The engine is ready for normal operation. However, extra care during the first 100 hours 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 Engine Break-in Oil. 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 make-up 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 Engine Break-In Oil and new John Deere oil filter.

**IMPORTANT:** Do not add makeup oil until the oil level is **BELOW** the add mark on dipstick. If make-up oil is required during the break-in period, an additional 100 hour break-in period is required. John Deere Engine Break-In Oil (TY22041) should be used to make up any oil consumed during the break-in period.

**DO NOT use PLUS-50® Engine Oil or engine oils meeting API CG4, API CF4, ACEA E3, ACEA E2 or CCMC D5 performance levels during the first 100 hours of operation of a new or rebuilt engine. These oils will not allow a new or rebuilt engine to break-in properly.**

3. Check oil more frequently during engine break-in period. If oil must be added during this period, John Deere Engine Break-In Oil is preferred. See ENGINE BREAK-IN OIL, in Fuels, Lubricants, and Coolant Section.

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

### Specification

Engine Oil Pressure— Full	
Load Rated Speed¹ .....	345 ± 103 kPa (3.45 ± 1.03 bar) (50 ± 15 psi)

**Specification**

Engine Oil Pressure—Low Idle ..... 140 kPa (1.40 bar) (20 psi)  
(Minimum)

Engine Coolant Temperature  
Range—Temperature ..... 82°—94°C (180°—202°F)

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

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

<sup>1</sup>At normal operating temperature of 115°C (240°F) in crankcase sump and at full load speeds of 1500—2200 rpm.

RG, RG34710, 4048 -19-08OCT02-2/4

6. After the first 100 hours maximum, change engine oil and replace engine oil filter as shown. (See CHANGING ENGINE OIL AND REPLACING FILTER in Lubrication and Maintenance/250 Hour Section.) Fill crankcase with seasonal viscosity grade oil. (See DIESEL ENGINE OIL, in Fuels, Lubricants, and Coolant Section.)

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

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



RG7379 -UN-20JUN00

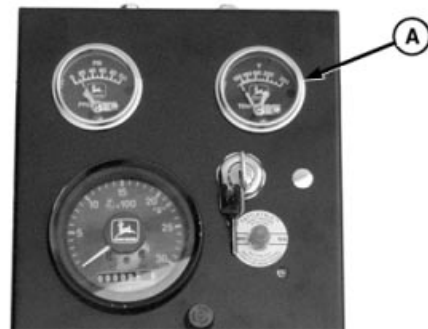
Replacing Engine Oil Filter

RG, RG34710, 4048 -19-08OCT02-3/4

7. Watch coolant temperature gauge (A) closely during engine operation. If coolant temperature rises above 104° C (220° F), reduce load on engine. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation. Normal temperature range at full load rated speed is 82—94° C (180—202° F).

**NOTE:** When the coolant temperature gauge rises to approximately 104° C (220° F), the engine will reduce power automatically if equipped with recommended safety controls.

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



RG11299D -UN-21AUG00

Engine Coolant Temperature Gauge

A—Coolant Temperature Gauge

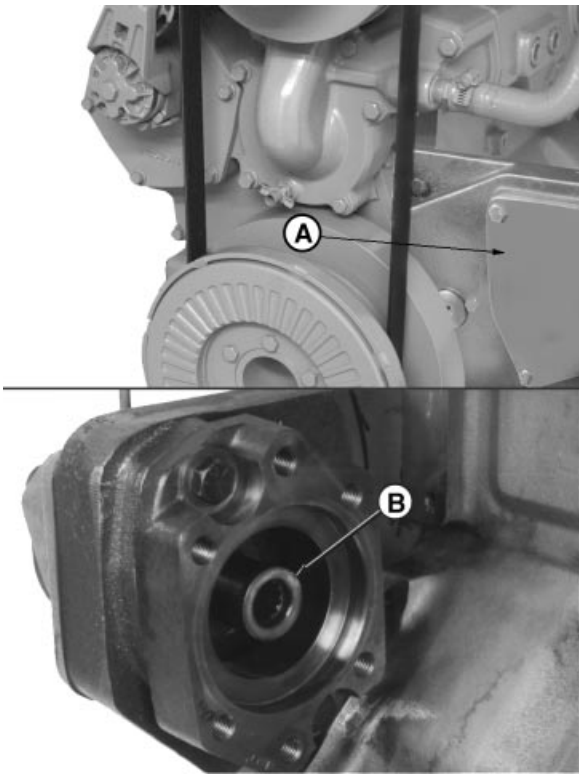
RG, RG34710, 4048 -19-08OCT02-4/4

Auxiliary Gear Drive Limitations

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

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

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



Auxiliary Drives

RG, RG34710, 4051 -19-08OCT02-1/1

Generator Set (Standby) Applications

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

RG, RG34710, 4052 -19-01JAN96-1/1

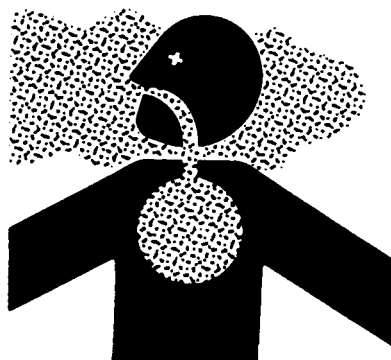
## Starting the Engine

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

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

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

1. Perform all prestarting checks outlined in DAILY PRESTARTING CHECKS in Lubrication & Maintenance/Daily Section.
2. Open the fuel supply shut-off valve, if equipped.

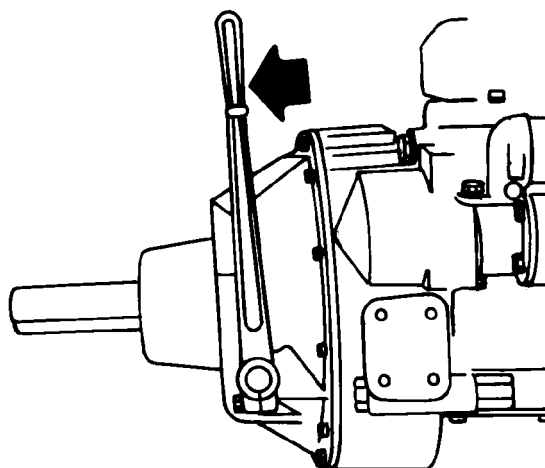


Use Proper Ventilation

TS220 -JUN-23AUG88

RG, RG34710, 4053 -19-08OCT02-1/4

3. If equipped with PTO clutch, pull lever (arrow) rearward (away from engine) to disengage PTO clutch.



PTO Clutch Control Lever

RG5602 -JUN-16JUN00

Continued on next page

RG, RG34710, 4053 -19-08OCT02-2/4

**NOTE:** Some electronically controlled governor applications may be equipped with a rotary speed potentiometer on instrument panel. (See (A) in lower drawing.)

4. On standard, mechanical governor (7-10% regulation) engines, pull hand throttle (A) 1/3 of the way out. Turn the handle in either direction to lock it in place.

On later engines, turn throttle (A) clockwise 1/3 of the way (see lower illustration). (If not equipped with analog throttle, move throttle control 1/3 of the distance away from slow idle stop.)

5. If equipped, depress and hold reset button (B) while starting.

**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.

6. Turn the key switch (C) clockwise to crank the engine. When the engine starts, release the key so that it returns to the "ON" position.

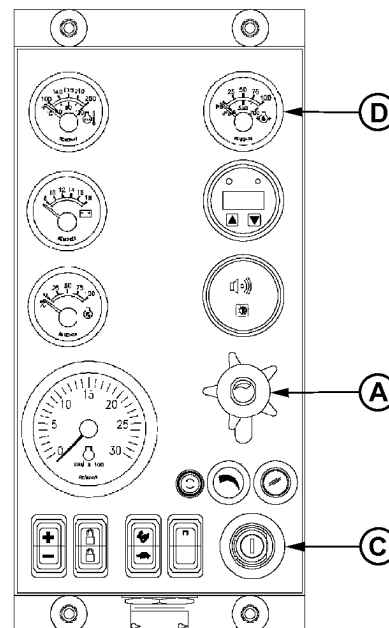
**IMPORTANT:** If the key switch is released before the engine starts, wait until the starter and the engine stop turning before trying again. This will prevent possible damage to the starter and/or flywheel.

7. After the engine starts, continue to hold the reset button in until the oil pressure gauge (D) reads at least 140 kPa (1.4 bar) (20 psi). The safety controls will not allow the engine to run at a lower oil pressure unless the reset button is held in.

A—Hand Throttle  
B—Reset Button  
C—Key Switch  
D—Oil Pressure Gauge



Instrument Panel—Engines with Standard Panel



Instrument Panel—Engines With Electronic Panel

Continued on next page

RG, RG34710, 4053 -19-08OCT02-3/4

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

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

RG, RG34710, 4053 -19-08OCT02-4/4

## 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 104° C (220° F), reduce load on engine. Unless temperature drops quickly, stop engine and determine cause before resuming operation.

*NOTE: When coolant temperature is excessive (above 104° C (220° F) engine will reduce power automatically if equipped with recommended safety controls.*

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

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

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

RG, RG34710, 4047 –19–01JAN96–1/1

### Cold Weather Operation

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

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

Engines may be equipped with intake air heaters, coolant heaters, or ether injectors as a cold weather starting aid.

Starting aids are required below 14°F (-10°C). They will enhance starting performance above these temperatures and may be needed to start applications that have high parasitic loads during cranking and/or start acceleration to idle.

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

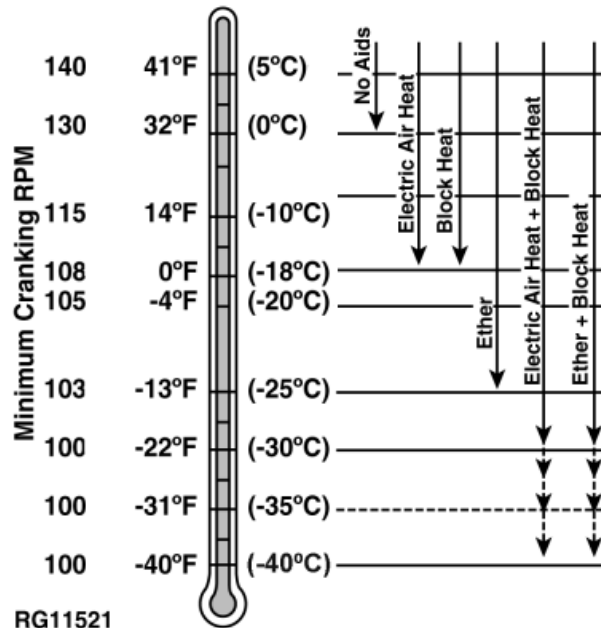
Other cold weather starting aids are required at temperatures below -22°F (-30°C) or at altitudes above 1500 m (5000 ft).

1. Follow steps 1—4 as listed under STARTING THE ENGINE, earlier in this section, then proceed as follows according to the instrument (control) panel on your engine.
2. Use cold weather starting aids as needed. Follow supplier instructions for starting aid provided on your engine.
3. Follow remaining steps 5—8 as listed under STARTING THE ENGINE earlier in this section.

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



Starting Fluid is Flammable



Cold Weather Starting Guidelines

TS1356 -UN-18MAR92

RG11521 -19-10JAN01

RG, RG34710, 4055 -19-01JAN96-1/1

## Warming Engine

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

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

1. Check oil pressure gauge (A) as soon as engine starts. If gauge needle does not rise above minimum oil pressure specification of 140 kPa (1.4 bar) (20.0 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is  $345 \pm 103$  kPa ( $3.45 \text{ bar} \pm 1.03 \text{ bar}$ ) ( $50 \pm 15$  psi) at rated full load speed (1800–2500 rpm) with oil at normal operating temperature of  $115^\circ \text{C}$  ( $240^\circ \text{F}$ ).

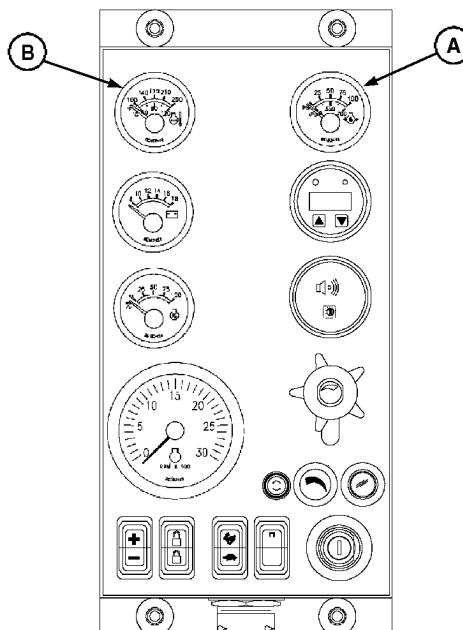
**NOTE:** On certain engines, the oil pressure and coolant temperature gauges are replaced by indicator warning lights. The lights must be "OFF" when engine is running.

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  $82^\circ\text{--}94^\circ \text{C}$  ( $180^\circ\text{--}202^\circ \text{F}$ ).

**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 Temp. Gauges (Standard Panel)



Oil Pressure and Coolant Temp. Gauges (Electronic Panel)

A—Oil Pressure Gauge  
B—Coolant Temperature Gauge

RG11299E –UN–21AUG00

RG9917 –UN–16NOV99

RG, RG34710, 4056 –19–01JAN96–1/1

## Idling Engine

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

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

speed. Slow idle speed for this engine is 850 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).*

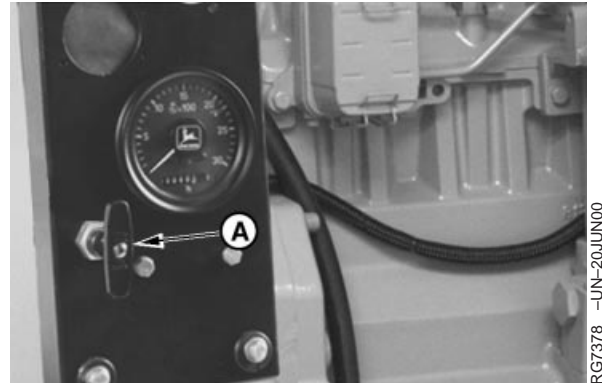
RG, RG34710, 4058 -19-01JAN96-1/1

## Changing Engine Speed—Standard (Mechanical) Governor

To increase engine speed on earlier engines, turn hand throttle handle (A) to the horizontal position and pull out until desired engine speed is obtained. Turn the handle in either direction to lock throttle position. The handle is pushed inward to decrease engine speed.

To increase speed on later engines, turn throttle control clockwise.

**A—Hand Throttle Handle**



Hand Throttle Handle

RG, RG34710, 4057 -19-01JAN96-1/1

## Changing Engine Speed (Engines With Electronic Instrument Panel)

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

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

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

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

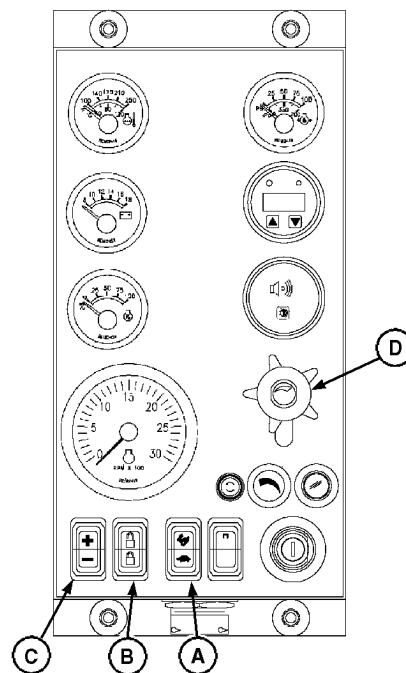
**NOTE:** Once the speed has been set, the Bump Speed Enable Switch (B) must be pressed and released three times within two seconds to commit the new slow or fast speed to memory. If not done, the engine's new slow or fast speed will only be effective until the key switch is shut off. Then the speed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

Changing engine speed using optional analog potentiometer throttle (D):

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

1. Set High-Low Speed Select Rocker Switch (A) to low speed position.
2. Turn potentiometer throttle 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.



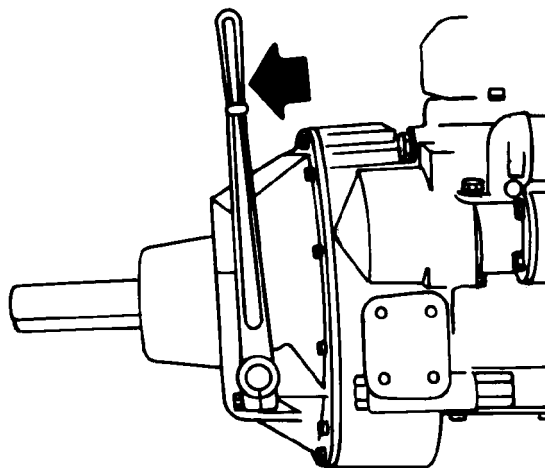
Changing Engine Speed

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

RG9918 -UN-16NOV99

## Stopping the Engine (Engines With Standard Instrument Panel)

1. Pull PTO clutch lever (arrow) rearward (away from engine) to disengage clutch, if equipped.



RG5602 -UN-16JUN00

PTO Clutch Control Lever

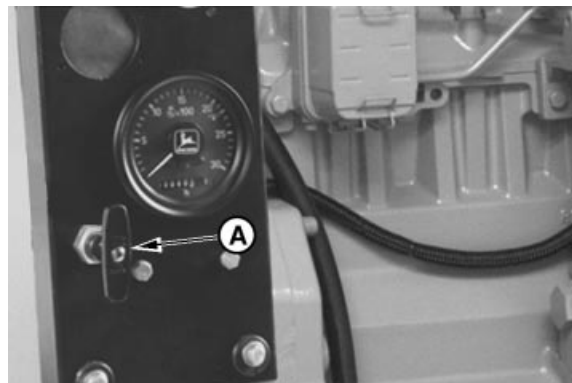
RG, RG34710, 4059 -19-01JAN96-1/2

2. Move the hand throttle handle (A) to slow idle on standard (mechanical) governor engines. On later engines, turn throttle control counterclockwise.

**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 governor 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.

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



RG7378 -UN-20JUN00

Hand Throttle Handle (Early Engine Shown)

A—Hand Throttle Handle

3. Turn key switch to “OFF” position to stop the engine. Remove ignition key.

RG, RG34710, 4059 -19-01JAN96-2/2

## Stopping the Engine (Engines With Electronic Instrument Panel)

1. Disengage power to any engine drivelines. If equipped, pull PTO lever rearward (away from engine) to disengage clutch.

**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.

Panels with High-Low Speed Select Rocker Switch (B) only: Set rpm using Bump Speed Enable Switch (C) with Speed Select Rocker Switch (D).

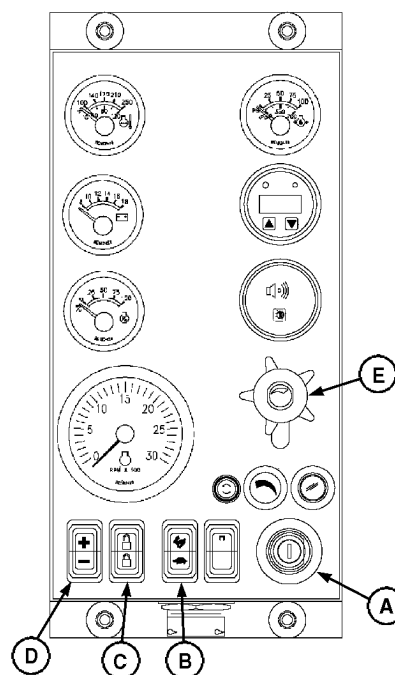
Panels with optional Analog Throttle (E): Set either High-Low Speed Select Switch (B) or Analog Throttle (E) to low idle, and set desired speed with remaining control.

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

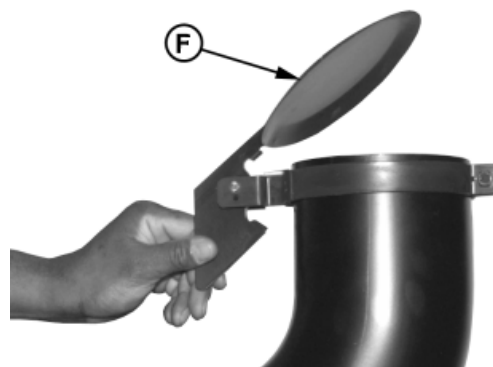
3. Push in on analog throttle potentiometer handle (if equipped) so that engine goes to slow idle, or set slow speed with High-Low Speed Select Rocker Switch.

4. Turn key switch (A) to "OFF" position to stop the engine. Remove ignition key.

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



Stopping The Engine



Exhaust Stack Rain Cap

- A—Key Switch
- B—High-Low Speed Select Rocker Switch
- C—Bump Speed Enable Switch
- D—Speed Select Rocker Switch
- E—Analog Throttle
- F—Exhaust Stack Rain Cap

RG9916 —UN—16NOV99

RG9933 —UN—18NOV99

## 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.

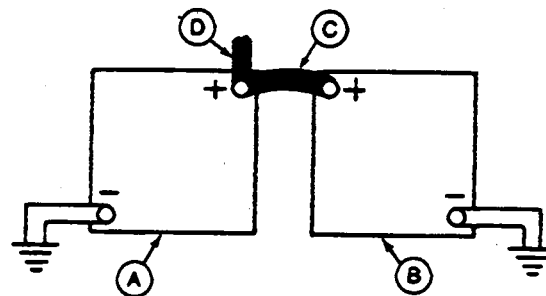
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

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

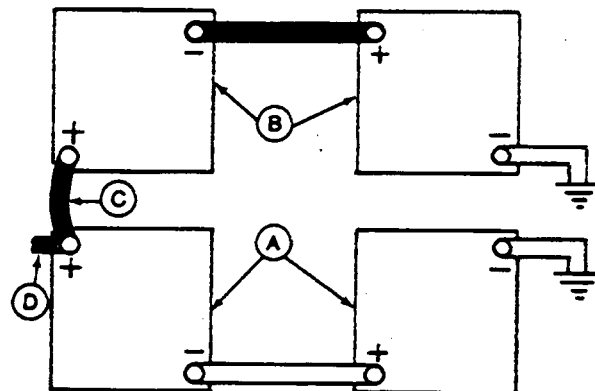
2. Connect one end of jumper cable to the **POSITIVE (+)** post of the booster battery.
3. Connect the other end of the jumper cable to the **POSITIVE (+)** post of battery connected to starter.
4. Connect one end of the other jumper cable to the **NEGATIVE (-)** post of the booster battery.
5. ALWAYS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

Continued on next page

RG, RG34710, 4060 -19-01JAN96-1/2

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

RG, RG34710, 4060 –19–01JAN96–2/2

# Lubrication and Maintenance

## Observe Service Intervals

**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.

Using hour meter (A) 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.



