Specifications

General Vehicle Specifications

NOTE: Specifications and design subject to change without notice.

Engine

Make	**Kohler**
Type	**OHV, vertical shaft, 4 cycle**
Model	**CV493T**
Aspiration	**Natural**
Cylinder	**One**
Compression Ratio	**8.5:1**
Speed, Fast Idle	**3600 ± 25 rpm**
Speed, Slow Idle	**1550 ± 25 rpm**
Operating Range	**1500 - 3600 rpm**
Displacement	**490 cc (29.9 cu. in.)**
Bore	**90 mm (3.60 in.)**
Stroke	**77 mm (3.03 in.)**
Cycle	**Four**
Ignition	**Solid state ignition**
Spark Plug Type	**M78543 (RC12YC)**
Cooling System	**Air cooled**
Oil Filter	**Standard single element**
Air Cleaner	**Dual-stage, dry, replaceable**
Governor	**Mechanical**
Weight (Approx.)	**41.9 kg (90 lb)**

Capacities

Crankcase Capacity with Oil Filter	**1.9 L (2.0 qt)**
Crankcase Capacity without Oil Filter	**1.6 L (1.7 qt)**
Fuel Tank Capacity	**19 L (5.0 gal)**

Dimensions

Overall Height	**1.04 m (41 in.)**
Overall Length	**2.01 m (79.2 in.)**
Overall Width (Chute Up)	**1.3 m (51 in.)**
Overall Width (Chute Down)	**1.6 m (62 in.)**
Machine Weight (with Deck)	**245 Kg (540 lb)**

Drive Train

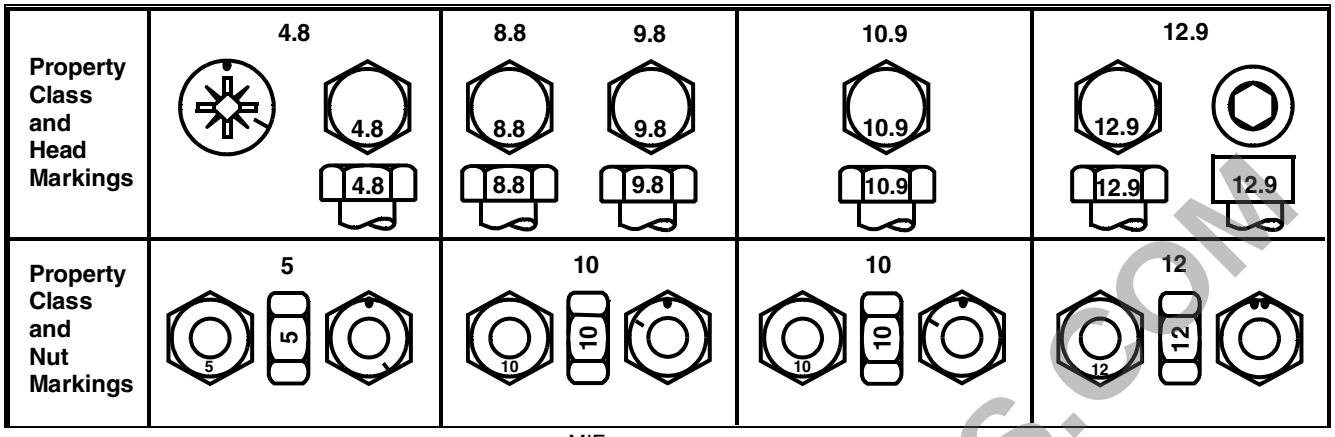
Transmission	**Dana, 5-speed with reverse**
Forward Gears	**Five**
Reverse Gears	**One**
Shift Mechanism	**Enclosed gear with keys**

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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
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 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.

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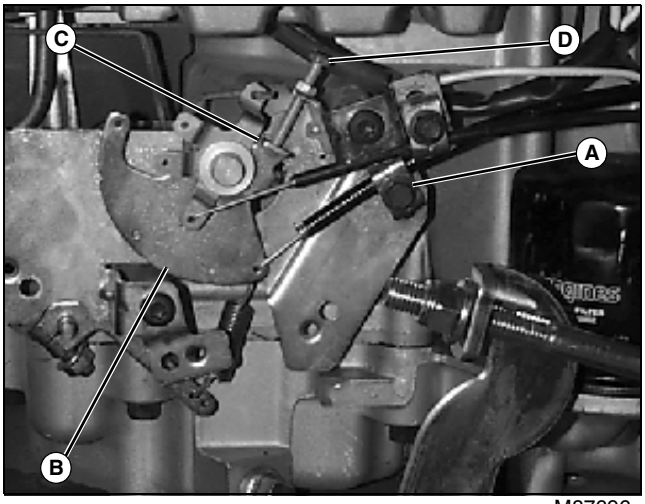
Tests and Adjustments

Throttle Cable Adjustment

Reason

To verify throttle cable moves throttle control lever through its full range of movement.

