2243 Diesel Professional Greensmower

TECHNICAL MANUAL

John Deere
Lawn & Grounds Care Division

TM1562 (01MAY94)

Litho in U.S.A

This technical manual is written for an experieced technician and contains sections that are specifically for this product. It is a part of a total product support program.

The manual is organized so that all the information on a particular system is kept together. The order of grouping is as follows:

- Table of Contents
- Specifications
- Component Location
- System Schematic
- Theory of Operation
- Troubleshooting Chart
- Diagnostics
- Tests and Adjustments
- Repair

NOTE: Depending on the particular section or system being covered, not all of the above groups may be used.

Each section will be identified with a symbol rather than a number. The groups and pages within a section will be consecutively numbered.

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.

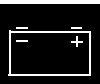
We appreciate your input on this manual. To help, there are postage paid post cards included at the back. If you find any errors or want to comment on the layout of the manual please fill out one of the cards and mail it back to us.

Safety

Specifications and General Information

Engine (Diesel)

Electrical



Power Train (Hydrostatic)

Steering

Brakes

Hydraulics

Miscellaneous

M

Attachments

RECOGNIZE SAFETY INFORMATION

T81389

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.

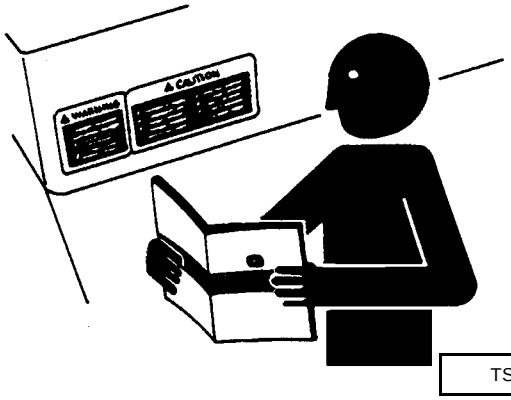
Follow recommended precautions and safe servicing practices.

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.

REPLACE SAFETY SIGNS

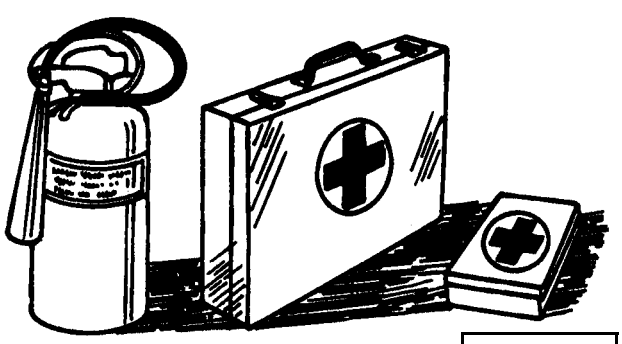


TS201

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

HANDLE FLUIDS SAFELY-AVOID FIRES

Be Prepared For Emergencies



TS291

TS227

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

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

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

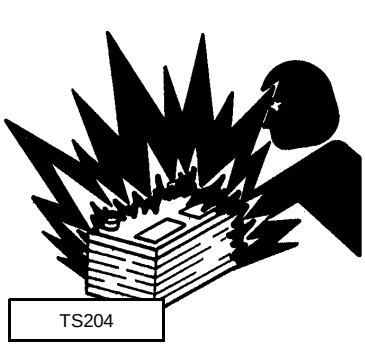
Do not store oily rags; they can ignite and burn spontaneously.

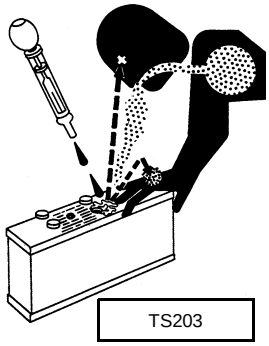
Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

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

USE CARE IN HANDLING AND SERVICING BATTERIES


TS204


TS203

Prevent Battery Explosions

- Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.
- Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.
- Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

Prevent Acid Burns

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

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

- **If you spill acid on yourself:**

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

- **If acid is swallowed:**

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 1.9 L (2 quarts).
3. Get medical attention immediately.

SERVICE COOLING SYSTEM SAFELY


TS281

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

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

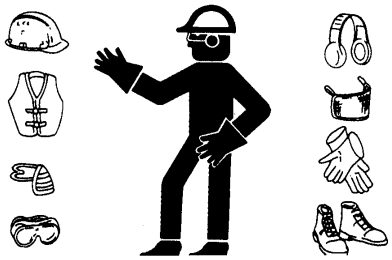
USE SAFE SERVICE PROCEDURES

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.

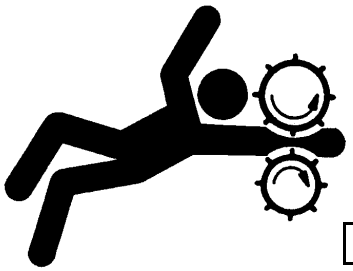
Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.


TS206

Service Machine Safely

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

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

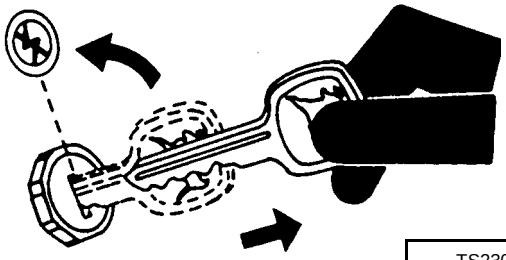


TS228

Use Proper Tools

Use tools appropriate to the work. Makeshift tools can create safety hazards. Use power tools only to loosen threaded parts and fasteners. For loosening and tightening hardware, use the correct size tools. **DO NOT** use U.S. measurement tools on metric fasteners. Use only service parts meeting John Deere specifications.

Park Machine Safely

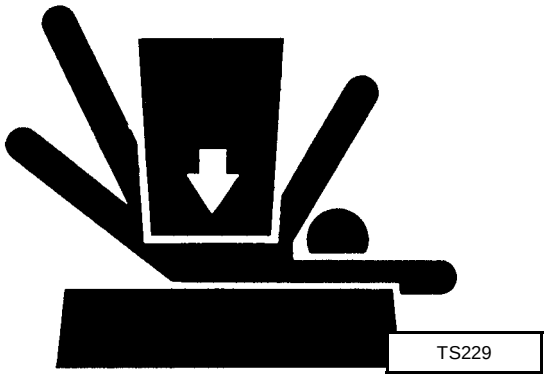


TS230

- **Before working on the machine:**

1. Lower all equipment to the ground.
2. Stop the machine and remove the key.
3. Disconnect the battery ground strap.
4. Hang a “DO NOT OPERATE” tag in operator station.

Support Machine Properly and Use Proper Lifting Equipment



TS229

If you must work on a lifted machine or attachment, securely support the machine or attachment.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.

Lifting heavy components incorrectly can cause severe injury or machine damage. Follow recommended procedure for removal and installation of components in the manual.

Work In A Clean Area

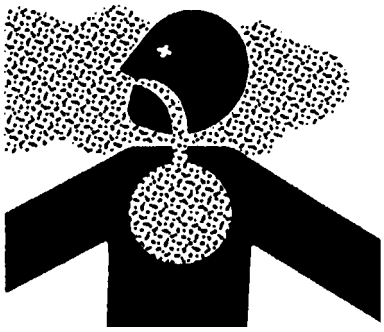
- **Before starting a job:**

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

Illuminate Work Area Safely

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

Work In A Ventilated Area



TS220

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.

