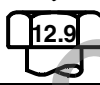
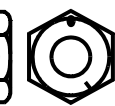


SPECIFICATIONS & INFORMATION FASTENER TORQUES

Fastener Torques

Metric Fastener Torque Values

Property Class and Head Markings	  	   	 	   
Property Class and Nut Markings	  	  	  	  

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 $\pm 10\%$ variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

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

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

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

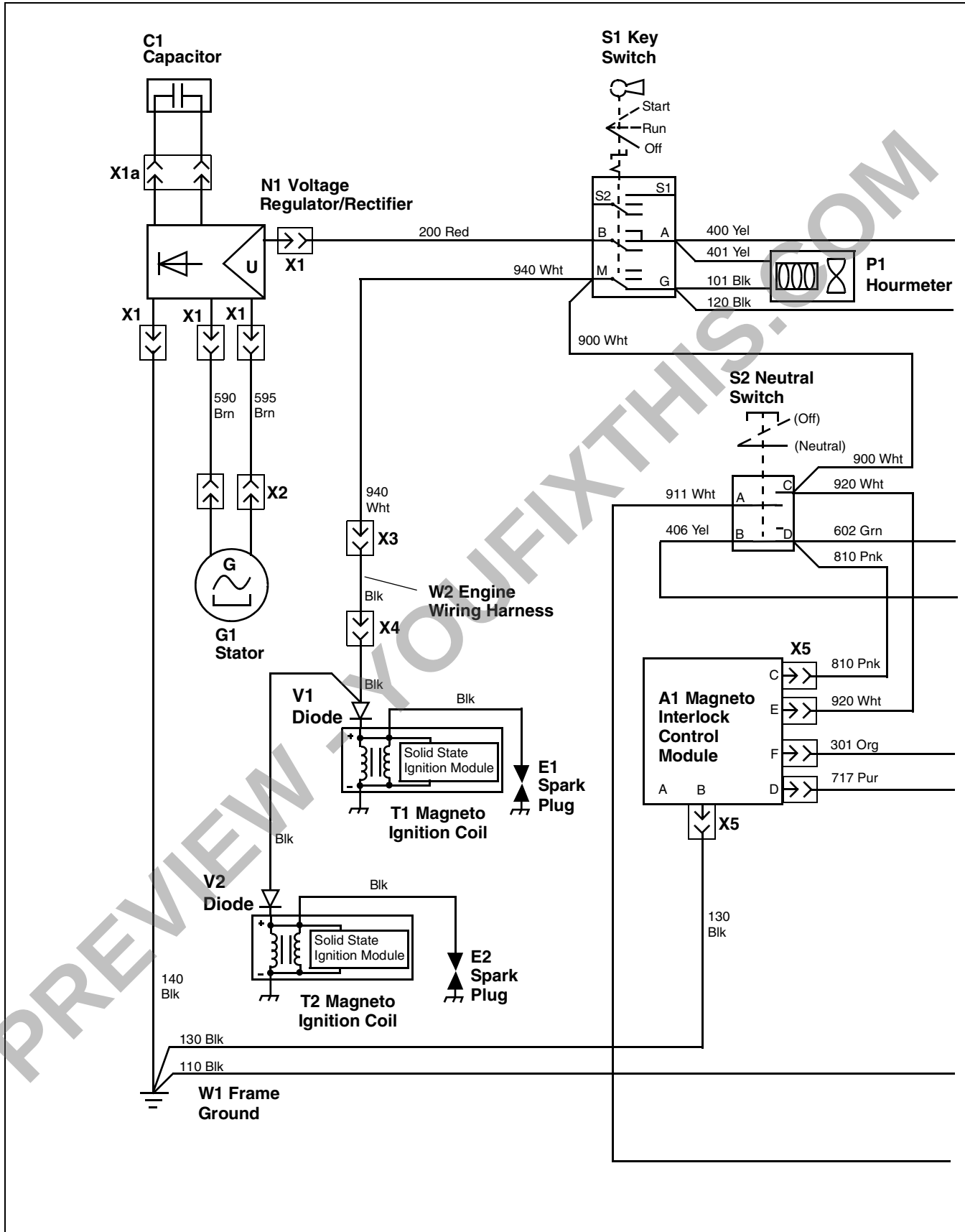
a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.

"Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.

Reference: JDS - G200.

