

**JOHN DEERE**  
**WORLDWIDE COMMERCIAL & CONSUMER**  
**EQUIPMENT DIVISION**

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**Compact Utility Tractor**  
**4105**

TM102419 DECEMBER 2010

**TECHNICAL MANUAL**



**JOHN DEERE**

North American Version  
Litho In U.s.a.

# INTRODUCTION

## Introduction

### Manual Description

This technical manual is written for an experienced 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 and Information
- Identification Numbers
- Tools and Materials
- Component Location
- Schematics and Harnesses
- Theory of Operation
- Operation and Diagnostics
- Diagnostics
- Tests and Adjustments
- Repair
- Other

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

The bleed tabs for the pages of each section will align with the sections listed on this page. Page numbering is consecutive from the beginning of the Safety section through the last section.

We appreciate your input on this manual. If you find any errors or want to comment on the layout of the manual please contact us.

**Safety**

**Specifications and Information**

**Engine**

**Electrical**

**Power Train**

**Final Drive**

**Hydraulics**

**Steering**

**Brakes**

**Miscellaneous**

# SAFETY

## Safety

### Recognize Safety Information



MIF

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.

### Special Messages

Your manual contains special messages to bring attention to potential safety concerns, machine damage as well as helpful operating and servicing information. Please read all the information carefully to avoid injury and machine damage.

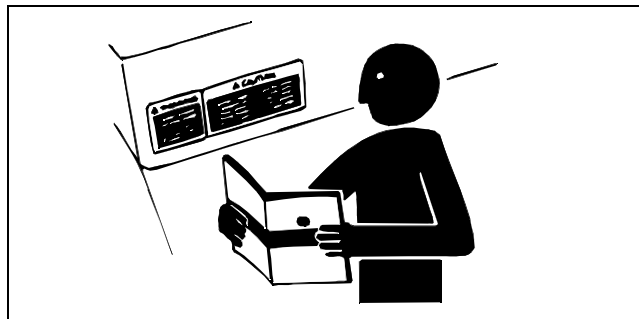


**Caution: Avoid Injury!** This symbol and text highlight potential hazards or death to the operator or bystanders that may occur if the hazards or procedures are ignored.

**Important: Avoid Damage!** This text is used to tell the operator of actions or conditions that might result in damage to the machine.

**Note:** General information is given throughout the manual that may help the operator in the operation or service of the machine.

### Replace Safety Signs

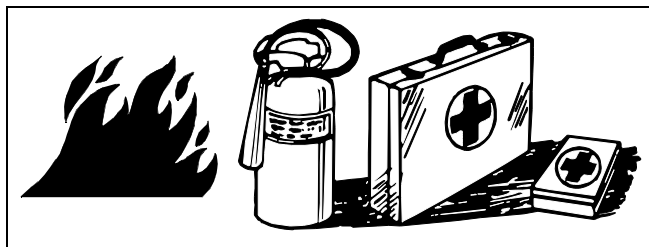


MIF

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

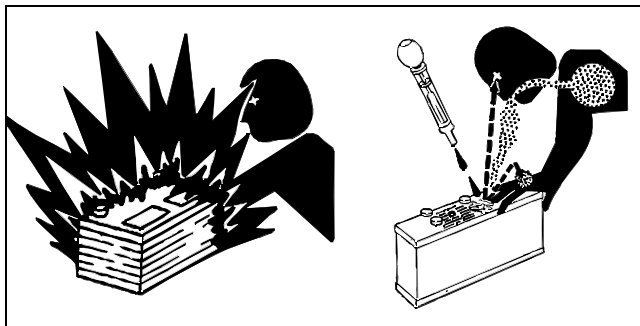


MIF

- 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.

# SAFETY

## Use Care In Handling and Servicing Batteries



MIF

### 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:

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

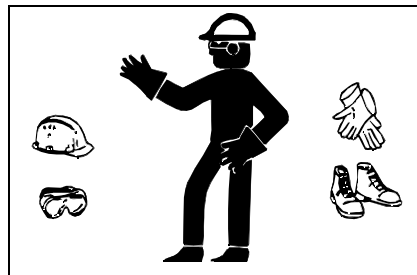
If you spill acid on yourself:

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

If acid is swallowed:

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

## Wear Protective Clothing



MIF

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.

## Use Care Around High-pressure Fluid Lines

### Avoid High-Pressure Fluids



MIF

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

Avoid injury from escaping fluid under pressure by stopping the engine and relieving pressure in the system before disconnecting or connecting 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.

# SAFETY

## Avoid Heating Near Pressurized Fluid Lines



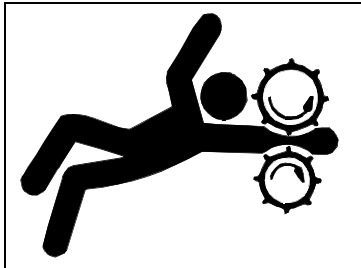
MIF

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.

## Parking Safely

1. Stop machine on a level surface, not on a slope.
2. Disengage PTO and stop attachments.
3. Lower attachments to the ground.
4. Lock park brake.
5. Stop engine.
6. Remove key.
7. Wait for engine and all moving parts to stop before you leave the operator's station.
8. Close fuel shut-off valve, if your machine is equipped.

## Service Machines Safely

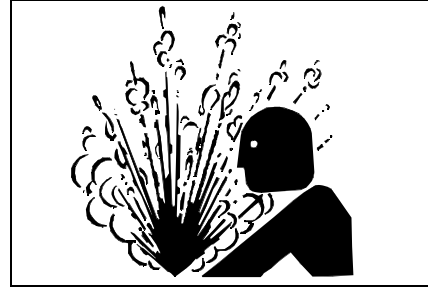


MIF

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.

## Service Cooling System Safely



MIF

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 Proper Tools

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

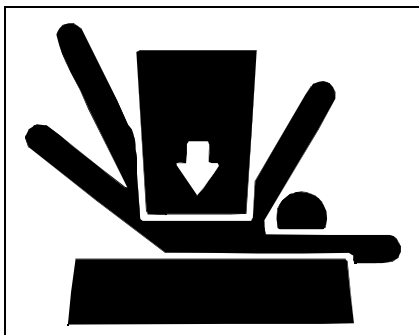
## Work in Clean Area

### 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.

# SAFETY

## Support Machine Properly and Use Proper Lifting Equipment



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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.

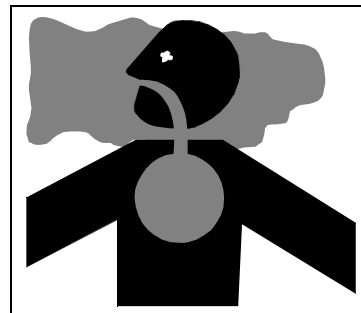
## Using High Pressure Washers

Directing pressurized water at electronic/electrical components or connectors, bearings, hydraulic seals, fuel injection pumps or other sensitive parts and components may cause product malfunctions. Reduce pressure and spray at a 45 to 90 degree angle.

## 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 Ventilated Area



MIF

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.

## Warning: California Proposition 65 Warning

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

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

## 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.

## Avoid Harmful Asbestos Dust

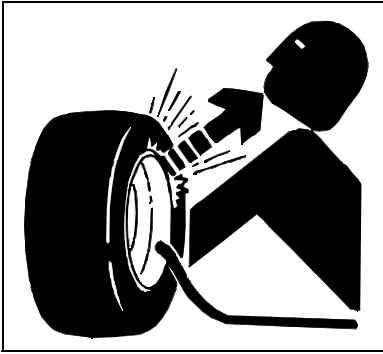
Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

# SAFETY

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos. Keep bystanders away from the area.

## Service Tires Safely



MIF

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

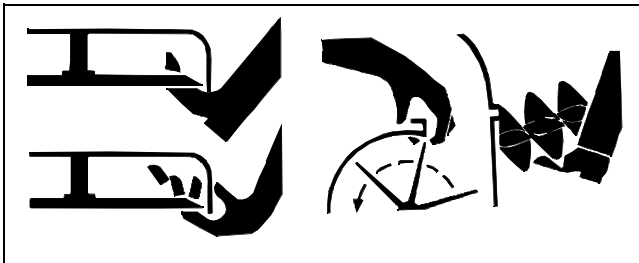
Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

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 air 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 to 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.

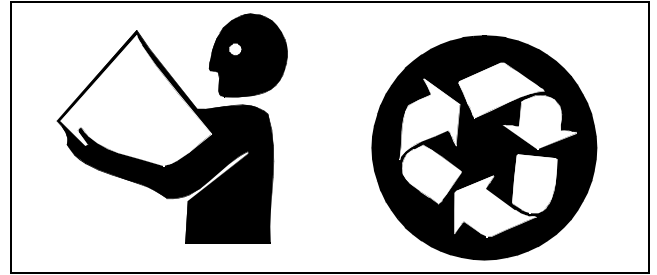
## Avoid Injury From Rotating Blades and Augers



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Keep hands and feet away while machine is running. Shut off power to service, lubricate or remove mower blades, augers or PTO shafts.

## Handle Chemical Products Safely



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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



MIF

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

# SPECIFICATIONS AND INFORMATION TABLE OF CONTENTS

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## Table of Contents





















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# SPECIFICATIONS AND INFORMATION FASTENER TORQUES

## Fastener Torques

## Metric Fastener Torque Values

Property Class and Head Markings	4.8		8.8		9.8		10.9		12.9	
										
Property Class and Nut Markings	5		10		10		10		12	
										

MIF

SIZE	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated a		Dry a		Lubricated a		Dry a		Lubricated a		Dry a		Lubricated a		Dry a	
	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	109
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 hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a  $\pm 10\%$  variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque

values should be applied to the NUT instead of 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 (yellow dichromate - Specification JDS117) without any lubrication.