*Hour Meter (Standard Instrument Panel Shown)*

A—Hour Meter

RG, RG34710, 4061 -19-01JAN96-1/1

## Use Correct Fuels, Lubricants, and Coolant

**IMPORTANT:** Use only fuels, lubricants, and coolants meeting specifications outlined in Fuels, Lubricants, and Coolant Section when servicing your John Deere Engine.

Consult your John Deere Servicing Distributor or your nearest John Deere Parts Network for recommended fuels, lubricants, and coolant. Also available are necessary additives for use when operating engines in tropical, arctic, or any other adverse conditions.



*John Deere Parts Network*

RG, RG34710, 4062 -19-01JAN96-1/1

## Lubrication and Maintenance Service Interval Chart—Industrial and Generator (Prime Power)

Item	Lubrication and Maintenance Service Intervals				
	Daily	250 Hour/6 Month	500 Hour/12 Month	2000 Hour/24 Month	As Required
Check Engine Oil and Coolant Level	•				
Check Fuel Filter/Water Separator Bowl	•				
Check Air Cleaner Dust Valve Restriction Indicator Gauge <sup>a</sup>	•				
Perform Visual Walkaround Inspection	•				
Lubricate PTO Release Bearing (If Equipped)		•			
Service Fire Extinguisher		•			
Service Battery		•			
Change Engine Oil and Replace Oil Filter <sup>b</sup>		•			
Check PTO Clutch Adjustment		•			
Check Coolant Pump Weep Hole Foam Filter		•			
Lubricate PTO Clutch Levers and Linkage			•		
Clean Crankcase Vent Tube			•		
Check Air Intake Hoses, Connections & System			•		
Replace Fuel Filter Element(s)			•		
Check Belt Tensioner and Belt Wear			•		
Check Cooling System			•		
Coolant Solution Analysis-SCAs as required			•		
Pressure Test Cooling System			•		
Check Engine Speeds			•		
Check Crankshaft Vibration Damper <sup>c</sup>			•		
Check Engine Ground Connection			•		
Flush and Refill Cooling System <sup>d</sup>				•	
Adjust Engine Valve Clearance				•	
Drain Water Separator Bowl When Alarm Sounds					•
Add Coolant					•
Service Air Cleaner Elements					•
Replace Belt					•
Check PTO Clutch (If Equipped)					•

<sup>a</sup>Service air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H<sub>2</sub>O.

<sup>b</sup>Change the oil for the first time before 100 hours maximum of (break-in) operation, then every 250 hours thereafter. If John Deere PLUS-50 or ACEA-E4/E5 oil is used along with the specified John Deere oil filter, the oil and filter change interval may be extended by 50 percent to every 375 hours.

<sup>c</sup>Replace crankshaft damper at 4500 hours or 60 months, whichever occurs first. Damper cannot be repaired.

<sup>d</sup>If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished by adding supplemental coolant additives (SCAs), the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

Continued on next page

OURGP11.0000011 -19-28JUN04-1/2

Lubrication and Maintenance

	Lubrication and Maintenance Service Intervals				
Item	Daily	250 Hour/6 Month	500 Hour/12 Month	2000 Hour/24 Month	As Required
Check Air Conditioning Compressor (If Equipped)					•
Check Fuses					•
Check Electrical Wiring					•
Bleed Fuel System					•
Check Air Compressors (If Equipped)					•

OURGP11,0000011 -19-28JUN04-2/2

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

**NOTE:** The service intervals in the Lubrication and Maintenance Sections that follow reflect standard engines. Use service intervals listed

below for standby generators. Match service items below to titles in Lubrication and Maintenance Sections for procedures.

Item	Lubrication and Maintenance Service Intervals				
	Every 2 Weeks	250 Hour/6 Month	500 Hour/12 Month	2000 Hour/24 Month	As Required
Operate Engine at Rated Speed and 50%–70% Load a Minimum of 30 Minutes	•				
Check Engine Oil and Coolant Level	•				
Check Fuel Filter/Water Separator Bowl	•				
Check Air Cleaner Dust Valve Restriction Indicator Gauges <sup>a</sup>	•				
Perform Visual Walkaround Inspection	•				
Lubricate PTO Release Bearing (if equipped)	•				
Service Battery		•			
Change Engine Oil and Replace Oil Filter <sup>b</sup>		•			
Check Coolant Pump Weep Hole Foam Filter		•			
Check Engine Mounts		•			
Service Fire Extinguisher		•			
Lubricate PTO Clutch Shaft Bearing (if equipped)		•			
Lubricate PTO Clutch Levers and Linkage (if equipped)			•		
Clean Crankcase Vent Tube			•		
Check Air Intake Hoses, Connections, & System			•		
Replace Fuel Filter Element(s)			•		
Check Automatic Belt Tensioner and Belt Wear			•		
Check Cooling System			•		
Coolant Solution Analysis-Add SCAs as required			•		
Pressure Test Cooling System			•		
Check Crankshaft Vibration Damper <sup>c</sup>			•		
Check and Adjust Engine Speeds			•		
Check Engine Ground Connection			•		
Flush and Refill Cooling System <sup>d</sup>				•	
Adjust Engine Valve Clearance				•	

<sup>a</sup>Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H<sub>2</sub>O.

<sup>b</sup>Change the oil for the first time before 100 hours maximum of (break-in) operation, then every 250 hours thereafter. If John Deere PLUS-50 or ACEA-E4/E5 oil is used along with the specified John Deere oil filter, the oil and filter change interval may be extended by 50 percent to every 375 hours.

<sup>c</sup>Replace crankshaft damper at 4500 hours or 60 months, whichever occurs first. Damper cannot be repaired.

<sup>d</sup>If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished by adding supplemental coolant additives (SCAs), the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

*Lubrication and Maintenance*

Item	Lubrication and Maintenance Service Intervals				
	Every 2 Weeks	250 Hour/6 Month	500 Hour/12 Month	2000 Hour/24 Month	As Required
Drain Water Separator Bowl When Alarm Sounds <sup>e</sup>					•
Add Coolant					•
Service Air Cleaner Element					•
Replace Belt					•
Check Fuses					•
Check Electrical Wiring					•
Bleed Fuel System					•
Check Air Compressors (If Equipped)					•

<sup>e</sup>Replace fuel filter element when audible alarm sounds and trouble codes indicate plugged fuel filter (low fuel pressure). If no alarm sounds during a 12 month interval, replace element at that time, or after every 500 hours of operation.

OURGP11,0000012 -19-28JUN04-2/2

# Lubrication & Maintenance/Daily

## Daily Prestarting Checks

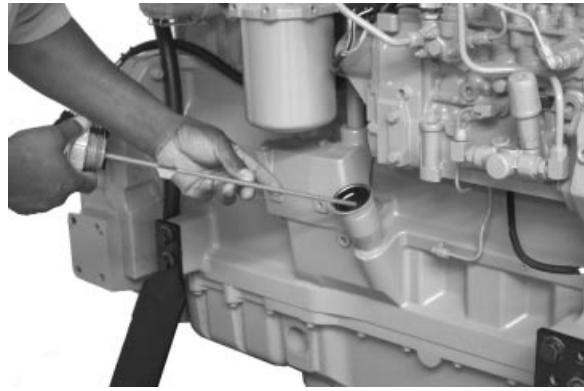
Do the following BEFORE STARTING THE ENGINE for the first time each day:

**IMPORTANT: DO NOT add makeup oil until the oil level is BELOW the add mark.**

1. Check engine oil level as shown by unscrewing cap and pulling out dipstick. (Dipstick may be located on left or right side of engine.) Add as required, using seasonal viscosity grade oil. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for oil specifications.)

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

Oil may be added at dipstick tube or rocker arm cover filler cap locations.



*Checking Engine Oil Level*

Continued on next page

OURGP11,0000015 -19-28JUN04-1/5

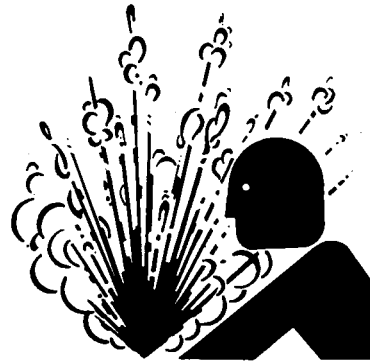
**CAUTION:** Explosive release of fluids from pressurized cooling system can cause serious burns.

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.

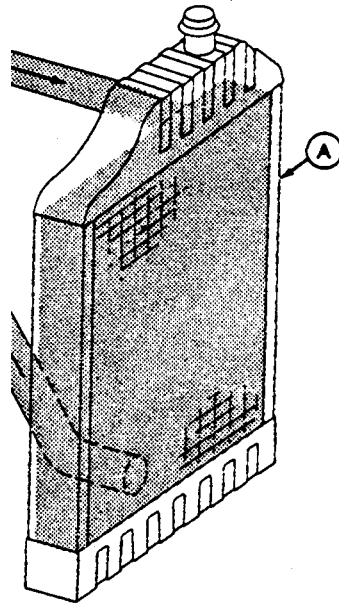
2. Check the coolant level when engine is cold. Coolant level should be at bottom of filler neck. Fill radiator (A) with proper coolant solution if level is low. (See **ADDING COOLANT** in Service As Required Section.) Check overall cooling system for leaks.

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

A—Radiator



High Pressure Fluids



Radiator and Coolant

RG4675 -UN-14DEC88

TS281 -UN-23AUG88

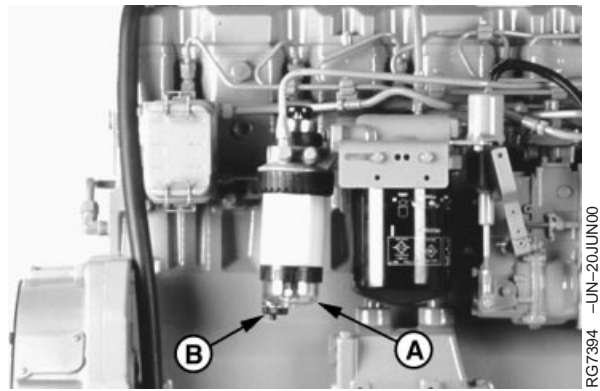
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OURGP11,0000015 -19-28JUN04-2/5

3. Check the separator bowl (A) of the primary fuel filter/water separator for water or debris.

Loosen thumb screw (B) and drain water and debris from bowl as needed.

A—Separator Bowl  
B—Thumb Screw



Drain Separator Bowl

OURGP11,0000015 -19-28JUN04-3/5

4. Apply one shot of John Deere Multi-Purpose Lubricant or equivalent at PTO release bearing grease fitting (A). DO NOT over-lubricate.

A—Grease Fitting



PTO Bearing Grease Fitting

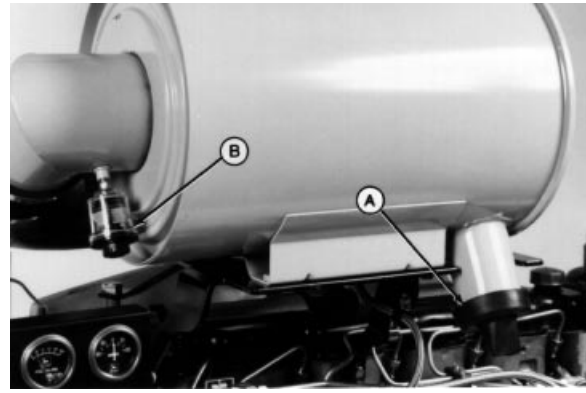
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OURGP11,0000015 -19-28JUN04-4/5

5. If the air cleaner has an automatic dust unloader valve (A), squeeze the unloader valve on air cleaner assembly to clear away any dust buildup.

**IMPORTANT: Do not exceed maximum air intake restriction. A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.**

If equipped with air intake restriction indicator gauge (B), check gauge and service air cleaner if air intake restriction exceeds specifications.



Air Cleaner

A—Unloader Valve  
B—Restriction Indicator Gauge

#### Specification

Maximum Air Intake Restriction—

Vacuum..... 25 in. (625 mm) H<sub>2</sub>O (6.25 kPa)  
(0.06 bar) (1.0 psi)

6. Make a thorough inspection of the engine compartment. Look for oil or coolant leaks, worn fan and accessory drive belts, loose connections and trash build-up. Remove trash build-up and have repairs made as needed if leaks are found.

*NOTE: Wipe all fittings, caps, and plugs before performing any maintenance to reduce the chance of system contamination.*

Inspect:

- Radiator for leaks and trash build-up.
- Air intake system hoses and connections for cracks and loose clamps.
- Fan, alternator, and accessory drive belts for cracks, breaks or other damage.
- Coolant pump for coolant leaks.

*NOTE: It is normal for a small amount of leakage to occur as the engine cools down and parts contract. Excessive coolant leakage may indicated the need to replace the coolant pump seal. Contact your engine distributor or servicing dealer for repairs.*

# Lubrication & Maintenance/250 Hour/6 Month

## 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 100 hours of engine operation or once a month. 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

RW4918 -UN-15DEC88

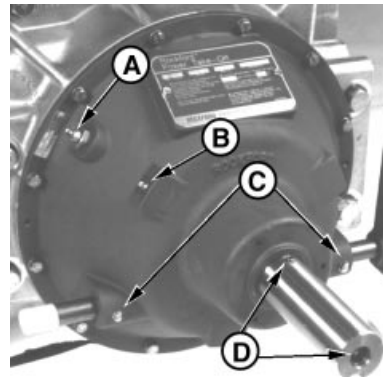
DPSG,OUOD002,1575 -19-21JUN00-1/1

## Lubricating PTO Clutch Shaft Bearings (If Equipped)

Apply one or two shots of John Deere Multipurpose Lubricant or equivalent at clutch drive shaft bearing fitting (B) and pilot bearing fittings (D). DO NOT over-lubricate to avoid getting oil on clutch facings.

**NOTE:** Location of pilot bearing fitting will depend on application. Only one fitting will be used.

- A—Release Bearing Grease Fitting
- B—Drive Shaft Bearing Fitting
- C—Lever Cross Shaft Fittings
- D—Pilot Bearing Fitting



Lubricate PTO Clutch

RG7331C -UN-26JUN00

DPSG,OUOD002,1576 -19-21JUN00-1/1

## 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. If necessary, add clean, soft water to bring level to bottom of filler neck.*

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

RG, RG34710, 7563 -19-05SEP02-1/2

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

Avoid the hazard by:

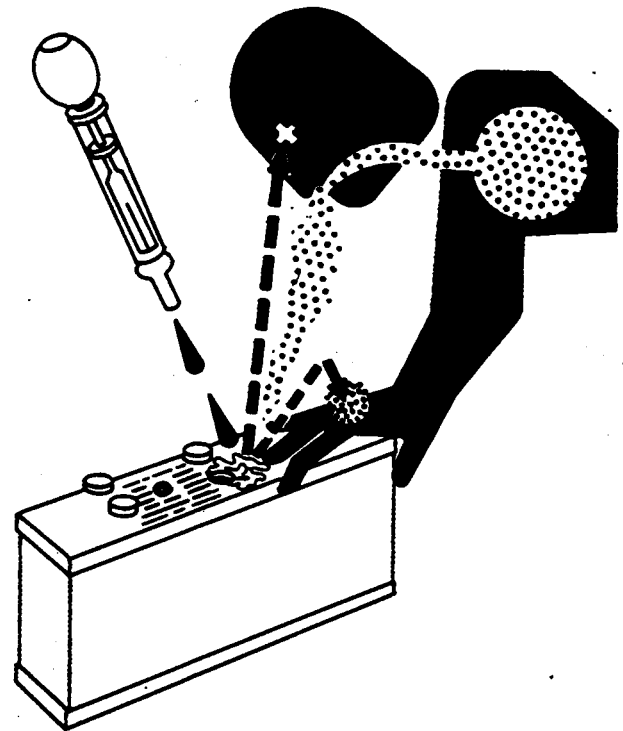
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Using proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10—15 minutes. Get medical attention immediately.

If acid is swallowed:

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.



Sulfuric Acid

TS203 -UN-23AUG88

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

Replacement battery(ies) must meet or exceed the following recommended capacities<sup>1</sup> at —18°C (0°F):

#### Specification

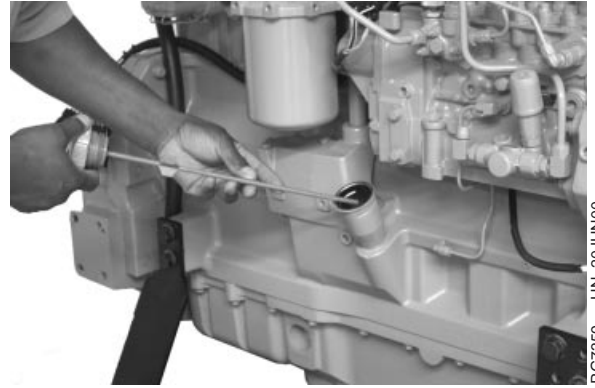
12-Volt System—Minimum	
Battery Capacity—Cold Cranking	
Amps.....	800 Minimum
Reserve Capacity (Minutes).....	350 Minimum
24-Volt System—Minimum	
Battery Capacity—Cold Cranking	
Amps.....	570 Minimum
Reserve Capacity (Minutes).....	275 Minimum

<sup>1</sup> Total recommended capacity based on batteries connected in series or parallel.

## Changing Engine Oil and Replacing Oil Filter



Replace Engine Oil Filter



Checking Engine Oil Level

**NOTE:** Change engine oil and filter for the first time after 100 hours maximum of operation, then every 250 hours thereafter.

If John Deere PLUS-50® or ACEA-E4/E5 engine oil and the specified John Deere oil filter are used, the oil and filter change interval may be extended by 50 percent or to every 375 hours.

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

**CAUTION:** Metal surfaces of engine may be hot to the touch after shutdown.

Change engine oil and filter as follows:

1. Run engine approximately 5 minutes to warm up oil. Shut off engine.
2. Remove oil pan drain plug.

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

3. Drain crankcase oil from engine while warm.

4. Remove and discard oil filter element using a suitable filter wrench.
5. Remove oil filter packing and clean filter mounting pad.

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

6. Oil new packing and install new filter element on to filter housing, tighten element approximately 1/2 - 3/4 turn after packing contacts filter housing. DO NOT overtighten filter element.
7. Install oil pan drain plug, with a new seal when equipped, and torque to specifications.

### Specification

Oil Pan Drain Plug—Torque..... 101 N•m (75 lb-ft)

8. Fill engine crankcase with correct John Deere engine oil through dipstick tube opening. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

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

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DPSG,OUOE003.8005 -19-09OCT02-1/2

**NOTE:** Crankcase oil capacity may vary slightly.  
**ALWAYS** fill crankcase to full mark or within crosshatch on dipstick, whichever is present.  
**DO NOT** overfill.

**without permitting engine to start.**  
**This will help insure adequate lubrication to engine components before engine starts.**

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

**IMPORTANT:** Immediately after completing any oil change, crank engine for 30 seconds

9. Start engine and run to check for possible leaks.
10. Stop engine and check oil level after 10 minutes. Oil level reading should be on upper mark of dipstick.

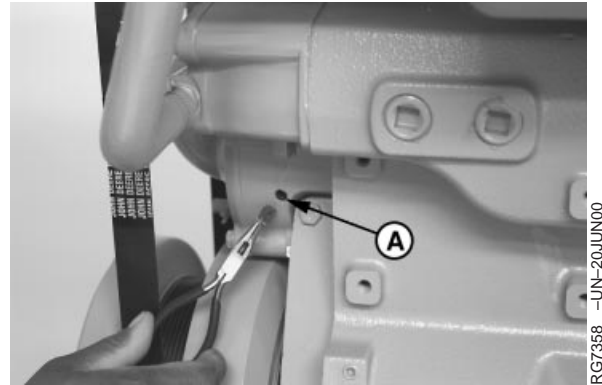
DPSG,OUOE003,8005 -19-09OCT02-2/2

## Visually Inspecting Coolant Pump

### Inspect Weep Hole

1. Remove foam filter from coolant pump weep hole (A) as shown.
2. Inspect weep hole for oil or coolant leakage.
  - Oil leakage indicates a damaged rear seal.
  - Coolant leakage indicates a damaged front seal.

Replace complete coolant pump assembly if leakage is detected: individual repair parts are not available.



Coolant Pump Weep Hole Filter

A—Weep Hole

### Inspect for Impeller Contact with Cover

1. Remove radiator-to-coolant pump hose from coolant pump inlet elbow.
2. Using a flashlight, inspect ID of coolant pump cover for internal impeller contact.
  - Impeller contact with cover usually indicates that impeller has moved on shaft or there is a damaged bearing.

Replace coolant pump assembly and cover as necessary if impeller contact is detected.

RG,RG34710,4069 -19-01JAN96-1/1

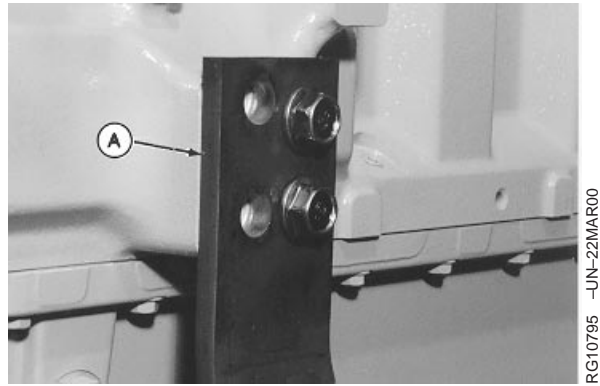
## Checking Engine Mounts (Generator Sets)

Engine mounting is the responsibility of the generator manufacturer. Follow manufacturer's guidelines for mounting specifications.

**IMPORTANT: Use only Grade SAE 8 or higher grade of hardware for engine mounting.**

1. Check the engine mounting brackets (A), vibration isolators, and mounting bolts on support frame and engine block for tightness. Tighten as necessary to recommended torque of generator manufacturer.

2. Inspect overall condition of vibration isolators, if equipped. Replace isolators if rubber has deteriorated or mounts have collapsed, as necessary.



