

WSM

WORKSHOP MANUAL
ZERO TURN MOWER

ZG20 ZG23

Kubota

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

Model		ZG20	ZG23
Tire size	Front	13 x 5.0 -6 (4PR) Rib	
	Rear	23 x 10.5 -12 (4PR) Turf	
Steering system		2 - Hand levers	
Transmission		2 - HST W / Gear	
Parking Brake		Wet multi disk / Foot released	
Traveling speed	Forward	0 to 14.5 km / h (0 to 9.0 mph)	
	Reverse	0 to 8.0 km / h (0 to 5.0 mph)	
PTO	Revolution	1 speed (2530 rpm at 3200 engine rpm)	
	Drive system	Shaft drive. KUBOTA 10 tooth involute spline (2530 rpm)	
	Clutch type	Wet multi disks	
	PTO brake	Wet multi disks	

Model		RCK48-20ZG	RCK54-23ZG
Mower deck	Suitable machine	ZG20	ZG23
	Total length	890 mm (35.0 in.)	
	Total width	1550 mm (61.1 in.)	1700 mm (67.0 in.)
	Total height	310 mm (12.2 in.)	
	Mounting method	Quick joint, Parallel linkage	
	Adjustment of cutting height	Dial gauge	
	Cutting width	1225 mm (48 in.)	1375 mm (54 in.)
	Cutting height	25 to 127 mm (1.0 to 5.0 in.)	
	Number of blades	3	
	Weight (Approx.)	82 kg (180.8 lbs)	86 kg (189.6 lbs)
	Discharge	Right side	

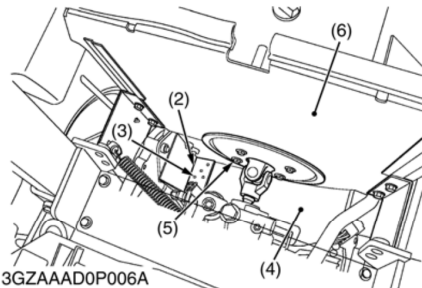
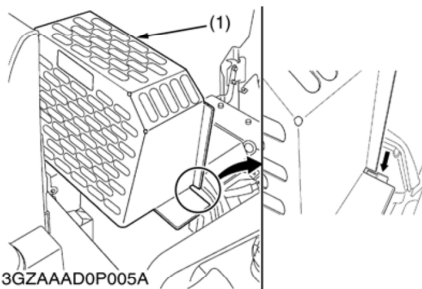
000006422E

4. LUBRICANTS, FUEL AND COOLANT

No.	Place	Capacity		Lubricants, fuel and coolant
		ZG20	ZG23	
1	Fuel tank	23 L 6.0 U.S.gals. 5.1 Imp.gals.		Automobile unleaded or regular gasoline Unleaded gasoline 87 octane or higher
2	Engine crankcase	1.9 L 2.0 U.S.qts. 1.7 Imp.qts.		Engine oil: API service classification SG, SH, SJ or higher Above -18 °C (0 °F) : SAE10W-30 or 10W-40 Below 0 °C (32 °F) : SAE5W-20 or 5W-30
3	Transmission case with filter & hose	7.5 L 7.9 U.S.gals. 6.6 Imp.qts.		KUBOTA UDT or SUPER UDT fluid*
4	Mower gear box	0.15 L 0.16 U.S.qts. 0.13 Imp.qts.		

* KUBOTA original transmission hydraulic fluid or its equivalent.

000006408E



Checking and Cleaning Air Intake Screen to Prevent Overheating

⚠ CAUTION

- Be sure to stop the engine and remove the key before cleaning.

■ IMPORTANT

- The air intake area must be clear of debris to prevent the engine from overheating.

Daily or after every 5 hours of operation, check to be sure the air intake grass screen and the air intake are clean.

Dirt or chaff around the air intake screen or the engine cooling area decrease cooling performance.

1. Remove the panel screen (1) and remove all foreign material.
2. Remove the dust and all foreign materials from the air intake area between the transmission and the engine plate dust.
3. Clean the engine shroud panel as necessary. For this refer to "EVERY 100 HOURS" in Maintenance section.
4. Each time the panel screen (1) is covered with grass and foreign materials during operation, rub it off the screen with hand. Check the air intake area from time to time if grass accumulates.
5. If the dust or chaff has accumulated inside of the panel screen (1), remove the panel screen (1) and clean the inside completely by using the bottom rubber plate from the cleanout hole.

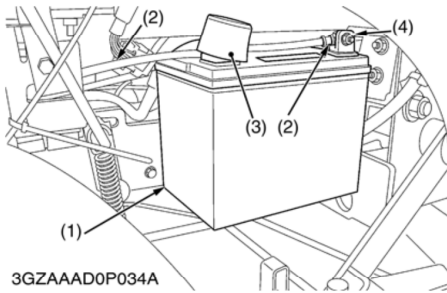
After cleaning, replace the panel screen (1) properly.

■ NOTE

- When assembling the panel screen, be sure to fit it in the runners.

- | | |
|-------------------------|-----------------------------|
| (1) Panel Screen | (4) Engine Cooling Area |
| (2) Bottom Rubber Plate | (5) Air Intake Grass Screen |
| (3) Cleanout Hole | (6) Dust Plate |

000006309E



Checking Battery Condition

CAUTION

- **Never remove the vent cap while the engine is running. Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately and get medical attention.**
- **Wear eye protection and rubber gloves when working around battery.**

Mishandling the battery shortens the service life and adds to maintenance costs.

The original battery is a maintenance-free, non accessible type battery.

If the battery is weak, the engine will be difficult to start and the lights will become dim. It is important to check the battery periodically.

- | | |
|------------------|-----------------------|
| (1) Battery | (3) Positive Terminal |
| (2) Ground Cable | (4) Negative Terminal |

000006358E



Adjusting the Motion Control Lever Pivot



CAUTION

● Be sure to stop the engine and set the parking brake to "ON" before checking.

1. Set the motion control lever (1) in "NEUTRAL" position.
2. Slightly move the motion control lever (1) back and forth and measure the free travel at the top of lever stroke.
3. If the proper free travel limits are exceeded, remove the fender and retighten the nut to specified torque.

Proper lever free travel (A)	Factory spec.	2 to 15 mm 0.08 to 0.59 in. on the lever
------------------------------	---------------	--

NOTE

● If the motion control lever pivot bolt is maladjusted, motion control may be difficult.

Tightening torque	Motion control lever pivot bolt	18.6 to 20.6 N·m 1.9 to 2.1 kgf·m 13.7 to 15.2 ft·lbs
-------------------	---------------------------------	---

- (1) Motion Control Lever
- (2) Bolt
- (3) Nut

A : Free Travel

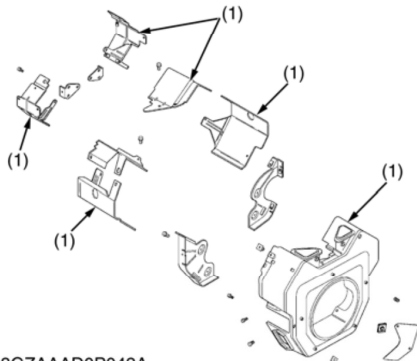
000006378E

Cleaning Engine Shrouds

1. Clean the engine shrouds.

- (1) Engine Shroud

000006379E



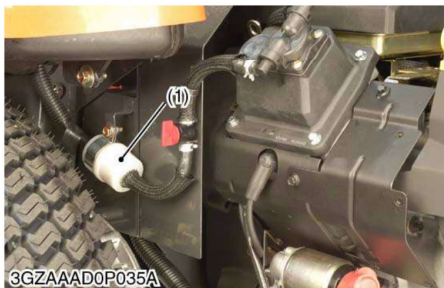
[7] CHECK POINT OF EVERY 400 HOURS

Replacing Fuel Filter

1. Change fuel filter (1) every 400 hours.

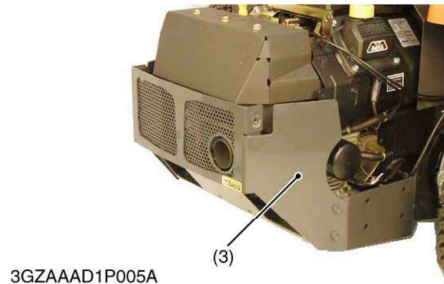
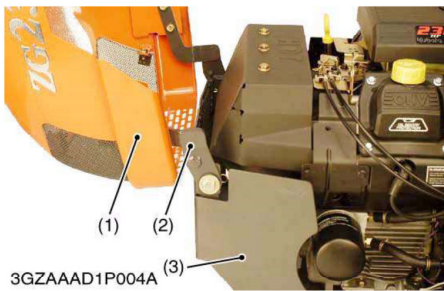
- (1) Fuel Filter