Remove Paint Before Welding Or Heating

Avoid potentially toxic fumes and dust. Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. Do all work outside or in a well ventilated area. Dispose of paint and solvent properly. Remove paint before welding or heating: If you sand or grind paint, avoid breathing the dust. Wear an approved respirator. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

SERVICE TIRES SAFELY

TS952

Explosive separation of a tire and rim parts can cause serious injury or death.

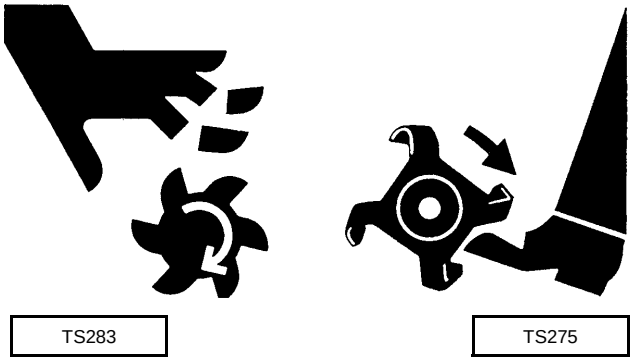
Do not attempt to mount tire unless you have the proper equipment and experience to perform the job.

Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in tire pressure resulting in a tire explosion. Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you stand to one side and NOT in front of or over the tire assembly. Use a safety cage if available.

Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.

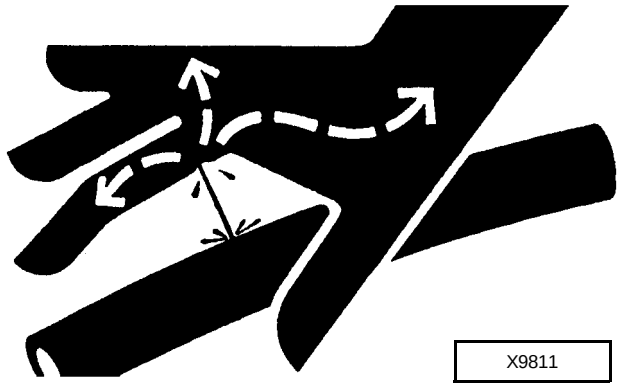
AVOID INJURY FROM ROTATING BLADES



Keep hands and feet away while machine is running. Shut off power to service, lubricate or unlatch cutting units.

USE CARE AROUND HIGH-PRESSURE FLUID LINES

Avoid High-Pressure Fluids



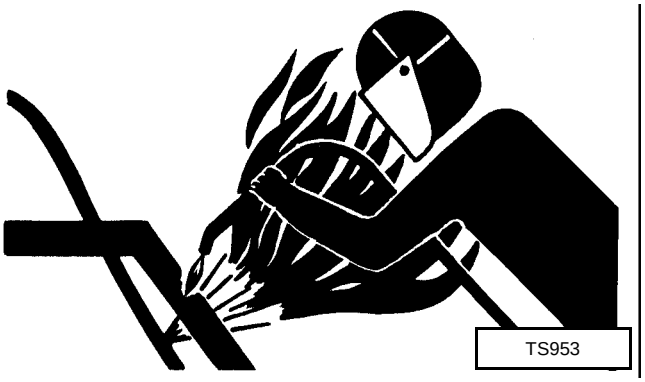
Escaping fluid under pressure can penetrate the skin causing serious injury.

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

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

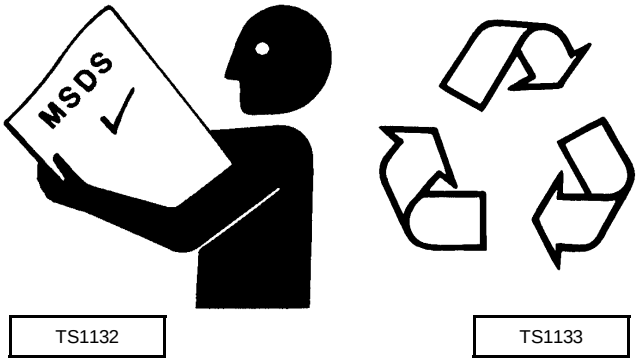
If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical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

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.

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.

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

LIVE WITH SAFETY

TS231

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

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VEHICLE SPECIFICATIONS

ENGINE

Make	Yanmar
Type	Diesel
Model	3TNE68
Aspriation	Natural
Horsepower (SAEJ1940)	13.4 kW (18 hp)
Cylinders	3
Displacement	585 cm3 (35.7 cu in.)
Stroke/Cycle	4 Cycle
Bore	68 mm (2.68 in.)
Stroke	72 mm (2.83 in.)
Compression Ratio	23:1
Slow Idle	1400± 75 rpm
Fast Idle	2975± 75 rpm
Firing Order	1-3-2-1
Timing	14° BTDC
Valving	Overhead Valves
Combustion System	Indirect Injection
Lubrication	Pressurized
Oil Filter	Full Flow Filter
Cooling System	Liquid Cooled
Air Cleaner	Semi-Cyclone Dry Type Dual Stage
Muffler	Horizontal discharge below frame
Engine Oil Capacity	2.3 L (2.4 qt)
Weight	81 kg (178.2 lbs)

FUEL SYSTEM

Fuel Tank Location	One on each side of machine
Fuel Tank Capacity (Total)	37.9 L (10 gal)
Fuel (min. octane)	Diesel #1 or #2
Fuel Pump Location	On Left-hand side of engine
Fuel Delivery	Inline Indirect Injection
Fuel Shut-Off	Fuel Shutoff Solenoid
Fuel Filter	Replaceable 5 Micron

ELECTRICAL

Ignition	Electronic
Type of Starter	Solenoid Shift
Charging System	16 amp Alternator, Regulated
Battery Type	BCI Group, 22F
Battery Voltage	12V
Battery Reserve Capacity at 25 amp	68 minutes
Battery Cold Cranking amps at 0° F	341 amps
Headlights	Optional
Warning Lights	Engine Oil Pressure, Battery Discharge, Engine Coolant Temperature, Hydraulic/Hydrostatic Oil Temperature
Indicator Lights	Pre-Heat Indicator (Glow Plugs)
Gauges	Hourmeter
Ignition Interlock Switches	Neutral Start, Operator Presence, Parking Brake, Mow/Transport Lever

POWER TRAIN

Drive Wheels	Front
Traction Drive	Hydrostatic, 2 Pedal Control
Pump Type	Piston Traction Drive
Pump Drive	Flex Coupler on Engine Flywheel to Driven Coupler on Pump Shaft
Transaxle	Motor Axle, Hydrostatic Pump Driven
Travel Speeds	
Forward	
Mowing Speed	0—6.4 km/h (0—4 mph)
Transport Speed	0—13.7 km/h (0—8.5 mph)
Reverse	0—4.8 km/h (0—3 mph)

