JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

Lawn Tractors
LT150, 160, 170, 180

TM1975 AUG 2002

TECHNICAL MANUAL

JOHN DEERE

North American Version
Litho in U.S.A.

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

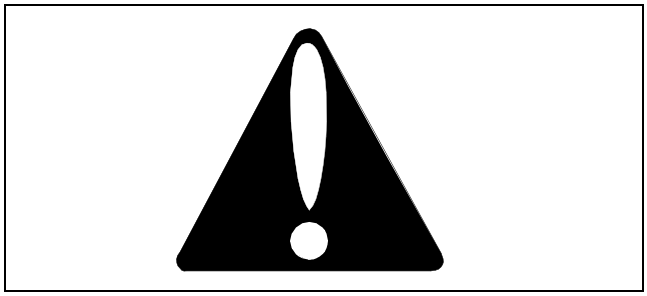
NOTE: Depending on the particular section or system being covered, not all of the above groups may be used.

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

Recognize Safety Information



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

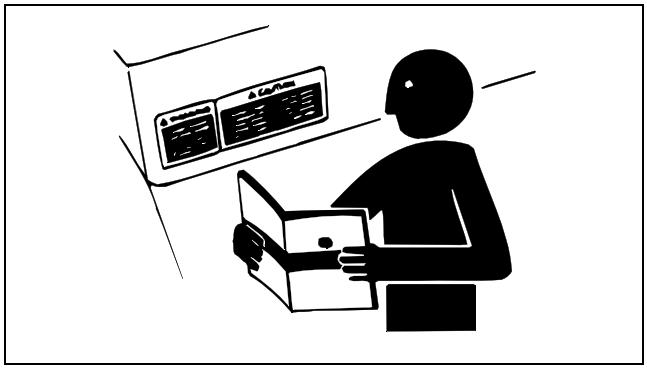
Follow recommended precautions and safe servicing practices.

Understand Signal Words

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

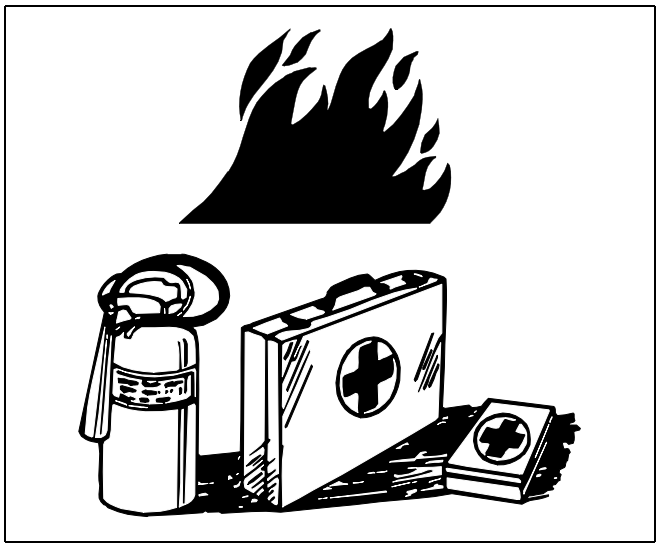
DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

Replace Safety Signs



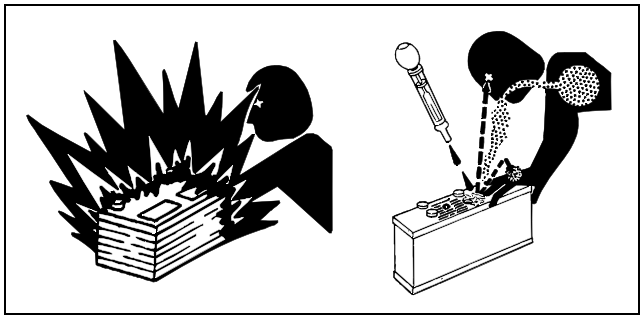
Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

Be Prepared for Emergencies



- 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



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.

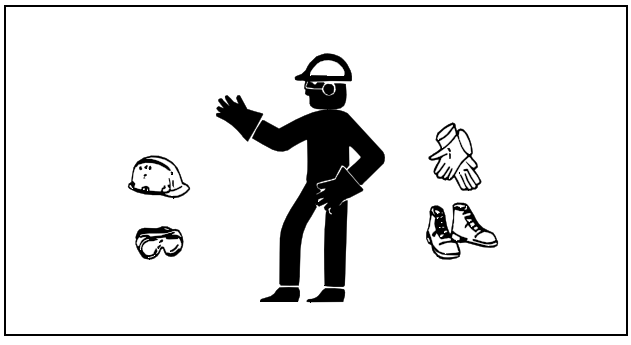
If you spill acid on yourself:

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

If acid is swallowed:

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

Wear Protective Clothing

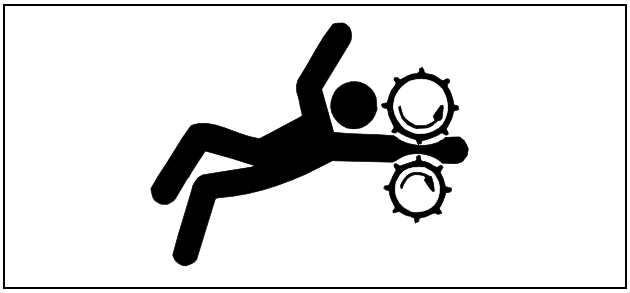


Wear close fitting clothing and safety equipment appropriate to the job.

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.

Service Machines Safely



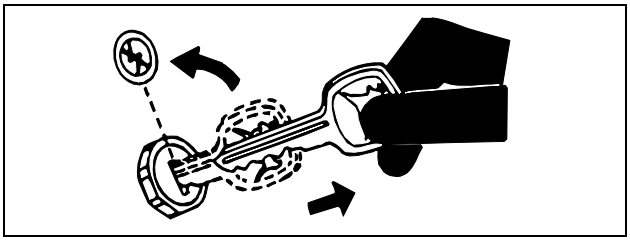
Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

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

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.

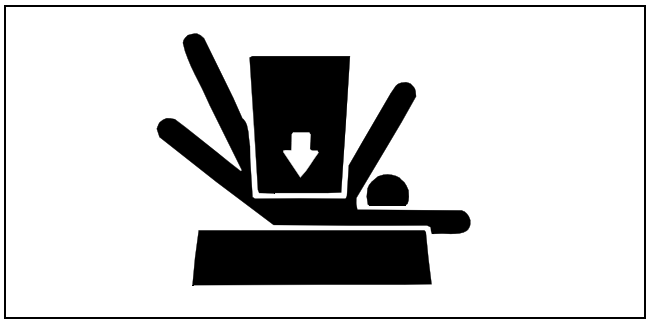
Park Machine Safely



Before working on the machine:

1. Lower all equipment to the ground.
2. Stop the engine 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



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 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.

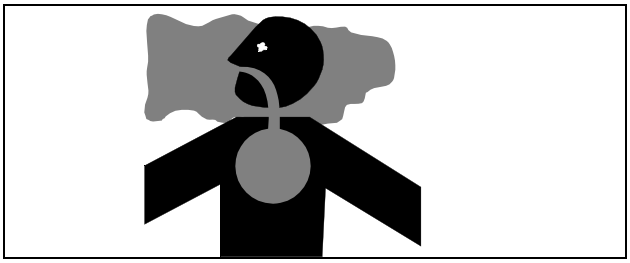
Using High Pressure Washers

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



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.

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.

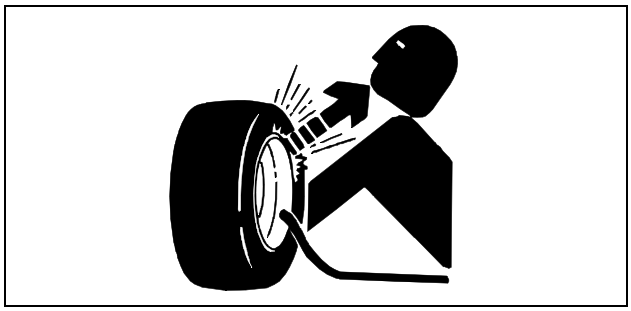
Avoid Harmful Asbestos Dust

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.

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



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

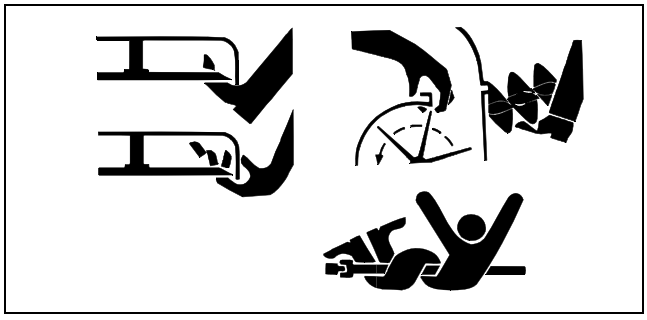
Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

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.

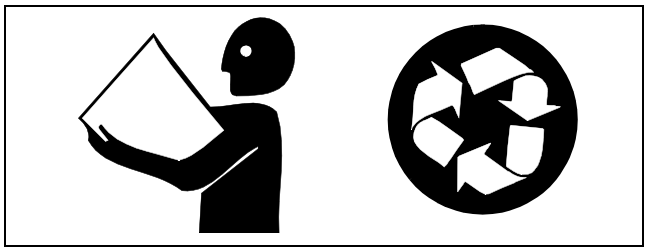
Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.

Avoid Injury From Rotating Blades, Augers and PTO Shafts



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



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.

