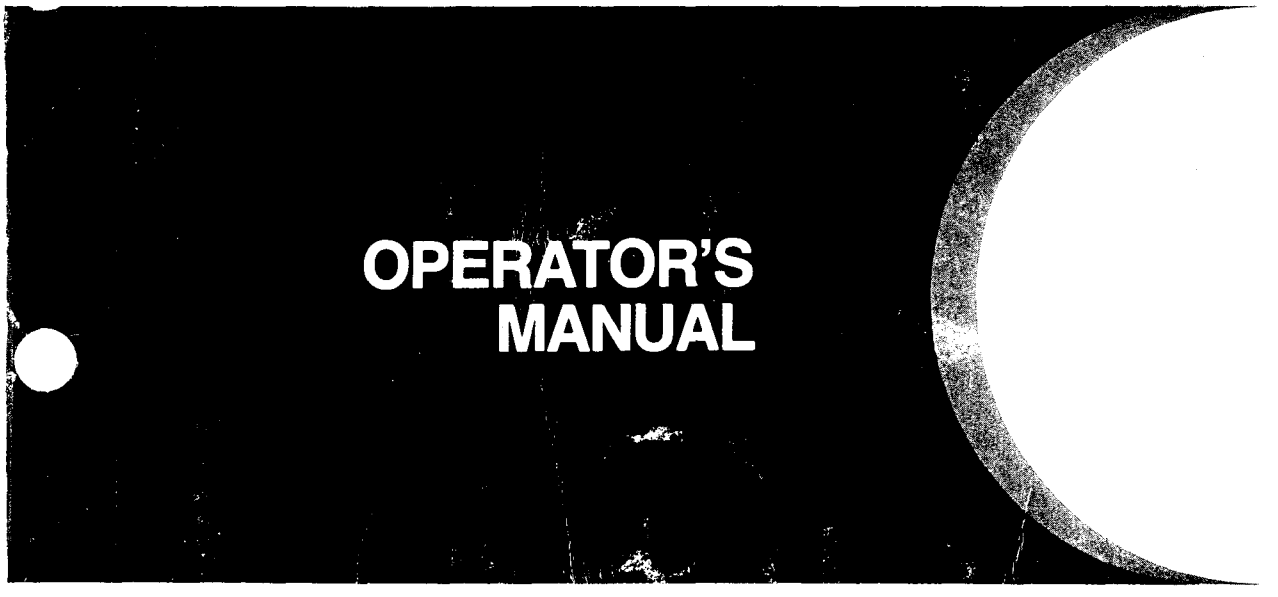
300 Series Liter Engines



John Deere Engine Works
OMRG18293 Issue A0

LITHO IN U.S.A.

Introduction

This new engine was carefully designed and manufactured to give years of dependable service. To keep it running efficiently, follow the instructions in this operator's manual. Each section is clearly identified so you can easily find the information you need—whether it is operation, lubrication, or service.

Read the Contents to learn where each section is located. Use the alphabetical index for fast reference.

Throughout this manual, "right-hand" and "left-hand" sides are determined by facing the drive end (rear) of the engine.

Record your engine serial number and accessory codes in the spaces indicated in the Specifications section in the back of this book. Your dealer needs this information to give you prompt, efficient service when you order parts. If your engine requires replacement parts, see your authorized servicing dealer. Authorized servicing dealers stock factory original parts and have the specified equipment and personnel with technical knowledge to provide skilled and efficient workmanship on your engine.

300 Series Liter Engines may be identified by one of the following designations which are in a portion of the serial number:

4039D	4039T
4045D	4045T
6059D	6059T
6068D	6068T

- The first digit shown above indicates the number of cylinders.

- The second, third, and fourth digits indicate the displacement in liters.

- The fifth digit indicates engine aspiration:

D—Naturally Aspirated
T—Turbocharged

For example: 4039D indicates a 4-cylinder engine that has 3.9 L (239 cu.in.) displacement and the engine is naturally aspirated.

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

IMPORTANT WARRANTY INFORMATION

The warranty on this engine appears on your copy of the purchase order which you should have received from your dealer when making your purchase. This warranty provides you the assurance that John Deere will back its products where defects appear within the warranty period. In some circumstances, John Deere also provides field improvements, often without charge to the customer, even if the product is out of warranty.

Warranty and field improvements are a part of John Deere's product support program for customers who operate and maintain their equipment as described in this manual. Should the equipment be abused, or modified to change its performance beyond the original factory specifications, the warranty will become void and field improvements may be denied. Setting fuel delivery above specifications or otherwise overpowering machines will result in such action.

Your Operator's Manual contains SI Metric equivalents which immediately precede the U.S. Customary units of measure.

Contents

Continued on next page

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

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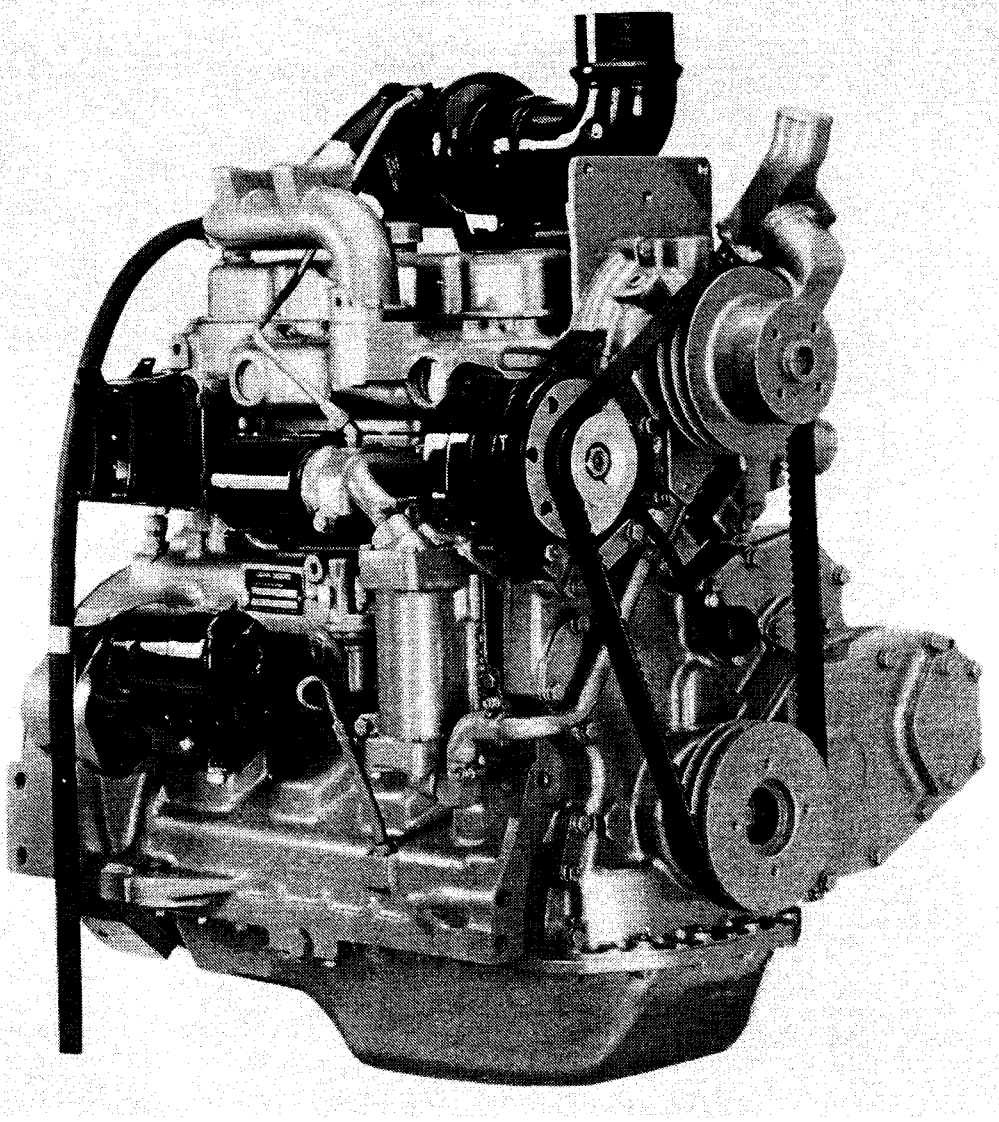
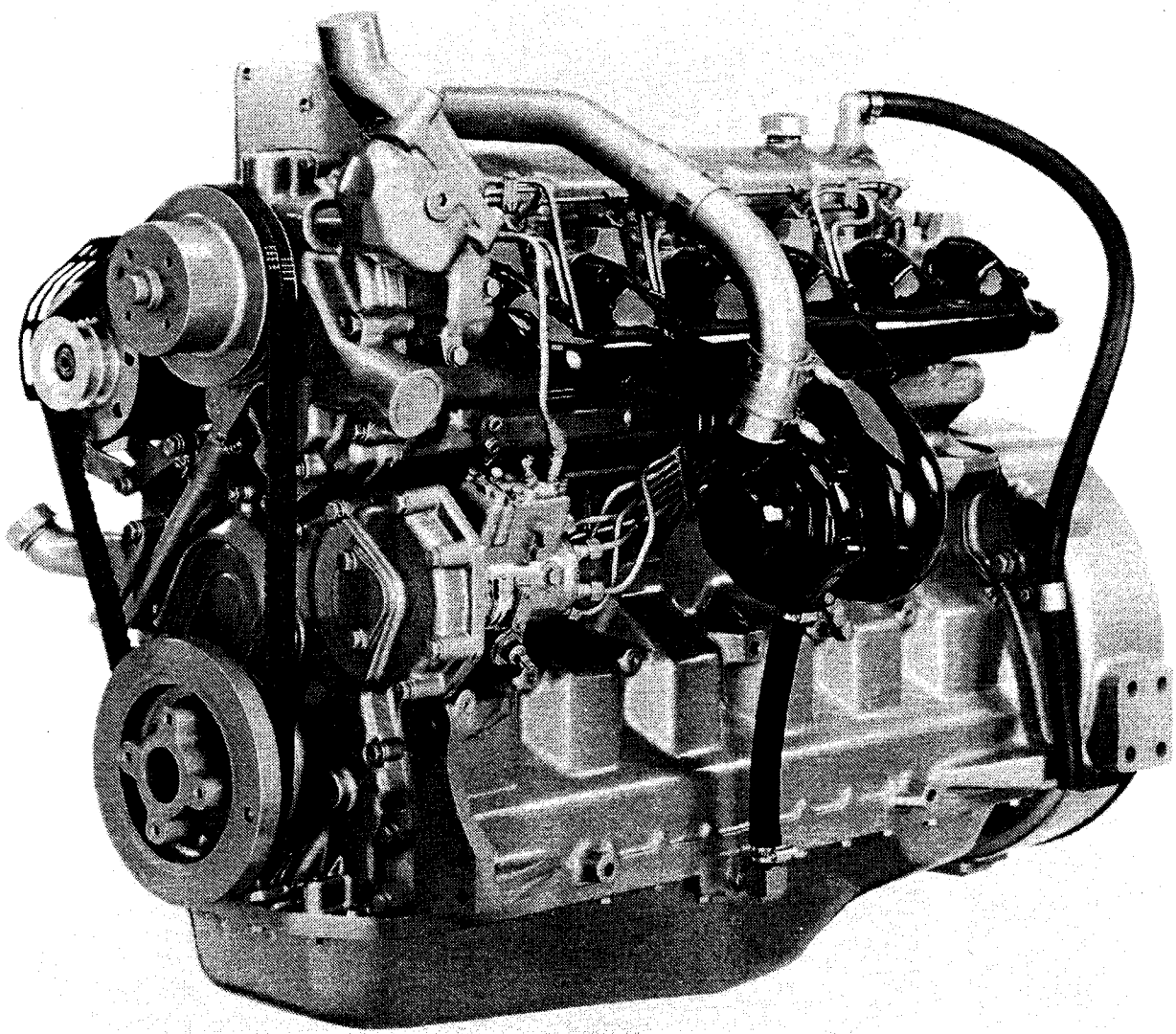
Identification Views



4045T Engine

RG5603 -UN-30NOV89

S11,CONT,L1 -19-27NOV89



RG5604 -UN-30NOV89

6068T Engine

S11,CONT,L2 -19-27NOV89

Safety

RECOGNIZE SAFETY INFORMATION

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

Follow recommended precautions and safe operating practices.

O53,ALERT -19-16JUN87

UNDERSTAND SIGNAL WORDS

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

Safety signs with signal word DANGER or WARNING are typically near specific hazards.

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

⚠ DANGER

⚠ WARNING

⚠ CAUTION

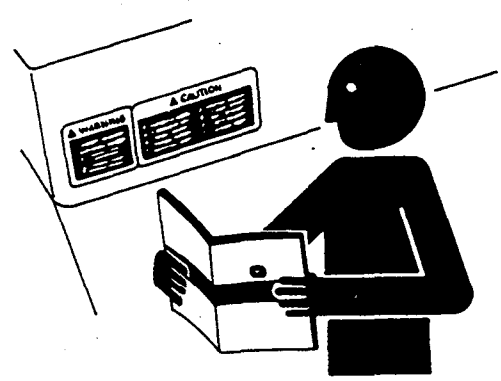
O53,SIGNAL -19-07OCT85

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.

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.



O53,READ -19-23APR87

HANDLE FUEL SAFELY—AVOID FIRES

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

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

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

TS202 -UN-23AUG88

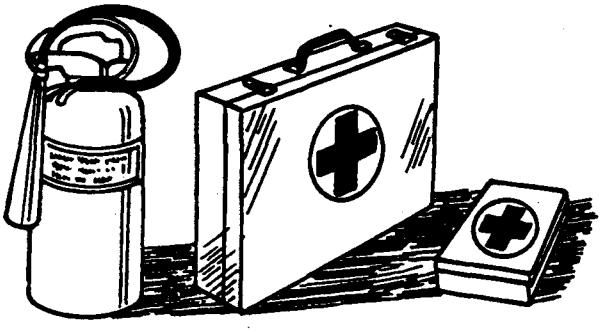
O53,FIRE1 -19-23APR87

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-23AUG88

O53,FIRE2 -19-03MAR88

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.

T6089AU -UN-23MAR89

O53,FIRE3 -19-17MAR89

WEAR PROTECTIVE CLOTHING

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

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

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

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

TS206 -UN-23AUG88

O53,WEAR -19-13OCT89

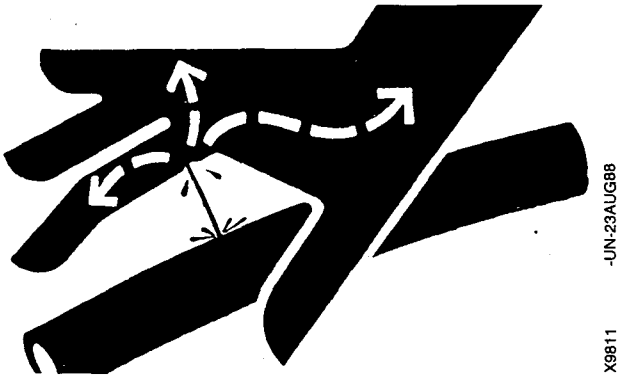
AVOID HIGH-PRESSURE FLUIDS

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

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

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

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.



X9811 -UN-23AUG88

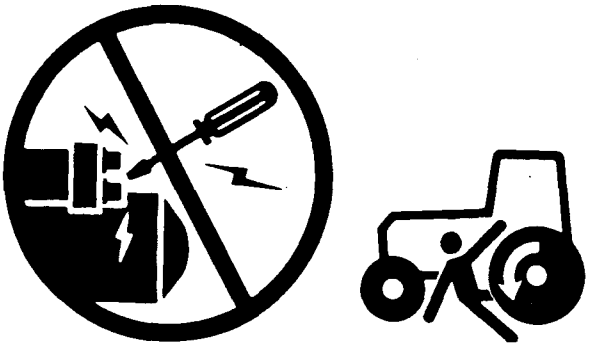
O53,FLUID -19-01DEC88

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

O53,BYPAS1 -19-21MAY85

STAY CLEAR OF PTO

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, connections, or servicing PTO-driven equipment.

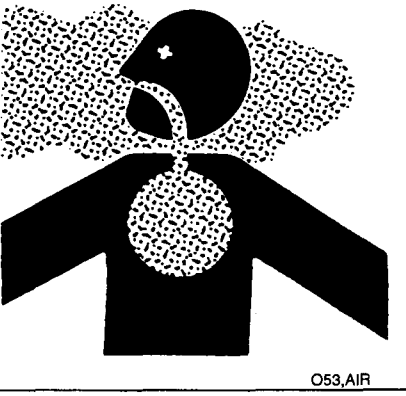
T5198 -UN-24FEB89

S11,OMSA,I -19-08NOV89

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-23AUG88

O53,AIR -19-05JAN88

PRACTICE SAFE MAINTENANCE

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

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

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

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

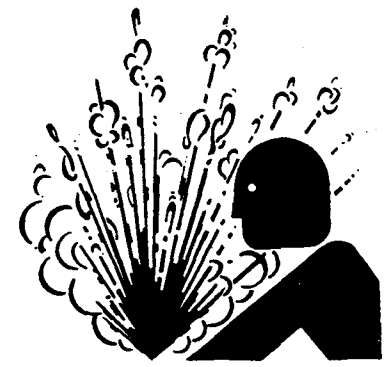
Disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

O53,SERV -19-21DEC87

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.

