JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

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Lightweight Fairway Mower
3225C, 3235C and 3245C

TM2105 DEC05

TECHNICAL MANUAL

JOHN DEERE

North American Version
Litho in U.S.A.

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.

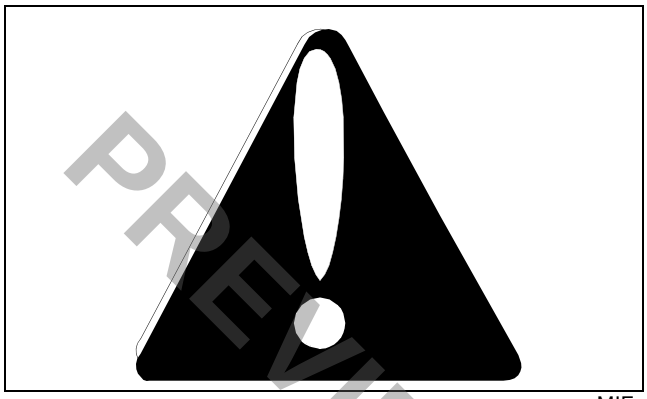
Safety
Specifications and Information
Engine
Electrical
Power Train
Hydraulics
Steering
Brakes
Attachments

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Recognize Safety Information



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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.

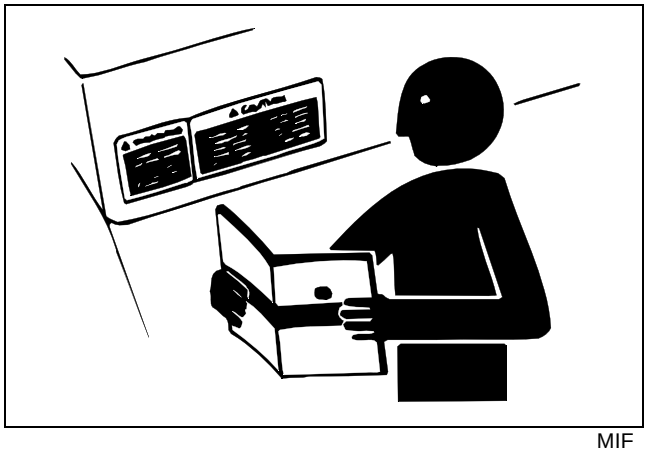
Follow recommended precautions and safe servicing practices.

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

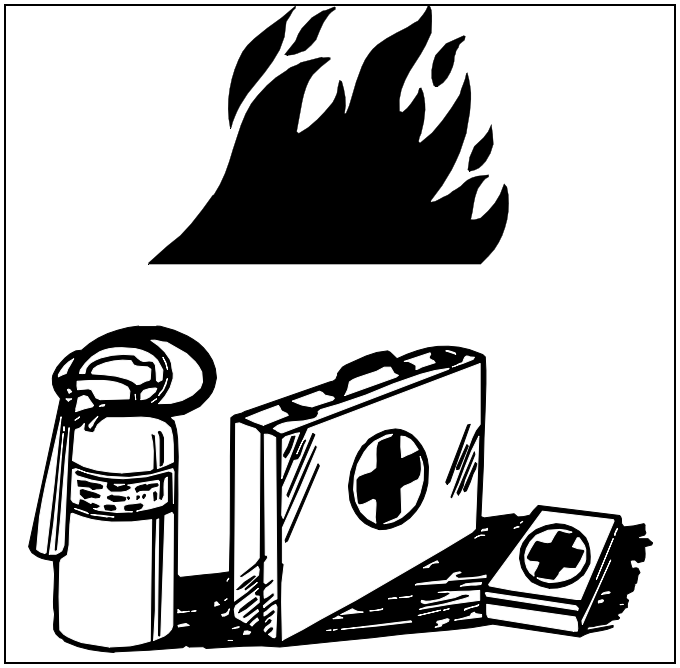


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Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

Handle Fluids Safely - Avoid Fires

Be Prepared For Emergencies



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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.

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Specifications

General Specifications

Engine Specifications

Make	Yanmar
Model	3TNV84(T)
Type	4-cycle diesel
Output Power 3225C (3TNV84)	23.9 kW (32 hp)
Output Power 3235C and 3245C (3TNV84T)	30.2 kW (40.5 hp)
Cylinders	3
Bore	84 mm (3.31 in.)
Stroke	90 mm (3.54 in.)
Displacement	1.496 L (91.3 cu. in.)
Firing Order	1-3-2
Direction of Rotation	Counterclockwise (viewed from flywheel)
Combustion System	Direct injection type
Compression Ratio	18:1
Cooling	Liquid
Governor	Centrifugal
RPM at Slow Idle	1400 ± 50
RPM at Fast Idle (No-Load)	3000 ± 50
Rated RPM	2800
Torque Rise	20 percent minimum

Electrical Specifications

Battery Voltage	12
Starter Type	Solenoid shift
Alternator	Nippondenso

Power Train

Triple Pump (Front Gear Set) Make	Danfoss

Hydrostatic Transmission (3225C)

Make	Eaton
Model	70145
Type	Rotating piston, variable flow

Hydrostatic Transmission (3235C and 3245C)

Make	Eaton
Model	72400
Type	Servo-controlled piston pump

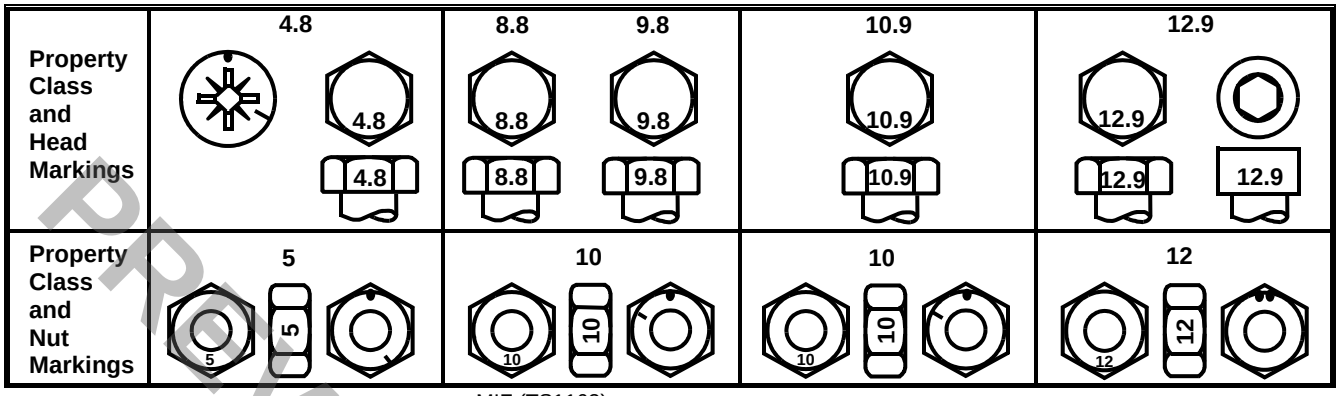
Front Wheel Motors

Make	Eaton
Model - 3225C	167-0035-001
Model - 3235C and 3245C	167-0036-001

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General Information

Metric Fastener Torque Values



MIF (TS1163)

	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[1]		Dry[1]		Lubricated[1]		Dry[1]		Lubricated[1]		Dry[1]		Lubricated[1]		Dry[1]	
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

1. "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.

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.

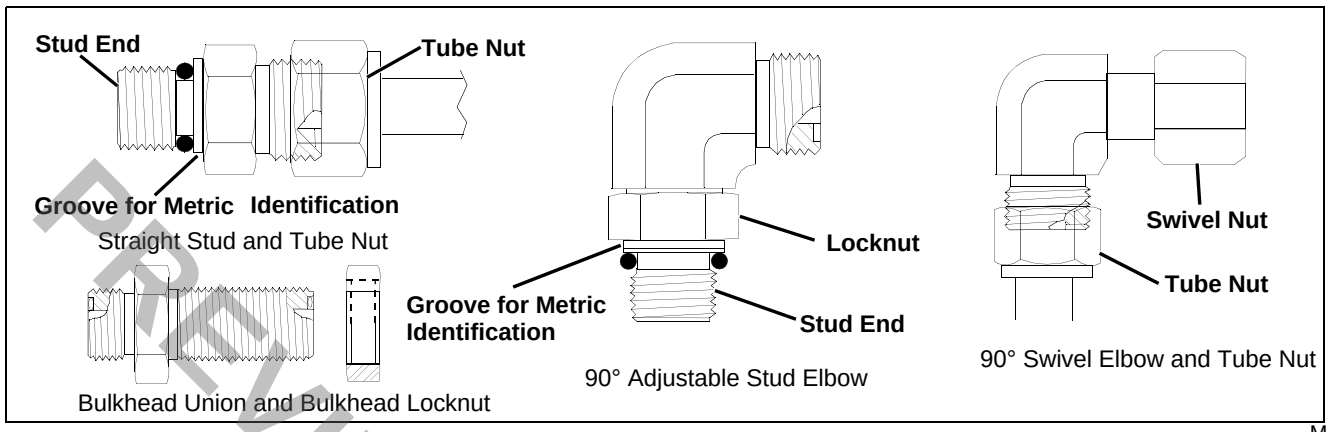
When bolt and nut combination fasteners are used, torque values should be applied to the NUT instead of the bolt head.

Tighten toothed or serrated-type locknuts to the full torque value.

Reference: JDS-G200.

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Face Seal Fittings 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 Locknut					
Metric Tube OD	Inch Tube OD			Thread Size	Hex Size	Tube Nut/ Swivel Nut Torque		Bulkhead Locknut 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%.

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Converting from HY-GARD to BIO HY-GARD

Systems being converted from HY-GARD to BIO HY-GARD should follow the procedure listed below to obtain maximum lubricant biodegradability.

1. Park machine on a level surface.
2. Lower cutting units, stop engine, set park brake and remove key from ignition.
3. Drain hydraulic reservoir.
4. Replace hydraulic filter.
5. Fill reservoir with BIO HY-GARD to appropriate level.
6. Start engine and bring to medium idle.
7. Turn steering wheel full stroke several times and cycle cutting units several times.
8. Stop engine and check hydraulic oil level. Add BIO HY-GARD to appropriate level.
9. Operate machine under normal operating conditions for a minimum of two hours.
10. Repeat steps 1-7.
11. Follow recommended maintenance schedules.