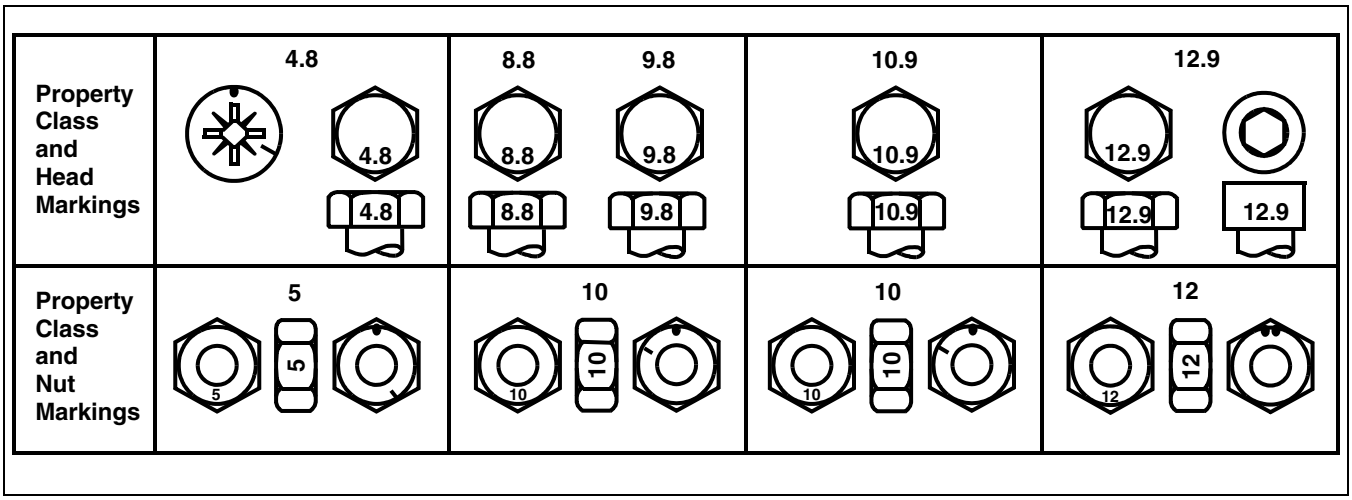
Live With Safety

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

Table of Contents

Fastener Torques

Metric Fastener Torque Values



MIF

	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	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 ±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 class. 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.

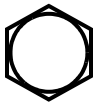
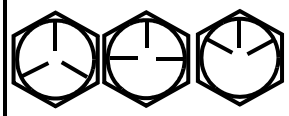
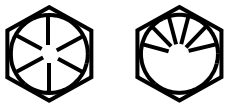
a *“Lubricated” means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. “Dry” means plain or zinc plated (Yellow Dichromate - Specification JDS117) without any lubrication*.

Reference: JDS - G200

Metric Fastener Torque Value - Grade 7

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

Inch Fastener Torque Values

SAE Grade and Head Markings	**No Marks**  **1 or 2[b]**	 **5** **5.1** **5.2**	 **8** **8.2**
SAE Grade and Nut Markings	**No Marks**  **2**	 **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 ±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

General Information

Gasoline

CAUTION: Avoid injury! Gasoline is HIGHLY FLAMMABLE, handle it with care.DO NOT refuel machine while:

indoors, always fill gas tank outdoors

machine is near an open flame or sparks

engine is running, STOP engine

engine is hot, allow it to cool sufficiently first

smoking

Help prevent fires:

fill gas tank to bottom of filler neck only

be sure fill cap is tight after fueling

clean up any gas spills IMMEDIATELY

keep machine clean and in good repair-free of excess grease, oil, debris, and faulty or damaged parts

any storage of machines with gas left in tank should be 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

To prevent fire or explosion caused by STATIC ELECTRIC DISCHARGE during fueling:

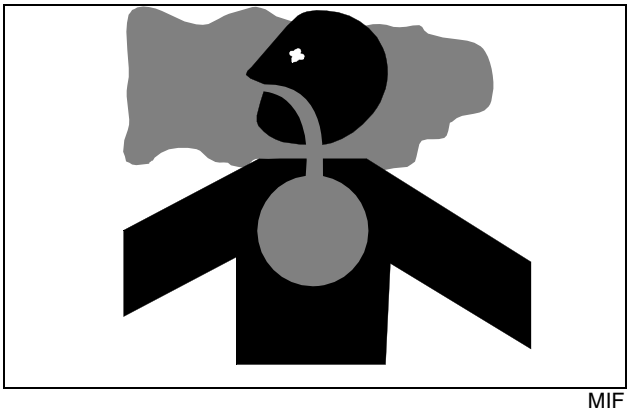
ONLY use a clean, approved POLYETHYLENE PLASTIC fuel container and funnel WITHOUT any metal screen or filter

To avoid engine damage:

- DO NOT mix oil with gasoline
- **ONLY use clean, fresh unleaded gasoline with an octane rating (anti-knock index) of 87 or higher**
- fill gas tank at the end of each day's operation to help prevent condensation from forming inside a partially filled tank
- keep up with specified service intervals

Use of alternative oxygenated, gasohol blended, unleaded gasoline is acceptable as long as:

- the ethyl or grain alcohol blends DO NOT exceed 10% by volume or



MIF

- methyl tertiary butyl ether (MTBE) blends DO NOT exceed 15% by volume

IMPORTANT: Avoid damage! DO NOT use METHANOL gasolines because METHANOL is harmful to the environment and to your health.

CAUTION: Avoid injury! 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.

Gasoline Storage

IMPORTANT: Avoid damage! Keep all dirt, scale, water or other foreign material out of gasoline.

Keep gasoline stored in a safe, protected area. Storage of gasoline in a clean, properly marked (“UNLEADED GASOLINE”) POLYETHYLENE PLASTIC container WITHOUT any metal screen or filter is recommended. DO NOT use de-icers to attempt to remove water from gasoline or depend on fuel filters to remove water from gasoline. Use a water separator installed in the storage tank outlet. BE SURE to properly discard unstable or contaminated gasoline. When storing machine or gasoline, it is recommended that you add **John Deere Gasoline Conditioner and Stabilizer (TY15977)** or an equivalent to the gasoline. BE SURE to follow directions on container and to properly discard empty container.

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 oil is PREFERRED:

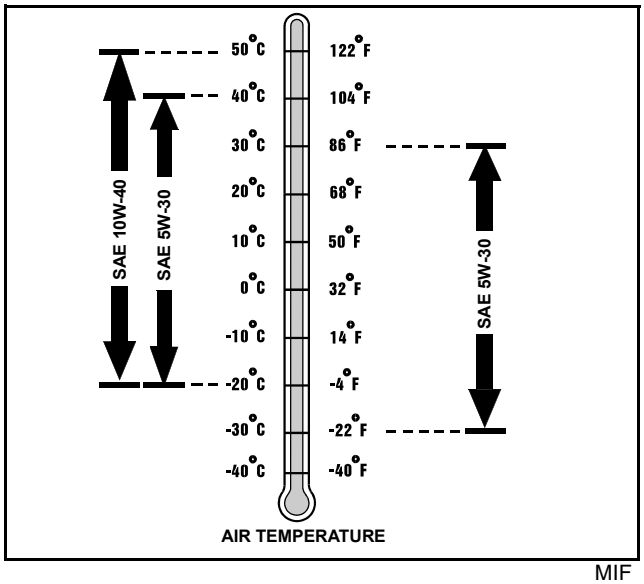
- **PLUS-4® - SAE 10W-40**
- **TURF-GARD® - SAE 10W-30**

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

- **TORQ-GARD SUPREME® - 5W-30**

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

- SAE 5W-30 - API Service Classification SJ or higher;
- SAE 10W-30 - API Service Classification SJ or higher;
- SAE 30 - API Service Classification SJ or higher.
- CCMC Specification G4 or higher.



MIF

John Deere Dealers: You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX,ENOIL2 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

Engine Break-In Oil

IMPORTANT: Avoid damage! ONLY use a quality break-in oil in rebuilt or remanufactured engines for the first 5 hours (maximum) of operation. DO NOT use oils with heavier viscosity weights than SAE 5W-30 or oils meeting specifications API SG or SH, these oils will not allow rebuilt or remanufactured engines to break-in properly.

The following John Deere oil is PREFERRED:

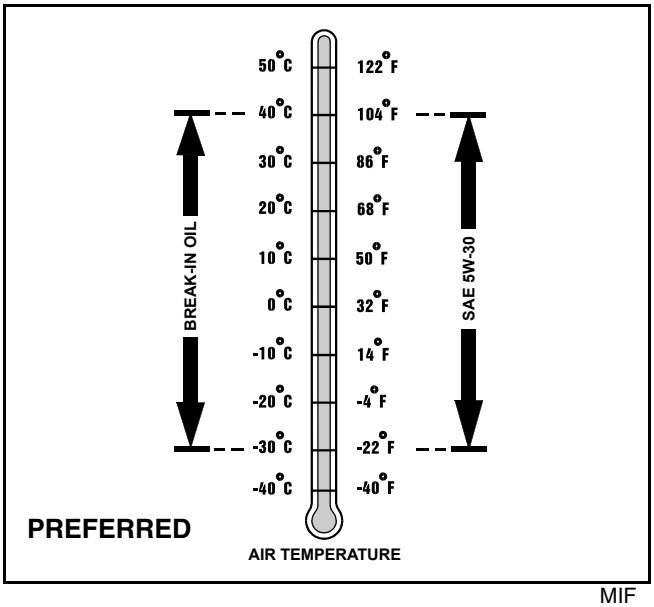
- **BREAK-IN ENGINE OIL**.

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.

The following John Deere oil is **also recommended as a break-in engine oil**:

- **TORQ-GARD SUPREME® - SAE 5W-30.**



MIF

If the above recommended John Deere oils are not available, use a break-in engine oil meeting the following specification during the first 5 hours (maximum) of operation:

- SAE 5W-30 - API Service Classification SJ or higher.
- SAE 5W-30 - CCMC Specification G4 or higher.

