

***POWERTECH* 4.5 L & 6.8 L 4045 and 6068 OEM Diesel Engines**

1996 EPA Certification Levels
(U.S.A.)

OPERATION AND MAINTENANCE MANUAL



Deere Power Systems Group
OMRG25204 (20MAY96)

LITHO IN U.S.A.
ENGLISH



Introduction

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.

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.

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.

Learn who he 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.

UTILISATEURS DE MOTEURS JOHN DEERE:

N'attendez pas d'être obligé d'avoir recours à votre Concessionnaire ou Point de Service le plus proche pour vous adresser à lui.

Renseignez-vous dès que possible pour l'identifier et le localiser. À la première occasion, prenez contact avec lui et faites-vous connaître. Il sera lui aussi heureux de faire votre connaissance et de savoir que vous pourrez compter sur lui 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.

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

PROPRIETARIO DEL MOTORE JOHN DEERE:

Non aspetti fino a quando ha bisogno della garanzia o di un altro tipo di assistenza per incontrarsi con il Suo Concessionario che fornisce l'assistenza tecnica.

Impari a conoscere chi è e dove si trova. Alla Sua prima occasione cerchi d'incontrarlo. Egli desidera farsi conoscere e conoscere 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.

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.

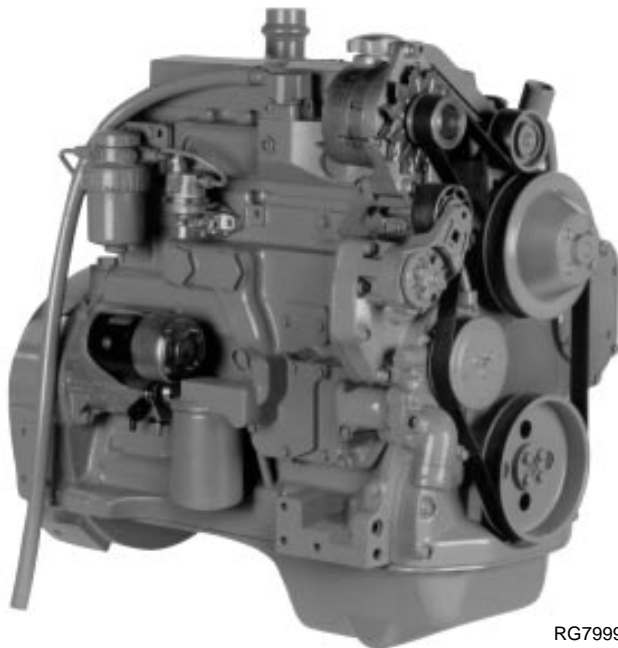
JOHN DEERE MOTORÄGARE:

Vänta inte med att besöka Din John Deere återförsäljare till dess att Du behöver service eller garanti reparation.

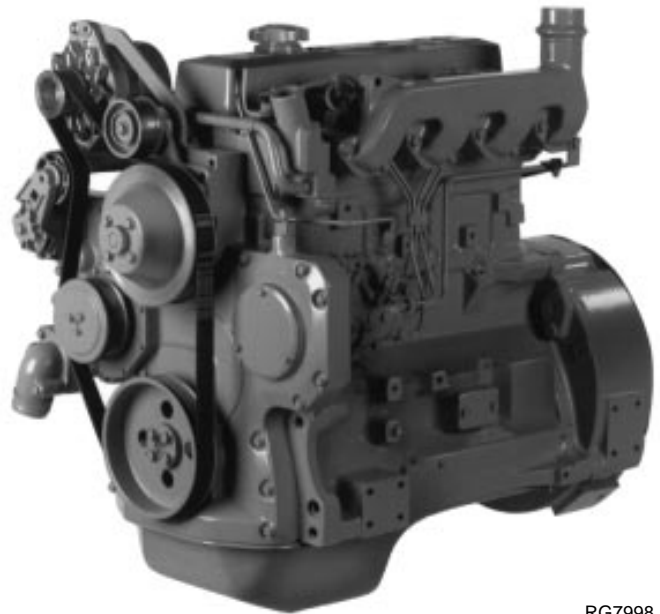
Bekanta Dig med var han är och vem han är. Tag första tillfälle att besöka honom. Han vill också träffa Dig för att få veta vad Du behöver och hur han kan hjälpa Dig.

Identification Views

POWERTECH 4.5 L ENGINES

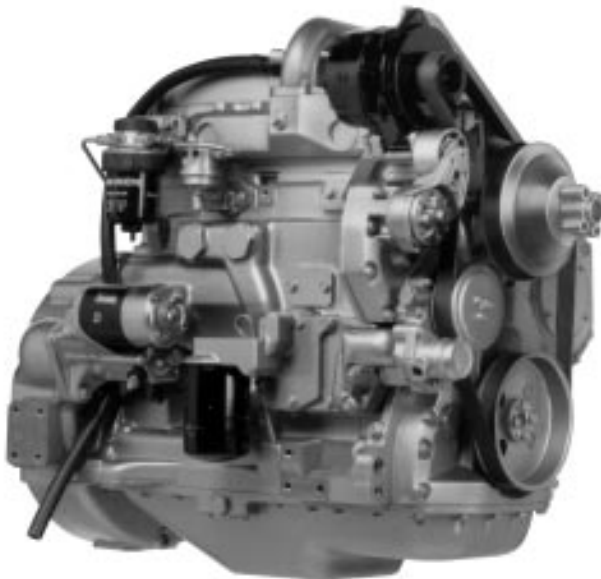


RG7999



RG7998

4045D Engine



RG7996



RG7997

4045T Engine

POWERTECH 6.8 L ENGINES

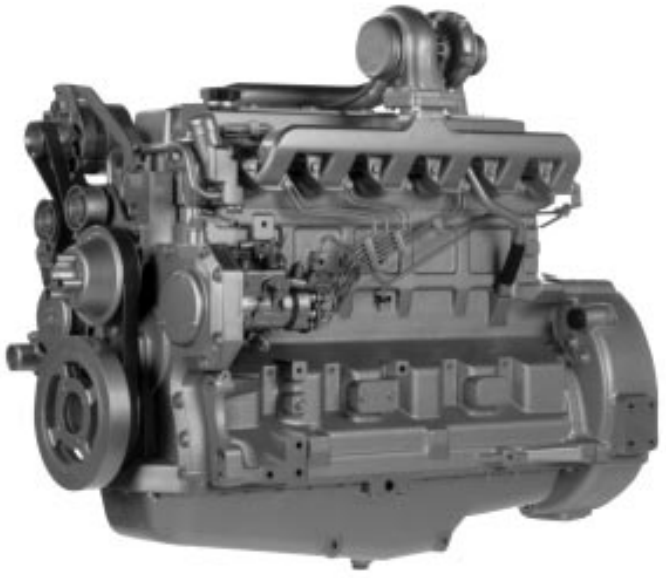


RG8003



RG8002

6068D Engine



RG8000

6068T Engine

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

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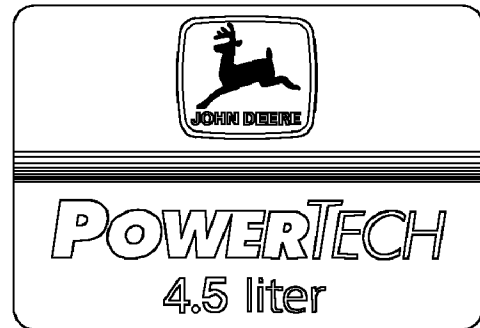
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A John Deere ILLUSTRATION® Manual

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Record Keeping

POWERTECH MEDALLION

A medallion is located on the rocker arm cover which identifies each engine as a John Deere **POWERTECH** engine.



RG8041

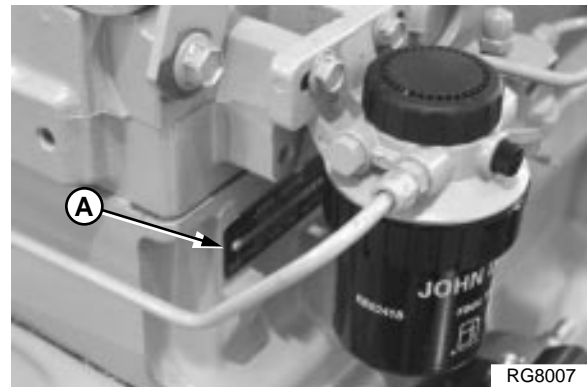
ENGINE SERIAL NUMBER PLATE

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

"T0" indicates the engine was built in Dubuque, Iowa

"CD" indicates the engine was built in Saran, France

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



RG8007

RECORD ENGINE SERIAL NUMBER

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

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

Engine Serial Number (B)

Engine Model Number(C)

Coefficient of Absorption Value (D)



RG7936

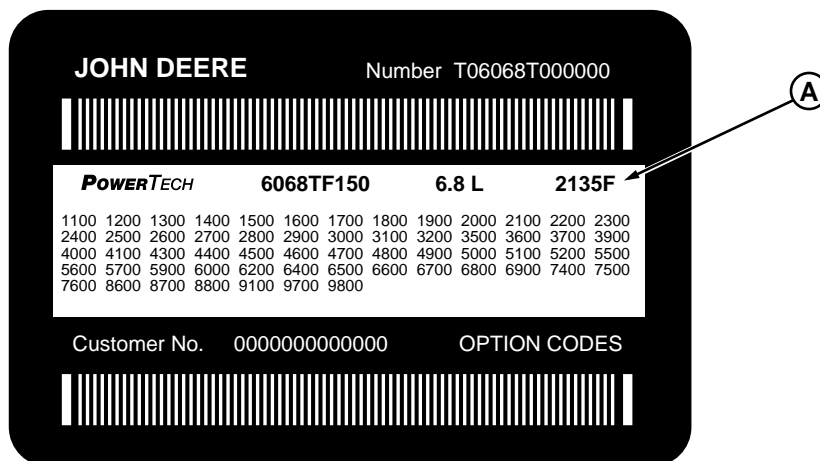
Dubuque Serial Number Plate



RG7935

Saran Serial Number Plate

ENGINE OPTION CODES



Option Code Label

RG7984

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.

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

The first two digits of each code identify a specific group, such as alternators. The last two digits of each code identify one specific option provided on your engine, such as a 12-volt, 55-amp alternator.

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

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

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.

ENGINE OPTION CODES—CONTINUED

Engine Base Code: _____

Option Codes	Description	Option Codes	Description
11_____	Rocker Arm Cover	45_____	Balancer Shaft
12_____	Oil Filler Neck	46_____	Cylinder Block With Liners and Camshaft
13_____	Crankshaft Pulley	47_____	Crankshaft and Bearings
14_____	Flywheel Housing	48_____	Connecting Rods and Pistons
15_____	Flywheel	49_____	Valve Actuating Mechanisms
16_____	Fuel Injection Pump	50_____	Oil Pump
17_____	Air Inlet	51_____	Cylinder Head With Valves
18_____	Air Cleaner	52_____	Auxiliary Gear Drive
19_____	Oil Pan	55_____	Shipping Stand
20_____	Water Pump	56_____	Paint Option
21_____	Thermostat Cover	57_____	Water Pump Inlet
22_____	Thermostat	59_____	Oil Cooler
23_____	Fan Drive	60_____	Add-on Auxiliary Drive Pulley
24_____	Fan Belt	62_____	Alternator Mounting
25_____	Fan	64_____	Exhaust Elbow
26_____	Engine Coolant Heater	65_____	Turbocharger
27_____	Radiator	66_____	Temperature Switch
28_____	Exhaust Manifold	67_____	Electronic Tachometer Sensor
29_____	Ventilator System	68_____	Damper
30_____	Starting Motor	69_____	Engine Serial Number Plate
31_____	Alternator	74_____	Air Conditioner Compressor Mounting
32_____	Instrument Panel	75_____	Air Restriction Indicator
35_____	Fuel Filter	76_____	Oil Pressure Switch
36_____	Front Plate	86_____	Fan Pulley
37_____	Fuel Transfer Pump	87_____	Automatic Belt Tensioner
39_____	Thermostat Housing	88_____	Oil Filter
40_____	Oil Dipstick	91_____	Special Equipment (Factory Installed)
41_____	Belt Driven Front Auxiliary Drive	97_____	Special Equipment (Field Installed)
43_____	Starting Aid	98_____	Shipping
44_____	Timing Gear Cover With Gears		

RECORD PTO SERIAL NUMBER

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

Serial Number

Model Number



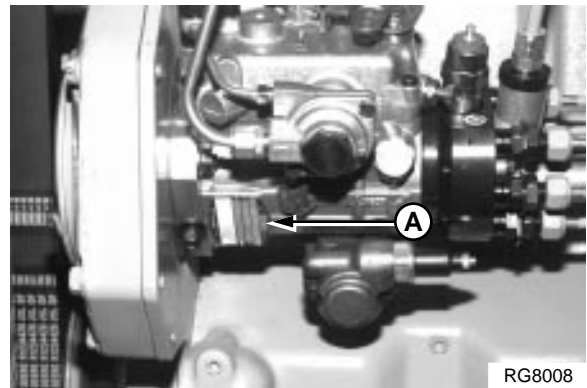
RECORD FUEL INJECTION PUMP MODEL NUMBER

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

Model No. _____ RPM _____

Manufacturer's No. _____

Serial No. _____



Safety

RECOGNIZE SAFETY INFORMATION

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

Follow recommended precautions and safe operating practices.



T81389

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**

TS187



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.



TS201

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.



RG5419



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.



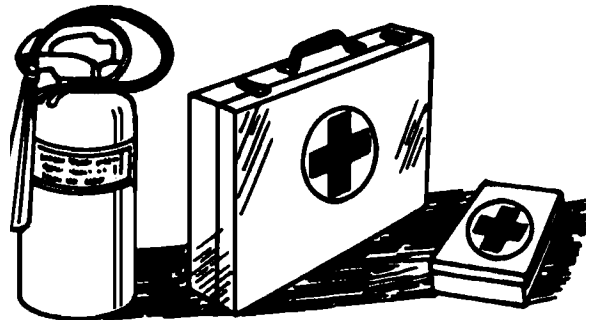
TS202

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

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



TS291

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.



TS1356



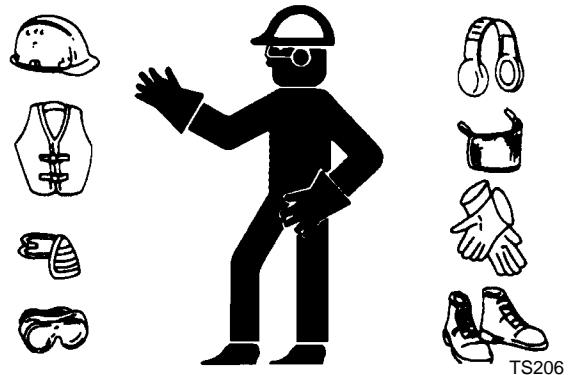
WEAR PROTECTIVE CLOTHING

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.



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.



TS207



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.)



TS1132

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 the PTO driveline is stopped before making adjustments or performing any type service on the engine or PTO-driven equipment.



TS1644



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.

Disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.



TS218

WORK IN VENTILATED AREA

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

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



TS220



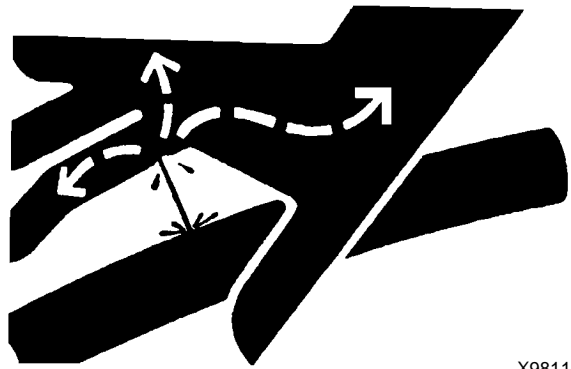
AVOID HIGH-PRESSURE FLUIDS

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.



X9811

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.



TS953



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.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- 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.



TS220

SERVICE COOLING SYSTEM SAFELY

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

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



TS281



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.



TS220

DISPOSE OF WASTE PROPERLY

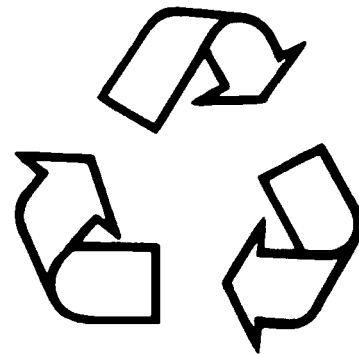
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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.



TS1133



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 with properties meeting DIN 51606 or equivalent specification may be used.

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

LUBRICITY OF DIESEL FUELS

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

Diesel fuels for highway use in the United States and Canada now require sulfur content less than 0.05%. Diesel fuel in the European Union will require sulfur content less than 0.05% by 1 October 1996.

