POWERTECH 10.5 L & 12.5 L
6105 and 6125
OEM Diesel Engines

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

OPERATION AND MAINTENANCE MANUAL

Deere Power Systems Group
OMRG25752 (30JUN97)
LITHO IN U.S.A.
ENGLISH

JOHN DEERE

DEERE POWER

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 know 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 a votre Concessionnaire ou Point de Service le plus proche pour vous adresser a lui.

Renseignez-vous des que possible pour l’identifier et le localiser. A la premiere 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.

Engine Owner

Identification Views

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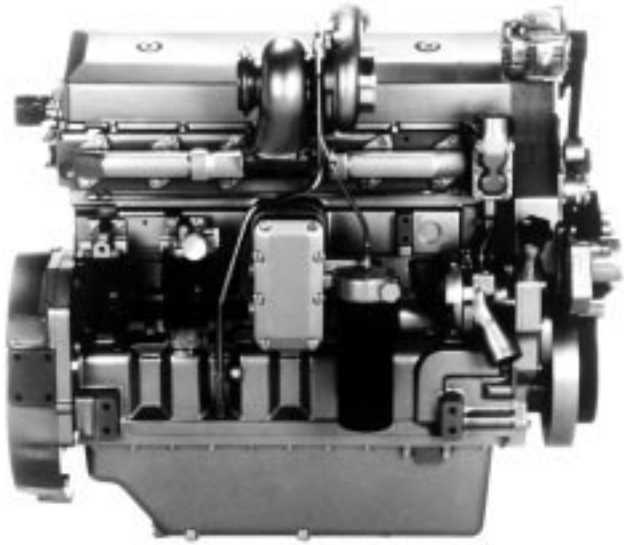
RG8694



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RG8697

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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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Record Keeping

POWERTECH MEDALLION

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

RG8739

RECORD ENGINE SERIAL NUMBER

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

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

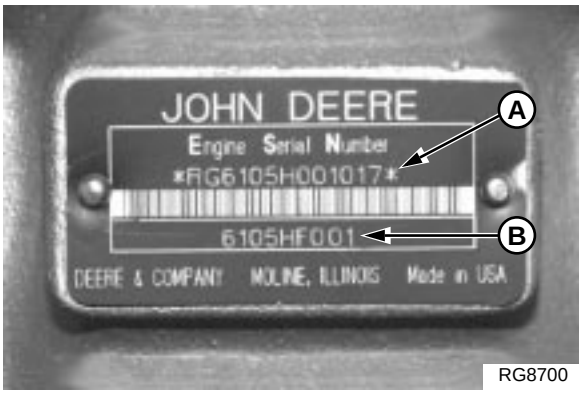
This information is very important for repair parts or warranty information.

Engine Serial Number (A)

_____

Application Data or Type(B)

_____



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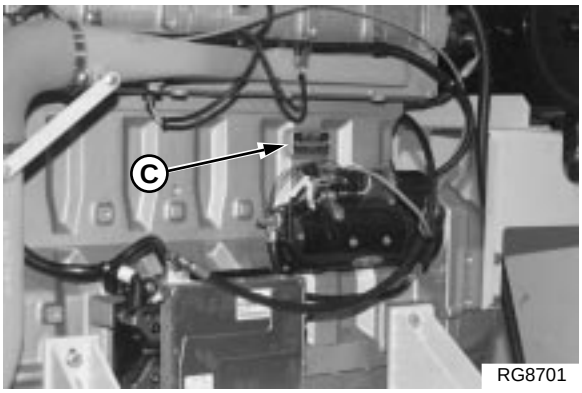
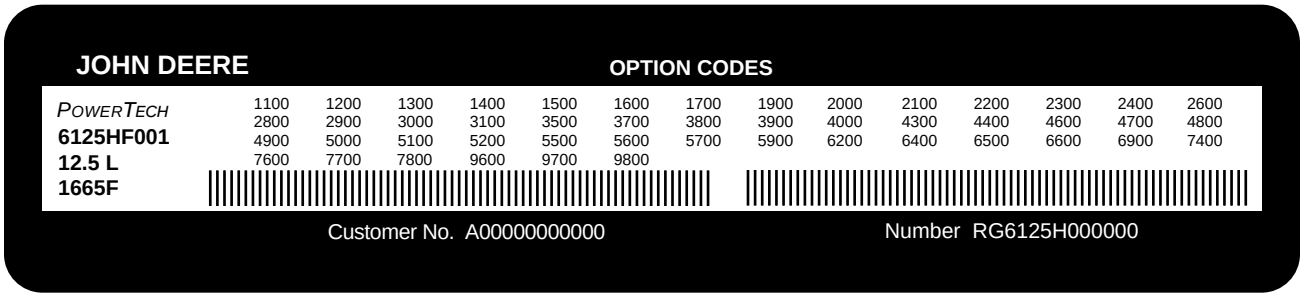


RG8701

ENGINE OPTION CODES



RG8740

Option Code Label

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

The first two digits of each code identify a specific group, such as alternators. The last two digits of each code identify one specific option provided on your engine, such as a 24-volt, 60-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

Option Codes	Description	Option Codes	Description
11 _____	Rocker Arm Cover	43 _____	Ether Starting Aid
12 _____	Oil Fill	44 _____	Electronic Speed Sensor
13 _____	Crankshaft Pulley	46 _____	Cylinder Block
14 _____	Flywheel Housing	47 _____	Crankshaft
15 _____	Flywheel	48 _____	Connecting Rods and Pistons
16 _____	Fuel System	49 _____	Rocker Arm Assembly
17 _____	Air Intake Manifold	50 _____	Oil Pump
19 _____	Oil Pan	51 _____	Cylinder Head
20 _____	Water Pump	52 _____	Gear-Driven Auxiliary Drive
21 _____	Thermostat Cover	55 _____	Transport Skid/Shipping Stand
22 _____	Thermostat	56 _____	Paint Option
23 _____	Fan Drive with Belt Tensioner	57 _____	Water Pump Inlet
24 _____	Fan Belt	59 _____	Oil Cooler
26 _____	Engine Coolant Heater	62 _____	Alternator Mounting
28 _____	Exhaust Manifold	64 _____	Exhaust Elbow
29 _____	Crankcase Vent System	65 _____	Turbocharger
30 _____	Starting Motor	66 _____	Coolant Temperature Sensor
31 _____	Alternator	69 _____	Engine Serial Number Plate
35 _____	Fuel Filter	74 _____	Air Conditioner Compressor Mounting
37 _____	Fuel Transfer Pump	76 _____	Oil Pressure Sensor
38 _____	Operator's Manual	77 _____	Timing Gear Cover
39 _____	Thermostat Housing	78 _____	Air Compressor
40 _____	Oil Dipstick and Tube	96 _____	Special Equipment (Factory Installed)
41 _____	Belt Driven Front Auxiliary Drive	97 _____	Special Equipment (Field Installed)
		98 _____	Shipping

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.

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.

TS187

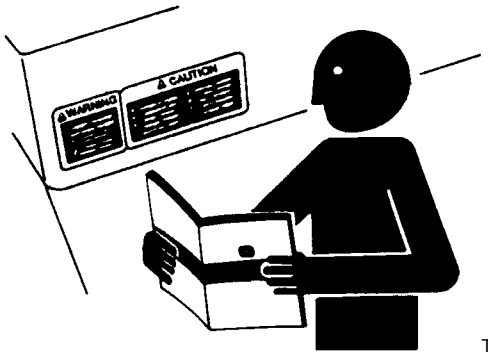
FOLLOW SAFETY INSTRUCTIONS

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.

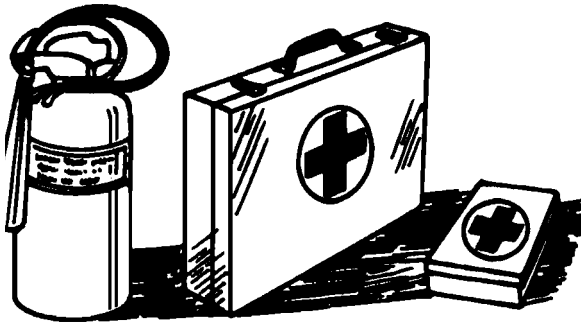
TS202

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

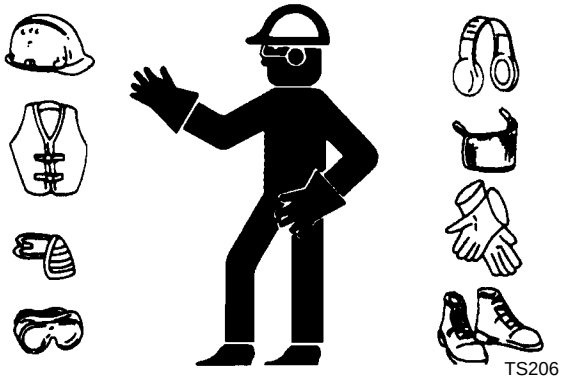
WEAR PROTECTIVE CLOTHING

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.

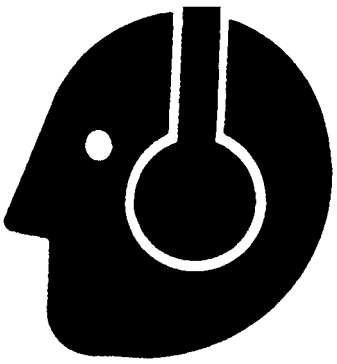


TS206

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

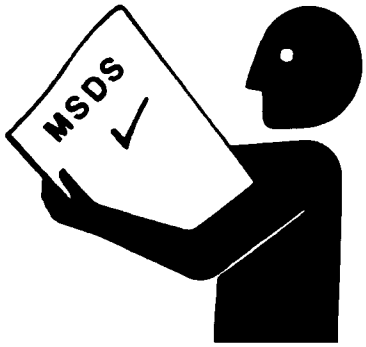
HANDLE CHEMICAL PRODUCTS SAFELY

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

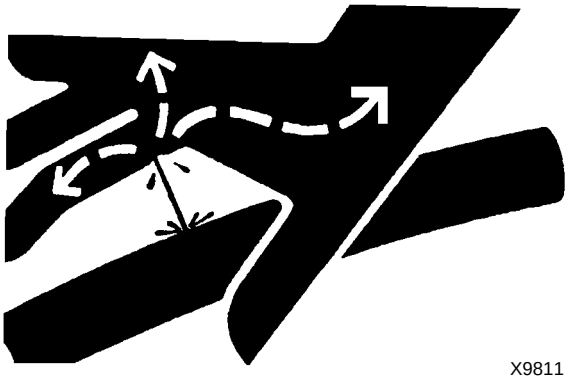
AVOID HIGH-PRESSURE FLUIDS

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

TS220

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.

SERVICE COOLING SYSTEM SAFELY

TS281

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.

AVOID HARMFUL ASBESTOS DUST

TS220

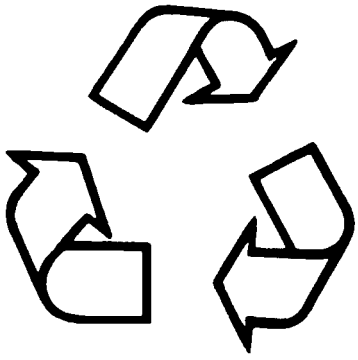
Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

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.

DISPOSE OF WASTE PROPERLY



TS1133

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.

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.


TS202

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 before the first 100 hours maximum 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 percent.

The following oil is also recommended:

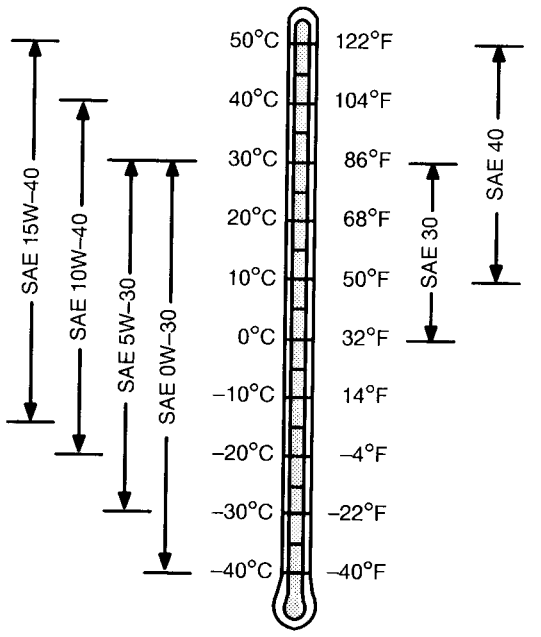
- John Deere TORQ-GARD SUPREME®

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.

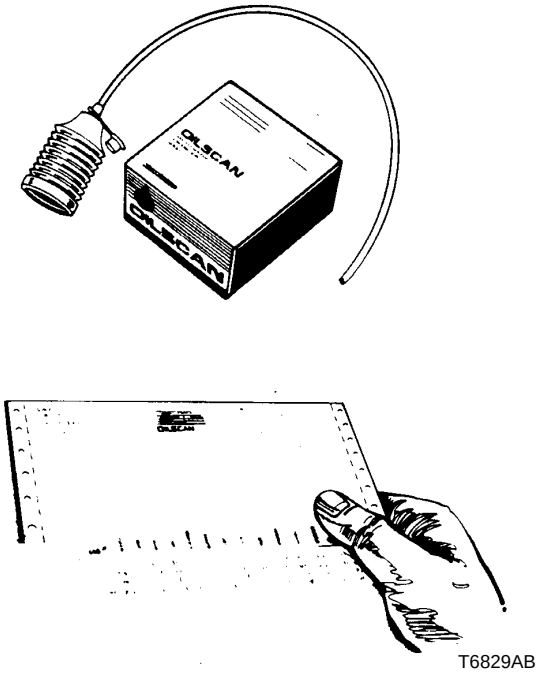
Consult your John Deere engine distributor or servicing dealer to obtain specific information and recommendations.

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

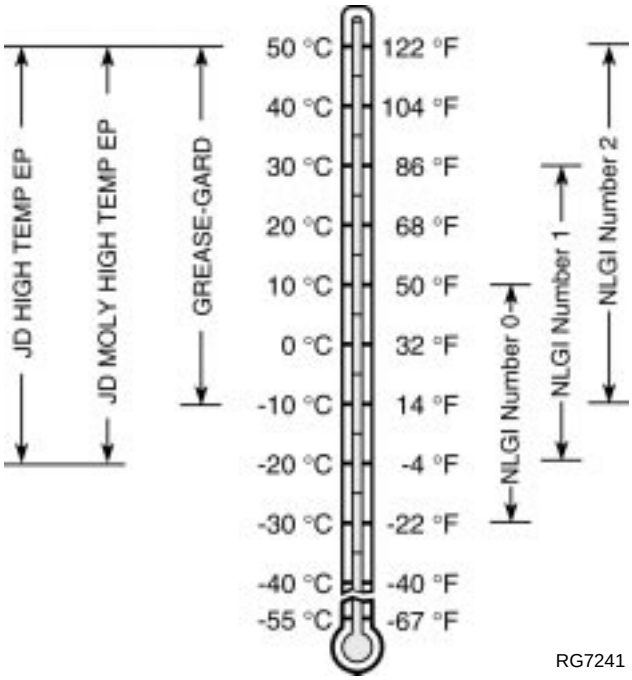
Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

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



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 5000 hours or 60 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 permits extended service life to 5000 hours or 60 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.

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

RG7297

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.

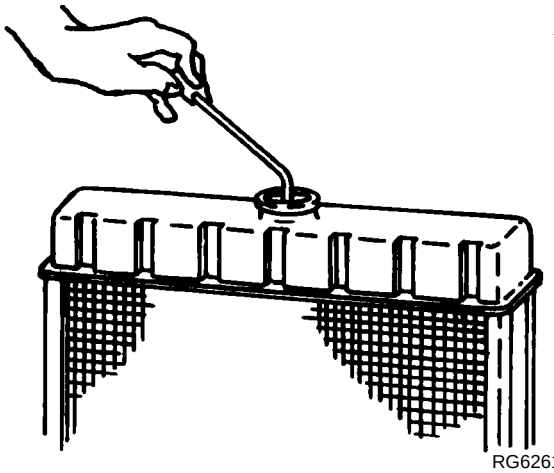

RG7397

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.