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

John Deere Dealers: You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX,ENOIL4 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

Anti-corrosion Grease

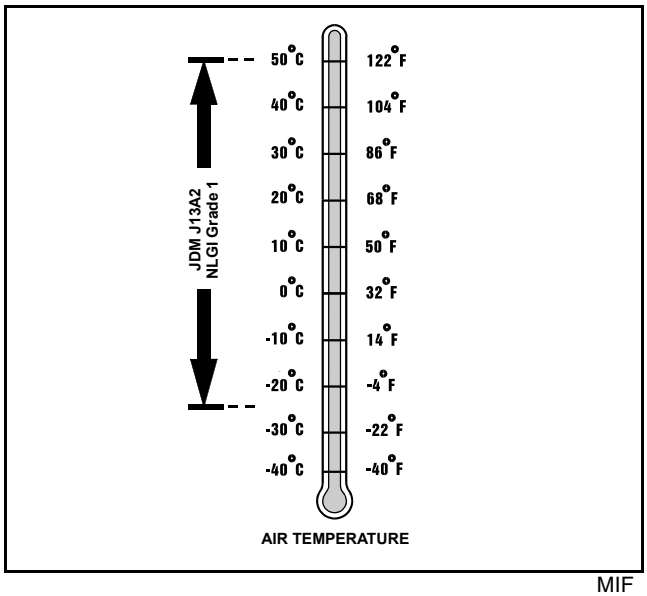
This anti-corrosion grease is formulated to provide the best protection against absorbing moisture, which is one of the major causes of corrosion. This grease is also superior in its resistance to separation and migration.

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 specifications:

- John Deere Standard JDM J13A2, NLGI Grade 1.



MIF

John Deere Dealers: You may want to cross-reference the following publications to recommend the proper grease for your customers:

- Module DX,GREA1 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

Alternative Lubricants

Conditions in certain geographical areas outside the United States and Canada may require different lubricant recommendations than the ones printed in this technical manual or the operator's manual. Consult with your John Deere Dealer, or Sales Branch, to obtain the alternative lubricant recommendations.

IMPORTANT: Avoid damage! 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.

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.

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.

ENGINE - KOHLER TABLE OF CONTENTS

Table of Contents

ENGINE - KOHLER SPECIFICATIONS

Specifications

General Specifications

Model	Kohler
Model Number 15 hp	CV15S
Model Number 16 hp	CV460S
Power:	
15 hp	11.2 kW
16 hp	11.9 kW
Displacement:	
15 hp	426 cm^3 (26.0 cu-in.)
16 hp	460 cm^3 (28.1 cu-in.)
Cylinders	1
Stroke/Cycle	4
Valves	Overhead Valves
Bore:	
15 hp	90 mm (3.55 in.)
16 hp	87 mm (3.43 in.)
Stroke:	
15 hp	67 mm (2.64 in.)
16 hp	77 mm (3.03 in.)
Compression Ratio	2:1 Cranking - 8.5:1 Running
Compression Release	Automatic/Centrifugal
Crankshaft Type	Vertical (Counterbalanced)
Lubrication	Pressurized Gerotor Pump
Oil Pressure	0 - 413 kPa (0 - 60 psi)
Oil Filter	Single Element, Full Flow, Spin-On Filter
Crankcase Capacity:	
With Filter	1.9 L (2.0 qt)
Without Filter	1.4 L (1.5 qt)
Cooling System	Air Cooled
Air Cleaner	Paper With Outer Foam Element
Muffler	Horizontal, Discharge Below Frame
Slow Idle	1700 ± 100 rpm
Fast Idle (Domestic)	3350 ± 100 rpm
Maximum Angle of Operation (With Full Crankcase):	
Continuous (All Directions)	20°
Intermittent (All Directions)	35°
Fuel Filter	Replaceable (In-Line Type)
Fuel Shut-Off Solenoid (Optional):	Replaceable (Below Carburetor Float Bowl)
Weight	39.5 kg (87 lbs)

Tests and Adjustments Specifications

Engine

Spark Plug Gap . . . . . 1.0 mm (0.040 in.)
Valve Adjustment . . . . . None (Hydraulic Lifters)
Oil Pressure (Minimum at 1250 rpm): . . . . . 124 kPa (18 psi)
Crankcase Vacuum (Minimum At Operating Temp.): . . . . . 10.2 cm (4 in.) Water Movement
Automatic Compression Release Minimum Lift (Engine Cold) . . . . . 0.25 mm (0.01 in.)

Fuel/Air System:

Slow Idle Speed . . . . . 1700 ± 100 rpm
Fast Idle Speed . . . . . 3350 ± 100 rpm

Repair Specifications

Cylinder Head:

Cylinder Head Flatness (Maximum Warpage) . . . . . 0.076 mm (0.003 in.)

Valves and Valve Lifters:

Hydraulic Lifter Clearance . . . . . 0.0124 - 0.0501 mm (0.0005 - 0.0020 in.)
Intake Valve-to-Guide Clearance . . . . . 0.038 - 0.076 mm (0.0015 - 0.0030 in.)
Intake Valve Stem OD . . . . . 6.982 - 7.000 mm (0.2749 - 0.2756 in.)
Exhaust Valve Stem OD . . . . . 6.970 - 6.988 mm (0.2744 - 0.2751 in.)
Exhaust Valve-to-Guide Clearance . . . . . 0.050 - 0.088 mm (0.0020 - 0.0035 in.)
Intake Valve Guide ID:
New . . . . . 7.038 - 7.058 mm (0.2771 - 0.2779 in.)
Maximum . . . . . 7.134 mm (0.2809 in.)
Exhaust Valve Guide ID:
New . . . . . 7.038 - 7.058 mm (0.2771 - 0.2779 in.)
Maximum . . . . . 7.159 mm (0.2819 in.)
Valve Guide Reamer:
Standard . . . . . 7.048 mm (0.2775 in.)
Oversize (0.25 mm) . . . . . 7.298 mm (0.2873 in.)
Intake Valve Lift (Minimum - Engine Cold) . . . . . 8.96 mm (0.353 in.)
Intake Valve Lift (Minimum - Engine Cold) . . . . . 8.96 mm (0.353 in.)
Exhaust Valve Lift (Minimum - Engine Cold) . . . . . 9.14 mm (0.360 in.)
Valve Face Angle . . . . . 45°
Valve Seat Angle . . . . . 44.5°

Rocker Arms:

Rocker Arm ID:
New . . . . . 15.837 - 16.127 mm (0.63 - 0.64 in.)
Wear Limit . . . . . 15.727 mm (0.619 in.)

Rocker Shaft:

Rocker Shaft OD:
New . . . . . 15.837 - 16.127 mm (0.63 - 0.64 in.)
Wear Limit . . . . . 15.727 mm (0.619 in.)

Crankshaft:

End Play . . . . . 0.058 - 0.493 mm (0.0023 - 0.0194 in.)

Crankshaft Bore ID (Crankcase Half):
New . . . . . 44.965 - 45.003 mm (1.7703 - 1.7718 in.)
Maximum . . . . . 45.016 mm (1.7723 in.)
Clearance (New) . . . . . 0.03 - 0.09 mm (0.0012 - 0.0035 in.)

Crankshaft Bore (Oil Pan Half):
New . . . . . 44.965 - 45.003 mm (1.7703 - 1.7718 in.)
Maximum . . . . . 45.016 mm (1.7723 in.)
Clearance (New) . . . . . 0.03 - 0.09 mm (0.0012 - 0.0035 in.)

Main Bearing Journal OD (Flywheel End):
New . . . . . 44.913 - 44.935 mm (1.7682 - 1.7691 in.)
Minimum . . . . . 44.84 mm (1.765 in.)
Maximum Taper. . . . . 0.022 mm (0.0009 in.)
Maximum Out-of-Round. . . . . 0.025 mm (0.0010 in.)

Main Bearing Journal OD (Oil Pan End):
New . . . . . 41.915 - 41.935 mm (1.6502 - 1.6510 in.)
Minimum . . . . . 41.86 mm (1.648 in.)
Maximum Taper. . . . . 0.020 mm (0.0008 in.)
Maximum Out-of-Round. . . . . 0.025 mm (0.0010 in.)

Connecting Rod Journal OD:
New . . . . . 38.958 - 38.970 mm (1.5338 - 1.5343 in.)
Minimum . . . . . 38.94 mm (1.5328 in.)
Maximum Taper. . . . . 0.012 mm (0.0005 in.)
Maximum Out-of-Round. . . . . 0.025 mm (0.0010 in.)

Crankshaft Total Indicated Runout (TIR):
PTO End (In Engine). . . . . 0.15 mm (0.0059 in.)
Entire Crankshaft (In Bench V-Blocks). . . . . 0.10 mm (0.0039 in.)

Camshaft:

End Play (with shims) . . . . . 0.076 - 0.127 mm (0.003 - 0.005 in.)
Clearance . . . . . 0.025 - 0.063 mm (0.0010 - 0.0025 in.)

Bore ID:
New . . . . . 20.000 - 20.025 mm (0.7874 - 0.7884 in.)
Maximum . . . . . 20.038 mm (0.7889 in.)

Bearing OD:
New . . . . . 19.962 - 19.975 mm (0.7859 - 0.7864 in.)
Minimum . . . . . 19.959 mm (0.7858 in.)

Balance Shaft:

End Play . . . . . 0.0575 - 0.3625 mm (0.0023 - 0.0143 in.)
Clearance . . . . . 0.025 - 0.063 mm (0.0010 - 0.0025 in.)

Bore ID:
New . . . . . 20.000 - 20.025 mm (0.7874 - 0.7884 in.)
Maximum . . . . . 20.038 mm (0.7889 in.)

