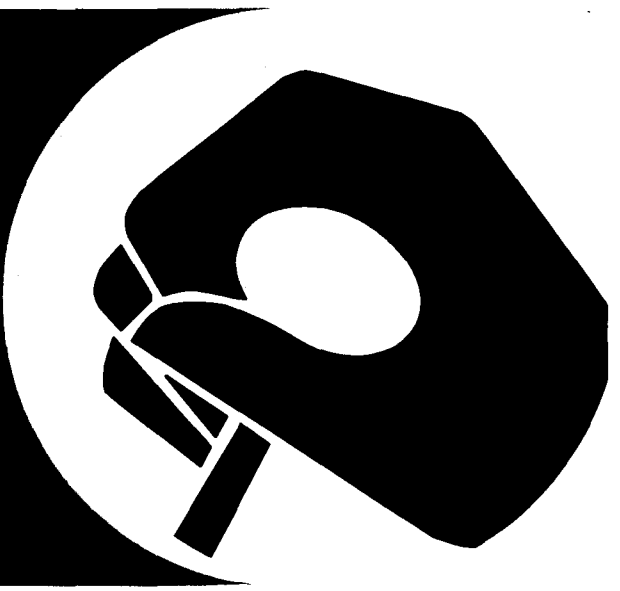
# Series 300
# 3029, 4039, 4045, 6059, and 6068
# OEM Diesel Engines

## OPERATION AND MAINTENANCE MANUAL



**Deere Power Systems Group**
**OMRG18293 Issue H4**
**(This manual replaces OMRG18293 C3)**
LITHO IN U.S.A.
**ENGLISH**

JOHN DEERE

DEERE POWER

# Introduction

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

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

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

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

WRITE ENGINE SERIAL NUMBERS and the option codes in the spaces indicated in the Specifications section. Accurately record all the numbers. Your dealer also needs these numbers when parts are ordered. File the identification numbers in a secure place off the engine.

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

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

CALIFORNIA PROPOSITION 65 WARNING
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

# Engine Owner

**JOHN DEERE ENGINE OWNER:**

Don't wait until you need warranty or other service to meet your local John Deere Engine Distributor or Service Dealer.

Learn who he is and where he is. At your first convenience, go meet him. He'll want to get to know you and to learn what your needs might be.

**UTILISATEURS DE MOTEURS JOHN DEERE:**

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

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

**AN DEN BESITZER DES JOHN DEERE MOTORS:**

Warten Sie nicht auf einen evt. Reparaturfall um den nächstgelegenen John Deere Händler kennen zu lernen.

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

**PROPRIETARIO DEL MOTORE JOHN DEERE:**

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

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

**PROPIETARIO DE EQUIPO JOHN DEERE:**

No espere hasta necesitar servicio de garantía o de otro tipo para conocer a su Distribuidor de Motores John Deere o al Concesionario de Servicio.

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

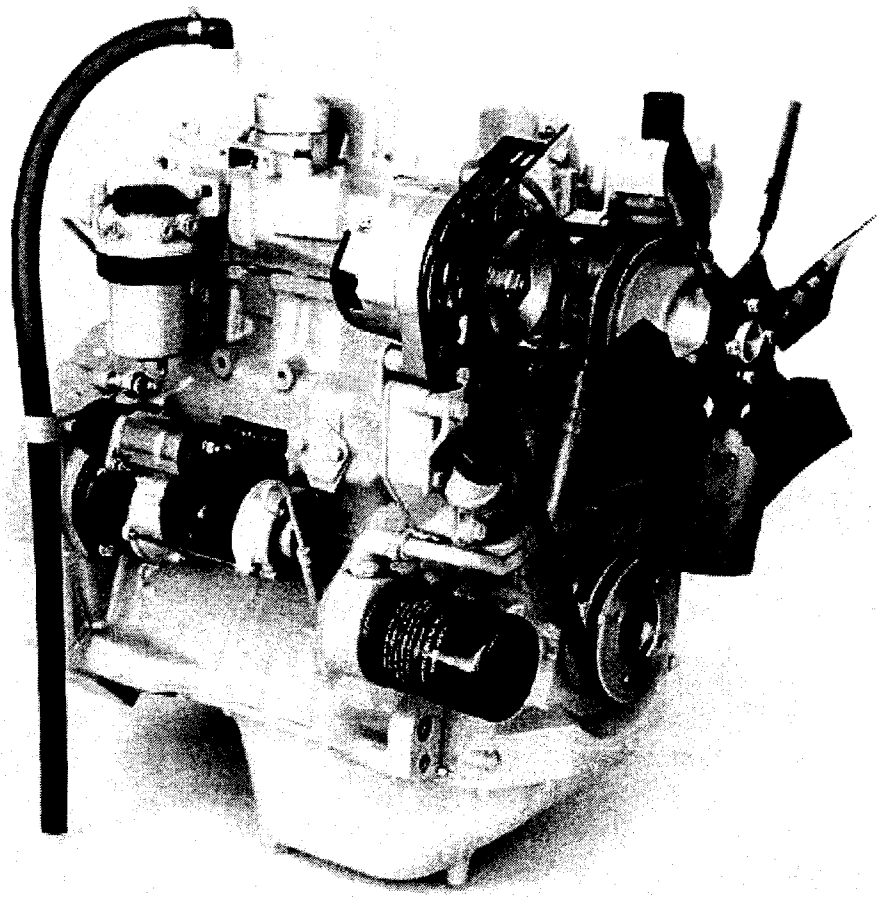
**JOHN DEERE MOTORÄGARE:**

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

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

RG6656 -UN-22FEB93

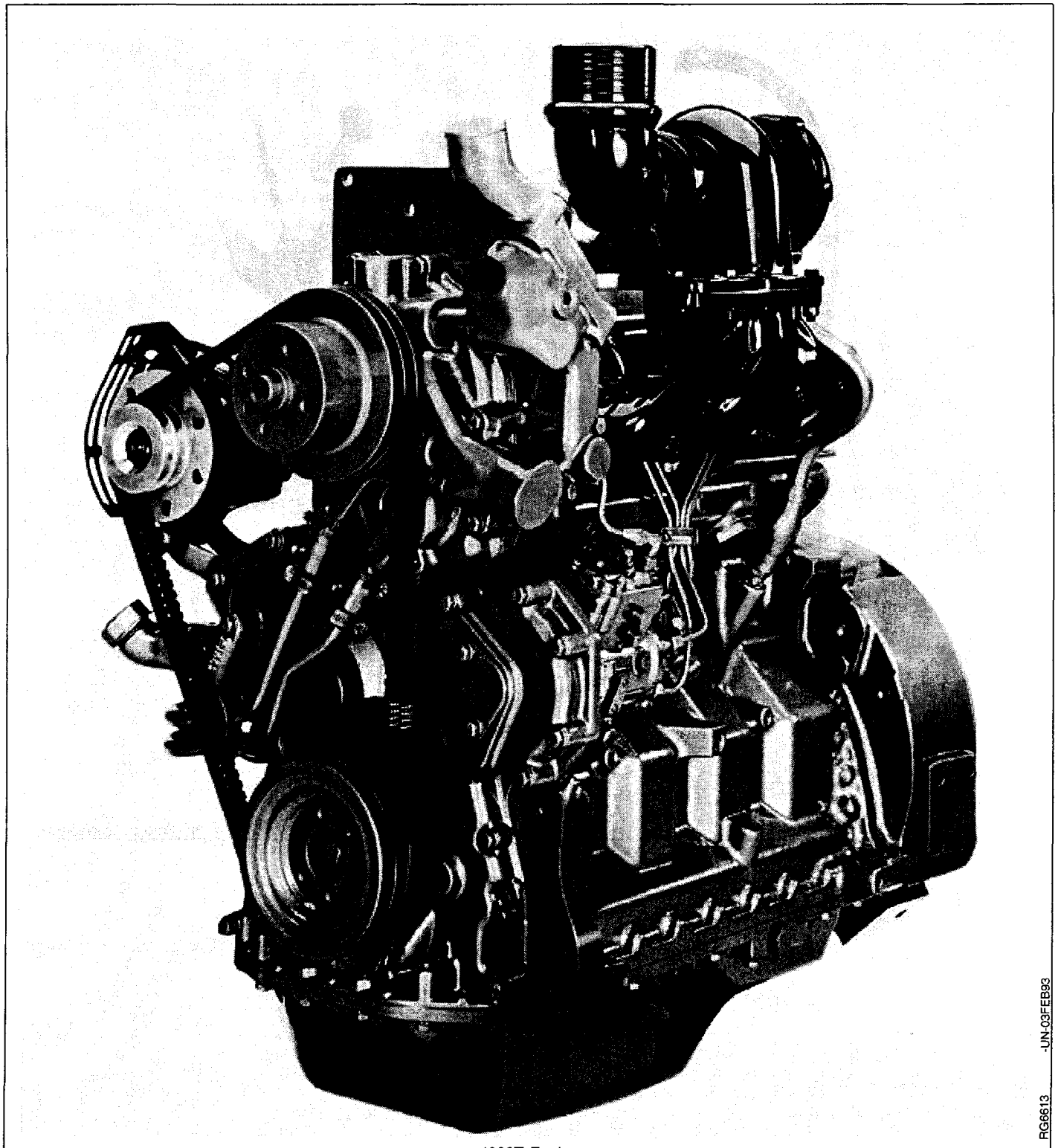
# Identification Views



*3029D Engine*

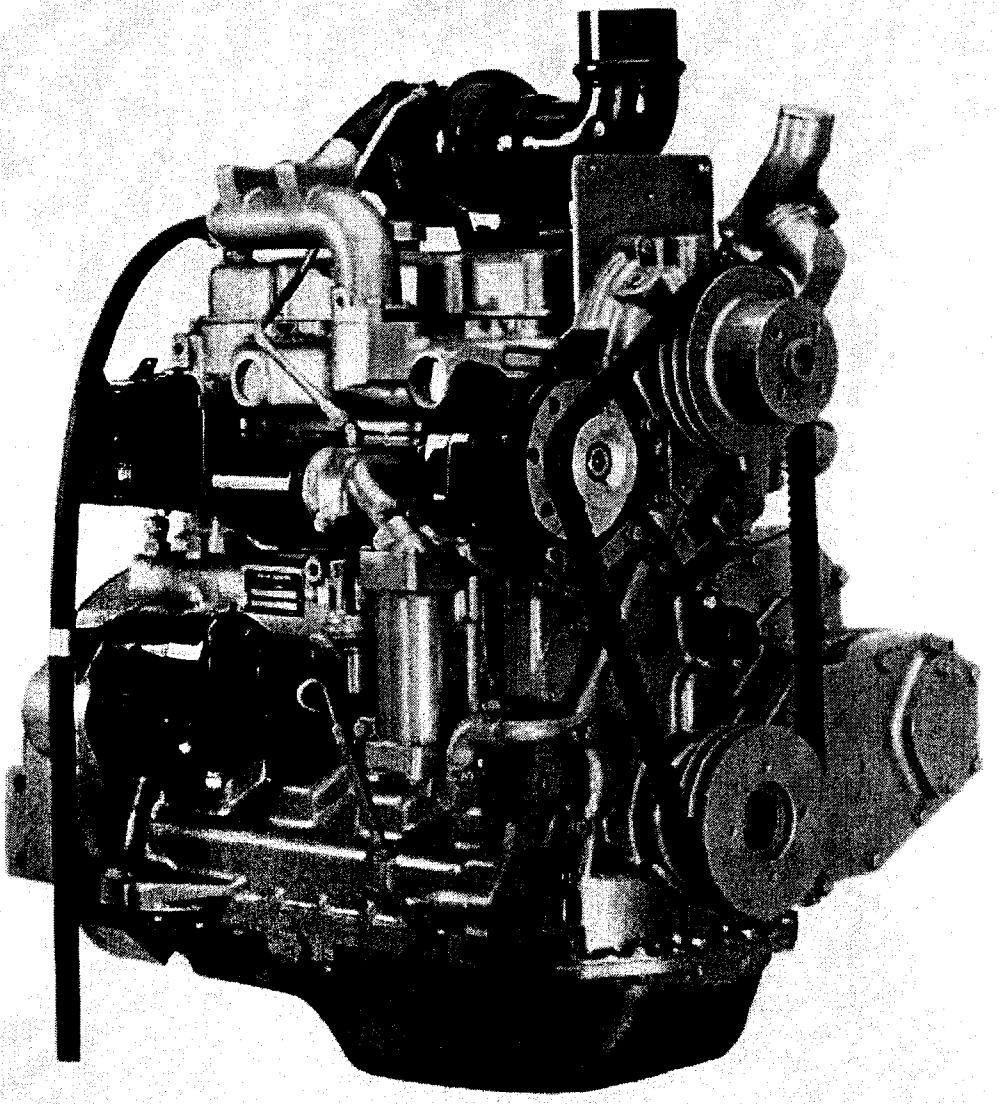
CD30356 -UN-03FEB93

S11,CONT,L3 -19-17FEB93




4039T Engine

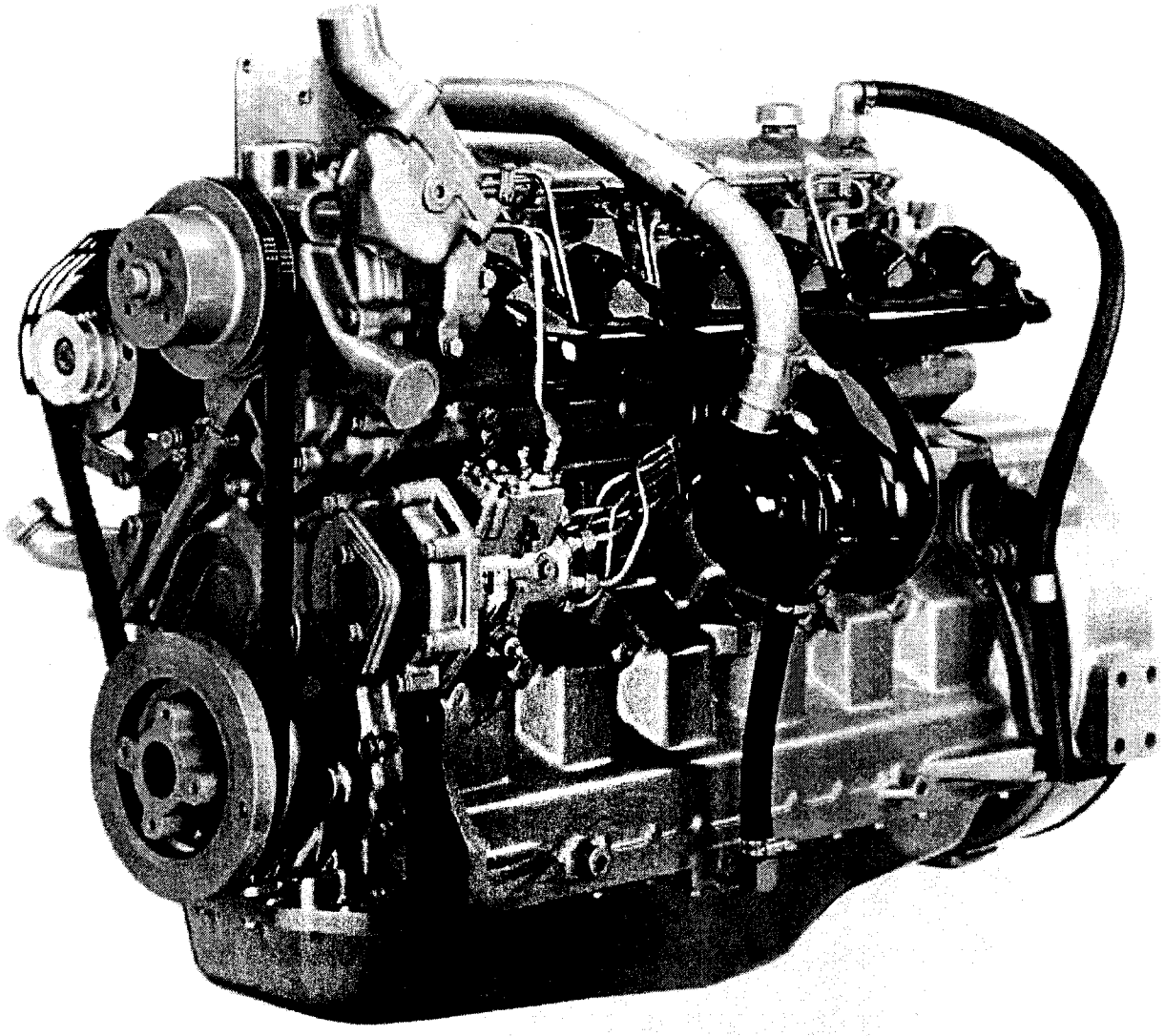
S11,CONT,L4 -19-17FEB93



RG5603 -UN-30NOV89

4045T Engine

S11,CONT,L1 -19-08FEB91



RG5604 -UN-30NOV89

6068T Engine

S11,CONT,L2 -19-08FEB91

# 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.*

OMRG18293 H4-19-11AUG94





140497
PN=114

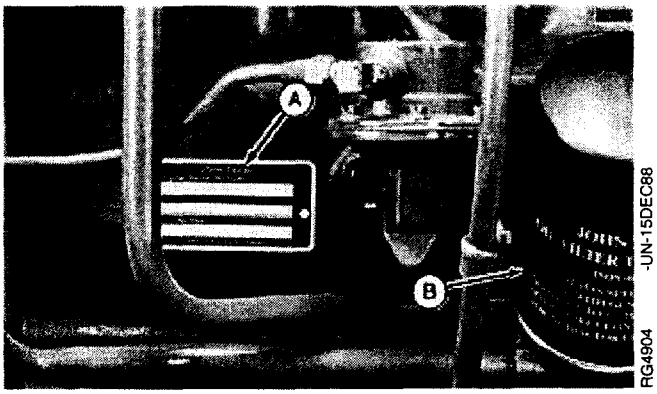
# Record Keeping

## ENGINE SERIAL NUMBER PLATE

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

"T0" indicates the engine was built in Dubuque, Iowa
"CD" indicates the engine was built in Saran, France

Your engine's serial number plate (A) is located on right-hand side of cylinder block near the oil filter housing (B).