Reference: JDS - G200.

# SPECIFICATIONS AND INFORMATION FASTENER TORQUES

## Inch Fastener Torque Values

SAE Grade and Head Markings	1 or 2 <sup>b</sup> No Marks 	5 5.1 5.2   	8 8.2  
SAE Grade and Nut Markings	2 No Marks 	5  	8  

MIF

	Grade 1				Grade 2b				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	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	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 hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a  $\pm 10\%$  variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the NUT instead of 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 (yellow dichromate - Specification JDS117) 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.

Reference: JDS - G200

# SPECIFICATIONS AND INFORMATION FASTENER TORQUES

## Metric Fastener Torque Value - Grade 7 (Special)

Size	Steel or Gray Iron Torque	Aluminum Torque
	N•m (lb-ft)	N•m (lb-ft)
M6	11 (8)	8 (6)
M8	24 (18)	19 (14)
M10	52 (38)	41 (30)
M12	88 (65)	70 (52)
M14	138 (102)	111 (82)
M16	224 (165)	179 (132)

## Gasket Sealant Application

### Cleaning:

Clean both surfaces that will be joined using 100% isopropyl alcohol. Wipe excess off with a clean cloth. Cleaner/degreaser can be substituted for isopropyl alcohol.

### How to Dispense/Apply/Assemble Gasket Sealants:

Dispense approximately 1 to 2 ounces of flexible form-in-place gasket on a clean sheet or table top. Avoid using excess amounts that may be exposed for long periods of time. This will help prevent contamination from surrounding atmosphere such as dust with metal content.

Using an ink roller or similar devise, apply to one surface of the joint by loading the roller from a plastic sheet and transferring the material in a thin film to the joint. The application should be the thinnest film possible, but providing complete coverage. This can be judged by the appearance of the joint once it is put together. Excessive amounts of will cause incorrect bearing end play, extend cure time, and will cause runoff of the material. A small bead or buildup at the joint is permissible and indicates good dispersion through the joint. Excess can be wiped from the joint. Joining should take place within three minutes after sealant application.

Apply proper cap screw torque and sequence as applicable. Allow a minimum of 30 minutes before air test or adding oil for test stand usage.

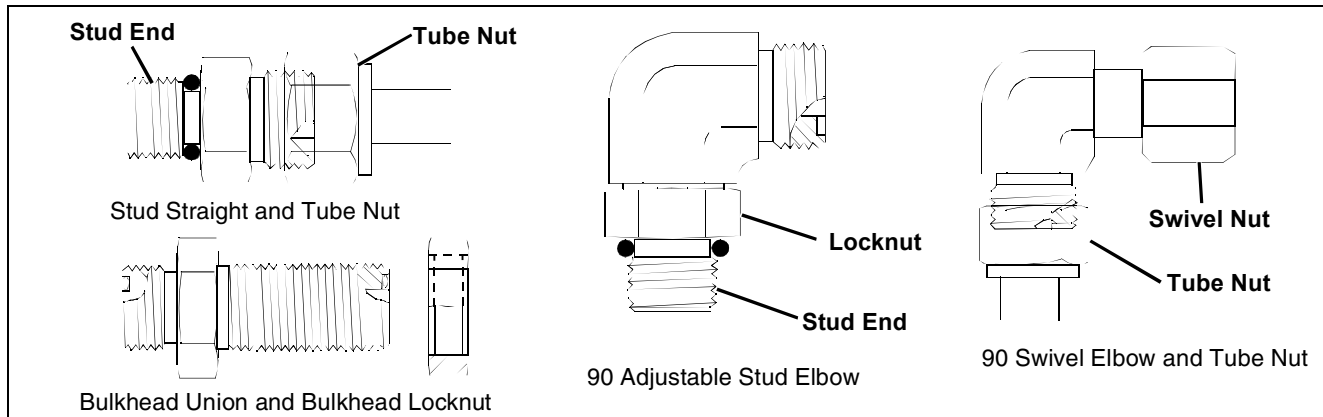
### Disassemble:

Cured material can be removed with a wire brush or scraper. Chemical cleaners are available for customer use, should they be deemed necessary.

# SPECIFICATIONS AND INFORMATION O-RING SEAL SERVICE

## O-Ring Seal Service Recommendations

### Face Seals With Inch Stud Ends Torque



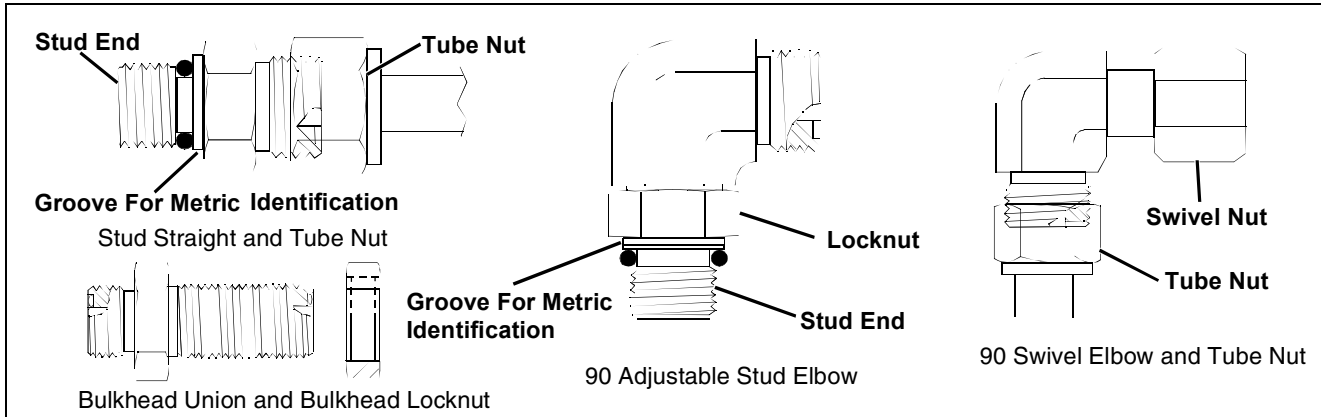
MIF

Nominal Tube OD/Hose ID				Face Seal Tube/Hose End					O-Ring Stud Ends		
Metric Tube OD	Inch Tube OD			Thread Size	Tube Nut/ Swivel Nut Torque		Bulkhead Lock Nut Torque		Thread Size	Straight Fitting or Lock Nut Torque	
mm	Dash Size	in.	mm	in.	N•m	lb-ft	N•m	lb-ft	in.	N•m	lb-ft
5	-3	0.188	4.76						3/8-24	8	6
6	-4	0.250	6.35	9/16-18	16	12	12	9	7/16-20	12	9
8	-5	0.312	7.94						1/2-20	16	12
10	-6	0.375	9.52	11/16-16	24	18	24	18	9/16-18	24	18
12	-8	0.500	12.70	13/16-16	50	37	46	34	3/4-16	46	34
16	-10	0.625	15.88	1-14	69	51	62	46	7/8-14	62	46
19	-12	0.750	19.05	1-3/16-12	102	75	102	75	1-1/16-12	102	75
22	-14	0.875	22.22	1-3/16-12	102	75	102	75	1-3/16-12	122	90
25	-16	1.000	25.40	1-7/16-12	142	105	142	105	1-5/16-12	142	105
32	-20	1.25	31.75	1-11/16-12	190	140	190	140	1-5/8-12	190	140
38	-24	1.50	38.10	2-12	217	160	217	160	1-7/8-12	217	160

**Note: Torque tolerance is +15%, -20%**

# SPECIFICATIONS AND INFORMATION O-RING SEAL SERVICE

## Face Seals With Metric Stud Ends Torque



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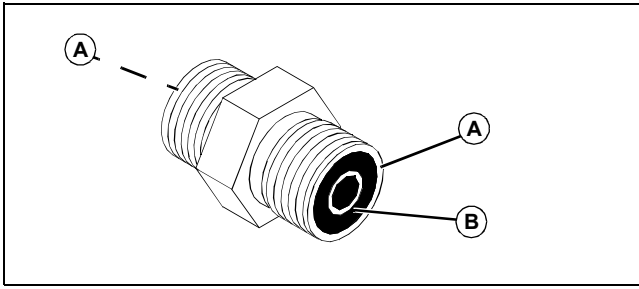
Nominal Tube OD/Hose ID				Face Seal Tube/Hose End						O-Ring Stud Ends, Straight Fitting or Lock Nut					
Metric Tube OD	Inch Tube OD			Thread Size	Hex Size	Tube Nut/ Swivel Nut Torque		Bulkhead Lock Nut Torque		Thread Size	Hex Size	Steel or Gray Iron Torque		Aluminum Torque	
mm	Dash Size	in.	mm	in.	mm	N•m	lb-ft	N•m	lb-ft	mm	mm	N•m	lb-ft	N•m	lb-ft
6	-4	0.250	6.35	9/16-18	17	16	12	12	9	M12X1.5	17	21	15.5	9	6.6
8	-5	0.312	7.94												
										M14X1.5	19	33	24	15	11
10	-6	0.375	9.52	11/16-16	22	24	18	24	18	M16X1.5	22	41	30	18	13
12	-8	0.500	12.70	13/16-16	24	50	37	46	34	M18X1.5	24	50	37	21	15
16	-10	0.625	15.88	1-14	30	69	51	62	46	M22X1.5	27	69	51	28	21
	-12	0.750	19.05	1-3/16-12	36	102	75	102	75	M27X2	32	102	75	46	34
22	-14	0.875	22.22	1-3/16-12	36	102	75	102	75	M30X2	36				
25	-16	1.000	25.40	1-7/16-12	41	142	105	142	105	M33X2	41	158	116	71	52
28										M38X2	46	176	130	79	58
32	-20	1.25	31.75	1-11/16-12	50	190	140	190	140	M42X2	50	190	140	85	63
38	-24	1.50	38.10	2-12	60	217	160	217	160	M48X2	55	217	160	98	72