Balance Shaft Bearing OD:
New . . . . . **19.962 - 19.975 mm (0.7859 - 7864 in.)**
Maximum . . . . . **19.959 mm (0.7858 in.)**

Cylinder Bore, Piston and Rings:

Cylinder Bore ID (15 hp):
New . . . . . **90.000 - 90.025 mm (3.5433 - 3.5443 in.)**
Maximum . . . . . **90.063 mm (3.5458 in.)**
Cylinder Bore ID (16 hp):
New . . . . . **87.000 - 87.025 mm (3.4252 - 3.4262 in.)**
Maximum . . . . . **87.063 mm (3.4277 in.)**
Maximum Out-of-Round . . . . . **0.12 mm (0.0047 in.)**
Maximum Taper . . . . . **0.05 mm (0.0020 in.)**
Piston-To-Pin Clearance:
New . . . . . **0.006 - 0.017 mm (0.0002 - 0.0007 in.)**
Piston Pin Bore ID:
New . . . . . **19.006 - 19.012 mm (0.7483 - 0.7485 in.)**
Maximum . . . . . **19.025 mm (0.7490 in.)**
Piston Pin OD:
New . . . . . **18.995 - 19.000 mm (0.7478 - 0.7480 in.)**
Minimum . . . . . **18.994 mm (0.74779 in.)**
Top Compression Ring-To-Groove Side Clearance: . . . . . **0.040 - 0.105 mm (0.0016 - 0.0041 in.)**
Middle Compression Ring-To-Groove Side Clearance: . . . . . **0.040 - 0.072 mm (0.0016 - 0.0028 in.)**
Oil Control Ring-To-Groove Side Clearance: . . . . . **0.551 - 0.675 mm (0.0217 - 0.0266 in.)**
Top and Center Compression Ring End Gap:
New Bore . . . . . **0.3 - 0.5 mm (0.012 - 0.020 in.)**
Used Bore (Maximum) . . . . . **0.77 mm (0.030 in.)**
Piston OD (15 hp):
New: . . . . . **89.941 - 89.959 mm (3.5410 - 3.5417 in.)**
Minimum: . . . . . **89.814 mm (3.5360 in.)**
Piston OD (16 hp):
New: . . . . . **86.941 - 86.959 mm (3.4229 - 3.4236 in.)**
Minimum: . . . . . **86.814 mm (3.4179 in.)**
Piston-To-Cylinder Bore Clearance:
New: . . . . . **0.055 - 0.063 mm (0.0020 - 0.0030 in.)**

Connecting Rod:

Crankshaft (Big End) Clearance:
New . . . . . **0.030 - 0.055 mm (0.0012 - 0.0022 in.)**
Maximum . . . . . **0.07 mm (0.0025 in.)**
Side . . . . . **0.18 - 0.41 mm (0.007 - 0.016 in.)**
Piston Pin Clearance . . . . . **0.015 - 0.028 mm (0.0006 - 0.0011 in.)**
Piston Pin End ID:
New . . . . . **19.015 - 19.023 mm (0.7486 - 0.7489 in.)**
Maximum . . . . . **19.036 mm (0.7495 in.)**

Governor:

Crankcase Control Arm Bore ID:
New . . . . . 6.025 - 6.050 mm (0.2372 - 0.2382 in.)
Maximum . . . . . 6.063 mm (0.2387 in.)

Control Arm OD:
New . . . . . 5.975 - 6.000 mm (0.2352 - 0.2362 in.)
Minimum . . . . . 5.962 mm (0.2347 in.)

Crankcase Bore-To-Control Arm Clearance: . . . . . 0.025 - 0.075 mm (0.0010 - 0.0030 in.)

Gear Shaft OD:
New . . . . . 5.990 - 6.000 mm (0.2358 - 0.2362 in.)
Minimum . . . . . 5.977 mm (0.2353 in.)

Gear Shaft-To- Gear Bore Clearance:
New . . . . . 0.015 - 0.140 mm (0.0006 - 0.0055 in.)

Torque Specifications (Alphabetical)

NOTE: Use appropriate torque wrench which will read within the inch pound range given, or convert inch pounds to foot pounds as follows: Inch-pounds/12 = Foot-pounds

Air Cleaner Base Nut . . . . . 10 N•m (88 lb-in.)
Cylinder Head Cap Screw . . . . . 41 N•m (30 lb-ft)
Connecting Rod Cap Screws:
8 mm Straight Shank Bolt . . . . . 22 N•m (200 lb-in.)
Step Down Shank Bolt . . . . . 14 N•m (130 lb-in.)
6 mm Straight Shank Bolt . . . . . 11 N•m (100 lb-in.)
Engine Mounting Cap Screws . . . . . 32 N•m (24 lb-ft)
Fan Cap Screw . . . . . 10 N•m (88 lb-in.)
Flywheel Cap Screw . . . . . 68 N•m (50 lb-ft)
Fuel Pump/Cover Screw:
New Installation
(Thread Forming) . . . . . 9 N•m (80 lb-in.)
Replacement . . . . . 7 N•m (62 lb-in.)
Fuel Bowl Nut . . . . . 4 N•m (35 lb-in.)
Governor Control Panel Screw . . . . . 10 N•m (88 lb-in.)
Ignition Module Screw:
New Installation (Thread Forming) . . . . . 6 N•m (55 lb-in.)
Replacement . . . . . 4 N•m (35 lb-in.)
Muffler Nut . . . . . 24 N•m (216 lb-in.)
Oil Filter . . . . . 7 N•m (62 lb-in.)
Oil Filter Drain Plug . . . . . 8 N•m (72 lb-in.)
Oil Pan Cap Screw . . . . . 24 N•m (216 lb-in.)
Oil Pump Cover Screw:
New Installation (Thread Forming) . . . . . 6 N•m (55 lb-in.)
Replacement . . . . . 4 N•m (35 lb-in.)
Rocker Arm Pivot Cap Screw . . . . . 14 N•m (124 lb-in.)
Spark Plug . . . . . 40 N•m (30 lb-ft)

Stator Cap Screw . . . . . **4 N•m (35 lb-in.)**

Valve Cover Cap Screw:
New Installation
(Thread Forming) . . . . . **11 N•m (95 lb-in.)**

Replacement . . . . . **7 N•m (62 lb-in.)**

Special or Required Tools

Tool	Purpose
JDG705 Reaming Tool	Valve guide
6.4 mm (0.25 in.) Drill Bit	Throttle and choke adjustment
Dial Indicator	Automatic compression relief test, Valve inspection
JTO5719 Photo Tachometer	Slow idle adjustment
JT03502 Cylinder Leakdown Tester	Cylinder leakdown test
JTO5697 U-Tube Manometer Test Kit; or,	Crankcase vacuum check
JT03503 Crankcase Vacuum Test Kit	
JT07262 Oil Pressure Test Adapter w/ O-ring (required ONLY on engines without test ports)	Oil pressure test
JT05847 Connector	
JT03017 Hose Assembly	
JT03262 Coupler	
JT07034 Gauge, 0 - 700 kPa (0 - 100 psi)	
Lapping Tool	Valve lapping

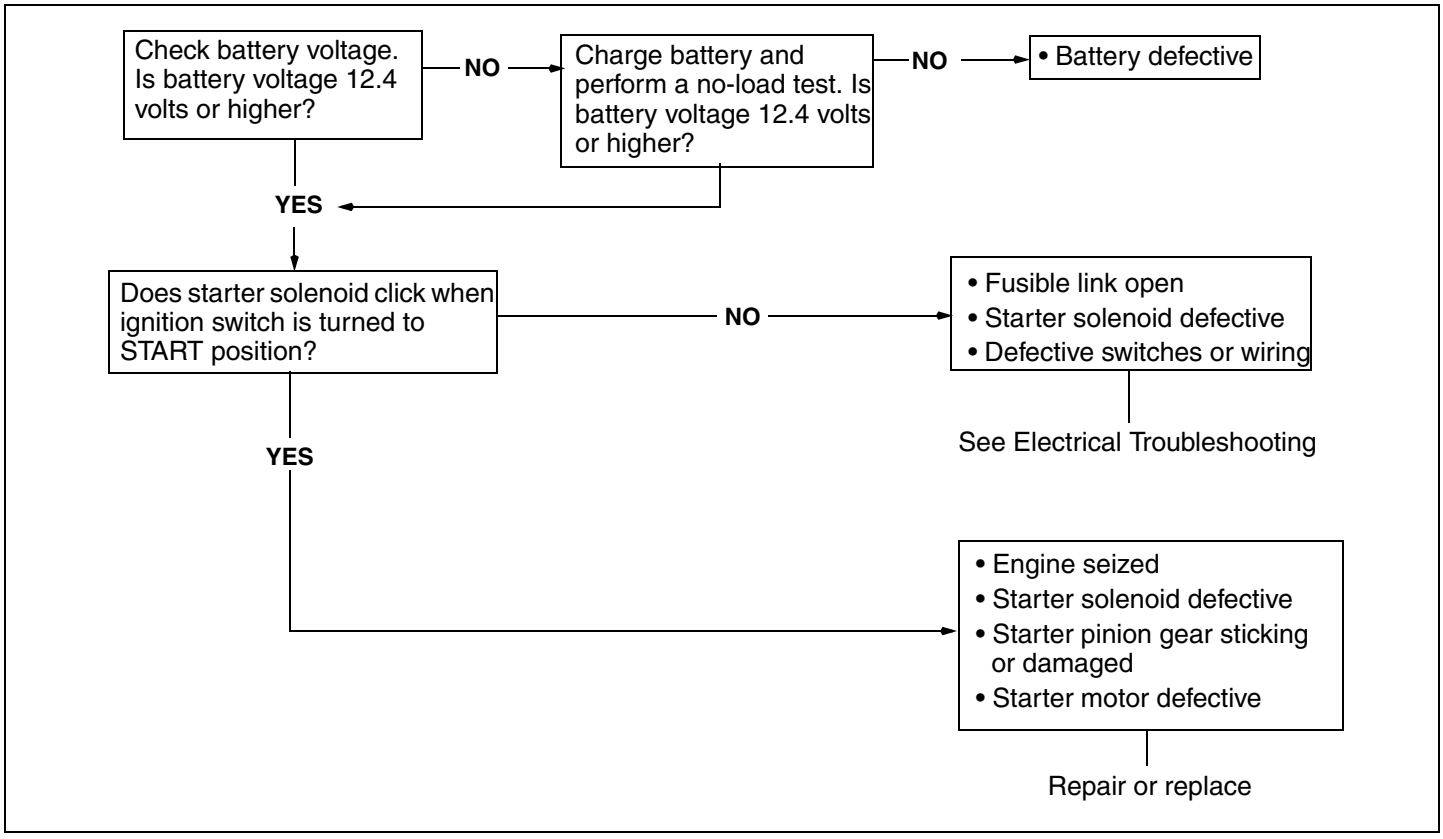
Troubleshooting

Engine Troubleshooting: Engine Will Not Crank

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

NOTE: To test specific electrical components, see Electrical Section and refer to either Diagnostics or Tests & Adjustments for further guidance.