ELECTRICAL SCHEMATICS AND HARNESSSES

Main Electrical Schematic

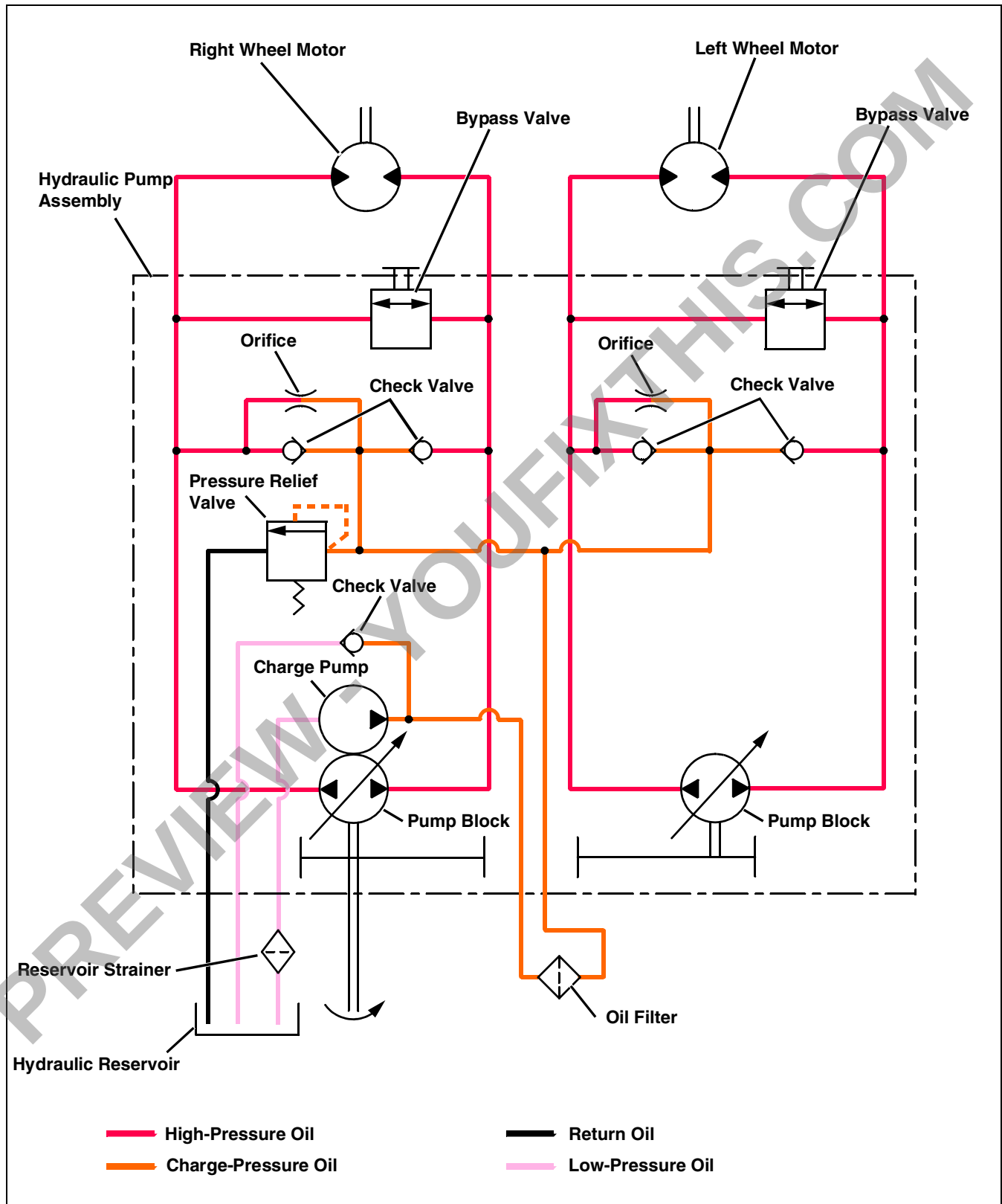


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POWER TRAIN - HYDRAULIC SCHEMATICS

Schematics

Hydraulic Schematic



ENGINE - GAS TESTS AND ADJUSTMENTS

9. Move throttle to SLOW idle and turn engine OFF.
10. Remove rubber plug and install dipstick.

Specification:

Crankcase Vacuum at fast idle

..... 1.27 - 25.4 cm (0.5 - 10 in.) of water

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

Results:

- If crankcase vacuum is BELOW specifications, check the following:
 - Breather reed valve clearance and condition.
 - Seals and gaskets for leakage.
 - Fuel pump vacuum hose leakage.
 - Rocker arm cover O-ring for leakage.
 - Rings, piston, and cylinder bore for wear or damage.