RG4904 -UN-15DEC88

RG,18293,SNPLTE-19-09AUG94

## RECORD ENGINE SERIAL NUMBER

Your engine will have a serial number plate.

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

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

Engine Serial Number (A)

_____

Application Data (B)

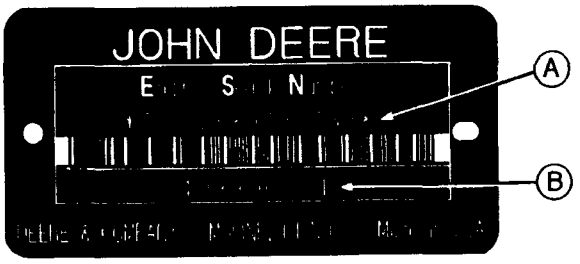
_____

European Customer Model/Application Data (C)

_____

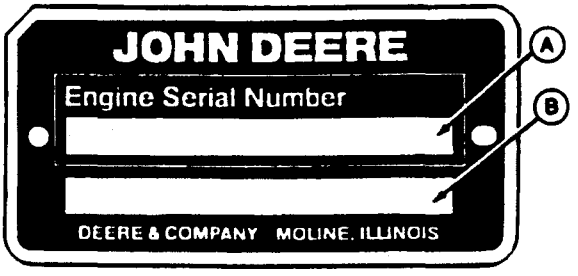
Coefficient of Absorption Value (D)

_____



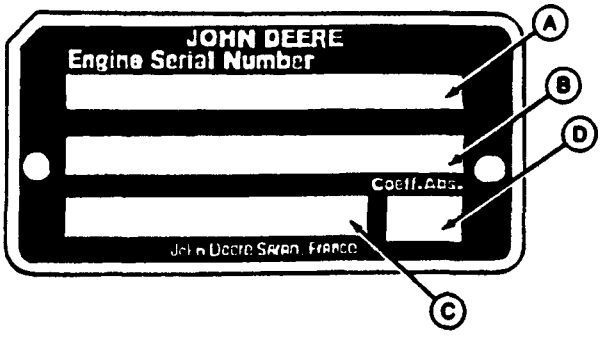

RG7225 -UN-07JUL94

*Dubuque Bar Coded Serial Number Plate*




RG5609 -UN-09JAN90

*Dubuque Serial Number Plate*




RG5610 -UN-09JAN90

*Saran Serial Number Plate*

S55,OMSN,B -19-02AUG94

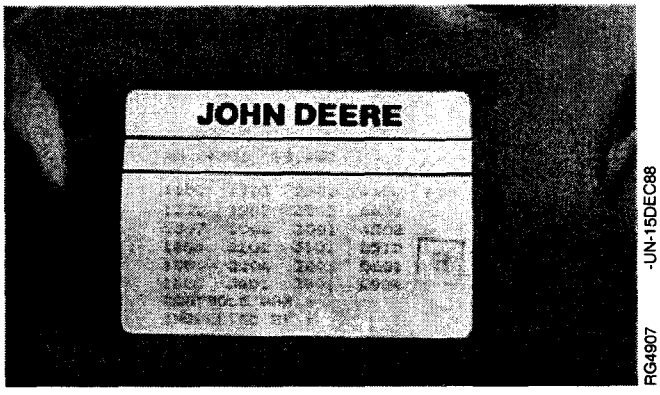
## ENGINE OPTION CODES

```
J O H N   D E E R E                          11/05/94

Commande: 182838760   Base code: 147AA   Load: 654150
   -    18  1101- 1202- 1301- 1406- 1501- 1603- 1701-
1902- 2004- 2109- 2204- 2403- 2802- 2902- 3001- 3115-
3519- 3601- 3703- 3901- 4005- 4199- 4398- 4499- 4599-
4603- 4708- 47AA  4802- 4901- 5001- 5101- 5299- 5525-
5601- 5906- 6206- 6699- 6903- 7699- 9801-
Controle par (inspected by):                  ***
```

RG7222 -UN-21JUN94

*Saran Option Code Label*




RG4907 -UN-15DEC88

*Dubuque Option Code Label*

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

On Saran-built engines, the engine option code label includes an engine base code. This base code must also be recorded along with the option codes. At times it will be necessary to furnish this base code to differentiate two identical option codes for the same engine model.

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

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

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

S11,OMSN,P -19-09AUG94

## ENGINE OPTION CODES—CONTINUED

Engine Base Code:_____

| Option Codes | Description | Option Codes | Description |
|---|---|---|---|
| 11 _____ | Rocker Arm Cover | 40 _____ | Dipstick |
| 12 _____ | Oil Filler | 41 _____ | Belt Driven Front Auxiliary Drive |
| 13 _____ | Crankshaft Pulley | 43 _____ | Air Inlet Heater |
| 14 _____ | Flywheel Housing | 44 _____ | Timing Gear Cover With Gears |
| 15 _____ | Flywheel | 45 _____ | Balancers For 4-Cylinder Engines |
| 16 _____ | Injection Pump | 46 _____ | Cylinder Block With Liners and Camshaft |
| 17 _____ | Air Inlet | 47 _____ | Crankshaft and Bearings |
| 18 _____ | Air Cleaner | 48 _____ | Connecting Rods and Pistons |
| 19 _____ | Oil Pan | 49 _____ | Valve Actuating Mechanisms |
| 20 _____ | Water Pump | 50 _____ | Oil Pumps |
| 21 _____ | Thermostat Cover | 51 _____ | Cylinder Head With Valves |
| 22 _____ | Thermostat | 52 _____ | Auxiliary Gear Drive |
| 23 _____ | Fan Drive | 55 _____ | Shipping Stand |
| 24 _____ | Fan Belt | 56 _____ | Paint Option |
| 25 _____ | Fan | 59 _____ | Oil Cooler and Filter |
| 27 _____ | Radiator | 62 _____ | Alternator Mounting |
| 28 _____ | Exhaust Manifold | 64 _____ | Exhaust Elbow |
| 29 _____ | Ventilator System | 65 _____ | Turbocharger |
| 30 _____ | Starting Motor | 66 _____ | Temperature Switch |
| 31 _____ | Alternator | 69 _____ | Engine Serial Number PLate |
| 32 _____ | Instrument Panel | 75 _____ | Air Restriction Indicator |
| 35 _____ | Fuel Filter | 76 _____ | Oil Pressure Switch |
| 36 _____ | Front Plate | 91 _____ | Special Equipment (Factory Installed) |
| 37 _____ | Fuel Transfer Pump | 97 _____ | Special Equipment (Field Installed) |
| 39 _____ | Thermostat Housing | 98 _____ | Shipping |

S11,OMSN,Q -19-09JUN94

## RECORD PTO SERIAL NUMBER

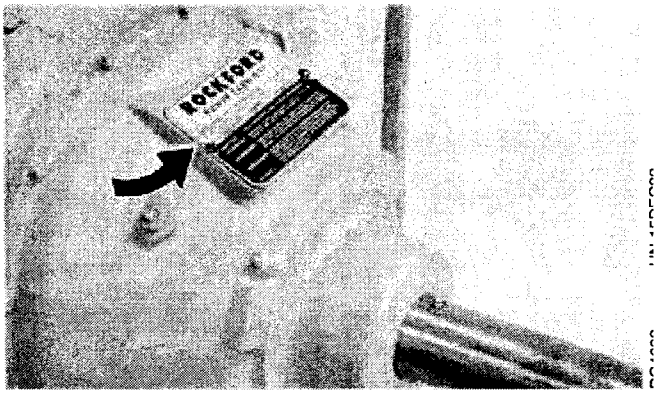
Serial number and model number are located on cover plate (Bold Arrow) of PTO housing. Record the numbers in the following spaces:

Serial Number

_____

Model Number

_____




S11,OMSN,N -19-26FEB93

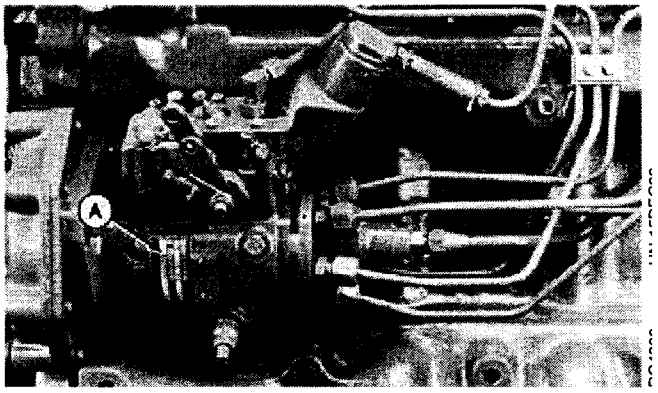
## RECORD FUEL INJECTION PUMP MODEL NUMBER

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

Model No. _____ RPM _____

Manufacturer's No. _____

Serial No. _____




S11,OMSN,O -19-02JUL86

# Safety

## RECOGNIZE SAFETY INFORMATION

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

Follow recommended precautions and safe operating practices.

T81389 -UN-07DEC88

DX,ALERT -19-03MAR93

## UNDERSTAND SIGNAL WORDS

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

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

**⚠ DANGER**

**⚠ WARNING**

**⚠ CAUTION**

TS187 -19-30SEP88

DX,SIGNAL -19-03MAR93

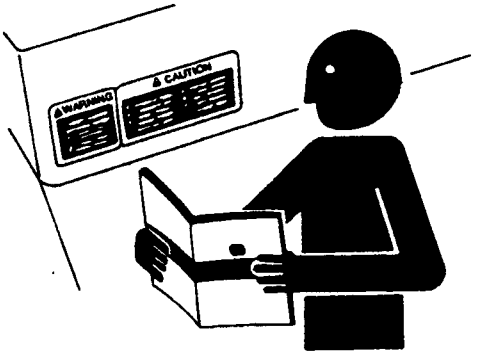
## FOLLOW SAFETY INSTRUCTIONS

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

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

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

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




TS201 -UN-23AUG88

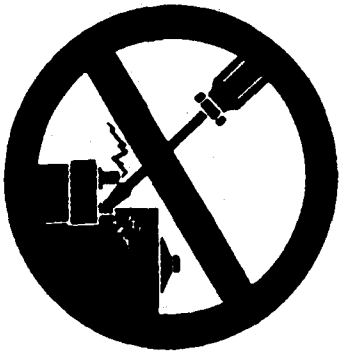
DX,READ -19-03MAR93

## PREVENT BYPASS STARTING

Avoid possible injury or death from engine runaway.

Do not start engine by shorting across starter terminal. Engine will start with PTO engaged if normal circuitry is bypassed.

Start engine only from operator's station with PTO disengaged or in neutral.



RG5419 -UN-28FEB89

RG,BYPAS1 -19-19MAR91

## 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

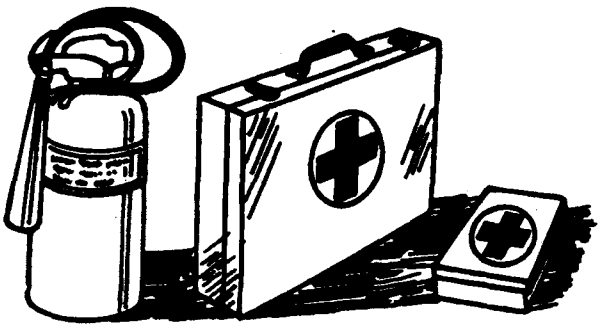
DX,FIRE1 -19-03MAR93

## 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

DX,FIRE2 -19-03MAR93

## HANDLE STARTING FLUID SAFELY

Starting fluid is highly flammable.

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

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

Do not incinerate or puncture a starting fluid container.

TS1356 -UN-18MAR92

DX,FIRE3 -19-16APR92

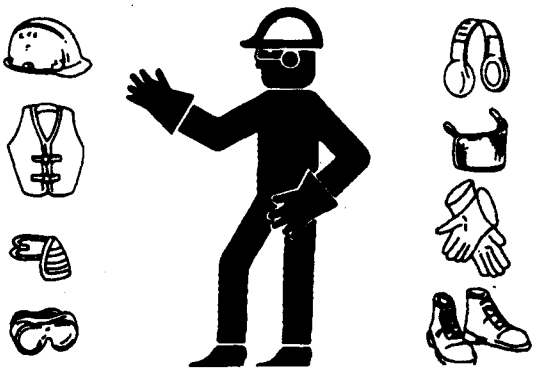
## WEAR PROTECTIVE CLOTHING

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.



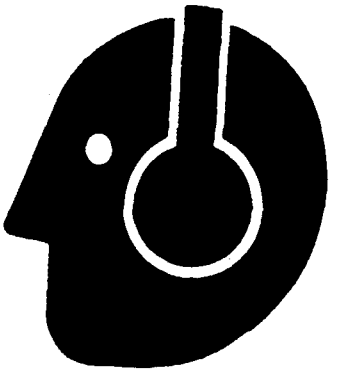
TS206 -UN-23AUG88

DX,WEAR -19-10SEP90

## PROTECT AGAINST NOISE

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

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



TS207 -UN-23AUG88

DX,NOISE -19-03MAR93

## HANDLE CHEMICAL PRODUCTS SAFELY

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)


TS1132 -UN-26NOV90

DX,MSDS,NA -19-03MAR93

## STAY CLEAR OF ROTATING DRIVELINES

Entanglement in rotating driveline can cause serious injury or death.

Keep master shield and driveline shields in place at all times. Make sure rotating shields turn freely.

Wear close fitting clothing. Stop the engine and be sure the PTO driveline is stopped before making adjustments or performing any type service on the engine or PTO-driven equipment.