STEERING

Type	Power, Hydraulic, Rear Wheel, Tilt Column

BRAKES

Type	Mechanical, Single Pedal, 2 Wheel Disk, 15.2 cm (6 in.) Dia. Disks
Parking Brake	Brake Pedal Lock Lever

HYDRAULICS

Pump Type	Double Gear
Pump Drive	Driven Coupler from Hydrostatic Pump Shaft
System	Mow (Reel Drive), Lift and Steering
Mow Control Valve	Electro-Hydraulic, One valve on/off
Lift Control Valve	Electro-Hydraulic, One valve raise/lower
Cutting Unit Lift	Front Cylinder, Rear Cylinder

Hydrostatic/Hydraulic System

Capacity (Total)	22.7 L (6.6 gal)
Hydraulic Reservoir Capacity	16.6 L (4.4 gal)
Filter	10 Micron, Replaceable
Oil Cooler	Standard (Part of Radiator)
Optional Equipment	Auxiliary Oil Cooler, Mow/Backlap Valve

CUTTING UNITS

Number of Cutting Units	3
Cutting Unit Drive	Direct Hydraulic Motor
Reel Diameter	12.7 cm (5 in.)
Number of Blades	9
Front Rollers	Optional—Smooth or Grooved
Clip Frequency	5.6 mm (0.22 in.), 6.4 km/h (4.0 mph)
Bed Knife Adjustment	Reel-to-Bed Knife
Height of Cut	2.4—19 mm (3/32—3/4 in.)
Backlapping	Optional Hydraulic Valve, Variable Speed Adjustment Capability

WEIGHTS AND DIMENSIONS

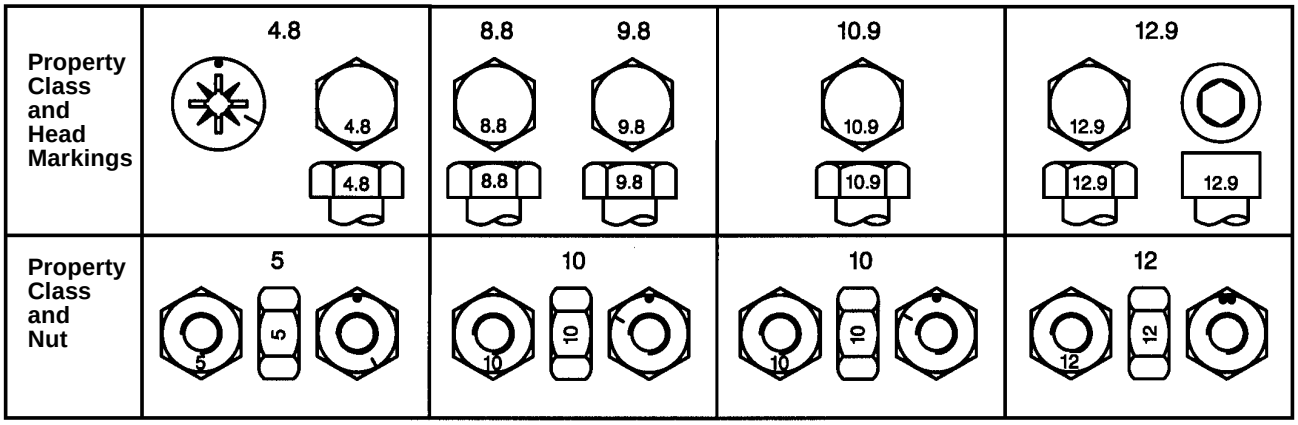
Empty Weight (less attachments)	467 kg (1030 lb)
Cutting Unit Weight	34 kg (74 lb)
Wheel Base	1.30 m (4 ft 3 in.)
Tread Width	1.02 m (3 ft 4 in.)
Mowing Position Width	1.57 m (5 ft 2 in.)
Turning Radius (uncut circle)	0.60 m (23.6 in.)
Overall Length	2.26 m (7 ft 5 in.)
Overall Width	1.83 m (6 ft)
Overall Height	1.26 m (4 ft 2 in.)

WHEELS AND TIRES

Standard	18 x 9.50-8.00 2 ply, Smooth
Optional	18 x 9.50-8.00 RS 2 ply, Turf

(Specifications and design subject to change without notice.)

METRIC BOLT AND CAP SCREW TORQUE VALUES



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

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

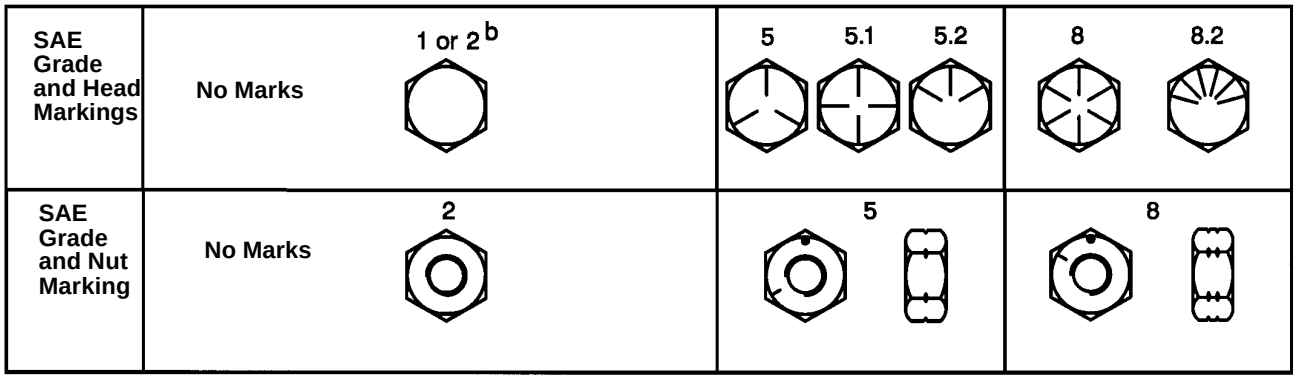
Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original. Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

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

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

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES



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	Grade 1				Grade 2[b]				Grade 5, 5.1 or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
Size	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	215	160	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	470	300	510	375	470	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

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

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

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original. Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

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

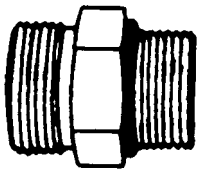
a *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.*

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

SERVICE RECOMMENDATIONS FOR O-RING BOSS FITTINGS

STRAIGHT FITTING

1. Inspect O-ring boss seal for dirt or defects.
2. Lubricate O-rings with petroleum jelly. Place electrical tape over threads to protect O-ring. Slide O-ring over tape and into O-ring groove of fitting. Remove tape.
3. Tighten fitting to torque value shown on chart.



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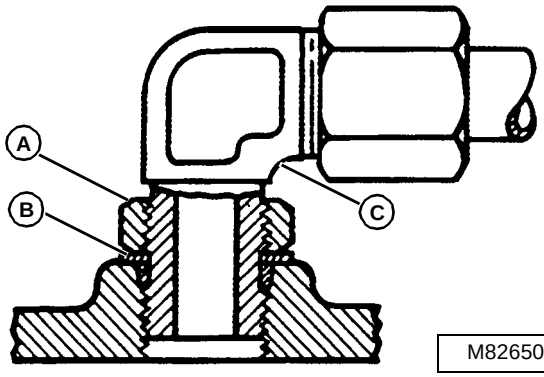
ANGLE FITTING

1. Back-off lock nut (A) and back-up washer (B) completely to head-end (C) of fitting.
2. Turn fitting into threaded boss until back-up washer contacts face of boss.
3. Turn fitting head-end counterclockwise to proper index (maximum of one turn).
4. Hold fitting head-end with a wrench and tighten locknut and back-up washer to proper torque value.