Anti-Corrosion Grease

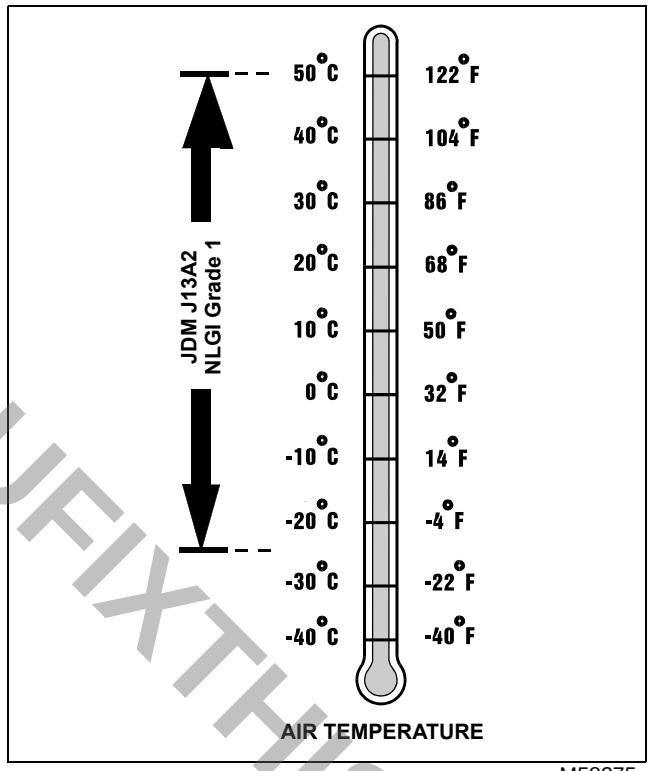
This anti-corrosion grease is formulated to provide the best protection against absorbing moisture, which is one of the major causes of corrosion. This grease is also superior in its resistance to separation and migration.

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.



M58275

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.

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Diagnostics

Diesel Engine Troubleshooting

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

Coolant in the radiator is extremely hot during operation.

Symptom: Engine Will Not Start

(1) Proper starting procedure being used is correct for conditions?

Yes - Go to step (2).

No - Use correct procedure for conditions. (See the Operator's Manual.)

(2) Battery 12.7 VDC or higher?

Yes - Go to step (3).

No - Charge and check battery.

(3) No open circuits in wiring?

Yes - Go to step (4).

No - Repair or replace as needed.

(4) Starting motor functioning properly?

Yes - Go to step (5).

No - Repair or replace starting motor. (See "Disassemble and Assemble Starting Motor" on page 114.)

(5) Engine oil of correct viscosity and type?

Yes - Go to step (6).

No - Replace engine oil with oil of proper viscosity and type. Replace oil filter.

(6) No water in fuel?

Yes - Go to step (7).

No - Drain and replace fuel.

(7) Fuel filter not clogged?

Yes - Go to step (8).

No - Replace fuel filter.

(8) No air leak in fuel system?

Yes - Go to step (9).

No - Repair fuel system.

Symptom: Engine Will Not Start

(9) Fuel lines not plugged, pinched or cracked?

Yes - Go to step (10).

No - Repair or replace fuel lines as needed.

(10) Correct volume of fuel supplied to injection pump?

Yes - Go to step (11).

No - Replace fuel transfer pump.

(11) Intake and/or exhaust valve clearance correct?

Yes - Go to step (12).

No - Adjust valve clearance. (See "Adjust Valve Clearance" on page 54.)

(12) Is injection pump timing correct?

Yes - Go to step (13).

No - Correctly time injection pump.

(13) Intake and/or exhaust valve not seized?

Yes - Go to step (14).

No - Replace valve and check valve guide. (See "Disassemble and Assemble Cylinder Head and Valves" on page 80.)

(14) Piston rings not broken or seized?

Yes - Go to step (15).

No - Replace rings. Check piston and cylinder. (See "Inspect Piston and Connecting Rod" on page 88. See "Inspect Cylinder Bore" on page 91.)

(15) Piston rings, piston or cylinder not worn?

Yes - Go to step (16).

No - Replace piston and/or rings; bore or hone cylinder. (See "Inspect Piston and Connecting Rod" on page 88. See "Inspect Cylinder Bore" on page 91.)

(16) Crankshaft pin or bearing not seized?

No - Regrind crankshaft and replace bearings. (See "Inspect Crankshaft and Main Bearings" on page 95.)

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

(1) Engine oil of proper viscosity and type?

Yes - Go to step (2).

No - Replace engine oil filter and oil of proper viscosity and type.

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Tests and Adjustments

Test Cylinder Compression

Reason

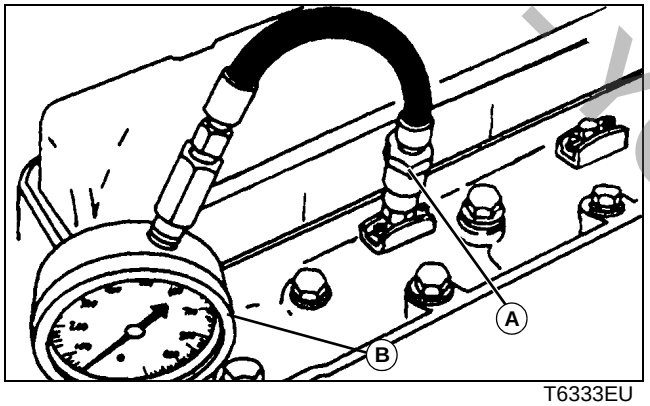
To determine the condition of the pistons, rings, cylinder walls and valves.

Special or Required Tools

Tool Name	Tool No.	Tool Use
Compression Gauge Assembly	JT01682	Used to measure cylinder compression.
Adapter	JDG560	Used to measure cylinder compression.

Procedure

1. Remove the injection nozzles.



T6333EU

2. Install heat protector on end of injector and install on JDG560 Adapter (A).

3. Install JT01682 Compression Gauge Assembly (B) and adapter.

4. Disconnect fuel control solenoid connector.

IMPORTANT: Avoid damage! DO NOT overheat starting motor during test.

5. Crank the engine for five seconds with the starting motor. Minimum cranking speed is 250 rpm.

6. Record the pressure reading for each cylinder.

Results

- If pressure reading is below specification, squirt clean engine oil into cylinders through injector ports and repeat test.
- If pressure increases significantly, check piston, rings and cylinder walls for wear or damage.
- If pressure does not increase significantly after retest, check for leaking valves, valve seats or cylinder head gasket.

Specifications

Cylinder Compression Pressure @ 250 RPM

Model 3225C . . . . . 3234 ± 103 kPa (469 ± 15 psi)
Model 3225C (Minimum) . 2551 ± 103 kPa (370 ± 15 psi)
Model 3235C and 3245C 2937 ± 103 kPa (426 ± 15 psi)
Model 3235C and 3245C (Minimum) . . . 2448 ± 103 kPa (355 ± 15 psi)
Difference Between Cylinders @ 250 RPM (Maximum) . 296 kPa (43 psi)

Adjust Slow Idle

Reason

To achieve proper slow idle rpm setting. Provides adequate rpm to keep the engine running smoothly without stalling.

Special or Required Tools

Tool Name	Tool No.	Tool Use
Inductive Electronic Tachometer	JT05801	Used to check engine rpm when setting slow idle speed.

Procedure

NOTE: Make sure the air cleaner is clean and not restricted. Replace the air cleaner element as necessary.

1. Place a small piece of reflective tape on the crankshaft pulley.

2. Start the engine and run for 5 minutes to attain operating temperature.

3. Move the throttle lever to slow idle position.

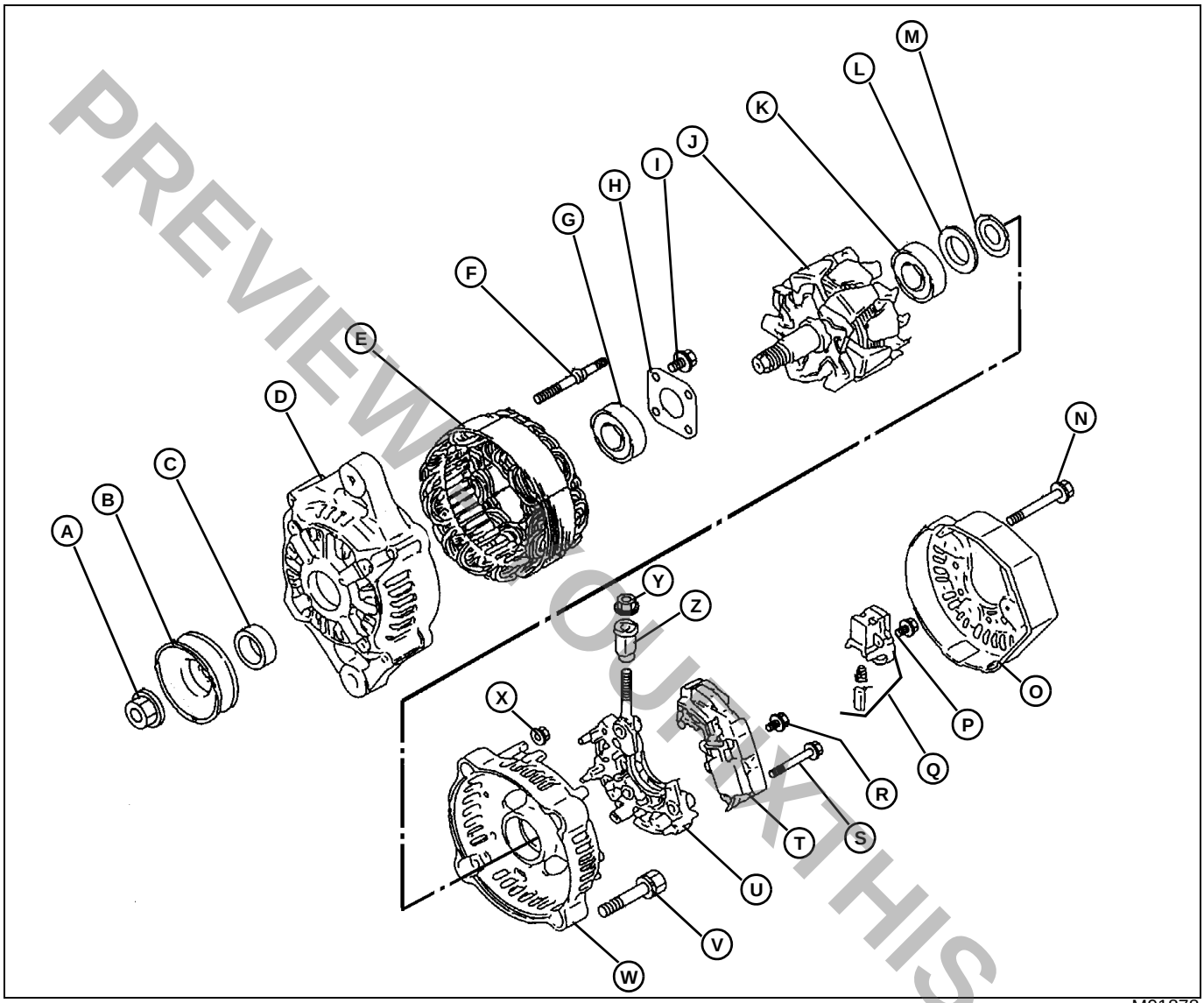
4. Use JT05801 Hand Held Digital Tachometer to check engine speed at the crankshaft pulley.