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 of 3100 gram load level as measured by the BOCLE scuffing test.

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

If fuel of low or unknown lubricity is used, add John Deere PREMIUM DIESEL FUEL CONDITIONER (or equivalent) at the specified concentration. John Deere PREMIUM DIESEL FUEL CONDITIONER is available in winter and summer formulas. Consult your John Deere engine distributor or servicing dealer for more information.

DIESEL FUEL STORAGE

Proper fuel storage is critically important. Use clean storage and transfer tanks. Periodically drain water and sediment from bottom of tank. Store fuel in a convenient place away from buildings.

IMPORTANT: DO NOT store diesel fuel in galvanized containers. Diesel fuel stored in galvanized containers reacts with zinc coating on container to form zinc flakes. If fuel contains water, a zinc gel will also form. The gel and flakes will quickly plug fuel filters, damage injection nozzles and injection pump.

DO NOT use brass-coated containers for fuel storage. Brass is an alloy of copper and zinc.

Store diesel fuel in plastic, aluminum, and steel containers specially coated for diesel fuel storage.

Avoid storing fuel over long periods of time. If fuel is stored for more than a month prior to use, or there is a slow turnover in fuel tank or supply tank, add a fuel conditioner such as John Deere PREMIUM DIESEL FUEL CONDITIONER or equivalent to stabilize the fuel and prevent water condensation. John Deere PREMIUM DIESEL FUEL CONDITIONER is available in winter and summer formulas. Fuel conditioner also reduces fuel gelling and controls wax separation during cold weather.

Consult your John Deere engine distributor or servicing dealer for recommendations and local availability. Always follow manufacturer's directions on label.

FILLING FUEL TANK



CAUTION: Handle fuel carefully. Do not fill the fuel tank when engine is running.

DO NOT smoke while filling fuel tank or servicing fuel system.

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.

Fill fuel tank at the end of each day's operation to prevent condensation in tank as moist air cools and freezing during cold weather.



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 become 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.

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
- ACEA Specification E1
- CCMC Specification D4

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

IMPORTANT: Do not use John Deere PLUS-50 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 the engine to break-in properly.

DIESEL ENGINE OIL

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

The following oil is preferred.

- **John Deere PLUS-50®**

If John Deere PLUS-50 engine oil and a John Deere oil filter are used, the service interval for oil and filter changes may be extended by 50 hours.

The following oil is also recommended:

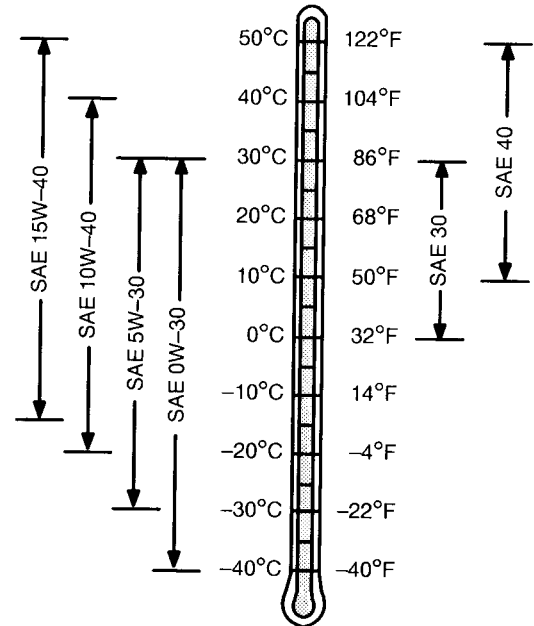
- John Deere TORQ-GARD SUPREME®

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

- John Deere UNI-GARD™
- API Service Classification CG-4
- API Service Classification CF-4
- ACEA Specification E3
- ACEA Specification E2
- CCMC Specification D5
- CCMC Specification D4

Multi-viscosity diesel engine oils are preferred.

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



TS1647

MIXING OF LUBRICANTS

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

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

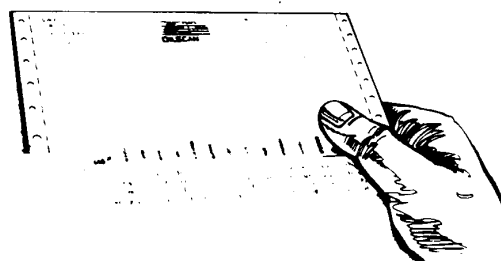
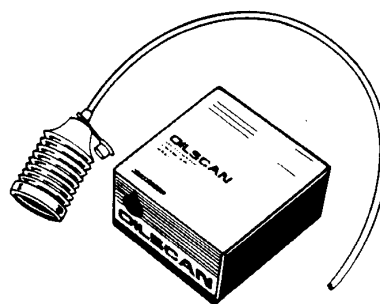
Consult your John Deere engine distributor or servicing dealer to obtain specific information and recommendations.

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.



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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.

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.

GREASE

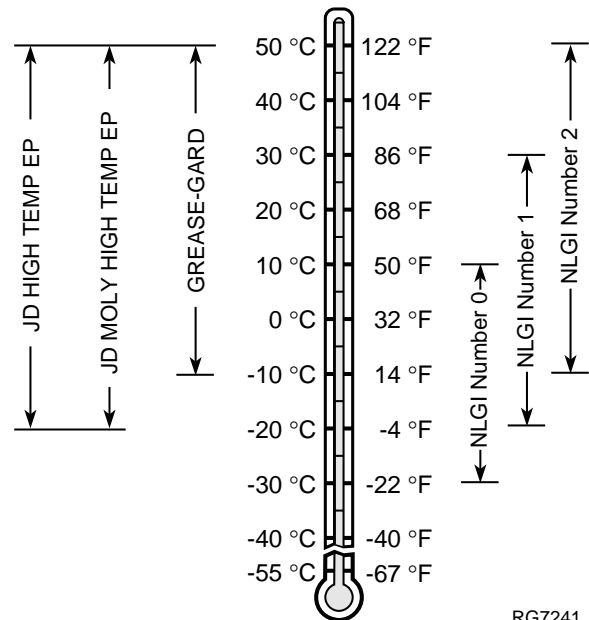
Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

The following greases are preferred:

- John Deere HIGH TEMPERATURE EP GREASE
- John Deere MOLY HIGH TEMPERATURE EP GREASE
- John Deere GREASE-GARD™

Other greases may be used if they meet one of the following:

- NLGI Performance Classification GC-LB



RG7241

DIESEL ENGINE COOLANT RECOMMENDATIONS

Contact your engine distributor or servicing dealer to determine what the cooling system of this engine is filled with and the winter freeze protection level.

Solutions of antifreeze and supplemental coolant additives **MUST** be used year-round for freeze protection, boil-over protection, and to provide a stable, noncorrosive environment for seals, hoses and metal engine parts.

The following engine coolant is preferred for service:

- John Deere PREDILUTED ANTIFREEZE/SUMMER COOLANT
- John Deere COOL-GARD, where available

The following engine coolant is also recommended:

- John Deere ANTIFREEZE/SUMMER COOLANT CONCENTRATE in a 40 to 60 percent mixture of concentrate with quality water

• JOHN DEERE PREDILUTED ANTIFREEZE/SUMMER COOLANT

This product contains all the necessary ingredients that make up the proper coolant solution: chemically pure water, ethylene glycol (low silicate antifreeze), and supplemental coolant additives (SCAs). It is ready to use; no mixing is required.

John Deere Prediluted Antifreeze/Summer Coolant permits extended service life to 3000 hours or 36 months of operation.

• JOHN DEERE COOL-GARD™

In certain geographical areas, John Deere COOL-GARD is marketed for use in the engine cooling system. This product contains all the necessary ingredients that make up the proper coolant solution: chemically pure water, ethylene glycol (low silicate antifreeze), and supplemental coolant additives (SCAs). It is ready to add to cooling system as is; no mixing or supplemental coolant additives required. Contact your John Deere Parts Network for local availability.

John Deere COOL-GARD has a service life of 2000 hours or 24 months of operation.

• JOHN DEERE ANTIFREEZE/SUMMER COOLANT CONCENTRATE

This product contains ethylene glycol (low silicate antifreeze) and supplemental coolant additives (SCAs). It must be mixed with quality water, as described later in this section, before adding to the engine cooling system. The proportion of water to be used depends upon the lowest freeze protection temperature desired according to the following table:

% CONCENTRATE	FREEZE PROTECTION LIMIT
40	-24° C (-12° F)
50	-37° C (-34° F)
60	-52° C (-62° F)

John Deere Antifreeze/Summer Coolant Concentrate has a service life of 2000 hours or 24 months of operation.

ENGINE COOLANT SPECIFICATIONS

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

Coolant solutions of quality water, ethylene glycol concentrate (antifreeze), and supplemental coolant additives (SCAs) **MUST** be used year-round to protect against freezing, boil-over, liner erosion or pitting, and to provide a stable, noncorrosive environment for seals, hoses, and metal engine parts.

Some products, including John Deere PREDILUTED ANTIFREEZE/SUMMER COOLANT and John Deere COOL-GARD, are fully formulated coolants that contain all three components in their correct concentrations. Do not add an initial charge of supplemental coolant additives to these fully formulated products.

Some coolant concentrates, including John Deere ANTIFREEZE/SUMMER COOLANT CONCENTRATE, contain both ethylene glycol antifreeze and inhibiting coolant additives. Mix these products and quality water, but do not add an initial charge of supplemental coolants additives.

Coolants meeting ASTM D5345 (prediluted coolant) or ASTM D4985 (coolant concentrate) require an initial charge of supplemental coolant additives.

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 base engine coolant concentrate. All water used in the cooling system should meet the following minimum specifications for quality:

Water Quality Specifications

Item	Parts Per Million	Grains Per U.S. Gallon
Chlorides (maximum)	40	2.5
Sulfates (maximum)	100	5.9
Total Dissolved Solids (maximum)	340	20
Total Hardness (maximum)	170	10
pH Level.	5.5—9.0	

Ethylene Glycol Concentrate (Antifreeze):

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

The use of John Deere coolant products, as outlined on the previous page, is **strongly recommended**.

If John Deere coolant products are not used, other low silicate ethylene glycol base coolants for heavy-duty diesel engines may be used when mixed with quality water and supplemental coolant additives (SCAs), if they meet one of the following specifications:

- ASTM D5345 (prediluted coolant)
- ASTM D4985 (coolant concentrate) in a 40% to 60% mixture of concentrate with quality water.

Coolants meeting these specifications require addition of supplemental coolant additives (SCAs), formulated for heavy-duty diesel engines, for protection against corrosion and cylinder liner erosion and pitting.

IMPORTANT: Never use automotive-type coolants (such as those meeting ASTM D3306 or ASTM D4656). These coolants do not contain the correct additives to protect heavy-duty diesel engines. They often contain a high concentration of silicates and may damage the engine or cooling system.

ENGINE COOLANT SPECIFICATIONS—CONTINUED

Supplemental Coolant Additives (SCAs):

IMPORTANT: DO NOT over-inhibit antifreeze solutions, as this can cause silicate-dropout. When this happens, a gel-type deposit is created which retards heat transfer and coolant flow causing engine to overheat.

NOTE: John Deere Prediluted Antifreeze/Summer Coolant, John Deere Antifreeze/Summer Coolant Concentrate, and John Deere COOL-GARD contain supplemental coolant additives (SCAs). However, as the coolant solution loses its effectiveness, additives will need to be added.



RG7276

John Deere Liquid Coolant Conditioner

Operating without proper coolant additive will result in increased corrosion, cylinder liner erosion and pitting, and other damage to the engine and cooling system. A simple mixture of ethylene glycol and water WILL NOT give adequate protection.

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

Inhibit the antifreeze-coolant mix with a non-chromate inhibitor. John Deere Liquid Coolant Conditioner is recommended as a supplemental coolant additive in John Deere engines.

IMPORTANT: Check inhibitors between drain intervals every 600 hours or 12 months of operation. Replenish inhibitors by the addition of a supplemental coolant additive as necessary.

DO NOT use soluble oil.

Additives eventually lose their effectiveness and must be recharged with additional supplemental coolant additives available in the form of liquid coolant conditioner. See TESTING ENGINE COOLANT and REPLENISHING SUPPLEMENTAL COOLANT ADDITIVES (SCAs) BETWEEN COOLANT CHANGES, as described later in this section.

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 600 hours or 12 month intervals and whenever excessive coolant is lost through leaks or overheating to ensure the necessary protection.

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 Liquid Coolant Conditioner should be added.

COOLSCAN

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

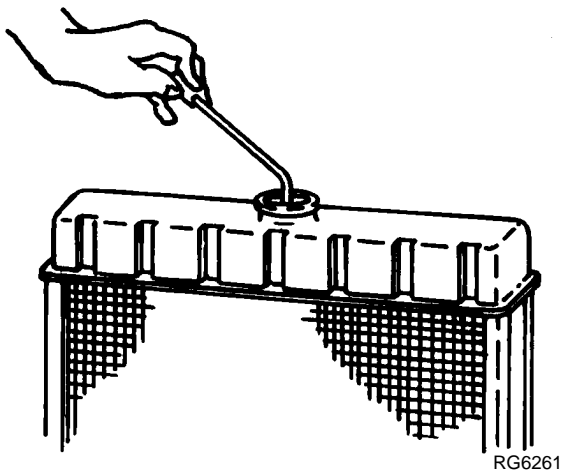


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RG7397

REPLENISHING SUPPLEMENTAL COOLANT ADDITIVES (SCAs) BETWEEN COOLANT CHANGES



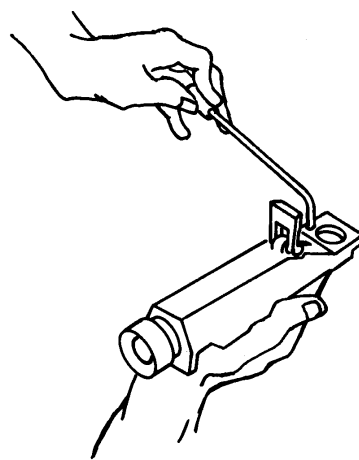
IMPORTANT: Do not add supplemental coolant additives when the cooling system is drained and refilled with John Deere ANTIFREEZE/SUMMER COOLANT or John Deere COOL-GARD.

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 or John Deere COOL-GARD is used. The cooling system must be recharged with additional supplemental coolant additives available in the form of liquid coolant conditioner.

Maintaining the correct coolant conditioner concentration (SCAs) and freeze point is essential in your cooling system to protect against rust, liner pitting and corrosion, and freeze-ups due to incorrect coolant dilution.

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

Test the coolant solution at 600 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 system per instructions printed on label of John Deere Liquid Coolant Conditioner.



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

If frequent coolant makeup is required, the glycol concentration should be checked with JT05460 Refractometer to assure that the desired freeze point is maintained. Follow manufacturer's instructions provided with refractometer.

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 ENGINE COOLANT SPECIFICATIONS earlier in this section for proper mixing of coolant ingredients before adding to the cooling system.

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.

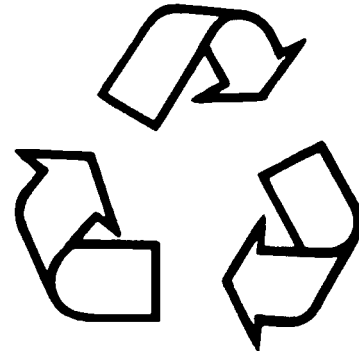
DISPOSING OF COOLANT

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 dealer.



TS1133

Engine Operating Guidelines

INSTRUMENT (GAUGE) 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.

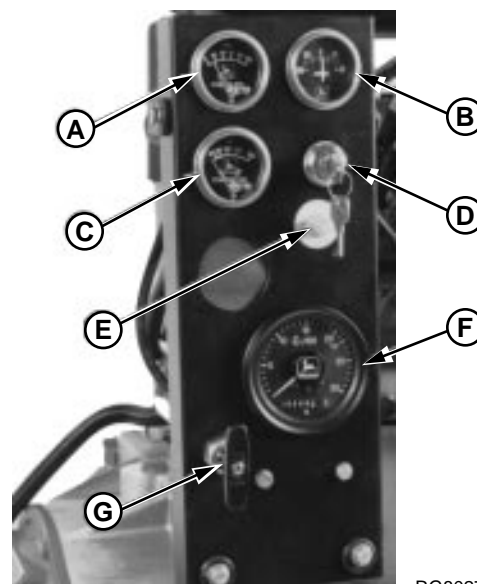
E—Reset (Safety) Switch - Overrides safety shutdown switch when depressed and held in during engine start-up. Hold button in until engine oil pressure is at a safe operating level. Switch will shut engine down when oil pressure drops below or coolant temperature rises above a (preset) safe operating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

F—Tachometer with Electric Hour Meter -

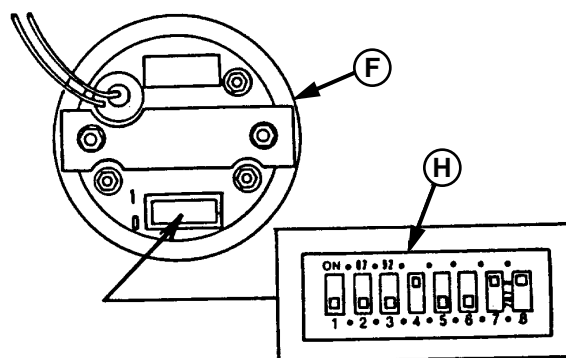
Tachometer senses engine speed from a speed sensor in front timing gear cover and indicates engine speed in revolutions per minute (rpm). Hour meter indicates the operating hours of the engine while key switch is in the "ON" position. The hour meter should be used as a guide for scheduling periodic service.