REPLENISHING SUPPLEMENTAL COOLANT ADDITIVES (SCAs) BETWEEN COOLANT CHANGES



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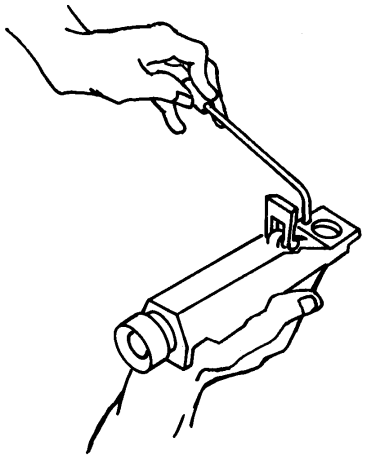


RG6262

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 CONDITIONER 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.

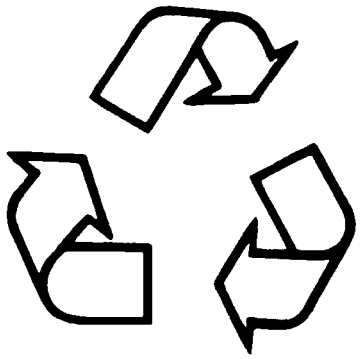
DISPOSING OF COOLANT

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

JOHN DEERE INSTRUMENT (GAUGE) PANEL

All electronic engine controls are optional equipment for John Deere *POWERTECH* OEM Engines. These electronic controls may be provided by the equipment manufacturer instead of purchased from John Deere. Refer to your engine application manual for specific guidelines if John Deere sourced controls and instrumentation are not used.

IMPORTANT: Whenever an electronic gauge or sensor does not register a correct reading, replace it with a new one. DO NOT attempt to repair it.

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

A—Oil Pressure Gauge - Indicates engine oil pressure.

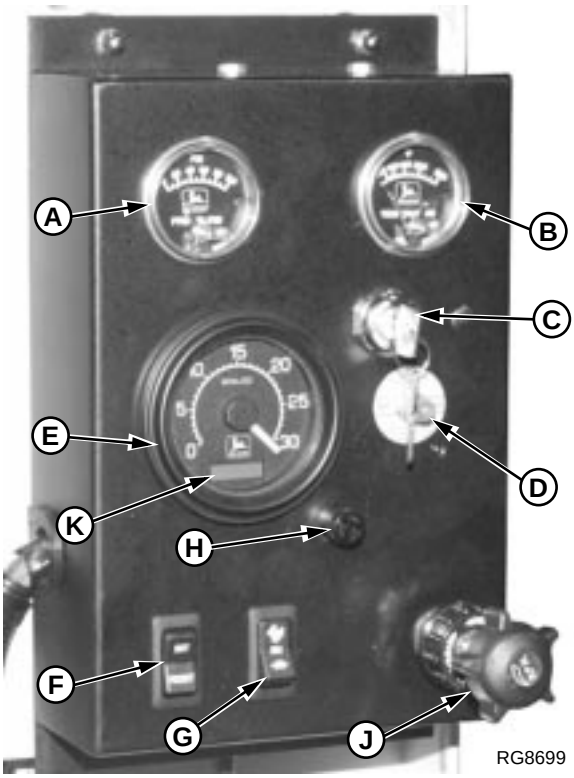
B—Coolant Temperature Gauge - Indicates engine coolant temperature.

C—Key Switch - The four position key switch controls the engine electrical system.

D—Automatic (Safety) Shutdown Switch - Switch will automatically shut off power to engine control unit (ECU) whenever oil pressure drops below or coolant temperature rises above a (preset) safe operating range. This switch is also equipped with a shutdown override button that is depressed and held in during engine start-up until oil pressure is above the preset shutdown range.

E—Analog Tachometer with Digital Display- Analog tachometer measures engine speed in revolutions per minute (rpm). Digital display (K), when used with tachometer toggle switch (F) is capable of providing engine diagnostic fault codes, digital engine rpm, battery voltage, coolant temperature, and an hour meter. Display defaults to hour meter function when selective functions are not requested.

F—Tachometer Toggle Switch - Three position (momentary) switch is used to selectively access the various functions available on the tachometer digital display (E) listed above by toggling on "SELECT" position. Toggle to "RESET" position to clear diagnostic fault codes.



A—Oil Pressure Gauge
B—Coolant Temperature Gauge
C—Key Switch
D—Automatic Shutdown Switch
E—Analog Tachometer with Digital Display
F—Tachometer Toggle Switch
G—Throttle Switch
H—Fuse Holder
J—Throttle Potentiometer
K—Digital Display (LCD)

G—Throttle Switch - Three position switch changes between adjustable and preset (slow idle, fast idle/rated) speeds.

H—Fuse Holder - Contains 30 amp fuse.

J—Analog Throttle Potentiometer - Used to manually adjust engine speeds.

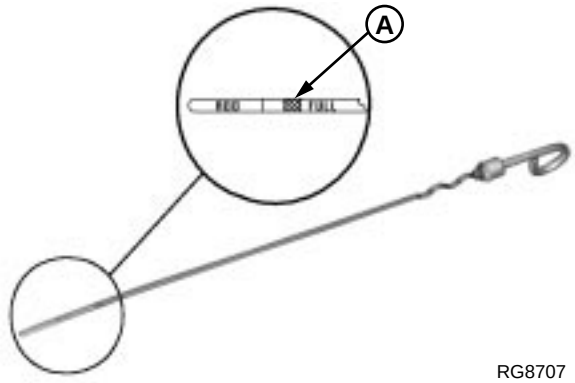
Refer to your engine applications manual for optional controls that may be adaptable to the John Deere instrument panel (such as foot throttle). Follow recommended guidelines closely for safe and reliable engine performance.

NORMAL ENGINE OPERATION

- Observe engine coolant temperature and engine oil pressure. Temperatures and pressures will vary between engines and with changing operating conditions, temperatures, and loads.
- Normal engine coolant operating temperature range is 82° – 94° C (180° – 202° F). If coolant temperature rises above 104° C (220° F), reduce load on engine. Unless temperature drops quickly, stop engine and determine cause before resuming operation.
- 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


RG8706



RG8707

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). Oil levels anywhere within the crosshatch are considered in the acceptable operating range.

ENGINE SPECIFICATIONS*

Oil Pressure at Full Load Rated Speed . . . . . .310 kPa (3.10 bar) (45 psi)

Oil Pressure at Low Idle . . . . . 138kPa (1.38 bar) (20 psi)

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

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

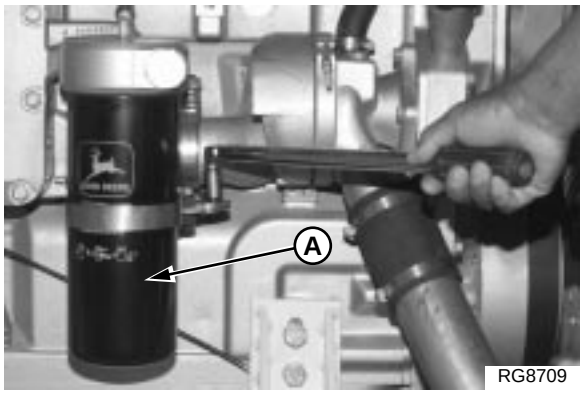
BREAK-IN SERVICE—CONTINUED

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. Before the first 100 hours (maximum), change engine oil and replace engine oil filter (A). (See CHANGING 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.



RG8709

6. Watch coolant temperatures (A) closely. If coolant temperature rises above 104° C (220° F), reduce load on engine. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

NOTE: When the coolant temperature gauge reads approximately 104 ° C (220 ° F), the engine will shutdown automatically, if equipped with safety controls.

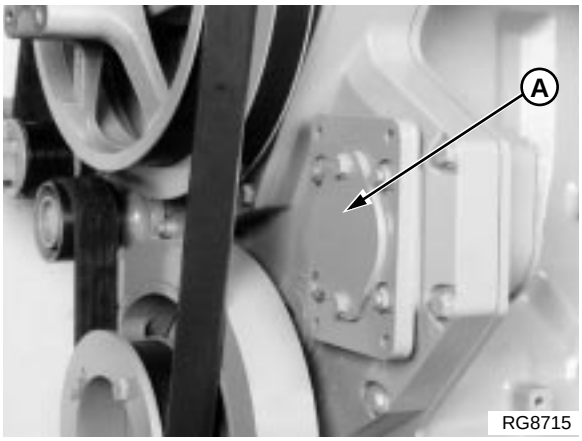
7. Check V-belts for proper alignment and seating in pulley grooves.

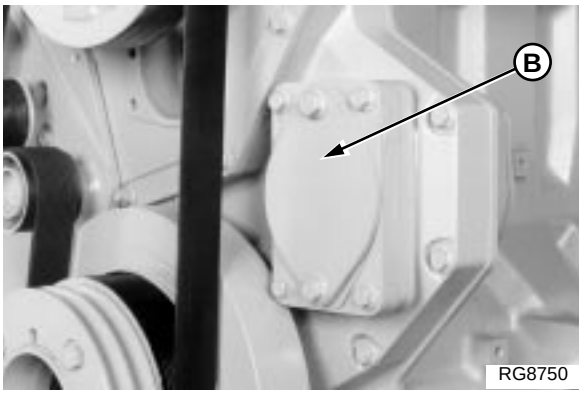
RG8699

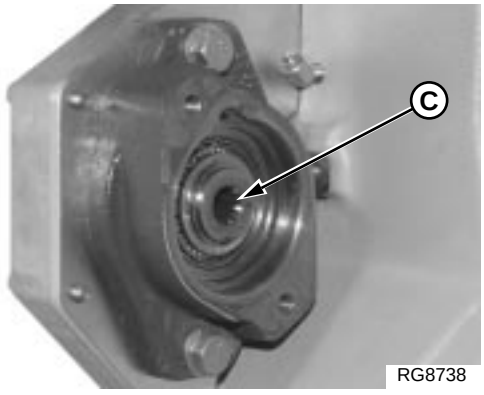
AUXILIARY GEAR DRIVE LIMITATIONS

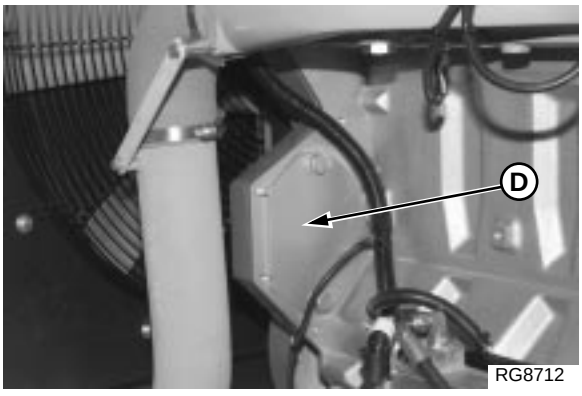
IMPORTANT: When attaching an air compressor, hydraulic pump, or other accessory to be driven by the auxiliary gear drive (engine timing gear train at front of engine), power requirements of the accessory must be limited to values listed below:

SAE Drive	Continuous Power	Intermittent Power
A	26 kW (35 hp)	30 kW (40 hp)
B or (A + B) or (B + B)	52 kW (70 hp)	60 kW (80 hp)
C	52 kW (70 hp)	60 kW (80 hp)









A—SAE “A”
B—SAE “B” Front
C—SAE “B” Rear
D—SAE “C”

GENERATOR SET (STANDBY) APPLICATIONS

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

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.

TS220

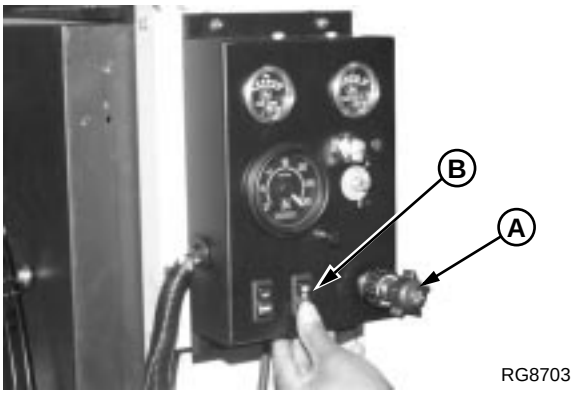
CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment. Always use safety approved fuel storage and piping.

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.

STARTING THE ENGINE—CONTINUED

3. Turn throttle potentiometer (A) all the way counterclockwise to slow idle position.
4. Change throttle switch (B) to center “ADJ” position.



STARTING THE ENGINE—CONTINUED

5. Depress and hold safety shutdown 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 (A) 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.

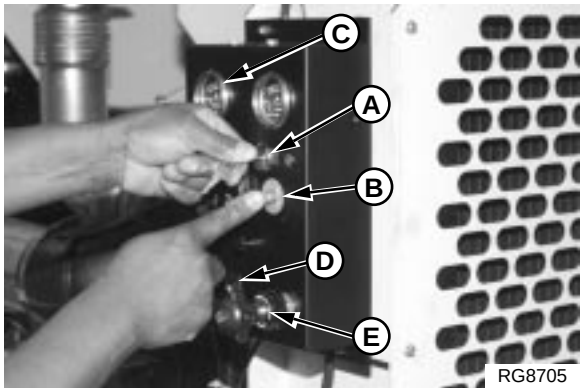
7. After the engine starts, continue to hold the reset button in until the oil pressure gauge (C) reads at least 138kPa (1.38 bar) (20 psi). The safety controls will not allow the engine to run at a lower oil pressure unless the reset button is held in.

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. Verify throttle switch (D) is at center “ADJ” position.

9. Turn throttle potentiometer (E) clockwise until engine is approximately 1200 rpm to warm up engine. (See WARMING ENGINE later in this section.)

10. Check all gauges for normal engine operation. If operation is not normal, stop the engine and determine the cause.



A—Key Switch
B—Safety Shutdown Reset Button
C—Oil Pressure Gauge
D—Throttle Switch
E—Throttle Potentiometer

COLD WEATHER OPERATION

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

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

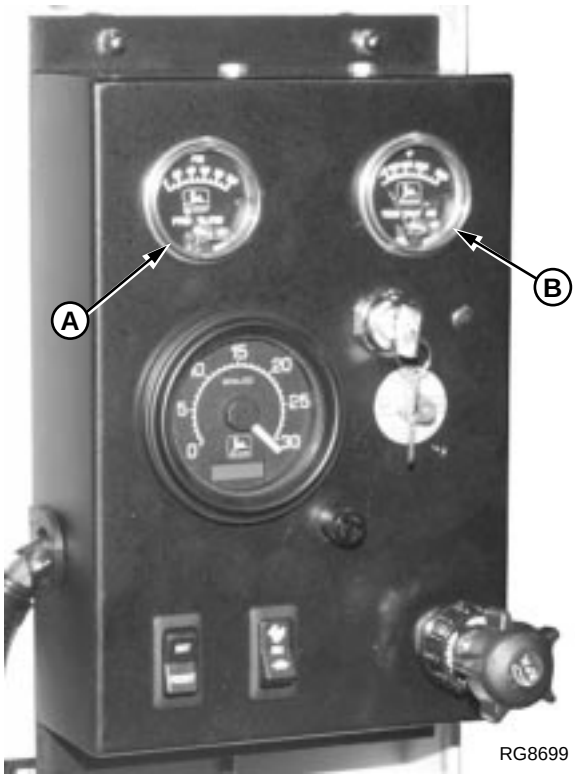
DO NOT use starting fluid near fire, sparks, or flames. DO NOT incinerate or puncture a starting fluid container.

TS1356

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 ECU is programmed to lock engine 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 100 kPa (1.00 bar) (15.0 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is 310±103 kPa (3.10±1.03 bar) (45±15 psi) at rated full load speed (1500–2100 rpm) with oil at normal operating temperature of 115° C (240° F).

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

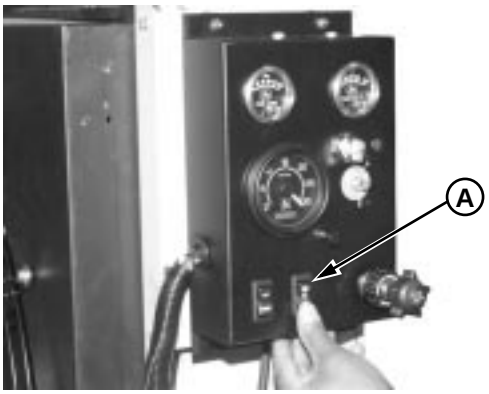
NOTE: It is a good practice to operate the engine under a lighter load and at lower speeds than normal for the first few minutes after start-up.

