ISSUE EMD-ES0159

Robin Engines

Air-cooled, 4-cycle Gasoline Engine

Model

EY10
EY14

SERVICE MANUAL

INDEX

CONTENTS

Model		EY10		EY14	
		EY10B	EY10D	EY14B	EY14D
Type		Air-Cooled, 4-Cycle, Vertical, Side Valve Gasoline Engine			
Bore x Stroke (in)		57mm x 40mm (2.24" x 1.57")		62mm x 47mm (2.44" x 1.85")	
Piston Displacement (cu. in)		102cc (6.22 cu. in)		142cc (8.66 cu. in)	
Compression Ratio		6.3			
Continuous Output (HP/rpm)		1.3/1,500 1.6/1,800	1.3/3,000 1.6/3,600	2.1/1,500 2.5/1,800	2.1/3,000 2.5/3,600
Max. Output (HP/rpm)		2.3/2,000	2.3/4,000	3.5/2,000	3.5/4,000
Max. Torque (kg-m/rpm)		0.83/1,800	0.415/3,600	1.34/1,600	0.67/3,200
Direction of Rotation		Counter-clockwise as viewed from output shaft			
Cooling System		Forced Air Cooling			
Lubrication		Splashing Type			
Lubricant		Engine Oil SAE #20 to #30 (10W ~ 30W in cold season)			
Carburetor		Horizontal Draft, Float Type			
Fuel		Automobile Gasoline			
Fuel Consumption Ratio (gr/HP-h)		310gr/HP-h at continuous rated output		290gr/HP-h at continuous rated output	
Fuel Feed System		Gravity Type			
Fuel Tank		Approx. 2.0 liter (0.52 U.S. gal.)		Approx. 2.5 liter (0.66 U.S. gal.)	
Speed Reduction		½ reduction gear	–	½ reduction gear	–
Governor		Centrifugal Flyweight Type			
Ignition System		Flywheel Magneto			
Spark Plug		NGK B-6HS			
Lighting Capacity (V-W)		6 ~ 8V, 15W (available, if required)			
Starting Method		Recoil Starter Type			
Dry Weight (lbs.)		13kg (28.7 lbs.)	12.5kg (27.6 lbs.)	14.5kg (32 lbs.)	14kg (30.9 lbs.)
Dimensions	Length (in)	290mm (11.4")		306mm (12.1")	
	Width (in)	312mm (12.3")		314mm (12.4")	
	Height (in)	351mm (13.8")		388mm (15.3")	

2. PERFORMANCE

2-1 MAXIMUM OUTPUT

The maximum output of an engine is such standard power as developed by the engine, after its initial run-in period with all the moving parts properly worn in, when operating with a fully open throttle valve. It follows, therefore, that a new engine may not develop the maximum output in the beginning because the moving parts are not in a properly worn-in condition.

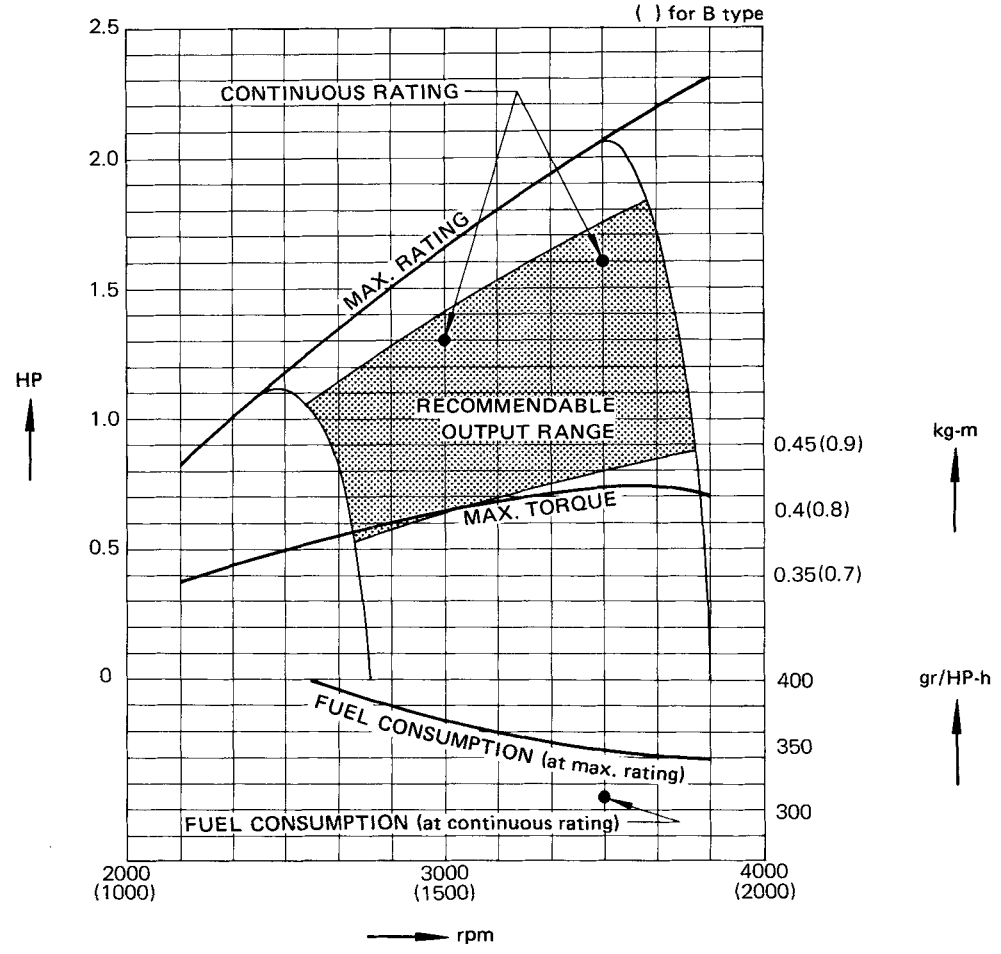
2-2 CONTINUOUS RATED OUTPUT

The continuous rated output of an engine is such power as developed by that engine when running continuously at an optimum speed most favorable from the viewpoint of engine life and fuel consumption ratio, with the governor in operation. It is suggested, therefore, that when designing a driving system for any mechanism, with this engine as prime mover, the continuous power requirement of that mechanism be kept below the continuous rated output specified.

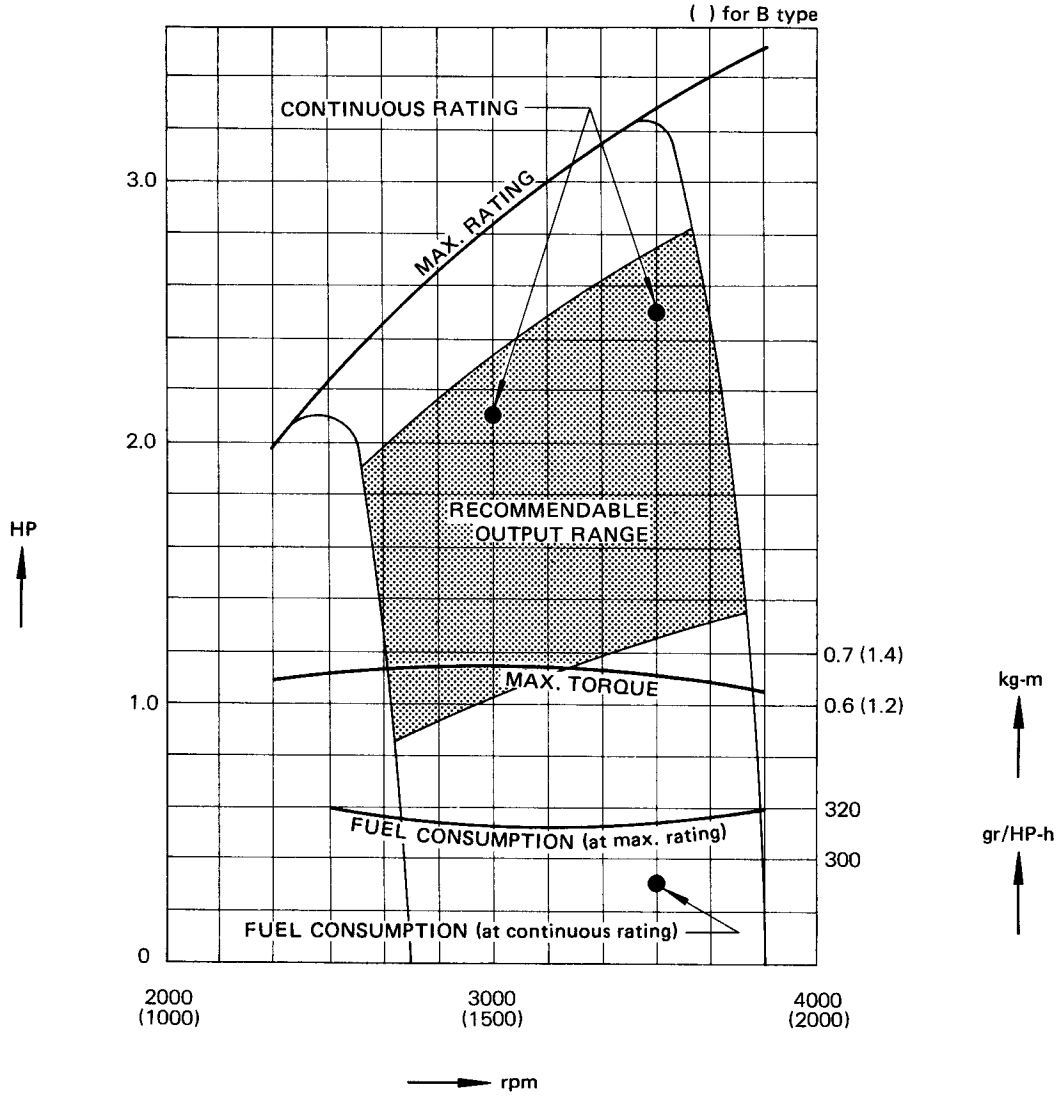
2-3 MAXIMUM TORQUE and FUEL CONSUMPTION RATIO AT MAXIMUM OUTPUT

These mean the maximum torque of the output shaft and fuel consumption ratio at the maximum ouput of an engine.

PERFORMANCE CURVE
MODEL EY10D



PERFORMANCE CURVE
MODEL EY14D



3. FEATURES

1. Compact, lightweight, durable, powerful 4-cycle air-cooled engine embodying ingenious design techniques and skilful workmanship.
2. Simple construction, smart appearance, maximum ease of start.
3. Reliable prime mover for variety of purposes with smooth speed control by a governor under varying load conditions.
4. Economical because fuel consumption is very low.
5. Great versatility in installation through a 360° belt extension possibility and a two-side oil fill and drain arrangement.

4. GENERAL DESCRIPTION of ENGINE CONSTRUCTION

4-1 CYLINDER, CRANKCASE

The cylinder and crankcase are a single piece aluminum die casting. The cylinder liner, made of special cast iron, is built into the alminum casting. The intake and exhaust ports are located on one side of the cylinder, and are also inserted into the casting.

The carankcase is separable on the output shaft side, where the main bearing cover is attached to it.

4-2 MAIN BEARING COVER

The main bearing cover made of aluminum die casting is built onto the output shaft side of the crankcase so that the inside of the engine can readily be checked by simply removing the cover. It is provided with a flange and boss for directly mounting machines, such as generators and pumps.

Two oil gauges also serving as oil filler caps can be mounted.

4-3 CRANKSHAFT

The crankshaft is forged of carbon steel, and the crankpin is induction-hardened. It has a contact breaker cam on the blower end, and a crank gear pressure-fitted on the output end.

4-4 CONNECTING ROD and PISTON

The connecting rod is forged of aluminum alloy, which itself serves as bearings at both the large and small ends. The large end has a built-in oil scraper for splashing the lubricating oil.

The piston is cast of aluminum alloy, and has grooves for receiving two compression rings and one oil ring.

4-5 CAMSHAFT

The camshafts in Models EY10B and EY14B, forged of carbon steel, have intake and exhaust cams. Also serving as output shaft, the camshaft is driven at one half the rate of the crankshaft.

The camshafts in Models EY10D and EY14D are integrally built with a cam gear of special cast iron, and have aluminum plain bearings attached to both ends. (No ball bearing are used.)

4-6 VALVE ARRANGEMENT

The exhaut valve is located upstream of the cooling air with the result that the exhaust valve is intensively cooled for improved engine durability. The inner side of the valve head is reinforced with hard alloy fused to it for added durability.

4-7 CYLINDER HEAD

The cylinder head is an aluminum die casting, and forms a Ricardo type combustion chamber with ample area for high combustion efficiency. The spark plug is tilted for easy mounting of the fuel tank.

4-8 GOVERNOR

The governor is a centrifugal flyweight type which permits constant operation at the selected speed against load variations. (The governor is installed on a special gear.)

4-9 COOLING

The cooling fan serving also as a flywheel cools the cylinder and cylinder head by forced air cooling. Cylinder baffles and head cover are provided for guiding the cooling air. The engine cooling fan employs curved vanes, which come in two types, one for direct drive and the other for reduction drive engines.

4-10 LUBRICATION

The rotating and sliding parts are being lubricated by scooping and splashing the oil in the crankcase with the oil scraper attached to the connecting rod.

4-11 IGNITION

The ignition system is a flywheel magneto type with ignition timing set at 23° before TDC. The magneto is composed of a flywheel, ignition coil, and breaker. The flywheel serving also as a fan is mounted directly on the crankshaft, and the ignition coil and breaker in the crankcase. (For further details, refer to the Section on the magneto.)

4-12 CARBURETOR

A horizontal draft carburetor is employed. It has been carefully set after thorough tests to assure satisfactory startup, acceleration, fuel consumption, output performance, etc.