000006380E



1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Vibration	<ul style="list-style-type: none"> Loosen engine mounting nuts 	Retighten mounting nuts	1-S12
Engine Will Not Crank	<ul style="list-style-type: none"> Engine jammed 	Check engine to find trouble and repair	—
	<ul style="list-style-type: none"> Battery discharged 	Check battery specific gravity, and charge or replace battery	G-27 to 29
	<ul style="list-style-type: none"> Starter malfunctioning 	Repair or replace starter	P-7-17 to P-7-30
	<ul style="list-style-type: none"> Slow blow fuse blown 	Replace slow blow fuse	G-39
	<ul style="list-style-type: none"> Main switch defective 	Repair or replace main switch	5-S7
	<ul style="list-style-type: none"> Motion control lever switch defective 	Repair or replace motion control lever switch	5-S8
	<ul style="list-style-type: none"> PTO switch defective 	Replace PTO switch	5-S8
	<ul style="list-style-type: none"> Brake switch defective 	Replace brake switch	5-S8
	<ul style="list-style-type: none"> Seat switch defective 	Replace seat switch	5-S8
	<ul style="list-style-type: none"> Wiring harness disconnected 	Connect wiring harness	—
Engine Cranks Slowly but Does Not Start	<ul style="list-style-type: none"> Battery charge low 	Check battery specific gravity, and charge or replace battery	G-27 to 29
	<ul style="list-style-type: none"> Battery cables loose, corroded or worn 	Repair or replace cables	1-S10
	<ul style="list-style-type: none"> Increased resistance of moving parts 	Repair or replace moving parts	—
	<ul style="list-style-type: none"> Excessively high viscosity of engine oil at low temperature 	Use specified engine oil	G-7

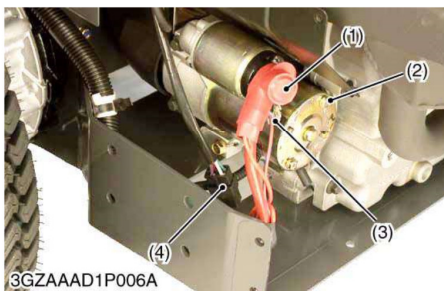


Bonnet and Under Guard

1. Remove the bonnet (1) with the bonnet stays (2).
2. Remove the under guard (3).

- | | |
|-----------------|-----------------|
| (1) Bonnet | (3) Under Guard |
| (2) Bonnet Stay | |

000006166E

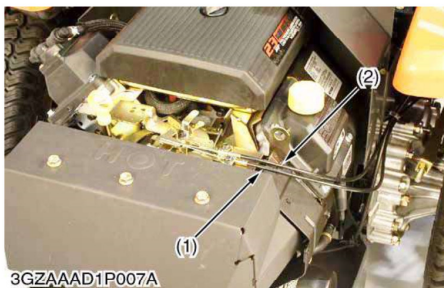


Wiring Harness (Engine Left Side)

1. Disconnect the positive cable (1) and wiring from the starter **B** terminal.
2. Disconnect the **1P** connector (3) from the starter **ST** terminal.
3. Disconnect the coupler (4)
4. Disconnect the ground cable.

- | | |
|--------------------|------------------|
| (1) Positive Cable | (3) 1P Connector |
| (2) Starter | (4) Connector |

000006167E

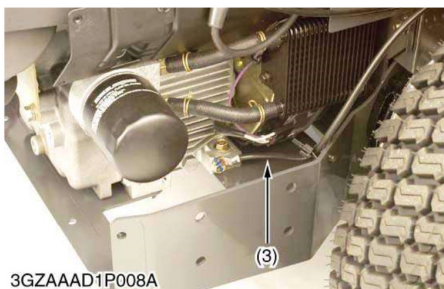


Throttle Cable, Cable and Wiring Harness (Engine Right Side)

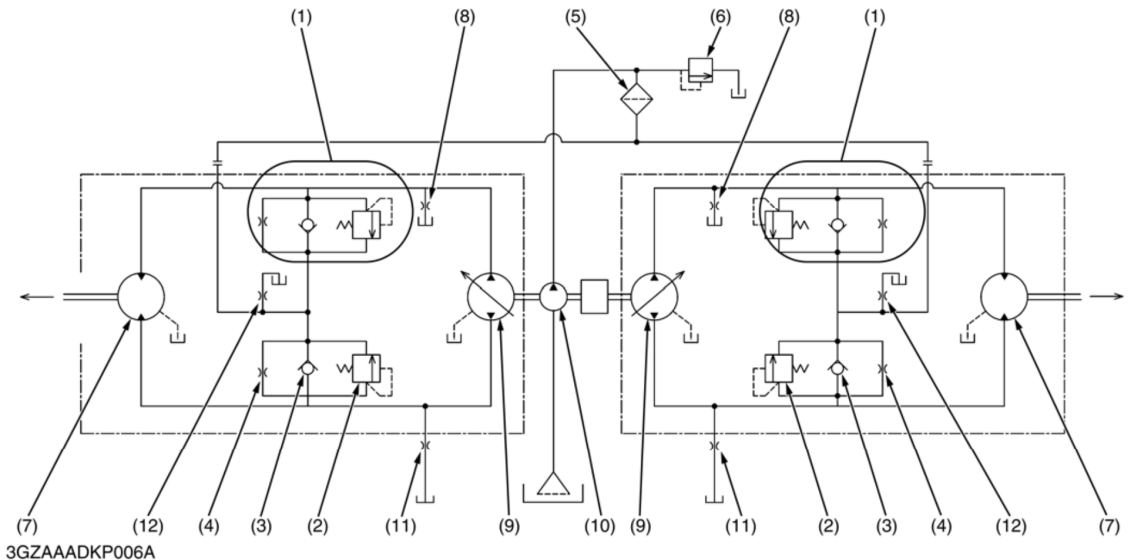
1. Disconnect the throttle cable (2) and choke cable (1).
2. Disconnect the ground cable (3).

- | | |
|--------------------|------------------|
| (1) Choke Cable | (3) Ground Cable |
| (2) Throttle Cable | |

000006168E



(5) Power Trains Operation



- | | | | |
|--|---------------------|-------------------------|----------------------------------|
| (1) Check and High Pressure Relief Valve | (4) Neutral Orifice | (7) Motor | (10) Hydraulic Pump |
| (2) High Pressure Relief Valve | (5) Oil Filter | (8) Lubricating Orifice | (11) Orifice (To Transmission) |
| (3) Check Valve | (6) Regulator Valve | (9) Pump | (12) Orifice (To Rear Axle Case) |

■ Neutral

With the control levers in the **NEUTRAL** position, the piston springs in the pump block in the pumps force the swash plates to a position that is parallel to the pump body. With the swash plates parallel to the pump body, the pistons do not reciprocate in the cylinder block, they merely rotate, and no oil is being drawn in or discharged from the pump. The machine is in a zero displacement position and the machine remains stationary.

Oil returning from the HST housing and hydraulic pump is directed through the regulating valve before returning to the transmission case.

■ Forward

As the control levers are pushed forward, the swash plates in the pumps move from the neutral position (parallel to the pump body) to a forward angle position. Piston springs inside the cylinder bores force the pistons against the swash plates.

