



4.5 L and 6.8 L Marine Diesel Engines



OPERATOR'S MANUAL 4.5 L and 6.8 L Marine Diesel Engines OMRG28997 ISSUE 08SEP20 (ENGLISH)

CALIFORNIA Proposition 65 Warning

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

If this product contains a gasoline engine:

WARNING

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

The State of California requires the above two warnings.

Additional Proposition 65 Warnings can be found in this manual.

John Deere Power Systems

Worldwide Edition
PRINTED IN U.S.A.



Introduction

OEM Engine and Drivetrain Warranty Registration

RG24614 —UN—21OCT13



Scan this code to register your OEM engine online. You can also visit us directly at JohnDeere.com/warranty.

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

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

You're Covered

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

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

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

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

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

Warranty Duration

Equipment operators can't afford downtime or unexpected repairs. That's why we offer a 2-year/2,000-hour warranty, with unlimited hours in the first year, on our OEM industrial and marine engines. This warranty takes effect the date that the engine is delivered to the first retail purchaser. In addition, extended warranties are available under certain conditions. John Deere offers a variety of purchased warranties to extend the warranty period for your engine. You'll be given the option to extend your coverage before your standard warranty term expires. Be sure to register your engine or drivetrain product and take full advantage of the John Deere service and support network.

Obtaining Warranty Service

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

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

Worldwide Support Network

Visit JohnDeere.com/dealer to find the authorized engine or drivetrain service location nearest you. For complete warranty details visit JohnDeere.com/warrantystatements to view, download, or print the warranty statement for your engine or drivetrain product.

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Foreword

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

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

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

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

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

POWERTECH is a trademark of Deere & Company

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

NOTE: This manual covers POWERTECH® 4.5 and 6.8 L Marine heat exchanger engine models 4045DFM50, 4045TFM50 and 6068TFM50. Also covered in this manual is the sea water aftercooled 6068SFM50 engine with electronic controls.

OMRG25204,IFC -19-03JAN02-1/1

Engine Owner

John Deere Engine Owner:

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

Your John Deere Engine Distributor or local John Deere Service Dealer will also be happy to provide this service. Engine service can be done by all Ag, C&FD, and JDPS branded dealers. To view the John Deere Service Dealer network or locate your nearest Dealer, use the following URL: <http://www.johndeere.com/dealer>

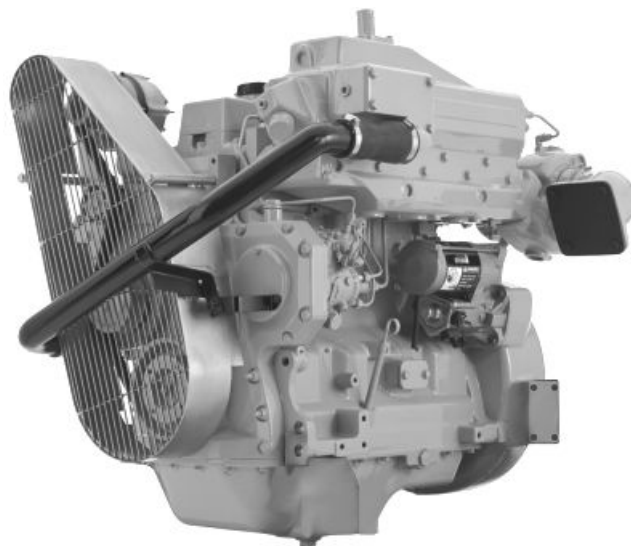
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4.5 L Marine Engines



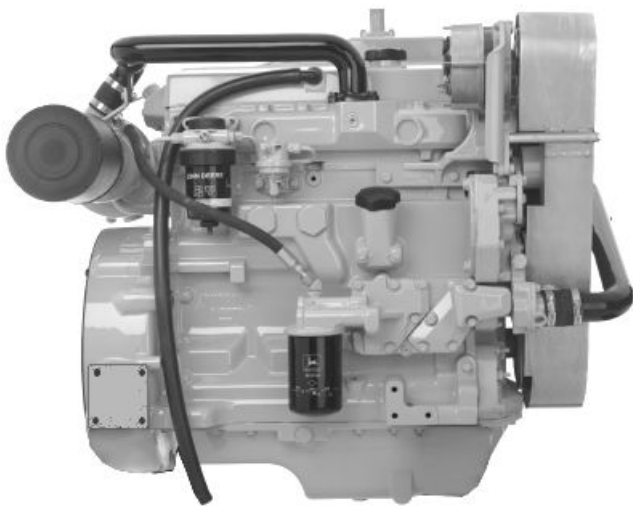
4045TFM50 Engine

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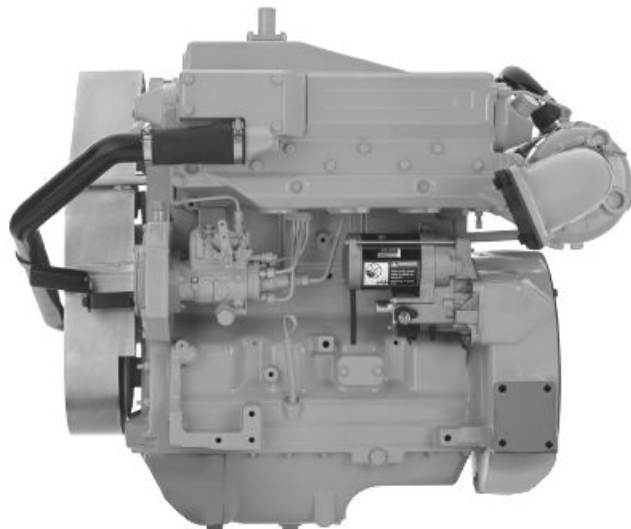
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4045TFM50 Engine

RG9825—UN—05JAN99



4045TFM50 Engine

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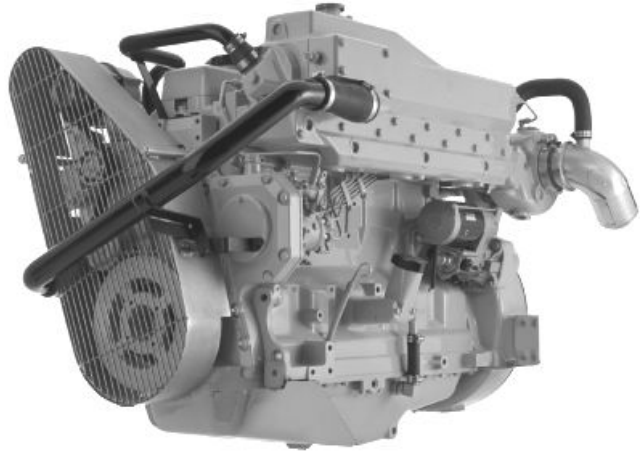
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6.8 L Marine Engines (6068TFM Mechanically Controlled)



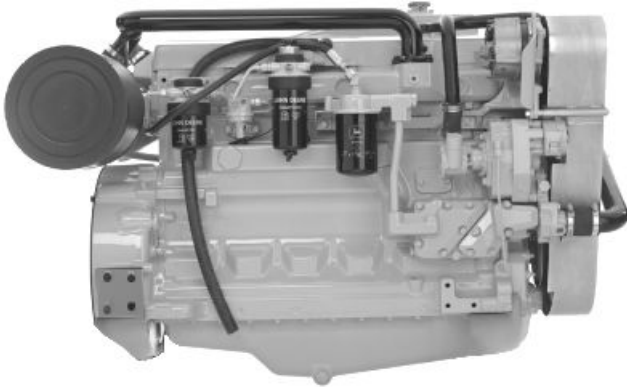
6068TFM50 Engine

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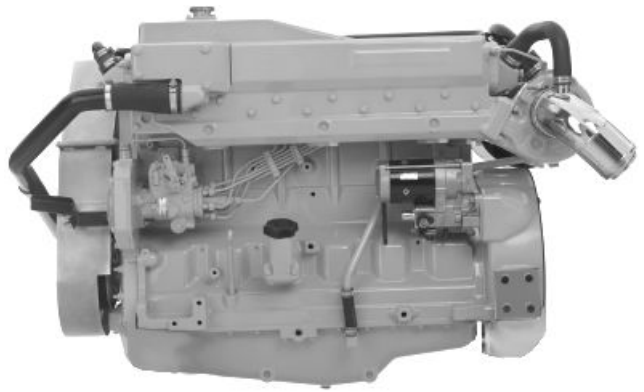
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6068TFM50 Engine

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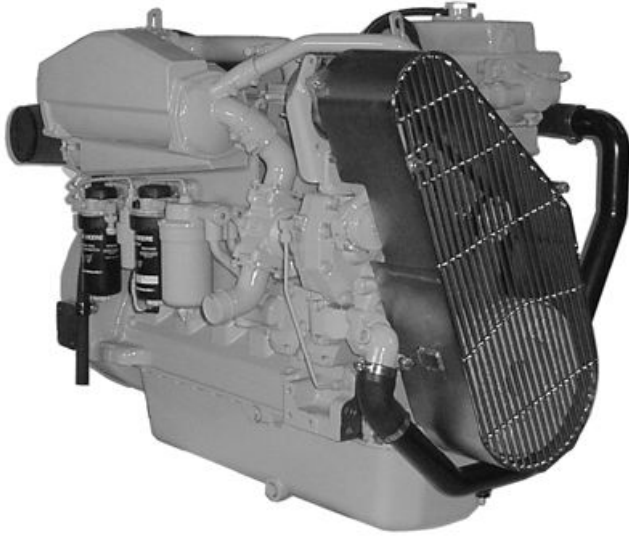


6068TFM50 Engine

RG9830—UN—05JAN99

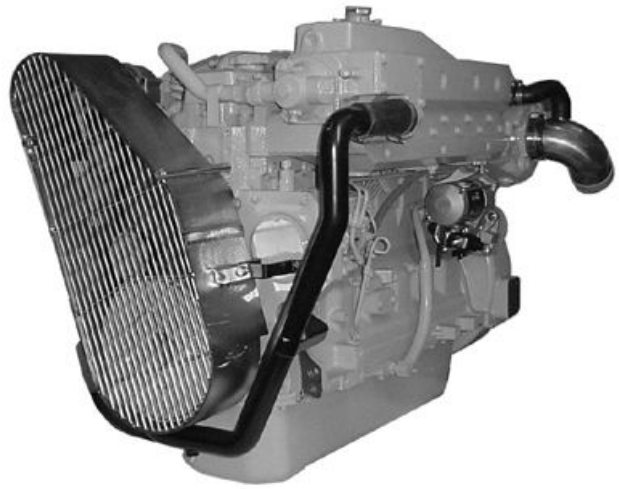
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6.8 L Marine Engines (6068SFM50 Electronically Controlled)



6068SFM50 Engine

RG12062 —UN—18JAN02



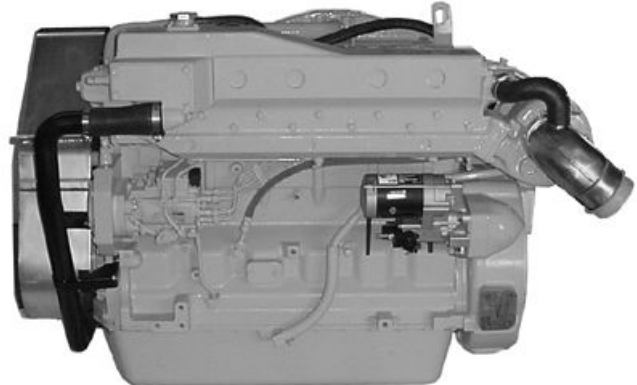
6068SFM50 Engine

RG12061 —UN—26FEB02



6068SFM50 Engine

RG12064 —UN—18JAN02



6068SFM50 Engine

RG12063 —UN—17JUL06

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Record Keeping

Medallion

RG12080 —UN—26FEB02

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



POWERTECH Medallion

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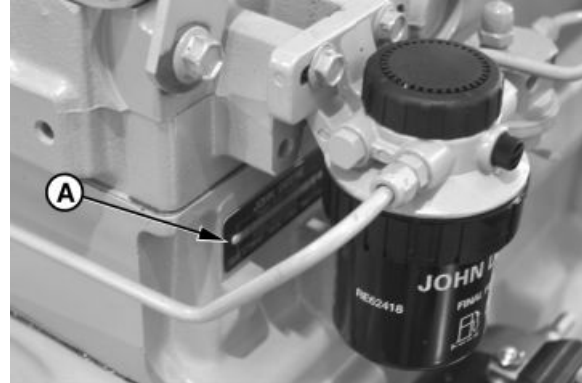
Engine Serial Number Plate

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

- "CD" indicates the engine was built in Saran, France
- "T0" indicates the engine was built in Dubuque, Iowa
- "PE" indicates the engine was built in Torreon, Mexico

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

A—Serial Number Plate



Engine Serial Number Plate

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Record Engine Serial Number

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

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

Engine Serial Number (A) _____

Engine Model Number (B) _____

A—Engine Serial Number

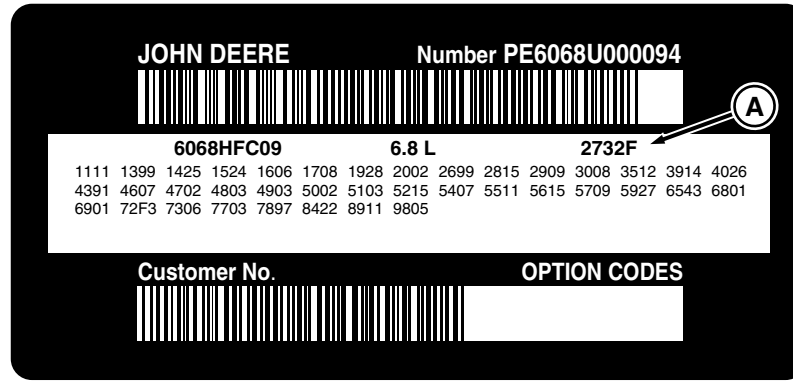
B—Engine Model Number



Serial Number Plate

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Engine Option Codes



Option Code Label Example

A—Engine Base Code (example)

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

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

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

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

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

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

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

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

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

Engine Base Code (A):

Option Codes	Description
10_____	Paint Protection
11_____	Rocker Arm Cover
12_____	Oil Filler
13_____	Crankshaft Pulley
14_____	Flywheel Housing
15_____	Flywheel
16_____	Fuel Injection System
17_____	Air Inlet
18_____	Air Cleaner
19_____	Oil Pan
20_____	Water Pump
21_____	Thermostat Cover

Option Codes	Description
56_____	Paint
57_____	Water Pump Inlet
58_____	Power Take Off
59_____	Oil Cooler/Oil Filter
60_____	Add-On Fan Drive Pulley
61_____	After Treatment Device/Muffler
62_____	Alternator Mounting
63_____	Low-Pressure Fuel Lines
64_____	Exhaust Elbow
65_____	Turbocharger
66_____	Temperature Switch
67_____	Engine Sensors

Continued on next page

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RG24026 —UN—05AUG13

Record Keeping

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

NOTE: This is a complete option code list based on the latest information available at the time of publication. The right is reserved to make changes

at any time without notice. Your engine will not contain all option codes listed.

RG, RG34710, 5004 -19-12JUN17-2/2

Record Fuel Injection Pump Model Number

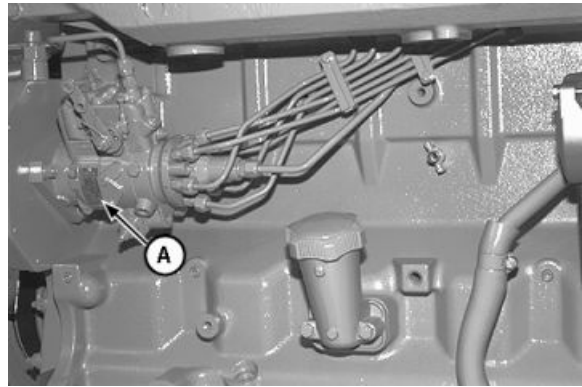
Record the fuel injection pump model and serial information found on the serial number plate (A).

Model No. _____ RPM _____

Manufacturer's No. _____

Serial No. _____

A—Serial Number Plate



Fuel Injection Pump Model Number

RG9913 —UN—25FEB99

RG, RG34710, 5511 -19-20MAY96-1/1

Safety

Recognize Safety Information

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

Follow recommended precautions and safe operating practices.



T81389 —UN—28JUN13

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

Understand Signal Words

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

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

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

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards. DANGER or WARNING safety signs are located near specific hazards. General

precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.



TS187 —19—30SEP88

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

Follow Safety Instructions

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

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

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

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

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



TS201 —UN—15APR13

DX,READ -19-16JUN09-1/1

Replace Safety Signs

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

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



TS201 —UN—15APR13

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

California Proposition 65 Warning

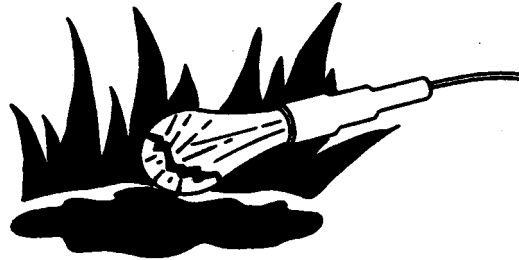
Diesel engine exhaust, some of its constituents, along with certain machine components contain or emit chemicals known to the State of California to cause cancer and birth

defects or other reproductive harm. In addition, certain fluids contained in the machine and certain products of component wear contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

RG41061,000001F -19-12JAN10-1/1

Illuminate Work Area Safely

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



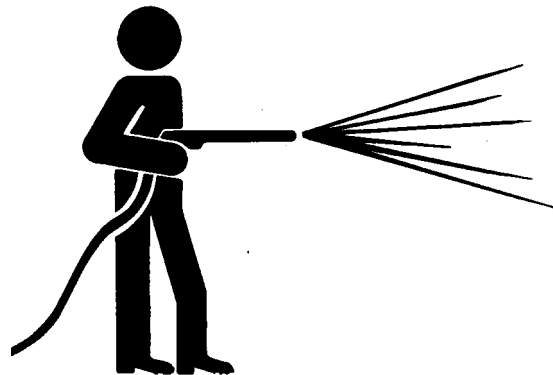
TS223 —UN—23AUG88

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

Work in Clean Area

Before starting a job:

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



T6642EJ —UN—18OCT88

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

Use Proper Tools

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

Use power tools only to loosen threaded parts and fasteners.

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

Use only service parts meeting John Deere specifications.



TS779 —UN—08NOV89

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

Live With Safety

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



TS231 —19—07OCT88

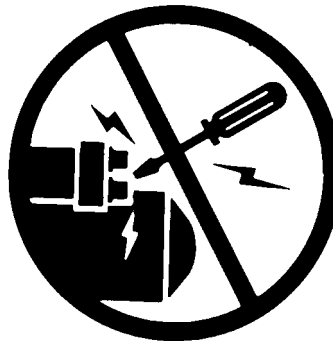
DX,LIVE -19-25SEP92-1/1

Prevent Machine Runaway

Avoid possible injury or death from machinery runaway.

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

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



TS177 —UN—11JAN89

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

Handle Fuel Safely—Avoid Fires

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

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

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

Use only an approved fuel container for transporting flammable liquids.

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



TS202 —UN—23AUG88

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

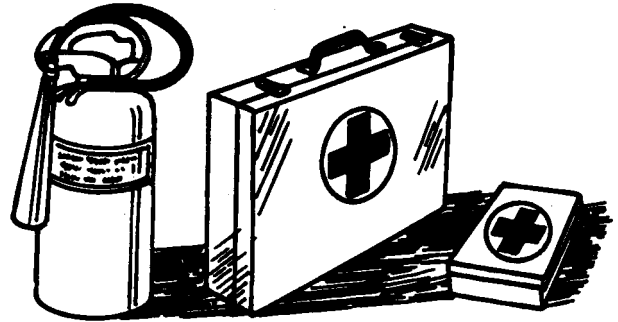
DX,FIRE1 -19-12OCT11-1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

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



TS291 —UN—15APR13

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

Handle Starting Fluid Safely

Starting fluid is highly flammable.

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

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

Do not incinerate or puncture a starting fluid container.

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



TS1356 —UN—18MAR92

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

In Case of Fire

CAUTION: Avoid personal injury.

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

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

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

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

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



TS227 —UN—15APR13

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

Handle Fluids Safely—Avoid Fires

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

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

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

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



TS227 —UN—15APR13

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

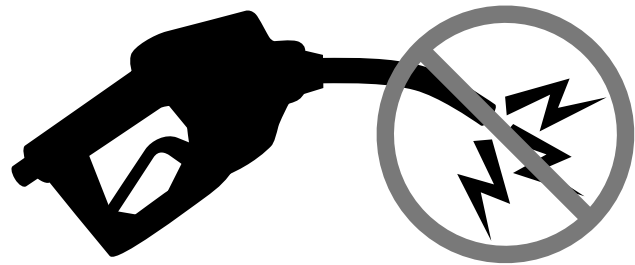
Avoid Static Electricity Risk When Refueling

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

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

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

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



RG22142 —UN—17MAR14

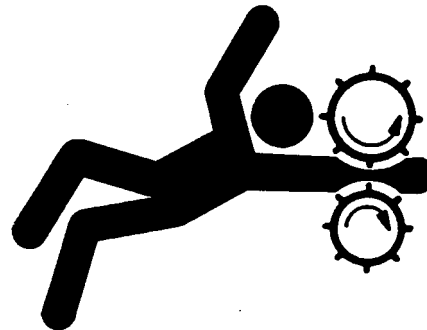
RG21992 —UN—21AUG13

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

Service Machines Safely

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

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



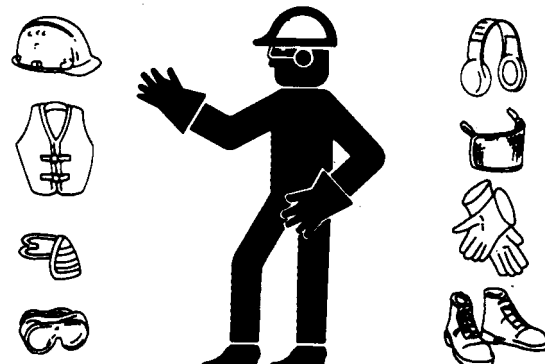
TS228 —UN—23AUG88

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

Wear Protective Clothing

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

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



TS206 —UN—15APR13

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

Protect Against Noise

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

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

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



TS207 —UN—23AUG88

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

Handling Batteries Safely

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

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

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

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

Avoid hazards by:

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

If acid is spilled on skin or in eyes:

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

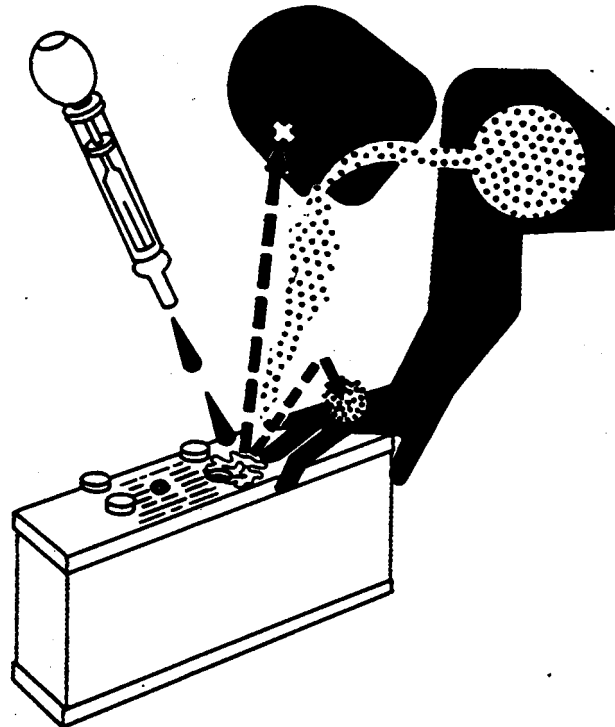
If acid is swallowed:

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

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



TS204 —UN—15APR13



TS203 —UN—23AUG88

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

Prevent Acid Burns

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

Avoid the hazard by:

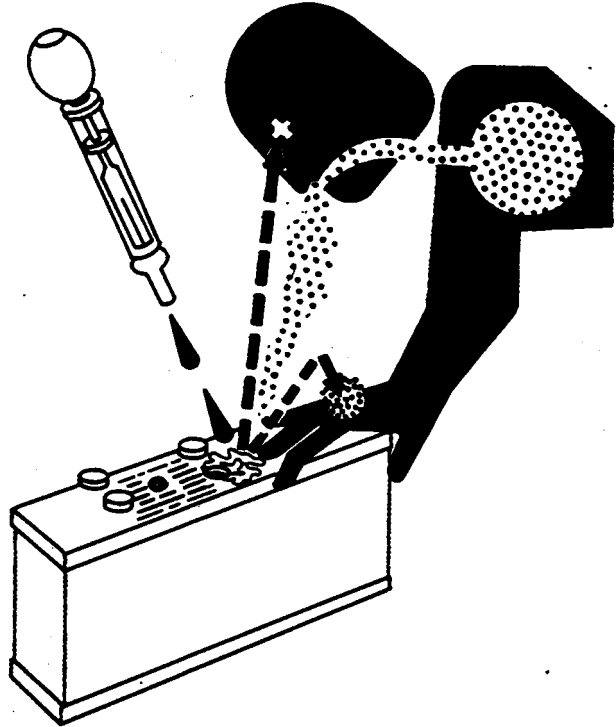
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

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

If acid is swallowed:

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



TS203 —UN—23AUG88

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

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

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

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



TS1644 —UN—22AUG95

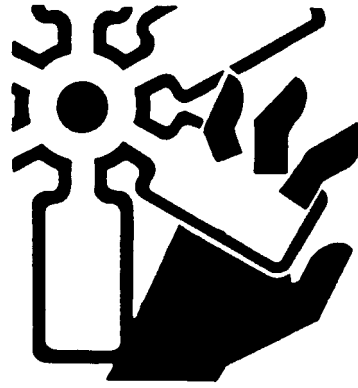
DX,ROTATING -19-18AUG09-1/1

Install All Guards

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

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

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



TS677 —UN—21SEP89

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

Practice Safe Maintenance

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

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

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

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

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

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

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



TS218 —UN—23AUG88

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

Remove Paint Before Welding or Heating

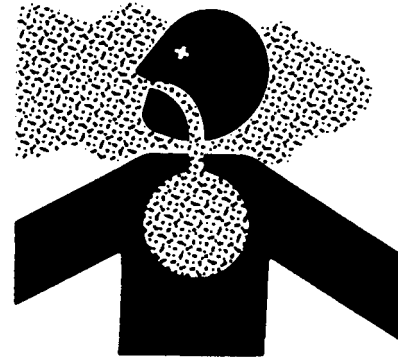
Avoid potentially toxic fumes and dust.

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

Remove paint before heating:

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

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



TS220 —UN—15APR13

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

Dispose of paint and solvent properly.

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

Avoid Heating Near Pressurized Fluid Lines

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



TS953 —UN—15MAY90

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

Avoid High-Pressure Fluids

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

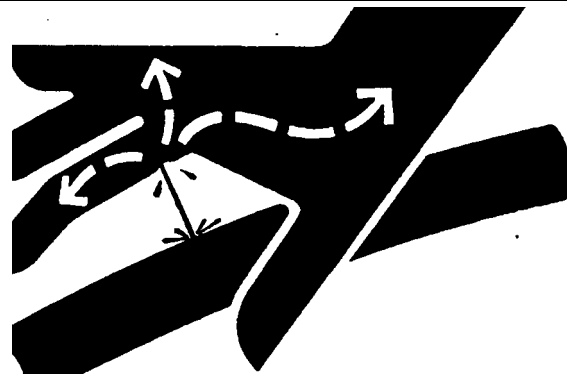
Replace worn or damaged hose assemblies immediately with John Deere approved replacement parts.

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

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

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

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within



X9811 —UN—23AUG88

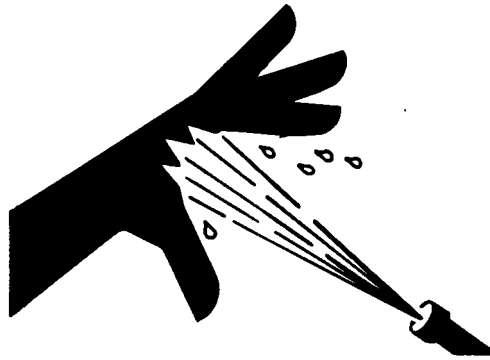
a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available in English from Deere & Company Medical Department in Moline, Illinois, U.S.A., by calling 1-800-822-8262 or +1 309-748-5636.

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

Do Not Open High-Pressure Fuel System

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

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



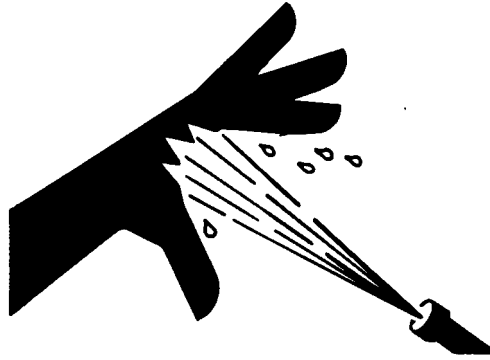
DX,WW,HPCR1 -19-07JAN03-1/1

TS1343 —UN—18MAR92

Protect Against High Pressure Spray

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

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



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

TS1343 —UN—18MAR92

Prevent Battery Explosions

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

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

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



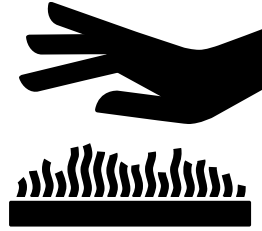
DX,SPARKS -19-03MAR93-1/1

TS204 —UN—15APR13

Avoid Hot Exhaust

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

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



RG17488 —UN—21AUG09

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

Work In Ventilated Area

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

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



TS220 —UN—15APR13

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

Service Cooling System Safely

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

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



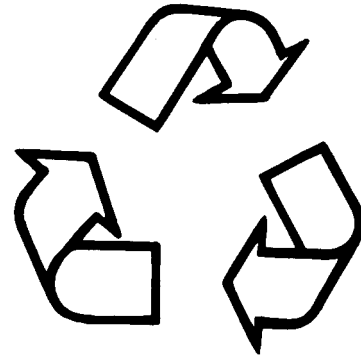
TS281 —UN—15APR13

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

Decommissioning — Proper Recycling and Disposal of Fluids and Components

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

- Use appropriate tools and personal protective equipment such as clothing, gloves, face shields or glasses, during the removal or handling of objects and materials.
- Follow instructions for specialized components.
- Release stored energy by lowering suspended machine elements, relaxing springs, disconnecting the battery or other electrical power, and releasing pressure in hydraulic components, accumulators, and other similar systems.
- Minimize exposure to components which may have residue from agricultural chemicals, such as fertilizers and pesticides. Handle and dispose of these components appropriately.
- Carefully drain engines, fuel tanks, radiators, hydraulic cylinders, reservoirs, and lines before recycling components. Use leak-proof containers when draining fluids. Do not use food or beverage containers.
- Do not pour waste fluids onto the ground, down a drain, or into any water source.
- Observe all national, state, and local laws, regulations, or ordinances governing the handling or disposal of waste fluids (example: oil, fuel, coolant, brake fluid);



TS1133 —UN—15APR13

filters; batteries; and, other substances or parts. Burning of flammable fluids or components in other than specially designed incinerators may be prohibited by law and could result in exposure to harmful fumes or ashes.

- Service and dispose of air conditioning systems appropriately. Government regulations may require a certified service center to recover and recycle air conditioning refrigerants which could damage the atmosphere if allowed to escape.
- Evaluate recycling options for tires, metal, plastic, glass, rubber, and electronic components which may be recyclable, in part or completely.
- Contact your local environmental or recycling center, or your John Deere dealer for information on the proper way to recycle or dispose of waste.

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

Fuels, Lubricants, and Coolant

Diesel Fuel

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

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

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

Required Fuel Properties

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

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

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

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

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

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

E-Diesel fuel

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

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

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

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

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

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

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

Sulfur Content for Tier 3 and Stage III A Engines

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

Sulfur Content for Tier 2 and Stage II Engines

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

Sulfur Content for Other Engines

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

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

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

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

Supplemental Diesel Fuel Additives

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

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

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

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

Lubricity of Diesel Fuel

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

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

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

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

Lubricity of BioDiesel Fuel

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

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

Handling and Storing Diesel Fuel

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

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

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

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

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

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

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

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

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

Biodiesel Fuel

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

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

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

John Deere Stage V Engines Operating in the European Union

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

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

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

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

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

John Deere Engines Without Exhaust Filter

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

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

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

Biodiesel Use Requirements and Recommendations

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

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

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

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

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

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

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

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

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

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

- Possible compatibility issues with other materials (including copper, lead, zinc, tin, brass, and bronze) used in fuel handling, distribution, and storage equipment
- Possible reduction in water separator efficiency
- Possible damage to paint if exposed to biodiesel
- Possible corrosion of fuel injection equipment
- Possible elastomeric seal and gasket material degradation (primarily an issue with older engines)
- Possible high acid levels within fuel system

- Because biodiesel blends above B20 contain more ash, using blends above B20 can result in more rapid ash loading and require more frequent cleaning of the Exhaust Filter (if present)

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

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

Testing Diesel Fuel

A fuel analysis program can help to monitor the quality of diesel fuel. The fuel analysis can provide critical data such as calculated cetane index, fuel type, sulfur content, water content, appearance, suitability for cold weather

operations, bacteria, cloud point, acid number, particulate contamination, and whether the fuel meets ASTM D975 or equivalent specification.

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

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

Fuel Filters

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

manufacturing tolerances have significantly reduced capacities for debris and water.

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

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

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

Minimizing the Effect of Cold Weather on Diesel Engines

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

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

Use Winter Grade Fuel

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

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

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

Air Intake Heater

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

Ether

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

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

Coolant Heater

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

Seasonal Viscosity Oil and Proper Coolant Concentration

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

Diesel Fuel Cold Flow Additive

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

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

Biodiesel

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

Winterfronts

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

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

Radiator Shutters

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

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

For more information, see your John Deere dealer.

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

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

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

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

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

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

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

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

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

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

- ACEA Oil Sequence E1

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

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

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

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

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

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

Diesel Engine Oil — Non-Emissions Certified and Certified Tier 1 and Stage I

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

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

John Deere Plus-50™ II oil is preferred.

John Deere Plus-50™ is also recommended.

John Deere Torq-Gard™ is also allowed.

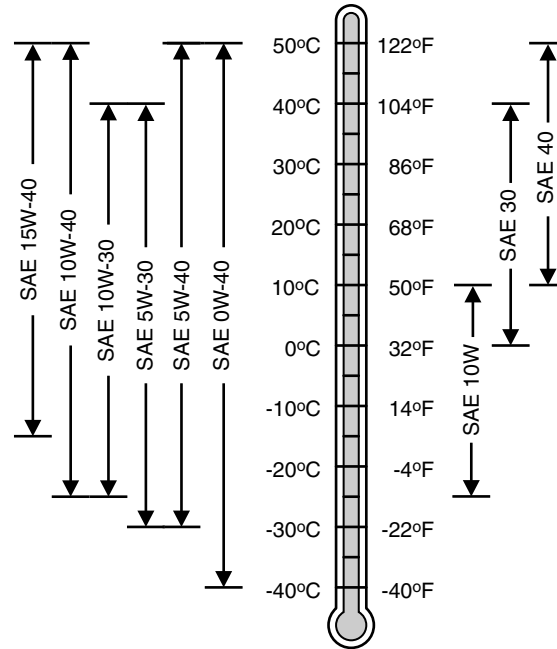
Other oils may be used if they meet one or more of the following standards:

- API Service Category CK-4
- API Service Category CJ-4
- API Service Category CI-4 PLUS
- API Service Category CI-4
- API Service Category CH-4
- API Service Category CG-4
- API Service Category CF-4
- ACEA Oil Sequence E9
- ACEA Oil Sequence E7
- ACEA Oil Sequence E6
- ACEA Oil Sequence E5
- ACEA Oil Sequence E4
- ACEA Oil Sequence E3
- ACEA Oil Sequence E2

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

Multi-viscosity diesel engine oils are preferred.

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



Oil Viscosities for Air Temperature Ranges

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

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

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

TS1743 —UN—25APR19

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

Extended Diesel Engine Oil Service Intervals — Non-Emissions Certified and Certified Tier 1 and Stage I

When John Deere Plus-50™ II or John Deere Plus-50™ is used with the specified John Deere filter, the service interval for engine oil and filter changes may be increased by 50% but not to exceed a maximum of 500 hours.

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

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

When ACEA E9, ACEA E7, ACEA E6, ACEA E5, or ACEA E4 oils are used with specified John Deere filter, use engine oil analysis to determine if the service interval for engine oil and filter changes may be increased by a maximum of 50%, but not to exceed 500 hours. Oil analysis means taking a series of oil samples at 50 hour increments beyond the normal service interval until either the data indicates the end of useful oil life or the maximum service interval is reached.

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

If John Deere Plus-50™ II or John Deere Plus-50™, ACEA E9, ACEA E7, ACEA E6, ACEA E5, or ACEA E4 oils are used with other than the specified John Deere filter, change the engine oil and filter at the normal service interval.

If John Deere Torq-Gard™, API CK-4, API CJ-4, API CI-4 PLUS, API CI-4, API CH-4, or ACEA E3 oils are used, change the engine oil and filter at the normal service interval.

If API CG-4, API CF-4, or ACEA E2 oils are used, change the engine oil and filter at 50% of the normal service interval.

IMPORTANT: To avoid engine damage:

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

DX,ENOIL6 -19-13JAN18-1/1

Mixing of Lubricants

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

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

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

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

Alternative and Synthetic Lubricants

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

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

Consult your John Deere dealer to obtain information and recommendations.

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

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

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

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

Lubricant Storage

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

Use clean containers to handle all lubricants.

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

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

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

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

Oil Filters

Filtration of oils is critically important for proper operation and lubrication. John Deere brand oil filters have been designed and produced specifically for John Deere applications.

John Deere filters adhere to engineering specifications for quality of the filter media, filter efficiency rating, strength

of the bond between the filter media and the element end cap, fatigue life of the canister (if applicable), and pressure capability of the filter seal. Non-John Deere branded oil filters might not meet these key John Deere specifications.

Always change oil filters regularly as specified in this manual.

DX,FILT1 -19-11APR11-1/1

Diesel Engine Coolant (engine with wet sleeve cylinder liners)

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

Preferred Coolants

The following pre-mix engine coolants are preferred:

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

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

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

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

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

Additional Recommended Coolants

The following engine coolant is also recommended:

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

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

Other Coolants

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

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

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

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

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

Water Quality

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

Coolant Drain Intervals

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

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

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

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

Do not mix ethylene glycol and propylene glycol base coolants.

Do not use coolants that contain nitrites.

Water Quality for Mixing with Coolant Concentrate

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

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

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

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

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

Freeze Protection

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

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

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

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

Operating in Warm Temperature Climates

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

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

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

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

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

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

Testing Coolant Freeze Point

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

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

To use this tool:

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



SERVICEGARD™ Part Number 75240

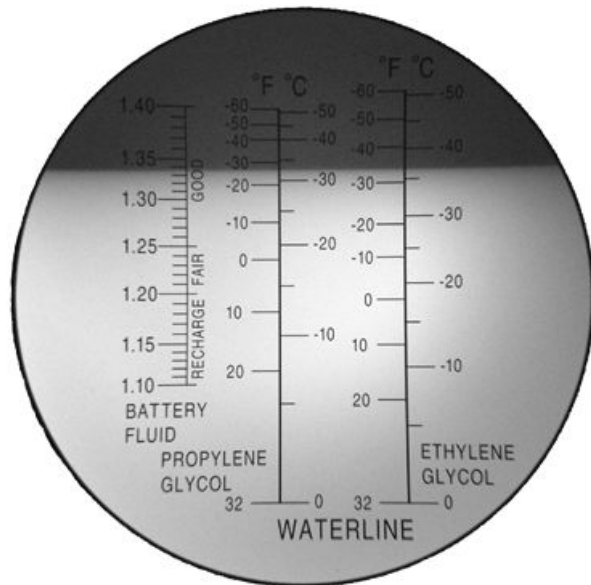


Image with a Drop of 50/50 Coolant Placed on the Refractometer Window

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

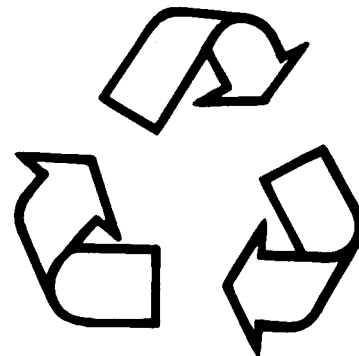
Disposing of Coolant

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

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

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

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



RG,RG34710,7543 -19-27JUL06-1/1

Engine Operating Guidelines

Sea Trials for Performance and Warranty

NOTE: John Deere Marine Engines are not eligible for an extended warranty until proper installation and performance is found to be consistent with John Deere's Application Guidelines; verified by a sea trial. Once a sea trial has been completed, your John Deere dealer / distributor will provide the results to John Deere for analysis. If the engine installation meets all guidelines it will then be eligible for extended warranty.

Following any John Deere marine engine installation a John Deere Marine dealer should conduct a sea trial in order to validate proper installation. In order to maximize the performance of each vessel, it is very important to have each installation checked mechanically and electronically before it is put into regular service. The testing and investigation conducted during sea trials can proactively identify issues before they potentially result in performance problems. Sea trials also provide valuable insight to optimize engine performance, improve long-term durability, and provide a useful reference for future updates.

Two important requirements examined in a sea trial are exhaust backpressure and rated engine speed. Exceeding the recommended backpressure could result in extensive engine damage or failure. The rated engine speed is checked to verify the vessel is not over-propped (propeller is too big) or under-propped (propeller is too small). Either of these conditions will reduce engine life expectancy, increase repair costs and negatively impact fuel consumption. The John Deere Marine dealer should



RG17228—UN—12JUN09

also verify that the additional requirements set forth in the John Deere Marine Application Guidelines were met during engine installation.

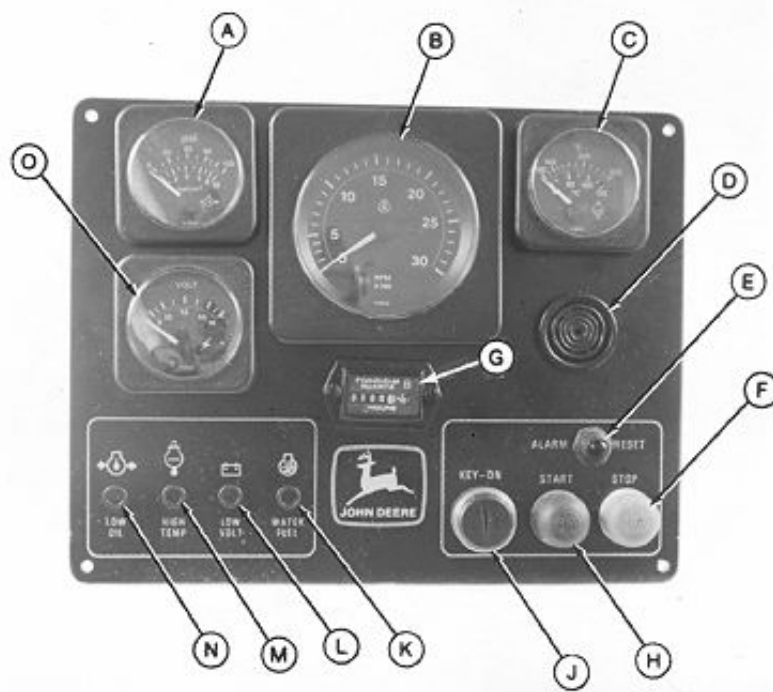
The overall benefit of the sea trial is to verify the engines are installed correctly and are properly matched to the vessel. This provides for the best possible performance in the unpredictable conditions you may operate in on the open water.

NOTICE: ANY ENGINE DAMAGE RESULTING FROM OVER-PROPPING, EXCESSIVE EXHAUST BACK-PRESSURE OR OTHER INSTALLATION / RIGGING ISSUES ARE NOT COVERED UNDER WARRANTY.

NOTE: The specifications section in the back of this manual lists the rated speed for each of the different available power ratings.

JR74534,0000294 -19-23AUG11-1/1

Instrument (Gauge) Panel (Propulsion Units Only) (Except 6068SFM50)



A—Oil Pressure Gauge
B—Tachometer
C—Coolant Temperature Gauge
D—Audible Alarm

E—Alarm Reset Switch
F—Stop Switch
G—Hour Meter
H—Start Switch
J—Key Switch

K—Water-in-Fuel Warning Light
L—Low Battery Voltage Warning Light
M—High Coolant Temperature Warning Light

N—Low Oil Pressure Warning Light
O—Voltmeter

All controls and gauges are optional equipment on John Deere Marine Engines. They may be supplied by the boat builder instead of John Deere. The following information applies only to those controls and gauges provided by John Deere. Consult your boat builder for information on instrumentation other than those supplied by John Deere.