5. Visually check that the injection pump throttle lever is against slow idle stop screw.

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Component Location

Alternator Components

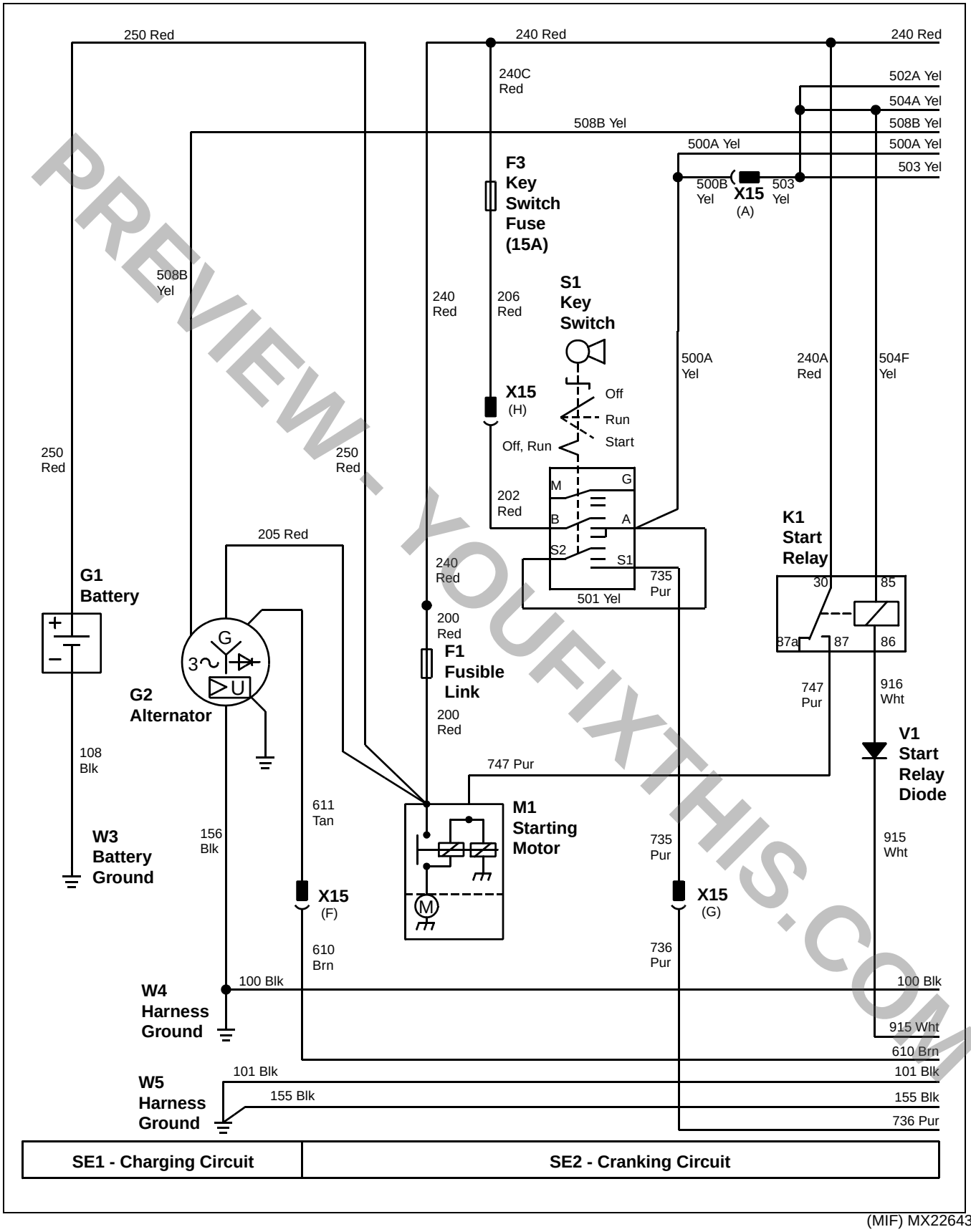


M91878

A - Nut
B - Pulley
C - Spacer (40 Amp Only)
D - Front Frame
E - Stator
F - Stud
G - Bearing
H - Cover
I - Screw
J - Rotor
K - Bearing
L - Cover
M - Thrust Washer (40 Amp)
N - Cap Screw
O - Cover
P - Screw
Q - Brush Assembly
R - Screw
S - Screw
T - Regulator
U - Diode Assembly
V - Cap Screw
W - Rear Frame
X - Nut
Y - Nut
Z - Insulator Bushing

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Main Electrical Schematic (Sheet 1 of 9)



(MIF) MX22643

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Operation and Diagnostics

Electronic Control Module Operation

This machine is equipped with an electronic control module (A1). The module controls and monitors all safety interlock functions and the engine air preheater function.

When key switch (S1) is in the RUN position, current flows through the following circuits, causing the electronic control module to power up:

- Key Switch (S1) - terminals B and A.
- Wires 500A and 500B yel.
- Control Arm Harness Connector (X15) - terminal A
- Wires 503, 507A, and 509 yel.
- Electronic Control Module Connector (X45) - terminal D.

Ground is provided to the control module through:

- W5 Harness Ground.
- Wire 101 blk.
- Wires 102 and 103 blk.
- Electronic Control Module Connector (X45) - terminals B and C.

The electronic control module features input LEDs, output LEDs, and a status LED (known as the “heartbeat” LED) to aid in electrical circuit diagnosis.

The input LEDs will light whenever a function switch has been activated. This will indicate that the input circuit is functioning properly.

The output LEDs, when lit, indicate that the control module circuitry for that particular function is operating properly, and that a controlled ground is available for that circuit at the control module output terminal.

If all circuits are OK, the status LED will flash at a steady rate called the heartbeat. The heartbeat pattern is 130 milliseconds ON and 830 milliseconds OFF.

If the control module detects a malfunction, the LED will flash a specific pattern to indicate one of the diagnostic codes. The flash pattern is 280 milliseconds ON and 280 milliseconds OFF for a given digit. There is a one second OFF delay between digits and two second OFF delay before the code is repeated.

- For diagnostic codes caused by the operator, see “Safety Interlock Diagnostic Codes” on page 162.
- For diagnostic codes most likely caused by a system malfunction on an input circuit, see “Electronic Control Module Input Circuits Diagnostic Codes” on page 162.
- For diagnostic codes most likely caused by a system malfunction on an output circuit, see “Electronic Control Module Output Circuits Diagnostic Codes” on page 163.

Safety Interlock Diagnostic Codes

The Sit On Seat (SOS) diagnostic feature alerts the operator when an attempt is made to start the machine when one or more safety interlock switches are not in the correct position for starting.

The following diagnostic codes are displayed by the flashing of the status LED on the electronic control module and the air preheater lamp on the control arm.

NOTE: The code will cycle continuously with a two-second pause between display cycles.

Only one code can be displayed at a time. Repeat check procedure after repairs have been completed.

- **Code 1-2** (One pulse followed by a short pause followed by two pulses.) Indicates that the brake switch is not activated and/or forward/reverse pedals are not in he NEUTRAL position during an attempted start.
- **Code 1-3** (One pulse followed by a short pause followed by three pulses.) Indicates that the mow/trans lever is in the MOW position during an attempted start.
- **Code 2-2** (Two pulses followed by a short pause followed by two pulses.) Indicates hydraulic oil is in an over-temperature condition.
- **Code 2-3** (Two pulses followed by a short pause followed by three pulses.) Indicates that the hood switch is not activated (European machines) or jumper wire is missing from hood switch connector (North American machines).

Electronic Control Module Input Circuits Diagnostic Codes

NOTE: The code will cycle continuously with a two-second pause between display cycles.