*Engine Mounting*

**A—Engine Mounting Brackets**

DPSG,OUOD002,1578 -19-21JUN00-1/1

## Checking PTO Clutch Adjustment (If Equipped)



**CAUTION:** Never attempt to service the PTO while it is in operation. Loose clothing could get caught in moving parts; keep clothing tight against body. Use extreme care when working around the PTO.

1. Measure clutch engagement force at handle grip using a spring scale. The engagement force should be 267–311 N (60–70 lb force).

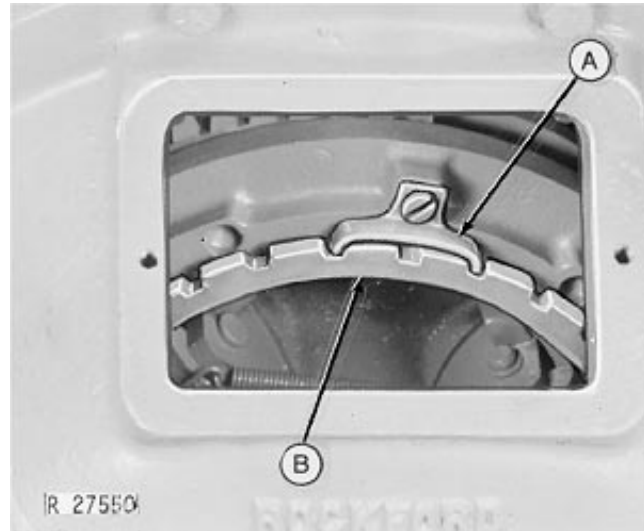
**IMPORTANT:** Improper adjustments of the PTO clutch may shorten clutch life. Make sure adjustments are made properly.

2. If adjustments are needed, disengage clutch and stop engine. Remove cover plate from clutch housing (shown removed).
3. Remove adjusting lock (A).
4. Turn adjusting ring (B) to adjust clutch engagement pressure.
5. Measure engagement force at clutch handle with spring scale.
6. Install lock screw and adjusting lock in clutch body splines when specified engagement pressure is achieved.
7. Tighten screw securely.
8. Recheck clutch engagement force with spring scale. Install cover plate. Disengage clutch.



Rotating Driveline

TS198 -JUN-23AUG88



PTO Clutch Adjustment

A—Adjusting Lock  
B—Adjusting Ring

R27550 -JUN-14DEC88

RG, RG34710, 4068 -19-01JAN96-1/1

## Lubricating PTO Clutch Internal Levers and Linkage (If Equipped)

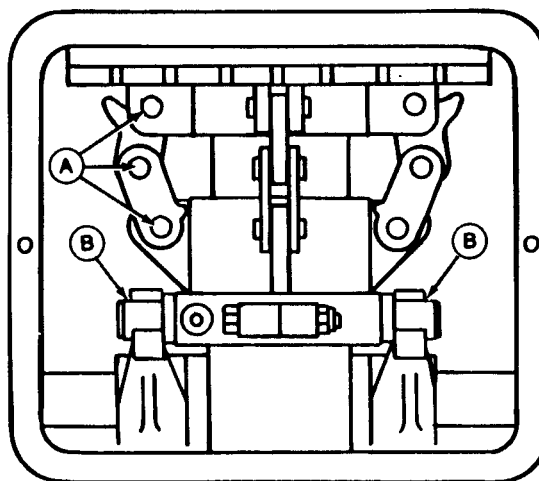
**CAUTION:** Never attempt to service the PTO while it is in operation. Loose clothing could get caught in moving parts; keep clothing tight against body. Use extreme care when working around the PTO.

1. Remove the PTO housing cover and apply one shot of John Deere Multipurpose Lubricant or equivalent (See Fuels, Lubricants, and Coolant Section) to the pivot points (A) of each clutch linkage.
2. Apply one shot of John Deere Multipurpose Lubricant or equivalent to the two PTO release lever shaft fittings (B).

A—Pivot Points  
B—Shaft Fittings



*Rotating Driveline*



*PTO Lubrication*

TS198 -JUN-23AUG88

RG6641 -JUN-18FEB93

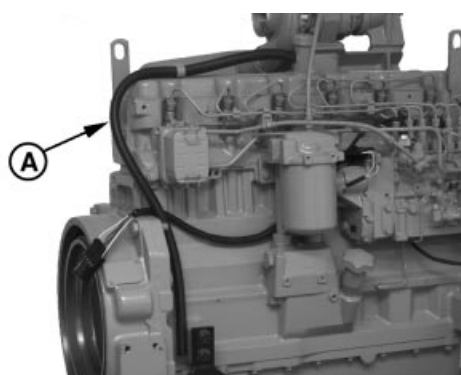
RG, RG34710, 4070 -19-01JAN96-1/1

## Cleaning Crankcase Vent Tube

If the engine is operated in dusty conditions, clean the tube at shorter intervals.

1. 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—Vent Tube



*Clean Crankcase Vent*

RG7366 -JUN-14AUG00

RG, RG34710, 4071 -19-10OCT02-1/1

## Checking Air Intake System

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

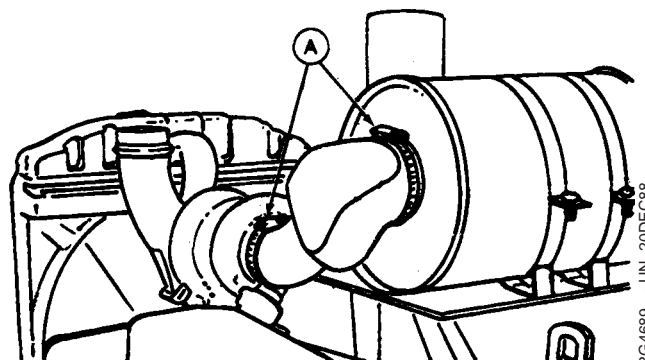
1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps (A) on piping which connect the air cleaner to the engine. Tighten clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.
3. If engine has a rubber dust unloader valve (B), inspect the valve on bottom of air cleaner for cracks or plugging. Replace as necessary.

**IMPORTANT:** ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H<sub>2</sub>O, is torn, or visibly dirty.

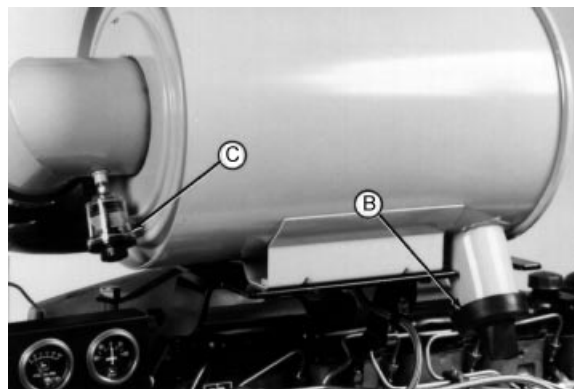
4. Test air restriction indicator gauge (C) for proper operation. Replace indicator as necessary.

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

5. Remove and inspect primary air cleaner element. Service as necessary. (See REPLACING AIR CLEANER ELEMENTS in Service As Required Section.)



Air Intake Hose Clamps



Air Cleaner

A—Clamps  
B—Unloader Valve  
C—Restriction Indicator Gauge

RG, RG34710, 4072 -19-09OCT02-1/1

## Replacing (Rectangular) Final Fuel Filter Element



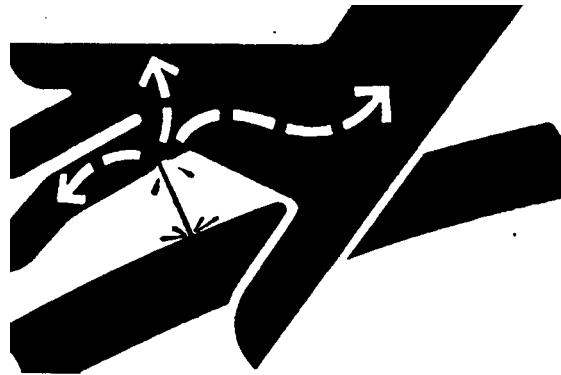
**CAUTION:** Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

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

1. Close fuel shut-off valve at bottom of fuel tank (not illustrated).

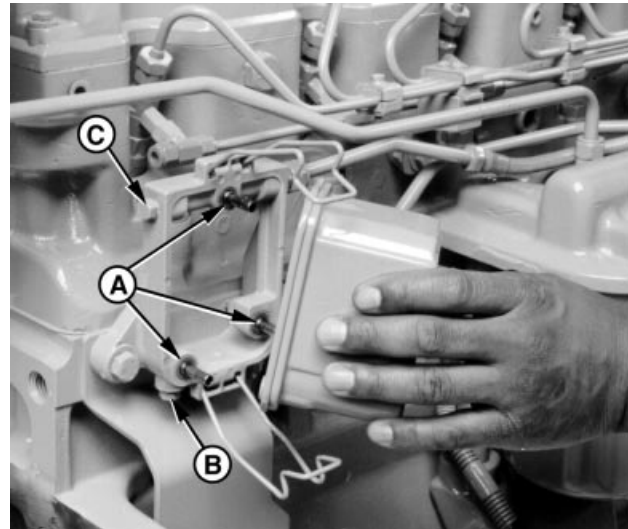
**NOTE:** Keep a small container under drain plug to catch draining fuel.

2. Loosen bleed plug (C) on side of filter base. Remove drain plug (B) to drain from fuel filter.
3. With fuel filter firm against base, lift up on top retaining spring and pull down on bottom retaining spring. Pull fuel filter off guide pins (A) of fuel filter base and discard.
4. Install new fuel filter onto guide pins of fuel filter base. Hold filter firmly against base.
5. Secure bottom filter retaining spring first, then secure top retaining spring (four arrows).
6. Install drain plug (B), shown installed. Tighten bleed plug and drain plug securely. Do not overtighten.
7. Open fuel shut-off valve and bleed the fuel system. See BLEEDING THE FUEL SYSTEM, in Service As Required Section.



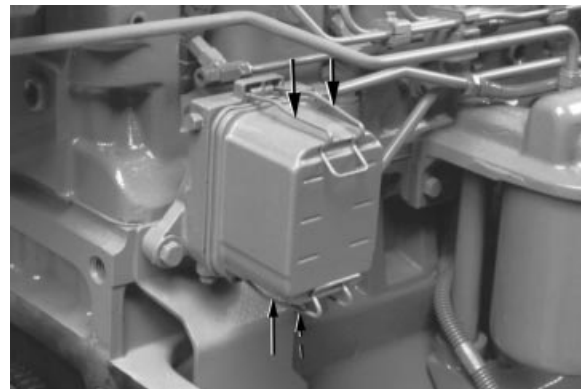
High Pressure Fluid

X9811 -UN-23AUG88



Replace Fuel Filter

RG7051 -UN-26NOV97



Fuel Filter Retaining Springs

RG7052 -UN-26NOV97

A—Guide Pins  
B—Drain Plug  
C—Bleed Plug

## Replacing (Round) Primary Fuel Filter/Water Separator



**CAUTION:** Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

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

1. Thoroughly clean fuel filter/water separator assembly and surrounding area.

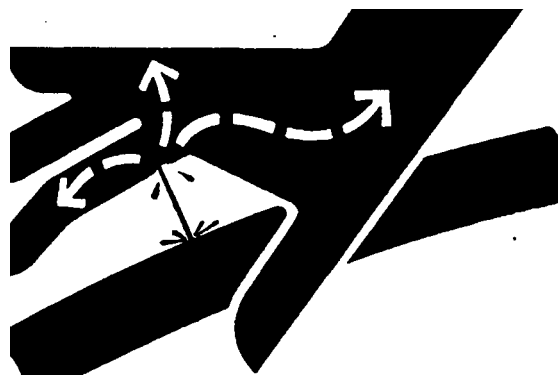
**NOTE:** Lifting up on retaining ring (F) as it is rotated helps to get it past retaining dent.

2. Rotate retaining ring (F) counterclockwise 1/4 turn. Remove ring with filter element (E).
3. Remove water separator bowl (G) from filter element (E). Drain and clean separator bowl. Dry with compressed air.

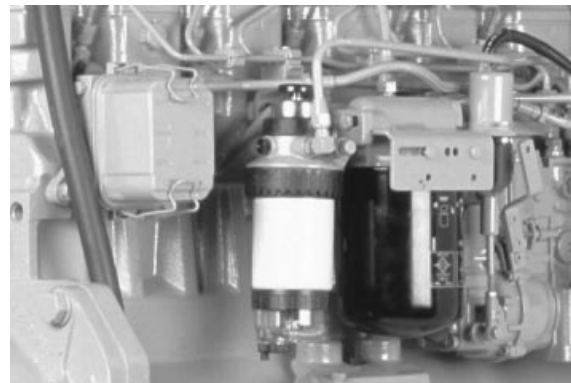
**NOTE:** Notice raised locators on filter element. These locators insure proper alignment of filter element to filter base.

4. Install water separator bowl onto new filter element. Tighten securely.

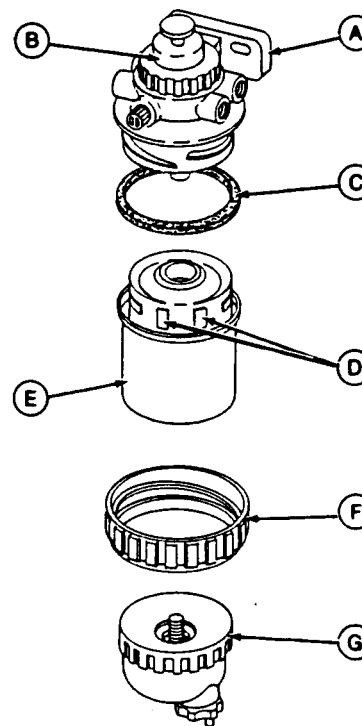
- A—Mounting Base
- B—Hand Primer
- C—Dust Seal
- D—Vertical Locators
- E—Filter Element
- F—Retaining Ring
- G—Water Separator Bowl



High Pressure Fluid



Primary Fuel Filter



Primary Fuel Filter/Water Separator Parts

Continued on next page

RG, RG34710, 4074 -19-10OCT02-1/2

5. Index filter element until longer, vertical locators (D) are oriented opposite mounting base. Insert filter element into base securely. It may be necessary to rotate filter for correct alignment.
6. Install retaining ring to filter base, making certain dust seal (C) is in place on filter base. Tighten retaining ring until it locks into detent position and a "click" sound can be heard.
7. Bleed fuel system. (See BLEEDING THE FUEL SYSTEM in Service As Required Section.)

RG, RG34710, 4074 -19-10OCT02-2/2

## Checking Belt Tensioner Spring Tension and Belt Wear

Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

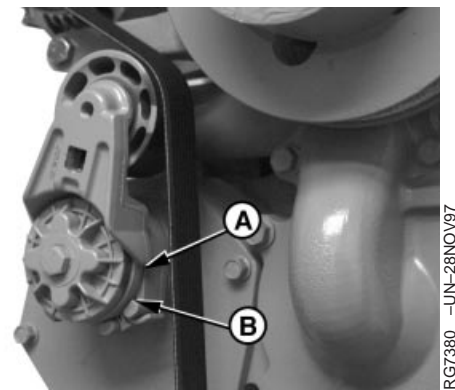
DPSG, OUOD002, 1917 -19-08DEC00-1/1

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



Belt Tensioner

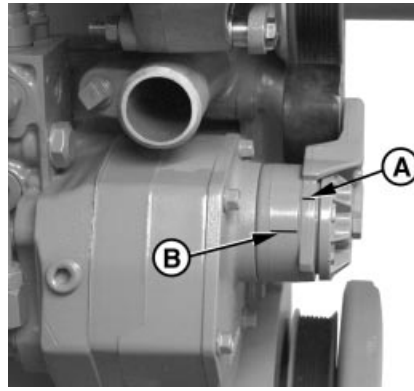
A—Tensioner Stop  
B—Fixed Stop

DPSG, OUOD002, 1918 -19-08DEC00-1/1

## Checking Tensioner Spring Tension

A belt tension gauge will not give an accurate measure of the belt tension when automatic spring tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below:

1. Release tension on belt using a long-handle 1/2 inch breaker bar in tension arm. Remove belt from pulleys.
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 mark (A) and put a mark (B) on tensioner mounting base.



Checking Belt Tension Spring

A—Mark  
B—Mark

RG7382 -UN-28NOV97

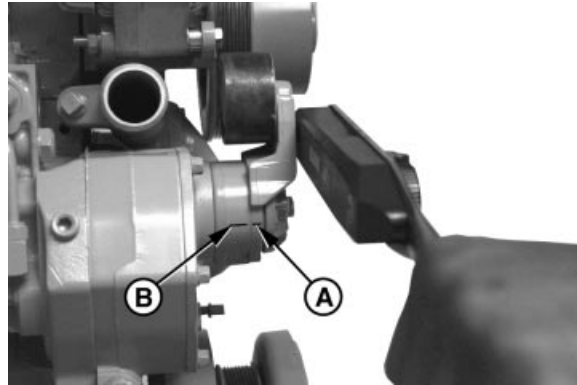
DPSG,OUOD002,1919 -19-08DEC00-1/2

5. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.
6. Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.

### Specification

Spring—Tension ..... 24-28 N•m (17-21 lb-ft)

A—Mark  
B—Mark



Checking Belt Tensioner Spring Tension

RG7381 -UN-28NOV97

DPSG,OUOD002,1919 -19-08DEC00-2/2

## Checking Cooling System



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

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

**IMPORTANT:** Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled.

1. Check entire cooling system for leaks. Tighten all clamps securely.
2. Thoroughly inspect all cooling system hoses for hard, flimsy, or cracked conditions. Replace hoses if any of the above conditions are found.



*High Pressure Fluids*

TS281 -JUN-23AUG88

RG, RG34710, 4077 -19-10OCT02-1/1

## Testing Diesel Engine Coolant

Maintaining adequate concentrations of glycol and inhibiting additives in the coolant is critical to protect the engine and cooling system against freezing, corrosion, and cylinder liner erosion and pitting.

Test the coolant solution at intervals of 12 months or less and whenever excessive coolant is lost through leaks or overheating.

### Coolant Test Strips

Coolant test strips are available from your John Deere dealer. These test strips provide a simple, effective method to check the freeze point and additive levels of your engine coolant.

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™

For a more thorough evaluation of your coolant, perform a COOLSCAN analysis. See your John Deere dealer for information about COOLSCAN.

*COOLSCAN is a trademark of Deere & Company*

DX,COOL9 -19-17FEB99-1/1

## 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 ANTIFREEZE/SUMMER COOLANT or 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.

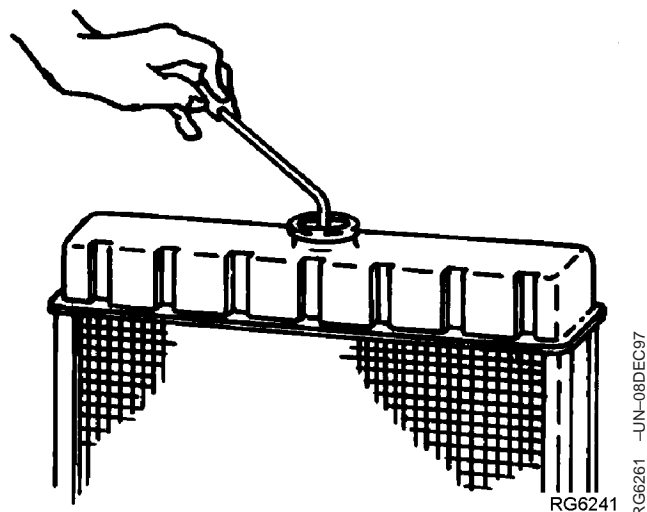
Through time and use, the concentration of coolant additives is gradually depleted during engine operation. Periodic replenishment of inhibitors is required, even when John Deere ANTIFREEZE/SUMMER COOLANT is used. The cooling system must be recharged with additional supplemental coolant additives available 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.

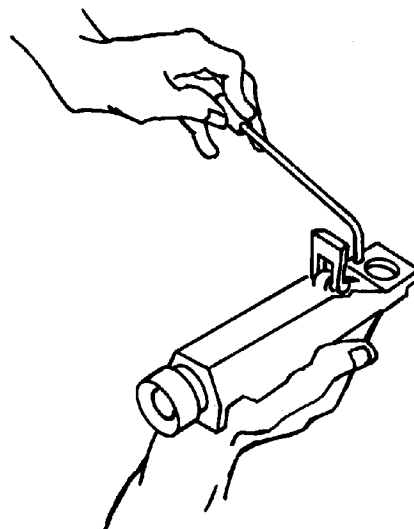
**John Deere LIQUID COOLANT CONDITIONER is recommended as a supplemental coolant additive in John Deere engines.**

**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™ analysis. If a COOLSCAN™ 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

COOL-GARD is a trademark of Deere & Company  
COOLSCAN is a trademark of Deere & Company

Continued on next page

OURGP11,0000016 -19-28JUN04-1/2

**IMPORTANT: ALWAYS maintain coolant at correct level and concentration. DO NOT operate engine without coolant even for a few minutes.**

**If frequent coolant makeup is required, the glycol concentration should be checked with JTO7298 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.

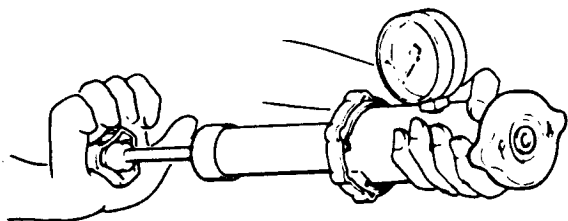
The use of non-recommended supplemental coolant additives may result in additive drop-out and gelation of the coolant.

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.

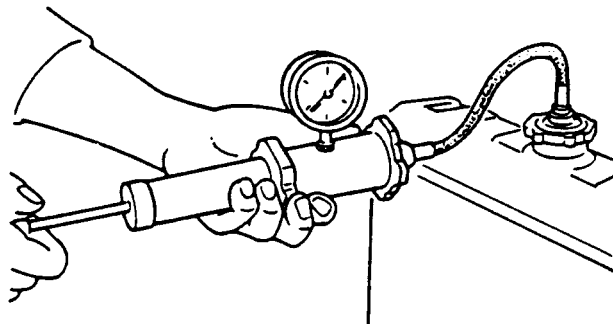
OURGP11,0000016 -19-28JUN04-2/2

## Pressure Testing Cooling System



Test Radiator Cap

RG6657 -JUN-20JAN93



Test Cooling System

RG6658 -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.**

### Test Radiator Cap

1. Remove radiator cap and attach to D05104ST Tester as shown.
2. Pressurize cap to following specifications<sup>1</sup>. Gauge should hold pressure for 10 seconds within the normal range if cap is acceptable.