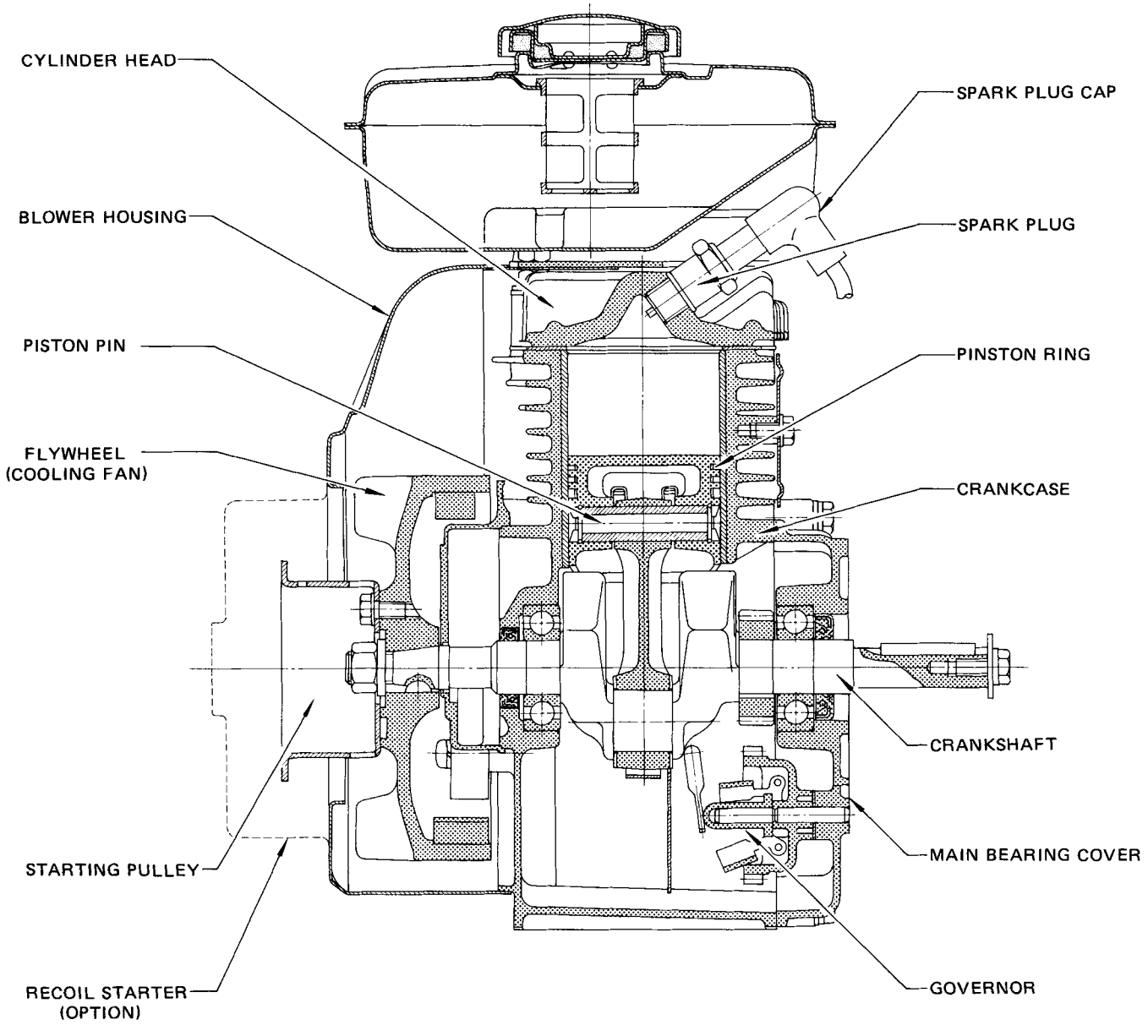
For construction and other details, refer to the Section on Carburetor Construction, Disassembly and Reassembly.

4-13 AIR CLEANER

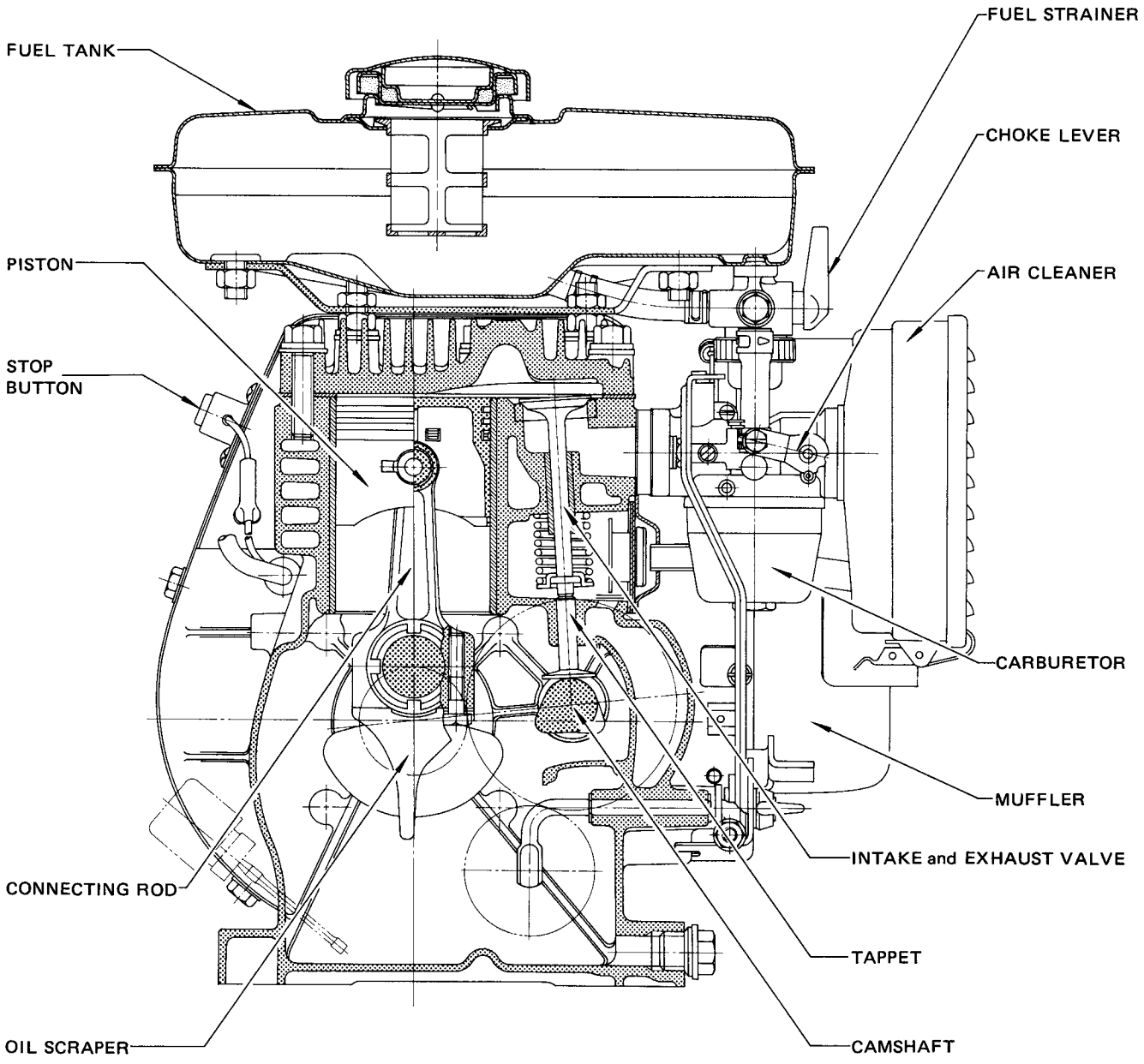
The air cleaner is an oblong type using a sponge element. (A cyclone type semi-wet double element air cleaner is optionally available.)

4-14 SECTIONAL VIEW OF ENGINE

4-14-1 MODEL EY10

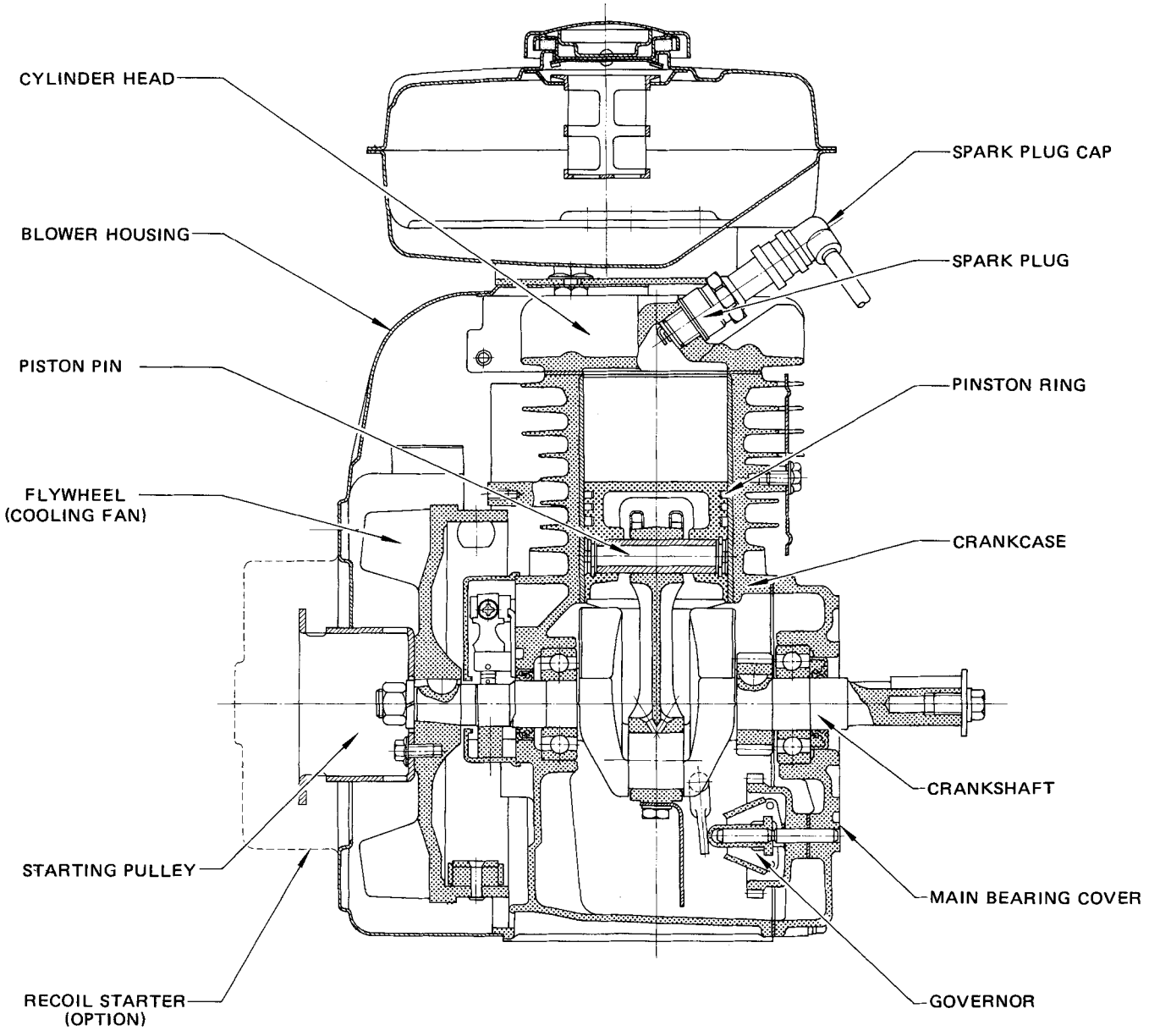


MODEL EY10

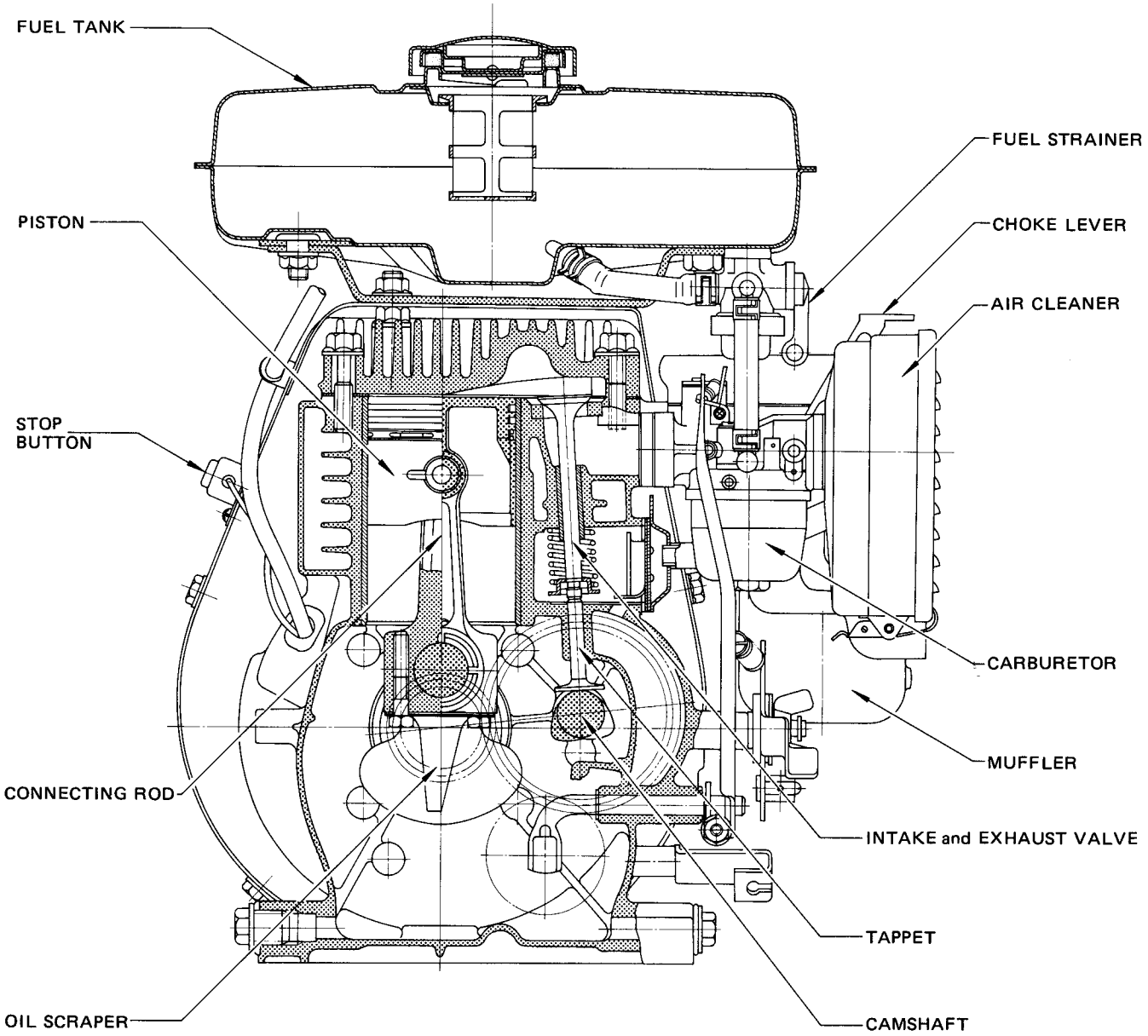

FUEL TANK
FUEL STRAINER
CHOKE LEVER
PISTON
AIR CLEANER
STOP
BUTTON
CARBURETOR
MUFFLER
INTAKE and EXHAUST VALVE
CONNECTING ROD
TAPPET
OIL SCRAPER
CAMSHAFT