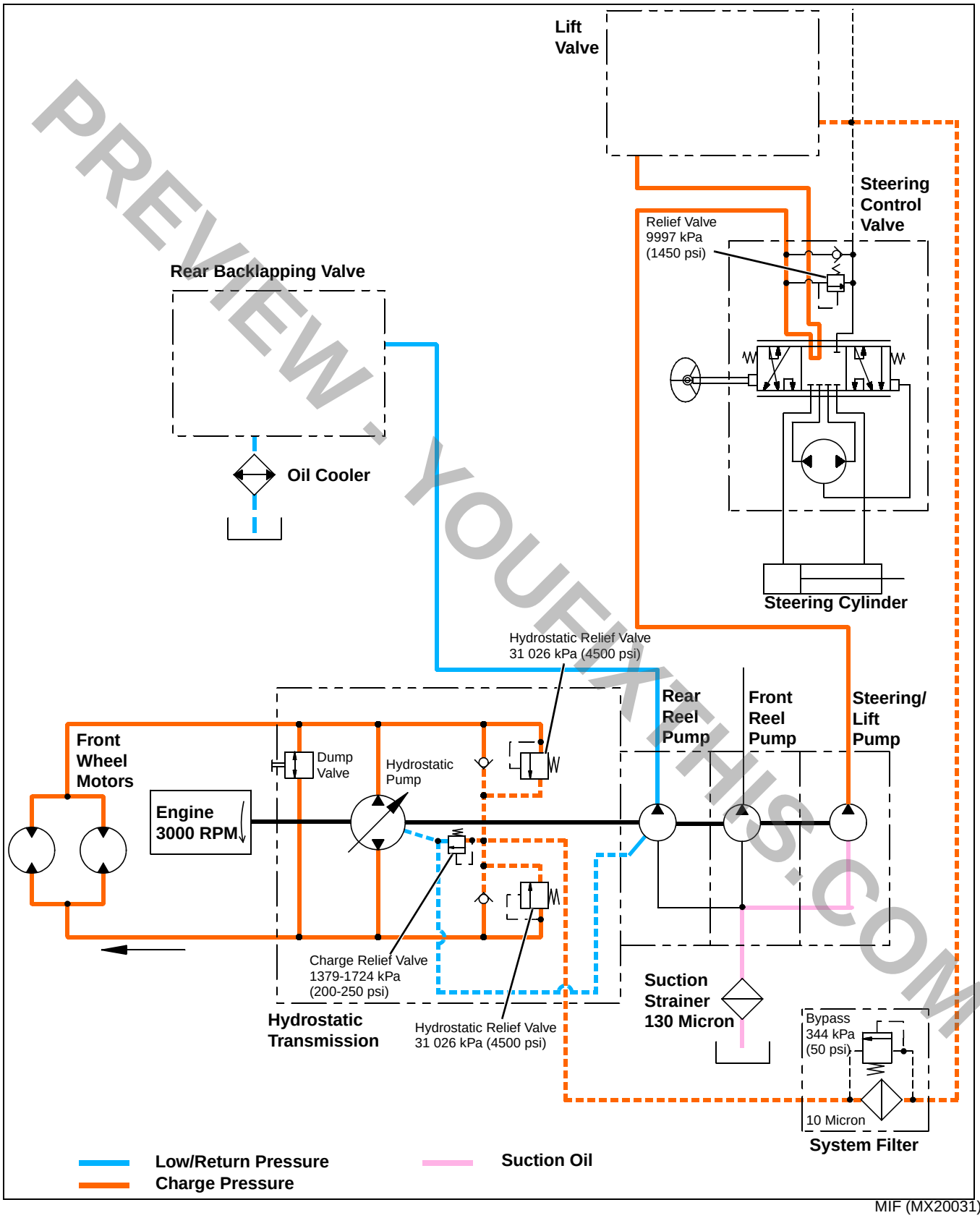
Only one code can be displayed at a time. Repeat check procedure after repairs have been completed.

- **Code 3-1** (Three pulses followed by a short pause followed by one pulse.) Indicates an over-voltage condition (voltage input to control box over 18 volts). This could also be caused by attempting to jump start the machine with a 24-volt power source.
- **Code 3-5** (Three pulses followed by a short pause followed by five pulses.) Indicates control module is missing ground connection.
- **Code 3-6** (Three pulses followed by a short pause followed by six pulses.) Indicates control module is missing supply voltage.
- **Code 3-7** (Three pulses followed by a short pause followed by seven pulses.) Indicates control module has an internal over-temperature condition.

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Hydrostatic Schematics

3225C in Neutral



MIF (MX20031)

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Theory of Operation

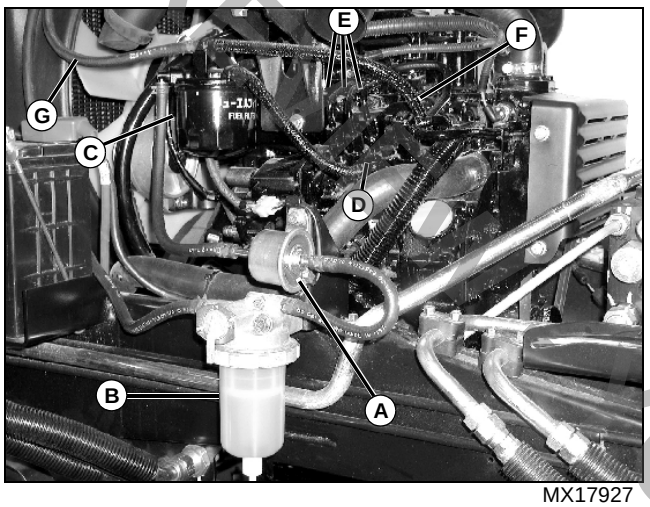
Fuel and Air System Operation

Function

Fuel system supplies fuel to injection nozzles.

The air intake system filters and supplies air needed for combustion.

Theory of Operation



MX17927

Fuel System

An electric fuel transfer pump (A) draws fuel through the water separator (B) from the tank outlet. The low-pressure fuel from the fuel pump flows through the filter (C) to the fuel injection pump inlet (D). The injection pump then directs high-pressure fuel through the injection lines (E) to the injectors where it is injected into the cylinders for combustion. Excess fuel from the injectors and the injection pump is returned by line (F) to the filter where, if needed, it can be sent back to the injection pump. If not needed, the fuel is sent back to the tank by line (G).

If the unit runs out of fuel, there are two air bleed lines that allow air to escape from the top of the filter and the injection pump. These two lines allow the system to be self-bleeding.

The engine speed is controlled by the throttle lever and cable. The cable is connected to the injection pump governor control lever. The fuel shutoff solenoid 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 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, 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.

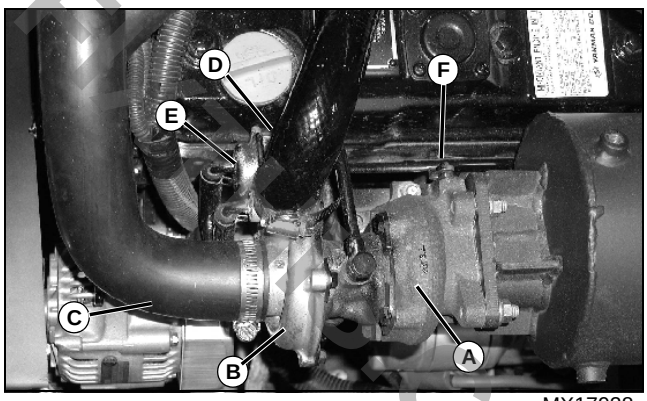
A fuel float gauge is mounted in the fuel tank to inform the operator of the fuel level.

Air Intake System

Air enters the air filter through the perforated side holes. The primary and secondary elements filter the air before entering the intake manifold.

An air filter restriction switch informs the operator when the air filter needs servicing. The air filter restriction switch closes when the vacuum reaches a specified level and lights a lamp. A small amount of vacuum is always present due to some restriction of air movement through the filter elements. The unloading valve is like a one-way valve. It ejects heavy dirt particles from the air stream during engine operation, but does not let air into the air filter housing. The operator can squeeze the valve to let the large particles out.

Turbocharger (Models 3235C and 3245C)



MX17928

The turbocharger provides additional air, to burn more fuel and produce more power without increasing the size of the engine. The turbine in the turbocharger may spin as fast as 150,000 rpm.

The turbine is on a shaft inside the turbine housing (A). The shaft is connected to the compressor wheel, which is inside the compressor housing (B). The shaft is supported by two floating bearings, which are located between the turbine and compressor housings.

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Valve Guides

1. Clean the valve guides using a valve guide brush.

2. Measure the valve guide inside diameter and compare with specifications.

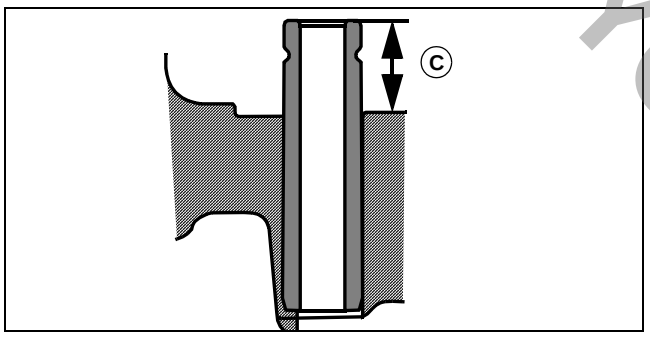
3. Subtract the valve stem OD from the valve guide ID to obtain the oil clearance and compare with specifications.

4. Determine the guide-to-stem oil clearance (guide diameter minus stem diameter).

- If the oil clearance exceeds 0.15 mm (0.006 in.) but is less than 0.20 mm (0.008 in.), knurl the valve guides using D-20019WI Valve Guide Knurler.
- If clearance exceeds 0.20 mm (0.008 in.), replace valve guides using JDE118 Valve Guide Driver.

IMPORTANT: Avoid damage! New valve guides must be cooled in a container of liquid nitrogen, or equivalent, before driving into cylinder head.

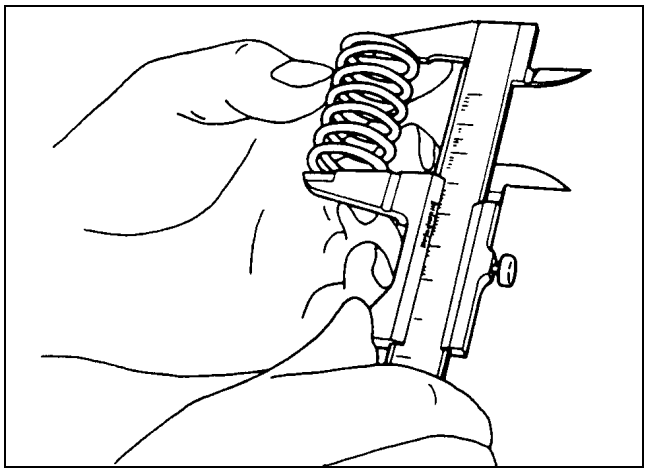
The intake and exhaust valve guides are different. The exhaust valve guide has one groove and the intake valve guide has none.



5. If replacing valve guide, install the valve guides with the tapered ends down. Push the valve guides into the cylinder head until the valve guide projection (C) is within specification.

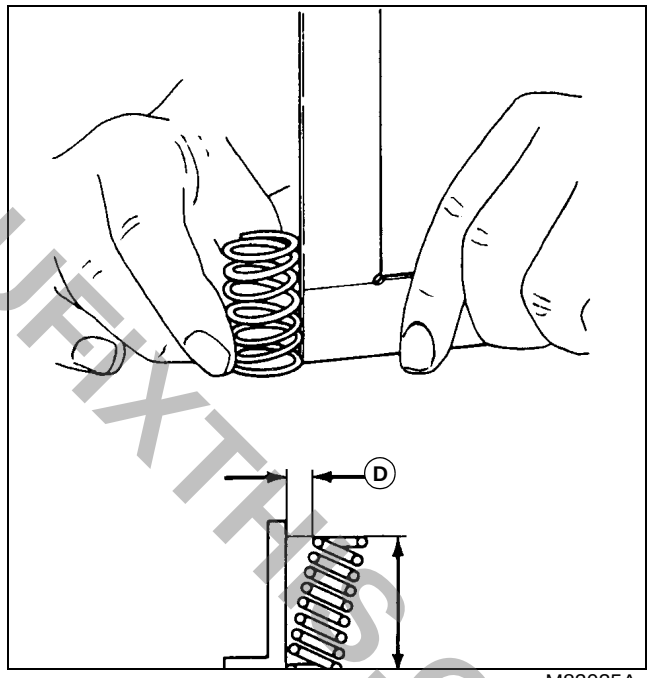
6. Ream the inside diameter of valve guides using D20021WI Valve Guide Reamer.

