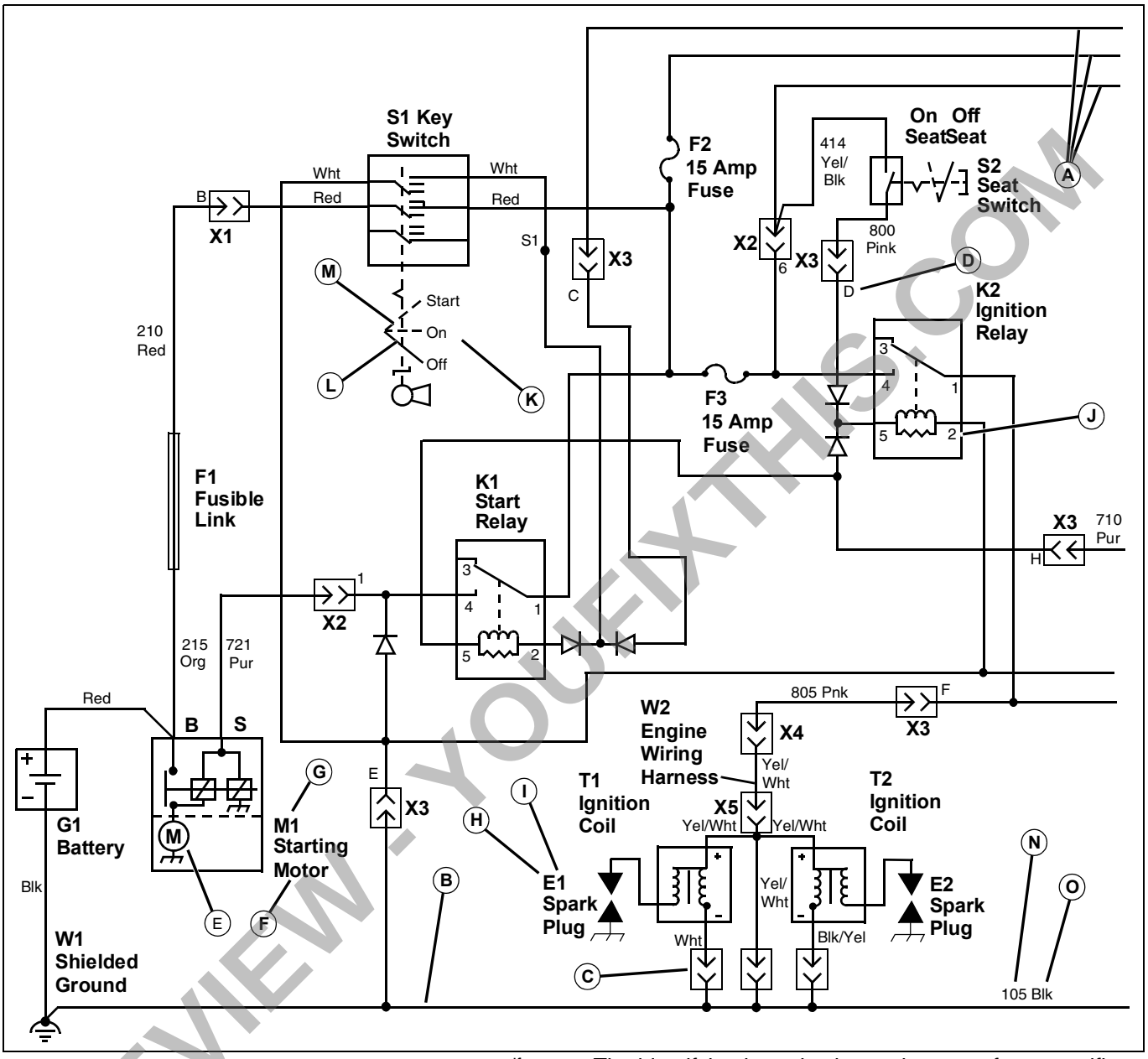
General Information

Reading Electrical Schematics



mif

The schematic is made up of individual circuits laid out in a sequence of related functions. It is formatted with all power wires (A) across the top and all ground wires (B) across the bottom. Current flow is generally from top to bottom through each circuit and component. All components are shown in the off position. The diagram does not list connector (C) information unless needed to avoid confusion. If the connector is shown, the number next to it is the terminal pin location (D) in the connector.

Each component is shown by a symbol (E), its name (F), and an identification code (G). The identification code contains a device identifying letter (H) and number (I).