As the cylinder block rotates, the pistons follow the contour of the swash plate, moving outward, drawing oil into their bores. As the cylinder block continues to rotate, the pistons are forced into their bores, discharging oil under pressure.

High-pressure oil from the pumps is routed to the motors, driving the machine forward.

■ Reverse

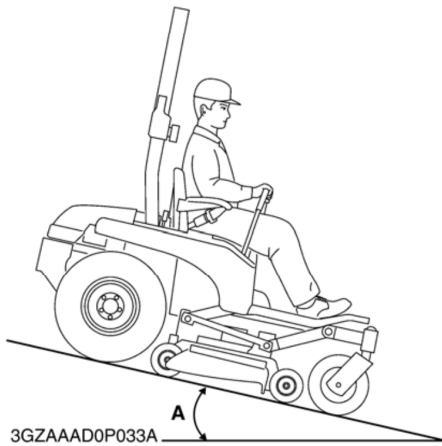
Reverse operation is accomplished by reversing the angle applied to the pump swash plates, reversing the flow of high-pressure oil to the motors.

0000006209E

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Regulator Valve	Setting pressure	0.50 to 0.7 MPa 5.0 to 7.0 kgf/cm ² 71.2 to 101.1 psi	—
PTO Clutch	Operating pressure	Above 0.50 MPa Above 5.0 kgf/cm ² Above 71.2 psi	—
Creeping Speed At Maximum Engine rpm	Wheel rotation	8 to 10 rpm	—
Check and High Pressure Relief Valve	Relief valve setting Pressure	23.5 to 25.5 MPa 240 to 260 kgf/cm ² 3408 to 3698 psi	—
Maximum Speed At Maximum Engine rpm	Wheel rotation	148 to 150 rpm	—
Motion control lever Alignment	Gap	0 to 2 mm 0 to 0.08 in.	—
	Space	10 to 20 mm 0.4 to 0.8 in.	—
16T Bevel Gear to 19T Bevel Gear	Backlash	0.20 to 0.30 mm 0.0078 to 0.0118 in.	—

000006222E



Checking Parking Brake on the Slope

1. Place the machine on a 17° ramp **A**.
2. Apply the parking brake.
3. Place the motion control levers in "**NEUTRAL LOCK**" position and shut off the engine.
4. Check that the machine does not move.

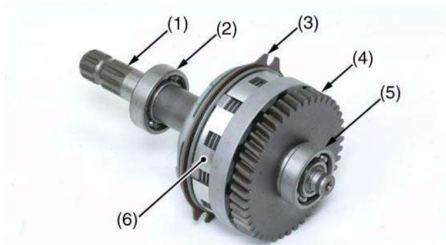
■ **NOTE**

- For parking brake test purposes, only use 17° ramp "A".

A : 17° ramp

000006235E

000006267E



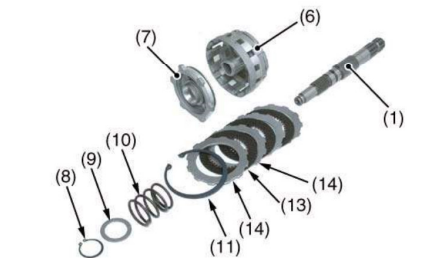
3GZAAADKP060A



3GZAAADKP061A



3GZAAADKP062A



3GZAAADKP063A

Disassembling PTO Clutch Assembly

1. Remove the bearing (5) and 43T gear (4).
2. Tap out the PTO clutch shaft (1) from the clutch case (6).
3. Remove the ball bearing (2), the external snap ring (17), brake plate (15) and brake disk (16).
4. Remove the external snap ring (18), spring collar (9) and clutch spring (10).
5. Remove the internal snap ring (11), piston (7), braking plates (12), (14) and clutch disks (13).

(When reassembling)

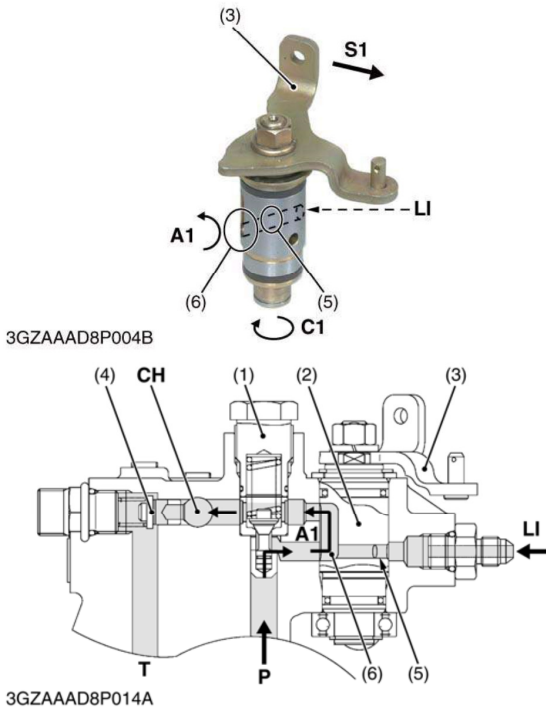
- Align splines of 43T gear (4) and clutch disks (13) and check it to rotate smoothly.
- Do not damage clutch disks (13).

- | | |
|------------------------|-------------------------|
| (1) PTO Shaft | (10) Clutch Spring |
| (2) Ball Bearing | (11) Internal Snap Ring |
| (3) PTO Brake Disk | (12) Braking Plate |
| (4) 43T Gear | (13) Clutch Disk |
| (5) Ball Bearing | (14) Clutch Plate |
| (6) PTO Clutch Case | (15) Brake Plate |
| (7) Piston | (16) Brake Disk |
| (8) External Snap Ring | (17) External Snap Ring |
| (9) Spring Collar | |

000006268E

CONTENTS

1. TROUBLESHOOTING.....	3-S1
2. TIGHTENING TORQUES.....	3-S2
3. CHECKING, DISASSEMBLING AND SERVICING.....	3-S3
[1] DISASSEMBLING AND ASSEMBLING.....	3-S3
(1) Separating Front Wheel and Wheel Bracket.....	3-S3



■ Mower "OPERATING" Position

When operator release his foot from mower lift pedal, control arm return spring pulls lift arm (3) clockwise, and control valve is turned clockwise.

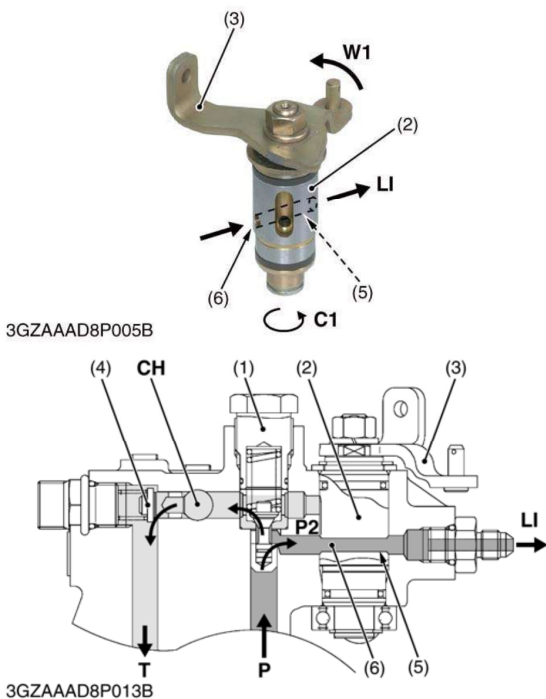
Groove (6) of control valve faces to relief valve (1). Hole in the groove (6) is connected to lift cylinder port (LI).

High-pressured oil from pump is delivered through lift cylinder groove to relief valve. Hydraulic oil in the lift cylinder returns through control valve inner passage (5) back to control valve groove and relief valve (1).

Since oil in the lift cylinder flows to relief valve, oil pressure drops, and mower lowers.