G—Hand Throttle - Controls engine speed.

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



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RG6861

- A—Oil Pressure Gauge
- B—Ammeter
- C—Coolant Temperature Gauge
- D—Key Switch
- E—Reset (Safety) Switch
- F—Tachometer with Hour Meter
- G—Hand Throttle
- H—Tachometer Binary Code

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 105° C (221° F), reduce load on engine. Unless temperature drops quickly, stop engine and determine cause before resuming operation.
- Operate the engine under a lighter load and at slower than normal speed for first 15 minutes after start-up. DO NOT run engine at slow idle.
- Stop engine immediately if there are any signs of part failure. Symptoms that may be early signs of engine problems are:
 - Sudden drop in oil pressure
 - Abnormal coolant temperatures
 - Unusual noise or vibration
 - Sudden loss of power
 - Excessive black exhaust
 - Excessive fuel consumption
 - Excessive oil consumption
 - Fluid leaks

BREAK-IN SERVICE

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

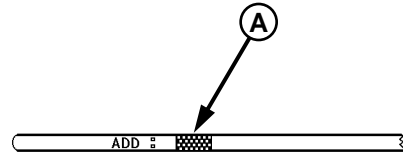
1. This engine is factory-filled with John Deere Engine Break-in Oil. Operate the engine at heavy loads with minimal idling during the break-in period.
2. If the engine has significant operating time at idle, constant speeds, and/or light load usage, or makeup oil is required in the first 100 hour period,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

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

3. Check engine oil level 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 use PLUS-50® Engine Oil during the break-in period of a new engine or engine that has had a major overhaul. PLUS-50 oil will not allow a new or overhauled engine to properly wear during this break-in period.

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



ENGINE SPECIFICATIONS*

Oil Pressure at Full Load Rated Speed	345 ± 103 kPa (3.45 ± 1.03 bar) (50 ± 15 psi)
Minimum Oil Pressure at Rated Speed	275 (2.75 bar) (40 psi)
Minimum Oil Pressure at 850 rpm	103 kPa (1.03 bar) (15 psi)
Coolant Temperature Range.	82°–94° C (180°–202° F)

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

BREAK-IN SERVICE—CONTINUED

4. During the first 20 hours, avoid prolonged periods of engine idling or sustained maximum load operation. If engine will idle longer than 5 minutes, stop engine.
5. After the first 100 hours (maximum), change engine oil and replace engine oil filter (A). (See CHANGE ENGINE OIL AND 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.

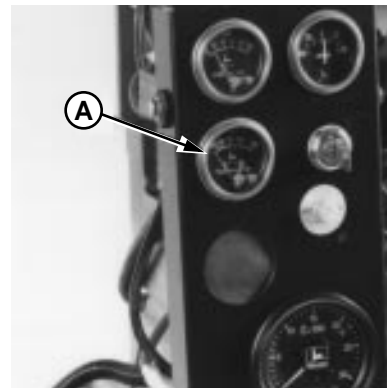


RG7961

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

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

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

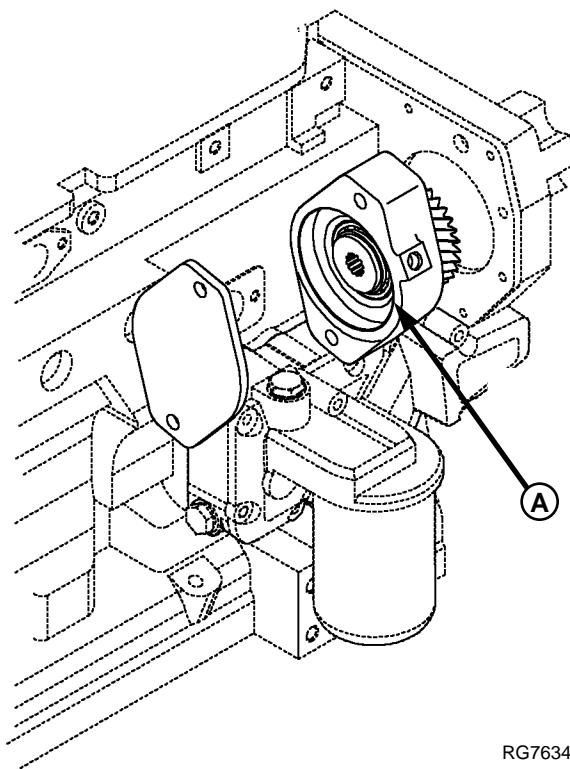


RG8029

AUXILIARY GEAR DRIVE LIMITATIONS

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

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



RG7634

STANDBY POWER UNITS

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

STARTING THE ENGINE

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



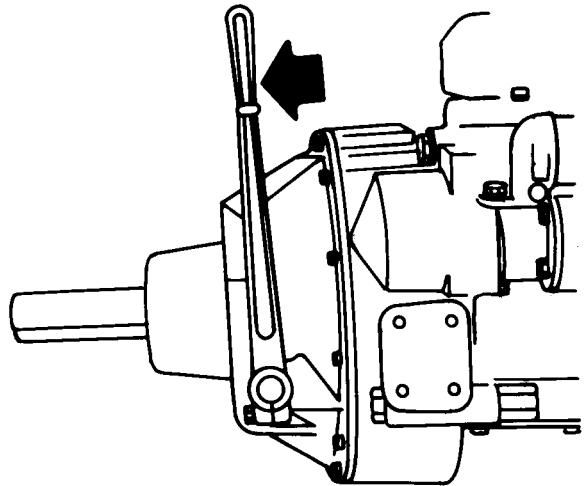
CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment. Always use safety approved fuel storage and piping.

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

1. Perform all prestarting checks outlined in Lubrication & Maintenance/Daily Section later in this manual.
2. Open the fuel supply shut-off valve, if equipped.
3. If equipped with PTO clutch, pull lever (arrow) rearward (away from engine) to disengage PTO clutch.



TS220



RG5602

STARTING THE ENGINE—CONTINUED

NOTE: Some electronically controlled governor applications may be equipped with a rotary speed potentiometer on instrument panel.

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.
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.

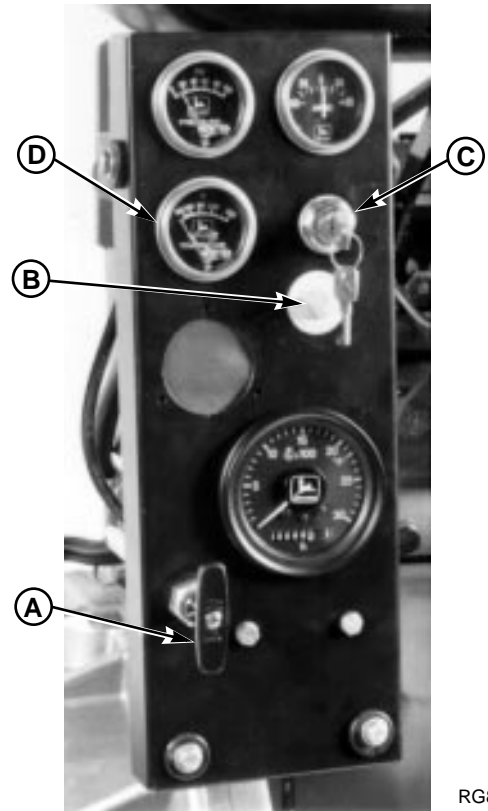
6. Turn the key switch (C) clockwise to crank the engine. When the engine starts, release the key so that it returns to the "ON" position.

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 105kPa (1.05 bar) (15 psi). The safety controls will not allow the engine to run at a lower oil pressure unless the reset button is held in.

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.



RG8033

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

COLD WEATHER OPERATION

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

Some engines are equipped with an air intake heater which will make starting the engine easier in cold weather. If equipped, follow steps 1–4 as listed under STARTING THE ENGINE, earlier in this section. Switch on the air intake heater for 30 seconds and then proceed to operate the starter. Follow remaining steps 5–8.



TS1356



CAUTION: 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.

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.

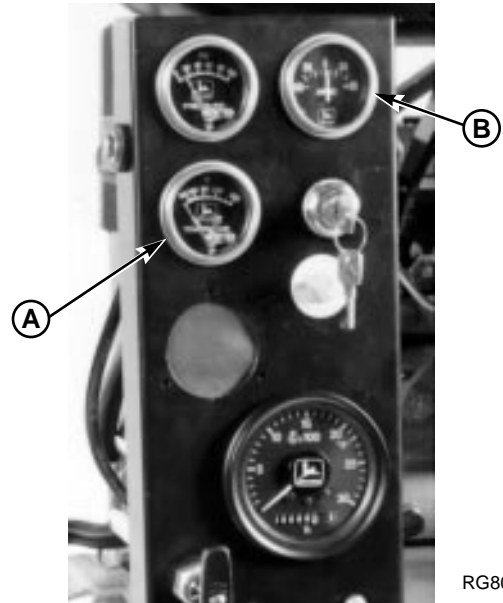
Engines used in generator set applications where the governor is locked at a specified speed may not have a slow idle function. Operate these engines at high idle for 1 to 2 minutes before applying the load. This procedure does not apply to standby generator sets where the engine is loaded immediately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

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

2. Watch coolant temperature gauge (B). Do not place engine under full load until it is properly warmed up. The normal engine coolant temperature range is 82°–94° C (180°–202° F).

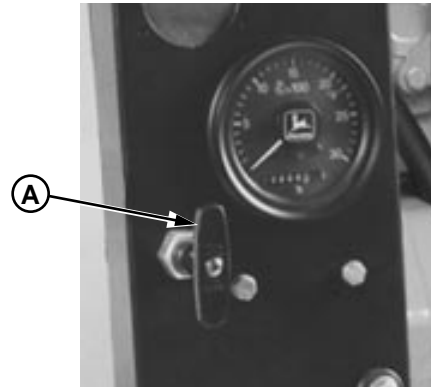
NOTE: It is a good practice to operate the engine under a lighter load and at lower speeds than normal for the first few minutes after start-up.



RG8033

CHANGING ENGINE SPEED—STANDARD (MECHANICAL) GOVERNOR

To increase engine speed, turn 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.



RG8039

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).*

STOPPING THE ENGINE

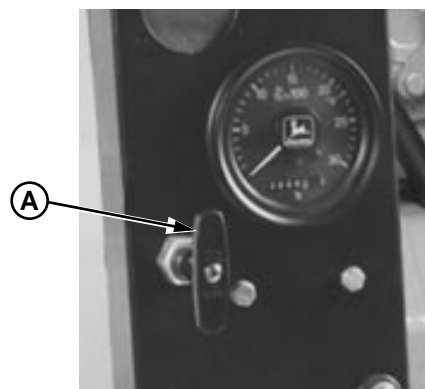
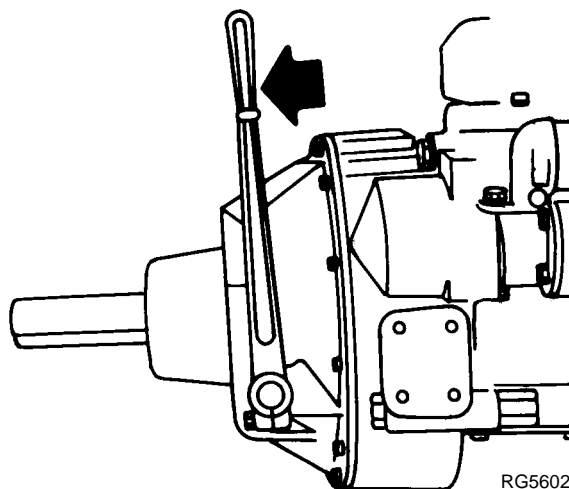
1. Pull PTO clutch lever (arrow) rearward (away from engine) to disengage clutch, if equipped.
2. Move the throttle lever (A) to slow idle on standard (mechanical) governor engines.

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.

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

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



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.



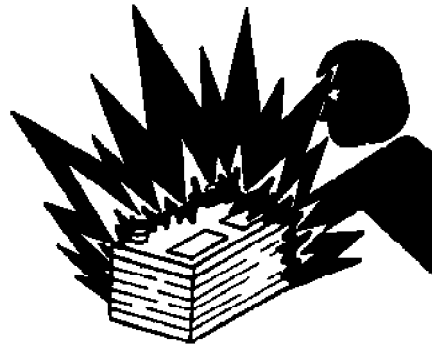
CAUTION: Gas given off by battery is explosive. Keep sparks and flames away from battery. Before connecting or disconnecting a battery charger, turn charger off. Make last connection and first disconnection at a point away from battery. Always connect **NEGATIVE (-)** cable last and disconnect this cable first.

IMPORTANT: Be sure polarity is correct before making connections. Reversed polarity will damage electrical system. Always connect positive to positive and negative to ground. Always use 12-volt booster battery for 12-volt electrical systems and 24-volt booster battery(ies) for 24-volt electrical systems.

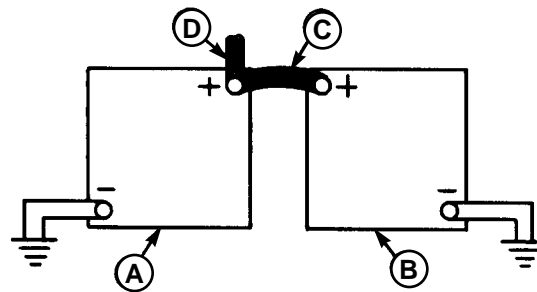
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

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

2. Connect one end of jumper cable to the **POSITIVE (+)** post of the booster battery.
3. Connect the other end of the jumper cable to the **POSITIVE (+)** post of battery connected to starter.
4. Connect one end of the other jumper cable to the **NEGATIVE (-)** post of the booster battery.
5. ALWAYS complete the hookup by making the last connection of the **NEGATIVE (-)** cable to a good ground on the engine frame and away from the battery(ies).
6. Start the engine. Disconnect jumper cables immediately after engine starts. Disconnect **NEGATIVE (-)** cable first.

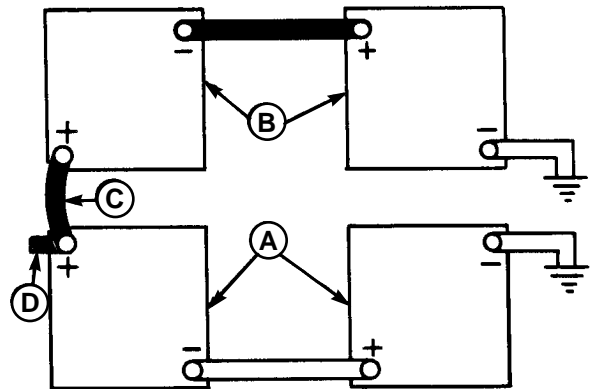


TS204



RG4678

12-Volt System



RG4698

24-Volt System

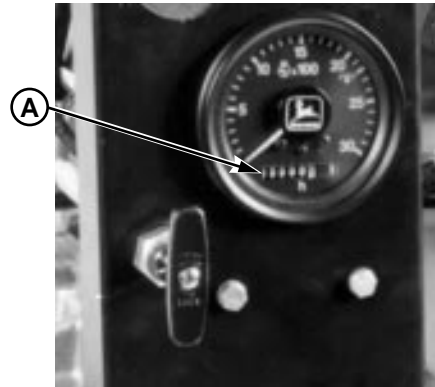
A—12-Volt Machine Battery (ies)
B—12-Volt Booster Battery (ies)
C—Booster Cable
D—Cable to Starting Motor

Lubrication and Maintenance

OBSERVE SERVICE INTERVALS

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.

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.