TS198 -UN-23AUG88

RG21891,3 -19-25JAN93

## PRACTICE SAFE MAINTENANCE

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

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

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

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

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

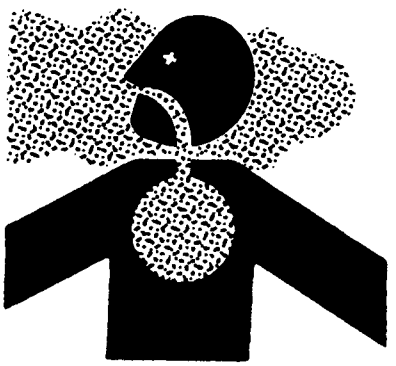
TS218 -UN-23AUG88

DX,SERV -19-03MAR93

## 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

DX,AIR -19-04JUN90

## AVOID HIGH-PRESSURE FLUIDS

X9811 -UN-23AUG88

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

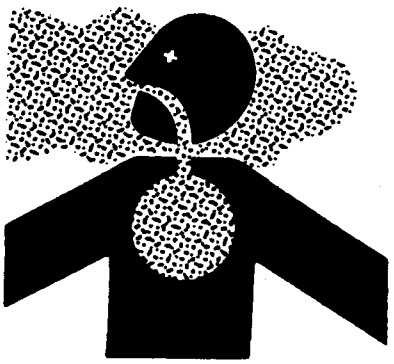
Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

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

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

DX,FLUID -19-03MAR93

## REMOVE PAINT BEFORE WELDING OR HEATING



TS220 -UN-23AUG88

Avoid potentially toxic fumes and dust.

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

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

Remove paint before welding or heating:

- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.

- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

DX,PAINT -19-03MAR93

## AVOID HEATING NEAR PRESSURIZED FLUID LINES

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

TS953 -UN-15MAY90

DX,TORCH -19-03MAR93

## SERVICE COOLING SYSTEM SAFELY

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

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

TS281 -UN-23AUG88

DX,RCAP -19-04JUN90

## DISPOSE OF WASTE PROPERLY

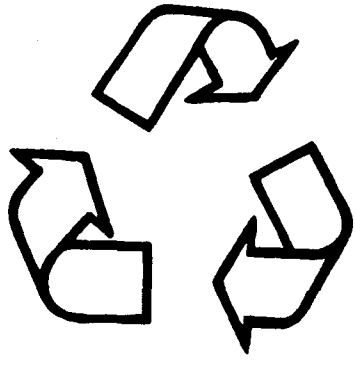
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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

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

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

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



TS1133 -UN-26NOV90

DX,DRAIN -19-03MAR93

## DIESEL FUEL

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

In general, diesel fuels are blended to satisfy the low temperature requirements of the geographical area in which they are marketed. Recommended standard grades are shown on the temperature charts.

In North America, diesel fuels meeting Military Specification VV-F-800E are preferred. In most European countries, diesel fuel is specified to EN 590. If diesel fuel specified to ASTM D975 is used or EN 590 is not available, the fuel must meet the following properties:

- Cetane Number 40 minimum.
Cetane number greater than 50 is preferred, especially for temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft).

- Cold Filter Plugging Point (CFPP) below the expected low temperature OR Cloud Point at least 5°C (9°F) below the expected low temperature

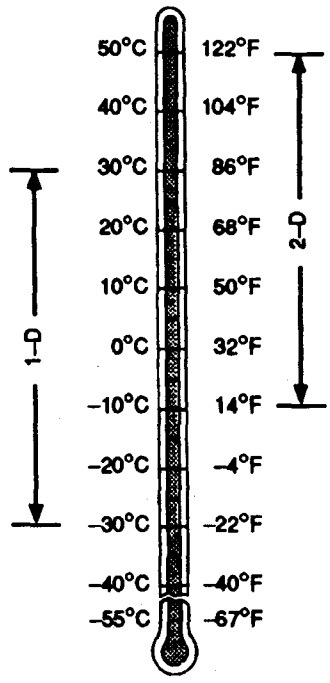
- Sulfur content:
— Sulfur content should not exceed 0.5% Sulfur content less than 0.05% is preferred.
— If diesel fuel with sulfur content greater than 0.5% sulfur content is used, reduce the service interval for engine oil and filter by 50%
— DO NOT use diesel fuel with sulfur content greater than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

- Lubricity
— Fuel lubricity must pass the BOCLE scuffing test at 3300 gram minimum load level.
— If fuel of low or unknown lubricity is used, add John Deere All-Season Diesel Fuel Conditioner at specified concentration.

Bio-diesel fuels with these properties and meeting an appropriate specification may be used as an alternative to petroleum-based diesel fuel.

Arctic fuels (such as Military Specification VV-F-800E, Grade DF-A) may be used at temperatures below -30°C (-22°F).

**CAUTION: Handle fuel carefully. Do not fill the fuel tank when engine is running. DO NOT smoke while you fill the fuel tank or service the fuel system.**




*North America ASTM D975*

RG,FUEL1 -19-10AUG94

## DIESEL FUEL STORAGE

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

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

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

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

Avoid storing fuel over long periods of time. If there is a very slow turnover in fuel tank or supply tank, it may be necessary to add John Deere TY22030 All Season Diesel Fuel Conditioner to prevent water condensation. TY22030 Conditioner also reduces fuel gelling and controls wax separation during cold weather.

Consult your John Deere Parts Network for local availability and always follow manufactuter's directions on label.

RG21891,5 -19-02MAR93

## 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.

TS202 -UN-23AUG88

S11,OMFL,C -19-02MAR93

## MINIMIZING THE EFFECT OF COLD WEATHER ON DIESEL ENGINES

John Deere diesel engines are designed to operate effectively in cold weather. However, for effective starting and cold weather operation, a little extra care is necessary. The information below outlines steps that can minimize the effect that cold weather may have on starting and operation of your engine. See your authorized engine distributor or servicing dealer for additional information and local availability of cold weather aids.

### Use Grade No. 1-D Fuel

When temperatures fall below 5° C (40° F), Grade No. 1-D fuel is best suited for cold weather operation. Grade No. 1-D fuel has a lower cloud point and a lower pour point.

Cloud point is the temperature at which wax will begin to form in the fuel and this wax causes fuel filters to plug. Pour point is the temperature at which fuel begins to thicken and become more resistant to flow through fuel pumps and lines.

*NOTE: On an average, Grade No. 1-D fuel has a lower BTU (heat content) rating than Grade No. 2-D fuel. When using Grade No. 1-D fuel you may notice a drop in power and fuel efficiency, but should not experience any other engine performance effects. Check the grade of fuel being used before troubleshooting for low power complaints in cold weather operation.*

### Diesel Fuel Flow Additive

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

Use John Deere TY22030 All Season Diesel Fuel Conditioner to treat Grade No. 2-D fuel if No. 1-D is not readily available during the cold weather season.

*NOTE: John Deere TY22030 Diesel Fuel Conditioner can also be used to treat No. 1-D fuel.*

John Deere TY22030 Diesel Fuel Conditioner will:

—Reduce the formation of wax to improve fuel flow through filters by reducing fuel gelling.

—Lower the pour point of untreated fuel from 5° C (40° F) to less than -40° C (-40° F). Allowing the burning of Grade No. 2-D fuel year-round which provides more BTU per gallon than No. 1-D fuel and reduces fuel costs.

### Coolant Heaters

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

### Seasonal Viscosity Oil and Proper Coolant Concentration

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

## ENGINE BREAK-IN OIL

This engine is filled at the factory with John Deere Engine Break-In Oil. This break-in oil should be drained and the oil filter changed after the first 100 hours of operation.

During the break-in period, add John Deere Engine Break-In Oil as needed to maintain the specified oil level.

A second 100-hour service interval with John Deere Engine Break-In Oil may be required if the engine is operated under light loads during the first 100-hour break-in period.

After the break-in period, use John Deere TORQ-GARD SUPREME© PLUS-50™ or other heavy-duty diesel engine oil as recommended in this manual.

**IMPORTANT: Do not use TORQ-GARD SUPREME PLUS-50 engine oil during the first 100 hours of operation after an engine rebuilt. TORQ-GARD SUPREME PLUS-50 will not allow the engine to wear properly during the break-in period.**

DX,ENOIL4 -19-20JUL94

## ENGINE OIL

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

The following oil is preferred:

- John Deere TORQ-GARD SUPREME PLUS-50™

The following oils are also recommended:

- John Deere TORQ-GARD SUPREME®
- John Deere UNI-GARD™

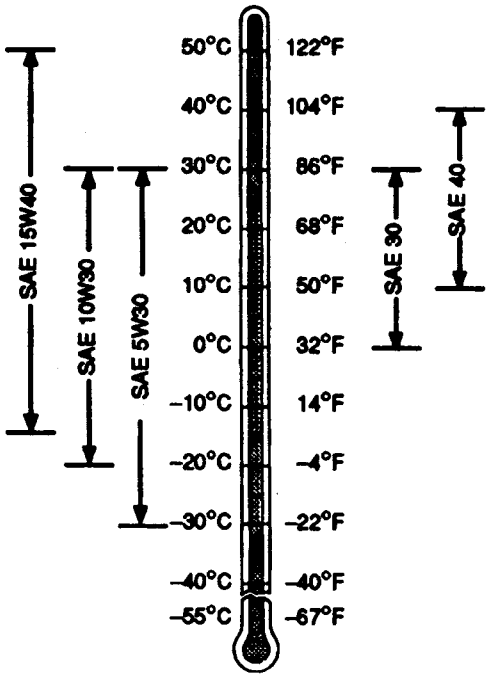
Other oils may be used if they meet one or more of the following:

- API Service Classification CE
- API Service Classification CD
- CCMC Specification D5
- CCMC Specification D4

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

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

Arctic oils (such as Military Specification MIL-L-46167B) may be used at temperatures below -30˚C (-22˚F).




TS1411 -UN-31JAN94

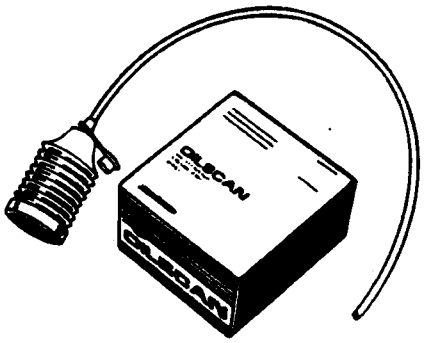
DX,ENOIL -19-01FEB94

## )ILSCAN® AND COOLSCAN™

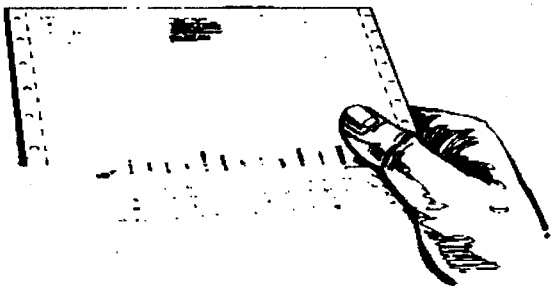
)ILSCAN and COOLSCAN are John Deere sampling ırograms to help you monitor machine performance and ɔlentify potential problems before they cause serious lamage.

)il and coolant samples should be taken from each ;ystem prior to its recommended change interval.

:heck with your John Deere dealer for the availability of )ILSCAN and COOLSCAN kits.




T6828AB -UN-15JUN89



T6829AB -UN-18OCT88

DX,OILSCAN -19-16APR92

## ALTERNATIVE AND SYNTHETIC LUBRICANTS

:onditions in certain geographical areas may require ubricant recommendations different from those ɔrinted in this manual. Some John Deere lubricants nay not be available in your location. Consult your John Deere dealer to obtain information and ·ecommendations.

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

DX,ALTER -19-01FEB94

## GREASE

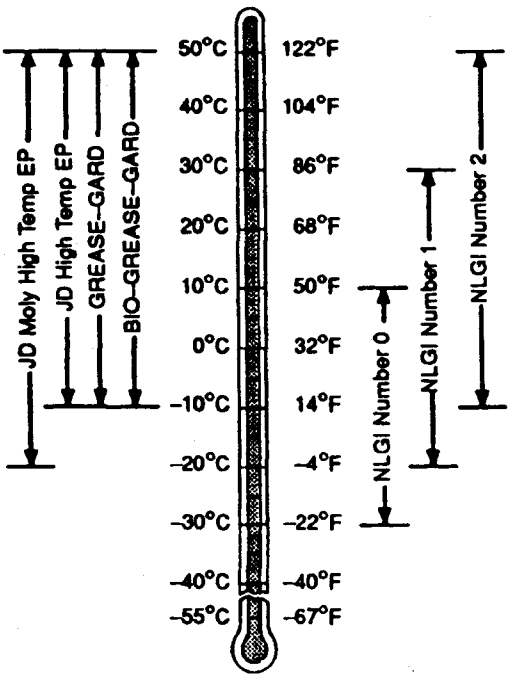
Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

The following greases are preferred:

- John Deere MOLY HIGH TEMPERATURE EP GREASE
- John Deere HIGH TEMPERATURE EP GREASE
- John Deere GREASE-GARD™
- John Deere BIO-GREASE-GARD™[1]

Other greases may be used if they meet **both** of the following:
- NLGI Performance Classification GC
- NLGI Performance Classification LB

Arctic greases (such as Military Specification MIL-G-10924F) may be used at temperatures below -30°C (-22°F).




*[1]BIO-GREASE-GARD meets or exceeds the minimum biodegradability of 80% within 21 days according to CEC-L-33-T-82 test method.*

DX,GREA1 -19-01FEB94

## LUBRICANT STORAGE

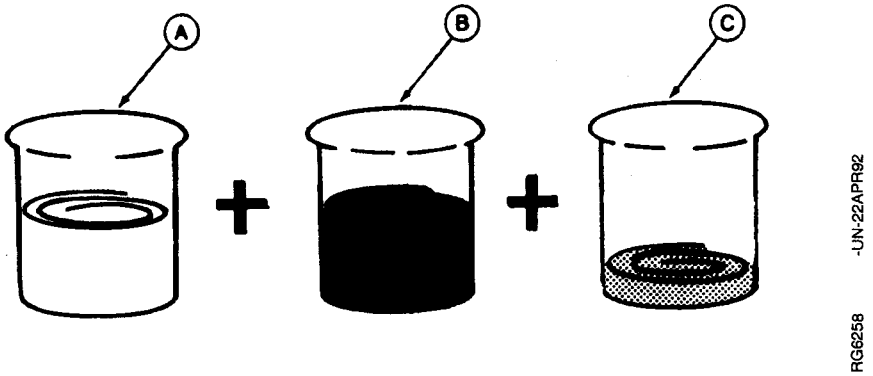
Your equipment can operate at top efficiency only if clean lubricants are used.

Use clean containers to handle all lubricants.