Engine Oil Pressure Test

Reason:

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

Test Equipment:

- JT03344 Pressure Gauge Assembly
- JT03017 Hose Assembly
- JT03349 Connector

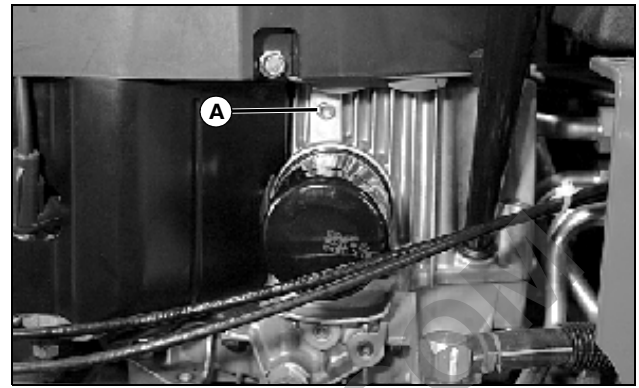
Procedure:

1. Park machine safely. See "Park Machine Safely" on page 2 of the SAFETY section.
2. Turn key switch OFF. Allow engine to cool.



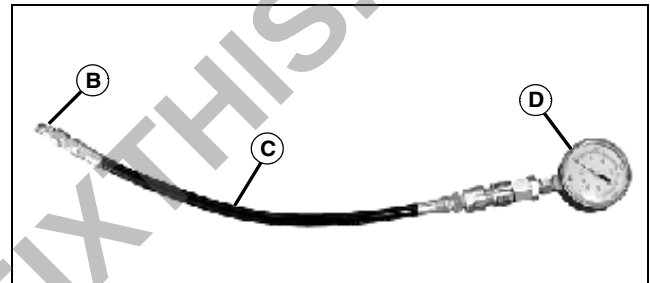
CAUTION: Avoid Injury! Engine components are HOT. Be careful not to touch, especially the exhaust pipe or muffler while making adjustments. Wear protective eye glasses and clothing.

3. Check engine oil level, bring level to full mark.



MX32452

4. Remove plug (A) above oil filter.



MX32453

5. Install JT03349 Connector (B) into hole where plug was removed.
6. Connect JT03017 Hose Assembly (C) and JT03344 Pressure Gauge Assembly (D).
7. Monitor oil pressure while cranking engine. If no oil pressure is present, discontinue cranking engine. Determine and correct cause before running engine.

IMPORTANT: Avoid damage! If pressure reading is below 69 kPa (10 psi), STOP ENGINE IMMEDIATELY and determine cause.

8. Start and run engine at MEDIUM idle for five minutes to heat engine oil to normal operating temperature.
9. Run engine at fast idle and check oil pressure. Gauge should read within specifications.

Results:

If oil pressure is BELOW specifications, inspect or replace the following:

- Oil pressure relief valve for broken or worn spring.
- Oil pressure relief valve for stuck or damaged valve.
- Worn or damaged oil pump.
- Oil pump suction screen or oil passages plugged.
- Excessive wear of connecting rod and main bearing journals.
- Oil filter plugged.

SPECIFICATIONS & INFORMATION FASTENER TORQUES

Inch Fastener Torque Values

SAE Grade and Head Markings	1 or 2 ^b No Marks 	5  5.1  5.2 	8  8.2 
SAE Grade and Nut Markings	2 No Marks 	5  	8  

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

DO NOT use these hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a $\pm 10\%$ variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

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

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

head.