The identifying letter is always the same for a specific component, but the identifying numbers are numbered consecutively from upper left to lower right. The terminal designation (J) is placed directly inside or outside the symbol next to the connecting wire path. Switch positions (K) are also placed directly inside or outside the symbol. The solid line (L) shows the position the switch is currently in and dash lines (M) represent other switch positions.

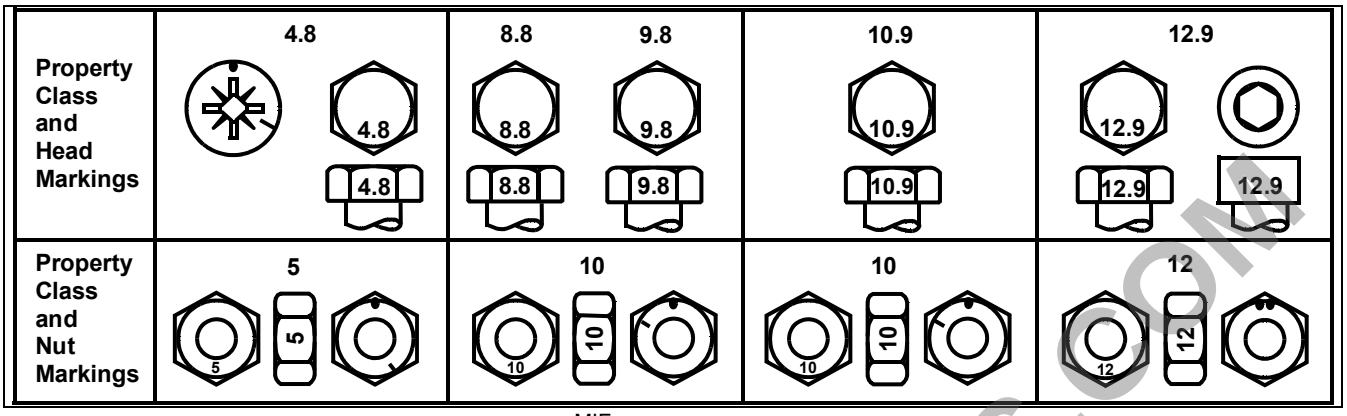
The circuit number (N) and wire color (O) of the wires are shown directly next to the wire path.

The same component name and identification code are used consistently on all diagrams in this section. Components can be easily cross-referenced.

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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

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

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Slow Idle Carburetor Adjustment

Reason:

To set the carburetor mixture screw for proper operation of the carburetor.

Equipment:

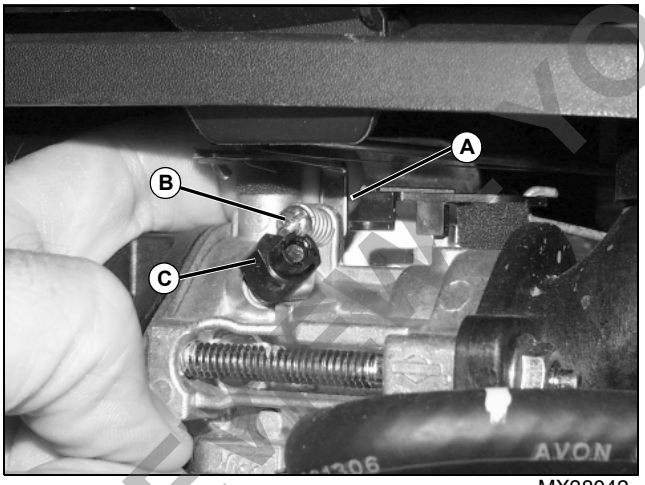
- JT07270 Pulse Tachometer, or
- JT05719 Digital Tachometer

Important: Avoid Damage! To obtain correct adjustment, the procedure must be performed in the sequence shown.

Procedure:

Important: Avoid Damage! When servicing engine (with engine running), remove hood to avoid damage from muffler exhaust heat.

1. Remove hood assembly. “Hood Removal and Installation” on page 263 in the Miscellaneous section.
2. Start engine. Run at 1/2 throttle for 5 minutes to bring engine to operating temperature.
3. Move throttle to SLOW.



MX38042

4. Hold throttle closed so that tab (A) is against idle speed screw (B). Turn idle speed screw (B) to obtain 1750 rpm.
5. Adjust idle mixture screw (C) slowly until best idle is obtained.
6. Check rpms and re adjust if necessary.