RG4699

USE CORRECT FUELS, LUBRICANTS, AND COOLANT

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

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



TS100

LUBRICATION AND MAINTENANCE SERVICE INTERVAL CHART

Item	Lubrication and Maintenance Service Intervals					
	Daily	50 Hour Every 2 Weeks	250 Hour	600 Hour/ 12 Month	1200 Hour/ 24 Month	2000 Hour
Check Engine Oil and Coolant Level	•					
Check Air Cleaner Dust Valve & Restriction Indicator*	•					
Lubricate PTO Release Bearing	•					
Visual Walkaround Inspection	•					
Check Fuel Filter		•				
Lubricate PTO Clutch Shaft Bearings		•				
Service Fire Extinguisher			•			
Service Battery			•			
Change Engine Oil and Replace Filter **			•			
Check PTO Clutch Adjustment			•			
Lubricate PTO Clutch Levers and Linkage				•		
Clean Crankcase Vent Tube				•		
Check Air Intake Hoses, Connections & System				•		
Replace Fuel Filter Element				•		
Check Automatic Belt Tensioner and Belt Wear				•		
Check Cooling System				•		
Coolant Solution Analysis-Add SCAs as needed				•		
Adjust Droop on Generator Set Engines					•	
Check Crankshaft Vibration Damper (6-Cylinder)					•	
Pressure Test Cooling System					•	
Flush Cooling System ***					•	
Check and Adjust Engine Valve Clearance						•

* Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H₂O.

** Change the oil for the first time after 100 hours maximum of (break-in) operation, then every 250 hours thereafter. If PLUS-50 oil is used along with a John Deere oil filter, the oil change interval may be extended by 50 hours.

*** If John Deere Antifreeze/Summer Coolant Concentrate or John Deere COOL-GARD is used, the flushing interval may be extended to 2000 hours. If John Deere Prediluted Antifreeze/Summer Coolant is used, the flushing interval may be extended to 3000 hours or 36 months, whichever occurs first.

Lubrication & Maintenance/Daily

DAILY PRESTARTING CHECKS

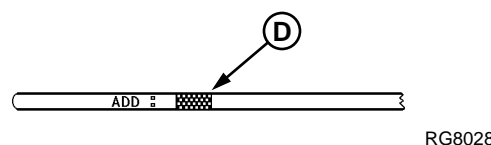
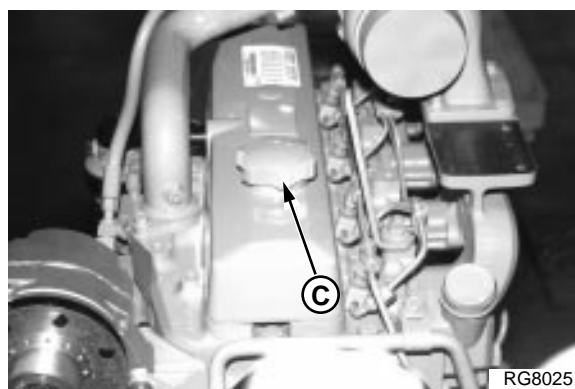
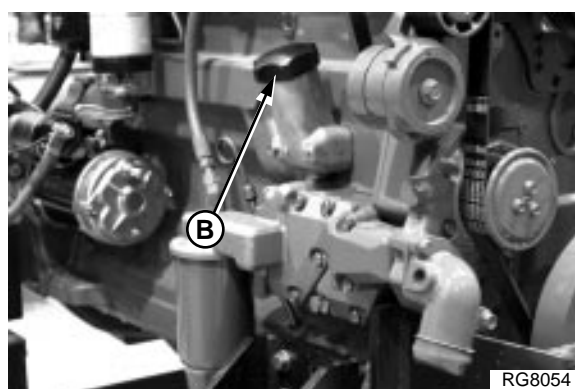
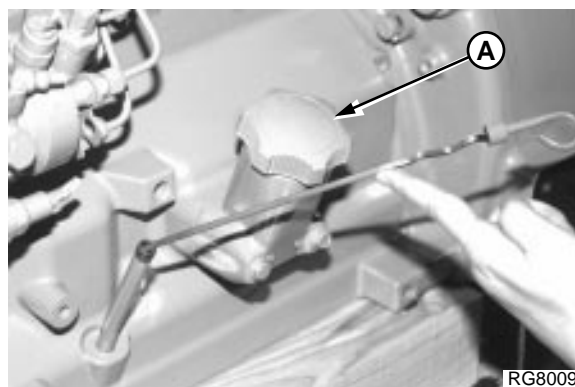
Do the following BEFORE STARTING THE ENGINE for the first time each day:

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

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

Depending on application, oil may be added at left (A) or right (B) side oil filler cap and rocker arm cover filler cap (C) locations.

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





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

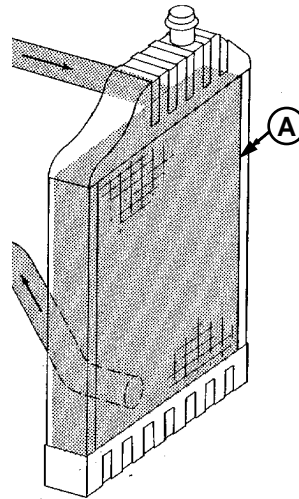
Only remove filler cap when engine is cold or when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

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.

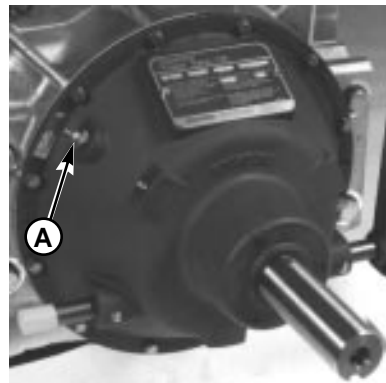


TS281



RG4675

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

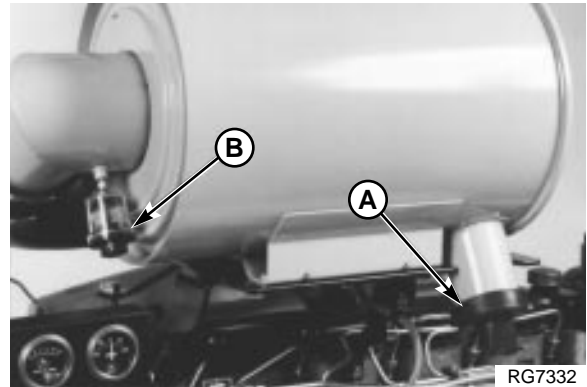


RG7331

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

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

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



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

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

Inspect:

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

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

Lubrication & Maintenance/50 Hour/2 Weeks

CHECKING FUEL FILTER

Periodically the fuel filter should be checked for water or debris.

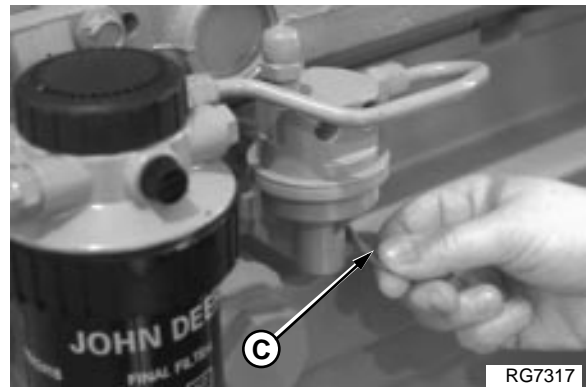
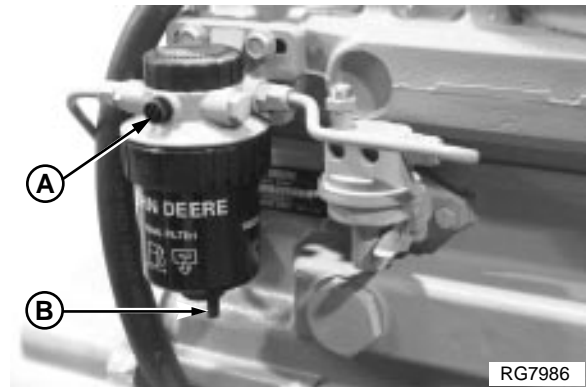
IMPORTANT: Drain water into a suitable container and dispose of properly.

1. Loosen drain plug (B) at bottom of fuel filter two or three turns.
2. Loosen air bleed plug two full turns (A) on fuel filter base and drain water from bottom until fuel starts to drain out.
3. When fuel starts to drain out, tighten drain plug securely.

After draining water from the fuel filter, the filter must be primed by bleeding all air from the fuel system.

4. Operate primer lever of the fuel supply pump (C) until fuel flow is free from air bubbles.
5. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Push hand primer inward (toward engine) as far as it will go.

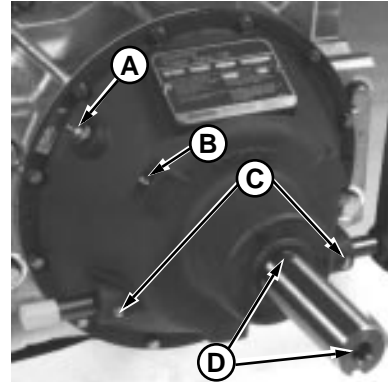
If the fuel system needs further bleeding of air, see BLEED FUEL SYSTEM in Service As Required Section, later in this manual.



LUBRICATING PTO CLUTCH SHAFT BEARINGS

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.



RG7331

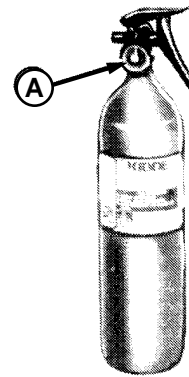
- A—Release Bearing Grease Fitting
- B—Drive Shaft Bearing Fitting
- C—Lever Cross Shaft Fittings
- D—Pilot Bearing Fitting

Lubrication and Maintenance/250 Hour

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 250 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.



RW4918

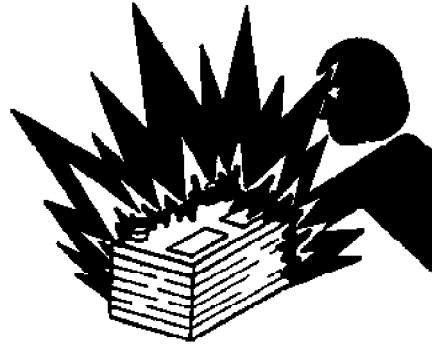
SERVICING BATTERY



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

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

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



TS204

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.

SERVICING BATTERY—CONTINUED



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

Avoid the hazard by:

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

If you spill acid on yourself:

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

If acid is swallowed:

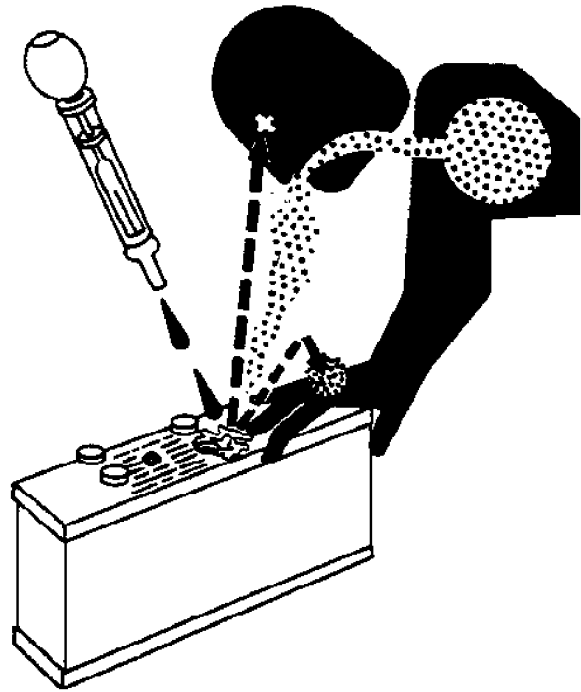
1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.

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

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

Battery Capabilities

12V-Standard Duty Starter	640 Cold Cranking Amps
12V-Heavy Duty Starter	800 Cold Cranking Amps
24V-Standard Duty Starter	570 Cold Cranking Amps



TS203

CHANGING ENGINE OIL AND REPLACING OIL FILTER

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 engine oil and a John Deere oil filter are used, the oil and filter change interval may be extended by 50 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.

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

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

4. Remove and discard oil filter element (A) using a suitable filter wrench.

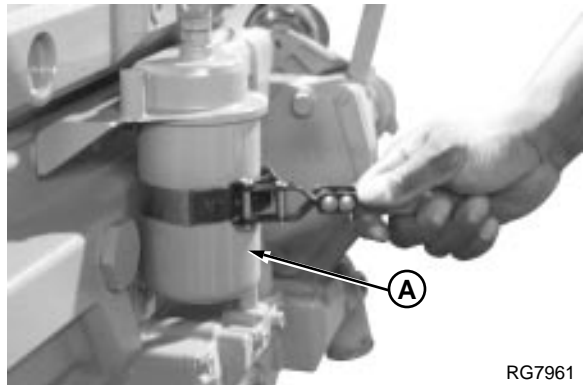
NOTE: Depending on engine application, oil filter may be located on either side of the engine.

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.



RG4881



RG7961

CHANGING ENGINE OIL AND REPLACING OIL FILTER—CONTINUED

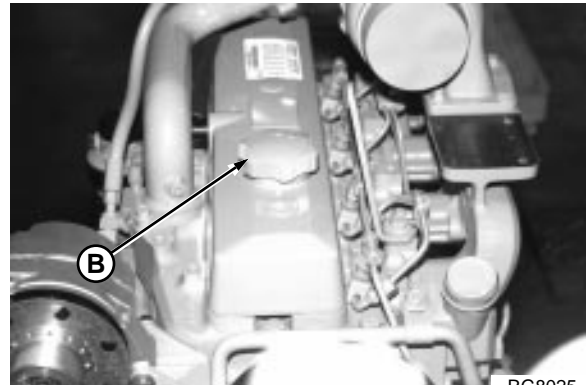
6. Oil new packing and install new filter element. Hand tighten element according to values printed on filter element. If values are not provided, tighten element approximately $\frac{3}{4}$ — 1-1/4 turn after packing contacts filter housing. **DO NOT** overtighten filter element.
7. Install oil pan drain plug with a new seal when equipped.
8. Fill engine crankcase with correct John Deere engine oil through rocker arm cover opening (B) or either side oil filler (C) depending on engine application. (See **DIESEL ENGINE OIL** in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

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

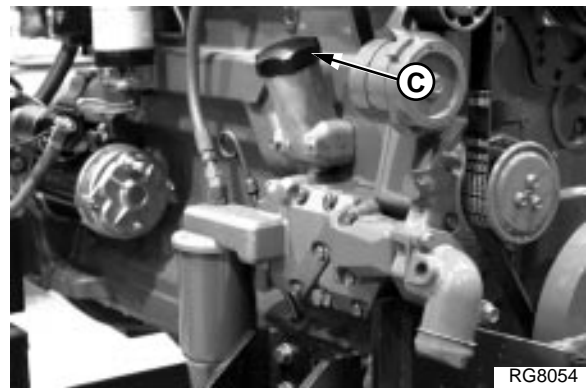
NOTE: *Crankcase oil capacity may vary slightly. ALWAYS fill crankcase to full mark or within crosshatch on dipstick, whichever is present. DO NOT overfill.*

IMPORTANT: Immediately after completing any oil change, crank engine for 30 seconds without permitting engine to start. This will help insure adequate lubrication to engine components before engine starts.

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 within crosshatch of dipstick.



RG8025



RG8054

CHECKING PTO CLUTCH ADJUSTMENT



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.

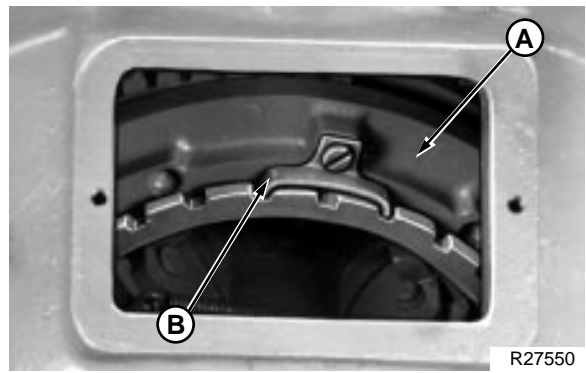
1. Measure clutch engagement force at handle grip using a spring scale. The engagement force should be 267–311 N (60–70 lb force).

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.



TS198



R27550

Lubrication & Maintenance/600 Hour/12 Month

LUBRICATING PTO CLUTCH INTERNAL LEVERS AND LINKAGE

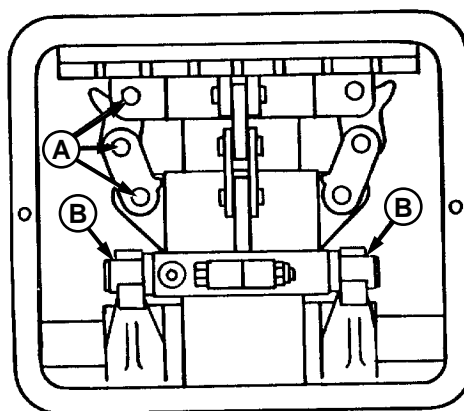


CAUTION: Never attempt to service the PTO while it is in operation. Loose clothing could get caught in moving parts; keep clothing tight against body. Use extreme care when working around the PTO.

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).