- | | |
|---------------------------------|---|
| (1) Relief Valve | P : Pressured Oil from Pump |
| (2) Control Valve | A1 : Pressured Oil from Groove to Relief Valve |
| (3) Lift Arm | LI : Oil from Lift Cylinder |
| (4) Regulator Valve | CH: Charge Port (Pressured Oil to Oil Filter, Hydraulic PTO Clutch and HST) |
| (5) Control Valve Inner Passage | S1 : Lift Arm Return Spring Force |
| (6) Control Valve Groove | C1 : Control Valve Rotation |

000006075E



■ Mower "HIGHEST" Position

While operator continues to push the mower lift pedal, lift wire pulls the lift arm (3) forward more and control valve is turned counterclockwise.

Control valve hole (6) faces to relief valve (1). Pressured oil from pump flows to lift cylinder.

Since oil fills in the lift cylinder, the pressure in the lift cylinder increases at highest pressure.

And mower is kept at the highest position.

Pressured oil opens the relief valve poppet and the regulator valve.

Oil is drained to the tank.

- | | |
|---------------------------------|---|
| (1) Relief Valve | P : Pressured Oil from Pump |
| (2) Control Valve | LI : Pressured Oil from Lift Cylinder |
| (3) Lift Arm | P2 : Pressured Oil from Relief Valve |
| (4) Regulator Valve | CH: Pressured Oil to Oil Filter, Hydraulic PTO Clutch and HST |
| (5) Control Valve Inner Passage | T : Oil to Tank |
| (6) Control Valve Hole | W1: Lift Arm Rotation |
| | C1 : Control Valve Rotation |

000006076E

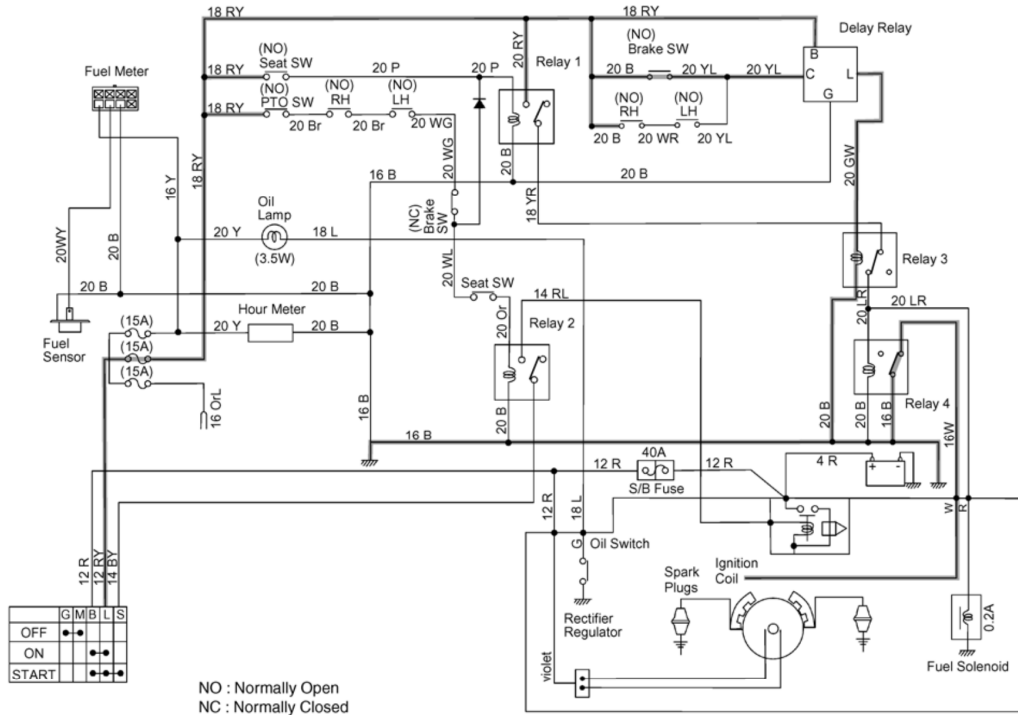
CONTENTS

1. WIRING DIAGRAM.....	5-M1
2. STARTING SYSTEM.....	5-M2
[1] STARTING SYSTEM.....	5-M2
[2] SAFETY SWITCH.....	5-M3
[3] RELAY.....	5-M8
3. ENGINE STOP SYSTEM.....	5-M9
[1] STOP SYSTEM.....	5-M9

[When engine is stopped]

Relay 1	Relay 2	Delay Relay	Relay 3	Relay 4	Fuel solenoid	Ignition coil short circuit
Should be "OFF"	Should be "OFF"	"ON" or "OFF"	"ON" or "OFF"	Should be "OFF"	Should be "OFF"	Connected to machine body

000006518E

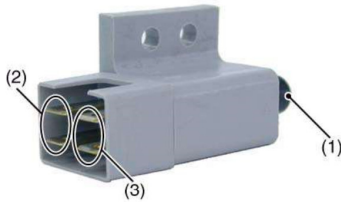


3GZAAAD9P005A

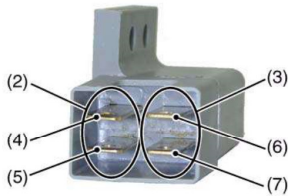
When operator leave from the operator's seat, seat switch is "OFF". Current does not flow to the relay 1 and relay 4 related to engine stopping, ignition coil circuit is short. And fuel solenoid is "OFF". And engine may stop.

000006519E

(3) Safety Switch



3GZAAAD9P013A



3GZAAAD9P008A

Safety Switches : Motion Control Lever (LH and RH) Switch PTO Lever Switch and Seat Switch

1. Measure the resistance with an ohmmeter between the terminals.
2. If the resistance values specified below are not indicated, the safety switch is faulty.

■ Plunger pushed into the switch body.

Resistance 1 terminal (4) - 2 terminal (5)	Factory spec.	Continuity
Resistance 3 terminal (6) - 4 terminal (7)	Factory spec.	Continuity

■ Plunger is released.

Resistance 1 terminal (1) - 2 terminal (2)	Factory spec.	Infinity
Resistance 3 terminal (6) - 4 terminal (7)	Factory spec.	Infinity

- (1) Plunger
- (2) 2P Connector (LH)
- (3) 2P Connector (RH)
- (4) 1 Terminal
- (5) 2 Terminal
- (6) 3 Terminal
- (7) 4 Terminal

000006670E

Brake Switch

1. Measure : the resistant with an ohmmeter between terminals.
2. If the resistance valves specified below are not indicated, safety switch faulty.

■ Plunger is pushed into the switch body.

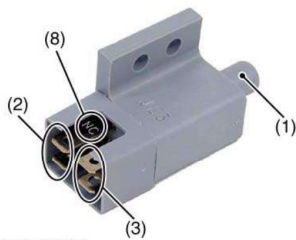
Resistance 1 terminal (4) - 2 terminal (5)	Factory spec.	Infinity
Resistance 3 terminal (6) - 4 terminal (7)	Factory spec.	Continuity

■ Plunger is released.

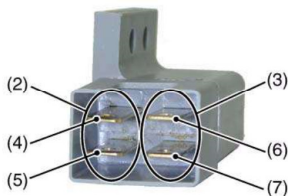
Resistance 1 terminal (4) - 2 terminal (5)	Factory spec.	Continuity
Resistance 3 terminal (6) - 4 terminal (7)	Factory spec.	Infinity

- (1) Plunger
- (2) 2P Connector (LH)
- (3) 2P Connector (RH)
- (4) 1 Terminal
- (5) 2 Terminal
- (6) 3 Terminal
- (7) 4 Terminal
- (8) NC Mark

000006671E



3GZAAAD9P007B



3GZAAAD9P008A

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-9)

Item	N·m	kgf·m	ft-lbs
Mower blade screw	103 to 118	10.5 to 12.0	76 to 87
Gear box screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
Gear box mounting screw (for aluminum gear case)	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Gear box mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Center pulley holder screw	77.6 to 90.2	8.0 to 9.2	57.1 to 66.5
Outer pulley mounting nut	166.7 to 186.3	17.0 to 19.0	123.0 to 137.4
Pulley holder mounting screw	77.4 to 90.2	7.9 to 9.2	57.1 to 66.5

000006115E

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

Contents

Section 1. Safety and General Information	P-1-1
Section 2. Special Tools	P-2-1
Section 3. Troubleshooting	P-3-1
Section 4. Air Cleaner and Air Intake System	P-4-1
Section 5. Fuel System and Governor	P-5-1
Section 6. Lubrication System	P-6-1
Section 7. Electrical System and Components	P-7-1
Section 8. Disassembly	P-8-1
Section 9. Inspection and Reconditioning	P-9-1
Section 10. Reassembling	P-10-1

Fan/Flywheel

Fan Fastener Torque9.9 N·m (88 in. lb.)