#### Specification

Radiator Cap—Test Pressure ..... 67 kPa (0.7 bar) (10 psi)

If gauge does not hold pressure, replace radiator cap.

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

### Test Cooling System for Leaks

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

1. Allow engine to cool, then carefully remove radiator cap.
2. Fill radiator with coolant to the normal operating level.

**IMPORTANT: DO NOT apply excessive pressure to cooling system; doing so may damage radiator and hoses.**

3. Connect gauge and adapter to radiator filler neck. Pressurize cooling system to the following specifications<sup>1</sup>.

#### Specification

Cooling System—Test Pressure ..... 67 kPa (0.7 bar) (10 psi)

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

<sup>1</sup>Test pressures recommended are for all Deere OEM cooling systems. On specific vehicle applications, test cooling system and pressure cap according to the recommended pressure for that vehicle.

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

If no leakage is detected, but the gauge indicated a drop in pressure, coolant may be leaking internally

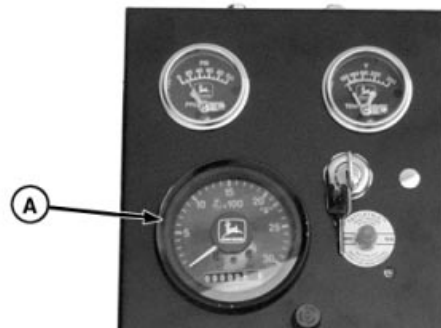
within the system or at the block-to-head gasket. Have your servicing dealer or distributor correct this problem immediately.

OURGP11,0000017 -19-28JUN04-2/2

## Checking and Adjusting Engine Speeds

If equipped with a tachometer (A) on the instrument panel, observe tachometer reading to verify engine speeds. (Refer to FUEL INJECTION PUMP SPECIFICATIONS in Specifications Section later in this manual for engine speed specifications.)

A—Tachometer



Using Tachometer to Check Engine Speeds

RG11076 -UN-21AUG00

RG, RG34710, 4080 -19-01JAN96-1/1

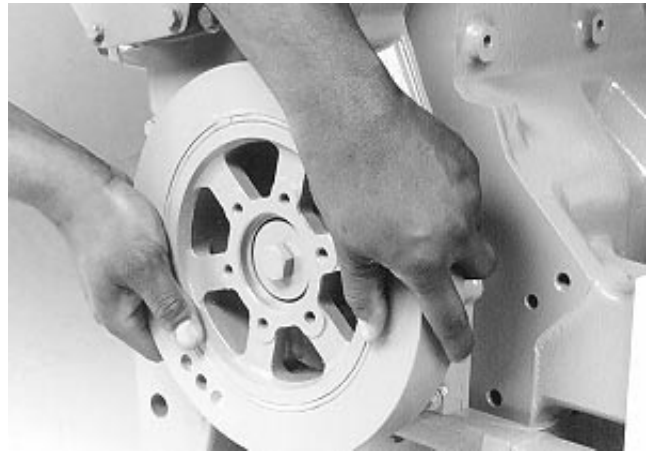
## Checking Crankcase Vibration Damper

On some applications there may be dual dampers. Make same checks on each damper.

1. Remove belts (shown removed).

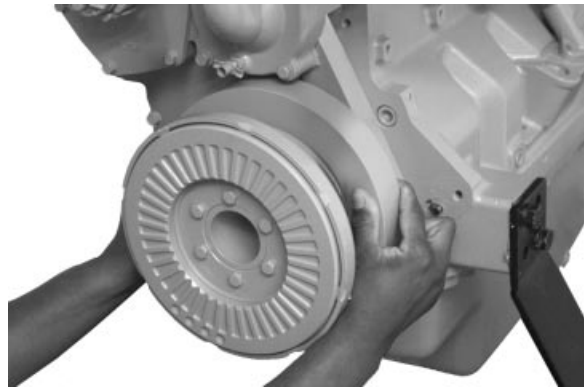
**NOTE:** On engines equipped with dual dampers, **ALWAYS** replace both dampers as a matched set.

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.



Single Damper

RG7208 -UN-28JUL94



Dual Damper

RG7369 -UN-05JAN98

Continued on next page

RG, RG34710, 4081 -19-01JAN96-1/2

**NOTE:** On engines equipped with dual dampers, check runout on inner damper only. Always replace both dampers as a matched set.

3. Check vibration damper radial runout by positioning a dial indicator (A) so probe contacts damper outer diameter.
4. Rotate crankshaft using JDG820 Flywheel Turning Tool.
5. Note dial indicator reading.

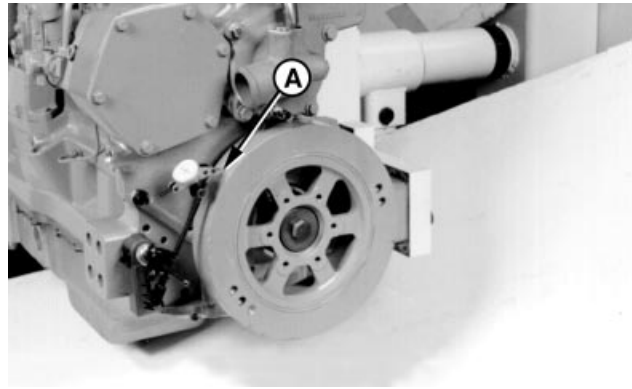
#### Specification

Damper—Maximum Radial  
Runout ..... 1.02 mm (0.040 in.)

If runout exceeds specifications, replace vibration damper.

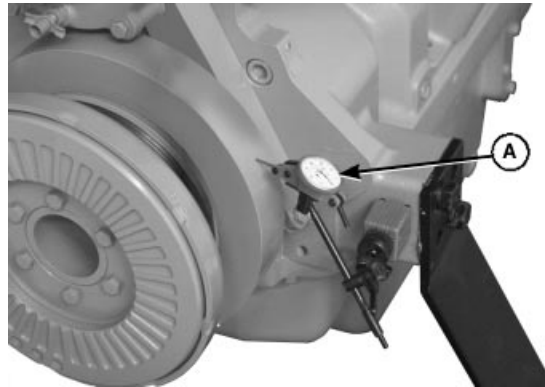
**IMPORTANT:** The vibration damper assembly is not repairable and should be replaced every 4500 hours or 60 months, whichever occurs first.

A—Dial Indicator



Single Damper

RG7065 -UN-26NOV97



Dual Damper

RG11601 -UN-11DEC00

RG, RG34710, 4081 -19-01JAN96-2/2

## Checking Engine Ground Connection

Check engine ground connection to be sure it is secure and clean. This will prevent electrical arcing which can damage engine.

DPSG, OUOD002, 1920 -19-08DEC00-1/1

## Flushing And Refilling Cooling System



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

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

**NOTE:** Drain the initial factory fill engine coolant after the first 3000 hours or 36 months of operation. Subsequent drain intervals are determined by the coolant used for service.

When John Deere COOL-GARD is used, the drain interval is 3000 hours or 36 months. The drain interval may be extended to 5000 hours or 60 months of operation **provided that the coolant is tested annually AND additives are replenished as needed, by adding a supplemental cooling additive (SCA).**

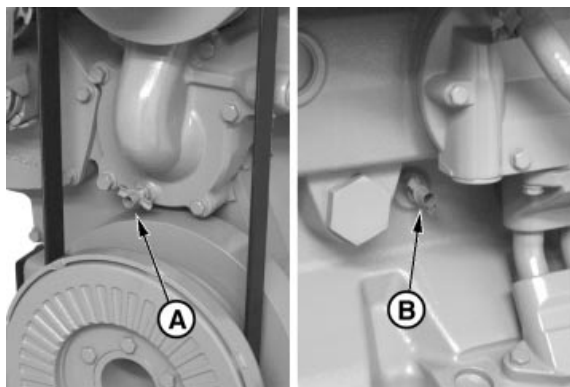
If COOL-GARD is not used, the drain interval is reduced to 2000 hours or 24 months of operation.

Drain old coolant, flush the entire cooling system, replace thermostats, and fill with recommended clean coolant.

1. Pressure test entire cooling system and pressure cap if not previously done. (See PRESSURE TESTING COOLING SYSTEM, in Lubrication and Maintenance 500 hour/12month.)
2. Slowly open the engine cooling system filler cap or radiator cap to relieve pressure and allow coolant to drain faster.
3. Open coolant pump drain valve (A) and engine block drain valve (B) on left side of engine. Drain all coolant from engine block.
4. Open radiator drain valve and drain coolant from radiator.



High Pressure Fluids



Cooling System Drains

A—Pump Drain Valve  
B—Block Drain Valve

TS281 -UN-23AUG88

RG7371 -UN-20JUN00

Continued on next page

OURGP11,0000018 -19-28JUN04-1/3

5. Remove thermostats at this time, if not previously done. Install cover (without thermostats) and tighten cap screws to 20 N•m (15 lb-ft).



**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.**

6. Close all drain valves after coolant has drained. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
7. Stop engine, pull off lower radiator hose and remove radiator cap. Immediately drain the water from system before rust and sediment settle.
8. After draining water, close drain valves and fill the cooling system with clean water and a heavy duty cooling system cleaner such as FLEETGUARD® RESTORE™ or RESTORE PLUS™. Follow manufacturer's directions on label.
9. 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.
10. Close all drain valves on engine and radiator. Install thermostats using a new gasket.

**IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting in cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled.**

11. Add coolant to radiator until coolant touches bottom of filler neck. (See ADDING COOLANT in Service As Required Section). For capacity of cooling system, see Specifications Section 60.

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

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OURGP11,0000018 -19-28JUN04-2/3

12. 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).
13. After running the engine, check coolant level and entire cooling system for leaks.

OURGP11,0000018 -19-28JUN04-3/3

## Checking and Adjusting Engine Valve Clearance

Too little valve clearance throws valves out of time. Valves open too early and close too late. This causes the valves to overheat due to hot combustion gases rushing past valves when out of time. Overheating lengthens valve stems which prevents proper seating of valves. The valves seat so briefly or poorly that normal heat transfer into the cooling system does not have time to take place causing burned valves and low power.

Too much valve clearance causes a lag in valve timing causing engine valve train imbalance. The fuel-air mixture enters the cylinders late during intake stroke. The exhaust valve closes early and prevents waste gases from being completely removed from cylinders. Also, the valves close with a great deal of impact, which may crack or break the valves and scuff the camshaft and followers

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

1. Remove rocker arm cover with vent tube.

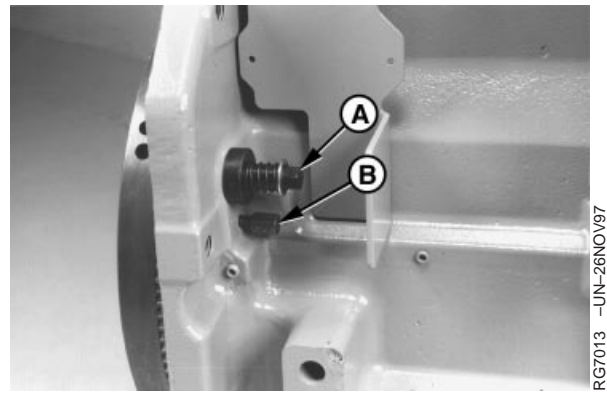
**IMPORTANT: Visually inspect contact surfaces of wear caps and rocker arm wear pads. Check all parts for excessive wear, breakage, or cracks. Replace parts that show visible damage.**

2. Remove plastic plugs from cylinder block bores as shown and install JDG820 Flywheel Turning Tool (A) and JDE81-4 Timing Pin (B).

3. Rotate engine with the flywheel turning tool until timing pin engages timing hole in flywheel.

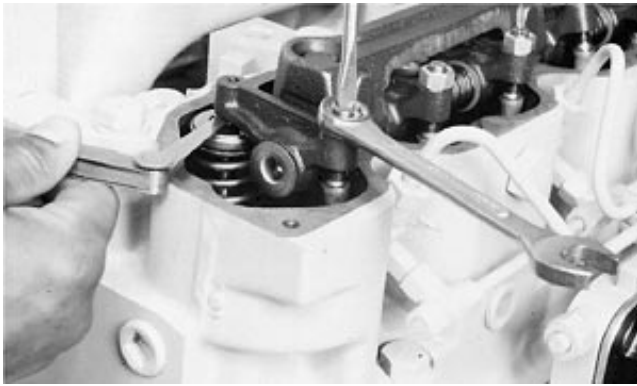
If the rocker arms for No. 1 cylinder are loose, the engine is at No. 1 "TDC-Compression."

If the rocker arms for No. 6 cylinder are loose, the engine is at No. 6 "TDC-Compression." Rotate the engine one full revolution to No. 1 "TDC-Compression."



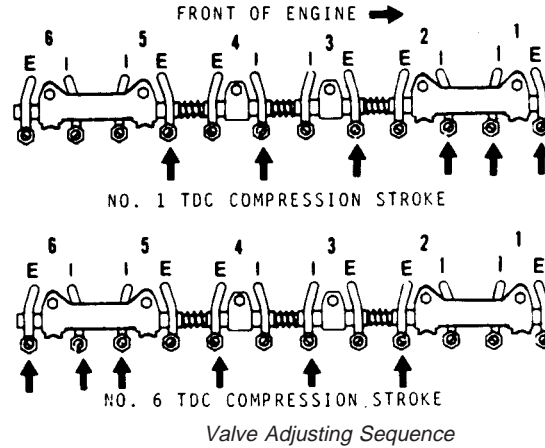
*Flywheel Turning Tool and Timing Pin*

**A—Flywheel Turning Tool  
B—Timing Pin**



Adjust Engine Valve Clearance (If Needed)

RG5241 -JUN-06DEC88



RG4295 -19-21AUG91

4. With engine lock-pinned at "TDC" of No. 1 piston's compression stroke, check and adjust (as needed) valve clearance on Nos. 1, 3 and 5 exhaust valves and Nos. 1, 2 and 4 intake valves.

#### Specification

Intake Valve Clearance  
Checking (Rocker  
Arm-To-Valve Tip With Engine  
Cold)—Clearance ..... 0.41-0.51 mm  
(0.016-0.020 in.)

Exhaust Valve Clearance  
Checking (Rocker  
Arm-To-Valve Tip With Engine  
Cold)—Clearance ..... 0.66-0.76 mm  
(0.026-0.030 in.)

5. Rotate flywheel 360° until No. 6 piston is at "TDC" of its compression stroke. Rocker arms for No. 6 piston should be loose.

6. Check valve clearance to the same specifications on Nos. 2, 4 and 6 exhaust and Nos. 3, 5 and 6 intake valves.

**NOTE:** Adjust valve clearance in the same sequence used for checking clearance.

7. If valve clearance needs to be adjusted, loosen the lock nut on rocker arm adjusting screw. Turn adjusting screw until feeler gauge slips with a slight drag. Hold

the adjusting screw from turning with screwdriver and tighten lock nut to specifications.

#### Specification

Valve Adjusting Screw Lock  
Nut—Torque Value ..... 27 N•m  
(20 lb-ft)

Recheck clearance again after tightening lock nut and compare to the following specifications. Readjust clearance as necessary.

#### Specification

Intake Valve Clearance  
Adjustment (Rocker  
Arm-To-Valve Tip With Engine  
Cold)—Clearance ..... 0.46 mm  
(0.018 in.)

Exhaust Valve Clearance  
Adjustment (Rocker  
Arm-To-Valve Tip With Engine  
Cold)—Clearance ..... 0.71 mm  
(0.028 in.)

8. Install rocker arm cover and tighten cap screws to specifications.

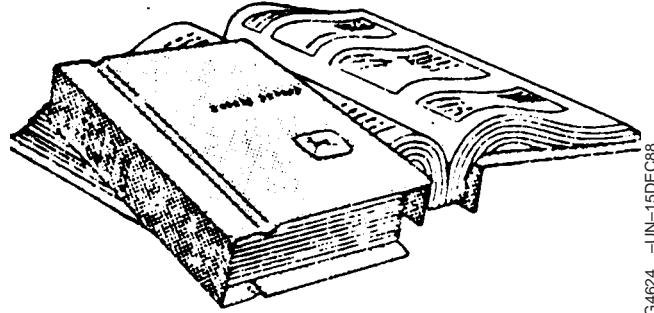
#### Specification

Rocker Arm Cover-To-Cylinder  
Head Cap Screws Torque—  
Value ..... 8 N•m (6 lb-ft) (72 lb-in.)

# Service As Required

## Additional Service Information

This is not a detailed service manual. If you want more detailed service information, See Publications For This Engine in the back of this manual to order the Component Technical Manuals for "Base Engine", "Mechanical Fuel System", or "Electronic Fuel System".



RG4624 -UN-15DEC88

*Additional Service Information*

RG, RG34710, 3591 -19-30AUG96-1/1

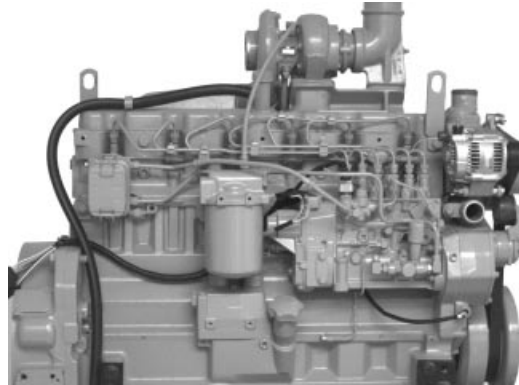
## Do Not Modify Fuel System

**IMPORTANT:** Modification or alteration of the injection pump, the injection pump 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 injection pump or fuel injectors yourself. Special training and special tools are required. (See your authorized servicing dealer or engine distributor.)

Never steam clean or pour cold water on an injection pump while it is still warm. To do so may cause seizure of pump parts.



RG7374 -UN-20JUN00

*Fuel System*

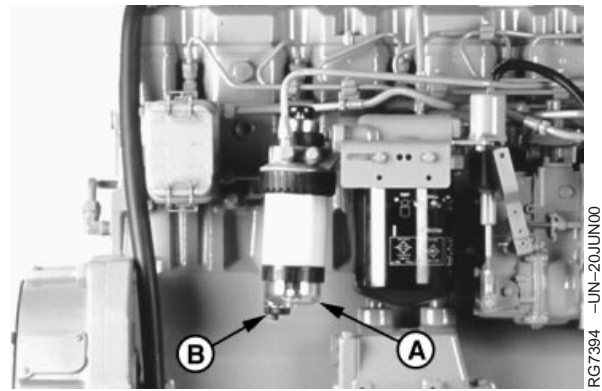
OURGP12,000004E -19-05AUG04-1/1

## Draining Fuel/Water Separator Bowl

Check the separator bowl (A) of the primary fuel/water separator for water or debris.

Loosen thumb screw (B) and drain water and debris from bowl as needed.

A—Separator Bowl  
B—Thumb Screw



*Drain Separator Bowl*

DPSG,OUOD002,1579 -19-09OCT02-1/1

## 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 system.

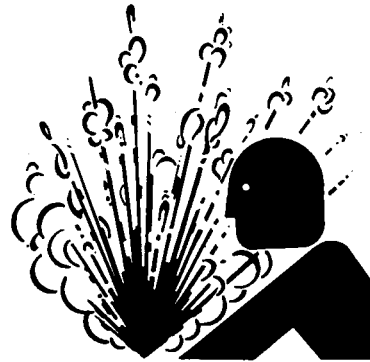
Air must be expelled from cooling system when coolant is added.

1. Loosen temperature sending unit fitting at rear of cylinder head or plug in side of thermostat housing to allow air to escape when filling system.

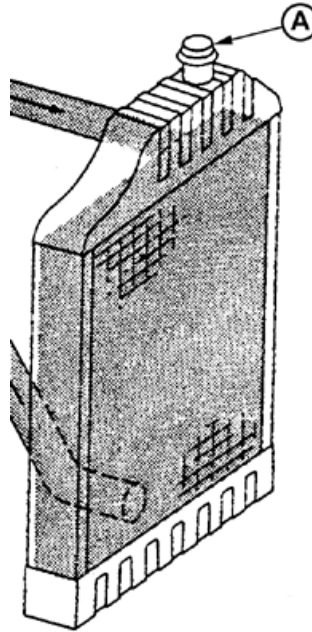
**IMPORTANT:** When adding coolant to the system, use the appropriate coolant solution. ( See **ENGINE COOLANT SPECIFICATIONS** in Fuels, Lubricants, and Coolant Section for mixing of coolant ingredients before adding to cooling system.)

Do not overfill cooling system. A pressurized system needs space for heat expansion without overflowing at top of radiator.

2. Remove radiator cap (A) and fill until coolant level touches bottom of radiator filler neck.
3. Tighten plugs and fittings when air has been expelled from system.
4. Run engine until it reaches operating temperature.



High-Pressure Fluids



Radiator Filler Cap

A—Radiator Filler Cap

RG12833 -UN-13FEB03

TS281 -UN-23AUG88

## Replacing Air Cleaner Filter Elements

**IMPORTANT:** ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H<sub>2</sub>O, is torn, or visibly dirty.

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

1. Remove wing nut and remove canister cover shown in small illustration inset.
2. Remove wing nut (A) and remove primary element (B) from canister.
3. Thoroughly clean all dirt from inside canister.

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

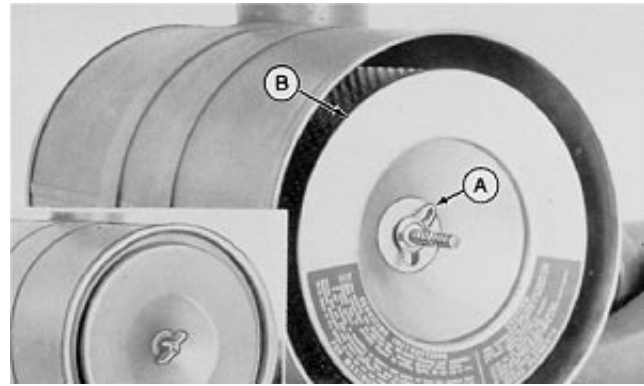
**IMPORTANT:** Remove secondary (safety) element (E) **ONLY** for replacement. **DO NOT** attempt to clean, wash, or reuse secondary element. Replacement of secondary element is usually necessary **ONLY** when primary element has a hole in it.

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.