**Note: Torque tolerance is +15%, -20%**

# SPECIFICATIONS AND INFORMATION O-RING SEAL SERVICE

## O-Ring Seal Service Recommendations

### O-Ring Face Seal Fittings



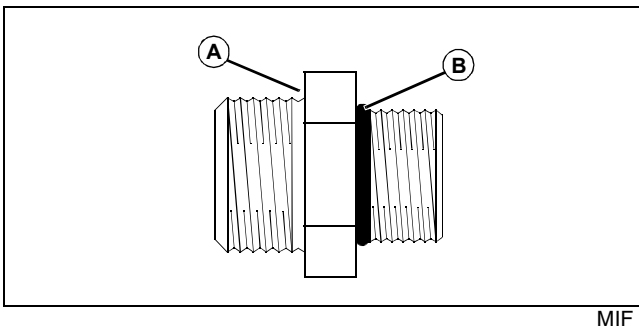
1. Inspect the fitting sealing surfaces (A). They must be free of dirt or defects.
2. Inspect the O-ring (B). It must be free of damage or defects.
3. Lubricate O-rings and install into groove using petroleum jelly to hold in place during assembly.
4. Index angle fittings and tighten by hand pressing joint together to insure O-ring remains in place.

**Important: Avoid Damage! Do not allow hoses to twist when tightening fittings. Use two wrenches to tighten hose connections; one to hold the hose, and the other to tighten the swivel fitting.**

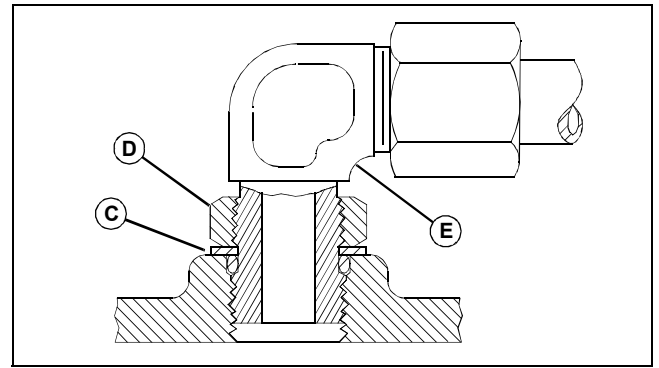
5. Tighten fitting or nut to torque value shown on the chart per dash size stamped on the fitting.

### O-Ring Boss Fittings

1. Inspect boss O-ring boss seat. It must be free of dirt and defects. If repeated leaks occur, inspect for defects with a magnifying glass. Some raised defects can be removed with a slip stone.



2. Put hydraulic oil or petroleum jelly on the O-ring (B). Place electrical tape over the threads to protect O-ring from nicks. Slide O-ring over the tape and into the groove (A) of fitting. Remove tape.



3. For angle fittings, loosen special nut (D) and push special washer (C) against threads so O-ring can be installed into the groove of fitting.
4. Turn fitting into the boss by hand until special washer or washer face (straight fitting) contacts boss face and O-ring is squeezed into its seat.
5. To position angle fittings (E), turn the fitting counter-clockwise a maximum of one turn.
6. Tighten straight fittings to torque value shown on chart. For angle fittings, tighten the special nut to value shown in the chart while holding body of fitting with a wrench.

### Straight Fitting or Special Nut Torques

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

<sup>a</sup>Torque tolerance is  $\pm 10$  percent.

<sup>b</sup>To be used if a torque wrench cannot be used. After tightening fitting by hand, put a mark on nut or boss; then tighten special nut or straight fitting the number of flats shown.

## General Information

### Diesel Fuel



**Caution: Avoid Injury! California Proposition 65 Warning: Diesel engine exhaust and some of its elements from this product are known to the State of California to cause cancer, birth defects, or other reproductive harm.**

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

In North America, diesel fuel is usually specified to **ASTM D975** and sold as either **Grade 1** for cold air temperatures or **Grade 2** for warm air temperatures.

If diesel fuels being supplied in your area **DO NOT** meet any of the above specifications, use diesel fuels with the following equivalent properties:

- **Cetane Number 40 (minimum)**

A cetane number **greater than 50 is preferred**, especially for air temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft).

- **Cold Filter Plugging Point (CFPP)**

The air temperature at which diesel fuel **begins to cloud or jell** - at least 5°C (9°F) below the expected low air temperature range.

- **Sulfur Content of 0.05% (maximum)**

Diesel fuels for highway use in the United States now require sulfur content to be **less than 0.05%**.

If diesel fuel being used has a sulfur content **greater than 0.05%**, **reduce the service interval for engine oil and filter by 50%**.

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

### Diesel Fuel Lubricity

Diesel fuel must have adequate lubricity to ensure proper operation and durability of fuel injection system components. Fuel lubricity should pass a **minimum of 3300 gram load level** as measured by the **BOCLE** scuffing test.

## Diesel Fuel Storage

**Important: Avoid Damage! Stale or contaminated fuel can produce varnish and plug fuel injectors, affect engine performance and/or damage fuel injectors and pumps.**

**Keep all dirt, scale, water or other foreign material out of fuel.**

**Do not store diesel fuel in galvanized containers which can react to zinc coating and form flakes.**

It is recommended that diesel fuel be stored **only** in a clean, approved **polyethylene plastic** container **without** any metal screen or filter. This will help prevent any accidental sparks from occurring. Store fuel in an area that is well ventilated to prevent possible igniting of fumes by an open flame or spark, this includes any appliance with a pilot light.

Keep fuel in a safe, protected area and in a clean, properly marked ("**diesel fuel**") container. **Do not** use de-icers to attempt to remove water from fuel. **Do not** depend on fuel filters to remove water from fuel. It is recommended that a water separator be installed in the storage tank outlet. **Be sure** to properly discard unstable or contaminated diesel fuel and/or their containers when necessary.

## Diesel Engine Oil

Use the appropriate oil viscosity based on the expected air temperature range during the period between recommended oil changes. Operating outside of these recommended oil air temperature ranges may cause premature engine failure.

The following John Deere oils are **PREFERRED**:

- **PLUS-50® - SAE 15W-40;**
- **TORQ-GARD SUPREME® - SAE 5W-30.**

The following John Deere oils are **also** recommended, based on their specified temperature range:

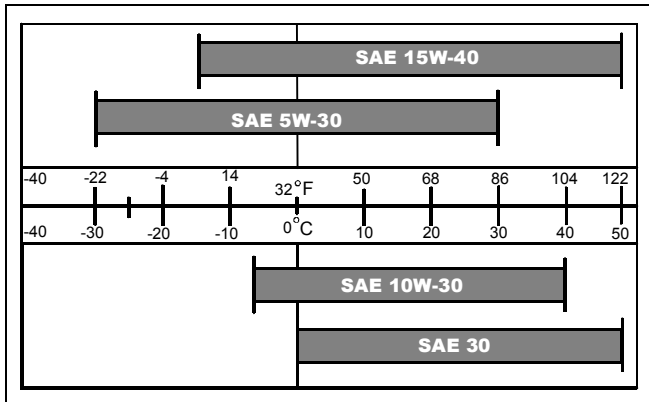
- **TURF-GARD® - SAE 10W-30;**
- **PLUS-4® - SAE 10W-30;**
- **TORQ-GARD SUPREME® - SAE 30.**

Other oils may be used if above John Deere oils are not available, provided they meet one of the following specifications:

- SAE 15W-40 - API Service Classifications CF - 4 or higher;
- SAE 5W-30 - API Service Classification CC or higher;
- SAE 10W-30 - API Service Classification CF or higher;
- SAE 30 - API Service Classification CF or higher.

# SPECIFICATIONS AND INFORMATION GENERAL INFORMATION

**Important: Avoid Damage! If diesel fuel with sulfur content greater than 0.5% is used, reduce the service interval for oil and filter by 50%.**



## Break-In Engine Oil - Diesel

**Important: Avoid Damage! Only use this specified break-in oil in rebuilt or remanufactured engines for the first 100 hours (maximum) of operation. Do not use PLUS - 50®, SAE 15W40 oil or oils meeting specifications API CG - 4 or API CF - 4, these oils will not allow rebuilt or remanufactured engines to break-in properly.**

The following John Deere oil is **PREFERRED**:

- **BREAK - IN ENGINE OIL.**

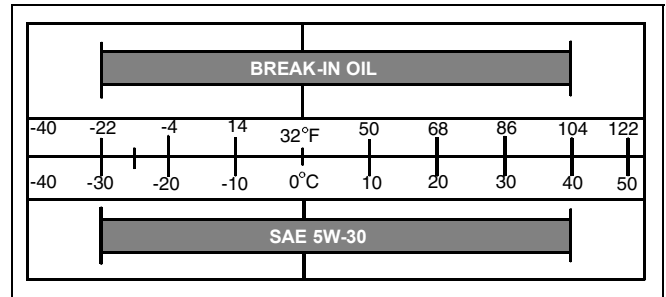
John Deere BREAK - IN ENGINE OIL is formulated with special additives for aluminum and cast iron type engines to allow the power cylinder components (pistons, rings, and liners as well) to “wear-in” while protecting other engine components, valve train and gears, from abnormal wear. Engine rebuild instructions should be followed closely to determine if special requirements are necessary.