Procedure



M87696

1. Loosen cable clamp screw (A) on engine control plate.
2. Move throttle lever to FAST idle position. Then move throttle lever back 4.75 mm (0.187 in.).
3. Rotate throttle plate (B) counterclockwise, pulling cable through cable clamp, until it stops against high-speed idle screw (D). Tighten cable clamp screw (A)
4. Move throttle lever to the SLOW idle position, then to full speed. Make sure throttle lever stop (C) is held up against high-speed idle screw (D).
5. Set fast idle speed. (See “Fast Idle Speed Adjustment” on page 33.)

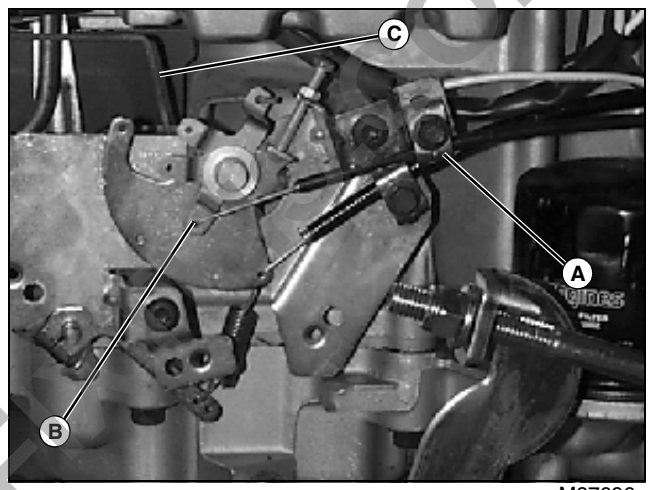
Choke Adjustment

Reason

To verify choke plate is fully closed when throttle lever is in full choke position. Correct adjustment also verifies choke is completely open at fast idle position.

Procedure

NOTE: Adjust throttle cable before adjusting choke.