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

DX,LUBST -19-01FEB94

## ENGINE COOLANT REQUIREMENTS




**A—Quality Water**

**B—Ethylene Glycol Concentrate (Antifreeze)**

**C—Supplemental Coolant Additives (SCA's)**

*Engine Coolant*

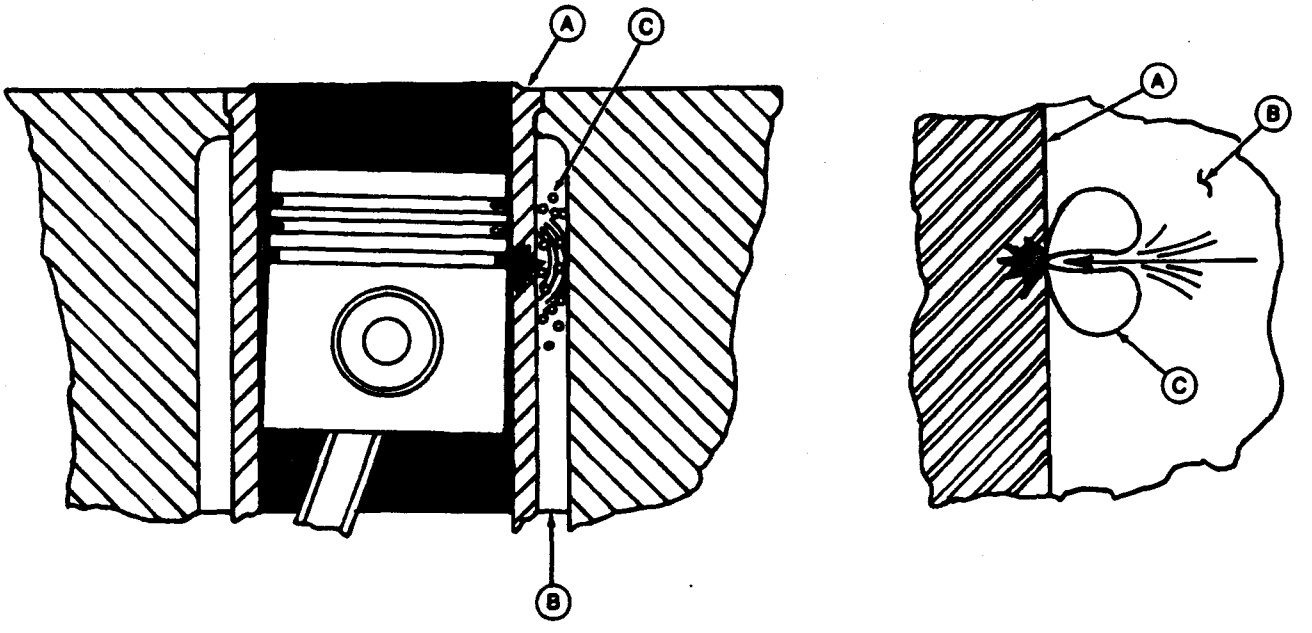
To meet cooling system protection requirements, the coolant MUST consist of a 50/50 mixture of quality water and ethylene glycol concentrate (antifreeze). Add to the mixture 3% (by volume) supplemental coolant additives (SCA's). See ENGINE COOLANT SPECIFICATIONS, later in this section, for further definition.

Makeup of the coolant between changes MUST consist of the same requirements as during a complete change. Performing a COOLSCAN analysis is the recommended method for determining the amount of quality water, ethylene glycol concentrate, and supplemental coolant additives that should be added.

**IMPORTANT: Supplemental coolant additives MUST be added to the coolant solution. Ethylene glycol concentrate (antifreeze) DOES NOT contain chemical inhibitors needed to control liner pitting or erosion, rust, scale, and acidity.**

RG,18293,REQ1AA-19-09AUG94

## ENGINE COOLANT REQUIREMENTS—CONTINUED




RG6263 -UN-22APR92

**A—Cylinder Liner Walls** **B—Engine Coolant** **C—Vapor Bubbles**

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

Water pump impellers and cylinder liner walls (A) which are in contact with engine coolant (B) can be eroded or pitted unless the proper concentration and type of SCA's are present in the coolant solution.

Vapor bubbles (C) are formed when piston impacts against liner ID causing walls to vibrate; sending compression waves into the coolant.

Erosion or pitting is caused by the formation and collapse of tiny vapor bubbles in the coolant on the surface of metal parts. Over a period of time, this pitting will progress completely through the metal. Generally, the most critical erosion occurs in the cylinder liner area of wet-sleeve, heavy-duty engines. If coolant is allowed to enter the combustion chamber, engine failure or other serious damage will result.

Use of SCA's will reduce the effects of erosion and pitting. The chemicals in the additives form a protective film on cylinder liner surface. This film acts as a barrier against collapsing vapor bubbles and also reduces the quantity of bubbles formed.

RG,COOL,REQ10 -19-12JUL94

## RECOMMENDED ENGINE COOLANT

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

John Deere Prediluted Antifreeze/Summer Coolant and John Deere Antifreeze/Summer Coolant Concentrate are recommended. John Deere Low Silicate Antifreeze and John Deere COOL-GARD™, where available, may also be used. Supplemental coolant additives MUST be added to John Deere Low Silicate Antifreeze.

### • JOHN DEERE PREDILUTED ANTIFREEZE/SUMMER COOLANT

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

### • JOHN DEERE ANTIFREEZE/SUMMER COOLANT CONCENTRATE

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

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

### • JOHN DEERE LOW SILICATE ANTIFREEZE

This ethylene glycol coolant concentrate MUST be mixed with proper concentration of quality water and 3% (by volume) supplemental coolant additives (SCA's) before adding to the cooling system. The proportion of water to be used depends upon the lowest freeze protection temperature desired according to the following table:

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

### • JOHN DEERE COOLGARD™ FLUID

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

RG,COOL,18293 -19-04AUG94

## ENGINE COOLANT SPECIFICATIONS

If John Deere coolant products are not used, ethylene glycol concentrate (antifreeze) can be used when mixed with quality water and supplemental coolant additives (SCA's), as described below and later in this section. Use an ethylene glycol concentrate meeting ASTM D5345 (prediluted coolant) or ASTM D4985 (coolant concentrate) mixed 50% with quality water.

**Water Quality:**

Distilled, de-ionized, or soft water is preferred for use in cooling systems. Mineral (hard/tap) water should NEVER be put in a cooling system unless first tested. However, water that meets the following water quality specifications is acceptable.

**Water Quality Specifications**

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

If Chlorides, Sulfates, or Total Dissolved Solids are higher than the above given specifications, the water must be distilled, de-mineralized, or de-ionized before using in cooling system.

If Total Hardness is higher than the above given specification and all other parameters are within the given specifications, the water must be softened before using in cooling system.

**Ethylene Glycol Concentrate (Antifreeze):**

**IMPORTANT: DO NOT use methyl alcohol or methoxy propanol base concentrate. This concentrate is not compatible with additives used in supplemental coolant additives. Damage can occur to rubber seals on cylinder liners which are in contact with coolant.**

**DO NOT use ethylene glycol concentrate containing sealer or stop-leak additives.**

**DO NOT use concentrate containing less than 10% ethylene glycol.**

**DO NOT use concentrate containing more than 0.1% anhydrous metasilicate. This type of concentrate, which is intended for use in aluminum engines, may cause a gel-like deposit to form that reduces heat transfer and coolant flow. Check container label or consult with supplier before using.**

RG,18293,COOL4 -19-09AUG94

## :NGINE COOLANT SPECIFICATIONS—CONTINUED

**;upplemental Coolant Additives (SCA's):**

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

**DO NOT use soluble oil.**

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

ALWAYS inhibit the antifreeze-coolant mix with a ıon-chromate inhibitor such as John Deere Liquid Coolant Conditioner. Follow the supplier's ecommendations printed on the container.

Iohn Deere Liquid Coolant Conditioner is available in he following sizes:

—TY16004 473 mL (16 oz) container
—TY16005 3.8 L (1 US gal) container

**IMPORTANT: John Deere Liquid Coolant Conditioner does NOT protect against freezing.**

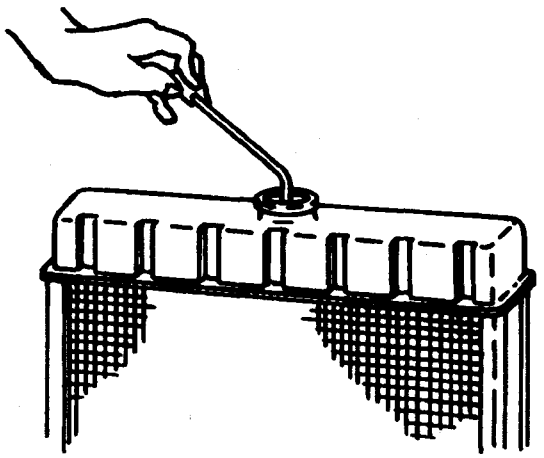
In tropical areas where antifreeze or John Deere Engine COOL-GARD is not available, it is acceptable to use water meeting the quality specifications on the previous page and John Deere Liquid Coolant Conditioner. The recommended concentration of John Deere Liquid Coolant Conditioner must be doubled to 6% (60 mL per Liter of cooling system capacity) by volume when used with water only (no antifreeze).

Additives eventually lose their effectiveness and must be recharged with additional liquid coolant conditioner. See label on container for recommended service intervals and concentration rates. See REPLENISHING SUPPLEMENTAL COOLANT ADDITIVES (SCA'S) BETWEEN COOLANT CHANGES, later in this section.

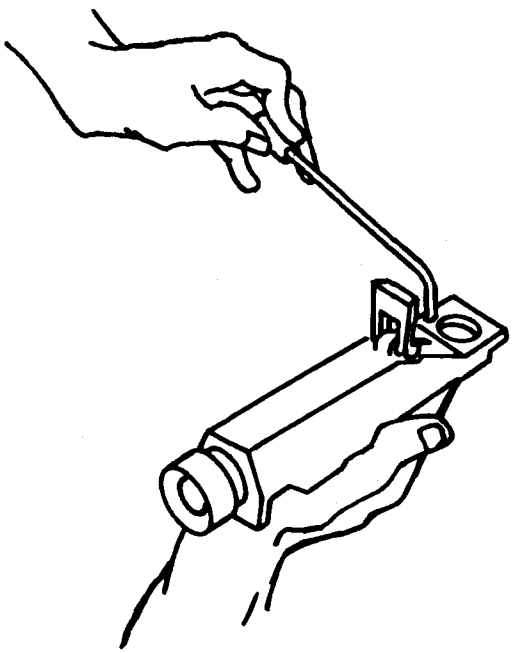
*Contact your authorized servicing dealer or engine distributor, if there are further questions.*

RG,COOL,182932 -19-15JUN94

## REPLENISHING SUPPLEMENTAL COOLANT ADDITIVES (SCA'S) BETWEEN COOLANT CHANGES



RG6261 -UN-22APR92



RG6262 -UN-22APR92

Through time and use, original additives eventually lose their effectiveness and must be recharged with additional supplemental coolant additives available in the form of liquid coolant conditioner.

*NOTE: Service intervals listed are a recommended engineering guideline. Refer to your vehicle operator's manual for a specific service interval.*

Perform a COOLSCAN analysis after 900 hours or 1-1/2 years of operation when using John Deere Prediluted Antifreeze/Summer Coolant, and after 600 hours or 6 months of operation when using all other John Deere coolant products. If a COOLSCAN analysis is not available, recharge system per instructions printed on label of TY16004 John Deere Liquid Coolant Conditioner.

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

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

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

RG,18293,REQ4A -19-09AUG94

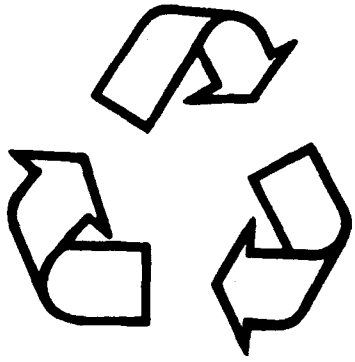
## DISPOSING OF COOLANT

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

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

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

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



TS1133 -UN-26NOV90

RG,COOL,REQ5 -19-12JUL94

## INSTRUMENT (GAUGE) PANEL

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

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

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

**A—Electric Hour Meter**—Indicates the operating hours of the engine while key switch is in the "ON" position. The hourmeter should be used as a guide for scheduling periodic service.

**B—Coolant Temperature Gauge**—Indicates the engine coolant temperature.

**C—Tachometer**—Indicates engine speed in revolutions per minute (rpm).

*NOTE: A combination tachometer and hour meter is also an available option. See your authorized servicing dealer or engine distributor.*

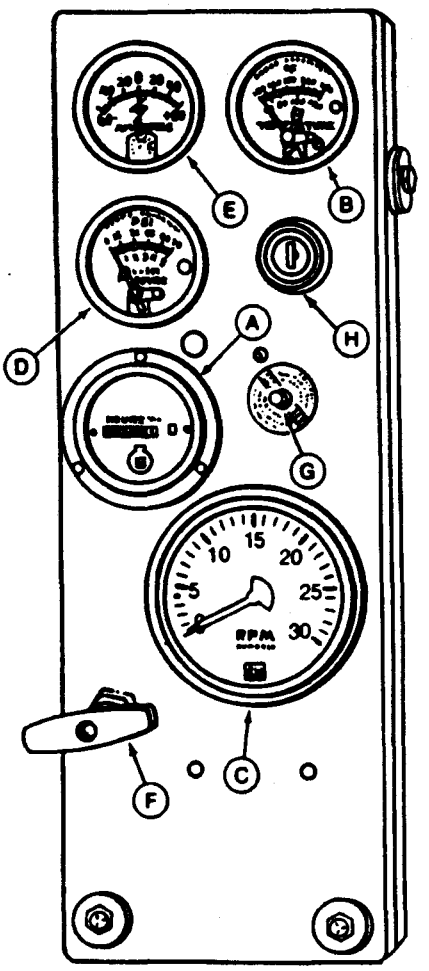
**D—Oil Pressure Gauge**—Indicates engine oil pressure.

**E—Ammeter**—Indicates charging current within electrical system.

**F—Hand Throttle**—Controls engine speed.

**G—Reset (Safety) Switch**—Overrides safety shutdown switch when depressed and held in during engine startup. Hold button in until engiine oil pressure is at a safe operating level.

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



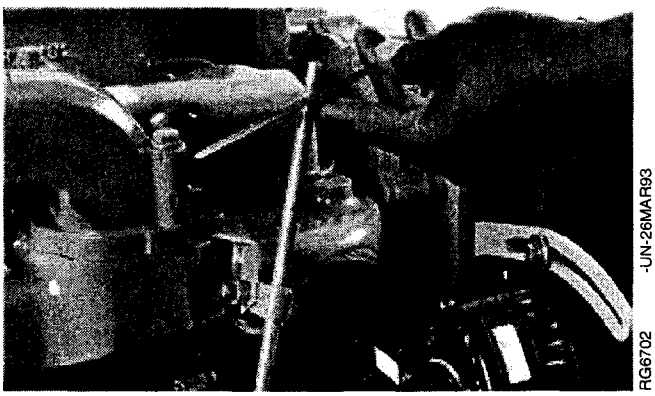

RG4477A -UN-11FEB93

**A—Electric Hour Meter**
**B—Coolant Temperature Gauge**
**C—Tachometer**
**D—Oil Pressure Gauge**
**E—Ammeter**
**F—Hand Throttle**
**G—Reset Switch**
**H—Key Switch**

S11,OMCI,D -19-03AUG94

## 3REAK-IN SERVICE

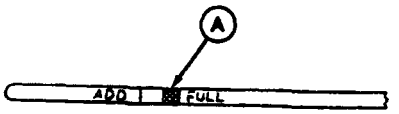
'he engine is ready for normal operation, however, extra :are during the first 100 hours will result in a more ;atisfactory long-term engine performance and life. DO JOT exceed 100 hours of operation with break-in oil.



RG6702 -UN-26MAR93

1. This engine is factory-filled with John Deere Break-in Oil. See ENGINE BREAK-IN OIL in Fuels, Lubricants, and Coolant section. Run the engine the first 100 hours with break-in oil.

**MPORTANT: If the engine is run at constant speed and/or light load usage, a longer break-in period maybe required. In these situations, an additional 100 hour break-in period is recommended using a new change of John Deere Engine Break-In oil.**




RG5420 -UN-15DEC88

When operating a new engine in extreme (high temperature or dusty) conditions, break-in oil MUST be drained after the first 50 hours of operation.

**MPORTANT: DO NOT operate engine when oil level is below ADD mark on dipstick. ALWAYS keep oil level within the crosshatch pattern (A) or at the FULL mark, whichever is present. Oil levels anywhere within crosshatch are considered full.**

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

**ENGINE SPECIFICATIONS***

| | |
|---|---|
| Minimum Oil Pressure at 850 rpm (except 3-cylinder) | 103 kPa (1.03 bar) (15 psi) |
| Minimum Oil Pressure at 850 rpm (3-cylinder engines) | 140 kPa (1.4 bar) (20 psi) |
| Coolant Temperature Range | 82°—94°C (180°—202°F) |

** At normal operating temperature of 105°C (220°F) sump.*

S11,OMBI,I -19-03AUG94

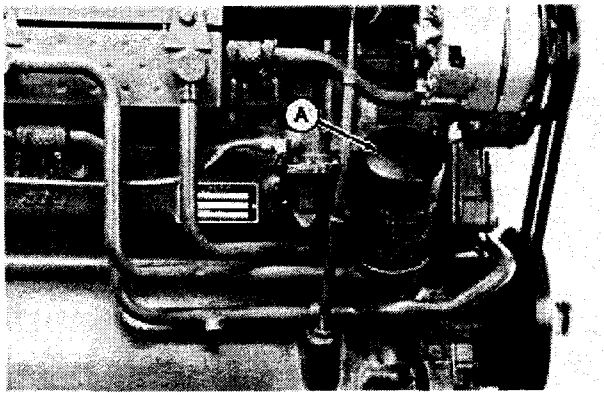
3. During the first 20 hours, avoid prolonged periods of engine idling or sustained maximum load operation.