MODEL EY10

4-14-2 MODEL EY14



MODEL EY14


FUEL TANK
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CONNECTING ROD
INTAKE and EXHAUST VALVE
TAPPET
OIL SCRAPER
CAMSHAFT

MODEL EY14

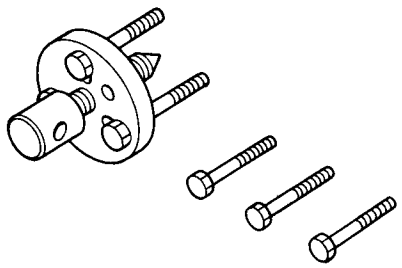
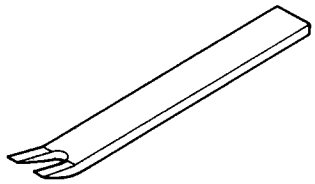
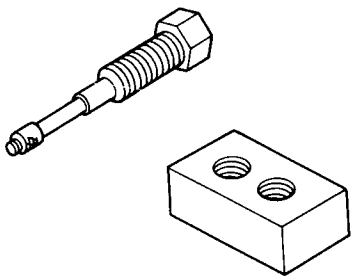
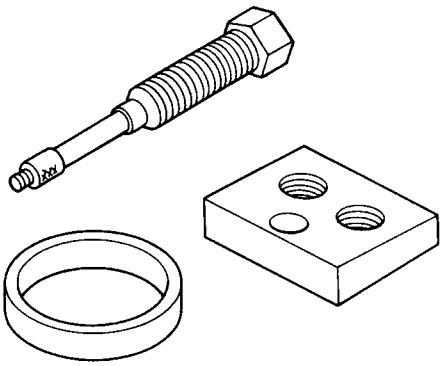
5. DISASSEMBLY and REASSEMBLY

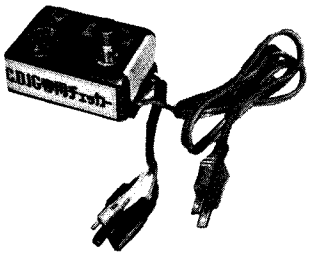
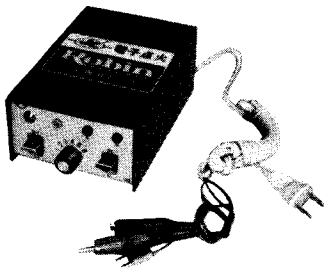
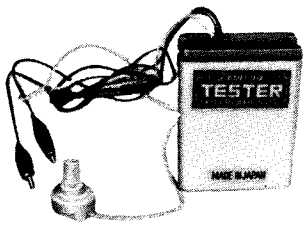
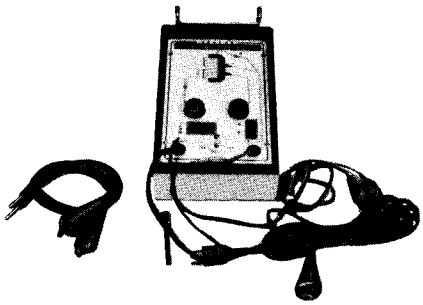
5-1 PREPARATIONS and SUGGESTIONS

1) When disassembling the engine, remember well the locations of individual parts so that they can be reassembled correctly. If you are uncertain of identifying some parts, it is suggested that tags be attached to them.
2) Have boxes ready to keep disassembled parts by group.
3) To prevent missing and misplacing, temporarily assemble each group of disassembled parts.
4) Carefully handle disassembled parts, and clean them with washing oil.
5) Use the correct tools in the correct way.
6) Tools to be prepared for disassembly and reassembly
   a) Work table
   b) Washing pan
   c) Disassembly tools
   d) Washing oil (Kerosene or gasoline), engine oil
   e) Emery cloth
   f) Cloth
7) Be sure to discharge the fuel and oil before disassembly.
   The oil can be discharged by turning counterclockwise the oil drain plug on the carburetor side of the crankcase.
8) When reassembling the cylinder head, main bearing cover, connecting rods, spark plug, and flywheel, be sure to tighten them with the specified torque.
9) Replace all packing and gaskets with new ones when reassembling.
10) Wash the parts with fresh gasoline or kerosene, and blow them with compressed air before reassembling.
11) Apply engine oil to the rotating and sliding parts when reassembling.
12) Be careful to keep the parts free of dust during reassembly.
13) Tighten bolts, nuts and screws to the correct torque readings specified. If small screws are tightened too strongly, they may break.
14) After reassembly, turn the moving parts by hand and check them for abnormalities and looseness.

5-2 SPECIAL TOOLS

For your reference, the following shows special tools of Robin Engine for Disassembly, Meauring and Inspection instruments.

Part No.	Tool	Use	Applicable Model	Shape
209 95004 07	Flywheel Puller (with bolt)	For pulling off Flywheel	EY10, 13, 14 EY18, 25, 27 EY33, 44 EC05, 07, 10 EC17, 37	
207 95003 07	Valve Spring Retainer	For mounting and dismounting Valve Spring Retainer and Retainer Lock	EY10, 13, 14 EY18, 25, 27 EY21, 80 EY33, 44	
205 95001 07	Valve Guide Puller	For pulling off Valve guide	EY13, 14	
206 95001 07			EY18	
207 95001 07			EY25, 27	

Part No.	Tool	Use	Applicable Model	Shape
214 81301 00	C.D.I. Unit Checker	For checking C.D.I. Unit	EY10, 13, 14 EY18, 25, 27 EY33, 44, 21 EY80 EC03, 04	
106 79901 00	T.C.I. Unit Checker	For checking T.C.I. Unit	EC05, 07 EC10, 17	
M-20248	Timing Tester	For adjusting Timing	EY10, 13, 14 EY18, 25, 27 EY33, 44, 21 EY80 EC03, 04, 05 EC07, 10, 17 EC37	
PF-2L	Coil Tester	For checking Ignition Coil	EY10, 13, 14 EY18, 25, 27 EY33, 44, 21 EY80 EC03, 04, 05 EC07, 10, 17 EC37	

5-3 DISASSEMBLY PROCEDURE and REASSEMBLY PRECAUTIONS

5-3-1 FUEL TANK and TANK BRACKETS

1) Close the fuel cock.
2) Disconnect the fuel pipe between the fuel strainer and carburetor from the carburetor.
3) Remove the fuel tank from the tank brackets. (three 8mm nuts)
4) Remove the tank brackets from the cylinder head. (Four 8mm nuts)

5-3-2 RECOIL STARTER, BLOWER COVER and HEAD COVER

1) Remove the recoil starter. (Four 6 x 10mm bolts)
2) Remove the blower cover from the crankcase and head cover. (Six 6 x 12mm bolts)
3) Remove the head cover from the cylinder head.

5-3-3 AIR CLEANER

1) Remove the air cleaner cover and element.
2) Loosen the two 6 x 10mm bolts, and remove the air cleaner case from the carburetor.
3) Disconnect the breather pipe.
4) Place the air cleaner element in kerosene, shake it well until it is thoroughly free of dust, take it out of the kerosene, shake it well to remove the kerosene, apply a mixture of 3 parts gasoline and 1 part engine oil to it, gently wring it, and reassemble.

5-3-4 MUFFLER

Remove the muffler from the cylinder portion of the crankcase. (Two 8mm nuts for Model EY14; two 6mm nuts for Model EY10)

5-3-5 GOVERNOR LEVER and CARBURETOR

1) Remove the governor lever from the governor lever shaft. (One 6 x 25mm bolt one 6mm special nut)
2) Remove the governor rod and rod spring from the carburetor.
3) Remove the carburetor from the cylinder portion of the crankcase.

REFER TO THE GOVERNOR ADJUSTMENT INSTRUCTIONS WHEN REASSEMBLING.

5-3-6 STARTING PULLEY and MAGNETO

1) Remove the starting pulley from the flywheel. (Three 6mm bolts)
   Fit a box or socket wrench over the flywheel nut, and strike it hard with a hammer to remove the 12mm nut and spring washer.
   Attach the flywheel magneto puller as shown in Fig. 5-3-1, turn the center bolt clockwise, and remove the flywheel.
3) Remove the spark plug cap from the ignition coil high-tension cable, and remove the ignition coil and capacitor from the crankcase. (Two 6 x 25mm screws for Model EY10; 6 x 30mm screws for Model EY14)

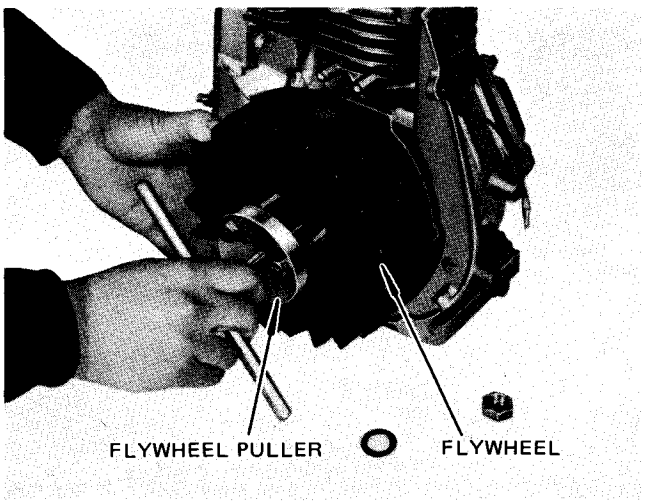


Fig. 5-3-1

4) Remove the breaker cover, and the breaker from the crankcase.
5) When reassembling the magneto, REFER TO THE SECTION ON BREAKER ADJUSTMENT AND IGNITION ADJUSTMENT.

5-3-7 CYLINDER HEAD and SPARK PLUG

1) Remove the spark plug from the cylinder head.
2) Remove the 8mm bolts, and the cylinder head from the crankcase.
3) Remove the cylinder head gasket and cylinder baffle from the crankcase.
4) Reassembly
   * Remove carbon from the cylinder head, particularly its combustion chamber, and clean the cooling fins of dust. Check the head for distortion. Replace the cylinder head gasket with a new one.
   * Tighten the cylinder head with the 8mm bolts with a tightening torque of 210±20 kg-cm.
   * Leave the spark plug detached to facilitate engine rotation during timing adjustmemt.
     Tighten the spark plug last. The tightening torque for both Models EY10 and EY14 is 280±20 kg-cm.

5-3-8 INTAKE and EXHAUST VALVES

1) Remove the inner and outer tappet covers from the crankcase.
2) Push up the valve spring with the valve spring retainer (special tool), unlock the retainer, and remove the valve. Do the same for both the intake and exhaust valves. (See Fig. 5-3-2.) Then remove the valve spring and retainer.

CAUTION: BE CAREFUL NOT TO DAMAGE THE FLANGE SURFACE OF THE TAPPET CHAMBER WITH THE VALVE SPRING RETAINER.

3) Reassembly
   * Remove carbon and gum deposits from the valves, valve seats, intake and exhaust ports, and valve guides. Replace valves with new ones if the valve face is dinted or warped.
   * Replace the valve guide with a spare if there is an excessive clearance between the valve guide and valve stem. (See Fig. 5-3-3.)
     To replace it, pull out the valve guide using the valve guide pulling base and bolt as shown in Fig. 5-3-3, and fit a new valve guide into place under pressure.
   * Reassemble the valve springs and spring retainers after adjusting the tappet clearance.