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

NOTE: Main station instrument panel shown, flybridge panel is similar except it does not have a key switch (J) or hour meter (G).

The optional instrument (gauge) panel available from your John Deere engine distributor or servicing dealer is recommended for propulsion units only and is not equipped with safety shut-down devices, only audible and visible warning devices provided.

Following is a brief description of the available optional gauges and warning devices:

A—Engine Oil Pressure Gauge

The oil pressure gauge (A) indicates engine oil pressure. It is connected to an audible alarm (D) and a warning light (N) for warning the operator if engine oil pressure falls below a safe operating pressure.

NOTE: Refer to photo on previous page.

B—Tachometer

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

C—Engine Coolant Temperature Gauge

The engine coolant temperature gauge (C) indicates the engine coolant temperature. It is connected to an audible alarm and a warning light (M) to warn the operator if coolant temperature rises above the preset safe operating temperature.

D—Audible Alarm

The audible alarm (D) will sound (and warning light will appear) whenever low oil pressure, high coolant temperature, low battery voltage, or water-in-fuel condition exists.

E—Reset (Audible Alarm Override) Switch

The reset switch (E) has a button that silences the audible alarm for approximately 2-1/2 minutes when depressed.

F—Stop Switch

Continued on next page

RG, RG34710, 5551 -19-20MAY96-1/2

RG6097—UN—30JAN92

The stop switch (F) has a button which when depressed and held in, will stop the engine with key switch at any position. The button must be held in until engine is completely stopped.

G—Hour Meter

The electric hour meter (G) is used to show the operating time of an engine while key switch is in the "ON" position. The hour meter records the time in tenths of an hour and should be used as a guide for scheduling periodic maintenance.

H—Start Switch

The start switch (H) has a button which when depressed and held in, operates the starting motor. The engine will only start with key switch in the "ON" position.

J—Key Switch

The two position (ON—OFF) key switch (J) controls the engine electrical system, it does not start nor stop the engine. When the switch is in the "ON" position, the engine may be started or stopped by depressing each respective button. When the switch is in the "OFF" position, the engine may be stopped but it can not be started.

K—Water-In-Fuel Warning Light

L—Low Battery Voltage Warning Light

M—High Coolant Temperature Warning Light

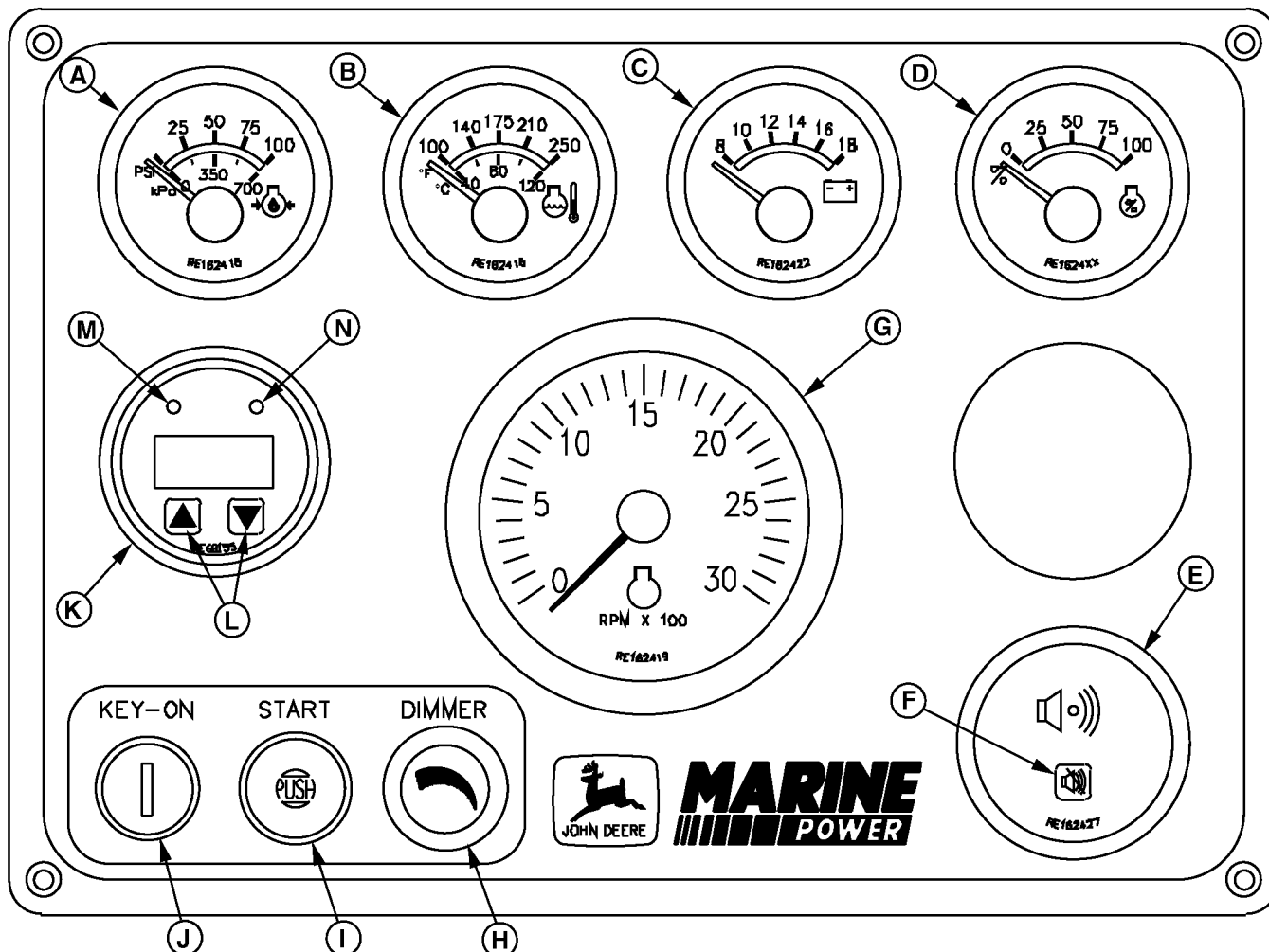
N—Low Oil Pressure Warning Light

O—Voltmeter

The voltmeter (O) indicates system battery voltage.

RG, RG34710, 5551 -19-20MAY96-2/2

John Deere Instrument Panel (6068SFM50 Electronically Controlled Engine)



Instrument Panel

- | | | | |
|-----------------------------|---------------------------------|-------------------------------|-------------------------------|
| A—Oil Pressure Gauge | E—Audible Alarm | I—Start Switch | M—Amber “WARNING” Indicator |
| B—Coolant Temperature Gauge | F—Audible Alarm Override Switch | J—Key Switch | N—Red “STOP ENGINE” Indicator |
| C—Voltmeter | G—Tachometer | K—Diagnostic Gauge/Hour Meter | |
| D—Power Meter | H—Dimmer Switch | L—Touch Switches | |

John Deere 6068SFM50 **POWERTECH®** Marine Engine has an electronic control system, which has the following controls and gauges. The following information applies only to those controls and gauges supplied by John Deere. Refer to your engine application manual or boat builder for specific guidelines if John Deere-sourced controls and instrumentation are not used.

NOTE: For generator - set engines, the gauges required are available from generator - set supplier. The gauges required are hour meter, oil pressure gauge and coolant temperature gauge.

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. Wiring diagram foldouts are

located in the **TROUBLESHOOTING** Section later in this manual.

NOTE: The standard main station (wheel house) instrument panel is shown. An optional flybridge panel is also available that includes the same gauges as the standard panel except there is no diagnostic gauge or audible alarm. Also the flybridge panel has engine start and stop buttons instead of the key start switch found on the standard panel.

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

A—Engine Oil Pressure Gauge

Continued on next page

JR74534,0000314 -19-04FEB11-1/2

RG9818A—UN—12NOV99

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

B—Engine Coolant Temperature Gauge

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

C—Voltmeter

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

D—Power Meter

The power meter shows percent of available engine power being used by the vessel.

E—Audible Alarm

The audible alarm (E) will sound whenever low oil pressure, high coolant temperature, or water-in-fuel conditions exist. This includes all signals that light up the amber “warning” indicator (intermittent alarm) or the red “stop engine” indicator (steady alarm).

F—Audible Alarm Override Switch

The override switch (F) has a button that silences the audible alarm for approximately 2-1/2 minutes when depressed.

G—Tachometer

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

H—Dimmer Switch

The dimmer switch (H) allows the operator to dim or brighten the illumination of the instrument panel.

I—Start Switch

The start switch (I) has a button which when depressed and held in, operates the starting motor to start the

engine. The engine will only start with key switch in the “ON” position.

J—Key Switch

The two-position (OFF/ON) key switch (J) controls the engine electrical system and stops the engine. When the switch is in the “ON” position, the engine may be started by depressing the start switch (I).

K—Diagnostic Gauge/Hour Meter

The diagnostic gauge (K) displays diagnostic trouble codes (DTCs) as they are accessed. Other information on the engine can be accessed using the touch switches (L). The hour meter feature shows the operating hours of the engine and should be used as a guide for scheduling periodic maintenance. If engine trouble occurs, display will alternately flash from hour meter reading to the message “SvcCode”. Then the touch switches (L) can be used to access the actual trouble code (DTC) (see following).

L—Touch Switches

Use the touch switches (L) to change the displays on the window of the diagnostic gauge and to access engine performance data.

Pressing the left-hand UP switch or the right-hand DOWN switch will allow you to view various engine parameters and any diagnostic fault codes that occur.

Refer to the following story for accessing engine information on the diagnostic gauge using the touch switches.

M—Amber “WARNING” Indicator Light

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

N—Red “STOP ENGINE” Indicator Light

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

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JR74534,0000314 -19-04FEB11-2/2

Using Diagnostic Gauge To Access Engine Information (6068SFM50 Engine)

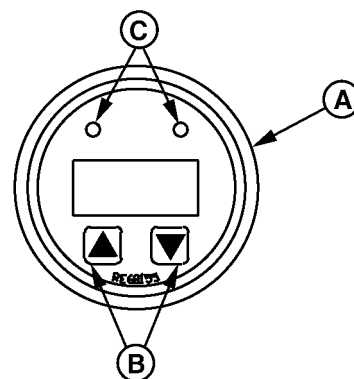
The diagnostic gauge (A) allow the operator to view many readouts of engine functions and trouble codes (DTCs). The gauge is linked to the electronic control system and its sensors. This allows the operator to monitor engine functions and to troubleshoot the engine systems when needed.

Press the two touch switches (B) to view the various engine functions in sequence. The displays can be selected as either customary English or metric units.

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

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

NOTE: Some items listed may not be active on all engines.



Diagnostic Gauge

A—Diagnostic Gauge
B—Touch Switches

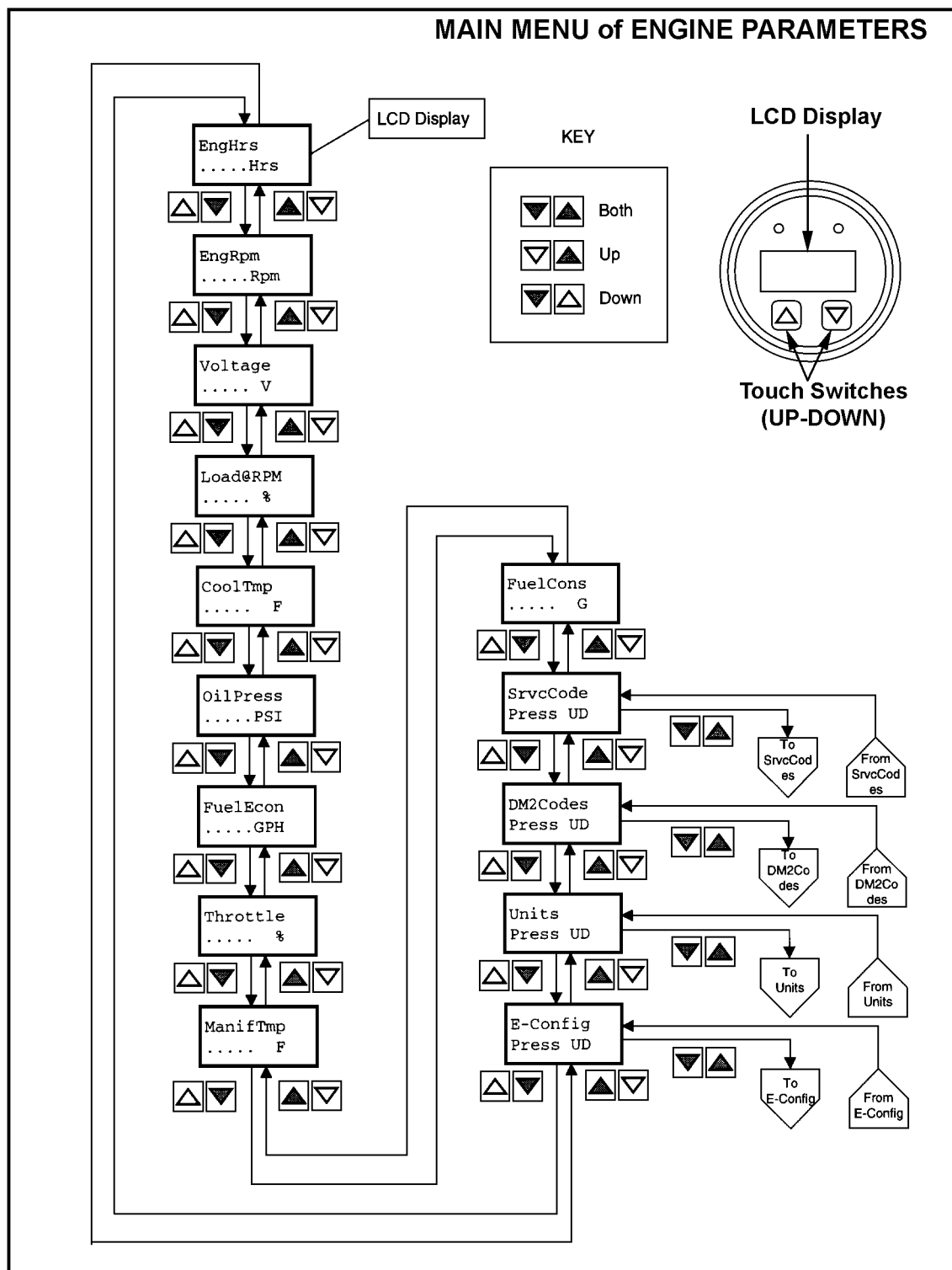
C—Lights

The diagnostic gauge includes a two-line by eight-character backlit Liquid Crystal Display (LCD). The top line displays the data label, i.e. "EngHrs" and the bottom line displays the matching units information, i.e. "80 psi" for oil pressure. The diagnostic gauge uses two touch switches (UP and DOWN) for scrolling through the engine parameter list and viewing the menu list. Two lights (C) (amber and red) are used to signal active fault messages received by the diagnostic gauge.

RG10031 —UN—28OCT99

RG, RG34710, 20046 -19-25MAR02-1/1

Using Touch Switches To Display Information (6068SFM50 Engine)



Using Touch Switches

The touch switches on the diagnostic gauge allow quick and easy navigation through the menu to find the information needed. The diagram on the preceding page is the Main Menu of Engine Parameters. The Main Menu has 14 entries; the first 10 are engine data parameters, and the last four are sub-menu entry points. The following

two rules are used for accessing the various items on the menus:

1. To scroll through the parameter list, press **either** the UP or DOWN touch switches.

Continued on next page

RG, RG34710, 20047 -19-25MAR02-1/2

RG9947 —19—09DEC99

2. To select or exit a sub-menu, ***simultaneously*** press the UP and DOWN switches.

Selecting Engine Data Parameters

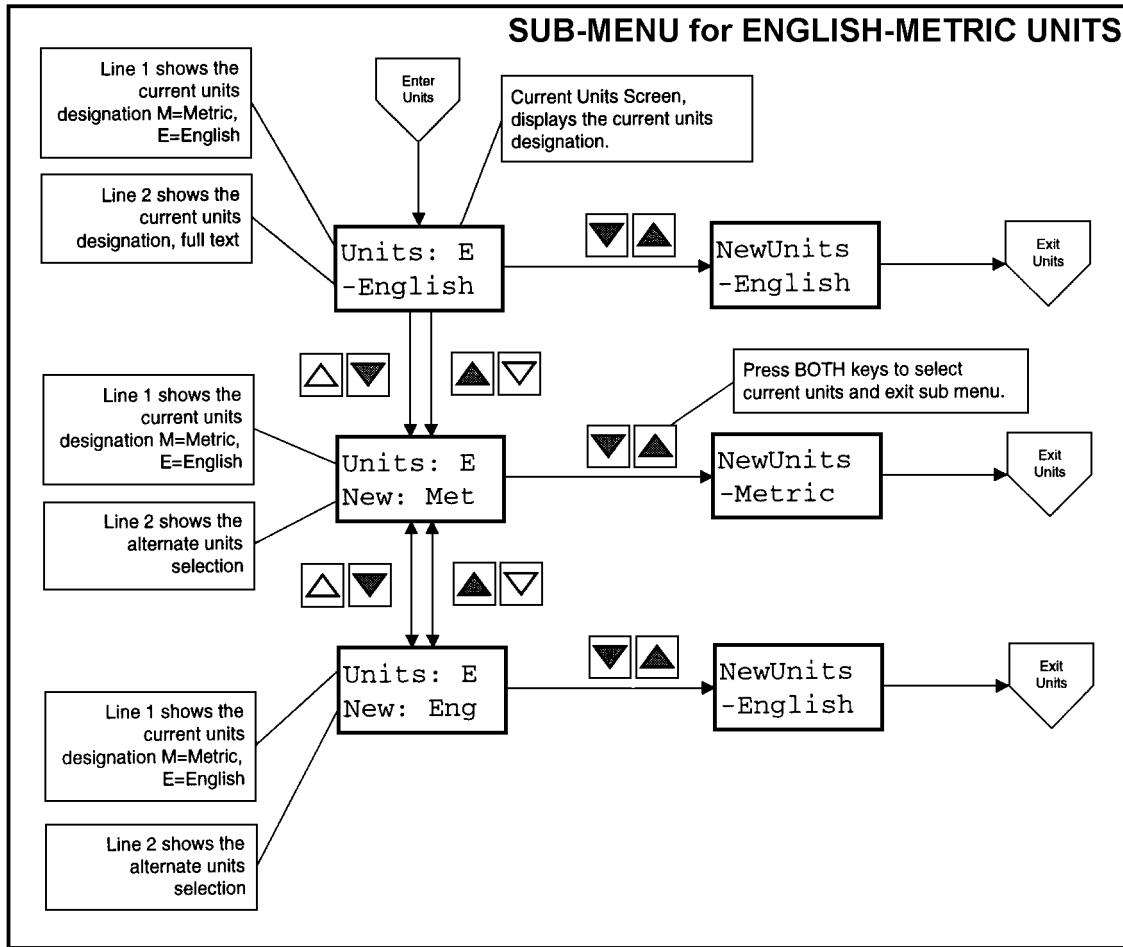
To read any of the engine parameters, press either UP or DOWN switches (as shown on diagram) until the top line of the display shows the desired information.

Selecting Sub-Menus

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

RG, RG34710, 20047 -19-25MAR02-2/2

Changing Units Of Measure (English Or Metric) (6068SFM50 Engine)



Changing Units Of Measure

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

To select the *Units Sub-Menu*, press the UP or DOWN switches until the top line of the display reads “units”.

Then Press BOTH the UP and DOWN switches at the same time to select the *Units Sub-Menu*. The above

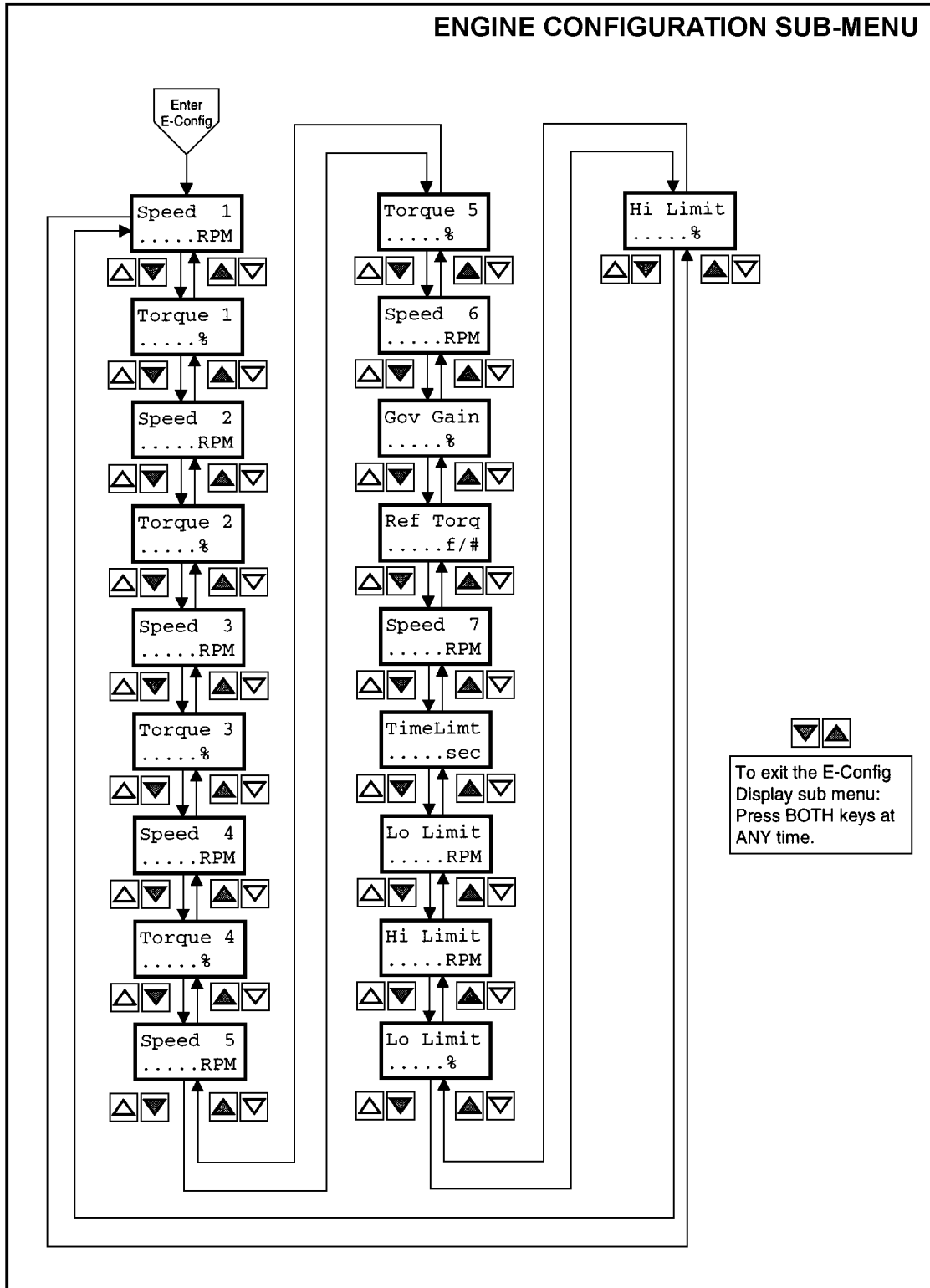
diagram shows the steps for selecting the desired units of measure. Two options are available:

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

RG, RG34710, 20048 -19-25MAR02-1/1

RG10018 —19—28OCT99

Viewing Engine Configuration Data (6068SFM50 Engine)



Viewing Configuration Data

The diagnostic gauge can display the engine configuration data stored in the Engine Control Unit (ECU). To select the *Engine Configuration Sub-Menu* (see diagram on

previous page), press the UP or DOWN switches until the top line of display reads "E-Config".

Continued on next page

DPSG,OUOE003,8001 -19-25MAR02-1/2

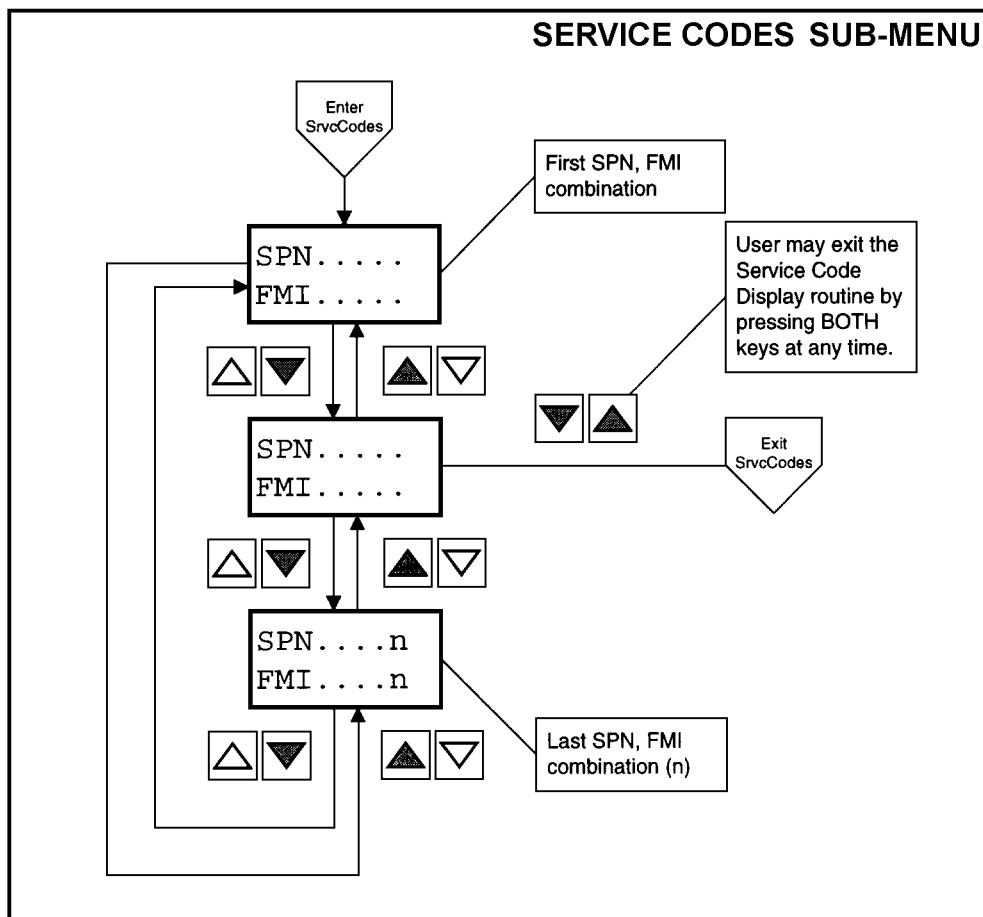
RG10019 — 19—28OCT99

Then Press BOTH the UP and DOWN switches at the same time to select the *Engine Configuration Sub-Menu*.

The diagnostic gauge will display the engine configuration data as shown in the diagram.

DPSG,OUOE003,8001 -19-25MAR02-2/2

Viewing Active Engine Service Codes (DTC) (6068SFM50 Engine)



Active Service Codes Sub-Menu

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

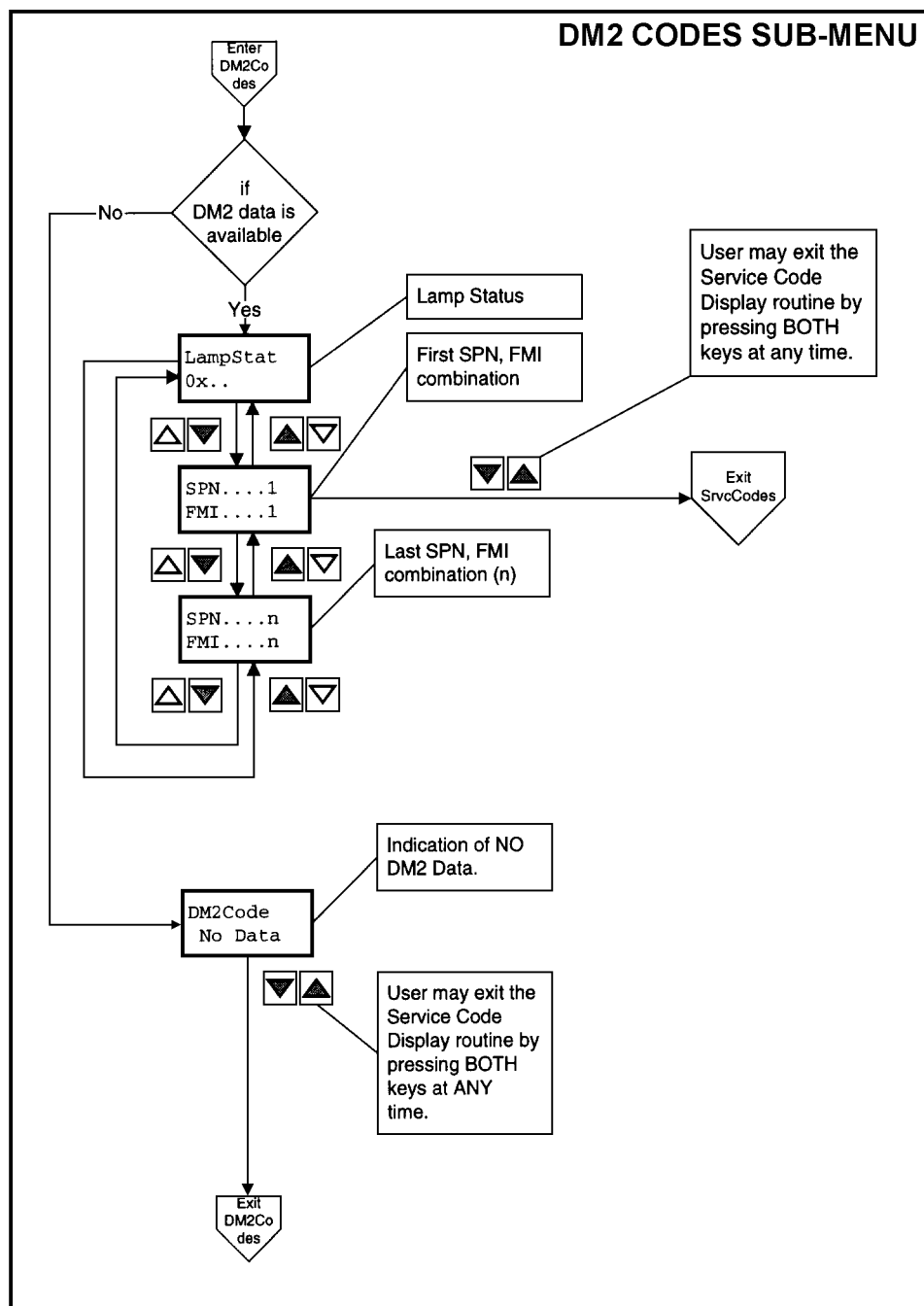
Then press BOTH the UP and DOWN switches at the same time to select the Service (DTC) Code Sub-Menu. The diagnostic gauge has the ability to display all Active Service Codes received. The diagram above titled *Service Codes (DTCs) Sub-Menu* shows the process for selecting Active Service Codes and their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

NOTE: For a list of Service Codes or Diagnostic Trouble Codes (DTCs), refer to *Troubleshooting Section* later in this manual.

DPSG,OUOE003,8002 -19-25MAR02-1/1

RG11510—19—31OCT00

Viewing Stored Service Codes (DTC) In The Engine ECU (6068SFM50 Engine)



Viewing Stored Service Codes

The diagnostic gauge can request Stored Service Codes (DTCs) from the engine. The Stored Service Codes may be used for diagnostic and service needs. To view the Stored Service Codes, it is necessary to select the *DM2Codes Sub-Menu* by pressing the UP or DOWN switches until the top line of display reads “DM2Codes”

Then press BOTH the UP and DOWN switches at the same time to select the *DM2Codes Sub-Menu*. The gauge will display the Stored Service Codes according to the menus shown in the preceding diagram.

DPSG,OUOE003,8003 -19-25MAR02-1/1

RG10021 —19—28OCT99

Normal Engine Operation

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

Normal engine coolant operating temperature range is 82° – 94°C (180° – 202°F). If coolant temperature rises above 105°C (221°F), reduce load on engine. Unless temperature drops quickly, stop engine and determine cause before resuming operation.

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

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

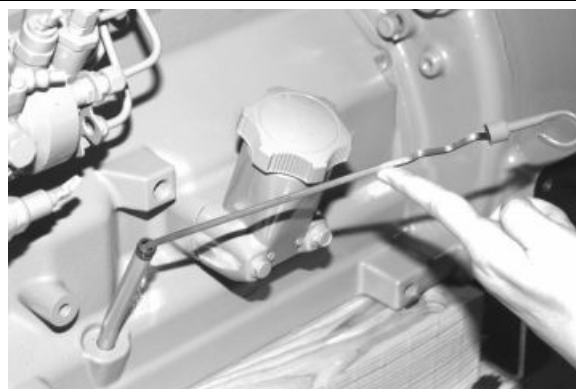
- Sudden drop in oil pressure
- Abnormal coolant temperatures
- Unusual noise or vibration
- Sudden loss of power
- Excessive black exhaust
- Excessive fuel consumption
- Excessive oil consumption
- Fluid leaks

RG, RG34710, 5552 -19-25MAR02-1/1

Break-In Service

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

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



Check Engine Oil

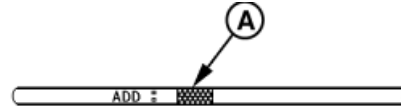
RG8009 —UN—06JAN99

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RG, RG34710, 5553 -19-27MAR02-1/5

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.

RG8028A —UN—15JAN99



Check Engine Oil

A—Crosshatch Pattern On Dipstick

3. Check engine oil level more frequently during engine break-in period. If oil must be added during this period, John Deere 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.

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

Specification

Engine ¹ —Oil Pressure at	
Full Load Rated Speed.....	345 ± 103 kPa (3.45 ± 1.03 bar) (50 ± 15 psi)
Minimum Oil Pressure at	
Rated Speed.....	275 (2.75 bar) (40 psi)
Minimum Oil Pressure at	
850 rpm	103 kPa (1.03 bar) (15 psi)
Coolant Temperature	
Range.....	82°–94° C (180°–202° F)

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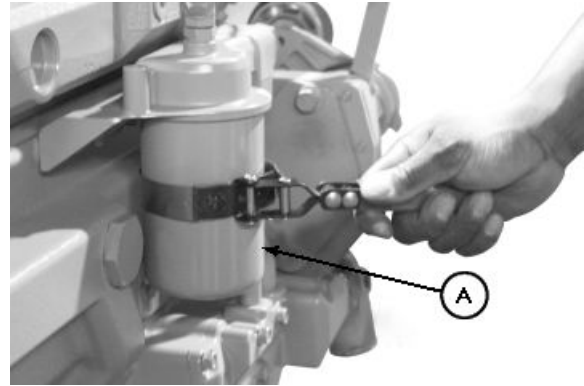
¹At normal operating temperature of 115 ° C (240 ° F) sump.

RG, RG34710, 5553 -19-27MAR02-2/5

4. During the first 20 hours, avoid prolonged periods of engine idling or sustained maximum load operation. If engine will idle longer than 5 minutes, stop engine.
5. After the first 100 hours (maximum), change engine oil and replace engine oil filter (A). (See CHANGE ENGINE OIL AND FILTER in Lubrication and Maintenance/250 Hour Section.) Fill crankcase with seasonal viscosity grade oil. (See DIESEL ENGINE OIL, in Fuels, Lubricants, and Coolant Section.)

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

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



Remove Oil Filter

A—Oil Filter

Continued on next page

RG, RG34710, 5553 -19-27MAR02-3/5

RG9867 —UN—15JAN99

6. Watch coolant temperature gauge (A) closely. If coolant temperature rises above 112°C (234°F), reduce load on engine. Check sea (raw) water strainer for plugging on heat exchanger engines. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

A—Coolant Temperature Gauge



Coolant Temperature Gauge

RG, RG34710, 5553 -19-27MAR02-4/5

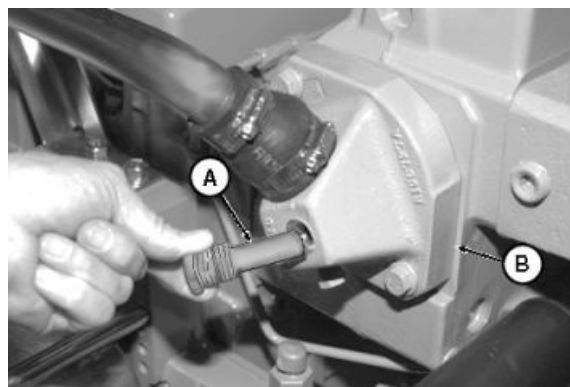
RG6002 —UN—27JAN92

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

Two zinc plugs (A) are installed in the sea water cooling system to help neutralize the corrosive action of salt water on internal cavities of marine engine components. The reaction of the zinc, when exposed to the salt water, causes the plugs to deteriorate instead of critical engine components.

8. After the first 50—100 hours or 2—4 weeks of operation, remove zinc plug from each heat exchanger end cap (B) and inspect for corrosion to get an idea of rate of deterioration in sea water.

If rate of corrosion is slight at 50—100 hours or 2—4 weeks initial inspection, zinc plugs should be inspected at 250 hour intervals thereafter. (See INSPECT AND REPLACE ZINC PLUGS in Lubrication & Maintenance/250 Hour Section)



Zinc Plugs

A—Zinc Plugs

B—End Cap

RG, RG34710, 5553 -19-27MAR02-5/5

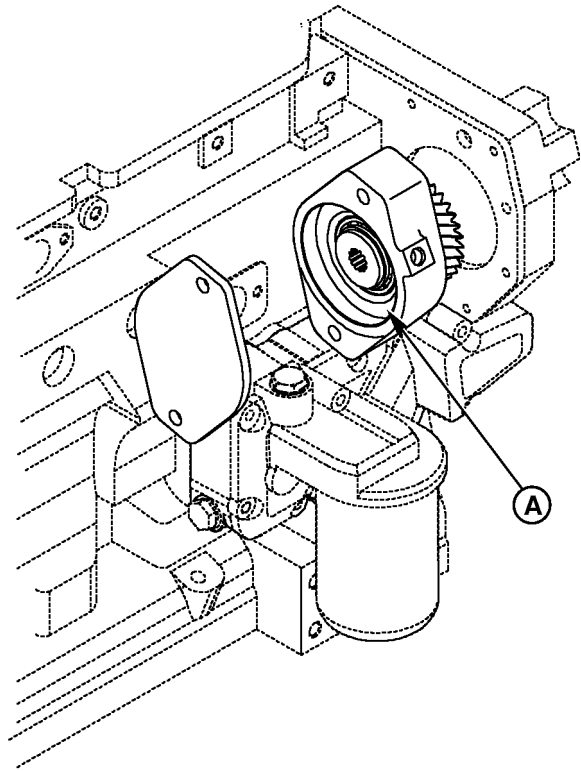
RG8835 —UN—05JAN99

Auxiliary Gear Drive Limitations

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

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

A—Auxiliary Gear Drive



Auxiliary Gear Drive

RG, RG34710, 5555 -19-03JAN02-1/1

RG7634A —UN—22JAN99

Generator Set Power Units

To assure that your engine will deliver efficient generator operation when needed, start engine and run at rated

speed (with 50%—70% load) for 30 minutes every 2 weeks. DO NOT allow engine to run extended period of time with no load.

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

Starting the Engine

The following instructions apply to the optional controls and instruments available through the John Deere Parts Distribution Network for propulsion applications only. The controls and instruments for your engine may be different from those shown here; always follow manufacturer's instructions and familiarize yourself with the correct starting procedure.

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 available from your authorized servicing dealer or engine distributor. Follow manufacturers recommended procedure when using starting aids.

1. Perform all prestarting checks if starting engine for the first time of the day. (See DAILY PRESTARTING CHECKS in this section).

2. Open the fuel supply shut-off valve.

NOTE: If equipped with PTO clutch, disengage PTO clutch.

3. Set marine gear control lever in the "NEUTRAL" position on propulsion units.

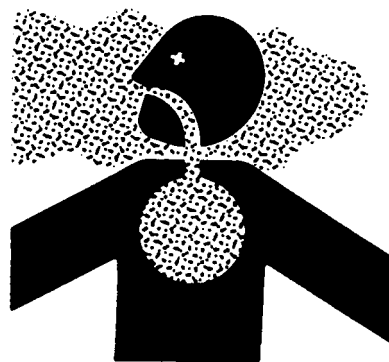
4. Move the throttle control lever approximately 1/3 of the way off the "IDLE" position.

5. Turn key switch (A) to "ON" position. You will hear an audible alarm.

6. Fully depress alarm reset button (B) and release. This silences the audible alarm for about 2-1/2 minutes.

A—Key Switch

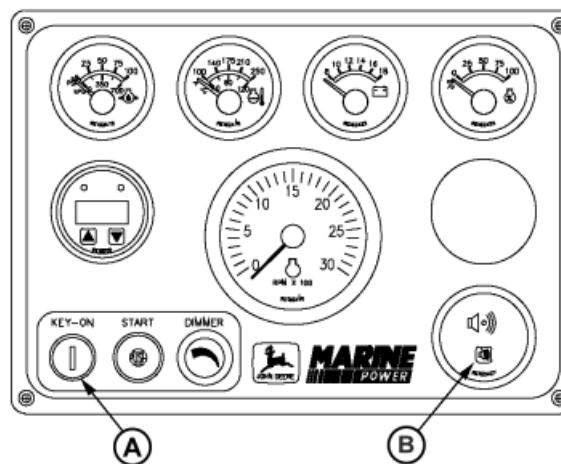
B—Reset Button



Use Proper Ventilation



Instrument Panel - Mechanically Controlled Engines



Instrument Panel - Electronically Controlled Engines

Continued on next page

JR74534,0000304 -19-04FEB11-1/3

TS220 —UN—15APR13

RG6001 —UN—27JAN92

RG12055 —UN—18JAN02

IMPORTANT: Do not crank the starter motor 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 it does not start after four attempts, see Troubleshooting Section.

7. Firmly depress and hold “START” button (A) in until engine starts. Release button as soon as engine starts.

IMPORTANT: If the start button 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.

NOTE: Engine oil pressure is usually higher than normal right after start-up. This is normal and there is no cause for concern.

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

8. Observe “LOW VOLTAGE” warning light (B) (on mechanically controlled engines only) immediately after engine starts, if light flashes on and off, stop engine and check V-belt tension and alternator output voltage.

9. Check sea water outlet for water flow. Check exhaust pipe for water flow on engines with wet exhaust systems.

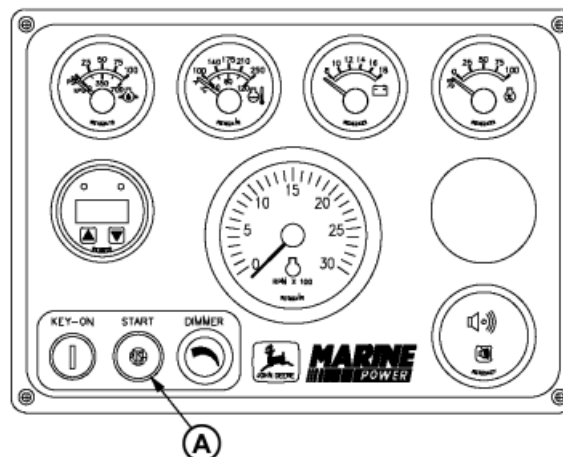
If sea water does not flow within 1 minute after engine starts, stop engine and check sea cock, sea water strainer, and sea water pump for restrictions.

A—Start Button

B—Warning Light



Instrument Panel - Mechanically Controlled Engines



Instrument Panel - Electronically Controlled Engines

Continued on next page

JR74534,0000304 -19-04FEB11-2/3

RG6087—UN—23JAN92

RG12056—UN—18JAN02

10. Allow engine to warm at 1200 rpm, no load for 5 minutes to assure proper lubrication and overall operating efficiency.

If audible alarm sounds or either warning light is lit after engine has been running for 10 seconds or more, stop engine and determine the cause.

IMPORTANT: Avoid unnecessary engine idling.

Prolonged idling may cause the engine coolant temperature to fall below its normal range. This causes incomplete fuel combustion, which results in crankcase oil dilution, 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.