Springs



M82034A

1. Measure the valve spring free length and compare with specifications.



M82035A

2. Measure the spring inclination (D) and compare with specifications.

Specifications

Cylinder Head

Cylinder Head Flatness (Allowable Distortion Without Resurfacing) . . . . . 0.05 mm (0.002 in.)

Cylinder Head Flatness (Resurface Range). . . 0.00-0.05 mm (0.000-0.002 in.)

Wear Limit . . . . . 0.15 mm (0.006 in.)

Cylinder Head Flatness (Maximum Distortion) 0.15 mm (0.006 in.)

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Remove and Install Turbocharger

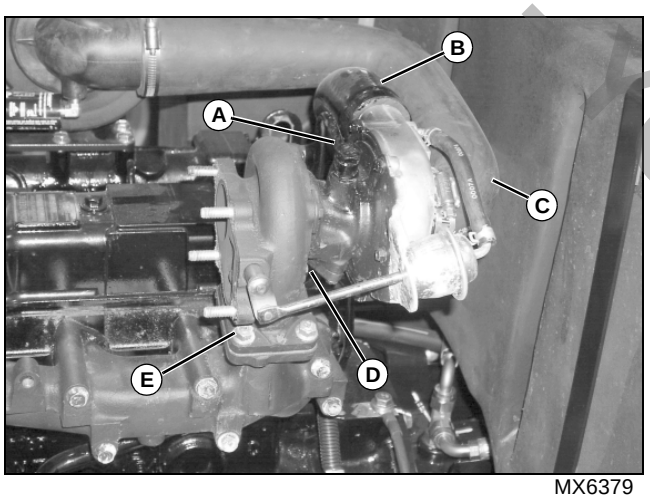
Removal

CAUTION: Avoid injury! Muffler may be hot. Allow muffler to cool before removing. A hot muffler can cause serious burns.

IMPORTANT: Avoid damage! When cleaning turbocharger, DO NOT spray directly into compressor turbine housing. If inspection is required of turbocharger, do not clean exterior prior to removal. Doing so may wash away evidence of a potential failure mode

If inspection is not required, thoroughly clean exterior of turbocharger and surrounding area to prevent entry of dirt into the air intake system during removal.

1. Remove muffler.



MX6379

2. Remove turbocharge-to-intake manifold hose (B).
3. Remove air cleaner-to-turbocharger hose (C).
4. Remove oil supply line (A) with copper washers on top and bottom surface of oil supply line.
5. Remove oil drain line (D).
6. Remove four nuts (E).
7. Remove turbocharger and gasket.
8. Close all openings using caps and plugs to prevent contamination.

Installation

Installation is done in the reverse order of removal.

- Prelube turbocharger: Fill oil inlet or drain port with clean oil and turn rotating assembly (by hand) to properly lubricate bearings.
- Install new gasket between exhaust manifold and turbocharger.
- Install new O-ring on oil drain line.
- Install new copper washers on oil supply line.

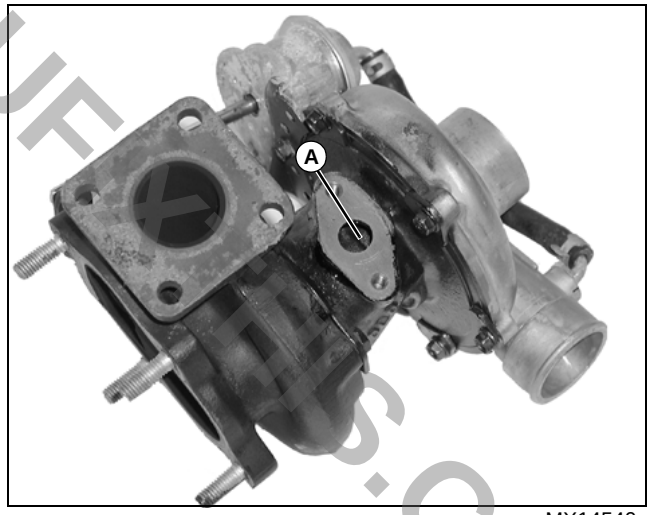
IMPORTANT: Avoid damage! A new or repaired turbocharger does not have an adequate oil supply for immediate start-up of engine. Perform the following steps to prevent damage to turbocharger bearings.

1. Disconnect fuel shutoff connector.
2. Crank engine over with starter until oil pressure light goes out. DO NOT crank engine longer than 30 seconds at a time to avoid damaging the starter.

Repair Turbocharger

Turbochargers used on the engines covered in this manual are available through service parts as a complete remanufactured assembly only. Individual components for repair are not available.

Prelube Turbocharger



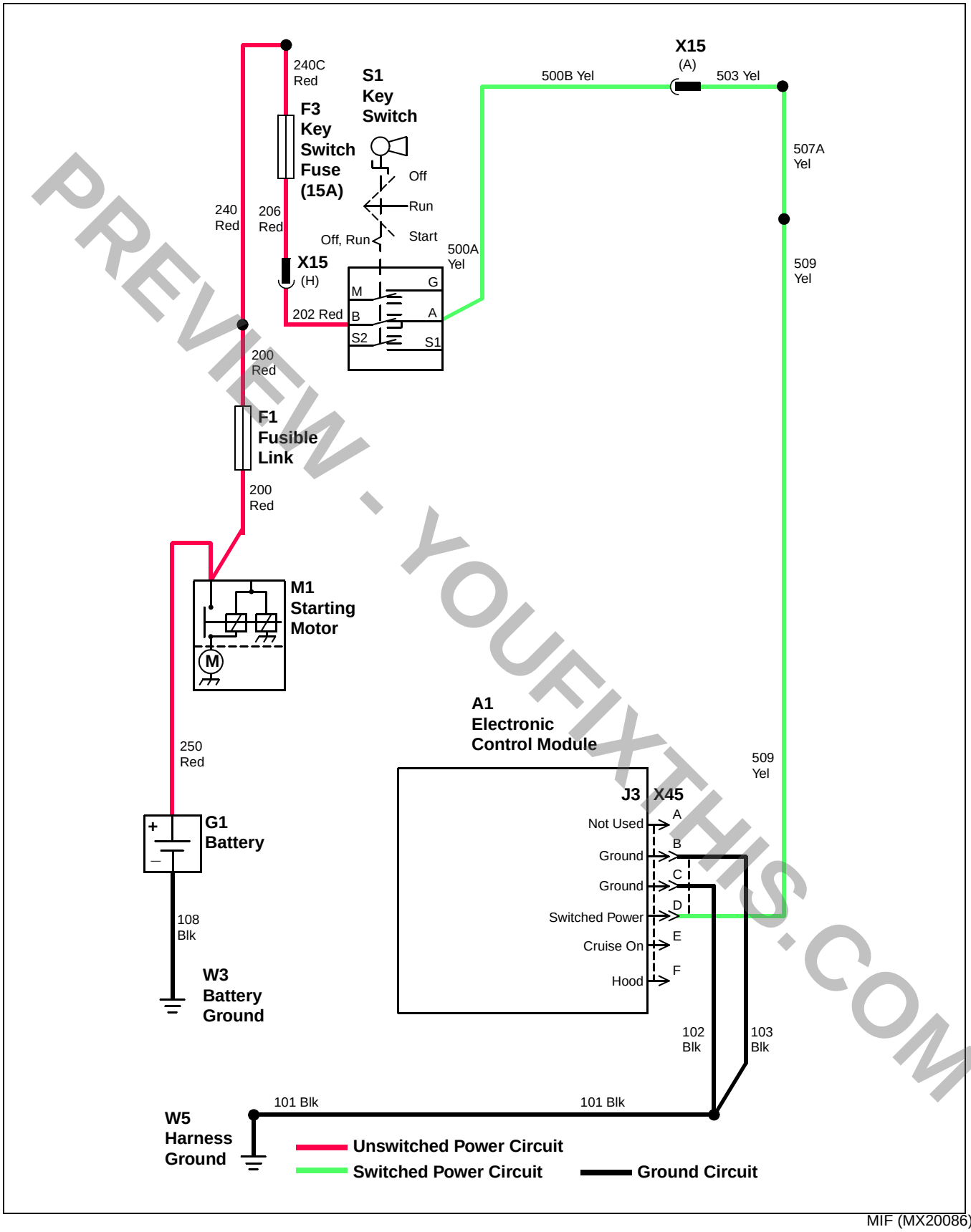
MX14540

IMPORTANT: Avoid damage! DO NOT spin the rotor assembly with compressed air. Damage to bearings can occur when using compressed air.

Fill oil inlet or drain port (A) with clean engine oil and spin rotating assembly (by hand) to properly lubricate bearings.

If turbocharger is to be stored for an extended period of time, lubricate internally and install protective covers on all openings.

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MIF (MX20086)

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Four-Wheel Drive Circuit Diagnosis

NOTE: Four-wheel drive is available as a kit only for the 3225C, as a factory installed option for the 3235C and is standard for the 3245C.

Diagnostics of circuits that include the electronic control module is a multi-step process. This process is designed to take advantage of the self-diagnostic feature of the control module and to minimize the need to perform voltage and/or continuity checks.

IMPORTANT: Avoid damage! When diagnosing the four-wheel drive circuit, it is important to perform the following steps in the sequence shown.

1. Electronic Control Module Checks. (See “Electronic Control Module Checks” on page 166.)

2. Four-Wheel Drive Circuit Tests. (See “Four-Wheel Drive Circuit Tests” on page 206.)

Four-Wheel Drive Circuit Tests

Test Conditions:

- Operator ON seat.
- Key switch in RUN position.
- Mow/trans lever in MOW position.
- Meter negative (-) lead on battery negative (-) terminal or chassis ground.
- Check connections for corrosion and looseness when testing.

System: Four-Wheel Drive Solenoid Circuit

(1) Measure voltage at four-wheel drive solenoid (Y5) - wire 508D yel. Is battery voltage present?

Yes - Go to step (2).

No - Test wires 508D, 508A, 503, 500B and 500A yel and connections.

(2) Electronic control module (A1) output LED check. Is 4WD LED ON?