Check battery voltage. Is battery voltage 12.4 volts or higher?	**Battery voltage.** • Less than battery voltage, charge battery and perform a no-load test.	Battery defective.
Does starter solenoid click when ignition switch is turned to START position?	**Starter solenoid clicks.** • Less than battery voltage, replace battery.	Fusible link open. Starter solenoid defective. Defective switch or wiring.
Does starter solenoid click when ignition switch is turned to START position?	**Engine starts. Test complete** • Engine seized. • Starter solenoid defective • Starter pinion gear sticking or damaged • Starter motor defective	Repair or replace.

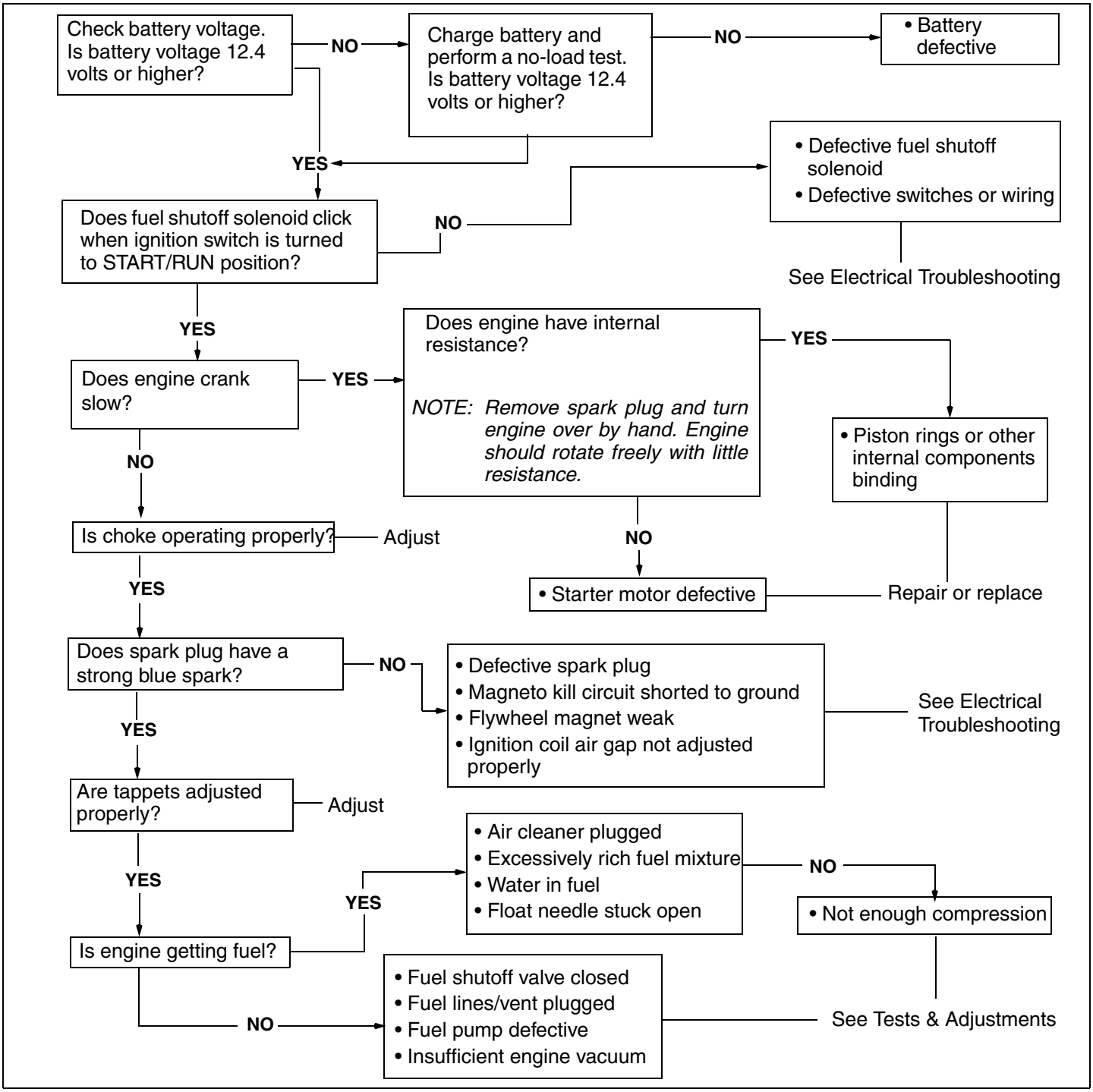


Engine Cranks But Will Not Start

CAUTION: Avoid Injury! DO NOT rotate engine with starter if the spark plugs are removed. Gasoline spray from the open cylinders may be ignited by ignition spark and cause an explosion or fire.

IMPORTANT: Avoid damage! Perform a visual inspection first to determine if battery cables are tight and not corroded and if the battery is of sufficient size to turn the engine over at minimum cranking speed of 350 rpm.

NOTE: To test specific electrical components, see Electrical Section and refer to either Diagnostics or Tests & Adjustments for further guidance.



Engine Runs Erratically/Loss Of Power

IMPORTANT: Avoid damage! Before proceeding, inspect the mower deck and belts for binding in the spindle assemblies or belts that are too tight/loose. A loose belt like a loose blade can cause a backlash effect that will counteract engine cranking effort. Excessive drive belt tension may cause premature bearing wear or result in bearing seizure. Grass clippings that build up near the cutting blades can cause excessive resistance and heat build-up that causes problems with the engine's ability to turn the blades at a constant speed. Low lubricant levels in the spindles will build-up heat causing excessive resistance for the engine to deal with.

NOTE: To test specific electrical components, see Electrical Section and refer to either Diagnostics or Tests & Adjustments for further guidance

- Defective spark plug

NOTE: A fouled spark plug may indicate that the carburetor is out of adjustment.

- Faulty ignition wire/ignition system
- Defective head gasket
- Intake manifold leak
- Piston rings
- Piston
- Cylinder bore
- Faulty diode in Magneto kill circuit
- Camshaft

→ See Tests & Adjustments

- Carburetion
- Crankcase vacuum
- Ignition Timing
- Governor operation
- Camshaft

→ See Tests & Adjustments

Tests and Adjustments

Throttle Cable Adjustment

Reason:

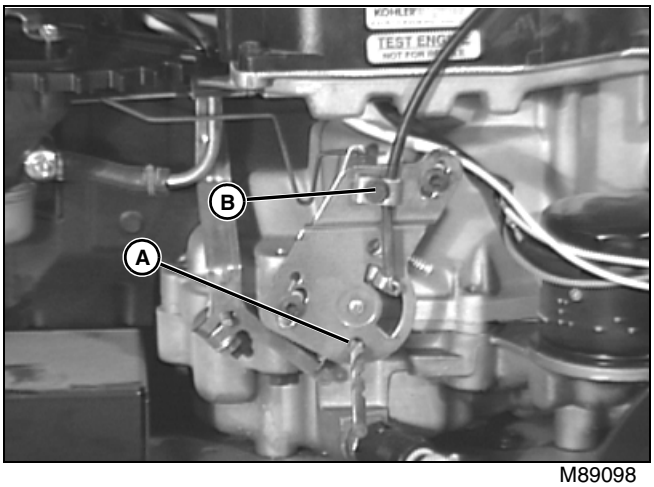
To make sure the throttle cable moves the throttle and choke control lever through its full range of movement.

Equipment:

- 6.4 mm (0.25 in.) Drill Bit

Procedure:

1. Move throttle lever to FAST idle position.



M89098

2. Align hole in throttle control lever with hole (A) in throttle control plate. Put a 6.4 mm (0.25 in.) drill bit through holes to keep the throttle control lever from moving. Be sure drill bit is perpendicular to the throttle control plate.

3. Loosen cap screw (B) and pull throttle cable housing tight. Tighten cap screw.

4. Remove drill bit.

5. Move throttle lever to the full choke position. Make sure throttle lever is held up against throttle plate. Choke should be fully closed.

6. Move throttle lever through full range to be sure linkage is not binding.

Choke Adjustment

Reason:

To make sure the choke plate is fully closed when the throttle lever is in the full choke position. Correct adjustment also makes sure choke is completely open in the fast idle position.

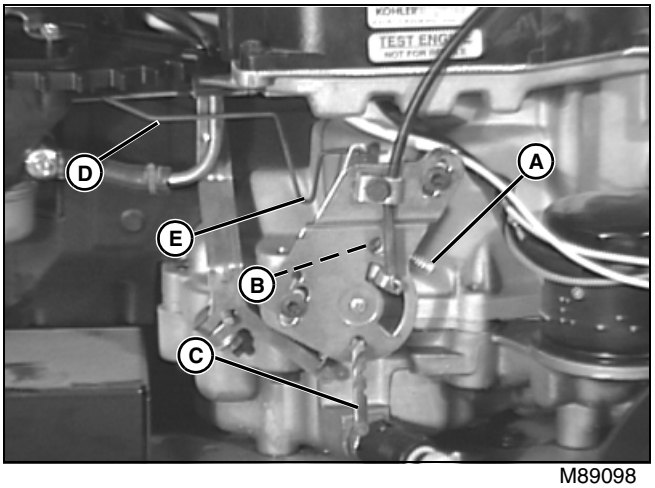
Equipment:

- 6.4 mm (0.25 in.) Drill Bit

Procedure:

NOTE: Adjust throttle cable before adjusting choke.