Specification:

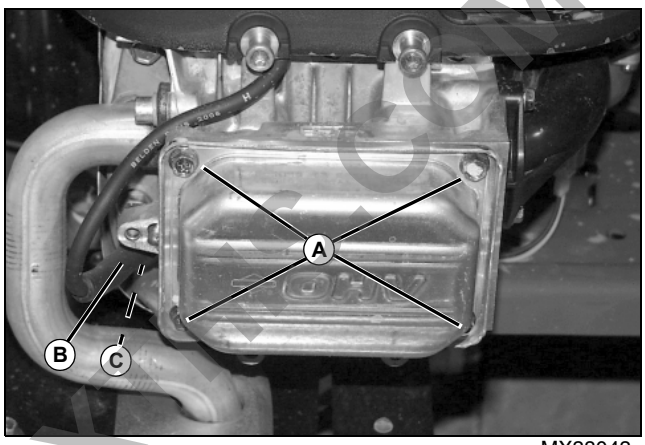
Carburetor Slow Idle Speed. . . . . .1750 ± 50 rpm

Valve Clearance Adjustment

Note: Correct position of crankshaft is necessary to eliminate interference by the compression release mechanism when adjusting valve clearance.

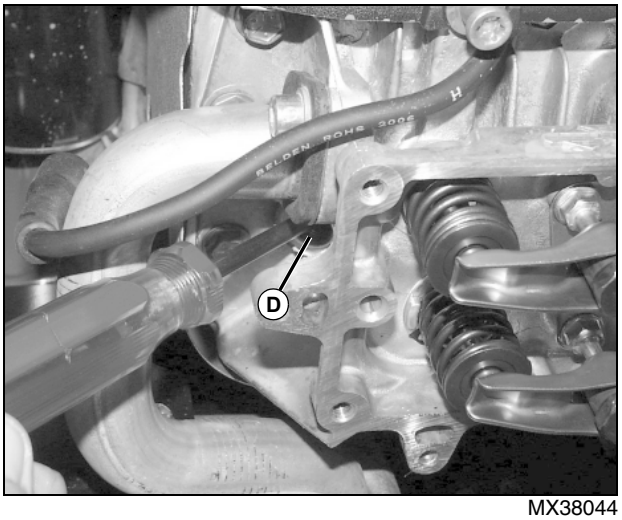
Procedure:

1. Park machine safely and allow engine to cool.



MX38043

2. Remove four bolts and valve cover (A).
3. Disconnect spark plug wire (B) and remove spark plug (C).
4. Place thumb or finger over spark plug hole and turn crankshaft (clockwise viewed from top, counter clockwise viewed from bottom) until air pressure is felt in spark plug hole (engine is on compression stroke).



MX38044

5. Insert a screwdriver through the spark plug opening (D). Slowly continue to turn the crankshaft until the piston has pushed the screwdriver to the top of it’s stroke and has started to move down again approximately **6.35 mm (0.25 in.)**.

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Other Materials

Other Material

Part No.	Part Name	Part Use
TY24416	Multipurpose Lithium Grease	Apply to engine crankshaft. Pack oil seals.
	SCOTCH-BRIGHT™ Abrasive Sheets/ Pads	Clean cylinder head.
	Valve Guide Cleaner	Clean valve guides.
	Stanisol or Kerosene	Finish ream valve guide.
	Prussian Blue Compound	Check valve seat contact.
	Zinc Oxide/Wood Alcohol	Check block for cracks.
	Mineral Spirits	Clean electric starter armature.

Diagnostics

Starting Problems

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 and Adjustments for further guidance.

Symptom: Engine Will Not Crank

Problem	Cause - Solution
1. Battery	a. Charge and test battery. See “Battery Voltage and Specific Gravity Tests” on page 165 in the Electrical section.
	b. Replace the battery if it will not take or hold a charge.
2. Starting Motor Solenoid does not click when ignition switch is turned to start position.	a. Cranking circuit problem. See “Cranking Circuit Diagnosis - All Models” on page 141 in the Electrical section.
	b. Key switch malfunction. See “Key Switch Test” on page 173 in the Electrical section.
	c. Starting motor solenoid malfunction. See “Starting Solenoid Test - All Models” on page 167 in the Electrical section.

Caution: Avoid Injury! Do not rotate engine with starter if the spark plug is removed. Gasoline spray from the open cylinder may be ignited by ignition spark and cause an explosion or fire.