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

5. After the first 100 hours maximum, drain engine oil and change engine oil filter (A). (See CHANGE ENGINE OIL AND FILTER in Lubrication and Maintenance/250 Hour section.) Fill with seasonal viscosity grade oil. (See ENGINE OIL, in Fuels, Lubricants, and Coolant Section.)

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

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



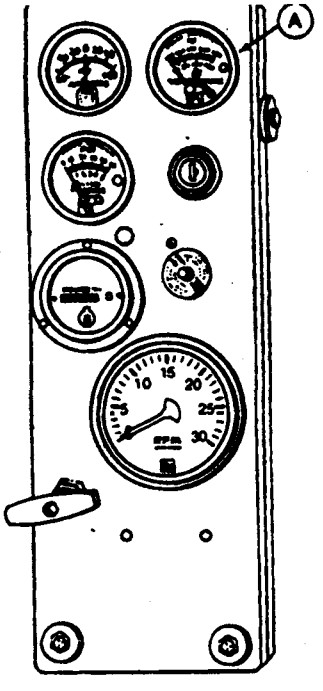

RG4876 -UN-15DEC88

S11,OMBI,J -19-09AUG94

6. Watch coolant temperatures (A) closely. If coolant temperature rises above 99°C (210°F), reduce load on engine. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

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

7. 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 -19-19MAR91

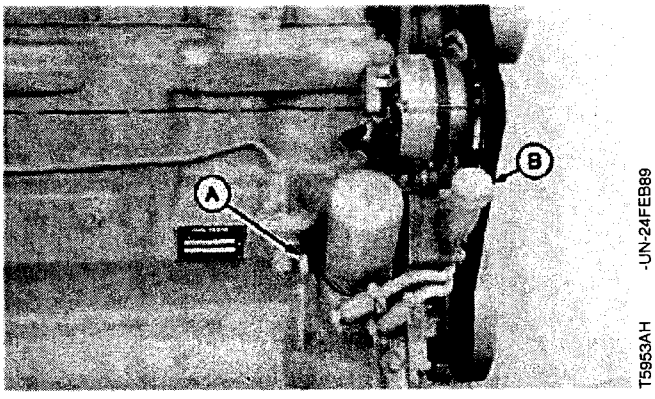
## DAILY PRESTARTING CHECKS

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

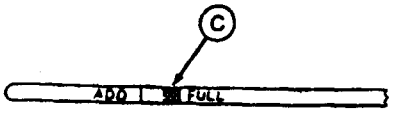
1. Check engine oil level on dipstick (A). Do not operate engine when oil level is below the ADD mark on dipstick. Add oil at filler cap (B), as required, using seasonal viscosity grade oil. (See ENGINE OIL in Fuels, Lubricants, and Coolant Section for oil specifications.)

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

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



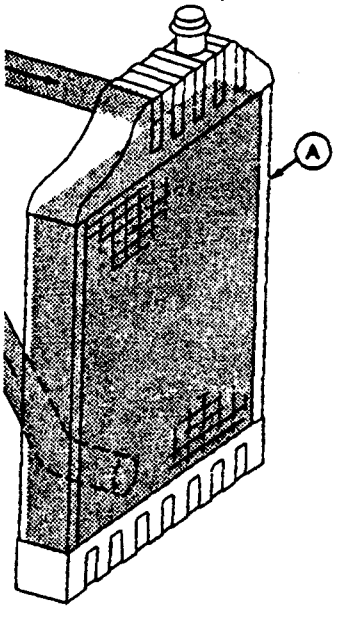

T5953AH -UN-24FEB89




RG5421 -UN-15DEC88

S11,OMPC,O -19-09AUG94

2. Check the coolant level when engine is cold. Coolant level should be at bottom of filler neck. Fill radiator (A) with appropriate coolant. (See RECOMMENDED ENGINE COOLANT in Fuels, Lubricants, and Coolant Section.)

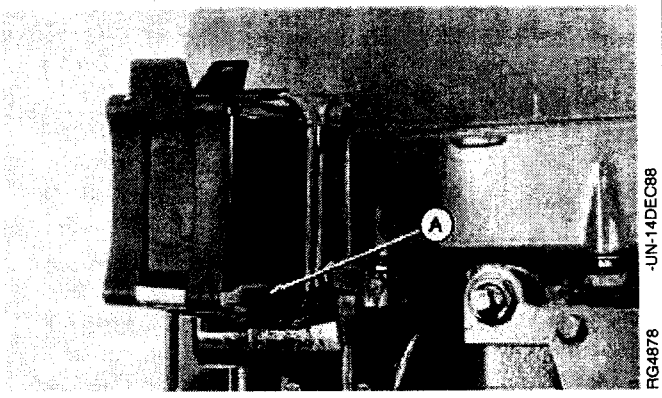



RG4675 -UN-14DEC88

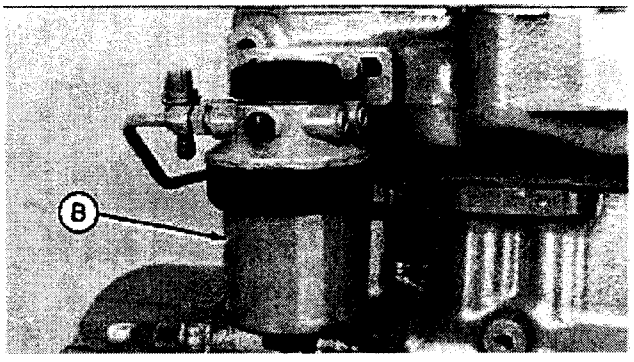
S11,OMPC,P -19-17JUN94

3. Check the glass sediment chamber of the rectangular fuel filter (A) for water or debris. If present, drain the filter. (See REPLACE FUEL FILTER ELEMENT in Lubrication and Maintenance/600 Hours/1-Year Section.)

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



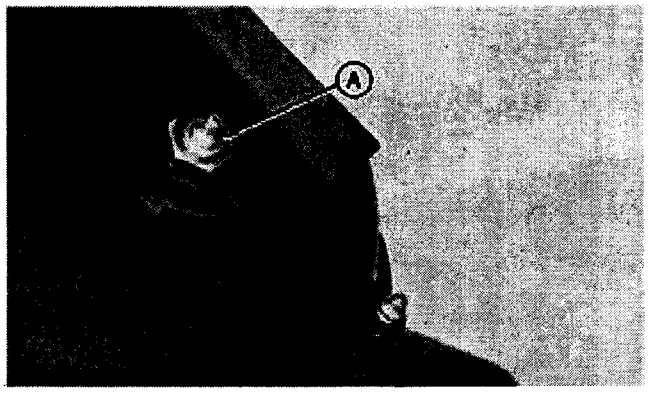

RG4878 -UN-14DEC88




CD30351 -UN-03FEB93

RG18293,1 -19-17FEB93

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



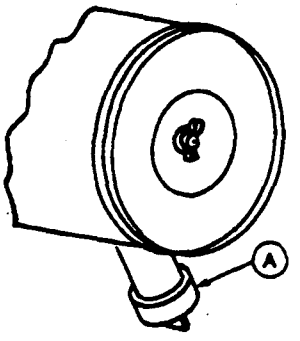

RG4594 -UN-15DEC88

S11,OMPC,S -19-07JUN91

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.**



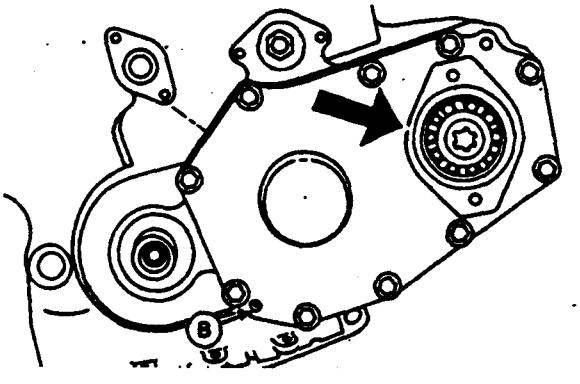

RG4676 -UN-20DEC88

S11,OMPC,R -19-03JUL86

## AUXILIARY GEAR DRIVE LIMITATIONS

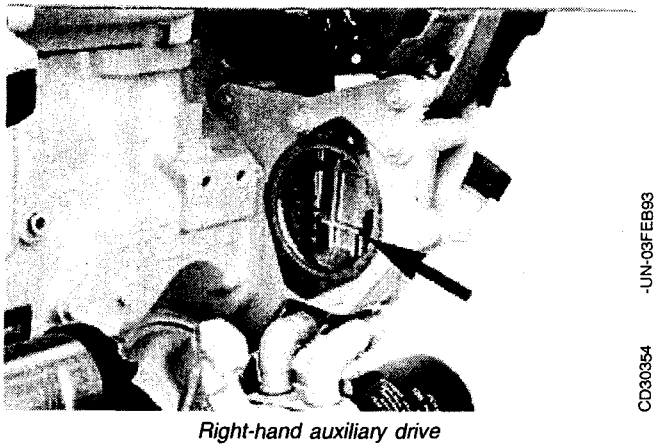
**IMPORTANT: When attaching an air compressor, hydraulic pump, or other attachment to be driven by the auxiliary gear drive (engine timing gear train at front of engine), power requirements of the accessory must be limited to:**

- **Left-Hand Auxiliary Gear Drive:**
  - **— 30 kW (40 hp) Continuous Operation**
  - **— 37 kW (50 hp) Intermittent Operation**
- **Right-Hand Auxiliary Gear Drive:**
  - **— 11 kW (15 hp) Continuous Operation**
  - **— 19 kW (26 hp) Intermittent Operation**




*Left-hand auxiliary drive*

RG5213 -UN-14DEC88



*Right-hand auxiliary drive*

CD30354 -UN-03FEB93

RG18293,2 -19-22FEB93

## STANDBY POWER UNITS

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

S55,OMOE,BE -19-04AUG93

## STARTING THE ENGINE

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

TS220 -UN-23AUG88

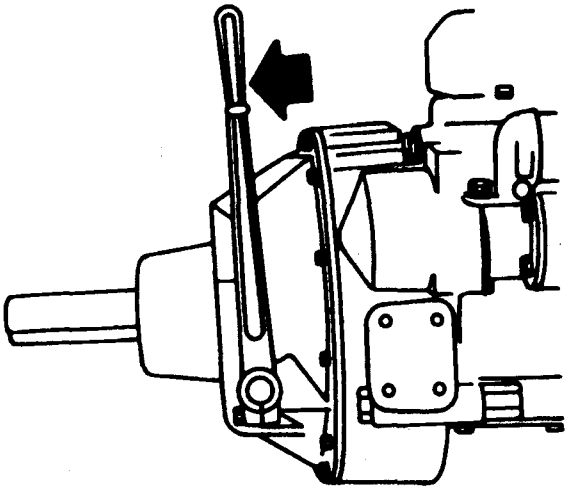
**CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment. Always use safety approved fuel storage and piping.**

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

1. Perform all prestarting checks outlined in 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.



RG5602 -UN-30NOV89

S11,OMOE,AS -19-09JUN94

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

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

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

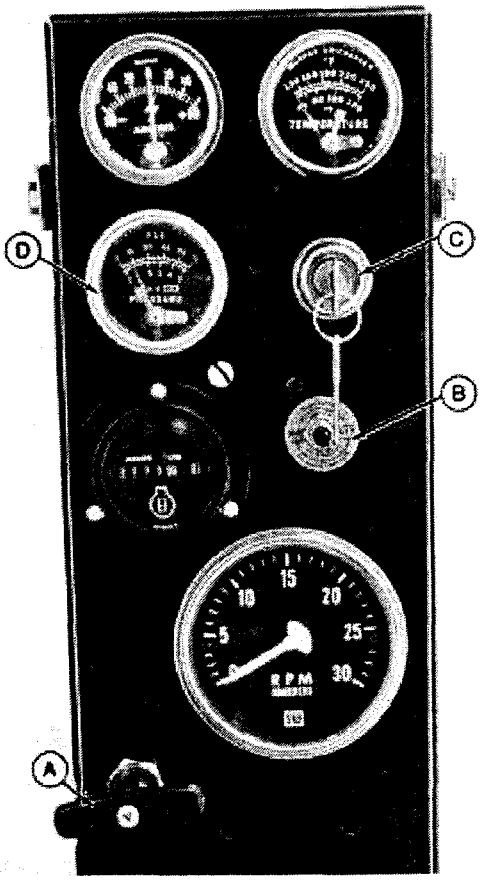
6. Turn the key switch (C) clockwise to crank the engine. When the engine starts, release the key so that it returns to the "ON" position.

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

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

**IMPORTANT: Should the engine die when operating under load, immediately disengage PTO 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 -19-17FEB93

## COLD WEATHER OPERATION

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

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

TS1356 -UN-18MAR92

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

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

RG18293,13 -19-02AUG94

## WARMING ENGINE

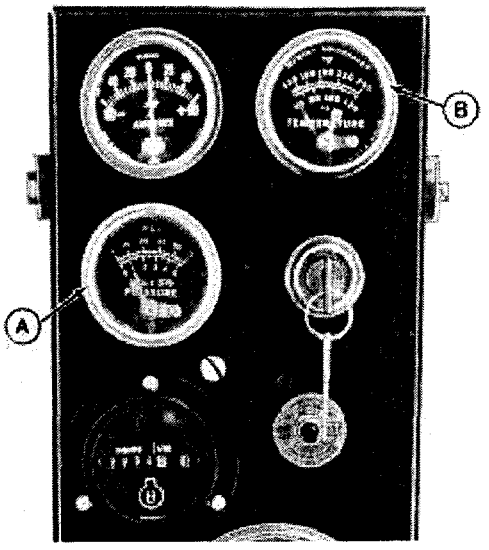
**IMPORTANT: To assure proper lubrication, operate engine at 1200 rpm with no load for 1—2 minutes. Extend this period 2—4 minutes when operating at temperatures below freezing.**

1. Check oil pressure gauge (A) as soon as engine starts. If gauge needle does not rise above minimum 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 380 ± 103 kPa (3.80 bar ± 1.03 bar) (55 ± 15 psi) at rated full load speed (1800—2500 rpm) with oil at normal operating temperature of 105°C (220°F).

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

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

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

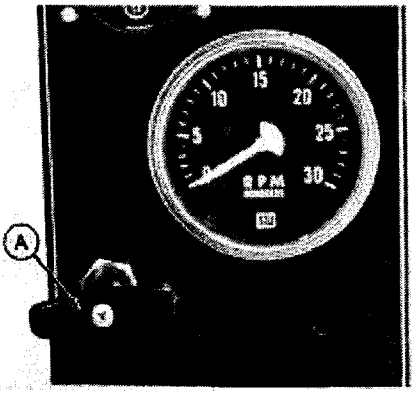



RG4696 -UN-15DEC88

S11,OMOE,AU1 -19-22FEB93

## CHANGING ENGINE SPEED—STANDARD (MECHANICAL) GOVERNOR

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




RG4697 -UN-15DEC88

S11,OMOE,M -19-08FEB91

## 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.

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

S11,OMOE,G -19-02MAR93

## STOPPING THE ENGINE

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

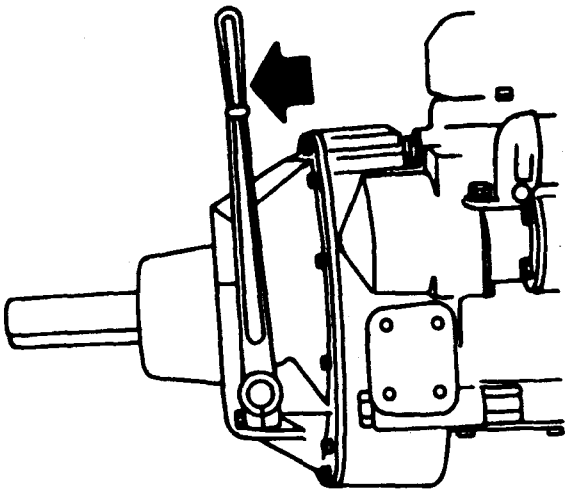
2. Move the throttle lever (A) to slow idle on standard (mechanical) governor engines.