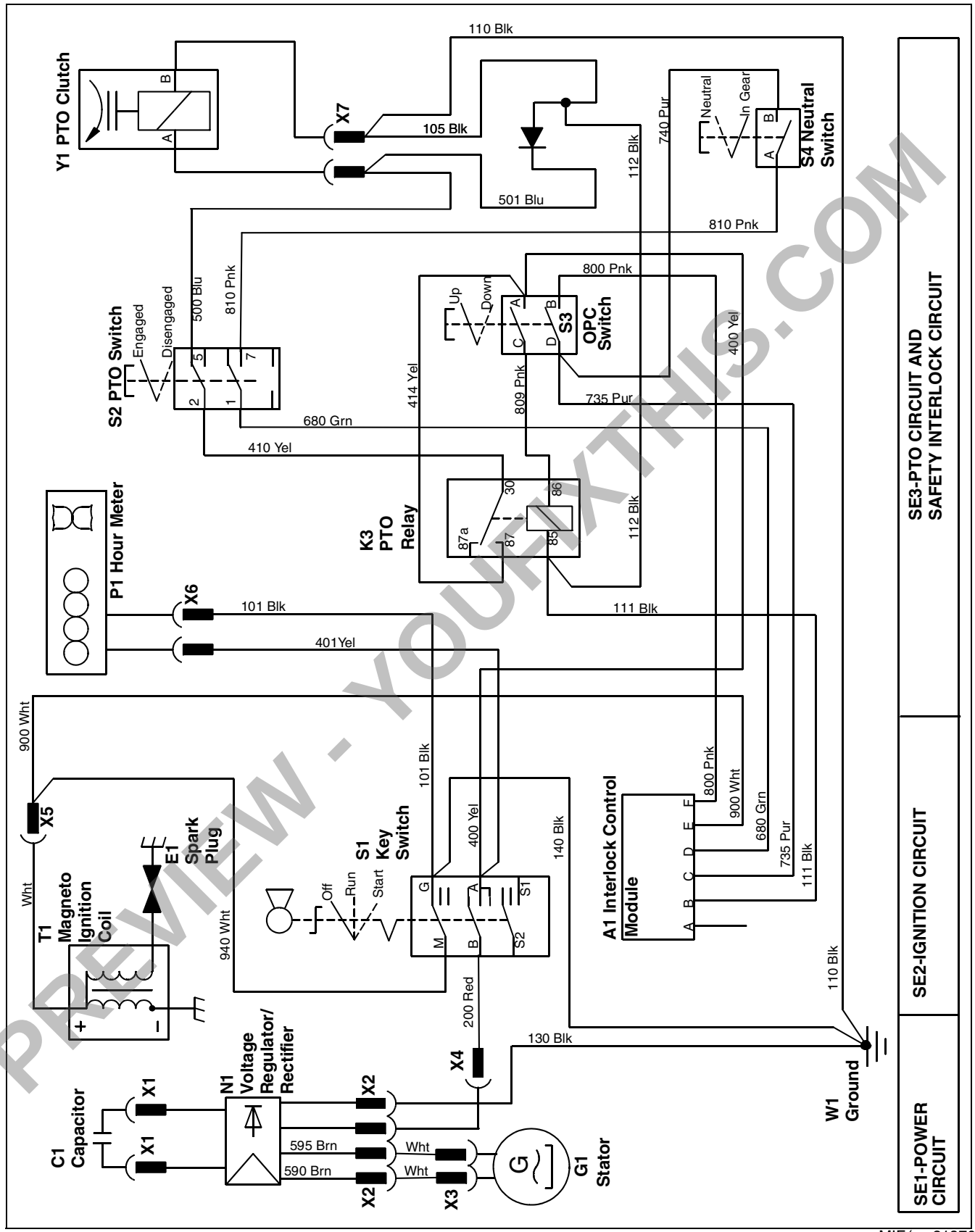
M87696

1. Loosen the cable clamp screw (A) on the engine control plate.
2. Pull out choke lever to CHOKE position then push the choke lever in 4.75 mm (0.187 in.).
3. Move choke plate (B) counterclockwise, pulling cable through cable clamp, as far as possible. Tighten cable clamp screw (A).
4. Try to move choke rod (C) 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 V-bend until the choke plate is fully closed.
5. Move choke lever through entire range while watching to make sure choke linkage is not binding.

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Main Electrical Schematic - Recoil Start



MIF.(mx21370)

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Diagnostics

Engine Diagnosis

Symptom: Engine Cranks But Will Not Start.

(1) Is choke adjusted properly?

Yes - Go to step (2).

No - Adjust choke. (See “Throttle Cable Adjustment” on page 32.)

(2) Is fuel in tank fresh, clean and of proper grade?

Yes - Go to step (3).

No - Replace fuel in tank and lines with fresh, clean fuel of proper grade.

(3) Remove spark plugs. Are the spark plug tips clear of any drops of fuel?

Yes - Go to step (4).

No - Possible incorrect use of choke. Clean spark plugs and set choke properly.

No - Check for plugged air cleaner.

No - Check float level for proper adjustment. (See “Float Level Adjustment” on page 50.)

(4) Does the ignition system produce a steady, strong blue spark? (See “Spark Test” on page 43.)

Yes - Go to step (5).

No - Check spark plug. (See “Spark Plug Gap Adjustment” on page 45.)

(5) Disconnect white wire at ignition coil terminal. Test wires for infinite resistance with key switch in RUN and START positions. Does meter show infinite resistance?

Yes - Go to step (6).

No - Repair short circuit as required.

(6) Does ignition coil test OK?

Yes - Go to step (7).

No - Test coil. (See “Ignition Coil Test” on page 142.) Replace ignition coil if necessary.

(7) Is air gap between ignition coil and flywheel adjusted properly?

Yes - Go to step (8).

No - Adjust air gap. (See “Ignition Coil Air Gap Adjustment” on page 44.)

Symptom: Engine Cranks But Will Not Start.

(8) Check flywheel for damage. Inspect magnetic pole plate, mounted on outer surface of flywheel. Is flywheel with magnetic pole plate in good condition?

Yes - Go to step (9).

No - Replace flywheel. (See “Flywheel Removal and Installation” on page 60.)

(9) Is fuel flow within specifications?

Yes - Go to step (10).

No - Replace fuel shutoff solenoid. (See “Fuel System Operation” on page 28.)

(10) Is carburetor clean and free of any build-up in fuel and air passages?

No - Clean carburetor as necessary. (See “Carburetor Removal and Installation” on page 47.)

Symptom: Engine Malfunctions at Low RPM

(1) Is governor linkage adjusted properly?

Yes - Go to step (2).

No - Adjust governor linkage. (See “Slow Idle Speed Adjustment” on page 34.)

(2) Is choke adjusted properly?

Yes - Go to step (3).

No - Adjust choke. (See “Throttle Cable Adjustment” on page 32.)

(3) Is slow idle speed adjusted properly?

Yes - Go to step (4).