TS198

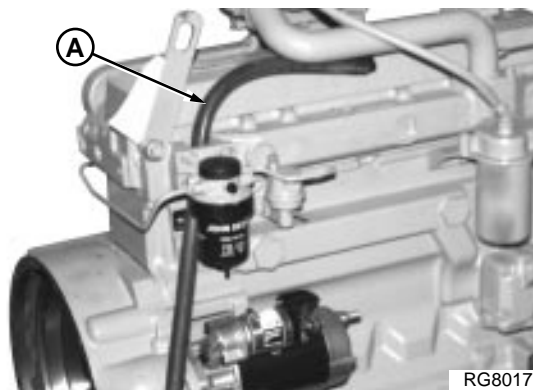


RG6641

CLEANING CRANKCASE VENT TUBE

If you operate the engine 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.



RG8017

CHECKING AIR INTAKE SYSTEM

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

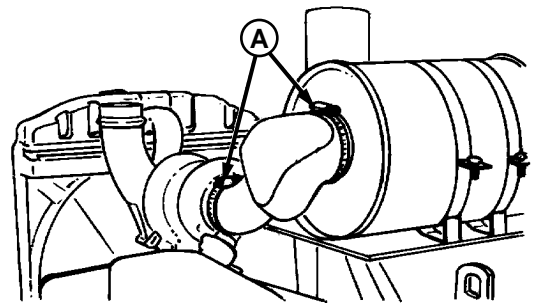
1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps (A) on piping which connect the air cleaner, engine and, if present, turbocharger. Tighten clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal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

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

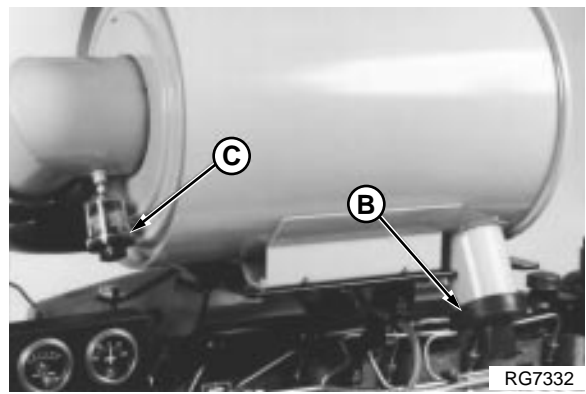
4. Test air restriction indicator (C) for proper operation. Replace indicator as necessary.

IMPORTANT: If not equipped with air restriction indicator, replace air cleaner elements at 600 Hours or 12 Months, whichever occurs first.

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



RG4689



RG7332

REPLACING 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 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.

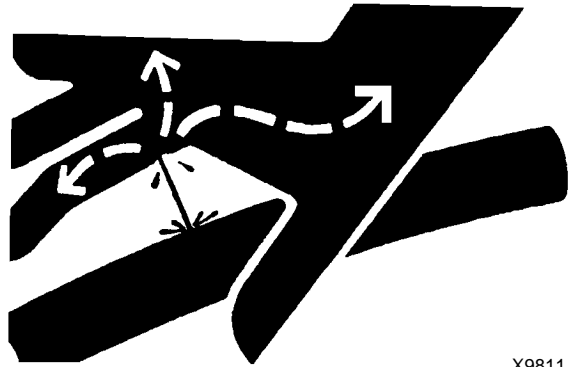
1. Close fuel shut-off valve, if equipped.
2. Thoroughly clean fuel filter assembly and surrounding area.
3. Loosen drain plug (C) and drain fuel into a suitable container.

NOTE: *Lifting up on retaining ring as it is rotated helps to get it past raised locators.*

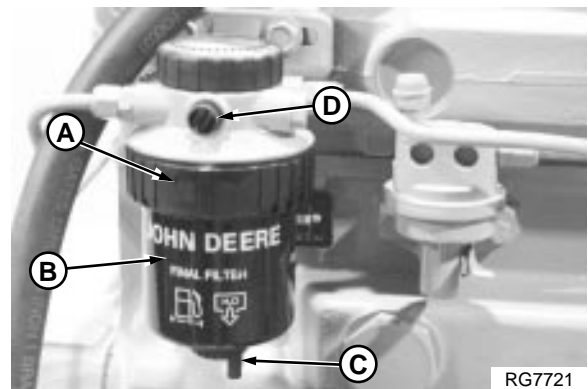
4. Firmly grasp the retaining ring (A) and rotate it counterclockwise 1/4 turn. Remove ring with filter element (B).
5. Inspect filter mounting base for cleanliness. Clean as required.

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

6. Install new filter element onto mounting base. Be sure element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment.



X9811



RG7721

A—Retaining Ring
B—Filter Element
C—Drain Plug
D—Bleed Plug

REPLACING FUEL FILTER ELEMENT—CONTINUED

If equipped with water separator, remove filter element from water separator bowl. Drain and clean separator bowl. Dry with compressed air. Install water separator bowl onto new element. Tighten securely.

7. Align keys on filter element with slots in filter base.
8. Install retaining ring onto mounting base making certain dust seal is in place on filter base. Hand tighten ring (about 1/3 turn) until it “snaps” into the detent. DO NOT overtighten retaining ring.

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

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

9. Open fuel shut-off valve and bleed the fuel system. (See BLEED FUEL SYSTEM in Service As Required Section.) Tighten bleed plug (D).

CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR

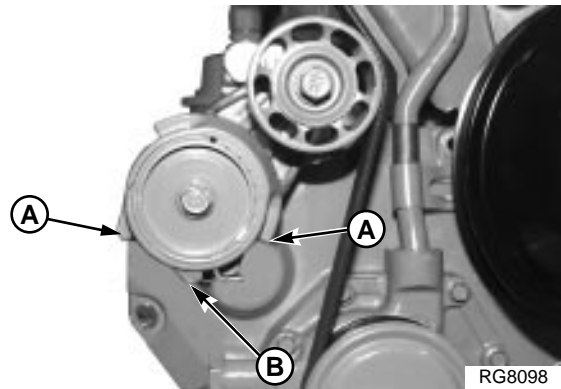
Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

• 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.

1. Visually inspect cast stops (A and B) on belt tensioner assembly.

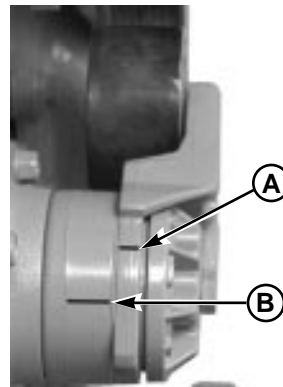
If the tensioner stop on swing arm (A) is hitting the fixed stop (B), check mounting brackets (alternator, belt tensioner, idler pulley, etc.) and the belt length. Replace belt as needed (see REPLACING FAN AND ALTERNATOR BELTS in Service As Required Section).



• Checking Tensioner Spring Tension:

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

1. Release tension on belt using a breaker bar and socket on 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 (A) and put a mark (B) on tensioner mounting base.

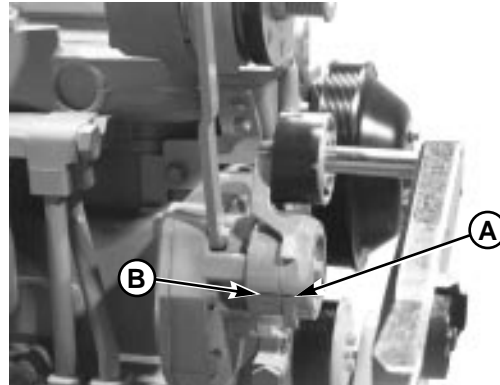


CHECKING BELT TENSIONER SPRING TENSION—CONTINUED

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.

SPRING TENSION SPECIFICATION

Spring Tension 18-22 N·m (13-16 lb-ft)



RG8037

CHECKING COOLING SYSTEM

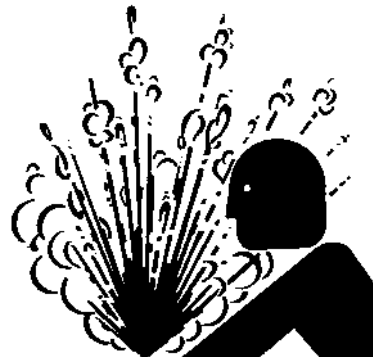


CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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. Replace hoses when hard, flimsy, or cracked.



TS281

CHECKING EFFECTIVENESS OF COOLANT SOLUTION

When your coolant has accumulated 600 hours or 12 months of operating time, the effectiveness of your engine coolant should be evaluated by obtaining a coolant sample.

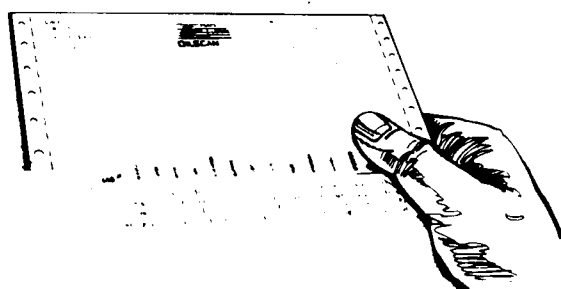
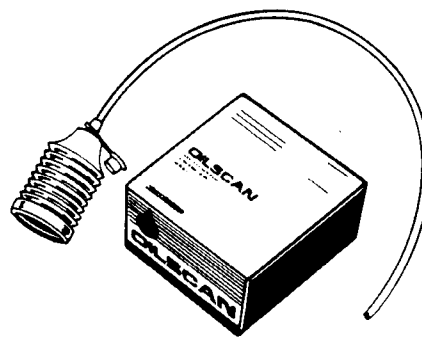
Maintaining adequate concentrations of glycol and inhibiting additives (SCAs) in the coolant is critical to protect the engine and cooling system against freezing, corrosion, and cylinder liner erosion and pitting.

A coolant strip test kit provides a simple, effective way to check freeze point and additive levels.

For a more thorough evaluation of your coolant, CoolScan™, where available, is a John Deere sampling program to help you monitor the effectiveness of your engine's coolant solution and identify potential problems before they cause serious damage.

TY16175 or TY16176 3-Way Heavy Duty Coolant Test Kit and DS0251 CoolScan kits are available from your John Deere dealer. Refer to instructions provided with kits.

Usually recharging your engine coolant with the recommended amount of TY16004 or TY16005 Liquid Coolant Conditioner at 600 hours or 12 months of operation is adequate. However, with a CoolScan analysis report you will be given a more thorough evaluation of your engine coolant condition along with detailed service recommendations. (See ADDING SUPPLEMENTAL COOLANT ADDITIVES, later in this section.)



TS6828AB



RG7297

ADDING SUPPLEMENTAL COOLANT ADDITIVES (SCA'S)

After 600 hours or 12 months of engine operating time, recharge your engine coolant with the recommended amount (see label on container) of TY16004 or TY16005 Liquid Coolant Conditioner.

IMPORTANT: TY16004 or TY16005 Liquid Coolant Conditioner is a non-chromate inhibitor and should be used only with low silicate, ethylene-glycol base antifreeze. It does not protect the cooling system from freezing.



RG7298

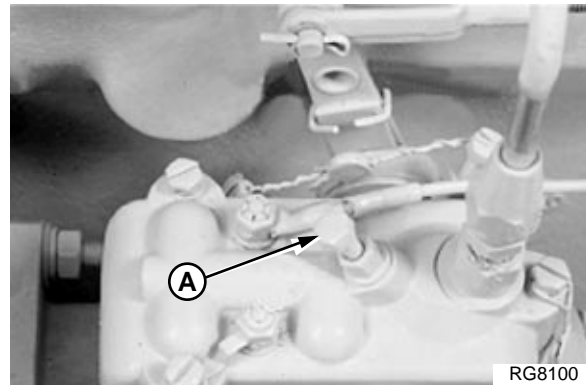
Liquid Coolant Conditioner

Lubrication & Maintenance/1200 Hour/24 Month

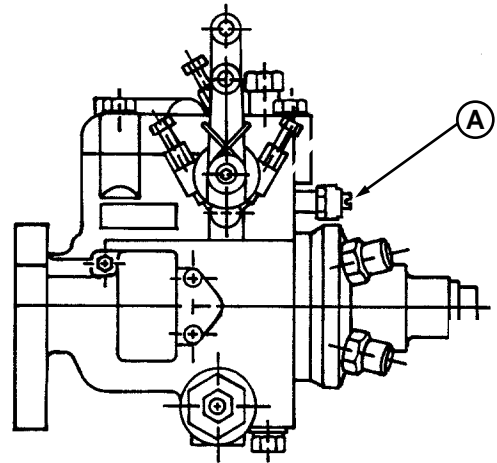
ADJUSTING VARIABLE SPEED (DROOP) ON GENERATOR SET ENGINES

STANADYNE INJECTION PUMPS ONLY

1. Warm engine to normal operating temperature.
2. Run engine at rated speed.
3. Apply full load.
4. Remove load.
5. Note the no-load speed or frequency.
6. If throttle is not spring-loaded type, disconnect throttle linkage or cable.
7. Turn screw (A) to adjust droop.
8. If necessary, adjust and connect throttle linkage or cables.



RG8100



RG8101

LUCAS INJECTION PUMPS ONLY

See your authorized Lucas Repair Station for speed droop adjustment. This service requires that an internal pump adjustment be made.

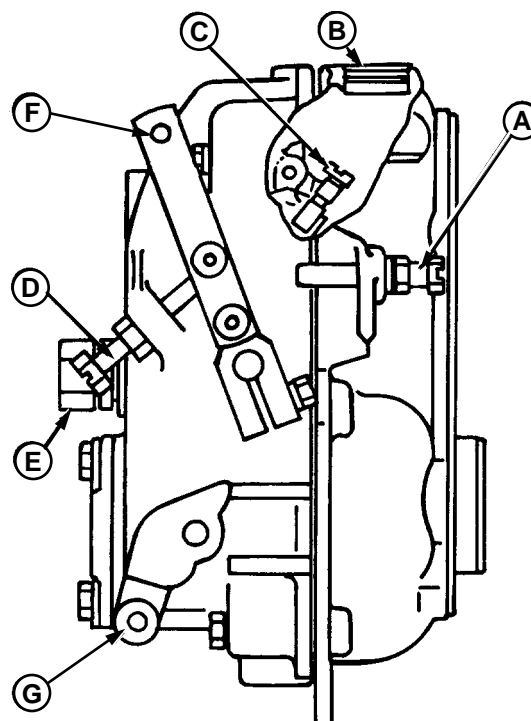
ADJUSTING VARIABLE SPEED (DROOP) ON GENERATOR SET ENGINES—CONTINUED

NIPPONDENSO IN-LINE INJECTION PUMPS ONLY

1. Check for specified no-load (frequency). If governor regulation is within 5–7% range, no adjustment is necessary.
2. If governor regulation is above 7% or below 5%, stop engine and remove cap nuts from adjusting screws before making adjustments.
3. Remove droop adjusting screw access plug (B, shown removed) from top of governor housing.
4. Back out slow idle (adjusting) screw (D) and bumper screw. Pull back on throttle lever (F, toward rear of governor housing) by hand until the droop adjusting screw (C) inside housing can be adjusted through the access plug hole.
5. Screw the droop screw in (clockwise), counting the turns until screw bottoms out. Then, return screw to original setting.

NOTE: A noticeable click will occur at each 1/4 turn of droop adjusting screw. One click clockwise will increase no-load speed approximately 10 rpm, counter-clockwise will reduce speed by 10 rpm.

6. Screw in the droop screw (clockwise) no more than 1/2 turn (two clicks) at a time to reduce governor droop. Turn counterclockwise no more than two clicks at a time to increase governor droop (to reduce governor sensitivity).
7. Replace access plug in top of governor housing. Start engine, apply full (100%) load, and readjust high idle adjusting screw until 1500 rpm is obtained at the specified power.
8. Screw in idle (bumper) spring until engine speed increases 5–10 rpm.
9. Repeat steps 4 through 7 until governor regulation is within the 5–7% range.
10. Replace all cap nuts onto adjusting screws and tighten lock nuts securely.



RG5752

- A—Fast Idle (Stop) Screw
- B—Droop Adjusting Screw Access Plug Location
- C—Droop Adjusting Screw
- D—Slow Idle (Adjusting) Screw
- E—Idle (Bumper) Spring
- F—Throttle Lever
- G—Mechanical Shutoff Lever

CHECKING CRANKSHAFT VIBRATION DAMPER (6-CYLINDER ENGINE ONLY)

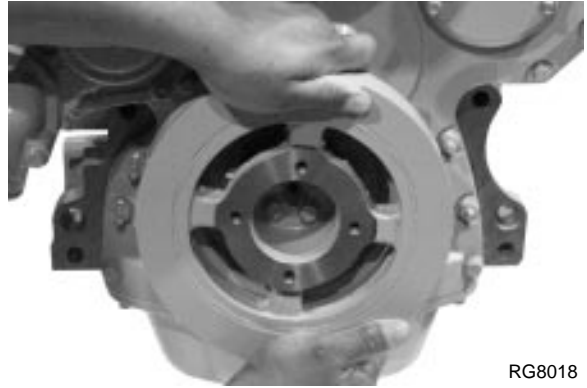
1. Remove belts (shown removed).
2. Grasp vibration damper with both hands and attempt to turn it in both directions. If rotation is felt, damper is defective and should be replaced.