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

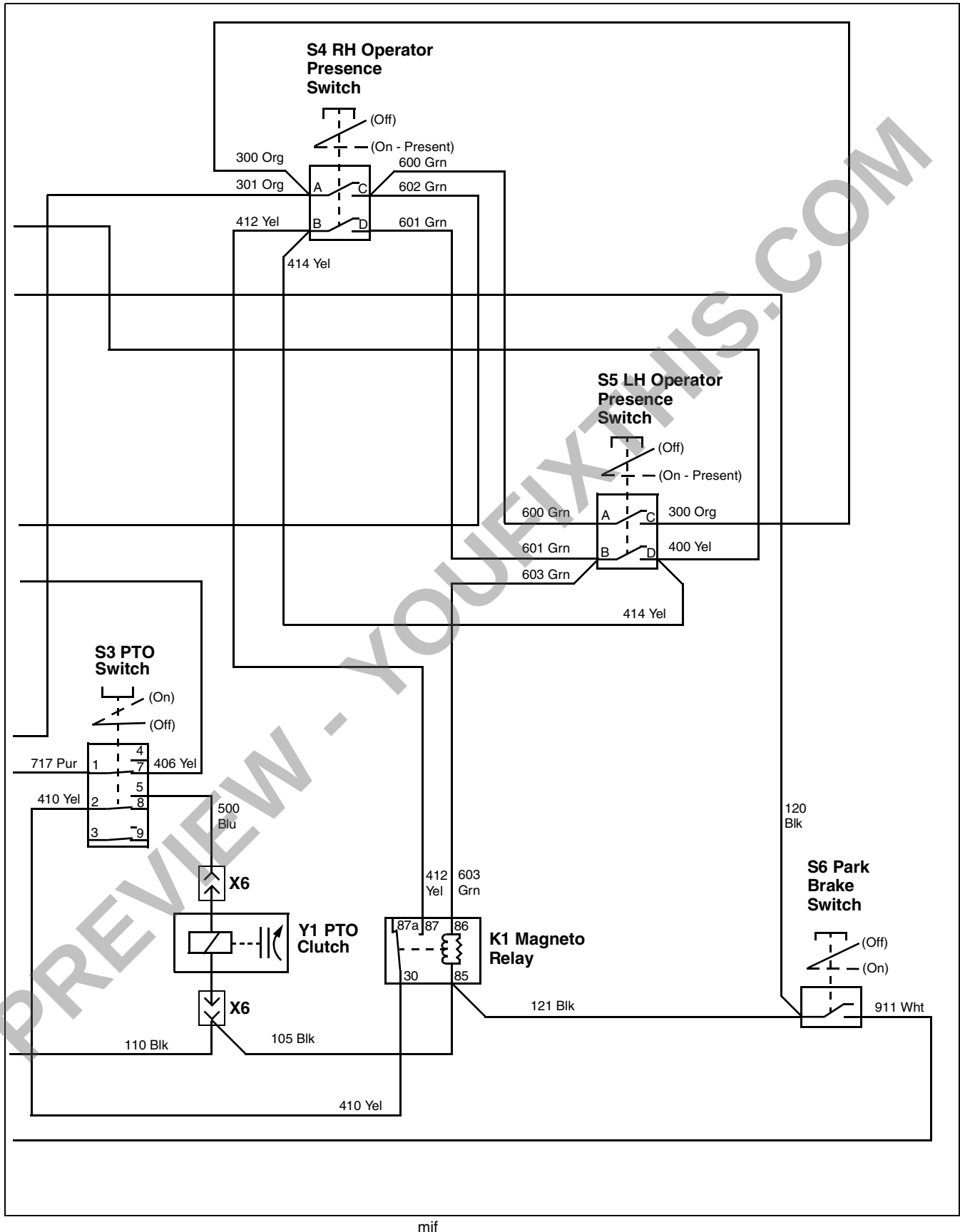
a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.