No - Adjust slow idle speed. (See “Slow Idle Speed Adjustment” on page 34.)

(4) Does the ignition system produce a steady, strong blue spark?

Yes - Go to step (5).

No - Test spark plug. (See “Spark Test” on page 43.)

(5) Is engine operating at normal temperature - engine not overheating?

Yes - Go to step (6).

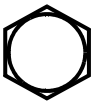
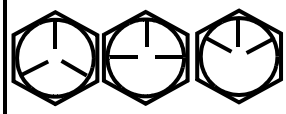
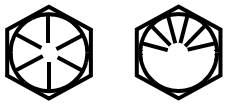
No - Engine load may be excessive. Reduce engine load.

No - Clean cooling intake screen, engine shrouding, and cooling fins.

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Inch Fastener Torque Values

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

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

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Cylinder Leakdown Test

Reason

To determine condition of piston, rings, cylinder wall, head flatness, gasket, or intake and exhaust valves.

Special or Required Tools

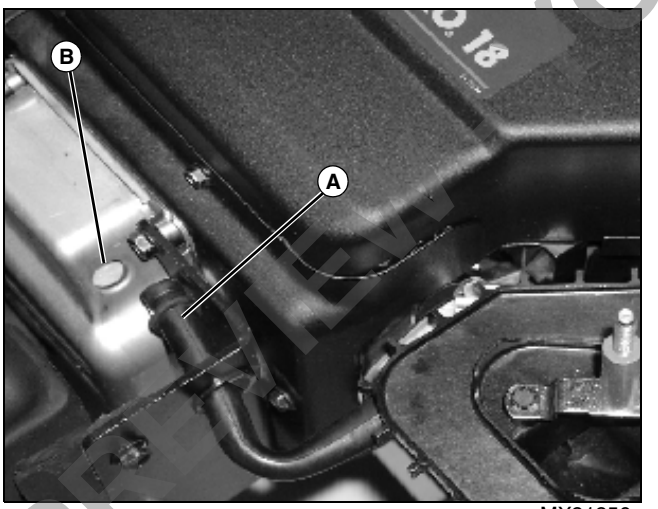
Tool Name	Tool No.	Tool Use
Cylinder Leakdown Test Kit	JT03502	Verify cylinder pressure
Ignition Test Plug	JT07285	Prevents damage to electronic ignition

Procedure

1. Park machine in a well-ventilated area and run engine at MEDIUM idle for five minutes to bring engine to operating temperature.

2. Turn key switch OFF.

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



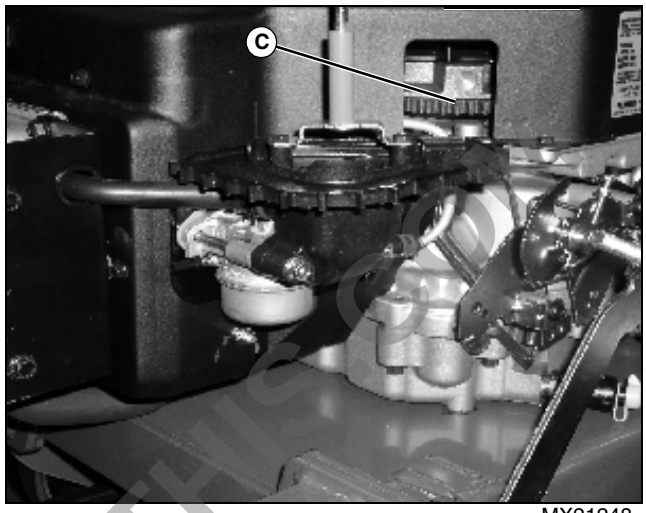
MX21256

3. Disconnect crankcase breather hose (A) from valve cover breather port (B) and remove air cleaner element from engine so you can listen for air leaks.

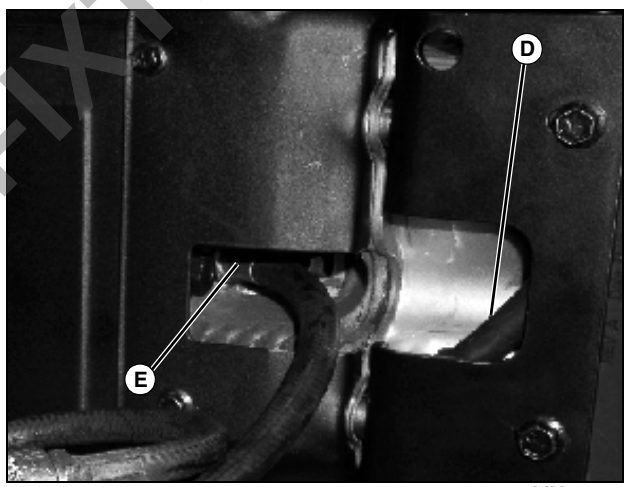
4. Use pull starter to turn flywheel and find approximate top dead center (TDC) of the compression stroke.