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

3. Check vibration damper radial runout by positioning a dial indicator (A) so probe contacts damper outer diameter.
4. With engine at operating temperature, rotate crankshaft using either JD281A, JDG820, or JDE83 Flywheel Turning Tool.
5. Note dial indicator reading. If runout exceeds specifications given below, replace vibration damper.

Damper Radial Runout Specification

Maximum 1.50 mm (0.060 in.)

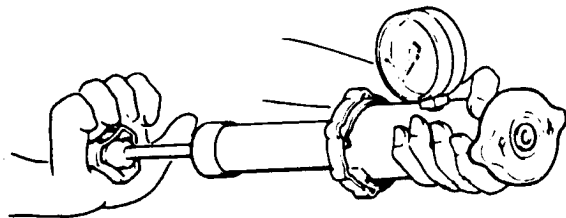


RG8018

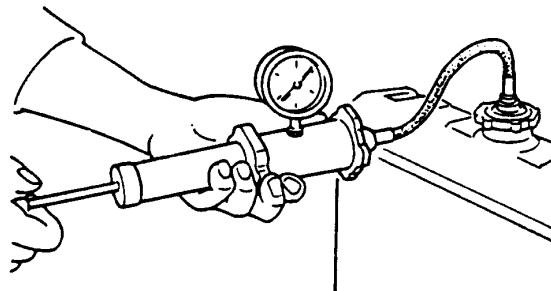


RG7508

PRESSURE TESTING COOLING SYSTEM



RG6557



RG6558



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 70 kPa (0.7 bar) (10 psi)*. Gauge should hold pressure for 10 seconds within the normal range if cap is acceptable.

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:

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

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

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

3. Connect gauge and adapter to radiator filler neck. Pressurize cooling system to 70 kPa (0.7 bar) (10 psi)*.
4. With pressure applied, check all cooling system hose connections, radiator, and overall engine for leaks.

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

If no leakage is detected, but the gauge indicated a drop in pressure, coolant may be leaking internally within the system or at the block-to-head gasket. Have your servicing dealer or distributor correct this problem immediately.

*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.

FLUSHING COOLING SYSTEM



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

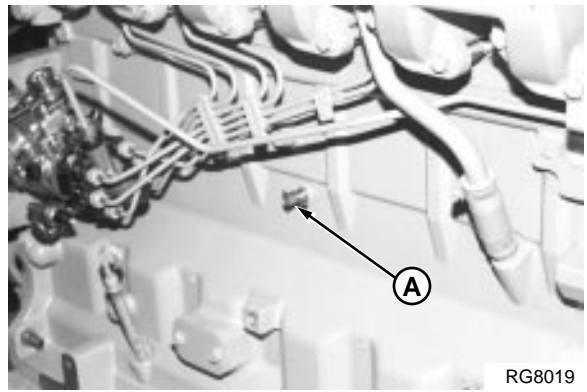
Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

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**, earlier in this section.)
2. Slowly open the engine cooling system filler cap or radiator cap to relieve pressure and allow coolant to drain faster.
3. Open engine block drain valve (A) on left side of engine. Drain all coolant from engine block.
4. Open radiator drain valve. Drain all coolant from radiator.
5. Remove thermostats at this time, if not previously done. Install cover (without thermostats) and tighten cap screws to 47 N·m (35 lb-ft).
6. Close all drain valves after coolant has drained.
7. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
8. Stop engine and immediately drain the water from system before rust and sediment settle.



TS281



RG8019

FLUSHING COOLING SYSTEM—CONTINUED

9. After draining water, close drain valves and fill the cooling system with clean water and TY15979 John Deere Heavy Duty Cooling System Cleaner or an equivalent cleaner such as Fleetguard® RESTORE™ and RESTORE PLUS™. Follow manufacturer's directions on label.
10. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run the engine about 10 minutes, then drain out flushing water.
11. Close all drain valves on engine and radiator. Install thermostats using a new gasket.
12. Add coolant to radiator until coolant touches bottom of filler neck. (See ADDING COOLANT in Service As Required Section.)
13. 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).
14. After running engine, check coolant level and entire cooling system for leaks.

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.

Fleetguard® is a registered trademark of Cummins Engine Company.

RESTORE™ and RESTORE PLUS™ are trademarks of Fleetguard.

Lubrication and Maintenance/2000 Hour

CHECKING AND ADJUSTING ENGINE VALVE CLEARANCE

NOTE: If desired, have your authorized servicing dealer or engine distributor adjust the engine valve clearance.



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

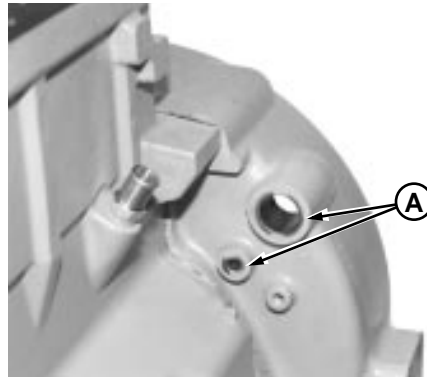
IMPORTANT: Engine valve clearance **MUST BE** checked and adjusted with engine **COLD**.

1. Remove rocker arm cover and crankcase ventilator tube.

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

Rocker arms that exhibit excessive valve clearance should be inspected more thoroughly to identify damaged parts.

2. Remove plastic plugs or cover plate from flywheel housing timing holes (A).



RG7408

CHECKING AND ADJUSTING ENGINE VALVE CLEARANCE—CONTINUED

- Using either JD281A, JDG820, or JDE83 Flywheel Turning Tool and JDE81-4 Timing Pin, rotate engine in running direction (clockwise viewed from front) until Number 1 cylinder is at Top Dead Center (TDC) Compression stroke. Insert timing pin in flywheel.

If Number 1 cylinder rocker arms are loose, the engine is at Number 1 "TDC-Compression".

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



- With engine lock-pinned at "TDC" of Number 1 piston's compression stroke, check and adjust (as needed) valve clearance to following specifications, as directed in the procedures (on next page) for 4 or 6-cylinder engines .

VALVE CLEARANCE SPECIFICATIONS (COLD)

Intake Valve 0.35 mm (0.014 in.)

Exhaust Valve 0.45 mm (0.018 in.)

- If valves need adjusting, loosen the locknut 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 locknut to 27 N·m (20 lb-ft). Recheck clearance again after tightening locknut. Readjust clearance as necessary
- Replace rocker arm cover and crankcase ventilator tube.

• **4-Cylinder Engine:**

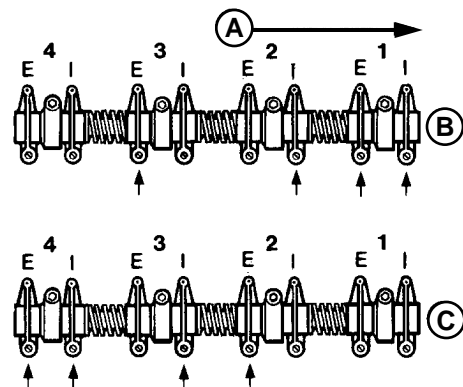
NOTE: Firing order is 1-3-4-2.

Lock No. 1 piston at TDC compression stroke (B).

Adjust valve clearance on No. 1 and 3 exhaust valves and No. 1 and 2 intake valves.

Rotate flywheel 360°. Lock No. 4 piston at TDC compression stroke (C).

Adjust valve clearance on No. 2 and 4 exhaust valves and No. 3 and 4 intake valves.



RG4776

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

• **6-Cylinder Engine:**

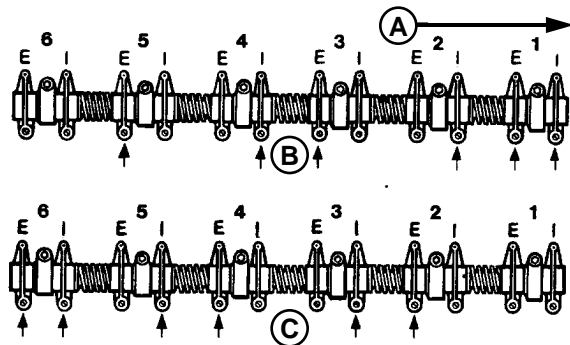
NOTE: Firing order is 1-5-3-6-2-4.

Lock No. 1 piston at TDC compression stroke (B).

Adjust valve clearance on No. 1, 3, and 5 exhaust valves and No. 1, 2, and 4 intake valves.

Rotate flywheel 360°. Lock No. 6 piston at TDC compression stroke (C).

Adjust valve clearance on No. 2, 4, and 6 exhaust valves and No. 3, 5, and 6 intake valves.



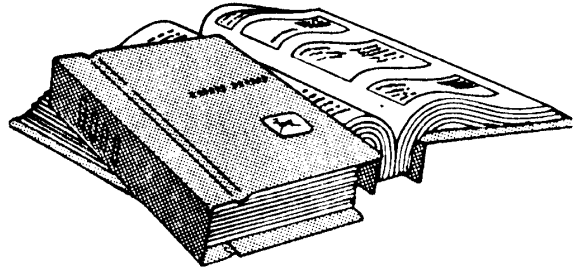
RG4777

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

Service As Required

ADDITIONAL SERVICE INFORMATION

This is not a detailed service manual. If you want more detailed service information, use the form in the back of this manual to order a component technical manual.

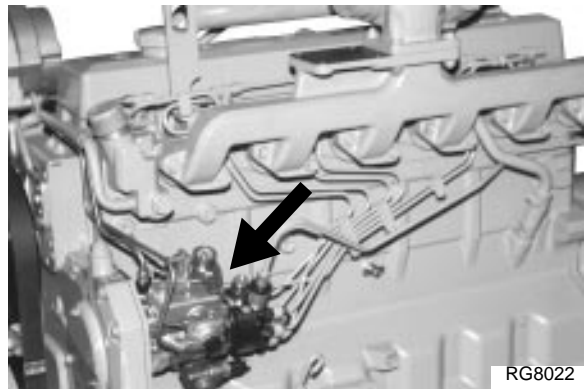


RG4624

DO NOT MODIFY FUEL SYSTEM

IMPORTANT: Modification or alteration of the injection pump (arrow), the injection pump timing, or the fuel injectors in ways not recommended by the manufacturer will terminate the warranty obligation to the purchaser.

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.)



RG8022

ADDING COOLANT



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

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

IMPORTANT: • Never pour cold liquid into a hot engine, as it may crack cylinder head or block. **DO NOT** operate engine without coolant for even a few minutes.

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

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

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. Fill until coolant level touches bottom of radiator filler neck.
3. Tighten plugs and fittings when air has been expelled from system.



TS281

REPLACING AIR CLEANER FILTER ELEMENTS

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

NOTE: This procedure applies to John Deere 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.

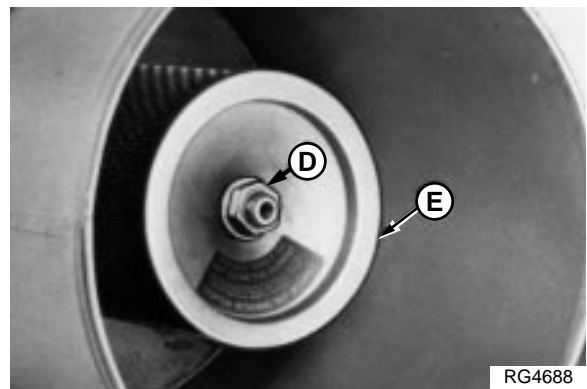
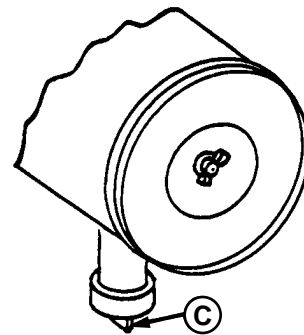
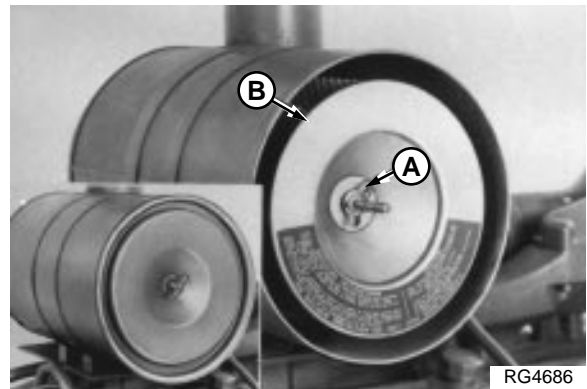
NOTE: Some engines may have a dust unloader valve (C) on the air cleaner. If equipped, squeeze valve tip to release any trapped dirt particles.

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.

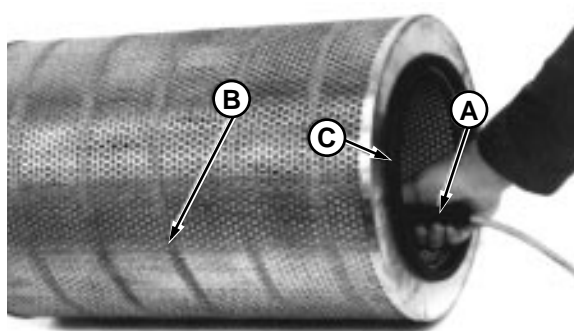
6. If equipped, fully depress air restriction indicator reset button and release to reset indicator.



INSPECTING PRIMARY FILTER ELEMENT

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

1. Hold a bright light inside element (A) 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.



RW4768

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.

CLEANING PRIMARY FILTER ELEMENT

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

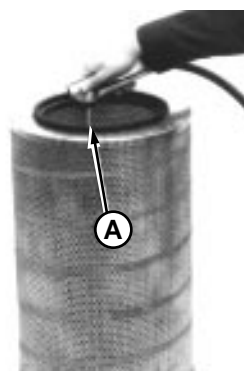
Do not blow air from outside portion of filter with air nozzle. Wear safety glasses and remove bystanders.

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



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. Replace element if any damage is found.



RW4765

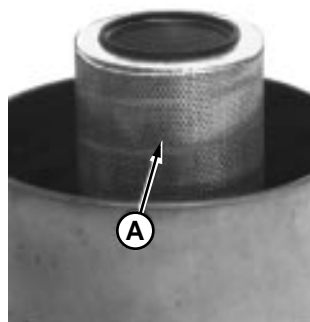
WASHING PRIMARY FILTER ELEMENT

IMPORTANT: Never wash element in gasoline or any solvent. Never use compressed air on a wet element. Do not oil element.

Use extreme caution when washing filters as washing can damage filtering media which could result in failure.

Although filter elements can be washed, replacement is highly recommended. Wash oily or sooty filter only if you have a second clean filter available since it may take up to 3 days to dry after washing.

1. Blow dust from the filter with compressed air or flush with clean water.
2. Soak filter for at least 15 minutes in a solution of warm water and John Deere R36757 Filter Element Cleaner. Agitate the filter gently to flush out dirt after soaking.
3. Rinse element thoroughly from inside (B) with clean water. Keep water pressure under 280 kPa (2.8 bar) (40 psi) to avoid damaging filtering pleats.
4. Allow element to dry completely before using. This usually takes from one to three days. Do not oven dry or use drying agents. Protect element from freezing until dry.
5. Inspect element before installing. (See INSPECTING PRIMARY FILTER ELEMENT, earlier in this section.)



RW4766



RW4767

ELEMENT STORAGE

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

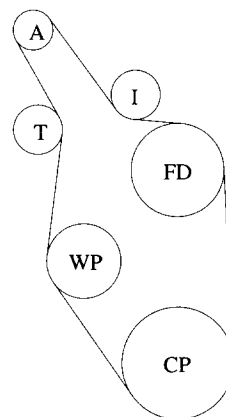
IMPORTANT: Air cleaner element **MUST BE DRY** before storing in plastic bag.

REPLACING FAN AND ALTERNATOR BELTS

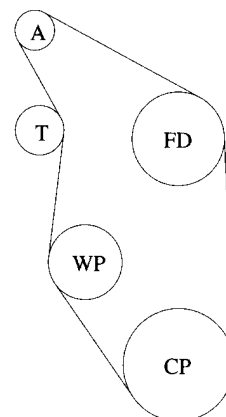
Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/600 Hour/12 Month Section for additional information on the belt tensioner.

1. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary.
2. To replace, release tension on belt using a breaker bar and socket on tension arm.
3. Remove poly-vee belt from pulleys and discard belt.
4. Install new belt, making sure belt is correctly seated in all pulley grooves. Refer to belt routing at right for your application.
5. Apply tension to belt with tensioner. Remove socket.
6. Start engine and check belt alignment.