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

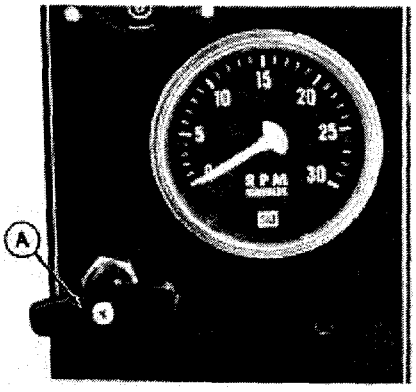
**Engines in generator set applications, where the governor is locked at a specified speed and no slow idle function is available, should be unloaded and idled for at least 2 minutes at high idle.**

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.**



RG5602 -UN-30NOV89




RG4697 -UN-15DEC88

S11,OMOE,AW -19-09JUN94

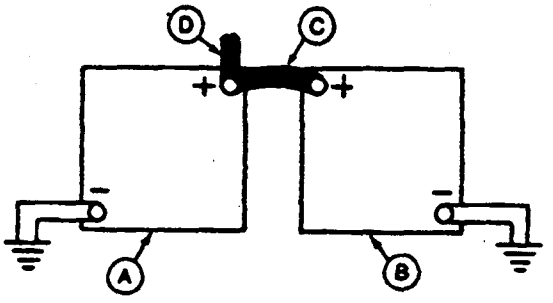
## USING A BOOSTER BATTERY OR CHARGER

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.

TS204 -UN-23AUG88

**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.**




RG4678 -UN-14DEC88

*12-Volt System*

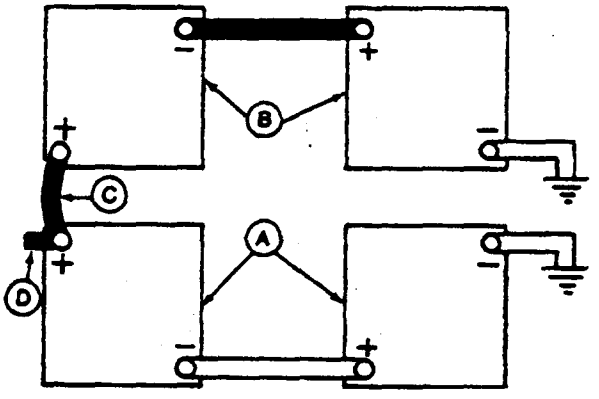
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

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.




RG4698 -UN-14DEC88

*24-Volt System*

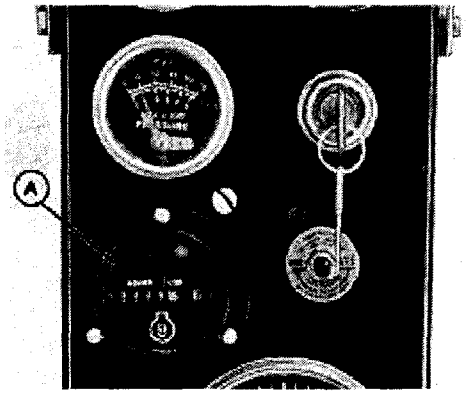
**A—12-Volt Machine Battery(ies)**
**B—12-Volt Booster Battery(ies)**
**C—Booster Cable**
**D—Cable To Starting Motor**

S11,OMOE,AX1 -19-07JUN91

## )BSERVE SERVICE INTERVALS

Jsing hour meter (A) as a guide, perform all services at he hourly intervals indicated on following pages. At each ;cheduled maintenance interval, perform all previous naintenance operations in addition to the ones specified. ‹eep track of services performed in Lubrication and Maintenance Records Section.

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




RG4699 -UN-15DEC88

S11,OMLM,BJ -19-09AUG94

## JSE CORRECT FUELS, LUBRICANTS, AND COOLANT

**MPORTANT: 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.


TS100 -UN-23AUG88

S11,OMLM,B1 -19-10AUG94

## LUBRICATION AND MAINTENANCE SERVICE INTERVAL CHART

| | Lubrication and Maintenance Service Intervals | | | | | | |
|---|---|---|---|---|---|---|---|
| **Item** | **Daily** | **100 Hour** | **250 Hour** | **400 Hour** | **600 Hour/ 1-Year** | **1200 Hour/ 2-Year** | **As Required** |
| Check Engine Oil and Coolant Level | • | | | | | | |
| Check Fuel Filter | • | | | | | | |
| Lubricate PTO Release Bearing | • | | | | | | |
| Check Air Cleaner Dust Unloader Valve | • | | | | | | |
| Lubricate PTO Clutch Shaft Bearing | | • | | | | | |
| Service Fire Extinguisher | | • | | | | | |
| Service Battery | | | • | | | | |
| Change Engine Oil and Filter* | | | • | | | | |
| Check V-Belt Tension | | | • | | | | |
| Check PTO Clutch Adjustment | | | • | | | | |
| Initial Valve Clearance Adjustment** | | | | • | | | |
| Lubricate PTO Clutch Levers & Linkage | | | | | • | | |
| Clean Crankcase Vent Tube | | | | | • | | |
| Check Air Intake Hoses and Connections | | | | | • | | |
| Replace Fuel Filter Element | | | | | • | | |
| Coolant Solution Analysis | | | | | • | | |
| Service Air Intake System | | | | | • | | |
| Check Cooling System | | | | | • | | |
| Perform Engine Tune-Up | | | | | | • | |
| Check and Adjust Engine Speeds | | | | | | • | |
| Adjust Engine Valve Clearance | | | | | | • | |
| Check Fuel Injection System | | | | | | • | |
| Inspect Turbocharger | | | | | | • | |
| Check Crankshaft Vibration Damper | | | | | | • | |
| Flush Cooling System & Replace Thermostats | | | | | | • | |
| Pressure Test Cooling System | | | | | | • | |
| Inspect and Service Air Cleaner Elements | | | | | | | • |

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

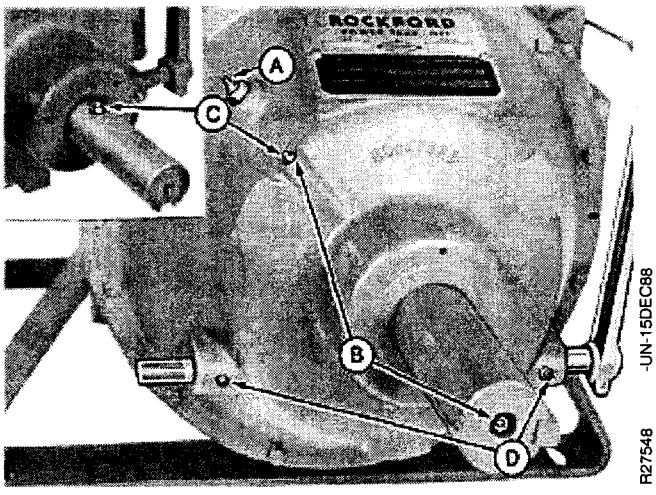
**** Have your authorized servicing dealer or engine distributor adjust valve clearance after the first 400 hours of operation. Then, have the valve clearance adjusted at 1200 hour/2-Year intervals thereafter.**

RG,OMLM,2 -19-02MAR93

## LUBRICATE PTO CLUTCH SHAFT BEARINGS

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

**IMPORTANT: Lubricate release bearing fitting (A) daily or at 10 hour intervals for continuous operation. (See Prestarting Checks Section.) Lubricate shaft fittings (D) at 600 Hours or 1-Year intervals. (See LUBRICATE PTO CLUTCH SHAFT BEARINGS in 600 Hour/1-Year Service Section.)**




**A—Release Bearing Grease Fitting**
**B—Fittings for Side-Loaded Drive**
**C—Fittings for In-Line Drive**
**D—Lever Shaft Fittings**

S11,OMLM,C -19-09AUG94

## SERVICING FIRE EXTINGUISHER

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

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


S11,OMLM,AP -19-22FEB93

## SERVICE BATTERY

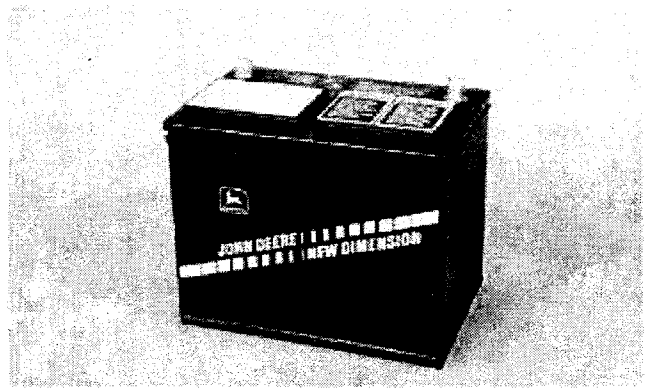
TS204 -UN-23AUG88

**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.

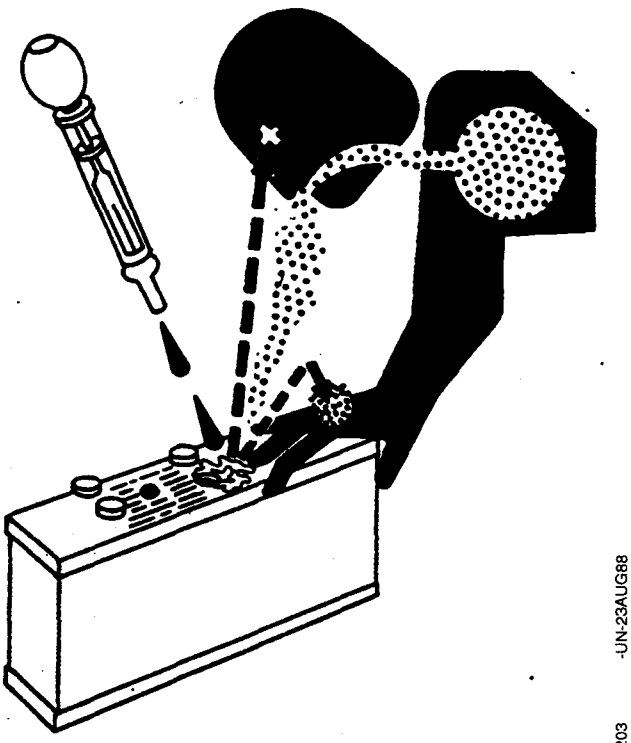
S55,OMLM,P -19-07JUN91

**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.**

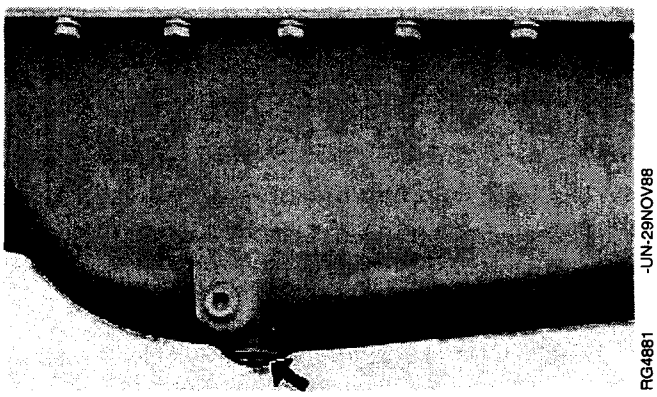



If necessary to replace battery(ies), replacements must meet or exceed the following recommended capabilities at -18° C (0° F):

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

S55,OMLM,Q -19-19MAR91

## CHANGE ENGINE OIL AND FILTER




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

If John Deere 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.

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

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

2. Drain oil while warm.

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

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

S11,OMLM,CW -19-09JUN94

4. Remove and discard oil filter element (A).

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

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

6. Oil new packing 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.

7. Install drain plug with a new seal when equipped.

8. Fill engine crankcase with correct John Deere engine oil through rocker arm cover opening or on some engine applications, the timing gear cover opening. (See ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

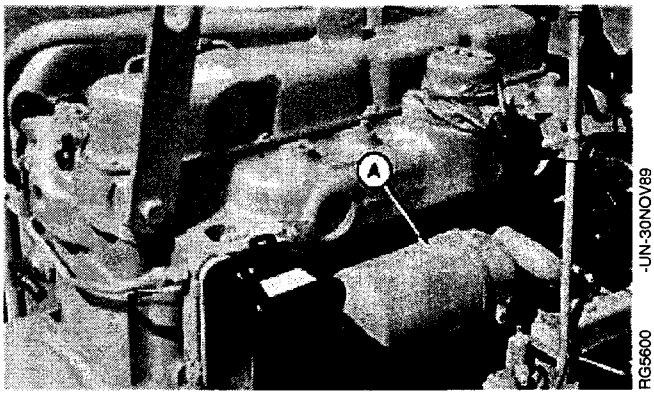
To determine the correct oil fill quantity for your engine, see ENGINE CRANKCASE OIL FILL QUANTITIES in the Specifications Section.

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

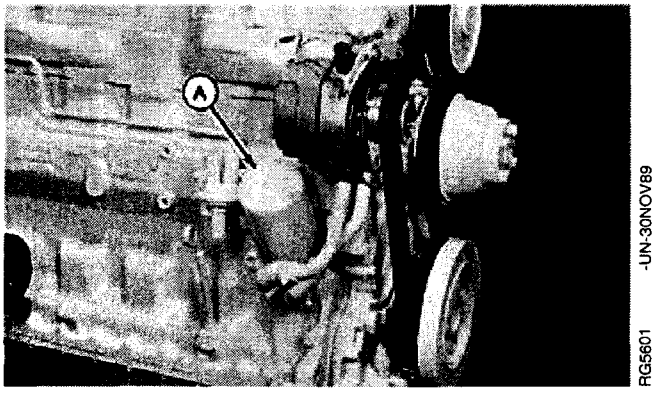
**IMPORTANT: Immediately after completing any oil change, crank engine for 30 seconds without permitting engine to start. This will help insure adequate lubrication to engine components before engine starts.**

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

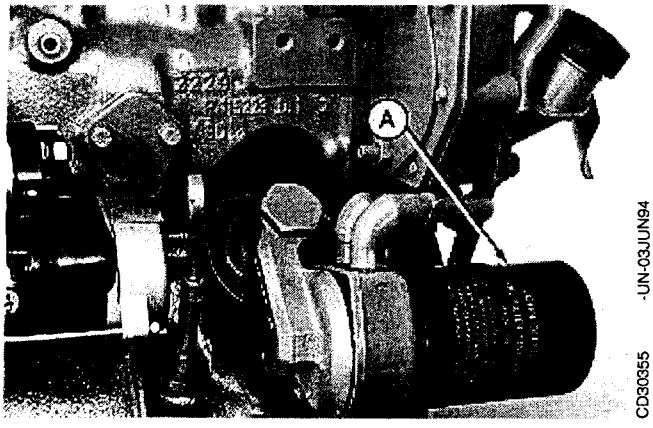
10. Stop engine and check oil level after 10 minutes. Oil level reading should be on upper mark of dipstick.




*4045 and 6068 Engines*




*4039 and 6059 Engines*




*3029 Engines*

S11,OMLM,CX1 -19-09AUG94

## FAN AND ALTERNATOR BELTS TENSION OR REPLACEMENT

Low belt tension causes slippage resulting in excessive cover wear, burn spots, overheating, or "slip and grab", causing belt breakage.