5. Remove spark plug and find actual TDC of the compression stroke.

NOTE: Once TDC is found, mark flywheel (C) with indelible marker or paint to identify tooth that lines up with engine post at TDC to make it easier to find.



MX21248



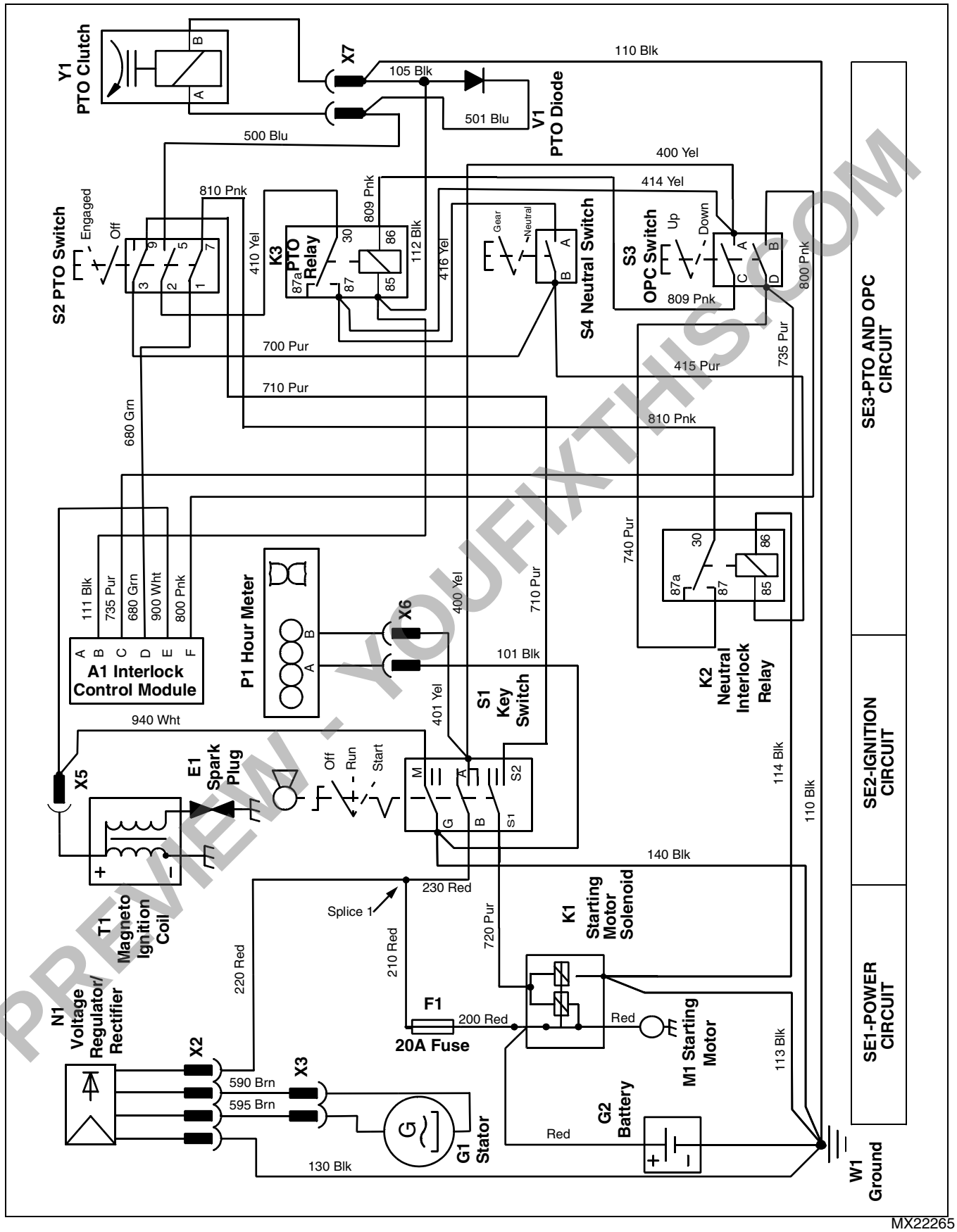
MX21249

6. Ground ignition high-tension lead using JT07285 Ignition Test Plug (D) to protect ignition system and install test kit adapter hose (E) into spark plug hole. Do not connect tester to hose at this time.