Yes - Go to step (3).

No - Test electronic control module circuit. (See “Electronic Control Module Circuit Diagnosis” on page 166.)

(3) Measure voltage at electronic control module connector (X46) - terminal A. Is voltage less than 0.1 volt?

Yes - Go to step (4).

No - Test connector terminal A.

System: Four-Wheel Drive Solenoid Circuit

(4) Measure voltage at four-wheel drive solenoid (Y5) - wire 771C blu. Is voltage less than 0.1 volt?

Yes - Test four-wheel drive solenoid. (See “Test Four-Wheel Drive Solenoid” on page 247.)

No - Test wires 771C and 771 blu and connections.

System: Four-Wheel Drive Indicator Light Circuit

(1) Measure voltage at four-wheel drive switch (S7) - wire 500E yel. Is battery voltage present?

Yes - Go to step (2).

No - Test wires 500E and 500A yel and connections.

(2) Measure voltage at four-wheel drive switch (S7) - wire 771 blu. Is voltage less than 0.1 volt?

Yes - Test four-wheel drive switch. (See “Bench Test Electrical Switches” on page 244.)

No - Test wires 771 and 771B blu and connections.

Test Conditions:

- Key switch in RUN position.
- Four-wheel drive switch in ON position.
- Meter negative (-) lead on battery negative (-) terminal or chassis ground.
- Check connections for corrosion and looseness when testing.

System: Four-Wheel Drive Indicator Light Circuit

(1) Measure voltage at four-wheel drive switch (S7) - wire 500E yel. Is battery voltage present?

Yes - Go to step (2).

No - Test wire 500E yel and connections. (See “Power Circuit Diagnosis - Switched” on page 175.)

(2) Measure voltage at four-wheel drive switch (S7) - wire 768 tan. Is battery voltage present?

Yes - Go to step (3).

No - Test four-wheel drive switch. (See “Bench Test Electrical Switches” on page 244.)

(3) Measure voltage at electronic control module connector (X44) - wire 769 tan. Is battery voltage present?

Yes - Go to step (4).

No - Test wires 768 and 769 tan and connections.

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- Continuity should exist between relay terminals 87a and 30 (A and B) and between 85 and 86 (C and D).
- No continuity between relay terminals 30 and 87 (B and E).

2. Connect jumper wire from battery positive (+) terminal to relay terminal 85 (C). Connect another jumper wire from relay terminal 86 (D) to battery negative (-) terminal.

- Continuity should exist between relay terminals 30 and 87 (B and E).
- No continuity between relay terminals 30 and 87a (B and A).

Results

If continuity is not correct, replace relay.

Test Fuel Shutoff Solenoid

Reason

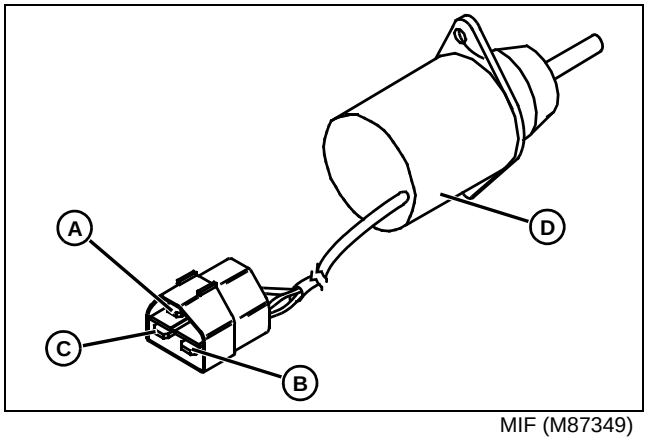
To determine if the fuel shutoff solenoid is operating properly.

Special or Required Tools

Tool Name	Tool No.	Tool Use
Digital Multimeter	JT05791	Used to test fuel shutoff solenoid.

Procedure

1. Open engine hood.
2. Disconnect fuel shutoff solenoid connector.



MIF (M87349)

3. Check pull-in coil resistance, terminals (A and B). Resistance must be to specification.
4. Check hold coil resistance, terminals (A and C). Resistance must be to specification.
5. Check resistance of both coils (combined), terminals (A and C). Resistance must be to specification.
6. Check for grounds or shorts between solenoid terminals (A, B and C) and solenoid housing (D). There must be NO continuity between terminal (A, B or C) and solenoid housing.

Results

- If resistance does not meet specifications, replace fuel shutoff solenoid.
- If continuity exists between connector terminals and solenoid housing, replace fuel shutoff solenoid.

Specifications

Fuel Shutoff Solenoid Resistance

Terminals A and B . . . . . 0.4 ohm
Terminals A and C . . . . . 23.6 ohms
Terminals B and C . . . . . 24 ohms

Test Four-Wheel Drive Solenoid

Reason

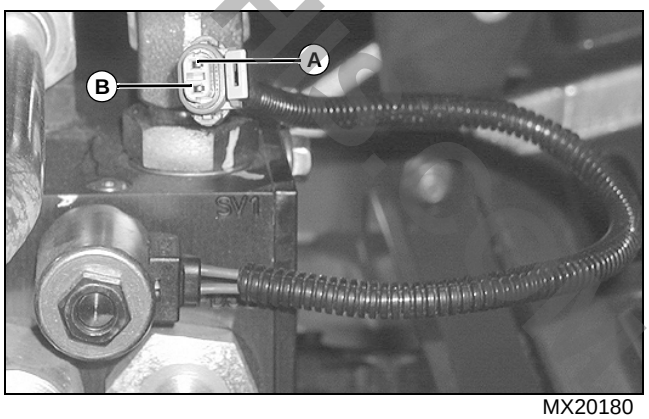
To determine if the four-wheel drive solenoid is operating properly.

Special or Required Tools

Tool Name	Tool No.	Tool Use
Digital Multimeter	JT05791	Used to test four-wheel drive solenoid.

Procedure

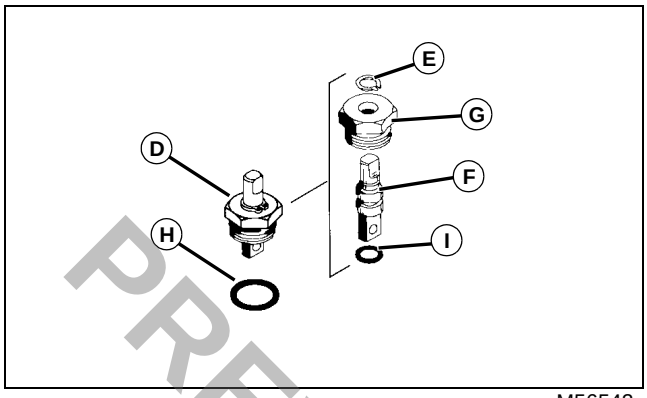
1. Open engine hood.
2. Disconnect four-wheel drive solenoid connector.



MX20180

3. Check resistance between terminals (A and B). Resistance must be to specification.
4. Check for grounds or shorts between solenoid terminals (A and B) and solenoid housing. There must be NO continuity between terminal (A or B) and solenoid housing.

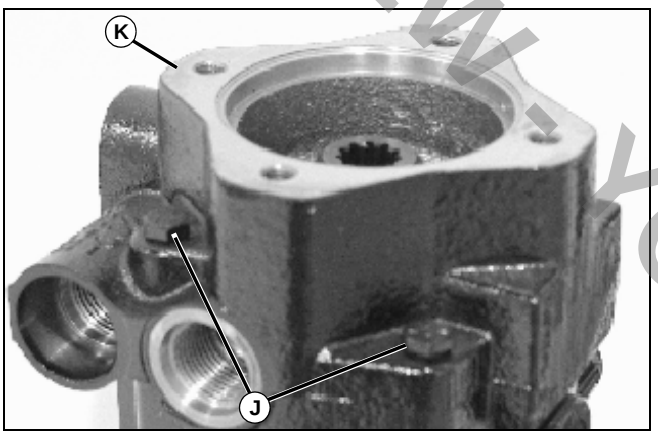
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M56542

2. Remove dump valve assembly (D) from backplate.

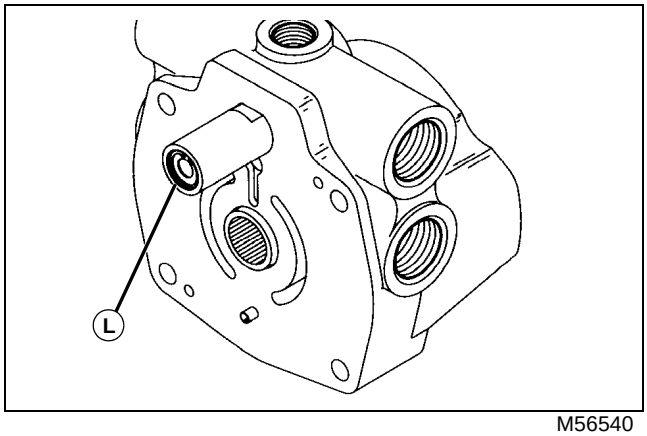
3. Disassemble dump valve by removing retaining ring (E) and pulling the spreader (F) from the spreader plug (G). Remove O-rings (H and I).



MX20247

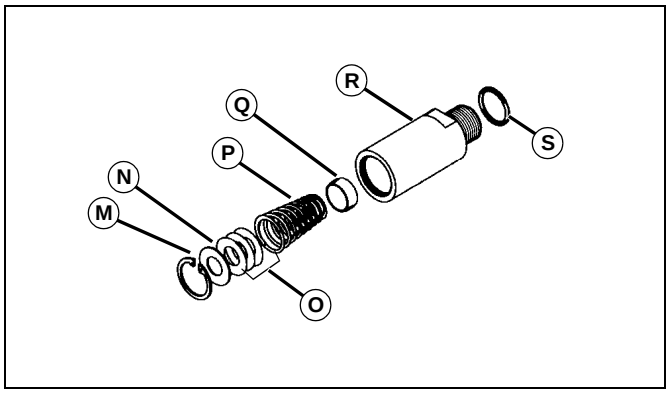
4. Remove four cap screws (J) from the backplate (K).

5. Tap backplate with a plastic mallet to loosen, then pull the backplate straight up to remove. Remove gasket and valve plate from backplate.