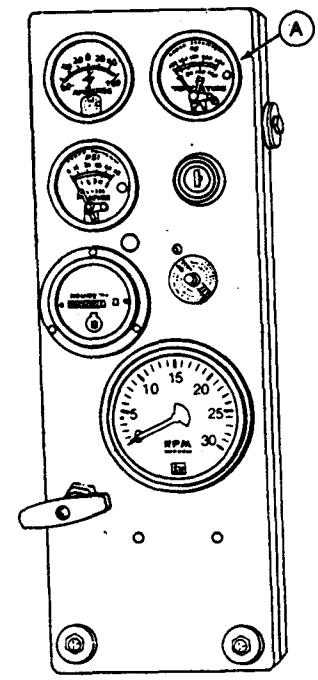


O53,RCAP -19-29NOV88

6. Watch coolant temperatures (A) closely. If coolant temperature rises above 90°C (195°F), reduce load on engine. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

NOTE: When the coolant temperature gauge reads approximately 99°C (210°F), the engine will shutdown automatically, if equipped with safety controls.

7. The tension on newly installed V-belts should be checked daily for the first few days of operation because of the initial stretching. Also, check belts for proper seating in pulley grooves.



RG4674 -UN-15DEC88

S11,OMBI,K -19-10JUN86

Prestarting Checks

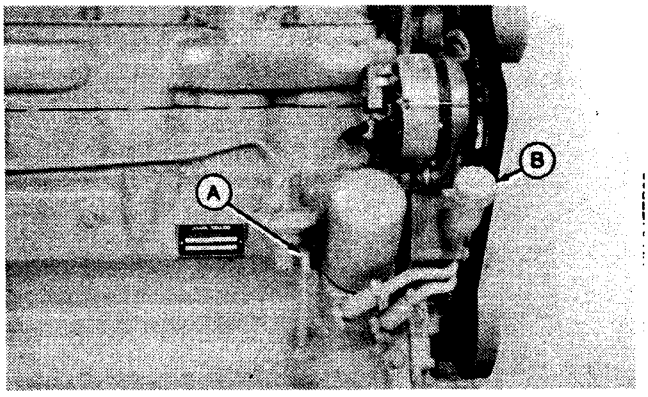
DAILY PRESTARTING CHECKS

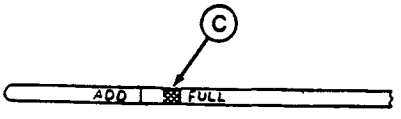
Do the following before starting the engine for the first time each day:

1. Check engine oil (A). Do not operate engine when oil level is below the ADD mark on dipstick. Add oil at filler cap (B), as required, using seasonal viscosity grade oil. (See Diesel Engine Oil in Fuels, Lubricants, and Coolant section for oil specifications.)

NOTE: Some engines may have the oil filler cap on rocker arm cover, while others will have the filler cap on the timing gear cover.

ALWAYS keep oil level within the crosshatch pattern (C) on dipstick when operating engine. Oil levels anywhere within crosshatch are considered full.

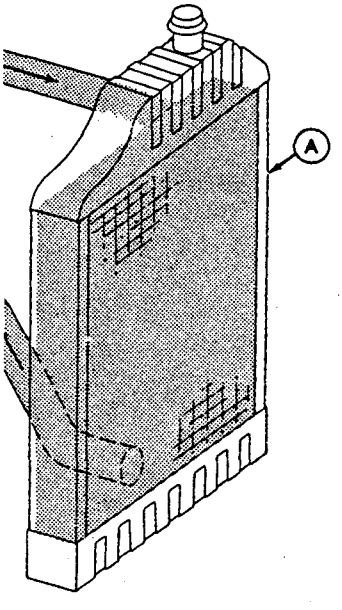




S11,OMPC,O -19-21MAY87

2. Check the coolant level when engine is cold. Coolant level should be approximately 19 mm (3/4 in.) below bottom of filler neck. Fill radiator (A) with John Deere Engine Cooling Fluid or a mixture of 33—50 percent clean soft water and 50—67 percent low silicate ethylene glycol antifreeze.

IMPORTANT: Engine coolant must contain coolant conditioner to guard against rust and corrosion in the engine. (See Adding Coolant in Lubrication and Maintenance/2 Year Section.)



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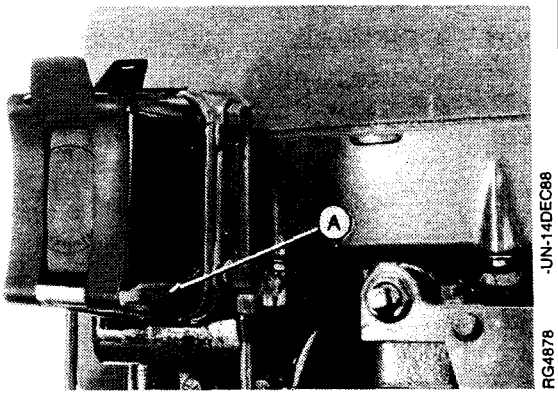
S11,OMPC,P -19-10JUN86

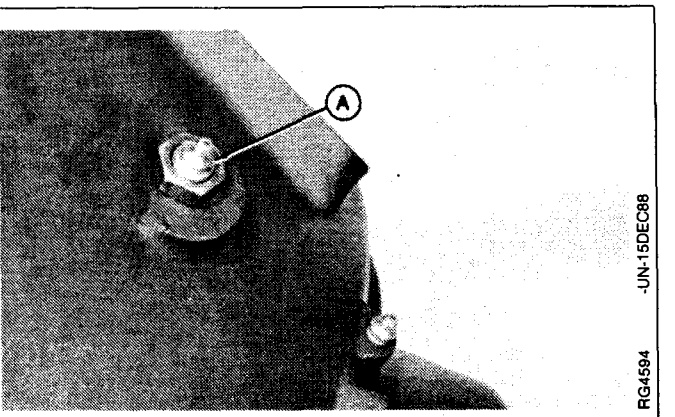
3. Check the glass sediment chamber of the fuel filter for water or debris. If present, drain the filter. (See Lubrication and Maintenance/600 Hour.)

NOTE: Some engines may be equipped with metal fuel filter(s). If so, periodically drain to remove water or debris and bleed the fuel system as outlined later in Service Section.



S11,OMPC,Q1 -19-21MAY87

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

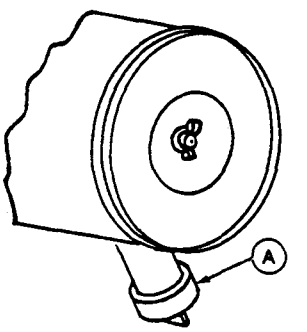


S11,OMPC,S -19-10JUN86

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

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

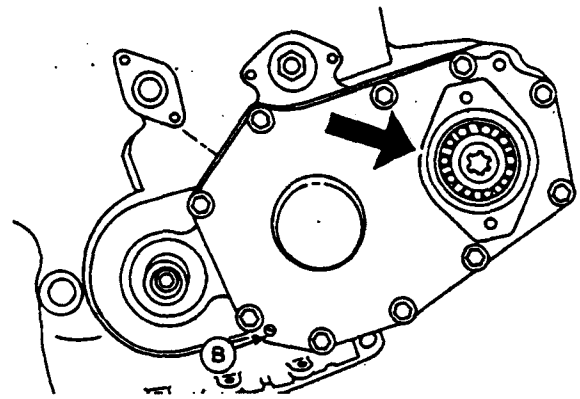
IMPORTANT: Maximum air intake restriction is 6.22 kPa (0.06 bar) (1.0 psi) (25 in. H_2O). A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.



S11,OMPC,R -19-03JUL86

ACCESSORY GEAR DRIVE LIMITATIONS

IMPORTANT: When attaching an air compressor, hydraulic pump, or other attachment to be driven by the auxiliary drive (engine timing gear train at front of engine), power requirements of the accessory must be limited to: 30 kW (40 HP) continuous operation and 37 kW (50 HP) intermittent operation.



S11,OMOE,BD -19-21MAY87

STARTING THE ENGINE

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

CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment.

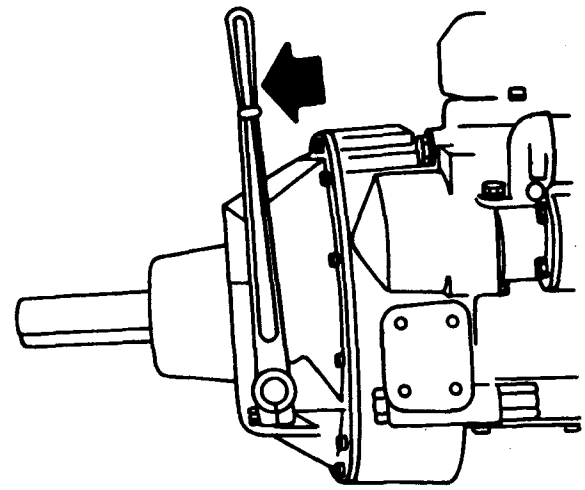
NOTE: If temperature is below 0°C (32°F), it may be necessary to use cold weather starting aids available from your authorized servicing dealer or engine distributor. Follow manufacturers recommended procedure when using starting aids.

CAUTION: Starting fluid is highly flammable. Do not use near fire, sparks, or flames. Do not incinerate or puncture a starting fluid container.

1. Perform all prestarting checks outlined in previous section.

2. Open the fuel supply shut-off valve, if equipped.

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



S11,OMOE,AS -19-18JUL86

4. Pull hand throttle (A) 1/3 of the way out. Turn the handle in either direction to lock it in place.

5. Depress and hold reset button (B) while starting.

IMPORTANT: Do not operate the starter for more than 30 seconds at a time. To do so may overheat the starter. If the engine does not start the first time, wait at least 2 minutes before trying again. If it does not start after four attempts, see Troubleshooting Section.

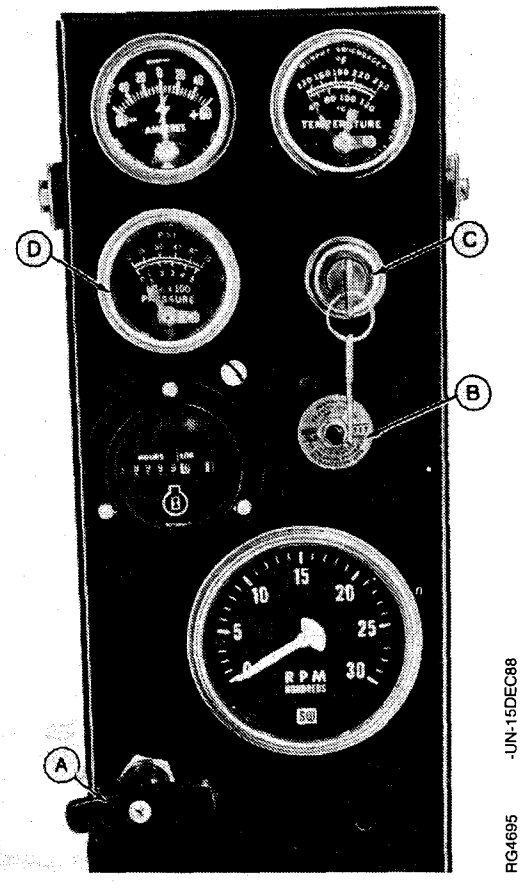
6. Turn the key switch (C) clockwise to crank the engine. When the engine starts, release the key so that it returns to the "ON" position.

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

7. After the engine starts, continue to hold the reset button in until the oil pressure gauge (D) reads at least 103 kPa (1.03 bar) (15 psi). The safety controls will not allow the engine to run at a lesser oil pressure unless the reset button is held in.

IMPORTANT: Should the engine die when operating under load, immediately disengage PTO and restart the engine to prevent overheating of turbocharged parts, caused when the flow of oil for cooling and lubrication is stopped.

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



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

S11,OMOE,AT -19-10JUN86

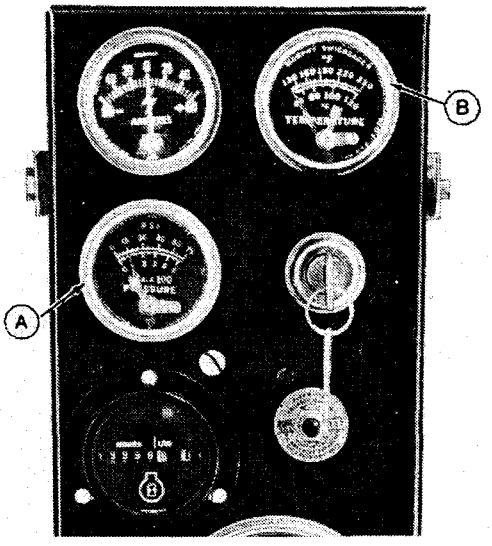
WARMING ENGINE

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.

1. Check oil pressure gauge (A) as soon as engine starts. If gauge needle does not rise above minimum engine oil pressure specification of 103 kPa (1.03 bar) (15.0 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is 276—345 kPa (2.76—3.45 bar)(40—50 psi) at rated speed and normal operating temperature.

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 70°—90°C (160°—194°F).

NOTE: It is a good practice to operate the engine under a lighter load and at lower speeds than normal for the first 30 minutes after start-up.

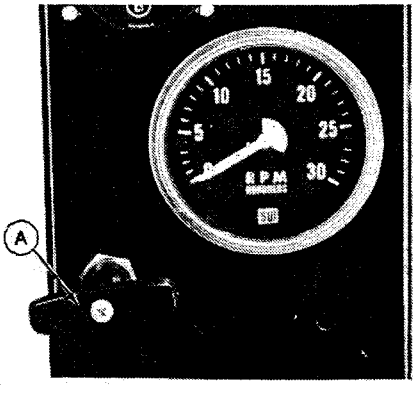


RG4696 -UN-15DEC88

S11,OMOE,AU1 -19-10NOV89

CHANGING ENGINE SPEED—STANDARD GOVERNOR

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



RG4697 -UN-15DEC88

S11,OMOE,M -19-20JAN86

ENGINE SPEEDS

NOTE: If equipped with a tachometer on the instrument panel, observe the tachometer to verify engine speeds.

• Recommended engine working speeds are as follows:

Engine	Full Load Working Range Minimum*	Maximum (Std. Governor)**
4039DF	1500 rpm	2500 rpm
4039TF	1500 rpm	2500 rpm
4045DF	1500 rpm	2400 rpm
4045TF	1500 rpm	2400 rpm
6059DF	1500 rpm	2500 rpm
6059TF	1500 rpm	2500 rpm
6068DF	1500 rpm	2400 rpm
6068TF	1500 rpm	2400 rpm

• Slow idle speeds are set at 800—850 rpm at the producing factory on all engines. Equipment manufacturers will reset slow idle according to specific application. Refer to your machine technical manual for this specification.

• Fast idle speeds are 200 rpm greater than maximum full load working range on standard governor engines and 100 rpm greater than maximum full load working range on generator set engines (3—5% governor).

**The engine will run at any speed from slow idle to fast idle. For constant operation, keep speed at or above 1500 rpm.*

***Generator set engines (3—5% governor) usually run at 1500 rpm (50 Hz) or 1800 rpm (60 Hz) when operating under load depending on cycles of AC current.*

S11,OMOE,AV1 -19-14NOV89

STANDBY POWER UNITS

To assure that your engine will deliver efficient standby operation when needed, run engine (at rated speed) without load for 30 minutes every 2 weeks. DO NOT run engine at slow idle unless absolutely necessary.

S55,OMOE,BE -19-15NOV89

IDLING ENGINE

Avoid unnecessary 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.

Slow idle speed for this engine is 800—850 rpm at factory. If engine must be left running more than 3 or 4 minutes, minimum engine speed should be 1200 rpm. DO NOT allow engine to idle longer than 5 minutes.

S11,OMOE,G -19-10NOV89

STOPPING THE ENGINE

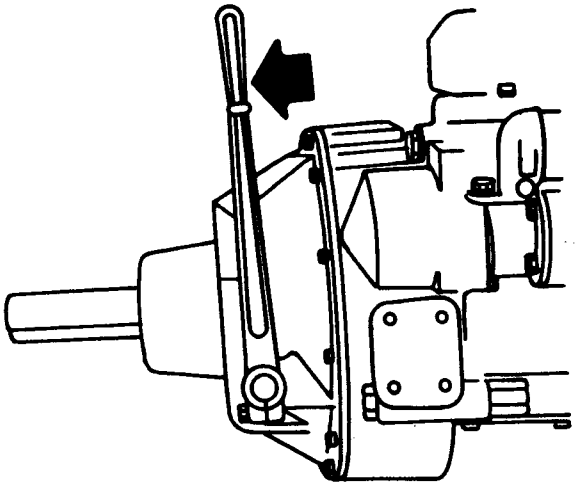
1. Pull PTO clutch lever (arrow) rearwards (away from engine) to disengage clutch.