CHANGING ENGINE SPEED

- Changing from slow idle to fast idle using three position throttle switch (A):
  - — For slow idle, change throttle switch to down position (indicated by turtle symbol).
  - — For fast idle, change throttle switch to up position (indicated by rabbit symbol).
- Changing engine speed using throttle potentiometer (B):

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

1. Change three position throttle switch (A) to center “ADJ” position to generate an adjustable throttle input signal.
2. Turn throttle potentiometer clockwise to increase speed or counterclockwise to decrease speed.



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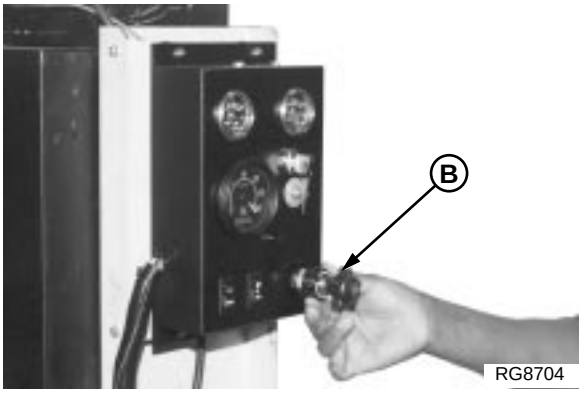


RG8704

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 ECU 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

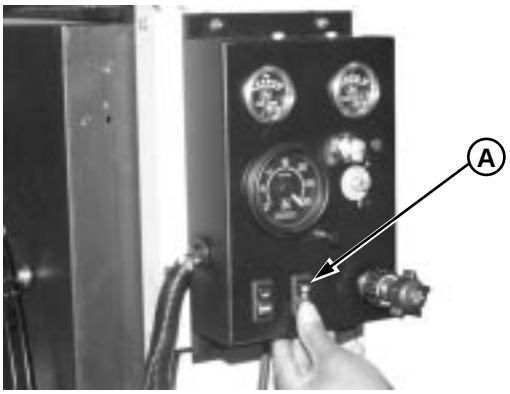
1. Pull PTO clutch lever rearward (away from engine) to disengage clutch, if equipped.
2. Change throttle switch (A) to center position to generate an analog throttle input signal.

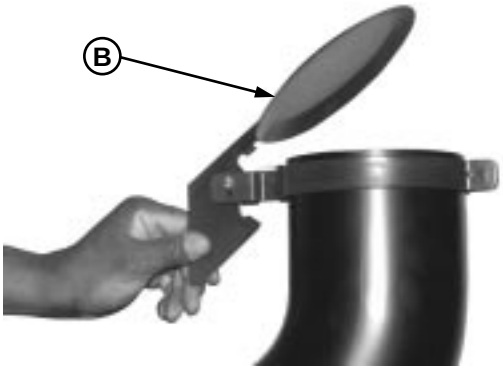
IMPORTANT: Before stopping an engine that has been operating at working load, idle engine at least 2 minutes at 1000–1200 rpm to cool hot engine parts.

Engines in generator set applications where the ECU is locked at a specified speed and no slow idle function is available, run engine for at least 2 minutes at fast idle and no load.

3. Run engine at 1000–1200 rpm for at least 2 minutes to cool.
4. Push in on throttle potentiometer handle so that engine goes to slow idle.
5. Turn key switch to “OFF” position to stop the engine. Remove ignition key.

IMPORTANT: Make sure that exhaust stack rain cap (B) 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.

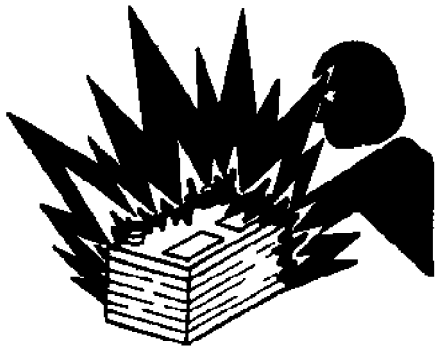
CAUTION: Gas given off by battery is explosive. Keep sparks and flames away from battery. Before connecting or disconnecting a battery charger, turn charger off. Make last connection and first disconnection at a point away from battery. Always connect NEGATIVE (–) cable last and disconnect this cable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

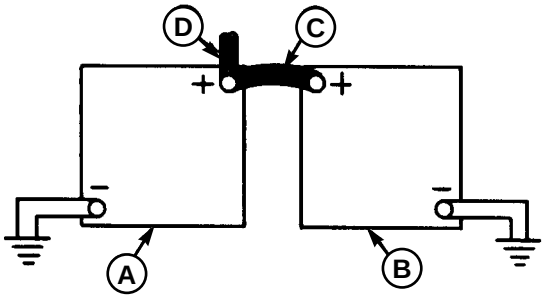
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

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.

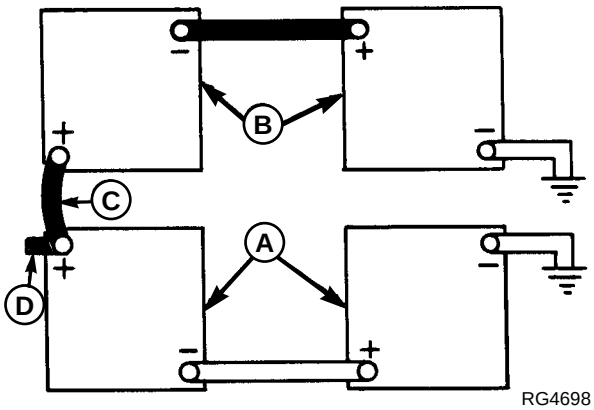


TS204



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

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.

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.

LUBRICATION AND MAINTENANCE SERVICE INTERVAL CHART—STANDARD

Item	Lubrication and Maintenance Service Intervals					
	Daily	**250 Hour**	**600 Hour/ 12 Month**	**1200 Hour/ 24 Month**	**2500 Hour**	**As Required**
Check Engine Oil and Coolant Level	•					
Check Fuel Filter/Water Separator Bowl	•					
Check Air Cleaner Dust Unloader Valve & Restriction Indicator Gauge [1]	•					
Visual Walkaround Inspection	•					
Service Fire Extinguisher		•				
Service Battery		•				
Change Engine Oil and Replace Oil Filter [2]		•				
Check Water Pump Weep Hole Foam Filter		•				
Clean Crankcase Ventilation Assembly			•			
Check Air Intake Hoses, Connections, & System			•			
Replace Primary/Water Separator and Secondary Fuel Filter Elements—Bleed Fuel System			•			
Check Automatic Belt Tensioners and Belt Wear			•			
Check Cooling System			•			
Coolant Solution Analysis-Add SCAs as required			•			
Check Crankshaft Vibration Damper				•		
Pressure Test Cooling System				•		
Flush Cooling System [3]				•		
Adjust Engine Valve Clearance & EUI Preload [4]					•	
Replace and Test Thermostats						•
Replace Air Cleaner Elements						•
Replace V-Belts						•

[1] Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H_2O.

[2] Change the oil for the first time before 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 percent to 375 hours.

[3] If John Deere COOL-GARD is used, the flushing interval may be extended to 2000 hours. If John Deere Prediluted Antifreeze/Summer Coolant or John Deere Antifreeze/Summer Coolant Concentrate is used, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

[4] This one-time adjustment is required after first 2500 hours for all new and overhauled engines.

LUBRICATION AND MAINTENANCE SERVICE INTERVAL CHART—GENERATOR (STANDBY) APPLICATIONS

NOTE: The service intervals in the Lubrication and Maintenance Sections that follow reflect standard engines. Use service intervals listed below for generator (standby) applications. Match service items below to titles in Lubrication and Maintenance Sections for procedures.

Item	Lubrication and Maintenance Service Intervals					
	Every 2 Weeks	**250 Hours or 12 Months**	**600 Hours or 12 Months**	**1200 Hours or 24 Months**	**2500 Hours**	**As Required**
Operate Engine at Rated Speed and 50%–70% Load a Minimum of 30 Minutes	•					
Check Engine Oil and Coolant Level	•					
Check Fuel Filter/Water Separator Bowl	•					
Check Air Cleaner Dust Unloader Valve & Restriction Indicator Gauge [1]	•					
Visual Walkaround Inspection	•					
Service Battery		•				
Change Engine Oil and Replace Oil Filter [2]		•				
Check Water Pump Weep Hole Foam Filter		•				
Clean Crankcase Ventilation Assembly			•			
Check Air Intake Hoses, Connections, & System			•			
Replace Primary/Water Separator and Secondary Fuel Filter Elements—Bleed Fuel System			•			
Check Automatic Belt Tensioners and Belt Wear			•			
Check Cooling System			•			
Coolant Solution Analysis-Add SCAs as required			•			
Check Crankshaft Vibration Damper				•		
Pressure Test Cooling System				•		
Flush Cooling System [3]				•		
Adjust Engine Valve Clearance and EUI Preload [4]					•	
Replace and Test Thermostats						•
Replace Air Cleaner Elements						•
Replace V-Belts						•

[1] Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H_2O.

[2] Change the oil for the first time before 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 percent to 375 hours.

[3] If John Deere COOL-GARD is used, the flushing interval may be extended to 2000 hours. If John Deere Prediluted Antifreeze/Summer Coolant or John Deere Antifreeze/Summer Coolant Concentrate is used, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

[4] This one-time adjustment is required after first 2500 hours for all new and overhauled engines.

DAILY PRESTARTING CHECKS

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

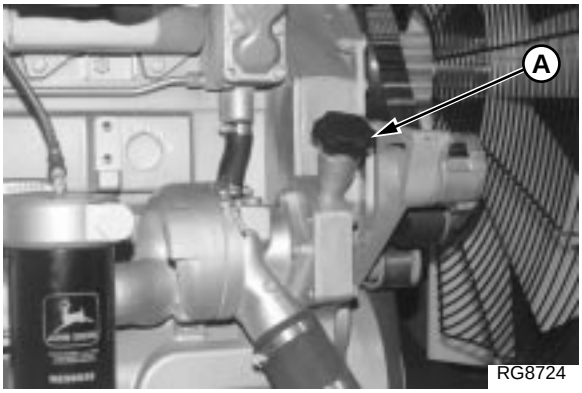
IMPORTANT: DO NOT add makeup oil until the oil level is BELOW the add mark.

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.)

Oil may be added at timing gear cover filler cap (A) or oil pan filler adapter ports (B), if equipped.

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


RG8706



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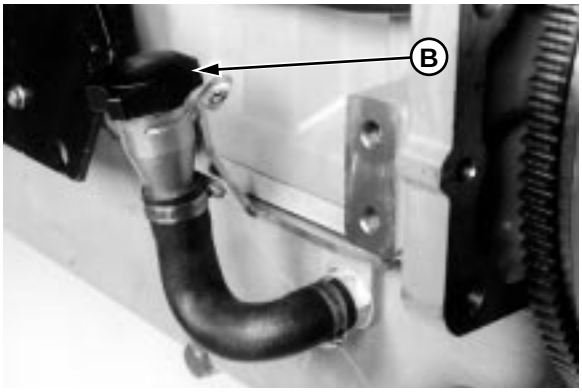
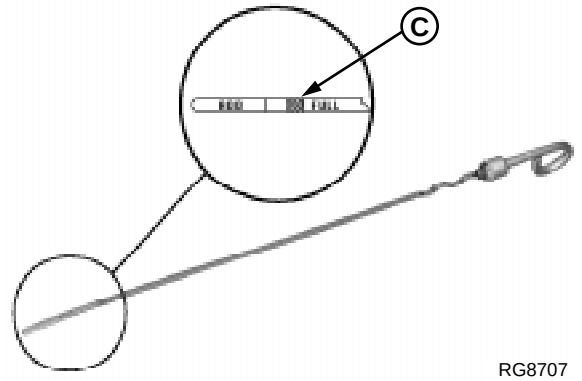




RG8707

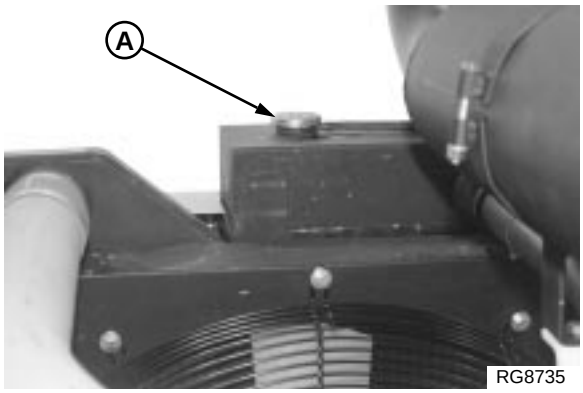
CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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.


TS281

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.

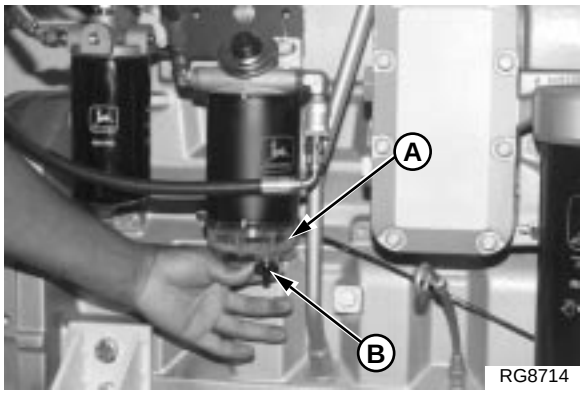


RG8735

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

   Loosen thumb screw (B) and drain water and debris from bowl into a suitable container, as needed.

   Dispose of water and debris in an environmentally safe manner.



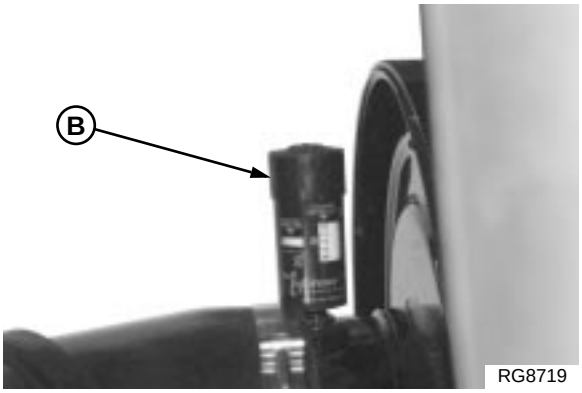
RG8714

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. H_2O). A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.

RG8717



RG8719

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:

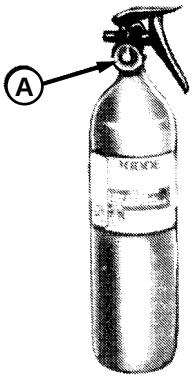
- Radiator for leaks and trash build-up.
- Air intake system hoses and connections for cracks and loose clamps.
- Fan, alternator, and accessory drive belts for cracks, breaks or other damage.
- Water pump for coolant leaks.

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.

SERVICING FIRE EXTINGUISHER

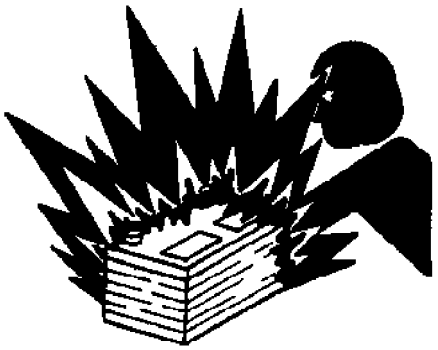
A fire extinguisher (A) is available from your authorized servicing dealer or engine distributor.

Read and follow the instructions which are packaged with it. The extinguisher should be inspected at least every 100 hours of engine operation or once a month. Once extinguisher is operated, no matter how long, it must be recharged. Keep record of inspections on the tag which comes with the extinguisher instruction booklet.



RW4918

SERVICING BATTERY



TS204

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.