Note: Perform a visual inspection first to determine if battery cables are tight and not corroded. The battery must be sufficient size to turn the engine over at minimum cranking speed of 350 rpm.

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Specifications

General Specifications

Specifications:

Make	Briggs & Stratton
Series	Intek
Type	Gasoline
Stroke/Cycle	4
Models	31P707
Cylinders	1
Valves	Overhead Valves
Displacement	502 cm^3 (30.63 cu in.)
Bore	90.68 mm (3.57 in.)
Stroke	77.72 mm (3.06 in.)
Cooling System	Air Cooled
Lubrication 31P707 engine	Oil Slinger
Crankcase Oil Capacity	1.4 L (1.5 qt)
Air Cleaner	Paper with outer foam element
Muffler	Horizontal discharge below frame
Fuel Filter	Replaceable (In-Line Type)
Aspiration	Normal
Alternator	9 amp regulated

Tests and Adjustments Specifications

Valve Clearance:

Slow Idle (governed)	1750 rpm
Fast Idle	3350 ± 100 rpm
Spark Plug Gap	0.76 mm (0.030 in.)
Spark Plug Torque	20 N•m (180 lb-in.)
Valve Clearance - Intake	0.08 - 0.13 mm (0.003 - 0.005 in.)
Valve Clearance - Exhaust	0.13 - 0.18 mm (0.005 - 0.007 in.)
Valve Guide Depth	0.12 - 0.15 mm (0.005 - 0.006 in.)
Magneto Air Gap	0.25 - 0.35 mm (0.010 - 0.014 in.)

Repair Specifications

Cylinder Bore, Pistons and Rings:

Cylinder Bore Maximum Dimension	90.51 mm (3.563 in.)
Cylinder Bore Minimum Dimension	90.47 mm (3.562 in.)
Cylinder Bore Out of Round (maximum)	0.04 mm (0.002 in.)
Piston Pin (Wear Limit	20.29 mm (0.799 in.)
Piston Pin Bore (Wear Limit)	20.35 mm (0.801 in.)

Ring End Gap (Wear Limit) Case Iron Bore:

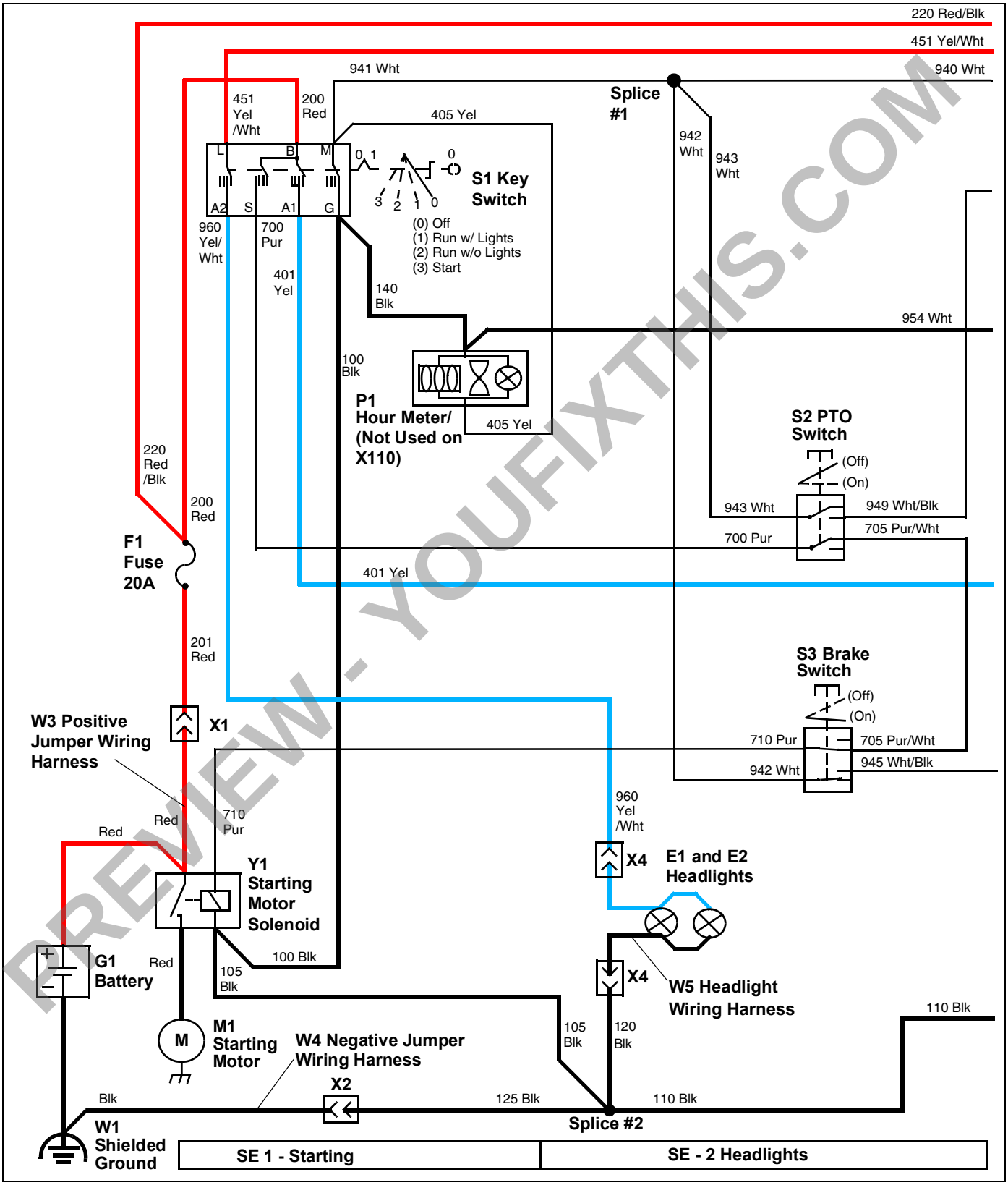
Compression Ring (Top)	0.64 mm (0.025 in.)
Compression Ring (Center)	0.76 mm (0.030 in.)