Flywheel Retaining Screw Torque66.4 N·m (49 ft. lb.)

Governor

Governor Cross Shaft-to-Crankcase Running Clearance

6 mm Shaft0.013/0.075 mm (0.0005/0.0030 in.)

8 mm Shaft0.025/0.126 mm (0.0009/0.0049 in.)

Governor Cross Shaft O.D.

6 mm Shaft

New5.975/6.012 mm (0.2352/0.2367 in.)

Max. Wear Limit5.962 mm (0.2347 in.)

8 mm Shaft

New7.949/8.000 mm (0.3129/.3149 in.)

Max. Wear Limit7.936 mm (0.3124 in.)

Governor Gear Shaft-to-Governor

Gear Running Clearance0.015/0.140 mm (0.0006/0.0055 in.)

Governor Gear Shaft O.D.

New5.990/6.000 mm (0.2358/0.2362 in.)

Max. Wear Limit5.977 mm (0.2353 in.)

Governor Lever Nut Torque6.8 N·m (60 in. lb.)

Ignition

Spark Plug Type (Champion or Equivalent)RC12YC or Platinum 3071

Spark Plug Gap0.76 mm (0.030 in.)

Spark Plug Torque24.4-29.8 N·m (18-22 ft. lb.)

Ignition Module Air Gap0.28/0.33 mm (0.011/0.013 in.)

Ignition Module Fastener Torque4.0-6.2 N·m (35-55 in. lb.)

Speed Sensor Air Gap (EFI engines)1.250/1.750 mm (0.049/0.068 in.)

Muffler

Muffler Retaining Nuts Torque24.4 N·m (216 in. lb.)

Oil Filter

Oil Filter Torque10.4-12.7 N·m (90-110 in. lb.)

Oil Cooler

Oil Cooler/Adapter Nipple Torque27 N·m (20 ft. lb.)

Section 3

Troubleshooting

Troubleshooting Guide

When troubles occur, be sure to check the simple causes which, at first, may seem too obvious to be considered. For example, a starting problem could be caused by an empty fuel tank.

Some general common causes of engine troubles are listed below. Use these to locate the causing factors. Refer to the specific section(s) within this service manual for more detailed information.

Engine Cranks But Will Not Start

1. Empty fuel tank.
2. Fuel shut-off valve closed.
3. Poor fuel, dirt or water in the fuel system.
4. Clogged fuel line.
5. Spark plug lead(s) disconnected.
6. Key switch or kill switch in "off" position.
7. Faulty spark plugs.
8. Faulty ignition module(s).
9. Smart Spark™ malfunction (applicable models).
10. Carburetor solenoid malfunction.
11. Diode in wiring harness failed in open circuit mode
12. Vacuum fuel pump malfunction, or oil in vacuum hose.
13. Vacuum hose to fuel pump leaking/cracked.
14. Battery connected backwards.

Engine Starts But Does Not Keep Running

1. Restricted fuel tank cap vent.
2. Poor fuel, dirt or water in the fuel system.
3. Faulty or misadjusted choke or throttle controls.
4. Loose wires or connections that short the kill terminal of ignition module to ground.
5. Faulty cylinder head gasket.
6. Faulty carburetor.
7. Vacuum fuel pump malfunction, or oil in vacuum hose.
8. Leaking/cracked vacuum hose to fuel pump.
9. Intake system leak.

Engine Starts Hard

1. PTO drive is engaged.
2. Dirt or water in the fuel system.
3. Clogged fuel line.
4. Loose or faulty wires or connections.
5. Faulty or misadjusted choke or throttle controls.
6. Faulty spark plugs.
7. Low compression.
8. Weak spark.
9. Fuel pump malfunction causing lack of fuel.
10. Engine overheated-cooling/air circulation restricted.
11. Quality of fuel.
12. Flywheel key sheared.
13. Intake system leak.

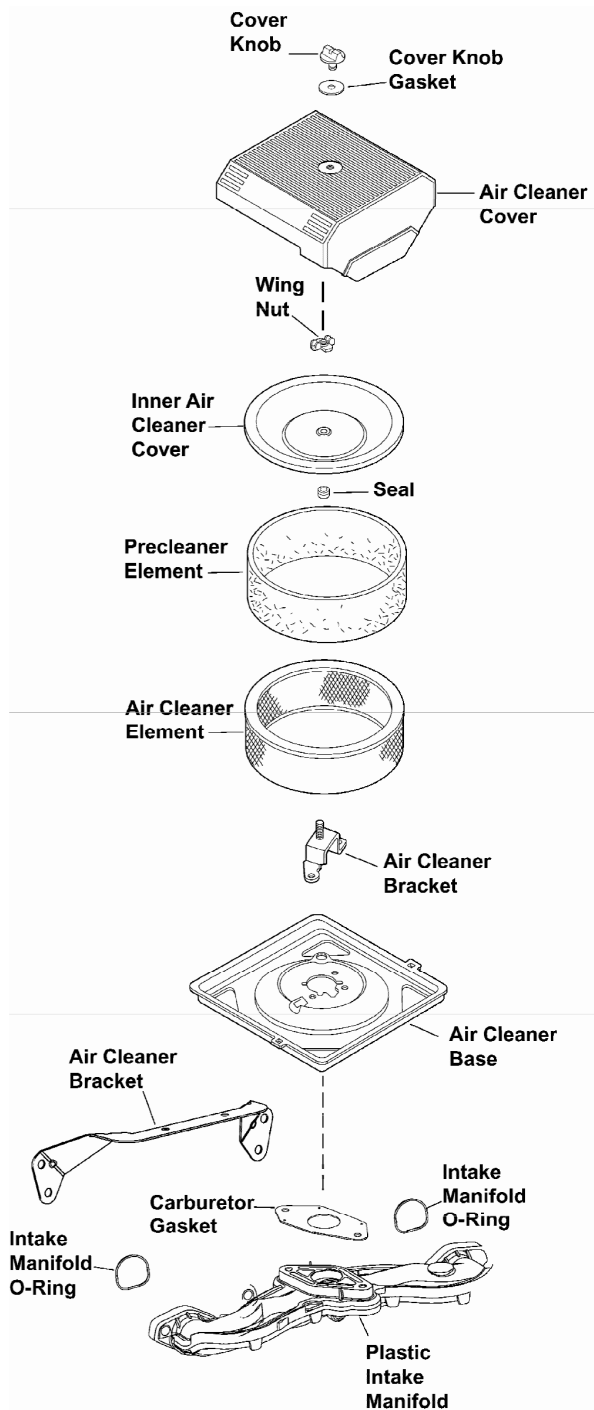


Figure 4-8. Exploded View of Standard Air Intake System Components.

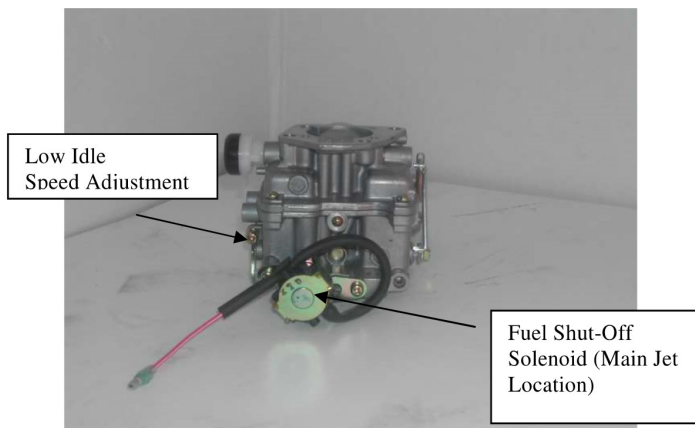


Figure 5-5. "Certified" Compliance Carburetor.