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:

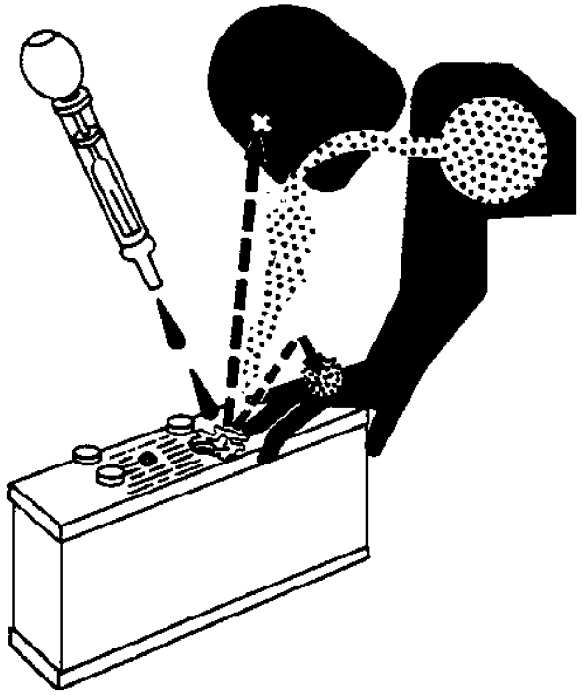
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

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.



TS203

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

12 V-Heavy Duty Starter . . . . . 800 Cold Cranking Amps . . . . . .350 Cold Cranking Amps Reserve

24 V-Standard Duty Starter* . . . . . 570 Cold Cranking Amps . . . . . .275 Cold Cranking Amps Reserve

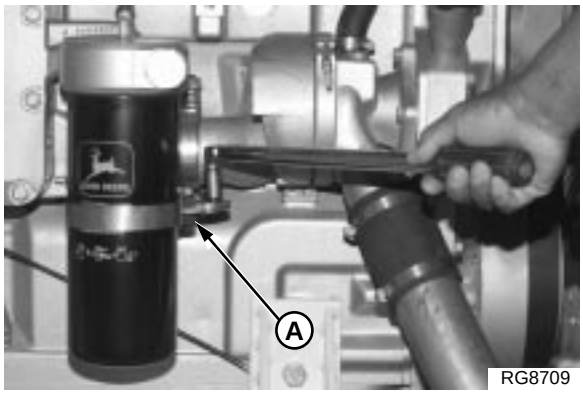
** Capacity of each battery connected in series or parallel.*

CHANGING ENGINE OIL AND REPLACING OIL FILTER

NOTE: Change engine oil and filter for the first time before 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 percent or to 375 hours.

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



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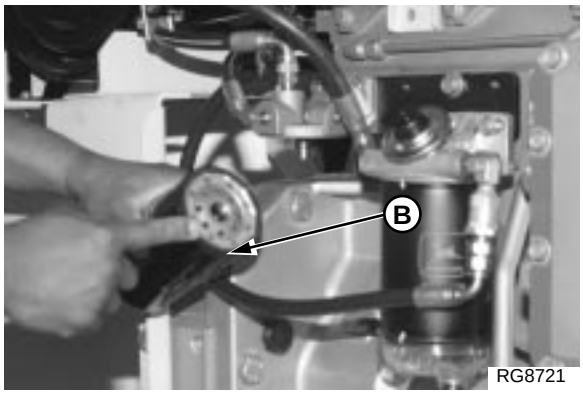


RG8721

1. Run engine approximately 5 minutes to warm up oil. Shut engine off.
2. Remove oil pan drain plug.
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 using a suitable filter wrench (A).
5. Remove oil filter packing and clean filter mounting pad.

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

6. Oil new packing (B) and install new filter element onto filter housing. Hand tighten element according to values printed on filter element. If values are not provided, tighten element approximately 1-1/4 turn after packing contacts filter housing. DO NOT overtighten filter element.

CHANGING ENGINE OIL AND REPLACING OIL FILTER—CONTINUED

7. Install oil pan drain plug with a new seal washer when equipped.

8. Fill engine crankcase with correct John Deere engine oil through timing gear cover opening (A) or oil pan filler adapter ports (B) depending on engine application. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

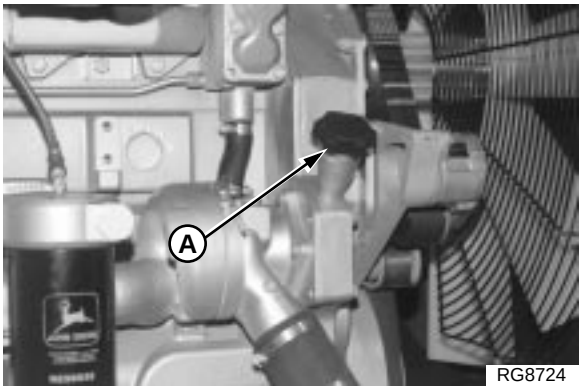
To determine the correct oil fill quantity for your engine, see ENGINE CRANKCASE OIL FILL QUANTITIES in the Specifications Section.

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.



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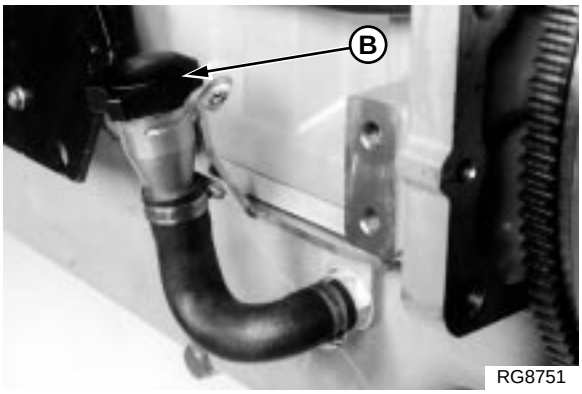


RG8751

VISUALLY INSPECTING WATER PUMP

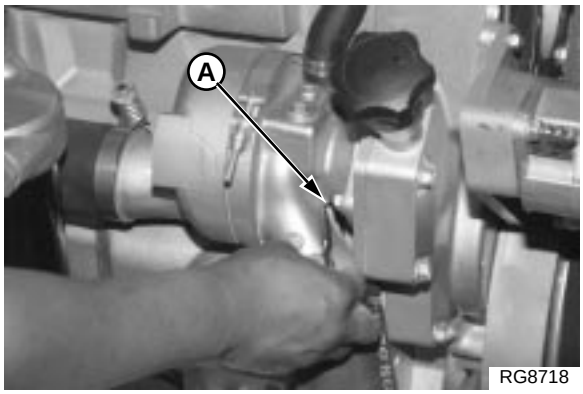
- **Inspect Weep Hole:**

1. Remove foam filter from water pump weep hole (A) as shown.
2. Inspect weep hole for oil or coolant leakage.

   — Oil leakage indicates a damaged rear seal.

   — Coolant leakage indicates a damaged front seal

Repair or replace complete water pump assembly if leakage is detected.



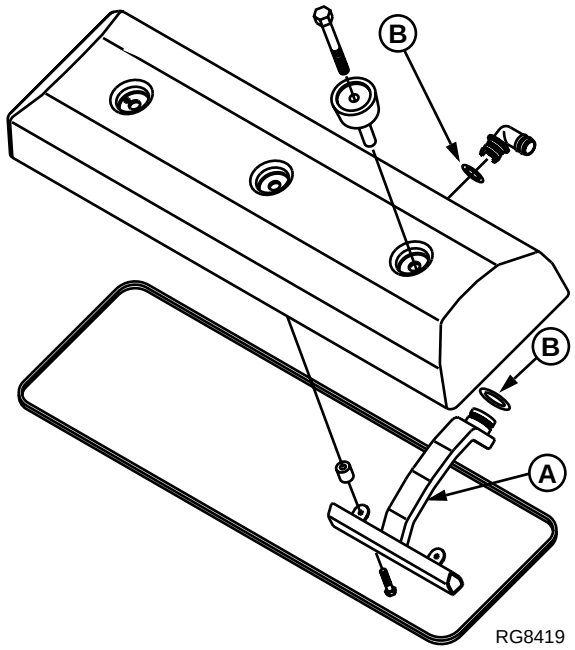
CLEANING AND INSPECTING CRANKCASE VENTILATION ASSEMBLY

If you operate the engine in dusty conditions, clean ventilation assembly at shorter intervals.

1. Remove rocker arm cover.
2. Remove ventilation outlet tube from rocker arm cover.
3. Remove two cap screws securing ventilator assembly (A) to cover and remove.
4. Clean ventilator assembly and tube in solvent and dry with compressed air.
5. Install ventilator assembly in reverse order of removal. Replace o-rings (B) as necessary.
6. Tighten ventilator assembly-to-rocker arm cover cap screws to 10 N·m (7.5 lb-ft).

NOTE: Tighten center rocker arm cover cap screw first.

7. Install rocker arm cover. Tighten cap screws to 30 N·m (22 lb-ft).



RG8419

CHECKING AIR INTAKE SYSTEM

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

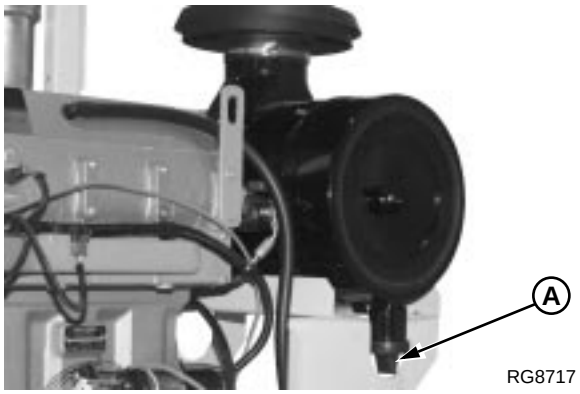
1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps on piping which connect the air cleaner to the engine. Tighten clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.
3. If engine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

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H_2O, is torn, or visibly dirty.

4. Test air restriction indicator (B) 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.)



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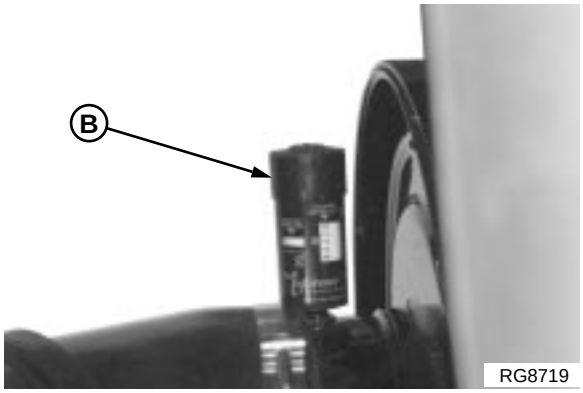
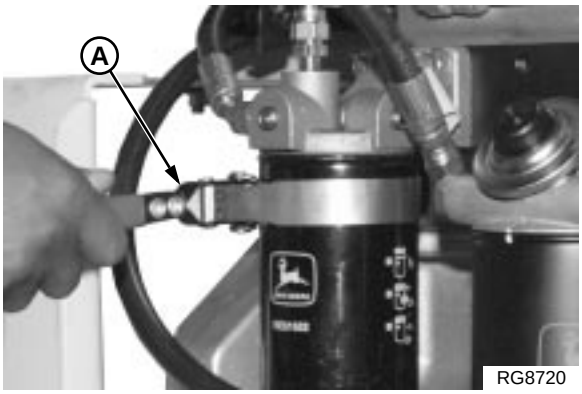


RG8719

REPLACING FINAL (SECONDARY) FUEL FILTER ELEMENT

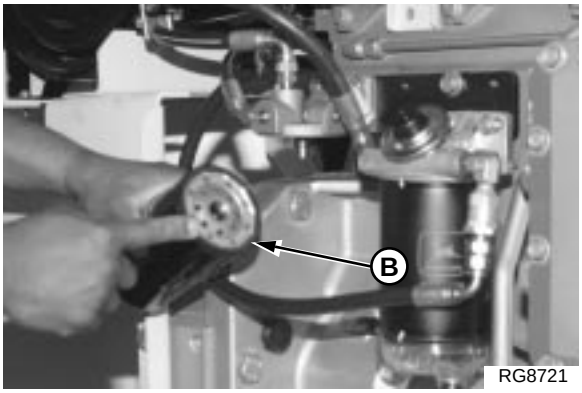
- **To Remove Old Final Fuel Filter:**

1. Close fuel shut-off valve at bottom of fuel tank (not illustrated).
2. Clean entire area surrounding fuel filter assembly to keep debris from entering fuel system.
3. Remove final fuel filter (A) using a suitable filter wrench. Dispose of fuel and filter in an environmentally safe manner.



- **To Install New Final Fuel Filter:**

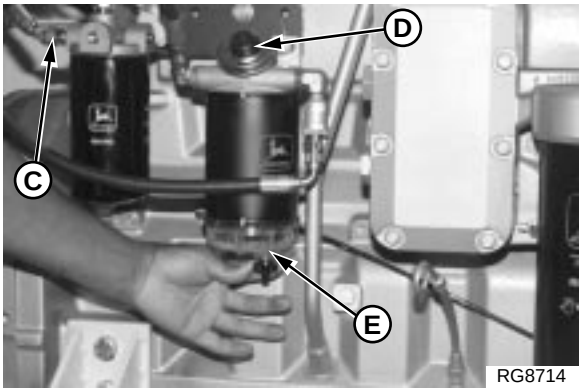
1. Clean filter gasket sealing surface with a clean, lint-free towel.
2. Apply a light coating of clean engine oil to filter gasket/o-ring (B).
3. Fill filter element with clean diesel fuel.
4. Install filter element onto threaded adapter and tighten until gasket contacts sealing surface on mounting base. Then, tighten an additional 3/4 turn.
5. Open fuel shut-off valve and bleed the fuel system.

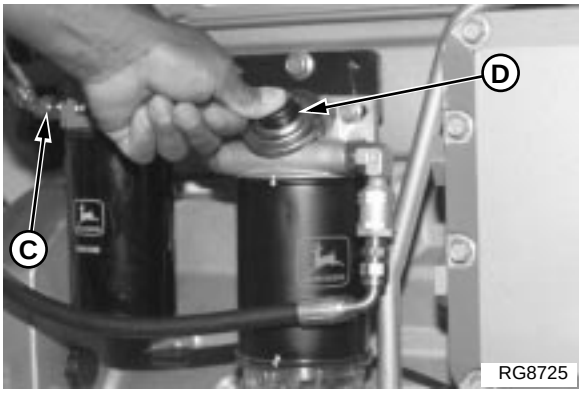


- **To Bleed the Fuel System:**

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.

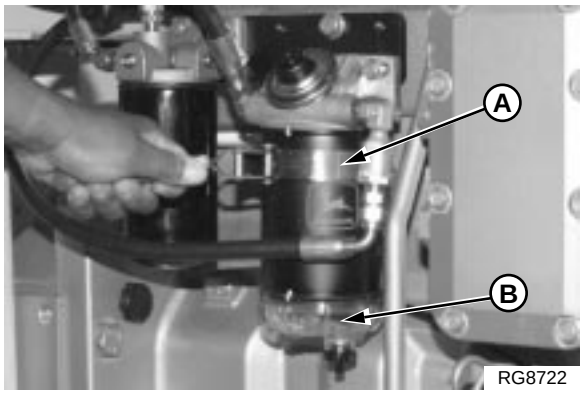
1. Drain water and contaminants from clear water separator sediment bowl (E).
2. Loosen secondary (final) fuel filter outlet line (C).
3. Pump hand primer (D) on primary filter until a steady flow of fuel (without bubbles) comes out of connection.
4. Continue pumping hand primer and simultaneously tighten outlet line connection to 25 N·m (18 lb-ft). DO NOT overtighten.
5. Start engine and run at high idle for 3–5 minutes.





REPLACING PRIMARY FUEL FILTER/WATER SEPARATOR

- **To Remove Old Primary Fuel Filter/Water Separator:**



1. Close fuel shut-off valve at bottom of fuel tank (not illustrated).
2. Clean entire area surrounding fuel filter assembly to keep debris from entering fuel system.
3. Remove primary fuel filter (A) using a suitable filter wrench. Drain filter element and sediment bowl into a appropriate container.
4. Clamp filter element in a vise and remove clear water separator bowl (B).
5. Thoroughly clean sediment bowl and dry with compressed air.