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

Reference: JDS - G200

ELECTRICAL SCHEMATICS AND HARNESSSES

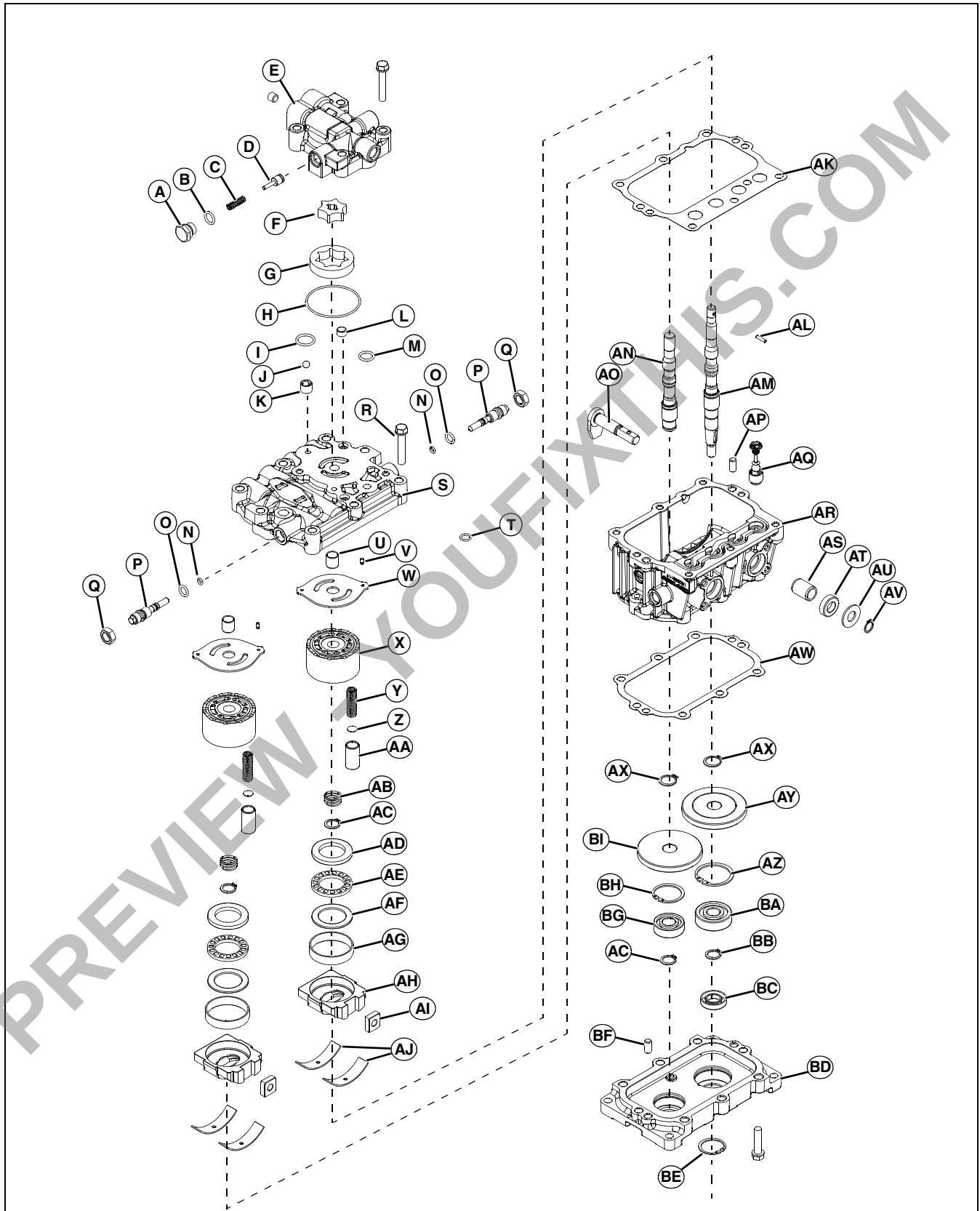
Main Electrical Schematic 2 of 2



POWER TRAIN - HYDRAULIC REPAIR

Disassemble and Inspect Hydrostatic Pump

Hydrostatic Pump Components



ENGINE - GAS TESTS AND ADJUSTMENTS

Specifications:

Oil Pressure

Minimum 69 kPa (10 psi)

Fast Idle 241 - 310 kPa (35 - 45 psi)

Fuel Pump Test

Reason:

To check condition of fuel pump and determine fuel pressure.

Test Equipment:

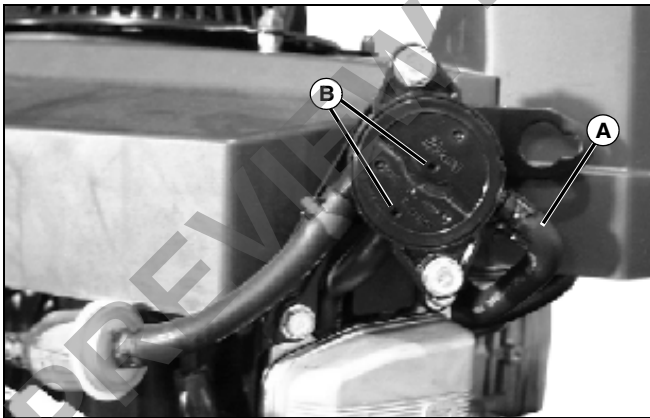
- JDG356 Pressure Gauge
- Graduated Container

Procedure:

1. Park machine safely. See "Park Machine Safely" on page 2 of the SAFETY section.
2. Start and run engine at slow idle for one minute to fill carburetor with fuel.
3. Stop the engine.