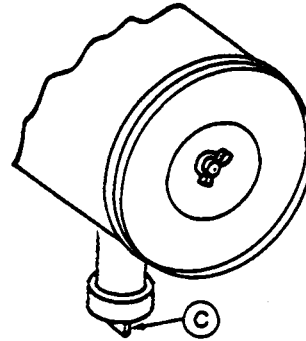
5. Install new primary element and tighten wing nut securely. Install cover assembly and tighten retaining wing nut securely.

**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.

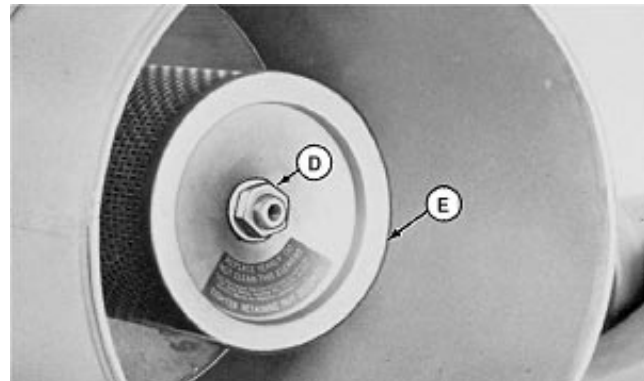
6. If equipped, fully depress air restriction indicator reset button and release to reset indicator.



Air Cleaner Primary Element



Dust Unloader Valve



Air Cleaner Secondary Element

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

## Inspecting Primary Filter Element

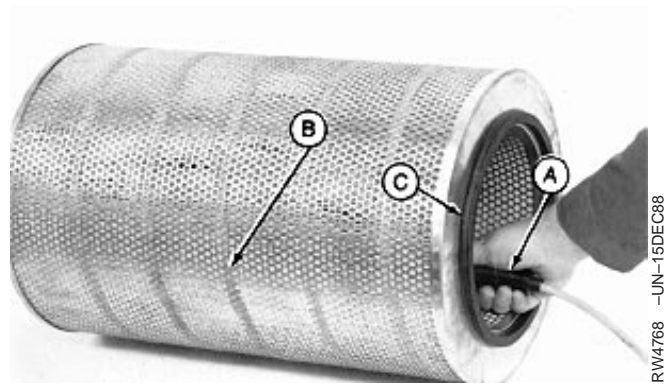
**IMPORTANT:** Do not wash primary filter element. Clean with dry air only (see procedure on following pages).

Inspect filter to determine if it is practical to clean or for damage after cleaning filter.

1. Hold a bright light (A) inside element and check carefully for holes. Discard any element which shows the smallest hole or rupture.
2. Be sure outer screen (B) is not dented. Vibration would quickly wear a hole in filter.
3. Be sure filter gasket (C) is in good condition. If gasket is damaged or missing, replace element.

**IMPORTANT:** Air cleaner **MUST BE DRY** before storing in plastic bag.

If the filter is to be stored for later use, place it in a plastic bag to protect it from dust and damage.



*Inspecting Primary Air Filter Element*

A—Light  
B—Outer Screen  
C—Gasket

RG, RG34710, 3598 -19-30AUG96-1/1

## Cleaning Primary Filter Element

**IMPORTANT:** Always replace secondary (safety) filter elements. **DO NOT** attempt to clean them.

**Do not blow air from outside portion of filter with air nozzle. Wear safety glasses and remove bystanders.**

1. Gently pat sides of element with palm of hand to loosen dirt. **DO NOT** tap element against a hard surface.

Continued on next page

RG, RG34710, 3599 -19-30AUG96-1/2



**CAUTION:** Only a special air cleaning gun (A) should be used. Concentrated air pressure from an ordinary air nozzle may severely damage filter element. Do not exceed 210 kPa (2.1 bar) (30 psi) when cleaning filter element.

2. Insert the cleaning gun into element, hold air nozzle about 25.4 mm (1.0 in.) from perforated metal retainer. Force air through filter from inside to outside and move air gun up and down pleats to remove as much dirt as possible.
3. Repeat steps 1 and 2 to remove additional dirt.
4. Inspect element for damage after cleaning (see previous instructions). Replace element if any damage is found.



RG11065 -UN-26JUN00

*Cleaning Primary Element*

**A—Air Cleaning Gun**

RG, RG34710, 3599 -19-30AUG96-2/2

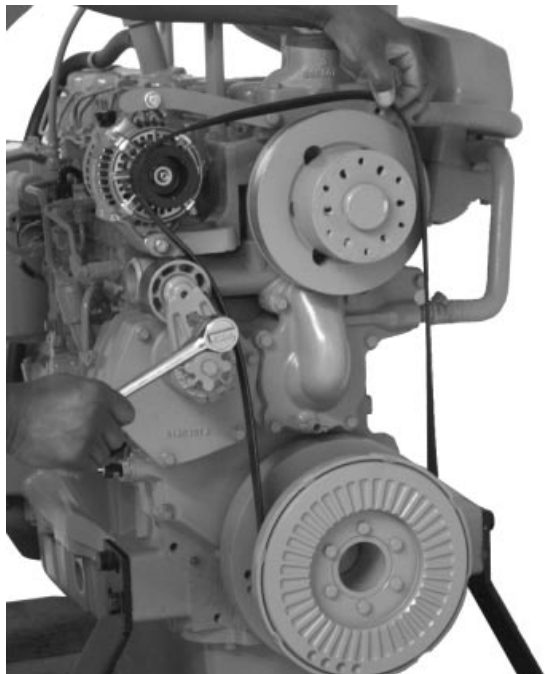
## Element Storage

**IMPORTANT:** Air cleaner element **MUST BE DRY** before storing in plastic bag.

Seal element in a plastic bag and store in shipping container to protect against dust and damage.

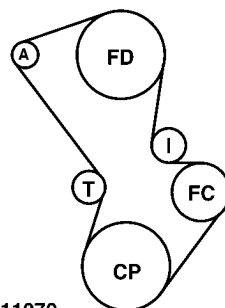
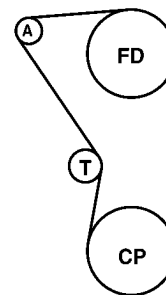
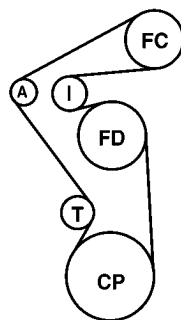
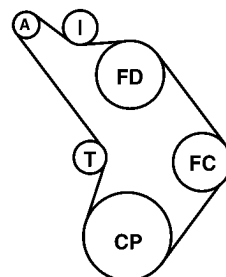
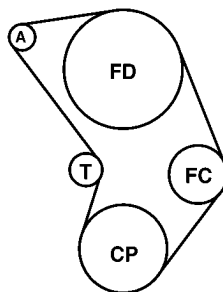
RG, RG34710, 3601 -19-30AUG96-1/1

## Replacing Fan/Alternator Belt

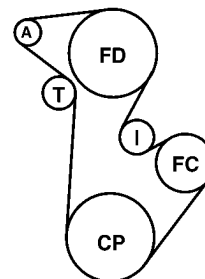


Replacing Belt

RG7392 -UN-26JUN00



RG11070



RG11070 -UN-05JUL00

Belt Routing Options

A—Alternator  
CP—Crankshaft Pulley

FC—Freon (A/C) Compressor  
(Optional)

FD—Fan Drive  
I—Idler

T—Tensioner

Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/500 Hour/12 Month section to determine if belt needs replacing.

1. Release tension on belt using a 1/2 in. drive ratchet as shown in photo.

2. Remove belt from pulleys and discard belt.

3. Install new belt, be sure that belt is correctly seated in all pulley grooves.

4. Apply tension to belt with tensioner. Remove ratchet.

5. Start engine and check belt alignment.

## Power Take-Off (PTO) Clutch (If Equipped)



**CAUTION:** Entanglement in rotating driveline can cause serious injury or death. Keep shield on PTO drive shaft (A) between the clutch housing and the engine driven equipment at all times during engine operation. Wear close fitting clothing. Stop the engine and be sure PTO driveline is stopped before making adjustments.

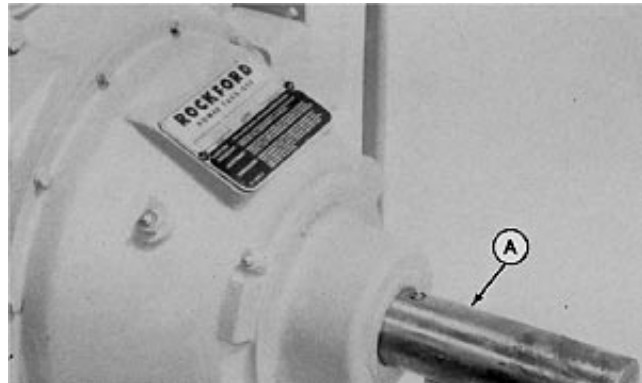
Proper performance of the power take-off unit will be related to the care it is given. Lubricate it periodically and keep the clutch properly adjusted. (See Lubrication and Maintenance/250 Hour/6 Month Section.)

If the power take-off does not work properly after adjustment and lubrication, contact your authorized servicing dealer or engine distributor.

A—PTO Drive Shaft



Rotating Driveline



PTO Clutch Drive Shaft

RG, RG34710, 3603 -19-30AUG96-1/1

TS198 -JUN-23AUG88

RG4693 -JUN-14DEC88

## Checking Air Conditioning Compressor (If Equipped)

Contact your authorized servicing dealer for any service or repairs to the air conditioning system.

OURGP12,0000046 -19-08JUL04-1/1

## Checking Fuses

The following instructions apply to engines equipped with a John Deere instrument panel.

1. *Engines With Standard Instrument Panel* — Check the fuse mounted in the fuse holder (A) on the face of the instrument panel. If defective, install an equivalent 14 amp fuse. (Some earlier engines have a separate hourmeter and fuse. See F3 on Engine Wiring Diagram, Later Engines With Standard Instrument Panel).

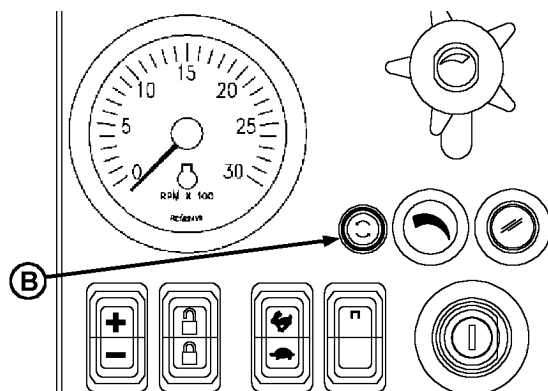
2. *Engines With Electronic Instrument Panel* — Check the fuse (B) located in the fuse holder on the face of the instrument panel. If defective, replace with a 5-amp fuse.

Also check the main electrical system fuse located in the engine wiring harness (see F1 on ENGINE WIRING DIAGRAM, ENGINES WITH ELECTRONIC INSTRUMENT PANEL in Troubleshooting Section). If defective, replace with a 30-amp fuse.

A—Fuse Holder  
B—Fuse



Fuse - Engines with Standard Instrument Panel



Fuse - Engines with Electronic Instrument Panel

RG12597 -JUN-11OCT02

RG12598 -JUN-11OCT02

RG, RG34710, 3604 -19-10OCT02-1/1

## Checking Electrical Wiring And Connections

Check for loose or corroded wiring and connectors. Tighten connections or replace wiring as needed. See your authorized servicing dealer for repairs.

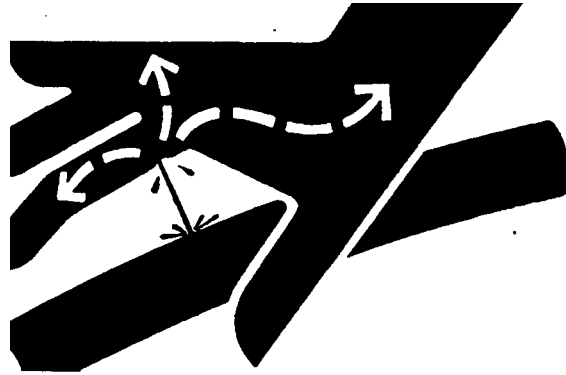
OURGP11,0000264 -19-19NOV03-1/1

## Bleeding Fuel System



**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.



*High Pressure Fluids*

X9811 -UN-23AUG88

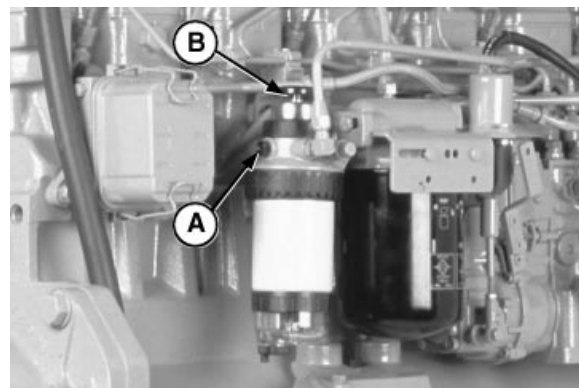
Whenever the fuel system has been opened up for service (lines disconnected or filters removed), it will be necessary to bleed air from the system.

DPSG,OUOD002,1581 -19-10OCT02-1/5

### • At Round Primary Fuel Filter/Water Separator:

1. Drain water and contaminants from clear sediment bowl.
2. Loosen air bleed vent screw (A) on fuel filter base.
3. Operate hand primer (B) until fuel flow is free from air bubbles.
4. Tighten vent screw as hand primer is held in downward pumping position.

A—Vent Screw  
B—Hand Primer



*Bleed Fuel/Water Separator*

RG11071 -UN-06JUL00

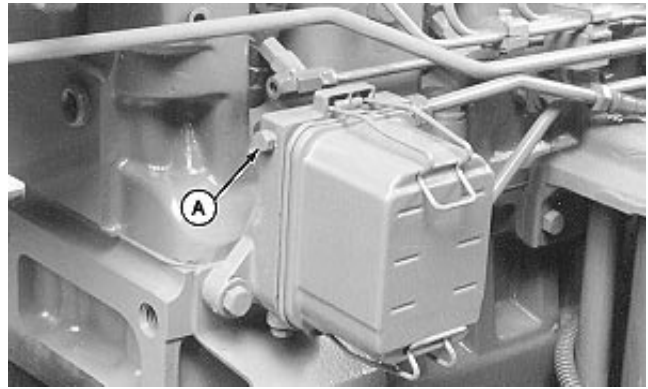
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DPSG,OUOD002,1581 -19-10OCT02-2/5

• **At Rectangular Final Fuel Filter:**

1. Turn key switch to "ON" position.
2. Loosen bleed plug (A) on fuel filter base.

**A—Bleed Plug**



*Fuel Filter Bleed Plug*

RG7072 -UN-07SEP94

DPSG,OUOD002,1581 -19-10OCT02-3/5

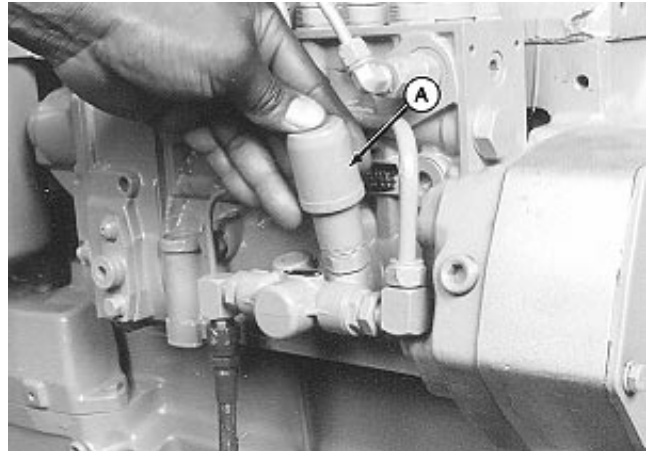
3. Operate hand primer (A) on fuel supply pump until a smooth flow of fuel, free of bubbles, comes out of the filter plug hole.

4. Simultaneously stroke the hand primer down and close the filter port plug. This prevents air from entering the system. Tighten plug securely. **DO NOT** overtighten.

5. Start engine and check for leaks.

If engine will not start, it may be necessary to bleed air from fuel system at injection nozzles as explained next.

**A—Hand Primer**



*Hand Primer for Bleeding Fuel System*

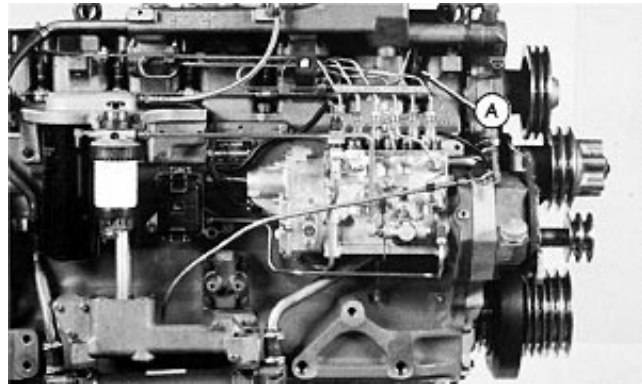
RG7071 -UN-07SEP94

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DPSG,OUOD002,1581 -19-10OCT02-4/5

• **At Fuel Injection Nozzles:**

1. Place throttle lever in fast speed position, if so equipped.
2. Loosen fuel line connection at No. 1 (front) injection nozzle (A).
3. Crank engine with starting motor (but do not start engine), until fuel free of bubbles flows out of loosened connections. Retighten connection.
4. Start engine and check for leaks.
5. If engine does not start, repeat procedure at remaining injection nozzles (if necessary) until enough air has been removed from fuel system to allow engine to start.



No. 1 (Front) Fuel Injection Nozzle

A—No. 1 Injection Nozzle

RG6727 –UN-14APR93

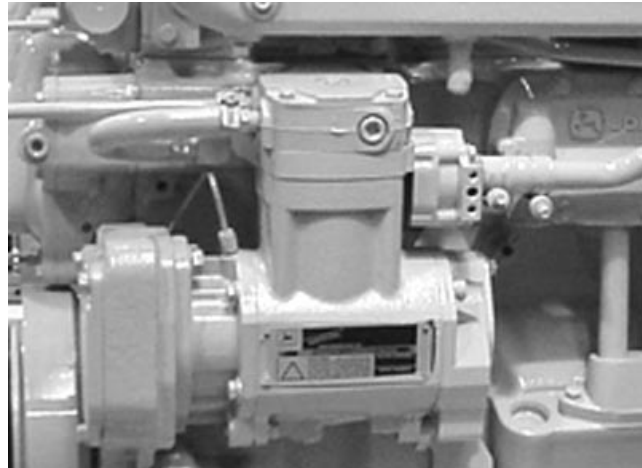
DPSG,OUOD002,1581 –19-10OCT02-5/5

## 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.



Air Compressor (Optional)

RG12738 –UN-07NOV02

OUOD006,0000080 –19-11OCT02-1/1

# 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.

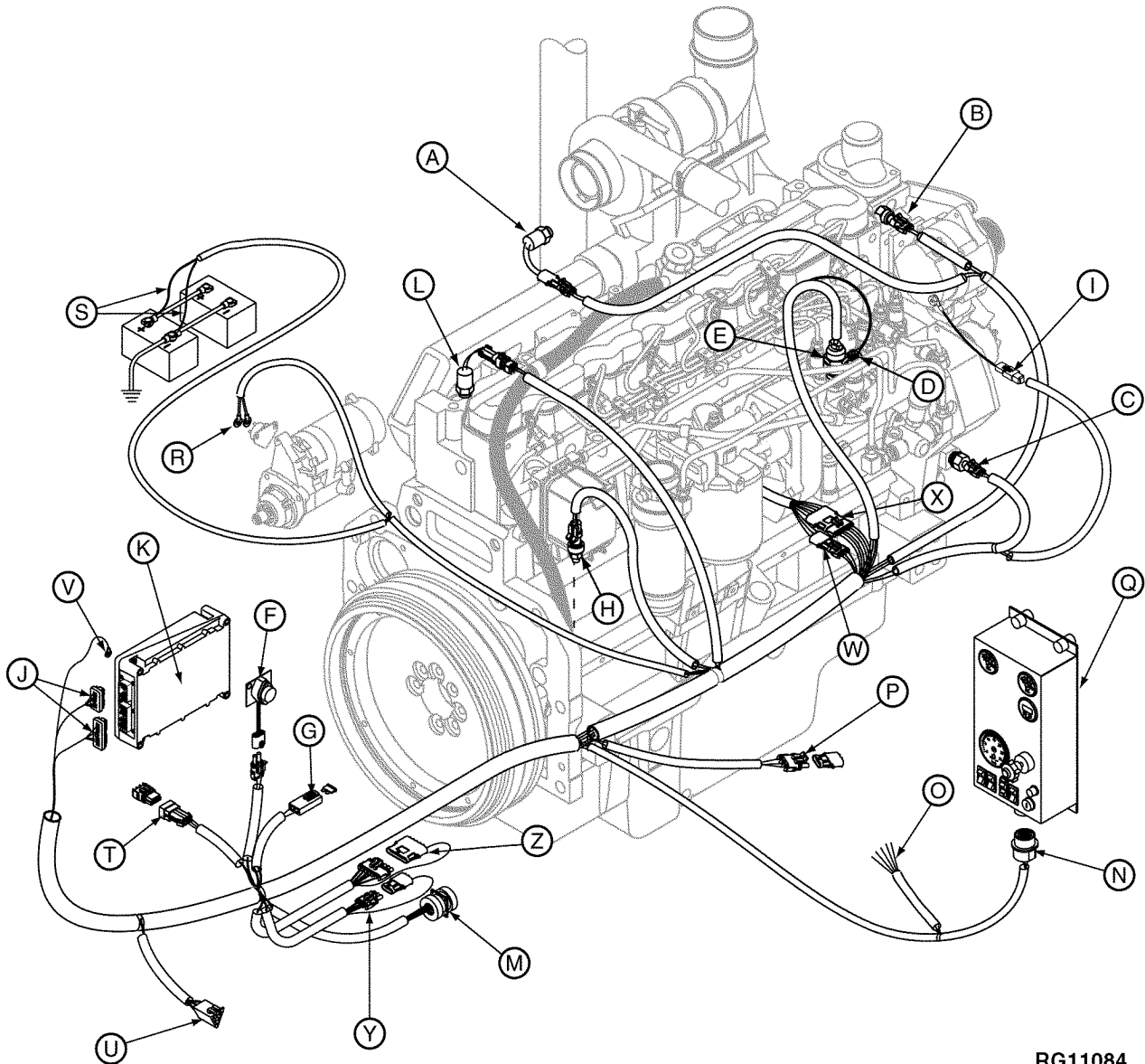
A reliable program for troubleshooting engine problems should include the following basic diagnostic thought process:

- 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: Later engines have electronic control systems which send diagnostic trouble codes to signal problems (see DIAGNOSTIC TROUBLE CODE PROCEDURE, later in this section).*

RG, RG34710, 4086 —19-01JAN96-1/1

# Engine Wiring Layout (Engines With Electronic Instrument Panel)



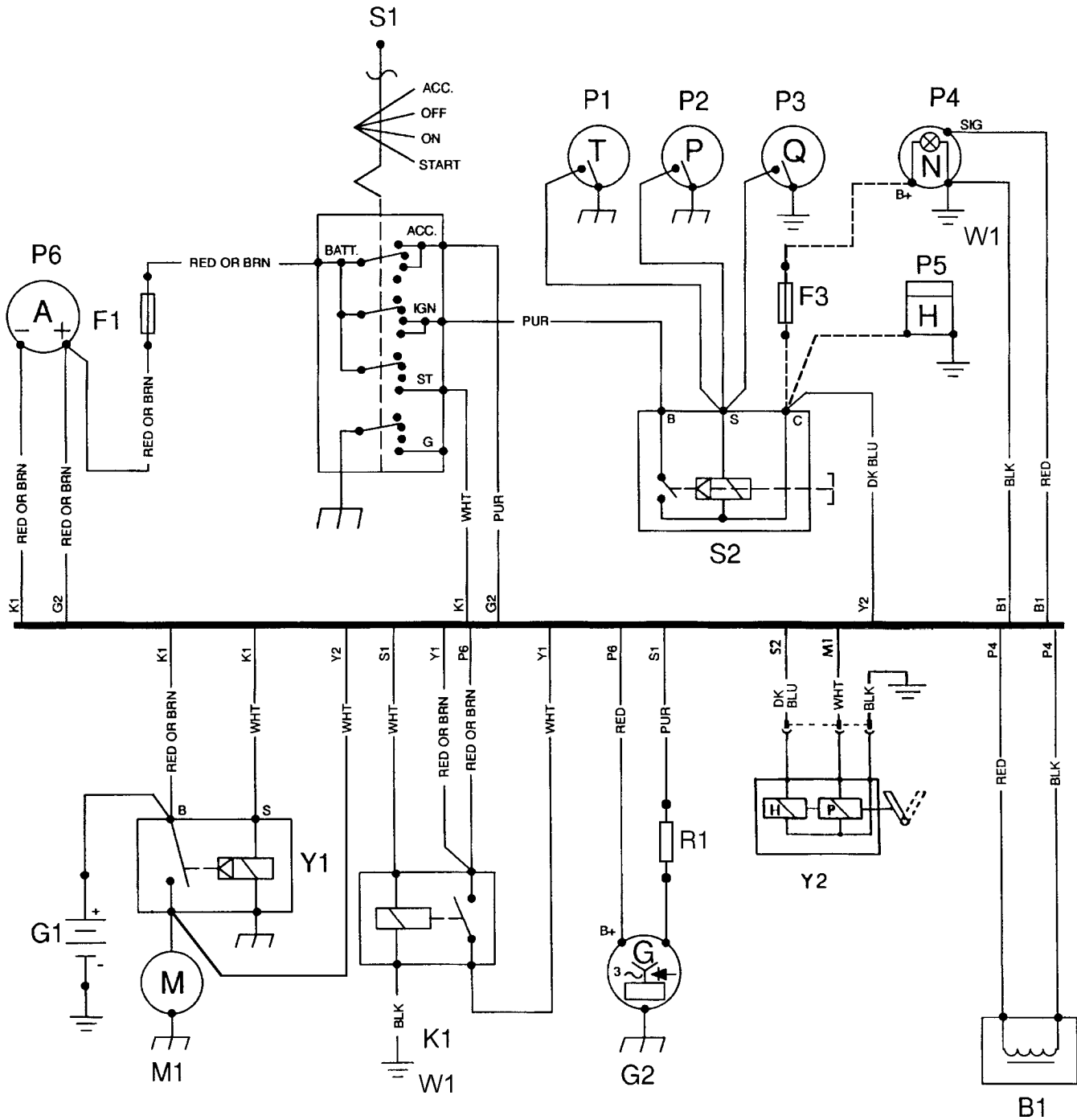
RG11084

RG11084 -UN-25OCT00

- |  |                                 |   |   |
|--|---------------------------------|---|---|
| A—Manifold Air Temperature (Mat) Sensor (Used On “H” engines only) | H—Oil Pressure Sensor           | P—Secondary Analog Throttle Connector (with terminator) | W—Injection Pump Solenoid Connector             |
| B—Coolant Temperature Sensor                                       | I—Alternator Ignition Connector | Q—Optional Instrument Panel                             | X—Injection Pump Rack Position Sensor Connector |
| C—Engine Speed Sensor  | J—ECU Connectors                | R—Starter Relay Connections                             | Y—Diagnostic Voltages Connector                 |
| D—Fuel Shutoff Solenoid  | K—Engine Control Unit           | S—Power And Ground Connections                          | Z—Diagnostic Reader Connector                   |
| E—Fuel Temperature Sensor  | L—Loss of Coolant Sensor        | T—12V/24V Jumper Connection (with jumper)               |   |
| F—Transient Voltage Protection (TVP) Module                        | M—CAN Diagnostic Sensor         | U—SAE 1939 CAN Connector                                |   |
| G—Main System Fuse (20 Amp)  | N—Instrument Panel Connector    | V—System Ground (ECU must also be grounded to frame)    |   |
|  | O—Unterminated Wires            |   |   |

# Engine Wiring Diagram—(Engines With Standard Instrument Panel)

S1 KEY SWITCH					
	B	G	ACC.	ON	ST.
OFF					
ACC.	•		•		
ON	•		•	•	
START	•	•		•	•



Continued on next page

DPSG,OUOD002,1588 -19-09OCT02-1/2

A1—Speed Control Unit	G2—Alternator	P3—Crankcase Oil Level Switch/Gauge	W1—Ground on K1 Starter Relay Mounting Stud
B1—Magnetic Speed Sensor	H1—Coolant Temperature Indicator Lamp	P4—Tachometer <sup>1</sup>	Y1—Starter Solenoid
B2—Coolant Temperature Sensor	H2—Oil Pressure Indicator Lamp	P5—Hourmeter (Early Models) <sup>2</sup>	Y2—Fuel Shut-Off Solenoid <sup>3</sup>
B3—Oil Pressure Sensor	H3—Alternator Indicator Lamp	P6—Ammeter	BLK—Black
F1—Starting Circuit Fuse (14 amp)	K1—Starter Relay	R1—Resistor (48 ohm)	BLU—Blue
F3—Fuse (Early Models) <sup>1</sup>	K2—Fuel Shut-Off Relay	S1—Key Switch	BRN—Brown
G1—Battery	M1—Starter Motor	S2—Magnetic Safety Switch-North American Auto Override Module-European (Saran)	GRN—Green
	P1—Coolant Temperature Gauge		ORG—Orange
	P2—Oil Pressure Gauge		PUR—Purple
			RED—Red
			YEL—Yellow

<sup>1</sup>P4 tachometer has a built-in hourmeter. On some earlier engines, a separate hourmeter (P5) and fuse (F3) were used.

<sup>2</sup>P4 tachometer has a built-in hourmeter. On some engines, a separate hourmeter (P5) and fuse (F3) are used.

<sup>3</sup>Y2 Fuel Shut-Off Solenoid shown is for 3-wire in-line fuel injection pump. Single connection rotary pumps will have one dark blue wire for power and one black wire for ground.

DPSG,OUOD002,1588 -19-09OCT02-2/2

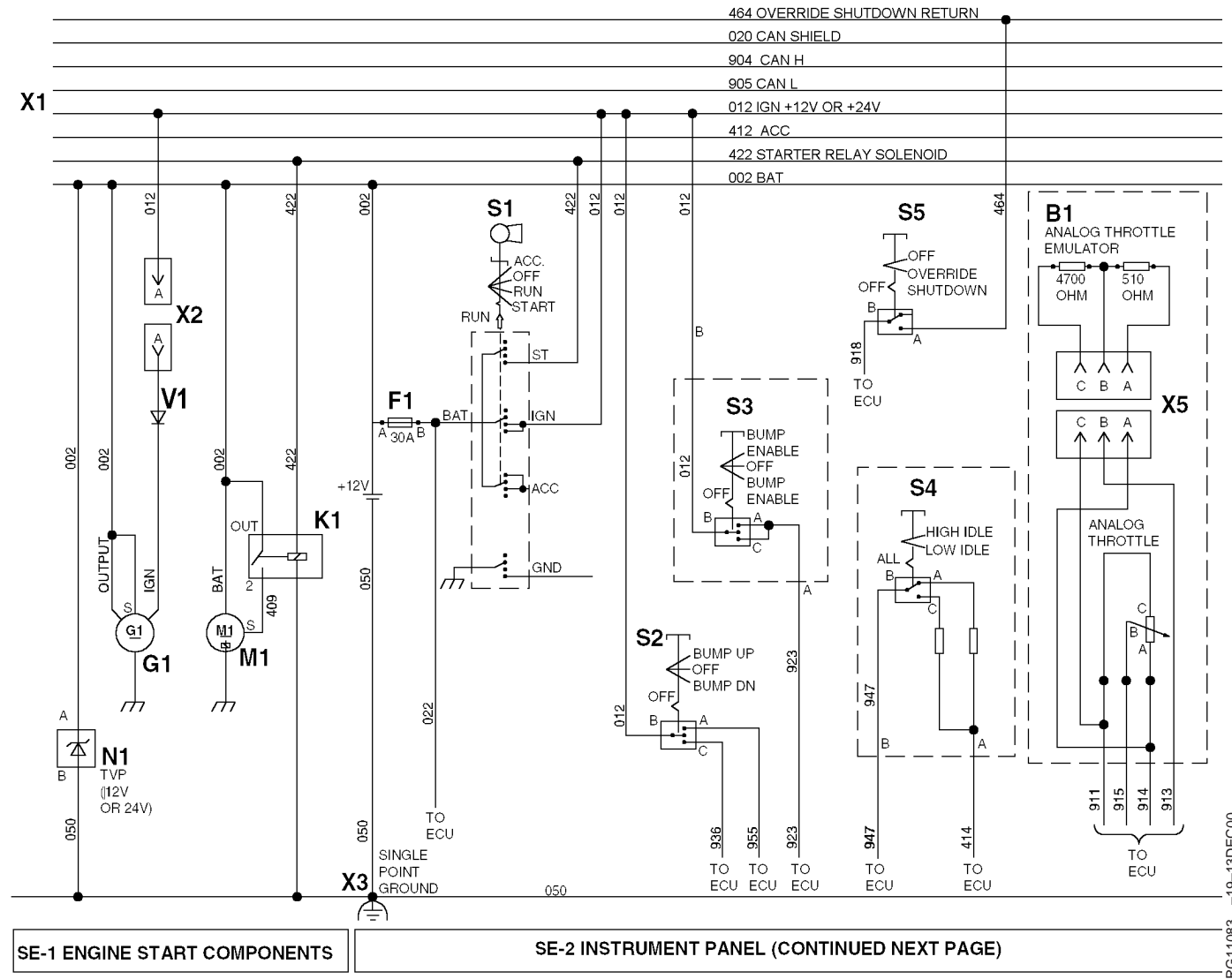
## Precautions for Welding on Vehicles Equipped with Electronic Engine Control Unit (ECU)

**IMPORTANT: ALWAYS disconnect Electronic Control Unit (ECU) connectors and engine control system-to-machine ground before welding. 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.

DPSG,OUOD002,1836 -19-15AUG00-1/1

# Engine Wiring Diagram—(Engines With Electronic Instrument Panel)



# Engine Wiring Diagram (Engines With Electronic Instrument Panel)—Continued

464 OVERRIDE SHUTDOWN RETURN

020 CAN SHIELD

904 CAN H

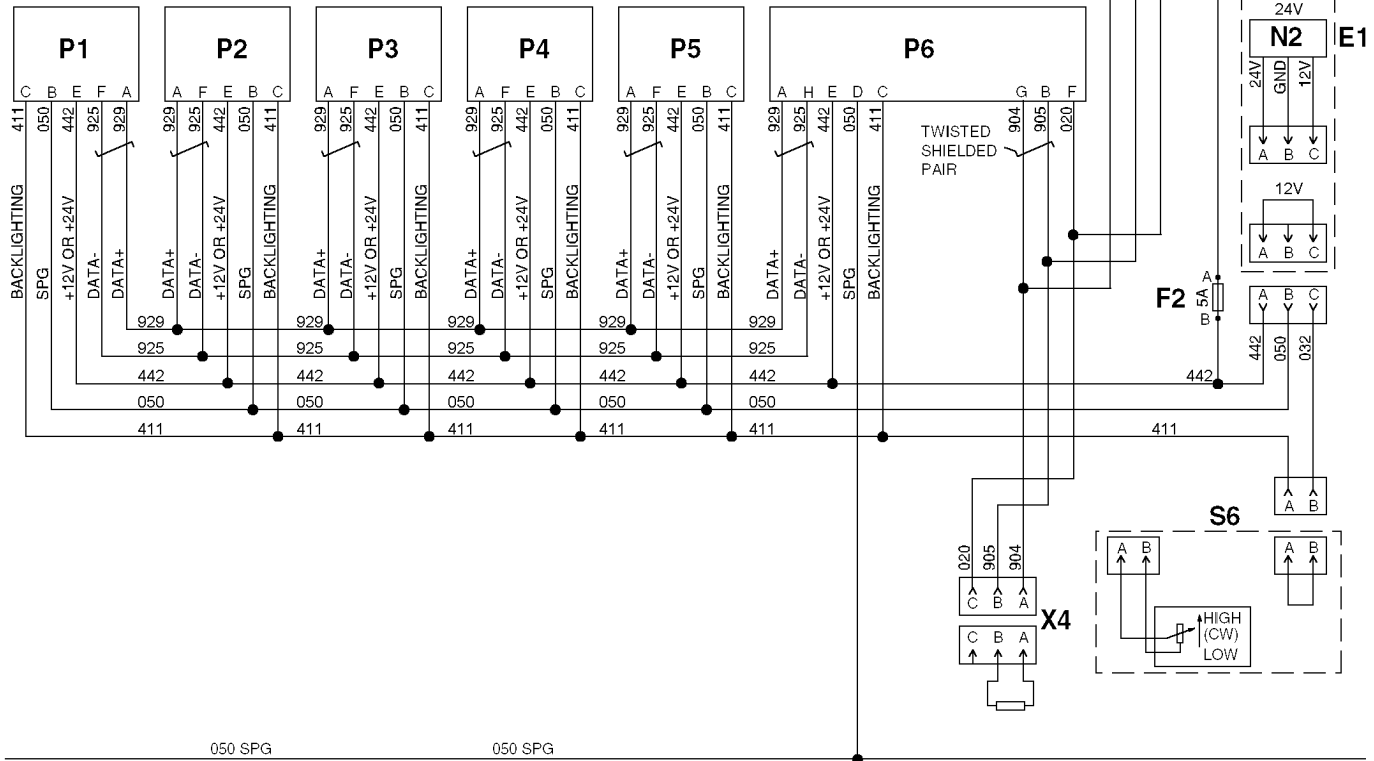
905 CAN L

012 IGN +12V OR +24V

412 ACC

422 STARTER RELAY SOLENOID

002 BAT



B1—Analog Throttle or Emulator  
E1—Back Light Regulator (24V) or Plug (12V)  
F1—Fuse (30 Amp) (for harness)  
F2—Fuse (5 Amp) (for instrument panel)  
G1—Alternator  
K1—Starter Relay  
M1—Starter Motor

N1—Transient Voltage Protector  
N2—Voltage Regulator (for 24V Operation)  
P1—Optional Gauge  
P2—Optional Gauge  
P3—Oil Pressure Gauge  
P4—Coolant Temperature Gauge  
P5—Tachometer Display  
P6—Hourmeter/Diagnostic Meter

S1—Ignition Key Switch  
S2—Speed Select Switch (Momentary)  
S3—Bump Enable Switch (Momentary)  
S4—High-Low Speed Switch  
S5—Override Shutdown Switch (Momentary)  
S6—Dimmer Control or Jumper Plug

V1—Diode  
X1—Vehicle Harness Connector  
X2—Alternator Harness Connector  
X3—Single Point Ground  
X4—CAN Terminator  
X5—Analog Throttle Connector

RG10040 -19-18MAY99

QUOD006.000007F -19-10OCT02-1/1

## Engine Troubleshooting

Symptom	Problem	Solution
<b>Engine Will Not Crank</b>	Weak battery	Replace battery.
	Corroded or loose battery connections	Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.
<b>Hard to Start or Will Not Start</b>	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Slow cranking speed	Check for problem in the charging/starting system.
	Too high viscosity crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic Control System Problem or Basic Engine Problem	See your John Deere engine distributor or servicing dealer.
<b>Engine Misfiring or Runs Irregularly</b>	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
<b>Lack of Engine Power</b>	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Engine overloaded	Reduce engine load.
	Improper crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 4089 -19-09OCT02-1/6

Symptom	Problem	Solution
<b>Black or Gray Exhaust Smoke</b>	Engine overloaded	Reduce engine load.
	Engine burning oil	See LUBRICATION SYSTEM TROUBLESHOOTING, later in this section.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Defective muffler/exhaust piping (causing back-pressure)	Replace muffler or defective piping.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
<b>White Exhaust Smoke</b>	Engine compression too low	Determine cause of low compression and repair as required. See your John Deere engine distributor or servicing dealer.
	Defective thermostat(s) (does not close)	Test thermostats; replace thermostats as required.
	Coolant entering combustion chamber (failed cylinder head gasket or cracked cylinder head)	Repair or replace as required. See your John Deere engine distributor or servicing dealer.
	Failed water-to-air aftercooler (6081AF engines only)	Remove and inspect water-to-air aftercooler. See your John Deere engine distributor or servicing dealer.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
<b>Engine Idles Poorly</b>	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Air leak on suction side of air intake system.	Check hose and pipe connections for tightness; repair as required.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 4089 -19-09OCT02-2/6

Symptom	Problem	Solution
<b>Excessive Fuel Consumption</b>	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Engine overloaded	Reduce engine load.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Compression too low	Determine cause of low compression and repair as required.
	Leaks in fuel supply system	Locate source of leak and repair as required.
	Improper type of fuel.	Use proper type of fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
	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.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
	Low engine temperature.	Check thermostat.
<b>Fuel in Oil</b>	Cracked cylinder head	Locate crack, repair/replace components as required. See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 4089 -19-09OCT02-3/6

Symptom	Problem	Solution
<b>Abnormal Engine Noise</b>	Worn main or connecting rod bearings	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Excessive crankshaft end play	Check crankshaft end play. See your John Deere engine distributor or servicing dealer.
	Loose main bearing caps	Check bearing clearance; replace bearings and bearing cap screws as required. See your John Deere engine distributor or servicing dealer.
	Worn connecting rod bushings and piston pins	Inspect piston pins and bushings. See your John Deere engine distributor or servicing dealer.
	Scored pistons	Inspect pistons. See your John Deere engine distributor or servicing dealer.
	Worn timing gears or excess backlash	Check timing gear back lash. See your John Deere engine distributor or servicing dealer.
	Excessive valve clearance	Check and adjust valve clearance. See your John Deere engine distributor or servicing dealer.
	Worn camshaft lobes	Inspect camshaft. See your John Deere engine distributor or servicing dealer.
	Worn rocker arm shaft(s)	Inspect rocker arm shafts. See your John Deere engine distributor or servicing dealer.
	Insufficient engine lubrication	See LUBRICATION SYSTEM TROUBLESHOOTING, later in this section.
	Turbocharger noise	See AIR INTAKE SYSTEM TROUBLESHOOTING, later in this section.

Continued on next page

RG, RG34710, 4089 -19-09OCT02-4/6

Symptom	Problem	Solution
<b>Engine emits white smoke</b>	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.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
<b>Engine emits black or gray exhaust smoke</b>	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.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.

Continued on next page

RG, RG34710, 4089 -19-09OCT02-5/6

Symptom	Problem	Solution
<b>Engine Overheats</b>	Engine overloaded.	Reduce load.
	Low coolant level.	Fill radiator to proper level, check radiator and hoses for loose connections or leaks.
	Faulty radiator cap.	Have technician check.
	Stretched V-belt or defective belt tensioner.	Check automatic belt tensioner and check belts for stretching. Replace as required.
	Low engine oil level.	Check oil level. Add oil as required.
	Cooling system needs flushing.	Flush cooling system.
	Defective 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.

RG, RG34710, 4089 -19-09OCT02-6/6

## Electrical Troubleshooting

Symptom	Problem	Solution
<b>Undercharged system</b>	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter, or alternator.	Inspect and clean as necessary.
	Defective battery.	Test battery.
	Defective alternator.	Test charging system.
<b>Battery used too much water</b>	Cracked battery case.	Check for moisture and replace as necessary.
	Defective battery.	Test battery.
	Battery charging rate too high.	Test charging system.
<b>Batteries will not charge</b>	Loose or corroded connections.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Stretched belt or defective belt tensioner.	Adjust belt tension or replace belts.
<b>Starter will not crank</b>	Engine drivelines engaged.	Disengage engine drivelines.
	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.
	Blown fuse.	Replace fuse.

Continued on next page

RG, RG34710, 4090 -19-09OCT02-1/2

Symptom	Problem	Solution
<b>Starter cranks slowly</b>	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.
<b>Starter and hour meter functions; rest of electrical system does not function</b>	Blown fuse on magnetic switch.	Replace fuse.
<b>Entire electrical system does not function</b>	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Blown fuse.	Replace fuse.