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NOTE: Do not allow hoses to twist when tightening fittings.

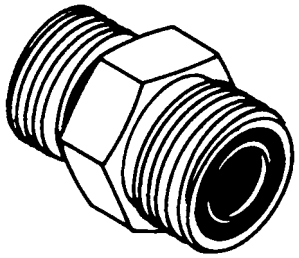
TORQUE VALUE

Thread Size	N•m	lb-ft
3/8-24 UNF	8	6
7/16-20 UNF	12	9
1/2-20 UNF	16	12
9/16-18 UNF	24	18
3/4-16 UNF	46	34
7/8-14UNF	62	46
1-1/16-12 UN	102	75
1-3/16-12 UN	122	90
1-5/16-12 UN	142	105
1-5/8-12 UN	190	140
1-7/8-12 UN	217	160

NOTE: Torque tolerance is ± 10%

SERVICE RECOMMENDATIONS FOR FLAT FACE O-RING SEAL FITTINGS

1. Inspect the fitting sealing surfaces. They must be free of dirt or defects.
2. Inspect the O-ring. It must be free of damage or defects.
3. Lubricate O-rings and install into groove using petroleum jelly to hold in place.
4. Push O-ring into the groove with plenty of petroleum jelly so O-ring is not displaced during assembly.
5. Index angle fittings and tighten by hand pressing joint together to insure O-ring remains in place.
6. Tighten fitting or nut to torque value shown on the chart per dash size stamped on the fitting. Do not allow hoses to twist when tightening fittings.



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FLAT FACE O-RING SEAL FITTING TORQUE

Nominal Tube O.D.		Dash Size	Thread Size (in.)	Swivel Nut Torque		Bulkhead Nut Torque	
mm	(in.)			N•m	(lb-ft)	N•m	(lb-ft)
6.35	0.250	-4	9/16-18	16	12	5.0	3.5
9.52	0.375	-6	11/16-16	24	18	9.0	6.5
12.70	0.500	-8	13/16-16	50	51	17.0	12.5
15.88	0.625	-10	1-14	69	51	17.0	12.5
19.05	0.750	-12	1-3/16-12	102	75	17.0	12.5
22.22	0.875	-14	1-3/16-12	102	75	17.0	12.5
25.40	1.000	-16	1-7/16-12	142	105	17.0	12.5
31.75	1.250	-20	1-11/16-12	190	140	17.0	12.5
38.10	1.500	-24	2-12	217	160	17.0	12.5

NOTE: Torque tolerance is +15 -20%.

DIESEL FUEL

Use either Grade No. 1-D or Grade No. 2-D fuel as defined by ASTM Designation D975 for diesel fuels. In European countries, use ISO 1585 commercial diesel fuel.

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

If engine is operated at temperatures of -40° to -57°C (-40° to -70°F), Grade DF-A arctic fuel is recommended.

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

IMPORTANT: If fuel sulfur content exceeds 0.5 percent, the engine oil drain interval must be reduced by 50 percent.

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

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

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

DIESEL ENGINE OIL

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

IMPORTANT: John Deere TORQ-GARD SUPREME PLUS-50™ engine oil is not recommended during engine break-in (first 100 hours on a new or overhauled engine). The superior lubricating properties of this oil will not allow the engine to properly wear during break-in period. Use SAE 10W 30.

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

NOTE: When John Deere TORQ-GARD SUPREME PLUS-50™ engine oil and a John Deere oil filter are used, the change interval may be extended by 50 hours. ALWAYS follow recommendations in the operator's manual.

John Deere TORQ-GARD SUPREME® engine oil is also recommended but standard operator's manual oil change intervals must be maintained. Other oils may be used if they meet one or more of the following specifications:

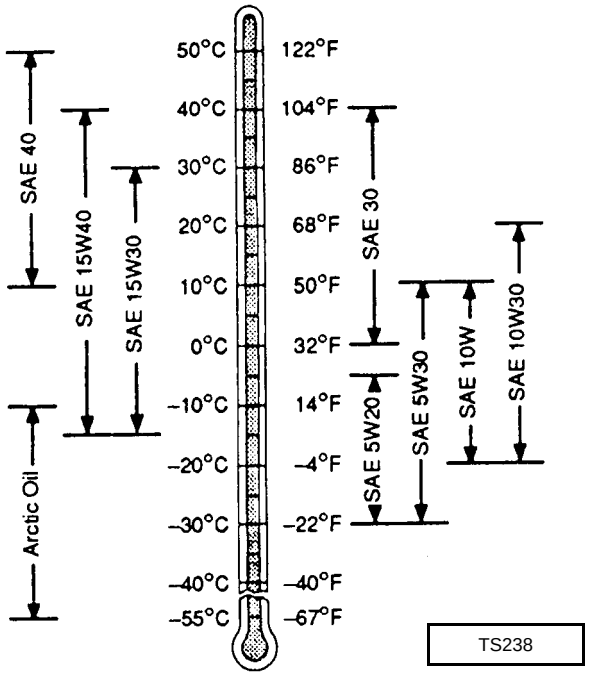
- API Service Classification CE or CD
- Military Specification MIL-L-2104E or MIL-L-2104D or MIL-L-2104C

In European countries, oils meeting CCMC Specification D4 or D5 may be used.

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

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

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

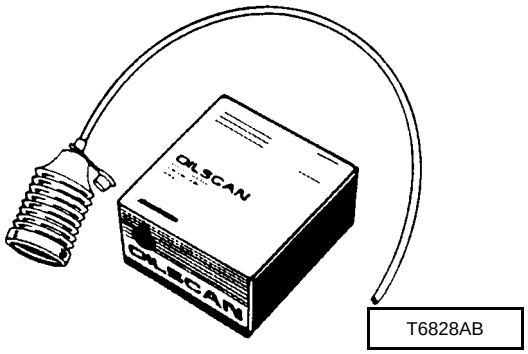


OILSCAN® AND COOLSCAN™

OILSCAN and COOLSCAN are John Deere sampling programs to help you monitor machine performance and identify potential problems before they cause serious damage.

Oil and coolant samples should be taken from each system prior to its recommended change interval.

Check with your John Deere dealer for the availability of OILSCAN and COOLSCAN kits.