M56540

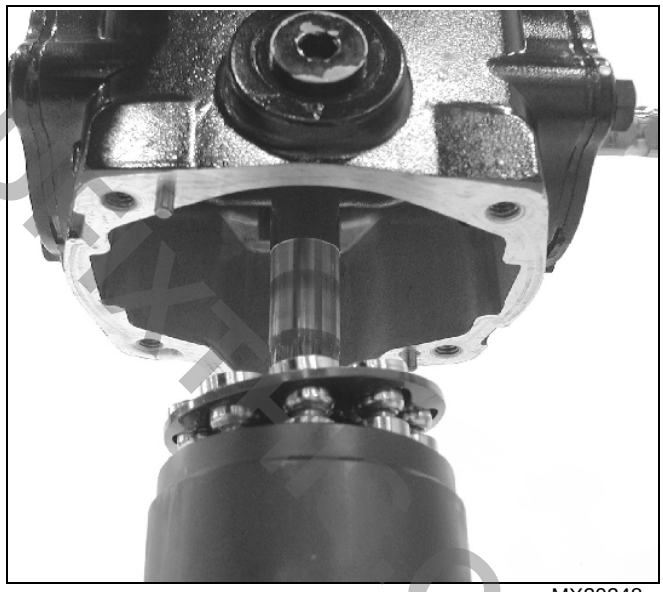
6. Remove charge relief valve (L) from backplate.



M56535

7. Disassemble by removing retaining ring (M), washer (N), shim(s) (O), conical spring (P), and plunger (Q) from charge relief valve (R). Remove O-ring (S) from charge relief valve body. Make note of the number of shims removed for reassembly.

IMPORTANT: Avoid damage! Try to keep the pistons and piston block together as an assembly when removing the rotating assembly.



MX20248

8. Hold your hand over the rotating assembly and turn the housing upside down. Remove the rotating assembly and any pistons that did not come out with the assembly.

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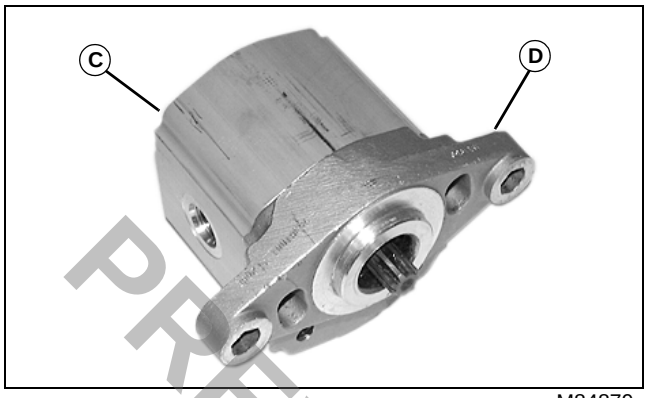
Tools and Materials

Tools

Special or Required Tools

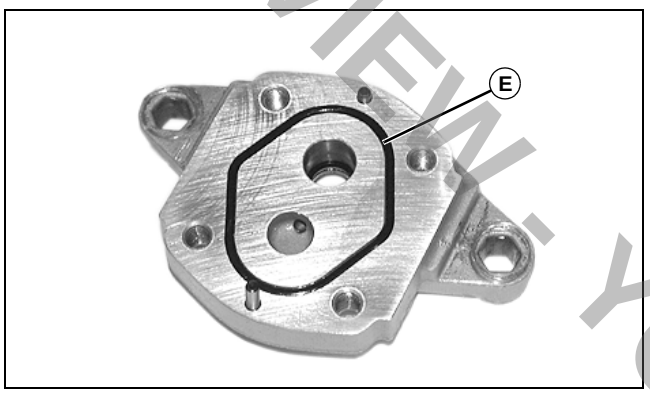
Tool Name	Tool No.	Tool Use
Flow Meter	D01074AA	Used to measure hydraulic circuit flow.
Pressure Diagnostic Kit	JDG2031	Used to test mower motor relief, lift system relief and to adjust optional down pressure valve.
Diagnostic Flow Kit	JDG2032	Used to measure hydrostatic pump, mow circuit and case drain hydraulic oil flow.
Pressure Gage Kit	JDG2033	Used to test mower motor relief and lift system relief and to adjust optional down pressure valve.
Inductive Electronic Tachometer	JT05801	Used to measure engine rpm.

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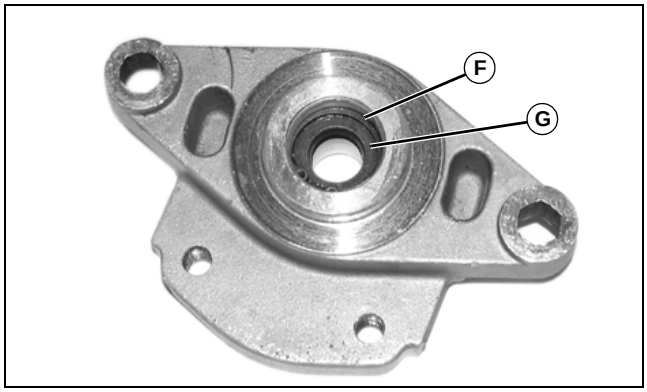
M84879