John Deere BREAK - IN ENGINE OIL is also recommended for non-John Deere engines, both aluminum and cast iron types.

If this preferred John Deere oil is not available, use a break-in engine oil meeting the following specification during the first 100 hours of operation:

- API Service Classification CE or higher.

**Important: Avoid Damage! After the break-in period, use the John Deere oil that is recommended for this engine.**



## Hydrostatic Transmission and Hydraulic Oil

Use the appropriate oil viscosity based on these air temperature ranges. Operating outside of these recommended oil air temperature ranges may cause premature hydrostatic transmission or hydraulic system failures.

**Important: Avoid Damage! Only use a quality oil in this transmission. Mixing of LOW VISCOSITY HY - GARD® and HY - GARD® oils is permitted.**

**DO NOT mix any other oils in this transmission.**

**DO NOT use engine oil or “Type F” (Red) Automatic Transmission Fluid in this transmission.**

**DO NOT use BIO-HY-GARD® in this transmission.**

The following John Deere transmission and hydraulic oil is **PREFERRED**:

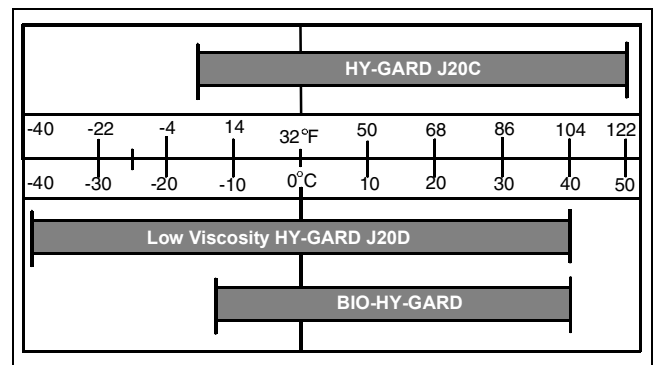
- **LOW VISCOSITY HY - GARD® - JDM J20C.**

The following John Deere oil is also recommended if above preferred oil is not available:

- **HY - GARD® - JDM J20D.**

Other oils may be used if above recommended John Deere oils are not available, provided they meet one of the following specifications:

- John Deere Standard JDM J20C;
- John Deere Standard JDM J20D.





# SPECIFICATIONS AND INFORMATION COOLANT

## Alternative Lubricants

Use of alternative lubricants could cause reduced life of the component.

If alternative lubricants are to be used, it is recommended that the factory fill be thoroughly removed before switching to any alternative lubricant.

## Synthetic Lubricants

Synthetic lubricants may be used in John Deere equipment if they meet the applicable performance requirements (industry classification and/or military specification) as shown in this manual.

The recommended air temperature limits and service or lubricant change intervals should be maintained as shown in the operator's manual, unless otherwise stated on lubricant label.

Avoid mixing different brands, grades, or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements. Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

## Anti-Corrosion Grease

This anti-corrosion grease is formulated to provide the best protection against absorbing moisture, which is one of the major causes of corrosion. This grease is also superior in its resistance to separation and migration.

The following anti-corrosion grease is **preferred**:

- DuBois MPG-2™ Multi-Purpose Polymer Grease - M79292.

Other greases may be used if they meet or exceed the following specification:

- John Deere Standard JDM J13A2, NLGI Grade 1.

## Lubricant Storage

All machines operate at top efficiency only when clean lubricants are used. Use clean storage containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contamination. Store drums on their sides. Make sure all containers are properly marked as to their contents. Dispose of all old, used containers and their contents properly.

## Mixing of Lubricants

In general, avoid mixing different brands or types of lubricants. Manufacturers blend additives in their lubricants to meet certain specifications and performance requirements. Mixing different lubricants can interfere with

the proper functioning of these additives and lubricant properties which will downgrade their intended specified performance.

## Oil Filters

**Important: Avoid Damage! Filtration of oils is critical to proper lubrication performance. Always change filters regularly.**

The following John Deere oil filters are **PREFERRED**:

- AUTOMOTIVE AND LIGHT TRUCK ENGINE OIL FILTERS.

Most John Deere filters contain pressure relief and anti-drainback valves for better engine protection.

Other oil filters may be used if above recommended John Deere oil filters are not available, provided they meet the following specification:

- ASTB Tested In Accordance With SAE J806.

## Coolant

### Recommended Engine Coolant

**Important: Avoid Damage! Using incorrect coolant mixture can cause overheating and damage to the radiator and engine:**

- Do not operate engine with plain water.
- Do not exceed a 50% mixture of coolant and water.
- Aluminum engine blocks and radiators require approved ethylene-glycol based coolant.

The engine cooling system is filled to provide year-round protection against corrosion and cylinder liner pitting, and winter freeze protection to -37 degrees C (-34 degrees F). If protection at lower temperatures is required, consult your John Deere dealer for recommendations.

**The following coolants are preferred:**

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

John Deere COOL-GARD II Premix and John Deere COOL-GARD Premix are available in a concentration of 50% propylene glycol.

John Deere COOL-GARD PG Premix is available in a concentration of 55% propylene glycol.

# SPECIFICATIONS AND INFORMATION SERIAL NUMBER LOCATIONS

## Additional recommended coolants:

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

**If the recommended coolants are unavailable, use an ethylene glycol or propylene glycol base coolant that meets the following specification:**

- ASTM D3306 prediluted (50%) coolant.
- ASTM D3306 coolant concentrate in a 40% to 60% mixture of concentrate with water.

Check container label before using to be sure it has the appropriate specifications for your machine. Use coolant with conditioner or add conditioner to coolant before using.

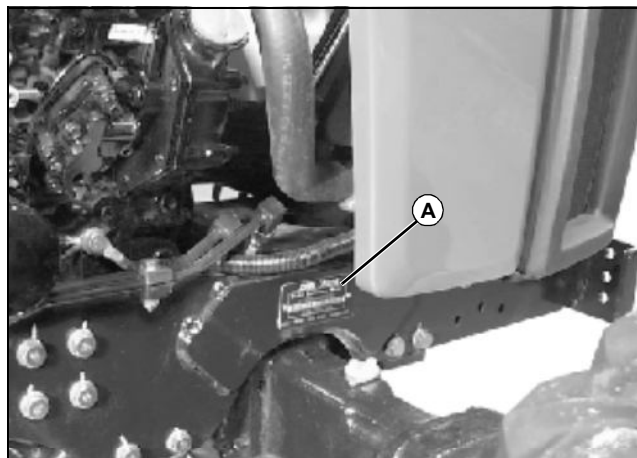
## Water Quality

- Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized water is recommended with ethylene glycol base engine coolant concentrate.

## Serial Number Locations

### Machine Product Identification Number

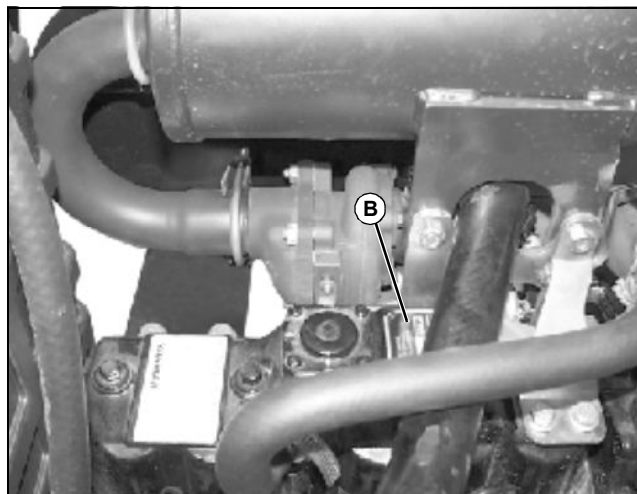
When ordering parts or submitting a warranty claim, it is **IMPORTANT** that the machine product identification number (PIN) and component serial numbers are included. The location of the PIN and component serial numbers are shown.



MX37279a

Located (A) on right side of frame.

### Engine Serial Number



MX40098

Located (B) on top of engine.

# ENGINE - DIESEL TABLE OF CONTENTS

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# ENGINE - DIESEL SPECIFICATIONS

## Specifications

### General Specifications

#### Specifications:

Make	Yanmar
Model	.3TNV84T-BKJT
Type	Diesel
Number of Cylinders	3
Bore	84 mm (3.31 in.)
Stroke	90 mm (3.54 in.)
Displacement	1.496 L (91.32 cu in.)
Firing Order (No. 1 Cylinder Closest to Flywheel)	1 - 3 - 2
Direction of Rotation	Counterclockwise (viewed from flywheel)
Combustion System	Direct Injection Type
Cooling	Liquid
Cooling System Capacity	Approximately 5.3 L (5.6 qt)
Oil Capacity (with filter)	Approximately 4.3 L (4.5 qt)
Governor	Centrifugal
Slow Idle	950 ± 50 rpm
High Idle (No Load)	2975 ± 50 rpm
Rated Speed	2800 ± 25 rpm

### Tests and Adjustments Specifications

#### Specifications:

Valve Clearance	0.15 - 0.25 mm (0.006 - 0.010 in.)
Connecting Rod Side Play	0.2 - 0.4 mm (0.008 - 0.016 in.)
Connecting Rod Bearing Clearance	0.04 - 0.07 mm (0.002 - 0.003 in.)
Crankshaft End Play	0.09 - 0.27 mm (0.004 - 0.011 in.)
Crankshaft Main Bearing Clearance	0.04 - 0.07 mm (0.001 - 0.003 in.)
Camshaft End Play	0.05 - 0.25 mm (0.002 - 0.010 in.)
Alternator Drive Belt Deflection	10 - 15 mm (0.4 - 0.6 in.)