2. Move the throttle lever to slow idle on regular governor engines.

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

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

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



S11,OMOE,AW -19-21MAY87

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.

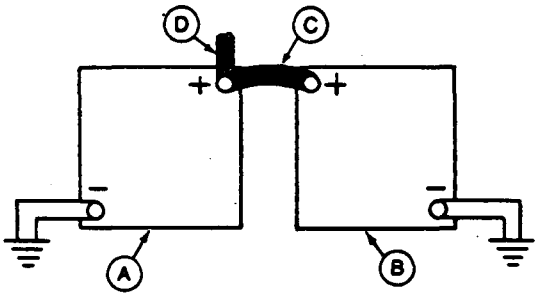
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

2. Connect one end of jumper cable to the POSITIVE (+) post of battery connected to the starting motor.

3. Connect the other end of the jumper cable to the POSITIVE (+) post of the booster battery.

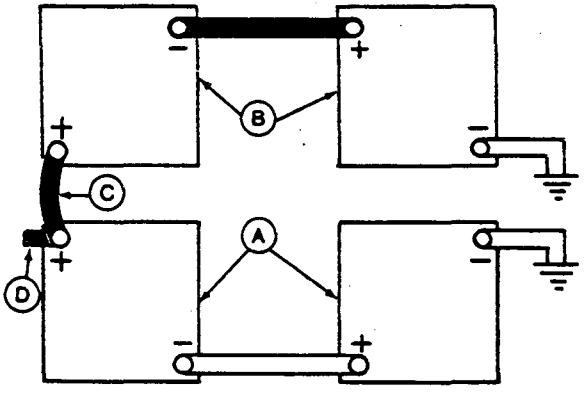
4. Connect one end of the other jumper cable to the NEGATIVE (-) post of the booster battery.

5. ALWAYS complete the hook-up by making the last connection of the NEGATIVE (-) cable to a good ground on the engine frame and away from the battery(ies). When disconnecting, make this the first connection to disconnect.



12-Volt System

RG4678 -UN-14DEC88



24-Volt System

RG4698 -UN-14DEC88

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

S11,OMOE,AX1 -19-21NOV89

DIESEL FUEL

Use either Grade No.1-D or Grade No. 2-D fuel as defined by ASTM Designation D975 for diesel fuels. Find expected air temperature at time of start on thermometer scale in chart. Correct diesel fuel grade is shown to the right of scale.

NOTE: At altitudes above 1500 m (5000 ft) use Grade 1-D for all temperatures. If engine is operated under "stand-by" conditions, use grade 1-D for all temperatures.

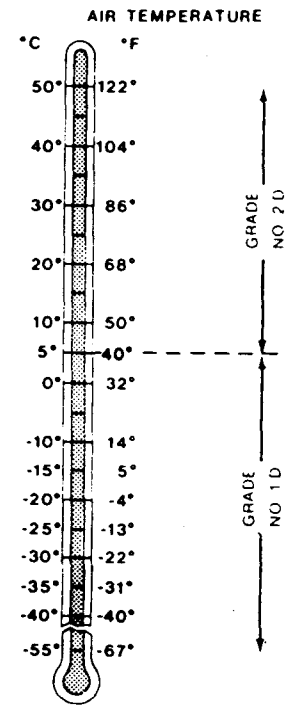
Fuel sulphur content of less than 0.5 percent is preferred, to prevent higher wear from corrosive combustion products.

IMPORTANT: If fuel sulphur content exceeds 0.7 per cent, the engine oil drain interval must be reduced by 50 per cent to 100 hours.

Cetane number should be no less than 40 to assure satisfactory starting and overall performance. At low temperatures and/or high altitude, a cetane number of more than 45 is recommended.

NOTE: Excessive white smoke at start-up could be the result of low cetane fuel.

Cloud point should be at least 6°C (10°F) below lowest expected air temperature at time of starting. Wax can separate from fuel when temperature decreases to cloud point and may plug filter.



IF YOU OPERATE YOUR EQUIPMENT AT TEMPERATURES BELOW THE LIMITS SHOWN, CONSULT YOUR DEALER FOR SPECIAL LUBRICANTS AND STARTING AIDS.

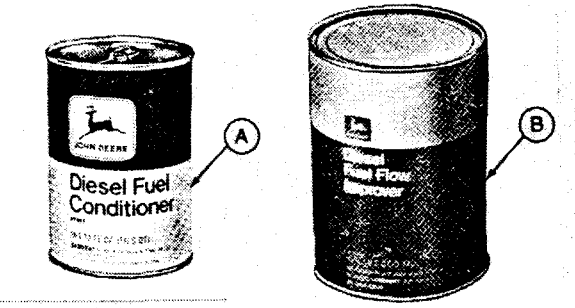
RW2517 -19-14FEB89

S11,OMFL,A -19-19AUG86

DIESEL FUEL STORAGE

IMPORTANT: Buy good quality, clean fuel from a reputable supplier.

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



RG5309 -UN-15DEC88

Avoid storing fuel over long periods of time. If there is a very slow turnover of fuel in the fuel tank or supply tank, it may be necessary to add John Deere Fuel Conditioner (A) to prevent water condensation. This conditioner may be poured directly into fuel tank or bulk storage tank.

John Deere Diesel Fuel Conditioner:

—Improves engine performance.
—Keeps injectors and nozzles clean.
—Reduces maintenance cost.
—Gives better combustion.
—Helps eliminate sludge and gum.
—Retards rust and corrosion.
—Keeps fuel system clean.
—Provides more power and faster starts.
—Prolongs fuel filter life.
—Improves storage stability.

NOTE: To reduce fuel gelling and control wax separation during cold weather, John Deere Diesel Fuel Flow Improver (B) may be added to fuel or bulk storage tank.

Consult your John Deere Parts Network for local availability and follow directions on label.

S11,OMFL,F -19-10NOV89

FILLING FUEL TANK

CAUTION: Be careful when handling fuel. Never fill tank while engine is hot or running. DO NOT smoke while filling fuel tank.

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

Fill fuel tank at end of each day's operation. This prevents condensation in tank as moist air cools.

S11,OMFL,C -19-10NOV89

DIESEL ENGINE OIL

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

John Deere TORQ-GARD SUPREME PLUS-50™ engine oil is recommended. This oil is specially formulated to provide superior protection against high temperature thickening and wear as well as exceptional cold weather starting performance; these properties allow an extended drain interval and may result in longer engine life.

If John Deere TORQ-GARD SUPREME PLUS-50 engine oil and a John Deere oil filter are used, the oil and filter change interval may be extended by 50 hours.

John Deere TORQ-GARD SUPREME® engine oil is also recommended. Other oils may be used if they meet one or more of the following:

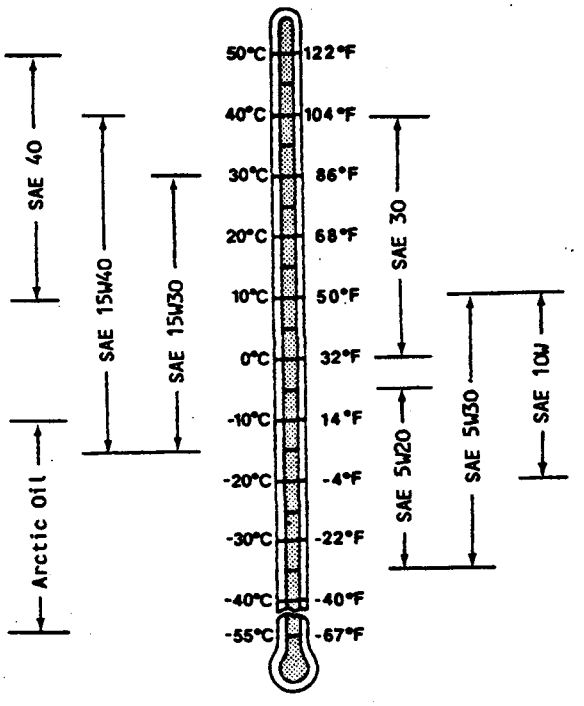
- API Service Classification CE or CD
- Military Specification MIL-L-2104D or MIL-L-2104C

SAE 5W20, SAE 5W30, and arctic oil viscosity grades meeting API Service Classification CC may be used, but oil and filter must be changed at one-half the normal interval.

Oils meeting Military Specification MIL-L-46167A may be used as arctic oils.

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

If ambient air temperature is -10°C (14°F) or less, use an engine heater.



O53,ENOIL -19-22FEB88

120190

SYNTHETIC LUBRICANTS

Synthetic lubricants may be used in John Deere equipment if they meet the applicable performance requirements (industry classifications and/or military specifications) as shown in the operator's manual.

The recommended temperature limits and service or oil change intervals should be maintained as shown in the operator's manual.

Avoid mixing different brands, grades, 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.

O53,SYNLU -19-16NOV88

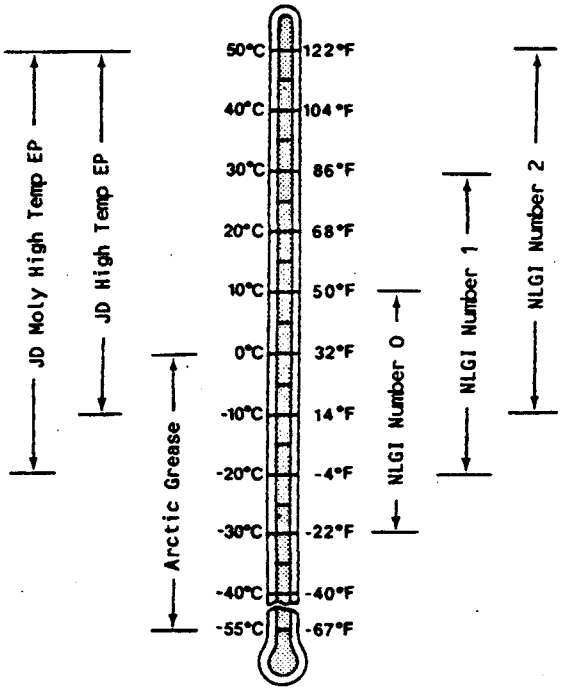
EXTREME PRESSURE GREASE

Use grease based on the expected air temperature range during the service interval.

John Deere Moly High Temperature EP Grease and John Deere High Temperature EP Grease are recommended.

Other greases that may be used are:

- SAE Multipurpose EP Grease with 3 to 5 percent molybdenum disulfide.
- SAE Multipurpose EP Grease.
- Greases meeting Military Specification MIL-G-10924C may be used as arctic grease.



O53,GREA1 -19-08FEB88

ALTERNATIVE LUBRICANTS

Additional information on cold weather operation is available from your John Deere dealer.

Conditions in certain geographical areas may require special lubricants and lubrication practices which do not appear in this operator's manual. If you have any questions, consult your John Deere dealer to obtain the latest information and recommendations.

O53,ALTER -19-05AUG86

LUBRICANT STORAGE

Your equipment can operate at top efficiency only if 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.

O53,LUBST -19-29FEB88

ENGINE COOLANT REQUIREMENTS

RG5214 -UN-14DEC88

Coolant solutions must provide the following basic requirements:

- Adequate heat transfer.
- Corrosion-resistant environment within the cooling system.
- Prevent formation of scale or sludge deposits in the cooling system.
- Be compatible with cooling system hose and seal material.
- Adequate freeze protection during cold weather operation and boil-over protection in hot weather.

NOTE: In some areas outside the U.S.A. and Canada, John Deere Engine Cooling Fluid is marketed for use in the engine cooling system. It protects the engine corrosion and freezing down to -37°C (-35°F).

Either John Deere Engine Cooling Fluid or John Deere Low Silicate Antifreeze are recommended for all John Deere Diesel Engines. John Deere Engine Cooling Fluid is ready to use as is without dilution or mixing. John Deere Low Silicate Antifreeze is concentrated and should be mixed 50—67% antifreeze and 33—50% distilled or deionized water.

S55,OMFL,B -19-10NOV89

ENGINE COOLANT REQUIREMENTS—CONTINUED

To meet these critical requirements, the engine coolant must consist of high quality water, the correct antifreeze type, and possess adequate inhibitors. Refer to water specification chart (A) and water quality evaluation chart (B) when determining coolant requirements:

1. Water Quality:

• Preferred—Distilled or deionized.

• Acceptable—Softened to 170 parts per million (10 grains per gallon).

2. Antifreeze:

• Must be ethylene glycol type, contain not more than 0.1 percent anhydrous metasilicate, and meet General Motors Performance Specification GM1899M or be formulated to GM6038M (or equivalent).

IMPORTANT: Some types of ethylene glycol antifreeze commonly available on the open market are intended for automotive use. These products are often labeled for use in aluminum engines and usually contain more than 0.1 percent anhydrous metasilicate. Use of this type antifreeze can cause a gel-like deposit to form that reduces heat transfer and coolant flow. When wet, the gel becomes the same color as the coolant. When dry, it is a white, powdery deposit. Check container label or consult with antifreeze supplier before using.

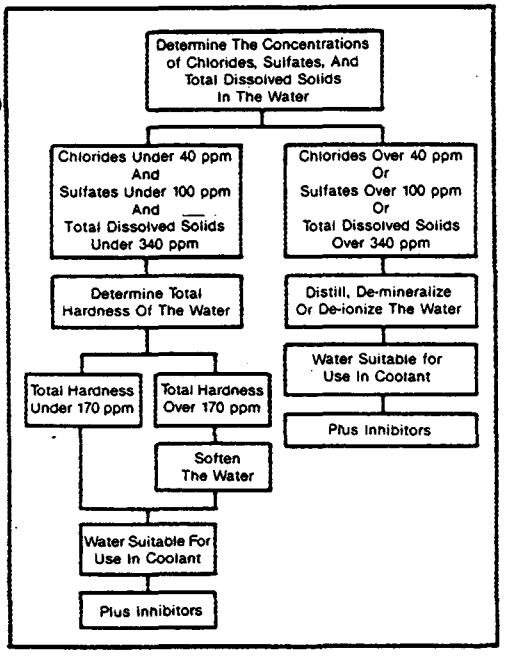
• Solutions containing 67 percent (maximum) to 50 percent (minimum) antifreeze are recommended.

• DO NOT use methyl alcohol base antifreeze. DO NOT use methoxy propanol antifreeze. Damage may occur to rubber seals on cylinder liners which are in contact with coolant.

(A)

	PARTS PER MILLION	GRAINS PER GALLON
Chlorides (Maximum)	40	2.5
Sulfates (Maximum)	100	5.8
Total Dissolved Solids (Maximum)	340	20
Total Hardness (Maximum)	170	10

(B)



RG5045 -19-28FEB89

S11,2000,FP1 -19-10NOV89

120190

3. Inhibitors:

John Deere RE23182 Liquid Coolant Conditioner is recommended for wet-sleeve diesel engines not having a coolant conditioner filter option. Other conditioners may be used if they contain non-chromate inhibitors.

IMPORTANT: If engine is equipped with a John Deere Coolant Filter Conditioner, the correct inhibitors are contained in the filter. If both are used, a gel-type deposit is created which could inhibit heat transfer and block coolant flow. John Deere Liquid Coolant Conditioner does not protect against freezing.

Various sizes of coolant conditioners are available from your John Deere dealer.

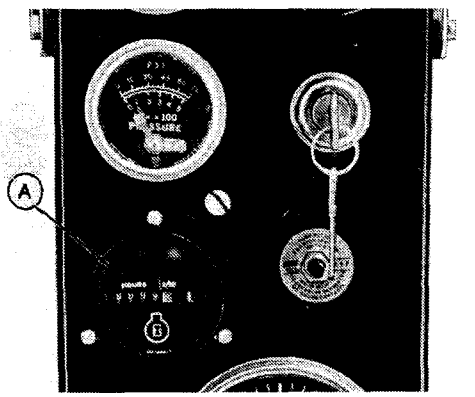
RG4690 -UN-14DEC88

S11,2000,FS -19-13NOV89

OBSERVE SERVICE INTERVALS

Using hour meter (A) as a guide, perform all services at the hourly intervals indicated on following pages. Keep track of services performed in Lubrication and Maintenance Record section.

IMPORTANT: Recommended service intervals are for average operating conditions. Service MORE OFTEN if engine is operated under adverse conditions.