REPLACING PRIMARY FUEL FILTER/WATER SEPARATOR—CONTINUED

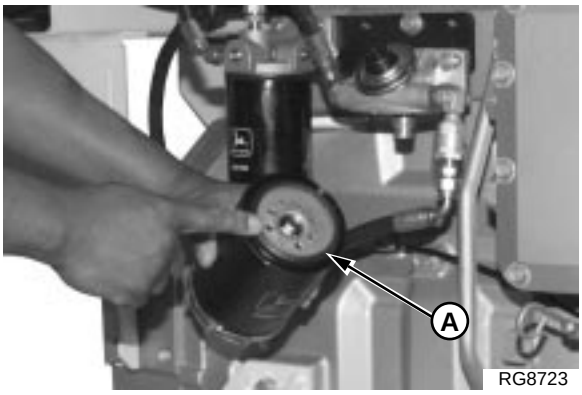
- **To Install New Primary Fuel Filter/Water Separator:**

1. Lubricate sediment bowl o-ring with clean engine oil and install onto new filter element. Tighten bowl an additional 1/2 turn after O-ring contacts filter element.
2. Apply a light coating of clean engine oil to filter gasket/o-ring (A).
3. Close sediment bowl drain adapter and fill filter element with clean diesel fuel.
4. Install filter element onto threaded adapter and tighten until gasket contacts sealing surface on mounting base. Then, tighten an additional 1-1/2 turn.
5. Open fuel shut-off valve and bleed the fuel system.

- **To Bleed the Fuel System:**

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. Drain water and contaminants from clear water separator sediment bowl (D).
2. Loosen secondary (final) fuel filter outlet line (B).
3. Pump hand primer (C) on primary filter until a steady flow of fuel (without bubbles) comes out of connection.
4. Continue pumping hand primer and simultaneously tighten outlet line connection to 25 N·m (18 lb-ft). DO NOT overtighten.
5. Start engine and run at high idle for 3–5 minutes.



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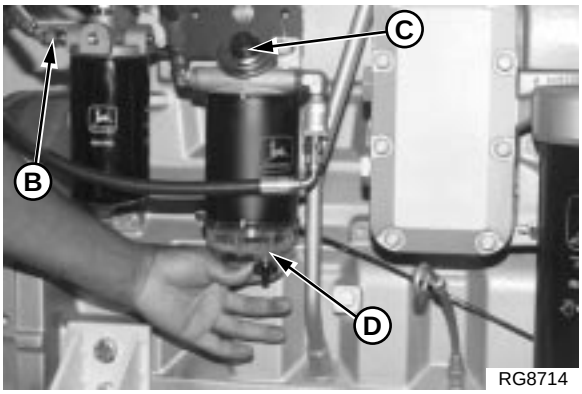

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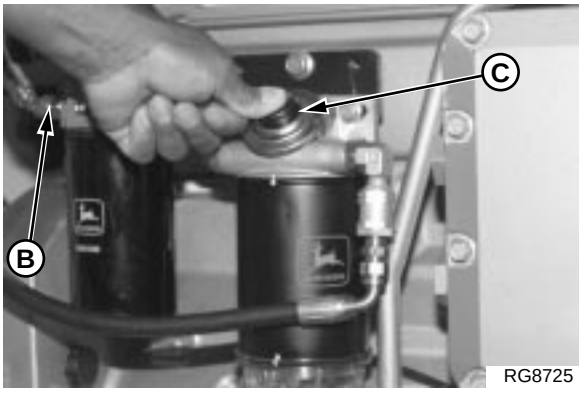


RG8725

CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR

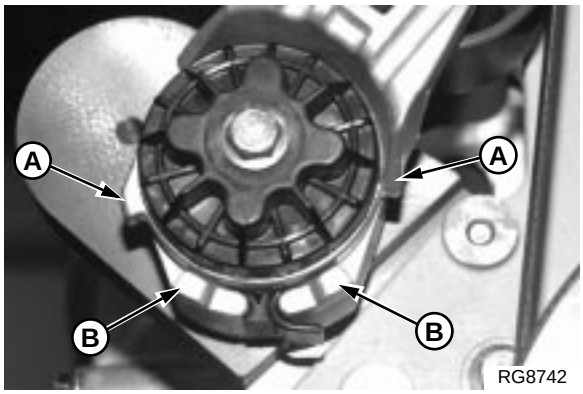
Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioners are designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

- **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).



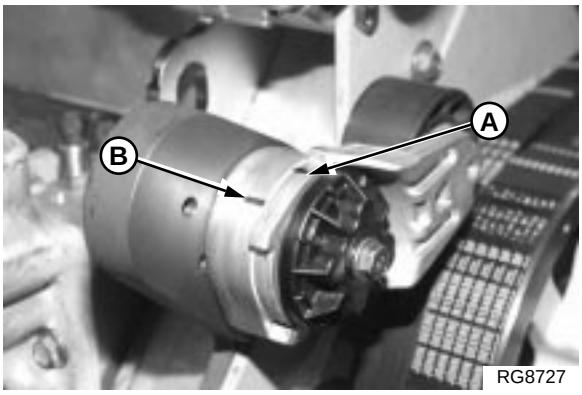
Upper tensioner shown, lower tensioner similar

CHECKING BELT TENSIONER SPRING TENSION—CONTINUED

- **Checking Upper Tensioner Spring Tension:**

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

1. Release tension on belt using a long handle 1/2-in. breaker bar in tension arm. Remove belt from pulleys.
2. Release tension on tension arm and remove breaker bar.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 21 mm (0.83 in.) from first mark (A) and put a second mark (B) on tensioner mounting base.
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.



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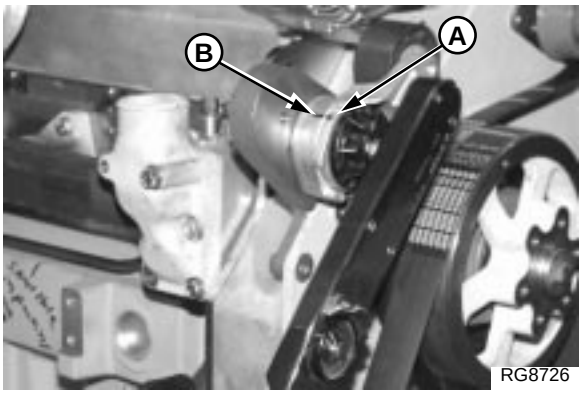


RG8726

UPPER SPRING TENSION SPECIFICATION

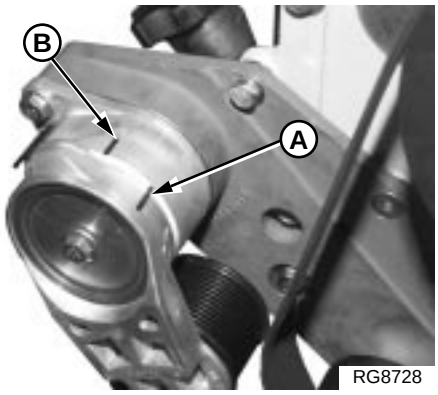
Spring Tension . . . . . 18–23 N·m (13–17 lb-ft)

CHECKING BELT TENSIONER SPRING TENSION—CONTINUED

- **Checking Lower Tensioner Spring Tension:**

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

1. Release tension on belt using a long-handle 3/4-in. breaker bar in tension arm. Remove belt from pulleys.
2. Release tension on tension arm and remove breaker bar.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 25 mm (1.0 in.) from first mark (A) and put a second mark (B) on tensioner mounting base.
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.



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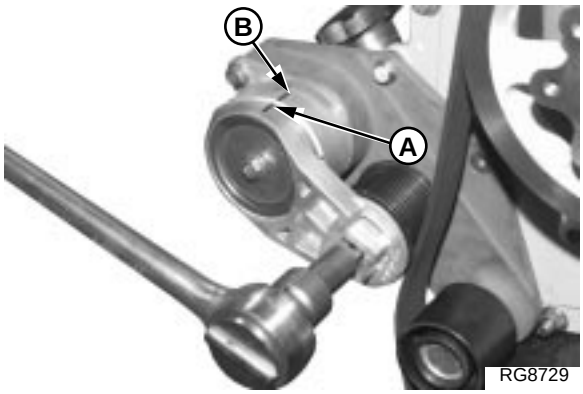


RG8729

LOWER SPRING TENSION SPECIFICATION

Spring Tension . . . . . 81–99 N·m (60–73 lb-ft)

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.


TS281

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

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

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.

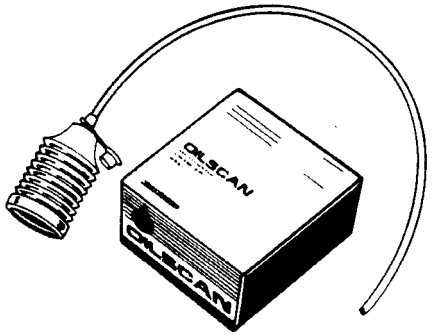
Maintaining adequate concentrations of glycol and inhibiting additives (SCAs) in the coolant is critical to protect the engine and cooling system against freezing, corrosion, and cylinder liner erosion and pitting.

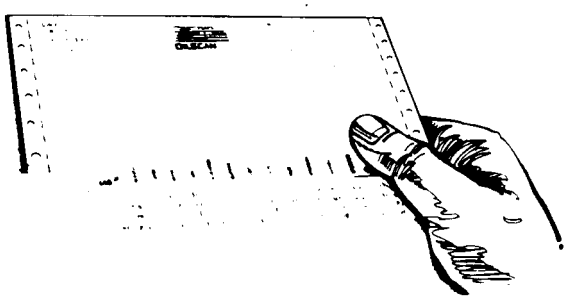
A coolant strip test kit provides a simple, effective way to check freeze point and additive levels.

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.)

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RG7297

ADDING SUPPLEMENTAL COOLANT ADDITIVES (SCAs)

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.

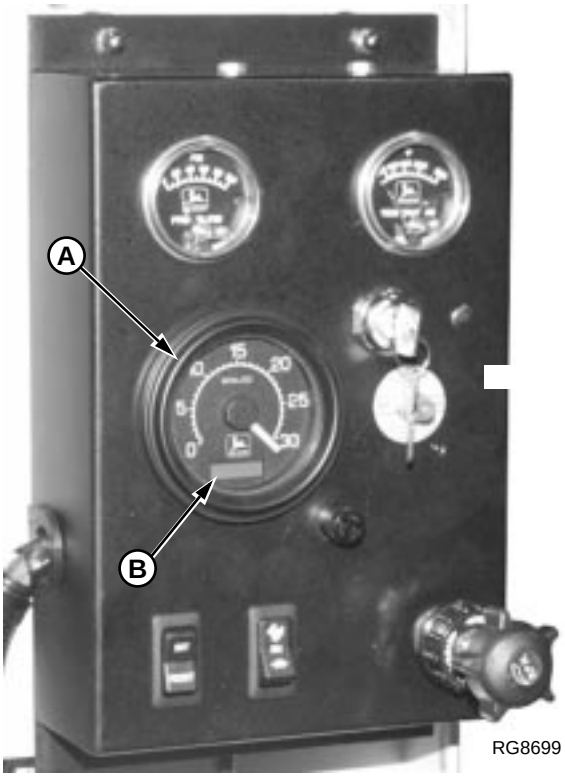
IMPORTANT: TY16004 or TY16005 Liquid Coolant Conditioner is a non-chromate inhibitor and should be used only with low silicate, ethylene-glycol base antifreeze. It does not protect the cooling system from freezing.

Liquid Coolant Conditioner

CHECKING AND ADJUSTING ENGINE SPEEDS

Observe tachometer reading (A) on the instrument panel to verify engine speeds. (Refer to FUEL SYSTEM SPECIFICATIONS in Specifications Section later in this manual for engine speed specifications.)

NOTE: Tachometer has a Liquid Crystal Display [LCD] (B) which also is capable of reading engine speed.



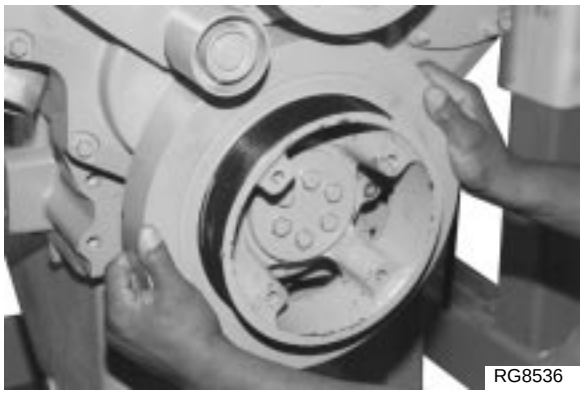
CHECKING CRANKSHAFT VIBRATION DAMPER

1. Remove belts (shown removed).

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

ALWAYS replace vibration damper whenever crankshaft is replaced or at engine major overhaul.

2. Carefully inspect vibration damper for torn or split rubber protruding from front and back of assembly.
3. 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.
4. Check vibration damper radial runout by positioning a dial indicator so probe (A) contacts damper outer diameter.
5. With engine at operating temperature, rotate crankshaft using JDG820 Flywheel Rotation Tool.
6. Note dial indicator reading. Replace vibration damper if radial runout exceeds 0.76 mm (0.030 in.).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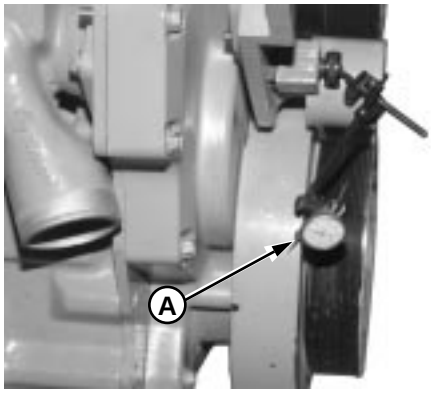
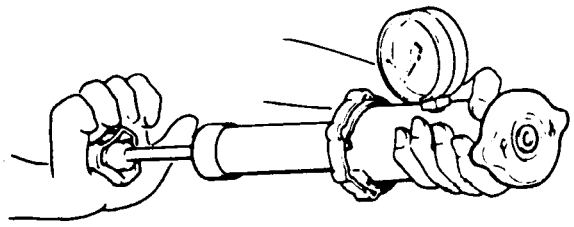


RG8537

PRESSURE TESTING COOLING SYSTEM



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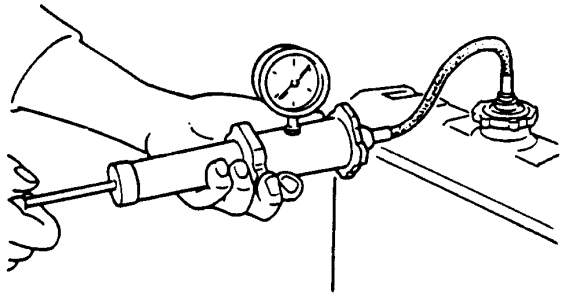


RG6558

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 50 kPa (0.5 bar) (7 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 50 kPa (0.5 bar) (7 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 Deere OEM cooling system for 10.5/12.5 engines. On specific vehicle applications, test cooling system and pressure cap according to the recommended pressure for that vehicle.*

FLUSHING COOLING SYSTEM

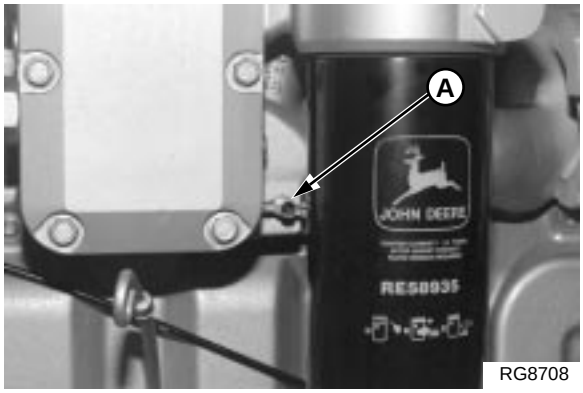
CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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.

TS281

Drain old coolant, flush the entire cooling system, test 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 oil cooler housing drain valve (A) on right side of engine. Drain all coolant from engine block.
4. Open radiator drain valve (B) and drain all coolant from radiator.