NOTE: Carburetor adjustments should be made only after the engine has warmed up.

Low Idle Fuel Adjusting Needle

To adjust the carburetor idle speed, see Figure 5-4 and follow these steps.

1. With the engine **stopped**, turn the low idle fuel adjusting needle in **clockwise** until it bottoms **lightly**.

NOTE: The tip of the idle fuel adjusting needle is tapered to critical dimensions. Damage to the needle and the seat in the carburetor body will result if the needle is forced.

2. Now turn the adjusting needle out **counterclockwise** 1-1/2 turns.
3. Start the engine and run at half throttle for 5 to 10 minutes to warm up. The engine must be warm before making final settings. Check that the throttle and choke plates can fully open.

NOTE: The carburetor has a self-relieving choke. Choke plate and shaft assembly is spring loaded. Check to make sure plate moves freely and is not binding and affecting idle fuel delivery.

4. Place the throttle control into the "idle" or "slow" position. Turn the low idle speed adjusting screw in or out to obtain a low idle speed of 1550 RPM (\pm 100 RPM). Check the speed using a tachometer.

NOTE: The actual low idle speed depends on the application. Refer to the equipment manufacturer's recommendations. The low idle speed for basic engines is 1550 RPM. To ensure best results when setting the low idle fuel needle, the low idle speed should be 1550 RPM (\pm 100 RPM).

5. Turn the low idle fuel adjusting needle in (slowly) until engine speed decreases and then back out approximately 3/4 turn to obtain the best low speed performance.
6. Recheck the idle speed using a tachometer and readjust the speed as necessary.



Figure 6-1. Oil Container Logo.

The top position of the symbol shows service class such as **API SERVICE CLASS SJ**. The symbol may show additional categories such as **SH, SG/CC, or CD**. The center portion shows the viscosity grade such as **SAE 10W-30**. If the bottom portion shows "Energy Conserving," it means that oil is intended to improve fuel economy in passenger car engines.

Checking Oil Level

The importance of checking and maintaining the proper oil level in the crankcase cannot be overemphasized. Check oil **BEFORE EACH USE** as follows:

1. Make sure the engine is stopped, level and is cool so the oil has had time to drain into the sump.
2. Clean the area around the dipstick before removing it. This will help to keep dirt, grass clippings, etc., out of the engine.
3. Remove the dipstick; wipe oil off. Reinsert the dipstick into the tube until fully seated. See Figure 6-2.

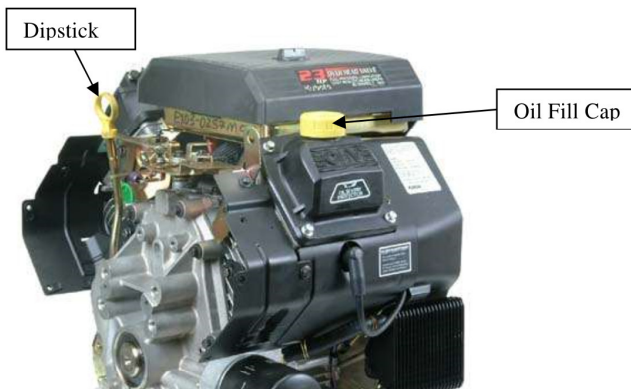


Figure 6-2. Location of Oil Fill Cap and Dipstick.

4. Remove dipstick and check oil level. The level should be between the "F" and "L" marks. If low, add oil of proper type up to the full mark. Reinstall oil fill cap and dipstick.



Overheated: Chalky, white deposits indicate very high combustion temperatures. This condition is usually accompanied by excessive gap erosion. Lean carburetor settings, an intake air leak, or incorrect spark timing are normal causes for high combustion temperatures.

Electronic CD Ignition Systems

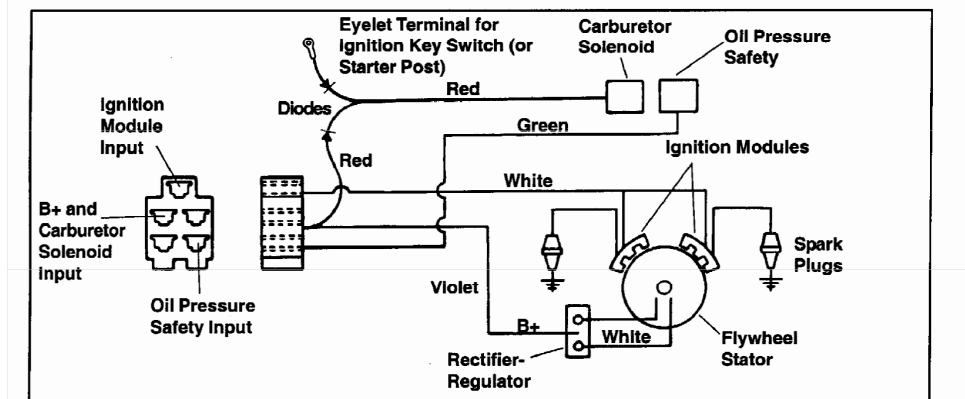


Figure 8-3. Electronic CD Ignition System (For Customer Connected Tractor Applications).

Operation of CD Ignition Systems

A. Capacitive Discharge with Fixed Timing

This system (Figure 8-3) consists of the following components.

- A magnet assembly which is permanently affixed to the flywheel.
- Two electronic capacitive discharge ignition modules which mount on the engine crankcase (Figure 8-4).
- A kill switch (or key switch) which grounds the modules to stop the engine.
- Two spark plugs.

Troubleshooting Guide

Problem	Test	Conclusion
No Charge to Battery	1. With engine running at 3000 RPM, measure voltage across battery terminals using a DC voltmeter.	1. If voltage is more than 12.5 volts, charging system is OK. If voltage is 12.5 volts or less, the stator or diode are probably faulty. Test the stator and diode (Tests 2, 3 and 4).
	2. Disconnect the charging lead from battery. With engine running at 3000 RPM, measure voltage from charging lead to ground using a DC voltmeter.	2. If voltage is 28 volts or more , stator winding is OK. If voltage is less than 28 volts , test stator using an ohmmeter (Tests 3 and 4).
	3. With charging lead disconnected from battery and engine stopped, measure resistance from charging lead to ground using an ohmmeter. Note reading. Reverse the leads and measure resistance again. In one direction, the resistance should be infinity ohms (open circuit). With the leads reversed, some resistance should be measured (about midscale on Rx1 range).	3. If resistance is low in both directions, the diode is shorted. Replace the diode. If resistance is high in both directions, the diode or stator winding is open. (Use Test 4.)
	4. Cut the sleeving on the charging lead to expose the diode connections. Measure the resistance from the stator side of diode to ground using an ohmmeter.	4. If resistance is approximately 1.07 ohms , stator winding is OK. If resistance is 0 ohms , stator winding is shorted. Replace stator. If resistance is infinity ohms , stator winding or lead is open. Replace stator.
No Lights	1. Make sure lights are not burned out.	1. Replace burned out lights.
	2. Disconnect the lighting lead from the wiring harness. With engine running at 3000 RPM, measure voltage from lighting lead to ground using an AC voltmeter.	2. If voltage is 15 volts or more , stator is OK. Check for loose connections or shorts in wiring harness. If voltage is less than 15 volts , test stator using an ohmmeter (Test 3).
	3. With engine stopped, measure the resistance of stator from lighting lead to ground using an ohmmeter.	3. If resistance is approximately 0.4 ohms , stator is OK. If resistance is 0 ohms , stator is shorted. Replace stator. If resistance is infinity ohms , stator or lighting lead is open. Replace stator.

Electric Starting Motors

Some engines in this series use inertia drive starting motors while most use solenoid shift type. The inertia drive types are covered first and the solenoid shift types following.

Starting Motor Precautions

NOTE: Do not crank the engine continuously for more than 10 seconds at a time. If the engine does not start, allow a 60 second cool-down period between starting attempts. Failure to follow these guidelines can burn out the starter motor.