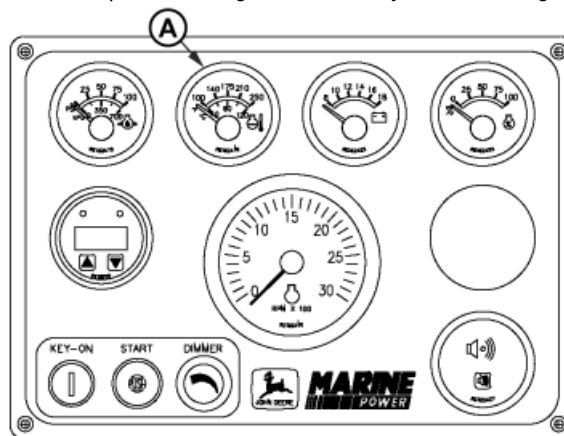
If engine must be left running more than 5 minutes, minimum engine speed should be 1200 rpm.

11. Observe engine coolant temperature gauge (A). Normal engine coolant operating temperature range is 82°—94°C (180°—202°F). Do not place engine under full load until it is warmed to normal operating temperature.

A—Coolant Temperature Gauge



Coolant Temperature Gauge - Mechanically Controlled Engines



Coolant Temperature Gauge - Electronically Controlled Engines

JR74534,0000304 -19-04FEB11-3/3

RG6002 —UN—27JAN92

RG12057 —UN—18JAN02

Warming Engine

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

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

1. Check oil pressure gauge (A) as soon as engine starts. If gauge needle does not rise above minimum oil pressure specification of 105 kPa (1.05 bar) (15.0 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is 345 kPa (3.45 bar) (50 psi) at rated full load speed (1800–2500 rpm) with oil at normal operating temperature of 115°C (240°F).

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

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

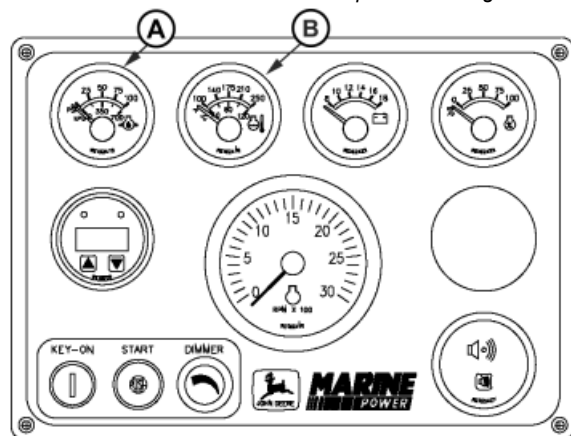
NOTE: It is a good practice to operate the engine under a lighter load and at lower speeds than normal for the first few minutes after start-up.

A—Oil Pressure Gauge

B—Coolant Temperature Gauge



Oil Pressure And Coolant Temperature Gauges



Oil Pressure And Coolant Temperature Gauges

RG, RG34710, 5560 -19-03JAN02-1/1

RG9836 —UN—05JAN99

RG12058 —UN—18JAN02

Idling Engine

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

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

Slow idle speed for this engine is 750 rpm at factory. If an engine will be idling for more than 5 minutes, stop and restart later.

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

RG, RG34710, 5562 -19-20MAY96-1/1

Cold Weather Operation

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

Some engines are equipped with an air intake heater which will make starting the engine easier in cold weather. If equipped, follow steps 1–4 as listed under STARTING THE ENGINE, earlier in this section. Switch on the air intake heater for 30 seconds and then proceed to operate the starter. Follow remaining steps 5–11.

⚠ 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.



Starting Fluid is Flammable

TS1356—UN—18MAR92

RG, RG34710, 5559 -19-03JAN02-1/1

Stopping the Engine

IMPORTANT: Stopping the engine immediately after it has been working under load, can result in overheating and accelerated wear of the engine components. **ALWAYS** allow the engine to cool before shutdown by following the procedures below.

1. Remove load from engine or shift marine gear to "NEUTRAL" and run engine for several minutes at 1000—1200 rpm to allow coolant and oil to carry heat away from the combustion chamber, turbocharger, pistons, and bearings.

2. **For Mechanically Controlled Engines** - Firmly depress the "STOP" button (B) until engine stops. Turn key switch (A) to "OFF" position and remove key from ignition.

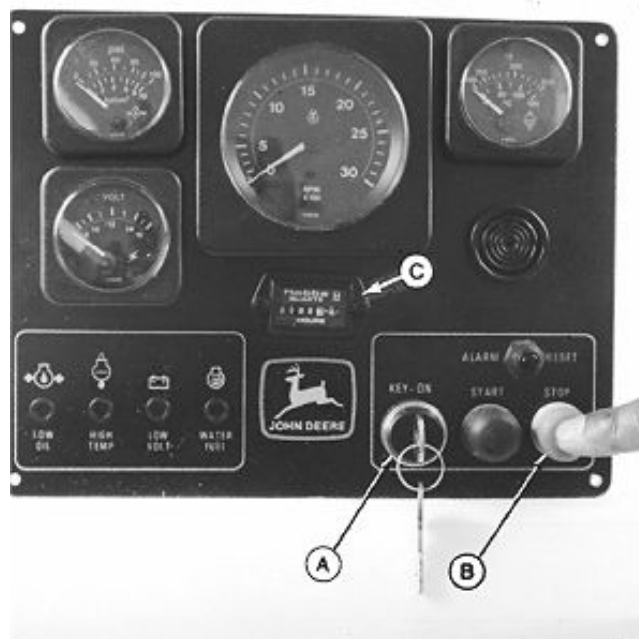
By completely stopping the engine before turning the key switch to "OFF", tests the alarm and keeps the tachometer working until shutdown.

For Electronically Controlled Engines - Turn key switch (A) to "OFF" position and remove key from ignition.

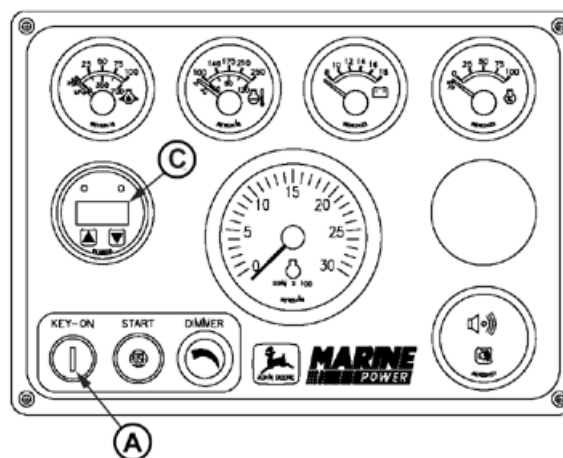
3. If vessel will not be used for several days, close fuel valves and sea cock.
4. Turn main electrical power switch to "OFF", if equipped.
5. Fill the fuel tank to minimize possible water condensation problems. Filling tanks at end of day drives out moisture laden air.
6. Observe the hour meter (C) reading to determine if periodic maintenance is necessary. Make appropriate entries in maintenance logs. (See LUBRICATION AND MAINTENANCE RECORDS section.)
7. Perform required periodic maintenance on all other equipment, as recommended by the equipment manufacturers.

A—Key Switch
B—Stop Button

C—Hour Meter



Stopping The Engine - Mechanically Controlled Engines



Stopping The Engine - Electronically Controlled Engines

RG6003 —UN—27JAN92

RG12060 —UN—26FEB02

RG, RG34710, 5563 -19-31JAN02-1/1

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.

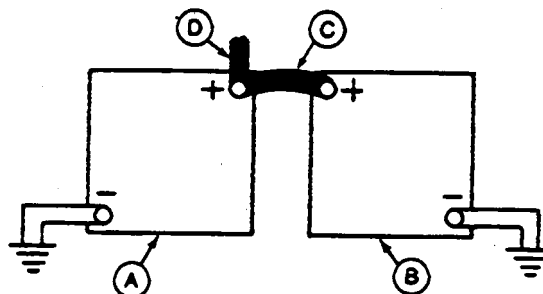
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

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

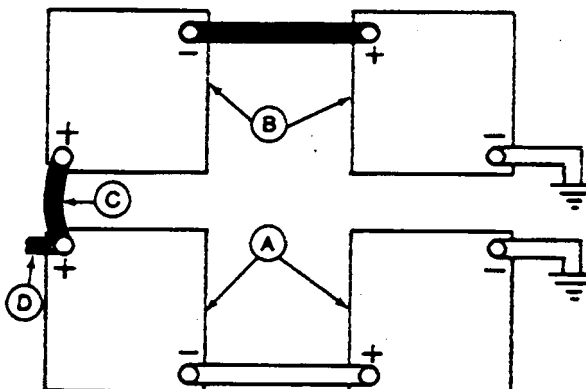
2. Connect one end of jumper cable to the **POSITIVE (+)** post of the booster battery.
3. Connect the other end of the jumper cable to the **POSITIVE (+)** post of battery connected to starter.
4. Connect one end of the other jumper cable to the **NEGATIVE (-)** post of the booster battery.
5. ALWAYS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



Exploding Battery



12-Volt System



24-Volt System

A—12-Volt Machine Battery (ies)
B—12-Volt Booster Battery (ies)

C—Booster Cable
D—Cable to Starting Motor

RG, RG34710, 5564 -19-03JAN02-1/1

TS204 —UN—15APR13

RG4678 —UN—14DEC88

RG4698 —UN—14DEC88

HelmView Display Panel

Product Information

The HelmView™ display is designed for instrumentation and control on electronically controlled engines communicating using SAE J1939 and NMEA 2000. The display is a multifunction tool that enables equipment operators to view many different engine or transmission parameters and service codes, and can support up to three engines, Port, Starboard and auxiliary. The HelmView integrates six screens of critical engine and vessel data in a single color display. It has the ability to monitor up

to three engines – two propulsion engines and a genset engine. The HelmView shows engine data and diagnostics combined in one display – along with recommended corrective actions in plain, easy-to-understand language. You can get trip information at the touch of a button, giving you the ability to quickly monitor fuel flow, instant fuel consumption and trip fuel consumption. Optional accessory kits are available. Everything you need to integrate vital vessel information at your fingertips.

JR74534,00002B9 -19-01SEP09-1/1

Display Features



A—Fault Lights
B—Amber Warning

C—Red Error
D—Keypad Indicator

E—SD Card Slot and Cap
F—Navigation Buttons

Fault Lights These indicators, located in the top two corners of the unit, will light up when a fault occurs. The unit will display an amber light for a warning or a red light for a shutdown condition. A corresponding pop-up message describing the fault may also be displayed on the screen.

Keypad Indicator Light Located on the bottom left of the unit, the keypad indicator lights up each time one of the touch capacitive buttons is pressed.

SD Card Slot This slot is used for reprogramming the unit. It should remain covered to keep out water, dust, and other contaminants.

NOTE: For complete installation and wiring instructions, refer to the "HelmView Installation Manual" included with your display.

JR74534,00002BB -19-23SEP09-1/1

RG17597 —UN—08SEP09

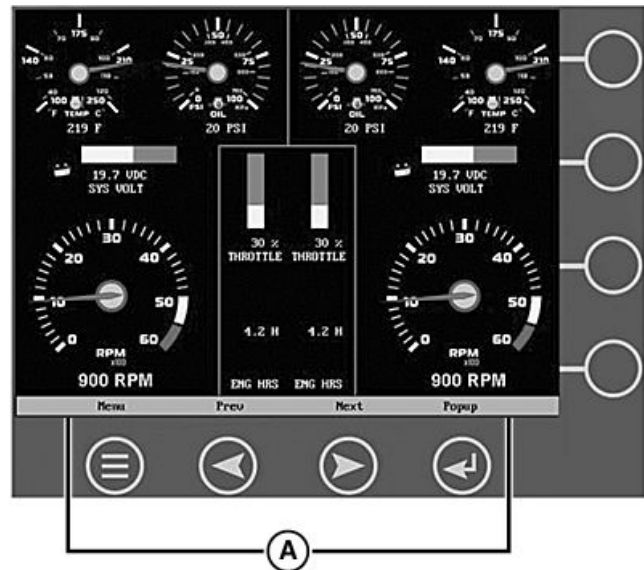
Navigation

Navigating the display is accomplished using two sets of buttons - one fixed and one virtual - to access menus, pop-ups, and make selections from available options. Each time a button is pressed, confirmation of the button press is given by the amber light at the lower left corner of the display.

Fixed Buttons

The fixed buttons run across the bottom of the display for **Menu**, **Prev**, **Next**, and **Select**. On some screens, **Select** may be replaced by other options such as **Save**, **Exit**, or **Popup**. **Prev** and **Next** may also be represented as **Up** and **Down**.

A—Fixed Buttons



RG17598—UN—08SEP09



RG17599—UN—08SEP09

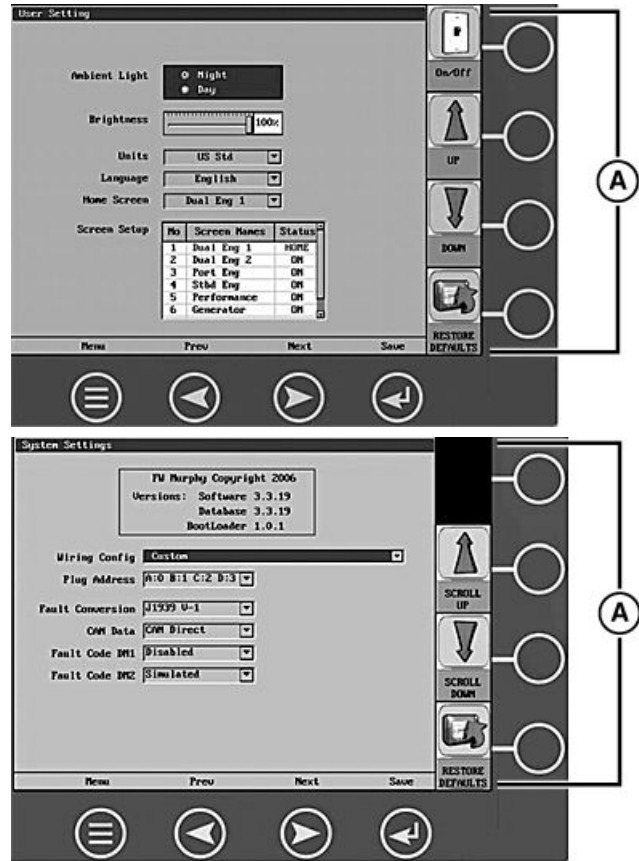
Continued on next page

JR74534.00002BC -19-23SEP09-1/4

Virtual Buttons

A column of vertical buttons located to the right of the display are virtual buttons. They will change according to the options available for the screen being displayed.

A—Virtual Buttons



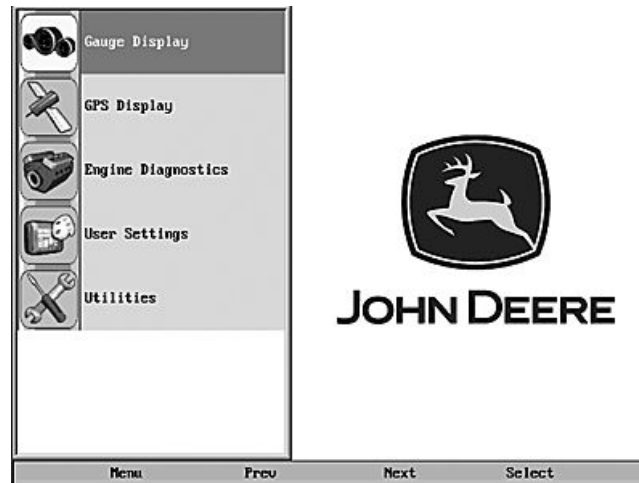
RG17600 —UN—08SEP09

RG17601 —UN—08SEP09

JR74534,00002BC -19-23SEP09-2/4

Menu

The **Menu** can be accessed at any time, from any screen being displayed, by pressing the **Menu** button. The **Menu** button symbol is always located in the first position of the fixed buttons.



RG17669 —UN—23SEP09

RG17602 —UN—08SEP09



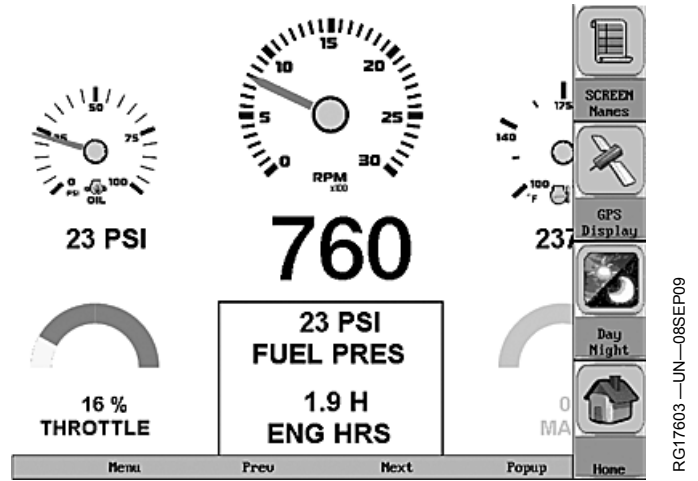
Menu Button Symbol

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JR74534,00002BC -19-23SEP09-3/4

Popup commands

The Popup button utilizes the virtual keys to the right of the display to provide shortcuts for navigation and display options.



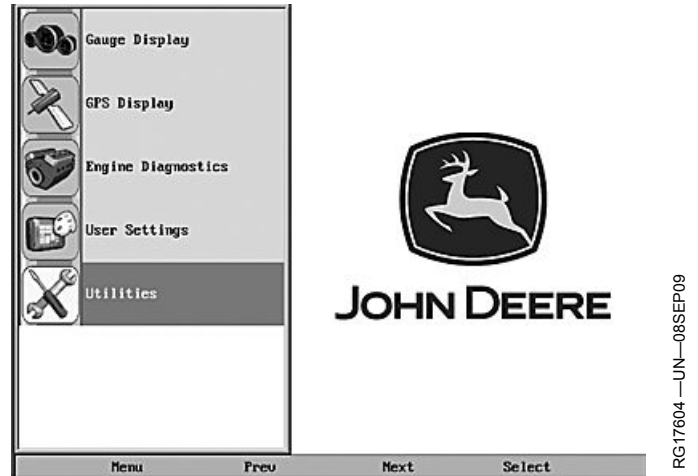
JR74534,00002BC -19-23SEP09-4/4

Setting up your display for the first time

The guidelines presented below are intended for setting up the display for the first time. Once the configuration is set up, there is no need to revisit or change any of the settings.

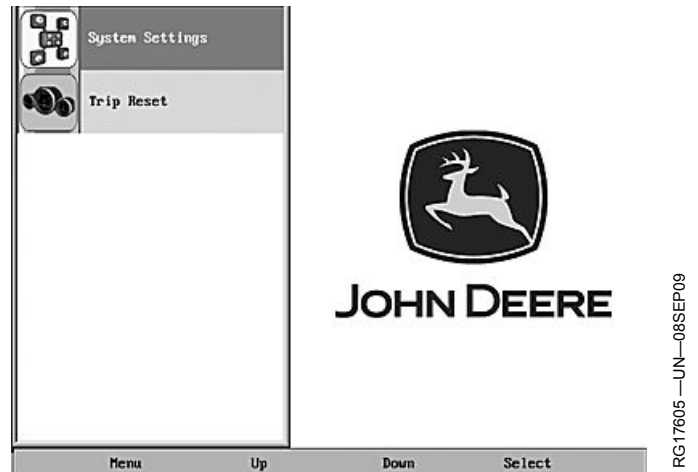
NOTE: If you require assistance during the set up process, contact your nearest Murphy customer support representative.

1. At the main menu, press the **Next** button to move the highlight bar through the options until **Utilities** is highlighted.



JR74534,00002BD -19-23SEP09-1/3

2. Press Select. The **Utilities** sub-menu is displayed.



Continued on next page

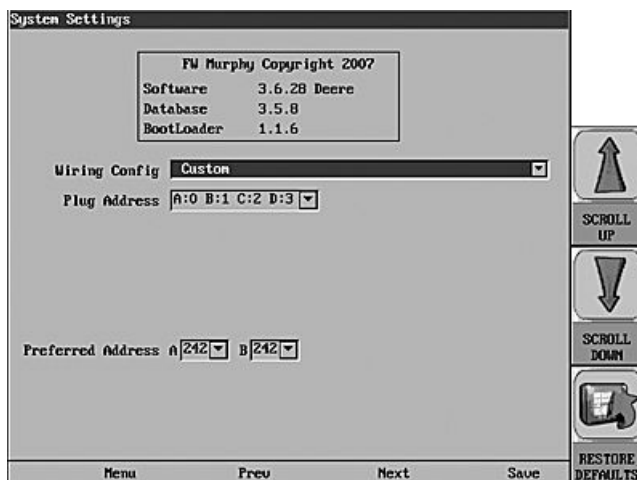
JR74534,00002BD -19-23SEP09-2/3

3. From the **Utilities** sub-menu, select **System Settings**. The following screen is displayed.

4. With the cursor highlighting the **Wiring Config** field, press the **Scroll Up** or **Scroll Down** virtual buttons (located to the right of the display), to scroll through the list of options.

The following table indicates the proper system settings for each kit by installation type.

Kit Type	Installation Type	System Settings
Single engine, main station, 12/24 volts	Main station HelmView	Engine(s) - Single Harness to Plug A-Port, Stbd
Single engine, flybridge, 12 volts	Main station HelmView	Engine(s) - Single Harness to Plug A-Port, Stbd
	Flybridge HelmView	Engine(s) - Single Harness to Plug A-Port, Stbd Preferred Address: A=243, B=243
Dual engine, main station, 12/24 volts	Main station HelmView	Engines - Dual harness to Plug A&B-Port, Stbd
Dual engine, flybridge, 12 volts	Main station HelmView	Engines - Dual Harness to Plug A&B-Port, Stbd
	Flybridge HelmView	Engines - Dual Harness to Plug A&B-Port, Stbd Preferred Address: A=243, B=243
Single engine, flybridge, 24 volts	Main station HelmView	Engine(s) - Single Harness to Plug A-Port, Stbd
	Flybridge HelmView	Engine(s) - Single Harness to Plug A-Port Stbd Preferred Address: A=243, B=243
Dual engine, flybridge, 24 volts	Main station HelmView	Engines - Dual Harness to Plug A&B-Port, Stbd
	Flybridge HelmView	Engines - Dual Harness to Plug A&B-Port, Stbd Preferred Address: A=243, B=243



RG17606—UN—08SEP09

NOTE: When configuring dual HelmView stations as the Main station and Flybridge, the Preferred Addresses must be different.

NOTE: This setting needs to match the wiring configuration for how your display was installed. Refer to the "Wiring Instructions" section of the "John Deere HelmView Model Installation Manual" for the associated wiring diagrams for each of these options.

Once the **System Settings** have been configured, you may want to set up your display options and favorites. For information on this process, refer to the **User Setting** section located in this manual.

JR74534,00002BD -19-23SEP09-3/3

Product Features

Power Up

The HelmView display is most frequently installed with power connected to the ignition. When the ignition is turned on, the HelmView display powers up and the engine health statistics can be viewed via preset gauges. To see more gauge screens, press the **Next** or **Prev** buttons.

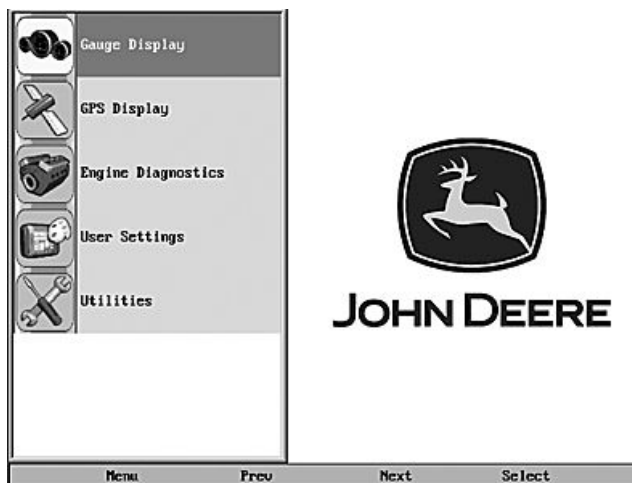
Main Menu

The main menu is activated at any time by pressing the **Menu** key on the display.

The following features are accessed through the main menu:

- Gauge Display – provides a series of screens that display engine and auxiliary information in a variety of formats.
- Engine Diagnostics – displays a list of engine fault codes, descriptions, and on some engines corrective action will be shown.
- User Settings – allows you to customize the display options for ambient light and brightness, set US or metric units, specify the Home screen and screen setup status.
- Utilities – allows configuration of the unit including wire configuration, plug address, fault conversion, CAN data, and fault codes. Also displays software version information at the top of the page.

Gauge Display



RG17602—UN—08SEP09

The Gauge Display screen consists of several predefined layouts that contain combinations of analog gauges, curved bar (half-moon) gauges, straight bar gauges, or digital (text) readouts. These screens are displayed upon startup. You can scroll through the various gauge screens by pressing the **Next** and **Prev** buttons. This can be repeated until all screens have been viewed. The currently displayed screen will stay active until another button is pressed.

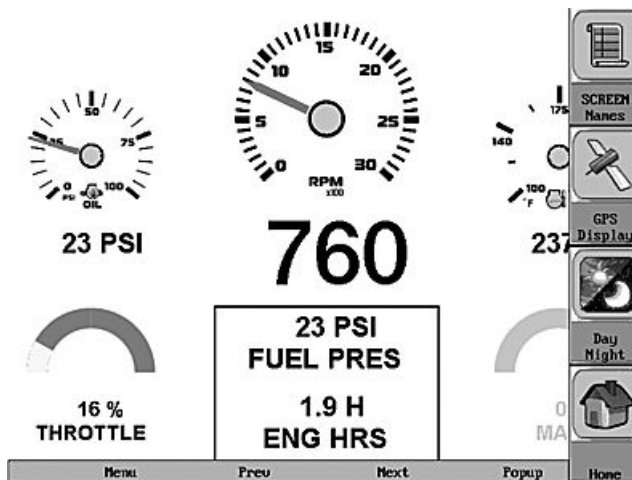
JR74534,00002BE -19-14SEP09-1/13

Gauge Display Popup

Pressing the Popup button on any of the Gauge Display screens will provide additional virtual buttons, as shown below.

These virtual buttons provide quick navigation and access to the following features:

- Screen Names
- Day/Night
- Home



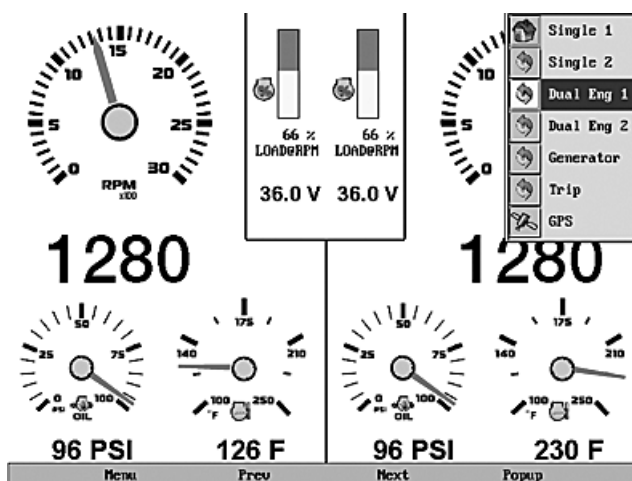
RG17608—UN—08SEP09

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JR74534,00002BE -19-14SEP09-2/13

Screen Names - When selected, a small window appears at the top right of the display. This window contains the names of each of the screens that are currently "Turned ON". Using the **Prev** and **Next** buttons allows you to scroll through and display the various gauge configurations.

NOTE: For instructions on how to turn screens ON or OFF, refer to the "User Settings" section.



RG17609—UN—08SEP09

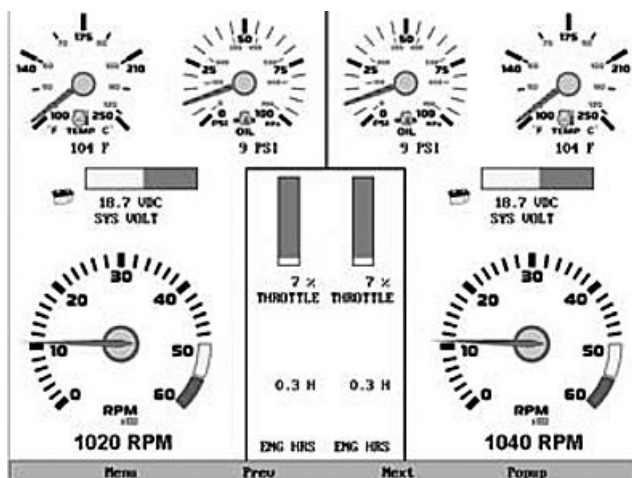
JR74534,00002BE -19-14SEP09-3/13

Day Night - Allows you to toggle the display screen between Day View and Night View.

NOTE: This feature can also be changed in the "User Settings" section.

Home - This one-touch navigation feature allows a pre-defined Home screen to be accessed from the available Gauge Display screens. Once selected, the Home screen will be displayed anytime the **Home** button is pressed.

NOTE: For instructions on how to setup the Home screen, refer to the "User Settings" section.



Day View



Night View

RG17610—UN—08SEP09

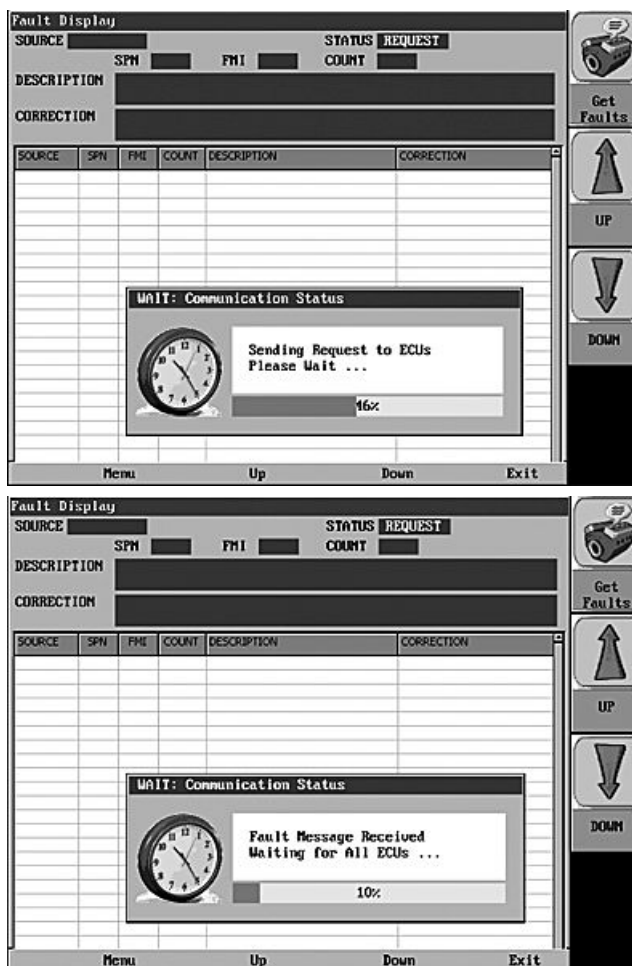
RG17611—UN—08SEP09

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JR74534,00002BE -19-14SEP09-4/13

Engine Diagnostics

When choosing this selection, the display will query the engine(s) ECU and provide feedback on any diagnostic codes that have been activated and stored in the ECU for service needs.



RG17612—UN—08SEP09

RG17613—UN—08SEP09

JR74534,00002BE -19-14SEP09-5/13

The Engine Diagnostics option displays faults based on engine or auxiliary source. A description of the fault as well as the suggested action for correction is provided for each fault occurrence.

The following is a list of field definitions contained on the ENGINE DIAGNOSTICS screen:

- Source – identifies the component having the fault; engine 1, 2, or auxiliary.
- Status – indicates whether the fault has been corrected.
- SPN – "Suspect Parameter Number" - fault code If not translated into text by the display, see the engine manufacturer's literature for the definition of the SPN number.
- FMI – "Failure Mode Indicator" - fault code The FMI is defined by SAE J1939. If not translated into text, see the SAE standard, or the engine manufacturer's literature.
- Count – The number of times the event has been flagged.
- Description – Most common SPN's and FMI's have text for the description stored in the display. If there is no



RG17614—UN—08SEP09

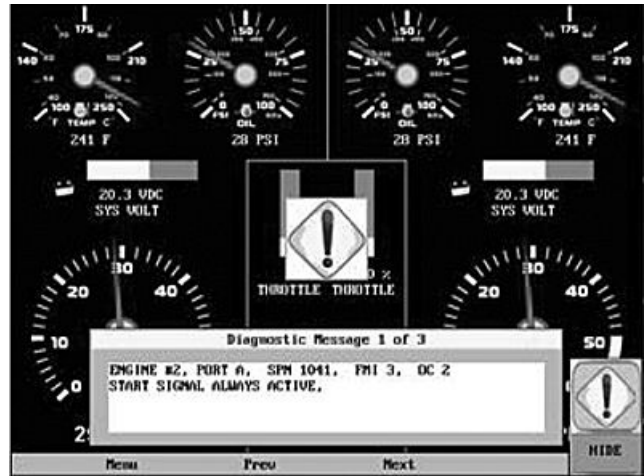
- text, then this SPN and FMI must be defined by referring to the engine manufacturer, or the SAE J1939 standard.
- Correction – Trouble-shooting guidelines for corrective action to take in addressing the fault.

Continued on next page

JR74534,00002BE -19-14SEP09-6/13

Fault Code Pop-ups

A fault condition will trigger a pop-up dialog box on the screen describing the nature of the fault. Corresponding red or amber fault lights on the corners of the unit are also activated to indicate the severity of the fault. The following screens are examples of warning and shutdown fault code pop-ups.



Warning



Shutdown

Continued on next page

JR74534,00002BE -19-14SEP09-7/13

RG17615—UN—08SEP09

RG17616—UN—08SEP09

How to Hide/Show Faults

To hide the fault code pop-up being displayed on the screen, press the virtual button on the right next to the Hide icon. The pop-up will disappear, however the "Warning" or "Stop" icon will remain on the screen to indicate there is still a fault. Pressing "Hide" does not clear the fault, it only hides the pop-up message. When a fault code has been hidden, a "Show" icon will remain in the bottom right corner. When this virtual button is pressed, the fault code will again be displayed.

Scrolling Through Multiple Messages

The title-bar of the fault code pop-up may indicate multiple messages, as in 'Diagnostic Message 1 of 3'. You may press the **Prev** and **Next** buttons to scroll through the different messages.



RG17617—UN—08SEP09



RG17618—UN—08SEP09

JR74534,00002BE -19-14SEP09-8/13

User Settings

User Settings provides options to specify viewing preferences for the DISPLAY. Pressing **Prev** and **Next** navigates through the options, and **Up** and **Down** scrolls through the selections for each option.



RG17619—UN—08SEP09

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JR74534,00002BE -19-14SEP09-9/13

Ambient Light

Night and Day options are provided for ambient lighting. The screens below illustrate these options. When the ambient lighting settings are changed in User Settings, the power-on default is changed.

NOTE: The ambient lighting option is also accessible through a pop-up menu on the gauge display screens. When the pop-up is activated, selecting the Day/Night virtual button changes the display to the opposite mode.

Units

Select how units are displayed by using the **UP** and **DOWN** virtual buttons to select:

- US Std (US Standard)
- Metric KPa
- Metric Bar
- English Imp (English Imperial)
- Nautical

Language

This option allows you to select the language that will be displayed on the HelmView. As an example, by using the **UP** and **DOWN** virtual buttons, you may select English, French, Italian, German, or Spanish to display the text.

Home Screen

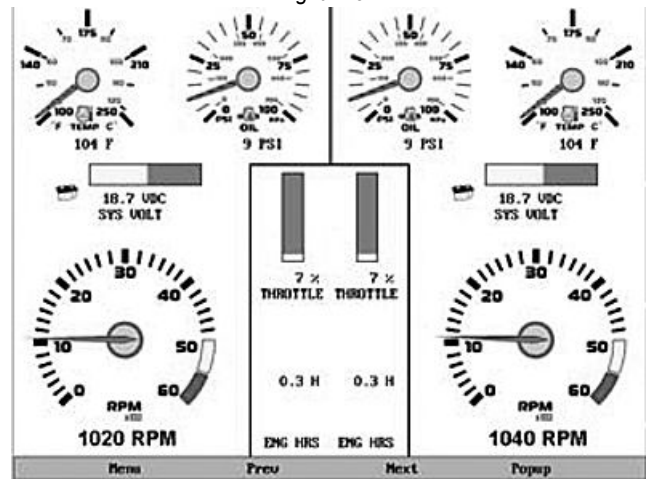
The Home Screen option allows you to specify a favorite screen from the Screen Names list that can be used as a shortcut back to that screen. The Home Screen will also be the first screen shown when Gauge Display is selected from the User Setting menu. Use the **UP** and **DOWN** virtual buttons to scroll through the list until the desired screen is listed. This will be the Home Screen.

Screen Setup

The Screen Setup option provides a list of screens that may be shown when accessing the Gauge Display screens. The 'Status' field will indicate which screen has



Night View



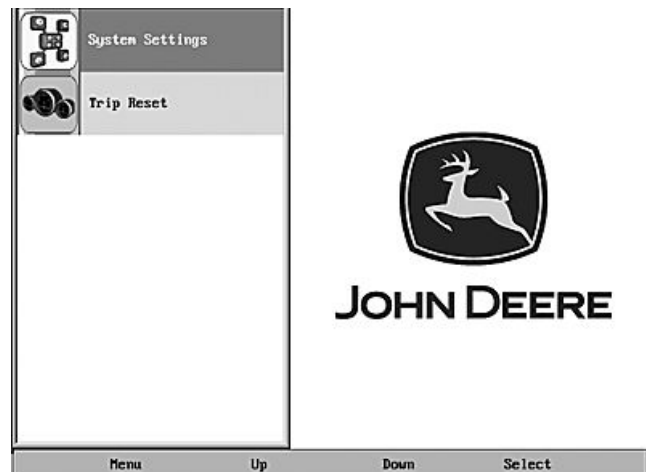
Day View

been specified as the HOME screen. It also provides the user the ability to turn the screens ON or OFF by pressing the **ON/OFF** virtual button. If a screen is turned OFF, it will not show up when Gauge Display is activated.

JR74534,00002BE -19-14SEP09-10/13

Utilities

Utilities allow you to reset external gauges and configure wiring and communication settings. It is typically only accessed when the unit is first installed in order to configure the unit. The following sub-menu is displayed when Utilities is selected.



Continued on next page

JR74534,00002BE -19-14SEP09-11/13

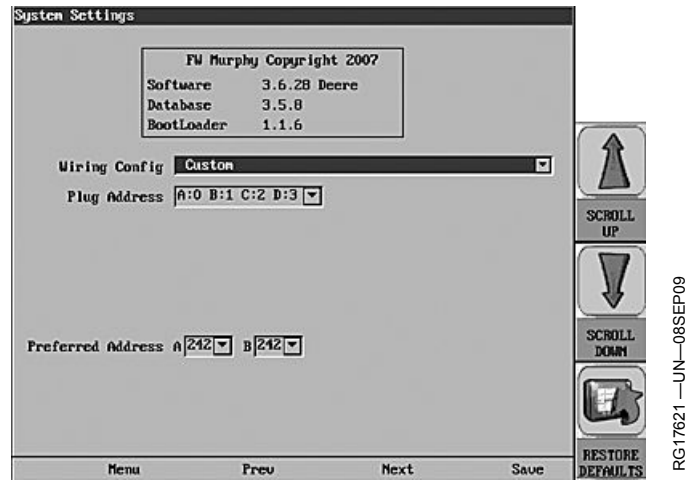
System Settings

The System Settings screen displays the current software version loaded on the HV1000 DISPLAY. You can set individual settings for the available options, or choose to select "Restore Defaults" for the factory settings.

NOTE: Refer to the section "Setting Up Your HV1000 Display for the First Time" for more information.

The Prev and Next buttons allow you to move from field to field. While the cursor is highlighting a field, the Scroll Up and Scroll Down buttons display available options. Once all the options have been selected, press Save.

NOTE: For guidelines to configure your display, refer to the "Setting Up your Display for the First Time" section.

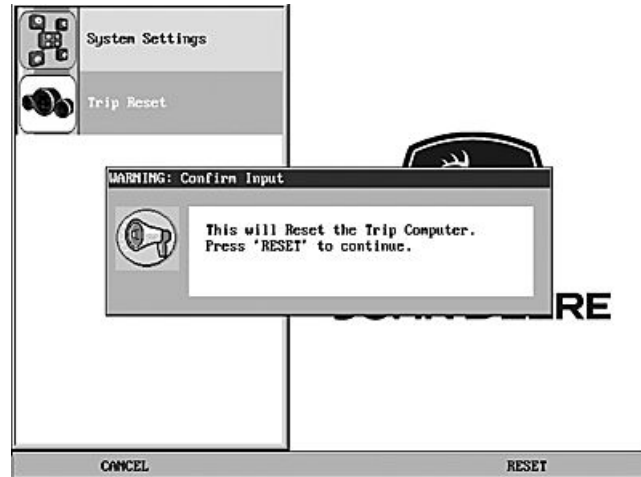


JR74534,00002BE -19-14SEP09-12/13

RG17621—UN—08SEP09

Trip Reset

This option resets the trip computer and fuel economy calculations. A DST or GPS device must be installed to receive speed data in order for the fuel economy calculations to work.



JR74534,00002BE -19-14SEP09-13/13

RG17622—UN—08SEP09

Reprogramming the Display

The SD card slot on the front of the unit is used for reprogramming the unit.

If you have been asked to create the card to reprogram the unit, you should:

1. Insert card into reader/writer. SD card must be 1 gigabyte or smaller.
2. Unzip the file provided into a directory on the PC.
3. Format the card to erase all current files residing on the card.
4. Copy all of the files in the directory to the SD card. Copy only the files to the card, not the directory or the zip file.
5. Remove card and place into display for programming.

The following steps guide you through using the SD card slot to reprogram your HelmView unit.

1. Turn off power to the display.
2. Carefully remove the slot cover.
3. Insert the SD card into the slot until it locks in.
4. The power should be turned on.
5. A screen will appear prompting you to reprogram the unit. Select "INSTALL" to continue. It will take about 6-8 minutes to reprogram the unit.



RG17623—UN—08SEP09

A—SD Card Slot and Cover

6. When done, remove the card from the slot and replace the cover.
7. Restart the power. The new software should be installed and available.

JR74534,00002BF -19-01SEP09-1/1

Group Numbers**NMEA 2000 Parameter Group Numbers (PGNs)***

127245	Rudder
127250	Vessel Heading
127488	Engine Parameters, Rapid Update
127489	Engine Parameters, Dynamic
127493	Transmission Parameters, Dynamic
127505	Fluid Levels
127508	Battery Status
128259	Speed
128267	Water Depth
129025	Position, Rapid Update
129026	COG & SOG, Rapid Update
130310	Environmental Parameters
130576	Small Craft Status

*Partial List

J1939 Parameter Group Numbers (PGNs)*

61442	ETC1 - Electronic Transmission Controller 1
61443	EEC2 - Electronic Engine Controller 2
61444	EEC1 - Electronic Engine Controller 1
61445	ETC2 - Electronic Transmission Controller 2
65164	AAI - Auxiliary Analog Information
65213	FD - Fan Drive
65243	EFL/P2 - Engine Fuel Level/Pressure 2
65248	VD - Vehicle Distance
65253	HOURS - Total Engine Hours
65257	LFC - Liquid Fuel Consumption
65262	ET1 - Engine Temperature 1
65263	EFL/P1 - Engine Fuel Level/Pressure 1
65265	CCVS - Vehicle Speed
65266	LFE - Fuel Economy (Liquid)
65269	AMB - Ambient Conditions
65270	IC1 - Inlet/Exhaust Conditions
65271	VEP - Vehicle Electrical Power
65272	TRF1 - Transmission Fluids 1

*Partial List

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JR74534,00002C0 -19-23SEP09-1/1

Lubrication and Maintenance

Observe Service Intervals

Using hour meter (A) as guide, perform all services at the hourly intervals indicated on following pages. At each scheduled maintenance interval, perform all previous maintenance operations in addition to the ones specified. Keep a record of hourly intervals and services performed using charts provided in Lubrication and Maintenance Records Section.

IMPORTANT: Recommended service intervals are for normal operating conditions. Service **MORE OFTEN** if engine is operated under adverse conditions. Neglecting maintenance can result in failures or permanent damage to the engine.

A—Hour Meter



Hour Meter

DPSG,OUOE003,20 -19-03JAN02-1/1

RG6113—UN—29JAN92

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.