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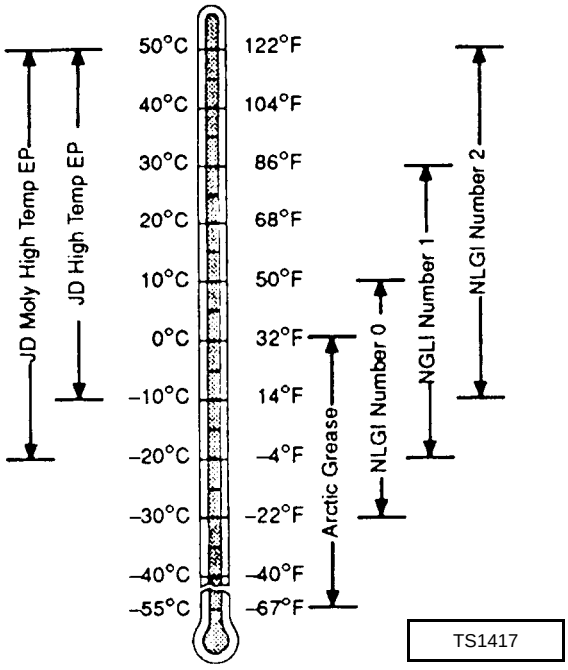

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ENGINE COOLANT RECOMMENDATIONS

GREASE

Use grease based on 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™

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

- SAE Multipurpose EP Grease with a maximum of 5% molybdenum disulfide
- SAE Multipurpose EP Grease

Grease meeting Military Specification MIL-G-10294F may be used as arctic grease.

C CAUTION

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

Shut off engine. Remove the radiator filler cap only when the cap is cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

- Always maintain engine coolant at correct level.
- Coolant make-up should be mixed at same concentrations as original coolant, including inhibitors.
- In tropical areas where antifreeze of John Deere Cooling Fluid is not available, use water meeting quality specifications outlined in this group and John Deere RE23182 Liquid Coolant Conditioner. The liquid coolant conditioner should be added in the amount recommended on the label for your cooling system capacity.

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

In certain geographical areas where water quality is unacceptable, John Deere Engine Cooling Fluid is marketed for use in the engine cooling system. It protects the engine from corrosion and freezing down to -37°C (-35°F).

John Deere Engine Cooling Fluid or John Deere Low Silicate Antifreeze are recommended for all John Deere Diesel Engines. John Deere Cooling Fluid is ready to use as it is without dilution or mixing. John Deere Low Silicate Antifreeze is concentrated and should be mixed minimum 40% - maximum 60% antifreeze and distilled to deionized water. Consult your John Deere Parts Network for local availability.


TS281

ENGINE COOLANT SPECIFICATIONS

Water Quality

Distilled, de-ioned, 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 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.

John Deere Low Silicate Antifreeze is the ethylene glycol concentrate recommended for all John Deere Diesel Engines. This product is concentrated and should be mixed 50/50 with quality water. Add to the mixture 3% (by volume) supplemental coolant additives (SCA's).

John Deere Low Silicate Antifreeze is available in the following sizes:

- TY6377 - 208 L (55 U.S. Gal) container
- TY15886 - 3.8 L (1 U.S. Gal) container

Contact your John Deere Parts Network for local availability.

If John Deere Low Silicate Antifreeze is not available, use an ethylene glycol concentrate meeting ASTM D 4985, SAEJ1941, General Motors Performance Specification GM1899M, or formulated to GM6038M.

Supplemental Coolant Additives (SCA's)

IMPORTANT: Ethylene glycol concentrate (antifreeze) DOES NOT contain sufficient additives to prevent liner erosion or pitting which could occur in wet sleeve diesel engines. ALWAYS mix the coolant solution with a supplemental coolant additive such as John Deere Liquid Coolant Conditioner or spin-on coolant filter conditioner element.

C CAUTION

John Deere Liquid Coolant Conditioner contains alkali. Avoid contact with eyes. Avoid prolonged or repeated contact with skin. Do not take internally. In case of contact, immediately wash skin with soap and water. For eyes, flush with large amounts of water for at least 15 minutes. Call physician. KEEP OUT OF REACH OF CHILDREN.

- John Deere Liquid Coolant Conditioner

IMPORTANT: ALWAYS mix the 50/50 solution of ethylene glycol concentrate with quality water in a separate container BEFORE adding the SCA's. Then add solution to the radiator. NEVER pour cold water into a hot engine, as it may crack cylinder block or head.

John Deere Liquid Coolant Conditioner MUST be added at a rate of 3% (by volume) to the coolant solution. When adding John Deere Liquid Coolant Conditioner, follow the supplier's recommendations printed on the container.

John Deere Liquid Coolant Conditioner is available in the following sizes:

- RE23182 473 mL (16 oz) container
- RE35992 3.8 L (1 gal) container

Contact your John Deere Parts Network for availability.

Other approved SCA's are:

- NALCOOL 3000®
- FLEETGARD®-DCA008-78L DCA2 in 473 mL (16 oz) container
- FLEETGARD®-DCA60-78L DCA4 in 473 mL (16 oz) container

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

DO NOT over-concentrate coolant solutions with supplemental coolant additives, 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.

JOHN DEERE ENGINE COOLING FLUID

In certain regions of the world, John Deere Engine Cooling Fluid is marketed for use in the engine cooling system. John Deere Cooling Fluid is premixed and contains the proper mixture of quality water, low silicate antifreeze to protect the engine from freezing down to -37°C (-35°F), and supplemental coolant additives (SCA's).

IMPORTANT: Additional SCA's should NOT be added to the Cooling Fluid.

John Deere Engine Cooling Fluid is available in the following sizes:

- AL66606 (formally DD14134) - 5 L (1.3 U.S. Gal) can
- AL66607 (formally DD14345) - 20 L (5.3 U.S. Gal) can
- AL67171 (formally DD14136) - 60 L (15.9 U.S. Gal) drum
- AL66608 (formally DD14346) 200 L (53 U.S. Gal) drum

Contact your John Deere Parts Network for local availability.

CHECK EFFECTIVENESS OF COOLANT SOLUTION

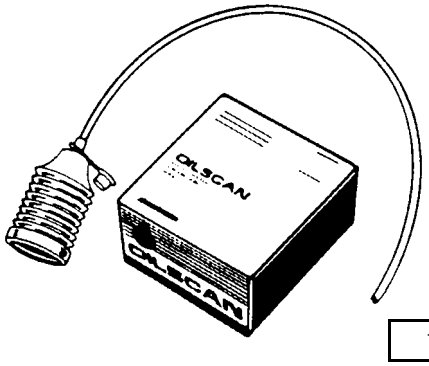
Prior to the recommended change interval or if concentration of coolant solution is in question, a coolant sample should be taken and a COOLSCAN analysis performed.

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.

NALCOOL 3000® is a registered trademark of the NALCO Company.
FLEETGARD® is a registered trademark of the Cummins Engine Company.

Check with your John Deere dealer for the availability of DS0251 COOLSCAN kit. Refer to instructions provided with kit.

Usually recharging your engine coolant with the recommended amount of John Deere Liquid Coolant Conditioner at the appropriate time is adequate. However, with a COOLSCAN analysis report, you will be given a more thorough evaluation of your engine coolant condition along with a detailed service recommendation.