#### Timing Gear Backlash:

All Except Hydraulic Pump Gear	0.07 - 0.15 mm (0.003 - 0.005 in.)
Hydraulic Pump Gear	0.11 - 0.19 mm (0.004 - 0.008 in.)

#### Fuel Injection Nozzle:

Opening Pressure	21600 - 22600 kPa (3133 - 3278 psi)
Leakage at 11032 kPa (1600 psi)	None for a minimum of 10 seconds

#### Chatter and Spray Pattern at 21600 - 22600 kPa (3133 - 3278 psi)

Slow Hand Lever Movement	Fine Stream; Chatter Sound
Fast Hand Lever Movement	Fine Atomized Spray; 150° Spray Pattern

# ENGINE - DIESEL SPECIFICATIONS

## Repair Specifications

### Valve Train:

Rocker Arm Shaft OD . . . . .	15.966 - 15.984 mm (0.6285 - 0.6295 in.)
Rocker Arm Shaft Wear Limit . . . . .	15.94 mm (0.6275 in.)
Rocker Arm and Shaft Support Bushing ID . . . . .	16.00 - 16.02 mm (0.630 - 0.631 in.)
Wear Limit . . . . .	16.09 mm (0.633 in.)
Oil Clearance . . . . .	0.02 - 0.05 mm (0.001 - 0.002 in.)
Wear Limit . . . . .	0.15 mm (0.006 in.)
Push Rod Bend . . . . .	0.0 - 0.03 mm (0.0 - 0.001 in.)

### Cylinder Head and Valves:

Cylinder Head Distortion . . . . .	0.0 - 0.05 mm (0.0 - 0.002 in.)
Wear Limit . . . . .	0.15 mm (0.006 in.)
Intake Valve Seat Width . . . . .	1.07 - 1.24 mm (0.042 - 0.049 in.)
Intake Valve Seat Width (Wear Limit) . . . . .	1.74 mm (0.069 in.)
Exhaust Valve Seat Width . . . . .	1.24 mm - 1.45 mm (0.042 - 0.049 in.)
Exhaust Valve Seat Width (Wear Limit) . . . . .	1.94 mm (0.076 in.)
Intake Valve Stem OD . . . . .	7.96 - 7.98 mm (0.313 - 0.314 in.)
Intake Valve Stem OD (Wear Limit) . . . . .	7.9 mm (0.311 in.)
Exhaust Valve Stem OD . . . . .	7.96 - 7.97 mm (0.313 - 0.314 in.)
Exhaust Valve Stem OD (Wear Limit) . . . . .	7.9 mm (0.311 in.)
Valve Head Thickness Intake . . . . .	1.24 - 1.44 mm (0.049 - 0.057 in.)
Valve Head Thickness Exhaust . . . . .	1.35 - 1.55 mm (0.053 - 0.061 in.)
Wear Limit . . . . .	0.50 mm (0.020 in.)
Intake Valve Recession . . . . .	0.31 - 0.51 mm (0.012 - 0.020 in.)
Intake Valve Recession Wear Limit . . . . .	1.00 mm (0.039 in.)
Exhaust Valve Recession . . . . .	0.3 - 0.5 mm (0.012 - 0.020 in.)
Wear Limit . . . . .	1.00 mm (0.039 in.)

### Valve Guide Stem-To-Guide Oil Clearance:

Intake . . . . .	0.04 - 0.07 mm (0.001 - 0.003 in.)
Exhaust . . . . .	0.05 - 0.08 mm (0.002 - 0.003 in.)
Exhaust (Wear Limit) . . . . .	0.20 mm (0.008 in.)
Valve Guide ID . . . . .	8.01 - 8.03 mm (0.315 - 0.316 in.)
Valve Guide ID (Wear Limit) . . . . .	8.10 mm (0.319 in.)
Valve Guide Projection . . . . .	15 mm (0.591 in.)
Valve Spring Free Length . . . . .	42.0 mm (1.654 in.)
Maximum Spring Inclination . . . . .	1.10 mm (0.044 in.)
Valve Spring Tension (Measured With Spring Compressed 1.0 mm (0.039 in.)	2.36 - 3.10 kg (5.20 - 6.84 lb)
Valve Seat Surface Angle Exhaust Valve . . . . .	45°
Valve Seat Surface Angle Intake Valve . . . . .	30°

### Valve Timing:

Intake Valve Opens . . . . .	10° - 20° BTDC
Intake Valve Closes . . . . .	40° - 50° ABDC
Exhaust Valve Opens . . . . .	51° - 61° BBDC
Exhaust Valve Closes . . . . .	13° - 23° ATDC
Piston-to-Cylinder Head Clearance . . . . .	0.66 - 0.78 mm (0.026 - 0.031 in.)

# ENGINE - DIESEL SPECIFICATIONS

## Connecting Rod

Large End Bearing ID . . . . .	51 - 51.01 mm (2.008 - 2.008 in.)
Large End Bearing Thickness . . . . .	1.49 - 1.50 mm (0.059 - 0.059 in.)
Oversize . . . . .	1.625 mm (0.064 in.)
Oil Clearance . . . . .	0.02 - 0.05 mm (0.001 - 0.002 in.)
Oil Clearance (Wear Limit) . . . . .	0.13 mm (0.005 in.)
Connecting Rod Side Play . . . . .	0.2 - 0.4 mm (0.008 - 0.016 in.)

## Piston Rings

First Compression Piston Ring Groove Width . . . . .	2.065 - 2.08 mm (0.081 - 0.082 in.)
First Compression Piston Ring Width . . . . .	1.97 - 1.99 mm (0.078 - 0.078 in.)
First Compression Ring Minimum Side Clearance . . . . .	0.075 - 0.110 mm (0.003 - 0.004 in.)
Second Compression Piston Ring Groove Width . . . . .	2.035 - 2.05 mm (0.080 - 0.081 in.)
Second Compression Piston Ring Width . . . . .	1.97 - 1.99 mm (0.078 - 0.078 in.)
Second Compression Piston Ring Minimum Side Clearance . . . . .	0.035 - 0.07 mm (0.001 - 0.003 in.)
Oil Control Piston Ring Groove Width . . . . .	4.015 - 4.03 mm (0.158 - 0.159 in.)
Oil Control Piston Ring Width . . . . .	3.97 - 3.99 mm (0.156 - 0.157 in.)
Oil Control Piston Ring Minimum Side Clearance . . . . .	0.025 - 0.06 mm (0.001 - 0.002 in.)
Piston Ring End Gap . . . . .	0.20 - 0.40 mm (0.008 - 0.016 in.)
Wear Limit . . . . .	1.50 mm (0.059 in.)

## Piston Pin

Piston Pin OD . . . . .	25.99 - 26.00 mm (1.023 - 1.024 in.)
Piston Pin OD (Wear Limit) . . . . .	25.90 mm (1.020 in.)
Piston Pin Bushing ID . . . . .	23.025 - 23.038 mm (0.906 - 0.907 in.)
Wear Limit . . . . .	23.10 mm (0.909 in.)
Piston Pin-To-Rod Bore Oil Clearance . . . . .	0.025 - 0.047 mm (0.001 - 0.002 in.)
Wear Limit . . . . .	0.2 mm (0.008 in.)
Piston Pin Bore (In Piston) ID . . . . .	26.00 - 26.009 mm (1.023 - 1.024 in.)
Piston Pin Bore (In Piston) ID (Wear Limit) . . . . .	26.02 mm (1.024 in.)
Piston Pin-To-Piston Oil Clearance . . . . .	0.00 - 0.022 mm (0.0 - 0.0009 in.)
Wear Limit . . . . .	0.12 mm (0.005 in.)

## Piston

Standard Piston OD . . . . .	83.95 - 83.98 mm (3.305 - 3.306 in.)
Standard Piston OD (Wear Limit) . . . . .	83.90 mm (3.303 in.)
Oversize Piston OD . . . . .	84.20 - 84.23 mm (3.315 - 3.316 in.)
Oversize Piston OD (Wear Limit) . . . . .	84.10 mm (3.311 in.)

## Cylinder Bore ID

Cylinder Bore ID . . . . .	84.00 - 84.03 mm (3.307 - 3.308 in.)
Cylinder Bore ID (Wear Limit) . . . . .	84.20 mm (3.315 in.)
Oversize Bore ID . . . . .	84.25 - 84.28 mm (3.317 - 3.318 in.)
Piston-to-Cylinder Clearance . . . . .	0.040 - 0.070 mm (0.0016 - 0.0027 in.)
Cylinder Roundness . . . . .	0.01 - 0.03 mm (0 - 0.001 in.)
Wear Limit . . . . .	0.03 mm (0.001 in.)
Cylinder Taper . . . . .	0.00 - 0.01 mm (0 - 0.0004 in.)
Wear Limit . . . . .	0.03 mm (0.001 in.)
Deglazing . . . . .	30 - 40° crosshatch pattern