CAUTION: Avoid Injury! Gasoline is extremely flammable. DO NOT SMOKE. Always work in a well ventilated area away from open flame or spark producing equipment; this includes equipment that utilizes pilot lights.



MX32318

4. Disconnect fuel pump outlet hose (A) and connect JDG356 Pressure Gauge to fuel pump outlet.
5. Start and run engine at fast idle for 15 seconds, then record pressure reading. Gauge should read a minimum pressure of 6.12 kPa (0.9 psi).
6. Stop engine.

7. Remove pressure gauge from fuel pump outlet and connect a length of hose long enough to reach into a graduated container.

8. Start and run engine at fast idle for 15 seconds, then stop the engine and record container measurement. Minimum flow is 60 ml/15 seconds (2.0 oz/15 seconds).

Results:

If fuel pump pressure or flow does not meet the specifications, check the following:

- Fuel lines, filter and fuel tank cap for restrictions.
- Check crankcase vacuum.
- Check vent holes (B) for plugging or clogging.
- Replace fuel pump.

Specifications:

Minimum Fuel Pressure 2.45 kPa (0.36 psi)

Minimum Fuel Flow 60 mL/15 seconds (2.0 oz/15 seconds)

Spark Test

Reason:

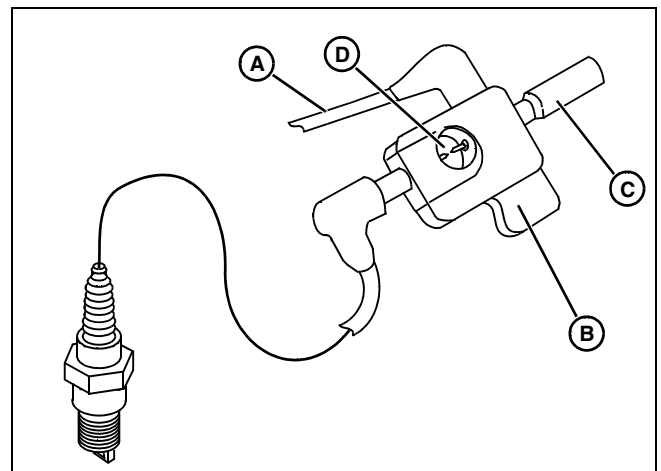
Check overall condition of ignition system.

Test Equipment:

- D-05351ST Spark Tester

Procedure:

1. Park machine safely. See "Park Machine Safely" on page 2 of the SAFETY section.
2. Turn key switch OFF.



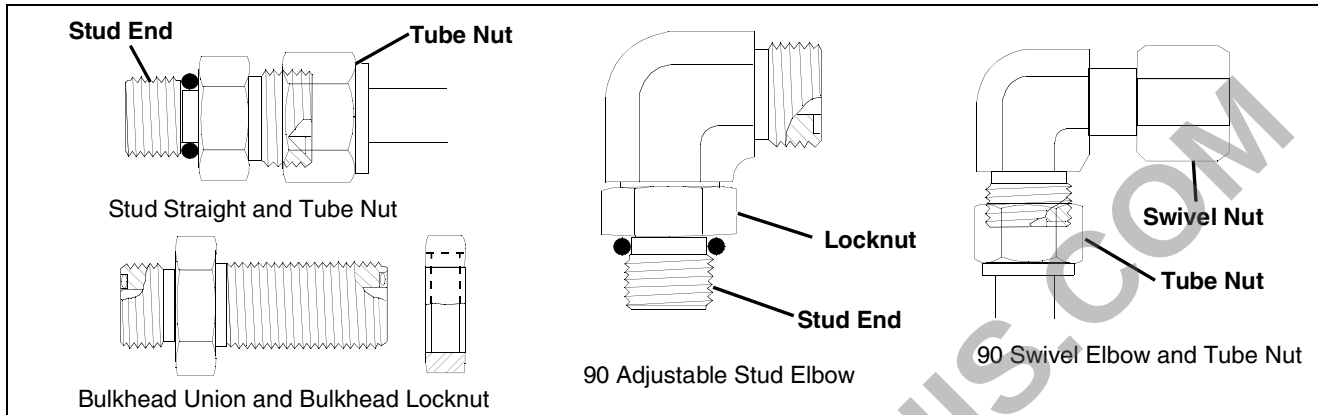
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3. Remove high tension lead (A) from spark plug.
4. Connect D-05351ST Spark Tester (B) to spark plug.