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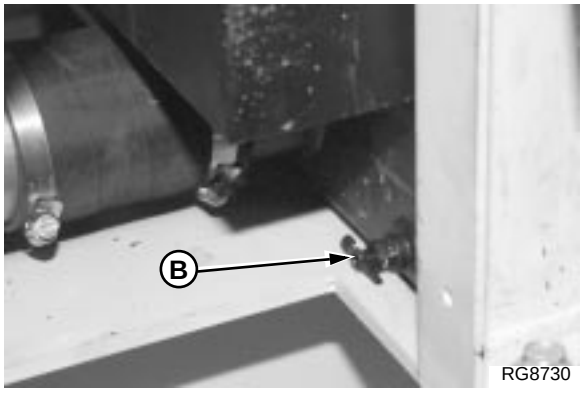
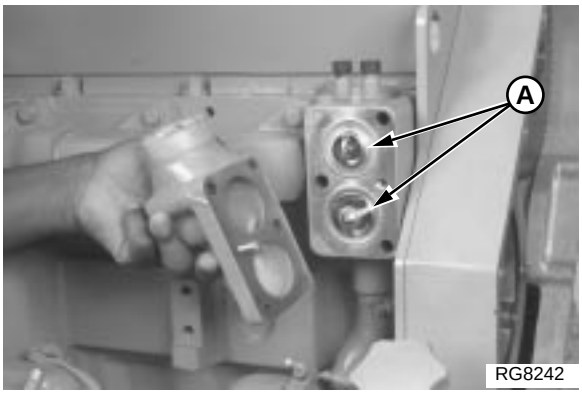


RG8730

FLUSHING COOLING SYSTEM—CONTINUED

5. Remove thermostats (A) at this time, if not previously done. Install cover (without thermostats) using old gasket and tighten short cover-to-housing cap screws to 35 N·m (26 lb-ft). Tighten three longer cap screws to 50 N·m (37 lb-ft).
6. Test thermostat opening temperature. (See INSPECTING THERMOSTATS AND TESTING OPENING TEMPERATURE in Service As Required Section.)
7. Close all drain valves after coolant has drained.
8. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
9. Stop engine and immediately drain the water from system before rust and sediment settle.
10. After draining water, close drain valves and fill the cooling system with clean water and 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.
11. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run the engine about 10 minutes, then drain out flushing water.
12. Close all drain valves on engine and radiator. Install thermostats using a new gasket. (See REMOVING AND INSTALLING THERMOSTATS in Service As Required Section.)



Fleetguard® is a registered trademark of Cummins Engine Company.

RESTORE™ and RESTORE PLUS™ are trademarks of Fleetguard.

FLUSHING COOLING SYSTEM—CONTINUED

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug after filling cooling system.


RG8735

13. Add coolant to radiator until coolant touches bottom of filler neck. (See ADDING COOLANT in Service As Required Section.)

14. Run engine until it reaches operating temperature. This mixes the solution uniformly and circulates it through the entire system. The normal engine coolant temperature range is 82° – 94° C (180° – 202° F).

15. After running engine, check coolant level and entire cooling system for leaks.

CHECKING AND ADJUSTING ENGINE VALVE CLEARANCE AND ELECTRONIC UNIT INJECTOR PRELOAD

Have your John Deere engine distributor or servicing dealer adjust intake and exhaust valve clearance and electronic unit injector (EUI) preload.

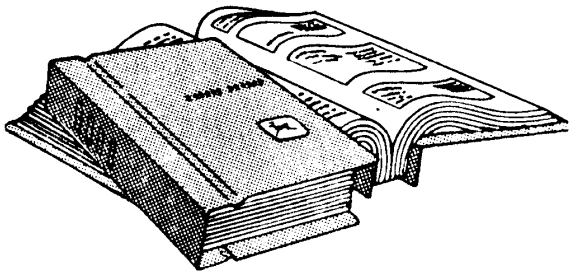
This one-time adjustment is required for all new and overhauled 6105 and 6125 *POWERTECH* OEM engines after first 2500 hours of operation.


RG8716

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

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.


TS281

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 on a temporary or emergency basis only. DO NOT use any other stop-leak additives in the cooling system. Leaks should be permanently repaired as quickly as possible.

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


RG8735

1. Loosen temperature sending unit fitting or plug in 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.

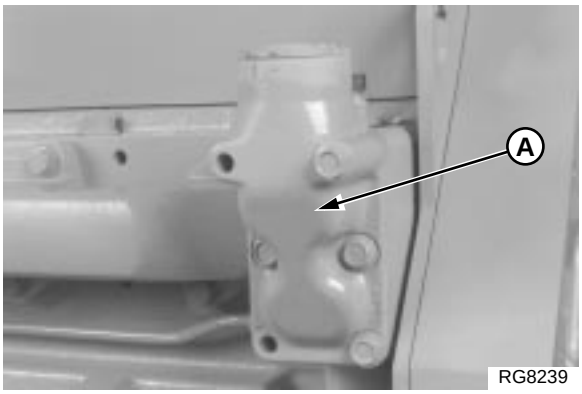
3. Tighten plugs and fittings after filling cooling system.

REMOVING AND INSTALLING THERMOSTATS

- **To Remove Thermostats:**

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

1. Visually inspect area around thermostat housing for leaks.
2. Remove radiator pressure cap and partially drain cooling system.
3. Remove four cap screws securing thermostat cover (A) to housing and remove cover.
4. Remove gasket (B) and remove both thermostats.
5. Test each thermostat for proper opening temperature. (See INSPECTING THERMOSTATS AND TESTING OPENING TEMPERATURE later in this section.)



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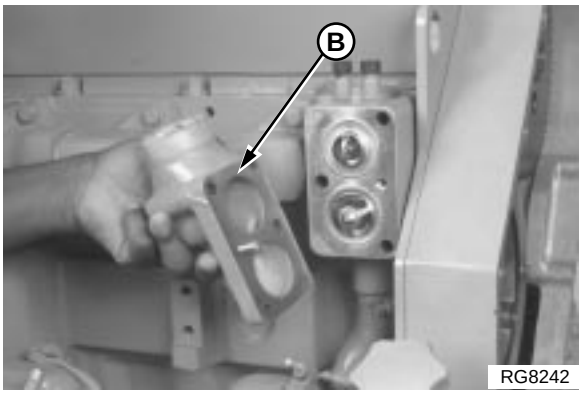


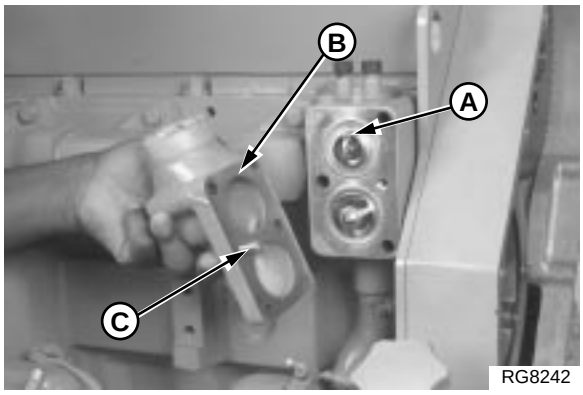
RG8242

REMOVING AND INSTALLING THERMOSTATS—CONTINUED

- **To Install Thermostats:**

IMPORTANT: Top thermostat has a vent notch with wiggle wire (A) for air bleeding. Wiggle wire MUST BE installed at 12 o'clock position. Bottom thermostat has a blocking poppet that opens passage to radiator when coolant warms.

1. Clean all gasket material from thermostat cover and housing mounting surfaces.
2. Install smaller (non-blocking) thermostat in top position with vent (wiggle wire) at 12 o'clock position. Install larger blocking thermostat in bottom position.
3. Install thermostat cover using a new gasket (B).
4. Install shorter cap screw (C) securing thermostat cover-to-housing and tighten to 35 N·m (26 lb-ft).
5. Install and tighten three longer cap screws to 50 N·m (37 lb-ft).



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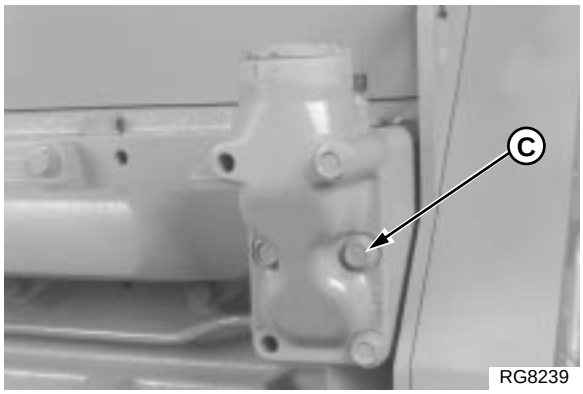


RG8239

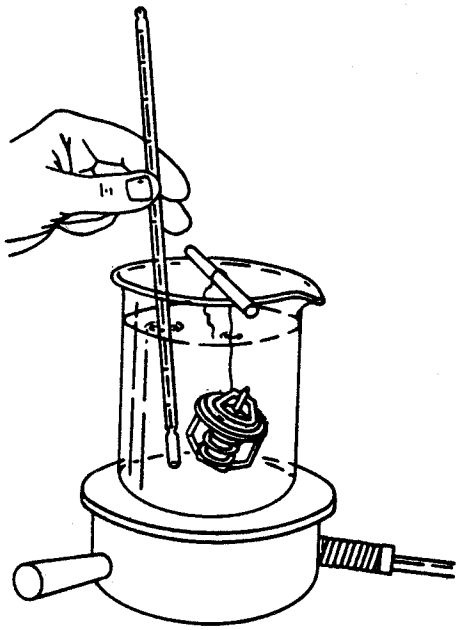
INSPECTING THERMOSTATS AND TESTING OPENING TEMPERATURE

1. Remove thermostats. (See REMOVING THERMOSTATS earlier in this section.)
2. Visually inspect thermostats for corrosion or damage. Replace thermostats as a matched set as necessary.
3. Inspect thermostat with wiggle wire in vent notch. If wire movement is restricted, replace thermostat if cleaning does not free movement.

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

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

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



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THERMOSTAT TEST SPECIFICATIONS

Rating	Initial Opening (Range)	Full Open (Nominal)
82° C (180° F)	80–84° C (175–182° F)	94° C (202° F)

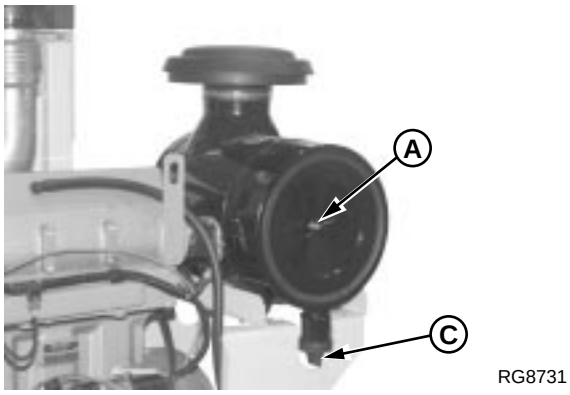
6. Remove thermostat and observe it's closing action as it cools. In ambient air the thermostat should close completely. Closing action should be smooth and slow.
7. If any one thermostat is defective, replace both thermostats.

REPLACING AIR CLEANER FILTER ELEMENTS

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H_2O, is torn, or visibly dirty.

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

1. Remove wing nut (A) and remove canister cover and primary filter assembly (B) from canister.

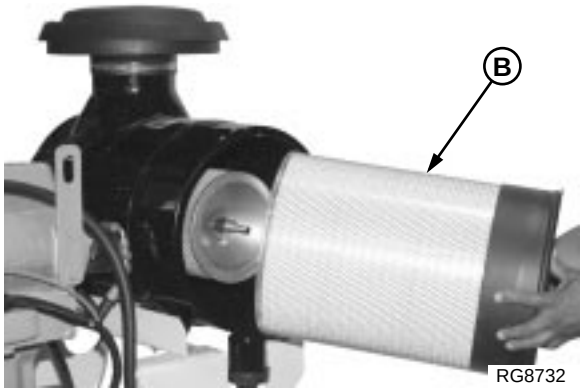


RG8731

IMPORTANT: Remove secondary (safety) air cleaner element (E) ONLY for replacement. DO NOT attempt to clean, wash, or reuse secondary element. Replacement of secondary element is usually necessary ONLY when primary element has a hole in it or restriction indicator green dot (•) has disappeared from window.

2. Thoroughly clean all dirt from inside canister.

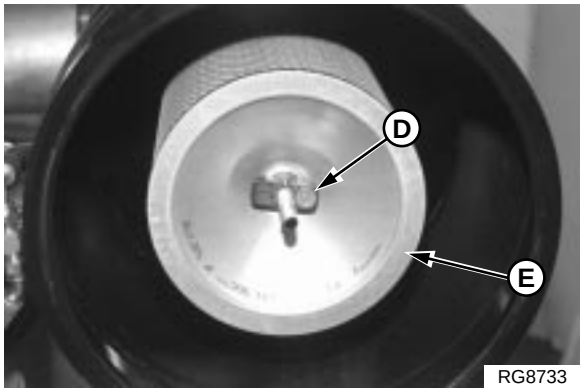
3. Squeeze dust unloader valve (C) on canister to remove all dust.



RG8732

4. Observe secondary (safety) element restriction indicator/retaining nut (D). If green dot (•) has disappeared from window, replace secondary element.

5. To replace secondary element, remove retaining nut/restriction indicator and secondary element: Immediately replace secondary element with new element to prevent dust from entering air intake system. Tighten retaining nut/restriction indicator to 14 N·m (10 lb-ft).



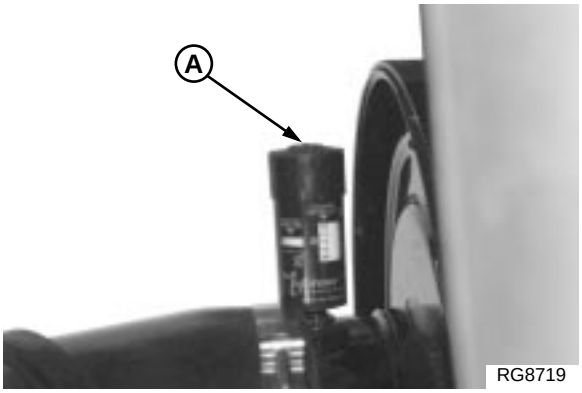
RG8733

REPLACING AIR CLEANER FILTER ELEMENTS—CONTINUED

6. Install new primary assembly element and tighten 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.

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



REPLACING FAN/ALTERNATOR V-BELTS

Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/600 Hour/12 Month Section to determine if V-belts need replacing.

NOTE: This engine is equipped with automatic belt tensioners which do not require adjustment.

- **To Replace Lower V-Belt:**

IMPORTANT: ALWAYS replace belts as a matched set.

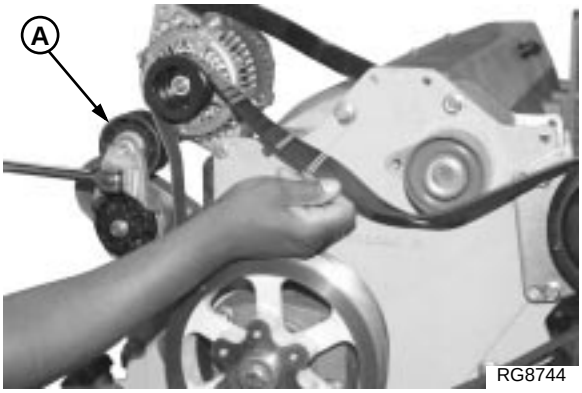
1. Release tension on lower belt using a 3/4-in. drive ratchet or breaker bar in lower tensioner (A).
2. Remove V-belt from pulleys and discard belt.
3. Install new belt; be sure that belt is correctly seated in all pulley grooves. (See V-BELT ROUTING, later in this section.)
4. Release belt tensioner to apply tension to belt. Remove ratchet.
5. Visually check belt alignment before starting engine.
6. Start engine and visually check belt alignment.