S11,OMLM,BJ -19-21JAN86

USE CORRECT FUELS, LUBRICANTS AND COOLANT

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

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

S11,OMLM,B1 -19-13NOV89

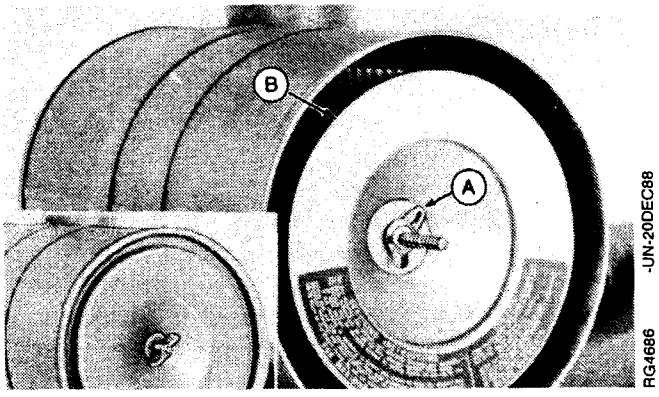
REMOVE AND INSPECT AIR CLEANER ELEMENTS

1. Remove wing nut and remove canister cover shown in small illustration inset.

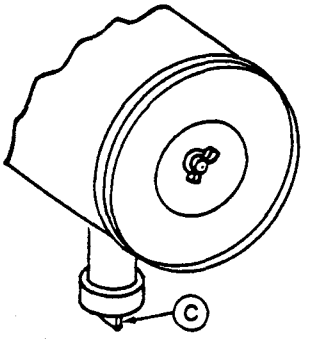
2. Remove wing nut (A) and remove primary element (B) from canister.

3. Thoroughly clean all dirt from inside canister.

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



RG4686 -UN-20DEC88

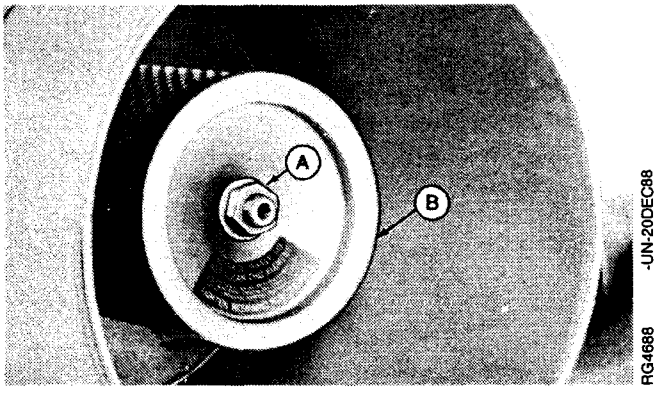


RG4687 -UN-20DEC88

S11,OMLM,FE -19-19DEC89

IMPORTANT: Remove secondary element (B) ONLY if it is to be replaced. DO NOT attempt to clean secondary element.

4. To replace secondary element, remove nut (A) and remove element. Immediately install a new element so dirt does not enter air intake system. (See Replace Air Cleaner Elements in Lubrication and Maintenance/Annual Service Section.)



RG4688 -UN-20DEC88

S11,OMLM,FF -19-15NOV89

CLEANING PRIMARY ELEMENT

1. Gently pat sides of element (A) to loosen dirt. DO NOT tap element against a hard surface.

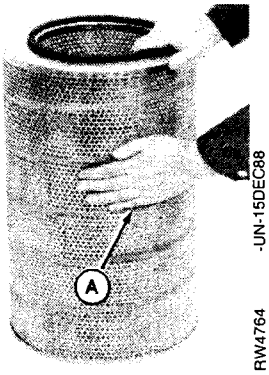
CAUTION: Reduce compressed air pressure to less than 210 kPa (2.1 bar) (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear proper protective safety equipment including eye protection.

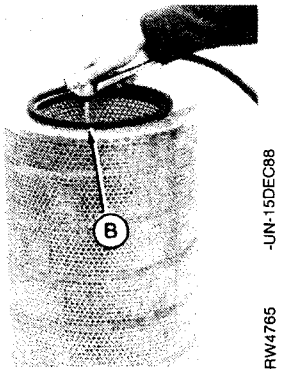
2. Using a John Deere AR62322 Dry Element Cleaner Gun (B), clean element with compressed air. Hold nozzle next to inner surface, and move up and down pleats.

IMPORTANT: Do not direct air against outside of element, as it might force dirt through to inside.

3. Repeat step 1 and 2 to remove additional dirt.

4. Inspect element before reinstalling.





S11,OMLM,AF -19-15NOV89

WASHING PRIMARY ELEMENT

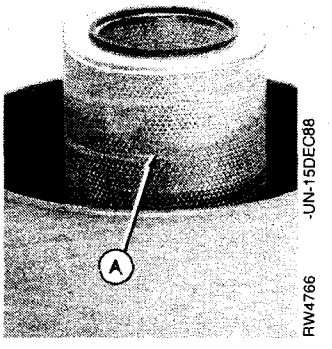
IMPORTANT: Never wash element in gasoline or any solvent. Never use compressed air on a wet element. Do not oil element.

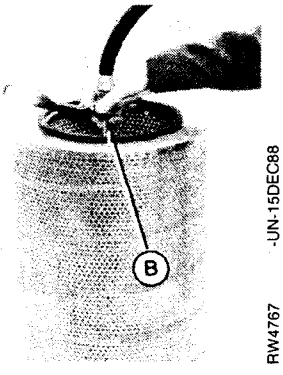
1. If element is coated with oil or soot, wash in a solution of warm water and John Deere R36757 Filter Element Cleaner. Let element soak at least 15 minutes (A), then agitate gently to flush out dirt.

2. Rinse element thoroughly from inside with clean water. Use element cleaning gun (B) or a free-running hose. Keep pressure under 280 kPa (2.8 bar) (40 psi) to avoid damaging filtering pleats.

3. Allow element to dry completely before using. This usually takes from one to three days. Do not oven dry or use drying agents. Protect element from freezing until dry.

4. Inspect element before installing.





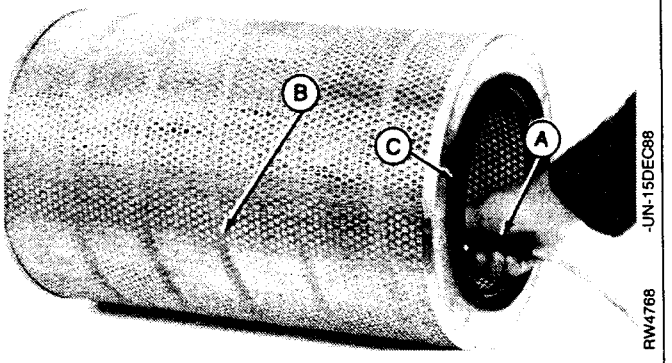
S11,OMLM,AG -19-15NOV89

INSPECT PRIMARY ELEMENT

1. Hold a bright light inside element (A) and check carefully for holes. Discard any element which shows the slightest hole.

2. Be sure outer screen (B) is not dented. Vibration would quickly wear a hole in filter.

3. Be sure filter gasket (C) is in good condition. If gasket is damaged or missing, replace element.



S11,OMLM,AH -19-24JAN85

ELEMENT STORAGE

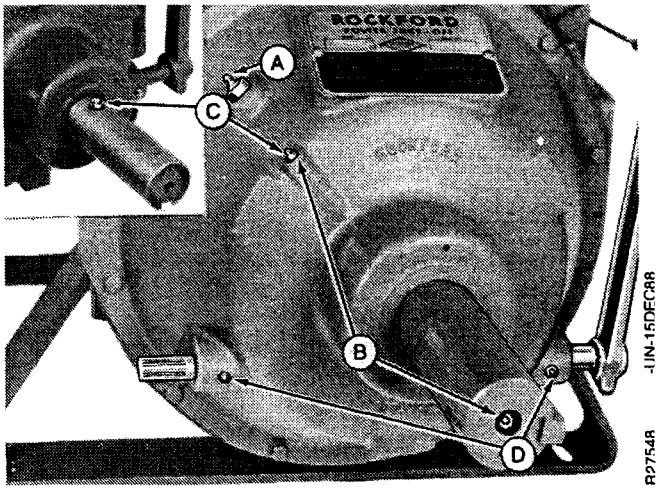
Seal element in a plastic bag and store in shipping container to protect against dust and damage.

S11,OMLM,AI -19-24JAN85

SHAFT

)eere Multipurpose
:h drive shaft bearing
'icate to avoid getting

**'ing fitting (A) daily or
ls for continuous
'estarting Checks
aft fittings (D) at
. (See 600-Hour
ction.)**



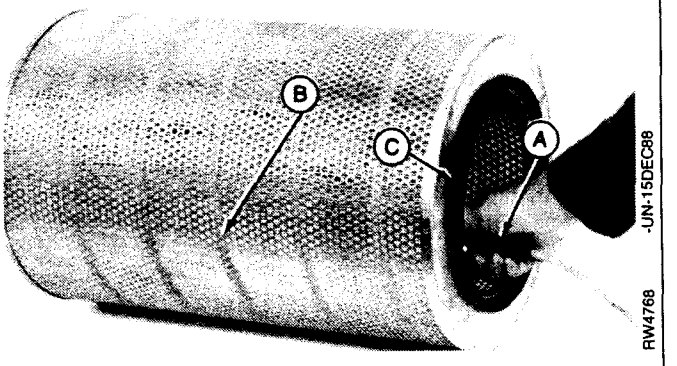
S11,OMLM,C -19-18FEB85

INSPECT PRIMARY ELEMENT

1. Hold a bright light inside element (A) and check carefully for holes. Discard any element which shows the slightest hole.

2. Be sure outer screen (B) is not dented. Vibration would quickly wear a hole in filter.

3. Be sure filter gasket (C) is in good condition. If gasket is damaged or missing, replace element.



S11,OMLM,AH -19-24JAN85

ELEMENT STORAGE

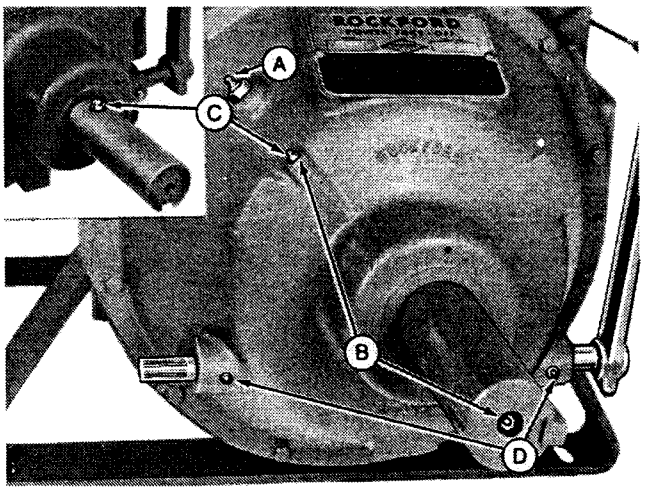
Seal element in a plastic bag and store in shipping container to protect against dust and damage.

S11,OMLM,AI -19-24JAN85

LUBRICATE PTO CLUTCH SHAFT BEARINGS

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

IMPORTANT: Lube release bearing fitting (A) daily or at 10 hour intervals for continuous operation. (See Prestarting Checks section.) Lube shaft fittings (D) at 600-hour intervals. (See 600-Hour Service in this section.)



S11,OMLM,C -19-18FEB85

SERVICE BATTERY

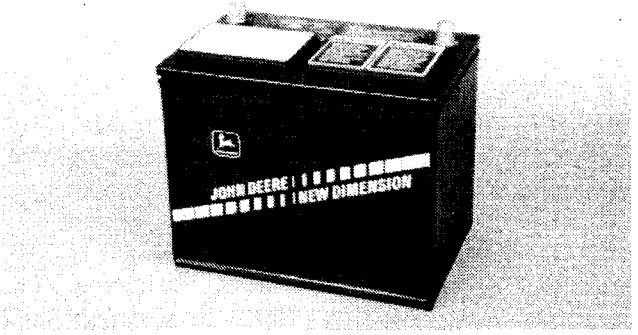
TS204 -UN-23AUG88

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

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

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

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



RG4694 -UN-15DEC88

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

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

2. Keep batteries clean by wiping them with a damp cloth. Keep all connections clean and tight. Remove any corrosion, and wash terminals with a solution of 1 part baking soda and 4 parts water. Tighten all connections securely.

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

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

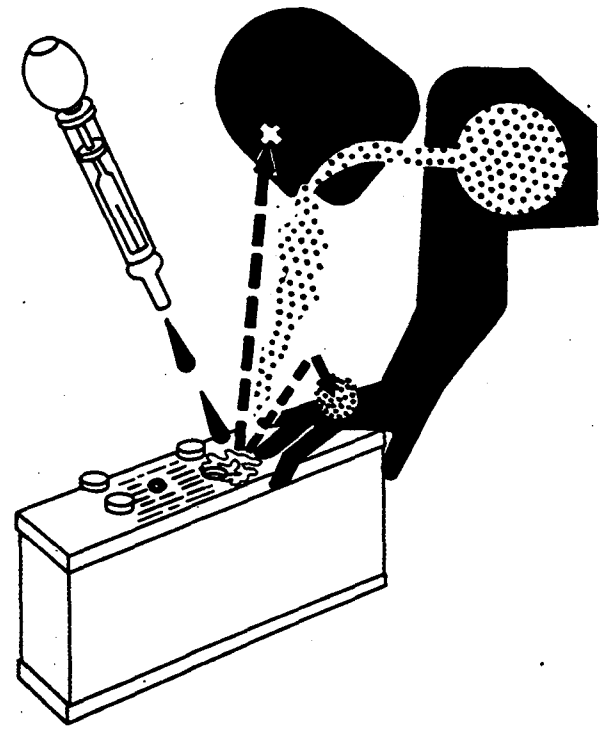
S55,OMLM,P -19-21DEC89

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

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

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

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



TS203 -UN-23AUG88

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

Std. Duty Starter	640 Cold Cranking Amps
Heavy Duty Starter	800 Cold Cranking Amps

S55,OMLM,Q -19-21DEC89

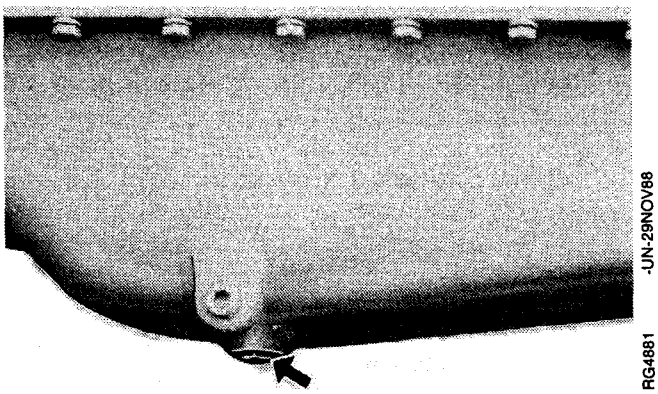
CHANGE ENGINE OIL AND FILTER

1. Run engine approximately 5 minutes to warm up oil. Shut engine off.

2. Drain oil while warm.

3. Remove plug (arrow) and drain oil from engine crankcase.

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



RG4881 -UN-29NOV88

S11,OMLM,CW -19-21MAY87

4. Remove oil filter element (A).

5. Remove oil filter packing and clean filter mounting pad. 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 one turn after packing contacts filter housing. DO NOT overtighten filter element.

6. Install drain plug.

7. Fill crankcase with correct engine oil through rocker arm cover opening or on some engine applications, the timing gear cover opening.

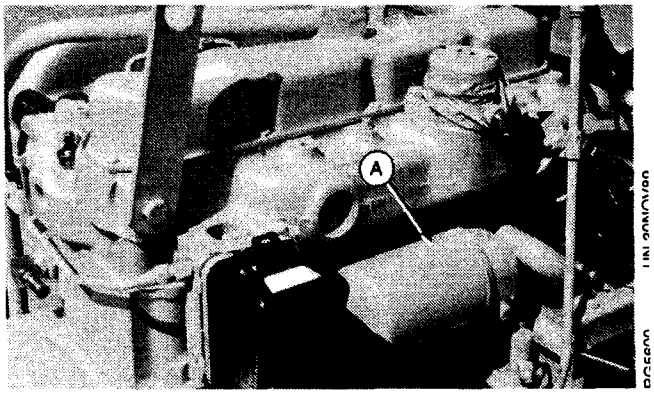
Engine Model	Option Code	Crankcase Oil Capacity
4039DF	4001, 4002, 4005	8.5L (9.0 qt)
4039DF	4006, 4007, 4010	8.5L (9.0 qt)
4039TF	4001, 4005, 4006	12.5L (13.0 qt)
4039TF	4002	13.5L (14.5 qt)
4039TF	4008, 4009	11.5L (12.0 qt)
4045DF	4001	8.5L (9.0 qt)
4045DF	4003	12.5L (13.0 qt)
4045TF	4004, 4005	12.5L (13.0 qt)
6059DF, TF	4001, 4010, 4012	17.0L (18.0 qt)
6059DF, TF	4004	11.5L (12.0 qt)
6059DF, TF	4005	14.0L (15.0 qt)
6059DF, TF	4007, 4011, 4015	15.0L (16.0 qt)
6068DF	4001	18.0L (19.0 qt)
6068TF	4001	19.0L (20.0 qt)

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

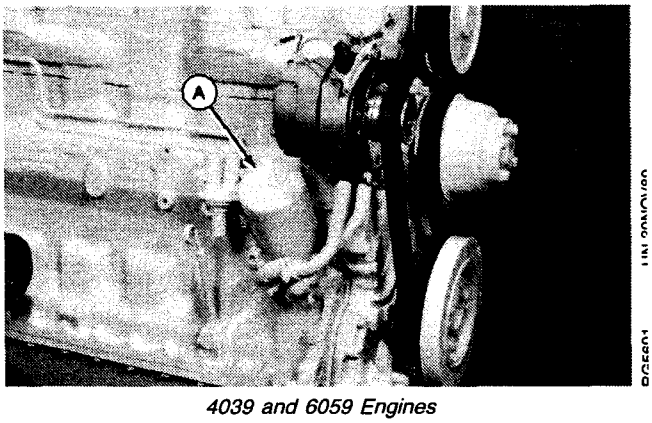
IMPORTANT: Immediately after completing any change, crank engine for 30 seconds without depressing reset button on instrument panel. This will help insure adequate lubrication to engine components before engine starts.