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HYDRAULIC/HYDROSTATIC DRIVE OIL

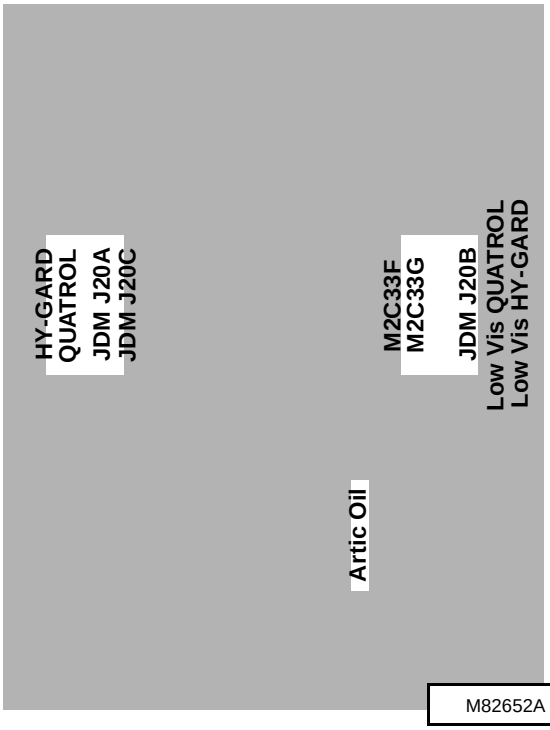
Use oil viscosity based on the expected air temperature range during the period between oil changes.

John Deere HY-GARD® Transmission/Hydraulic Oil is recommended.

Other oils may be used if they are QUATROL® oils or if they meet John Deere Standard JDM J20A, J20B or J20C.

Automatic transmission fluids of Type M2C33F or M2C33G may also be used.

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



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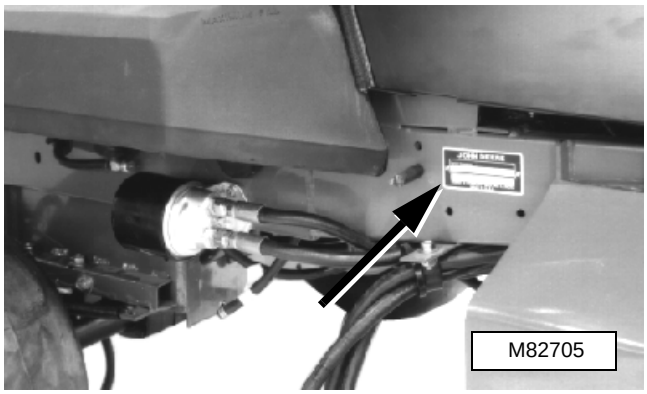
When ordering parts or submitting a warranty claim, it is IMPORTANT that you include the machine product identification number and the component serial numbers.

The location of the machine identification number and component serial numbers are shown.

MACHINE IDENTIFICATION NUMBER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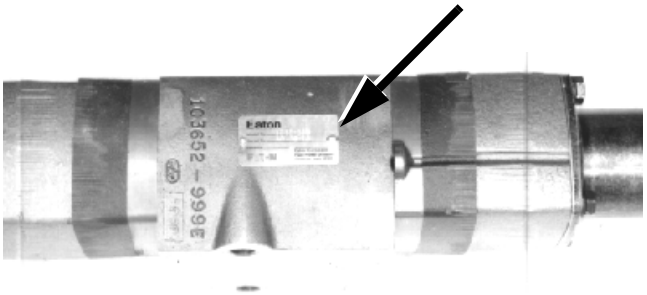
TRANSAXLE SERIAL NUMBER



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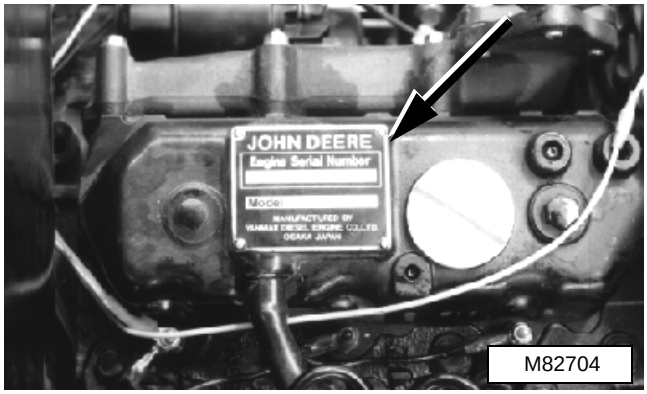

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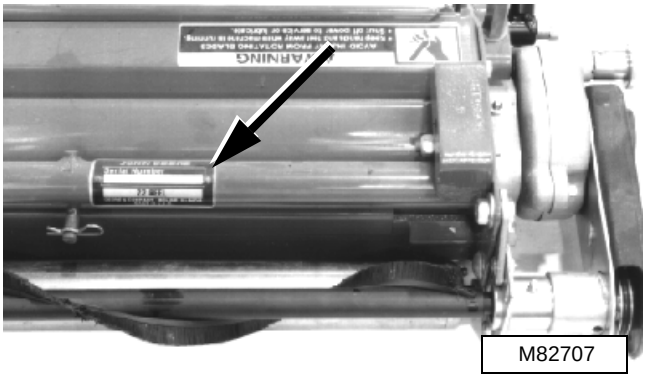
CUTTING UNIT SERIAL NUMBER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INTERLOCK SYSTEM

It is important to understand the interlock system and how it works. Before performing the checkout procedures, become familiar with the interlock system so that an interlock function will not be taken as a machine problem.

1. For the starter to engage and the engine to run, the following conditions must be met simultaneously:

   - Operator on seat and /or parking brake (A) engaged.
   - Mow/Transport lever (B) in TRANSPORT position.
   - Travel pedals (C) in NEUTRAL position.

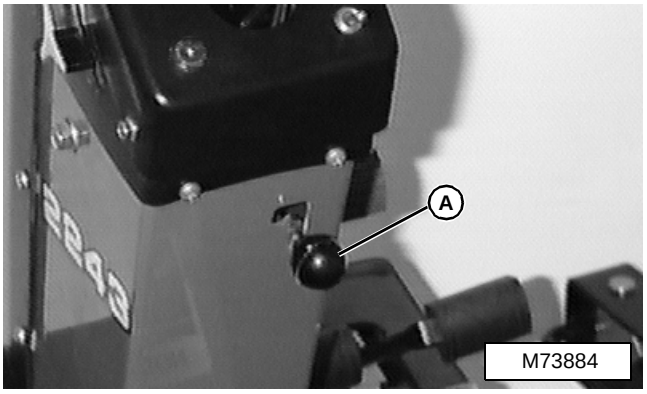
2. If the operator is mowing (mow/transport lever in MOW position and/or ground drive engaged) and the driver leaves the seat, engine will stop.

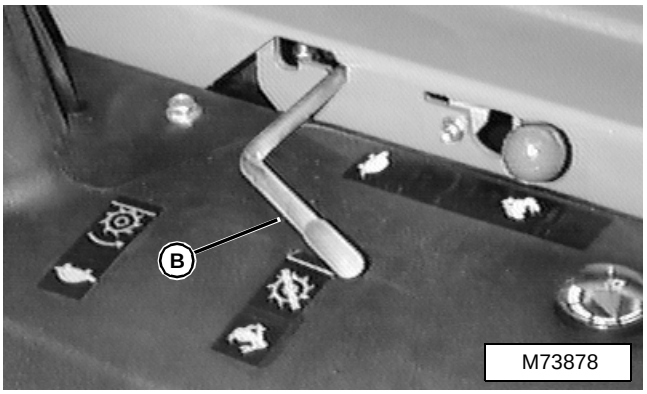
3. If the operator has stopped mowing (mow/transport lever in TRANSPORT position) and leaves the seat with ground drive in neutral, but without the parking brake engaged, the engine will stop.