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Schematics and Harnesses

Main Wiring Schematic X110 and X120



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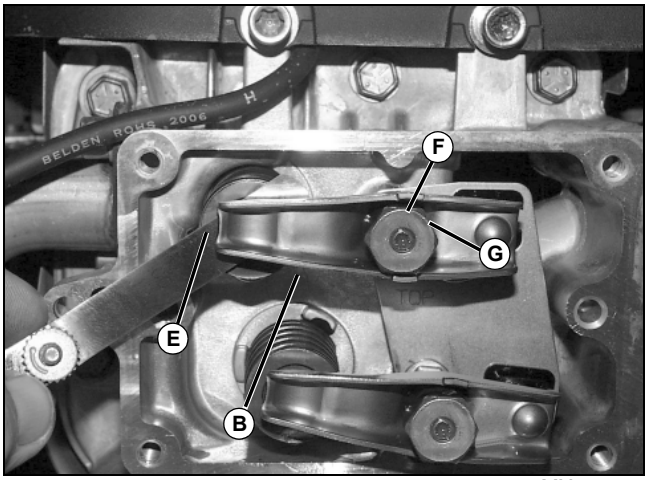
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Metric Fastener Torque Value - Grade 7

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

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MX38045

6. Check valve clearance with a feeler gauge (E) between valve stem and rocker arm. Valve clearance should be **0.08 - 0.13 mm (0.003 - 0.005 in.)** for the intake (bottom) valve, and **0.13 - 0.18 mm (0.005 - 0.007 in.)** for the exhaust (top) valve.

7. If not within specification, adjust as necessary by loosening set screw (F) and adjusting nut (G) until slight drag is felt on feeler gauge. Hold nut with wrench and tighten set screw to **7 N•m (60 lb-in.)**.

8. Recheck clearance and make adjustments if necessary.

9. Install spark plug. Torque to **20 N•m (180 lb-in.)**.

10.Install valve cover with new gasket. Torque screws to **7 N•m (60 lb - in.)**.

Specifications:

Lock Nut . . . . . 7 N•m (60 lb - in.)
Valve Clearance
Intake . . . . . 0.08 - 0.13 mm (0.003 - 0.005 in.)
Exhaust . . . . . 0.13 - 0.18 mm (0.005 - 0.007 in.)
Valve Cover Cap Screws . . . . . 7 N•m (60 lb - in.)
Spark Plug Torque . . . . . 20 N•m (180 lb - in.)