6. Separate front end cover (D) from main body (C).



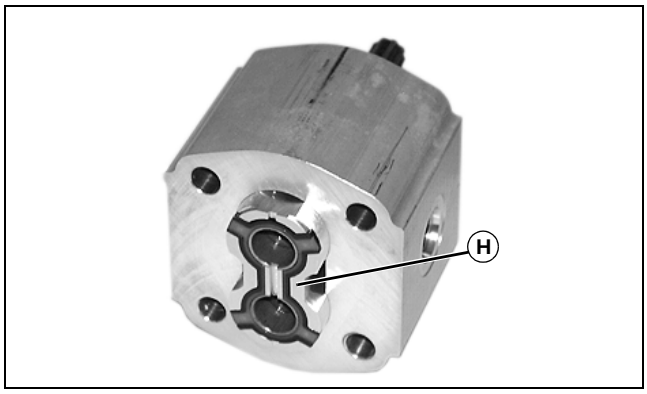
M84880

7. Remove O-ring (E) from front end cover.



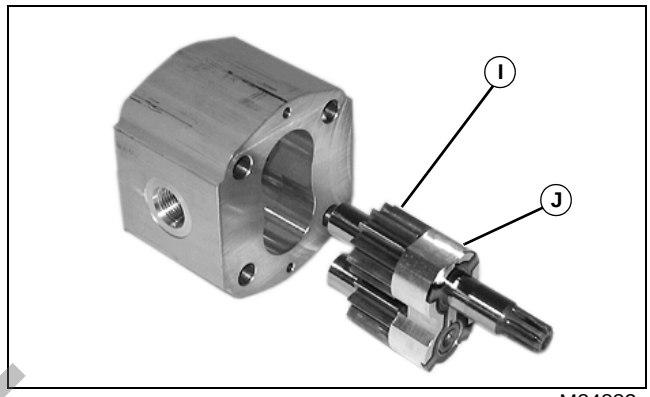
M84881

8. Remove retaining ring (F).
9. Remove seal (G).



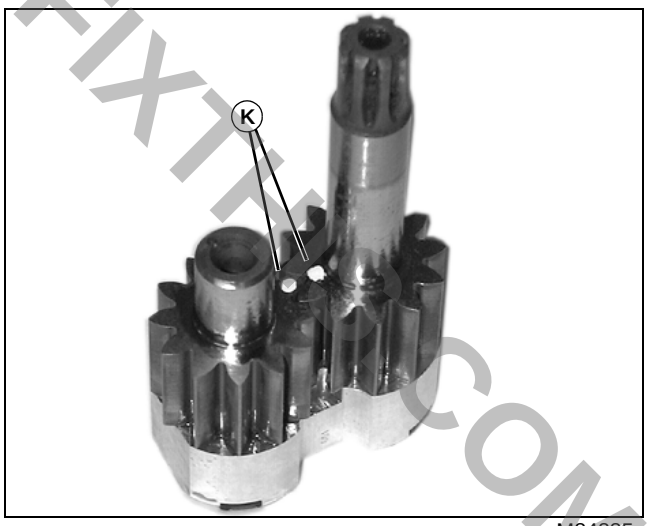
M84882

10. Remove rear wear block assembly (H).



M84883

11. Remove front block assembly (J) and gear set (I).

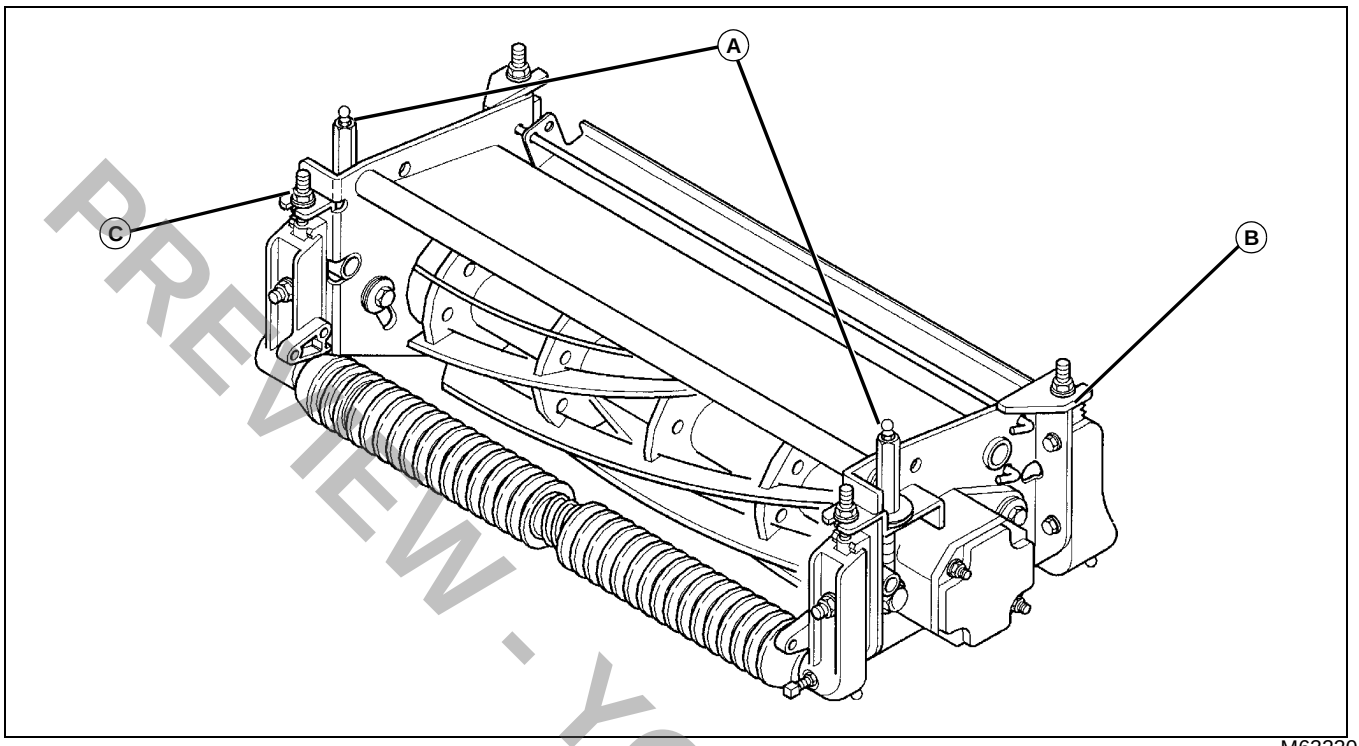


M84885

12. Place alignment marks (K) on gear mating teeth and remove gears from wear block assembly.

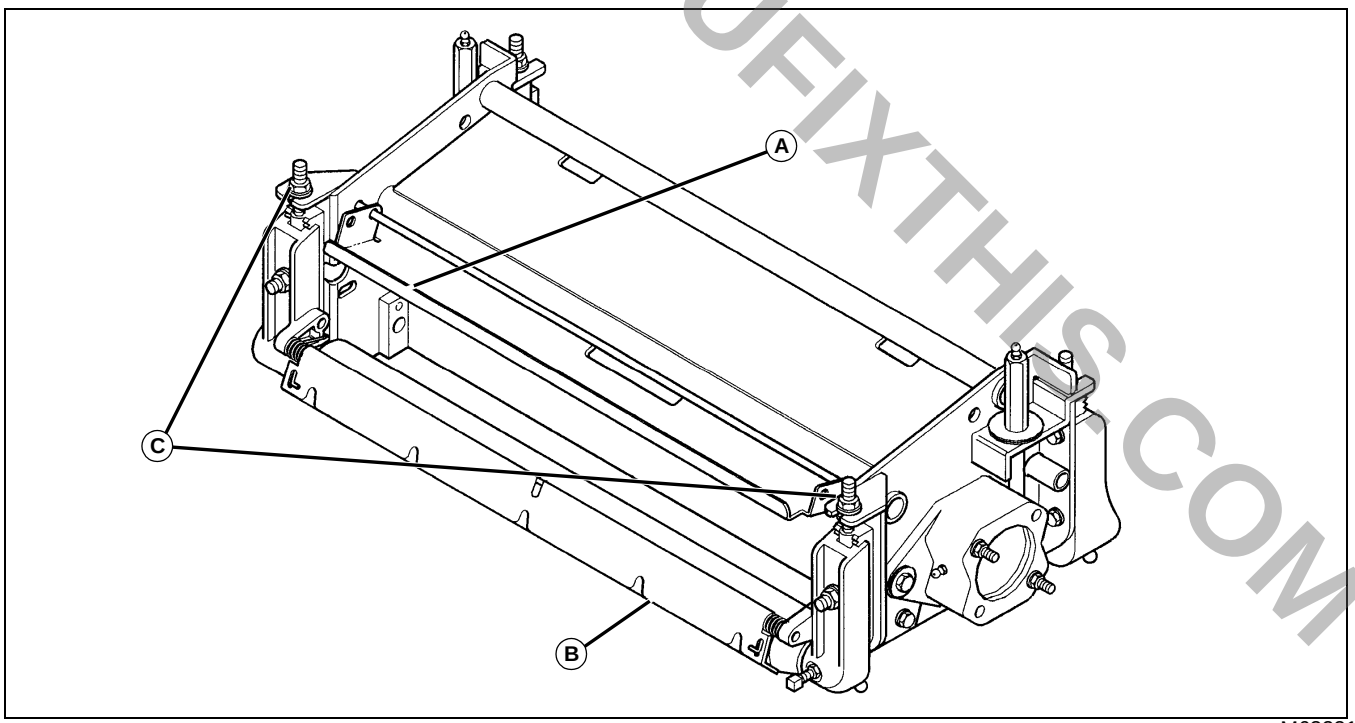
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Component Location **22-In. Heavy Duty Cutting Unit**



M63220

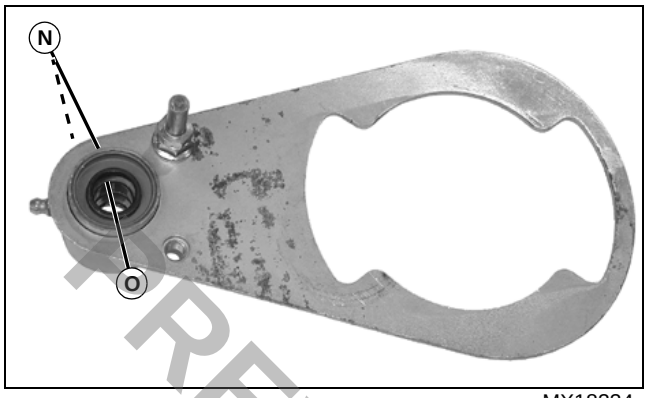
A - Reel-to-Bed Knife Clearance Adjustment
B - Ratchet Teeth
C - Front Roller HOC Adjustment



M63221

A - Rear Deflector
B - Rear Roller Scraper
C - Rear Roller HOC Adjustment

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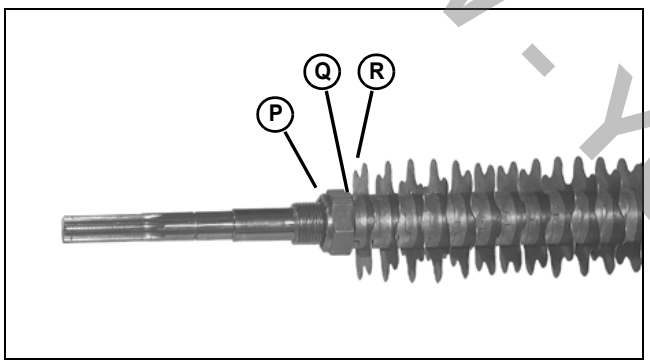


MX18334

10.Inspect seals (N) on both sides of bearing for wear or damage. Replace as needed.

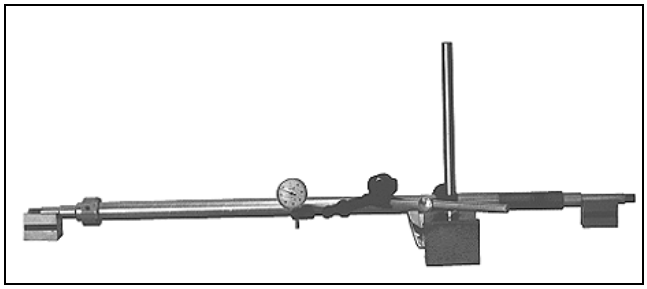
11.Inspect bearing (O) for free movement and excessive play. Replace bearing if it has excessive play or is noisy.

FTC Shaft Assembly

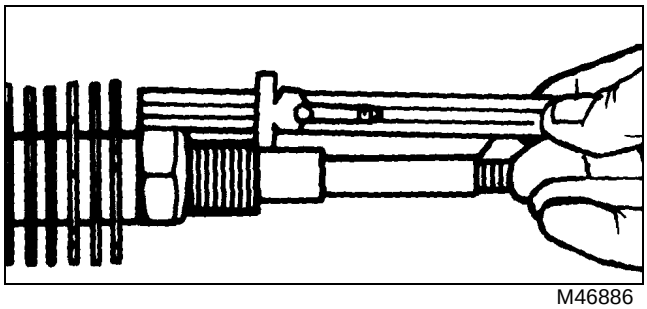


MX18332

1. Remove lock nut (P).
2. Remove index rings (Q) and blades (R).
3. Inspect blades for excessive wear and broken, cracked, or distorted cutting teeth. Replace parts as needed.


M46725

4. Remove debris and/or corrosion from shaft and place on V-blocks. Check runout at center of the shaft. Runout should not exceed 1.4 mm (0.0625 in.). Straighten or replace shaft as necessary.

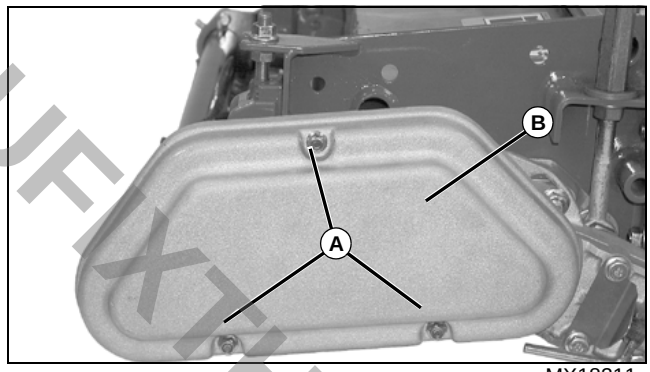

M46886

5. Install index rings and blades on shaft, rotating occasionally to align blades and index rings. Install all spacers and blades until approximately 38 mm (1.50 in.) of exposed shaft is left.
6. Stand shaft on end and shake it slightly to ensure blades and index rings are aligned.
7. Install locking nut and tighten to specification.

Specifications

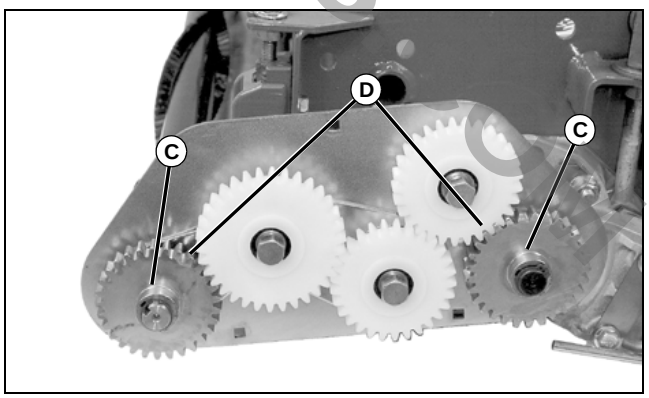
Locking Nut Torque . . . . . 47 N•m (35 lb-ft)

Remove Power Brush - 22-In. Heavy Duty



MX18311

1. Remove three nuts and carriage bolts (A).
2. Remove cover (B) and gasket.



MX18312

3. Remove snap rings (C).
4. Remove gears (D).

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