1. Move throttle lever to CHOKE position then back to FAST idle position.



M89098

2. Align hole in throttle control lever with hole in throttle control plate. Put a 6.4 mm (0.25 in.) drill bit (C) through holes to keep the throttle control lever from moving. Be sure drill bit is perpendicular to the throttle control plate.

3. Turn screw (A) counterclockwise until screw does not contact the choke control lever (B).

4. Turn screw clockwise until screw just touches the choke control lever.

5. Remove drill bit.

6. Move throttle lever to full choke position.

7. Try to move choke rod (D) forward (choke rod should not move). If the choke rod moves forward, the choke plate is not fully closed. Carefully bend the choke rod at Vee bend (E) until the choke plate is fully closed.

8. Move throttle lever to be sure choke linkage is not binding.

Governor Adjustment

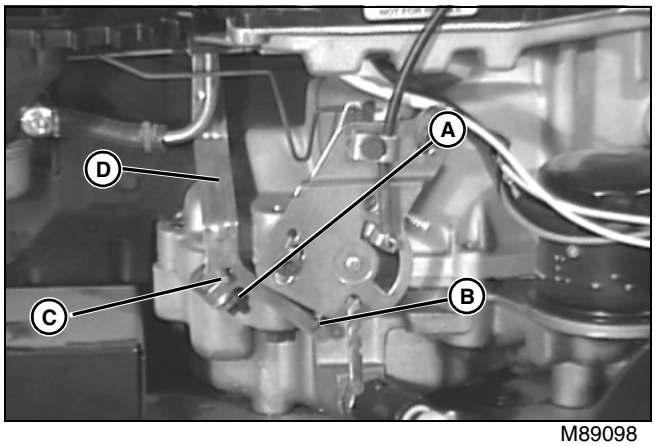
Reason:

To make sure the governor shaft contacts the flyweight plunger when the engine is stopped.

NOTE: Adjust throttle cable before adjusting governor linkage.

Procedure:

1. Move throttle lever to FAST idle position.



M89098

2. Loosen nut (A).

3. Hold top of governor arm (D) toward carburetor. Turn governor shaft (C) counter-clockwise until it stops. Hold governor shaft and tighten nut.

4. Move throttle lever through full range to be sure linkage is not binding.

5. Governor spring (B) should be installed in the hole closest to governor shaft. If governor is not responding properly, replace spring and readjust fast idle speed. If spring did not correct the problem, repair governor.

Fast Idle Speed Adjustment

Reason:

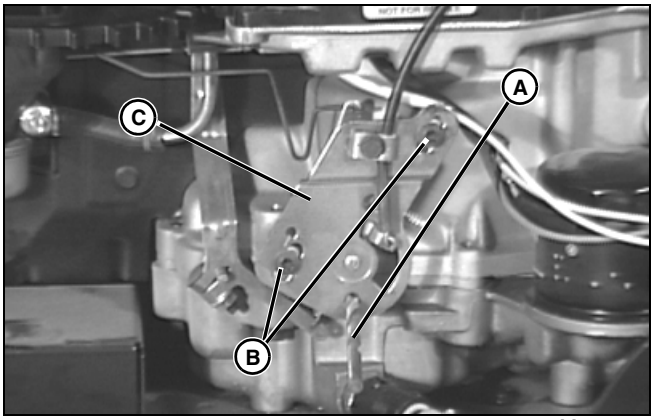
To set engine fast idle rpm.

Equipment:

- JTO5719 Photo Tachometer

Procedure:

1. Move transaxle shift lever to NEUTRAL position. Engage park brake.



M89098

2. Put reflective tape on blower housing screen.

3. Start and run engine at MEDIUM idle for five minutes.

CAUTION: Avoid Injury! Engine will be HOT. Be careful not to burn skin.

4. Move throttle lever to FAST idle position.

5. Align holes of throttle lever and throttle control plate with **6.4 mm (0.25 in.)** drill bit (A). This keeps the throttle control lever from moving during adjustment. Be sure drill bit is perpendicular to the throttle control plate.

6. Use a photo tachometer to check engine rpm at the blower housing screen.

Specifications:

Fast Idle Speed Setting . . . . . 3400 ± 25 rpm

Control Panel Screw Torque . . . . . 10 N•m (88 lb-in.)

Results:

- If fast idle speed does not meet the specifications, loosen cap screws (B)
- Move throttle control plate (C) upward to increase rpm or downward to decrease rpm
- Hold the throttle control plate and tighten cap screws

Slow Idle Speed Adjustment

Reason:

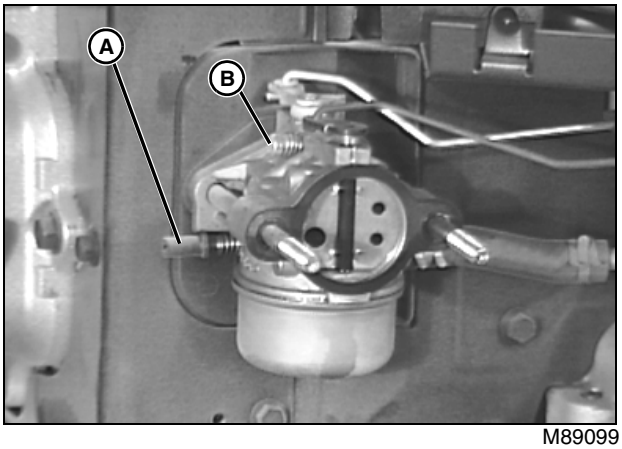
To set engine slow idle mixture and rpm.

Equipment:

- JTO5719 Photo Tachometer

Procedure:

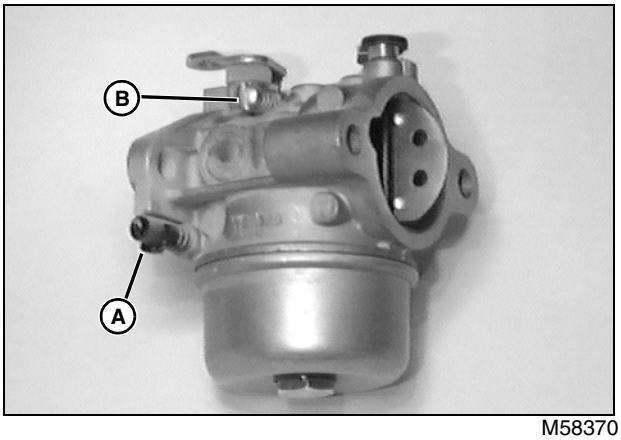
1. Move transaxle to NEUTRAL. Engage park brake.



M89099

2. Put reflective tape on blower housing screen.

IMPORTANT: Avoid damage! Forcing the idle mixture screw tight will damage the needle and seat. Air cleaner removed for photo, DO NOT remove for tests.



M58370

3. No preliminary adjustment is required for black limiter slow idle mixture screw (A), this is pre-set by manufacturer.

4. Start and run engine at MEDIUM idle for five minutes.

5. Move throttle lever to SLOW idle position.

6. Use a photo tachometer to check engine rpm at the blower housing screen.

7. Turn SLOW idle stop screw (B) in either direction until specified SLOW idle speed is reached.

8. Turn slow idle mixture screw (A) in either direction until a maximum slow idle speed is reached. It may be necessary to adjust SLOW idle stop screw (B) again.

Specification:

SLOW idle stop screw setting. . . . . .1700 ± 25 rpm

NOTE: For high altitude operation above 4000 feet, use high altitude carburetor kit, to prevent over rich fuel mixture and black exhaust smoke.

Cylinder Leakdown Test

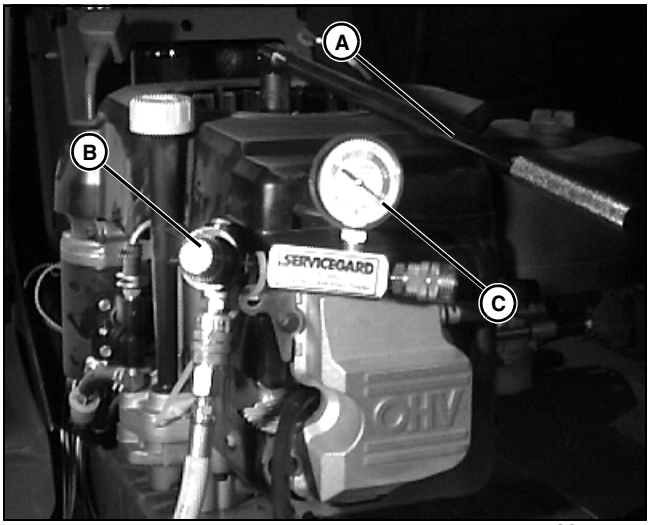
Reason:

To check pressure capacity of piston rings and cylinder bore for efficient engine operation.

Equipment:

- JT03502 Cylinder Leakdown Tester

Connections:



M89073

Procedure:

1. Warm engine to operating temperature.
2. Move transaxle shift lever to NEUTRAL. Engage park brake.
3. Pry off the flywheel screen and use a breaker bar (A) on the flywheel nut to hold the flywheel in position when performing the test.
4. Remove spark plug and install hose fitting.
5. Bring the piston to Top Dead Center (TDC) with both valves closed.
6. Attach an air source regulated at **85 - 95 psi** to the tester.
7. Rotate the calibration knob (B) to bring the needle into the set range (C).
8. Connect the leak tester to the hose fitting and record reading.

Results:

- Leakage should not exceed 25%, if so, listening at the carburetor (intake valve), oil filler (piston rings) or muffler (exhaust valve) for escaping air will provide clues as to where to investigate for problems.