Armature Air Gap Adjustment

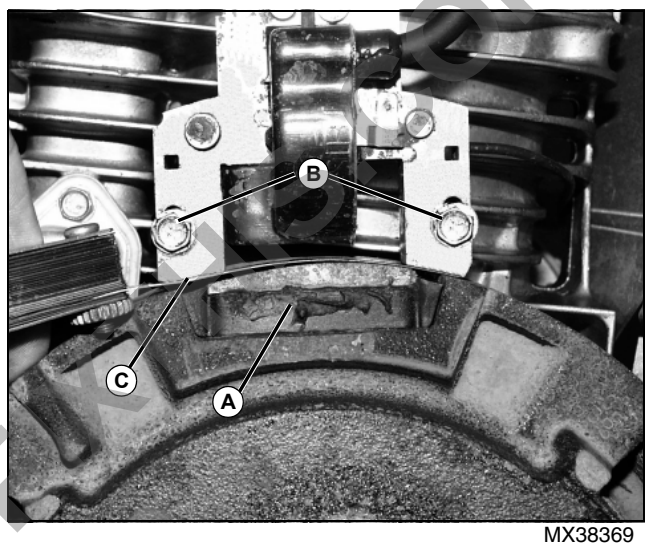
Reason:

To set the ignition air gap for proper operation.

Equipment:

- 0.30 mm (0.012 in.) Thickness Gauge

Procedure:



MX38369

1. Remove blower housing.

2. Rotate flywheel until magnet (A) is away from armature.

3. Loosen the armature mounting screws (B). Slide armature away from flywheel as far as possible.

4. Tighten one screw enough to hold the armature in place.

5. Rotate flywheel until magnet is directly under armature.

6. Place a **0.30 mm (0.012 in.)** thickness gauge (C) between armature and magnet.

7. Loosen the mounting screw so magnet will pull armature against thickness gauge.

8. Tighten both mounting screws (B) to specification.

9. Rotate flywheel while pulling thickness gauge out from between the armature and the magnet.

Specification:

Armature Air Gap . . . . . 0.25 - 0.35 mm (0.010 - 0.014 in.)
Armature Mounting Screws . . . . . 2.8 N•m (25 lb-in.)

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Symptom: Engine Cranks But Will Not Start

Problem	Cause - Solution
1. Engine cranks slowly.	a. Charge and test battery. See “Battery Voltage and Specific Gravity Tests” on page 165 in the Electrical section.
	b. Replace the battery if it will not hold a charge.
2. Poor or no spark at spark plug.	a. Replace spark plug,
	b. Ignition coil gap incorrect. See “Armature Air Gap Adjustment” on page 27.
	c. Magneto shorted to ground, flywheel magnet weak.
3. Choke or throttle not adjusted properly.	a. Adjust cable. See “Throttle/ Choke Cable Adjustment” on page 23.
4. Fuel supply.	a. Check air cleaner, fuel mixture, possible contaminated fuel, or stuck float needle.
	b. Check fuel shutoff valve, fuel lines, fuel pump, and engine vacuum.
5. Fuel shutoff solenoid does not open when ignition switch is turned to start/run.	a. Check fuel solenoid and ignition circuit. See “Ignition and Shutoff Circuit Diagnosis - All Models” on page 146 and “Fuel Shutoff Solenoid Test” on page 177 in the Electrical section.
6. Valve clearance improperly.	a. Check and adjust valve clearance. See “Valve Clearance Adjustment” on page 26.
7. Internal components binding.	a. Remove spark plug and turn the engine over by hand. If the engine is hard to turn over by hand repair or replace engine.

Tests and Adjustments

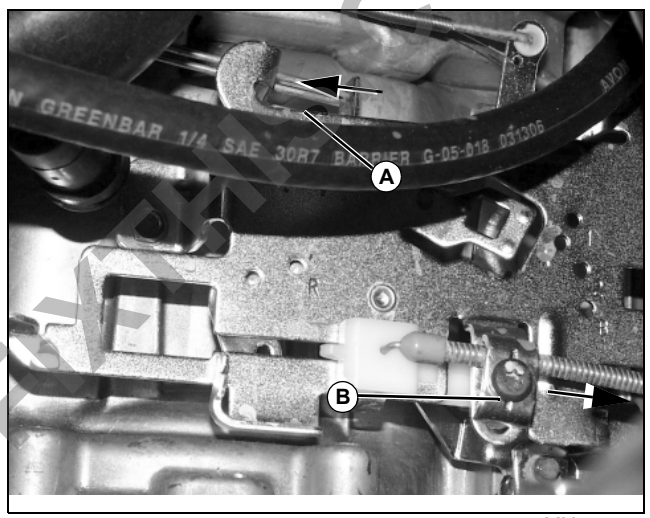
Throttle/Choke Cable Adjustment

Reason:

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

Procedure:

1. Move throttle lever all the way forward to Start (Choke) position.



MX38035

2. Locate choke control rod (A) on right side of engine at top of throttle control plate.
3. With your fingers or a needle nose pliers, try and move choke rod (A) toward carburetor (top arrow).
4. If choke control rod moves toward carburetor, choke is not completely closing and throttle cable needs to be adjusted.
5. Loosen throttle cable clamp (B).
6. Slide the throttle cable as far as it will go to the right.
7. Tighten throttle cable clamp (B).

Fuel Shutoff Solenoid Test

Reason:

To test proper operation of fuel shutoff solenoid.

Required Tools:

- Two Jumper wires

Procedure:

1. Park machine safely.
2. Listen for an audible click when ignition switch is turned

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Oil Ring	0.76 mm (0.030 in.)
Compression and Oil Ring Groove Wear Limit (New Rings Installed)	0.15 mm (0.006 in.)

Valves:

Valve Guide (Wear Limit)	6.09 mm (0.240 in.)
Valve Seat Width	0.79 - 1.98 mm (0.031 - 0.078 in.)
Valve Margin (Minimum)	0.40 mm (0.016 in.)
Valve Face Angle	45°
Valve Seat Narrowing Angle	30°

Connecting Rod and Crankshaft:

Connecting Rod Crankpin (Wear Limit)	38.15 mm (1.502 in.)
Connecting Rod Piston Pin Bearing (Wear Limit)	20.37 mm (0.802 in.)
Crankshaft PTO Journal (Wear Limit)	41.20 mm (1.622 in.)
Crankshaft Magneto Journal (Wear Limit)	34.95 mm (1.376 in.)
Crankshaft Crankpin Journal (Wear Limit)	38.02 mm (1.497 in.)
Crankshaft Eccentric Journal (Wear Limit)	55.93 mm (2.202 in.)
PTO Bearing (Wear Limit)	41.37 mm (1.629 in.)
Magneto Bearing (Wear Limit)	35.13 mm (1.383 in.)
Crankshaft End Play	0.05 - 0.58 mm (0.002 - 0.023 in.)
Cam Gear PTO Journal (Wear Limit)	12.65 mm (0.498 in.)
Cam Gear Magneto Journal (Wear Limit)	12.65 mm (0.498 in.)
Cam Lobe (Wear Limit)	30.07 mm (1.184 in.)
Cam Gear Bearing (Wear Limit)	12.80 mm (0.504 in.)
Compression Release Lobe	0.25 mm (0.010 in.)

Counterweight:

Crankshaft Eccentric Journal (Wear Limit)	55.93 mm (2.202 in.)
Counterweight Link Bearing (Wear Limit)	56.13 mm (2.210 in.)