# ENGINE - DIESEL SPECIFICATIONS

Deboring .....	30 - 40° crosshatch pattern
<b>Crankshaft and Main Bearings</b>	
Connecting Rod Crankshaft Journal OD .....	47.95 - 47.96 mm (1.888 - 1.888 in.)
Wear Limit .....	47.91 mm (1.886 in.)
Main Bearing Journal OD .....	53.95 - 53.96 mm (2.124 - 2.124 in.)
Wear Limit .....	53.91 mm (2.122 in.)
Main Bearing Oil Clearance .....	0.04 - 0.07 mm (0.002 - 0.003 in.)
Main Bearing Oil Clearance (Wear Limit) .....	0.16 mm (0.006 in.)
Crankshaft Bend (Maximum) .....	0.02 mm (0.001 in.)
Crankshaft End Play .....	0.13 - 0.23 mm (0.005 - 0.009 in.)
<b>Camshaft</b>	
Camshaft End Play .....	0.05 - 0.20 mm (0.002 - 0.008 in.)
Camshaft Bend .....	0 - 0.02 mm (0 - 0.001 in.)
Wear Limit .....	0.05 mm (0.002 in.)
Camshaft Side Gap .....	0.05 - 0.25 mm (0.002 - 0.010 in.)
Lobe Height (Intake and Exhaust) .....	38.64 - 38.77 mm (1.521 - 1.526 in.)
Wear Limit .....	38.40 mm (1.512 in.)
Bearing Journal OD:	
Flywheel Side and Gear Side .....	44.93 - 44.95 mm (1.769 - 1.770 in.)
Intermediate Journal .....	44.91 - 44.94 mm
Wear Limit .....	44.85 mm (1.766 in.)
Oil Clearance (Gear and Flywheel Ends) .....	0.04 - 0.13 mm (0.002 - 0.005 in.)
Oil Clearance (Intermediate) .....	0.07 - 0.12 mm (0.003 - 0.005 in.)
<b>Camshaft Followers</b>	
Stem OD .....	11.98 - 11.99 mm (0.471 - 0.472 in.)
Wear Limit .....	11.93 mm (0.470 in.)
Bore ID .....	12.00 - 12.02 mm (0.472 - 0.473 in.)
Wear Limit .....	12.05 mm (0.474 in.)
Oil Clearance .....	0.01 - 0.04 mm (0.0004 - 0.0016 in.)
Wear Limit .....	0.12 mm (0.005 in.)
<b>Idler Gear</b>	
Shaft OD .....	45.95 - 45.98 mm (1.809 - 1.810 in.)
Wear Limit .....	45.93 mm (1.808 in.)
Bushing ID .....	46.00 - 46.03 mm (1.811 - 1.812 in.)
Wear Limit .....	46.08 mm (1.814 in.)
Clearance .....	0.15 mm (0.006 in.)
<b>Oil Pump</b>	
Rotor Shaft OD to Cover Hole ID Clearance .....	0.01 - 0.04 mm (0.001 - 0.002 in.)
Wear Limit .....	0.20 mm (0.08 in.)
Inner Rotor to Outer Rotor Clearance .....	0.03 - 0.09 mm (0.001 - 0.004 in.)
Wear Limit .....	0.15 mm (0.006 in.)
Outer Rotor to Pump Body Clearance .....	0.10 - 0.16 mm (0.004 - 0.006 in.)
Wear Limit .....	0.25 mm (0.010 in.)



# ENGINE - DIESEL SPECIFICATIONS

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## Operational Tests

### Specifications:

Cooling System Test Pressure	88 ± 15 kPa (12.8 ± 2.2 psi)
Thermostat Opening Temperature	107 - 113° C (224 - 235° F)
Minimum Lift Height above 85° C (185° F)	8.0 mm (0.135 in.)
Radiator Cap Opening Pressure	88 ± 15 kPa (12.8 ± 2.2 psi)
Cylinder Compression Difference Between Cylinders (maximum)	200 - 300 kPa (29 - 43 psi)
Oil Pressure (Rated Speed)	294 - 392 kPa (42.6 - 56.8 psi)
Slow Idle (Minimum)	58.8 kPa (8.5 psi)
Oil Relief Valve Opening Pressure	294 - 392 kPa (43 - 57 psi)
Oil Pressure Switch Opening Pressure	49 ± 9.8 kPa (7.1 ± 1.4 psi)

## Torque Values, Non-Standard Fasteners

### Specifications:

Cylinder Head Bolts (Lubricating Oil Applied)	85 - 91 N•m (63 - 67 lb-ft)
Connecting Rod Bolts (Lubricating Oil Applied)	44 - 49 N•m (33 - 36 lb-ft)
Flywheel Mounting Bolts (Lubricating Oil Applied)	83 - 88 N•m (62 - 65 lb-ft)
Main Bearing Bolts (Lubricating Oil Applied)	93 - 98 N•m (63 - 72 lb-ft)
Crankshaft Pulley Bolt (Lubricating Oil Applied)	113 - 122 N•m (83 - 90 lb-ft)
Fuel Injector Nozzle Nut	6.8 - 8.8 N•m (60 - 78 lb-in.)
Governor Weight Support Nut	44 - 49 N•m (33 - 36 lb-ft)
Rocker Arm Mounting Cap Screw and Nut	26 N•m (19 lb-ft)
Oil Pump Mounting Cap Screw	25 N•m (18 lb-ft)
Starting Motor Mounting Bolts	47 N•m (35 lb-ft)
Lock plate set bolt	11.8 - 12.8 N•m (105 - 113 lb-in.)
Thrust bearing set screw	1.2 - 1.4 N•m (11 - 12 lb-in.)
Seal plate set screw	1.2 - 1.4 N•m (11 - 12 lb-in.)

# ENGINE - DIESEL SPECIFICATIONS

## Special Tools

**Note:** Order tools according to information given in the **U.S. SERVICE-GARD™ Catalog** or in the **European Microfiche Tool Catalog (MTC)**.

### Special or Required Tools

Tool Name	Tool No.	Tool Use
Dial Indicator	(English, in.) D17526CI or (Metric, mm) D17527CI	Use with JDG451 to measure valve recess.
Spring Compression Tester	D01168AA	Test valve spring compression.
Valve Inspection Center	D05058ST	Check valves for out-of-round.
End Brush	D17024BR	Clean valve seat and bores.
Compression Test Adapter	JDG1687	To check cylinder compression pressure on diesel engines
Universal Pressure Test Kit	JT05470 (D15027NU or FKM10002)	Used to check engine oil pressure.
Cooling System Pressure Pump	D05104ST	Used to pressure test radiator cap and cooling system.
Magnetic Follower Holder Kit	D15001NU	Hold cam followers when removing and installing camshaft.
Nozzle Cleaning Kit	JDF13	Use to clean fuel injection nozzles.
Valve Guide Service Kit	JT07096A	Service valve guides.
Pressure Gauge 0 - 200 kPa (0 - 2 bar) (0 - 30 psi), Hose and Fittings.	JT05470	Measure supply pump pressure in rotary injection pump systems. Assemble test equipment from JT05470 Universal Pressure Test Kit or any other suitable equipment.
Noncontact Temperature Measuring Gun	JT07254	Spots heat problems early in your electrical and mechanical systems.

## Other Materials

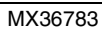
### Other Material

Part No.	Part Name	Part Use
	Brake Kleen or Ignition Cleaner	Remove sealant from crankshaft flange.
	PLASTIGAGE®	Check main bearing-to-crankshaft journal oil clearance.
PM37463	John Deere RTV Clear Silicone	Seals rear oil seal case and flywheel housing to engine block. Seals oil pan to timing gear housing and engine block.
PM37418 LOCTITE® No. 242	Thread Lock and Sealer (Medium Strength)	Apply to threads of crankshaft pulley cap screw.
AR44402	Valve Stem Lubricant	Lubricate valve stems.

PLASTIGAGE® is a registered trademark of the DANA Corporation.

LOCTITE® is a registered trademark of the Loctite Corp.