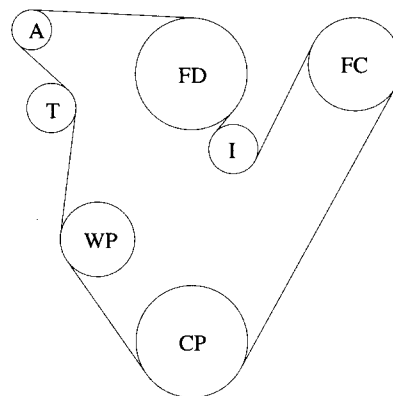
A — Alternator
 CP — Crank Pulley
 FC — Freon Compressor
 FD — Fan Drive
 I — Idler Pulley
 T — Tensioner
 WP — Water Pump



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



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



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

** Measured from crank centerline to fan drive center.*

POWER TAKE-OFF (PTO) CLUTCH



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 Section.)

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



TS198

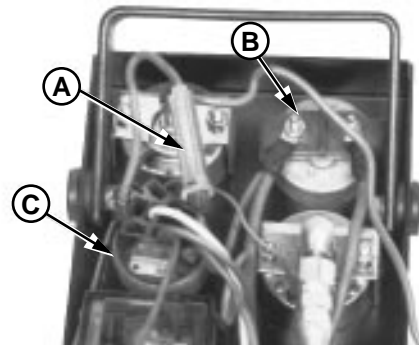


RG4693

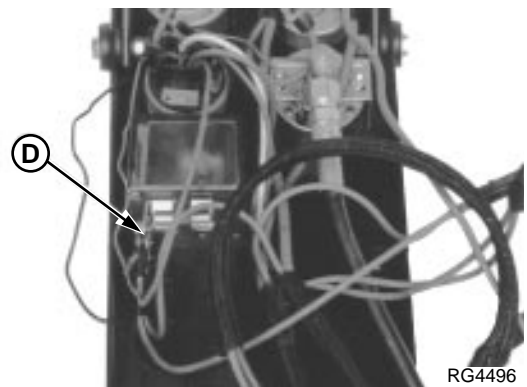
CHECKING FUSES

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

1. Check the fuse (A) between the ammeter (B) and key switch (C) located on back side of instrument panel. If defective, replace with an equivalent 25-amp fuse.
2. Check the fuse (D) mounted on the bottom of the magnetic safety switch. If defective, install an equivalent 14-amp fuse.



RG4493



RG4496

BLEEDING THE FUEL SYSTEM



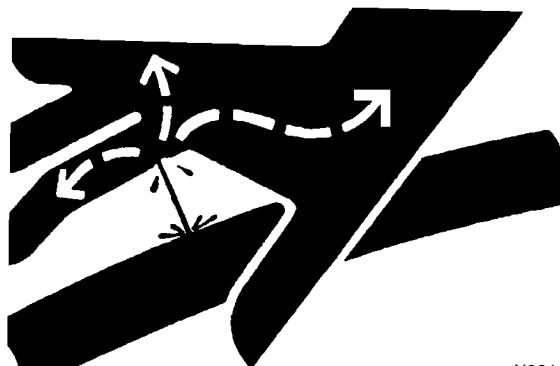
CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of 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.

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.

1. Loosen the air bleed vent screw (A) two full turns by hand on fuel filter base.
2. Operate supply pump primer lever (B) until fuel flow is free from air bubbles.
3. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Push hand primer inward (toward engine) as far as it will go.
4. Start engine and check for leaks.

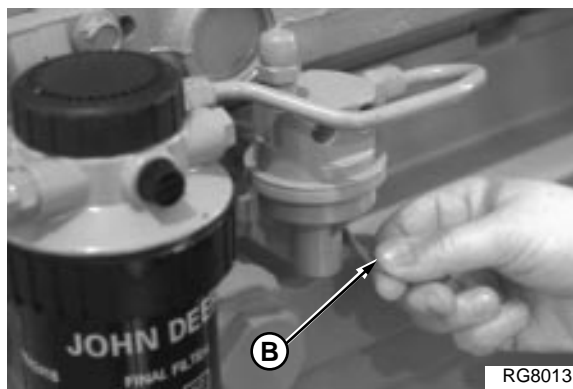
If engine will not start, it may be necessary to bleed air from fuel system at fuel injection pump or injection nozzles as explained next.



X9811



RG7947



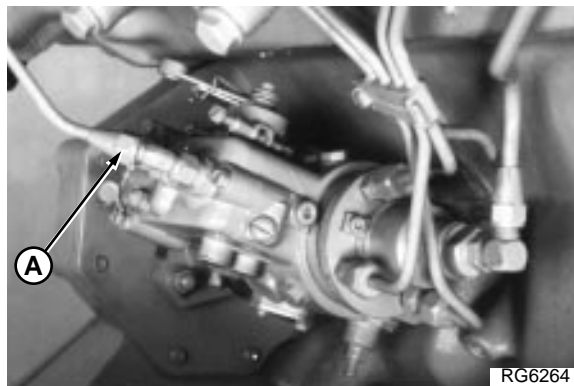
RG8013

BLEEDING THE FUEL SYSTEM—CONTINUED

- **At Fuel Injection Pump**

On Stanadyne rotary pumps:

1. Slightly loosen fuel return line connector (A) at fuel injection pump.
2. Operate fuel supply pump primer lever until fuel, without air bubbles, flows from fuel return line connection.
3. Tighten return line connector to 16 N·m (12 lb-ft).
4. Leave hand primer in the inward position toward cylinder block.

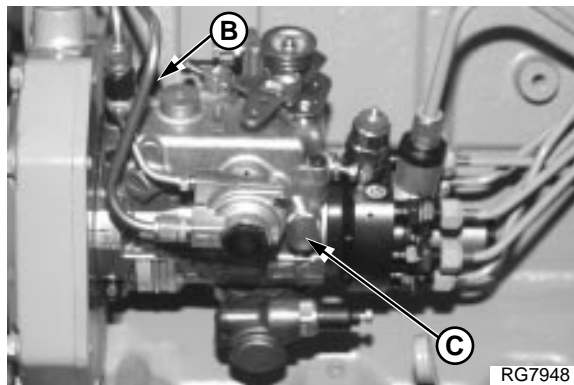


On Lucas rotary pumps:

1. Loosen bleed screw (B) on pump cover.

NOTE: On Models DP200/201 Injection Pumps, bleed screw is located on top of cover near the fuel return line.

2. Operate fuel supply pump primer lever or turn ignition switch to "ON".
3. Wait until fuel flow is free from air bubbles. Tighten bleed screw.
4. Leave hand primer in the inward position toward cylinder block.



CAUTION: NEVER loosen screw (C) securing pump head, otherwise pump damage may occur.

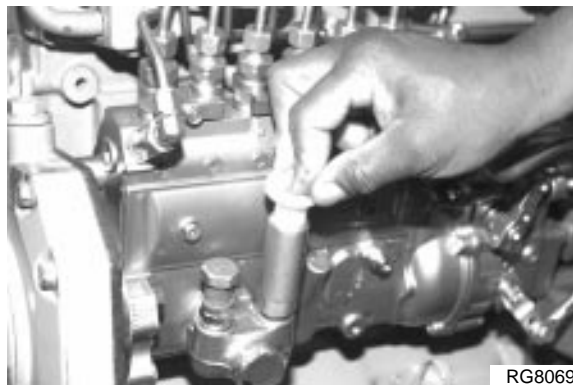
BLEEDING THE FUEL SYSTEM—CONTINUED

On Nippondenso in-line pumps:

1. Unscrew hand primer on fuel supply pump until it can be pulled by hand.
2. Operate the hand primer until a smooth flow of fuel, free of bubbles, comes out of the filter plug hole.

IMPORTANT: Be sure hand primer is all the way down in barrel before tightening to prevent internal thread damage.

3. 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.
4. Lock hand primer in position.



• At Fuel Injection Nozzles:

1. Move the speed control lever to half throttle position. On engines equipped with electronic fuel shut-off solenoid, energize solenoid.
2. Using two open-end wrenches, loosen fuel line connection at injection nozzle.
3. Crank engine over with starting motor, (but do not start engine), until fuel free from bubbles flows out of loosened connection. Retighten connection to 27 N·m (20 lb-ft).
4. Repeat procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.



If engine still will not start, see your authorized servicing dealer or engine distributor.

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.

ENGINE WIRING DIAGRAM LEGEND

A1—Speed Control Unit	G2—Alternator	P3—Crankcase Oil Level Switch/Gauge	Y2—Fuel Shut-off Solenoid
B1—Magnetic Speed Sensor	H1—Coolant Temperature Indicator Lamp	P4—Tachometer	Y3—Electric Fuel Pump
B2—Coolant Temperature Sensor	H2—Oil Pressure Indicator Lamp	P5—Hourmeter	BLK—Black
B3—Oil Pressure Sensor	H3—Alternator Indicator Lamp	P6—Ammeter	BLU—Blue
F1—Starting Circuit Fuse (25 amp)	K1—Starter Relay	S1—Key Switch	BRN—Brown
F2—Safety Switch Fuse (10 amp)	K2—Fuel Shut-off Relay	S2—Magnetic Safety Switch	DK BLU—Dark Blue
F3—Tachometer Fuse (3 amp)	M1—Starter Motor		GRN—Green
G1—Battery	P1—Coolant Temperature Gauge		ORG—Orange
			PUR—Purple
			RED—Red
			YEL—Yellow

WIRING DIAGRAM

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

The diagram illustrates the electrical system for a vehicle, featuring a key switch and various components connected to a battery. The key switch has four positions: OFF, ACC., ON, and START, with corresponding terminals B, G, ACC., ON, and ST. The battery (BATT.) is connected to a fuse (F1) and the key switch. The key switch controls the ACC. lamp (P4), the ignition switch (S2), and the starter motor (M1). The ignition switch (S2) is connected to the battery, a fuse (F2), and a relay (Y1). The starter motor (M1) is connected to the battery and a relay (Y1). The diagram also shows a horn (H), a bell (B1), a buzzer (G2), and a bell (B1). Various wires are labeled with colors and codes: RED OR BRN, PUR, WHT, DK BLU, BLK, RED, and Y2.

ENGINE TROUBLESHOOTING

SYMPTOM	PROBLEM	SOLUTION
Engine cranks but will not start	Incorrect starting procedure.	Verify correct starting procedure.
	No fuel.	Check fuel in tank and manual shut-off valve.
	Exhaust restricted.	Check and correct exhaust restriction.
	Fuel filter plugged or full of water.	Replace fuel filter or drain water from filter.
	Injection pump not getting fuel or air in fuel system.	Check fuel flow at supply pump or bleed fuel system.
	Faulty injection pump or nozzles.	Consult authorized diesel repair station for repair or replacement.
Engine hard to start or will not start	Engine starting under load.	Disengage PTO.
	Improper starting procedure.	Review starting procedure.
	No fuel.	Check fuel tank.
	Air in fuel line.	Bleed fuel line.
	Cold weather.	Use cold weather starting aids.
	Slow starter speed.	See "Starter Cranks Slowly".
	Crankcase oil too heavy.	Use oil of proper viscosity.
	Improper type of fuel.	Consult fuel supplier; use proper type fuel for operating conditions.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
	Clogged fuel filter.	Replace filter element.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Injection pump shut-off not reset.	Turn key switch to "OFF" then to "ON".

Continued on next page

SYMPTOM	PROBLEM	SOLUTION
Engine knocks	Low engine oil level.	Add oil to engine crankcase.
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Low coolant temperature.	Remove and check thermostat.
	Engine overheating.	See "Engine Overheats".
Engine runs irregularly or stalls frequently	Low coolant temperature.	Remove and check thermostat.
	Clogged fuel filter.	Replace fuel filter element.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
Below normal engine temperature	Defective thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check gauge, sender, and connections.

Continued on next page

SYMPTOM	PROBLEM	SOLUTION
Lack of power	Engine overloaded.	Reduce load.
	Intake air restriction.	Service air cleaner.
	Clogged fuel filter.	Replace filter elements.
	Improper type of fuel.	Use proper fuel.
	Overheated engine.	See "Engine Overheats".
	Below normal engine temperature.	Remove and check thermostat.
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning. (Turbocharger engines only.)	See your authorized servicing dealer or engine distributor.
	Leaking exhaust manifold gasket.	See your authorized servicing dealer or engine distributor.
	Defective aneroid control line.	See your authorized servicing dealer or engine distributor.
	Restricted fuel hose.	Clean or replace fuel hose.
	Low fast idle speed.	See your authorized servicing dealer or engine distributor.
Low oil pressure	Low oil level.	Add oil.
	Improper type of oil.	Drain, fill crankcase with oil of proper viscosity and quality.
High oil consumption	Crankcase oil too light.	Use proper viscosity oil.
	Oil leaks.	Check for leaks in lines, gaskets, and drain plug.
	Restricted crankcase vent tube.	Clean vent tube.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.

Continued on next page

SYMPTOM	PROBLEM	SOLUTION
Engine emits white smoke	Improper type of fuel.	Use proper fuel.
	Low engine temperature.	Warm up engine to normal operating temperature.
	Defective thermostat.	Remove and check thermostat.
	Defective injection nozzles.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
Engine emits black or gray exhaust smoke	Improper type of fuel.	Use proper fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
	Engine overloaded.	Reduce load.
	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.
Engine overheats	Engine overloaded.	Reduce load.
	Low coolant level.	Fill radiator to proper level, check radiator and hoses for loose connections or leaks.
	Faulty radiator cap.	Have serviceman check.
	Stretched poly-vee belt or defective belt tensioner.	Check automatic belt tensioner and check belts for stretching. Replace as required.
	Low engine oil level.	Check oil level. Add oil as required.
	Cooling system needs flushing.	Flush cooling system.
	Defective thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check water temperature with thermometer and replace, if necessary.
	Incorrect grade of fuel.	Use correct grade of fuel.

Continued on next page

SYMPTOM	PROBLEM	SOLUTION
High fuel consumption	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.

ELECTRICAL TROUBLESHOOTING

SYMPTOM	PROBLEM	SOLUTION
Undercharged system	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter, or alternator.	Inspect and clean as necessary.
	Defective battery.	Test battery.
	Defective alternator.	Test charging system.
Battery uses too much water	Cracked battery case.	Check for moisture and replace as necessary.
	Defective battery.	Test battery.
	Battery charging rate too high.	Test charging system.
Batteries will not charge	Loose or corroded connections.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Stretched poly-vee belt or defective belt tensioner.	Adjust belt tension or replace belts.
Starter will not crank	PTO engaged.	Disengage PTO.
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output voltage.	See your authorized servicing dealer or engine distributor.
	Faulty start circuit relay.	See your authorized servicing dealer or engine distributor.
	Blown fuse (MDL-25)	Replace fuse.

Continued on next page

SYMPTOM	PROBLEM	SOLUTION
Starter cranks slowly	Low battery output.	See your authorized servicing dealer or engine distributor.
	Crankcase oil too heavy.	Use proper viscosity oil.
	Loose or corroded connections.	Clean and tighten loose connections.
Starter and hour meter functions; rest of electrical system does not function	Blown fuse on magnetic switch.	Replace fuse.
Entire electrical system does not function	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Blown fuse (MDL-25).	Replace fuse.

Storage

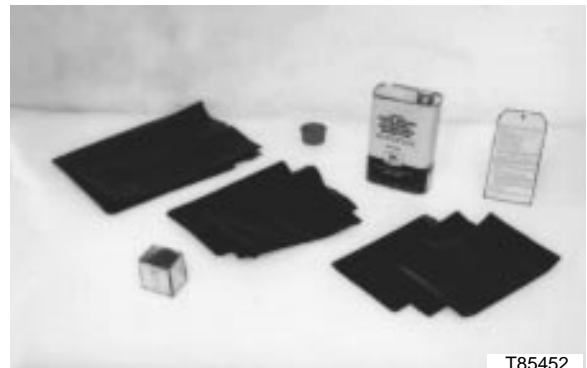
ENGINE STORAGE GUIDELINES

1. John Deere engines can be stored outside for up to three (3) months with no long term preparation IF COVERED BY WATERPROOF COVERING.
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.)
5. For John Deere engines not yet installed in machines, run a line from a container of AR41937 Nucle Oil to the fuel transfer pump intake, and another line from the fuel return manifold to the tank, so that Nucle Oil is circulated through the injection system during cranking.

USE AR41785 ENGINE STORAGE KIT

See your John Deere servicing dealer or engine distributor for an AR41785 Engine Storage Kit. Closely follow instructions provided with this kit.

IMPORTANT: Inhibitors can easily change to gas. Seal or tape each opening immediately after adding inhibitor.



T85452

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. Use the AR41785 Engine Storage Kit. Follow recommended service procedure included with storage kit.