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Main Electrical Schematic - Electric Start



MX22265

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Symptom: Engine Malfunctions at Low RPM

(6) Are valves properly adjusted? (See "Valve Removal and Installation" on page 54.)

Yes - Go to step (7).

No - Adjust valve clearance. (See "Valve Removal and Installation" on page 54.)

(7) Are carburetor and intake manifold flanges properly sealed (no air leaks)?

Yes - Go to step (8).

No - Seal flanged surfaces as required. (See "Carburetor Removal and Installation" on page 47.)

(8) Is carburetor clean and free of any build-up in fuel and air passages?

Yes - Go to step (9).

No - Clean carburetor as necessary. (See "Clean and Inspect Carburetor" on page 49.)

(9) Is governor assembly in good condition with no binding?

No - Repair as necessary. (See "Governor Adjustment" on page 33.) (See "Camshaft" on page 19.)

Symptom: Engine Malfunctions at High RPM

(1) Is choke adjusted properly?

Yes - Go to step (2).

No - Adjust choke. (See "Choke Adjustment" on page 32.)

(2) Is governor spring in good condition?

Yes - Go to step (3).

No - Replace governor spring.

(3) Is fast idle speed adjusted properly?

Yes - Go to step (4).

No - Adjust fast idle speed. (See "Fast Idle Speed Adjustment" on page 33.)

(4) Does the ignition system produce a steady, strong blue spark?

Yes - Go to step (5).

No - Test spark plug. (See "Spark Test" on page 43.)

(5) Does ignition coil test OK?

Yes - Go to step (6).

No - Test coil. (See "Ignition Coil Test" on page 142.) Replace if necessary.

Symptom: Engine Malfunctions at High RPM

(6) Is engine coolant temperature within normal operating range (engine not overheating)?

Yes - Go to step (7).

No - Engine load may be excessive. Reduce engine load.

No - Clean cooling intake screen, engine shrouding, and cooling fins.

Yes - Go to step (7).

No - Repair or replace engine as necessary. (See "Engine Removal" on page 82.) (See "Cylinder Head Removal and Installation" on page 53.) (See "Analyze Piston Ring Wear" on page 68.)

(7) Are valves properly adjusted?

Yes - Go to step (8).

No - Adjust valve clearance. (See "Valve Analysis" on page 56.)

(8) Is fuel flow within specifications?

Yes - Go to step (9).

No - Perform fuel pump test. (See "Fuel Pump Test" on page 42.)

(9) Is float level in carburetor properly adjusted?

Yes - Go to step (10).

No - Adjust float level. (See "Float Level Adjustment" on page 50.)

(10) Are carburetor and intake manifold flanges properly sealed - no air leaks.?

Yes - Go to step (11).

No - Seal flanged surfaces as required. (See "Carburetor Removal and Installation" on page 47.)

(11) Is carburetor clean and free of any build-up in fuel and air passages?

Yes - Go to step (12).

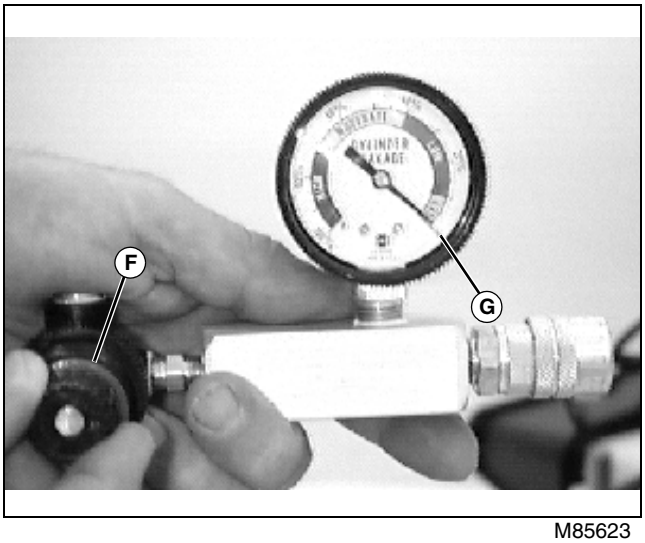
No - Clean carburetor as necessary. (See "Clean and Inspect Carburetor" on page 49.)

(12) Is governor assembly in good condition with no binding?

No - Repair as necessary. (See "Governor Removal and Installation" on page 66.) (See "Camshaft Inspection" on page 62.)