Automatic Compression Release (ACR) Check

Reason:

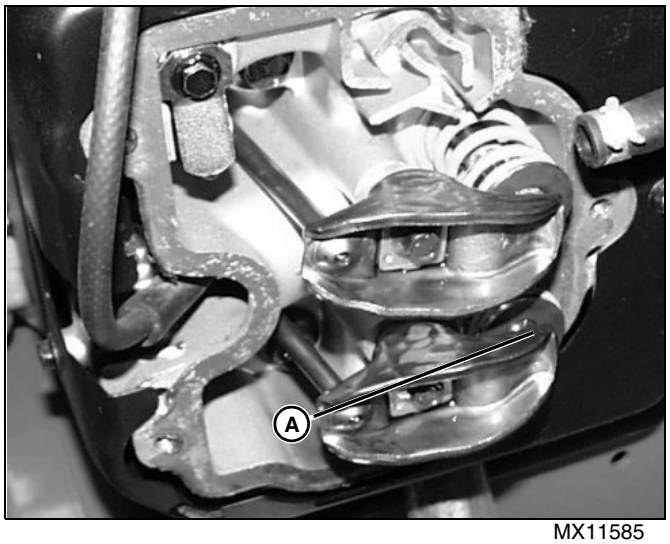
To determine if the automatic compression release is opening the exhaust valve.

Equipment:

- Dial Indicator

Procedure:

1. Remove valve cover and spark plug. Rotate crankshaft slowly to observe ACR operation.



MX11585

2. The exhaust valve (A) must open (depress) briefly just after the intake valve closes.
3. Use a dial indicator to measure exhaust valve ACR movement.
4. Install rocker cover, see “Remove and Install Cylinder Head” in the Repair group.

Specification:

Exhaust valve ACR movement
Minimum . . . . . 0.25 mm (0.01 in.)

Results:

- If the exhaust valve does not open or depress properly, the automatic compression release tab is faulty and camshaft assembly must be replaced

Crankcase Vacuum Test

Reason:

To measure the amount of crankcase vacuum, to ensure the crankcase is not pressurized. A pressurized crankcase will force oil to leak past the seals.

Equipment:

- JTO5697 U-Tube Manometer Test Kit; or,
- JT03503 Crankcase Vacuum Test Kit

Procedure 1:

IMPORTANT: Avoid damage! Test must be run with the engine at normal operating temperature, if not, test will be inaccurate. DO NOT use more than 3 feet of manometer tubing. If a longer hose is used the readings will be inaccurate.

1. Park machine on level surface.

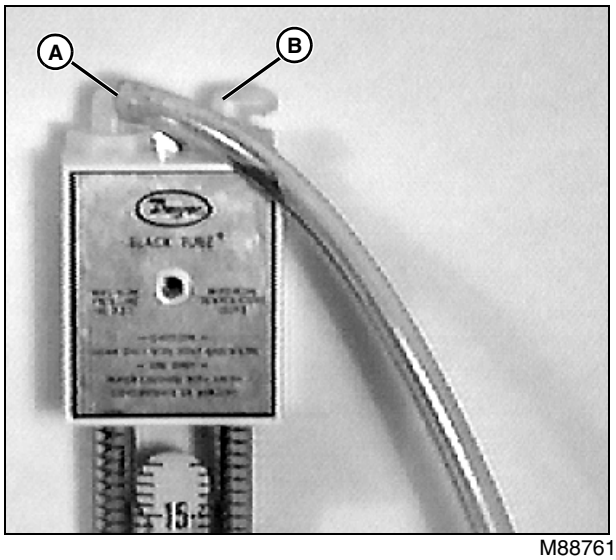
2. Raise engine hood and remove dipstick. Check dipstick/oil fill cap and O-ring for cracks or damage, replace as necessary.

3. Install appropriate size rubber plug in dipstick tube.

4. Insert barbed fitting in rubber plug so that clear line to fitting (A) can be connected at a later step.

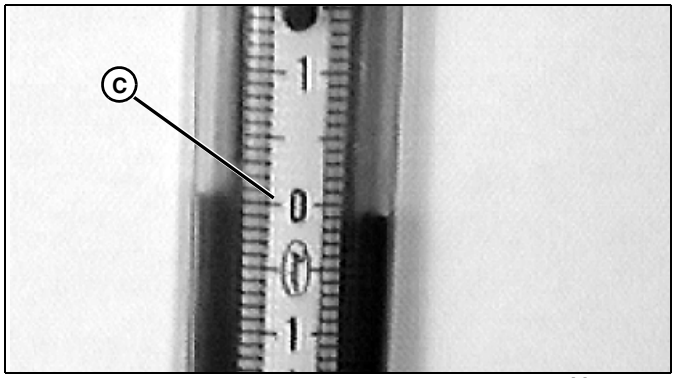
IMPORTANT: Avoid damage! DO NOT make connection between U-Tube Manometer clear line and engine crankcase BEFORE engine is running or fluid in manometer could be drawn into crankcase.

5. Attach manometer magnets to a solid metal surface.



M88761

6. Open top valves (A) and (B) one turn.

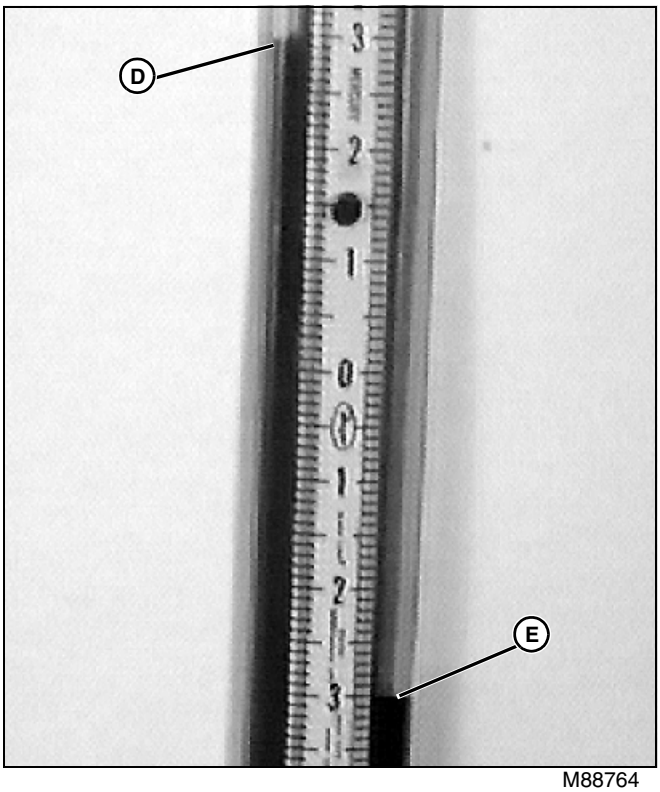


M88762

7. Zero out the manometer by sliding the ruled scale up or down so “0” (C) is located where water level on both sides is even.

8. Hold finger over rubber plug hole to keep oil from spraying out. Start engine, move the throttle lever to fast idle **(3400 rpm)** and allow engine to reach operating temperature.

9. Quickly attach clear line from manometer to rubber plug in dipstick opening.



M88764

Example: 3 + 3 = 6 in. of vacuum

10.Record vacuum reading. Gauge should show a minimum vacuum of **10.2 cm (4 in.)** of water movement. The reading is obtained by adding (D) and (E) water movement from “0” position.

IMPORTANT: Avoid damage! Repeat test at least three times for accuracy. To repeat test, remove the manometer tube from top of manometer at "A". DO NOT remove manometer tube from engine. Perform step #7 then reattach manometer tube to side "A". Continue with step #10.

11.Remove line from manometer before stopping engine. Then remove dipstick hose connection and install dipstick.

Procedure 2:

1. Park machine on level surface.

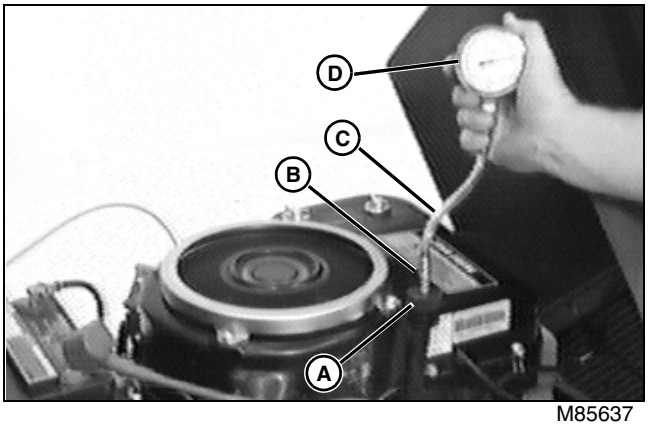
2. Raise engine hood and remove dipstick. Check dipstick/oil fill cap and O-ring for cracks or damage, replace as necessary.

3. Install appropriate size rubber plug (A) in dipstick tube.

4. Insert barbed fitting (B) in rubber plug so that clear line (C) to fitting can be connected at a later step.

IMPORTANT: Avoid damage! DO NOT make connection between test gauge and rubber plug BEFORE engine is running at FAST idle or gauge damage may result.

After test reading is made, DO disconnect test gauge WHILE engine is running at FAST idle to prevent damage to gauge.



M85637

5. Hold finger over rubber plug hole to keep oil from spraying out. Start engine, move the throttle lever to fast idle **(3400 rpm)** and allow engine to reach operating temperature.

6. Connect gauge (D), clear line, and barbed fitting to rubber plug.

7. Record crankcase vacuum reading. Gauge should show a minimum vacuum of **10.2 cm (4 in.)** of water movement.

8. Disconnect barbed fitting, clear line, and gauge from rubber plug while engine is running at FAST idle. Hold finger over rubber plug hole to keep oil from spraying out.

9. Move throttle to SLOW idle and turn engine OFF.

10.Remove rubber plug and install dipstick.

Specification:

Minimum crankcase
Vacuum at 3400 rpm . . . . . 10.2 cm (4 in. water)

Results:

If crankcase vacuum does not meet specification, check the following:

NOTE: A new engine may have low vacuum readings due to the fact that the rings are not seated.