RG, RG34710, 4090 -19-09OCT02-2/2

## Lubrication System Troubleshooting

Symptom	Problem	Solution
<b>Low Oil Pressure</b>	Low crankcase oil level	Fill crankcase to proper oil level.
	Clogged oil cooler or filter	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Excessive oil temperature	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Defective oil pump	Remove and inspect oil pump. See your John Deere engine distributor or servicing dealer.
	Incorrect oil	Drain crankcase and refill with correct oil.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Clogged oil pump screen or cracked pick-up tube	Remove oil pan and clean screen/replace pick-up tube.
<b>High Oil Pressure</b>	Excessive main or connecting rod bearing clearance	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Improper oil classification	Drain crankcase and refill with correct oil.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged filter bypass valve	Remove and inspect filter bypass valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged oil cooler bypass valve	Remove and inspect oil cooler bypass valve. See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 7600 -19-30JUN97-1/3

Symptom	Problem	Solution
<b>Excessive Oil Consumption</b>	Too low viscosity crankcase oil	Drain crankcase and refill with correct viscosity oil.
	Crankcase oil level too high	Drain oil until oil level is correct.
	External oil leak(s)	Determine source of oil leak(s) and repair as required.
	Oil control rings worn or broken	Replace piston rings. See your John Deere engine distributor or servicing dealer.
	Scored cylinder liners or pistons	Remove and inspect cylinders and liners; replace as required. See your John Deere engine distributor or servicing dealer.
	Worn valve guides or stems	Inspect and measure valve stems and valve guides; repair as required. See your John Deere engine distributor or servicing dealer.
	Excessive oil pressure	See High Oil Pressure.
	Piston ring grooves excessively worn	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston rings sticking in ring grooves	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Insufficient piston ring tension	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston ring gaps not staggered	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Front and/or rear crankshaft oil seal faulty	Replace oil seals. See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 7600 -19-30JUN97-2/3

Symptom	Problem	Solution
		See LOW PRESSURE SYSTEM-FUEL PRESSURE LOW TROUBLESHOOTING earlier in this section.
Fuel in Oil		See FUEL IN OIL TROUBLESHOOTING earlier in this section.
Coolant in Oil		See COOLING SYSTEM TROUBLESHOOTING later in this section.

RG, RG34710, 7600 -19-30JUN97-3/3

## Cooling System Troubleshooting

Symptom	Problem	Solution
Engine Overheats	Lack of coolant in cooling system	Fill cooling system to proper level.
	Radiator core dirty	Clean radiator as required.
	Engine overloaded	Reduce engine load.
	Too low crankcase oil level	Fill crankcase to proper oil level.
	Loose or defective fan belt	Replace fan belt as required. Check belt tensioner. (See Lubrication and Maintenance 500 Hour/12 Month Section.)
	Defective thermostat(s)	Test thermostat opening temperature; replace thermostats as required.
	Damaged cylinder head gasket	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Defective coolant pump	Replace coolant pump. See your John Deere engine distributor or servicing dealer.
	Defective radiator cap	Replace radiator cap as required.

Continued on next page

RG, RG34710, 7601 -19-09OCT02-1/2

Symptom	Problem	Solution
<b>Coolant in Crankcase</b>	Cylinder head gasket defective	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Cylinder head or block cracked	Locate crack, repair/replace components as required.
	Cylinder liner seals leaking	Remove and inspect cylinder liners. See your John Deere engine distributor or servicing dealer.
	Leaking oil cooler	Pressure test oil cooler; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Defective oil cooler O-rings	Remove and inspect oil cooler O-rings; replace as required. See your John Deere engine distributor or servicing dealer.
	Faulty coolant pump seal; weep hole plugged; coolant leaking through bearing	Replace coolant pump seals. See your John Deere engine distributor or servicing dealer.
<b>Coolant Temperature Below Normal</b>	Defective thermostat(s)	Test thermostats; replace thermostats as required.

RG, RG34710, 7601 -19-09OCT02-2/2

## Air Intake System Troubleshooting

If turbocharger requires replacement, determine what caused the failure of the defective unit, and correct the condition. This will prevent an immediate repeat failure of the replacement unit.

Symptom	Problem	Solution
<b>Hard to Start or Will Not Start</b>		See ENGINE TROUBLESHOOTING earlier in this section.
<b>Engine Misfiring or Runs Irregularly</b>		See ENGINE TROUBLESHOOTING earlier in this section.
<b>Black or Grey Exhaust Smoke</b>		See ENGINE TROUBLESHOOTING earlier in this section.
<b>Lack of Engine Power</b>		See ENGINE TROUBLESHOOTING earlier in this section.
<b>Turbocharger "Screams"</b>	Air leak in intake manifold.	Check intake manifold gasket and manifold; repair as required. See your John Deere engine distributor or servicing dealer.
<b>Turbocharger Noise or Vibration</b>  <i>NOTE: Do not confuse the whine heard during run down with noise which indicates a bearing failure.</i>	Bearings not lubricated (insufficient oil pressure)	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
	Air leak in engine intake or exhaust manifold	Check intake and exhaust manifold gaskets and manifolds; repair as required. See your John Deere engine distributor or servicing dealer.
	Improper clearance between turbine wheel and turbine housing	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Broken blades (or other wheel failures)	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 7602 -19-30JUN97-1/3

Symptom	Problem	Solution
<b>Oil on Turbocharger Compressor Wheel or in Compressor Housing (Oil Being Pushed or Pulled Through Center Housing)</b>	Excessive crankcase pressure.	Determine cause of excessive crankcase pressure; repair as required. See your John Deere engine distributor or servicing dealer.
	Air intake restriction	Determine cause of intake restriction; repair as required. See your John Deere engine distributor or servicing dealer.
	Drain tube restriction	Determine cause of drain tube restriction; repair as required. See your John Deere engine distributor or servicing dealer.
<b>Oil in Intake Manifold or Dripping from Turbocharger Housing</b>	Excessive crankcase pressure	Determine cause of excessive crankcase pressure; repair as required. See your John Deere engine distributor or servicing dealer.
	Air intake restriction	Determine cause of intake restriction; repair as required. See your John Deere engine distributor or servicing dealer.
	Drain tube restriction	Determine cause of drain tube restriction; repair as required. See your John Deere engine distributor or servicing dealer.
	Damaged or worn housing bearings	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Imbalance of rotating assembly	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Damage to turbine or compressor wheel or blade	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Dirt or carbon build-up on wheel or blade	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

Continued on next page

RG, RG34710, 7602 -19-30JUN97-2/3

Symptom	Problem	Solution
<b>Turbocharger Turbine Wheel Drag</b>	Bearing wear	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Oil starvation or insufficient lubrication	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
	Shaft seals worn	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Carbon build-up behind turbine wheel caused by coked oil or combustion deposits	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Dirt build-up behind compressor wheel caused by air intake leaks.	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Bearing seizure or dirty, worn bearings	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

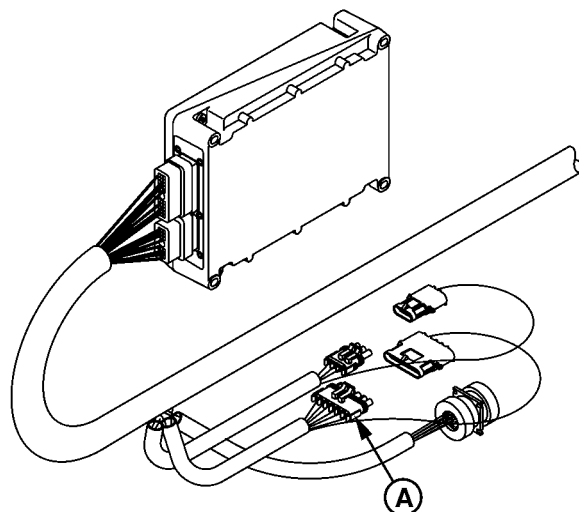
RG, RG34710, 7602 -19-30JUN97-3/3

## Diagnostic Trouble Code Procedure (Engines With Standard Instrument Panel)

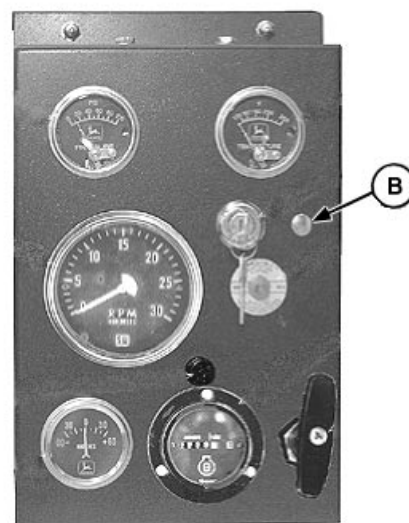
On OEM applications that have a Fault Lamp (B), the ECU has the ability to display diagnostic trouble codes (DTCs) using blinking sequences of the fault lamp. To retrieve DTCs from the ECU using the "blink code" method:

1. Locate and uncap the 6-way WEATHER PACK™ diagnostic reader connector (A).
2. Using a short piece of wire, jump terminals B and F in the diagnostic reader connector together.
3. Turn the ignition switch "ON".
4. The Fault Lamp (B) will begin to flash a code number. For example, flash three times..short pause..flash two times..long pause. This example is code 32.
5. The ECU begins the flashing sequence by flashing a code 32, this indicates the start of blinking active codes. If there are any active DTCs, the ECU will flash its 2-digit number. If there is more than one active DTC, the ECU will flash each code in numerical order. If there are no active DTCs, the Fault Lamp will flash a code 88.
6. Following the active codes, the Fault Lamp will flash a code 33, this indicates the start of blinking stored codes. If there are any stored DTCs, the Fault Lamp will flash its 2-digit number. If there is more than one stored DTC, the ECU will flash each code in numerical order. If there are no stored DTCs, the Fault Lamp will flash a code 88.
7. Once complete, this sequence will repeat.
8. When complete, turn ignition "OFF", remove jumper wire, and recap the diagnostic reader connector.

As an example, if an engine had an active DTC 18, and a stored DTC 53, the flashing sequence would be: flash three times..short pause..flash two times..long pause..flash one time..short pause..flash eight times..long pause..flash three times..short pause..flash three times..long pause..flash five times..short pause..flash three times.



Diagnostic Reader Connector



Fault Lamp on Standard Instrument Panel

A—Diagnostic Reader Connector  
B—Fault Lamp

RG10016A -UN-19FEB89

RG11075 -UN-14AUG00

9. Go to the LISTING OF DIAGNOSTIC TROUBLE CODES (DTCs) later in this section, to interpret to the DTC(s) present.

10. Contact your nearest engine distributor or servicing dealer with a list of DTC(s) so that necessary repairs can be made.

DPSG,OUOD002,1831 -19-02AUG00-2/2

## Diagnostic Trouble Code Procedure (Engines With Electronic Instrument Panel)

**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 should be performed according to the following procedure:

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

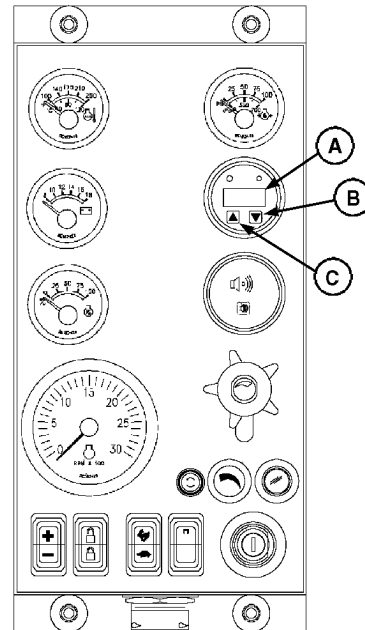
**NOTE:** Liquid Crystal Display [LCD] will always default to last menu item. If an active Diagnostic Trouble Code (DTC) is present, display will alternately flash from the hour meter reading to DTC(s).

The code number will appear on the first line and the words *SrvcCode* on the second line. Active DTC(s) can be viewed by selecting "SrvcCode" on the menu and pressing both touch switches at the same time. Pressing touch switches (B) and (C) scrolls through various engine parameters and diagnostic trouble codes.

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.



Diagnostic Gauge - Electronic Instrument Panels

- A—LCD Display on Diagnostic Gauge
- B—Touch Switch (DOWN)
- C—Touch Switch (UP)

RG9923 —UN—16NOV99

## Displaying of Diagnostic Trouble Codes (DTCs)

There are several different methods for displaying both stored and active DTCs from the ECU or from a fault lamp.

### 2-3 DIGIT CODES

Some engines display Service Codes or DTCs as 2-3 digit codes read from a display on the instrument panel.

### SPN/FMI CODES

On most engines, including those with fault lamps, the DTCs are output according to the J1939 standard as a two part code.

The first part is a two to four-digit Suspect Parameter Number (SPN) followed by a one or 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 110 indicates a failure in the engine coolant temperature circuit.

The FMI identifies the type of failure that has occurred; for example FMI 3 indicates value above normal. Combining SPN 110 with FMI 3 yields engine coolant temperature input voltage too high, or the equivalent of 2-3 digit fault code 18.

If diagnosing an application that shows DTCs as SPNs and FMIs, using the following list, determine the equivalent 2-3 digit code and use the diagnostic procedure in CTM134 for that 2-3 digit code.

Contact your servicing dealer for help in correcting diagnostic trouble codes which are displayed for your engine.

## Listing of Diagnostic Trouble Codes (DTCs)

**NOTE:** Not all of these codes are used in all engine applications. Code descriptions will be different for SPNs 28, 29 and 91 depending on whether the engine was manufactured before or after January 2000.

### DIAGNOSTIC TROUBLE CODES (DTCs)

SPN	FMI	2-Digit Code	Description
28	3	13	Analog Throttle (B) Input High- ECUs (—Jan00)
28	4	14	Analog Throttle (B) Input Low- ECUs (—Jan00)
29	3	11	Analog Throttle (A) Input High- ECUs (—Jan00)
29	4	12	Analog Throttle (A) Input Low- ECUs (—Jan00)
28	3	115	Multi-state Throttle Input High- ECUs (Jan00—)
28	4	116	Multi-state Throttle Input Low- ECUs (Jan00—)
29	3	13	Analog Throttle (B) Input High- ECUs (Jan00—)
29	4	14	Analog Throttle (B) Input Low- ECUs (Jan00—)
91	3	11	Analog Throttle (A) Input High- ECUs (Jan00—)
91	4	12	Analog Throttle (A) Input Low- ECUs (Jan00—)
97	0	N/A <sup>a</sup>	Water in Fuel Continuously Detected
	16	N/A <sup>a</sup>	Water in Fuel Detected
	31	N/A <sup>a</sup>	Water in Fuel Detected
100	1	64, 65	Engine Oil Pressure Extremely Low
	3	23	Engine Oil Pressure Input Voltage High
	4	24	Engine Oil Pressure Input Voltage Low
	18	64	Engine Oil Pressure Moderately Low
105	0	47	Derated Torque Curve Selected
	3	25	Manifold Air Temperature Input Voltage High
	4	26	Manifold Air Temperature Input Voltage Low
	9	26	Manifold Air Temperature Invalid
	16	66	Manifold Air Temperature Moderately High
107	0	N/A <sup>a</sup>	Air Filter Restriction High
110	0	62, 63	Engine Coolant Temperature Extremely High
	3	18	Engine Coolant Temperature Input Voltage High
	4	19	Engine Coolant Temperature Input Voltage Low
	9	19	Engine Coolant Temperature Invalid
	16	62	Engine Coolant Temperature Moderately High
111	1	61	Engine Coolant Level Low
158	2	54, 41	Intermittent Loss of ECU Power Supply
160	2	88	Wheel Speed Input Noise
171	3	16	Ambient Air Temperature Input Voltage High
	4	17	Ambient Air Temperature Input Voltage Low
174	0	81	See SPN 174 FMI 16
	3	37	Fuel Temperature Input Voltage High
	4	38	Fuel Temperature Input Voltage Low
	16	81	Fuel Temperature Moderately High
177	2	94	Transmission Oil Temperature Erratic
	9	93	Transmission Oil Temperature Invalid
189	0	69	Engine Speed Derate
190	0	42	Engine Overspeed Extreme
	2	39	On 644 Loaders, see SPN 191 FMI 2.

<sup>a</sup>N/A = Not applicable

Continued on next page

OUOD006,0000092 -19-30OCT02-1/3

DIAGNOSTIC TROUBLE CODES (DTCs)

SPN	FMI	2-Digit Code	Description
	2	44	Engine Speed Input Noise
	3	87	Engine Speed Input Voltage High
	4	86	Engine Speed Input Voltage Low
	5	85	Engine Speed Circuit Open
	14	45	Engine Speed/Pump Speed Out of Sync
	16	42	Engine Overspeed Moderate
191	2	39	Pump Speed Input Noise
	14	45	See SPN 190 FMI 14
	16	42	See SPN 190 FMI 0
620	3	21	Sensor Supply Voltage High
	4	22	Sensor Supply Voltage Low
629	13	28	ECU Error
632	11	48	Fuel Shut-off Circuit Fault
638	2	53	See SPN 834 FMI 2
	7	34	See SPN 834 FMI 7
639	0	55	See SPN 639 FMI 13
	2	55	See SPN 639 FMI 13
	13	55	CAN Error
640	11	49	See SPN 970 FMI 11.
	31	52	See SPN 970 FMI 0.
723	2	44	See SPN 190 FMI 2
733	2	31	See SPN 833 FMI 2
	3	35	See SPN 833 FMI 3
	4	36	See SPN 833 FMI 4
833	0	253	See SPN 833 FMI 7
	1	251	See SPN 833 FMI 7
	2	31	Rack Position Error with Engine Off
	3	35	Rack Position Voltage High
	4	36	Rack Position Voltage Low
	7	79	Rack Position Calibration Error
	15	254	See SPN 833 FMI 7
	17	252	See SPN 833 FMI 7
834	2	53	Rack Instability
	3	77	Rack Actuator Circuit Shorted to Power
	5	75	Rack Actuator Circuit Open
	6	76	Rack Actuator Circuit Grounded
	7	34	Rack Position Error
898	9	194	Vehicle Speed Invalid
970	0	52	See SPN 970 FMI 31
	11	49	Engine Shutdown Signal Invalid
	31	52, 83	Auxiliary Engine Shutdown Switch Active
1041	2	0, 41	Start Signal Missing
	3	46	Start Signal Always Active
1069	9	96	Tire Size Invalid
	31	89	Tire Size Error
1082	9	95, 195	Engine Coolant Load Increase Invalid
1109	14	67	See SPN 1110 FMI 31
1110	31	67	Engine Shutdown
1568	2	29	Torque Curve Selection Invalid
	9	196	Torque Curve Selection Invalid
1569	31	68, 47	Fuel Derate
1639	1	56	Fan Speed Input Missing
	2	59	Fan Speed Input Noise

Continued on next page

OUOD006,0000092 -19-30OCT02-2/3

**DIAGNOSTIC TROUBLE CODES (DTCs)**

SPN	FMI	2-Digit Code	Description
	16	58	Fan Speed Higher than Expected
	18	57	Fan Speed Lower than Expected
2000	13	78	Security Violation

*NOTE: The Diagnostic Gauge on the electronic instrument panel can have communication problems that result in Error Codes being shown on its LCD display window. The following Error Codes all indicate that there is a Diagnostic Gauge communication error with the ECU. Contact your servicing dealer for help in correcting these codes:*

EE — Error	XXXXX — EP No Data
ACP — Err No Addr	XXXXX — BO No Data
ACP — Err BUS — EP	XXXXX — BR No Data

OUOD006,0000092 -19-30OCT02-3/3

## Intermittent Fault Diagnostics

Intermittent faults are problems that periodically “go away”. A problem such as a terminal that intermittently doesn’t make contact can cause an intermittent fault. Other intermittent faults may be set only under certain operating conditions such as heavy load, extended idle, etc.

When diagnosing intermittent faults, take special note of the condition of wiring and connectors, since a high percentage of intermittent problems originate here. Check for loose, dirty or disconnected connectors. Inspect the wiring routing, looking for possible shorts caused by contact with external parts (for example, rubbing against sharp sheet metal edges). Inspect the connector vicinity, looking for wires that have pulled out of connector terminals, damaged connectors, poorly positioned terminals, and corroded or damaged splices and terminals. Look for broken wires, damaged splices, and wire-to-wire shorts.

Use good judgement if component replacement is thought to be required.

**NOTE:** *The engine control unit (ECU) is the component LEAST likely to fail.*

### Suggestions for diagnosing intermittent faults:

- If diagnostic charts on preceding pages indicate that the problem is intermittent, try to reproduce the operating conditions that were present when the diagnostic trouble code (DTC) set.
- If a faulty connection or wire is suspected to be the cause of the intermittent problem: clear DTCs, then check the connection or wire by wiggling it while watching the diagnostic gauge to see if the fault resets.

### Possible causes of intermittent faults:

- Faulty connection between sensor or actuator harness.
- Faulty contact between terminals in connector.
- Faulty terminal/wire connection.
- Electromagnetic interference (EMI) from an improperly installed 2-way radio, etc., can cause faulty signals to be sent to the ECU.

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

OUO1004,0000BB5 -19-06DEC02-1/1

# 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 WATER PROOF 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, warehoused, for up to six (6) months with no long term preparation.
4. John Deere engines expected to be stored more than six (6) months, long term storage preparation MUST BE taken. (See PREPARING ENGINE FOR LONG TERM STORAGE, later in this section.)

RG, RG34710, 4091 -19-09OCT02-1/1

## Preparing Engine for Long-Term Storage

The following storage preparations are good 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. Used oil will not give adequate protection. (See CHANGE ENGINE OIL AND FILTER in Lubrication and Maintenance/250 Hour/6 Month Section.)
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. Remove fan/alternator belt, if desired.
5. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
6. Disengage the clutch to any engine drivelines.
7. Clean the exterior of the engine with salt-free water and touch up any scratched or chipped painted surfaces with a good quality paint.
8. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
9. Seal all openings on engine with plastic bags and tape.
10. Store the engine in a dry protected place. If engine must be stored outside, cover it with a water proof canvas or other suitable protective material and use a strong water proof tape.