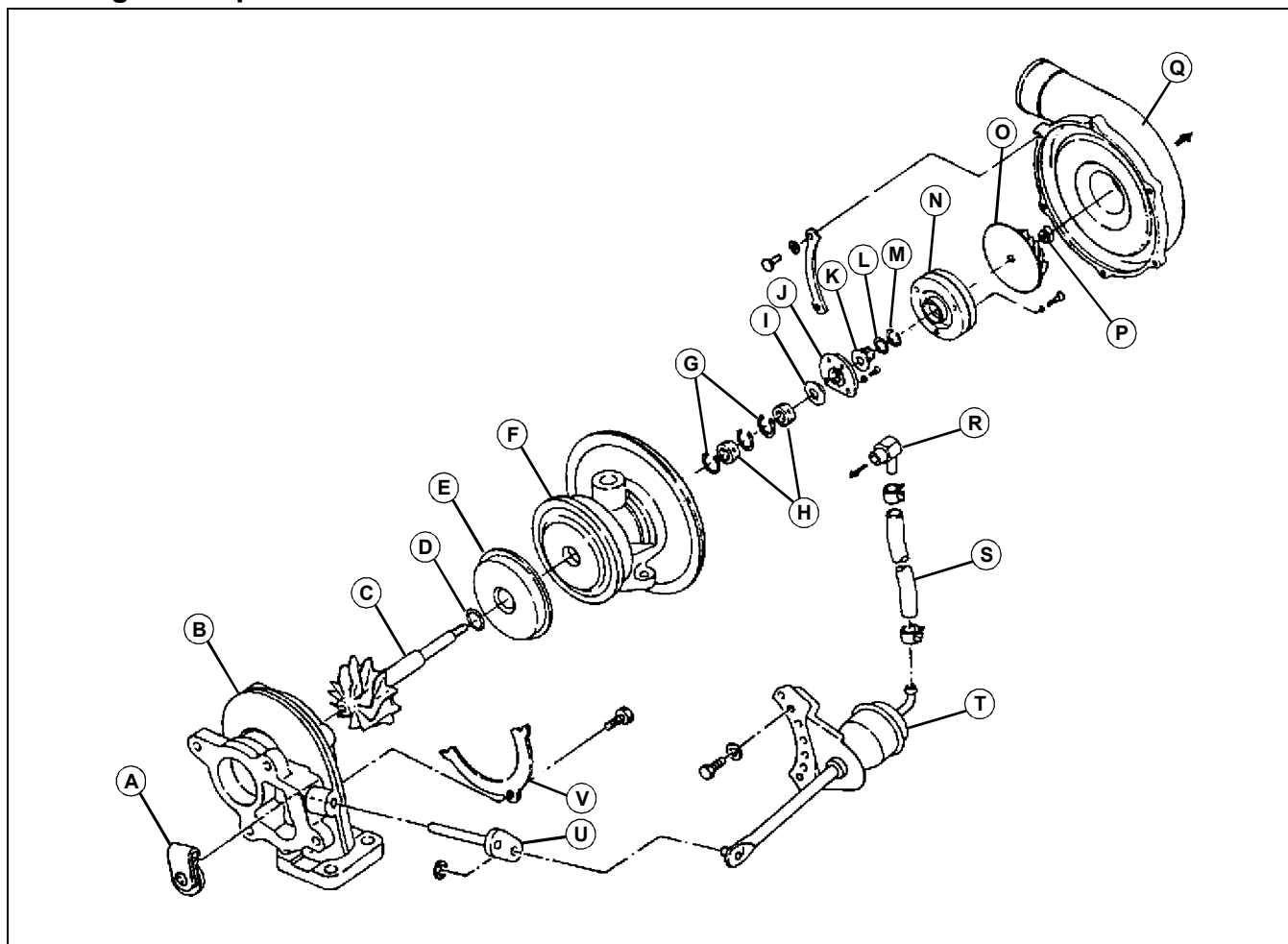
## Fuel Supply Components



- Engine - Diesel    Component Location - 27

# ENGINE - DIESEL COMPONENT LOCATION

## Turbocharger Components



MX33697

U- Waste Gate Link Plate

V- Lock Plate

- A- Waste Gate Valve
- B- Turbine Housing
- C- Turbine Shaft
- D- Seal Ring (Turbine Side)
- E- Heat Shield
- F- Bearing (Center) Housing
- G- Retaining Ring
- H- Journal Bearing
- I- Thrust Bushing
- J- Thrust Bearing
- K- Oil Thrower
- L- Seal Ring
- M- Seal Ring
- N- Seal Plate
- O- Impeller
- P- Lock Nut (LH Thread)
- Q- Compressor Housing
- R- Fitting (To Intake Manifold)
- S- Hose
- T- Waste Gate Actuator

# ENGINE - DIESEL THEORY OF OPERATION

## Theory of Operation

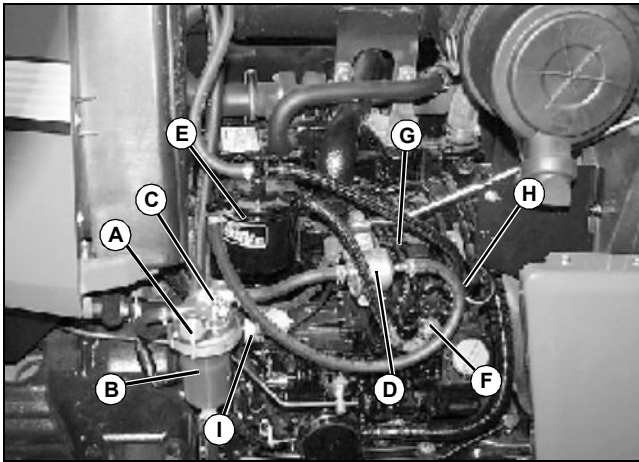
### Fuel System Operation

#### Function:

Fuel system supplies fuel to the injection nozzles.

The air intake system filters and supplies air for combustion.

#### Theory of Operation:



MX39098

#### Fuel System:

Fuel from the fuel tank flows to the fuel shutoff valve (A) in the top of the fuel strainer/water separator (B). An air bleed screw (C) in the top of the housing is used for bleeding air out of the fuel strainer/water separator when tractor is run out of fuel or fuel filters are serviced. An electric fuel supply pump (D) pumps low pressure fuel to the secondary fuel filter (E) and then to the fuel injector pump inlet (F). The injection pump then directs high pressure fuel through the injector lines (G) to the fuel injector nozzles for combustion. Excess fuel from the injector pump is combined with leak off fuel from the injectors, through a junction fitting (H) and is routed through the top of the secondary filter base, back to the fuel tank.

If the machine runs out of fuel, or after servicing fuel strainer/water separator, air must be bled from the fuel strainer/water separator. Make sure fuel shutoff valve is ON. Open bleed screw (C) two or three turns and observe bleed screw. When a steady stream of fuel with no bubbles is observed close bleed screw. Turn the key switch ON. Let the electric fuel supply pump run (you should hear clicking sound) for 30 seconds to purge the air from the fuel system.

The engine speed is controlled by the throttle lever and rod. The rod is connected to the injection pump governor control lever. The fuel shutoff solenoid (I) controls the injection pump shutoff shaft. When the solenoid is retracted (key in

the START or ON position), the engine can be started. When the key is turned off, return springs on the shutoff shaft, extend the solenoid, moving the shutoff linkage to the shutoff position. The solenoid also closes if the machine is operated in an unsafe condition. See "Engine Shutoff Circuit Operation" in the Electrical section.

The injection pump meters fuel as determined by the governor and delivers it at high pressure to the injection nozzles.

The injection nozzle prevents flow until high pressure is reached, then opening the valve and spraying atomized fuel into the combustion chamber. Injection lines contain trapped fuel whenever injection is not taking place.

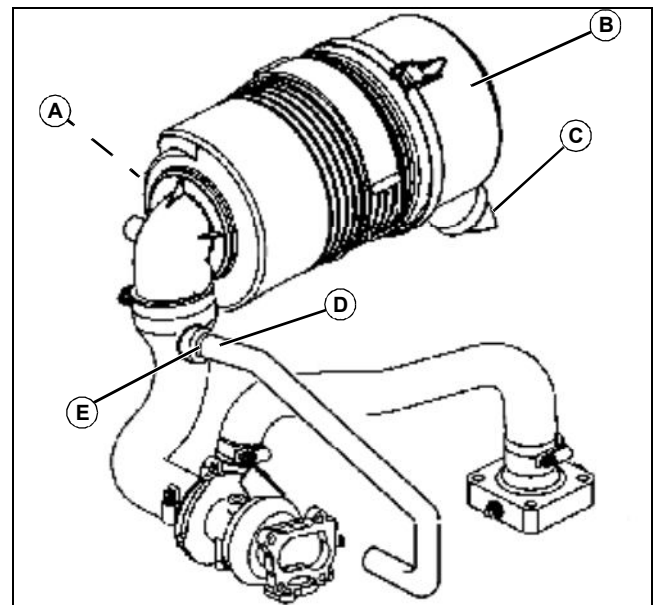
A small amount of fuel leaks past the nozzle valve to lubricate the fuel injection nozzle. This leakage combines with excess fuel from the injection pump and is returned to tank. Any air in the fuel system is bled out with return fuel to the fuel tank.

### Air Intake System

#### Function:

To supply clean air to the engine for combustion. New Closed Crankcase Ventilation system is routed to intake system to burn crankcase gasses, reducing engine emissions.

#### Theory of Operation:

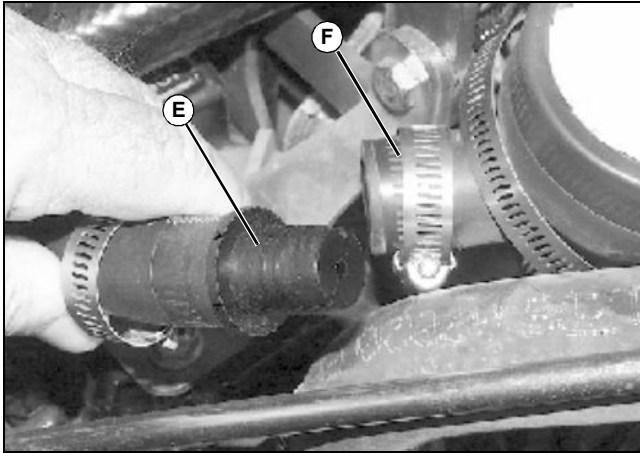


MX40204

Air enters the air cleaner inlet tube above the radiator (A) and is directed into the air cleaner housing. The air is directed to a baffle which starts a high-speed centrifugal motion of air which continues around the element until it reaches the far end of the air cleaner housing (B).

# ENGINE - DIESEL THEORY OF OPERATION

Most of the dust is separated from the air by centrifugal force that causes heavy dust particles to enter the opening at the top of the unloader valve (C). The air flows through the primary air filter element. The primary filter element filters the larger dirt particles before the air enters the secondary air filter element. The finer dirt particles are filtered out by the secondary air filter before the air enters the intake manifold.



MX40205

A restrictor fitting (E) connects the crankcase vent hose (D) and the rubber elbow (F) between the air cleaner and turbo inlet. This is a directional fitting and must be installed with arrows and/or the small hole in the end toward the air inlet to the turbo.

The dirt that is deposited in the unloader valve is removed through the rubber diaphragm at the base of the air cleaner. When the engine is running, a pulsing action is created in the intake system by each intake stroke of the engine. This pulsing action causes the rubber diaphragm to open and close, thus emptying the unloader valve. The operator can squeeze the valve to let the large particles out.