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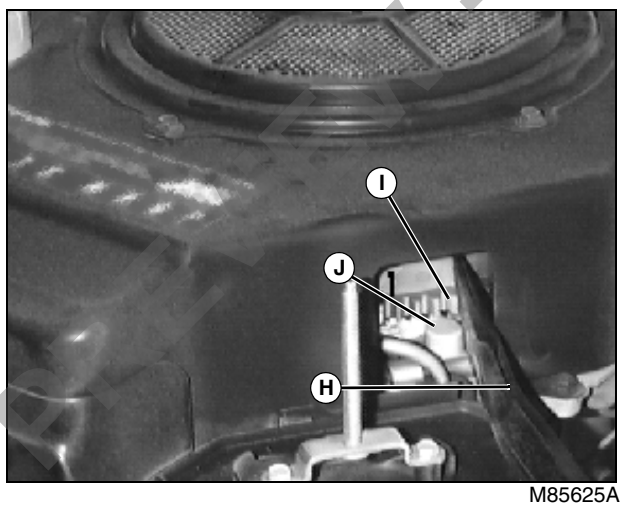
M85623

7. Turn regulator knob (F) on tester OFF (fully counterclockwise), then attach appropriate air source to coupler below black regulator valve.

NOTE: A minimum 551 kPa (80 psi) air supply must be used for this test.

8. Gradually turn regulator knob clockwise until needle aligns with “zero” of the yellow “SET” scale (G).

IMPORTANT: Avoid damage! Insert a wide blade pry-bar (H) between two flywheel teeth (I) and engine block post (J). Firmly wedge pry-bar against edge of shroud opening. This must be done to prevent piston and crankshaft from turning in a clockwise direction when compressed air is applied.



M85625A

9. With a wide blade pry-bar (H) move flywheel 3 teeth in the clockwise direction to insure the compression release mechanism is not activated.

NOTE: A slight air leak from the breather port is normal as air escapes from the crankcase.



MX21338

10. Connect adapter hose (K) to tester. Record gauge reading while listening for excessive air leaks at carburetor, crankcase breather port (L), and exhaust outlet. Pressure should hold steady or reduce only slightly, and only a faint air leak should be heard at the breather port.