High belt tension causes belt heating and excessive stretch, as well as damage to drive components such as pulleys and shafts. V-belts should ride on the sides of standard pulleys not on the bottom of the groove.

Standard V-Belt tension can be checked with JDG529 Tension Gauge (arrow) or equivalent gauge.

*NOTE: On engines with dual belts, check tension of front belt only.*

1. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary.

2. Using either JDG529 Tension Gauge (arrow) or belt tension tester (A) and straightedge (B), check tension of warm belts:

• For standard V-Belt, an 89 N (20 lb force) applied halfway between pulleys should deflect belt by 19 mm (3/4 in.).

• For Poly V-Belt, a 130 N (30 lb force) applied halfway between pulleys should deflect belt by 13 mm (1/2 in.).

3. If adjustment is necessary, loosen alternator bracket cap screw (C) and nut (D) on mounting bolt. Pull alternator frame outward until belts are correctly tensioned.

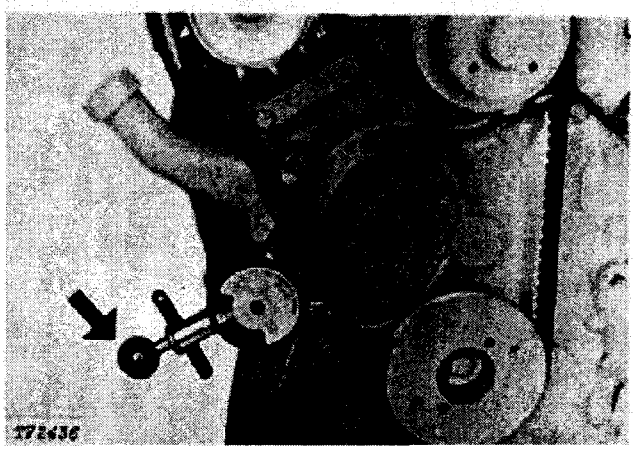
**IMPORTANT: Do not pry against the alternator rear frame. Do not tighten or loosen belts while they are hot.**

4. Tighten alternator bracket cap screw and nut firmly.

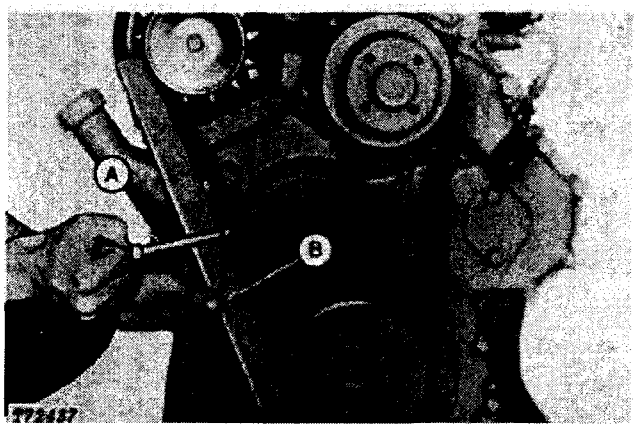
5. After a new or used belt has run for 10 minutes, recheck belt tension.

**Standard V-Belts**

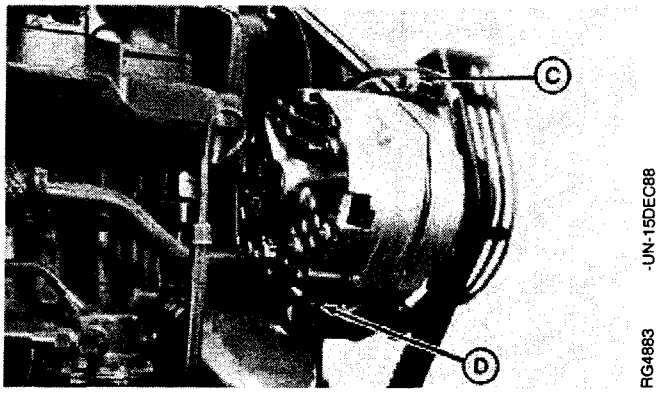
| | Tension New Belt | Tension Used* Belt |
|---|---|---|
| Single Belt | 578—622 N (130—140 lb force) | 378—423 N (85—94 lb force) |
| Dual Belt | 423—467 N (95—104 lb force) | 378—423 N (85—94 lb force) |




T72436 -UN-23FEB89




T72437 -UN-23FEB89




RG4883 -UN-15DEC88

**A—Tension Tester**
**B—Straightedge**
**C—Alternator Bracket Cap Screw**
**D—Nut on Mounting Bolt**

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

RG,FANALT,A -19-11AUG94

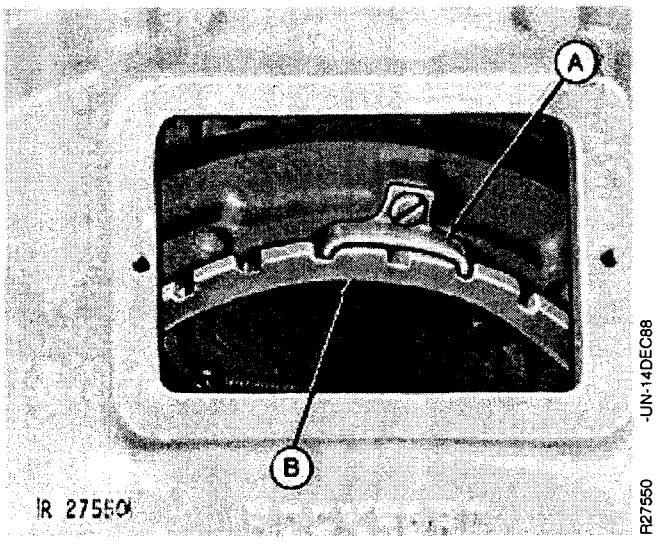
## CHECK PTO CLUTCH ADJUSTMENT

**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 force 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 -19-02MAR93

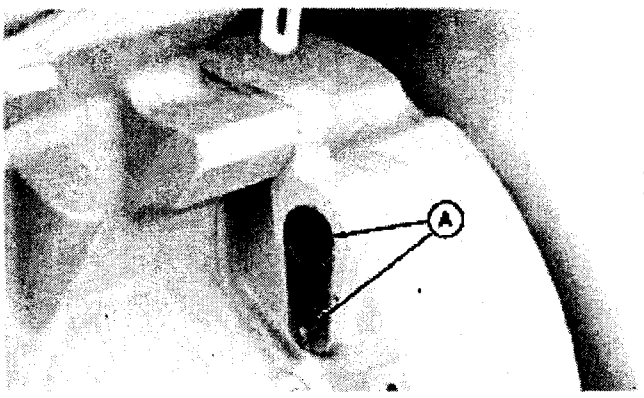
## CHECK AND ADJUST ENGINE VALVE CLEARANCE

**IMPORTANT: Any time air intake system is opened, it must be checked for leaks before machine is returned to service. (See CHECK AIR INTAKE HOSES in 600 Hour/1-Year Section.)**

Engine valve clearance MUST BE checked and/or adjusted with engine COLD.

1. Remove rocker arm cover and crankcase ventilator hose.

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




RG6305 -UN-03AUG92

RG18293,3 -19-11AUG94

3. Using JD281A, JDE83, or JDG820 Engine Rotation Tool and JDE81-4 Timing Pin, rotate engine in running direction (clockwise viewed from front) until No. 1 cylinder is at TDC Compression stroke. Insert timing pin in flywheel.

*NOTE: Some engines are equipped with flywheel housings which do not allow use of an engine rotation tool.*

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

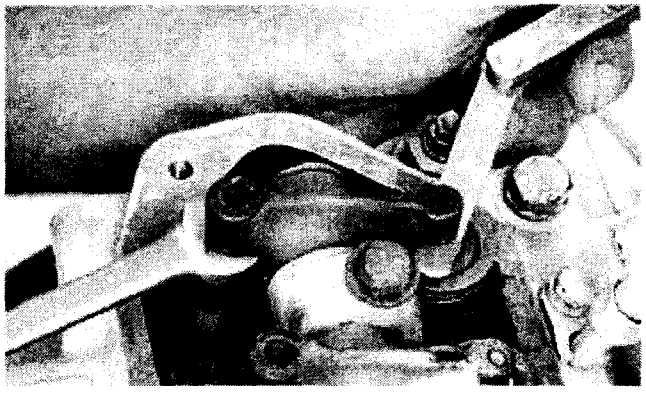
4. Check and adjust valve clearance to specifications, as directed in the following procedures for 3-, 4-, or 6-cylinder engines.

**VALVE CLEARANCE (ROCKER ARM-TO-VALVE TIP) SPECIFICATION**

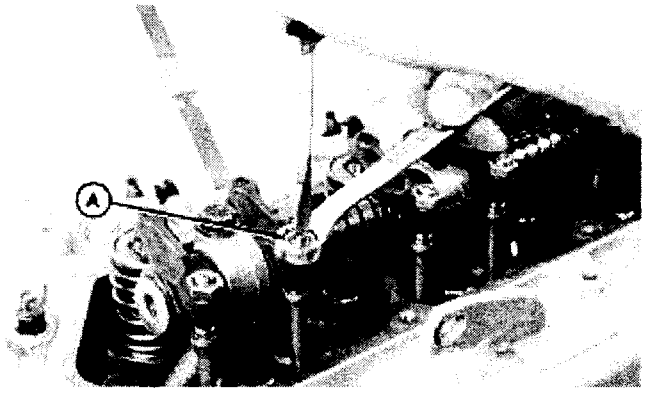
Intake Valve . . . . . 0.35 mm (0.014 in.)

Exhaust Valve . . . . . 0.45 mm (0.018 in.)

5. If rocker arm is equipped with adjusting screw and jam nut (A), tighten jam nut to 27 N·m (20 lb-ft) after adjusting valve clearance.



T81224 -UN-07NOV88




RG6307 -UN-03AUG92

RG18293,4 -19-09JUN94

- **3-Cylinder Engine:**

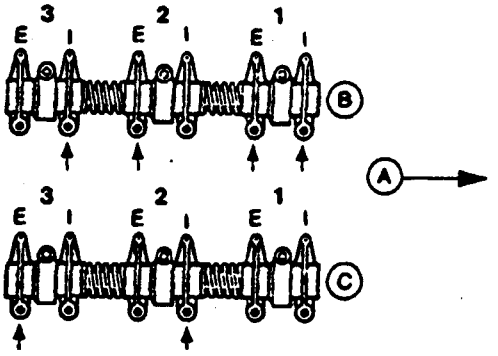
*NOTE: Firing order is 1-2-3.*

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

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

Turn crankshaft 360° and lock No. 1 piston at TDC exhaust stroke (C).

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




RG4775 -UN-06DEC88

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

RG,CTM8,G05,67 -19-10JUL92

- **4-Cylinder Engine:**

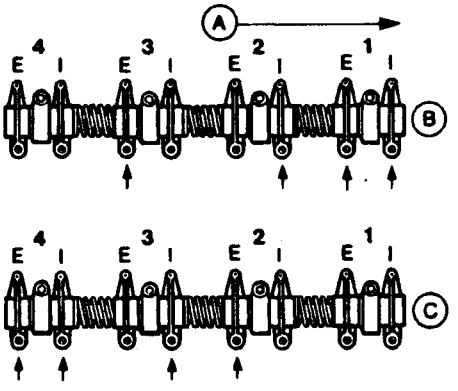
*NOTE: Firing order is 1-3-4-2.*

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

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

Turn crankshaft 360°. Lock No. 4 piston is at TDC compression stroke (C).

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




RG4776 -UN-22SEP92

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

RG,CTM8,G05,9 -19-10JUL92

• **6-Cylinder Engine:**

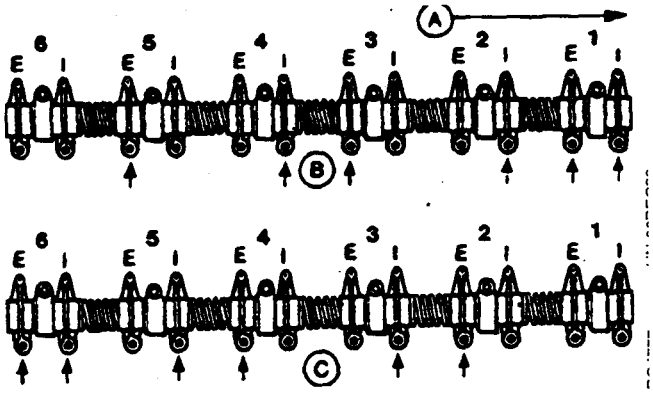
*NOTE: Firing order is 1-5-3-6-2-4.*

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

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

Turn crankshaft 360°. Lock No. 6 piston is at TDC compression stroke (C).

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




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

RG,CTM8,G05,10 -19-10JUL92

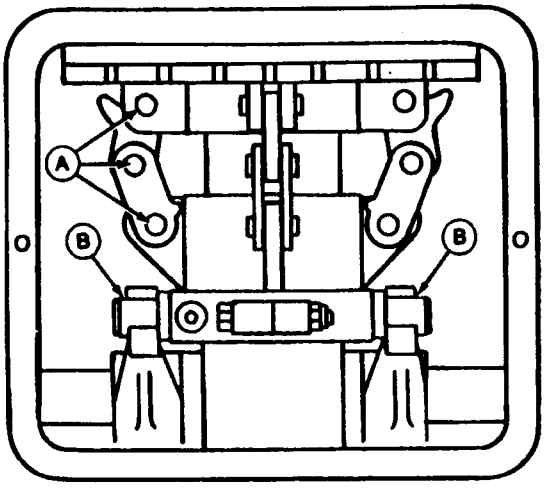
## LUBRICATING PTO CLUTCH INTERNAL LEVERS AND LINKAGE

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

TS198 -UN-23AUG88

1. Remove the PTO housing cover and apply one shot of John Deere Multipurpose Lubricant to the pivot points (A) of each clutch linkage.

2. Apply one shot of John Deere Multipurpose Lubricant to the two PTO release lever shaft fittings (B).




RG6641 -UN-18FEB93

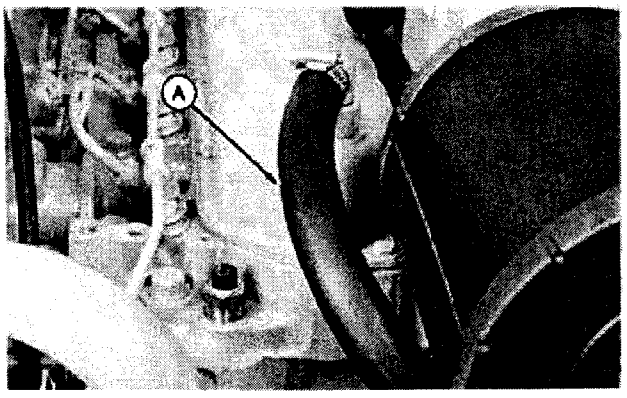
RG,21881,PTO4 -19-26FEB93

## CLEAN CRANKCASE VENT TUBE

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

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 for elbow adapter. Tighten hose clamp securely.




RG6005 -UN-27JAN92

RG,20144,64 -19-17DEC91

## 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 due to abrasive dirt and dust entering the intake system.**

S11,OMLM,DG -19-17DEC91

## REPLACE FUEL FILTER ELEMENT

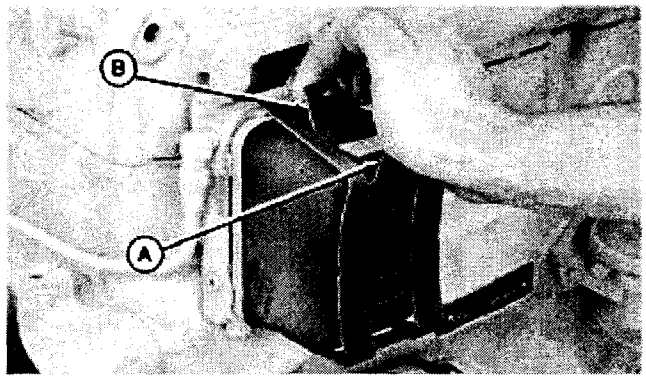
**On Rectangular Fuel Filters:**

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 base.