SPECIFICATIONS & INFORMATION O-RING SEAL SERVICE

O-Ring Seal Service Recommendations

Face Seal Fittings With Inch Stud Ends Torque



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

NOTE: Torque tolerance is +15%, -20%

ENGINE - GAS TESTS AND ADJUSTMENTS

5. Connect high tension lead to Spark Tester.

IMPORTANT: Avoid damage! Do not adjust spark tester gap beyond 5.0 mm (0.200 in.) (5 turns), as damage to ignition components could occur.

6. Adjust spark tester gap to 4.2 mm (0.166 in.) (4 turns) with screw (C).
7. Move key switch to RUN position.
8. Spin engine with starter and watch spark (D) at spark tester. If engine will start, watch spark with engine running. A steady, strong, blue spark should be observed.

Results:

- If spark is weak, or no spark is present, install a new spark plug and repeat test.
- If spark is still weak, or no spark is present, run tests on individual components to find the cause of the malfunction.

Spark Plug Gap Adjustment

Equipment:

- Feeler Gauge, or
- Wire Gauge

Procedure:

1. Park machine safely. See "Park Machine Safely" on page 2 of the SAFETY section.



CAUTION: Avoid Injury! Engine components are HOT. Be careful not to touch, especially the exhaust pipe or muffler while making adjustments. Wear protective eye glasses and clothing.

2. Remove spark plug.

IMPORTANT: Avoid damage! Do not clean spark plug with sand paper or abrasives. Engine scoring can result.

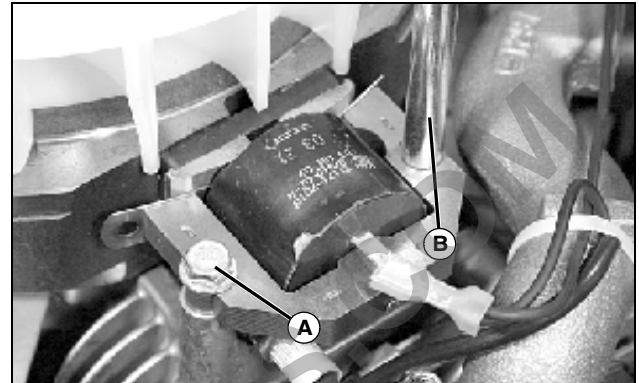
3. Clean deposits from spark plug.
4. Inspect spark plug for:
 - Cracked porcelain
 - Pitted or damaged electrodes
5. Check spark plug gap using a feeler or wire gauge.
6. Install and tighten spark plug to specification.

Specifications:

Spark Plug Gap 0.75 mm (0.030 in.)

Spark Plug Torque 22 N•m (195 lb-in.)

Ignition Coil Air Gap Adjustment



MX32450

1. Center flywheel magnet under armature.
2. Insert a 0.30 mm (0.012 in.) feeler gauge between flywheel and armature.
- NOTE: Feeler gauge may have to be removed from holder, as shown, to allow proper positioning.**
3. Push armature against flywheel and tighten cap screw (A) and stud (B) to specification.
4. Turn flywheel to remove feeler gauge.

Specifications:

Ignition Coil Air Gap 0.30 mm (0.012 in.)

Ignition Coil Studs 7.8 N•m (69 lb-in.)

Ignition Cap Screws 5.9 N•m (52 lb-in.)

INTRODUCTION

Manual Description

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

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

- Table of Contents
- Specifications and Information
- Identification Numbers
- Tools and Materials
- Component Location
- Schematics and Harnesses
- Theory of Operation
- Operation and Diagnostics
- Diagnostics
- Tests and Adjustments
- Repair
- Other

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

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

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

Safety

Specifications and Information

Engine

Electrical

Hydraulics

Attachments

Miscellaneous

All information, illustrations and specifications in this manual are based on the latest information at the time of publication. The right is reserved to make changes at any time without notice.