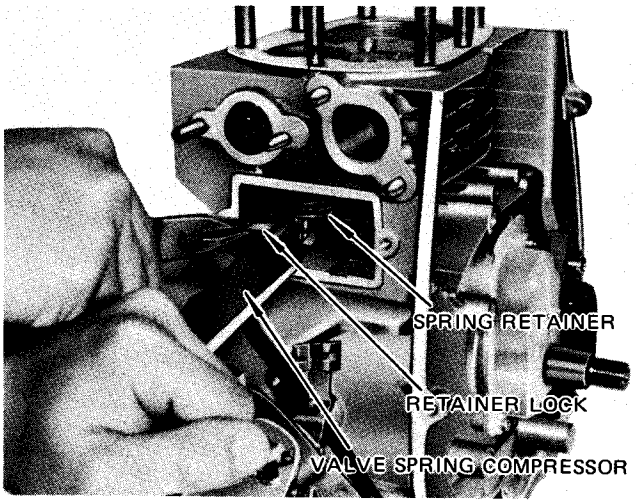
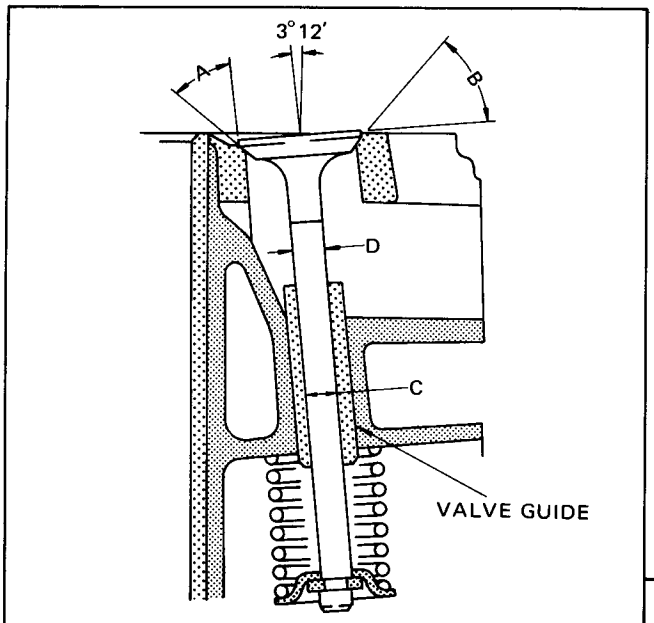


Fig. 5-3-2



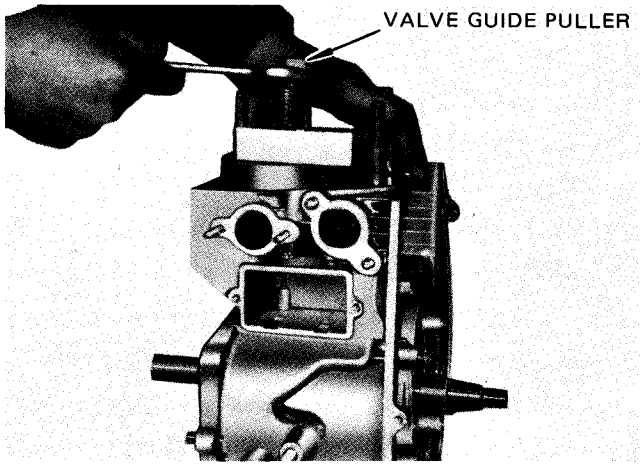


Fig. 5-3-3

VALVE and VALVE GUIDE CLEARANCE

		EY10	EY14
A-VALVE FACE ANGLE		45°	
B-SEAT ANGLE		45°	
C-GUIDE INSIDE DIA.		6 dia. $^{+0.022}_{0}$	
D-VALVE STEM OUTSIDE DIA.	INTAKE	6 dia. $^{-0.030}_{-0.048}$	6 dia. $^{-0.025}_{-0.040}$
	EXHAUST	6 dia. $^{-0.075}_{-0.095}$	
MAXIMUM ALLOWABLE CLEARANCE BETWEEN C and D	INTAKE	0.030L ~ 0.070L	0.025L ~ 0.062L
	EXHAUST	0.075L ~ 0.117L	

L: LOOSE

Fig. 5-3-4

4) Tappet adjustment

* Lower the tappet all the way down, push the valve, and insert a feeler gauge between the valve and tappet stem to measure the clearance. (See Fig. 5-3-5.)
* The correct tappet clearance for both intake and exhaust valves is 0.16 to 0.20mm as measured when the engine is cold.
* If the clearance is smaller than specified, slightly grind the valve stem, and measure it again.
* If the clearance is too large, replace the valve with a new one, polish its contact surface with a compound to obtain a good fit, and adjust the clearance.
* After the tappet clearance adjustment, install the valve spring retainers, fix them with retainer washers, turn the crankshaft, and measure the tappet clearance once again if it is correct.

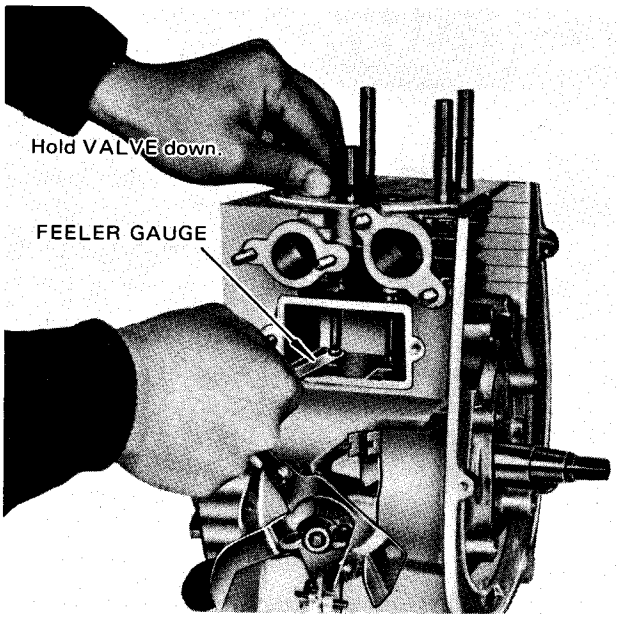


Fig. 5-3-5

5-3-9 MAIN BEARING COVER

1) Remove the 7 bolts for the main bearing cover, lightly tap the cover evenly, and remove it, exercising care not to damage the oil seal.

2) Main bearing cover reassembly

The governor gear is mounted on the main bearing cover side. So install the main bearing cover while checking that it meshes with the teeth of the cam gear. (See Fig. 5-3-6.)

If the oil seal need be replaced, pressure-fit a new oil seal before installing the main bearing cover. When installing the cover, apply oil to the bearing, tappets and oil seal lip, and also to the cover to form a thin oil film where necessary to place the main bearing cover packing. Fit the oil seal guide over the crankshaft to protect the oil seal lip from damage. Then place the main bearing cover on. (See Fig. 5-3-7.)

Check the crankshaft if its side clearance is 0 to 0.2mm; and if not, adjust it with the adjusting collar. (See Fig. 5-3-8.)

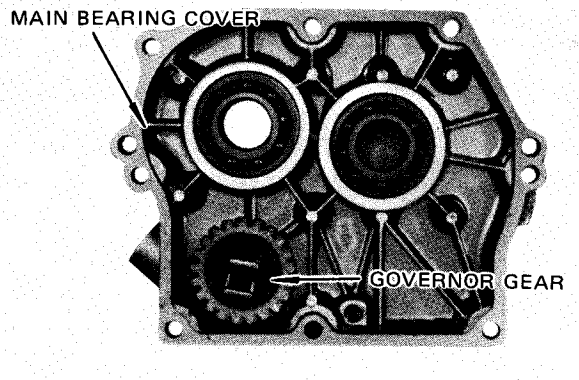


Fig. 5-3-6

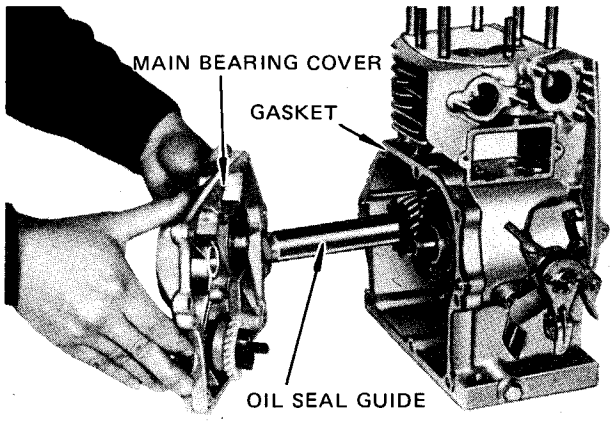


Fig. 5-3-7

3) Bolt tightening torque: 80 to 100kg-cm.

CAUTION: FIG. 5-3-8 SHOWS ONE OF THE METHODS OF MEASURING THE CRANKSHAFT SIDE CLEARANCE BETWEEN THE MACHINED FACE OF THE CRANKCASE AND ADJUSTING COLLAR. AS PAPER PACKING IS USED ON THE MACHINED FACE OF THE CRANKCASE, ADJUST THE CLEARANCE BY TAKING THIS THICKNESS INTO ACCOUNT.

CONSIDER THE THICKNESS AS FOLLOWS:

EY10..... 0.25mm

EY14..... 0.25mm

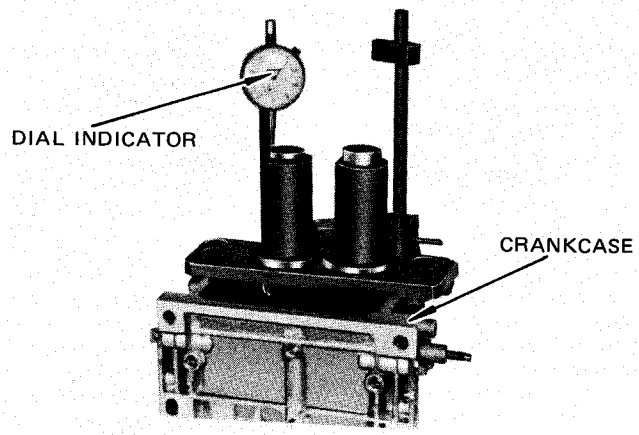


Fig. 5-3-8

5-3-10 CAMSHAFT and TAPPETS

1) Remove the camshaft from the crankcase.
   To prevent the tappets from falling or damaging, place the crankcase on the side as shown in Fig. 5-3-10.
2) Remove the tappets.
   Before removing the tappets, mark the holes and tappets so that they can be installed in the same holes.
3) Reassembly
   a) Insert the tappets back into their holes, and then mount the camshaft.
      In case of Models EY10 and EY14, the governor sleeve is attached to the main bearing cover. When installing a new one, place a spacer on the governor gear shaft, and assemble the governor gear and governor sleeve together. (See Fig. 5-3-9.)
   b) Align the timing mark at the root of a tooth of the cam gear with the one on the crank gear. If the valve timing is wrong, the engine cannot operate properly or at all. (See Fig. 5-3-11.)

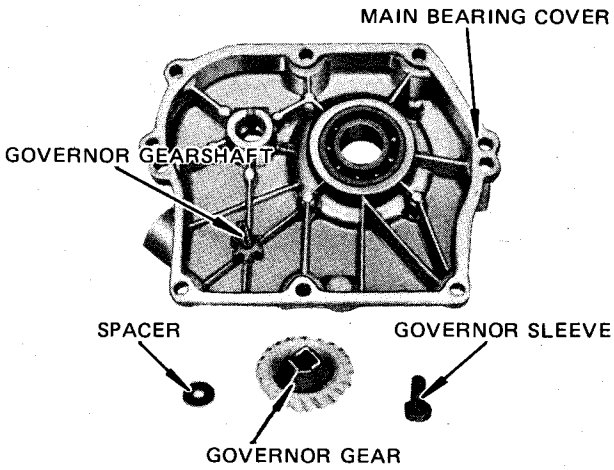


Fig. 5-3-9

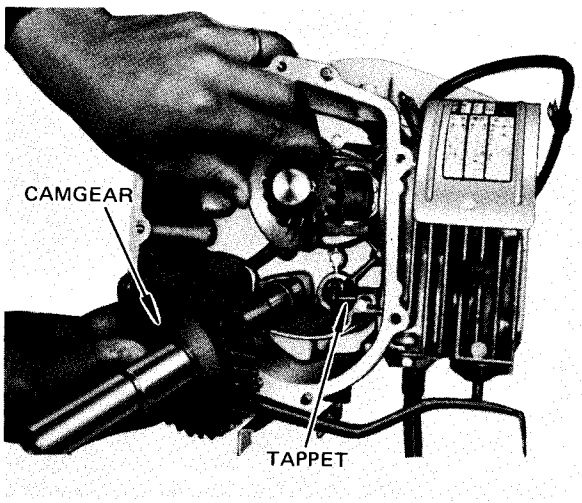


Fig. 5-3-10

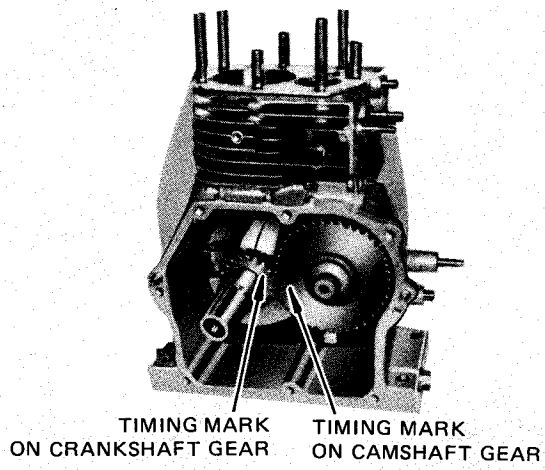


Fig. 5-3-11

5-3-11 CONNECTING ROD and PISTON

1) Scrape off carbon and other foreign deposits from the upper parts of the cylinder and piston to prevent them from damaging the piston in its vertical movement.
2) Straighten out the bent tabs of the lock washers on the connecting rod, and remove the bolts.
3) Remove the oil scraper, lock washers, and connecting rod cap from the crankshaft.
4) Turn the crankshaft until the piston is raised up to the highest position, push the connecting rod up, and remove the piston out of the top of the cylinder.
5) Remove the two clips, pull out the piston pin, and take the piston off from the small end of the connecting rod.
6) Spread the open ends of the pistion rings and remove them from the piston.
7) Reassembly

a) PISTON RINGS

If no ring expander is available, install the rings by placing the open ring ends over the first land of the piston and spreading the rings only far enough to slip them over the correct ring grooves.

* Pay attention not to break the rings by twisting.

Install the oil ring first, followed by the second ring and then the top ring. (See Fig. 5-3-12.)

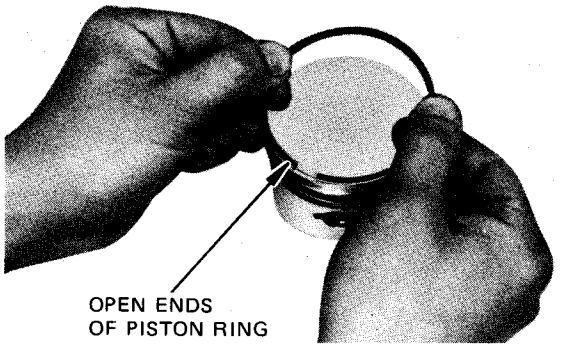


Fig. 5-3-12

b) Reassemble the pistion and connecting rod together with the piston pin. Be sure to place the clips on both ends of the pistion pin.

c) When installing the connecting rod into place, hold the piston rings with the ring guide as shown in Fig. 5-3-14 (if no ring guide is available, keep pressing the pistion rings with finger tips and gently strike the top of the piston with a wooden piece or the like to push it in), and check that the symbol ❼ on the connecting rod is in the direction of the flywheel magneto.

* Apply enough oil to the piston rings, connecting rod plain bearings and cylinder wall before reassembly.
* The open ends of the piston rings must be 90° apart from one another on the piston periphery.
* The clearance between the piston and cylinder must be measured at the piston skirt where thrust force is directed.

Turn the crankshaft to the bottom dead center, lightly hammer the piston head until the connecting rod contacts the crankpin, and assemble. Match the marks on the rod when reassembling the connecting rod cap. Make sure that the oil scraper is opposite to the magneto (on the main bearing cover side).

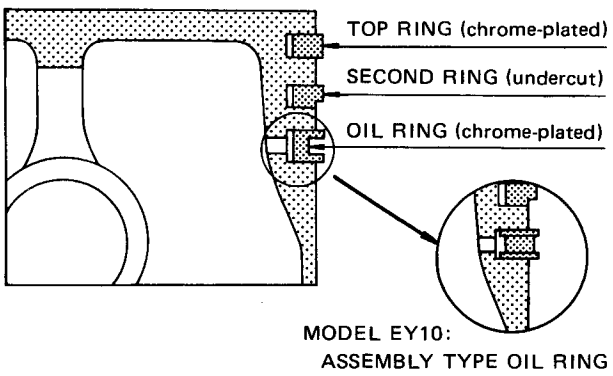


Fig. 5-3-13

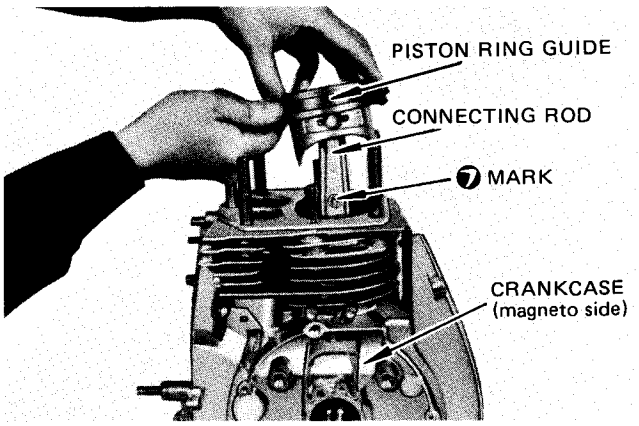
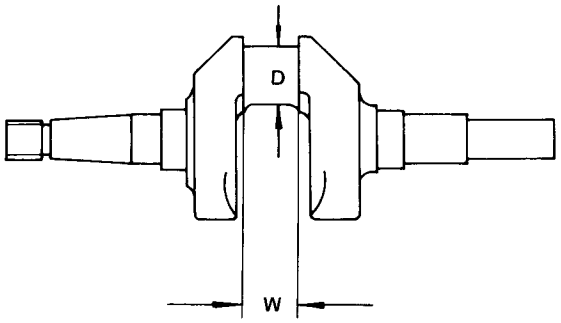


Fig. 5-3-14

* Use new lock washers, and bend the tabs securely.
* After the reassembly, check that the connecting rod moves lightly.
* Connecting rod cap tightening torque for Models EY10, EY14: 90 to 115kg-cm (6.5 ~ 8.3 ft-lb).

For the piston, piston ring and rod clearance, see Fig. 5-3-15.



		EY10	EY14
D (Crankshaft pin Dia.)		23 dia $^{-0.050}_{-0.063}$	24 dia $^{-0.050}_{-0.063}$
W (Crankshaft pin Width)		22 ± 0.1	23.4 $^{+0.1}_{0}$
PISTION TO CYLINDER AT PISTION SKIRT THRUST FACE		0.037L ~ 0.076L	0.037L ~ 0.075L
PISTON RING GAP	TOP, SECOND	0.15L ~ 0.35L	0.2L ~ 0.4L
	OIL	0.3L ~ 0.9L	0.2L ~ 0.9L
PISTON RING SIDE CLEARANCE IN GROOVES	TOP RING	0.050L ~ 0.095L	0.050L ~ 0.095L
	SECOND RING	0.040L ~ 0.085L	0.040L ~ 0.085L
	OIL RING	0.050L ~ 0.155L	0.010L ~ 0.055L
CONNECTING ROD TO CRANK PIN	DIA	0.050L ~ 0.076L	0.050L ~ 0.076L
	SIDE	0.1L ~ 0.6L	0.2L ~ 0.7L
CONNECTING ROD TO PISTION PIN		0.015L ~ 0.034L	0.010L ~ 0.029L
PISTION PIN TO PISTON		0.004T ~ 0.015L	0.009T ~ 0.010L

T: LOOSE T: TIGHT

Fig. 5-3-15

5-3-12 CRANKSHAFT

1) Remove the flywheel woodruf key.
2) Lightly hammer the magneto end of the crankshaft, and pull it out of the crankcase, exercising care not to damage the oil seal.
3) Reassembly

   Fit the oil seal guide onto the end of the crankshaft, and insert the crankshaft into the crankcase as shown in Fig. 5-3-16.

* *IN CASE OF NOT USING THE OIL SEAL GUIDE, EXERCISE GOOD CARE NOT TO DAMAGE THE OIL SEAL LIP.*

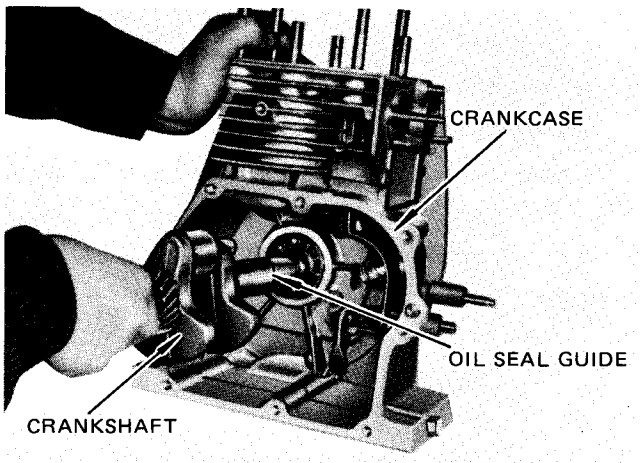


Fig. 5-3-16

6. MAGNETO

6-1 MAGNETO

Models EY10 and EY14 employ a magneto type ignition system. The magneto for Model EY10 is made by Nihon Denso Co., Ltd., and that for Model EY14 by Kokusan Electric Co., Ltd.

The magneto consists of a flywheel, ignition coil, and contact breaker assembly (including a capacitor). The flywheel is directly mounted on the crankshaft, and the ignition coil, contact breaker assembly and point cover in the crankcase.

6-2 CONTACT BREAKER POINT ADJUSTMENT

1) The contact breaker points are located inside the flywheel, and directly mounted to the crankcase.
2) Check the breaker points twice a season, or whenever ignition sparks are weak. If the surface of points become rough, correct them, and readjust the point gap to the specified clearance of 0.35mm.
3) The correct point gap is 0.35mm when the points are fully open. The spark timing of 23° is regulated by the point opening, so use a timing light to obtain an accurate spark advance.
4) To adjust the breaker point opening, remove the starting pulley, blower cover and flywheel from the engine, and take the following steps. (See Fig. 6-2.)
   a) Remove the point cover from the contact breaker.
   b) Turn the crankshaft until the contact breaker arm comes into contact with the highest point of the breaker cam. At this time, the point gap is the largest (0.35mm).
   c) Loosen the contact breaker screw just enough to make the breaker movable.
   d) Insert a 0.35mm feeler gauge between the points.

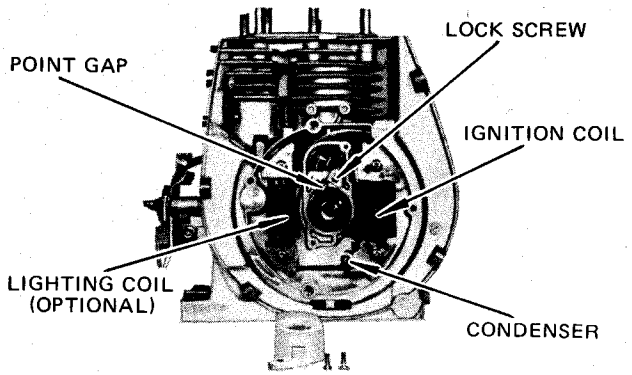


Fig. 6-2

CAUTION: ADJUST BREAKER POINT GAP WITHOUT OPENING IT MORE THAN 2mm, OTHERWISE RATED HEEL-PRESSING FORCE MAY NOT BE OBTAINED DUE TO THE BENDING OF CONTACT BREAKER ARM.

   e) Turn the adjusting tab with a screwdriver to move the contact breaker, opening or closing the points until the correct gap is obtained.
   f) Retighten the contact breaker screw securely, and check the point gap again.
   g) Insert a piece of white paper 8 to 10mm wide between the points, and clean the points of oil and dust.

CAUTION: IN THIS CASE, NEVER OPEN THE BREAKER POINT GAP MORE THAN 2mm.

   h) After the adjustment, install the flywheel, blower cover and starting pulley back on the engine.

6-3 TIMING ADJUSTMENT

1) Spark timing (or spark advance) is 23° before TDC for models EY10 and EY14, and it can be adjusted by the contact breaker point gap, which can be set to 0.35mm (0.014 in.) as mentioned in the Contact Breaker Point Adjustment procedure.
2) However, the advance timing can be more accurately adjusted through the following procedure using a timing tester as shown in Fig. 6-3-1.
3) For timing adjustment, the following TIMING MARKS are provided.

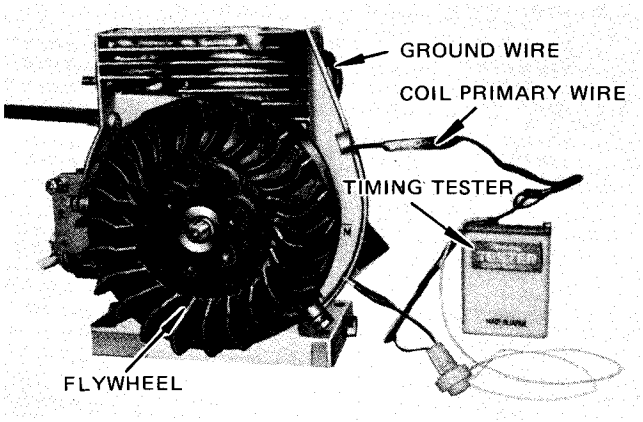


Fig. 6-3-1

* EY10: "P" mark and relief line at right side of crankcase.
  "M" mark and slit on flywheel circumference (See Fig. 6-3-2.)
* EY14: Projection at upper left of crankcase (See Fig. 6-3-3.)
  "M" mark and slit on flywheel circumference.

CAUTION: IN THE MODELS EY10 AND EY14 THE FLYWHEEL DIFFERS BETWEEN THE D AND B TYPES.

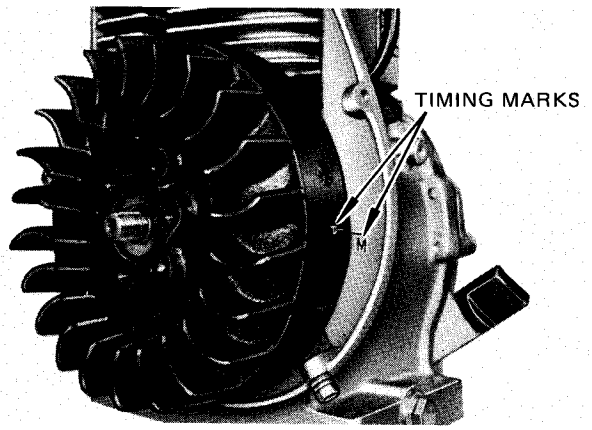


Fig. 6-3-2 (EY10)

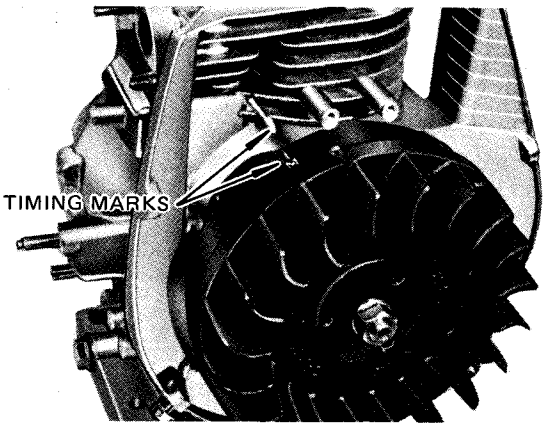


Fig. 6-3-3 (EY14)

4) Observe the following instructions, when using a timing tester for spark timing adjustment.
   a) Disconnect the stop button leads and coil primary wire.
   b) Remove the blower cover from the engine.
   c) Connect one of the timing tester leads to the coil primary wire, and the other to the crankcase. (See Fig. 6-3-1.)
   When the points are open, the tester sounds, and they are closed, it is silenced.
   d) Slowly turn the flywheel couterclockwise for Type D or clockwise for Type B until the tester is silenced.
   e) Then slowly turn the flywheel in the normal rotating direction, i. e., clockwise for Type D or counterclockwise for Type B, until the tester sounds. Check that the flywheel's slit meets the arrow mark on the crankcase.
   If so, the timing is correct.
   f) If not, remove the flywheel, adjust the point gap as mentioned in "Contact Breaker Adjustment", and repeat Steps 3 through 5 to adjust the timing. After the adjustment, place the blower cover back on the engine, and connect the coil primary wire to the stop button.

6-4 MAGNETO TROUBLE SHOOTING

If the engine does not start, or starts with difficulty, or if it does not run properly, check the magneto as mentioned below to see if there is anything wrong with the magneto.

1) Check the high-tension cable carefully for short-circuit.
2) Check the sparks.
   a) Remove the spark plug from the cylinder head, connect it to the high-tension cable, and ground the tip of spark plug to the cylinder head or the like. (The spark plug's correct spark gap is 0.6 to 0.7mm.)
   b) Pull the recoil starter to run the engine a few turns to check if the sparks produced in the spark gap are intense or weak, or if no sparks are produced. (Disconnect the primary wire from the connector beforehand.)
   c) Then remove the spark plug and plug cap, and check if sparks are produced from the tip of the high-tension cable.
3) Check the breaker points if they require cleaning or adjustment.
   If the points are dirty, burnt or oxidized, repair or replace the breaker. (In cases, the condenser may have to be replaced.
4) If no sparks are produced, check the ignition coil with a coil tester. If it is found faulty, replace it with a new one.

7. GOVERNOR ADJUSTMENT

Models EY10 and EY14 employ a centrifugal flyweight type governor. The governor is mounted on the governor gear and the throttle valve of the carburetor is automatically regulated by a lever which is connected to the governor in order to maintain constant engine speed against load variations.

The adjustment procedure of the governor is as follows (See Fig. 7-1.)

1) Connect the carburetor throttle lever to the governor lever with the connecting link, and mount them onto the governor shaft.
2) Install the control lever to the crankcase.
3) Connect the governor lever to the control lever with the governor spring.
4) Turn the control lever "clockwise" (towards high speed), and confirm that the carburetor throttle valve can be fully opened. Lock the control lever with the butterfly nut.
5) With a screwdriver in the groove of the goneror shaft, turn it "clockwise" fully until the governor shaft no longer moves, and then lock the governor lever to the governor shaft with the governor lever nut.

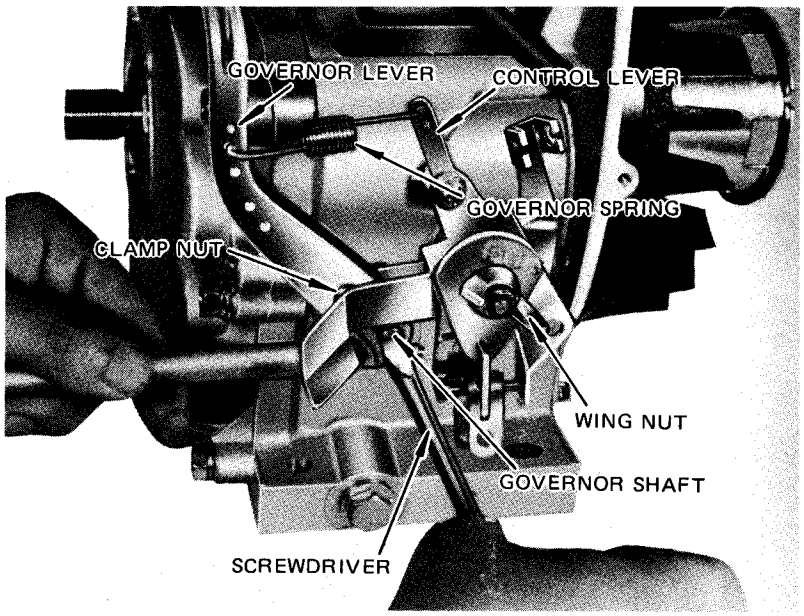


Fig. 7-1

8. CARBURETOR

8-1 OPERATION and CONSTRUCTION (See Fig. 8-1-1 and Fig. 8-1-2.)

8-1-1 FLOAT SYSTEM

The float chamber is located just below the carburetor body and, with a float and a needle velve, maintains a constant fuel level during engine operation.

The fuel flows from the fuel tank into the float chamber through the needle valve. When the fuel rises to a specific level, the float rises; and when its buoyancy and fuel pressure are balanced, the needle valve close to the shut off the fuel, thereby keeping the fuel at the reference level.

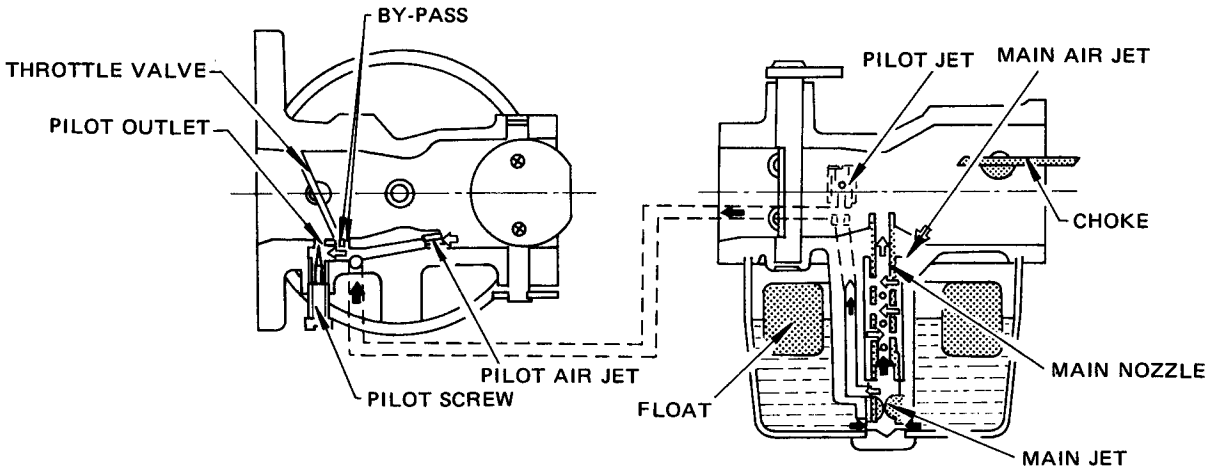


Fig. 8-1-1

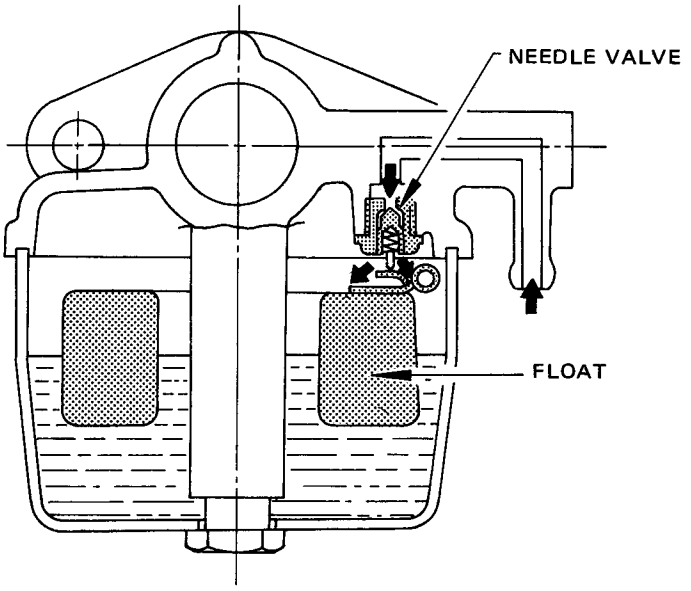


Fig. 8-1-2

8-1-2 PILOT SYSTEM

The pilot system feeds the fuel to the engine during idling and low-speed operation.

The fuel is fed through the main jet to the pilot jet, where it is metered, and mixed with the air metered by the pilot air jet. The fuel-air mixture is regulated by the pilot screws, and fed from the pilot outlet to the engine through the by-pass.

During engine idling, the fuel is mainly fed from the pilot outlet.

8-1-3 MAIN SYSTEM

The main system feeds the fuel to the the engine during medium- and high-speed operation.

The fuel is metered by the main jet and fed to the main nozzle. The air metered by the main air jet is mixed with the fuel through the bleed holes in the main nozzle, and the mixture is atomized out of the main bore. It is mixed again with the air taken through the air cleaner into an optimum fuel-air mixture, which is supplied to the engine.

8-1-4 CHOKE

The choke is used for easy start in the cold season. When the starter button is pushed with a closed choke, the negative pressure applied to the main nozzle increases and draws much fuel accordingly; thus easily start up the engines.

8-2 DISASSEMBLY and REASSEMBLY

Apart from mechinical failures, most of carburetor troubles are caused by an incorrect mixing ratio, which may arise mainly due to a clogged up air or fuel passage in jets, or fuel level variations. In order to assure proper flow of air and fuel, the carburetor must be kept clean at all times. The carburetor disassembly and reassembly procedures are as follows: (See Fig. 8-2-1 and Fig. 8-2-2.)

8-2-1 THROTTLE SYSTEM

1) Remove the Philips screw (16) and throttle valve (21), and pull out the throttle shaft (22).
2) The spring (23) can be taken out by removing the throttle stop screw (24).

* Exercise care not to damage the throttle valve ends.

8-2-2 CHOKE SYSTEM

1) Remove the Philips screw (16) and choke valve (17), and pull out the choke shaft (18).
2) When reassembling the choke shaft, make sure that the cutout in the choke valve faces the main air jet.

8-2-3 PILOT SYSTEM

1) Remove the pilot jet (27), using the correct tool to avoid damage to it.
2) Remove the pilot screw (26) and spring (25).
3) Reassembly
   a. Tighten the pilot jet securely. Otherwise, the fuel may leak, causing engine malfunction.
   b. If the tapered part of the pilot screw is out of shape, replace it with a new one. Do not tighten it too hard.

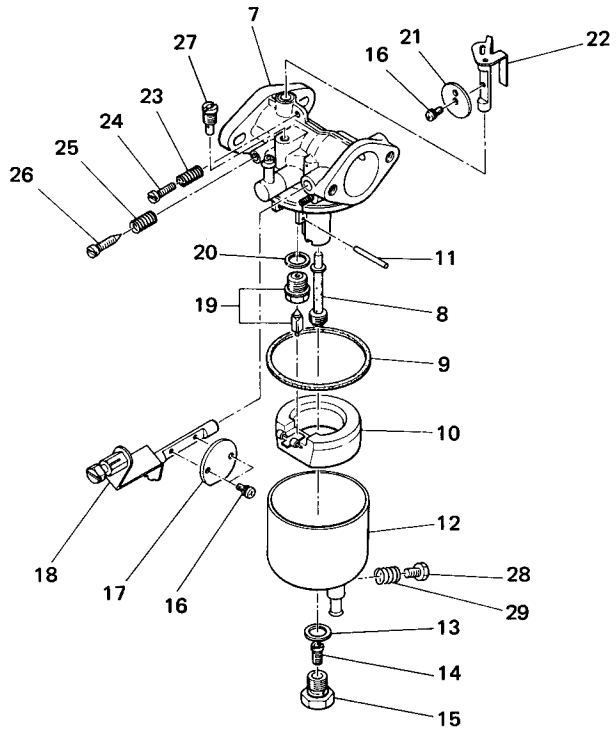


Fig. 8-2-1 (EY10)

8-2-4 MAIN SYSTEM

1) Remove the main jet holder (15) and float chamber body (12).
2) Remove the main jet (14) from the main jet holder (15).
3) Remove the main nozzle (8) from the carburetor body.
4) Reassembly
   a. Tighten the metering needle to the main jet holder securely, and set it to the specified opening for a regulated fuel flow because of adjustable metering needle.
   b. The main jet holder tightening torque is 70 ~ 80 kg-cm (5.0 ~ 5.8 ft-lb).

CAUTION: BE CAREFUL NOT TO DAMAGE THE O-RING ON THE MAIN JET ASSEMBLY.

8-2-5 FLOAT SYSTEM

1) Pull out the float pin (11), and remove the float (10) and needle valve (19).
2) Reassembly
   If the needle valve need be replaced, be sure to replace it together with the valve seat.

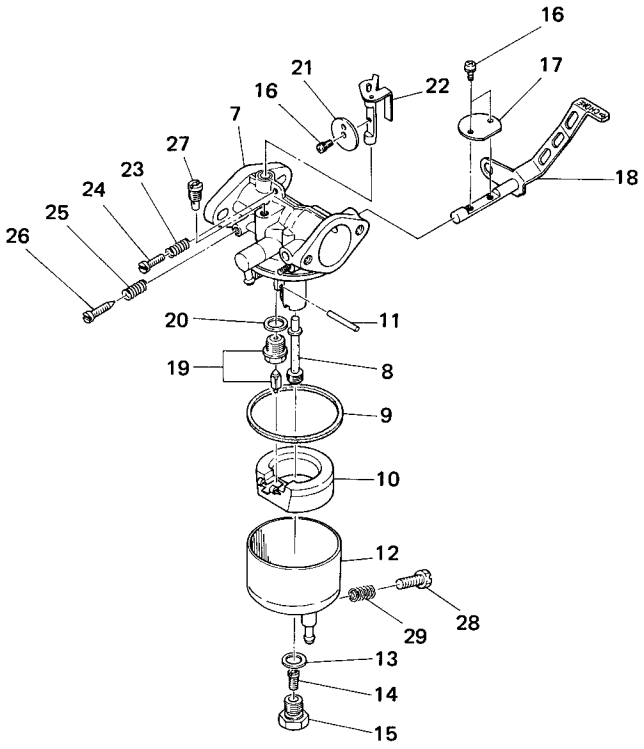


Fig. 8-2-2 (EY14)

CAUTION: WHEN CLEANING THE JETS, USE NEITHER A DRILL NOR A WIRE (BECUASE OF POSSIBLE DAMAGE OF THE ORIFICE WHICH WILL ADVERSELY AFFECT FUEL FLOW). BE SURE TO USE COMPRESSED AIR TO BLOW THEM CLEAN.

8-3 ADJUSTMENT

1) Fully close the pilot screw (turning it in all the way), then turn it back counterclockwise 1-1/8 turns for Model EY10, or 1-1/2 turns for Model EY14.

   Model EY10 ..... 1-1/8 turns

   Model EY14 ..... 1-1/2 turns

CAUTION: DO NOT OVERTIGHTEN THE PILOT SCREW WHEN CLOSING IT, OTHERWISE, THE NEEDLE AT THE TIP MAY BREAK.

2) Turn the throttle stop screw clockwise until the engine runs at the normal idling speed of 1,200 rpm. If the engine runs faster than that, turn the screw counterclockwise.
3) Make a final adjustment when the engine is in normal operation, at normal temperature, with a proper air cleaner mounted on it.

9. RUN-IN OPERATION of REASSEMBLED ENGINE

An overhauled engine must be operated at low speed to run-in the parts. A thorough run-in is indispensable particularly when the cylinder, piston, piston rings or valves are replaced with new ones.

The recommended run-in schedule is shown below.

LOAD		SPEED	TIME
EY10	EY14		
NO LOAD		2,500 rpm	10 minutes
NO LOAD		3,000 rpm	10 minutes
NO LOAD		3,600 rpm	10 minutes
0.8 HP	1.25 HP	3,600 rpm	30 minutes
1.6 HP	2.5 HP	3,600 rpm	60 minutes

10. ROBBIN ELECTRONIC IGNITION ENGINE

10-1 FEATURES

The EY Series with pointless magneto is available which features an electronic ignition engine of the C.D.I. (Capacitor, Discharge and Ignition) system as option.

The electronic ignition engine is completely free of the faulty sparking in the conventional engine caused by a dirty or burnt point, oxidation during long storage or mechanical wear; requires no maintenance, provides good sparks, and are unaffected by water, oil, dust, moisture, etc.

10-2 BASIC THEORY of C.D.I.

The C.D.I. system consists of an exciter coil, pulser coil and C.D.I. unit. Its operating theory is as follows:

1) The AC voltage generated in the exciter coil by the rotation of the flywheel charges the capacitor.
2) As the flywheel turns further, the AC voltage generated in the pulser coil is applied to the gate of S.C.R. to energize S.C.R.
   a. In case of EY10 with old type and EY14:
      AC voltage applied to S.C.R. is positive (+) voltage,
   b. In case of EY10 with new type:
      AC voltage applied to S.C.R. is negative (-) voltage.
3) When S.C.R. is energized, the electric charge in the capacitor is suddenly released through S.C.R. to the primary coil, and a high voltage is generated in the secondary coil due to a change in the current, thus generating a spark from the spark plug.

EY10 WITH OLD TYPE and EY14

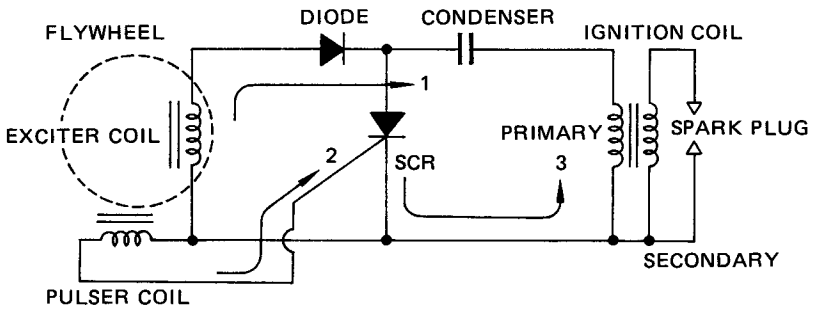


Fig. 10-1-1

EY10 WITH NEW TYPE

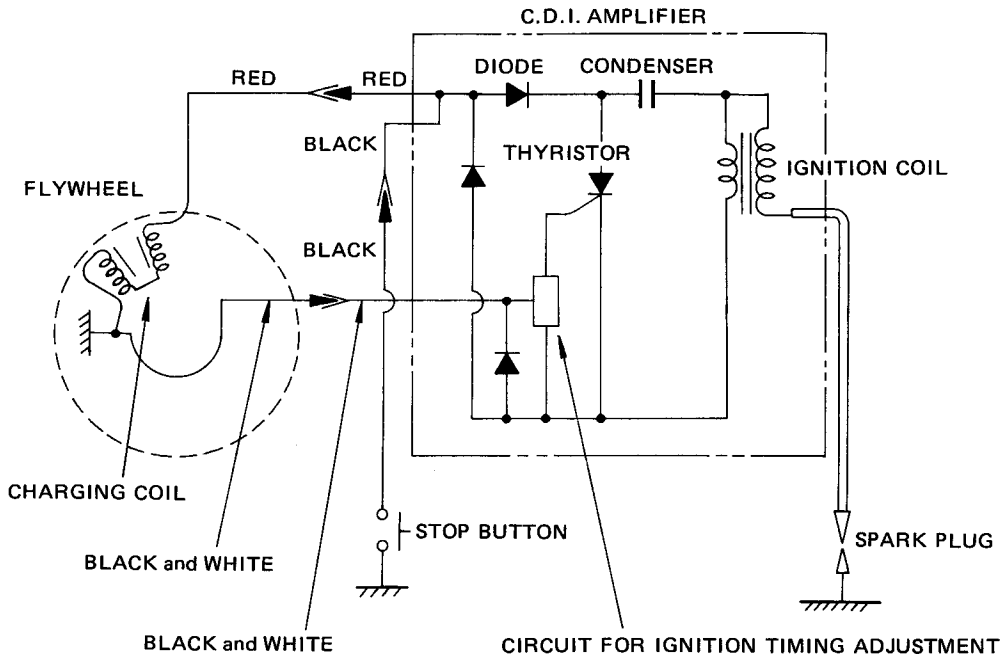


Fig. 10-1-2

10-3 CHECK

The electronic ignition parts are completely packaged so that they will hardly develop troubles. If a spark failure or other trouble should develop, check as follows:

1) Measure the resistances of the exciter coil and pulser coil.

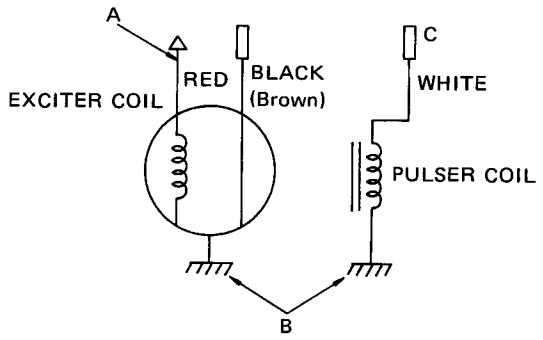


Fig. 10-2

		A ~ B Exciter coil	C ~ B Pulser coil
EY10	NEW	118 ~ 158Ω	———
	OLD	250Ω ± 15%	67Ω ± 15%
EY13, 14 EY18, 25 EY27, 33 EY44		370Ω ± 15%	67Ω ± 15%

**Resistance must be within the limits mentioned in the table above.*

2) C.D.I. ignition unit

Check the unit with a C.D.I. unit checker to see if sparks are generated.

3) Please refer to **"Robin Electronic Ignition Engine"**, Instruction Manual for detailed information.

11. TROUBLE SHOOTING

The following three conditions must be satisfed for satisfactory engine start.

1. The cylinder filled with a proper fuel-air mixture.
2. An appropriate compression in the cylinder.
3. Good sparks at the correct time to ignite the mixture.

The engine cannot be started unless these three conditions are met. There are also other factors which make engine start difficult, e. g., a heavy load on the engine when it is about to start at low speed, and a high back pressure due to a long exhaust pipe, just to say a few.

The most common causes of engine troubles are given below:

11-1 STARTING DIFFICULTIES

11-1-1 FUEL SYSTEM

1) No gasoline in the fuel tank; or the fuel cock is closed.
2) The carburetor is not choked enough, particularly when the engine is cold.
3) Water, dust or gum in the gasoline block flow of the fuel to the carburetor.
4) Inferior grade gasoline or poor quality gasoline is not gasfied enough to produce the correct fuel-air mixture.
5) The carburetor needle valve is held open by dirt or gum. This trouble can be detected as the fuel flows out of the carburetor when the engine is idling. (Overflow)
   This trouble may be remedied, depending on cases, by lightly tapping the float chamber with the grip of a screwdriver or the like.
6) If the carburetor overflows, excessive fuel runs into the cylinder when starting the engine, making the fuel-air mixture too rich to burn. If this happens, remove the spark plug, and turn the starting pulley a few tunrs in order to let the rich fuel-air mixture out of the spark plug hole into the atmosphere. Keep the carburetor choke open during this operation. Dry the spark plug well, screw it into place, and try to start again.
7) When the engine is cold, pull the carburetor knob to let the gasoline flow into the carburetor.

11-1-2 COMPRESSION SYSTEM

If starting difficulties and loss of power are not due to the fuel system or ignition system, the following must be checked for possible lack of compression.

1) Engine inside is completely dried up because of a long period of non-operation.
2) Loose or broken spark plug. This causes a hissing noise made by mixture gas running out of cylinder in compression stroke during cranking.
3) Damaged head gasket or loose cylinder head. A similar hissing noise is produced during compression stroke.
4) Incorrect Tappet Clearance
   If the correct compression is not obtained even after remedying the above, disassemble the engine and check further as follows:

a) Valve stuck open due to carbon or gum on the valve stem.
b) If the piston rings are stuck on the piston, remove the piston and connecting rod from the engine, and clean, remedy or replace the parts.

11-1-3 ELECTRICAL SYSTEM

Check the following for lack of sparks.

1) Leads of the ignition coil, spark plug or contact breaker disconnected.
2) Ignition coil damaged and shorted.
3) Spark plug cable wet or soaked with oil.
4) Spark plug dirty or wet.
5) Spark plug electrode gap incorrect.
6) Spark plug electrodes in contact with each other.
7) Contact breaker points pitted or fused.
8) Breaker arm stuck.
9) Condenser leaking or grounded.
10) Incorrect spark timing.

11-2 ENGINE MISFIRES

1) Incorrect spark plug electrode gap. Adjust it to anywhere between 0.6 and 0.7mm.
2) Ignition cable worn and leaking.
3) Sparks weak.
4) Ignition wire connections loose.
5) Pitted or worn breaker points.
6) Water in gasoline.
7) Insufficient compression.

11-3 ENGINE STOPS

1) Fuel tank empty. Water, dirt, gum, etc. in gasoline.
2) Vapor lock, i. e., gasoline evaporating in the fuel lines due to overheat around the engine.
3) Vaper lock in the fuel lines or carburetor due to the use of too volatile winter gas in the hot season.
4) Air vent hole in the fuel tank cap plugged.
5) Bearing parts seized due to lack of oil.
6) Magneto or ignition coil faulty.

11-4 ENGINE OVERHEAT

1) Crankcase oil level low. Add oil immediately.
2) Spark timing incorrect.
3) Low grade gasoline is used, or engine is overloaded.
4) Cooling air circulation restricted.
5) Cooling air partly misdirected causes loss of cooling efficiency.
6) Cylinder head cooling fins clogged up with dirt.
7) Engine operated in an enclosed space without fresh supply of cooling air.
8) Exhaust gas discharge restricted, or carbon deposits in the combustion chamber.
9) Engine running on low-octane gasoline detonates due to heavy load at low speed.

11-5 ENGINE KNOCKS

1) Low-quality gasoline.
2) Engine operating under heavy load at low speed.
3) Carbon or lead deposits in the cylinder head.
4) Spark timing incorrect.
5) Loose connecting rod bearing due to wear.
6) Loose pistion pin due to wear.
7) Causes of engine overheat.

11-6 ENGINE BACKFIRES through CARBURETOR

1) Water or dirt in gasoline, or low-grade gasoline.
2) Intake valve stuck.
3) Valves overheated, or red-hot carbon particles in the combustion chamber.
4) Engine cold.

12. INSTALLATION

Engine life, ease of maintenance and inspection, frequency of checks and repairs, and operating cost all depend on the way in which the engine is installed. Carefully observe the following instructions for installing the engine.

12-1 INSTALLING

When mounting the engine, carefully examine its position, the method of connecting it to a load (machine), the foundation, and the method of supporting the engine.

When determining its mounting position, in particular, make sure that gasoline and oil can easily be supplied and checked, the spark plug and breaker can easily be checked, the air cleaner can easily be serviced, and that the oil can easily be discharged.

12-2 VENTILATION

Fresh air is necessary for cooling the engine and burning the fuel.

In cases where the engine is operated under a hood or in a small room, temperature rise in the engine room can cause vapor lock, oil deterioration, increased oil consumption, loss of power, piston seizure, shorter engine life, etc., making it impossible to operate the engine properly. It is necessary, therefore, to provide a duct or baffle to guide cooling air to the engine to prevent recirculation of the hot air used for engine cooling, and temperature rise of the load (machine).

Take steps as necessary to keep the engine room temperature below 50°C even in the hottest period of the year.

12-3 EXHAUST GAS DISCHARGE

Exhaust gas is noxious. When operating the engine indoors, be sure to discharge the exhaust gas outdoors. If a long exhaust pipe is used in such a case, the internal resistance increases causing loss of engine power. Thus pipe inside diameter must increase in proportion to exhaust pipe length.

Exhaust pipe: Less than 3m long, pipe inside diameter 25mm,
Less than 5m long, pipe inside diameter 30mm.

12-4 FUEL SYSTEM

* If a battery is used, a solenoid pump can be used so that the fuel tank may be located lower than the carburetor. (Up to about 80cm)
* Be sure to install a fuel strainer between the fuel tank and the solenoid pump.

12-5 POWER TRANSMISSION to DRIVEN MACHINES

12-5-1 BELT DRIVE

Take the following notes into consideration.

* V-belts are preferable to flat velts.
* The driving shaft of the engine must be parallel to the driven shaft of the load.
* The driving pulley of the engine must be in line with the driven pully of the load.
* Install the engine pulley as close to the engine as possible.
* If possible, span the belt horizontally.
* Disengage the load when starting the engine.

If no clutch is used, use a belt tension pulley or the like.

12-5-2 FLEXIBLE COUPLING

When using a flexible coupling, runout and misalignment between the driven shaft and engine shaft must be minimized. Runout and misalignment tolerances are specified by the coupling manufacturer.

12-6 WIRING

a) Recoil starter operation

Wire as shown in the wiring diagram below. Normally, those indicated by dotted lines are not included in engine wiring. Lighting coil for Models EY10, EY14 (an optional, not standard accessory) permits installation of an AC buzzer with an intermediate tap.

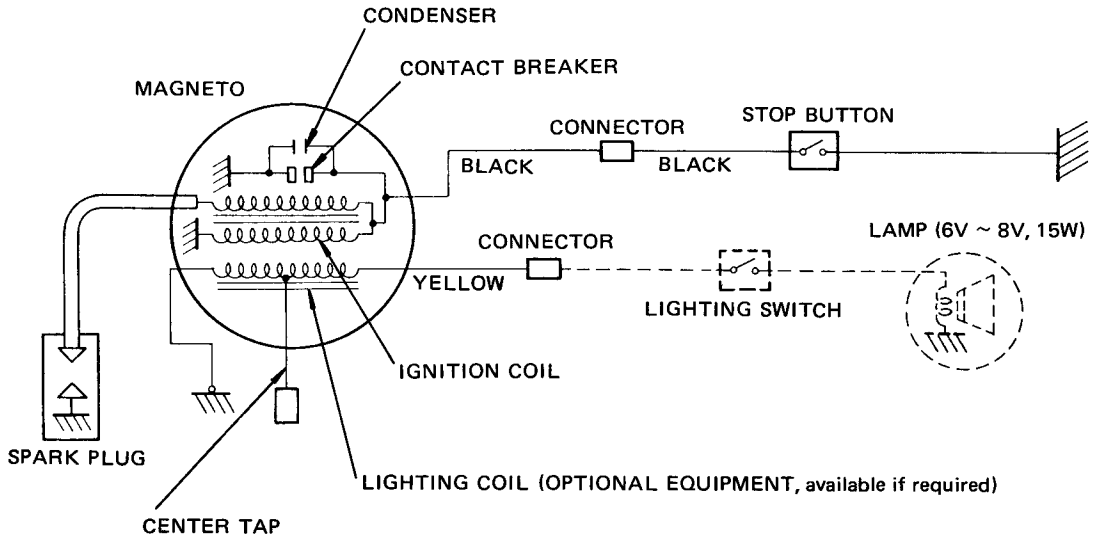


Fig. 12-1

13. CHECKS and CORRECTIONS

After disassembling and cleaning the engine, check and repair, if necessary, according to the correction table. The correction table applies whenever the engines are repaired. It is important for the servicemen to be familiar with the contents of this table. Correct maintenenace is recommended by observing the correction standards specified.

The meanings of the terms used in the correction table are as follows:

1) Correction

Repair, adjustment or replacement of any engine parts.

2) Correction Limit

The limit on wear, damage or functional deterioration of engine parts beyond which normal engine performance cannot be expected without repairing such parts.

3) Use Limit

The limit beyond which parts can no longer be used in respect of performance or strength.

4) Standard Dimensions

The design dimensions of new parts minus tolerance.

5) Correction Tolerance

Tolerance on the dimensions of engine parts refinished or adjusted.

14. TABLES OF CORRECTION STANDARDS

ITEM		ENGINE MODEL	STANDARD SIZE	CORRECTION		USE LIMIT	REMARKS	TOOL	CORRECTION METHOD
				TOLERANCE	LIMIT				
Flatness of cylinder head		EY10 EY14	Less than 0.1	0.05	0.15			Surface plate, Feeler	Correct
Cylinder	Bore	EY10	S.T.D. 57 dia.	+0.019 0	0.15	0.65		Cylinder gauge	Boring
		EY14	62 dia.						
	Roundness	EY10 EY14		0.01					
	Cylindricity	EY10 EY14		0.015					
	Valve seat contact width	EY10 EY14		1.2~1.5	2.5			Seat cutter	Correct
	Valve guide I.D.	EY10 EY14	6 dia.	+0.022 0	0.15	0.15	At middle portion	Cylinder gauge	Replace
Piston	O.D. at skirt, in thrust direction (over size)	EY10	S.T.D. 56.963 dia. B 57.213 dia. C 57.463 dia.	0 -0.02	-0.1	-0.1		Micro-meter	Replace
		EY14	S.T.D. 61.963 dia. B 62.213 dia. C 62.463 dia.						
	Width of ring groove	EY10	Top, 2nd 2 Oil 3.5	+0.025 0	0.15	0.15		Vernier calipers	Replace
		EY14	Top, 2nd 2.5 Oil 0.4						
	Piston pin hole	EY10 EY14	13 dia. 14 dia.	+0.002 -0.009	0.035	0.035		Cylinder gauge	
	Clearance between piston and cylinder	EY10		0.037~0.076	0.025	0.25	Max. cylinder dia. and piston dia. at skert in thrust direction	Cylinder gauge, Micro-meter	Replace
		EY14		0.037~0.075					
	Clearance between pisition ring and ring groove	EY10	Top 2nd Oil	0.050~0.095 0.040~0.085 0.050~0.155	0.15	0.15		Feeler gauge	Replace
		EY14	Top 2nd Oil	0.050~0.095 0.040~0.085 0.010~0.055					
	Fit between piston and piston pin	EY10		0.004~0.015	0.06L	0.06L		Cylinder gauge, Micro-meter	Replace
		EY14		0.009~0.010					
Piston Ring	Ring gap	EY10	Top 2nd Oil	0.15 ~ 0.35 0.15 ~ 0.35 0.3 ~ 0.9	1.5	1.5		Feeler gauge	Replace
		EY14	Top 2nd Oil	0.2 ~ 0.4 0.2 ~ 0.4 0.2 ~ 0.9					
	Ring width	EY10	Top 2.0 2nd 2.0 Oil 3.5	-0.03~-0.01	-0.1	-0.1		Mircro-meter	Replace
		EY14	Top 2.5 2nd 2.5 Oil 4.0						

ITEM		ENGINE MODEL	STANDARD SIZE	CORRECTION		USE LIMIT	REMARKS	TOOL	CORRECTION METHOD
				TOLERANCE	LIMIT				
Piston pin O.D.		EY10	13 dia.	-0.005 -0.013	-0.04	-0.04		Micro-meter	Replace
		EY14	14 dia.	0 -0.003					
Connecting Rod	Large end I.D.	EY10	23 dia.	+0.013 0	0.1	0.1		Cylinder gauge	Replace
		EY14	24 dia.						
	Clearance between rod large end I.D. and crankpin	EY10		0.050~0.076	0.2	0.2		Cylinder gauge, Micro-meter	Replace
		EY14							
	Small end I.D.	EY10	13 dia.	+0.021~+0.010	0.08	0.08		Cylinder gauge	Replace
		EY14	14 dia.						
	Clearance between small end I.D. and pinston pin	EY10		0.015~0.034	0.12	0.12		Cylinder gauge, Micro-meter	Replace
		EY14		0.010~0.029					
	Large end side clearance	EY10		0.1~0.6	1.0	1.0		Feeler gauge	Re-machine or Replace
		EY14		0.2~0.7					
	Parallelism between large end and small end bores	EY10		Less than 0.1	0.1	0.1		Test bar and Dial gauge	Re-machine or Replace
		EY14							
	Distance between large end and small end bores	EY10	73	±0.1		0.15			
		EY14	85						
Crankshaft	Crankpin O.D.	EY10	23 dia.	-0.050 -0.063	0.15	0.5		Micro-meter	Re-machine or Replace
		EY14	24 dia.						
	Crankpin O.D. roundness	EY10		Less than 0.005				Micro-meter	
		EY14							
	Crankpin O.D. cylindricity	EY10		Less than 0.005				Micro-meter	
		EY14							
	Crankpin O.D. parallelism	EY10		Less than 0.008				Dial gauge	
		EY14							
	Crankshaft journal O.D.	EY10	Drive s. 20 dia.	-0.003 -0.012	-0.05	-0.05		Micro-meter	Replace
			Mag. s. 20 dia.						
		EY14	Drive s. 22 dia.						
			Mag. s. 20 dia.						
Camshaft	Cam lobe height	EY10 EY14	24.8		-0.25	-0.25		Micro-meter	Replace
	Journal O.D.	EY10D	Drive s. 20 dia.		0.05	0.05		Micro-meter	Replace
			Mag. s. 15 dia						
		EY10B	15 dia.						

ITEM		ENGINE MODEL	STANDARD SIZE	CORRECTION		USE LIMIT	REMARKS	TOOL	CORRECTION METHOD
				TOLERANCE	LIMIT				
Camshaft	Journal O.D.	EY14D	Drive s. 22 dia. Mag. s. 15 dia.		0.05	0.05		Micro-meter	Replace
		EY14B	15 dia.						
Valve spring	Free length	EY10 EY14	32		-1.5			Vernier calipers	Replace
	Squareness	EY10 EY14				1.0	For total length	Square	Replace
Intake & Exhaust Valves	Valve stem O.D.	EY10	Intake Exhaust 6 dia.	-0.030~-0.048 -0.075~-0.095	-0.15			Micro-meter	Replace
		EY14	Intake Exhaust 6 dia.	-0.025~-0.040 -0.075~-0.095					
	Clearance between stem and guide	EY10	Intake Exhaust	0.030 ~ 0.070 0.075 ~ 0.117	0.3	0.3	At middle	Cylinder gauge	Replace
		EY14	Intake Exhaust	0.025 ~ 0.062 0.075 ~ 0.117					
	Tappet clearance	EY10 EY14		When cold 0.16~0.20	below 0.05 above 0.25			Feeler gauge	Correct
	Clearance between groove and retainer	EY10 EY14	2.5	0.04 ~ 0.15	0.5	0.5		Feeler gauge	Replace
	Stem end length	EY10	4.9			-2.0	-2.0	Vernier calipers	Replace
		EY14	4.0						
Tappet	Total length	EY10	30.95	+0.06 ~ 0	-0.5	-0.5		Vernier calipers	Replace
		EY14	38.12						
	Clearance between stem and guide	EY10		0.013 ~ 0.044	0.2	0.2		Cylinder gauge, Micro-meter	Replace
		EY14		0.025 ~ 0.062					
Carburetor	Metering needle unscrew	EY10 EY14	Fixed	± 1/4					
	Pilot screw unscrew	EY10	BV18 1-1/8	± 1/4					
		EY14	BV18 1-1/2						
Electric Device	Spark plug	EY10 EY14	NGK B-6HS						
	Spark gap	EY10 EY14		0.5~0.6	1			Feeler gauge	Adjust or replace
	Spark timing	EY10 EY14	23° before T.D.C.	± 3°	± 5°			Timing tester	Adjust
	Point opening	EY10 EY14	0.35	± 0.05	± 0.1			Contact breaker spanner	Adjust

ITEM	MODEL	HP/rpm	CORRECTION LIMIT	REMARKS
Max. Output	EY10 EY14	2.3/4000 3.5/4000	Below 110% of rated output	
Continuous Rated Output	EY10 EY14	1.6/3600 2.5/3600		

ITEM	MODEL	liter/hr	REMARKS
Fuel Consumption	EY10 EY14	0.82 1.1	

ITEM	MODEL	cc/hr	USE LIMIT cc/hr	REMARKS
Lubricant Consumption	EY10	10	50	
	EY14	15	60	

ITEM	MODEL	liter	REMARKS
Specified Lubrican Quantity	EY10 EY14	0.50 0.50	Use the class SC or higher grade Engine Oil Below - 10°C (14°F) SAE 10W-30 - 10°C (14°F) ~ 20°C (68°F) SAE #20 20°C (68°F) ~ 40°C (104°F) SAE #30

ITEM	MODEL	FREQUENCY OF OIL CHANGE
Oil Change	EY10 EY14	First time: Change oil after 20 hours operation. Second Time and Thereafter: Change oil every 50 hours operation.

ITEM	MODEL	kg/cm²/rpm	CORRECTION LIMIT	TOOL
Cylinder pressure	EY10 EY14		70% of normal value	Pressure gauge

ITEM	MODEL	rpm	TOOL	REMARKS
Min. accelerating revolution	EY10D EY14D	1200 ~ 1300	Tachometer	
	EY10B EY14B	600 ~ 650		

	ITEM	MODEL	kg-cm	ft-lb	TOOL	REMARKS
Tightening Torque	Cylinder head clamp nuts	EY10 EY14	190 ~ 230			Torque wrench
	Connecting rod bolts	EY10 EY14	90 ~ 115			Torque wrench
	Magneto clamp nuts	EY10 EY14	450 ~ 500			Torque wrench
	Main bearing cover bolts	EY10 EY14	80 ~ 110			Torque wrench
	Spark plug	EY10 EY14	260 ~ 300			Torque wrench

15. MAINTENANCE and STORING

The following maintenance jobs apply when the engine is operated correctly under normal conditions. The indicated maintenance intervals are by no means guarantees for maintenance free operations during these intervals.

For example, if the engine is operated in extremely dusty conditions, the air cleaner should be cleaned every day instead of every 50 hours.

15-1 DAILY CHECKS and MAINTENANCE

Checks and maintenance	Reasons for requiring them
Remove dust from whatever parts which accumulated dust.	The governor linkage is especially susceptible to dust.
Check external fuel leakage. If any, retighten or replace.	Not only wasteful but also dangerous
Check screw tightening. If any loose one is found, re-tighten.	Loose screws and nuts will result in vibration accidents.
Check oil level in crankcase and add up as necessary.	If the engine is operated without sufficient oil, it will fail.

15-2 EVERY 20 HOURS CHECKS and MAINTENANCE

Checks and maintenance	Reasons for requiring them
Change crankcase oil.	To remove run-in wear particles

15-3 EVERY 50 HOURS (10 DAYS) CHECK and MAINTENANCE

Checks and maintenance	Reasons for requiring them
Change crankcase oil.	Contaminated oil accelerates wear.
Clean air cleaner.	Clogged air cleaner harms engine operation.
Check spark plug. If contaminated, wash in gasoline or polish with emery paper.	Output power is reduced and starting is made difficult.

15-4 EVERY 100 ~ 200 HOURS (MONTHLY) CHECKS and MAINTENANCE

Checks and maintenance	Reasons for requiring them
Clean fuel filter and fuel tank.	The engine will be out of order.
Clean contact breaker points.	The engine output drops.

15-5 EVERY 500 ~ 600 HOURS (SEMIANNUAL) CHECKS and MAINTENANCE

Checks and maintenance	Reasons for requiring them
Remove cylinder head and remove carbon deposit.	The engine will be out of order.
Disassemble and clean carburetor.	

15-6 EVERY 1000 HOURS (YEARLY) CHECKS and MAINTENANCE

Checks and maintenance	Reasons for requiring them
Perform overhauls, clean, correct or replace parts.	The engine output drops and become out of order.
Change piston rings.	
Replace fuel pipe once a year.	To prevent from danger caused by the fuel leakage.

15-7 PREPARATION for LONG ABEYANCE

1) Perform the above 15-1 and 15-2 maintenance jobs.
2) Drain fuel from the fuel tank and carburetor float chamber.
3) To prevent rust in the cylinder bore, apply oil through the spark plug hole and turn the crankshaft several turns by hand. Re-insall the plug.
4) Turn the starting pulley by hand and leave it where the resistance is the heaviest.
5) Clean the engine outside with oiled cloth.
6) Put a vinyl or other cover over the engine and store the engine in dry place.