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 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. Drain fuel tank and add 30 ml (1 oz) of inhibitor to the fuel tank for each 15 L (4 U.S. gal) of tank capacity. Completely drain fuel filter and close fuel valve, if equipped.
5. Add 30 ml (1 oz) of inhibitor to the engine crankcase for each 0.95 L (1 qt) of crankcase oil.
6. Disconnect air intake piping from the manifold. Pour 90 ml (3 oz) of inhibitor into intake system and reconnect the piping.
7. Crank the engine several revolutions with starter (do not allow the engine to start).
8. Remove fan/alternator poly-vee belt, if desired.
9. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
10. Disengage the PTO clutch.
11. Clean the exterior of the engine with salt-free water and touchup any scratched or chipped painted surfaces with a good quality paint.
12. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
13. Seal all openings on engine with plastic bags and tape supplied in storage kit. Follow instructions supplied in kit.
14. Store the engine in a dry protected place. If engine must be stored outside, cover it with a waterproof canvas or other suitable protective material and use a strong waterproof tape.

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.

IMPORTANT: DO NOT operate starter more than 30 seconds at a time. Wait at least 2 minutes for starter to cool before trying again.

1. Remove all protective coverings from engine. Unseal all openings in engine and remove covering from electrical systems.
2. Remove the batteries from storage. Install batteries (fully charged) and connect the terminals.
3. Install fan/alternator poly-vee belt if removed.
4. Fill fuel tank.
5. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS in Engine Operating Guidelines Section.)
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.

Specifications

GENERAL OEM ENGINE SPECIFICATIONS

ITEM	UNIT OF MEASURE	4045DF150	4045TF150	4045TF250
Number of Cylinders	—	4	4	4
Fuel	—	Diesel	Diesel	Diesel
Bore	mm (in.)	106 (4.19)	106 (4.19)	106 (4.19)
Stroke	mm (in.)	127 (5.00)	127 (5.00)	127 (5.00)
Displacement	L (cu in.)	4.5 (276)	4.5 (276)	4.5 (276)
Compression Ratio	—	17.6:1	17.0:1	17.0:1
Physical Dimensions:				
Width	mm (in.)	598 (23.5)	598 (23.5)	598 (23.5)
Height	mm (in.)	854 (33.6)	980 (38.6)	980 (38.6)
Length	mm (in.)	861 (33.9)	861 (33.9)	861 (33.9)
Basic Dry Weight	kg (lb)	387 (851)	396 (872)	396 (872)

GENERAL OEM ENGINE SPECIFICATIONS—CONTINUED

ITEM	UNIT OF MEASURE	6068DF150	6068TF150	6068TF250
Number of Cylinders	—	6	6	6
Fuel	—	Diesel	Diesel	Diesel
Bore	mm (in.)	106 (4.19)	106 (4.19)	106 (4.19)
Stroke	mm (in.)	127 (5.00)	127 (5.00)	127 (5.00)
Displacement	L (cu in.)	6.8 (414)	6.8 (414)	6.8 (414)
Compression Ratio	—	17.6:1	17.0:1	17.0:1
Physical Dimensions:				
Width	mm (in.)	598 (23.5)	598 (23.5)	598 (23.5)
Height	mm (in.)	956 (37.6)	984 (38.7)	984 (38.7)
Length	mm (in.)	1117 (44.0)	1117 (44.0)	1117 (44.0)
Basic Dry Weight	kg (lb)	522 (1149)	533 (1172)	533 (1172)

FUEL INJECTION PUMP SPECIFICATIONS¹

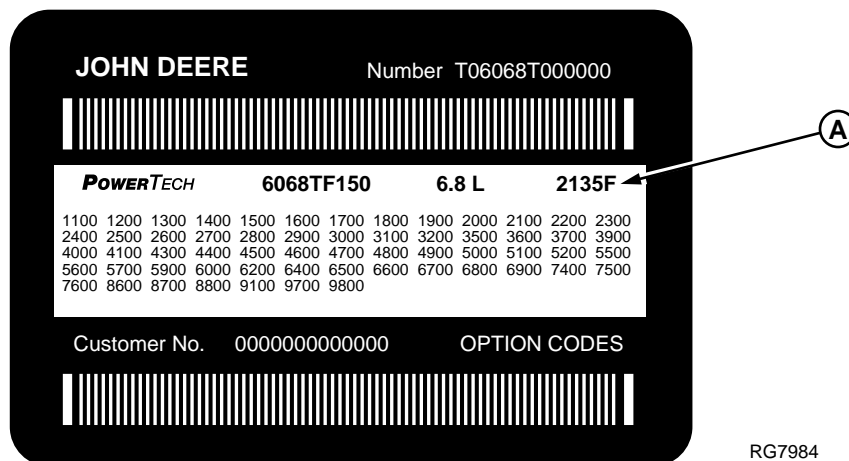
ENGINE MODEL	INJECTION PUMP OPTION CODES	POWER RATING @ RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED ² (rpm)	SLOW IDLE (rpm)	FAST IDLE ³ (rpm)
4045DF150	1601, 1671	60 (80)	2500	850	2700
	1602	63 (84)	2500	850	2700
	1603, 1673, 1674	53 (71)	1800	—	1890
4045TF150	1605, 1675	86 (115)	2500	850	2700
	1656, 1677	75 (100)	1800	—	1890
	1694, 1695	75 (100)	2500	850	2700
4045TF250	1606, 1667, 1683	93 (125)	2400	850	2600
	1608, 1682	84 (112)	1800	—	1890
6068DF150	1613, 1678	93 (125)	2500	850	2700
6068TF150	1614, 1680	127 (170)	2500	850	2700
	1681, 1688	112 (150)	1800	—	1890
	1696, 1697	116 (155)	2500	850	2700
6068TF250	1615, 1668, 1686	138 (185)	2400	850	2600
	1619, 1685	124 (166)	1800	—	1890

¹ Engine speeds listed are preset to factory specification. Slow idle speed may be reset depending upon specific vehicle application requirements. Refer to your machine operator's manual for engine speeds that are different from those preset at the factory.

² 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.

³ 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.

ENGINE CRANKCASE OIL FILL QUANTITIES



RG7984

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:

“CD” indicates the engine was built in Saran, France
 “T0” indicates the engine was built in Dubuque, 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.

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



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 (40) identify the dipstick tube group. The last two digits of each code identify the specific dipstick and tube assembly on your engine.

Listed below are engine crankcase oil fill quantities:

Engine Model	Oil Pan Option Code (s)	Crankcase Oil Capacity
4045DF150	1901, 1902	8.5 L (9.0 qt)
4045DF150, 4045TF150, 4045TF250	1903	13.0 L (14.0 qt)
4045DF150, 4045TF150, 4045TF250	1904	13.5 L (14.5 qt)
6068DF150, 6068TF150, 6068TF250	1907, 1908, 1909	19 L (20.0 qt)

Crankcase oil capacity may vary slightly from amount shown. ALWAYS fill crankcase to full mark or between arrows on dipstick, whichever is present. DO NOT overfill.

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES

SAE Grade and Head Markings	1 or 2 ^b	5	5.1	5.2	8	8.2
	NO MARK 					
SAE Grade and Nut Markings	2	5			8	
	NO MARK 					

Size	Grade 1				Grade 2 ^b				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a	
	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.





















^b Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

METRIC BOLT AND CAP SCREW TORQUE VALUES

Property Class and Head Markings	4.8		8.8		9.8		10.9		12.9	
										
Property Class and Nut Markings	5		10		10		10		12	
										

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a	
	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	255	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical class.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

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.

DAILY (PRESTARTING) SERVICE

- Check engine oil level.
- Check coolant level.
- Lubricate PTO release bearing.
- Check air cleaner dust unloader valve and air restriction indicator, if equipped.
- Visual walkaround inspection.

50 HOUR/EVERY 2 WEEKS SERVICE

- Check fuel filter.
- Lubricate PTO clutch shaft bearings.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

250 HOUR SERVICE

- Change engine oil and filter.*
- Service battery.
- Service fire extinguisher.
- Check PTO clutch adjustment.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

* If John Deere PLUS-50 oil is used along with a John Deere oil filter, the oil change interval may be extended by 50 hours.

600 HOUR/12 MONTH SERVICE

- Lubricate PTO clutch internal levers and linkage.
- Clean crankcase vent tube.
- Replace fuel filter element.
- Check automatic belt tensioner and belt wear.
- Check cooling system.
- Coolant solution analysis – add SCAs as needed.
- Check air intake hoses, connections, and system.
- Replace air cleaner elements.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

1200 HOUR/24 MONTH SERVICE

- Flush cooling system.*
- Check crankshaft vibration damper (6-cylinder only).
- Have your authorized servicing dealer or engine distributor pressure test overall cooling system and cap.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

** If John Deere Antifreeze/Summer Coolant Concentrate or John Deere COOL-GARD is used, the flushing interval may be extended to 2000 hours. If John Deere Prediluted Antifreeze/Summer Coolant is used, the flushing interval may be extended to 3000 hours or 36 months, whichever occurs first.*

2000 HOUR SERVICE

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

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

SERVICE AS REQUIRED

- Service air cleaner.
- Replace poly-vee belts.

Hours									
Date									
Hours									
Date									
Hours									
Date									
Hours									
Date									

Emission System Warranty

EMISSIONS CONTROL SYSTEM WARRANTY LABEL

NOTE: Emission system warranty applies only to **POWERTECH** 6.8 L engines with a power rating of 131 kW (175 hp) or above at this time. As of 01 January 1997, the emission system warranty will apply to all **POWERTECH** 4.5 L and 6.8 L engines.

The emissions warranty described below applies only to those engines that have been certified by the Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB). The presence of an emissions label like the one shown to the right signifies that the engine has been certified with the EPA and CARB. The EPA and CARB emissions warranties do not apply to engines that were built before 01 January 1996.



RG7357

U.S. 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".

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT

Your Warranty Rights and Obligations

The California Air Resources Board (CARB) and John Deere are pleased to explain the emission control system on your new engine. In California, new heavy-duty engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. John Deere must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect, or improper maintenance of your engine.

Your emissions control system includes:

- Fuel Metering System
- Fuel Injection System
- Air Induction System
- Intake Manifold
- Turbocharger System
- Charge Air Cooling System
- Miscellaneous Items used in above systems

Where a warrantable condition exists, i.e. failure due to defect in John Deere-supplied material and/or workmanship, John Deere will repair your heavy-duty engine at no cost to you including diagnosis, parts and labor.

John Deere's Warranty Coverage:

The emission control system of your heavy-duty engine is warranted for five years or 3000 hours of operation, whichever occurs first. If any emission-related part on your engine is defective, the part will be repaired or replaced by John Deere. 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".

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT—CONTINUED

Owner's Warranty Responsibilities:

As the heavy-duty engine owner, you are responsible for the performance of the required maintenance as outlined in this Operation and Maintenance Manual. John Deere recommends that you retain all receipts covering maintenance on your heavy-duty engine, but John Deere cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

However, as the heavy-duty engine owner, you should be aware that John Deere may deny you warranty coverage if your heavy-duty engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.

You are responsible for initiating the warranty process. The CARB suggests that you present your heavy-duty engine to the nearest John Deere engine service dealer as soon as a problem is suspected. The warranty repairs should be completed by the service dealer as expeditiously as possible.

If you have any questions regarding your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

The warranty period begins on the date the engine is delivered to an ultimate purchaser, or when otherwise put into service. John Deere warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board, and that it is free from defects in materials and workmanship which would cause the failure of a warranted part.

Any warranted part which is scheduled for replacement as required maintenance by this Operation and Maintenance Manual is warranted by John Deere for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement point, the part shall be repaired or replaced under the warranty. Any such part repaired or replaced under warranty is warranted for the remainder of the period prior to the first scheduled replacement point for the part.

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of repairing or replacing as necessary, is warranted for the warranty period.

Repair or replacement of a warranted part will be performed at no charge to you by a John Deere engine service dealer. You will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, if the diagnostic work is performed by a John Deere engine service dealer.

John Deere is liable for damages to other engine components caused by the failure under warranty of any warranted part.

Any replacement part may be used in the performance of any maintenance or repairs, and such use will not reduce the warranty obligations of John Deere. However, the use of add-on or modified parts are grounds for disallowing a warranty claim.

John Deere Service Literature Available

OPERATOR'S MANUAL

The operator's manual provides safety, operating, maintenance, and service information about John Deere engine.

An extra copy of the operator's manual is available. The operator's manual and safety signs on your engine may also be available in other languages. (See your John Deere dealer to order.)



RG7258

PARTS CATALOG

The parts catalog lists service parts available for your engine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.



RG7252

TECHNICAL AND SERVICE MANUALS

Technical and service manuals are service guides for your machine. Included in the manual are specifications, diagnosis, and adjustments; also illustrations of assembly and disassembly procedures, hydraulic oil flows, and wiring diagrams.

Component technical manuals are required for some products. These supplemental manuals cover specific components.



RG7254

FMO AND FOS MANUALS

Covering all types of vehicles, regardless of manufacturer, each book starts with basic theory and proceeds through complex systems. There are four series:

- Farm Business Management (FBM)
- Fundamentals of Machine Operation (FMO)
- Fundamentals of Service (FOS)
- Fundamentals of Compact Equipment Service (FCP)



TS1646

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To order, fill out this form and mail it to the address above. Check for prices with your John Deere dealer or call **1-800-522-7448**. You may also place credit card orders by calling this number. Make checks payable to Deere & Co. Service Publications. Allow three weeks for delivery. No COD orders. Do not send cash or stamps. If you want manuals or catalogs for equipment not shown on this list, provide the model number, serial number, and name of product.

Title	Order Number	Price Each	x Quantity	= Total
POWERTECH 4.5 L and 6.8 L OEM Engines				
Operator's Manual (English)	OMRG25204		x	=
Parts Catalog POWERTECH 4.5 L POWERTECH 6.8 L	PC2521 PC2522		x	=
Component Technical Manual POWERTECH 4.5 L and 6.8 L Engines	CTM104		x	=
OEM Engine Accessories	CTM67		x	=
Alternators and Starting Motors	CTM77		x	=
FOS Manual—Hydraulics	FOS1005B		x	=
FOS Manual—Electrical Systems	FOS2006B		x	=
FOS Manual—Engines	FOS3007B		x	=
FOS Manual—Power Trains	FOS4006B		x	=
FOS Manual—Shop Tools	FOS5105B		x	=
FOS Manual—Welding	FOS5207B		x	=
FOS Manual—Belts and Chains	FOS5304B		x	=
FOS Manual—Bearings and Seals	FOS5405B		x	=
FOS Manual—Tires and Tracks	FOS5507B		x	=
FOS Manual—Air Conditioning	FOS5707B		x	=
FOS Manual—Fuels Lubricants & Coolant	FOS5807B		x	=
FOS Manual—Fasteners	FOS6004B		x	=
FOS Manual—Identification of Parts Failures	FOS6104B		x	=
1-inch 3-Ring Binder (400 pages max.)	SX2062		x	=
1 1/2-inch 3-Ring Binder (600 pages max.)	SX2063		x	=
1—1 1/2-inch 3-Post Binder (600 pages max.)	SX2066		x	=
2—3 1/2-inch 3-Post Binder (1400 pages max.)	SX2064		x	=
2—4-inch 4-Post Expandable (2000 pages max.)	SX2056		x	=
Catalog of Available Service Publications	DB1112	No Charge		
Subtotal				

Method of Payment

- ☐ Check or Money Order enclosed
☐ John Deere ☐ Farm Plan
☐ Master Card ☐ Discover
☐ Visa ☐ American Express

Credit Card Account Number (13 or 16 digits)

Expiration date: _____

Your Signature

Subtotal	Shipping & Handling
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50.00 to	99.99 . . . 5.50
100.00 to	199.99 . . . 7.50
200.00 and over	. . . 4% of subtotal

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☐ 1 day air \$15.00
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Total Shipping & Handling

Amount Due in U.S. Dollars
(Prices subject to change without notice.)

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John Deere Service Keeps You On the Job

JOHN DEERE PARTS

We help minimize downtime by putting genuine John Deere parts in your hands in a hurry.

That's why we maintain a large and varied inventory—to stay a jump ahead of your needs.



TS100

THE RIGHT TOOLS

Precision tools and testing equipment enable our Service Department to locate and correct troubles quickly . . . to save you time and money.



TS101

WELL-TRAINED TECHNICIANS

School is never out for John Deere service technicians.

Training schools are held regularly to be sure our personnel know your equipment and how to maintain it.

Result?

Experience you can count on!



TS102

PROMPT SERVICE

Our goal is to provide prompt, efficient care when you want it and where you want it.

We can make repairs at your place or at ours, depending on the circumstances: see us, depend on us.

JOHN DEERE SERVICE SUPERIORITY: We'll be around when you need us.



TS103