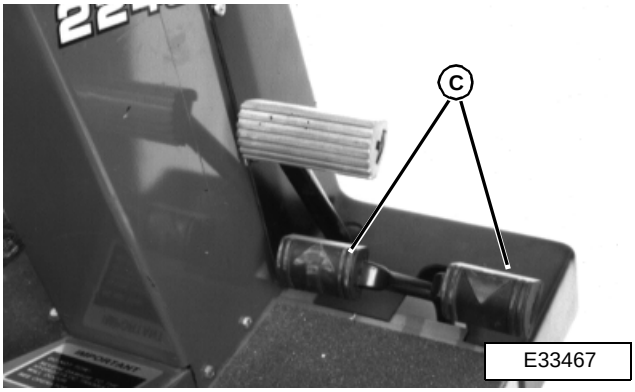
4. Provision has been made to allow service of the reels to be performed by one person (with optional mow/backlap valve assembly). Complete the following steps:

   - Place mow/backlap switch in BACKLAP position.
   - Move travel pedals in NEUTRAL position.
   - Engage parking brake.
   - Move mow/transport lever to TRANSPORT position.

The machine can then be started from either the ground or seat. The seat can then be raised and the knob on the mow/backlap valve assembly can then be turned to operate the reel motors in the reverse direction for backlapping.







OPERATIONAL CHECKOUT PROCEDURES

The procedures covered in this group are used to give a quick checkout of all the systems and components on the unit. These checkouts should be run to insure proper operation after any extended storage, when the unit comes in for service and after repairs have been made on the unit. They can also be helpful in determining the value of the unit at trade-in time. The unit should be placed on a level surface to run the checkout. All the checkouts should be done and all the steps of each checkout should be followed.

Each checkout lists:

- Conditions—How the unit should be set up for the checkout.
- Procedure—The specific action to be done.
- Normal—What should happen, or be heard, or seen.
- If Not Normal—Where to go if other tests or adjustments are needed.

When performing the checkout, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The “NORMAL” paragraph gives the result that should happen when performing the checkout. If the results are not normal, go to the group listed in the “If Not Normal” paragraph to determine the cause and repair the malfunction.

The paragraph that accompanies each checkout procedure is included to help conduct the checkout.

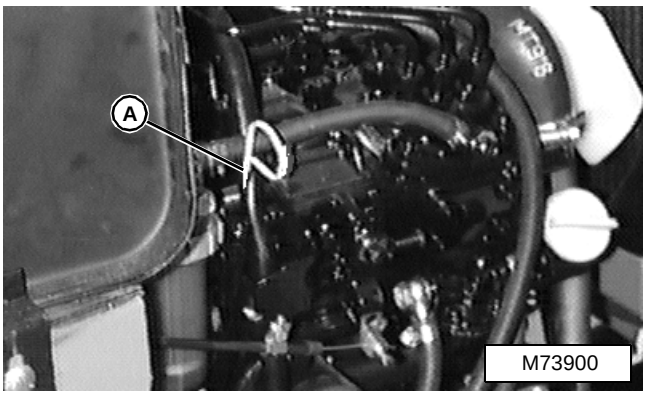
ENGINE OIL CHECK

Conditions:

- Engine stopped.
- Machine on level surface.
- Key switch in OFF position.
- Engine oil cold.

Procedure:

1. Lift engine hood.
2. Before removing dipstick (A), clean around dipstick.
3. Wipe dipstick with clean rag.
4. Install dipstick. Allow dipstick to rest on top of tube.
5. Remove dipstick and check oil level.



Normal:

- Oil level is between ADD and FULL marks.

If Not Normal:

- Oil level is below ADD, add oil until level is between FULL and ADD.
- Oil level is above FULL, drain excess oil until level is between full and add.
- Find cause of overfill and correct.

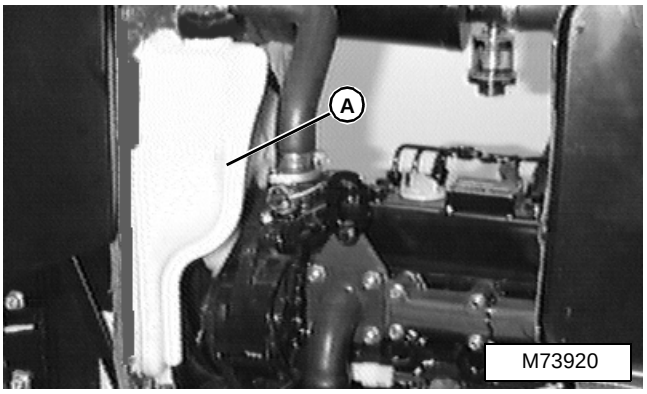
ENGINE COOLANT LEVEL CHECK

Conditions:

- Machine on level surface.
- Engine stopped.

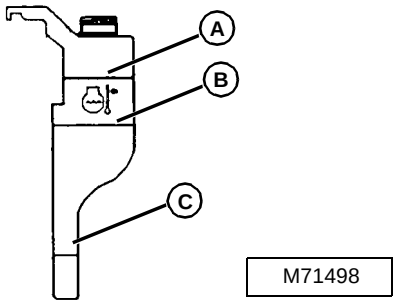
Procedure:

1. Lift engine hood.
2. Observe coolant level in recovery tank (A).



Normal:

- Hot engine—Coolant level between lines (A and B) on recovery tank.
- Cold engine—Coolant level above line (C).



If Not Normal:

- Allow system to cool, remove recovery tank cap. Add ethylene glycol (without stop-leak additive) antifreeze and water in the ratio specified on the antifreeze container. Add until level is up to proper mark, depending on engine temperature.
- Check for leaks.

HYDRAULIC RESERVOIR OIL LEVEL CHECK

Conditions:

- Machine on level surface.
- Lower cutting units to ground.
- Engine stopped.
- Hydraulic oil cold.

Procedure:

1. Lift engine hood.
2. Remove reservoir cap.
3. Lift filler neck screen and check oil level on screen.
4. Install screen and cap.

Normal:

- Hydraulic oil level from bottom to 25 mm (1.0 in.) above bottom of filler neck screen.

If Not Normal:

- Add hydraulic oil until level is between bottom of screen and 25 mm (1.0 in.) above the bottom of the screen.
- Check for leaks.