8. Start engine and run to check for possible leaks.

9. Stop engine and check oil level after 10 minutes. Oil level reading should be on upper mark of dipstick.



4045 and 6068 Engines



4039 and 6059 Engines

INSPECT, CHECK, AND ADJUST FAN AND ALTERNATOR BELT TENSION

1. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary. (See Replace Fan and Alternator Belts in Service Section.)

2. Use one of the following methods to check fan and alternator belt tension with the belt warm.

- JDG529 Belt Tension Gauge (arrow) or equivalent belt tension gauge (for use on standard V-belts), capable of measuring 579—623 N (130—140 lb force).

- Tension tester (A)/straightedge (B).

NOTE: Poly V-belt tension is measured by deflection method with a tension tester and straightedge.

Run engine for 5 minutes if belt is cold. If belt is hot, let engine cool for 10—15 minutes. If engine has dual belts, check front belt tension only.

3. If belts need adjustment, loosen alternator bracket cap screw (C) and nut (D) on mounting bolt.

Apply outward pressure to alternator front frame until belt tension is correct.

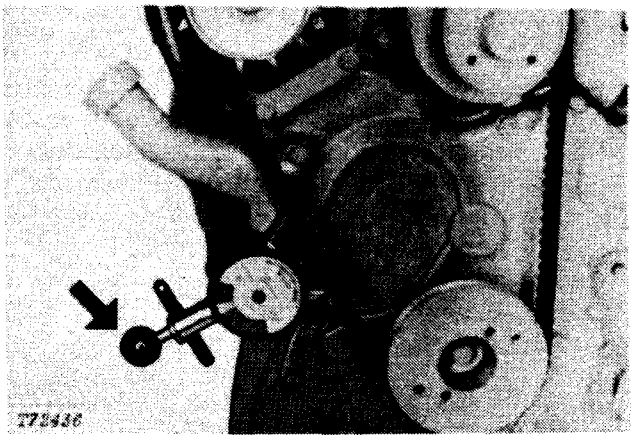
4. Tighten alternator bracket cap screw and nut securely.

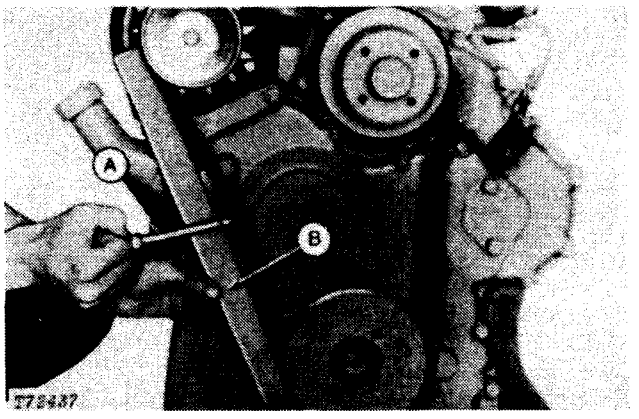
5. Immediately after a 10 minute run-in of a new or used belt, recheck belt tension.

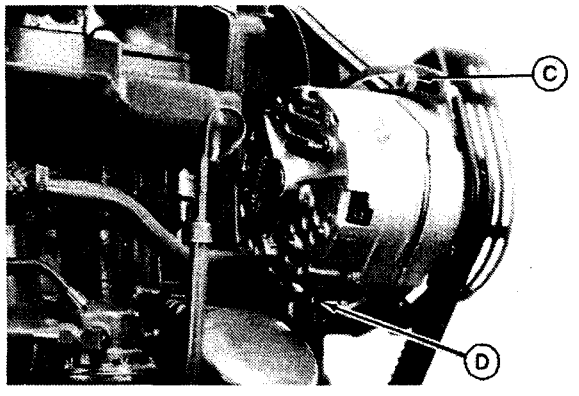
6. If tension is not within specifications, wait 10 minutes, loosen belt and retighten to used belt strand tension.

Tension Tester/Straightedge Method:

An 89 N (20 lb force) halfway between the pulleys should deflect the belt 19 mm (3/4 in.). Use a straightedge (B) when measuring distance belt moves.







	Standard V-Belts Tension New Belt	 Tension Used* Belt
Single Belt	578—622 N (130—140 lb force)	378—423 N (85—94 lb force)
Dual Belt	423—467 N (95—104 lb force)	378—423 N (85—94 lb force)

Single Poly V-Belts
Tension New And Used* Belt

Tension Tester/Straightedge Method:

- A 130 N (30 lb force) applied halfway between pulleys should deflect belt 13 mm (1/2 in.)

**Belts are considered used after 10 minutes of operation.*

S11,OMLM,CY -19-13NOV89

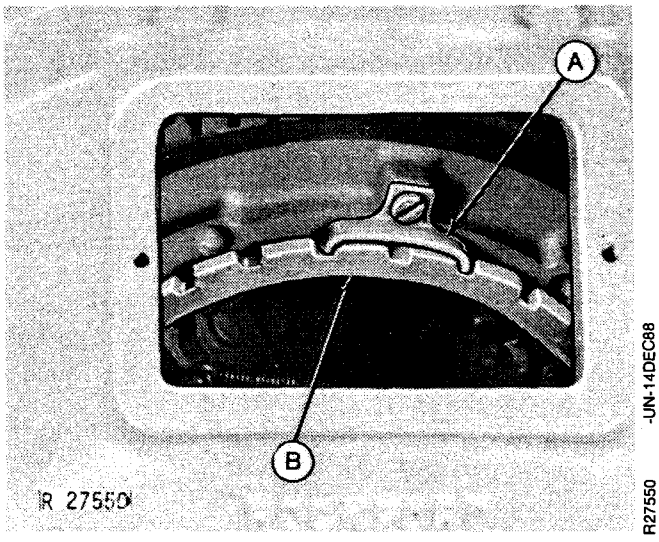
CHECK PTO CLUTCH ADJUSTMENT

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

TS198 -UN-23AUG88

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

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



R27550 -UN-14DEC88

2. If adjustments are needed, disengage clutch and stop engine. Remove cover plate from clutch housing (shown removed).

3. Remove adjusting lock (A).

4. Turn adjusting ring (B) to adjust clutch engagement pressure.

5. Measure engagement pressure at clutch handle with spring scale.

6. Install adjusting lock and tighten screw securely.

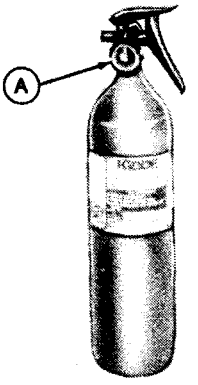
7. Install cover plate and recheck clutch engagement force.

S11,OMLM,CZ -19-14NOV89

SERVICE 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 a record of inspections on the tag which comes with the extinguisher instruction booklet.



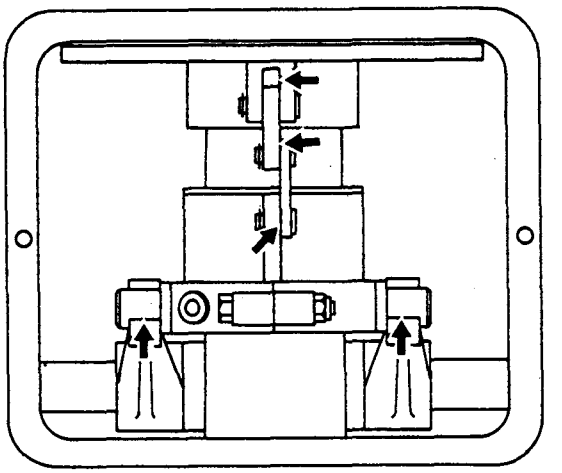
RW4918 -UN-15DEC88

S11,OMLM,AP -19-13FEB86

LUBRICATE PTO CLUTCH INTERNAL LEVERS AND LINKAGE

1. Remove the PTO housing cover and apply one shot of John Deere Multipurpose Lubricant to each pivot point of each clutch linkage (upper three arrows).

2. Apply one shot of John Deere Multipurpose Lubricant to PTO lever shaft fittings (lower two arrows).



RG01044

RG1044 -UN-15DEC88

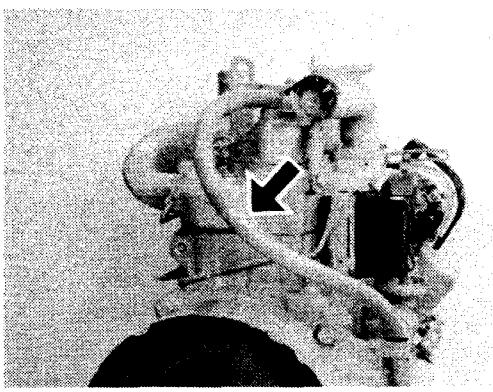
S11,OMLM,I -19-18FEB85

CLEAN CRANKCASE VENT TUBE

1. Remove and clean crankcase vent tube (arrow).

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

2. Install the vent tube. Be sure the O-ring fits correctly in the rocker arm cover.



T5953AJ -UN-10FEB89

S11,OMLM,DA -19-14NOV89

ADJUST ENGINE VALVE CLEARANCE (FIRST 600-HOUR INTERVAL)

After the first 600 hours of operation on a new or rebuilt engine, adjust the engine valve clearance. Adjust valve clearance at the normal 1200-hour interval thereafter.

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

S1,OMLM,DB -19-14NOV89

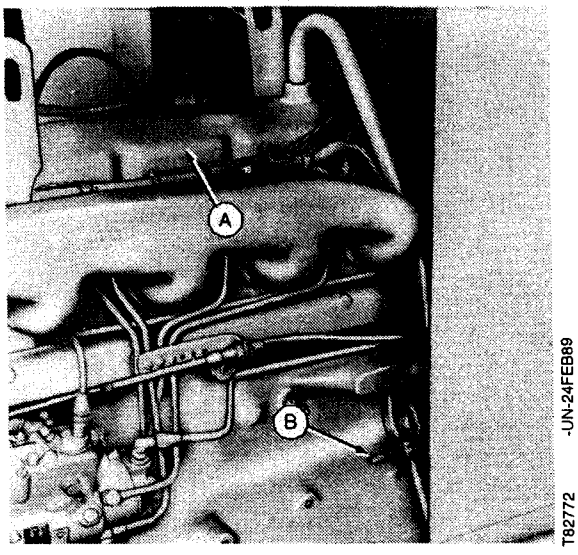
ADJUST ENGINE VALVE CLEARANCE

IMPORTANT: Any time the air intake system is opened, it must be checked for leaks before the machine is returned to service. (See Check Air Intake Hoses in this section.)

The engine valve clearance can be checked and/or adjusted with the engine cold or hot.

1. Remove valve cover (A).

2. Rotate engine flywheel in running direction (clockwise viewed from water pump) using the JDE83 or JDE81-1 Engine Rotation Tool until No. 1 piston (front) has reached top dead center (TDC) on compression stroke. Insert timing pin (B) or JDE81-4 Timing Pin into flywheel. See your authorized servicing dealer or engine distributor to obtain these tools.



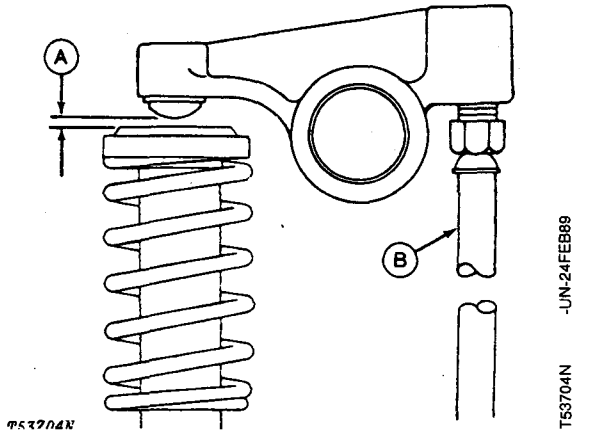
T82772 -UN-24FEB89

S11,OMLM,DC1 -19-14NOV89

3. The engine valve clearance (A) is adjusted at two flywheel positions. Both positions are at top dead center (TDC) of No. 1 piston.

- TDC of compression stroke—Both valves of No. 1 cylinder are closed and both push rods (B) are loose.

- TDC of exhaust stroke—Exhaust valve is closing (push rod will not be loose) and intake valve will start to open.

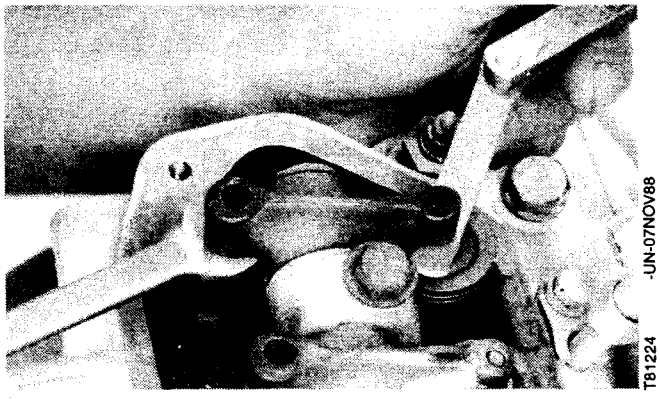


T53704N -UN-24FEB89

S11,OMLM,DD1 -19-14NOV89

4. Use a feeler gauge to check valve clearance, and if not correct; turn the adjusting screw until valve clearance is correct. See the valve location drawing on the following page for your engine: 4-cylinder or 6-cylinder.

- Exhaust valve clearance: 0.46 mm (0.018 in.)
- Intake valve clearance: 0.36 mm (0.014 in.)



S11,OMLM,DE1 -19-21DEC89

- 4-Cylinder Engine:

No. 1 piston at TDC of compression stroke (D), adjust Nos. 1 and 3 exhaust valves (B) and Nos. 1 and 2 intake valves (C).

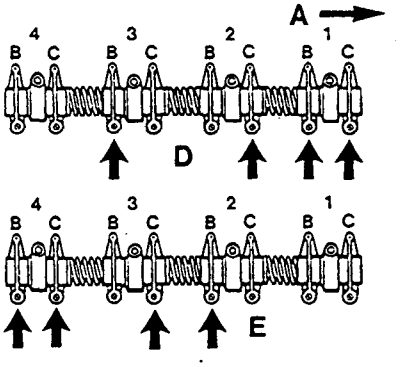
No. 1 piston at TDC of exhaust stroke (E), adjust Nos. 2 and 4 exhaust valves (B) and Nos. 3 and 4 intake valves (C).

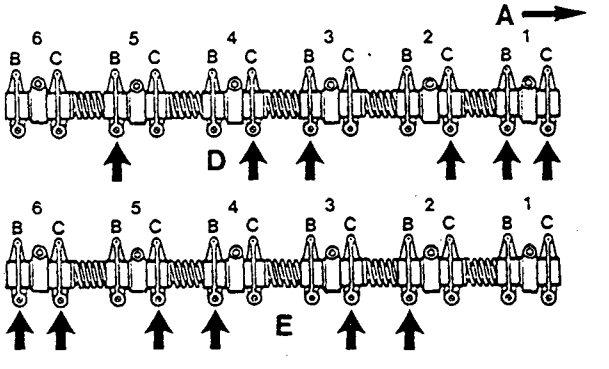
- 6-Cylinder Engine:

No. 1 piston at TDC of compression stroke (D), adjust Nos. 1, 3, and 5 exhaust valves (B) and Nos. 1, 2, and 4 intake valves (C).

No. 1 piston at TDC of exhaust stroke (E), adjust Nos. 2, 4, and 6 exhaust valves (B) and Nos. 3, 5, and 6 intake valves (C).

5. When all valve clearances are correct, install valve cover and timing pin or flywheel housing plugs. If disconnected, reconnect the air intake system and check hoses for leaks.





S11,OMLM,DF1 -19-11JUN86

CHECK AIR INTAKE HOSES

Check the clamps on the hoses which connect the air cleaner, engine and, if present, turbocharger. If necessary, tighten the hose clamps. Inspect the hoses for cracks.

IMPORTANT: The air intake system must not leak. Any leak, no matter how small, may result in engine failure.