T88843 -UN-09NOV88

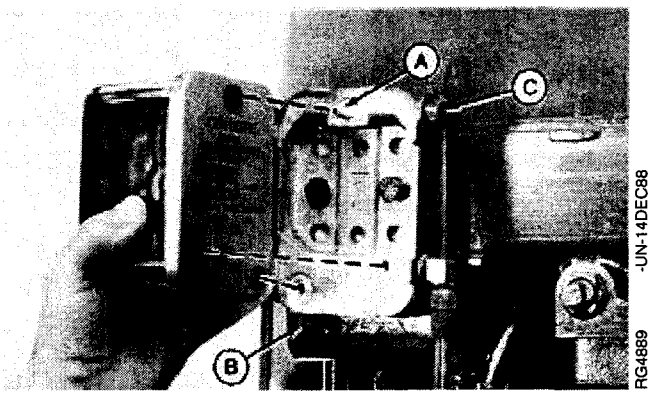
S11,3010,RF1 -19-17FEB93

4. Place filter on filter base with upper seal over spring pin (A) on filter base.

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

6. Install drain plug (B). Tighten drain plug securely.

7. Open fuel shut-off valve and bleed filters. (See BLEED FUEL SYSTEM in Service As Required Section.) Tighten bleed plug (C).




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

S11,OMLM,DK -19-17FEB93

**On Round Fuel Filters:**

1. When equipped, close the fuel shut-off valve.

2. Loosen retaining ring (A) and remove filter element (B).

3. When equipped with water separator, remove filter element from glass sediment bowl. Clean sediment bowl and reinstall a new element onto bowl.

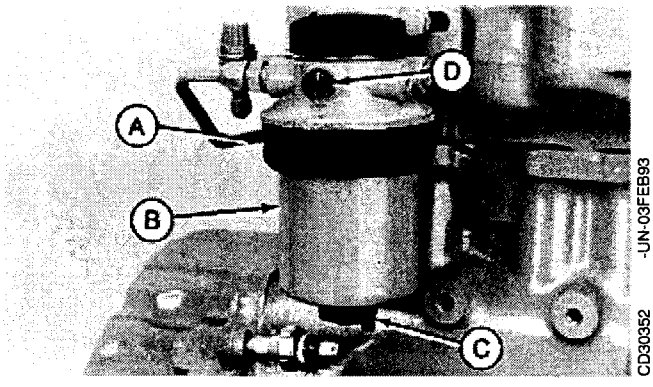
4. Align keys on filter element with slots in filter base.

5. Hand tighten until the retaining ring fits into the lock position.

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

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

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



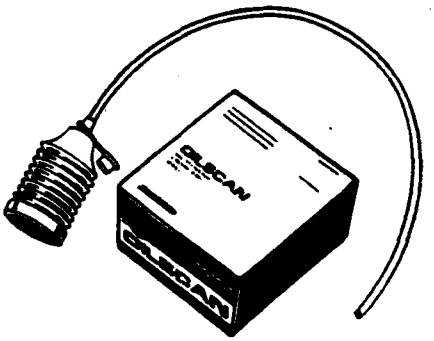

**A—Retaining Ring**
**B—Filter element**
**C—Drain Plug**
**D—Bleed Plug**

RG18293,5 -19-02AUG94

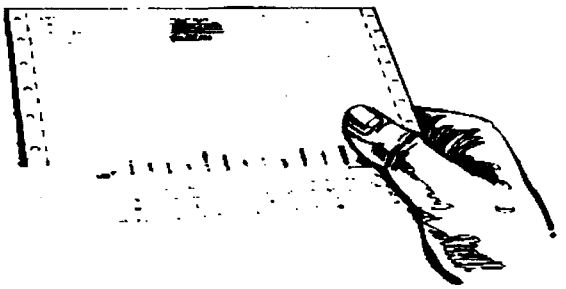
## CHECK EFFECTIVENESS OF COOLANT SOLUTION

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

COOLSCAN is a John Deere sampling program to help you monitor the effectiveness of your engine's coolant solution and identify potential problems before they cause serious damage. COOLSCAN kits are available from your John Deere dealer. Refer to instructions provided with kit.




T6828AB -UN-15JUN89



T6829AB -UN-18OCT88

RG,OMLM,3 -19-17FEB93

## REPLACE AIR CLEANER ELEMENTS

If equipped with this air cleaner, service as follows:

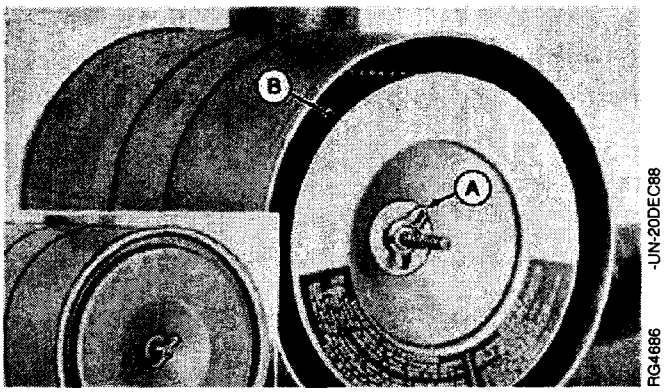
1. Remove wing nut and remove cover shown in small illustration inset.

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

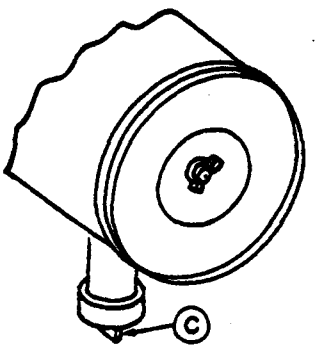
*NOTE: Primary air cleaner element fits snugly in canister. It may be necessary to wiggle element as it is removed from canister.*

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



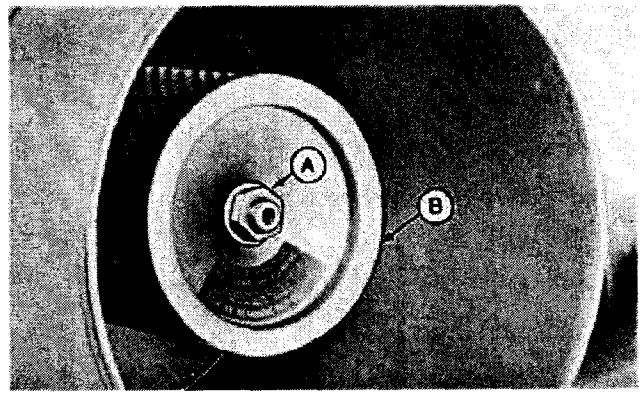

RG4687 -UN-20DEC88

S55,OMLM,R -19-10MAY91

**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.

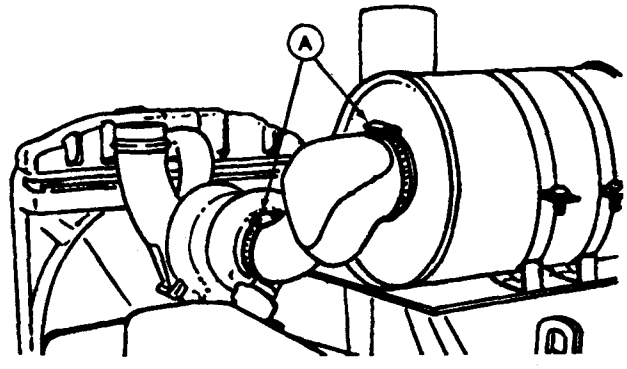



S55,OMLM,S -19-21DEC89

## CHECK AIR INTAKE SYSTEM

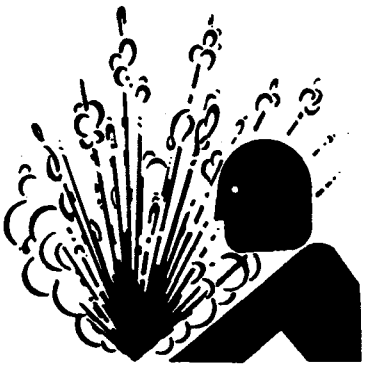
1. Check the clamps (A) on the piping which connect the air cleaner to the engine. Tighten the clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.

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 -19-10MAY91

## CHECK COOLING SYSTEM



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.**

**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.

RG,COOL,CHK,SYS-19-16JUN94

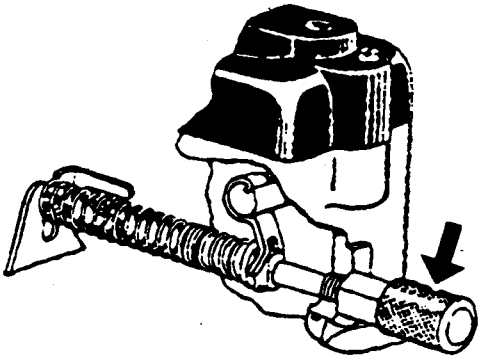
## CHECK AND ADJUST ENGINE SPEEDS

If equipped with a tachometer on the instrument panel, observe the tachometer to verify engine speeds. Refer to FUEL INJECTION PUMP SPECIFICATIONS in Specifications Section, later in this manual.

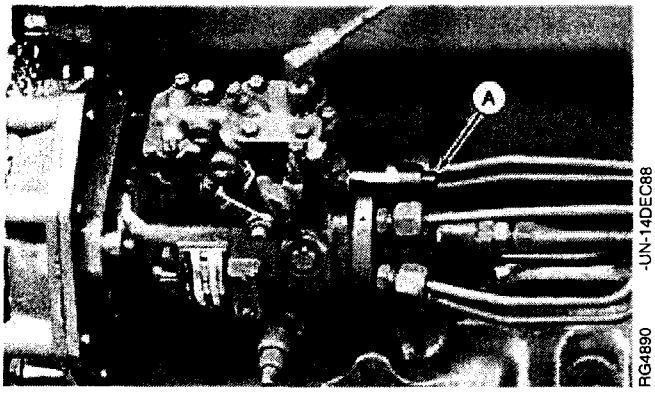
S11,OMOE,DL1 -19-09AUG94

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

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



T86735 -UN-23FEB89



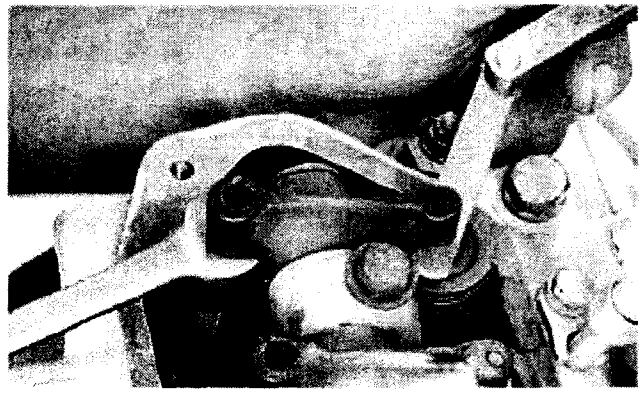

RG4890 -UN-14DEC88

S11,OMLM,DM -19-10MAY91

## ADJUST ENGINE VALVE CLEARANCE

Adjust engine valve clearance. (See ADJUST ENGINE VALVE CLEARANCE in Lubrication and Maintenance/400 Hours Section or have your authorized servicing dealer or engine distributor adjust the valve clearance.)

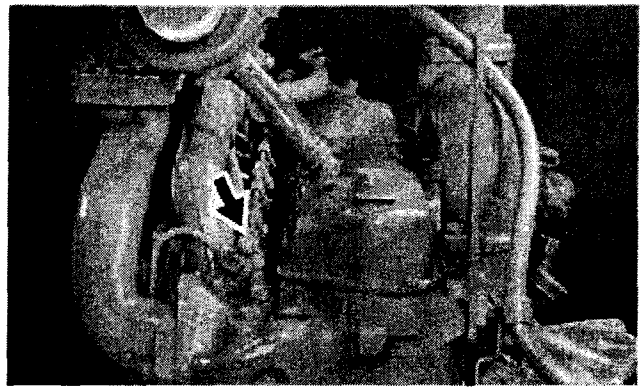
**IMPORTANT: Have valves adjusted after the first 400 hours of operation on new or rebuilt engines. Then, have them adjusted at 1200 Hr/2-Year interval thereafter.**




S11,OMLM,DN -19-09AUG94

## CHECK FUEL INJECTION SYSTEM

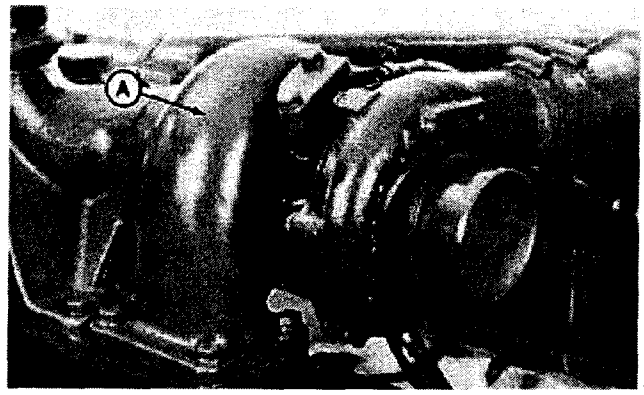
Check the overall fuel injection system. Also check the engine/injection pump timing, clean the injection nozzles, and adjust opening pressure. (See your authorized diesel injection repair station, servicing dealer, or engine distributor.)




S11,OMLM,DO -19-02MAR93

## 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.)

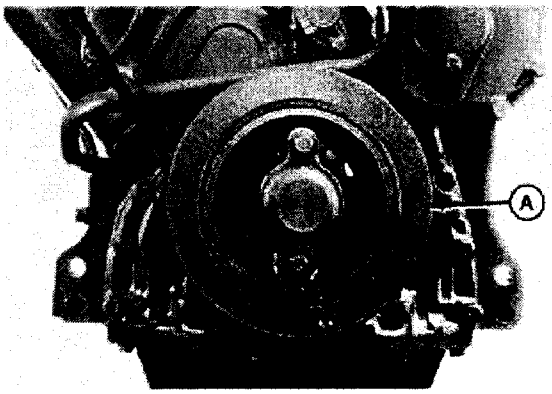



S11,OMLM,DP -19-07JUN91

## 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 4500 hours or 5-years, whichever occurs first.*




RG4893 -UN-14DEC88

S11,OMLM,DU -19-07JUN91

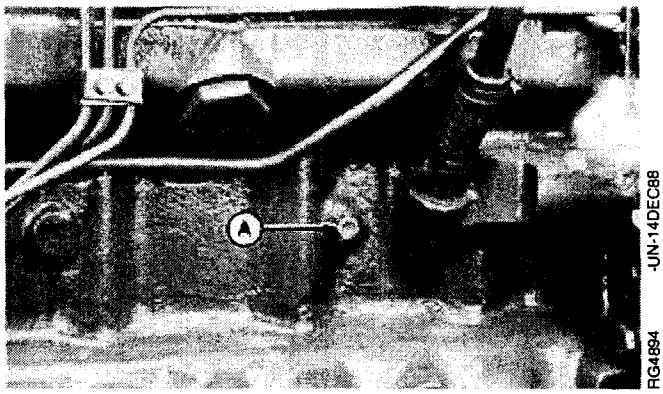
## FLUSH COOLING SYSTEM AND REPLACE THERMOSTATS

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 old 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 coolant to drain faster.

2. Open radiator drain valve. Drain all coolant from radiator.

3. On left side of engine, open drain valve or remove drain plug (A) from engine block. Drain all coolant 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 clean water and TY15979 John Deere Heavy Duty Cooling System Cleaner or an equivalent cleaner such as Fleetguard® RESTORE™. Follow manufacturer's directions on label.

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

*Fleetguard® is a registered trademark of Cummins Engine Company.*

*RESTORE™ is a trademark of Fleetguard.*

S11,OMLM,DV1 -19-11AUG94