REPLACING FAN/ALTERNATOR V-BELTS—CONTINUED

- **To Replace Upper V-Belt:**

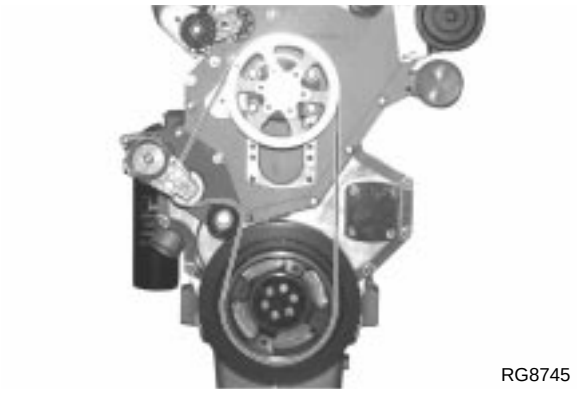
IMPORTANT: ALWAYS replace belts as a matched set.

1. Remove lower V-belt as detailed earlier.
2. Release tension on upper V-belt using a 1/2-in. drive ratchet or breaker bar in upper tensioner (A).
3. Remove V-belt from pulleys and discard belt.
4. Install new belt; be sure that belt is correctly seated in all pulley grooves. (See V-BELT ROUTING, later in this section.)
5. Slowly release belt tensioner to apply tension to belt. Remove ratchet.
6. Check belt alignment before starting engine.
7. Install lower V-belt as detailed earlier.
8. Start engine and visually check belt alignment.



Service As Required

V-BELT ROUTING


RG8745

Lower V-Belt


RG8746

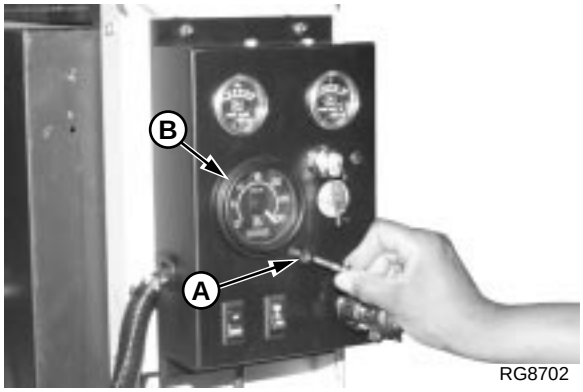
Upper V-Belt

Lower V-belt MUST BE removed before removing upper V-belt. Reverse sequence for V-belt installation.

CHECKING FUSE

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

1. Remove fuse holder (A) directly below tachometer (B) on instrument panel.
2. Check fuse and replace as necessary with a 30-amp fuse.

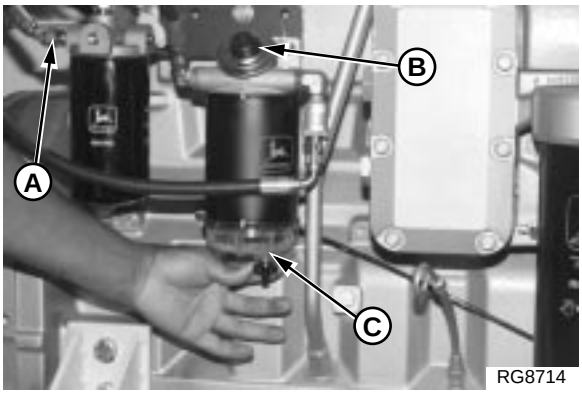


RG8702

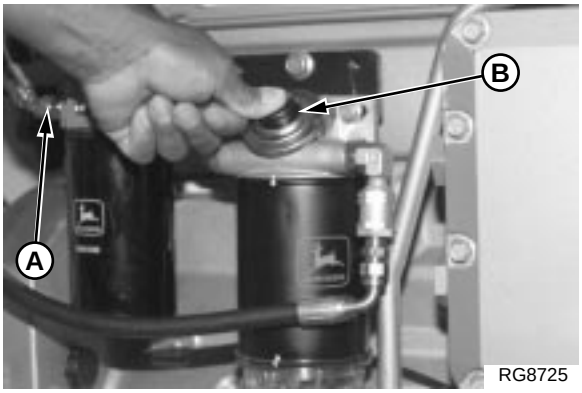
BLEEDING THE FUEL SYSTEM

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. Drain water and contaminants from clear water separator sediment bowl (C).
2. Loosen secondary (final) fuel filter outlet line (A).
3. Pump hand primer (B) on primary filter until a steady flow of fuel (without bubbles) comes out of connection.
4. Continue pumping hand primer and simultaneously tighten outlet line connection to 25 N·m (18 lb-ft). DO NOT overtighten.
5. Start engine and run at high idle for 3–5 minutes.



RG8714



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Service As Required

Troubleshooting

GENERAL TROUBLESHOOTING INFORMATION

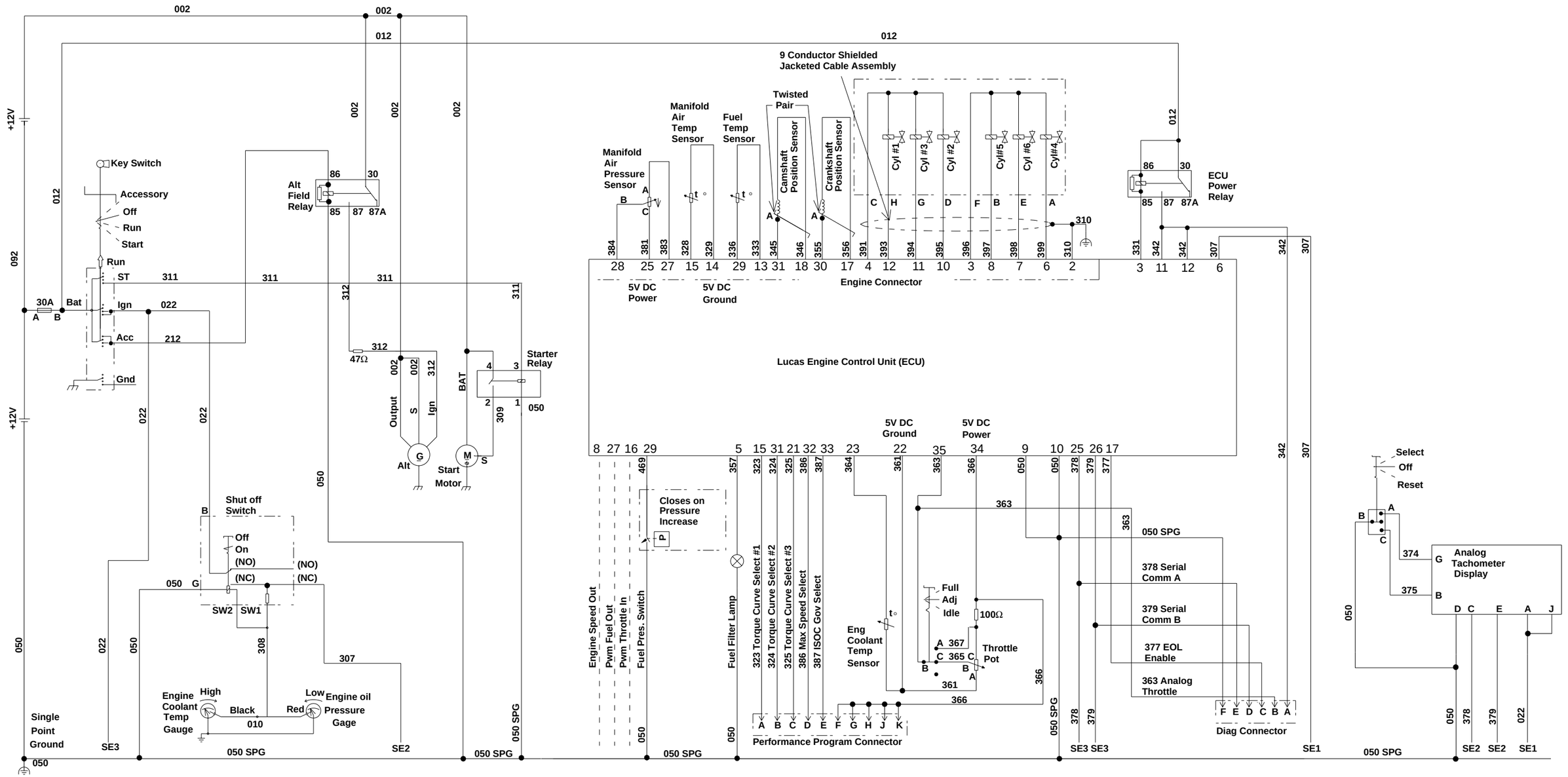
Troubleshooting engine problems can be difficult. An engine wiring diagram is provided in this section to help isolate electrical problems on power units using John Deere wiring harness and instrument (gauge) panel.

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 FOR JOHN DEERE INSTRUMENT PANEL



SE1-Power Supply, Starting and Charging Circuits (Murphy)

SE2-Electronic Engine Control Unit (ECU)

SE3-Analog Tachometer Display

RG8689

ENGINE TROUBLESHOOTING

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

ENGINE TROUBLESHOOTING—CONTINUED

Symptom	Problem	Solution
Black or Gray Exhaust Smoke	Engine overloaded	Reduce engine load.
	Engine burning oil	See LUBRICATION SYSTEM TROUBLESHOOTING, later in this section.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Defective muffler/exhaust piping (causing back-pressure)	Replace muffler or defective piping.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
White Exhaust Smoke	Engine compression too low	Determine cause of low compression and repair as required. See your John Deere engine distributor or servicing dealer.
	Defective thermostat(s) (does not close)	Test thermostats; replace thermostats as required. (See Service As Required Section.)
	Coolant entering combustion chamber (failed cylinder head gasket or cracked cylinder head)	Repair or replace as required. See your John Deere engine distributor or servicing dealer.
	Failed water-to-air aftercooler (6105AF & 6125AF engines only)	Remove and inspect water-to-air aftercooler. See your John Deere engine distributor or servicing dealer.
Engine Idles Poorly	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Air leak on suction side of air intake system.	Check hose and pipe connections for tightness; repair as required.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.

ENGINE TROUBLESHOOTING—CONTINUED

Symptom	Problem	Solution
Excessive Fuel Consumption	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Engine overloaded	Reduce engine load.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Compression too low	Determine cause of low compression and repair as required.
	Leaks in fuel supply system	Locate source of leak and repair as required.
Abnormal Engine Noise	Worn main or connecting rod bearings	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Excessive crankshaft end play	Check crankshaft end play. See your John Deere engine distributor or servicing dealer.
	Loose main bearing caps	Check bearing clearance; replace bearings and bearing cap screws as required. See your John Deere engine distributor or servicing dealer.
	Worn connecting rod bushings and piston pins	Inspect piston pins and bushings. See your John Deere engine distributor or servicing dealer.
	Scored pistons	Inspect pistons. See your John Deere engine distributor or servicing dealer.
	Worn timing gears or excess backlash	Check timing gear back lash. See your John Deere engine distributor or servicing dealer.
	Excessive valve clearance	Check and adjust valve clearance. See your John Deere engine distributor or servicing dealer.

ENGINE TROUBLESHOOTING—CONTINUED

Symptom	Problem	Solution
Abnormal Engine Noise	Worn camshaft lobes	Inspect camshaft. See your John Deere engine distributor or servicing dealer.
	Worn rocker arm shaft(s)	Inspect rocker arm shafts. See your John Deere engine distributor or servicing dealer.
	Insufficient engine lubrication	See LUBRICATION SYSTEM TROUBLESHOOTING, later in this section.
	Turbocharger noise	See AIR INTAKE SYSTEM TROUBLESHOOTING, later in this section.

LUBRICATION SYSTEM TROUBLESHOOTING

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

LUBRICATION SYSTEM TROUBLESHOOTING–CONTINUED

Symptom	Problem	Solution
High Oil Pressure	Improper oil classification	Drain crankcase and refill with correct oil.
	Oil pressure regulating valve bushing loose (wanders)	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Improperly operating regulating valve	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Plugged piston spray jet	Replace piston spray jet. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged filter bypass valve	Remove and inspect filter bypass valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged oil cooler bypass valve	Remove and inspect oil cooler bypass valve. See your John Deere engine distributor or servicing dealer.

LUBRICATION SYSTEM TROUBLESHOOTING–CONTINUED

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

COOLING SYSTEM TROUBLESHOOTING

Symptom	Problem	Solution
Engine Overheats	Lack of coolant in cooling system	Fill cooling system to proper level.
	Radiator core and/or side screens dirty	Clean radiator as required.
	Engine overloaded	Reduce engine load.
	Too low crankcase oil level	Fill crankcase to proper oil level.
	Loose or defective fan belt	Replace fan belt as required.Check belt tensioner. (See Lubrication and Maintenance 600 Hours/12 Months Section.)
	Defective thermostat(s)	Test thermostat opening temperature; replace thermostats as required. (See Service As Required Section.)
	Damaged cylinder head gasket	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Defective water pump	Replace water pump. See your John Deere engine distributor or servicing dealer.
	Defective radiator cap	Replace radiator cap as required.

COOLING SYSTEM TROUBLESHOOTING–CONTINUED

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

AIR INTAKE SYSTEM TROUBLESHOOTING

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

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

AIR INTAKE SYSTEM TROUBLESHOOTING–CONTINUED

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

AIR INTAKE SYSTEM TROUBLESHOOTING–CONTINUED

Symptom	Problem	Solution
Turbocharger Turbine Wheel Drag	Carbon build-up behind turbine wheel caused by coked oil or combustion deposits	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Dirt build-up behind compressor wheel caused by air intake leaks.	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Bearing seizure or dirty, worn bearings	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

LOW PRESSURE FUEL SYSTEM TROUBLESHOOTING

Symptom	Problem	Solution
Fuel in Oil	Cracked or worn Electronic Unit Injector (EUI) O-ring	Remove suspected EUI, replace EUI O-ring as required. See your John Deere engine distributor or servicing dealer.
	Cracked cylinder head	Locate crack, repair/replace components as required. See your John Deere engine distributor or servicing dealer.
Fuel Aeration	EUI hold-down clamp loose	Tighten hold-down clamp cap screw to proper torque. See your John Deere engine distributor or servicing dealer.
	Cracked or worn Electronic Unit Injector (EUI) O-ring	Remove suspected EUI, replace EUI O-ring as required. See your John Deere engine distributor or servicing dealer.
Fuel Pressure Low	Plugged primary and final fuel filters	Replace fuel filters.
	Restricted fuel line	Locate restriction, repair as required.
	Faulty fuel transfer pump	Remove fuel transfer pump, repair/replace pump as required. See your John Deere engine distributor or servicing dealer.

FAULT CODE DIAGNOSTIC PROCEDURE

IMPORTANT: Care should be used during diagnostic procedures to avoid damaging the terminals of connectors, sensors, and actuators. Probes should not be poked into or around the terminals or damage will result. Probes should only be touched against the terminals to make measurements.

Diagnosis of the electronic control system should be performed according to the following procedure:

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

NOTE: Liquid Crystal Display [LCD] (A) will always default to show an hour meter reading. If an active DFC is present, display will alternately flash from hour meter reading to DFC(s).

2. Read and record DFC(s) displayed on LCD of tachometer.

3. Go to the LISTING OF SERIAL INTERFACE DIAGNOSTIC FAULT CODES (DFCs) earlier in this section, to correspond to the DFC(s) present.

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

LISTING OF SERIAL INTERFACE DIAGNOSTIC FAULT CODES (DFCs)

The serial interface codes are output as a two part code. The first part is a three-digit parameter identification (PID) or subsystem identification (SID) code followed by a one or two digit failure mode identifier (FMI) code.

Following is a list of serial interface codes along with a Diagnostic Fault Code (DFC) cross reference that can occur in the electronic control system. Not all of these codes will be present in all engine applications.