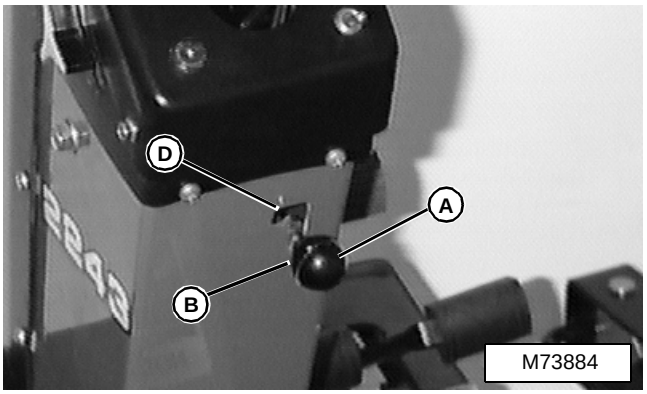
PARKING BRAKE LOCK CHECK

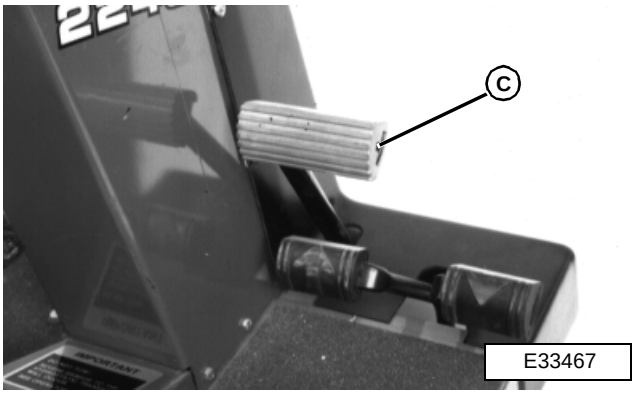
Conditions:

- Operator on seat.
- Engine stopped.

Procedure:

1. Move parking brake knob (A) into long slot (B).
2. Push brake pedal (C) down and release pedal.





A— Parking Brake Knob
B— Long Slot
C— Brake Pedal
D— Short Slot

Normal:

- Pedal must stay down.

If Not Normal:

- Adjust park brake. See procedure in BRAKES section.

Procedure:

1. Push down and hold pedal (C).
2. Move parking brake knob into short slot (D).
3. Release pedal.

Normal:

- Pedal must return to full up position and brakes release.

If Not Normal:

- Adjust parking brake. See procedure in BRAKES section.

INDICATOR LAMPS CHECK—ENGINE OFF

Conditions:

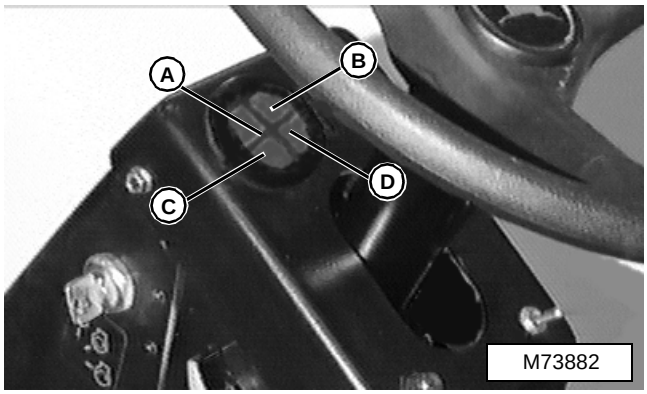
- Parking brake locked.
- Engine Stopped.
- Travel pedals in NEUTRAL position.

Procedure:

Turn key switch to a position between RUN and START.

Normal:

- Hydraulic oil temperature indicator (A) must come on.
- Engine oil pressure indicator (B) must come on.
- Battery discharge indicator (C) must come on.
- Engine coolant temperature indicator (D) must come on.
- Hourmeter must be operating (clicking).



A— Hydraulic Oil Temperature Indicator
B— Engine Oil Pressure Indicator
C— Battery Discharge Indicator
D— Engine Coolant Temperature Indicator

If Not Normal:

- Go to Theory and Diagnosis in ELECTRICAL section.

START CIRCUIT CHECK

Conditions:

- Operator on seat.
- Parking brake engaged.
- Travel pedals in NEUTRAL position.
- Mow/transport lever in TRANSPORT position.
- Fuel control lever in CHOICE position.

Procedure:

Turn key switch to START and release when engine starts or hold switch for 20 seconds maximum.

Normal:

- Starter must turn flywheel and engine must start.

If Not Normal:

- Go to Theory and Diagnosis in ELECTRICAL section.

MOW/TRANSPORT LEVER INTERLOCK CHECK

Conditions:

- Operator on seat.
- Parking brake locked.
- Travel pedals in NEUTRAL position.

Procedure:

1. Move mow/transport lever to MOW position (A).
2. Turn key switch to START.

Normal:

- Starter must NOT turn flywheel.

If Not Normal:

- Check mow/transport switch wire connections.
- Check or adjust mow/transport switch. See procedure in ELECTRICAL section.

Procedure:

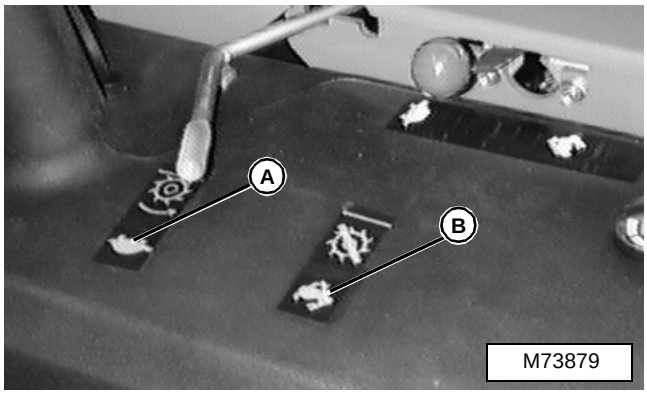
1. Move mow/transport lever to TRANSPORT position (B).
2. Turn key switch to START.

Normal:

- Starter must turn flywheel.

If Not Normal:

- Check mow/transport switch wire connections.
- Check or adjust mow/transport switch. See procedure in ELECTRICAL section.



HYDROSTATIC DRIVE NEUTRAL INTERLOCK CHECK

Conditions:

- Operator on seat.
- Parking brake locked.
- Mow/transport lever in TRANSPORT position.

Procedure:

1. Move travel pedals out of neutral position.
2. Turn key switch to START.

Normal:

- Starter must NOT turn flywheel.

If Not Normal:

- Check transmission switch wire connections.
- Check or adjust travel/neutral switch. See procedure in ELECTRICAL section.

Procedure:

1. Release and allow travel pedals to return to neutral position.
2. Turn key switch to START.

Normal:

- Starter must turn flywheel.

If Not Normal:

- Check travel/neutral switch wire connections.
- Check or adjust travel/neutral switch. See procedure in ELECTRICAL section.

PARKING BRAKE INTERLOCK CHECK

Conditions:

- Operator on seat.
- Mow/transport lever in TRANSPORT position.
- Travel pedals in NEUTRAL position.

Procedure:

1. Unlock parking brake pedal.
2. Turn key switch to START.

Normal:

- Starter must not turn flywheel.

If Not Normal:

- Check brake switch wire connections.
- Check or adjust brake switch. See procedure in ELECTRICAL section.

Procedure:

1. Lock parking brake pedal.
2. Turn key switch to START.

Normal:

- Starter must turn flywheel.

If Not Normal:

- Check brake switch wire connections.
- Check or adjust brake switch. See procedure in ELECTRICAL section.

SEAT SWITCH INTERLOCK CHECK

Conditions:

- Operator not on seat.
- Mow/transport lever in TRANSPORT position.
- Travel pedals in NEUTRAL position.

Procedure:

1. Unlock parking brake pedal
2. Turn key switch to START.

Normal:

- Starter must not turn flywheel.