RG, RG34710, 4093 -19-10DEC02-1/1

## 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 belts if removed.
4. Fill fuel tank.
5. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS in Engine Operating Guidelines 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, 4094 -19-01JAN96-1/1

# Specifications

## General OEM Engine Specifications

*NOTE: For John Deere vehicle engines, see Machine Technical Manual.*

ITEM	UNIT OF MEASURE	6081TF	6081AF	6081HF001 Engine S.N. ( —199,999)
<b>General Data</b>				
Engine Type	—	In-line, 4 cycle diesel	In-line, 4 cycle diesel	In-line, 4 cycle diesel
Aspiration	—	Turbocharged	Turbocharged, water-to-air aftercooled	Turbocharged and air-to-air after cooled
Number of Cylinders	—	6	6	6
Bore	mm (in.)	116 (4.56)	116 (4.56)	116 (4.56)
Stroke	mm (in.)	129 (5.06)	129 (5.06)	129 (5.06)
Displacement	L (cu in.)	8.1 (496)	8.1 (496)	8.1 (496)
Combustion System	—	Direct Injection	Direct Injection	Direct Injection
Compression Ratio	—	16.5:1	16.5:1	15.7:1
<b>Physical Dimensions:</b>				
Width	mm (in.)	599 (23.8)	698 (27.5)	597 (23.5)
Height	mm (in.)	1138 (44.8)	1138 (44.8)	1152 (45.3)
Length	mm (in.)	1200 (47.6)	1200 (47.6)	1200 (47.6)
Basic Dry Weight	kg (lb)	735 (1620)	796 (1755)	776 (1710)
<b>Performance Data (Industrial Applications)</b>				
Net Rated Power (Continuous) at 2200 rpm	kW (hp)	127 (170)	160 (215)	190 (255)
Net Peak Torque(Continuous) at 1200 rpm	N•m (lb-ft)	758 (559)	967 (713)	1184 (873)
Net Rated Power (Intermit.) at 2200 rpm	kW (hp)	149 (200)	168 (225)	224 (300)
Net Peak Torque (Intermit) at 1200 rpm	N•m (lb-ft)	891 (656)	1012 (747)	1393 (1027)
Low Idle Speed	rpm	850	850	850
Fast Idle Speed	rpm	2300	2300	2300
<b>Performance Data (Generator Applications)</b>				
Net Rated Power (Prime) at 1800 rpm	kW (hp)	142 (190)	168 (225)	218 (292)
Net Rated Power (Standby) at 1800 rpm	kW (hp)	157 (211)	187 (250)	240 (322)
Net Rated Power (Prime) at 1500 rpm	kW (hp)	119 (160)	142 (190)	182 (244)
Net Rated Power (Standby) at 1500 rpm	kW (hp)	130 (175)	157 (210)	200 (268)
Low Idle Speed	rpm	850	850	850
Fast Idle Speed	rpm	1900/1600	1900/1600	1900/1600
<b>Lubrication System</b>				
Oil Pressure at Rated rpm	kPa (psi)	345 (50)	345 (50)	345 (50)
Oil Pressure (Minimum) at Low Idle	kPa (psi)	140 (20)	140 (20)	140 (20)
In-Crankcase Oil Temp at Full Load Speeds	°C (°F)	115°C (240°F)	115°C (240°F)	115°C (240°F)
<b>Cooling System</b>				
<b>(Liquid, pressurized with centrifugal pump)</b>				
Recommended Pressure Cap	kPa (psi)	69 (10)	69 (10)	69 (10)
Coolant Temperature Operating Range	°C (°F)	82°-94°C (180°-202F°)	82°-94°C (180°-202F°)	82°-94°C (180°-202F°)
Cooling System Capacity <sup>a</sup>	L (qt.)	14 (15)	15 (16)	14 (15)
<sup>a</sup> Cooling system capacity may vary with engine application.				

Continued on next page

OURGP11,0000019 —19—29JUN04—1/2

## Specifications

ITEM	UNIT OF MEASURE	6081TF	6081AF	6081HF001 Engine S.N. ( —199,999)
<b>Cooling System (Continued)</b> <b>(Liquid, pressurized with centrifugal pump)</b>				
Coolant Flow (Industrial)	L/min (gal/min)	330 (87)	330 (87)	330 (87)
Coolant Flow (Generator)				
at 1800 rpm	L/min (gal/min)	270 (71)	270 (71)	270 (71)
at 1500 rpm	L/min (gal/min)	210 (55)	210 (55)	210 (55)
<b>Engine Operation System</b>				
Hot Cylinder Compression Pressure with Injection Nozzles Removed Valve Clearance (Cold)	kPa (psi)	2380-2790 (345-405)	2380-2790 (345-405)	2380-2790 (345-405)
Intake	mm (in.)	0.46 (0.018)	0.46 (0.018)	0.46 (0.018)
Exhaust	mm (in.)	0.71 (0.028)	0.71 (0.028)	0.71 (0.028)
<b>Fuel System</b>				
Nozzle Opening Pressure New	kPa (psi)	29000 (4200)	29000 (4200)	29000 (4200)
Nozzle Opening Pressure Used (min.)	kPa (psi)	26200 (3800)	26200 (3800)	26200 (3800)
<b>Electrical System</b>				
Battery Capacity (Minimum)- 12 Volt System	CCA	800	800	800
Reserve Capacity- 12 Volt System	Minutes	350	350	350
Battery Capacity (Minimum)- 24 Volt System	CCA	570	570	570
Reserve Capacity- 24 Volt System	Minutes	275	275	275
<b>Air System</b>				
Maximum Air Intake Restriction	in. H <sub>2</sub> O (kPa) (bar) (psi)	25 (6.25) (0.06) (1.0)	25 (6.25) (0.06) (1.0)	25 (6.25) (0.06) (1.0)
<b>Injection Pump Timing</b> Timing Lines aligned with flywheel at TDC				

OURGP11,0000019 —19—29JUN04—2/2

## Engine Power and Speed Ratings Specifications<sup>1</sup> (OEM Engines)

ENGINE MODEL	FUEL SYSTEM OPTION CODES	POWER RATING @ RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED <sup>a</sup> (rpm)	SLOW IDLE (rpm)	FAST IDLE <sup>b</sup> (rpm)
6081TF	1601, 1602, 1605, 1606	149 (200)	2200	850	2420
	1603, 1604, 1606	157 (211)	1800	850	1890
	1608, 1609, 1610	131 (176)	1500	850	1575
	1611, 1612, 1613	128 (172)	2200	1000	2420
	1614, 1615, 1616	194 (260)	1800	850	1890
	1603, 1604, 1605	157 (211)	1500	850	1575
	1607, 1608, 1609	187 (250)	1500	850	1575
	1611	168 (225)	2200	850	2420
	1617, 1618	149 (200)	2200	850	2420
	1619, 1620, 1621	169 (227)	1500	850	1575
6081AF	1601, 1602, 1606	149 (200)	2200	850	2420
	1603, 1604, 1605	157 (211)	1500	850	1575
	1603, 1604, 1605	182 (244)	1500	850	1575
	1613, 1615, 1620, 1621	205 (275) <sup>c</sup>	2200	850	2420
	1613, 1615, 1620, 1621, 1688	205 (275)	2200	850	2420
	1607, 1608, 1609	219 (292)	1500	850	1575
	1607, 1608, 1609	187 (251)	1500	850	1575
	1610, 1618, 1640	187 (250)	2200	850	2420
	1617, 1656	168 (227) <sup>c</sup>	2200	850	2420

<sup>a</sup>Generator set engines (3-5% governor) usually run at 1500 rpm (50 Hz) or 1800 (60 Hz) when operating under load depending on cycles of AC current.

<sup>b</sup>For engines with standard governor, fast idle is 7-10% above rated speed. For engines with generator set governors, fast idle is 3-5% above rated speed.

<sup>c</sup>These engines have a power bulge which allows for INTERMITTENT operation above rated power.

<sup>1</sup>Engine speeds listed are preset to factory specification for application. Therefore, speeds may vary depending upon specific vehicle application requirements. Refer to your machine operator's manual for engine speeds that are different from those preset at the factory.

Continued on next page

OURGP11,000001C -19-29JUN04-1/3

## Specifications

ENGINE MODEL	FUEL SYSTEM OPTION CODES	POWER RATING @ RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED <sup>a</sup> (rpm)	SLOW IDLE (rpm)	FAST IDLE <sup>b</sup> (rpm)
	1611, 1656, 1617	205 (275)	2200	850	2420
	1611, 1617	168 (227)	2200	850	2420
	1612, 1619, 1676	187 (251)	1800	850	1890
	1612, 1619, 1676	205 (275)	2200	850	1890
	1616	159 (213) <sup>c</sup>	2200	850	2420
	1616, 1660, 1662	187 (251) <sup>c</sup>	2200	850	2420
	1619	187 (250)	1800	850	1890
	1621	175 (235) <sup>c</sup>	2200	850	2420
	1633, 1635, 1642, 1644, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1662, 1667, 1668, 1669, 1670, 1671, 1672	205 (275) <sup>c</sup>	2200	850	2420
	1622, 1623, 1624	224 (300)	1800	850	1890
	1616, 1625, 1632, 1634, 1640, 1641, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1660, 1661, 1663, 1664, 1665, 1666, 1667	187 (250) <sup>c</sup>	2200	850	2420
	1673, 1674	168 (225)	2200	850	2420
	1681	179 (240) 205 (275) 216 (290) 224 (300)	1470 2100 1760 2350, 3100	850 850 850 850	1540 2320 1850 2500, 3300
	1682, 1683, 1684	258 (347)	1800	850	1890
	1685, 1686, 1687	225 (302)	1500	850	1560
6081HF001 Engine S.N ( —199,999)	1601, 1602, 1605, 1621, 1633, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1688, 1689, 1690, 1691, 1692, 1693	224 (300) <sup>c</sup>	2200	850	2420
	1603, 1604, 1606	240 (322)	1800	850	1890
	1621	190 (255) <sup>c</sup>	2200	850	2420

<sup>a</sup>Generator set engines (3-5% governor) usually run at 1500 rpm (50 Hz) or 1800 (60 Hz) when operating under load depending on cycles of AC current.

<sup>b</sup>For engines with standard governor, fast idle is 7-10% above rated speed. For engines with generator set governors, fast idle is 3-5% above rated speed.

<sup>c</sup>These engines have a power bulge which allows for INTERMITTENT operation above rated power.

Continued on next page

OURGP11,000001C —19–29JUN04–2/3

## Specifications

ENGINE MODEL	FUEL SYSTEM OPTION CODES	POWER RATING @ RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED <sup>a</sup> (rpm)	SLOW IDLE (rpm)	FAST IDLE <sup>b</sup> (rpm)
	1622, 1623, 1624	200 (268)	1500	850	1575
	1624	245 (328)	1500	850	1575
	1661, 1662, 1663	255 (342)	1500	850	1575
	1661, 1662, 1663, 1684, 1686	268 (359)	1500	850	1575
	1673, 1674	225 (302)	2200	850	2350
	1681, 1682, 1683	263 (353)	1800	850	1890
	1681, 1682, 1683, 1685, 1687	308 (413)	1800	850	1890
	1680	224 (300)	2350	850	2500
		224 (300)	2100	850	2320
		216 (290)	1760	850	1850
		179 (240)	1470	850	1540
	1685	225 (302)	1500	850	1575

<sup>a</sup>Generator set engines (3-5% governor) usually run at 1500 rpm (50 Hz) or 1800 (60 Hz) when operating under load depending on cycles of AC current.

<sup>b</sup>For engines with standard governor, fast idle is 7-10% above rated speed. For engines with generator set governors, fast idle is 3-5% above rated speed.

**NOTE:** Some Option Codes appear more than once. This is because the option number was used on earlier engines, then used on later engines with a different power rating.

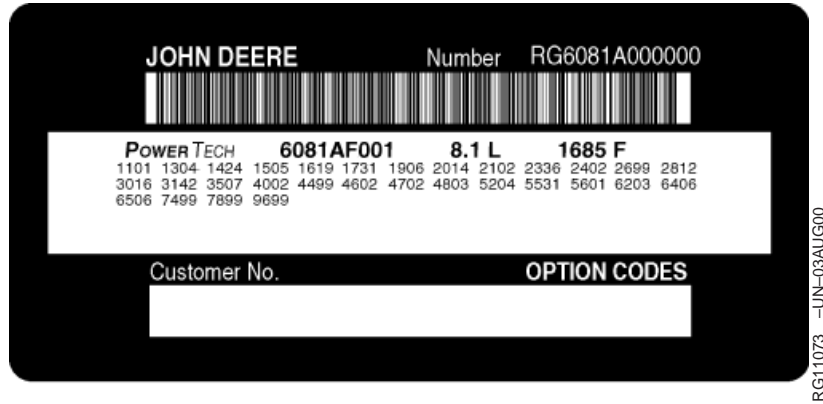
**NOTE:** Cruise Control option is available with the following injection pump option codes:

6081 AF: 1632, 1633, 1634, 1635, 1644, 1645, 1646, 1651, 1652, 1653, 1654, 1660.

6081 HF: 1633, 1639, 1641, 1642, 1643, 1644.

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## Engine Crankcase Oil Fill Quantities



Option Code Label

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

“RG” indicates the engine was built in Waterloo, Iowa.

In addition to the serial number plate, OEM engines have an engine option code label affixed to the rocker arm cover. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your

authorized servicing dealer or engine distributor with these numbers.

To determine the option code for the oil fill quantity of your engine, refer to the engine option code label affixed to the rocker arm cover. The first two digits of the code (19) identify the oil pan group. The last two digits of each code identify the specific oil pan on your engine.

Listed below are engine crankcase oil fill quantities:

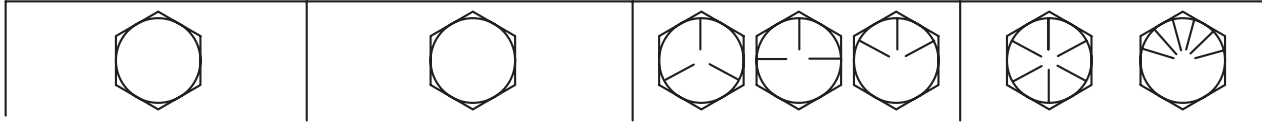
Engine Model	Oil Pan Option Code(s)	Crankcase Oil Capacity
6081TF,AF,HF	1905, 1910	28 L (29.7 qts)
	1906, 1908, 1911, 1912, 1913, 1914, 1915, 1916	28.5 L (30.1 qts)
	1901, 1909	32 L (34 qts)

**NOTE:** Crankcase oil capacities are based on installing a new (dry) oil filter and then filling crankcase with oil to “FULL” mark on dipstick.

RG, RG34710, 4097 -19-21AUG00-1/1

## Unified Inch Bolt and Screw Torque Values

TS1671 –UN-01MAY03



Bolt or Screw	SAE Grade 1				SAE Grade 2 <sup>a</sup>				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Lubricated <sup>b</sup>		Dry <sup>c</sup>		Lubricated <sup>b</sup>		Dry <sup>c</sup>		Lubricated <sup>b</sup>		Dry <sup>c</sup>		Lubricated <sup>b</sup>		Dry <sup>c</sup>	
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.

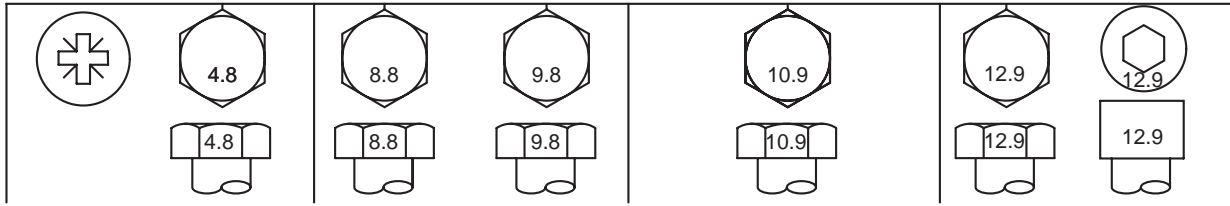
Replace fasteners with the same or higher grade. If higher grade fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

<sup>a</sup>Grade 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.

<sup>b</sup>"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.

<sup>c</sup>"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 <sup>a</sup>		Dry <sup>b</sup>		Lubricated <sup>a</sup>		Dry <sup>b</sup>		Lubricated <sup>a</sup>		Dry <sup>b</sup>		Lubricated <sup>a</sup>		Dry <sup>b</sup>	
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.

<sup>a</sup>"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.

<sup>b</sup>"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, 4100 -19-01JAN96-1/1

## Daily (Prestarting) Service

*NOTE: Refer to DAILY PRESTARTING CHECKS in Engine Operating Guidelines Section for detailed procedures.*

Check engine oil level.

Check (primary) fuel filter/water separator

Check coolant level.

Check air cleaner dust unloader valve and air restriction indicator, if equipped.

Lubricate PTO release bearings, if equipped.

Perform visual walk around inspection.

RG, RG34710, 4101 -19-01JAN96-1/1

## 250 Hour/6 Month Service

Service fire extinguisher.

Lubricate PTO clutch shaft bearings (if equipped).

Change engine oil and filter.<sup>1</sup>

Service battery.

Check PTO clutch adjustment (if equipped).

Check coolant pump weep hole foam filter.

Check engine mounts (generator sets).

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

<sup>1</sup>If John Deere PLUS-50 or ACEA-E4/E5 oil is used along with the specified John Deere oil filter, the oil change interval may be extended by 50 percent or to 375 hours.

## 500 Hour/12 Month Service

Lubricate PTO clutch internal levers and linkage (if equipped).

Clean crankcase vent tube.

Check automatic belt tensioner and belt wear.

Check cooling system

Coolant solution analysis - add SCA's as needed.

Check air intake hoses, connections, and system.

Replace primary and final fuel filter elements.

Check engine speeds.

Check crankshaft vibration damper.

Pressure test cooling system.

Check engine ground connection.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

RG, RG34710, 4104 -19-09OCT02-1/1

## 2000 Hour/24 Month Service

Have your authorized servicing dealer or engine distributor adjust valve clearance.

Flush and refill cooling system.<sup>1</sup>

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

<sup>1</sup>If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished by adding supplemental coolant additives (SCA's), the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

OURGP11,000001A -19-29JUN04-1/1

Service as Required

- Drain water separator bowl.
- Add coolant.
- Service air cleaner.
- Replace fan-alternator belt.
- Service PTO clutch (if equipped).
- Check air conditioning compressor (if equipped).
- Check fuses.
- Check electrical wiring.
- Bleed fuel system.
- Check air compressors (if equipped). (See your John Deere dealer.)

Hours									
Date									
Hours									
Date									
Hours									
Date									

# Emission System Warranty

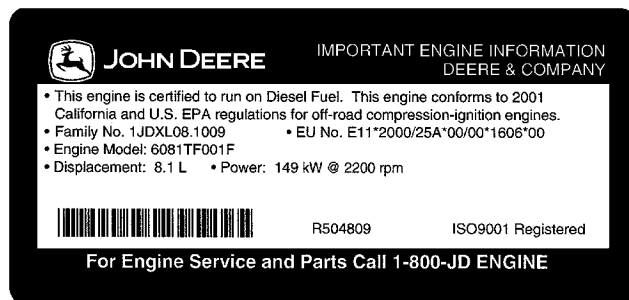
## Emissions Control System Certification Label



**CAUTION:** Statutes providing severe penalties for tampering with emissions controls may apply at the user's location.

The emissions warranty described below 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/transportable<sup>1</sup>) 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.*



*Emissions Label*

RG11598 -UN-08DEC00

<sup>1</sup>Equipment moved at least once every 12 months.

## **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, 4108 -19-01JAN96-1/1

# John Deere Service Literature Available

## Technical Information

Technical information is available from John Deere. Some of this information is available in electronic as well as printed form. Order from your John Deere dealer or call **1-800-522-7448**. Please have available the model number, serial number, and name of the product.

Available information includes:

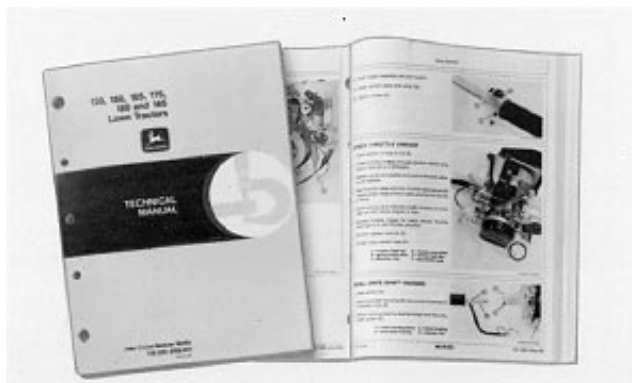
- **PARTS CATALOGS** list service parts available for your machine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.
- **OPERATOR'S MANUALS** providing safety, operating, maintenance, and service information. These manuals and safety signs on your machine may also be available in other languages.
- **OPERATOR'S VIDEO TAPES** showing highlights of safety, operating, maintenance, and service information. These tapes may be available in multiple languages and formats.
- **TECHNICAL MANUALS** outlining service information for your machine. Included are specifications, illustrated assembly and disassembly procedures, hydraulic oil flow diagrams, and wiring diagrams. Some products have separate manuals for repair and diagnostic information. Some components, such as engines, are available in separate component technical manuals
- **FUNDAMENTAL MANUALS** detailing basic information regardless of manufacturer:
  - Agricultural Primer series covers technology in farming and ranching, featuring subjects like computers, the Internet, and precision farming.
  - Farm Business Management series examines "real-world" problems and offers practical solutions in the areas of marketing, financing, equipment selection, and compliance.
  - Fundamentals of Services manuals show you how to repair and maintain off-road equipment.
  - Fundamentals of Machine Operation manuals explain machine capacities and adjustments, how to improve machine performance, and how to eliminate unnecessary field operations.



TS189 -UN-17JAN89



TS191 -UN-02DEC88



TS224 -UN-17JAN89



TS1663 -UN-10OCT97

## Publications for This Engine

Technical information is available from John Deere in support of our products. Some of this information is available in electronic as well as printed form. Order from your John Deere dealer or call **1-800-522-7448**. Please have available the model number and serial number, and name of your John Deere engine.

Title		Order Number
POWERTECH 8.1 L OEM Engines ( —199,999)		
Operation and Maintenance Manual (English) ( —199,999)		OMRG24828
Parts Catalog—Engines ( —199,999)		PC2527
Component Technical Manuals		
	Base Engine	CTM86
	Mechanical Fuel System	CTM243
	Level 3 Electronic Fuel System	CTM134
OEM Engine Accessories		CTM67
Alternators and Starter Motors		CTM77

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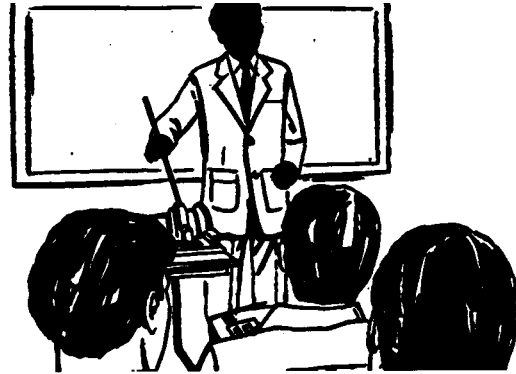
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