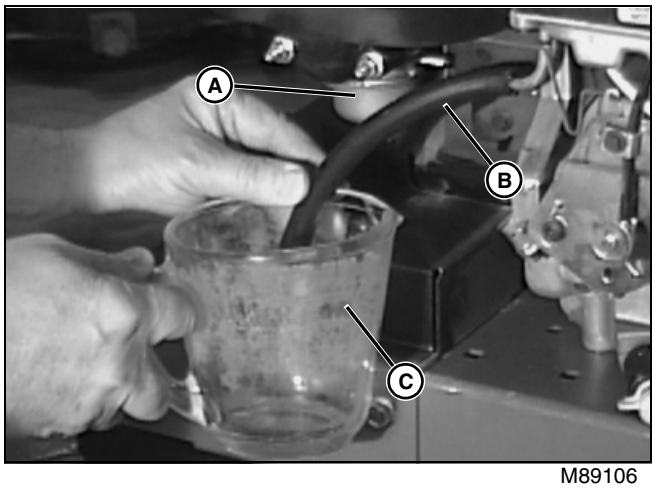
- Breather reed valve clearance and condition
- Seals and gaskets for leakage
- Rocker arm cover O-ring for leakage
- Rings, piston, and cylinder bore for wear or damage

Fuel Flow Test

Equipment:

- Proper Fuel Container

Procedure:



M89106

1. Clamp fuel line (B) or turn off fuel shut-off valve, if equipped, to prevent fuel flow.

IMPORTANT: Avoid damage! Ensure that the fuel container is clean if fuel is to be returned to the tank after test.

2. Disconnect fuel line from carburetor (A) and place in container (C).

3. Release clamp on fuel line (B) or turn on fuel shut-off valve, if equipped.

4. Crank engine, fuel should flow freely into container (C).

5. Clamp line or close fuel shut-off valve to install fuel line on carburetor (A).

6. Pour captured fuel into tank.

Results:

If fuel flow is slow, check the following:

- Replace fuel filter
- Check fuel lines, fuel pump, shut-off valve (if equipped), fuel tank outlet, and fuel tank cap for restrictions

Oil Pressure Test

Reason:

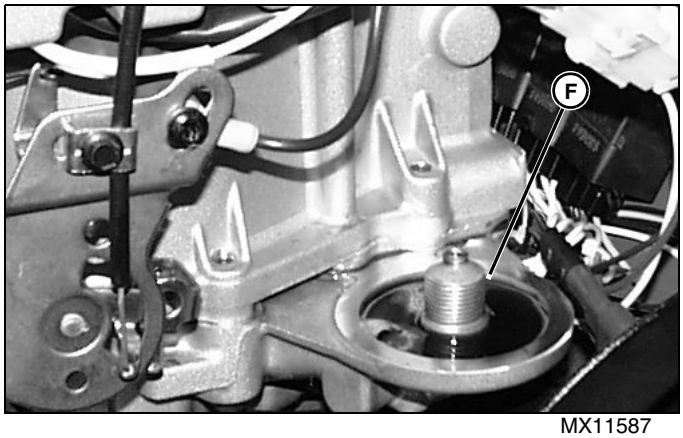
To verify that the engine has enough oil pressure to lubricate the internal engine components.

Equipment:

- JT07262 Oil Pressure Test Adapter w/ O-ring (required ONLY on engines without test ports)
- JT05847 Connector
- JT03017 Hose Assembly
- JT03262 Coupler
- JT07034 Gauge, 0 - 700 kPa (0 - 100 psi)

NOTE: The connector, hose assembly, coupler, and gauge are found in other SERVICEGARD™ test kits. The connector pipe thread (NPT) also matches the oil pressure switch port on early Kohler engines.

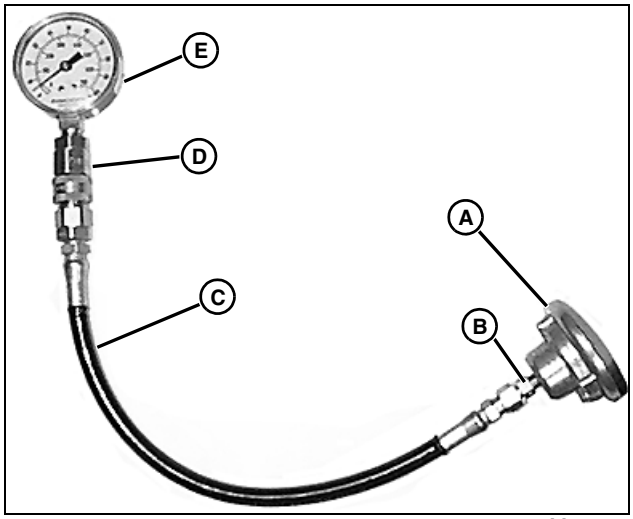
Procedure:



MX11587

Test Procedure At Oil Filter Base:

1. Perform test procedure with engine level.
2. Stop engine.
3. Disconnect spark plug wire and allow engine to cool.
4. Drain engine oil from oil filter.
5. Remove oil filter and wipe filter base clean.
6. Install pre-assembled adapter (A), connector (B), hose assembly (C), coupler (D), and gauge (E) on to oil filter base (F). ONLY hand-tighten adapter to oil filter base.
7. Check crankcase oil level and adjust to full mark.



M91215

A - JTO7262 Oil Pressure Adapter
B - JTO5487 Connector
C - JTO3017 Hose Assembly
D - JTO3262 Coupler
E - JTO7034 Gauge

8. Monitor oil pressure during cranking, if oil pressure is below **28 kPa (4 psi)** - STOP engine immediately and correct cause before continuing.
9. Connect spark plug wire.
10. Warm-up engine by running at MEDIUM idle for five minutes.

CAUTION: Avoid Injury! Engine components are HOT. DO NOT touch with bare skin. Wear protective eye glasses and clothing.

11. Record oil pressure readings at SLOW and FAST idle.
12. Stop engine and allow to cool.
13. Remove adapter, connector, hose assembly, coupler, and gauge.
14. Install new oil filter.
15. Run engine for **30 seconds** and stop engine.
16. Check crankcase oil level and adjust to full mark.

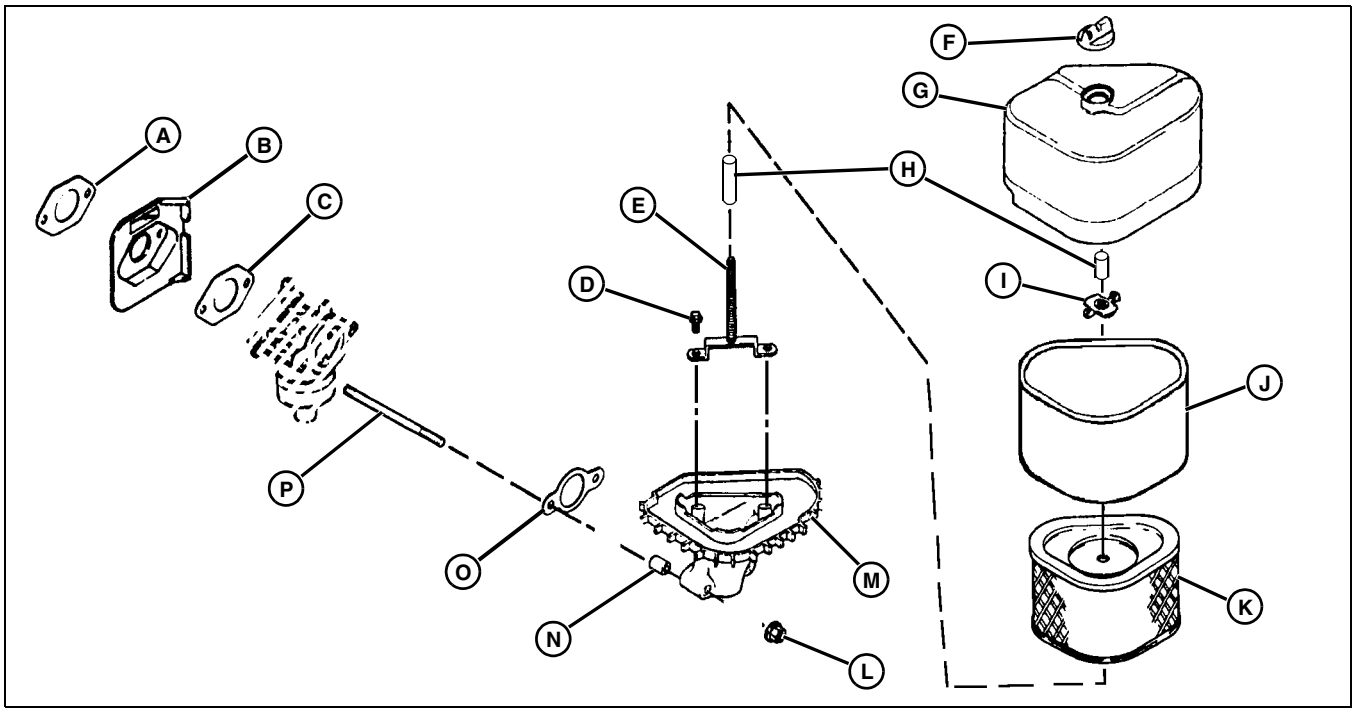
Results:

- If oil pressure readings are not within **69 kPa (10.0 psi) - 517 kPa (75.0 psi)** at FAST idle, inspect and/or replace the following:

- Oil pump assembly. See “Oil Pump Disassembly and Inspection.”
- Oil suction screen.
- Oil passages
- Crankshaft bearings
- Oil Seals

Fuel and Air Repair

Air Intake System Components



MX9541

A. Gasket

B. Shield

C. Gasket

D. Stud Retaining Screw (Use Thread Lock and Sealer)

E. Stud

F. Knob

G. Cover

H. Rubber Seal

I. Wing Nut

J. Foam Element

K. Paper Element

L. Nut (Tighten to 10 N•m (88 lb-in.)

M. Air Cleaner Housing

N. Sleeve)

O. Gasket

P. Stud