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Consumer Equipment Division

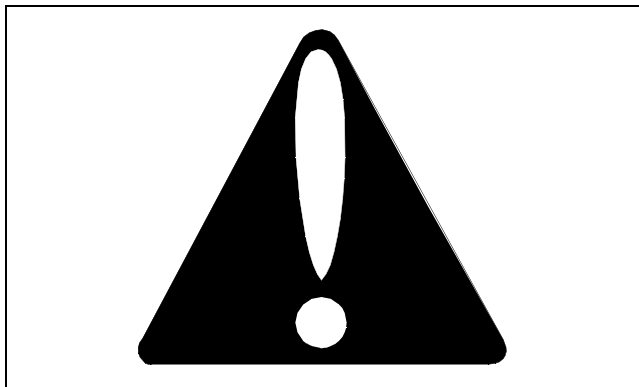
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SAFETY

Recognize Safety Information



MIF

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

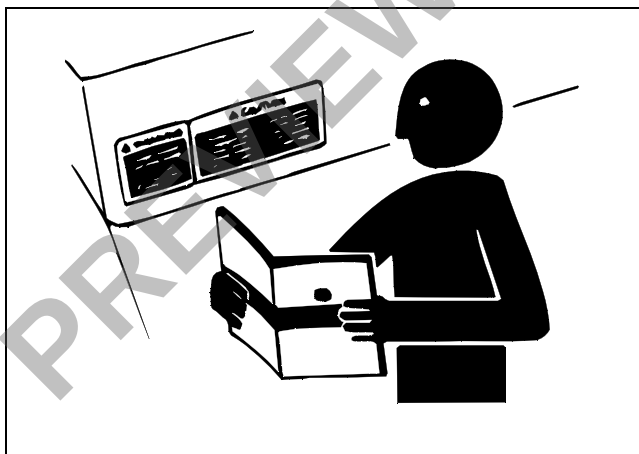
Follow recommended precautions and safe servicing practices.

Understand Signal Words

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

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

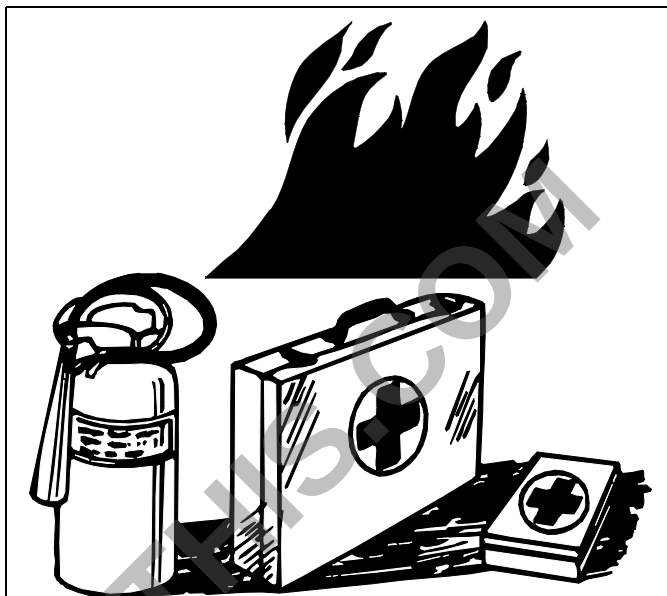
Replace Safety Signs



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

Be Prepared For Emergencies



Handle fluids safely - Avoid fires

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.

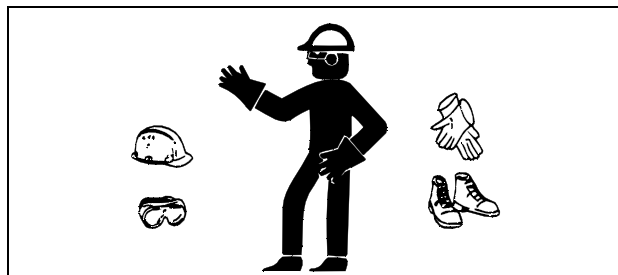
Do not store oily rags; they can ignite and burn spontaneously.

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.

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

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