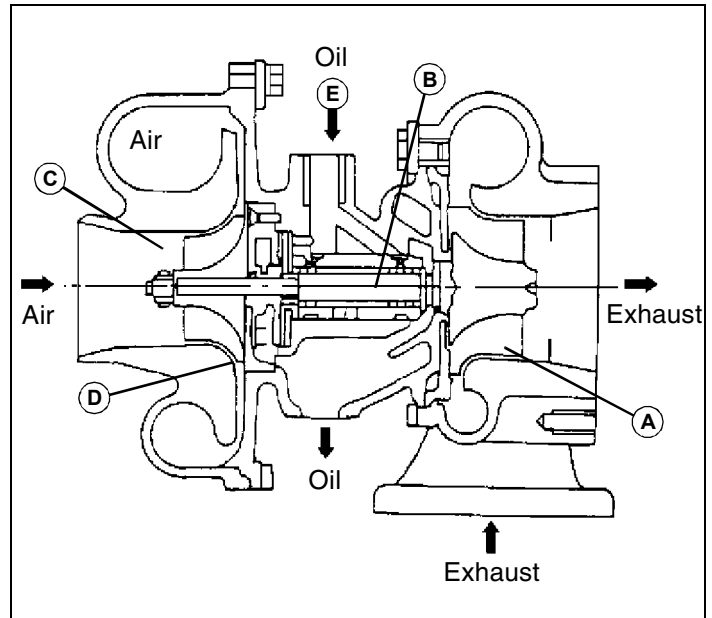
## Turbocharger Operation

### Function:

The turbocharger supplies pressurized air to the air intake manifold of the engine.

### Theory of Operation:

The turbocharger, which is an air pump that is driven by exhaust gases, allows the engine to produce added power without increasing displacement.



MX33696

Exhaust gas from the engine is blown onto the turbine impeller (A) in the turbocharger turbine housing to rotate the turbine shaft (B). The turbine impeller and shaft are referred to as the turbine.

The compressor impeller (C) installed on the turbine shaft rotates with the shaft to draw in filtered air and discharge the compressed air into the intake manifold, where it is then delivered to the engine combustion chambers. The compressor impeller and housing are referred to as the blower or compressor.

To prevent the intake air and oil from leaking, a seal ring and a seal plate (D) are provided to form a double wall structure on the rear side of the compressor impeller.

A waste gate assembly is installed on the turbocharger to prevent it from overspeeding and maintain constant manifold intake pressure. When the blower side pressure (intake pressure) exceeds a specified level, the exhaust gas at the turbine inlet is partially bypassed to the discharge side to control the turbine rpm. This improves response to load variations in the low to medium speed range and minimizes black exhaust smoke.

The waste gate consists of a control assembly separated from the turbocharger and a valve assembly installed in the turbine impeller chamber.

Engine oil, under pressure from the engine lubricating system, is provided to the turbocharger center housing (E) to lubricate and cool the shaft and bearings.

Engine oil, under pressure from the lubricating system, is pumped through a passage in the bearing housing and directed to the bearings, thrust plate, and thrust sleeve. Oil is sealed from the compressor and turbine at both ends of the bearing (center) housing.

# ENGINE - DIESEL THEORY OF OPERATION

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Engine oil then drains through the bottom of the center housing, through a tube and hose, into the back of the timing gear housing and returns to crankcase.

## Cooling System Operation

### Function:

The coolant pump circulates the coolant through the cooling system, drawing hot coolant from the engine block, circulating it through the radiator to cool.

### Theory of Operation:

The pressurized cooling system includes the radiator, water pump, fan and thermostat.

During warm-up the thermostat remains closed and the impeller type coolant pump draws coolant from the bypass tube. Coolant from the pump flows to the cylinder block water jacket and up through the cylinder head providing a fast warm-up.

Once the engine has reached operating temperature, the thermostat opens and coolant is pumped from the bottom of the radiator via the lower radiator hose into the cylinder block. Here it circulates through the block and around the cylinders.

From the block, coolant is then directed through the cylinder head, and into thermostat housing. With the thermostat open; warm engine coolant passes through the housing into the top of the radiator where it is circulated to dissipate heat.

### Specifications:

**Start to Open. . . . . 69.5 - 72.5° C (157 - 163° F)**

**Fully Opened. . . . . 85° C (185° F)**

When coolant system pressure exceeds **89 kPa (13 psi)**, a valve in the radiator cap opens to allow coolant to discharge into the coolant recovery tank.

When temperature is reduced, a vacuum is produced in the radiator and coolant is drawn back out of the coolant recovery tank through a valve in the radiator cap.

A coolant temperature sensor near the thermostat operates the temperature gauge, informing the operator of the engine coolant temperature.

There are small coolant lines between the water pump and the cold start advance unit on the fuel injection pump. The water pump circulates engine block coolant through the fuel injection pump. While the engine is cold, the fuel injection pump timing is advanced from normal operation which aids in cold starting. When warm water circulates through the fuel injection pump the timing is retarded to provide a cleaner burning of fuel.





# ENGINE - DIESEL DIAGNOSTICS

## Diagnostics

### Engine Troubleshooting



**Caution: Avoid Injury! Engine radiator fluid is extremely hot during operation.**



**Caution: Avoid Injury! The engine may start to rotate at any time. Keep hands away from all moving parts when testing.**

### Symptom: Starting Problems



**Caution: Avoid Injury! Keep away from all moving parts when testing. The engine may start to rotate at any time.**

### Symptom: Engine Does Not Crank

Problem	Cause - Solution
1. Starting procedure being used is not correct for conditions	a. Use correct procedure (i.e. operator on seat, machine in neutral). Check Operator's Manual.
2. Battery voltage low	a. Charge and check battery. See "Battery Test" in the Electrical section. b. Battery is not being charged. Check charging system. See "Charging Circuit Diagnosis" in the Electrical section.
3. Open circuit in the wiring	a. Repair or replace as needed. See "Cranking Circuit Diagnosis" and "Common Circuit Tests" in the Electrical section.
4. Starting motor not functioning properly	a. Repair or replace starting motor.

### Symptom: Engine Cranks But Does Not Start

Problem	Cause - Solution
1. No fuel	a. Faulty fuel shutoff solenoid circuit or fuel shutoff solenoid. Test electrical circuit, replace fuel shutoff solenoid.

### Symptom: Engine Cranks But Does Not Start

Problem	Cause - Solution
2. Fuel volume to injection pump low	a. Fuel filter plugged. Replace fuel filter. b. Clogged or cracked fuel lines. Clean or replace fuel lines. c. Air leak in fuel system. d. Incorrect volume of fuel being supplied to injection pump. Check or replace fuel transfer pump.
3. Water in fuel.	a. Drain and replace fuel.
4. Engine problem	a. Improper timing between injection pump, intake and exhaust valves. Adjust valve clearance. Check valve timing. b. Seized intake/exhaust valve. Replace valve and check valve guide. c. Cylinder, piston or piston rings worn, broken or seized. Replace rings and/or piston, bore or hone cylinder. d. Crankshaft pin or bearing seized. Regrind crank and replace bearings.

### Symptom: Engine Starts But Does Not Continue Running - No Exhaust Smoke

Problem	Cause - Solution
1. Fuel volume to injection pump low	a. Fuel filter plugged. Replace fuel filter. b. Clogged or cracked fuel lines. Clean or replace fuel lines. c. Air leak in fuel system. d. Check or replace fuel transfer pump.
2. Water in fuel.	a. Drain and replace fuel.
3. Engine problem	a. Adjust valve clearance. Check valve timing. b. Seized intake/exhaust valve. Replace valve and check valve guide.

# ENGINE - DIESEL DIAGNOSTICS

## Symptom: Low Engine Output

### Symptom: Engine Starts But Does Not Continue Running - Excess Exhaust Smoke

Problem	Cause - Solution
1. Water in fuel.	a. Drain and replace fuel.
2. Engine problem	a. Improper timing between injection pump, intake and exhaust valves. Adjust valve clearance. Check valve timing. b. Improper intake or exhaust valve clearance. Adjust valve clearance. c. Cylinder, piston or piston rings worn. Replace rings and/or piston, bore or hone cylinder.



**Caution: Avoid Injury! Keep away from all moving parts when testing. The engine may start to rotate at any time.**

### Symptom: Low Engine Output - Exhaust Color Normal

Problem	Cause - Solution
1. Fuel volume to injection pump low	a. Fuel filter plugged. Replace fuel filter. b. Clogged or cracked fuel lines. Clean or replace fuel lines. c. Air leak in fuel system. d. Incorrect volume of fuel being supplied to injection pump. Check or replace fuel transfer pump.
2. Fuel or oil	a. Wrong type of fuel. Drain and replace fuel. b. Poor fuel injection pattern. Clean or replace injector nozzles. Check for retarded injection pump timing. c. Improper engine oil viscosity/type. Replace engine oil and filter.
3. Low compression	a. Improper intake or exhaust valve clearance. Adjust valve clearance. b. Compression leakage from valve seat. Grind valve seat; regrind valves.
4. Engine problem	a. Seized intake/exhaust valve. Replace valve and check valve guide. b. Leaking cylinder head gasket. Replace head gasket. c. Crankshaft pin or bearing seized. Regrind crank and replace bearings.

## Symptom: Starting Problems

### Engine Does Not Start

#### Symptom: Engine does not crank

Problem	Cause - Solution
1. Starting procedure being used is not correct for conditions	a. Use correct procedure (i.e. operator on seat, machine in neutral). Check Operator's Manual.
2. Battery voltage low	a. Charge and check battery. See "Battery Test" in the Electrical section. b. Battery is not being charged. Check charging system. See "Charging Circuit Diagnosis" in the Electrical section.
3. Open circuit in the wiring	a. Repair or replace as needed. See "Cranking Circuit Diagnosis" and "Common Circuit Tests" in the Electrical section.
4. Starting motor not functioning properly	a. Repair or replace starting motor.

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