S11,OMLM,DG -19-05AUG86

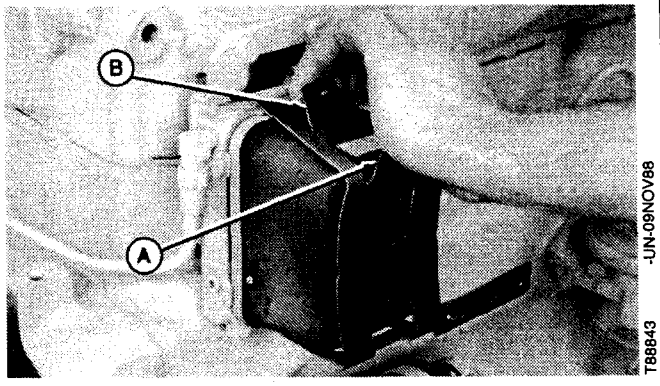
REPLACE FUEL FILTER ELEMENT

1. Close the fuel shut-off valve at bottom of fuel tank, if equipped.

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

2. Loosen bleed plug on side of filter base. Remove drain plug from bottom of filter base to drain fuel from filter.

3. Push tab (A) inward while lifting tab (B) upward and release the retaining spring. Pull fuel filter off fuel filter body.



S11,3010,RF1 -19-16NOV89

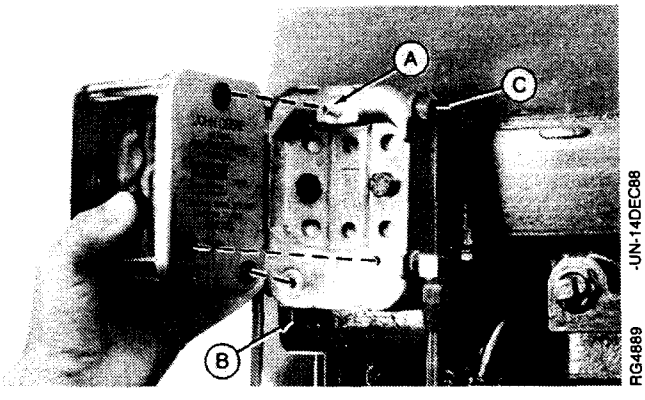
4. Place filter on filter body with upper seal over spring pin on filter body.

5. Hook bottom end of retaining spring first; then hook the top end.

6. Install drain plug. Tighten drain plug securely.

7. Open fuel shut-off valve and bleed filters. (See Bleed Fuel System in Service Section.) Tighten bleed plug.

A—Spring Pin
B—Drain Plug
C—Bleed Plug



S11,OMLM,DK -19-11JUN86

ENGINE SPEEDS

If equipped with a tachometer on the instrument panel, observe the tachometer to verify engine speeds. See your authorized servicing dealer or engine distributor for any necessary speed adjustments.

Slow idle speeds are set at 800—850 rpm at the producing factory on all engines. Equipment manufacturers will usually reset slow idle according to specific application. Refer to your machine technical manual for this specification.

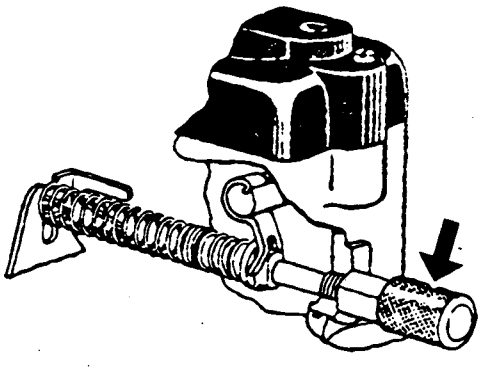
Recommended fast idle and rated full load engine speeds on standard governor engines are as follows:

Engine	Fast Idle RPM	Rated Full Load RPM
4039DF	2700	2500
4039TF	2700	2500
4045DF	2600	2400
4045TF	2600	2400
6059DF	2700	2500
6059TF	2700	2500
6068DF	2600	2400
6068TF	2600	2400

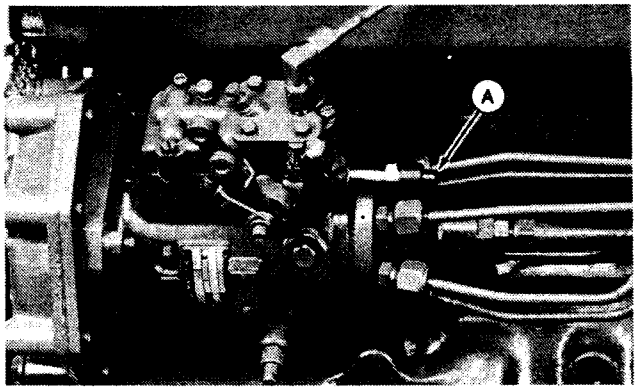
Generator set engines (3—5% governor) usually run at 1500 rpm (50 Hz) or 1800 rpm (60 Hz) when operating under load depending on cycles of AC current. Fast idle speed is usually 3—5% faster (100 rpm maximum).

S11,OMOE,DL1 -19-15NOV89

ADJUST VARIABLE SPEED ON GENERATOR SET ENGINES (STANADYNE INJECTION PUMPS ONLY)


T86735 -UN-23FEB89

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



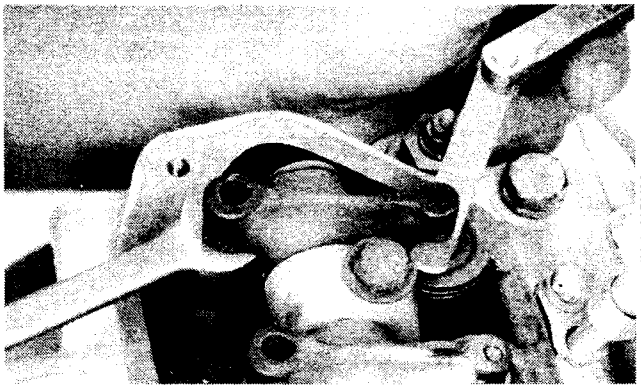
RG4890 -UN-14DEC88

S11,OMLM,DM -19-03JUL86

ADJUST ENGINE VALVE CLEARANCE

Adjust engine valve clearance. (See Adjust Engine Valve Clearance in Lubrication and Maintenance/600 Hour or have your authorized servicing dealer or engine distributor adjust the valve clearance.)

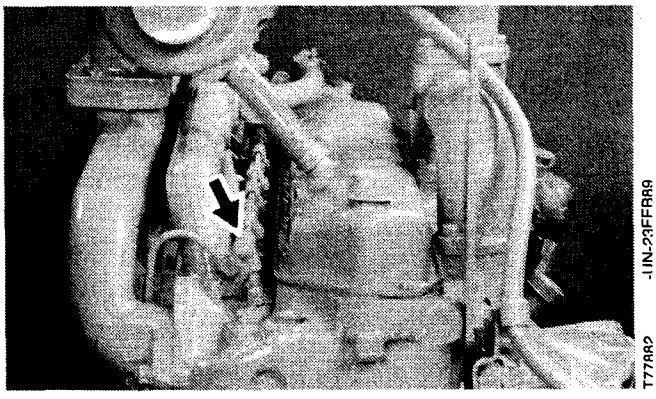
IMPORTANT: Have valves adjusted after the first 600 hours of operation on new or rebuilt engines. Then, have them adjusted at 1200-hour interval thereafter.


T81224 -UN-07NOV88

S11,OMLM,DN -19-15NOV89

CHECK FUEL INJECTION SYSTEM

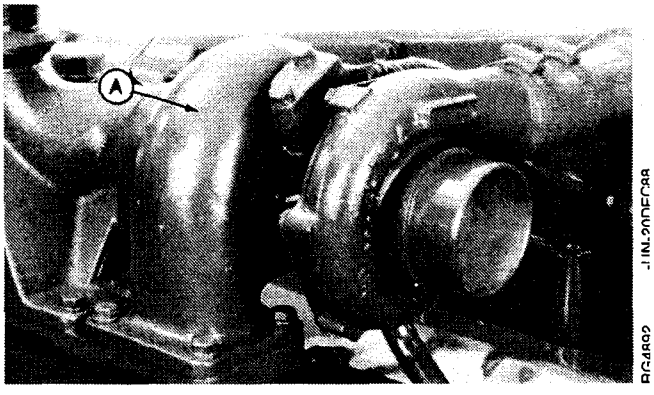
Check the overall fuel injection system. Also check the engine/injection pump timing, clean the injection nozzles, and adjust opening pressure. Check and adjust speed advance. (See your authorized diesel injection repair station, servicing dealer or engine distributor.)



S11,OMLM,DO -19-15NOV89

INSPECT TURBOCHARGER

On turbocharged engines, check for excessive radial or axial end play of compressor wheel (A) and turbocharger boost pressure. (See your authorized servicing dealer or engine distributor.)

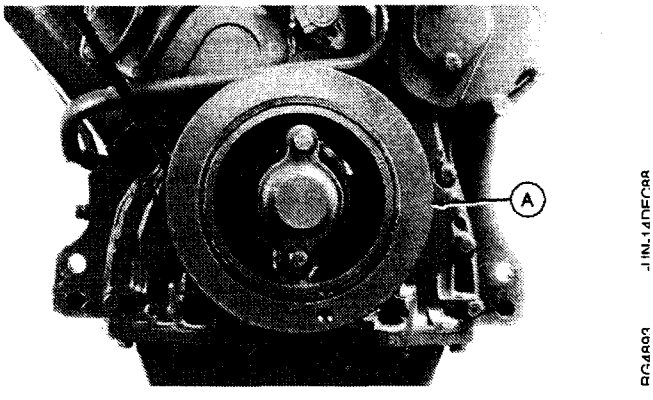


S11,OMLM,DP -19-15NOV89

CHECK CRANKSHAFT VIBRATION DAMPER

Grasp vibration damper (A) with both hands and attempt to turn it in both directions. If rotation is felt, damper is malfunctioning and should be replaced.

NOTE: The vibration damper assembly is not repairable and should be replaced every 5 years or 4500 hours, whichever occurs first.



S11,OMLM,DU -19-11JUN86

REPLACE AIR CLEANER ELEMENTS

If equipped with this air cleaner, service as follows:

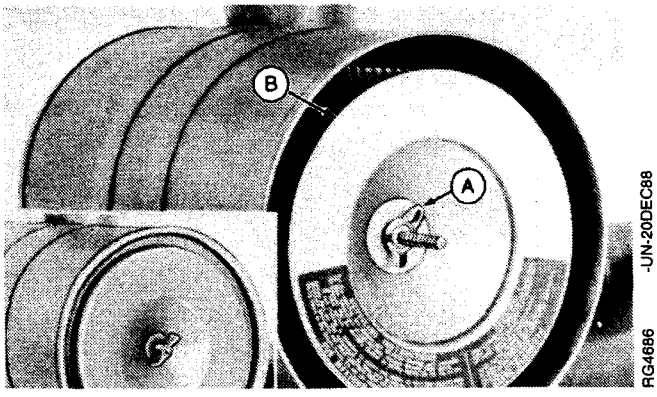
1. Remove wing nut and remove cover shown in small illustration inset.

2. Remove wing nut (A) and remove primary air cleaner assembly (B) from canister.

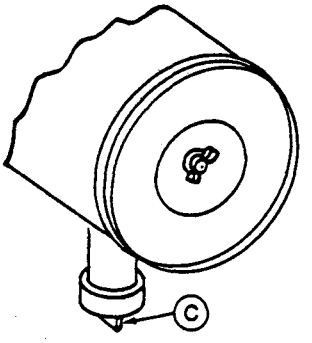
NOTE: Primary air cleaner element fits snugly in canister. It may be necessary to wiggle element as it is removed from canister.

3. Thoroughly clean all dirt from inside of canister.

4. If equipped, squeeze dust unloader valve (C) to discharge any trapped dirt particles. Inspect as instructed in Step 2 of Check Air Intake System, later in this section.



RG4686 -UN-20DEC88



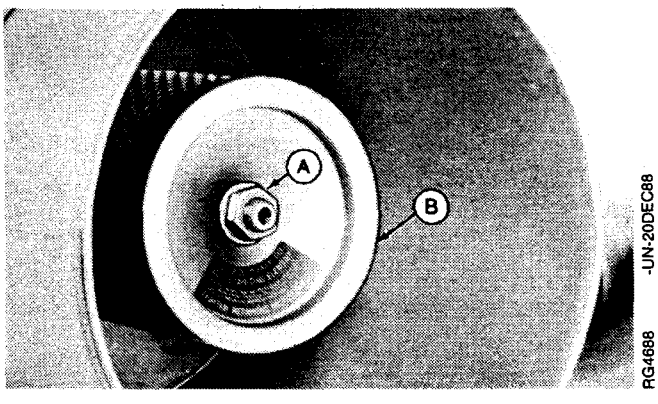
RG4687 -UN-20DEC88

S55,OMLM,R -19-21DEC89

IMPORTANT: Thoroughly clean all dirt from inside of canister before removing secondary element.

5. Remove retaining nut (A) and secondary element (B). Replace secondary element with new element immediately to prevent dust from entering air intake system.

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



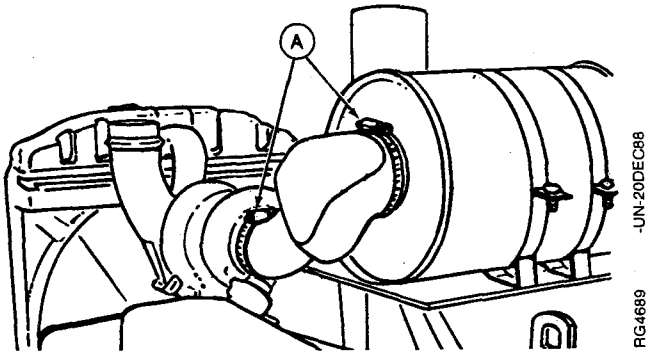
RG4688 -UN-20DEC88

S55,OMLM,S -19-21DEC89

CHECK AIR INTAKE SYSTEM

1. Check the clamps (A) on the piping which connect the air cleaner to the engine. Tighten the clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.

2. If engine has a rubber dust unloader valve, inspect the valve on bottom of air cleaner for cracks or plugging. Replace as necessary.



S11,OMLM,DS -19-11JUN86

CHECK COOLING SYSTEM

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

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

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

1. Check entire cooling system for leaks. Tighten all clamps securely.

2. Replace hoses when hard, flimsy, or cracked.

3. In tropical areas when John Deere Liquid Coolant Conditioner is used with clean, soft water; drain, flush and add new coolant as specified in Fuels, Lubricants, and Coolant Section.

S11,OMLM,DT1 -19-15NOV89

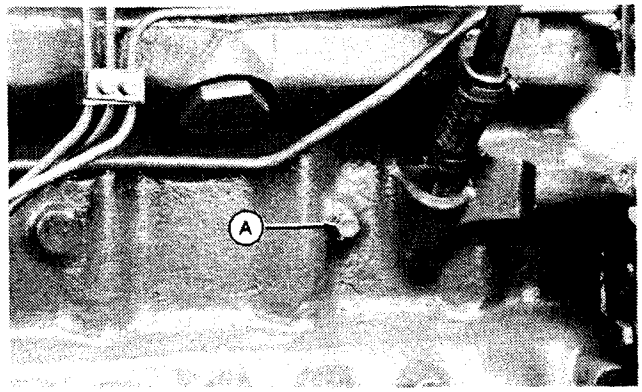
FLUSH COOLING SYSTEM AND REPLACE THERMOSTATS

TS281 -UN-23AUG88

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

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

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



RG4894 -UN-14DEC88

1. Slowly open the engine cooling system filler cap or radiator cap to relieve pressure and allow faster coolant draining.

2. Open radiator drain or heat exchanger engine coolant drain.

3. On left side of engine, open drain cock or remove drain plug (A) from engine block.

4. Close all drain valves after coolant has drained.

5. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.

6. Stop engine and immediately drain the water from system before rust and sediment settle.

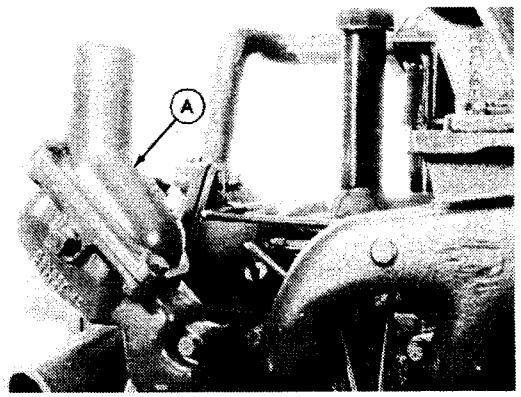
7. After draining water, close drain valves and fill the cooling system with a good commercial radiator cleaner and water. Follow the instructions with the cleaner.

8. After cleaning the cooling system, fill with water to flush the system. Run the engine about 10 minutes, then drain out flushing water.

S11,OMLM,DV1 -19-15NOV89

9. For thermostat replacement, remove cap screws and thermostat cover (A).

NOTE: Some engines have only one thermostat. Illustration shows the two-thermostat engine.