11. Remove test equipment and install spark plug.

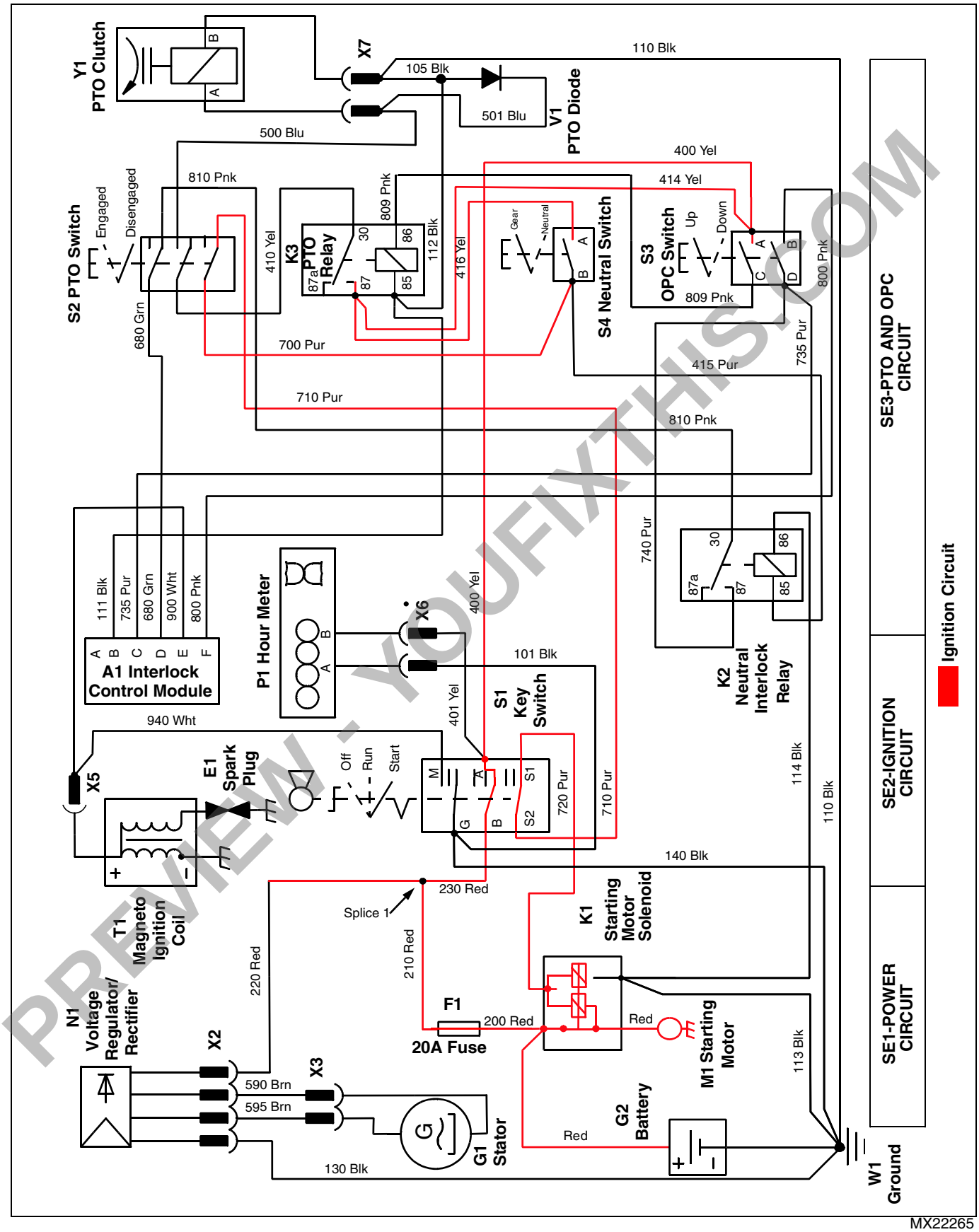
Results

NOTE: All engines will leak air past the piston rings to some extent. Rings are worn if leakage is excessive.

- If air escapes from muffler, check for worn exhaust valve.
- If air escapes from carburetor, check for worn intake valve.
- If air escapes from crankcase breather port, check for worn piston rings.
- Gauge reading in “low” (green) zone: Piston rings and cylinder in good condition.
- Gauge reading in “moderate” (yellow) zone: Engine is still usable, but there is some wear present. Customer should start planning for overhaul or replacement.
- Gauge reading in “high” (red) zone: Rings and/or cylinder have considerable wear. Engine should be reconditioned or replaced.

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Cranking Circuit Schematic - Electric Start



MX22265

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Symptom: Excessive Oil Consumption

(1) Is engine oil the correct viscosity for conditions?

Yes - Go to step (2).

No - Drain oil from engine and replace with oil of proper viscosity.

(2) Is engine filled with oil to proper level on the dipstick (crankcase not excessively full)?

Yes - Go to step (3).

No - Drain excessive engine oil.

(3) Are the breather valves functioning properly?

Yes - Go to step (4).

No - Clean or replace breather valve. (See “Air Cleaner Removal and Installation” on page 46.)

(4) Is the drain in the breather chamber clear of obstructions?

Yes - Go to step (5).

No - Clear obstructions from drain in breather chamber.

(5) Are the oil ring grooves clear of obstructions?

No - Clean oil ring grooves. (See “Piston Removal” on page 68.)

Symptom: Engine Overheats

(1) Is engine being operated under normal operating conditions?

Yes - Go to step (2).

No - Adjust mower operation to comply with normal operating conditions. (See owner’s manual for more information.)

(2) Is flywheel intake screen clear of debris?

Yes - Go to step (3).

No - Clean screen of debris.

(3) Are engine cooling shrouds in place?

Yes - Go to step (4).

No - Repair or replace shrouds as needed.

(4) Are the flywheel fan and engine cooling fins free of obstruction and not damaged?

No - Clean or repair as necessary.

Symptom: Excessive Fuel Consumption

(1) Is choke adjusted properly?

Yes - Go to step (2).

No - Adjust choke. (See “Throttle Cable Adjustment” on page 32.)

(2) Remove spark plugs. Are the spark plug tips clear of any drops of fuel?

Yes - Go to step (3).

No - Check for plugged air cleaner.

No - Possible incorrect use of choke. Clean spark plugs and set choke properly.

No - Check float level for proper adjustment. (See “Float Level Adjustment” on page 50.)

(3) Does the ignition system should produce a steady, strong blue spark? (See “Spark Test” on page 43.)

Yes - Go to step (4).

No - Check spark plug. (See “Spark Plug Gap Adjustment” on page 45.)

(4) Does ignition coil test OK?

Yes - Go to step (5).

No - Replace ignition coil. (See “Ignition Coil Test” on page 142).

(5) Is slow idle speed adjusted properly?

Yes - Go to step (6).

No - Adjust slow idle speed. (See “Slow Idle Speed Adjustment” on page 34.)

(6) Is fast idle speed adjusted properly?

Yes - Go to step (7).

No - Adjust fast idle speed. (See “Fast Idle Speed Adjustment” on page 33.)

(7) Are cylinder head cap screws properly torqued - not loose?

No - Torque cylinder head cap screws. (See “Cylinder Head Removal and Installation” on page 53.)

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