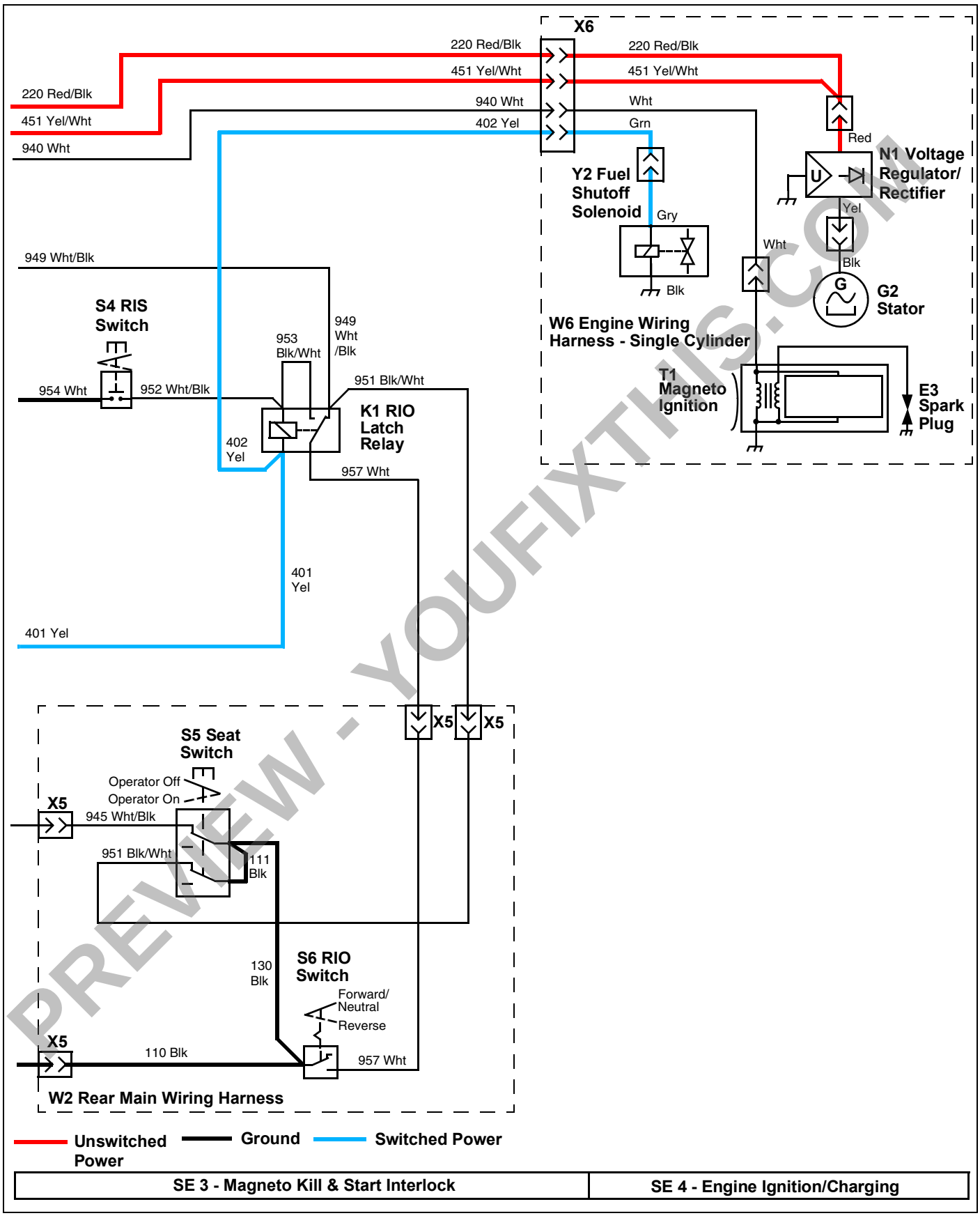
Torque Specifications (Alphabetical)

Specifications:

Armature Mounting Screws	2.8 N•m (25 lb-in.)
Blower Housing Screws	10 N•m (85 lb-in.)
Breather Mounting Bolts	3 N•m (25 lb-in.)
Carburetor to Intake Manifold	8 N•m (70 lb-in.)
Carburetor Bowl Screw	4.5 N•m (40 lb-in.)
Connecting Rod Cap Screws	21 N•m (186 lb-in.)
Control Bracket Screws	3.4 N•m (30 lb-in.)
Cylinder Head Cap Screws	25 N•m (220 lb-in.)
Drive Belt Idler Pulley	9.6 N•m (85 lb-in.)
Engine Mounting Bolts	32 N•m (24 lb-ft)
Engine Output Pulley Assembly	75 N•m (55 lb-ft)
Exhaust Manifold	18.5 N•m (165 lb-in.)
Flywheel Fan Screws	16 N•m (140 lb-in.)
Flywheel Nut	136 N•m (100 lb-ft)
Flywheel Screen Screws	4.5 N•m (40 lb-in.)
Fuel Pump Bracket	7.3 N•m (65 lb-in.)

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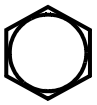
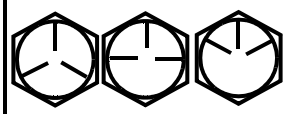
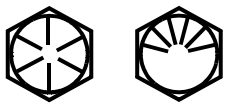
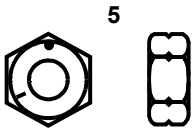
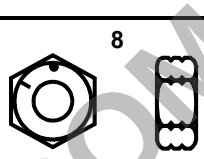


SE 3 - Magneto Kill & Start Interlock	SE 4 - Engine Ignition/Charging

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Inch Fastener Torque Values

SAE Grade and Head Markings	No Marks 		
SAE Grade and Nut Markings	No Marks 		

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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

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

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