S11,OMLM,DX1 -19-15NOV89

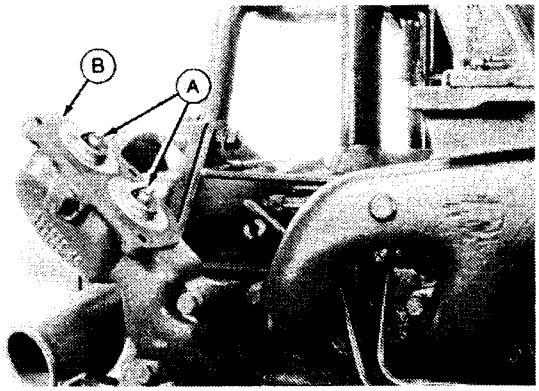
10. Remove and discard thermostats (A) and all gasket material (B).

11. Apply gasket sealant to new gasket and install.

12. Install new thermostats and cover. Tighten all cap screws to 27 N·m (20 lb-ft).

13. Close all drain valves on the engine and the radiator or heat exchanger.

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.



14. Fill cooling system with coolant. Follow recommendations given on the following page under "Adding Coolant".

15. Run engine until it reaches operating temperature. This mixes coolant and water uniformly and circulates it through the entire system. The normal engine coolant temperature range is 70°—90°C (160°—195°F).

NOTE: Radiator coolant level should be approximately 19 mm (3/4 in.) below bottom of radiator filler neck.

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

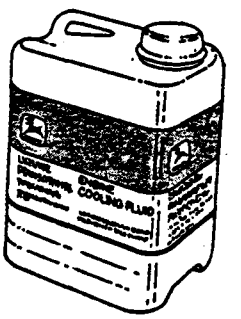
S11,OMLM,DY -19-15NOV89

ADDING COOLANT

TS281 -UN-23AUG88

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 relevel pressure before removing completely.



RG5214 -UN-14DEC88

IMPORTANT: When adding coolant to the system, use a solution of 50—67 percent John Deere Low Silicate Antifreeze and 33—50 percent CLEAN, SOFT WATER. John Deere Engine Cooling Fluid may be used as is where available (pre-mixed, no mixing required).

- **Never use a cooling system sealing additive. Never use a coolant solution containing less than 10 percent ethylene glycol.**
- **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.**

RG4690 -UN-14DEC88

RE23182 Liquid Coolant Conditioner may be used with a low silicate, ethylene glycol antifreeze if neither John Deere Low Silicate Antifreeze nor, John Deere Cooling Fluid is available.

Engines using John Deere Liquid Coolant Conditioner must be drained, flushed and refilled every year.

John Deere Liquid Coolant Conditioner does not protect the cooling system from freezing.

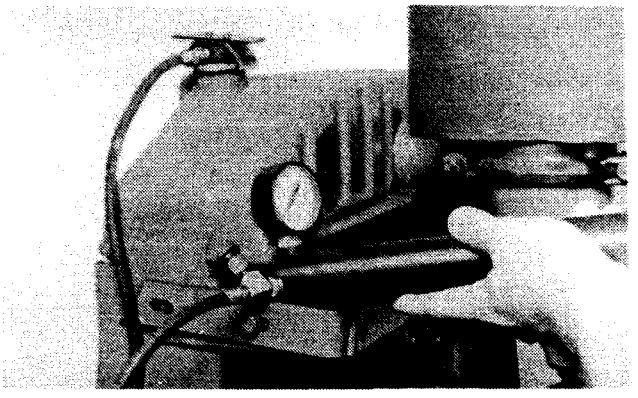
IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled.

S11,OMLM,DZ1 -19-15NOV89

120190

PRESSURE TEST COOLING SYSTEM

1. Pressure test cooling system and radiator cap to insure efficient operation and eliminate the chance of engine damage due to overheating as a result of coolant loss. (See your authorized servicing dealer or engine distributor.)



RG7819GD1 -UN-14DEC88

S11,OMLM,BC -19-20NOV85

Engine Tune-Up

ENGINE TUNE-UP/1200 HOUR OR 2 YEAR

An engine tune-up is recommended every 1200 hours or two years, whichever comes first. Have your authorized servicing dealer or engine distributor perform the following checks and services:

- Change oil and filter. (Lubrication and Maintenance/250 Hour.)
- Check electrical system. (Lubrication and Maintenance/250 Hour.)
- Lubricate PTO clutch internal levers and linkage. (Lubrication and Maintenance/600 Hour.)
- Clean crankcase vent tube. (Lubrication and Maintenance/600 Hour.)
- Replace fuel filters. (Lubrication and Maintenance/600 Hour.)
- Check, and adjust if necessary, engine valve clearance. (Lubrication and Maintenance/600 and 1200 Hour.)
- Check, and adjust if necessary, engine speeds. (Lubrication and Maintenance/1200 Hour.)
- Check fuel injection system: Check, and if necessary, adjust injection pump speed advance and timing, clean injection nozzles and adjust opening pressure. (Lubrication and Maintenance/1200 Hour.)
- Inspect turbocharger and check turbocharger boost pressure on turbocharged engines. (Lubrication and Maintenance/1200 Hour.)
- Check air intake system and replace air cleaner elements. (Lubrication and Maintenance/Annual.)
- Check crankshaft vibration damper. (Lubrication and Maintenance/1200 Hour.)
- Check and service engine cooling system. (Lubrication and Maintenance/2 Year.)
- Check engine oil pressure. Adjust, if necessary. (See your authorized servicing dealer or engine distributor.

S55,OMTU,B -19-21DEC89

Troubleshooting

ENGINE

Symptom	Problem	Solution
Engine hard to start or will not start	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 dealer or engine distributor check injectors.
	Injection pump shut-off not reset.	Turn key switch to "OFF" then to "ON".
Engine knocks	Insufficient oil.	Add oil.
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Low coolant temperature.	Remove and check thermostat.
	Engine overheating.	See "Engine Overheats".
Engine runs irregularly or stalls frequently	Low coolant temperature.	Remove and check thermostat.
	Clogged fuel filter.	Replace filter element.
	Water, dirt, or air in fuel system.	Drain, flush, fill, and bleed system.
	Dirty or faulty injection nozzles.	Have authorized dealer or engine distributor check injectors.
Below normal engine temperature	Defective thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check gauge, sender, and connections.
Lack of power	Engine overloaded.	Reduce load.

Continued on next page

Symptom	Problem	Solution
	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. (Turbocharged engines only.)	See your authorized servicing dealer or engine distributor.
	Leaking exhaust manifold gasket.	See your authorized servicing dealer or engine distributor.
	Defective aneroid control line.	See your authorized servicing dealer or engine distributor.
	Restricted fuel hose.	Clean or replace fuel hose.
	Low fast idle speed	See your authorized servicing dealer or engine distributor.
Low oil pressure	Low oil level.	Add oil.
	Improper type of oil.	Drain, fill crankcase with oil of proper viscosity and quality.
High oil consumption	Crankcase oil too light.	Use proper viscosity oil.
	Oil leaks.	Check for leaks in lines, gaskets and drain plug.
	Restricted crankcase vent tube.	Clean vent tube.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
Engine emits white smoke	Improper type of fuel.	Use proper fuel.

Continued on next page

Symptom	Problem	Solution
	Low engine temperature.	Warm up engine to normal operating temperature.
	Defective thermostat.	Remove and check thermostat.
	Defective injection nozzles.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
Engine emits black or gray exhaust smoke	Improper type of fuel.	Use proper fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
	Engine overloaded.	Reduce load.
	Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.
Engine Overheats	Engine overloaded.	Reduce load.
	Low coolant level.	Fill radiator to proper level, check radiator and hoses for loose connections or leaks.
	Faulty radiator cap.	Have serviceman check.
	Loose or defective fan belts.	Adjust belt tension. Replace as required.
	Low engine oil level.	Check oil level. Add oil as required.
	Cooling system needs flushing.	Flush cooling system.
	Defective thermostat.	Remove and check thermostat.
	Defective temperature gauge or sender.	Check water temperature with thermometer and replace, if necessary.
	Incorrect grade of fuel.	Use correct grade of fuel.
High fuel consumption	Improper type of fuel.	Use proper type of fuel.
	Clogged or dirty air cleaner.	Service air cleaner.

Continued on next page

Symptom	Problem	Solution
	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.

S11,OMTS,Z -19-18JUL86

ELECTRICAL SYSTEM

Symptom	Problem	Solution
Undercharged System	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter or alternator.	Inspect and clean as necessary.
	Defective battery.	Test battery.
	Defective regulator.	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.
	Loose or defective alternator belt.	Adjust belt tension or replace belts.
Starter inoperative	PTO engaged.	Disengage PTO.
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output.	See your authorized servicing dealer or engine distributor.
	Faulty or misadjusted starter safety switch or starter solenoid malfunction.	See your authorized servicing dealer or engine distributor.
	Blown fuse (MDL-25)	Replace fuse.
Starter cranks slowly	Low battery output.	See your authorized servicing dealer or engine distributor.
	Crankcase oil too heavy.	Use proper viscosity oil.
	Loose or corroded connections.	Clean and tighten loose connections.

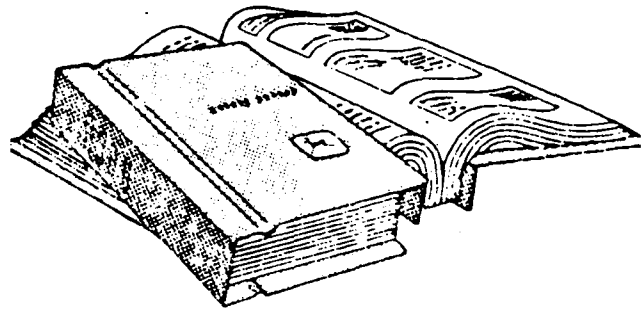
Continued on next page

Symptom	Problem	Solution
Starter and hour meter functions; rest of electrical system does not function	Blown fuse on magnetic switch	Replace fuse. (14 amp)
Entire electrical system does not function	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries	See your authorized servicing dealer or engine distributor.
	Blown fuse (MDL-25)	Replace fuse.

S11,OMTS,AB -19-02JUL86

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.



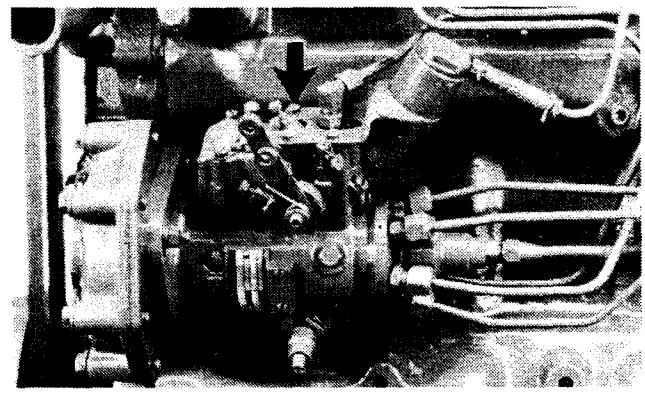
RG4624 -UN-15DEC88

S11,OMSE,AL -19-10JUN86

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. See warranty information inside front cover.

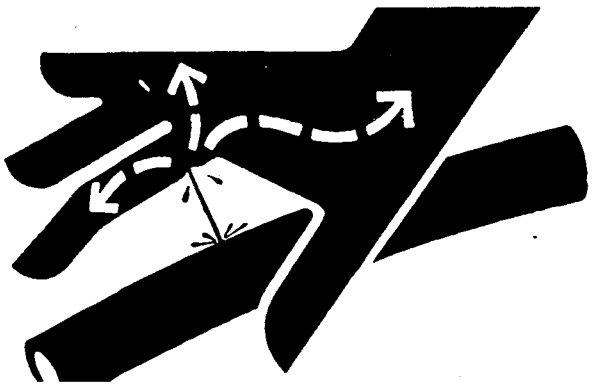
Do not attempt to service injection pump or fuel injectors yourself. Special training and special tools are required. (See your authorized servicing dealer or engine distributor.)



RG4898 -UN-14DEC88

S11,OMSE,AM -19-10JUN86

BLEED THE FUEL SYSTEM



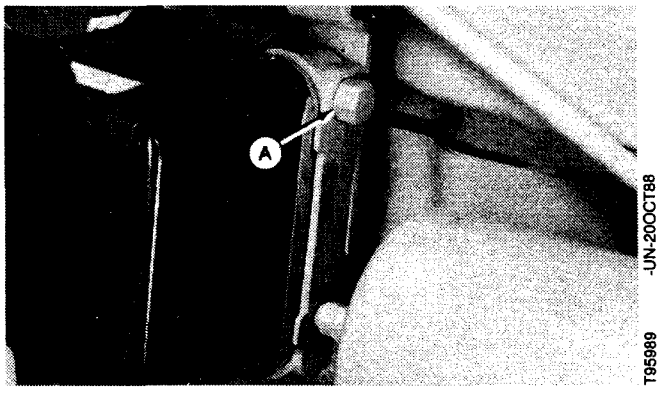
CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure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

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

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

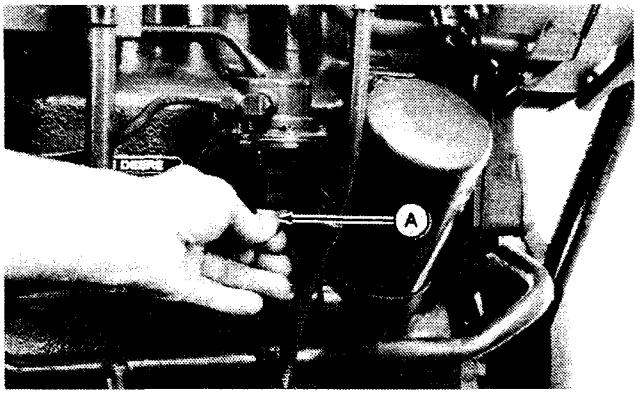
S11,0408,AC -19-21JAN86

1. Loosen the bleed plug (A) on fuel filter base.



S11,OMSE,AN1 -19-16NOV89

2. Operate hand primer (A) until fuel comes out of the bleed hole plug. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Pull hand primer outward (away from block) as far as it will go.



S11,OMSE,AO1 -19-16NOV89

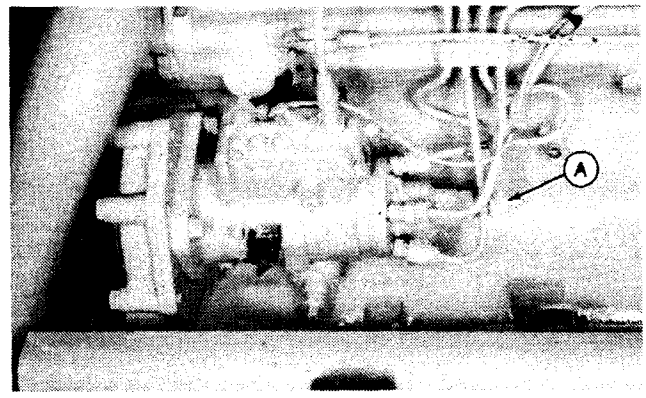
If the engine will not start:

3. Slightly loosen fuel supply line connector (A) at injection pump.

4. Pump hand primer lever fuel, without air bubbles, flows from fuel supply line connection.

5. Tighten supply line connector to 27 N·m (20 lb-ft).

6. Leave hand primer in the outward position away from cylinder block.



S11,OMSE,AO2 -19-16NOV89

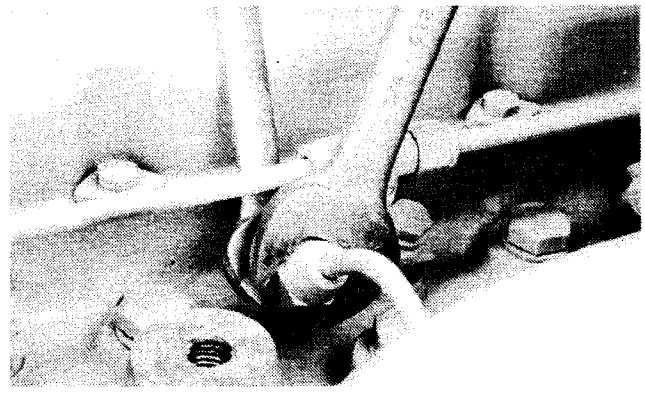
If the engine still will not start:

7. Move the speed control lever to slow idle.

8. While cranking engine with starting motor, loosen one fuel line connector slightly using two wrenches until fuel (free of air bubbles) flows from connector. Tighten connector while cranking engine.

9. Repeat procedure for remaining injection nozzles until engine starts and air has been removed from fuel system.

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



S11,OMSE,AO3 -19-16NOV89

REPLACE FAN AND ALTERNATOR BELTS

Poly V-belt tension is measured by deflection with a tension tester and straightedge.

IMPORTANT: Belts must not be hot when tension is checked or adjusted. Belt tension specified is for a warm belt. DO NOT pry against alternator rear frame.