NOTE: If the engine develops sufficient speed to disengage the inertia drive starter but does not keep running (a false start), the engine rotation must be allowed to come to a complete stop before attempting to restart the engine. If the starter is engaged while the flywheel is



Figure 8-56. Service Brush Kit.

5. Perform Steps 10-13 in the “Starter Reassembly” sequence. Installation must be done after the armature, drive lever, and frame are installed, if the starter has been disassembled.

Starter Service

Clean the drive lever and armature shaft. Apply Kohler electric starter drive lubricant Part No. **52 357 02-S** to the lever and shaft (Versilube G322L or Mobil Temp SHC 32). Clean and check the other starter parts for wear or damage as required.

Starter Reassembly

1. Apply drive lubricant (Kohler Part No. **52 357 02-S**) to the armature shaft splines. Install the drive pinion onto the armature shaft.
2. Install and assemble the stop collar/retainer assembly.
 - a. Install the stop collar down onto the armature shaft with the counter bore (recess) up.
 - b. Install a new retainer in the larger (rear) groove of the armature shaft. Squeeze with a pliers to compress it in the groove.
 - c. Slide the stop collar up and lock it into place, so the recess surrounds the retainer in the groove. If necessary, rotate the pinion outward on the armature splines against the retainer to help seat the collar around the retainer.



Figure 8-57. Installing Stop Collar and Retainer.

NOTE: Always use a new retainer. Do not reuse old retainers which have been removed.

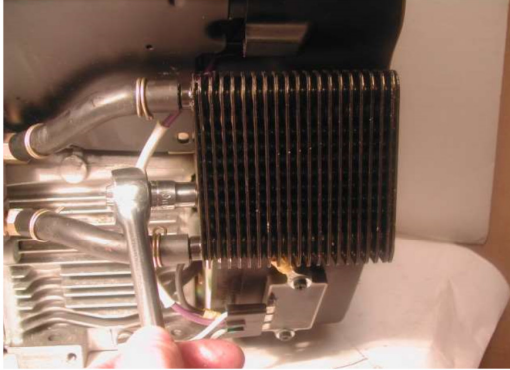


Figure 9-7. Removing Oil Cooler.

4. An oil cooler is standard equipment on some models and an option on others. It may be a cast aluminum housing, part of the oil filter adapter, or attached to the blower housing, separated from the oil filter adapter. If so equipped, remove the adapter and the cooler. See Figures 9-6 and 9-7.

Remove Air Cleaner Assembly

1. Disengage the latches or unscrew the knob and remove the cover. Refer to Section 4.
2. Remove the wing nut from the element cover.
3. Remove the element cover, the air cleaner element with precleaner and the stud seal.
4. Remove the hex. flange screws securing the bracket and base. See Figure 9-8. Two additional rear screws must be removed if the engine contains a rear air cleaner support bracket. See Figure 9-9.



Figure 9-8. Removing Air Cleaner Base Retainer.



Figure 9-38. Removing Breather Filter.

7. Remove the hex. flange screw, breather reed retainer and breather reed. See Figure 9-39.



Figure 9-39. Removing Breather Reed.

Remove Valve Covers

1. Remove the four hex. flange screws securing each valve cover. Note the position of any attached brackets or lifting straps.
2. Remove the valve covers, valve cover gaskets or O-Rings and any brackets or lifting straps. Note which side of the engine has the oil fill and or fuel pump valve cover. See Figure 9-40.



Figure 9-40. Removing Valve Covers.

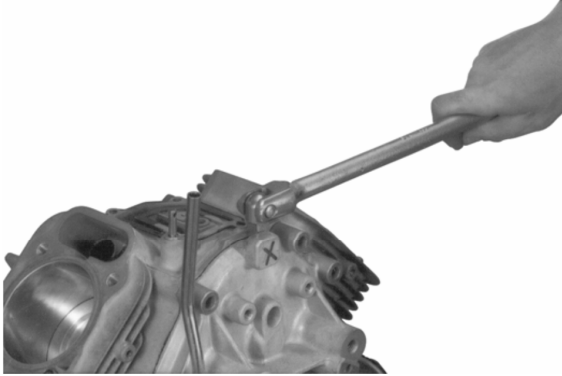


Figure 9-63. Breaking Seal on Top Splitting Tab.

Governor Assembly

The governor assembly is located inside the closure plate. If service is required, refer to the service procedures under “Governor Assembly” in Section 10.

Oil Pump Assembly

The oil pump is mounted to the inside of the closure plate. If service is required, refer to the service procedures under “Oil Pump Assembly” in Section 10.

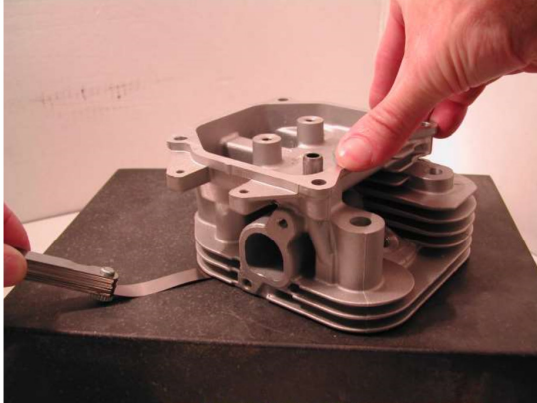


Figure 10-5 Checking Cylinder Head Flatness.

Carefully inspect the valve mechanism parts. Inspect the valve springs and related hardware for excessive wear or distortion. Check the valves and valve seat area or inserts for evidence of deep pitting, cracks, or distortion. Check clearance of the valve stems in the guides. See Figure 10-6 for valve details and specifications.

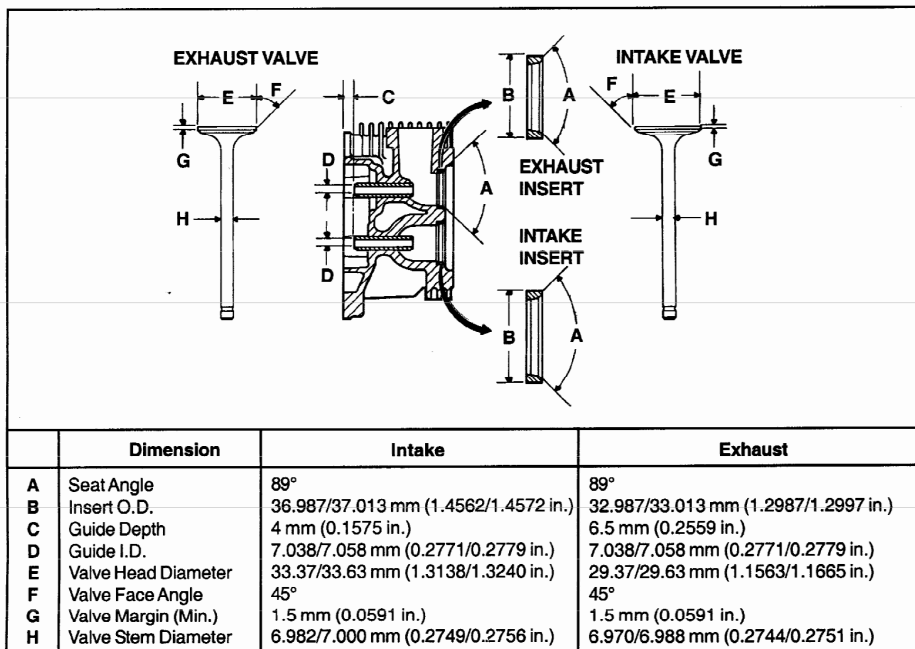


Figure 10-6. Valve Details.

Hard starting or loss of power accompanied by high fuel consumption may be symptoms of faulty valves. Although these symptoms could also be attributed to worn rings, remove and check the valves first. After removal, clean the valve heads, faces, and stems with a power wire brush. Then, carefully inspect each valve for defects such as a warped head, excessive corrosion, or a worn



Figure 10-11. Installing Piston Rings.