Serial Interface Codes (PID/SID)	(FMI)	Diagnostic Fault Code	Description
PID 091	**03**	**11**	Analog Throttle input voltage too high
PID 091	**04**	**12**	Analog Throttle input voltage too low
PID 091	**03**	**13**	Pulse-Width-Modulated (PWM) Throttle input voltage too high
PID 091	**04**	**13**	Pulse-Width-Modulated (PWM) Throttle input voltage too low
PID 106	**03**	**21**	Manifold Air Pressure (MAP) input voltage too high
PID 106	**04**	**22**	Manifold Air Pressure (MAP) input voltage too low
PID 105	**03**	**23**	Manifold Air Temperature (MAT) input voltage too high
PID 105	**04**	**24**	Manifold Air Temperature (MAT) input voltage too low
PID 110	**03**	**25**	Engine Coolant Temperature (ECT) input voltage too high
PID 110	**04**	**26**	Engine Coolant Temperature (ECT) input voltage too low
N/A	**N/A**	**27**	Fuel Rail Pressure periodically low
N/A	**N/A**	**28**	Fuel Rail Pressure continuously low
SID 001	**06**	**31**	Cylinder 1 Electronic Unit Injector (EUI) fault
SID 002	**06**	**32**	Cylinder 2 Electronic Unit Injector (EUI) fault
SID 003	**06**	**33**	Cylinder 3 Electronic Unit Injector (EUI) fault
SID 004	**06**	**34**	Cylinder 4 Electronic Unit Injector (EUI) fault
SID 005	**06**	**35**	Cylinder 5 Electronic Unit Injector (EUI) fault
SID 006	**06**	**36**	Cylinder 6 Electronic Unit Injector (EUI) fault
PID 174	**03**	**37**	Fuel Temperature input voltage too high
PID 174	**04**	**38**	Fuel Temperature input voltage too low

LISTING OF SERIAL INTERFACE DIAGNOSTIC FAULT CODES (DFCs)—CONTINUED

Serial Interface Codes (PID/SID)	(FMI)	Diagnostic Fault Code*	Description
SID 022	**03**	**41**	Crankshaft Position input missing
SID 022	**11**	**42**	Crankshaft Position input out of sync
SID 021	**03**	**43**	Camshaft Position input missing
SID 021	**11**	**44**	Camshaft Position input out of sync
N/A	**N/A**	**45**	Camshaft/Crankshaft Position inputs out of sync
N/A	**N/A**	**50**	Fuel Pressure Switch fault
PID 106	**10**	**52**	Manifold Air Pressure (MAP) input voltage erratic
PID 105	**10**	**53**	Manifold Air Temperature (MAT) input voltage erratic
PID 110	**10**	**54**	Engine Coolant Temperature (ECT) input voltage erratic
PID 174	**10**	**55**	Fuel Temperature input voltage erratic
PID 021	**08**	**57**	Camshaft Position input erratic
SID 254	**11**	**81**	Electronic Control Unit (ECU) error
PID 000	**0**	**84**	Power Down error

INTERMITTENT FAULT DIAGNOSTICS

Intermittent faults are problems that periodically “go away”. A problem such as a terminal that intermittently doesn't make contact can cause an intermittent fault. Other intermittent faults may be set only under certain operating conditions such as heavy load, extended idle etc. When diagnosing intermittent faults, take special note of the condition of wiring and connectors since a high percentage of intermittent problems originate here. Check for loose, dirty or disconnected connectors. Inspect the wiring routing looking for possible shorts caused by contact with external parts (for example, rubbing against sharp sheet metal edges). Inspect the connector vicinity looking for wires that have pulled out of connector terminals, damaged connectors, poorly positioned terminals, and corroded or damaged terminals. Look for broken wires, damaged splices, and wire-to-wire shorts. Use good judgement if component replacement is thought to be required.

NOTE: The ECU is the component LEAST likely to fail.

Suggestions for diagnosing intermittent faults:

- If diagnostic chart indicates that the problem is intermittent, try to reproduce the operating conditions that were present when the DFC set. When a DFC sets, the ECU stores a Freeze Frame of the data parameter values the instant the DFC sets. Observing these values on the DST can help determine the operating conditions when the fault occurred. In addition, the DST includes a function called Snap Shot. The Snap Shot function permits the recording of data parameter values during a diagnostic session. The Snap Shot mode can be set up so that its’ recording is “triggered” by the setting of a fault code.
- If a faulty connection or wire is suspected to be the cause of the intermittent problem: clear DFCs, then check the connection or wire by wiggling it while watching the DST to see if the fault resets.

Possible Causes of Intermittent Faults:

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

Storage

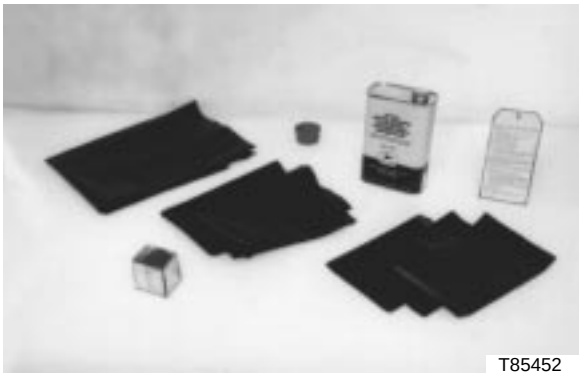
ENGINE STORAGE GUIDELINES

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.



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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 V-belts, if desired.
9. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
10. Clean the exterior of the engine with salt-free water and touchup any scratched or chipped painted surfaces with a good quality paint.
11. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
12. Seal all openings on engine with plastic bags and tape supplied in storage kit. Follow instructions supplied in kit.
13. 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.

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 V-belts if removed.
4. Fill fuel tank.
5. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS in Lubrication and Maintenance/Daily Section.)

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

6. Crank engine for 20 seconds with starter (do not allow the engine to start). Wait 2 minutes and crank engine an additional 20 seconds to assure bearing surfaces are adequately lubricated.
7. Start engine and run at low idle and no load for several minutes. Warm up carefully and check all gauges before placing engine under load.
8. On the first day of operation after storage, check overall engine for leaks and check all gauges for correct operation.

Specifications

GENERAL OEM ENGINE SPECIFICATIONS

ITEM	UNIT OF MEASURE	6105AF	6105HF	6125AF	6125HF
Number of Cylinders	——	6	6	6	6
Fuel	——	Diesel	Diesel	Diesel	Diesel
Stroke	mm (in.)	138 (5.43)	138 (5.43)	165 (6.50)	165 (6.50)
Bore	mm (in.)	127 (5.00)	127 (5.00)	127 (5.00)	127 (5.00)
Displacement	L (cu in.)	10.5 (640)	10.5 (640)	12.5 (766)	12.5 (766)
Compression Ratio	——	16:1	16:1	16:1	16:1
Physical Dimensions:					
Width	mm (in.)	741 (29.2)	808 (31.8)	741 (29.2)	808 (31.8)
Height	mm (in.)	1224 (48.2)	1239 (48.8)	1224 (48.2)	1239 (48.8)
Length	mm (in.)	1326 (52.2)	1326 (52.2)	1326 (52.2)	1326 (52.2)
Basic Dry Weight	kg (lb)	1211 (2665)	1200 (2640)	1216 (2675)	1205 (2650)

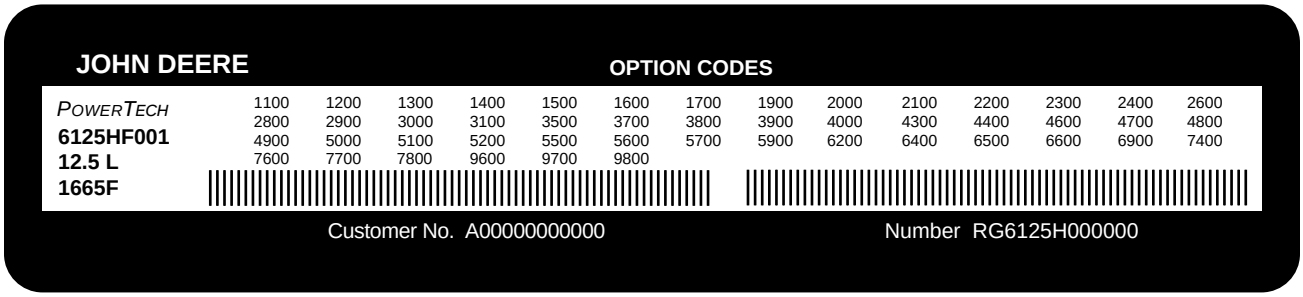
FUEL SYSTEM SPECIFICATIONS — INDUSTRIAL APPLICATIONS

ENGINE MODEL	FUEL SYSTEM OPTION CODES	POWER RATING @RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED (rpm)	SLOW IDLE (rpm)	FAST IDLE (rpm)
6105AF	1601, 1603	224 (300)	2100	850	2225
6105HF	1610, 1620	242 (325)	2100	850	2225
	1601, 1611	261 (350)	2100	850	2225
6125AF	1610, 1620	242 (325)	2100	850	2225
	1601, 1611	261 (350)	2100	850	2225
	1602, 1612	280 (375)	2100	850	2225
	1603, 1613	298 (400)	2100	850	2225
6125HF	1601, 1611	317 (425)	2100	850	2225
	1602, 1612	336 (450)	2100	850	2225
	1603, 1613	354 (475)	2100	850	2225
	1604, 1614	373 (500)	2100	850	2225

FUEL SYSTEM SPECIFICATIONS — GENERATOR SET (STANDBY) APPLICATIONS

ENGINE MODEL	FUEL SYSTEM OPTION CODES	POWER RATING @RATED SPEED WITHOUT FAN kW (hp)	RATED SPEED (rpm)	SLOW IDLE (rpm)	FAST IDLE (rpm)
6125AF	1604, 1614	280 (375)	1800	900	1850
	1607, 1617	233 (312)	1500	900	1550
	1605, 1615	300 (402)	1800	900	1850
	1608, 1618	250 (335)	1500	900	1550
	1606, 1616	330 (442)	1800	900	1850
	1609, 1619	275 (369)	1500	900	1550
6125HF	1601, 1611	420 (563)	1800	900	1850
	1602, 1612	360 (483)	1800	900	1850
	1603, 1613	300 (402)	1500	900	1550
	1604, 1614	350 (469)	1500	900	1550

ENGINE CRANKCASE OIL FILL QUANTITIES



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Option Code Label

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

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

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

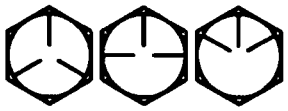
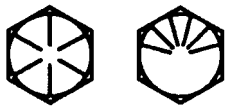
To determine the option code for the oil fill quantity of your engine, refer to the engine option code label affixed to the rocker arm cover. The first two digits of the code (19) identify the oil pan group. The last two digits of each code identify the specific oil pan on your engine.

Listed below are engine crankcase oil fill quantities:

Engine Model	Oil Pan Option Code (s)	Crankcase Oil Capacity
6105AF, 6105HF, 6125AF, 6125HF	1901	42.0 L (44.4 qt)
6105AF, 6105HF, 6125AF, 6125HF	1902, 1903	40.0 L (42.3 qt)

Crankcase oil capacity may vary slightly from amount shown. ALWAYS fill crankcase within crosshatch on dipstick. DO NOT overfill.

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES

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

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.

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.

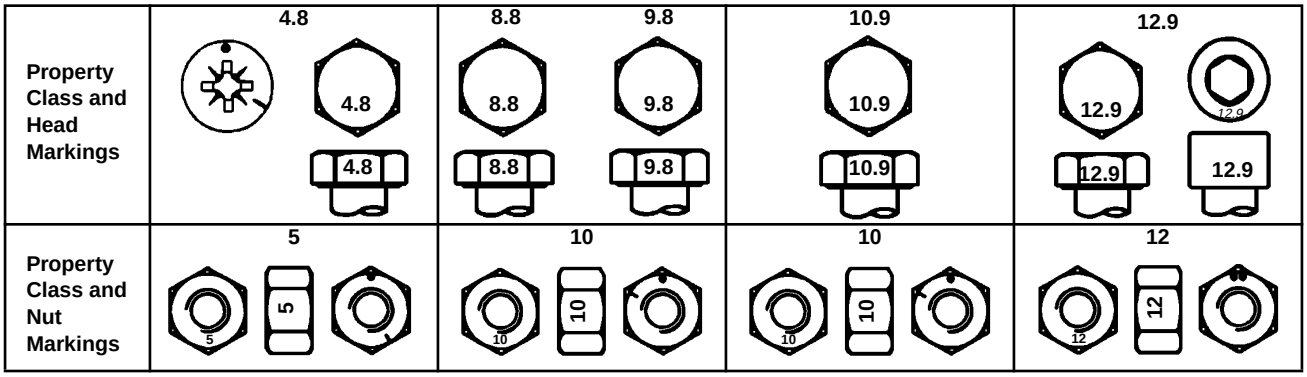
Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

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.

[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

METRIC BOLT AND CAP SCREW TORQUE VALUES



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.
- Check (primary) fuel filter/water separator.
- Check air cleaner dust unloader valve and air restriction indicator, if equipped.
- Visual walkaround inspection.

250 HOUR SERVICE

- Change engine oil and oil filter.*
- Service battery.
- Service fire extinguisher.
- Check water pump weep hole foam filter.

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** If John Deere PLUS-50 oil is used along with a John Deere oil filter, the oil change interval may be extended by 50 percent to 375 hours.*

600 HOUR/12 MONTH SERVICE

- Clean crankcase ventilation assembly.
- Replace fuel filter elements.
- Check automatic belt tensioner and belt wear.
- Check cooling system.
- Coolant solution analysis – add SCAs as needed.
- Check air intake hoses, connections, and system.

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1200 HOUR/24 MONTH SERVICE

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

Hours									
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** If John Deere COOL-GARD is used, the flushing interval may be extended to 2000 hours. If John Deere Prediluted Antifreeze/Summer Coolant or John Deere Antifreeze/Summer Coolant Concentrate is used, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.*

2500 HOUR SERVICE

- Have your authorized servicing dealer or engine distributor check and adjust valve clearance and Electronic Unit Injector (EUI) preload.

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SERVICE AS REQUIRED

- Replace air cleaner elements.
- Replace V-belts.

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Emission System Warranty

EMISSIONS CONTROL SYSTEM CERTIFICATION LABEL

The emissions warranty described below applies only to those engines marketed by John Deere that have been certified by the United States Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB); and used in the United States in non-road mobile (self-propelled or portable/ transportable*) equipment. The presence of an emissions label like the one shown signifies that the engine has been certified with the EPA and/or CARB. The EPA and CARB warranties only apply to new engines having the certification label affixed to the engine and sold as stated above in the geographic areas governed by the regulating agencies.

RG8752

NOTE: The hp/kW rating on the engine emissions certification label specifies the gross engine hp/ kW, which is flywheel power without fan. In most applications this will not be the same rating as the advertised vehicle hp/kW rating.

** Equipment moved at least once every 12 months.*

U.S. EMISSIONS CONTROL WARRANTY STATEMENT (*UNITED STATES ONLY*)

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 *(CALIFORNIA ONLY)*

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 or the State of California Air Resources Board, Mobile Source Operation Division, PO Box 8001, El Monte, CA 91731-2990.

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

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TS1646

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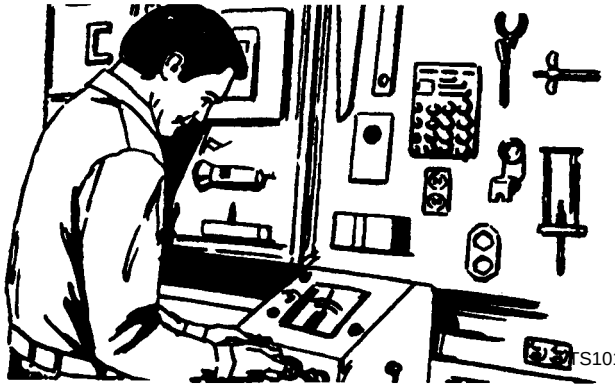

TS101

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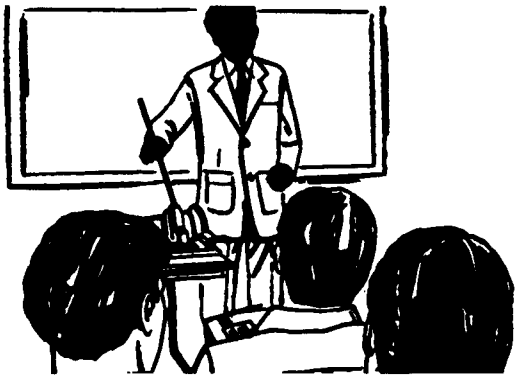

TS102

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

TS103


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