Parts Network

DPSG,OUOE003,20 -19-03JAN02-1/1

TS100—UN—23AUG88

Lubrication and Maintenance Service Interval Chart—Propulsion and Power Units

Item	Lubrication and Maintenance Service Intervals					
	Daily/Before Every Start Up	250 Hour	500 Hour/12 Month	1000 Hour/24 Month	2000 Hour	Service As Required
Operate Standby Generator Set Engines at Rated Speed and 50%—70% Load for a Minimum of 30 Minutes. Perform every 2 weeks.						
Check Engine Oil Level and Coolant Level	•					
Check Sea Water Strainer	•					
Check Air Cleaner Dust Unloader Valve and Restriction Indicator Gauge ^a	•					
Visual Walkaround Inspection	•					
Check Fuel Filter/Drain Water-In-Fuel Bowl	•					
Service Fire Extinguisher		•				
Service Battery		•				
Change Engine Oil and Replace Oil Filter (Except 6068SFM50 Engines) ^b		•				
Inspect and Replace Zinc Plugs		•				
Check Belt Tension and Wear (Manual Tensioner)		•				
Check Engine Mounts		•				
Check Engine Electrical Ground Connection		•				
Change Engine Oil And Replace Oil Filter (6068SFM50 Engines) ^{c,d}			•			
Clean Crankcase Ventilation Assembly			•			
Check Air Intake Hoses, Connections, and System			•			
Replace Fuel Filter Element			•			
Check Automatic Belt Tensioner and Belt Wear			•			
Check Cooling System			•			
Coolant Solution Analysis-Add SCAs as required			•			
Inspect and Clean Heat Exchanger Core and Aftercooler Core (If Equipped)			•			
Adjust Droop on Generator Set Engines				•		
Pressure Test Cooling System				•		
Inspect and Repair Sea Water Pump				•		
Check and Adjust Engine Valve Clearance					•	
Check Crankshaft Vibration Damper (6-Cylinder) ^e					•	
Flush Cooling System ^f					•	
Add Coolant						•
Replace Air Cleaner Element						•
Service Dry Air Cleaner Element						•
Replace Drive Belt						•
Inspect Driveline (PTO) (If Equipped)						•
Bleed Fuel System						•

^aReplace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (52 in) H2O

Continued on next page

DPSG,OUOD007,341 -19-02NOV15-1/2

^bChange 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.

^cDuring engine break-in, change the oil and filter for the first time before 100 hours of operation.

^dIf the recommended engine oils, John Deere PLUS-50® or equivalent are not used, the oil and filter change interval is reduced to every 250 hours. If diesel fuel with a sulfur content greater than 0.05% is used, the oil and filter change interval is also reduced.

^eReplace crankshaft vibration damper every 4500 hours or 60 months, whichever comes first.

^fIf John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished as needed by adding a supplemental coolant additive, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

DPSG,OUOD007,341 -19-02NOV15-2/2

Lubrication & Maintenance — Daily

Daily Prestarting Checks

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

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

Depending on application, oil dipstick (A) and oil filler cap (B) may be located on either the left or the right side of engine. In addition, oil may be added at rocker arm filler cap (C).

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

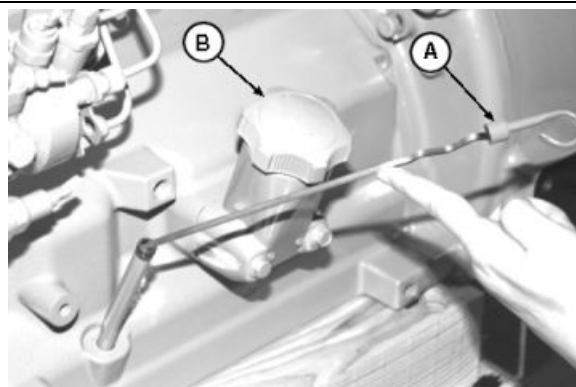
IMPORTANT: DO NOT fill above the top mark on the dipstick. Oil levels anywhere within crosshatch (D) are considered in the acceptable operating range.

A—Dipstick

B—Left Side Oil Filler Cap

C—Rocker Arm Filler Cap

D—Crosshatch On Oil Dipstick

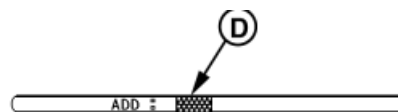


Left Side Oil Filler Cap



Rocker Arm Cover Filler Cap

RG8028B —UN—15JAN99



Crosshatch On Oil Dipstick

Continued on next page

DPSG,OUOE003,20 -19-03JAN02-1/4

RG9837 —UN—12JAN99

RG9838 —UN—05JAN99

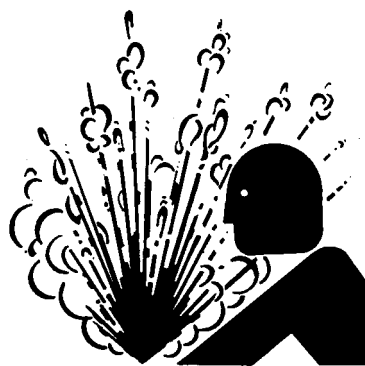
CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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

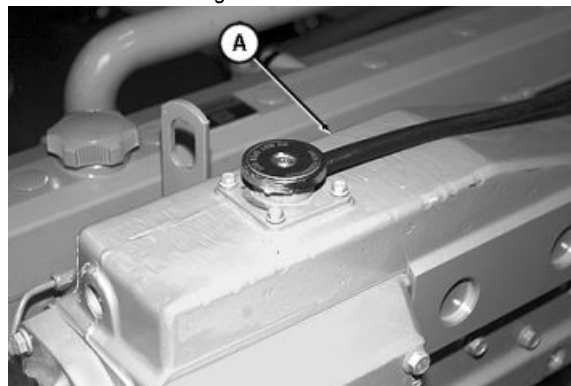
2. Check the coolant level in engine top tank (A) when engine is cold. Coolant level should be at bottom of filler neck. Fill with proper coolant solution if level is low. (See ADDING COOLANT in Service As Required Section.) Check overall cooling system for leaks.

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

A—Engine Top Tank



High-Pressure Fluids



Engine Top Tank

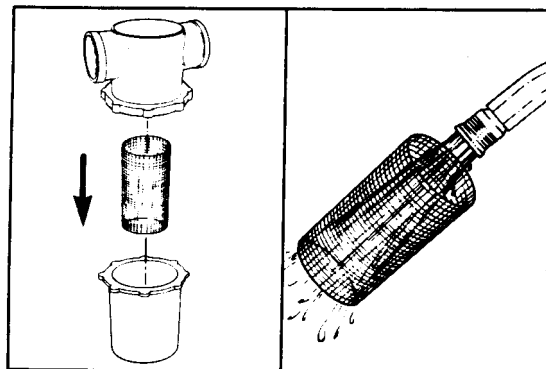
DPSG,OUOE003,20 -19-03JAN02-2/4

TS281 —UN—15APR13

RG9839 —UN—05JAN99

IMPORTANT: A restricted or clogged sea water strainer will result in hotter than normal (or overheated) engine coolant and marine gear oil temperatures.

3. The sea water strainer should be checked daily and cleaned as required, depending upon the operating environment.



Sea Water Strainer

Continued on next page

DPSG,OUOE003,20 -19-03JAN02-3/4

RG5993 —UN—27JAN92

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

IMPORTANT: Maximum air intake restriction is 625 mm (25 in. H₂O). A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.

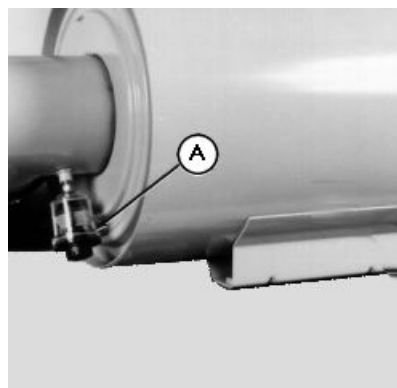
5. Make a thorough inspection of the engine compartment. Look for oil or coolant leaks, worn drive belts, loose connections and trash build-up. Remove trash buildup and have repairs made as needed if leaks are found.

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

Inspect:

- Engine shields and guards for trash build-up.
- Air intake system hoses and connections for cracks and loose clamps.
- Alternator drive belt for cracks, breaks or other damage.
- Water pump for coolant leaks.
- Coolant system for leaks.

NOTE: It is normal for a small amount of leakage to occur as the engine cools down and parts contract.



Air Intake Restriction Gauge

A—Air Intake Restriction Gauge

Excessive coolant leakage may indicate the need to replace the water pump seal. Contact your engine distributor or servicing dealer for repairs.

6. Refer to manufacturer's literature for marine gear and generator set daily service recommendations.

DPSG,OUOE003,20 -19-03JAN02-4/4

RG9874 —UN—12FEB99

Lubrication & Maintenance — 50 Hours/2 Weeks

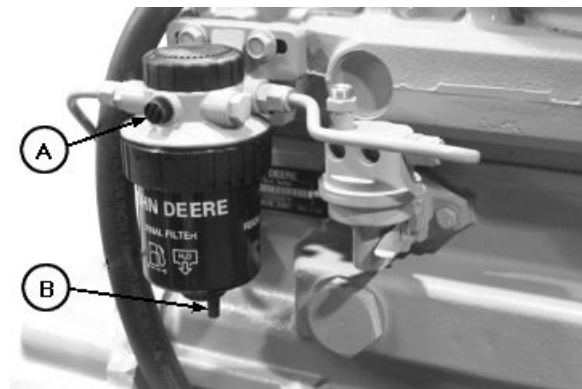
Checking Fuel Filter—4.5 L Engine

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

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

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

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



Drain Fuel Filter

A—Air Bleed Plug

B—Drain Plug

RG, RG34710, 5565 -19-04JAN02-1/2

RG9868 —UN—15JAN99

4. Operate primer lever (C) of the fuel supply pump until fuel flow is free from air bubbles.
5. Tighten bleed plug, continue operating hand primer until pumping action is not felt. Leave hand primer in the up position, away from the cylinder block.

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

C—Primer Lever



Primer Lever On Fuel Supply Pump

RG, RG34710, 5565 -19-04JAN02-2/2

RG8013B —UN—15JAN99

Checking Fuel Filter—6.8 L Engine

Check the sediment bowl of the primary fuel filter/water separator for water or debris.

1. Loosen thumb screw (A) at bottom of sediment bowl and drain water and debris into a suitable container.
2. Dispose of water and debris in an environmentally safe manner.

A—Thumb Screw



Drain Primary Fuel Filter

DPSG, QUOD007, 340 -19-04JAN02-1/1

RG9840 —UN—05JAN99

Lubrication & Maintenance — 250 Hours

Servicing Fire Extinguisher

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

Read and follow the instructions which are packaged with it. The extinguisher should be inspected at least every 250 hours of engine operation or once a month. Once extinguisher is operated, no matter how long, it must be recharged. Keep record of inspections on the tag which comes with the extinguisher instruction booklet.

A—Fire Extinguisher



Fire Extinguisher

RG, RG34710, 5567 -19-04JAN02-1/1

RW4918 —UN—15DEC88

Servicing Battery

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

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

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

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

1. On regular batteries, check electrolyte level. Fill each cell to bottom of filler neck with distilled water.

NOTE: Low-maintenance or maintenance-free batteries should require little additional service. However, electrolyte level can be checked by cutting the center section of decal on dash-line, and removing cell plugs. If necessary, add clean, soft water to bring level to bottom of filler neck.

2. Keep batteries clean by wiping them with a damp cloth. Keep all connections clean and tight. Remove



Exploding Battery

any corrosion, and wash terminals with a solution of 1 part baking soda and 4 parts water. Tighten all connections securely.

NOTE: Coat battery terminals and connectors with a mixture of petroleum jelly and baking soda to retard corrosion.

3. Keep battery fully charged, especially during cold weather. If a battery charger is used, turn charger off before connecting charger to battery(ies). Attach **POSITIVE (+)** battery charger lead to **POSITIVE (+)** battery post. Then attach **NEGATIVE (–)** battery charger lead to a good ground.

Continued on next page

RG, RG34710, 5568 -19-27JUL06-1/2

TS204 —UN—15APR13

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

Avoid the hazard by:

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

If you spill acid on yourself:

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

If acid is swallowed:

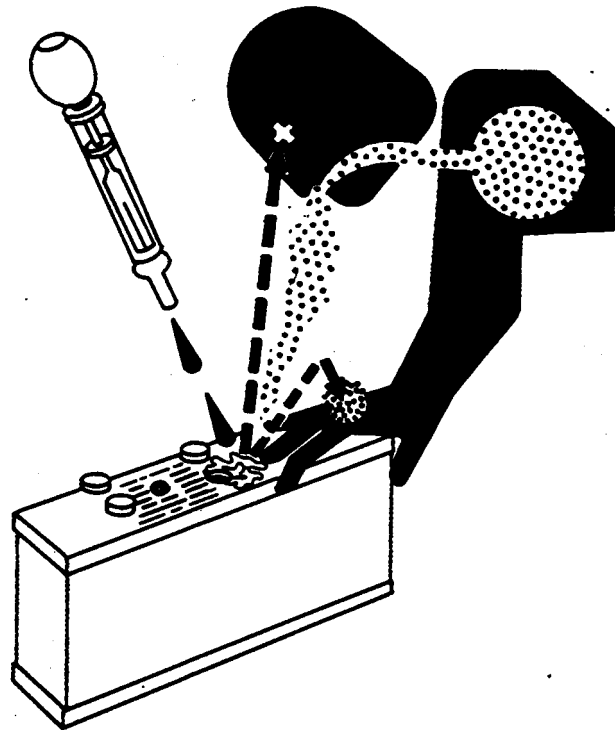
1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.

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

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

Specification

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



Sulfuric Acid

24 Volt Standard Duty Starter—Cold Cranking Amps.....	570
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TS203 —UN—23AUG88

RG, RG34710, 5568 -19-27JUL06-2/2

Changing Engine Oil and Replacing Oil Filter (Except 6068SFM50 Engines)

NOTE: For 6068SFM50 engines, the oil and filter is changed at 500 hour/12 month intervals. See next section.

During break-in, 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 to 375 hours.

NOTE: If the above recommendations are not followed, the recommended oil and filter change interval is every 250 hours/ or 6 months. If diesel fuel with a sulfur content greater than 0.05% (500 ppm) is used, reduce the oil and filter change interval by 100 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.

PLUS-50 is a trademark of Deere & Company



Oil Pan Drain Plug

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

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

RG4881 —UN—29NOV88

RG, RG34710, 5570 -19-04JAN02-1/3

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

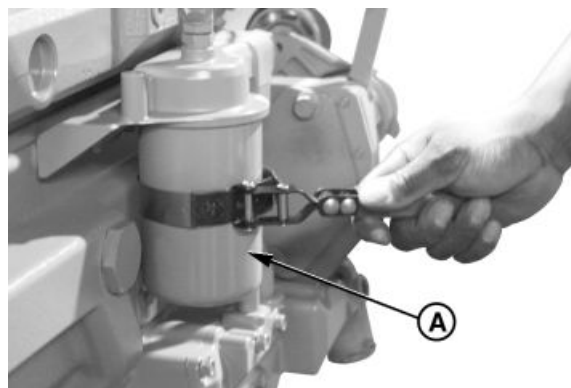
NOTE: Depending on engine application, oil filter may be located on either side of the engine.

5. Remove oil filter packing and clean filter mounting pad.

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

6. Oil new packing and install new filter element. Hand tighten element according to values printed on filter element. If values are not provided, tighten element approximately 3/4 — 1-1/4 turn after packing contacts filter housing. DO NOT overtighten filter element.

7. Install oil pan drain plug with a new seal when equipped. Tighten drain plug to 47 N·m (35 lb-ft) of torque.



Removing Oil Filter

A—Oil Filter Element

RG7961A —UN—22JAN99

Continued on next page

RG, RG34710, 5570 -19-04JAN02-2/3

8. Fill engine crankcase with correct John Deere engine oil through rocker arm cover opening (C) or either side oil filler (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.

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

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

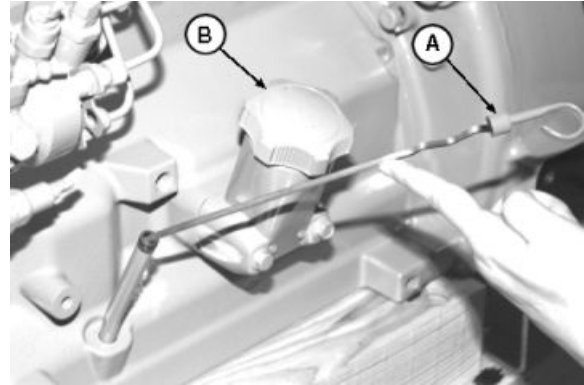
9. Start engine and run to check for possible leaks.
10. Stop engine and check oil level on dipstick (A) after 10 minutes. Oil level reading should be within crosshatch of dipstick.

A—Dipstick
B—Side Oil Filler

C—Rocker Arm Cover Oil Filler Opening



Rocker Arm Cover Oil Filler Opening



Side Oil Filler And Dipstick

RG, RG34710, 5570 -19-04JAN02-3/3

RG9838 —UN—05JAN99

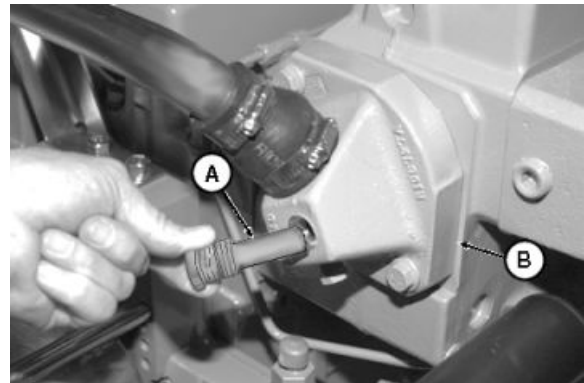
RG9837 —UN—12JAN99

Inspect and Replacing Zinc Plugs

Two zinc plugs (A) are installed in the sea water cooling system to help reduce the corrosive action of salt in the sea water. The reaction of the zinc to sea water causes the plugs to deteriorate, instead of the more critical cooling system parts. Therefore, the zinc plugs MUST BE inspected every 250 Hours.

NOTE: Zinc plugs are located in each heat exchanger end cap and are mounted on hex-head pipe plug.

1. Remove zinc rod from each end cap (B) and observe condition of each.
2. Tap the zinc rods lightly with a hammer. If rod flakes apart when tapped, install a new zinc plug.



Inspect Zinc Plugs

A—Zinc Plugs

B—End Cap

Continued on next page

JR74534, 0000305 -19-04FEB11-1/2

RG9835 —UN—05JAN99

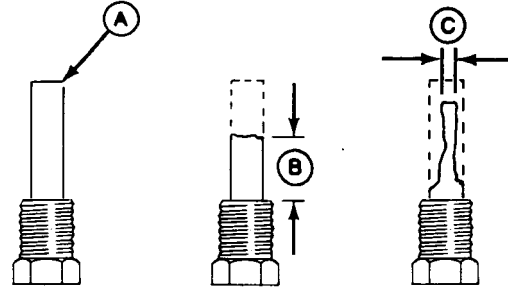
3. Measure zinc plugs (A) to determine the amount of erosion on length (B) and outer diameter (C).

If length is less than 15.9 mm (0.63 in.) or outer diameter is less than 4.8 mm (0.19 in.) on either plug, replace all zinc plugs.

NOTE: Zinc plug new part dimensions are 31.8 mm (1.25 in.) long and 9.5 mm (0.38 in.) outer diameter.

A—Measure Zinc Plugs
B—Measure Length

C—Measure Diameter



Zinc Plug Erosion

JR74534,0000305 -19-04FEB11-2/2

RG6007 —UN—27JAN92

Checking Belt Wear (Manual Tensioner)

Inspect belt for cracks, fraying, or stretched-out areas. Replace if necessary. (See REPLACING BELT (MANUAL TENSIONER) in Service as Required Section.

NOTE: It is not necessary to remove belt guard (A) to check belt wear.

1. Loosen both belt tensioner mounting cap screws (B).
2. Swing tensioner arm (C) to remove all belt slack.

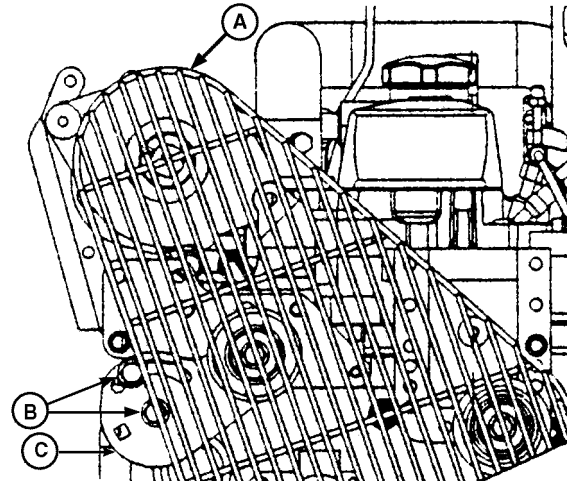
NOTE: Belt adjustment is measured using notched units (D) above the adjusting cap screw slot on the tensioner.

3. Using the notches on tensioner to count units, move the tensioner arm to stretch belt 1-1/2 units for appropriate tension on new belt. (Move arm one unit for used belt.)

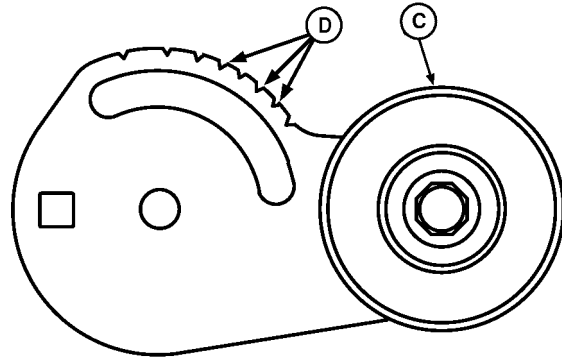
4. Tighten tensioner mounting cap screws (B) to 70 N·m (52 lb-ft).

A—Belt Guard
B—Mounting Cap Screws

C—Tensioner Arm
D—Notched Units



Check Belt Tension



Tensioner Arm

DPSG,OUOD013,510 -19-04JAN02-1/1

RG9872 —UN—12FEB99

RG9873 —UN—12FEB99

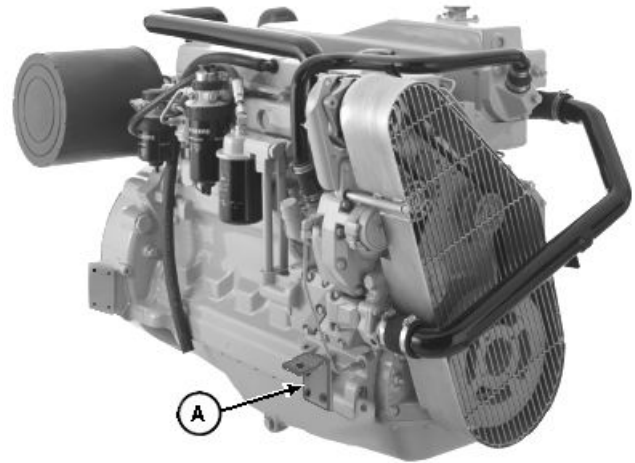
Checking Engine Mounts

Engine mounting is the responsibility of the vessel or generator manufacturer. Follow manufacturer's guidelines for mounting specifications. Front engine mounts (A) only are available from John Deere.

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

1. Check the engine mounting bolts on support frame and engine block for tightness. Tighten as necessary.
2. Inspect overall condition of vibration isolators, if equipped. Replace isolators, as necessary, if rubber has deteriorated or mounts have collapsed.

A—Engine Mounts



Check Engine Mounts

RG9841 —UN—06JAN99

DPSG,OUOD007,313 -19-04JAN02-1/1

Checking Engine Electrical Ground Connections

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

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

OUOD002,0000169 -19-27JUL06-1/1

Changing Engine Oil and Replacing Filter (6068SFM50 Engines)

Your engine is equipped with a special extended-life oil filter (A).

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

After break-in, if John Deere PLUS-50® engine oil (or equivalent) **and** a John Deere extended-life oil filter are used, the oil and filter change interval is 500 hours or every 12 months, whichever comes first.

NOTE: If the above recommendations are not followed, the recommended oil and filter change interval is every 250 hours or 6 months. If diesel fuel with a sulfur content greater than 0.05% (500 ppm) is used, the oil and filter change interval is also reduced.

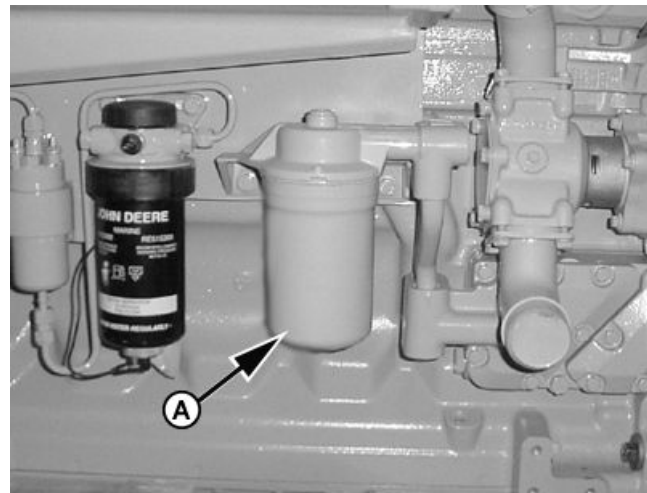
OILSCAN® or OILSCAN PLUS® is a John Deere sampling program to help you monitor machine performance and identify potential problems before they cause serious damage. OILSCAN® and OILSCAN PLUS® kits are available from your John Deere engine distributor or servicing dealer. Oil samples should be taken prior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

To change engine oil and extended-life oil filter:

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

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

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



Extended-Life Oil Filter



Oil Pan Drain Plug

A—Extended-Life Oil Filter Element

Continued on next page

OUOD002,0000168 -19-13MAR02-1/3

RG12196 —UN—13MAR02

RG4881 —UN—29NOV88

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

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

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

5. Apply clean engine oil to the new filter at the inner (B) and outer (C) seals and to filter threads.
6. Wipe both sealing surfaces of the header (D, E) with a clean rag. Ensure dust seal (F) is in place, replace if damaged.

IMPORTANT: When installing filter element, **HAND TIGHTEN only**. A filter wrench may be used for **REMOVAL ONLY**.

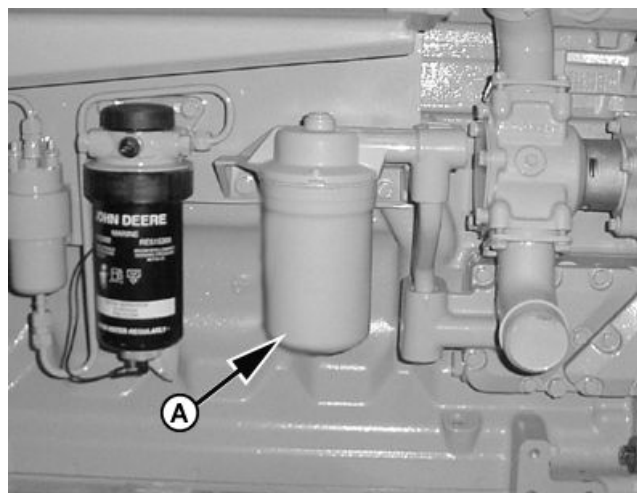
7. Install and tighten oil filter by hand until firmly against dust seal (F). DO NOT apply an extra 3/4 to 1-1/4 turn after gasket contact as done with standard filters.
8. Tighten drain plug to specifications.

Specification

Oil Pan Drain	
Plug With Copper	
Washer—Torque.....	70 N·m (52 lb-ft)
Oil Pan Drain Plug With	
O-Ring—Torque.....	50 N·m (37 lb-ft)

A—Extended-Life Oil Filter Element
B—Inner Seal
C—Outer Seal

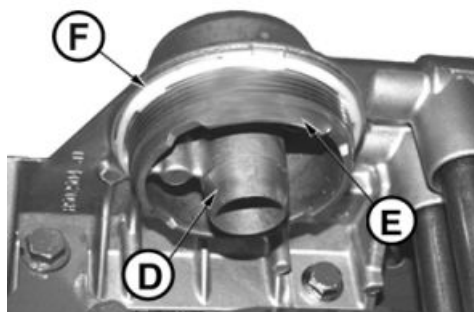
D—Sealing Surface On Header
E—Sealing Surface On Header
F—Dust Seal



Extended-Life Oil Filter And Mounting Header



Oil Filter Seals



Extended-Life Filter And Mounting Header

Continued on next page

OUOD002,0000168 -19-13MAR02-2/3

RG12196 —UN—13MAR02

RG11617 —UN—24OCT01

RG11618 —UN—24OCT01

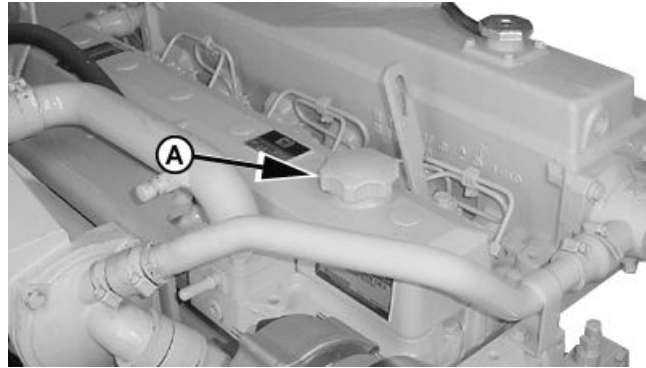
9. Fill engine crankcase with correct John Deere engine oil through rocker arm cover opening (A). (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

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

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

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

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



Rocker Arm Cover Oil Filler Opening

A—Rocker Arm Cover Oil Filler Opening

RG12197—UN—13MAR02

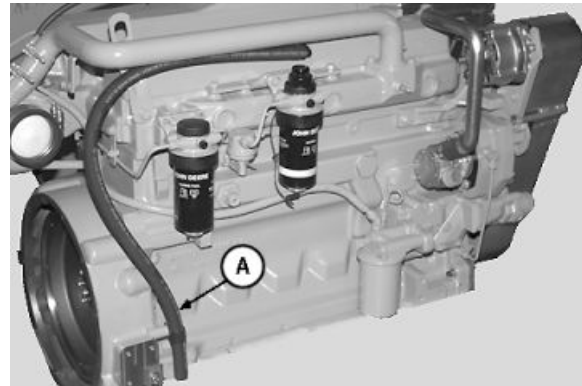
OUOD002,0000168 -19-13MAR02-3/3

Cleaning Crankcase Vent Tube

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

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

A—Crankcase Vent Tube



Check Crankcase Vent Tube

RG9842—UN—06JAN99

RG, RG34710, 5574 -19-04JAN02-1/1

Checking Air Intake System

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

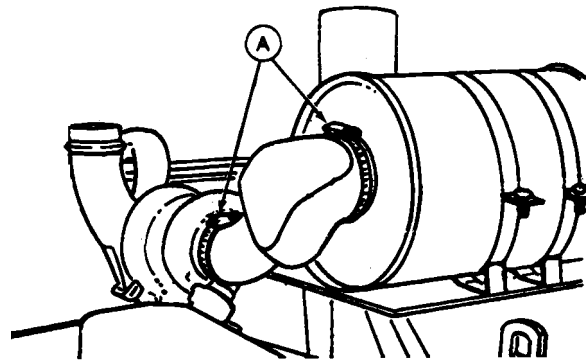
1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps (A) on piping which connect the air cleaner, engine and, if present, turbocharger. Tighten clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.

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

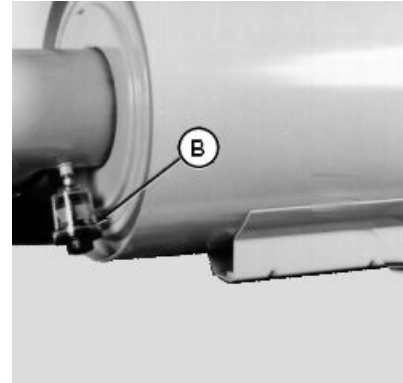
3. Test air restriction indicator (B) for proper operation. Replace indicator as necessary.

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

4. Replace air cleaner element if restriction indicator shows vacuum of 625 mm (25 in.) H₂O, is torn or visibly dirty. Service as necessary. (See REPLACING AIR CLEANER in Service As Required Section.)



Check Clamps



Air Restriction Indicator

A—Clamps

B—Air Restriction Indicator

RG, RG34710, 5575 -19-04JAN02-1/1

RG9869 —UN—15JAN99

RG9875 —UN—12FEB99

Replacing Fuel Filter Element—4.5 L Engine

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

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

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

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

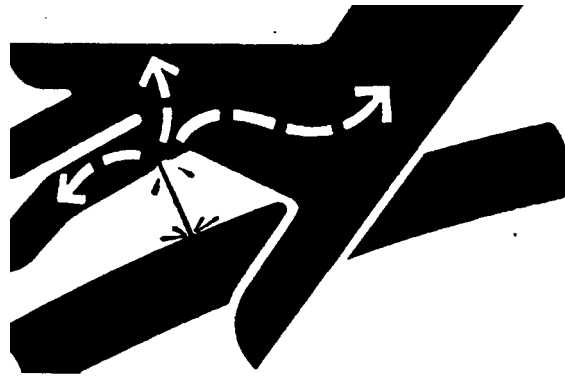
4. Firmly grasp the retaining ring (A) and rotate it counterclockwise 1/4 turn. Remove ring with filter element (B).
5. Inspect filter mounting base for cleanliness. Clean as required.

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

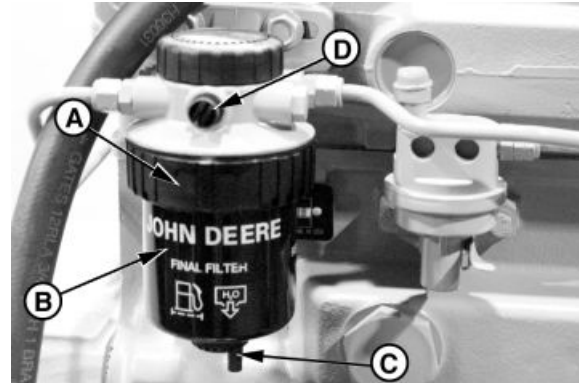
6. Install new filter element onto mounting base. Be sure element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment.

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

7. Align keys on filter element with slots in filter base.



High-Pressure Fluids



Replace Fuel Filter

A—Retaining Ring
B—Filter Element

C—Drain Plug
D—Bleed Plug

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

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

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

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

RG, RG34710, 5576 -19-04JAN02-1/1

X9811 —UN—23AUG88

RG7721 —UN—15JAN99

Replacing Primary Fuel Filter/Water Separator—6.8 L Engine

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

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

1. Close fuel shut-off valve at bottom of fuel tank (not illustrated).
2. Clean entire area surrounding fuel filter assembly to keep debris from entering fuel system.
3. Loosen drain plug (A) and air vent screw (B). Drain fuel into a suitable container.

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

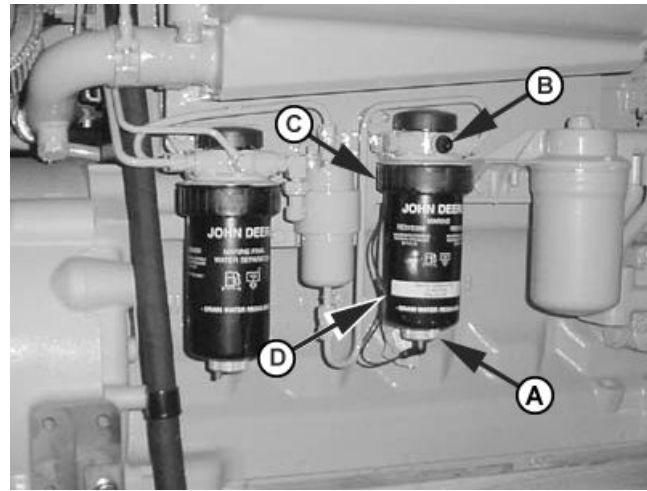
4. Firmly grasp the retaining ring (C) and rotate it counterclockwise 1/4 turn. Remove ring with filter element (D).

5. Inspect filter mounting base for cleanliness. Clean as required.

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

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

If equipped with a water separator bowl, remove separator bowl from filter element. Drain and clean separator bowl.



Primary Fuel Filter

- | | |
|------------------|------------------|
| A—Drain Plug | C—Retaining Ring |
| B—Air Vent Screw | D—Filter Element |

Dry with compressed air. Install bowl onto new filter element. Tighten securely.

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

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

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

9. Open fuel shut-off valve. 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. (See BLEEDING THE FUEL SYSTEM in Service as Required Section.)

DPSG,OUOD007,315 -19-04JAN02-1/1

RG12070—UN—01FEB02

Replacing Final (Secondary) Fuel Filter Element—6.8 L Engine

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

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

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

2. Clean entire area surrounding fuel filter assembly to keep debris from entering fuel system.

3. Loosen drain plug (A) and air vent screw (B). Drain fuel into a suitable container.

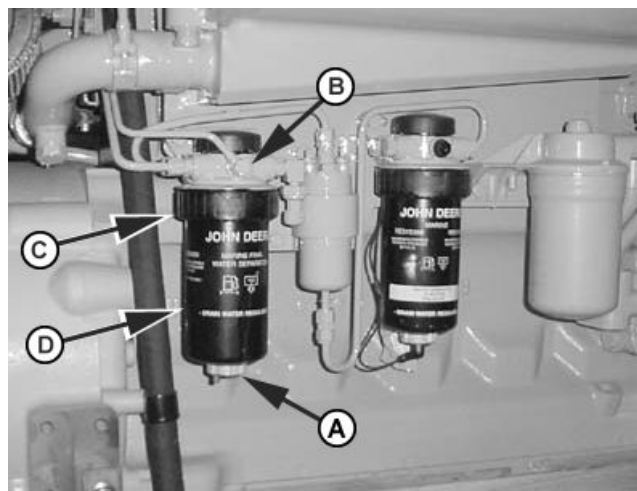
NOTE: Lifting up on retaining ring (C) as it is rotated helps to get it past raised locators.

4. Firmly grasp the retaining ring (C) and rotate it counterclockwise 1/4 turn. Remove ring with filter element (D).

5. Inspect filter mounting base for cleanliness. Clean as required.

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

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



Final Fuel Filter

A—Drain Plug
B—Air Vent Screw

C—Retaining Ring
D—Filter Element

7. Align keys on filter element with slots in filter base.

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

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

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

9. Open fuel shut-off valve. 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. (See BLEEDING THE FUEL SYSTEM in Service as Required Section.)

DPSG,OUOD007,314 -19-04JAN02-1/1

RG12069—UN—01FEB02

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

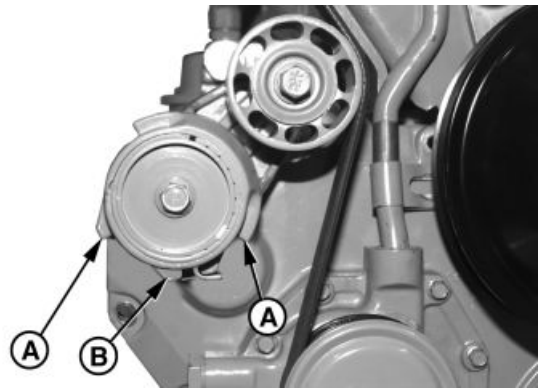
Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

Checking Belt Wear

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops (A and B) when correct belt length and geometry is used.

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

If the tensioner stop 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).



Cast Stops

A—Cast Stops

B—Cast Stop

Continued on next page

RG, RG34710, 5578 -19-25FEB02-1/2

RG8098 —UN—18NOV97

Checking Tensioner Spring Tension

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

1. Release tension on belt using a breaker bar and socket on tension arm. Remove belt from pulleys.
2. Release tension on tension arm and remove breaker bar.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 21 mm (0.83 in.) from (A) and put a mark (B) on tensioner mounting base.
5. Install torque wrench (C) so that it is aligned with centers of pulley and tensioner. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.
6. Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.

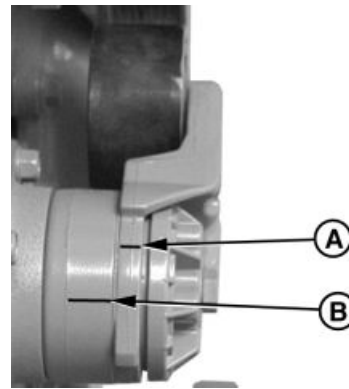
Specification

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

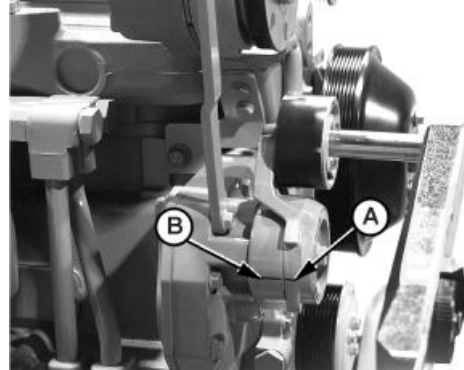
NOTE: Threads on belt tensioner roller cap screw are **LEFT-HAND** threads

A—Mark On Swing Arm
B—Mark On Tensioner
Mounting Base

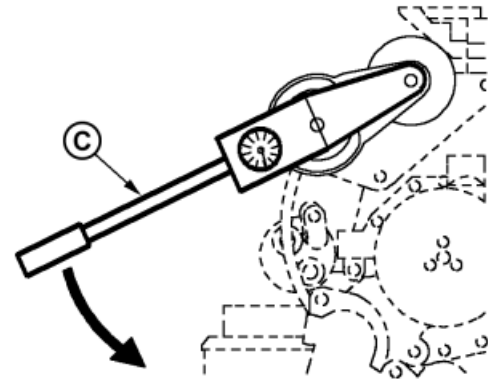
C—Torque Wrench



Marks on Tensioner



Align Marks



Align Torque Wrench with Pulley and Tensioner

RG, RG34710, 5578 -19-25FEB02-2/2

RG7977 —UN—14NOV97

RG12054 —UN—08JAN02

RG12065 —UN—28JAN02

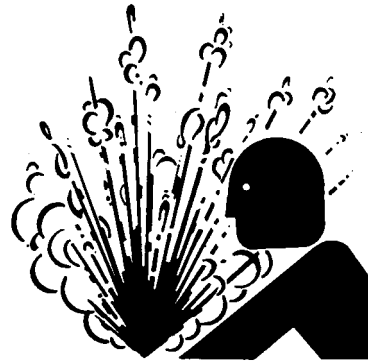
Checking Cooling System

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

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

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

1. Check entire cooling system for leaks. Tighten all clamps securely.



High-Pressure Fluids

2. Thoroughly inspect all cooling system hoses. Replace hoses when hard, flimsy, or cracked.

RG, RG34710, 5580 -19-20MAY96-1/1

TS281 —UN—15APR13

Replenishing Supplemental Coolant Additives (SCAs) Between Coolant Changes

IMPORTANT: Do not add supplemental coolant additives when the cooling system is drained and refilled with John Deere COOL-GARD®

NOTE: If system is to be filled with coolant that does not contain SCAs, the coolant must be precharged. Determine the total system capacity and premix with 3% John Deere Coolant Conditioner.

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

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

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

DO NOT mix one brand of SCA with a different brand.

Test the coolant solution at 500 hours or 12 months of operation using either John Deere coolant test strips or a COOLSCAN® or COOLSCAN PLUS® analysis. If a COOLSCAN® or COOLSCAN PLUS® analysis is not available, recharge the system per instructions printed on label of John Deere Liquid Coolant Conditioner.

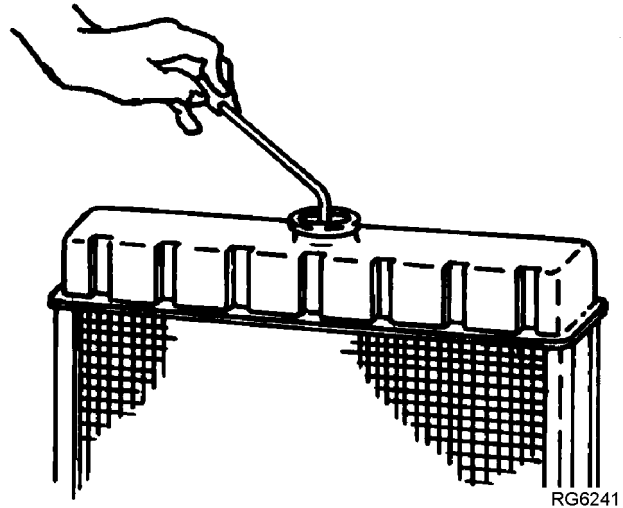
IMPORTANT: ALWAYS maintain coolant at correct level and concentration. DO NOT operate engine without coolant even for a few minutes.

If frequent coolant makeup is required, the glycol concentration should be checked with JTO7298 Coolant/Battery Tester to ensure that the desired freeze point is maintained. Follow manufacturer's instructions provided with Coolant/Battery Tester.

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

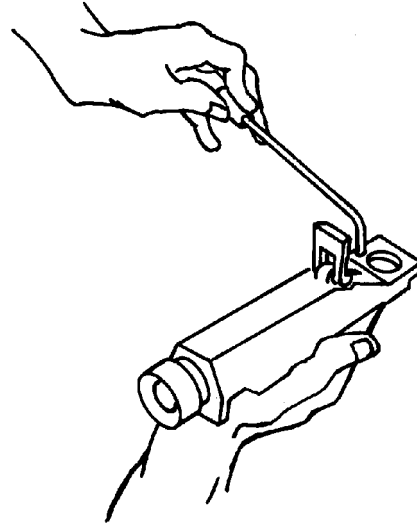
The use of non-recommended supplemental coolant additives may result in additive drop-out and gelation of the coolant.

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



RG6241

Radiator Coolant Check



RG6262

JTO7298 Coolant/Battery Tester

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

See DIESEL ENGINE COOLANTS AND SUPPLEMENTAL ADDITIVE INFORMATION for proper mixing of coolant ingredients before adding to the cooling system.

Testing Diesel Engine Coolant

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

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

Coolant Test Strips

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

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

COOLSCAN Or COOLSCAN PLUS

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

OUOD002,0000175 -19-27JUL06-1/1

Remove, Inspect and Clean Engine Heat Exchanger Core

IMPORTANT: Initially remove and inspect the engine heat exchanger core at 250 hour or three month service interval on a new engine. Then, remove and clean at every 500 hour or 12 month interval thereafter.

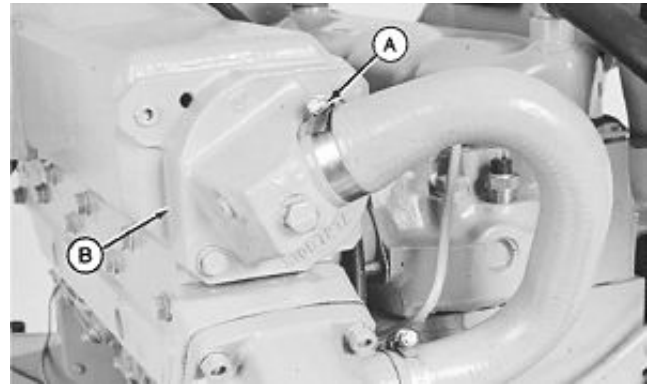
1. Close sea cocks and drain the sea water system.
2. Open drain cock on cylinder block and drain approximately two gallons of engine coolant into a clean container. Close drain cock.

On 4045D Engines Only:

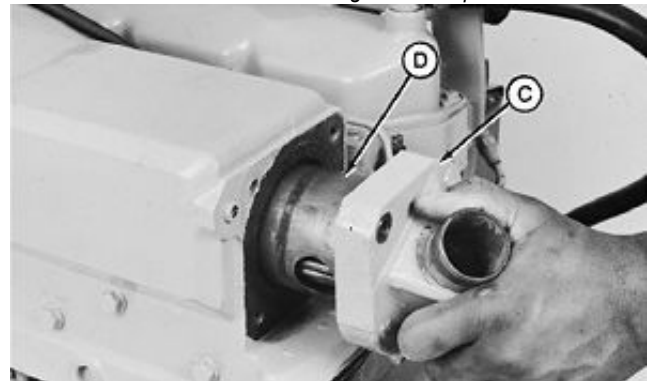
3. Loosen hose clamp (A) and remove hose from rear end cap (B).
4. Remove two end cap mounting cap screws and remove end cap (C) with heat exchanger core (D) from rear of engine.

A—Clamp
B—End Cap

C—End Cap
D—Heat Exchanger Core



Heat Exchanger End Cap



Remove Heat Exchanger Core

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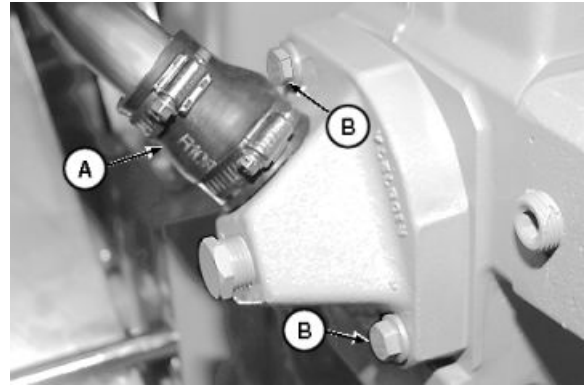
JR74534,0000306 -19-04FEB11-1/3

RG6063 —UN—23JAN92

RG6064 —UN—23JAN92

On 4045T, 6068T And 6068SFM50 Engines Only:

3. Loosen hose clamps and remove sea water pump-to-front end cap connecting hose (A) from heat exchanger end cap.
4. Remove two end cap mounting cap screws (B) and remove end cap with heat exchanger core from front of engine.



Heat Exchanger End Cap

JR74534,0000306 -19-04FEB11-2/3

RG9847 —UN—06/JAN99

On all engines:

NOTE: The heat exchanger core may be removed from housing when either end cap is removed. It is strongly recommended that both end caps be removed for cleaning when cleaning the heat exchanger core.

5. Remove remaining end cap from water manifold/heat exchanger housing. Remove end cap from heat exchanger core.
6. Thoroughly clean all buildup from both end caps and inspect zinc plug in each. Replace plugs as needed. (See INSPECT AND REPLACE ZINC PLUGS in 250 Hour Section.)
7. Use a 4.76 mm (3/16 in.) diameter brass rod to clean out any buildup in each heat exchanger tube. Run the rod the entire length of each tube to push debris out.
8. Flush the heat exchanger tubes with clean water, making sure all tubes are cleared of debris. Clean (with brass rod) and flush heat exchanger again if necessary to remove any remaining debris from tubes.



Clean Heat Exchanger

If you suspect that your heat exchanger core is defective, have your authorized servicing dealer or engine distributor pressure test for leaks. Replace heat exchanger core as required.

9. Remove and thoroughly clean water manifold/heat exchanger housing if needed.

JR74534,0000306 -19-04FEB11-3/3

RG6066 —UN—23/JAN92

Install Heat Exchanger Core

Thoroughly inspect condition of end cap sealing O-rings (A). Sealing O-rings may be reused if not excessively worn or damaged during disassembly. Replace sealing rings as necessary.

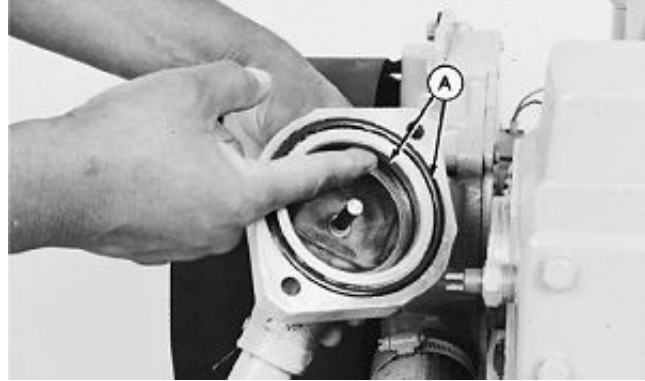
Lubricate front and rear end cap O-rings with clean multi-purpose grease.

On 4045D Engines:

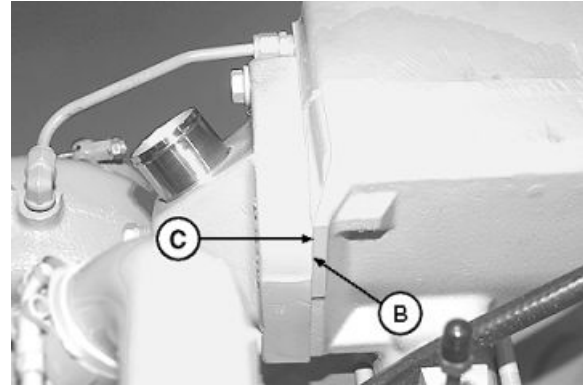
1. Install front end cap, install cap screws and evenly tighten until end cap (B) is about 6.4 mm (0.25 in.) from housing (C). Index end cap in same position as removed.
2. Install heat exchanger core from rear of engine. Make sure core is properly seated in front end cap to avoid cutting O-ring.
3. Install rear end cap with heat exchanger core properly seated in cap and cap properly indexed in same position as removed.
4. Install and evenly tighten rear end cap screws until cap contacts housing. Evenly tighten front end cap screws until cap contacts housing. Tighten front and rear end cap screws to 24 N·m (18 lb-ft).
5. Connect all water piping and tighten hose clamps securely. Fill cooling system with the proper amount and concentration of ethylene-glycol base antifreeze.
6. Open sea cock, start engine and check for leaks.

On 4045T, 6068T and 6068SFM50 Engines:

1. Install rear end cap, install cap screws and evenly tighten until end cap (B) is about 6.4 mm (0.25 in.) from housing (C). Index end cap in same position as removed.
2. Install heat exchanger core from front of engine. Make sure core is properly seated in rear end cap to avoid cutting O-ring.
3. Install front end cap with heat exchanger core properly seated in cap and cap properly indexed in same position as removed.
4. Install and evenly tighten front end cap screws until cap contacts housing. Evenly tighten rear end cap screws



Inspect Heat Exchanger End Cap



Install Heat Exchanger

A—O-Rings
B—End Cap

C—Housing

until cap contacts housing. Tighten front and rear end cap screws to 24 N·m (18 lb-ft).

5. Connect all water piping and tighten hose clamps securely. Fill cooling system with the proper amount and concentration of ethylene-glycol base antifreeze.
6. Open sea cock, start engine and check for leaks.

DPSG,OUOD007,322 -19-04JAN02-1/1

RG6067 —UN—23JAN92

RG9848 —UN—06JAN99

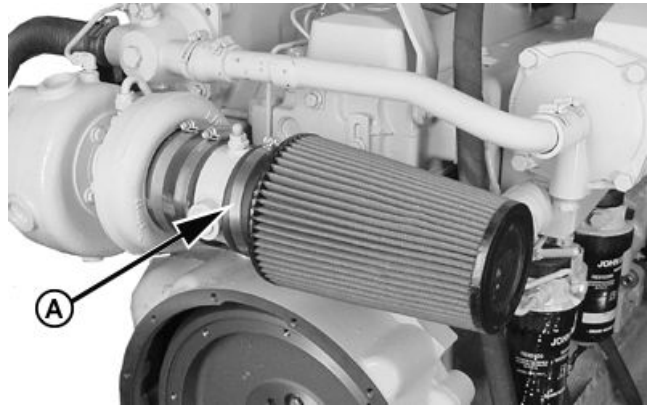
Remove, Inspect and Clean Engine Aftercooler Core (6068SFM50)

IMPORTANT: Initially remove and inspect the aftercooler core at 250 hour or three month service interval on a new engine. Then, remove and clean at every 500 hour or 12 month interval thereafter.

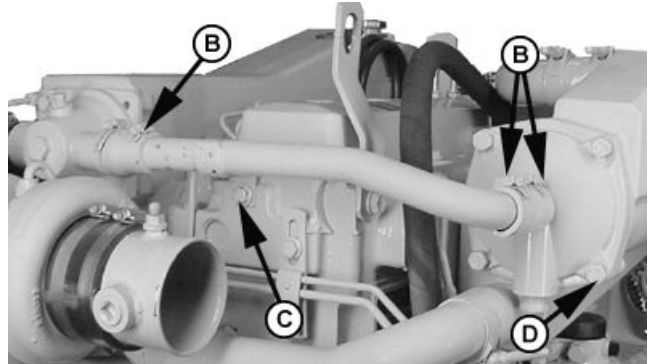
1. Close sea cocks and drain the sea water system.
2. Loosen clamp (A) and remove air filter.
3. Loosen clamps (B), remove mounting bolt (C) and remove water line from rear of aftercooler.
4. Remove four cap screws (D) and remove rear cap and O-ring.
5. Remove clamps (E) and remove hoses from front cap.
6. Remove four cap screws (F), front cap and O-ring.
7. Remove aftercooler core from the rear of the engine.

A—Clamp
B—Clamps
C—Mounting Bolt

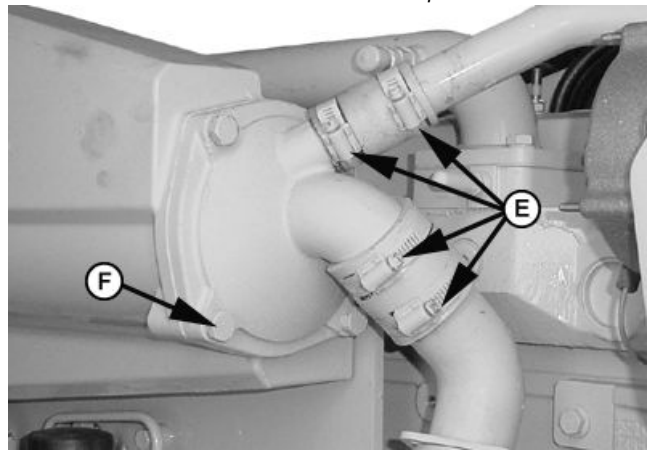
D—Cap Screws
E—Clamps
F—Cap Screws



Remove Clamp And Air Filter Element



Remove Rear Cap



Remove Front Cap

Continued on next page

OUOD005,000017C -19-18FEB02-1/2

RG12190 —UN—25FEB02

RG12182 —UN—25FEB02

RG12183 —UN—25FEB02

8. Thoroughly clean all buildup from both end caps.
9. Use a 4.76 mm (3/16 in.) diameter brass rod to clean out any buildup in each tube. Run the rod the entire length of each tube to push debris out.
10. Flush the tubes with clean water, making sure all tubes are cleared of debris. Clean (with brass rod) and flush aftercooler core again if necessary to remove any remaining debris from tubes.

If you suspect that your aftercooler core is defective, have your authorized servicing dealer or engine distributor pressure test for leaks. Replace aftercooler core as required.



Clean Aftercooler Core

OUOD005,000017C -19-18FEB02-2/2

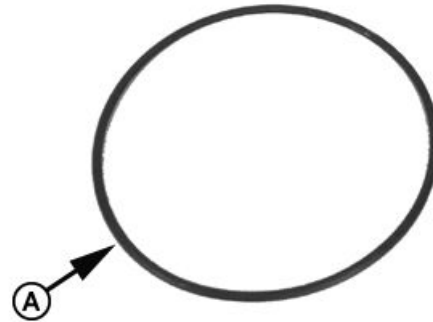
RG12181 —UN—25FEB02

Install Aftercooler Core (6068SFM50)

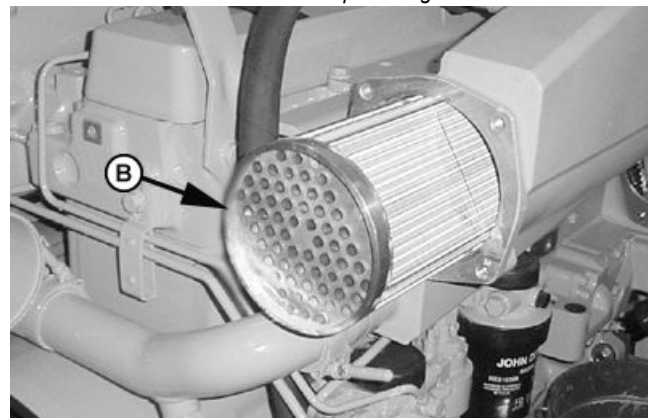
Thoroughly inspect condition of end cap sealing O-rings (A). Sealing O-rings may be reused if not excessively worn or damaged during disassembly. Replace sealing rings as necessary.

Lubricate front and rear end cap O-rings with clean multi-purpose grease.

1. Install aftercooler core (B) from rear of engine.
2. Index end cap in same position as removed. Install O-ring and rear end cap, install cap screws and evenly tighten until snug.
3. Install O-ring and front end cap with aftercooler core properly seated in cap and cap properly indexed in same position as removed.
4. Install and evenly tighten front cap screws until cap contacts housing. Tighten front and rear end cap screws to 24 N·m (18 lb-ft).
5. Connect all water piping and tighten water line-to-cylinder head cap screw to 50 N·m (37 lb-ft). Tighten hose clamps securely. Open sea cocks.



End Cap O-Ring



Install Aftercooler Core

OUOD005,000017D -19-18FEB02-1/1

RG12184 —UN—25FEB02

RG12185 —UN—25FEB02

A—O-Ring

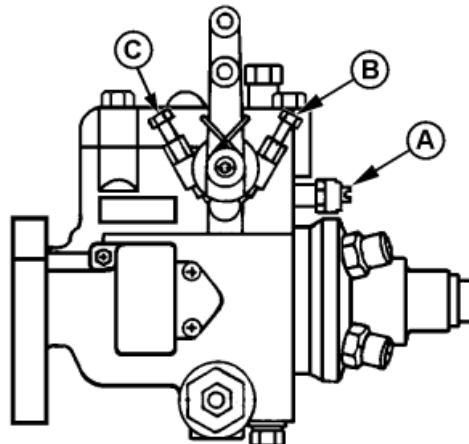
B—Aftercooler Core

Adjusting Variable Speed (Droop) on Generator Set Engines

NOTE: This adjustment is not required on 6068SFM50 electronically-controlled engines.

Stanadyne Mechanical Injection Pumps Only

1. Warm engine to normal operating temperature.
2. When necessary, disconnect throttle linkage or cable.
3. Adjust slow idle (C) and adjust fast idle (B) speed when necessary.
4. Run engine at fast idle, then apply load until reaching rated speed.
5. Check power. Adjust with the screw (A) if needed.
6. Remove load from engine.
7. Again check and adjust fast idle if screw (A) has been turned.
8. Repeat procedure until both the engine power and the fast idle speed are correct.
9. Reinstall throttle linkage if previously removed.



Droop Adjustment Screw

A—Adjustment Screw
B—Fast Idle Adjustment

C—Slow Idle Adjustment

Continued on next page

RG, RG34710, 5583 -19-25MAR02-1/2

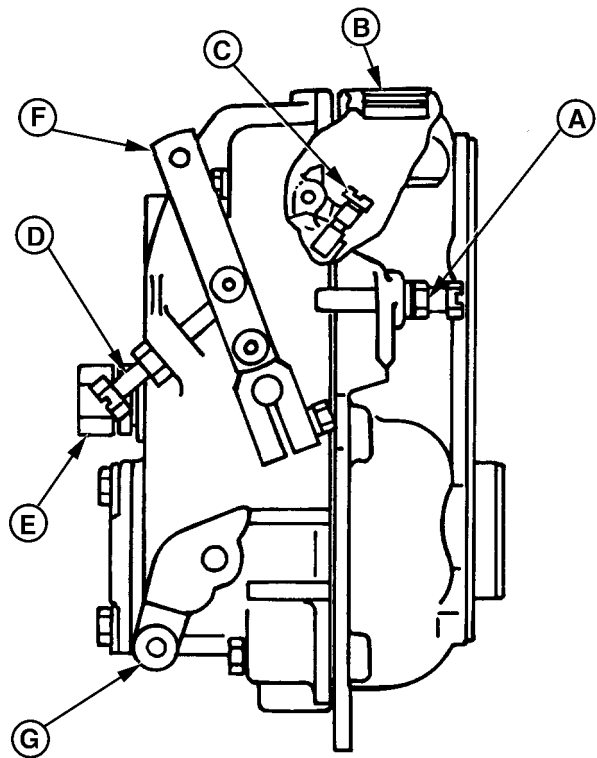
RG12066 —UN—29JAN02

DENSO In-Line Injection Pumps Only

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

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

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



DENSO In-Line Injection Pump

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

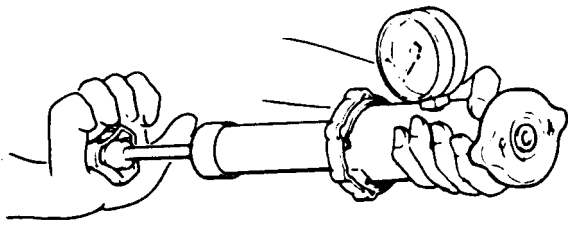
Delphi (Lucas) Injection Pumps Only

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

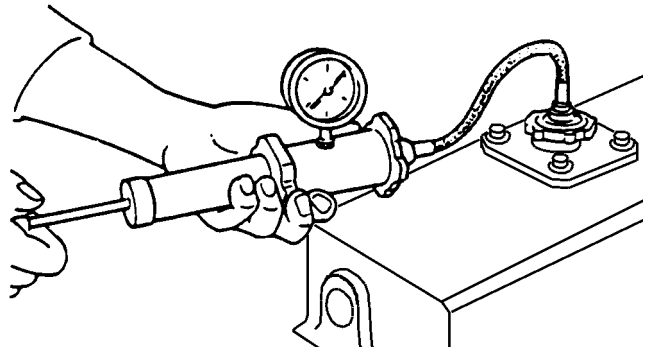
RG, RG34710, 5583 -19-25MAR02-2/2

RG5752 —UN—03NOV97

Pressure Testing Cooling System



RG6557 —UN—20JAN93



RG9850 —UN—06JAN99

⚠ 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 Coolant Filler Cap

1. Remove coolant filler cap and attach to an appropriate tester as shown.
2. Pressurize cap to 70 kPa (0.7 bar) (10 psi). Gauge should hold pressure for 10 seconds within the normal range if cap is acceptable.
If gauge does not hold pressure, replace pressure 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 coolant filler cap.
2. Fill tank with coolant to the normal operating level.

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

3. Connect gauge and adapter to filler neck. Pressurize system to 70 kPa (0.7 bar) (10 psi).
4. With pressure applied, check all cooling system hose connections, coolant tank, 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.

RG, RG34710, 5586 -19-20MAY96-1/1

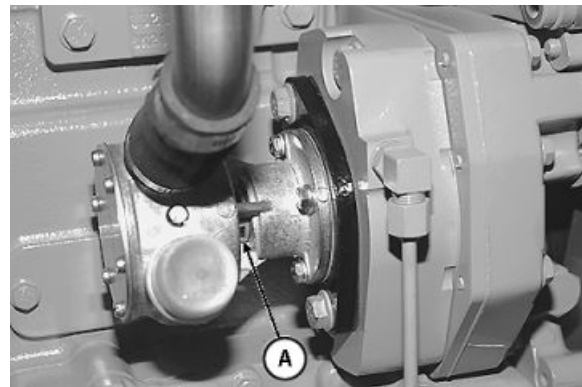
Inspect and Repair Sea Water Pump (Except 6068SFM50)

• Inspect pump housing for seal leakage

1. Inspect the sea water pump housing weep hole (A) for evidence of water or oil indicating seal leakage.

If water leakage is evident, order a RE49490 Impeller Repair Kit and replace impeller and front housing/shaft seal.

If oil leakage is evident, order a RE49491 Major Repair Kit and replace all internal components except shaft. An arbor press and drivers are needed to install this kit. Have an experienced repairman install this kit.



Inspect Sea Water Pump

A—Weep Hole

JR74534,0000307 -19-04FEB11-1/3

RG9852 —UN—05/JAN99

• Remove and Inspect Impeller

1. Close sea cock and drain sea water system if not previously done.
2. Remove six cover plate cap screws with washers and remove cover plate (A) with O-ring. Remove impeller end cap from end of impeller bore.

NOTE: Normally the impeller can be removed by using two pair of pliers to grip impeller vanes on opposite sides of impeller. A spray penetrating lubricant will help loosen a stuck impeller. Also, rotating the pump shaft by hand may help free the impeller.

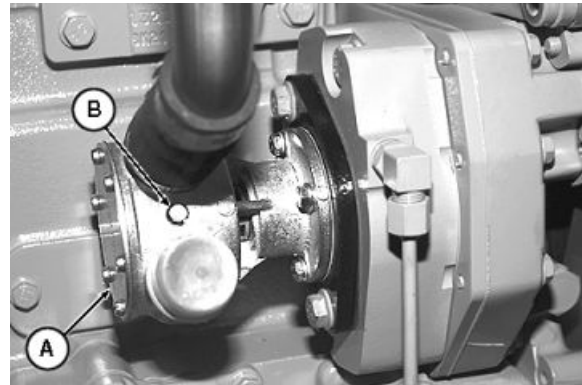
3. Carefully remove impeller with cam plate. Be careful not to damage impeller if in reusable condition. Remove key from shaft keyway.

The impeller must be installed in the same direction as removed. Mark the impeller to ensure installation in proper direction of rotation if impeller is reused.

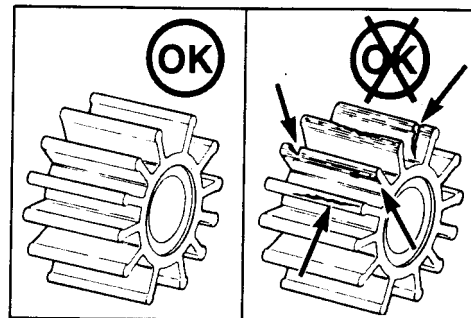
4. Inspect impeller for damages such as tears, stress cracks, excess abrasions on vane ends, or chunks of material missing. If impeller replacement is necessary, order an impeller repair kit.

IMPORTANT: If impeller has chunks of material missing, the heat exchanger, marine gear oil cooler and any other circuit that are cooled by raw water should be thoroughly cleaned and flushed.

5. Remove cam screw (B) holding cam plate to impeller housing bore.
6. Thoroughly clean impeller housing bore and cam plate (if cam plate is reused).



Remove Cover Plate



Inspect Sea Water Pump Impeller

A—Cover Plate

B—Cam Screw

Continued on next page

JR74534,0000307 -19-04FEB11-2/3

RG9853 —UN—05/JAN99

RG6243 —UN—23/MAR92

• Install Impeller

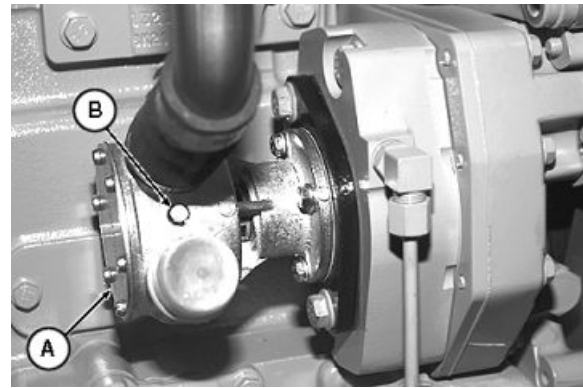
1. Apply LOCTITE® 242 (Deere Part No. TY9370) to curved side of cam plate near threaded hole and install cam plate into impeller housing bore, be sure holes in cam plate and housing are aligned. Apply LOCTITE® 242 to cam screw (B), install, and tighten.

The cam plate should be inspected to insure that none of the cam fingers are protruding which could cause impeller damage. The cam screw should also be inspected to insure that it does not protrude below the cam plate. Replace cam plate and cam screw or grind screw flush as needed.

2. Lubricate impeller blades with a non-petroleum based lubricant such as silicone or soapy water. Install impeller using a twisting motion and be sure the impeller blades are bent in the same direction as they were upon removal.

Be sure impeller is installed in same direction as removed if reusing existing impeller.

3. Rotate impeller to align keyway and slide the key in place. Install impeller end cap in end of impeller bore.



Install Cover Plate

A—Cover Plate

B—Cam Screw

4. Using a new O-ring, install cover plate (A) onto impeller housing. Install six screws with washers. Tighten screws evenly.

5. Reconnect all water piping, if disconnected.

6. Close sea cock, start engine, and check for leaks.

LOCTITE is a registered trademark of Loctite Corp.

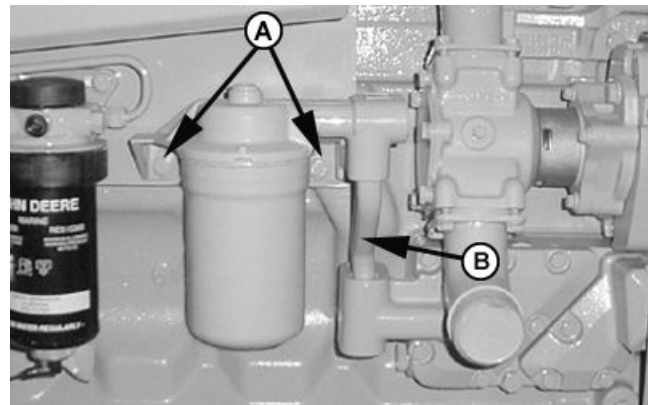
JR74534,0000307 -19-04FEB11-3/3

Inspect And Repair Sea Water Pump (6068SFM50)

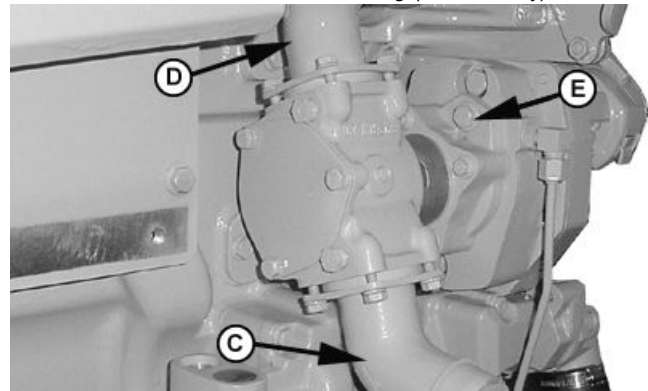
NOTE: On 6068SFM50 engines, the sea water pump must be removed from the engine for inspection and repair.

If engine is equipped with a remote oil filter, steps 2 and 16 are not necessary.

1. Close sea cocks and drain sea water system.
2. Remove two cap screws (A) and remove oil filter housing and oil tubes (B).
3. Remove flange mount cap screws and remove sea water inlet tube (C) and outlet tube (D).
4. Remove mounting cap screws (E) and remove sea water pump.
5. Clean all gasket material from both mating surfaces.



Remove Oil Filter Housing (If Necessary)



Remove Sea Water Pump

A—Cap Screws
B—Oil Tubes
C—Sea Water Inlet Tube

D—Sea Water Outlet Tube
E—Mounting Cap Screws

Continued on next page

DPSG,OUOD005,3475 -19-04FEB02-1/2

RG9853 —UN—05JAN99

RG12186 —UN—25FEB02

RG12187 —UN—25FEB02

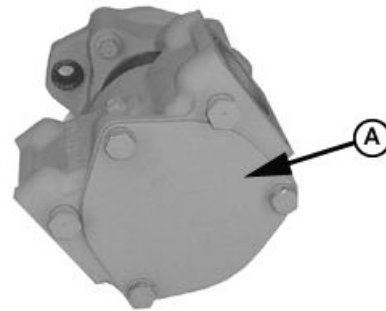
6. Remove cover plate (A) from sea water pump.

NOTE: Normally the impeller can be removed using two pair of pliers to grip impeller vanes on opposite sides of impeller. A spray penetrating lubricant will help loosen a stuck impeller.

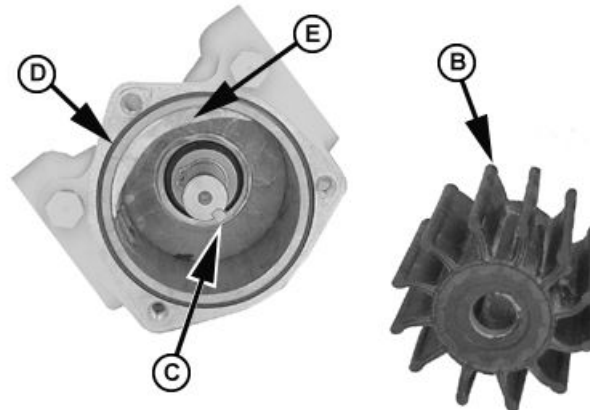
7. Remove impeller (B) and shaft key (C) from pump housing.
8. Remove O-ring (D).
9. Inspect cam plate (E) for evidence of heavy pitting or wear. Replace as needed.
10. Inspect impeller for cracks, tears or excess abrasion on vane ends. Replace if either condition exists.

IMPORTANT: If impeller has chunks of material missing, the heat exchanger, aftercooler, marine gear oil cooler and any other circuit that are cooled by raw water should be thoroughly cleaned and flushed.

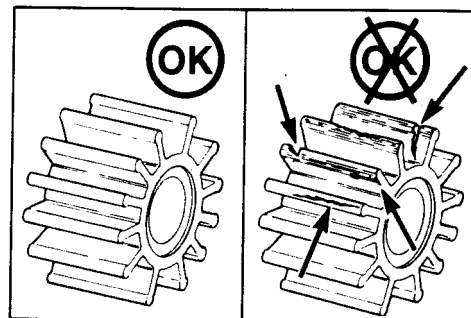
11. Install shaft key (C) on shaft.
12. Lubricate new impeller blades with a non-petroleum based lubricant such as silicone or soapy water. Install impeller using a twisting motion and be sure the impeller blades are bent in the same direction as they were upon removal to prevent damage at startup. Rotate impeller on shaft to align keyways and slide the impeller onto the shaft.
13. Using a new O-ring (D), install cover plate and tighten cap screws with washers securely.
14. Install sea water pump and tighten cap screws to 73 N·m (54 lb-ft).
15. Connect sea water inlet and outlet tubes. Tighten mounting cap screws **evenly** until secure.
16. Replace O-rings on oil tubes and install oil filter housing and oil tubes. Tighten mounting cap screws to 35 N·m (26 lb-ft).
17. Open sea cocks, start engine and check pump operation.



Remove Impeller



Remove and Inspect Components



Inspect Sea Water Pump Impeller

A—Cover Plate
B—Impeller
C—Shaft Key

D—O-Ring
E—Cam Plate

DPSG,OUOD005,3475 -19-04FEB02-2/2

RG12188 —UN—25FEB02

RG12189 —UN—25FEB02

RG6243 —UN—23MAR92

Checking and Adjusting Engine Valve Clearance

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

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

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

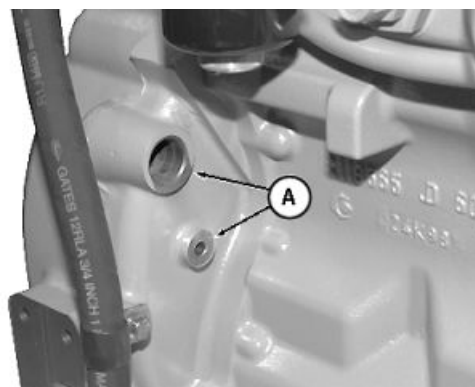
1. Remove rocker arm cover and crankcase ventilator tube.

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

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

2. Remove plastic plugs or cover plate from flywheel housing timing holes (A).
3. Using either JDG820 or JDE83 Flywheel Turning Tool and JDE81-4 or JDG1571 Timing Pin, rotate engine in running direction (clockwise viewed from front) until Number 1 (front) cylinder is at Top Dead Center (TDC) Compression stroke. Insert JDE81-4 or JDG1571 timing pin in flywheel.

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



Flywheel Housing Timing Holes

A—Timing Holes

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

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

Specification

Intake Valve Clearance	
Checking (Rocker Arm-to-Valve Tip) (Engine Cold)—Clearance.....	0.31-0.38 mm (0.012-0.015 in.)
Exhaust Valve Clearance	
Checking (Rocker Arm-to-Valve Tip) (Engine Cold)—Clearance.....	0.41-0.48 mm (0.016-0.019 in.)

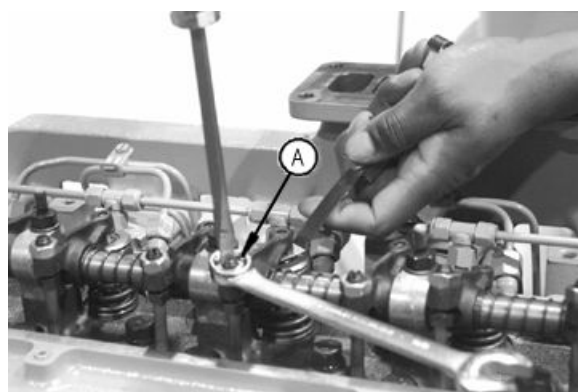
RG, RG34710, 5589 -19-04JAN02-1/4

5. If valves need adjusting, loosen the locknut (A) on rocker arm adjusting screw. Turn adjusting screw until feeler gauge slips with a slight drag. Hold the adjusting screw from turning with screwdriver and tighten locknut to 27 N·m (20 lb-ft). Recheck clearance again after tightening locknut. Readjust clearance as necessary.

6. Replace rocker arm cover and crankcase ventilator tube.

Specification

Intake Valve Clearance	
Adjustment (Rocker Arm-to-Valve Tip) (Engine Cold)—Clearance.....	0.36 mm (0.014 in.)
Exhaust Valve Clearance	
Adjustment (Rocker Arm-to-Valve Tip) (Engine Cold)—Clearance.....	0.46 mm (0.018 in.)



Adjust Valves

A—Locknut

Continued on next page

RG, RG34710, 5589 -19-04JAN02-2/4

RG9854 —UN—05JAN99

RG7409 —UN—06AUG96

4-Cylinder Engine

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

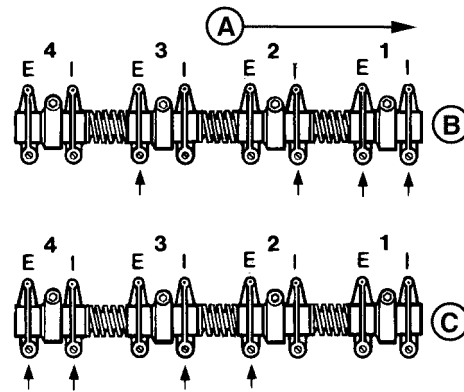
Lock No. 1 piston at TDC compression stroke (B).

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

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

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

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



4-Cylinder Engine Valve Adjustment

RG, RG34710, 5589 -19-04JAN02-3/4

RG4776 —UN—31OCT97

6-Cylinder Engine

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

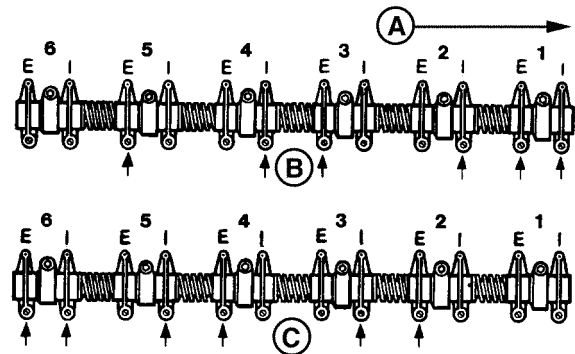
Lock No. 1 piston at TDC compression stroke (B).

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

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

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

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



6-Cylinder Engine Valve Adjustment

RG, RG34710, 5589 -19-04JAN02-4/4

RG4777 —UN—31OCT97

Flushing Cooling System

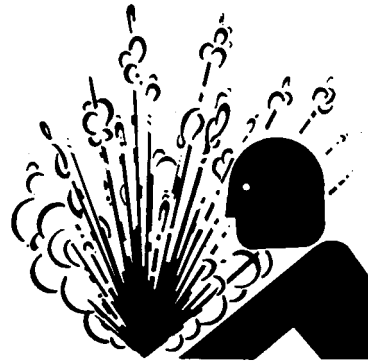
⚠ CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

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.

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

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

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



High-Pressure Fluids

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

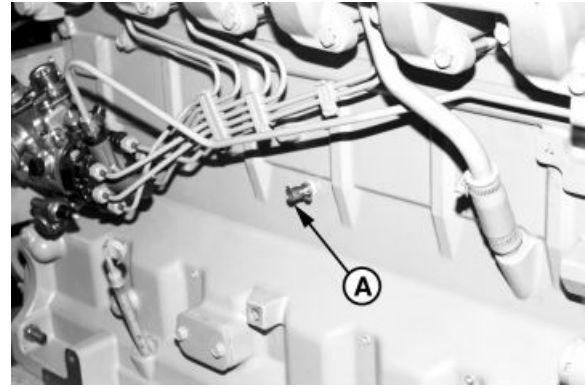
Continued on next page

RG, RG34710, 5587 -19-15FEB02-1/2

TS281 —UN—15APR13

3. Open engine block drain valve (A) on left side of engine. Drain all coolant from engine block.
4. Open radiator drain valve. Drain all coolant from radiator.
5. Remove thermostats at this time, if not previously done. Install cover (without thermostats) using old gasket and tighten cap screws to 47 N·m (35 lb-ft).
6. Close all drain valves after coolant has drained.

CAUTION: Do not run engine longer than 10 minutes. Doing so may cause engine to overheat which may cause burns when radiator water is draining.



Engine Block Drain Valve

A—Engine Block Drain Valve

7. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
8. Stop engine, pull off lower radiator hose and remove radiator cap. Immediately drain the water from system before rust and sediment settle.
9. After draining water, close drain valves. Reinstall radiator cap, radiator hose and clamp. Fill the cooling system with clean water and a heavy duty cooling system cleaner such as Fleetguard® RESTORE™ and RESTORE PLUS™. These products may be available from your John Deere dealer. Follow manufacturer's directions on label.
10. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run the engine about 10 minutes, remove radiator cap and pull off lower radiator hose to drain out flushing water.
11. Close all drain valves on engine and radiator. Reinstall radiator hose and tighten clamps securely. Install thermostats using a new gasket.

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

12. Add coolant to radiator until coolant touches bottom of filler neck. (See ADDING COOLANT in Service As Required Section.) Install radiator cap.
13. Run engine until it reaches operating temperature. This mixes the solution uniformly and circulates it through the entire system. The normal engine coolant temperature range is 82°—94°C (180° — 202°F).
14. After running engine, check coolant level and entire cooling system for leaks.

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

RG, RG34710, 5587 -19-15FEB02-2/2

RG8019A—UN—19JUN00

Checking Crankshaft Vibration Damper (6-Cylinder Engine Only)

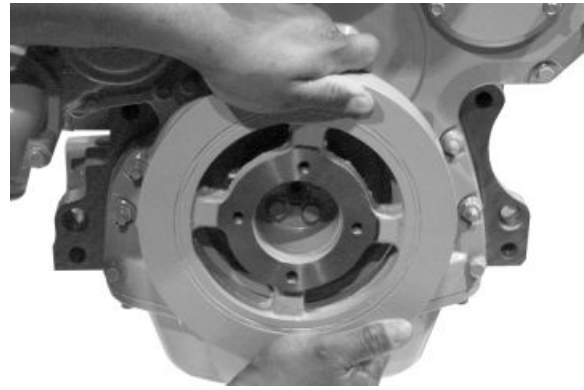
IMPORTANT: Crankshaft vibration damper is not repairable. For engines equipped with elastomeric crankshaft vibration damper replace every 4500 hours or 60 months, whichever comes first. For engines equipped with viscous crankshaft vibration damper replace at major engine overhaul. Also replace viscous crankshaft vibration damper when short block, complete block, or remanufactured basic engine is installed.

NOTE: Checking procedure only applies to elastomeric crankshaft vibration damper.

1. Remove belts (shown removed).
2. Grasp crankshaft vibration damper with both hands and attempt to turn it in both directions. If rotation is felt, crankshaft vibration damper is defective and should be replaced.
3. Check crankshaft vibration damper radial runout by positioning dial indicator so probe contacts damper outer diameter.
4. With engine at operating temperature, rotate crankshaft using JDE83 or JDE81-1 flywheel turning tool.
5. Note dial indicator reading. If runout exceeds specification, replace crankshaft vibration damper.

Specification

Crankshaft Vibration
Damper—Maximum
Radial Runout..... 1.50 mm (0.060 in)



Grasp Crankshaft Vibration Damper



Check Runout

RG8018 —UN—15JAN99

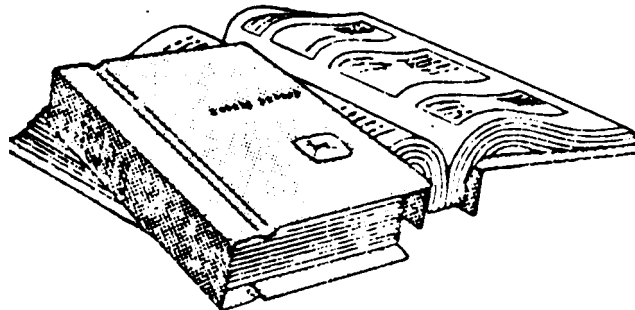
RG7508 —UN—23NOV97

AT89373,0000E90 -19-02NOV15-1/1

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 —UN—15DEC88

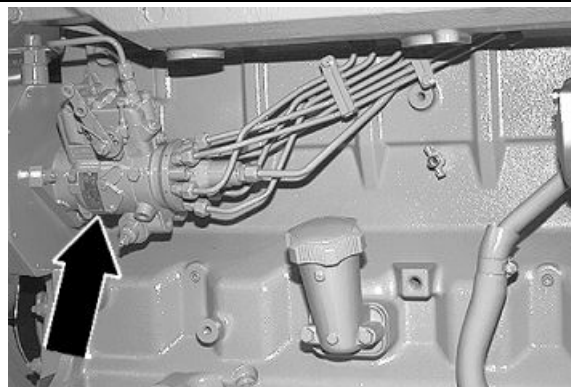
RG, RG34710, 5591 -19-20MAY96-1/1

Do Not Modify Fuel System

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

In addition, tampering with fuel system which alters emission-related equipment on engines may result in fines or other penalties, per EPA regulations or other local emission laws.

Do not attempt to service injection pump or fuel injectors yourself. Special training and special tools are required. (See your authorized servicing dealer or engine distributor.)



Injection Pump

RG9855 —UN—05JAN99

RG, RG34710, 5592 -19-11JAN02-1/1

Adding Coolant

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

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

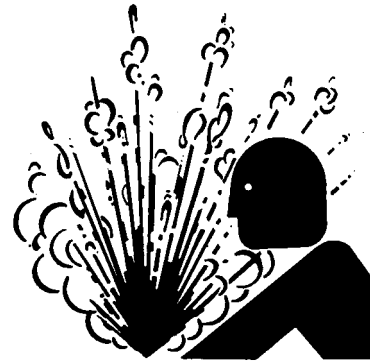
IMPORTANT: Never pour cold liquid into a hot engine, as it may crack cylinder head or block. **DO NOT** operate engine without coolant for even a few minutes.

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

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

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

IMPORTANT: When adding coolant to the system, use the appropriate coolant solution. (See



High-Pressure Fluids

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 coolant tank.

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

RG, RG34710, 5593 -19-04JAN02-1/1

Pre-Start Cleaning Guide

CAUTION: Avoid injury. Before cleaning machine, allow ample time for hot surfaces to cool.

IMPORTANT: Avoid machine damage. Do not direct high-pressure spray from hose output directly at or close to electrical connections and sensors.

Cleaning as needed is recommended. Clean more frequently during heavy machine use, and when weather conditions are dry.

- Check enclosed areas daily. Clean the engine and other enclosed areas of equipment to remove debris and any buildup of oil and grease. Keep the engine and engine compartment free of combustible material.
- Check for debris buildup daily on and around intake systems, exhaust systems, and intercooler piping systems. Verify that there are no holes or leaks in intake or exhaust systems. Do not allow debris to build up near hot exhaust components. Verify that hot exhaust components are cleaned as often as environmental conditions require.
- Inspect cooling system daily to determine whether cooling system needs cleaning. Visible buildup of

residue that blocks airflow may degrade machine performance and requires more frequent cleaning depending on environmental conditions.

- Inspect difficult to observe areas daily as conditions may require additional cleaning care to remove debris.
- Check for oil and fuel leaks daily. Replace or repair sources of leaks, including gaskets, seals, breather tubes, fittings, and fluid lines.

Maintenance and Service Reminders

- Keep surfaces free of grease and oil.
- Clean up hydraulic and other fluid leaks.
- Fuel Lines — Check for leaks, cracks, and kinks.
- Fuel Pumps — Check fittings, especially compression ring couplings, for cracks and leaks.
- Fuel Injectors — Check pressure and return lines for signs of leaks.
- When servicing fuel filter or draining water separator, avoid fuel spills. Immediately clean up any fuel spill.
- Check for transmission case venting system seepage, transmission case leakage, power steering cylinder leakage, or power steering line leakage.
- Check for loose electrical connectors, damaged wiring, corrosion, or poor connections.

ZE59858, 0000009 -19-07JUL20-1/1

Replacing Dry Air Cleaner Element (Enclosed Element Installations)

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

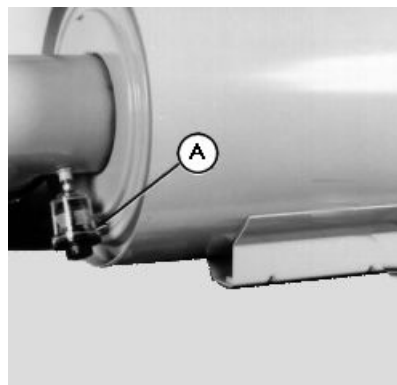
1. Loosen band clamp (B) securing air cleaner-to-intake elbow. Remove air cleaner.

IMPORTANT: Tighten all air intake connections securely to prevent ingestion of abrasive dirt and dust into the system, causing possible engine damage.

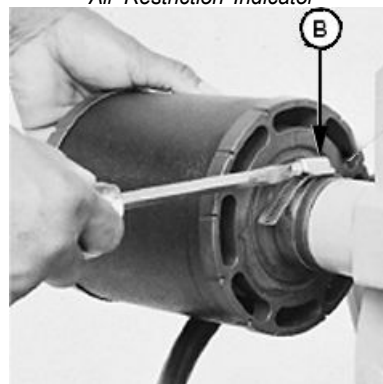
2. Install a new air cleaner and tighten band clamp securely.

A—Air Restriction Indicator

B—Band Clamp



Air Restriction Indicator



Loosen Band Clamp

RG9874 —UN—12FEB99

RG9912 —UN—25FEB99

RG, RG34710, 5594 -19-04JAN02-1/1

Servicing Dry Air Cleaner Element (Open Element Installations)

IMPORTANT: Always service primary air cleaner element when air restriction indicator (A) shows a vacuum of 625 mm (25 in.) H₂O, or element 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.

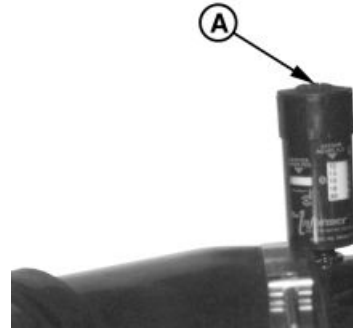
1. Loosen clamp (B) and remove filter element.

IMPORTANT: Replace filter element after 10 cleanings. (See following procedure.)

2. Tap end of filter GENTLY on hard surface to dislodge loose dirt.
3. Brush dirt side of filter GENTLY with soft bristle brush.

IMPORTANT: Use kit RE504585 to service filter element. DO NOT clean element with gasoline, solvents, parts cleaners, strong detergents, or caustic cleaning solutions. DO NOT steam clean or use high-pressure washers to clean element. These processes will damage filter media and/or rubber base or end cap.

A—Air Restriction Indicator B—Clamp



Air Filter Restriction Indicator



Remove Filter Element

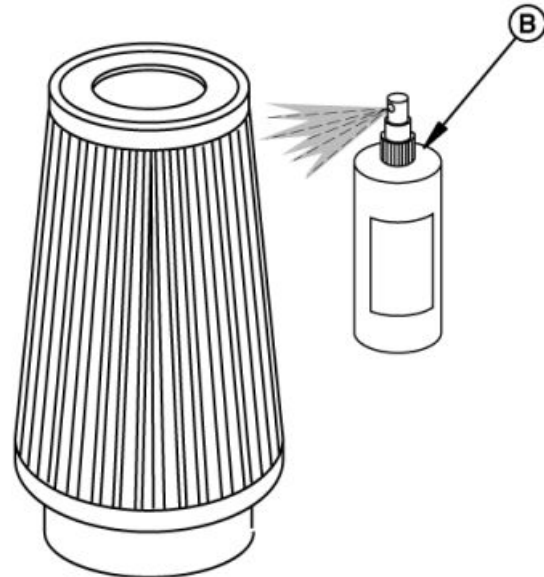
RG9927 —UN—18NOV99

RG12191 —UN—26FEB02

JR74534,0000308 -19-04FEB11-1/5

4. Spray air filter cleaner (B) (from kit RE504585) liberally onto entire element. Let soak into filter media for 10 minutes.

B—Air Filter Cleaner



Spray Filter with Cleaner

Continued on next page

JR74534,0000308 -19-04FEB11-2/5

RG9943 —UN—17NOV99

5. Rinse filter with low pressure water, flushing opposite the direction of air flow (from clean side to dirty side).

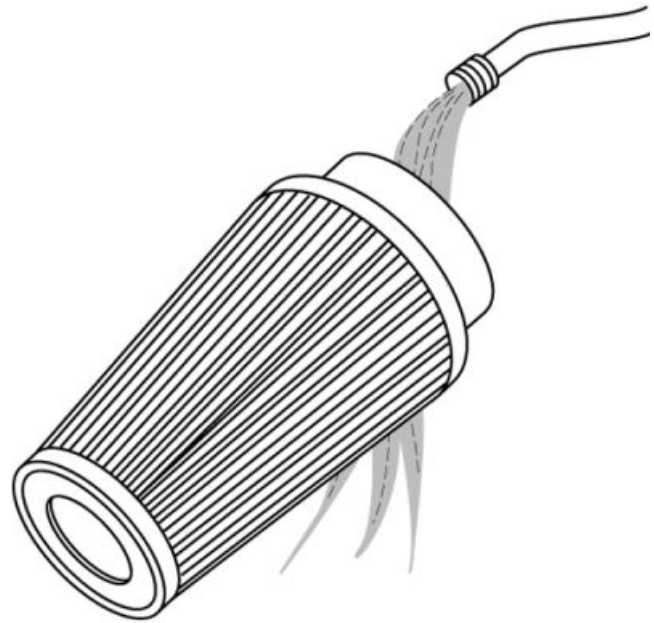
IMPORTANT: Let element dry at room temperature. Compressed air will damage filter media. Heat will shrink filter media and may damage rubber base or end cap.

6. Shake off excess water and let the element dry at room temperature.

IMPORTANT: Never put filter in service without oiling it. The filter will not function properly without being oiled with oil provided in kit RE504585.

Do not use automatic transmission fluid, motor oil, diesel fuel, or any type light-weight spray lubricant. These products will damage filter or degrade its performance.

NOTE: Red dye is added to oil to show areas of oil application.



Rinse Filter

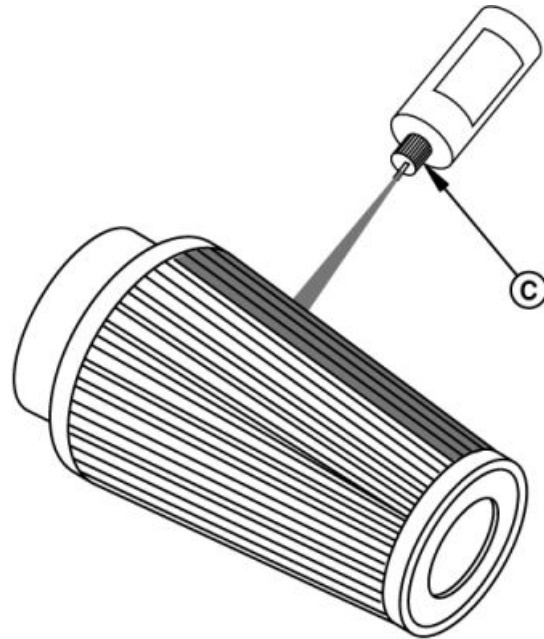
JR74534,0000308 -19-04FEB11-3/5

RG9944—UN—17NOV99

7. Spray air filter oil from squeeze bottle (C) in kit from distance of 25 cm (10 in.) onto a group of pleats until the pleats become reddish in color. Respray any areas that are still white 10 minutes after initial application.

8. Install filter and tighten clamp.

C—Squeeze Bottle



Apply Oil To Filter

Continued on next page

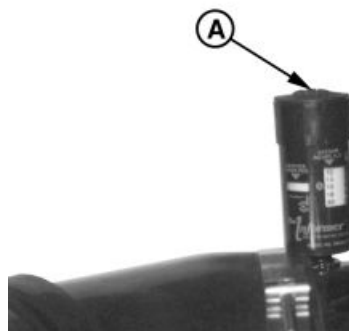
JR74534,0000308 -19-04FEB11-4/5

RG9945—UN—17NOV99

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

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

A—Reset Button



Air Filter Restriction Indicator Reset Button

JR74534,0000308 -19-04FEB11-5/5

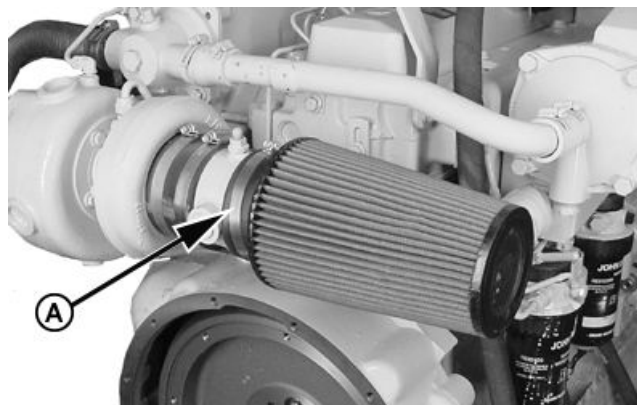
RG9927 —UN—18NOV99

Replacing Air Filter Element (Open Element Installations)

IMPORTANT: Replace the element after 10 cleanings.

1. Loosen clamp (A) and remove filter element.
2. Install new filter element and tighten clamp.

A—Clamp



Remove Filter Element

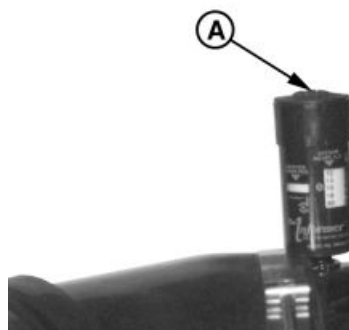
JR74534,0000309 -19-04FEB11-1/2

RG12190 —UN—25FEB02

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

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

A—Reset Button



Air Filter Restriction Indicator Reset Button

JR74534,0000309 -19-04FEB11-2/2

RG9927 —UN—18NOV99

Replacing Alternator Belt (With Automatic Tensioner)

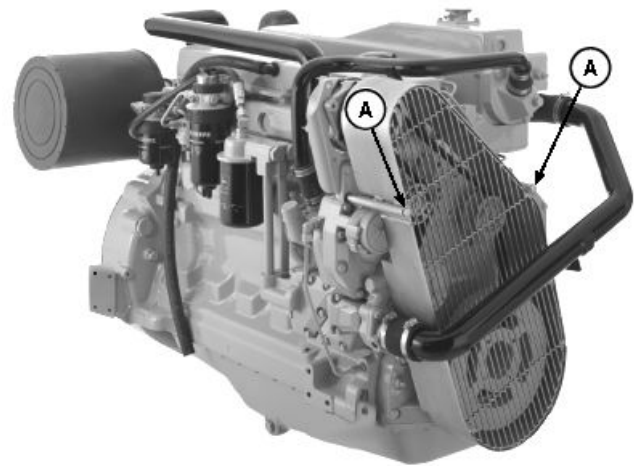
Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/500 Hour/12 Month Section for additional information on the belt tensioner.

⚠ CAUTION: Belt guard should be in place at all times when engine is running.

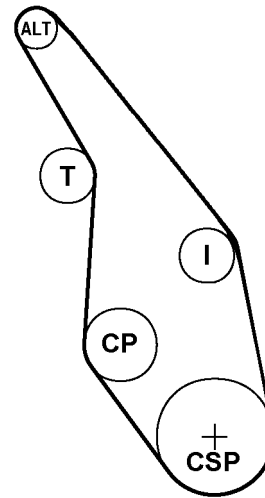
1. Remove cap screws (A) and carefully remove belt guard from engine.
2. Release tension on belt using a breaker bar and socket on tension arm and remove poly-vee belt from pulleys.
3. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary.
4. Install new belt, making sure belt is correctly seated in all pulley grooves. Refer to belt routing at right.
5. Apply tension to belt with tensioner. Remove socket.
6. Start engine and check belt alignment.

A—Cap Screws
ALT— Alternator
CSP—Crankshaft Pulley

I— Idler Pulley
T— Tensioner
CP—Coolant Pump



Remove Belt Guard



Belt Routing

RG9856 —UN—05JAN99

RG12077 —UN—26FEB02

RG, RG34710, 5599 -19-13FEB02-1/1

Replacing Alternator Belt (With Manual Tensioner)

Inspect belt for cracks, fraying or stretched-out areas. If belt is worn or damaged, replace it as follows.

NOTE: It is not necessary to remove belt guard (A) to replace belt.

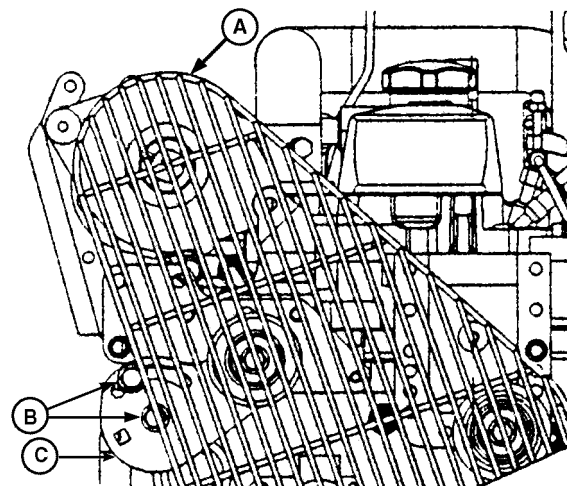
1. Loosen both belt tensioner mounting cap screws (B).
2. Swing tensioner arm (C) away from belt to loosen belt.
3. Remove poly-vee belt from pulleys and discard belt.
4. Install new belt, making sure belt is correctly seated in all pulley grooves.
5. Swing tensioner arm into belt to remove all belt slack.

NOTE: Belt adjustment uses notched units (D) above the adjusting cap screw slot on the tensioner.

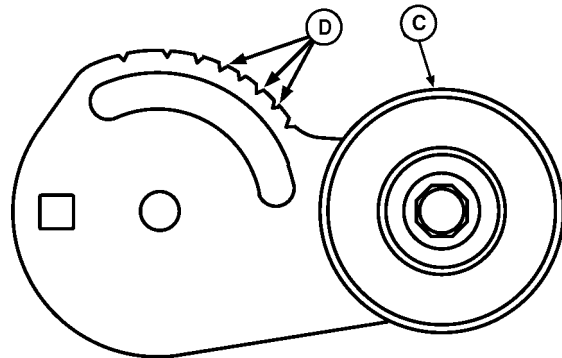
6. Using notches on tensioner to count units, move tensioner arm to stretch belt 1-1/2 units (new belt) or one unit (used belt) for appropriate tension.
7. Tighten tensioner mounting cap screws (B) to 70 N·m (52 lb-ft).

A—Belt Guard
B—Mounting Cap Screws

C—Tensioner Arm
D—Notched Units



Remove Belt Guard



Tension With Swing Arm

RG9872—UN—12FEB99

RG9873—UN—12FEB99

DPSG,OUOD013,511 -19-04JAN02-1/1

Inspect Driveline (PTO) (If Equipped)

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

Proper performance of the power take-off (PTO) unit will be related to the care it is given. Lubricate it periodically and keep the clutch properly adjusted. (See Service Literature provided by manufacturer.)

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



Avoid Entanglement

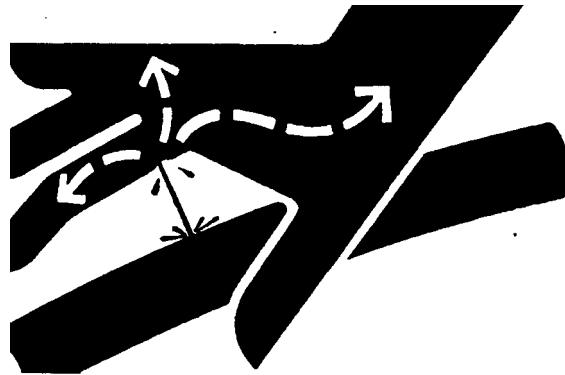
TS198—UN—23AUG88

RG,RG34710,5600 -19-04JAN02-1/1

Bleeding the Fuel System

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

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



High-Pressure Fluids

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.

RG, RG34710, 5602 -19-04JAN02-1/1

X9811 —UN—23AUG88

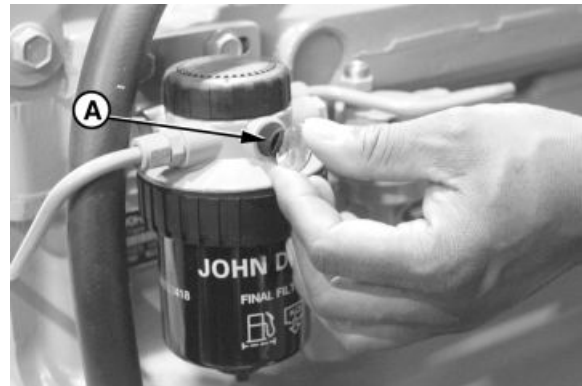
Bleeding Fuel System—4.5 L Engine

1. Loosen the air bleed vent screw (A) two full turns by hand on fuel filter base.
2. Operate supply pump primer lever (B) until fuel flow is free from air bubbles.
3. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Leave hand primer in the up position, away from the cylinder block.
4. Start engine and check for leaks.

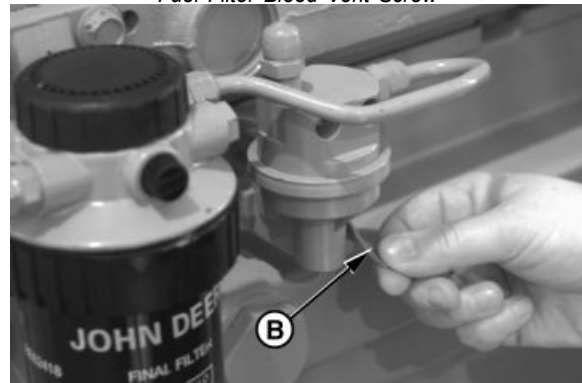
If engine will not start, it may be necessary to bleed air from fuel system at fuel injection pump or injection nozzles as explained next.

A—Bleed Vent Screw

B—Primer Lever



Fuel Filter Bleed Vent Screw



Fuel Supply Pump Primer Lever

DPSG, OUOD007, 326 -19-04JAN02-1/1

RG7947 —UN—13NOV97

RG8013A —UN—15JAN99

Bleeding Fuel System—6.8 L Engine (Except 6068SFM50 Engines)

1. Drain water and contaminants from water separator sediment bowl (B) on primary fuel filter (A).
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.

A—Primary Fuel Filter
B—Bowl

C—Outlet Line
D—Hand Primer



Bleed Fuel System



Pump Hand Primer

DPSG,OUOD007,327 -19-04JAN02-1/1

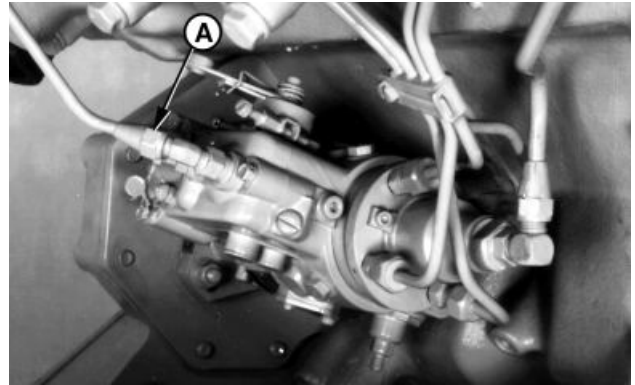
RG9858 —UN—06JAN99

RG9845 —UN—06JAN99

Bleeding Fuel System at Fuel Injection Pump (Except 6068SFM50 Engines)

1. Slightly loosen fuel return line connector (A) at fuel injection pump.
2. Operate fuel supply pump primer until fuel, without air bubbles, flows from fuel return line connection.
3. Tighten return line connector to 16 N·m (12 lb-ft).
4. On 4.5 L Engines, leave hand primer in the up position away from the cylinder block.

A—Fuel Return Line Connector



Bleed Fuel At Injection Pump

DPSG,OUOD007,328 -19-04JAN02-1/1

RG6264 —UN—03NOV97

Bleeding Fuel System At Fuel Injection Nozzles (Except 6068SFM50 Engines)

1. Move the speed control lever to half throttle position. On engines equipped with electronic fuel shut-off solenoid, energize solenoid.

IMPORTANT: Always use a backup wrench when loosening or tightening fuel lines at nozzles and/or injection pump to avoid damage.

2. Using two open-end wrenches, loosen fuel line connection at injection nozzle.

3. Crank engine over with starting motor, (but do not start engine), until fuel free from bubbles flows out of loosened connection. Retighten connection to 27 N·m (20 lb-ft).

4. Repeat procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.



Loosen Fuel Pressure Line

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

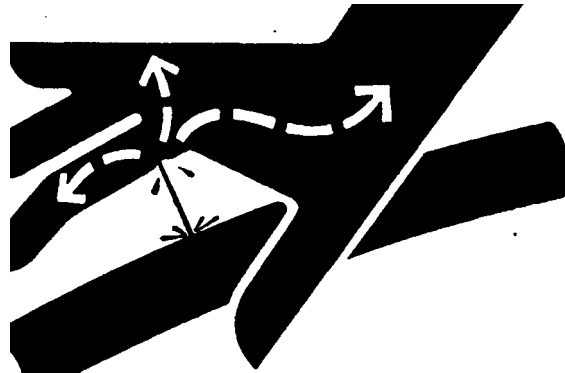
DPSG,OUOD007,329 -19-19JAN99-1/1

RG9860—UN—06JAN99

Bleeding Fuel System—6.8 L Engines (6068SFM50 Engines)

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

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



High-Pressure Fluids

This fuel system can only be bled by the electronic transfer pump or at the injection nozzles. **BLEEDING SHOULD NOT BE PERFORMED** at any location on the Bosch VP44 injection pump.

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.

Continued on next page

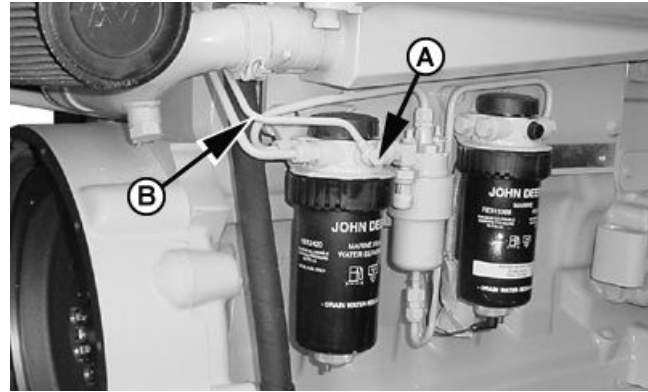
OUOD002,000016A -19-04JAN02-1/3

X9811—UN—23AUG88

Bleed Using Electronic Transfer Pump

The bleed is automatically performed by a small orifice (A) inside the final fuel filter base connected to the overflow valve on injection pump. The system allows air to escape continually through the fuel return line (B) when ignition is ON.

1. Ignition ON.
2. Allow 40 seconds for electronic transfer pump to complete priming.
3. If additional system bleeding is required, bleed the circuit by loosening fuel line connections at injection nozzles. See the next procedure, BLEED FUEL SYSTEM AT FUEL INJECTION NOZZLES.



Bleed Fuel System

A—Bleed Orifice in Final Fuel Filter Base B—Fuel Return Line

OUOD002,000016A -19-04JAN02-2/3

RG12192—UN—26FEB02

Bleed Fuel System at Fuel Injection Nozzles

IMPORTANT: Always use a backup wrench when loosening or tightening fuel lines at nozzles and/or injection pump to avoid damage.

1. Using **two** open-end wrenches, loosen two fuel line connections at injection nozzles.
2. Crank engine over with starter motor for 15 seconds (but do not start engine) until fuel free from bubbles flows out of loosened connection. Retighten connection to specifications.

Specification

Fuel Injection Nozzle
Delivery Line—Torque..... 27 N·m (20 lb-ft)

3. Repeat procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.



Bleed At Fuel Injection Nozzles

OUOD002,000016A -19-04JAN02-3/3

RG7725—UN—08JAN97

Remove and Install Auxiliary Gear Driven Sea Water Pump (Except 6068SFM50)

• Remove Sea Water Pump:

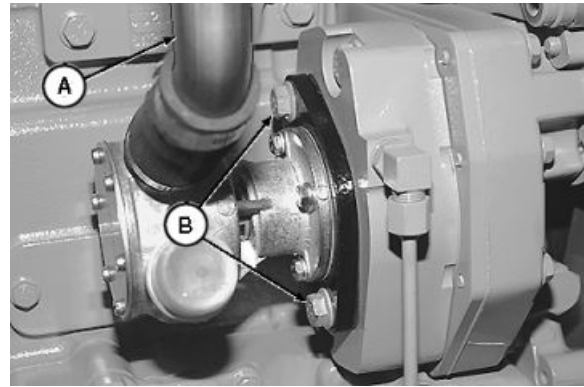
1. Close sea cock and drain sea water system, if not previously done.
2. Remove water inlet tube (shown removed) and outlet tube (A) from sea water pump.
3. Remove two cap screws (B) attaching sea water pump to gear housing. Withdraw pump from housing until splined shaft (C) is free from splined drive gear ID (D).
4. Clean all gasket material from both mating surfaces.

• Install Sea Water Pump:

1. Position a new gasket on water pump mounting flange. Install splined pump shaft in splined ID of drive gear.
2. Align mounting holes in water pump flange and gasket with threaded holes in gear housing. Install cap screws with washers and tighten cap screws to 47 N•m (35 lb-ft).
3. Connect water piping and tighten clamps.
4. Open sea cock, start engine, and check for leaks.

A—Outlet Tube
B—Mounting Screws

C—Splined Shaft
D—Drive Gear Splined ID



Remove Sea Water Pump



Install Sea Water Pump

RG9861—UN—06JAN99

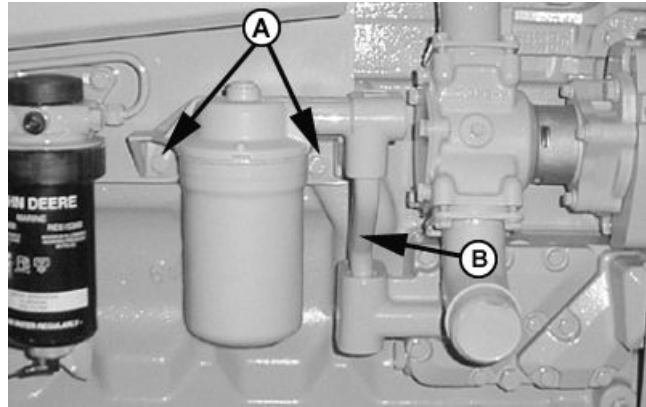
RG9864—UN—06JAN99

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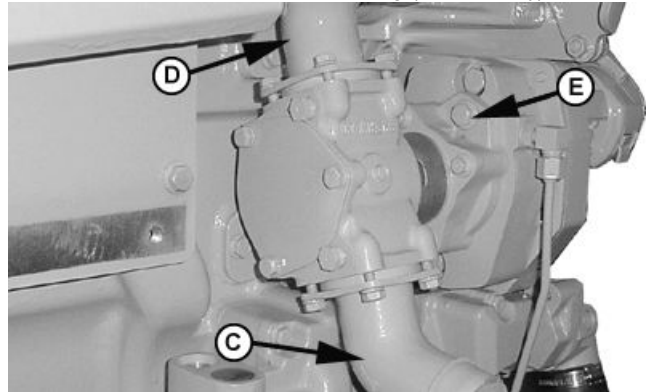
Remove And Install Sea Water Pump (6068SFM50)

NOTE: If engine is equipped with a remote oil filter, steps 2 and 10 are not necessary.

1. Close sea cock and drain sea water system.
2. Remove two cap screws (A) and remove oil filter housing and tubes (B).
3. Remove four flange mount cap screws and remove sea water inlet tube (C) and outlet tube (D).
4. Remove two cap screws (E) and remove sea water pump.
5. Clean all gasket material from both mating surfaces.
6. Position a new gasket on sea water pump mounting flange. Install splined pump shaft in splined ID of drive gear.
7. Align mounting holes in water pump mounting flange and gasket with threaded holes in drive gear housing. Install cap screws with washers and tighten cap screws to 73 N·m (54 lb-ft) of torque.
8. Inspect condition of O-ring in sea water pump inlet and outlet tubes determine if they are reusable. Replace O-rings as needed.
9. Connect sea water inlet and outlet tubes and install and tighten cap screws **evenly** until secure. Tighten hose clamps.
10. Replace O-rings on oil tubes and install oil tubes and oil filter housing. Tighten mounting cap screws to 35 N·m (26 lb-ft).
11. Open sea cock, start engine and check for leaks.



Remove Oil Filter Housing (If Necessary)



Remove Sea Water Pump

A—Cap Screws
B—Oil Tubes
C—Sea Water Inlet

D—Sea Water Outlet
E—Cap Screws

RG12186 —UN—25FEB02

RG12187 —UN—25FEB02

DPSG,OUOD005,3476 -19-20MAR00-1/1

Troubleshooting

General Troubleshooting Information

Troubleshooting engine problems can be difficult. Engine wiring diagrams are provided in this section to help isolate electrical problems on power units using John Deere wiring harness and instrument (gauge) panels.

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.

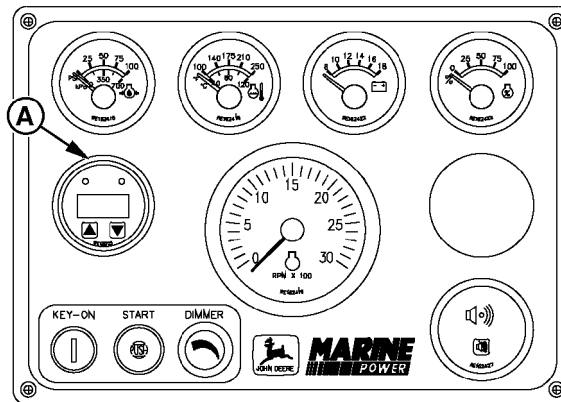
For the electronically-controlled 6068SFM50 engine, diagnosis is aided by the Electronic Control Unit (ECU) which can display trouble codes (DTC's) on the instrument panel. These codes are listed later in this section.

If the ECU detects a problem with the electronic control system, a Diagnostic Trouble Code (DTC) specific to the failed system will be stored in the ECU's memory.

There are two types of DTC's:

- Active
- Inactive (Stored)

Active or stored DTC's indicate that the failure is occurring. These type of failures are sometimes called "hard"



Diagnostic Gauge (6068SFM50 Engines)

A—Diagnostic Gauge

failures. They can be accessed on the diagnostic gauge (A) on the instrument panel.

Inactive DTC's indicate that a failure has occurred in the past, but is not currently occurring. This type of "stored" DTC can be caused by an "intermittent" failure. These could be problems such as a bad connection or a wire intermittently shorting to ground.

If a sensor or wiring fails and a DTC is active for the sensor, the ECU will use a "limp home" value in its calculations to continue engine operation.

A list of DTCs is given later in this section with a description of each. Contact your engine servicing dealer to correct any DTCs which are displayed on the instrument panel.

RG9818J — UN—18NOV99

RG, RG34710, 5605 -19-04JAN02-1/1

Transition Harness Wiring Diagram

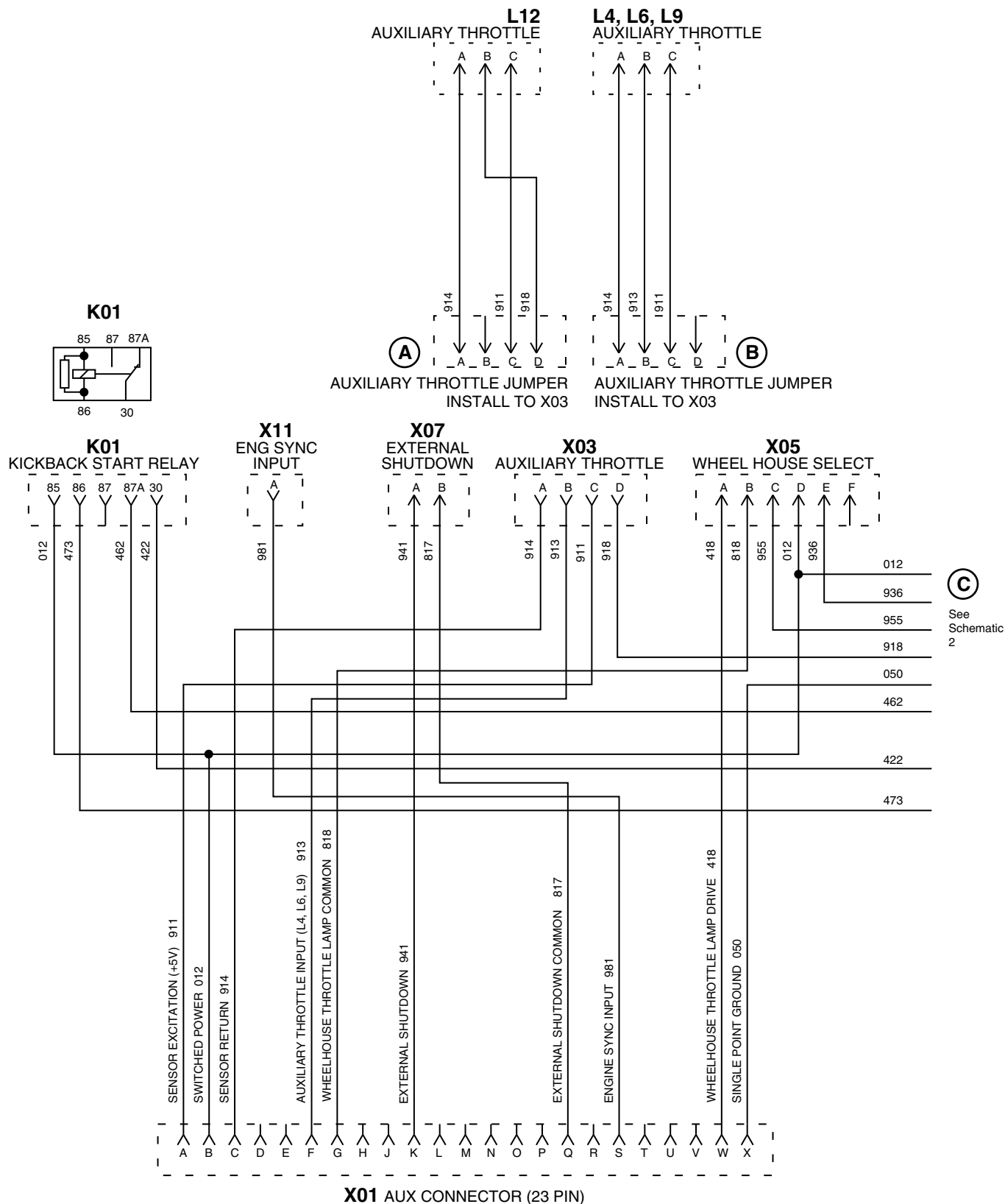


Diagram 1 of 2

Continued on next page

JR74534,000045E -19-12DEC11-1/4

RG21119 —UN—07DEC11

L12— Auxiliary Throttle	X07— External Shutdown	818— Wheelhouse Throttle Lamp	955— Wheelhouse Throttle Transfer Switch Input
L4, L6, L9—Auxiliary Throttle	X03— Auxiliary Throttle	- Common	918— Auxiliary Throttle Input
Circled A—Auxiliary Throttle Jumper - Install to X03	X05— Wheelhouse Select	941— External Shutdown	422— Starter Relay Solenoid
Circled B—Auxiliary Throttle Jumper - Install to X03	Circled C—See Diagram 2	817— External Shutdown Common	473— Starter Kickback Relay Drive
K01— Kickback Start Relay	X01— Aux Connector (23 Pin)	981— Engine Sync Input	
X11— Engine Sync Input	911— Sensor Excitation (+5 volts)	418— Wheelhouse Throttle Lamp Drive	
	012— Switched Power	050— Single Point Ground	
	914— Sensor Return	936— Engine Sync Enable	
	913— Auxiliary Throttle Input (L4, L6, L9)		

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JR74534,000045E -19-12DEC11-2/4

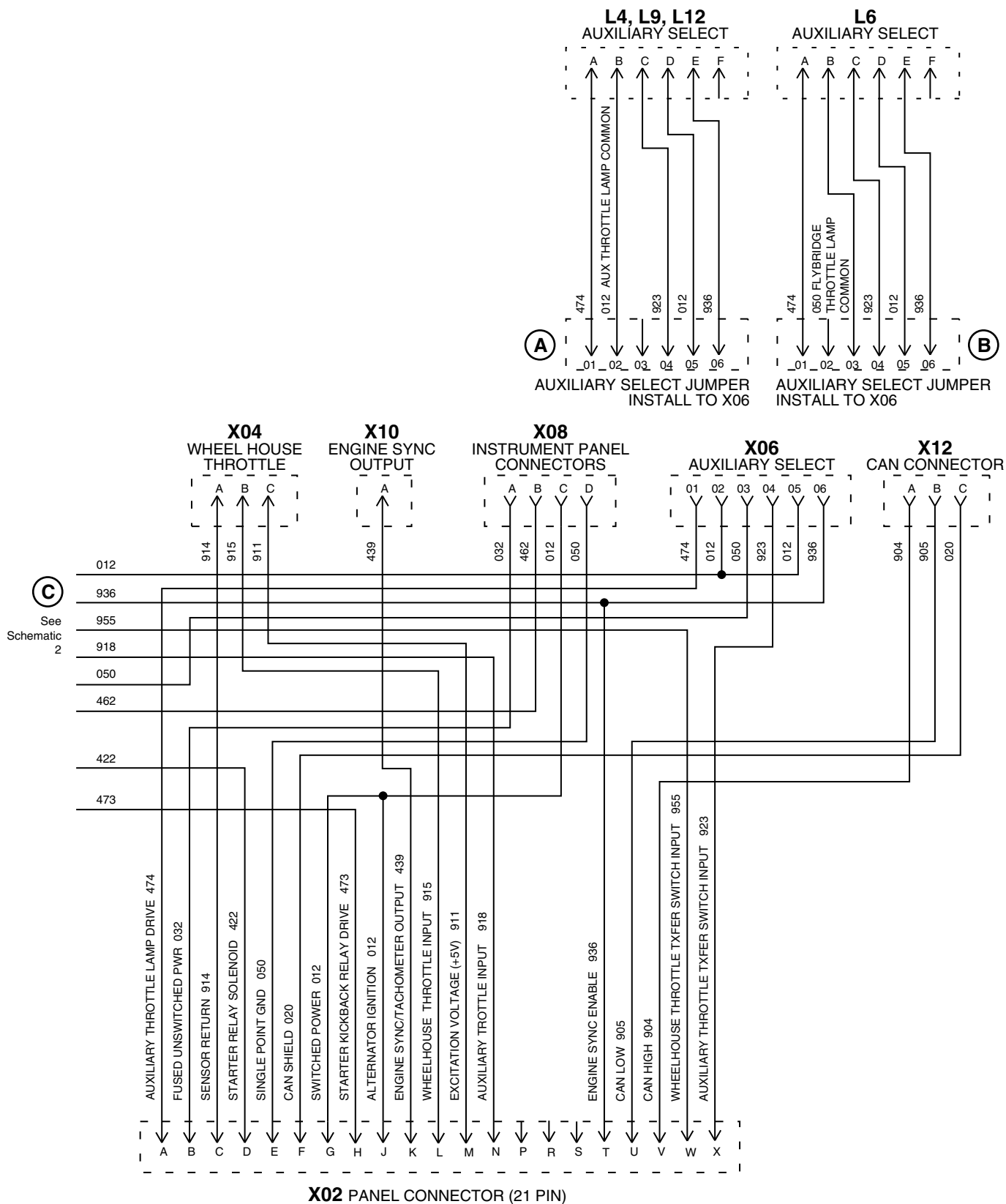


Diagram 2 of 2

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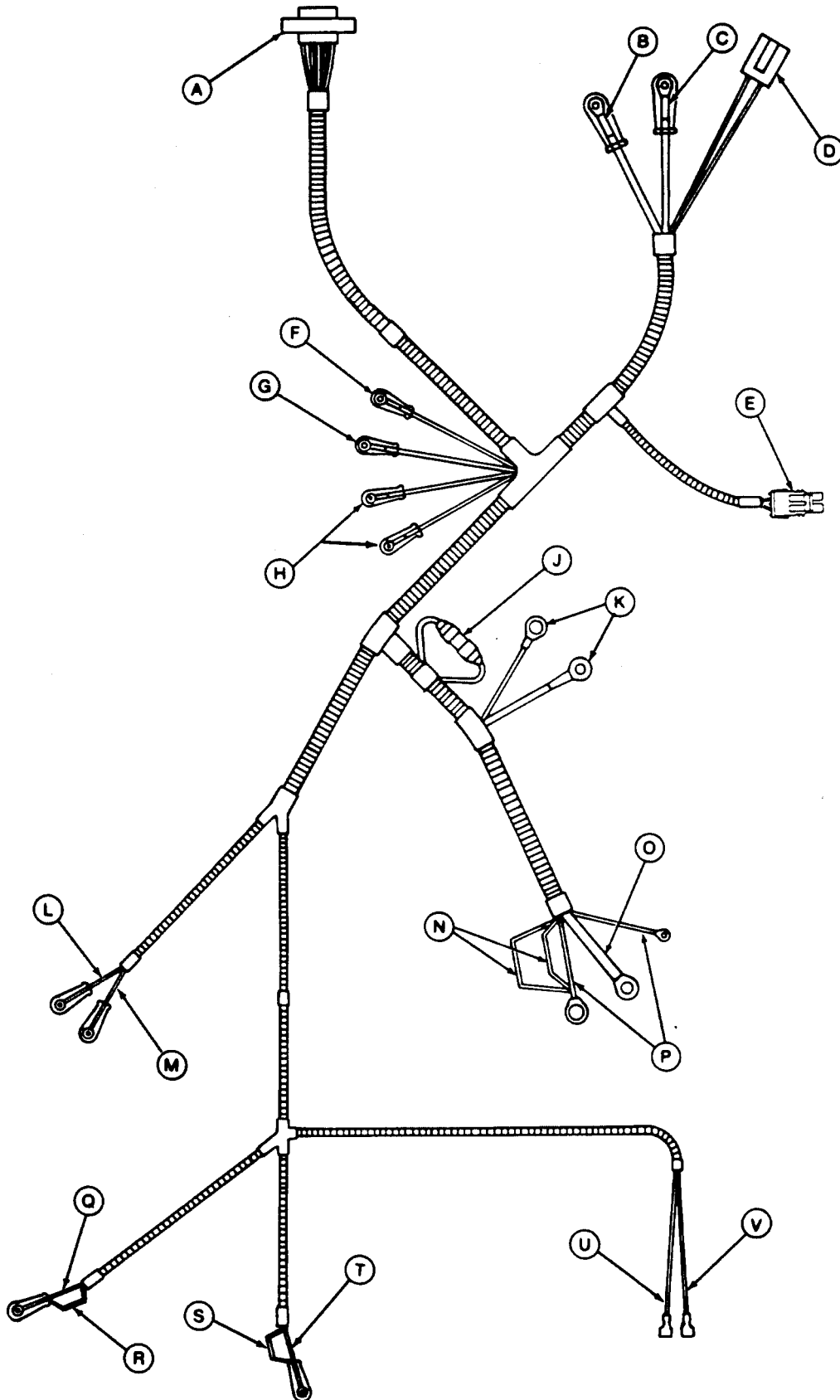
JR74534.000045E -19-12DEC11-3/4

RG21125—UN—07DEC11

L4, L9, L12—Auxiliary Select	X12— CAN Connector	473— Starter Kickback Relay Drive	955— Wheelhouse Throttle Transfer Switch Input
L6— Auxiliary Select	Circled C—See Diagram 1	012— Alternator Ignition	923— Auxiliary Throttle Transfer Switch Input
Circled A—Auxiliary Select Jumper Install to X06	X02— Panel Connector (21 Pin)	439— Engine Sync/Tachometer Output	012 (Inside Circled A)—Auxiliary Throttle Lamp Common
Circled B—Auxiliary Select Jumper Install to X06	474— Auxiliary Throttle lamp Drive	915— Wheelhouse Throttle Input	050 (Inside Circled B)—Flybridge Throttle Lamp Common
X04— Wheelhouse Throttle	032— Fused Unswitched Power	911— Excitation Voltage (+5 volts)	
X10— Engine Sync Output	914— Sensor Return	918— Auxiliary Throttle Input	
X08— Instrument Panel Connectors	422— Starter Relay Solenoid	936— Engine Sync Enable	
X06— Auxiliary Select	050— Single Point Ground	905— CAN Low	
	020— CAN Shield	904— CAN High	
	012— Switched Power		

JR74534,000045E -19-12DEC11-4/4

Propulsion Engine Wiring Harness (Except 6068SFM50)



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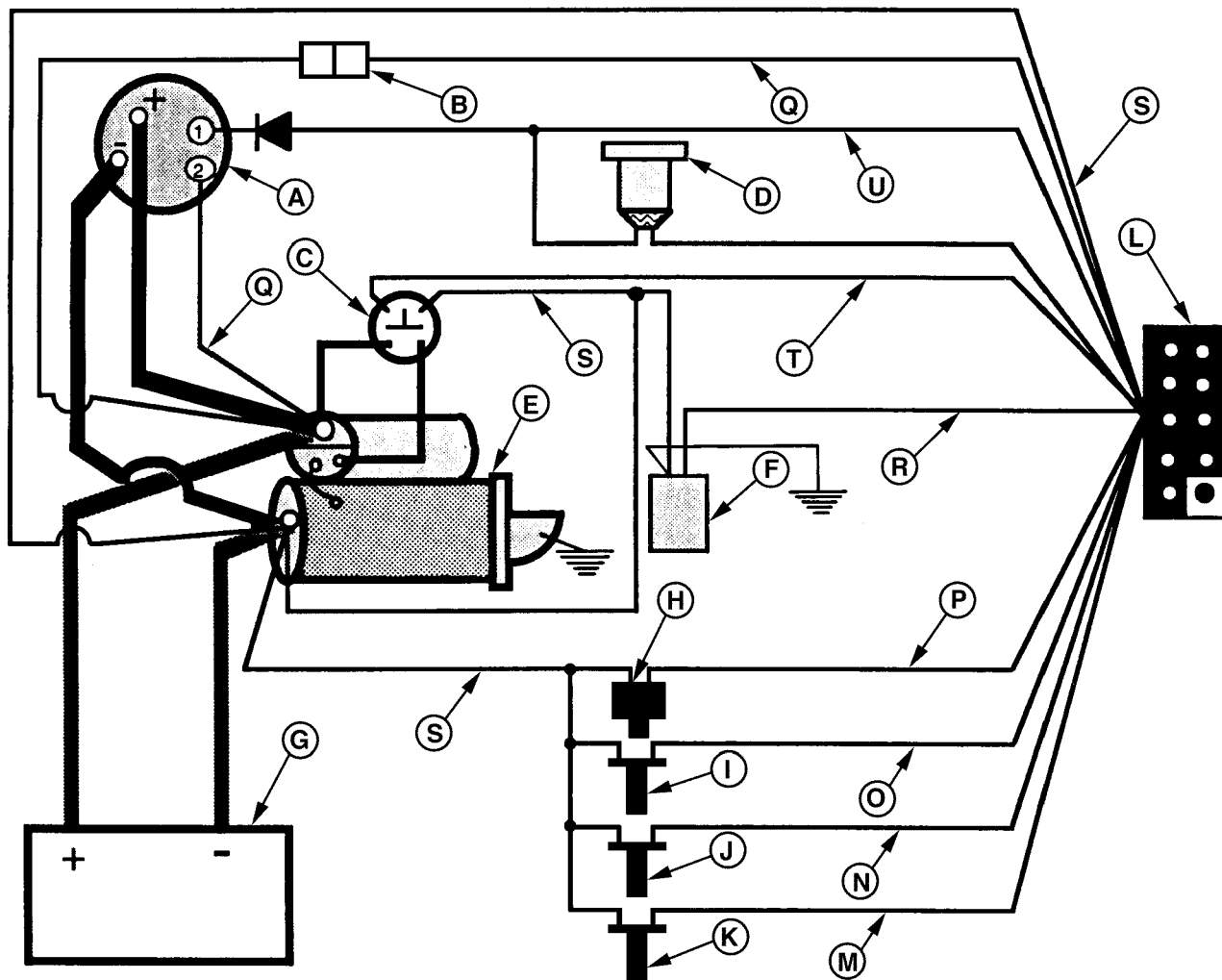
DPSG,OUOD007,331 -19-19JAN99-1/2

RG6728 —UN—14APR93

A—10-Way Molded Connector	G—14 Ga. Black (Start Circuit Relay)	N—14 Ga. Red (Starting Motor)	T—14 Ga. Black (Tachometer Pick-Up)
B—6 Ga. Red (Alternator)	H—12 Ga. Red (Start Circuit Relay)	O—6 Ga. Red (Starting Motor)	U—14 Ga. Tan (Coolant Temperature Sender)
C—6 Ga. Black (Alternator)	J—14 Ga. Red (Fuse Holder)	P—12 Ga. Red (Starting Motor)	V—14 Ga. Black (Coolant Temperature Sender)
D—14 Ga. Yellow and Red (Alternator)	K—6 Ga. and 12 Ga. Black (Ground)	Q—14 Ga. Black/Yellow (Fuel Shut-Off Solenoid)	
E—14 Ga. Pink/Black and Black (Fuel Filter/Water Separator)	L—14 Ga. Lt. Blue (Oil Sender)	R—14 Ga. Black (Fuel Shut-Off Solenoid)	
F—14 Ga. Yellow/Red (Start Circuit Relay)	M—14 Ga. Black (Oil Sender)	S—14 Ga. Gray (Tachometer Pick-Up)	

DPSG,OUOD007,331 -19-19JAN99-2/2

Wiring Diagram—Propulsion Engine Wiring Harness (Except 6068SFM50)

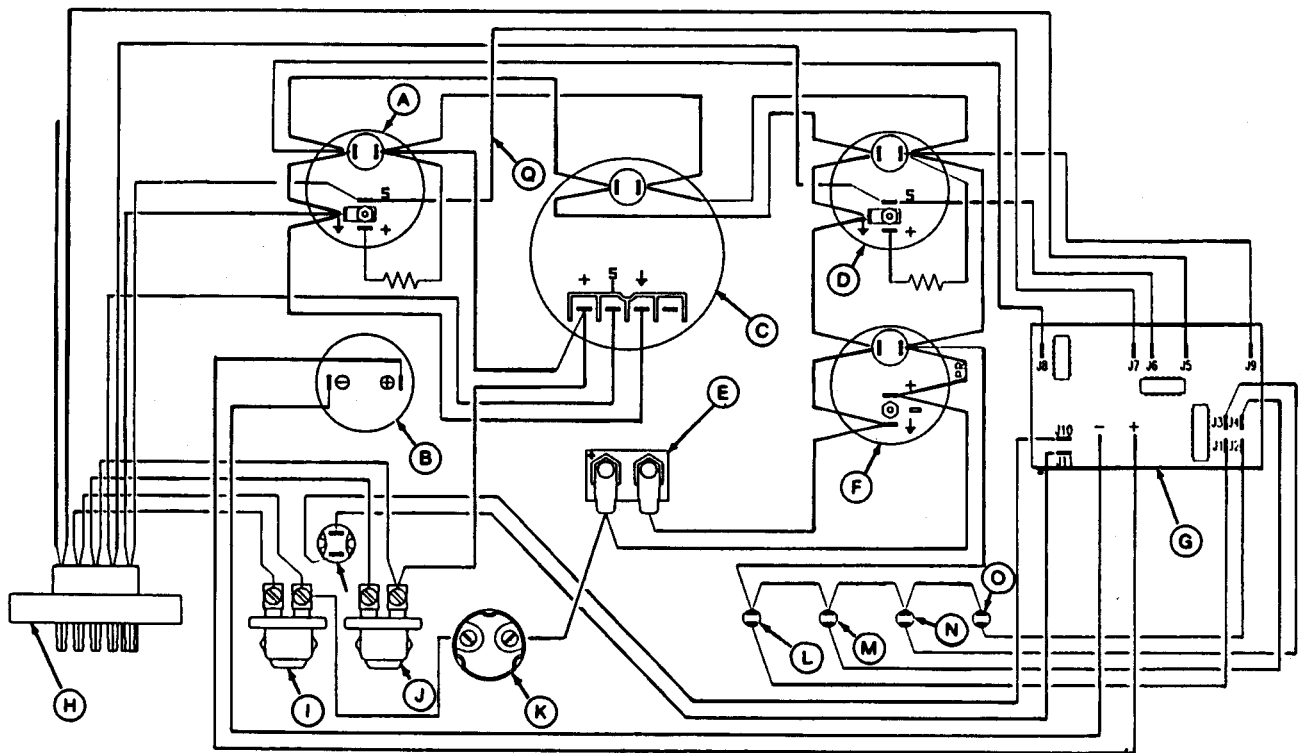


A—Alternator	E—Starting Motor	J—Engine Oil Pressure Sensor	O—Tan
B—20-Amp Fuse with Holder	F—Fuel Shut-Off Solenoid	K—Spare Sensor	P—Gray
C—Start Circuit Relay	G—Battery	L—10-Way Molded Connector	Q—Red
D—Fuel Filter/Water Separator	H—Tachometer Pick-up	M—White	R—Black/Yellow
	I—Coolant Temperature Sensor	N—Lt. Blue	S—Black
			T—Yellow/Red
			U—Purple

DPSG,OUOD007,332 -19-19JAN99-1/1

RG9862—UN—06JAN99

Wiring Diagram—Propulsion Engine Instrument Panel (Except 6068SFM50)



- | | | | |
|-----------------------------|---------------------------|--|----------------------------------|
| A—Coolant Temperature Gauge | F—Voltmeter | K—Key Switch | O—Low Oil Pressure Warning Light |
| B—Audible Alarm | G—Alarm Circuit Board | L—Water-in-Fuel Warning Light | |
| C—Tachometer | H—10-Way Molded Connector | M—Low Battery Voltage Warning Light | |
| D—Oil Pressure Gauge | I—Stop Switch | N—High Coolant Temperature Warning Light | |
| E—Hourmeter | J—Start Switch | | |

NOTE: The following precautions apply only to the 6068SFM50 electronically-controlled engine.

JR74534,000030A -19-04FEB11-1/1

RG6121—UN—03FEB92

Precautions for Welding

Remove paint before welding or heating (see Safety Section in this manual for more information on paint removal and high-pressure lines).

CAUTION: 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. If you sand or grind paint, avoid breathing the dust by wearing an approved respirator. If you use solvent or paint stripper, remove with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area before welding. Allow fumes to disperse at least 15 minutes before welding or heating.

IMPORTANT: Welding on the engine is **NOT ALLOWED**. If welding must be performed on the machine, follow these precautions.

IMPORTANT: High currents or electrostatic discharge into electronic components from welding may cause permanent damage.

1. Remove paint from the area to be welded and ground cable clamp location.
2. Disconnect the negative (-) battery cable(s) or open battery (-) switch if equipped.



TS953 —UN—15MAY90

3. Disconnect the positive (+) battery cable(s) or open battery (+) switch if equipped.
4. Clear or move any wiring harness sections away from the welding area.
5. Welding on engine components is not allowed.
6. Never connect the welder ground to any engine component or engine driven components that may be connected to the engine.
7. After welding, reverse steps 2—3.

DX,WELDING,PRECAUTIONS -19-06DEC10-1/1

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

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

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



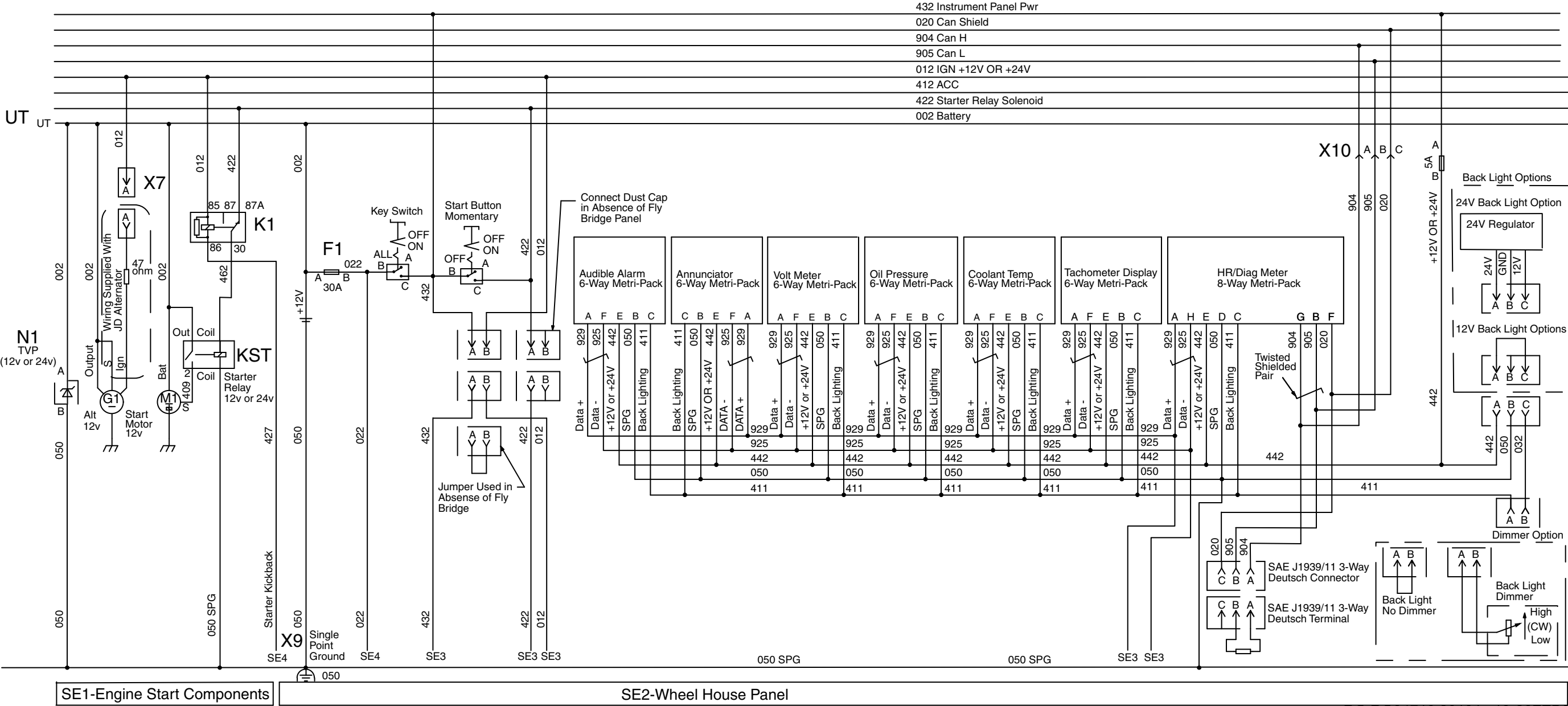
Welding Precautions

TS953 —UN—15MAY90

DPSG,OUOD007,2898 -19-13NOV13-1/1

Wiring Diagram For John Deere Main (Wheel House) Instrument Panel (6068SFM50)

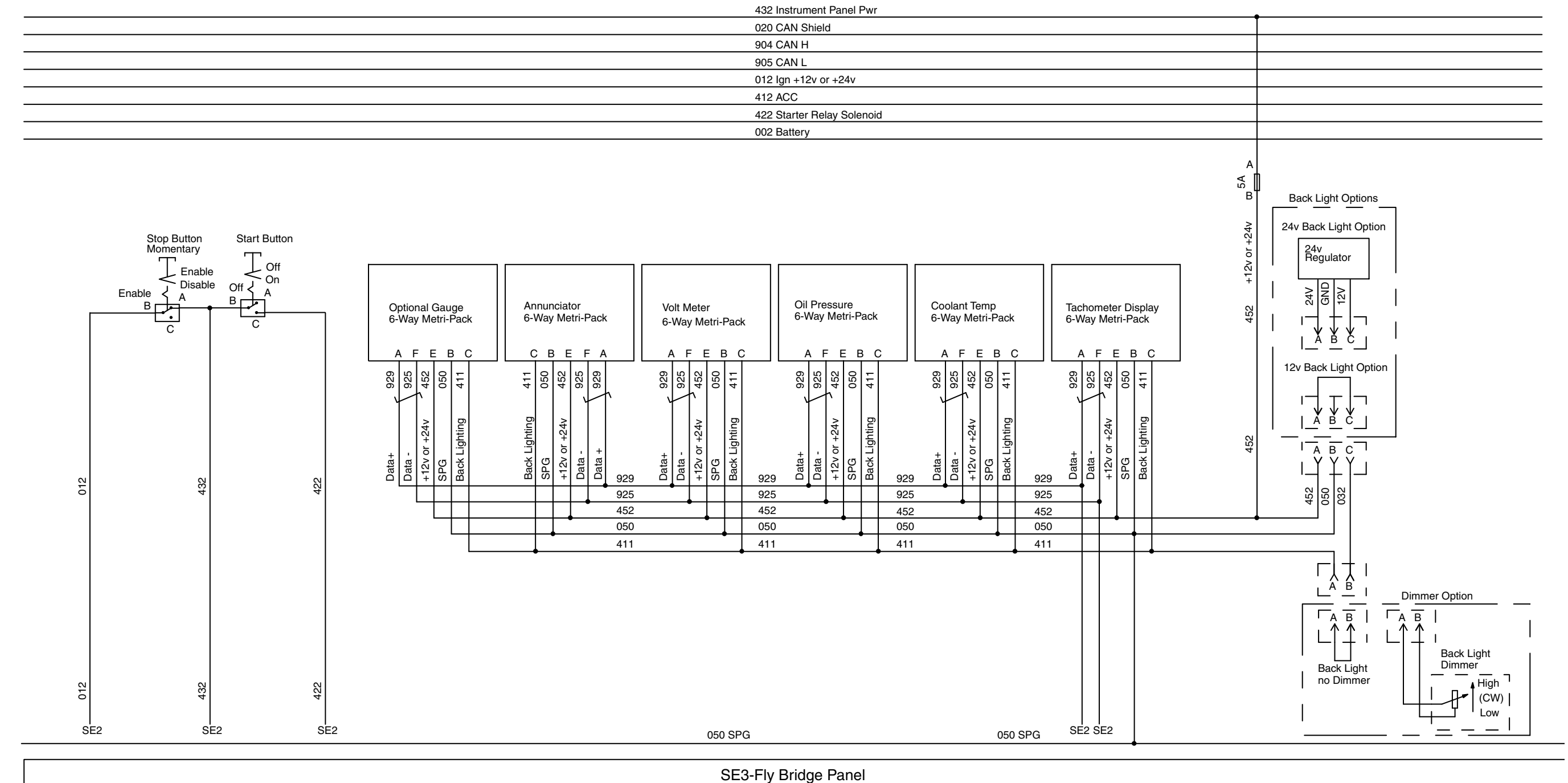
RG9812 —UN—05NOV99



RG, RG34710, 20101 -19-26FEB02-1/1

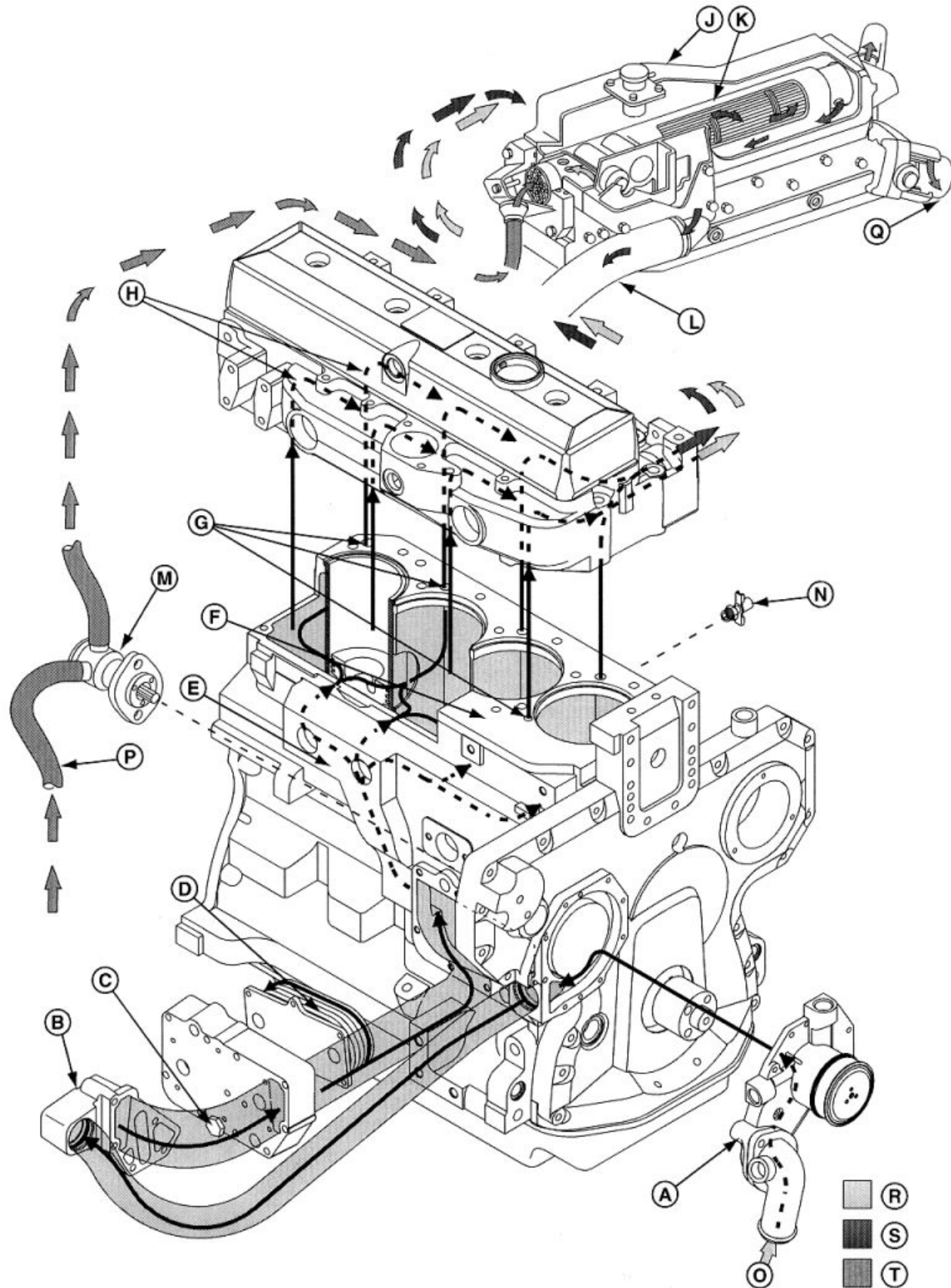
Wiring Diagram For John Deere Optional Flybridge Instrument Panel (6068SFM50)

RG9813 —UN—05NOV99



DPSG,OUOD007,2922 -19-26FEB02-1/1

Engine Coolant and Sea Water Flow (Except 6068SFM50)



Engine Coolant And Sea Water Flow

Continued on next page

DPSG,OUOD007,334 -19-19JAN99-1/2

RG9865 —UN—20JAN99

A—Coolant Pump	F—Coolant Jacket	L—Coolant Outlet Hose	Q—Sea Water Outlet
B—Coolant Passage Adapter	G—Block Deck Passages	M—Sea Water Pump	R—High-Temperature Coolant
C—Oil Cooler Drain Plug	H—Passages	N—Drain Valve (Coolant)	S—Low-Temperature Coolant
D—Oil Cooler Plates	I—Thermostat(s)	O—Coolant Inlet to Water Pump	T—Sea Water
E—Main Coolant Gallery	J—Heat Exchanger/Thermostat Housing	P—Sea Water Inlet	
	K—Heat Exchanger Core		

Coolant is circulated from the coolant pump (A) into the coolant passage adapter (B) and circulates around the oil cooler plates (D). From the oil cooler, coolant flows into the main coolant gallery (E). From the gallery, coolant flows into the coolant jacket (F), around the cylinder liners, up through the block deck passages (G), and into the cylinder head. In the cylinder head, the coolant flows through passages (H) around the intake and exhaust ports, valve seats, and injection nozzles. Coolant flows toward the front end of the cylinder head and exits into the heat exchanger/thermostat housing (J).

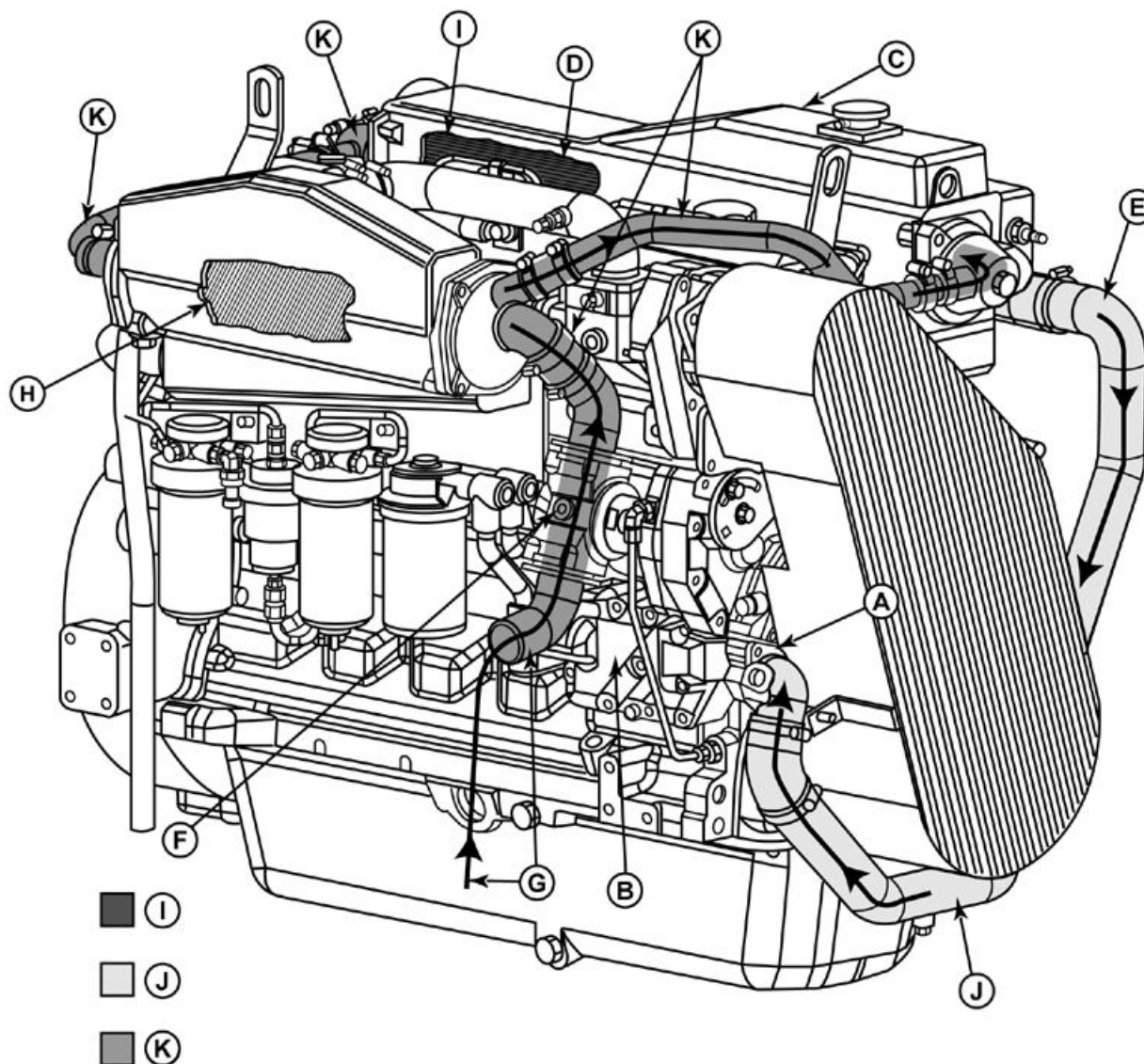
During the warm-up period, thermostats (I) are closed and coolant bypasses heat exchanger core (K), exiting through hose (L) into the coolant inlet side (O) of the coolant pump. The coolant continues circulating through the cylinder block, cylinder head, heat exchanger and coolant pump to provide a uniform and fast warm-up period.

Once the engine has reached operating temperature, the thermostats open and allow high-temperature coolant to flow around tubes in the heat exchanger core (K), dissipating heat. Low-temperature coolant flows out coolant outlet hose (L) and into coolant inlet side (O) of the coolant pump. Coolant continues flowing through the engine and heat exchanger circuit until the coolant temperature drops below the thermostat opening temperature.

Sea water flows into sea water pump (M) at inlet (P). Water then flows through tubing in the heat exchanger core (K). It absorbs heat from high-temperature coolant flowing around the tubing and exits through the sea water outlet (Q), or is discharged overboard.

DPSG,OUOD007,334 -19-19JAN99-2/2

Engine Coolant and Sea Water Flow (6068SFM50)



Engine Coolant And Sea Water Flow

- | | | | |
|-------------------------------------|-----------------------|-----------------------------|----------------------------|
| A—Coolant Pump | D—Heat Exchanger Core | G—Sea Water Inlet | J— Low-Temperature Coolant |
| B—Oil Cooler | E—Coolant Outlet Hose | H—Aftercooler Core | K—Sea Water |
| C—Heat Exchanger/Thermostat Housing | F—Sea Water Pump | I— High-Temperature Coolant | |

Coolant is circulated from the coolant pump (A) into the oil cooler (B) and circulates around the oil cooler plates. From the oil cooler, coolant flows into the main coolant gallery. From the gallery, coolant flows into the coolant jacket, around the cylinder liners, up through the block deck passages, and into the cylinder head. In the cylinder head, the coolant flows through passages around the intake and exhaust ports, valve seats, and injection nozzles. Coolant flows from the cylinder head and exits into the heat exchanger/thermostat housing (C).

During the warm-up period, thermostats are closed and coolant bypasses heat exchanger core, exiting through hose (E) into the coolant inlet side of the water pump.

The coolant continues circulating through the cylinder block, cylinder head, heat exchanger and coolant pump to provide a uniform and fast warm-up period.

Once the engine has reached operating temperature, the thermostats open and allow high-temperature coolant (I) to flow around tubes in the heat exchanger core (D), dissipating heat. Low-temperature coolant (J) flows out coolant outlet hose (E) and into coolant inlet side of the coolant pump. Coolant continues flowing through the engine and heat exchanger circuit until the coolant temperature drops below the thermostat opening temperature.

Continued on next page

DPSG,OUOD007,334 -19-19JAN99-1/2

Sea water (K) flows into sea water pump (F) at inlet (G). Sea water then flows into the aftercooler core (H) and into the heat exchanger core (D). In the aftercooler core, the sea water flowing through the aftercooler core tubes absorbs heat from the turbocharged air passing around

the core, and exits through the sea water outlet on the turbocharger. In the heat exchanger core (C), sea water (K) flowing through the heat exchanger core absorbs heat from high-temperature coolant (I) flowing around the core and exits through the sea water outlet on the turbocharger.

DPSG,OUOD007,334 -19-19JAN99-2/2

Engine Troubleshooting

Symptom	Problem	Solution
Engine cranks but will not start	Incorrect starting procedure.	Verify correct starting procedure.
	No fuel.	Check fuel in tank and manual shut-off valve.
	Exhaust restricted.	Check and correct exhaust restriction.
	Fuel filter plugged or full of water.	Replace fuel filter or drain water from filter.
	Injection pump not getting fuel or air in fuel system.	Check fuel flow at supply pump or bleed fuel system.
	Faulty injection pump or nozzles.	Consult authorized diesel repair station for repair or replacement.
Engine hard to start or will not start	Engine starting under load.	Disengage PTO (if equipped).
	Improper starting procedure.	Review starting procedure.
	No fuel.	Check fuel tank.
	Air in fuel line.	Bleed fuel line.
	Cold weather.	Use cold weather starting aids.
	Slow starter speed.	See "Starter Cranks Slowly".
	Crankcase oil too heavy.	Use oil of proper viscosity.
	Improper type of fuel.	Consult fuel supplier; use proper type fuel for operating conditions.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
	Clogged fuel filter.	Replace filter element.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Electronic fuel system problem (6068SFM50 Only)	See your authorized servicing dealer
Engine knocks	Injection pump shut-off not reset.	Turn key switch to "OFF" then to "ON".
	Low engine oil level.	Add oil to engine crankcase.

Continued on next page

RG, RG34710, 5608 -19-04JAN02-1/5

Symptom	Problem	Solution
Engine runs irregularly or stalls frequently	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Low coolant temperature.	Remove and check thermostat.
	Engine overheating.	See "Engine Overheats".
	Low coolant temperature.	Remove and check thermostat.
	Clogged fuel filter.	Replace fuel filter element.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
Below normal engine temperature	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Electronic fuel system problem (6068SFM50 Only)	See your authorized servicing dealer
	Defective thermostat.	Remove and check thermostat.
Lack of power	Defective temperature gauge or sender.	Check gauge, sender, and connections.
	Engine overloaded.	Reduce load.
	Intake air restriction.	Service air cleaner.
	Clogged fuel filter.	Replace filter elements.
	Improper type of fuel.	Use proper fuel.
	Overheated engine.	See "Engine Overheats".
	Below normal engine temperature.	Remove and check thermostat.
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning. (Turbocharger engines only.)	See your authorized servicing dealer or engine distributor.

Continued on next page

RG, RG34710, 5608 -19-04JAN02-2/5

Symptom	Problem	Solution
	Leaking exhaust manifold gasket.	See your authorized servicing dealer or engine distributor.
	Defective aneroid control line.	See your authorized servicing dealer or engine distributor.
	Restricted fuel hose.	Clean or replace fuel hose.
	Low fast idle speed.	See your authorized servicing dealer or engine distributor.
	Damaged propeller	Have propeller checked.
	Marine growth	Clean hull.
Low oil pressure	Low oil level.	Add oil.
	Improper type of oil.	Drain, fill crankcase with oil of proper viscosity and quality.
High oil consumption	Crankcase oil too light.	Use proper viscosity oil.
	Oil leaks.	Check for leaks in lines, gaskets, and drain plug.
	Restricted crankcase vent tube.	Clean vent tube.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
Engine emits white smoke	Improper type of fuel.	Use proper fuel.
	Low engine temperature.	Warm up engine to normal operating temperature.
	Defective thermostat.	Remove and check thermostat.
	Defective injection nozzles.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
Engine emits black or gray exhaust smoke	Improper type of fuel.	Use proper fuel.
	Clogged or dirty air cleaner.	Service air cleaner.

Continued on next page

RG, RG34710, 5608 -19-04JAN02-3/5

Symptom	Problem	Solution
Engine overheats	Engine overloaded.	Reduce load.
	Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.
	Electronic fuel system problem (6068SFM50 Only)	See your authorized servicing dealer
	Engine overloaded.	Reduce load.
	Low coolant level.	Fill coolant tank to proper level, check coolant tank and hoses for loose connections or leaks.
	Faulty coolant tank cap.	Have serviceman check.
	Stretched poly-vee belt or defective belt tensioner.	Check automatic belt tensioner and check belts for stretching. Replace as required.
	Faulty sea (raw) water pump.	Check/replace impeller/pump.
	Low engine oil level.	Check oil level. Add oil as required.
	Cooling system needs flushing.	Flush cooling system.
	Defective thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check water temperature with thermometer and replace, if necessary.
	Electronic fuel system problem (6068SFM50 Only)	See your authorized servicing dealer
	Incorrect grade of fuel.	Use correct grade of fuel.
	Plugged heat exchanger.	Clean heat exchanger and core.
	Plugged keel cooler.	Flush and clean keel cooler. Check for marine growth on O.D. of keel cooler tubes.
	Trash or debris in engine compartment.	Clean engine compartment.

Continued on next page

RG, RG34710, 5608 -19-04JAN02-4/5

Symptom	Problem	Solution
High fuel consumption	Improper type of fuel.	Use proper type of fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
	Engine overloaded.	Reduce load.
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
	Low engine temperature.	Check thermostat.

RG,RG34710,5608 -19-04JAN02-5/5

Electrical Troubleshooting

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

Continued on next page

DPSG,OUOD007,335 -19-04JAN02-1/2

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

DPSG,OUOD007,335 -19-04JAN02-2/2

Diagnostic Trouble Code Procedure (6068SFM50 Electronically-Controlled Engine)

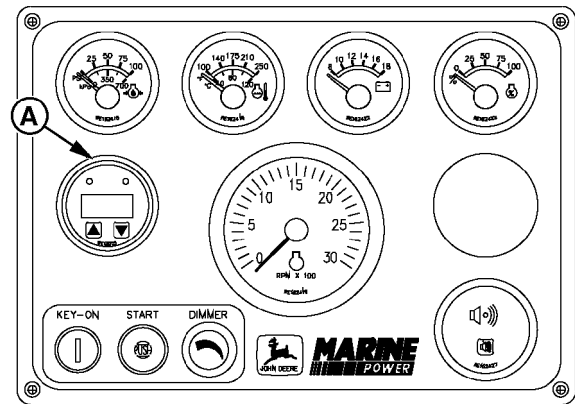
IMPORTANT: Care should be used during diagnostic procedures to avoid damaging the terminals of connectors, sensors, and actuators. Probes should not be poked into or around the terminals or damage will result. Probes should only be touched against the terminals to make measurements.

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] on diagnostic gauge (A) will always default to show an hour meter reading. If an active Diagnostic Trouble Code (DTC) is present, display will alternately flash from hour meter reading to DTC(s). The code number will appear on the first line, with the words "SvcCode" on the second line.

2. Read and record DTC(s) displayed on LCD of diagnostic gauge (A). For procedure to access diagnostic codes, refer to USING DIAGNOSTIC



Diagnostic Gauge

A—Diagnostic Gauge

GAUGE TO ACCESS ENGINE INFORMATION, earlier in this manual

3. Go to the LISTING OF DIAGNOSTIC TROUBLE CODES (DTCs) later in this section, to interpret the DTC(s) present.
4. Contact your nearest engine distributor or servicing dealer with a list of DTC(s) so that necessary repairs can be made.

RG,RG34710,20112 -19-04JAN02-1/1

RG9818J —UN—18NOV99

Listing Of Diagnostic Trouble Codes (DTC) (6068SFM50 Engine)

The Diagnostic Trouble Codes (DTCs) are output on the diagnostic gauge according to the J1939 standard as a two-part code. The first part is a two to four-digit Suspect Parameter Number (SPN) followed by a one or two-digit Failure Mode Identifier (FMI) code. When a trouble code

appears, it will be on the first line of the gauge readout, followed by "SrvcCode" on the second line.

Following is a list of SPNs, FMIs, and description of the diagnostic trouble codes that can occur in the various engine systems. Not all of these codes will be present in all engine applications.

When trouble codes appear on the diagnostic gauge, see your engine dealer for repairs as soon as possible.

Displayed Code

SPN	FMI	Definition
28	3	Analog Throttle (A) No. 3 Voltage High
	4	Analog Throttle (A) No. 3 Voltage Low
29	3	Analog Throttle (B) No. 2 Voltage High
	4	Analog Throttle (B) No. 2 Voltage Low
84	2	Vehicle Speed Mismatch
91	3	Multistate Throttle Input High
	4	Multistate Throttle Input Low
94	1	Fuel Supply Pressure Extremely Low
	3	Fuel Supply Pressure Input Voltage High
	4	Fuel Supply Pressure Input Voltage Low
	18	Fuel Supply Pressure Moderately Low
100	1	Engine Oil Pressure Extremely Low
	3	Engine Oil Pressure Input Voltage High
	4	Engine Oil Pressure Input Voltage Low
	18	Engine Oil Pressure Moderately Low
105	0	Manifold Air Temperature Extremely High
	3	Manifold Air Temperature Input Voltage High
	4	Manifold Air Temperature Input Voltage Low
	16	Manifold Air Temperature Moderately High
107	0	Air Filter Differential Pressure
110	0	Engine Coolant Temperature Extremely High
	3	Engine Coolant Temperature Input Voltage High
	4	Engine Coolant Temperature Input Voltage Low
	15	Engine Coolant Temperature High Least Severe
	16	Engine Coolant Temperature Moderately High
111	1	Engine Coolant Level Low
158	17	ECU Power Down Error
174	0	Fuel Temperature High-Most Severe
	15	Fuel Temperature High-Least Severe
	16	Fuel Temperature High-Moderately Severe
	31	Fuel Temperature Sensor Faulty
189	0	Fuel temperature Sender Faulty
	31	Engine Speed Derate
190	0	Engine Overspeed Extreme

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JR74534,000030B -19-04FEB11-1/3

190	16	Engine Overspeed Moderate
620	3	Sensor Supply Voltage High
	4	Sensor Supply Voltage Low
627	4	ECU Unswitched, Power Missing
629	13	ECU Error
629	19	ECU to Pump Communication Error
632	2	Fuel Shutoff Error
	5	Fuel Shutoff Not Functioning
636	2	Pump Position Sensor Input Noise
	8	Pump Position Sensor Input Missing
	10	Pump Position Sensor Input Pattern Error
637	2	Crankshaft Position Input Noise
	8	Crankshaft Position Input Missing
	10	Crankshaft Position Input Pattern Error
729	3	Inlet Air Heater Signal High
	5	Inlet Air Heater Signal Low
810	2	Calculated Vehicle Speed Input Noise
898	9	Vehicle Speed Invalid/Missing
970	2	Auxiliary Engine Shutdown Switch Signal Invalid
	31	Auxiliary Engine Shutdown Switch Active
971	31	External Engine Derate Switch Active
1069	2	Tire Size Error
1076	2	Injection Pump Detected Defect
1077	7	Attempting to Fuel Without Command
	11	Pump Supply Voltage Out of Range
	12	Pump Self Test Error
	19	Pump Detected Communication Error
	31	Pump Initiated Engine Protection
1078	7	ECU/Pump Timing Moderately Out of Sync
	11	ECU/Pump Speed Out of Sync
	31	ECU/Pump Timing Extremely Out of Sync
1079	3	Sensor Supply 1 Voltage High
	4	Sensor Supply 1 Voltage Low
1080	3	Sensor Supply 2 Voltage High
	4	Sensor Supply 2 Voltage Low
1109	31	Engine Shutdown Warning
1110	31	Engine Shutdown
1485	2	Pump Power Relay Fault
1569	31	Fuel Derate
2000	13	Security Violation

Continued on next page

JR74534,000030B -19-04FEB11-2/3

NOTE: The Diagnostic Gauge on the electronic instrument panel can have communication problems that result in Error Codes being shown on its LCD display window. The following Error Codes all indicate

that there is a Diagnostic Gauge communication error with the ECU. Contact your servicing dealer for help in correcting these codes:

EE — Error

XXXXX — EP
No Data

ACP — Err
No Addr

XXXXX — BO
No Data

ACP — Err
BUS — EP

XXXXX — BR
No Data

JR74534,000030B -19-04FEB11-3/3

Intermittent Fault Diagnostics (6068SFM50 Engine)

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 Engine Control Unit (ECU) is the component **LEAST** likely to fail.

Suggestions for diagnosing intermittent faults:

If the problem is intermittent, try to reproduce the operating conditions that were present when the Diagnostic Trouble Code (DTC) set. When a DTC sets, the ECU stores a Freeze Frame of the data parameter values the instant

the DTC sets. Observing these values on the diagnostic gauge can help determine the operating conditions when the fault occurred. In addition, the diagnostic gauge 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 DTCs, then check the connection or wire by wiggling it while watching the diagnostic gauge to see if the fault resets.

Possible Causes of Intermittent Faults:

1. Faulty connection between sensor or actuator and harness.
2. Faulty contact between terminals in connector.
3. Faulty terminal/wire connection.

Electromagnetic interference (EMI) from an improperly installed 2-way radio, etc. can cause faulty signals to be sent to the ECU.

NOTE: Refer to wiring diagram foldouts earlier in this section as a guide to connections and wires.

RG, RG34710, 20115 -19-04JAN02-1/1

Storage

Engine Storage Guidelines

IMPORTANT: Special considerations should be taken prior to storage when using BioDiesel. See BioDiesel Fuel in the Fuels, Lubricants, and Coolant Section.

1. John Deere engines can be stored outside for up to three months with no long-term preparation if covered by a waterproof covering. No outside storage is recommended without a waterproof covering.
2. John Deere engines can be stored in a standard overseas shipping container for up to three months with no long-term preparation.
3. John Deere engines can be stored inside, warehoused, for up to six months with no long-term preparation.
4. John Deere engines expected to be stored more than six months **must** have long-term storage preparation. See Preparing Engine for Long-Term Storage in the Storage Section.

RG,RG34710,5610 -19-04FEB15-1/1

Preparing Engine for Long-Term Storage

IMPORTANT: Any time the engine is not used for over six months, the following recommendations for storing it and removing it from storage helps to minimize corrosion and deterioration.

IMPORTANT: Long-term storage is not advised when using BioDiesel. For storage longer than one year, use straight hydrocarbon fuel.

If BioDiesel must be used it is recommended the blend not exceed B7 and a high-quality fuel stabilizer be used. Storage should not exceed one year.

For more information see BioDiesel Fuel in the Fuels, Lubricants, and Coolants Section.

NOTE: The following storage preparations are used for long-term engine storage up to one year. After that, the engine should be started, warmed up, and retreated for an extended storage period.

1. Change engine oil and replace filter. Used oil does not give adequate protection. Add 30 mL of rust preventive oil to the engine crankcase for every 1 L of engine oil, or 1 oz. of rust preventative oil per 1 qt. of engine oil. This rust preventive oil should be an SAE 10W oil with 1%-4% morpholine or equivalent vapor corrosion inhibitor, such as NOX RUST VCI-10 OIL from Daubert Chemical Company, Inc.
 2. Replace air cleaner.
 3. Draining and flushing of cooling system is not necessary if the engine is only stored for less than one year. 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 Diesel Engine Coolant (engine with wet sleeve cylinder liners) in the Fuels, Lubricants, and Coolants Section.
 4. Prepare a solution of diesel fuel and rust preventive oil in a temporary container, add 78 mL of rust preventive oil per 1 L of diesel fuel, 10 oz. of rust preventive oil per 1 gal. of diesel fuel.
 5. Remove existing lines and plugs as required. Run a temporary line from the temporary container to the engine fuel intake before the fuel filters, and another temporary line from the fuel return to the temporary container, so rust preventive oil solution is circulated through the injection system during cranking.
- 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 the engine several revolutions with starter. Do not allow the engine to start. This allows rust preventive oil solution to circulate.
See your authorized dealer for the proper procedure for your application.
 7. Remove temporary lines installed in Step 5 and replace any lines or plugs previously removed.
 8. Loosen (or remove) and store fan and alternator poly-vee belt.
 9. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
 10. Disengage the clutch for any driveline.
 11. Clean the exterior of the engine with salt-free water and touch up any scratched or chipped painted surfaces with a good quality paint.
 12. Coat all exposed bare metal surfaces with grease or corrosion inhibitor if not feasible to paint.
 13. Seal all openings on engine with plastic bags and tape.
 14. Store the engine in a dry protected place. If engine must be stored outside, cover it with a waterproof canvas or other suitable protective material and use a strong waterproof tape.

OUOD006,00000FC -19-28APR16-1/1

Removing Engine from Long-Term Storage

Refer to the appropriate section for detailed services listed below or have your authorized servicing dealer or engine distributor perform services that you may not be familiar with.

1. Remove all protective coverings from engine. Unseal all openings in engine and remove covering from electrical systems.
2. Remove the batteries from storage. Install batteries (fully charged) and connect the terminals.
3. Install alternator poly-vee belt if removed. Adjust belt tension. (See CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/500 Hour/12 Month Section.) Install belt guard.
4. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS in Lubrication and Maintenance/Daily Section.)
5. Open sea water valve and prime the sea water system.
6. Open fuel valve, fill fuel filter/water separator with clean fuel and bleed the fuel system. (See BLEEDING THE FUEL SYSTEM in Service as Required 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.

7. 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.
8. 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.
9. On the first day of operation after storage, check overall engine for leaks and check all gauges for correct operation.

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

Specifications

General Engine Specifications—4.5 L Engines

ITEM	UNIT OF MEASURE	4045DFM	4045TFM
Number of Cylinders	—	4	4
Fuel	—	Diesel	Diesel
Bore	mm (in.)	106 (4.19)	106 (4.19)
Stroke	mm (in.)	127 (5.00)	127 (5.00)
Displacement	L (cu in.)	4.5 (276)	4.5 (276)
Compression Ratio	—	17.6:1	17.0:1
Rated Speed: Std. Governor 3—5% Governor	RPM RPM	2500 1800	2400 1800
Fast Idle Speed (Std. Governor)	RPM	2700	2675
Slow Idle Speed: Propulsion Engines Gen-Set Engines	RPM RPM	700 850	700 850
Propulsion/Auxiliary Power Rating @ Rated Speed M1 M2 M3 M4	kW (hp) kW (hp) kW (hp) kW (hp)	56 (76) 63 (85) — —	78 (105) 90 (120) 101 (135) 112 (150)
Gen-Set Prime Power Rating*: @ 1800 RPM @ 1500 RPM Gen Set Recommended Power Rating	kW (hp) kW (hp) kW (hp)	48 (64) 40 (54) 38-40 (51-54)	76 (102) 60 (80) 67-70 (90-94)
Oil Pressure @ Rated Speed	kPa (psi)	345 (50)	345 (50)
Flywheel and Housing	SAE No.	3,4	2,3,4
Injection Nozzles	mm	9.5	9.5
Physical Dimensions: Width Height Length Basic Dry Weight	mm (in.) mm (in.) mm (in.) kg (lb)	712 (28) 902 (35.5) 885 (35) 437 (961)	712 (28) 911 (36) 885 (35) 462 (1017)

RG, RG34710, 5614 -19-20MAY96-1/1

General Engine Specifications—6.8 L Engines

ITEM	UNIT OF MEASURE	6068TFM50 ^a	6068SFM50 ^b
Number of Cylinders	—	6	6
Fuel	—	Diesel	Diesel
Bore	mm (in.)	106 (4.19)	106 (4.19)
Stroke	mm (in.)	127 (5.00)	127 (5.00)
Displacement	L (cu in.)	6.8 (414)	6.8 (414)
Compression Ratio	—	17.2:1	17.2:1
Rated Speed: Std. Governor 3—5% Governor	RPM RPM	2400—2600 1800	2200—2600 —
Fast Idle Speed	RPM	2600	2600
Slow Idle Speed: Propulsion Engines Gen-Set Engines	RPM RPM	650 850	650 —
Propulsion/Auxiliary Power Rating @ Rated Speed M1 Engines M2 Engines M3 Engines M4 Engines M5 Engines	kW (hp) kW (hp) kW (hp) kW (hp) kW (hp)	115 (154) 130 (175) 150 (200) 168 (225) —	134 (180) 153 (205) 175 (235) 198 (265) 224 (300)
Gen-Set Prime Power Rating*: @ 1800 RPM (60 Hz) @ 1500 RPM (50 Hz)	kW (hp) kW (hp)	115 (154) 89 (119)	— —
Gen Set Recommended Power Rating*: @ 1800 RPM @ 1500 RPM	kW (hp) kW (hp)	99—106 (133—142) 83—88 (111—118)	— —
Oil Pressure @ Rated Speed	kPa (psi)	345 (50)	345 (50)
Flywheel and Housing	SAE No.	2,3,4	2,3
Injection Nozzles	mm	9.5	9.5
Physical Dimensions: Width Height Length Basic Dry Weight	mm (in.) mm (in.) mm (in.) kg (lb)	703 (28) 882 (35) 1286 (51) 590 (1298)	721 (28) 947 (37) 1324 (52) 636 (1400)

^aMechanically-controlled engine^bElectronically-controlled engine

DPSG,OUOD007,336 -19-19JAN99-1/1

Fuel Injection Pump Specifications¹

Engine Model	Injection Pump Option Codes	Power Rating @ Rated Speed Without Fan kW (hp)	Rated Speed ^a (rpm)	Slow Idle (rpm)	Fast Idle ^b (rpm)
4045DFM50	16HR, 16HS	63 (85)	2500	700	2700
	16HT, 16HU	40 (54)	1800		1870
4045TFM50	16HP, 16HQ	101 (135)	2500	700	2700
	16HM, 16HN	65 (87)	1800	700	1870
	16LK, 16LL	112 (150)	2600	700	2800
6068TFM50	16FA, 16FB	168 (225)	2600	700	2800
	16FC, 16FD	130 (175)	2400	700	2600
	16FE, 16FF	115 (154)	1800	—	1870
6068SFM50	161E (7238), 162K (7247)	224 (300)	2600	650	2700
	161E (7248), 162K (7249)	198 (266)	2500	650	2600
	161E (7250), 162K (7251)	175 (235)	2400	650	2500
	161E (7252), 162K (7253)	153 (205)	2300	650	2400
	161E (7254), 162K (7255)	134 (180)	2200	650	2300

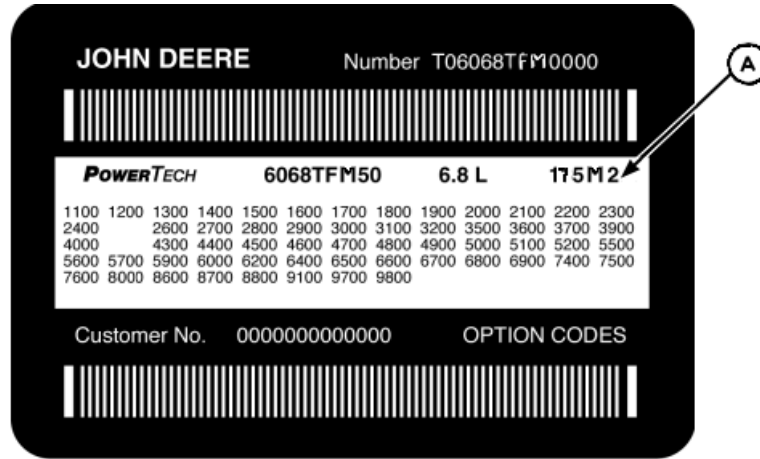
^aGenerator set engines (3-5% governor) usually run at 1500 rpm (50 Hz) or 1800 (60 Hz) when operating under load depending on cycles of AC current.

^bFor engines with standard governor, fast idle is 7-10% above rated speed. For engines with generator set governors, fast idle is 3-5% above rated speed.

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

RG, RG34710, 5616 -19-26MAR02-1/1

Engine Crankcase Oil Fill Quantities



Option Code Label

A—Engine Base Code

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

“T0” indicates the engine was built in Dubuque, Iowa, while “CD” means that the engine was built in Saran, France and “PE” indicates Torreon, Mexico

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

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

To determine the option code for the oil fill quantity of your engine, refer to the engine option code label affixed to the rocker arm cover. The first two digits of the code (40) identify the dipstick tube group. The last two digits of each code identify the specific dipstick and tube assembly on your engine.

Listed below are engine crankcase oil fill quantities:

Engine Model	Oil Pan Option Code (s)	Crankcase Oil Capacity
4045DFM50	1901,1902	8.5 L (9.0 qt.)
4045DFM50, 4045TFM50	1903	13.0 L (14.0 qt.)
4045DFM50, 4045TFM50	1904	13.5 L (14.5 qt.)
4045TFM50	1954	13.0 L (14.0 qt.)
6068TFM50	1907, 1908, 1909, 1945	19.6 L (20.7 qt.)
6068SFM50	1987	31.5 (33.3 qt.)

NOTE: Crankcase oil capacity may vary slightly from amount shown. ALWAYS fill crankcase to full

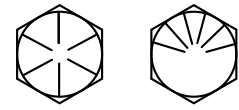
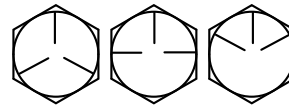
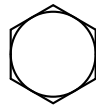
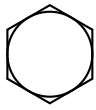
mark or between arrows on dipstick, whichever is present. DO NOT overfill.

RG, RG34710, 5617 -19-04JAN02-1/1

RG9911—19—25FEB99

Unified Inch Bolt and Screw Torque Values

TS1671 —UN—01MAY03



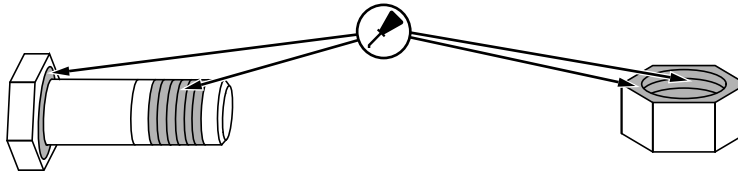
Bolt or Screw Size	SAE Grade 1 ^a				SAE Grade 2 ^b				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Hex Head ^c		Flange Head ^d		Hex Head ^c		Flange Head ^d		Hex Head ^c		Flange Head ^d		Hex Head ^c		Flange Head ^d	
	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in
1/4	3.1	27.3	3.2	28.4	5.1	45.5	5.3	47.3	7.9	70.2	8.3	73.1	11.2	99.2	11.6	103
													N·m	lb·ft	N·m	lb·ft
5/16	6.1	54.1	6.5	57.7	10.2	90.2	10.9	96.2	15.7	139	16.8	149	22.2	16.4	23.7	17.5
									N·m	lb·ft	N·m	lb·ft				
3/8	10.5	93.6	11.5	102	17.6	156	19.2	170	27.3	20.1	29.7	21.9	38.5	28.4	41.9	30.9
					N·m	lb·ft	N·m	lb·ft								
7/16	16.7	148	18.4	163	27.8	20.5	30.6	22.6	43	31.7	47.3	34.9	60.6	44.7	66.8	49.3
	N·m	lb·ft	N·m	lb·ft												
1/2	25.9	19.1	28.2	20.8	43.1	31.8	47	34.7	66.6	49.1	72.8	53.7	94	69.3	103	75.8
9/16	36.7	27.1	40.5	29.9	61.1	45.1	67.5	49.8	94.6	69.8	104	77	134	98.5	148	109
5/8	51	37.6	55.9	41.2	85	62.7	93.1	68.7	131	96.9	144	106	186	137	203	150
3/4	89.5	66	98	72.3	149	110	164	121	230	170	252	186	325	240	357	263
7/8	144	106	157	116	144	106	157	116	370	273	405	299	522	385	572	422
1	216	159	236	174	216	159	236	174	556	410	609	449	785	579	860	634
1-1/8	305	225	335	247	305	225	335	247	685	505	751	554	1110	819	1218	898
1-1/4	427	315	469	346	427	315	469	346	957	706	1051	775	1552	1145	1703	1256
1-3/8	564	416	618	456	564	416	618	456	1264	932	1386	1022	2050	1512	2248	1658
1-1/2	743	548	815	601	743	548	815	601	1665	1228	1826	1347	2699	1991	2962	2185

The nominal torque values listed are for general use only with the assumed wrenching accuracy of 20%, such as a manual torque wrench. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application.

Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original.

- Make sure that fastener threads are clean.
- Apply a thin coat of Hy-Gard™ or equivalent oil under the head and on the threads of the fastener, as shown in the following image.
- Be conservative with the amount of oil to reduce the potential for hydraulic lockup in blind holes due to excessive oil.
- Properly start thread engagement.

TS1741 —UN—22MAY18



^aGrade 1 applies for hex cap screws over 6 in (152 mm) long, and for all other types of bolts and screws of any length.

^bGrade 2 applies for hex cap screws (not hex bolts) up to 6 in (152 mm) long.

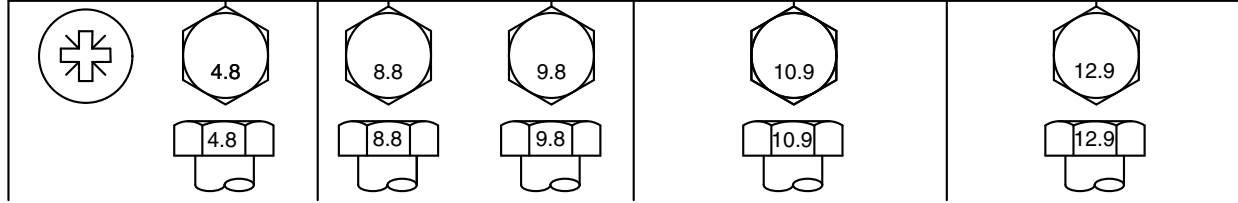
^cHex head column values are valid for ISO 4014 and ISO 4017 hex head, ISO 4162 hex socket head, and ISO 4032 hex nuts.

^dHex flange column values are valid for ASME B18.2.3.9M, ISO 4161, or EN 1665 hex flange products.

DX,TORQ1 -19-30MAY18-1/1

Metric Bolt and Screw Torque Values

TS1742 —UN—31MAY18



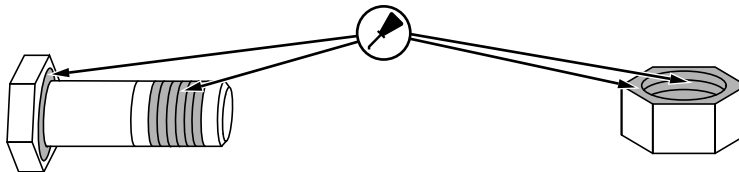
Bolt or Screw Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Hex Head ^a		Flange Head ^b		Hex Head ^a		Flange Head ^b		Hex Head ^a		Flange Head ^b		Hex Head ^a		Flange Head ^b	
	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in	N·m	lb·in
M6	3.6	31.9	3.9	34.5	6.7	59.3	7.3	64.6	9.8	86.7	10.8	95.6	11.5	102	12.6	112
									N·m	lb·ft	N·m	lb·ft	N·m	lb·ft	N·m	lb·ft
M8	8.6	76.1	9.4	83.2	16.2	143	17.6	156	23.8	17.6	25.9	19.1	27.8	20.5	30.3	22.3
			N·m	lb·ft	N·m	lb·ft	N·m	lb·ft								
M10	16.9	150	18.4	13.6	31.9	23.5	34.7	25.6	46.8	34.5	51	37.6	55	40.6	60	44.3
	N·m	lb·ft														
M12	—	—	—	—	55	40.6	61	45	81	59.7	89	65.6	95	70.1	105	77.4
M14	—	—	—	—	87	64.2	96	70.8	128	94.4	141	104	150	111	165	122
M16	—	—	—	—	135	99.6	149	110	198	146	219	162	232	171	257	190
M18	—	—	—	—	193	142	214	158	275	203	304	224	322	245	356	263
M20	—	—	—	—	272	201	301	222	387	285	428	316	453	334	501	370
M22	—	—	—	—	365	263	405	299	520	384	576	425	608	448	674	497
M24	—	—	—	—	468	345	518	382	666	491	738	544	780	575	864	637
M27	—	—	—	—	683	504	758	559	973	718	1080	797	1139	840	1263	932
M30	—	—	—	—	932	687	1029	759	1327	979	1466	1081	1553	1145	1715	1265
M33	—	—	—	—	1258	928	1398	1031	1788	1319	1986	1465	2092	1543	2324	1714
M36	—	—	—	—	1617	1193	1789	1319	2303	1699	2548	1879	2695	1988	2982	2199

The nominal torque values listed are for general use only with the assumed wrenching accuracy of 20%, such as a manual torque wrench. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application.

Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original.

- Make sure that fastener threads are clean.
- Apply a thin coat of Hy-Gard™ or equivalent oil under the head and on the threads of the fastener, as shown in the following image.
- Be conservative with the amount of oil to reduce the potential for hydraulic lockup in blind holes due to excessive oil.
- Properly start thread engagement.

TS1741 —UN—22MAY18



^aHex head column values are valid for ISO 4014 and ISO 4017 hex head, ISO 4162 hex socket head, and ISO 4032 hex nuts.

^bHex flange column values are valid for ASME B18.2.3.9M, ISO 4161, or EN 1665 hex flange products.

DX,TORQ2 -19-30MAY18-1/1

Lubrication and Maintenance Records

Using Lubrication and Maintenance Records

Refer to specific Lubrication and Maintenance Section for detailed service procedures.

1. Keep a record of the number of hours you operate your engine by regular observation of hour meter.
2. Check your record regularly to learn when your engine needs service.
3. DO ALL the services within an interval section. Write the number of hours (from your service records) and

the date in the spaces provided. For a complete listing of all items to be performed and the service intervals required, refer to the quick-reference chart near the front of the Lubrication and Maintenance Section.

IMPORTANT: The service recommendations covered in this manual are for the accessories that are provided by John Deere. Follow manufacturer's service recommendations for servicing engine driven equipment not supplied by Deere.

JR74534,000030C -19-04FEB11-1/1

Daily (Prestarting) Service

- Check engine oil level.
- Check coolant level.
- Check sea water strainer.
- Check air cleaner dust unloader valve and air restriction indicator, if equipped.
- Visual walkaround inspection.

JR74534,000030D -19-04FEB11-1/1

50 Hour/Every 2 Weeks Service

- Check fuel filter.

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

JR74534,000030E -19-04FEB11-1/1

250 Hour Service

- Service fire extinguisher.
- Service battery.
- Change engine oil and filter (Except 6068SFM50).¹
- Inspect zinc plugs.
- Check belt tension and wear.
- Check engine mounts.
- Check engine electrical ground connections

Hours									
Date									
Hours									
Date									
Hours									
Date									
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¹If 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.

JR74534,000030F -19-04FEB11-1/1

500 Hour/12 Month Service

- Change engine oil and filter (6068SFM50 engine only).
- Clean crankcase vent tube.
- Check air intake hoses, connections, and system.
- Replace fuel filter element.

- Check automatic belt tensioner and belt wear.
- Check cooling system.
- Coolant solution analysis – add SCAs as needed.
- Inspect and clean heat exchanger and aftercooler core.

Hours									
Date									
Hours									
Date									
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Hours									
Date									

JR74534,0000310 -19-04FEB11-1/1

1000 Hour/24 Month Service

- Inspect and repair sea water pump.

- Adjust droop on generator set engines (Except 6068SFM50).
- Have your authorized servicing dealer or engine distributor pressure test overall cooling system and cap.

Hours									
Date									
Hours									
Date									
Hours									
Date									
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Date									
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Hours									
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Hours									
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Hours									
Date									

JR74534,0000311 -19-27OCT15-1/1

2000 Hour Service

- Flush cooling system.¹

- Check crankshaft vibration damper.
- Have your authorized servicing dealer or engine distributor adjust valve clearance.

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

¹If John Deere Cool-Gard is used, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first, provided the coolant is tested annually AND additives are replenished by adding supplemental coolant additives (SCAs).

JR74534,0000312 -19-27OCT15-1/1

Service As Required

- Adding coolant.
- Replace dry air cleaner element (Enclosed element installations).
- Service dry air cleaner element (Open element installations).
- Replace dry air cleaner element (Open element installations).
- Replace poly-vee belt.
- Inspect driveline.
- Bleed fuel system.
- Remove and install sea water pump.

Hours									
Date									
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Warranty

John Deere Warranty in OEM Applications

Overview

This section focuses on John Deere engines marketed in products manufactured by companies other than John Deere or its affiliates, and on John Deere repower engines in all applications. Herein appears the original warranty applicable to the engine as delivered to the retail purchaser on or after 1 May 2010. The following is information about the warranty and warranty service.

NOTE: “John Deere” means John Deere Power Systems with respect to users in the United States, John Deere Limited with respect to users in Canada, and Deere & Company or its subsidiary responsible for making John Deere equipment in other countries where the user is located.

Promptly register your engine online at <https://www.johndeere.com/enginewarranty>

When Warranty Service Is Needed

The nearest dealer stands ready with genuine parts and trained and equipped personnel should the need arise. If following the Operator’s Manual delivered with the engine/machine are not adequate to correct an engine problem, contact the nearest John Deere service dealer for assistance. Authorized engine service dealers can be found at: <https://www.johndeere.com/> (click on “Dealer Locator”).

NOTE: When requesting warranty service, the purchaser must be prepared to provide proof that the engine is within the warranty period.

The following information is always required: Engine serial number, date of delivery, engine owner, name and location of dealer and specific person contacted, date of contact, nature of engine problem, and outcome of the service dealer contact.

Given that normally it is the dealer contacted who in the end will provide the service required, maintaining a purchaser-dealer relationship of mutual respect from the beginning is always helpful.

Privacy Notice

At John Deere your privacy is important to us. We collect, use, and disclose your personal information in accordance with the John Deere privacy statement. For instance, we collect, use, and disclose your personal information to provide you with the products and services that you request; to communicate with you as our customer (examples include warranty and product improvement programs) and to meet safety and legal requirements; and for marketing and promotional purposes. Sometimes, we may ask our John Deere affiliates, dealers, or business partners to do work for us which involves your information. For complete details on your privacy rights and to obtain a copy of the John Deere Privacy Statement, please visit our website at <https://www.johndeere.com/>.

Warranty Duration

Unless otherwise provided in writing by John Deere, John Deere makes the following warranty to the first retail purchaser and each subsequent purchaser (if purchase is made prior to the expiration of applicable warranty) of each John Deere new off-highway engine marketed as part of a product manufactured by a company other than John Deere or its affiliates and on each John Deere engine used in an off-highway repower application:

- 12 months, unlimited hours of use, or
- 24 months and before the accumulation of 2000 hours of use.

NOTE: In the absence of a functional hourmeter, hours of use will be determined on the basis of 12 hours of use per calendar day.

Warranty Coverage

This warranty applies to the engine and to integral components and accessories sold by John Deere, and delivered to the first retail purchaser on or after 1 May 2010.

All John Deere-warranted parts and components of John Deere engines which, as delivered to the purchaser, are defective in materials and/or workmanship will be repaired or replaced, as John Deere elects. Warrantable repairs will be made without charge for parts or engine repair labor, including reasonable labor costs to remove and reinstall non-engine parts or components of the equipment in which the engine is installed. If required, reasonable labor costs for engine removal and reinstallation will also be included. All coverage is based on the defect appearing within the warranty period as measured from the date of delivery to the first retail purchaser.

Obtaining Warranty Service

Warranty service must be requested of the nearest authorized John Deere engine service outlet before the expiration of the warranty. An *authorized* service outlet is a John Deere engine distributor, a John Deere engine service dealer, or a John Deere equipment dealer selling and servicing equipment with an engine of the type covered by this warranty. (See When Warranty Service is Needed above.)

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

NOTE: Authorized engine service locations are listed on the Internet at <https://www.johndeere.com/> (Click on “Dealer Locator”).

At the time of requesting warranty service, the purchaser must be prepared to present evidence of the date of delivery of the engine.

John Deere reimburses authorized service outlets for limited travel expenses incurred in making warranty service repairs in non-John Deere applications when travel is actually performed. The limit, as of the date of publication of this booklet, is US\$400.00 (US\$500.00 if engine is marine) or equivalent. **If distances and travel times are greater than reimbursed by John Deere, the service outlet will charge the purchaser for the difference.**

Warranty Exclusions

John Deere's obligations will not apply to components and accessories which are not furnished or installed by John Deere, nor to failures caused by such items, except as required by law.

Purchaser's Responsibilities

The cost of normal maintenance and depreciation.

Periodic cleaning of the diesel particulate filter (DPF).

Consequences of negligence, misuse, or accident involving the product, or improper application, installation, or storage.

Consequences of service performed by someone other than an authorized John Deere engine service outlet.

Consequences of any product modification or alteration not approved by John Deere, including, but not limited to, tampering with engine fuel and air delivery systems.

Consequences of failure of non-product components.

Consequences of fuels, lubricants, or coolants that fail to meet the specifications and requirements listed in the Operator's Manual.

The effects of cooling system neglect as manifested in cylinder liner or cylinder block cavitation ("pitting", "erosion", "electrolysis").

Any premium for overtime labor requested by the purchaser.

Costs of transporting the product or the equipment in which it is installed to and from the location at which the warranty service is performed, if such costs are in excess of the travel reimbursement payable to the dealer had the warranty service been performed at the product's location.

Costs incurred in gaining access; for example, overcoming physical barriers such as walls, fences, floors, decks, or similar structures impeding access to the product, rental of cranes or similar, or construction of ramps or lifts or protective structures for product removal and reinstallation.

Incidental travel costs including meals, lodging, and similar, and any travel time or mileage costs in excess of the maximum allowance.

Service outlet costs incurred in solving or attempting to solve non-warrantable problems.

Services performed by a party other than an authorized John Deere service dealer.

Charges by dealers for initial start-up and inspection deemed unnecessary by John Deere when an Operator's Manual is supplied with the product are followed.

Costs related to interpretation or translation services.

No Representations or Implied Warranty

Where permitted by law, neither John Deere nor any company affiliated with it makes any guaranties, warranties, conditions, representations or promises, express or implied, oral or written, as to the nonoccurrence of any defect or the quality of performance of its engines other than those set forth in this booklet, and DOES NOT MAKE ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY OR FITNESS otherwise provided for in the Uniform Commercial Code or required by any Sale of Goods Act or any other statute. This exclusion includes fundamental terms. In no event will a John Deere engine distributor or engine service dealer, John Deere equipment dealer, or John Deere or any company affiliated with John Deere be liable for incidental or consequential damages or injuries including, but not limited to, loss of profits, loss of crops, rental of substitute equipment or other commercial loss, damage to the equipment in which the engine is installed or for damage suffered by purchaser as a result of fundamental breaches of contract or breach of fundamental terms, unless such damages or injuries are caused by the gross negligence or intentional acts of the foregoing parties.

Remedy Limitation

The remedies set forth in this warranty are the purchaser's exclusive remedies in connection with the performance of, or any breach of guaranty, condition, or warranty in respect of new John Deere engines. In the event the above warranty fails to correct purchaser's performance problems caused by defects in workmanship and/or materials, purchaser's exclusive remedy shall be limited to payment by John Deere of actual damages in an amount not to exceed the cost of the engine.

No Seller's Warranty

No person or entity, other than John Deere, who sells the engine or product in which the engine has been installed makes any guaranty or warranty of its own on any engine warranted by John Deere unless it delivers to the purchaser a separate written guaranty certificate specifically guaranteeing the engine, in which case John Deere shall have no obligation to the purchaser. Neither original equipment manufacturers, engine or equipment distributors, engine or equipment dealers, nor any other person or entity, has any authority to make any representation or promise on behalf of John Deere or to modify the terms or limitations of this warranty in any way.

Replacement Parts Warranty

John Deere and John Deere Reman parts and components (excluding replacement engines) installed during engine warranty service are warranted for the remaining warranty period of the engine or the applicable warranty term for the installed service part, whichever is greater. A new or remanufactured engine replacing a failed engine under warranty is warranted for 90 days or the remaining warranty period of the original engine, whichever is greater.

Warranty Transfer

The remainder of the original engine warranty and the emissions control-related warranty may be transferred to a subsequent owner of the engine. The Engine Warranty Transfer card should be used to report the transfer to John Deere. If a card is not available, contact your Dealer or simply send the following Information to JDPS Warranty Administration at Diesel-US@JohnDeere.com.

1. The complete 13-character engine serial number.
2. The name and mailing address of the original purchaser.
3. Delivery date to the original purchaser.
4. Hours at the time of transfer.
5. Date of transfer to the new owner.
6. Name and mailing address of the new owner.
7. How the engine/drivetrain being used, i.e., what equipment it powers, by manufacturer and model.
8. Equipment it powers, by manufacturer and model.

Purchased Extended Warranty

Extended warranty may be purchased on most engines in many areas of the world. John Deere engine distributors and equipment dealers, and dealers of manufacturers using John Deere engines in their products, have details. John Deere may also be contacted at U.S.A. fax number 1-309-749-0816, or in Europe fax number 33.2.38.84.62.66.

Emissions Warranties

Emissions warranties appear in the Operator's Manual furnished with the engine/machine. **(Warning: Statutes providing severe penalties for tampering with emissions controls may apply at the user's location.)** John Deere may also be contacted at U.S.A. fax number 1-309-749-0816; or in Europe fax number 33.2.38.84.62.66.

Local Warranty Requirements

Warranties required by local statutes will be furnished by the seller.

Option Codes (Engine Manufacturing Configuration)

When in need of engine replacement parts, your authorized John Deere service dealer will need to know the corresponding "Option Codes" for your engine. The option code label on the engine rocker arm cover may become damaged over time. By recording the four-digit codes when the engine is new, and storing this manual where it can be found when parts are needed, fast, accurate parts ordering and service will be assured. (See Engine Option Codes in the Record Keeping Section).

Should there be a question about an engine option code, note the engine serial number and call 1-800-JDENGINE from the U.S.A. or Canada, or fax U.S.A. number 1-309-749-0816; or E-mail at diesel-us@johndeere.com, Attention: Warranty Administration; or in Europe fax number 33.2.38.84.62.66, or E-mail at saranservice@johndeere.com.

Registering The Engine For Warranty

Completion and submission of the John Deere Engine Warranty Registration form (cut out sheet found in this manual) is very important. John Deere will not deny warranty service on an engine within its warranty period if the engine has not been registered. However, registering your engine will assure your servicing dealer that the engine is within the warranty period.

The easiest way to register your engine is via the Internet. Go to website <https://www.johndeere.com/enginewarranty>. You can use the sheet in this manual to gather the information needed to register the warranty.

NOTE: Information provided on the form must be legible!

Typing is preferred, but legible handwritten reports are acceptable. "Block" numbers and Roman alphabet letters should be used. For example: 1,2,3,4 and A, B, C, D.

All requested information should be given. Much of it contributes to reports, including those required by governments.

The purchaser's telephone number or E-mail address allows John Deere to make contact should there be questions concerning the registration. The purchaser should sign and date the form.

JR74534,0000462 -19-05JUL16-3/3

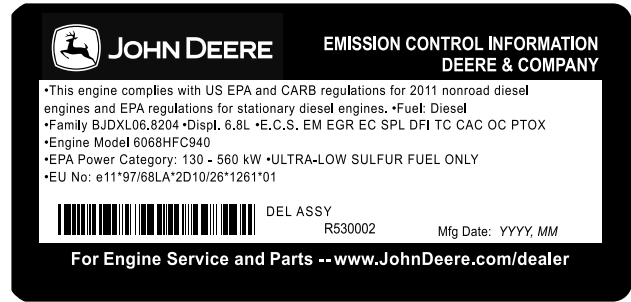
Emissions Control System Certification Label

⚠ CAUTION: Statutes providing severe penalties for tampering with emissions controls may apply to the user or dealer.

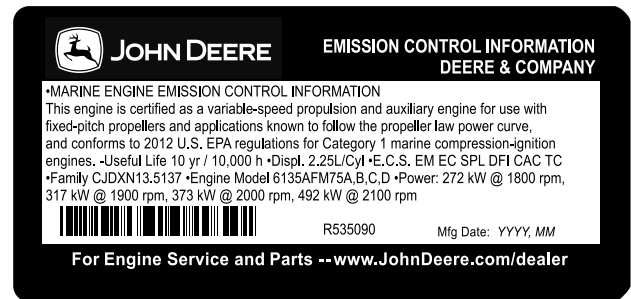
The emissions warranty applies to those engines marketed by John Deere that have been certified by the United States Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB); and used in the United States and Canada in Non-road equipment (excluding marine engines for Canada). The presence of an emissions label like the one shown signifies that the engine has been certified with the EPA and/or CARB. The EPA and CARB warranties only apply to new engines having the certification label affixed to the engine and sold as stated above in the geographic areas. The presence of an EU number signifies that the engine has been certified with the European Union countries per Directive 97/68/EC. The EPA and/or CARB emissions warranties do not apply to the EU countries.

Emission Control System(s) Laws

The U.S. EPA and CARB prohibit the removal or rendering inoperative of any device or element of design installed on or in engines/equipment in compliance with applicable emission regulations prior to or after the sale and delivery of the engines/equipment to the ultimate purchaser.



Industrial Label - Sample



Marine Label - Sample

JR74534,00002D9 -19-19MAY14-1/1

RG21186—UN—21DEC11

RG21185—UN—21DEC11

U.S. Marine Compression-Ignition Engine Emission Control Warranty Statement

DXLOGOV1 —UN—28APR09



JOHN DEERE

U.S. MARINE COMPRESSION-IGNITION ENGINE EMISSION CONTROL WARRANTY STATEMENT

YOUR WARRANTY RIGHTS AND OBLIGATIONS

To determine if the John Deere engine qualifies for the additional warranties set forth below, look for the "Emission Control Information" label located on the engine and verify that it states the engine conforms to U.S. EPA regulations for Recreational or commercial marine compression-ignition engines.

Warranties stated on this certificate refer only to emissions-related parts and components of your engine. The complete engine warranty, less emissions-related parts and components, is provided separately. The U.S. EPA Emissions Warranty only applies to engines in vessels that are registered and operated in the USA. Engines that are not covered by the U.S. EPA Emissions regulations are not covered by the EPA Emissions Warranty. If you have any questions about your warranty rights and responsibilities, you should contact John Deere at 1-319-292-5400.

JOHN DEERE'S WARRANTY RESPONSIBILITY:

John Deere warrants to the ultimate purchaser and each subsequent purchaser that this marine diesel engine including all parts of its emission control system was designed, built and equipped so as to conform at the time of sale with applicable regulations under section 213 of the Clean Air Act and is free from defects in materials and workmanship which would cause the engine to fail to conform with applicable US EPA regulations for the following periods:

Recreational Category 1 Marine Engine	Five years or 500 hours, whichever comes first *
Commercial Category 1 Marine Engine	Five years or 5,000 hours, whichever comes first *

Where a warrantable condition exists, John Deere will repair or replace, as it elects, any part or component with a defect in materials or workmanship that would increase the engine's emissions of any pollutant within the stated warranty period at no cost to you, including expenses related to diagnosing and repairing or replacing emission-related parts. Warranty coverage is subject to the limitations and exclusions set forth herein.

EMISSION WARRANTY EXCLUSIONS:

John Deere may deny warranty claims for malfunctions or failures caused by:

- Non-performance of maintenance requirements listed in the Operator's Manual.
- The use of the engine / equipment in a manner for which it was not designed.
- Abuse, neglect, improper maintenance or unapproved modifications or alterations.
- Accidents for which it does not have responsibility or by acts of God.

The marine engine is designed to operate on diesel fuel as specified in the Fuels, Lubricants and Coolants section in the Operators Manual. Use of any other fuel can harm the emission control system of the engine / equipment and is not approved for use.

To the extent permitted by law, John Deere is not liable for damage to other engine components caused by a failure of an emission-related part, unless otherwise covered by standard warranty.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISIONS OF MATERIAL AND SERVICES AS SPECIFIED HEREIN. WHERE PERMITTED BY LAW, NEITHER JOHN DEERE NOR ANY AUTHORIZED JOHN DEERE ENGINE DISTRIBUTOR, DEALER, OR REPAIR FACILITY OR ANY COMPANY AFFILIATED WITH JOHN DEERE WILL BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

* The emissions-related warranty shall not be shorter than any published warranty Deere offers without charge to the customer.

Emission_Marine_EPA(13Mar10)

JR74534,00002FC -19-08MAR13-1/1

European Union (EU) Declaration of Emissions Conformity

The presence of an EU number on the label signifies that the Marine Diesel Engine has been certified with the European Union countries per Directives 97/68/EC as amended by Directive 2004/26/EC. The EU engine family is listed on the Emissions Label. When installed in

accordance with the manufacturer's instructions, John Deere marine diesel propulsion engines without integral exhaust certified under Directive 97/68/EC as amended by Directive 2004/26/EC produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides and particle emissions which comply with the requirements of the Recreational Craft Directive 2003/44/EC.

OURGP11,00000C7 -19-19JUN07-1/1

John Deere Service Literature Available

Technical Information

Technical information can be purchased from John Deere. Publications are available in print or CD-ROM format.

Orders can be made using one of the following:

- John Deere Technical Information Store:
www.JohnDeere.com/TechInfoStore
- Call 1-800-522-7448
- Contact your John Deere dealer

Available information includes:

PARTS CATALOGS list service parts available for your machine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.



TS189 —UN—17JAN89

DX,SERVLIT -19-07DEC16-1/4

OPERATOR'S MANUALS providing safety, operating, maintenance, and service information.



TS191 —UN—02DEC88

DX,SERVLIT -19-07DEC16-2/4

TECHNICAL MANUALS outlining service information for your machine. Included are specifications, illustrated assembly and disassembly procedures, hydraulic oil flow diagrams, and wiring diagrams. Some products have separate manuals for repair and diagnostic information. Some components, such as engines, are available in a separate component technical manual.



TS224 —UN—17JAN89

Continued on next page

DX,SERVLIT -19-07DEC16-3/4

EDUCATIONAL CURRICULUM including five comprehensive series of books detailing basic information regardless of manufacturer:

- Agricultural Primer series covers technology in farming and ranching.
- Farm Business Management series examines “real-world” problems and offers practical solutions in the areas of marketing, financing, equipment selection, and compliance.
- Fundamentals of Services manuals show you how to repair and maintain off-road equipment.
- Fundamentals of Machine Operation manuals explain machine capacities and adjustments, how to improve machine performance, and how to eliminate unnecessary field operations.
- Fundamentals of Compact Equipment manuals provide instruction in servicing and maintaining equipment up to 40 PTO horsepower.



TS1663—UN—10OCT97

DX,SERV LIT -19-07DEC16-4/4

Publications For This Engine

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

Title	Order Number
POWERTECH 4.5 L and 6.8L Marine Engines	
Operation and Service Manual (English)	OMRG28997
Parts Catalogs:	
POWERTECH 4.5 L Marine	PC2758
POWERTECH 6.8 L Marine	PC2727
Component Technical Manuals	
Base Engine	CTM104
Mechanical Fuel Systems	CTM207
Electronic Fuel Systems (6068SFM50)	CTM170
OEM Engine Accessories	CTM67
Alternators and Starter Motors	CTM77

DPSG,OUOD002,524 -19-04JAN02-1/1

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