1. Inspect belt(s) on pulleys.

2. Use one of the following methods to check fan and alternator belt tension with the belt warm:

• JDG529 Belt Tension Gauge (arrow) or equivalent belt tension gauge (for use on standard V-belts), capable of measuring 579—623 N (130—140 lb force).

• Tension tester (A)/straightedge (B).

3. If belts need adjustment, loosen alternator bracket cap screw (C) and nut (D) on mounting bolt. Apply outward pressure to alternator front frame until belt tension is correct.

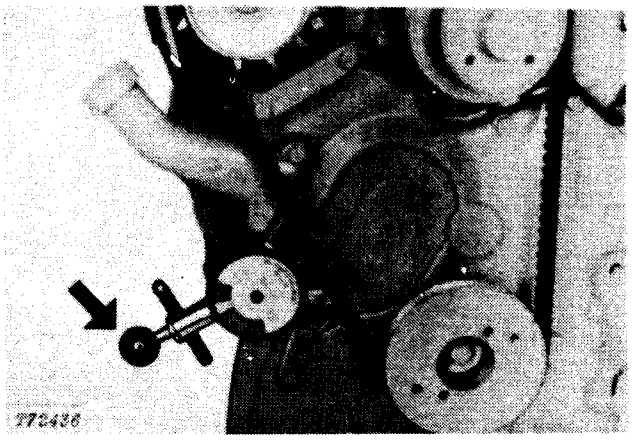
4. Tighten alternator bracket cap screw and nut securely.

5. Immediately after a 10 minute run-in of a new or used belt, recheck belt tension.

7. If tension is not within specifications, wait 10 minutes, loosen belt and retighten to used belt strand tension.

If JDG529 Tension Gauge is not available an alternate Tension Tester/Straightedge Method may be used on standard V-belts:

An 89 N (20 lb force) halfway between the pulleys should deflect the belt 19 mm (3/4 in.). Use a straightedge (B) when measuring distance belt moves.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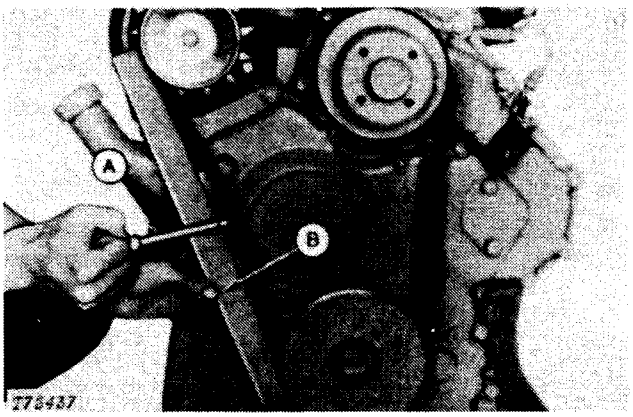

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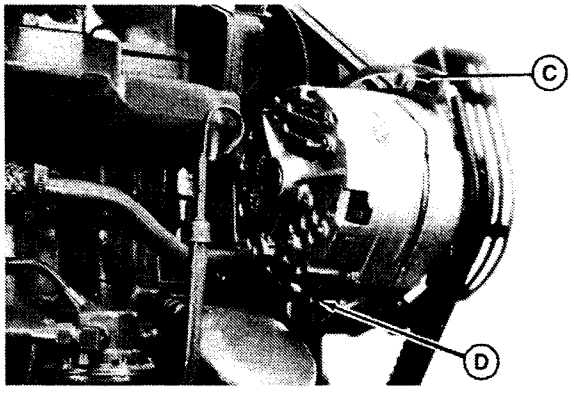


RG4883 -UN-15DEC88

Standard V-Belts

	Tension New Belt	Tension Used* Belt
Single Belt	578—622 N (130—140 lb force)	378—423 N (85—94 lb force)
Dual Belt	423—467 N (95—104 lb force)	378—423 N (85—94 lb force)

Single Poly V-Belt
Tension New And Used* Belts

Tension Tester And Straightedge Method:
- Apply a 130 N (30 lb force) halfway between pulleys to deflect belt 13 mm (1/2 in.)

** Belts are considered used after 10 minutes of operation.*

S11,OMSE,AP -19-22MAY87

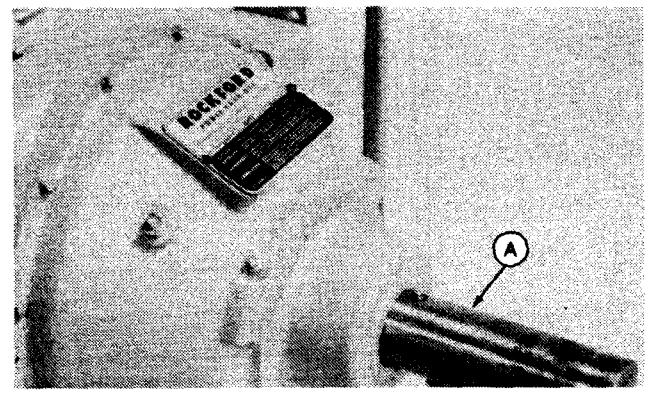
120190

POWER TAKE-OFF (PTO) CLUTCH

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

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

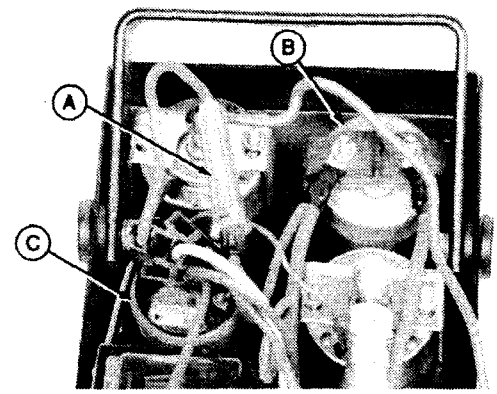
If the power take-off does not work properly after adjustment and lubrication, contact your authorized servicing dealer or engine distributor.



S11,OMSE,U -19-28MAY87

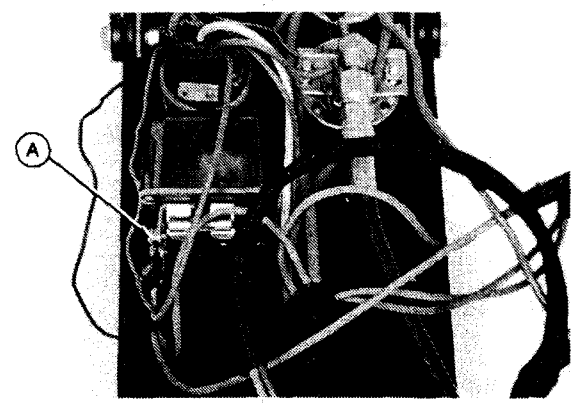
CHECK FUSES

1. Check the fuse (A) between the ammeter (B) and key switch (C) located on back side of instrument panel. If defective replace with an MDL-fuse.



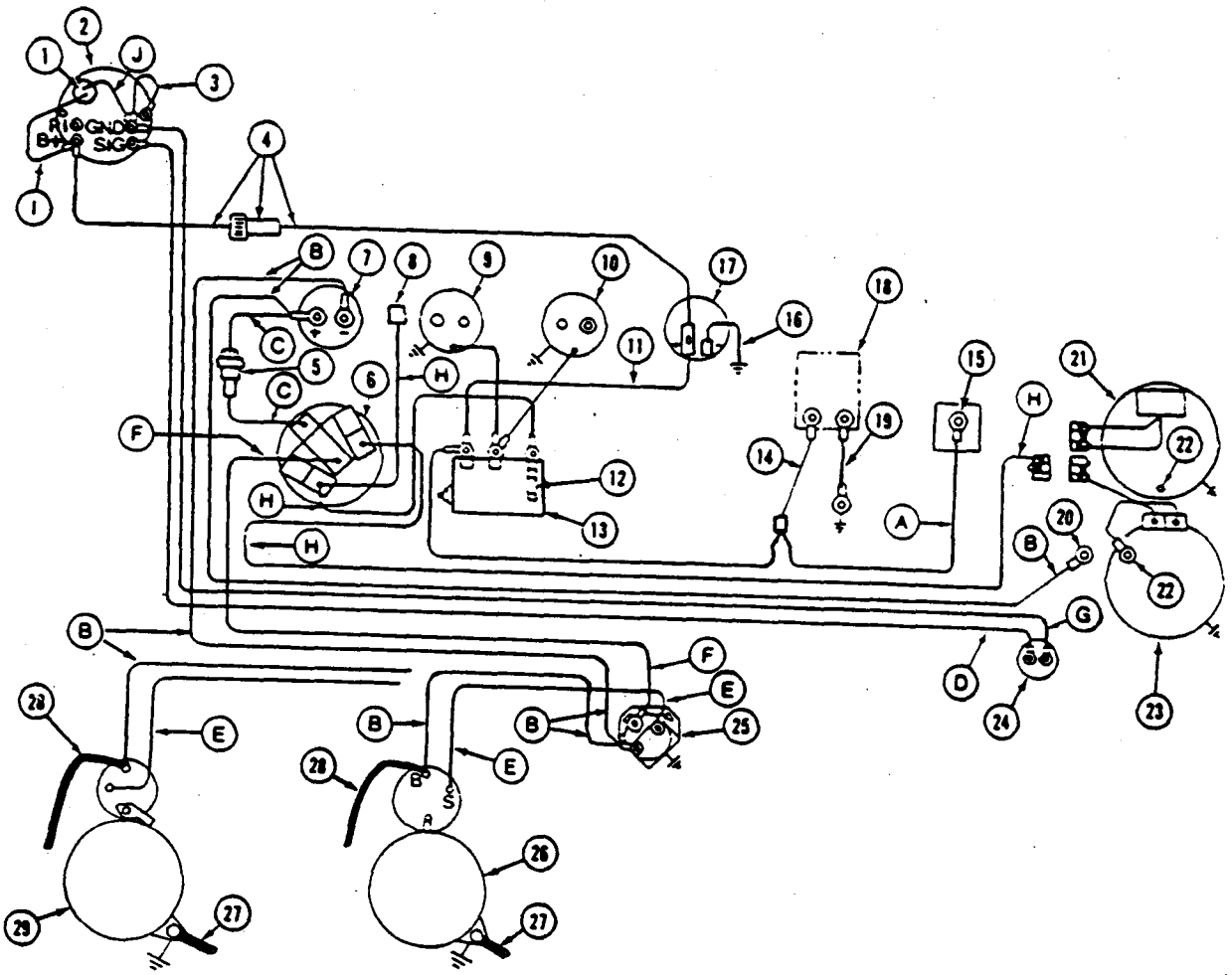
S11,OMSE,AA -19-06DEC85

2. Check the fuse (A) mounted on the bottom of the magnetic safety switch. If defective install a new SFE-14 fuse.



S11,OMSE,W -19-20NOV85

WIRING DIAGRAM—WITH MAGNETIC SPEED SENSOR AND ELECTRONIC TACHOMETER



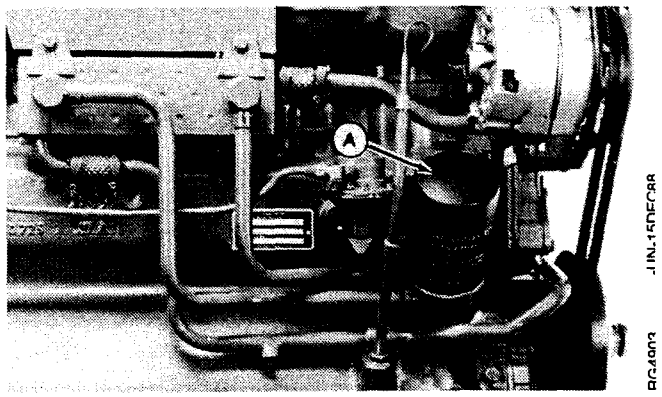
1—Light Socket
2—Tachometer
3—Ground Wiring Lead
4—Wiring Lead with 3-Amp MDX Fuse
5—Fuseholder with 25-Amp MDL Fuse
6—Key Switch
7—Ammeter
8—This terminal Not Used
9—Oil Pressure Gauge
10—Coolant Temperature Gauge
11—Wiring Lead
12—14-Amp SFE Fuse
13—Safety Switch with Reset Button
14—Injection Pump Wiring Lead
15—Insulate Terminal to Prevent Grounding
16—Hour Meter Ground Lead
17—Hour Meter
18—Shut-Off Solenoid
19—Ground Lead
20—Ammeter Output Terminal
21—Motorola Alternator
22—Alternator Output Terminal
23—Delco-Remy Alternator
24—Magnetic Speed Sensor
25—Starter Circuit Relay
26—Delco-Remy Starting Motor
27—Negative Battery Cable
28—Positive Battery Cable
29—John Deere (Nippondenso) Starting Motor
A—14 Gauge—Dark Blue
B—8 Gauge—Red
*C—12 Gauge—Red
D—18 Gauge—Red
E—10 Gauge—White
F—14 Gauge—White
G—18 Gauge—Black or Black with White Stripe
H—16 Gauge—Purple
I—18 Gauge—Yellow
J—18 Gauge—Brown

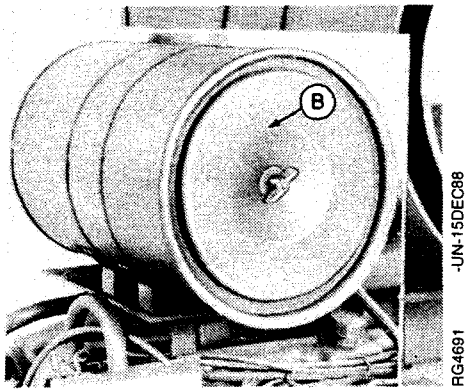
*Brown insulation may be used on some red leads.

S11,24005,AF -19-02JUL86

STORING THE ENGINE

IMPORTANT: Any time your engine will not be used for several months, the following recommendations for storing it and removing it from storage will help to minimize corrosion and deterioration. Use the AR41785 Engine Storage Kit. An extra 0.95 L (1 U.S. qt) of AR41870 Corrosion Inhibitor may be required to protect the fuel system. Follow recommended service procedure included with storage kit.





1. Change engine oil and replace filter (A). Used oil will not give adequate protection. (See Change Engine Oil and Filters, Lubrication and Maintenance/250 Hour Service.)

2. Service air cleaner (B). (See Remove and Inspect Air Cleaner Elements, Lubrication and Maintenance/Service As Required.)

NOTE: John Deere Low Silicate Antifreeze is recommended for use in all John Deere diesel engines and should be mixed with a 33—50 percent solution of clean, soft water. Ethylene glycol type antifreeze that meets General Motors Performance Specification GM1899M (mixed with a 33—50 percent solution of clean, soft water), or formulated to (GM) Specification GM6038M are also acceptable. (See coolant recommendations in Fuels, Lubricants, and Coolant Section and/or Lubrication and Maintenance/2 Year Service Section.)

In some areas outside U.S.A. and Canada, John Deere Engine Cooling Fluid is marketed for use in the engine cooling system. It is ready for use without dilution or mixing, and protects the engine from corrosion and freezing down to -37°C (-35°F).

3. Draining and flushing of cooling system is not necessary if engine is to be stored for only several months. However, for extended storage periods of a year or longer, it is recommended that the cooling system be drained of all coolant and refilled. Refill with John Deere Engine Cooling Fluid or a solution of 50—67 percent John Deere Low Silicate Antifreeze and 33—50 percent clean, soft water as recommended in Lubrication and Maintenance/2 Year Service Section.

4. Drain fuel tank and add 30 ml (1 oz) of inhibitor to the fuel tank for each 15L (4 U.S. gal) of tank capacity.

5. Add 30 ml (1 oz) of inhibitor to the engine crankcase for each 0.95 L (1 qt) of crankcase oil.

6. Disconnect air intake piping from the manifold. Pour 90 ml (3 oz) of inhibitor into intake system and reconnect the piping.

7. Crank the engine several revolutions with starter (do not depress reset button on instrument panel so engine does not start).

8. Loosen fan and alternator belts to relieve tension. Remove belts if desired.

9. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.

10. Disengage the PTO clutch.

11. Seal all openings on engine with plastic bags and tape supplied in storage kit. Follow instructions supplied in kit.

12. Coat all exposed metal surfaces with grease or corrosion inhibitor.

13. Clean the exterior of the engine and touchup any scratched or chipped painted surfaces.

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.

RG4694 -UN-15DEC88

S11,OMST,G1 -19-16NOV89

REMOVING ENGINE FROM STORAGE

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 and connect the cables.

3. Install new fan and alternator belts. Adjust belt tensions to their appropriate specifications. (See Replace Fan and Alternator Belts in Service Section).

4. Fill fuel tank.

5. Perform all appropriate prestarting checks, 50-hour, 100-hour, 250-hour, and 600 hour services. (See Prestarting Checks and Lubrication and Maintenance sections.)

6. Without pushing reset button, crank engine (do not start) for 20 seconds with starter. Then push and hold in the reset button on instrument panel and start engine.

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. Operate engine at slow idle for several minutes. Warm up carefully and check all gauges before placing engine under load.

S11,OMST,J -19-16NOV89