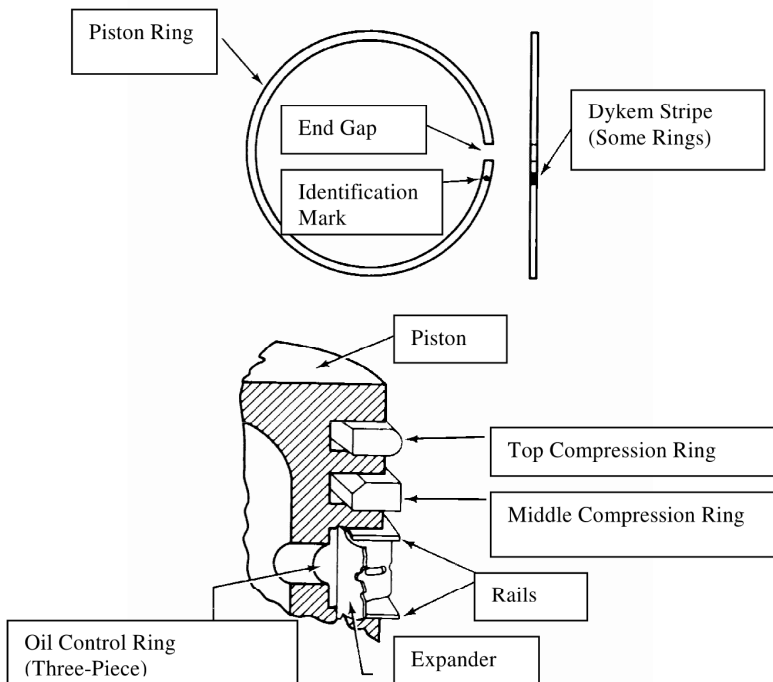


Figure 10-12. Piston Ring Installation.

1. Oil Control Ring (Bottom Groove): Install the expander and then the rails. Make sure the ends of expander are not overlapped.
2. Middle Compression Ring (Center Groove): Install the center ring using a piston ring installation tool. Make sure the "identification" mark is up or dykem stripe (if contained) is to the left of end gap.
3. Top Compression Ring (Top Groove): Install the top ring using a piston ring installation tool. Make sure the "identification" mark is up or the dykem stripe (if contained), to the left of the end gap.



Figure 11-10. End Cap and Rod Bolt Detail.

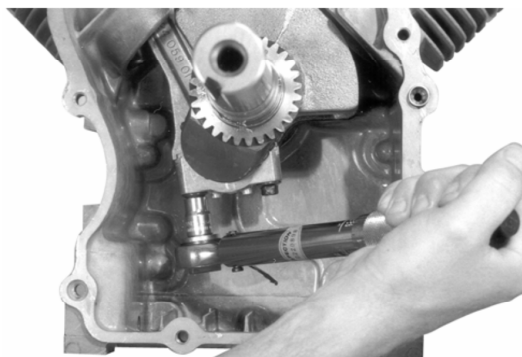


Figure 11-11. Tightening Connecting Rod End Cap.

6. Repeat the above procedure for the other connecting rod and piston assembly.

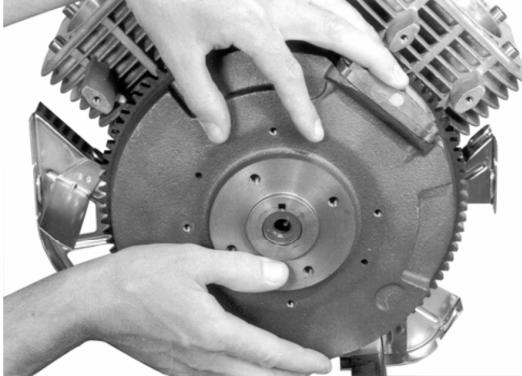


Figure 11-28. Carefully Align Keyway to Key.

NOTE: Make sure the flywheel key is installed properly in the keyway. The flywheel can become cracked or damaged if the key is not properly installed.

1. Install the woodruff key into the keyway of the crankshaft. Make sure that the key is properly seated and parallel with the shaft taper.
2. Install the flywheel onto the crankshaft, being careful not to shift the woodruff key. See Figure 11-28.
3. Install the hex. flange screw and washer.
4. Use a flywheel strap wrench or holding tool to hold the flywheel. Torque the hex. flange screw securing the flywheel to the crankshaft to **66.4 N·m (49 ft. lb.)**. See Figure 11-29.

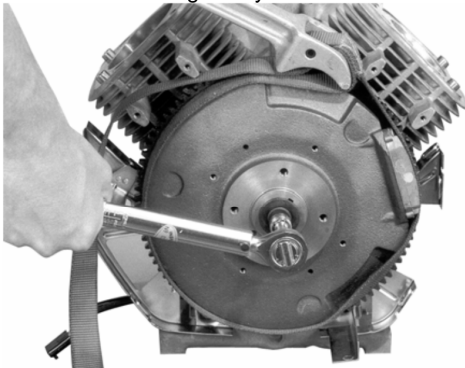


Figure 11-29. Hold Flywheel with a Strap Wrench while Torquing Fastener.

Install New Spark Plugs

1. Use new Champion® (or equivalent) spark plugs.
2. Set the gap at 0.76 mm (0.030 in.).
3. Install new plugs and torque to **24.4-29.8 N·m (18-22 ft. lb.)**. See Figure 11-48.

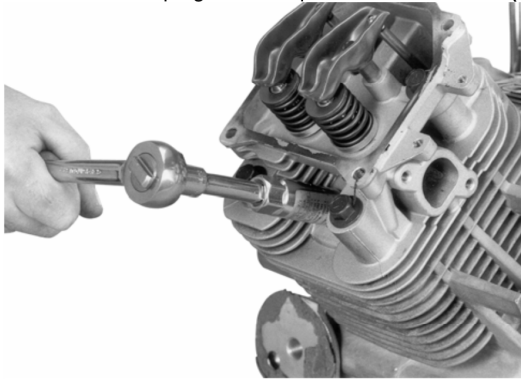


Figure 11-48. Install New Spark Plugs and Tighten to Torque Specified.

Install Ignition Modules

1. Rotate the flywheel to position the magnet away from the ignition module bosses.



Figure 11-49. Installing Ignition Module.

2. Install each ignition module to the crankcase bosses with the two screws (hex. flange or allen head, based on model). Slide the modules up as far away from the flywheel as possible and snug the screws to hold them in that position.
3. Rotate the flywheel to position the magnet directly under one ignition module.
4. Insert a flat feeler gauge: **0.30 mm. (0.012 in.)** between the magnet and the ignition module. See Figure 11-50. Loosen the screws enough to allow the magnet to pull the module down against the feeler gauge.

Install Fuel Pump

WARNING: Explosive Fuel

Gasoline may be present in the carburetor and fuel system. Gasoline is extremely flammable and its vapors can explode if ignited. Keep sparks and other sources of ignition away from the engine.

1. Install fuel pump as an assembly.



Figure 11-74. Reinstall Fuel Pump.

Install Carburetor

1. Install a new carburetor gasket. Make sure all holes align and are open.
2. Install the carburetor, throttle linkage and governor lever as an assembly. See Figure 11-75. If a plastic intake manifold is used and the carburetor is equipped with a fuel solenoid, attach the ground lead to the carburetor mounting screw. See Figure 11-76.

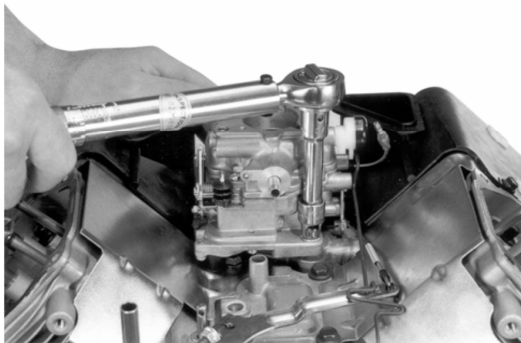


Figure 11-75. Installing Carburetor Assembly.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL