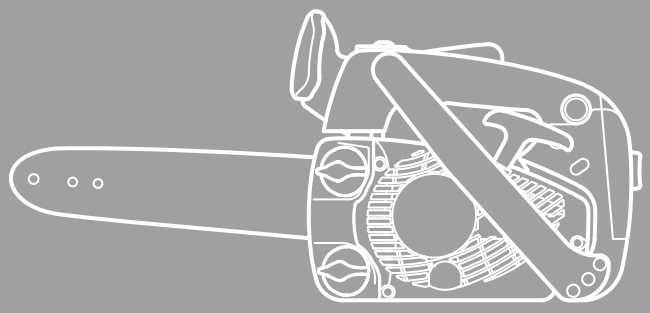
ECHO®



SERVICE MANUAL

CS-271T

Ord. No. 401-37

INTRODUCTION

This service manual contains information for service and maintenance of **ECHO CHAIN SAW,** model **CS-271T**.

For systematic diagnosis, to avoid extra work, time loss and to meet Emission regulation, please refer to “Troubleshooting guide” that describes problems, testing, remedies and references. We recommend you make use of Operator’s Manual and Parts Catalogue together with this manual when servicing.

We are constantly working on technical improvement of our products. For this reason, technical data, equipment and design are subject to change without notice. All specifications, illustrations and directions in this manual are based on the latest product information available at the time of publication.

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1 SERVICE INFORMATION

1-1 Specifications

Model			CS-271T
Dimensions	Length*	mm(in)	257 (10.12)
	Width	mm(in)	228 (8.98)
	Height	mm(in)	210 (8.27)
Dry weight*		kg(lb)	3.0 (6.6)
Engine	Type		YAMABIKO, air-cooled, two-stroke, single cylinder gasoline engine
	Rotation		Clockwise as viewed from the output end
	Displacement	$cm^3(in^3)$	26.9 (1.641)
	Bore	mm(in)	35.0 (1.378)
	Stroke	mm(in)	28.0 (1.102)
	Compression ratio		6.6
Carburetor	Type		Diaphragm horizontal-draft with acceleration pump
	Model		Walbro WT-1008
	Venturi size-Throttle bore	mm(in)	11.11-14.3 (0.437-0.563)
Ignition	Type		CDI (Capacitor discharge ignition) system Digital Magneto
	Spark plug		BPM8Y (CANADA: BPMR8Y)
Starter	Type		Automatic rewind starter
	Rope diameter x length	mm(in)	3.5x700 (0.14x27.6)
Fuel	Type		Premixed two-stroke fuel
	Mixture ratio		50 : 1 (2 %)
	Gasoline		Minimum 89 octane gasoline
	Two-stroke air cooled engine oil		ISO-L-EGD (ISO/CD13738), JASO M345-FD
	Tank capacity	L (U.S.fl.oz.)	0.24 (8.1)
Exhaust	Muffler type		Spark arrester muffler
Clutch	Type		Centrifugal type, 3-shoe slide with 3-tension spring
Guide bar / Saw chain lubrication type			Adjustable automatic oil pump
Oil	Tank capacity	L (U.S.fl.oz.)	0.16 (5.4)
Auto oiler	Type		Clutch related type
Sprocket	Type		Spur
	Number of teeth		6
	Pitch	in	3/8

* Without guide bar and saw chain.

Oregon Saw chain 90SG

Cutting devices				
Guide bar	Part No.		10A4CD3740	12A4CD3745
	Called length	in	10	12
	Gauge	in	0.043	
Saw chain	Number of drive links		40	45
	Pitch	in	3/8	
	Gauge	in	0.043	

Oregon Saw chain 91VG as option

Cutting devices				
Guide bar	Part No.		10A0CD3740	12A0CD3745
	Called length	in	10	12
	Gauge	in	0.050	
Saw chain	Number of drive links		40	45
	Pitch	in	3/8	
	Gauge	in	0.050	

1-2 Technical data

Engine			
Idling speed		RPM	3,200 +/- 300
Wide open throttle speed*		RPM	11,300 - 12,500
Clutch engagement speed		RPM	4,400
Engagement Minimum†		RPM	3,800
Compression pressure		MPa (kgf/cm^2) (psi)	0.85 (8.7) (124)
Ignition system			
Spark plug gap		mm(in)	0.6 - 0.7 (0.024 - 0.028)
Minimum secondary voltage at 1,500 RPM		kV	17
Primary coil resistance (Red Probe on stop terminal of module)		MΩ	2.0 - 2.5
Secondary coil resistance		Ω	930 - 970
Pole shoe air gaps		mm(in)	0.3 - 0.4 (0.012 - 0.016)
Ignition timing	at 3,000 RPM	°BTDC	16
	at 8,000 RPM	°BTDC	31
	at 10,000 RPM	°BTDC	32
Carburetor			
Idle adjust screw initial setting		turns in**	7/8
L mixture needle initial setting		turns out	2
H mixture needle initial setting		turns out	2 7/8
Test Pressure, minimum		MPa (kgf/cm^2) (psi)	0.05 (0.5) (7.0)
Metering lever height		mm(in)	1.65 (0.06) lower than diaphragm seat
Chain oil discharge volume		mL/min(U.S.fl.oz./min)	Adjustable: 1.5 - 13 (0.05 - 0.40) (Factory set: 7 mL/min)

BTDC: Before top dead center.

* With 12 in. guide bar and properly adjusted saw chain.

**Set idle adjust screw to the point that its tip contacts throttle plate before initial setting.

† If clutch engagement speed is lower than minimum RPM, replace clutch assembly with new one.

1-3 Torque limits

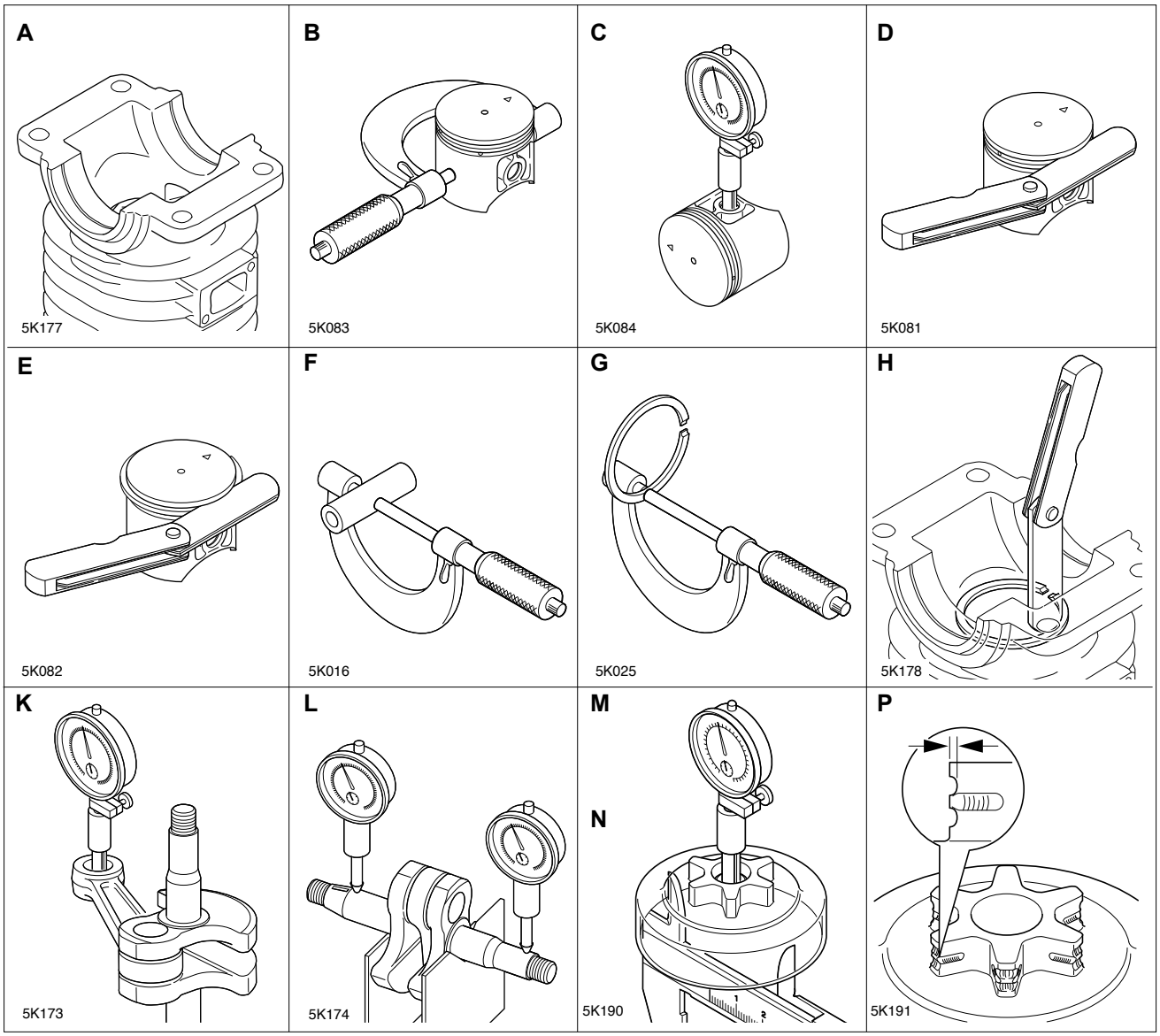
Descriptions		Size	kgf•cm	N•m	in•lbf
Starter system	Starter pawl	M5*	30 - 45	3 - 4.5	25 - 40
	Starter case	M5	10 - 20	1 - 2	9 - 18
Ignition system	Magneto rotor (Flywheel)	M8	250 - 290	25 - 29	220 - 255
	Ignition coil	M4*	30 - 45	3 - 4.5	25 - 40
	ON-OFF switch	M3*	3 - 5	0.3 - 0.5	3 - 4
	Spark plug	M14	130 - 170	13 - 17	113 - 150
Fuel system	Carburetor	M5	30 - 45	3 - 4.5	25 - 40
	Intake bellows	M4	35 - 50	3.5 - 5	30 - 45
Clutch	Clutch hub	LM10	230 - 260	23 - 26	200 - 230
Engine	Crankcase	M5*	55 - 95	5.5 - 9.5	48 - 85
	Engine mount	M5	70 - 110	7 - 11	60 - 95
	Dust cover	M4	10 - 20	1 - 2	9 - 18
	Eye plate	M4	10 - 20	1 - 2	9 - 18
	Muffler	M5	70 - 100	7 - 10	60 - 90
	Muffler cover	M5	10 - 20	1 - 2	9 - 18
Others	Exhaust guide	M4	15 - 25	1.5 - 2.5	13 - 22
	Auto-oiler	M4	20 - 35	2 - 3.5	18 - 30
	Front handle	M5	20 - 40	2 - 4	18 - 35
	Top handle	M4	10 - 20	1 - 2	9 - 18
	Top handle assembly	M4	20 - 30	2 - 3	18 - 25
	Cushion	M4	10 - 20	1 - 2	9 - 18
	Brake cover	M4	10 - 20	1 - 2	9 - 18
	Sprocket guard plate	M4	10 - 20	1 - 2	9 - 18
	Brake lever (Hand guard)	M5	25 - 45	2.5 - 4.5	22 - 40
	Chain catcher	M5	20 - 40	2 - 4	18 - 35
	Guide bar stud	M8	180 - 250	18 - 25	160 - 220
	Bolt (at guide bar mount)	M4	20 - 40	2 - 4	18 - 35
Regular bolt, nut and screw		M3	6 - 10	0.6 - 1	5 - 9
		M4	15 - 25	1.5 - 2.5	13 - 22
		M5	25 - 45	2.5 - 4.5	22 - 40
		M6	45 - 75	4.5 - 7.5	40 - 65

LM: Left-hand thread *Apply special repairing materials

1-4 Special repairing materials

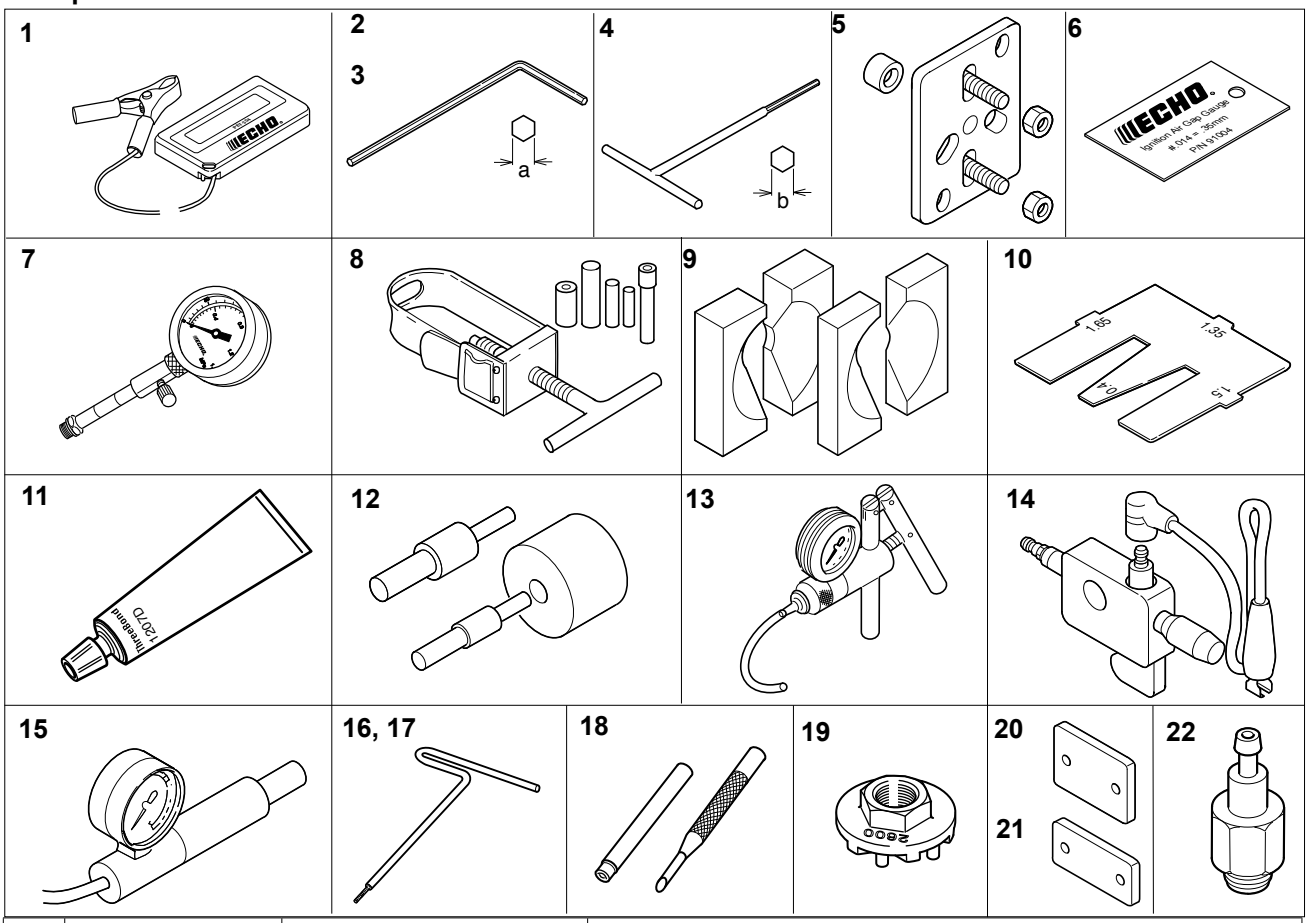
Material	Location	Remarks
Adhesive	Ball bearing outer / crankcase	Loctite® #675 or equivalent
Liquid gasket	Crankcase seams	ThreeBond 1207D
Thread locking sealant	Starter pawl	Loctite® #222, ThreeBond #1342 or equivalent
	Ignition coil	
	ON-OFF switch	Loctite® #242, ThreeBond #1324 or equivalent
Grease	Clutch needle bearing	Lithium based grease or ECHO XTended Protection™ Lubricant
	Rear handle cushion	
	Collar	
	Starter grip rope guide	
	Oil seal lip	
	Chain brake (metal contact part)	Molybdenum grease (approx.1 gram)

1-5 Service Limits



	Description		mm (in)
A	Cylinder bore		When plating is worn and aluminum can be seen
B	Piston outer diameter	Min.	34. 91 (1.374)
C	Piston pin bore	Max.	8. 035 (0.3163)
D	Piston ring groove	Max.	1. 6 (0.063)
E	Piston ring side clearance	Max.	0. 1 (0.004)
F	Piston pin outer diameter	Min.	7. 98 (0.3142)
G	Piston ring width	Min.	1. 45 (0.057)
H	Piston ring end gap	Max.	0. 5 (0.02)
K	Con-rod small end bore	Max.	12. 00 (0.4724)
L	Crankshaft runout	Max.	0. 02 (0.001)
M	Sprocket bore	Max.	12. 80 (0.5039)
N	Clutch drum bore	Max.	55. 5 (2.19)
P	Sprocket wear limit	Max.	0. 5 (0.02)

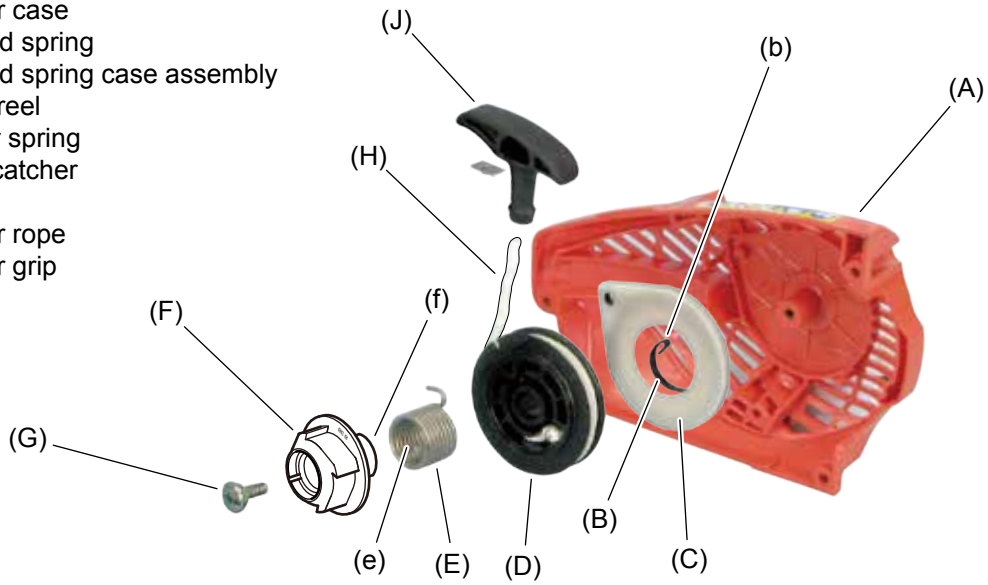
1-6 Special tools



Key	Part Number	Description	Reference
1	900303	Tachometer PET-304	Measuring engine speed
2	89561279920	L-hex wrench (3 mm)	Removing and installing hex. socket bolt (M4)
3	89561079920	L-hex wrench (4 mm)	Removing and installing hex. socket bolt (M5)
4	89755902831	T-hex wrench (4 mm)	Removing and installing hex. socket bolt (M5)
5	89750103938	Puller	Removing magneto rotor
6	91004	Module air gap gauge	Adjusting pole shoe air gaps
7	91037	Compression gauge	Measuring cylinder compression
8	89770230131	Piston pin tool	Removing and installing piston pin
9	89770106030	Bearing wedge	Removing and crankshaft ball bearings
10	89756319830	Metering lever gauge	Measuring metering lever height on carburetor
11	X686000000	ThreeBond 1207D	Applying crankcase seam
12	89770511520	Bearing tool	Replacing needle bearing on con-rod small end
13	91024	Pressure tester	Testing crankcase leakages
14	89780079931	Spark tester	Checking ignition system
15	89780330133	Pressure tester	Testing carburetor and crankcase leakage
16	89801	Limiter cap removal tool	Removal limiter cap (Left hand thread 2.5 mm)
17	89802	Limiter cap removal tool	Removal limiter cap (Left hand thread 3.0 mm)
18	500-500	Welch plug tool	Removing and installing welch plug tool
19	X640000011	Clutch tool	Removing and assembling clutch assembly
20	89782616131	Pressure rubber plug	Plugging intake port to test crankcase / cylinder leakages
21	89782812330	Pressure rubber plug	Plugging intake port to test crankcase / cylinder leakages
22	89783516131	Pressure connector	Checking crankcase and cylinder leakages

2 STARTER SYSTEM (i-30 starter)

(A) Starter case
(B) Rewind spring
(C) Rewind spring case assembly
(D) Rope reel
(E) Power spring
(F) Pawl catcher
(G) Screw
(H) Starter rope
(J) Starter grip



Construction

1. Rewind spring case assembly (C) is installed inside starter case (A).

2. Rope reel (D) with starter rope (H) is installed on rewind spring case assembly.

3. Hook located on the backside of rope reel engages with end (b) of rewind spring (B).

4. Power spring (E) is installed on rope reel.

5. Hook of power spring engages with rope reel and top end hook (e) of power spring engages with pawl catcher (F).

NOTE: Pawl catcher (F) of CS-271T has an extended collar (f) to provide smooth power spring (E) action and prevent power spring deformation.

Working principle

1. When starter grip (J) is pulled, rope reel (D) rotates.

2. The rotation force of rope reel (D) is transmitted to pawl catcher (F) by power spring (E).

3. Pawl catcher (F) engages with starter pawls on flywheel to turn crankshaft.

4. The load from compression pressure in cylinder will keep crankshaft from rotating as power spring (E) is twisted and accumulates energy.

5. As starter grip is pulled further, more energy is stored in power spring (E) until accumulated energy is enough to overcome compression pressure in cylinder.

6. When accumulated energy in power spring (E) overcomes the load from compression pressure in cylinder, crankshaft is rotated.

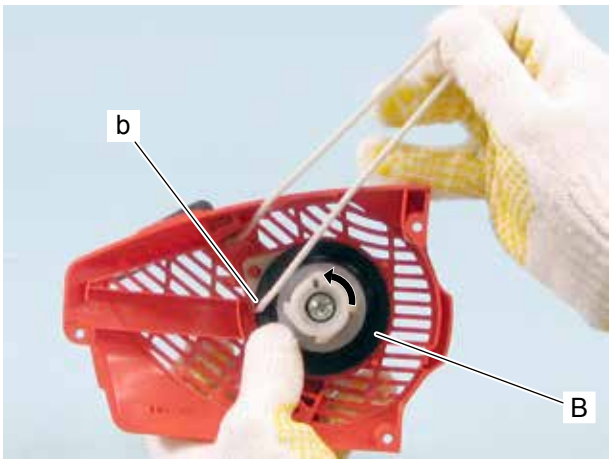
7. Power spring absorbs compression resistance of cylinder and snatch back of engine during starting action.

8. When starter rope is released, rope reel (D) is returned together with power spring (E) and pawl catcher (F) by rewind spring tension.

9. After engine starts, starter pawls pivot outward by centrifugal force and disengage from pawl catcher (F).

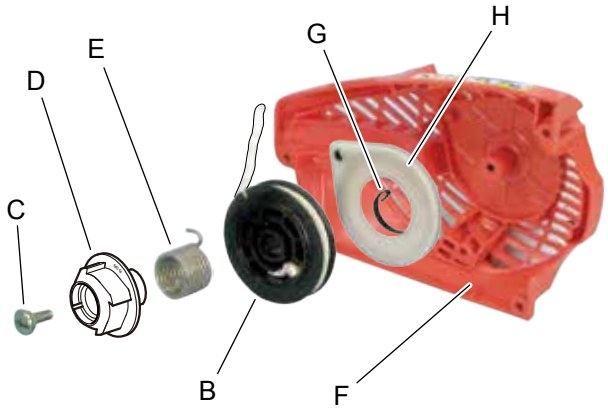
2-1 Disassembling starter assembly

1. Remove three screws and remove starter assembly (A) from unit.



2. Pull out starter rope about 30cm (12in) and hold rope reel (B) by hand. Loop excess rope in rope reel notch (b) as shown.

3. Rotate rope reel (B) counterclockwise to release tension of rewind spring.



4. Remove screw (C).

5. Remove pawl catcher (D) and power spring (E).

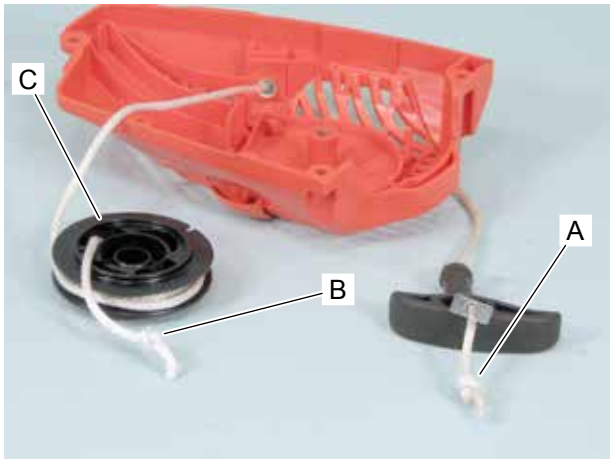
6. Remove rope reel (B) from starter case (F) slowly to prevent rewind spring (G) from unwinding.

7. Remove rewind spring case assembly (H) from starter case (F).

WARNING ⚠ DANGER

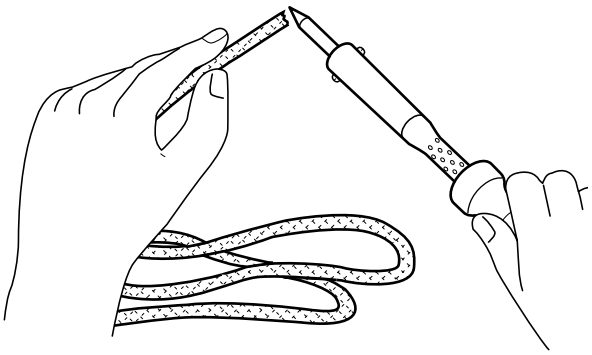
Wear eye protection and take care when removing starter drum. Rewind spring may unwind suddenly and cause personal injury.

2-2 Replacing starter rope

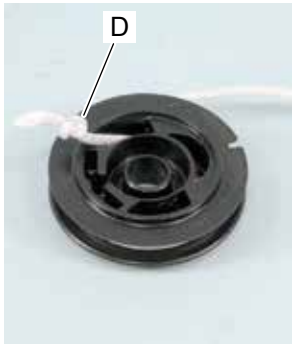


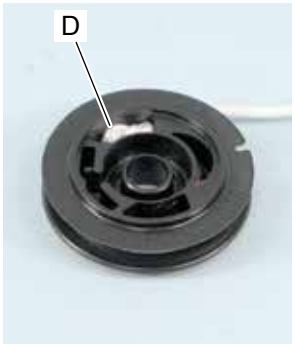
1. Pull out and untie knot (A).

2. Pull knot (B) to remove rope from rope reel (C).

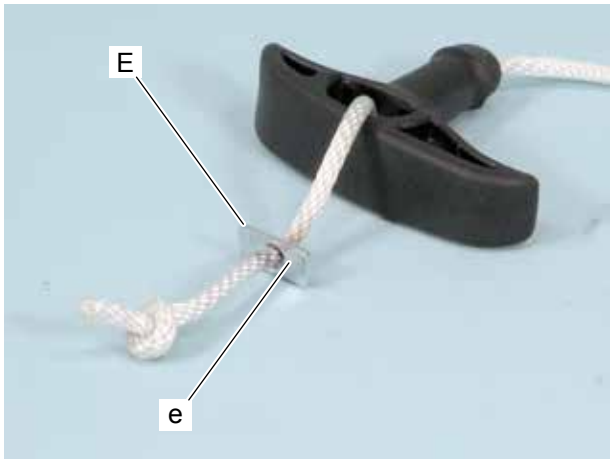


3. When installing a new starter rope, singe both ends of the rope to prevent fraying.





4. Make a knot (D) at end of starter rope and pass the rope through hole of rope reel, then press the knot (D) into recess as shown.

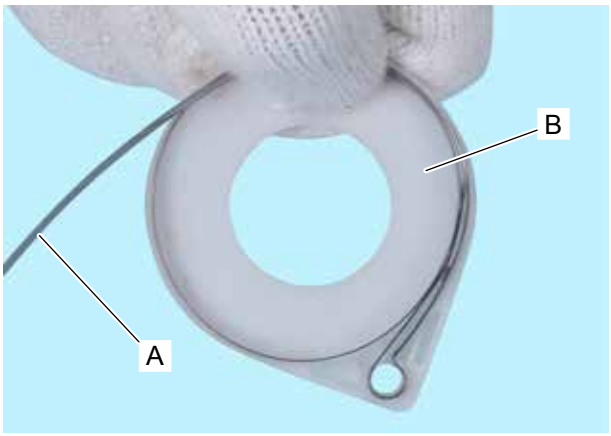


5. Pass the other end of starter rope through starter case, from inside to outside.

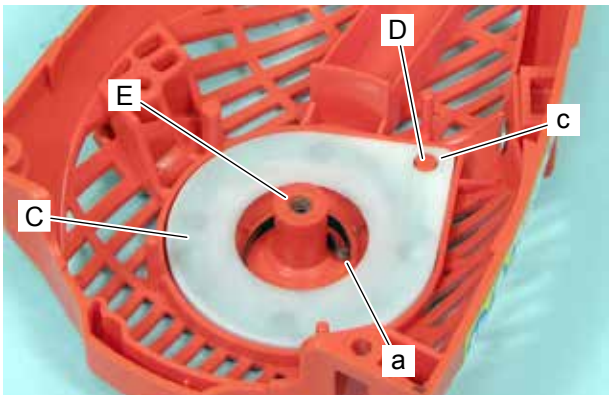
6. Pass starter rope through starter grip. Set plate (E) facing smooth side (e) to starter rope end. Make a knot as shown.

7. Tighten knot. Push plate and knot into recess of starter grip.

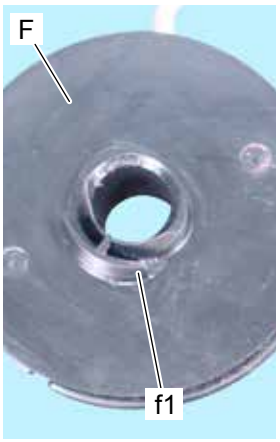
2-3 Assembling starter



1. If rewind spring (A) is unwound from rewind spring case (B), wind the spring inside case as shown.



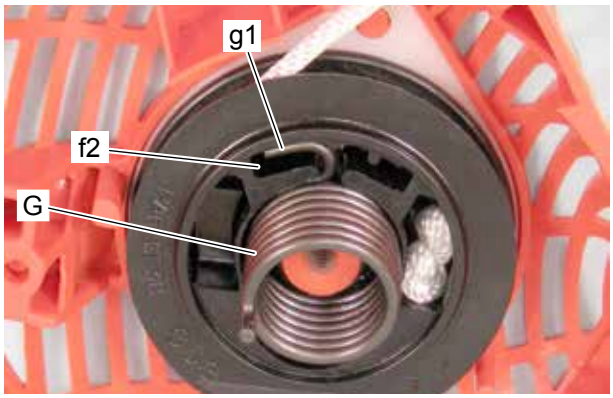
2. Carefully install rewind spring case assembly (C) on starter case, matching hole (c) with post (D). Hook (a) of rewind spring should contact with post (E) of starter case.



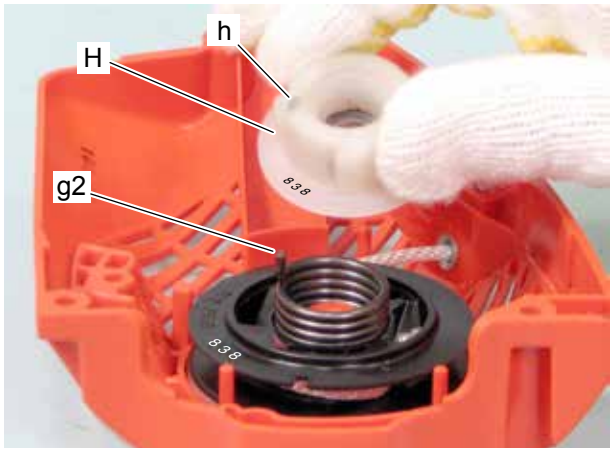
3. Assemble rope reel (F) engaging hook (f1) with hook (a) of rewind spring.

4. Check for proper engagement of rewind spring and rope reel by turning rope reel (F) clockwise and counterclockwise.

2-3 Assembling starter (continued)

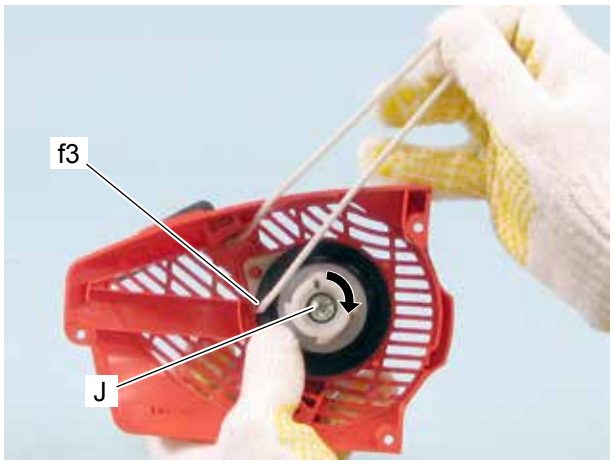


5. Install power spring (G), engaging hook (g1) with rope reel groove (f2).



6. Install pawl catcher (H), engaging hole (h) with power spring top end hook (g2).

NOTE: Make sure pawl catcher and rope reel have ID mark “838” on them.



7. Reinstall screw (J) on starter post.

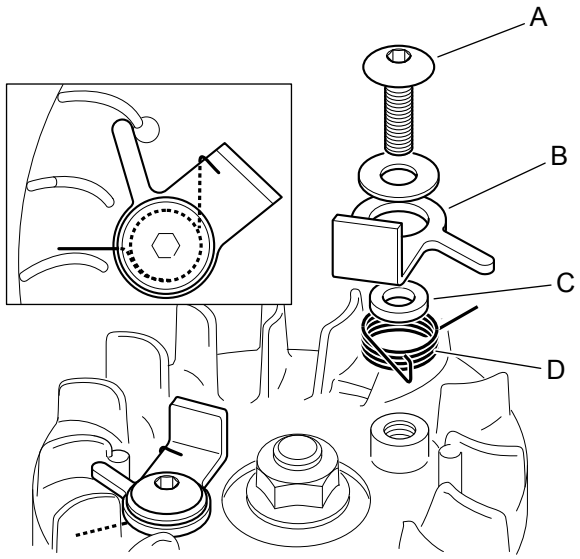
8. Pull out starter rope inside starter case. Rotate rope reel clockwise several turns with starter rope hooked at notch (f3) as shown. Hold rope reel to prevent it from unwinding and pull out starter grip to take the rope slack.

9. Pull starter several times to check rewind spring tension. If starter is not rewinding fully, increase spring tension by rotating rope reel one more turn clockwise following above step (8).

10. Pull out starter rope all the way, and check that rope reel can be rotated an additional half or more turn clockwise as shown, to prevent rewind spring from breaking.

11. If rope reel can not be turned clockwise, reduce tension by rotating rope reel counterclockwise one turn with starter rope hooked at notch (f3).

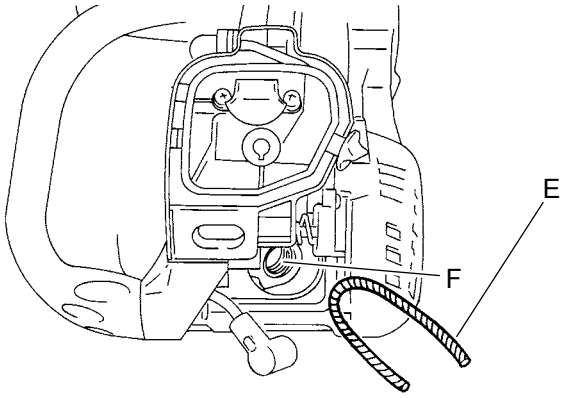
2-4 Replacing starter pawl



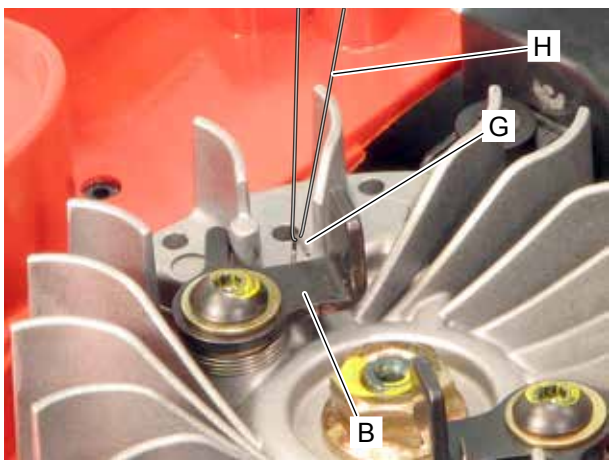
1. Remove starter assembly from unit.

2. Loosen bolt (A) and remove washer, pawl (B), spacer (C) and torsion spring (D). Replace damaged or worn parts.

NOTE: When it is hard to loosen bolt, install clean rope (E) in spark plug hole (F) to stop crankshaft rotation and remove bolt easily.



3. Install torsion spring, spacer, pawl, washer and bolt. To avoid pinching of torsion spring, install these parts without setting the end (G) of torsion spring on starter pawl. The bolt is pre-coated with sealant on the thread. If the sealant is peeled off, apply thread locking sealant (Loctite #242, ThreeBond #1324 or equivalent).

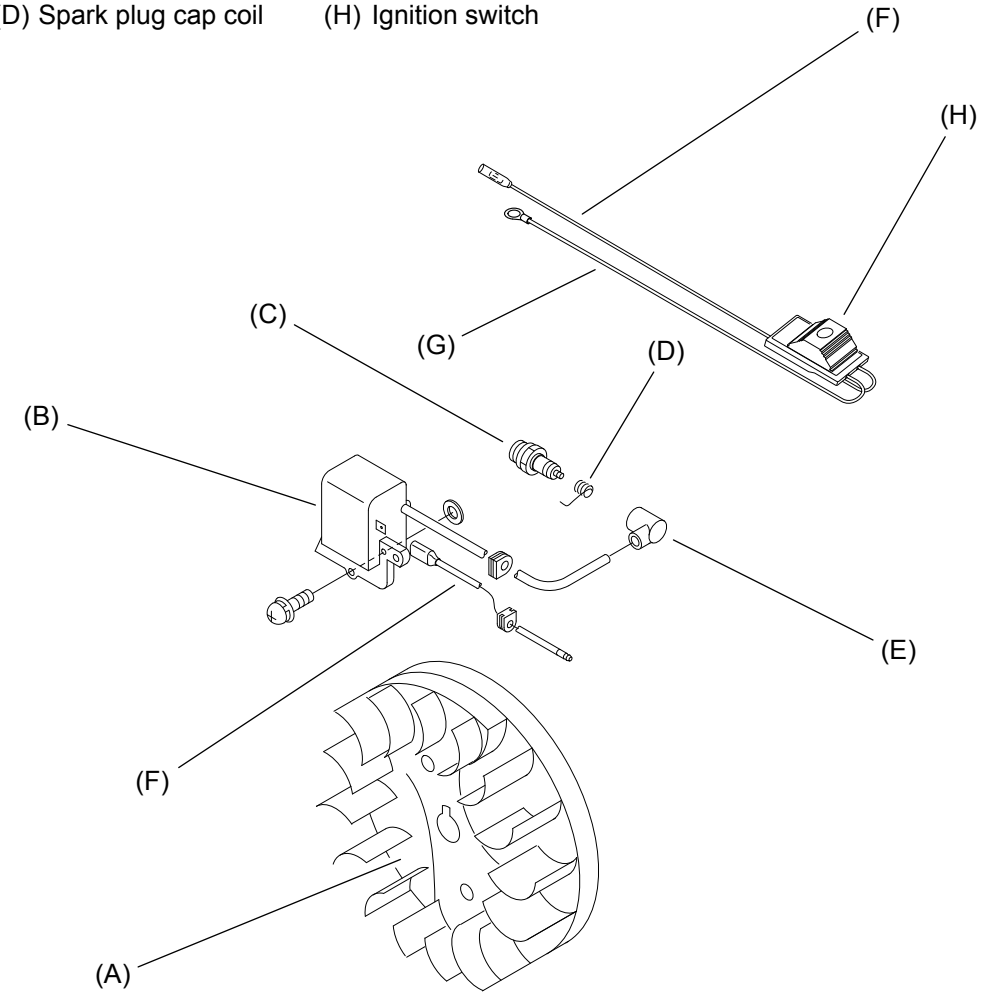


4. Using fine wire (H) or appropriate tool, place the end (G) of torsion spring on pawl (B), by hooking and passing under pawl as shown. Remove fine wire or tool.

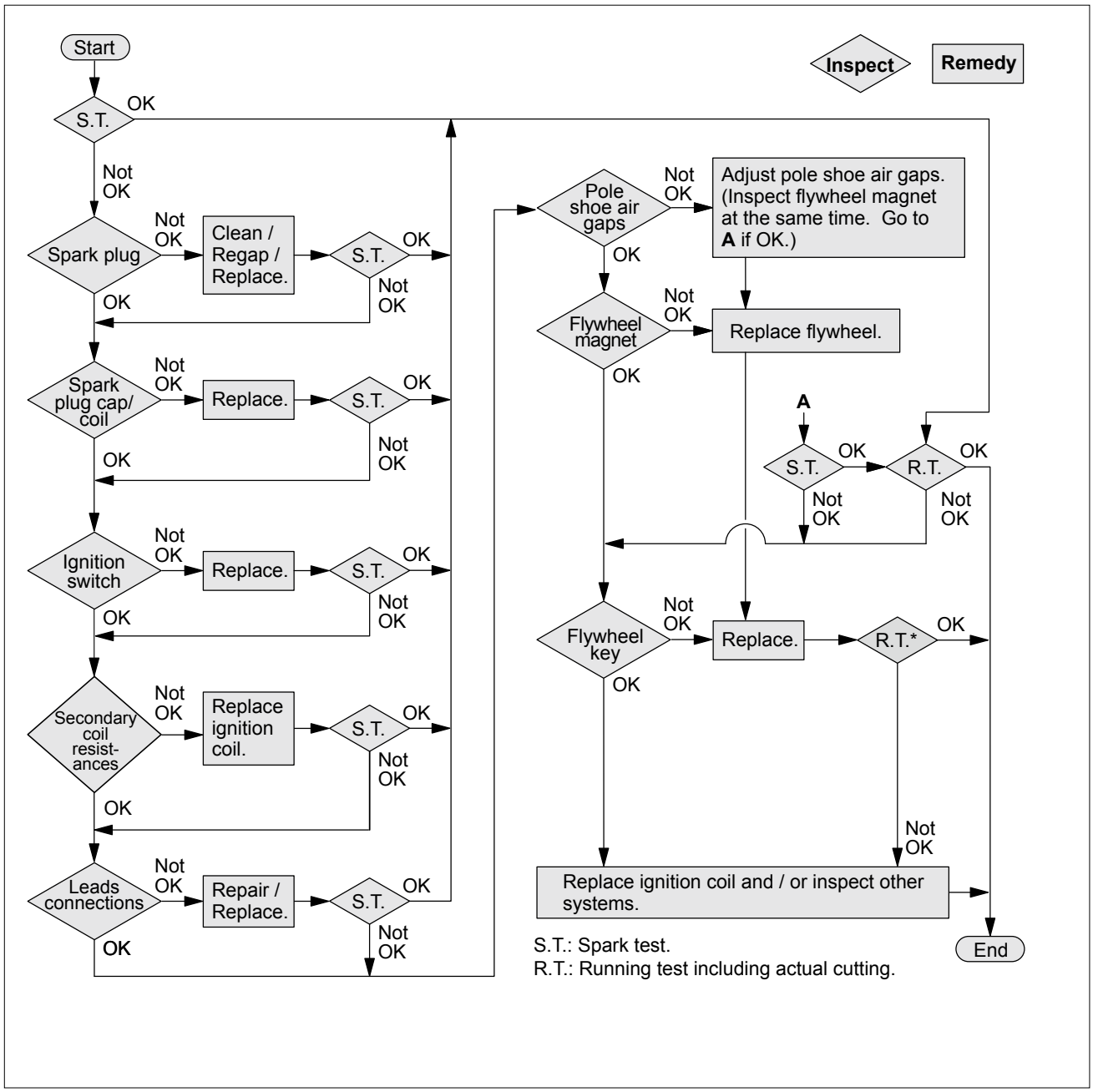
5. Make sure pawl can move smoothly. If it does not move smoothly, check parts for correct installation.

3 IGNITION SYSTEM

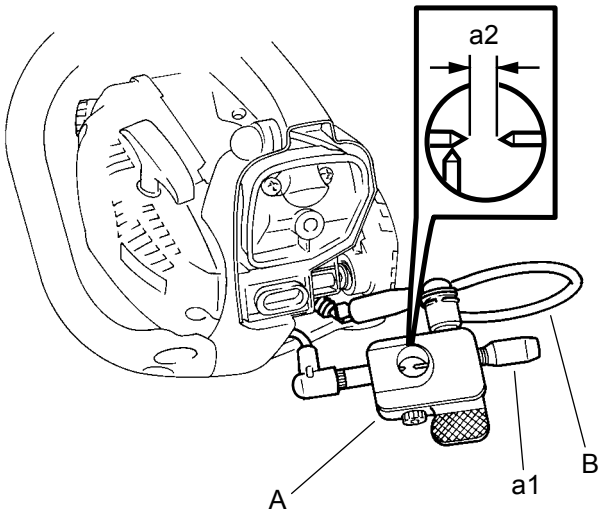
(A) Flywheel
(B) Ignition coil
(C) Spark plug
(D) Spark plug cap coil
(E) Spark plug cap
(F) Switch lead
(G) Ground lead
(H) Ignition switch



3-1 Troubleshooting guide



3-2 Testing spark



1. Remove air filter cover. Remove spark plug cap from spark plug.

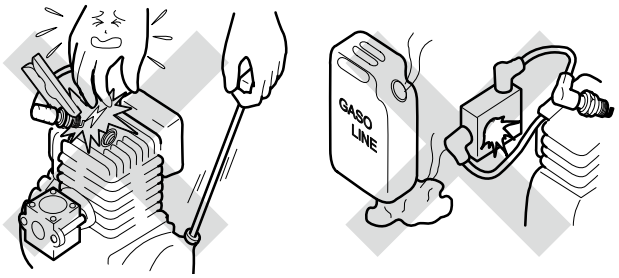
2. Connect spark plug cap to spark tester 99051130023 (A), and connect spark tester lead (B) on spark plug as shown.

3. Screw in adjuster (a1) until the needle tips contact. Turn out adjuster (a1) 4 turns to set spark tester gap (a2) to 4 mm (0.16 in).

4. Turn ignition switch upward ("RUN" position). Pull starter grip several times.

5. If spark is steady blue or white at the tester gap, ignition system is considered good.

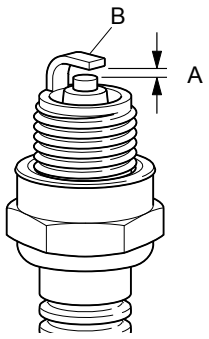
6. If no spark exists or spark is intermittent in yellow, orange, or red, continue with further inspection.



DANGER

***Do not test near spark plug hole without spark plug installed, otherwise there is a chance to ignite fuel mixture inside cylinder.**
***Do not touch metal parts of spark tester while performing the test to avoid receiving electrical shock.**
***Do not check spark in area where gasoline is spilled or flammable gases may exist.**

3-3 Inspecting spark plug



1. Remove spark plug to inspect for fouling, cracked or broken insulator, cracked outer electrode, or rounded center electrode. Clean or replace spark plug as required.

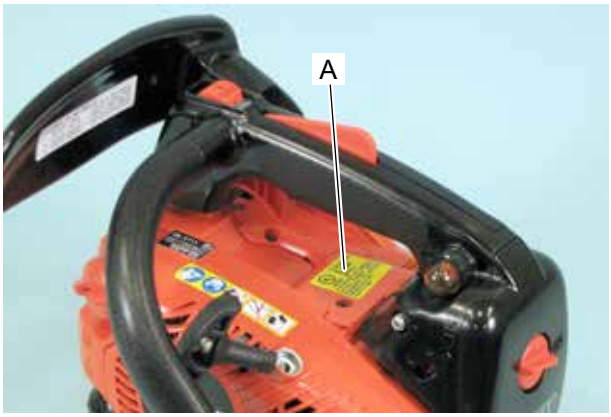
2. Set spark plug gap (A) by bending outer electrode (B).

Standard : 0.6 to 0.7 mm (0.024 to 0.028 in)

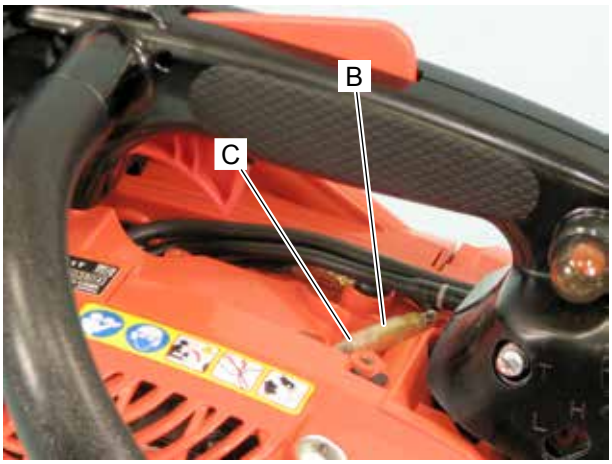
NOTE: Take care not to crack outer electrode when bending.

3. If engine does not start with correct spark plug, inspect if spark plug is wet or dry. If it is excessively wet or dry, inspect fuel system.

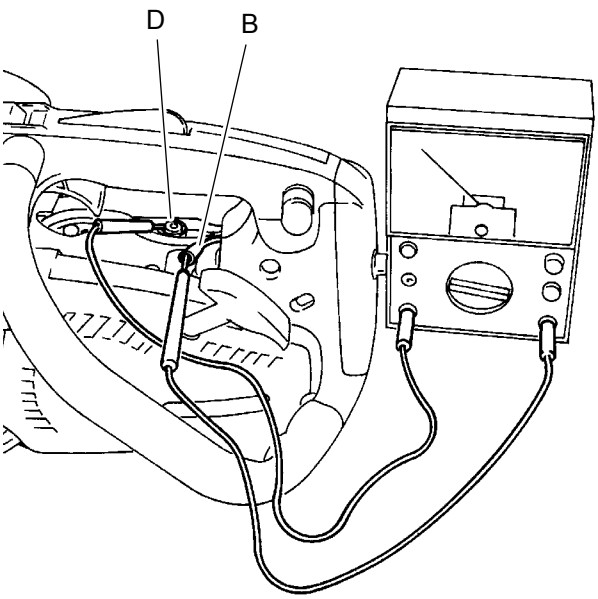
3-4 Inspecting ignition switch



1. Remove dust cover (A).



2. Disconnect ignition switch terminal (B) from primary lead terminal (C).



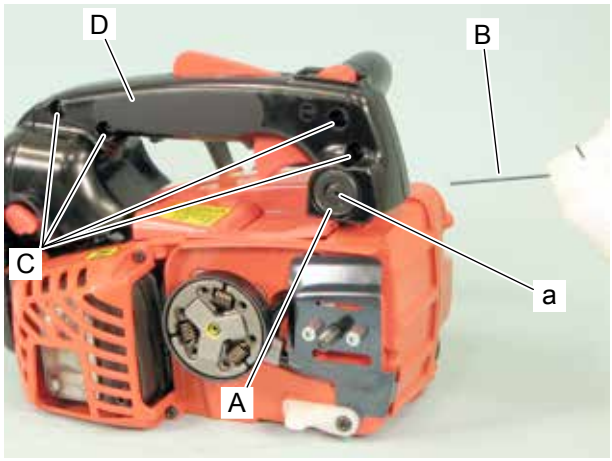
3. Connect one probe of Ohm-meter or multi-meter to ignition switch terminal (B). Connect the other probe to another ignition switch terminal (D).

4. When ignition switch is upward (“RUN” position), tester should indicate infinite resistance.

5. When ignition switch is in “STOP” position, tester should show that the circuit is in conducting state (closed circuit).

6. If ignition switch is defective, replace with a new one.

3-5 Replacing ignition switch

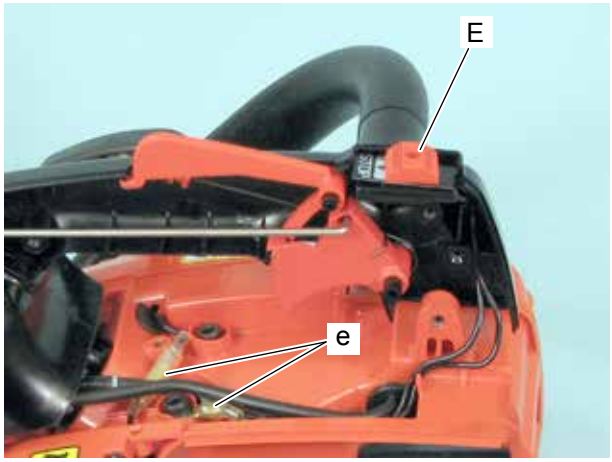


1. Remove sprocket guard.

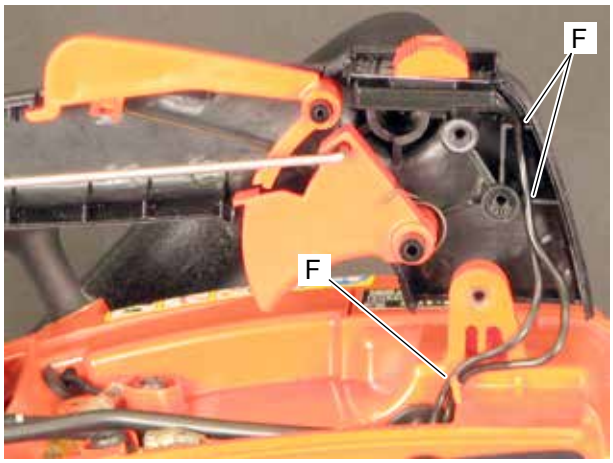
2. Remove cushion cap (A) by hooking hole (a) with small hexagon wrench (B) etc., and remove screw inside.

3. Remove four screws (C).

4. Remove top handle lid (D).



5. Disconnect terminals (e) and remove ignition switch (E).



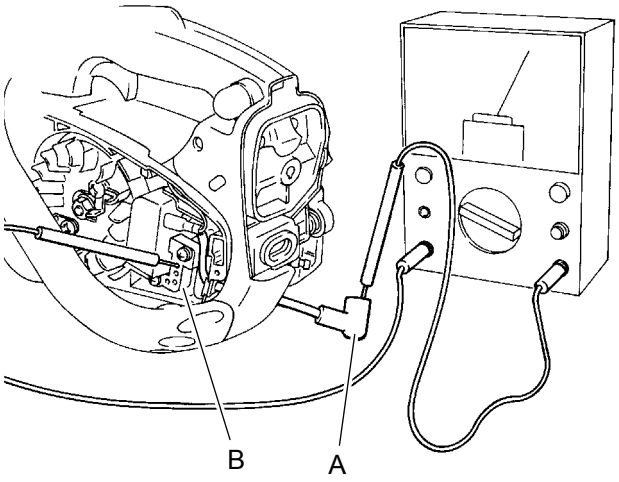
6. Assemble new ignition switch, passing leads through three guides (F).

7. Connect terminals of ignition switch.

8. Pass leads under fuel lines.

9. Reassemble all removed parts.

3-6 Inspecting ignition coil resistance and primary lead



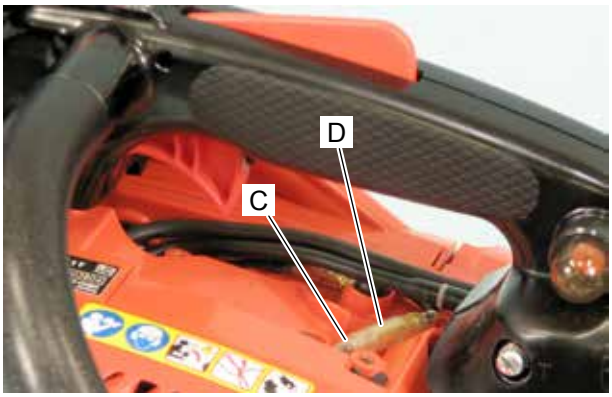
1. Remove air cleaner cover and starter assembly.

2. Connect one probe of Ohm-meter or multimeter to spark plug cap coil in spark plug cap (A).

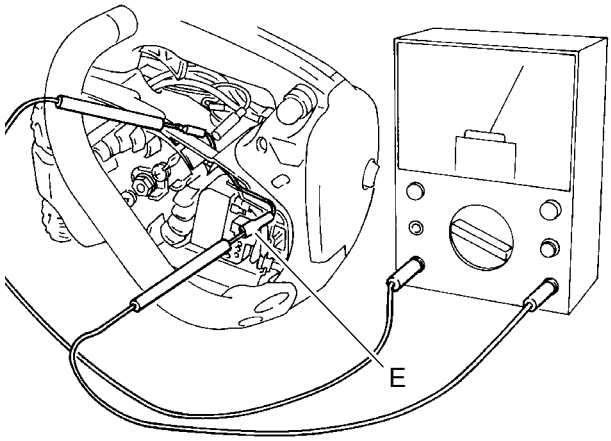
3. Connect the other probe to ignition coil core (B) to measure secondary coil resistance. Secondary coil resistance should be in the range of 930 to 970 Ω.

4. If the meter reading indicates infinite resistance, remove spark plug cap and spark plug cap coil, and measure resistance between the conduction wire of high tension lead and ignition coil core.

5. If the reading at step 3 or 4 is not in the range of 930 to 970 Ω, replace with a new ignition coil (Go to “3-8 Replacing ignition coil”).



6. Remove dust cover. Disconnect primary lead terminal (C) from ignition switch terminal (D).

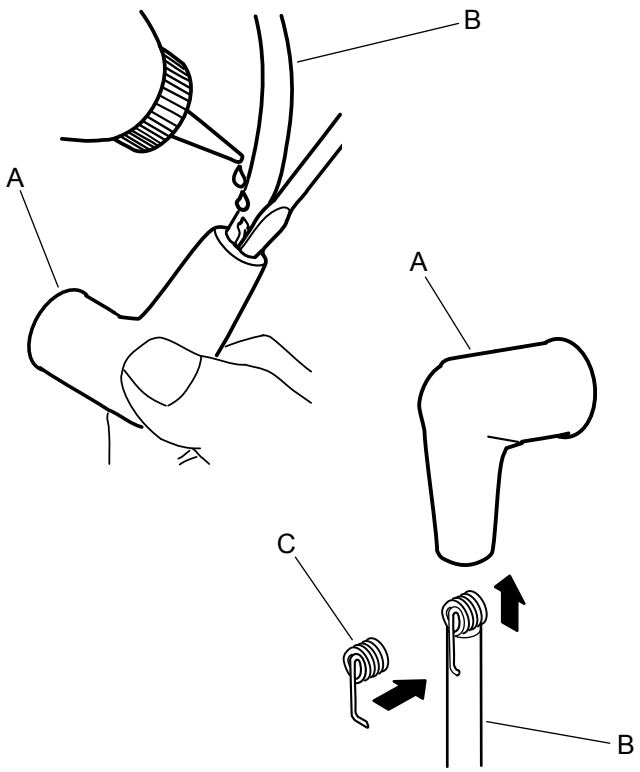


7. Disconnect the other primary lead terminal (E) from ignition coil.

8. Connect both probes of Ohm-meter or multimeter to both ends of primary lead as shown.

9. If the meter reading indicates infinite resistance, replace with a new primary lead.

3-7 Replacing spark plug cap and coil



1. Disconnect spark plug cap (A) from spark plug.

2. Apply some oil in spark plug cap (A) for easy removal from high tension lead (B).

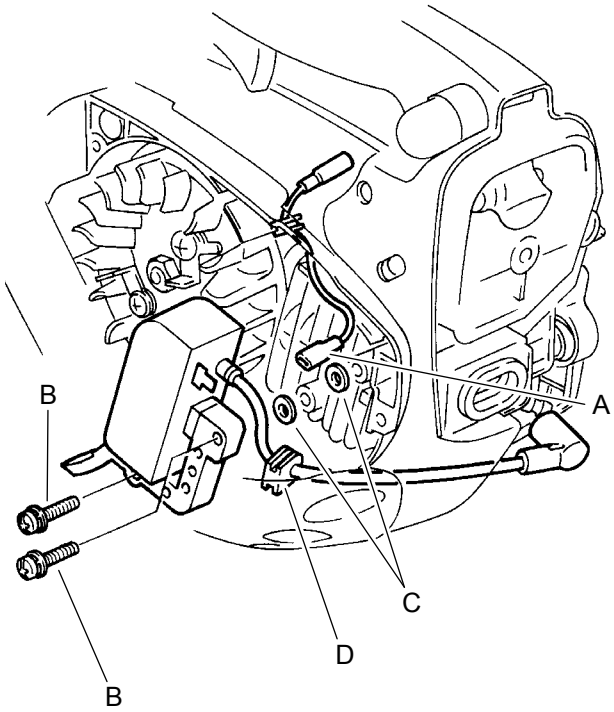
3. Pull spark plug cap away from high tension lead.

4. Inspect spark plug cap coil (C) for corrosion and correct connection. Inspect spark plug cap for cracks. Replace as required.

NOTE: Make sure spark plug cap coil (C) contacts center core of high tension lead when reinstalling it.

5. Coat end of high tension lead (B) with small amount of oil, and insert it into spark plug cap (A) as shown, until the spark plug cap coil is properly seated in the cap.

3-8 Replacing ignition coil



1. Remove air cleaner cover and starter assembly. Disconnect spark plug cap from spark plug.

2. Disconnect primary lead terminal (A) from ignition coil. Loosen bolts (B) of ignition coil.

3. Remove ignition coil from cylinder, taking care of collars (C).

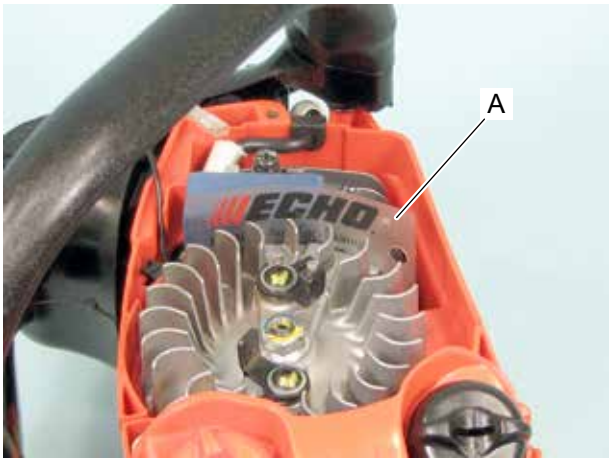
4. Remove spark plug cap, spark plug cap coil and grommet (D) from high tension lead (Refer to “3-7 Replacing spark plug cap and coil”).

5. Install grommet (D), spark plug cap and spark plug cap coil to new ignition coil.

6. Loosely install new ignition coil and collars (C) with two bolts (B). Set air gap (Refer to “3-9 Setting pole shoe air gaps“). Tighten two bolts (B).

7. Set grommet (D) in place and connect spark plug cap to spark plug. Reinstall disassembled parts.

3-9 Setting pole shoe air gaps



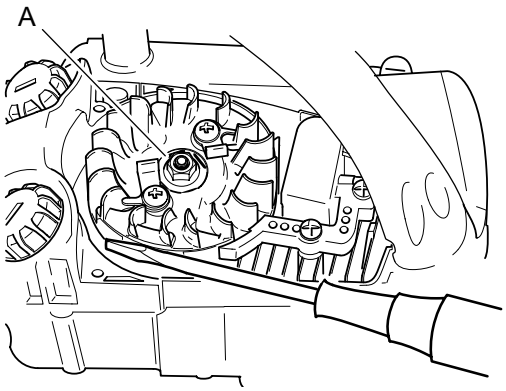
1. Insert Module air gap gauge: 91004 (A) or 0.3 - 0.4 mm (0.012 - 0.016 in) thick feeler gauge between flywheel and ignition coil shoes.

2. Rotate flywheel until magnetic poles of flywheel face ignition coil shoes.

3. Hold ignition coil against flywheel and tighten the bolts to specified torque (Refer to “Service information 1-3 Torque limits”). After tightening bolts, remove Module air gap gauge: 91004 (A) (or feeler gauge).

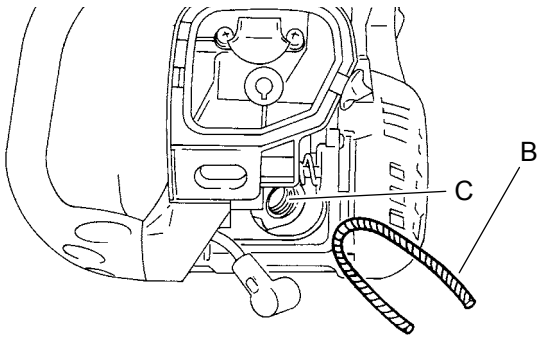
NOTE: When air gap is too narrow, contact with flywheel may result. When the air gap is too wide, spark is weak.

3-10 Inspecting flywheel and key



1. Inspect magnetic force of flywheel using flux meter, or bridging with a screwdriver as shown.

2. If magnetic force is weak, replace flywheel as follows.



3. Disconnect spark plug cap and remove spark plug.

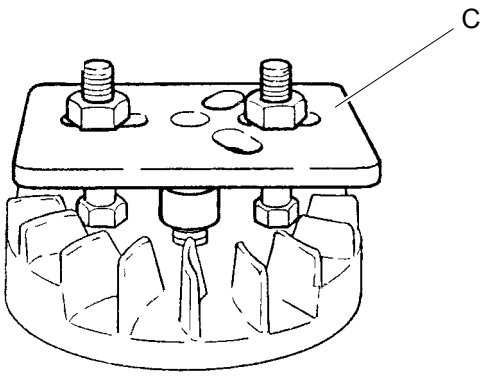
4. Install clean rope (B) in spark plug hole (C) to stop crankshaft rotation.

NOTE: Do not use piston stopper to avoid piston damage.

NOTE: Do not use power tool to remove nut (A). Otherwise, piston damage may occur.

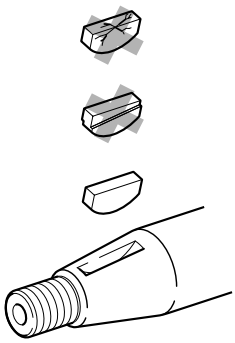
5. Remove nut (A) by rotating counterclockwise.

3-10 Inspecting flywheel and key (continued)

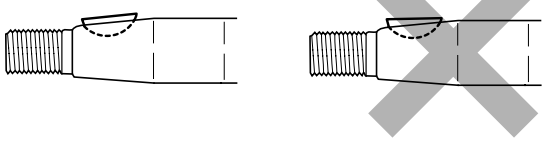


6. Remove starter pawls. Then set puller 89750103938 (C) on flywheel as shown.

7. Tighten two nuts on the puller alternately to remove flywheel.



8. Inspect woodruff key for damage or shearing. Replace as required.



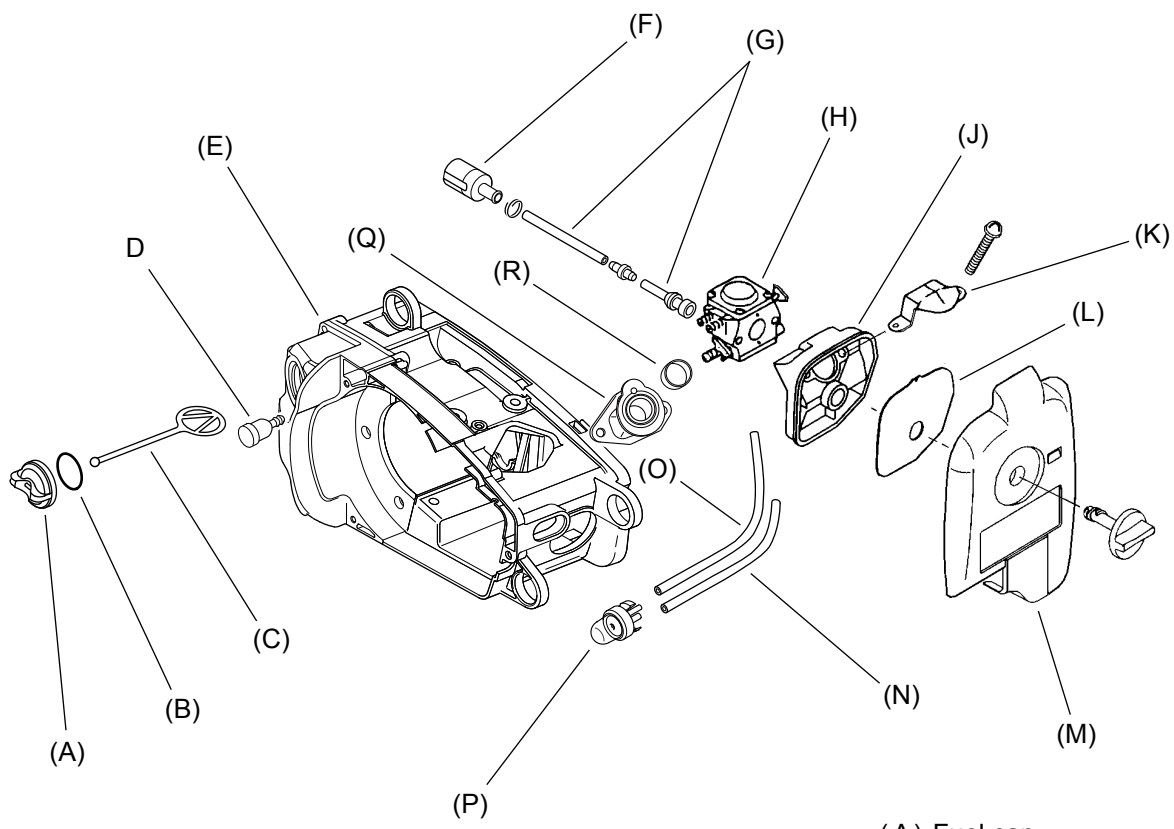
9. Wipe off oil from taper part of crankshaft and flywheel before assembling flywheel.

10. Install woodruff key into key groove.

11. Reinstall starter pawls (Refer to “2-4 Replacing starter pawl”).

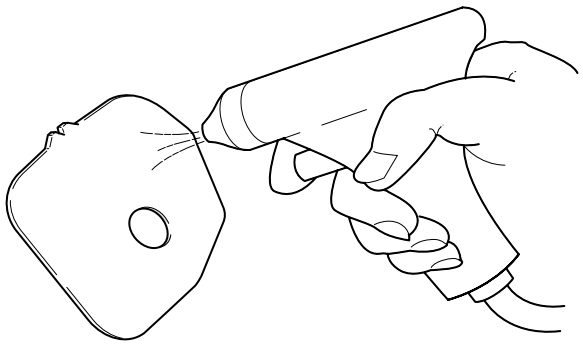
12. Align flywheel key groove with woodruff key on crankshaft. Install flywheel and fasten flywheel nut clockwise.

4 FUEL SYSTEM



(A) Fuel cap
(B) O-ring
(C) Connector
(D) Fuel tank vent
(E) Fuel tank
(F) Fuel strainer
(G) Fuel lines
(H) Carburetor
(J) Air cleaner case
(K) Prevent plate
(L) Air filter
(M) Air cleaner cover
(N) Purge line
(O) Fuel return line
(P) Purge bulb
(Q) Intake bellows
(R) Collar

4-1 Inspecting air filter



1. Close choke shutter. Remove air cleaner cover and air filter.

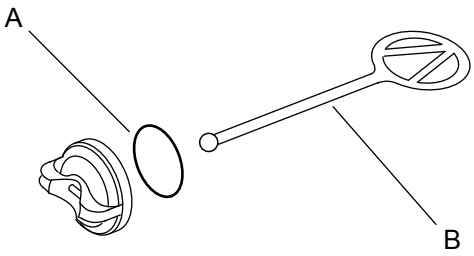
2. Inspect air filter. If blocked with dirt or dust, remove the obstruction with compressed air.

WARNING ⚠ DANGER

Wear eye protection when working with compressed air. Eye damage can occur from flying particles.

3. If heavily blocked with dirt or dust, or if heavily soiled or damaged, replace air filter with new one.

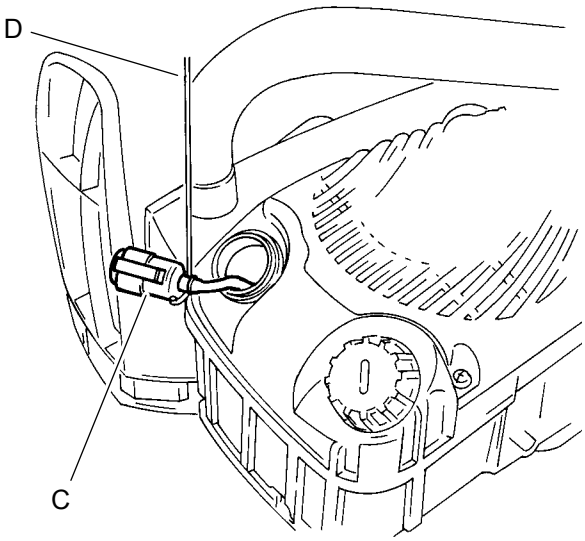
4-2 Inspecting fuel cap and fuel strainer



1. Remove fuel cap.

2. Inspect fuel cap for cracks and O-ring (A) for cuts or damage, and replace with new one as required.

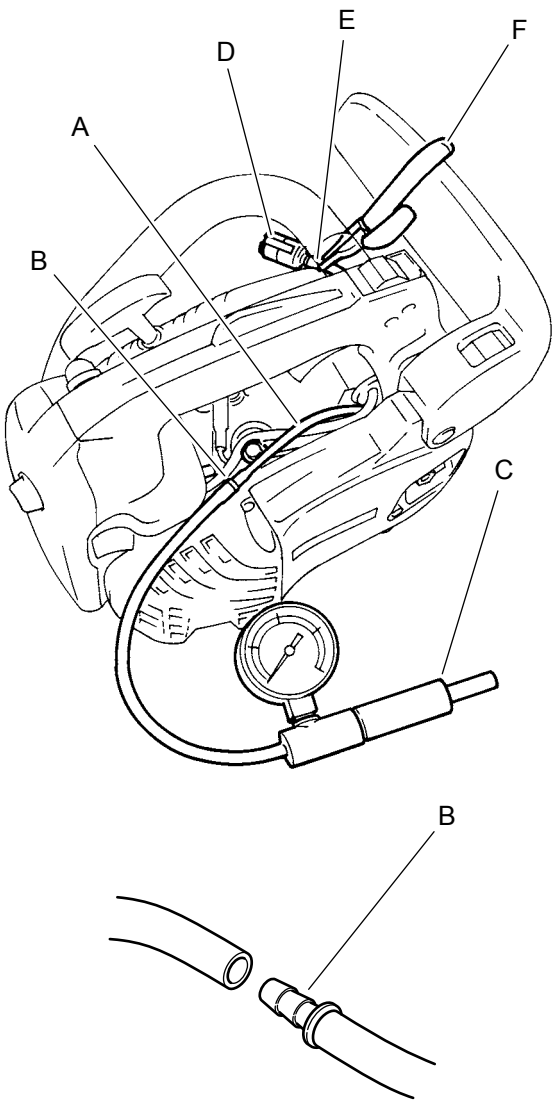
3. Replace connector (B) if damaged.



4. Pull fuel strainer (C) out from fuel tank using a wire hook (D). Clean fuel strainer. Replace with new one if defective or heavily soiled.

5. Reinstall fuel cap.

4-3 Inspecting fuel tank and line



1. Clean fuel tank inside as required.

2. Remove dust cover, disconnect fuel line (A) with joint (B) and connect pressure tester 89780330133 (C) to fuel line.

3. Remove fuel cap and pull out fuel strainer (D) from fuel tank.

4. Pinch fuel line (E) with longnose pliers (F) as shown.

NOTE: Wrap the ends of longnose pliers with tape (or cover with soft pipes) to protect fuel line from damage.

5. Apply pressure approx. 50 kPa (0.5 kgf/cm^2) (7 psi).

6. If pressure drops, replace fuel line.

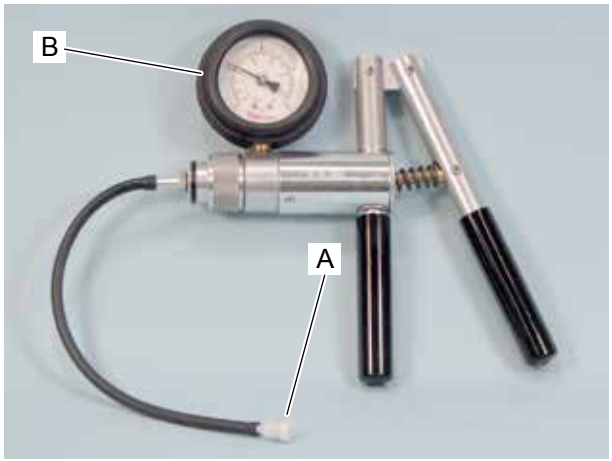
7. Put fuel strainer in fuel tank and fasten fuel cap securely.

8. Apply pressure approx. 10 kPa (0.1 kgf/cm^2) (1.4 psi).

9. Pressure should not drop. If pressure drops, leakage may occur from fuel cap, fuel cap O-ring, mating surface of fuel tank, grommet, or tank vent. Inspect and replace defective part(s) with new one.

10. Remove pressure tester and connect fuel lines with joint.

4-4 Inspecting and replacing tank vent



NOTE: Tank vent prevents a vacuum from forming in fuel tank when fuel in fuel tank is being consumed. When pressure in fuel tank becomes too high, tank vent releases the pressure.

1. Remove starter assembly. Remove tank vent (A) from fuel tank and connect pressure tester 91024 (B).

2. Apply pressure approx. 50 kPa (0.5 kgf/cm^2) (7 psi). Make sure pressure is stable in range of 10 - 40 kPa (0.1 - 0.4 kgf/cm^2) (1.4 - 5.7 psi).

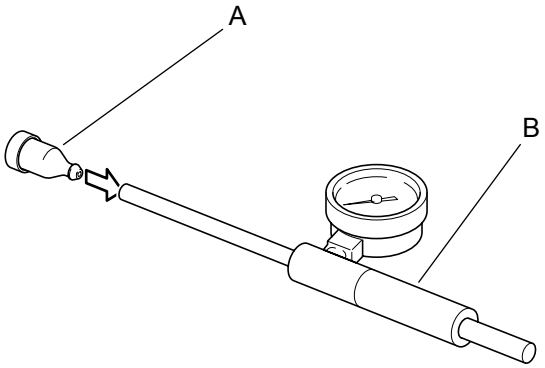
3. If it is not in the range, gently clean tank vent with compressed air or replace with new one.

NOTE: Do not disassemble valves in tank vent assembly. Damage to valves will occur.

4. Apply negative pressure 20 kPa (0.2 kgf/cm^2) (3 psi).

5. Tank vent should pass air freely without holding any pressure. If it does not, replace tank vent with new one.

4-4 Inspecting and replacing tank vent (continued)



NOTE: Inspection using 897803-30133

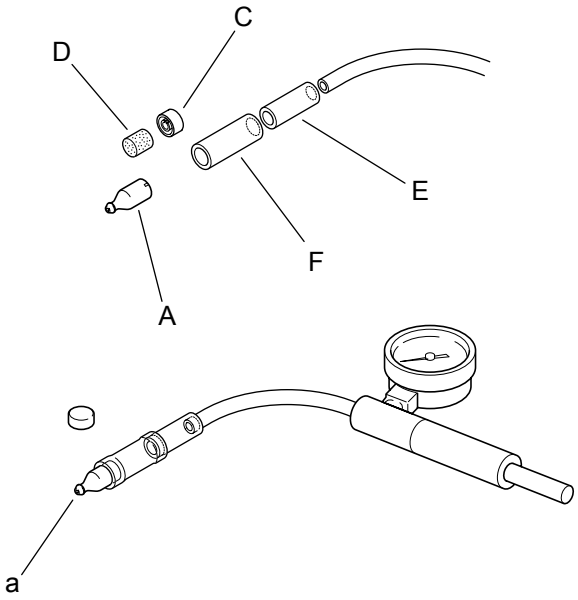
If pressure tester 91024 is not available, tank vent can be inspected with pressure tester 89780330133 as follows.

1. Connect tank vent (A) to pressure tester 89780330133 (B).

2. Apply pressure approx. 50 kPa (0.5 kgf/cm^2) (7 psi). Make sure pressure is stable in range of 10 - 40 kPa (0.1 - 0.4 kgf/cm^2) (1.4 - 5.7 psi).

3. If it is not in the range, gently clean tank vent with compressed air or replace with new one.

NOTE: Do not disassemble valves in tank vent assembly. Damage to valves will occur.



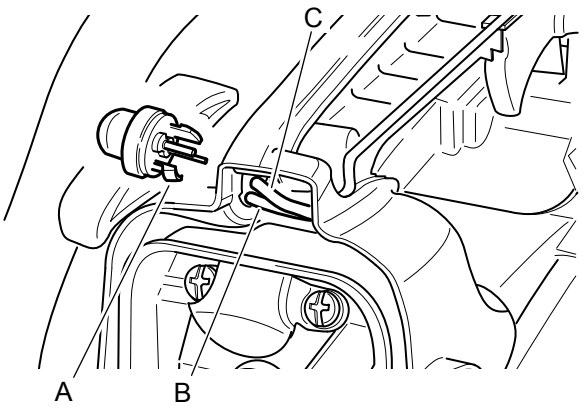
4. Remove cap (C) of tank vent, and clean sponge (D).

5. Cut pipe 36301100210 (E: 7x11x170mm) and 38201101110 (F: 9x13x350) in approx. 30mm (1 1/4 in) length, and connect them to pressure tester as shown. Connect tank vent (A) without cap to pipe as shown.

6. Plug hole (a) with finger and apply pressure 20 kPa (0.2 kgf/cm^2) (3 psi). The pressure should hold steady.

7. Remove finger from hole (a). Tank vent should pass air freely without holding any pressure. If it does not, replace tank vent with new one.

4-5 Replacing purge bulb



NOTE: Purge bulb can be replaced even if carburetor is assembled.

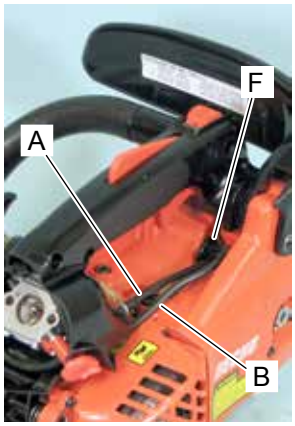
1. Disconnect lines from purge bulb.

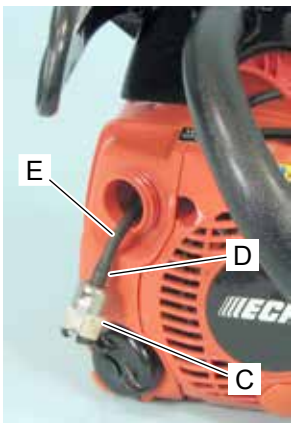
2. Press leg (A) of purge bulb with screwdriver to remove purge bulb from top handle.

3. Push new purge bulb into top handle.

4. Connect fuel return line (B) to longer fitting of purge bulb. Connect purge line (C) to shorter fitting of purge bulb.

4-6 Replacing fuel line and fuel return line





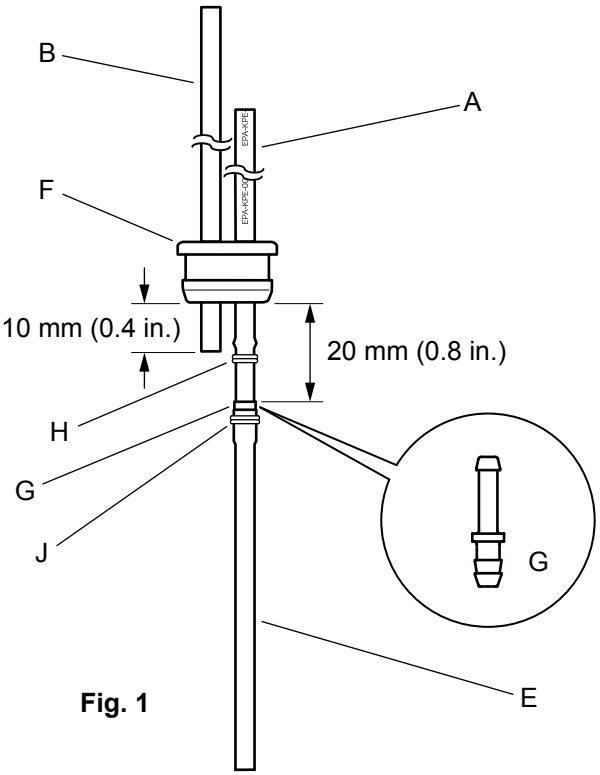


Fig. 1

1. Remove dust cover.

2. Remove air cleaner cover, air filter and air cleaner case.

3. Inspect fuel line (A) and fuel return line (B). Replace them if defective.

4. To replace fuel line and fuel return line, remove fuel cap and remove fuel strainer (C) and clip (D) from fuel line (E).

5. Remove grommet (F) from the unit together with fuel line and fuel return line.

6. Install fuel return line (B) through grommet (F) as shown in **Fig. 1**. Place 5 mm (0.20 in.) dia. clip (H) over fuel line (A) then install (A) to pipe joint (G) and secure with clip as shown. Place 6 mm (0.24 in.) dia. clip (J) over fuel line (E) then install (E) to pipe joint (G) and secure with clip as shown. Insert fuel line (A) through grommet (F) as showon.

NOTE: Make sure fuel line (A) has ID mark “EPA-KPE-002 lot.xxxx” on it.

7. Install assembled grommet on the unit.

NOTE: Be certain grommet is inserted on unit with fuel return line (B) positioned above fuel line (A) as sown in **Fig. 2** below.

8. Pull out fuel line from fuel tank and install clip and fuel strainer.

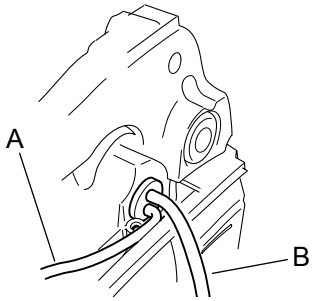


Fig. 2

4-7 Adjusting carburetor

4-7-1 General adjusting rules

A. Before adjustment, check the following items.

1. The correct spark plug must be clean and properly gapped.

2. The air filter element must be clean and properly installed.

3. The muffler exhaust port must be clear of carbon.

4. The fuel lines, tank vent and fuel filter are in good condition and clear of debris.

5. The fuel is fresh (> 89 octane : $\frac{RON+MON}{2}$) and properly mixed at 50 : 1 with “ISO L-EGD” or “JASO M345-FD” 2-stroke oil.

6. The recommended bar and chain must be installed, and properly tensioned.

NOTE : In order to achieve proper carburetor adjustment, a 10 or 12 inch bar and chain combination should be installed on the unit, otherwise serious engine damage will occur due to overspeeding.

B. Adjustment with limiter caps on carburetor.

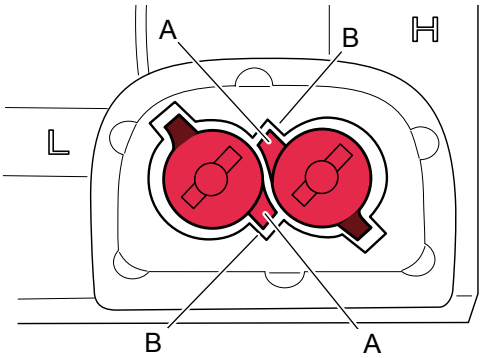
Set L and H mixture needles fully counterclockwise (CCW). Start and run engine for 100 seconds alternating engine speed between WOT and idle every 5 seconds. Adjust idle adjust screw to 3,200 +/- 200 rpm. Adjust H mixture needle to 11,900 +/- 600 rpm by turning H limiter cap. If engine does not run correctly after this adjustment, proceed to the next step 4-7-2.

IMPORTANT : After adjusting carburetor according to the steps 4-7-2 and 4-7-3, the limiter cap(s) must be installed on L and H mixture needle(s) to comply with Emission regulation.

4-7-2 Presetting idle adjust screw, L mixture needle and H mixture needle

Tools Required : Small screwdriver with 2.5 mm blade, electronic tachometer P/N 900303, limiter cap removal tool with 2.5 mm left-hand thread P/N 89801. Parts Required : (2) limiter caps P/N P003000010.

1. Turn the L and H mixture needles CCW to rich side stop to align limiter cap tab (A) with locating slot (B), using 2.5 mm blade screwdriver.



NOTE : If cap tabs (A) misalign with locating slots (B), the cap cannot be removed and the center hole threads will strip. If center hole threads strip, use 3 mm limiter cap removal tool P/N 89802 to remove the limiter cap.

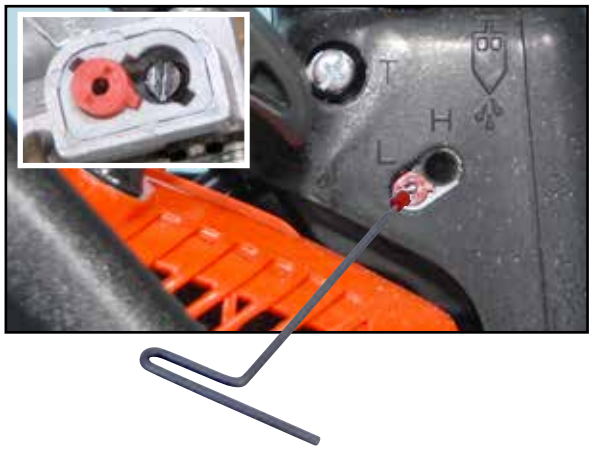
4-7 Adjusting carburetor (continued)

2. Screw 2.5 mm limiter cap removal tool P/N 89801 CCW into center hole of limiter cap until tab of the limiter cap just comes out of the locating slot.

NOTE : DO NOT COMPLETELY REMOVE LIMITER CAP FROM CARBURETOR!

If the first limiter cap is removed completely, the second limiter cap can be misaligned while inserting the cap removal tool.

3. Remove the limiter cap removal tool from the limiter cap by turning the tool clockwise (CW), leaving the limiter cap in place.



4. Screw 2.5 mm limiter cap removal tool P/N 89801 CCW into center hole of another limiter cap until the limiter cap is removed from the mixture needle completely. Remove the limiter cap from limiter cap removal tool by turning CW, then screw limiter cap removal tool into center hole of previous limiter cap to remove completely.

5. Turn L and H mixture needle CW until lightly seated, then turn both mixture needles CCW for initial setting as follows :

L mixture needle : 2, H mixture needle : 2 7/8

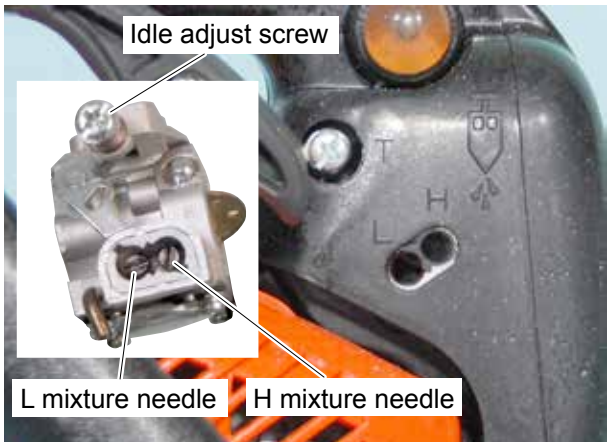
NOTE : If needles are forced during seating, damage to carburetor may occur.

6. Remove air cleaner cover and air filter to expose Idle adjust screw and throttle plate. Turn Idle adjust screw CCW and set the screw until the tip just contacts the throttle plate. Then turn Idle adjust screw 7/8 turn CW. Reinstall air filter and air cleaner cover.

NOTE : The initial carburetor settings for Idle adjust screw, L and H mixture needles are intended to start and run the engine before final carburetor adjustments are made to conform the unit to meet Emission Regulations. The actual number of turns needed for engine operation may vary.

4-7 Adjusting carburetor (continued)

4-7-3 Adjusting carburetor



1. Start and warm engine for 100 seconds alternating engine speed between WOT and idle every 5 seconds. Turn H mixture needle CCW until engine speed drops to approx. 11,400 rpm at WOT.

NOTE : Do not run engine at high speed without load longer than 10 seconds, or engine damage may occur.

2. Adjust L mixture needle using 2.5mm blade screwdriver to reach maximum engine rpm just before lean rpm drop off.

3. Set idle speed to 3,600 rpm by turning Idle adjust screw. Engine rpm should be stable at 3,600 +/- 50 rpm after idle adjust screw adjustment.

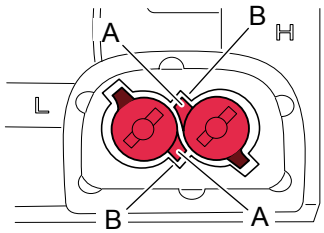
4. Turn L mixture needle CCW reducing engine idle speed 700 rpm to set idle speed at 2,900 rpm. The idle speed range is 2,800 - 3,000 rpm.

5. Set idle speed to 3,200 rpm by turning Idle adjust screw. Engine rpm should be stable at 3,200 +/- 50 rpm after idle adjust screw adjustment.

NOTE : Engine speed must be allowed to stabilize a minimum of 20 seconds after each adjustment of L mixture needle to assure accurate tachometer readings.

6. Before adjustment, WOT engine speed should be less than or equal to 11,400 rpm. If rpm is higher, turn H mixture needle CCW until 11,400 rpm is achieved. To make the final WOT engine speed adjustment, turn the H mixture needle CW in 1/8 turn increments with the engine at idle. After each adjustment, accelerate to WOT, and check rpm. The final rpm should fall within 11,600 - 11,800 rpm.

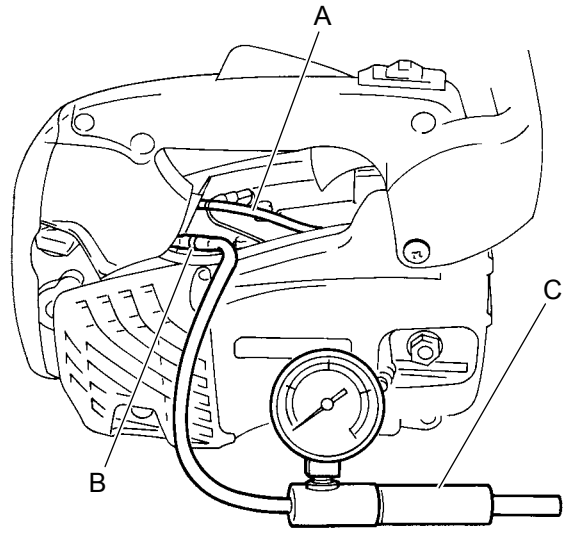
7. After adjusting carburetor, screw new limiter cap CCW on the limiter cap removal tool (C) (P/N 89801) approx. 2 turns as shown. Align the limiter cap tabs (A) with locating slots (B) in extended housing of carburetor and put the limiter caps on L and H mixture needles respectively. Gently press the caps onto L and H mixture needles (do not rock caps back and forth). Remove tool (C) then fully seat caps until flush with housing of carburetor using bar tool.

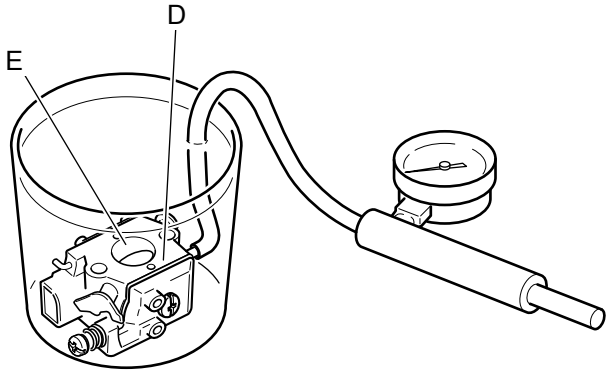


IMPORTANT : The limiter caps must be properly installed on L and H mixture needles to comply with Emission Regulations.

8. Start engine, and verify engine idle speed ranges from 2,900 to 3,500 rpm, and WOT engine speed ranges from 11,300 to 12,500 rpm. Make sure the chain does not rotate when engine is idling. When final adjustment is completed, the engine should idle, accelerate smoothly, and attain WOT per above specifications.

4-8 Testing carburetor





NOTE: To perform this test, carburetor interior should be wet with fuel. If dry, a little leakage may occur.

1. Remove dust cover.

2. Disconnect fuel line (A) from joint (B). Connect pressure tester 89780330133 (C) to joint (B).

3. Apply pressure approx. 100 kPa (1 kgf/cm^2) (14 psi).

4. If pressure remains steady, follow step 5 and 6. If pressure drops, proceed to step 7.

5. Lightly push purge bulb once. Pressure tester reading should drop and remain above 50 kPa (0.5 kgf/cm^2) (7 psi).

6. If reading does not drop, inspect inlet needle valve for sticking or metering lever height is too low.

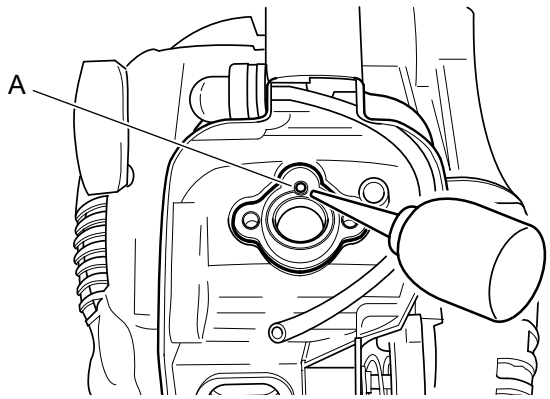
7. If pressure drops at step 3, or if pressure drops below standard figure at step 5, remove carburetor from the unit, disconnecting purge line and throttle rod.

8. Submerge carburetor in suitable clean solvent to locate the leak by applying pressure approx. 100 kPa (1 kgf/cm^2) (14 psi).

9. If air bubbles come out between pump cover and carburetor body (D), inspect pump diaphragm, pump gasket, and diaphragm seat of carburetor body (Refer to “4-12 Inspecting diaphragm”).

10. If air bubbles come out from throttle bore (E), inspect inlet valve, metering lever spring, and metering lever height (Refer to “4-11 Inspecting inlet needle valve”).

4-9 Inspecting crankcase pulse passage

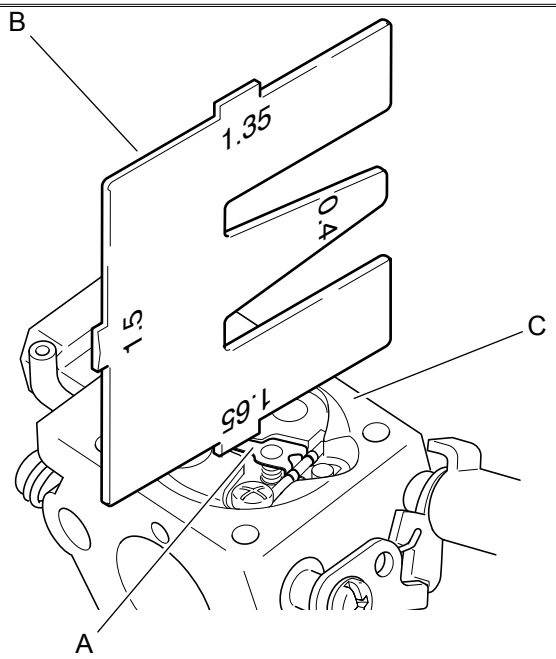


1. Drop a little oil in pulse hole (A) on intake bellows.

2. Remove spark plug and pull starter grip several times. Oil should spit back from the hole.

3. If not, inspect whether pulse passage is clogged. Repair or replace as required.

4-10 Inspecting metering lever height



1. Remove carburetor.

2. Remove metering diaphragm cover, metering diaphragm and gasket.

3. Inspect metering lever (A) height by Metering lever gauge 89756319830 (B).

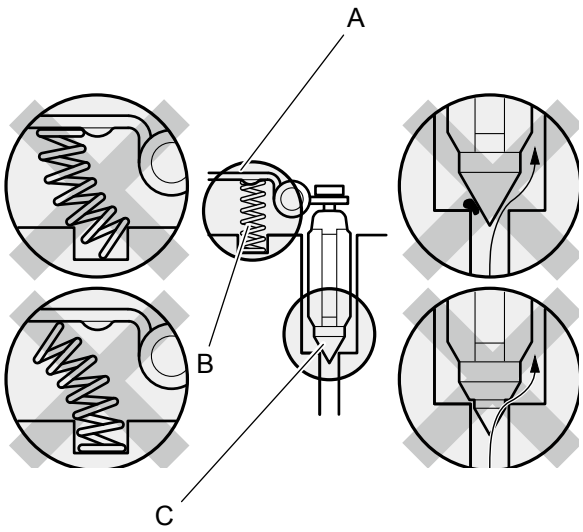
Metering lever height: 1.65 mm (0.065 in) lower than diaphragm seat (C).

4. If necessary, gently bend metering lever up or down to set metering lever to proper position.

NOTE: When metering lever is:

Too high → Fuel flooding occurs
Too low → Fuel starvation / overheating occurs

4-11 Inspecting inlet needle valve



1. Remove metering lever (A) and pivot pin. Remove spring (B) and inlet needle valve (C).

2. Inspect inlet needle valve if worn or sticky. Clean or replace as required.

NOTE: Causes of fuel flooding from carburetor to cylinder are as follows:

- Improper assembling of metering lever and spring.
- Dirt between inlet needle valve and valve seat.
- Worn inlet needle valve tip.

3. Clean inlet needle valve seat using suitable clean solvent (do not use metal tools).

4. Reassemble inlet needle valve, spring, metering lever and pivot pin.

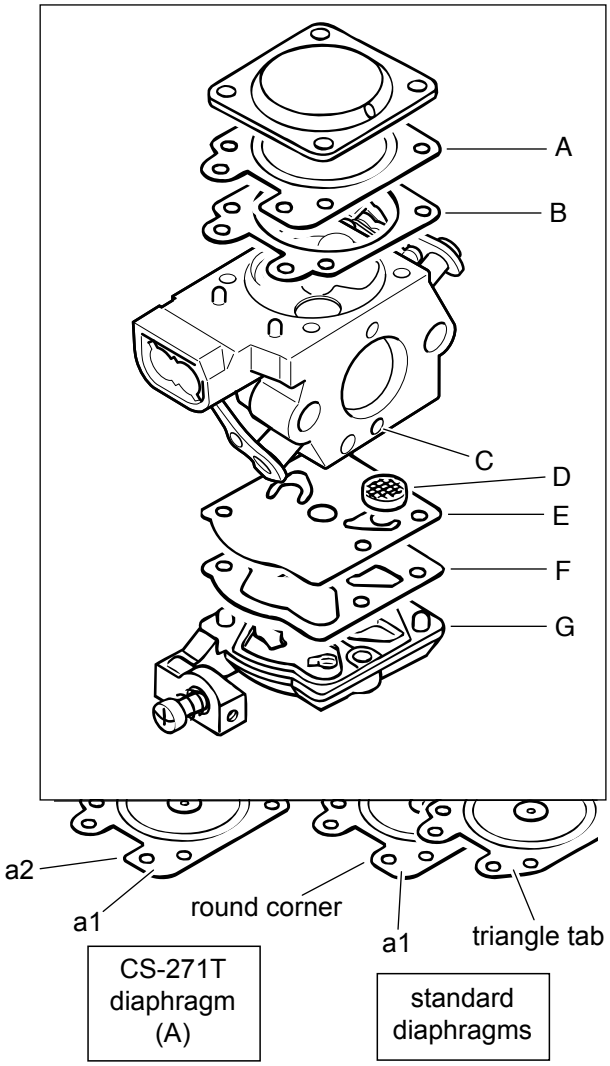
NOTE: Insure proper metering lever installation as follows.

(1) Spring is seated in its hole at chamber floor.

(2) Spring is under dimple of metering lever.

(3) metering lever fork is holding inlet needle valve.

4-12 Inspecting diaphragm



1. Inspect metering diaphragm (A) for hardening, distortion, or pin hole. Replace as required.

2. Remove pump cover (G), pump diaphragm (E) and pump gasket (F).

3. Inspect pump diaphragm (E) and replace if hardened or curled at valve tabs.

4. Make sure pulse chamber is clear of debris. If not, clean it.

5. Inspect metering gasket (B) and pump gasket (F) and replace if defective.

6. Inspect inlet screen (D). If blocked, remove and clean it, or replace.

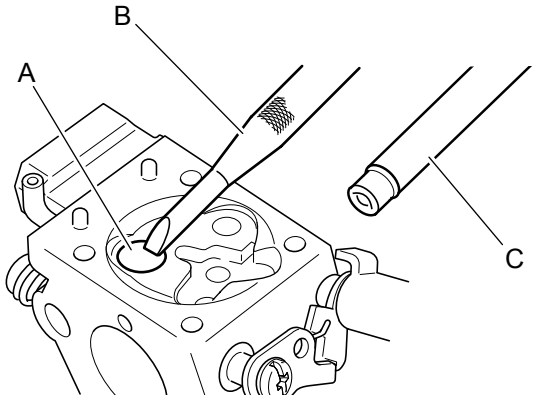
7. Clean pulse passage (C) with compressed air.

8. Clean fuel passages in carburetor body with compressed air.

NOTE: Before cleaning metering side with compressed air, turn "H" needle clockwise until lightly seated and remove inlet needle valve. Otherwise, main nozzle check valve and inlet needle valve spring may be damaged by the compressed air.

NOTE: CS-271T uses an alcohol resistant metering diaphragm (A). The alcohol resistant metering diaphragm has both a square tab (a1) and sharper corner (a2) as ID mark.

4-13 Replacing Welch plug



If engine does not run smoothly even after readjusting carburetor and inspecting carburetor parts, inspect low speed ports on carburetor as follows:

1. Remove metering lever and related parts to protect them from damage.

2. To remove Welch plug (A), punch the remover tool (B) through Welch plug at low angle and pry it out.

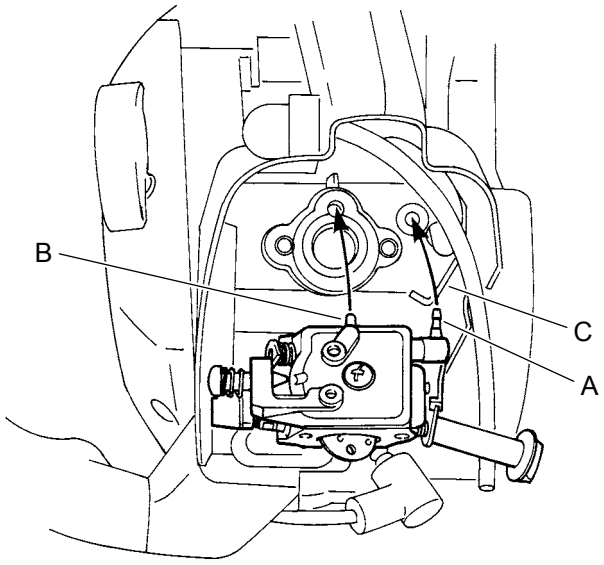
NOTE: Remover tool (B) is included in Welch plug tool (Part number: 500-500).

3. Clean low speed ports with compressed air.

4. Place a new Welch plug over the opening and gently tap it until flush using welch plug installer (C).

5. Install all removed parts to carburetor body.

4-14 Installing carburetor



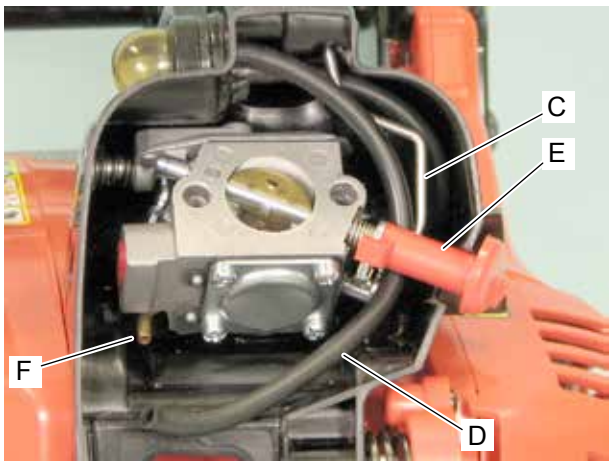
1. Install fuel inlet (A) and pulse passage nipple (B) as shown.

2. Connect throttle rod (C) to carburetor.

NOTE: Early production CS-271T used sealant on mating surface between carburetor and intake bellows. Use of sealant is no longer required on any CS-271T after confirmation test.

Effective date: March 1, 2012
Starting serial number:

CS-271T(11):	11004001 and after
CS-271T(12):	12008705 and after
CS-271T(13):	13001901 and after

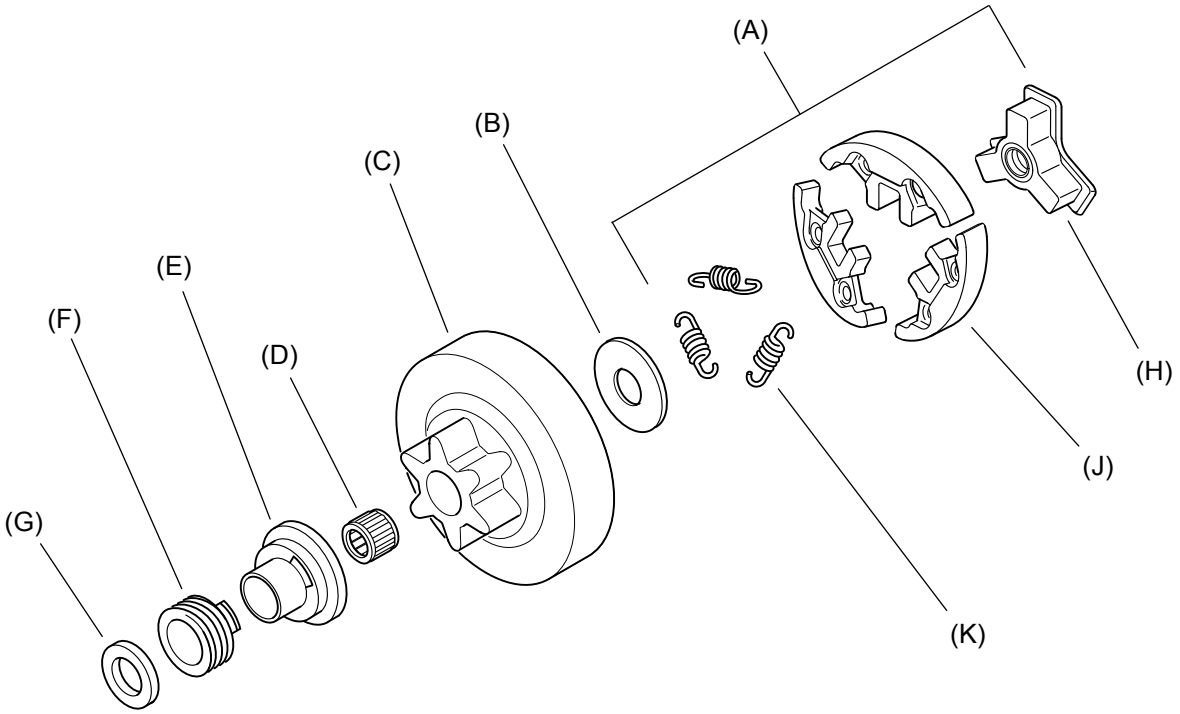


3. Pass purge line (D) between throttle rod (C) and choke knob (E).

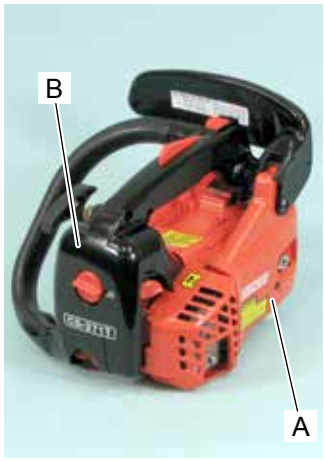
4. Connect purge line (D) to fitting (F) of carburetor.

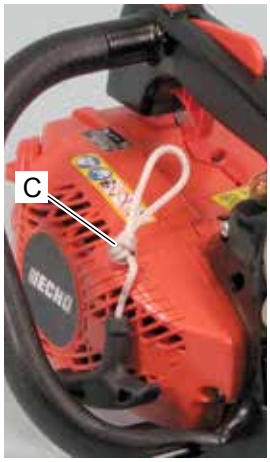
5 CLUTCH SYSTEM

(A) Clutch assembly
(B) Clutch plate
(C) Clutch drum
(D) Needle bearing
(E) Collar
(F) Worm gear
(G) Circular washer
(H) Clutch hub
(J) Clutch shoe
(K) Clutch spring



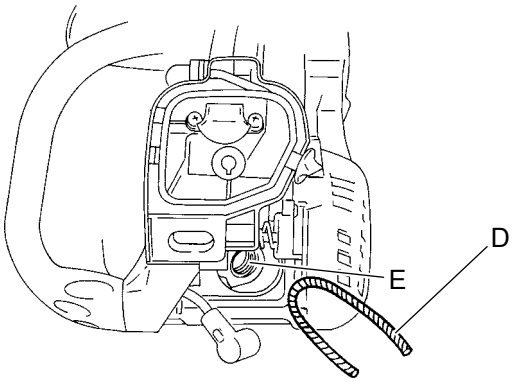
5-1 Inspecting clutch parts





1. Remove sprocket guard (A) and air cleaner cover (B).

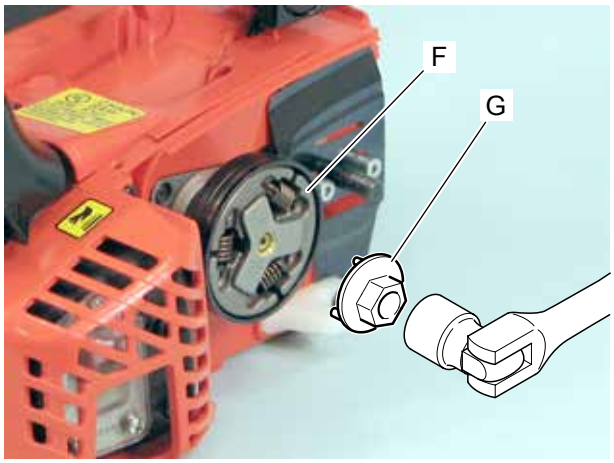
NOTE: If starter assembly is installed, pull starter rope out about 20 cm (8 in), and make a temporary knot (C) to prevent starter damage when installing clutch assembly.



2. Disconnect spark plug cap and remove spark plug.

3. Install clean rope (D) in spark plug hole (E) to stop crankshaft rotation.

NOTE: Do not use piston stopper to avoid piston damage.



4. Rotate clutch assembly (F) clockwise by hand until it cannot be rotated further.

5. Loosen clutch assembly (Left-hand thread) rotating clockwise with clutch tool X640000011 (G) and remove it.

NOTE: Do not use power tools. Otherwise, piston damage may occur.

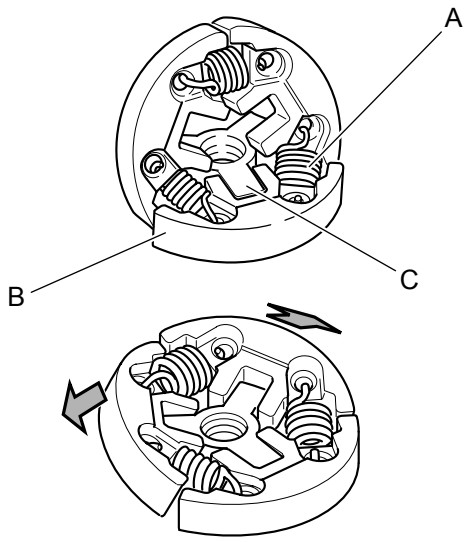
6. Remove clutch drum, clutch plate, needle bearing, collar, worm gear and circular washer.

7. Inspect clutch shoes for wear and spring for weakness or damage. Replace clutch parts as required.

8. Inspect clutch drum and sprocket. Replace if deformed or worn out.

9. Inspect needle bearing, collar and worm gear for damage, discoloration or deformation. Replace as required.

5-2 Replacing clutch parts

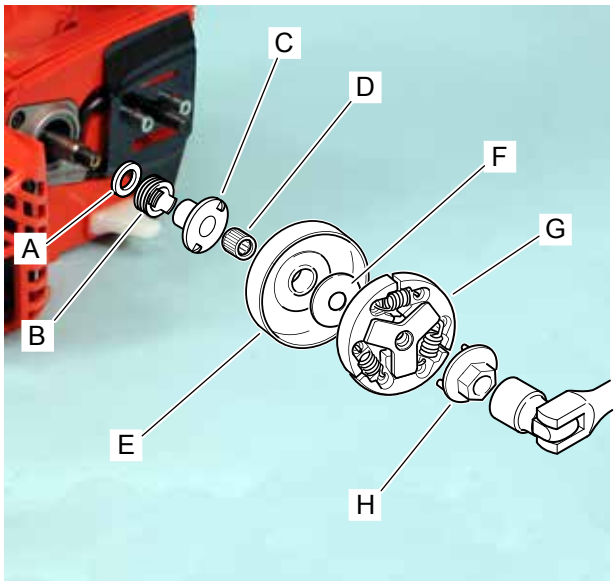


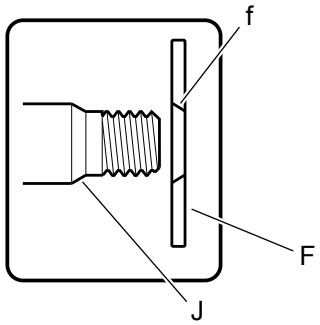
1. Install clutch springs (A) to clutch shoes (B).
NOTE : Make sure to have ends of clutch springs (A) face clutch hub (C)

2. Set one arm of clutch hub (C) to one clutch shoe (B).

3. Install other two clutch shoes (B) on two arms as shown.

5-3 Installing clutch assembly





1. Apply lithium-based grease to needle bearing (D) and install circular washer (A), worm gear (B), collar (C), needle bearing and clutch drum (E) on crankshaft as shown order.

2. Install clutch plate (F) and clutch assembly (G) to crankshaft turning counterclockwise by hand.

NOTE: Chamfered corner (f) of clutch plate (F) should face inside, against crankshaft chamfer (J).

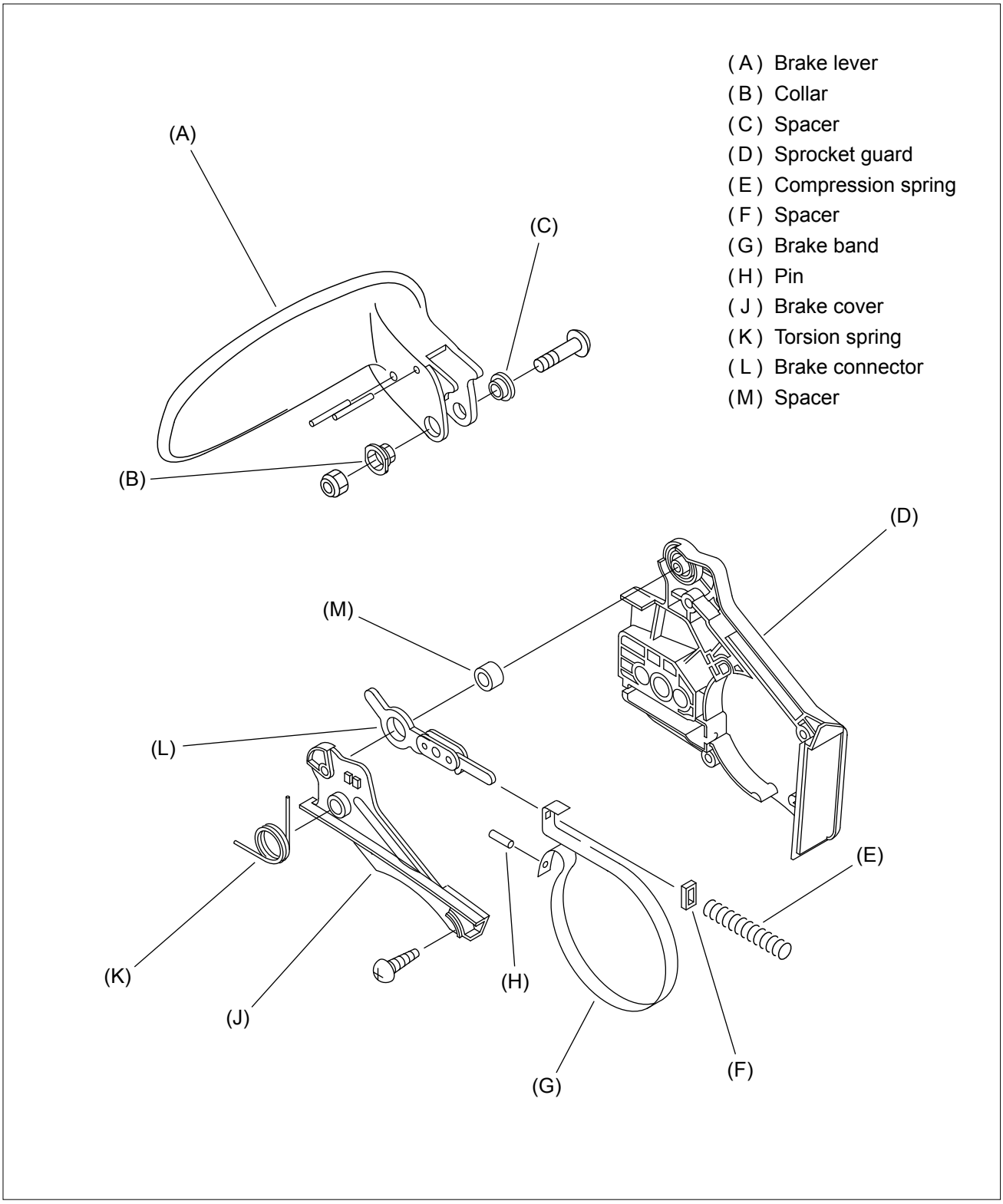
NOTE: If starter assembly is installed, untie temporary knot in the first NOTE of “5-1 Inspecting clutch parts”. Hold starter grip as the rope is pulled out.

3. Turn clutch assembly counterclockwise by hand until it can not be turned further.

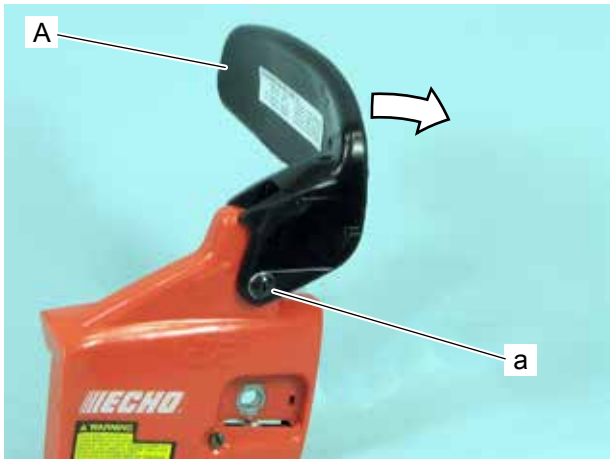
4. Tighten clutch assembly (Left-hand thread) with clutch tool X640000011.

5. Remove rope from spark plug hole and reinstall all removed parts.

6 CHAIN BRAKE SYSTEM



6-1 Disassembling chain brake



WARNING DANGER

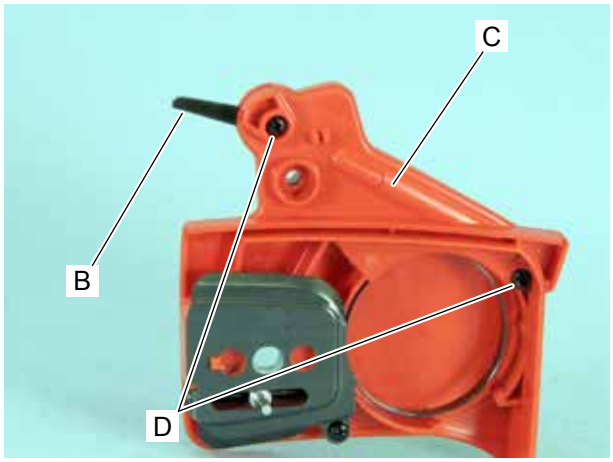
Wear eye protection and safety gloves when disassembling or assembling chain brake to protect eye and hand from injury.

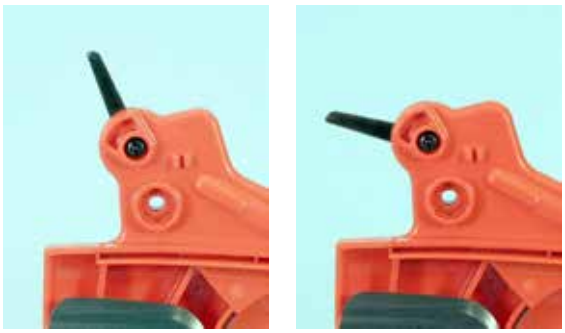
1. Remove sprocket guard from the unit.

2. Move brake lever (A) to chain brake engaging position.

3. Remove bolt (a) and remove brake lever (A) from sprocket guard.

NOTE: Make sure that brake connector (B) is in engaging position before removing brake cover (C), otherwise compression spring may jump out.



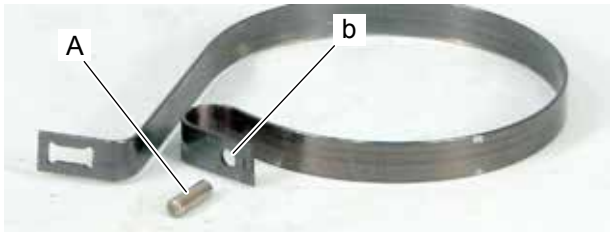


Released position Engaging position

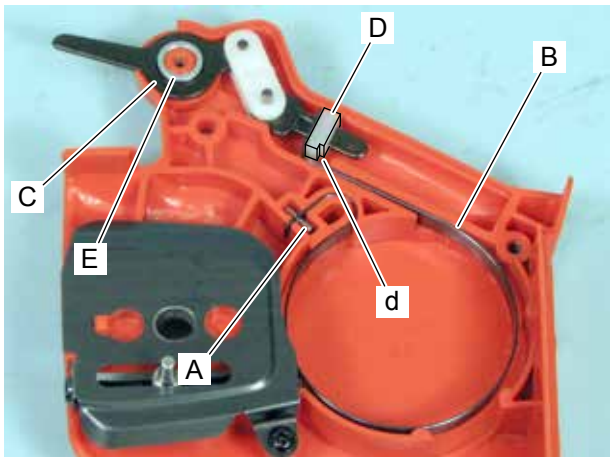
4. Loosen two screws (D) securing brake cover (C) and remove brake cover.

5. Inspect all the brake parts for damage. Replace them as required.

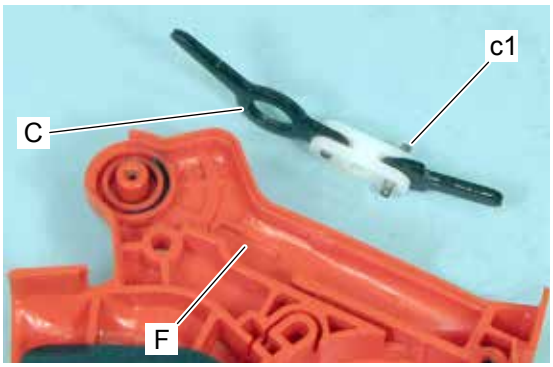
6-2 Assembling brake parts

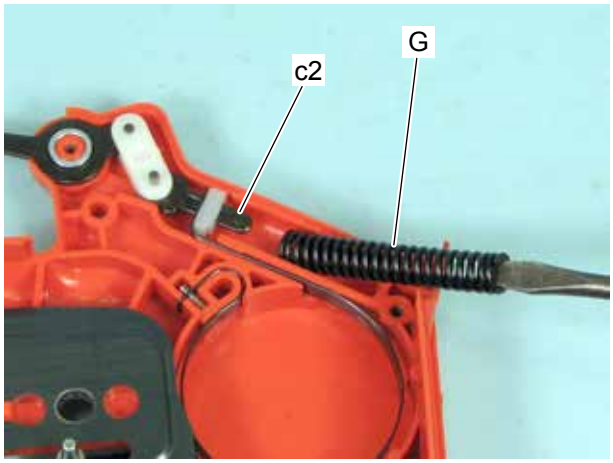


1. Install pin (A) through brake band hole (b).



2. Install brake band (B) with pin (A) in sprocket guard as shown in the left picture. Set brake connector (C), spacer (D) and spacer (E), placing the notch (d) of spacer (D) as shown. Make sure the pin (c1) of brake connector (C) is engaging with the groove (F) of sprocket guard.





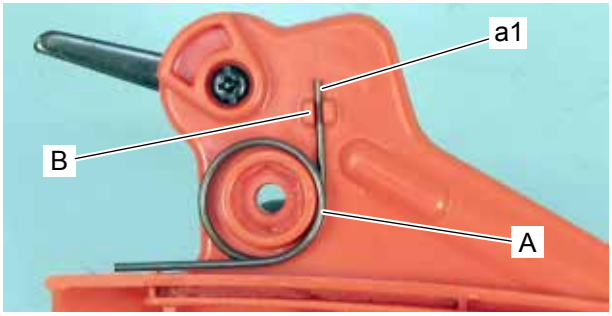
3. Slide in compression spring (G) to the end (c2) of brake connector as sown.

4. Push compression spring (G) with driver etc. and install compression spring in sprocket guard as shown in the below picture.

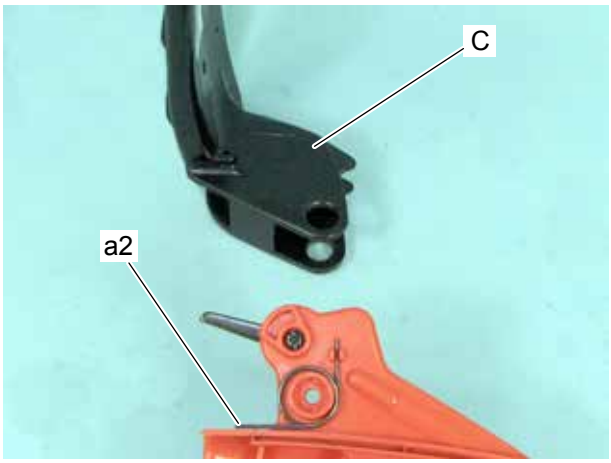
5. Apply molybdenum grease on entire compression spring and other friction parts.

6. Reinstall brake cover.

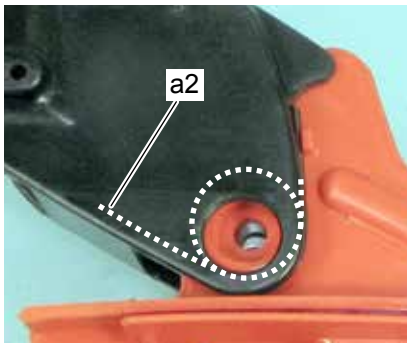
6-3 Assembling brake lever

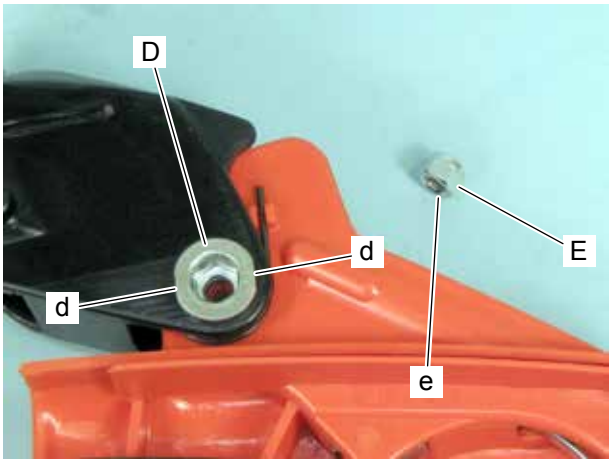


1. Install torsion spring (A) setting shorter end (a1) in the groove (B) of sprocket guard as shown.



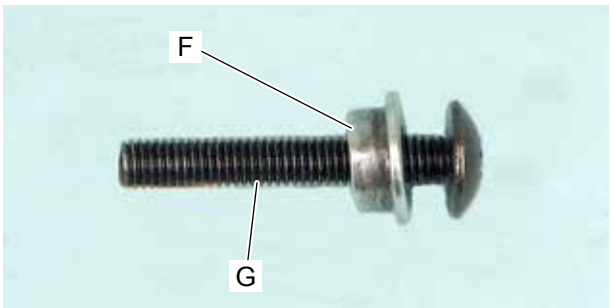
2. Set brake lever (C) on sprocket guard, installing torsion spring longer end (a2) inside brake lever by bending with driver etc.





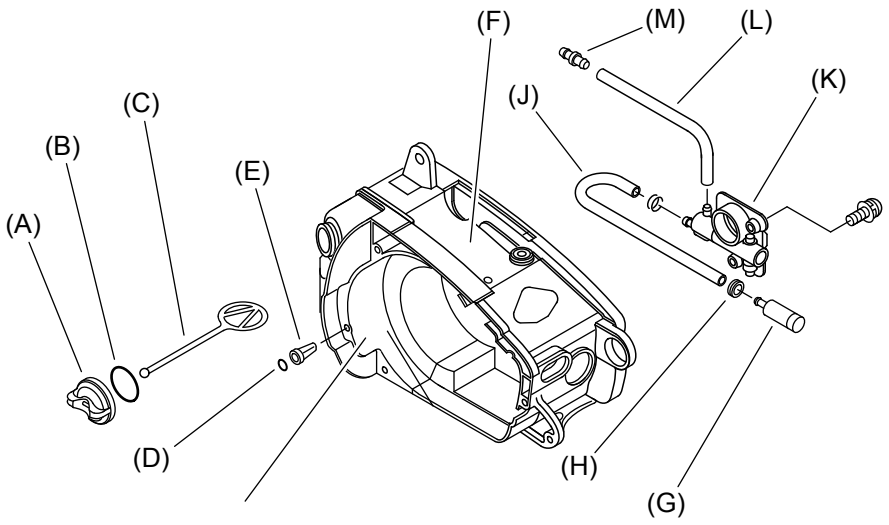
3. Install collar (D) on brake lever, setting flat sides (d) as shown.

4. Install nut (E) in collar (D), facing flat side (e) to collar (D).



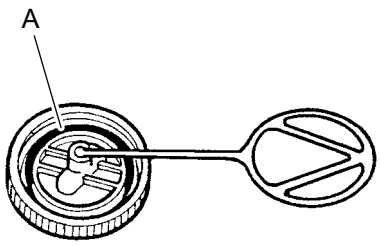
5. Set spacer (F) on bolt (G) and assemble brake cover on sprocket guard.

7 SAW CHAIN LUBRICATION SYSTEM



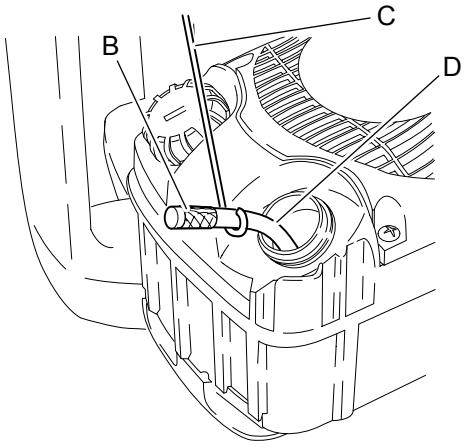
(A) Oil cap
(B) O-ring
(C) Connector
(D) O-ring
(E) Oil tank vent
(F) Engine cover
(f) Oil tank
(G) Oil strainer
(H) Grommet
(J) Oil line
(K) Auto-oiler assembly
(L) Oil outlet line
(M) Pipe joint

7-1 Inspecting oil cap and strainer



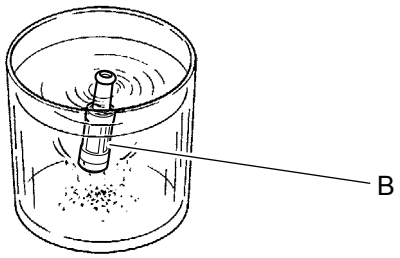
1. Remove oil cap.

2. Inspect oil cap for cracks and O-ring (A) for cuts or damage. Replace worn or damaged parts as required.

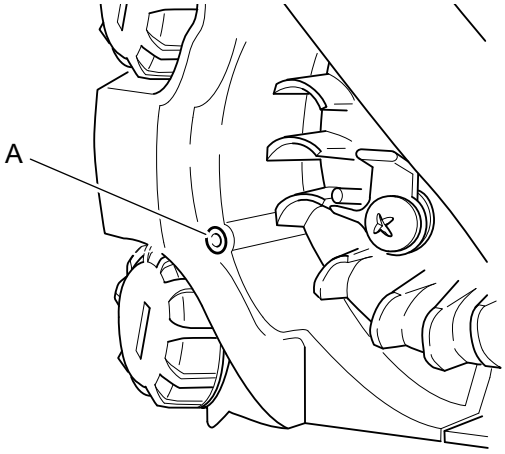


3. Pull oil strainer (B) from oil tank using a wire hook (C).

4. Remove oil strainer (B) from oil line (D) and clean oil strainer in suitable solvent, or replace if damaged.



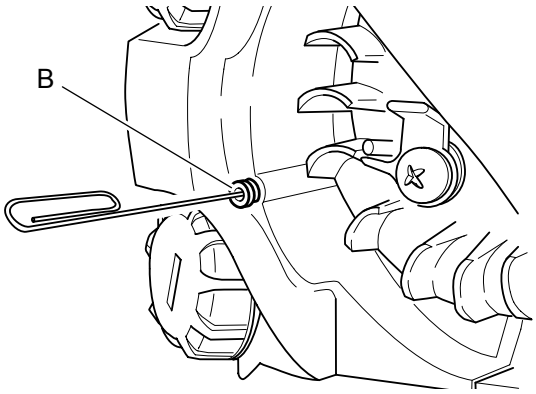
7-2 Inspecting oil tank vent



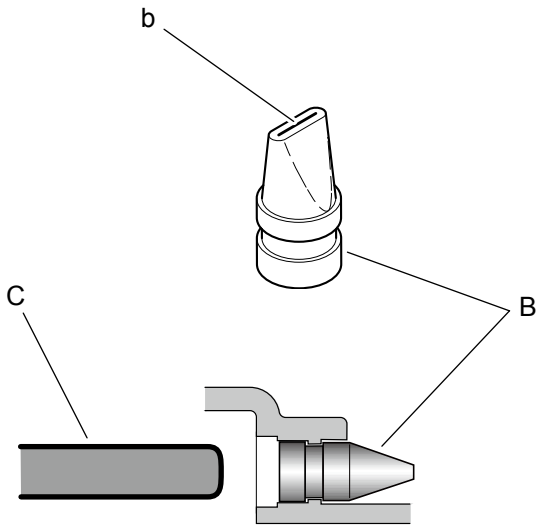
NOTE: Oil tank vent prevents a vacuum from forming in oil tank when chain oil in the tank is consumed.

1. Remove starter assembly.

2. Remove O-ring (A).

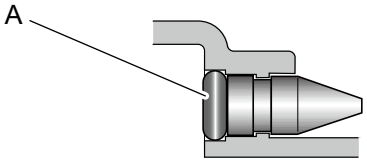


3. Remove oil tank vent (B) using paper clip and clean it.



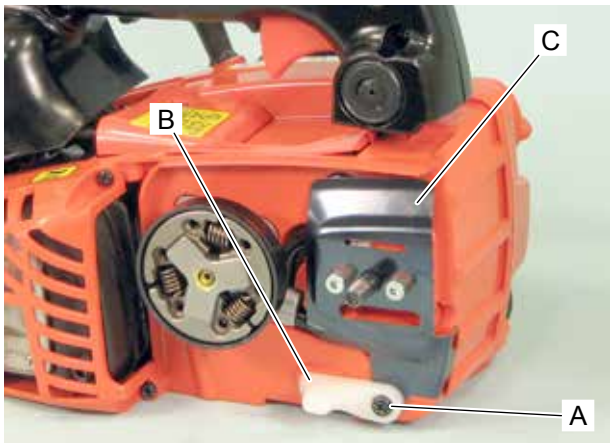
4. Check that oil tank vent lips (b) are not hard or deformed. Replace as required.

5. Install oil tank vent (B) using suitable tool (C) as shown.



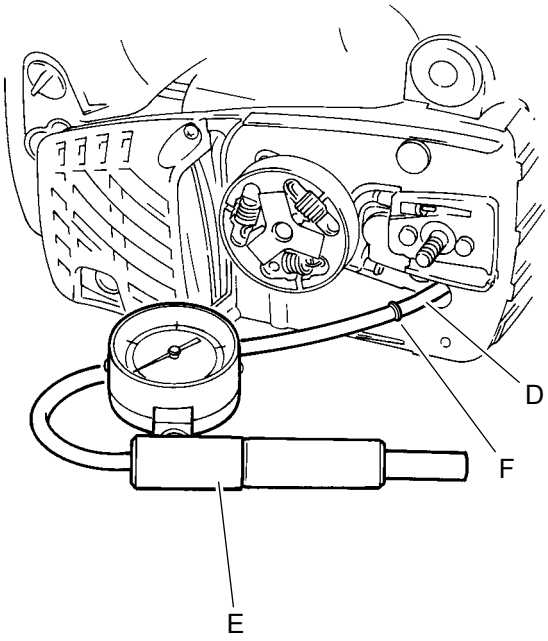
6. Reinstall O-ring (A) as shown. Reinstall starter assembly.

7-3 Inspecting oil line



1. Remove sprocket guard.

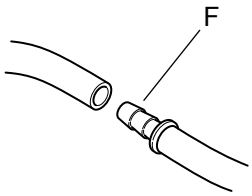
2. Remove screw (A) and remove chain catcher (B) and sprocket guard plate (C).



3. Disconnect oil line (D) and clip from auto-oiler assembly.

4. Connect pressure tester 89780330133 (E) to oil line (D).

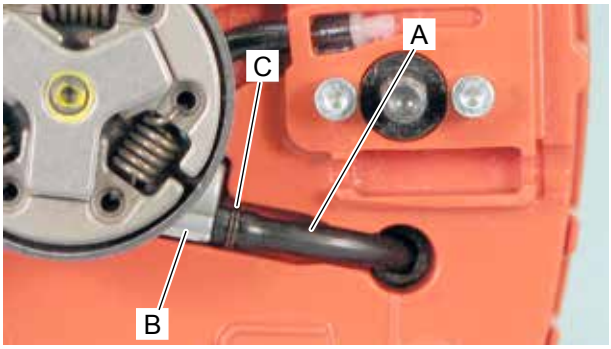
NOTE: To connect pressure tester to oil line, it is recommended to use pipe joint V186000020 (F).



5. Tighten oil cap and apply pressure approx. 9.8 kPa (0.1kgf/cm^2) (1.4psi).

6. Pressure should not drop. If the pressure drops, leakage may occur at oil cap, oil cap O-ring, oil line, grommet, oil tank vent, or oil tank. Inspect them and replace defective part(s) with new parts as required.

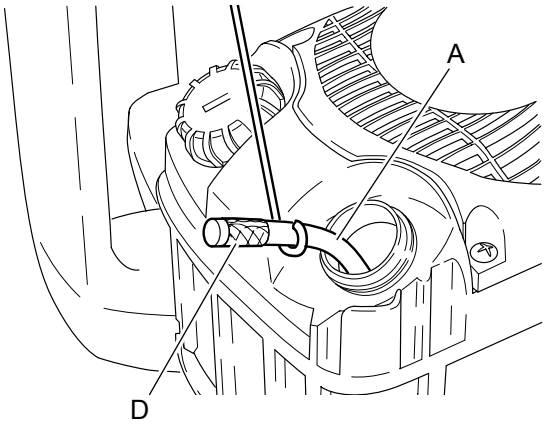
7-4 Replacing oil line and grommet



1. Remove sprocket guard plate from the unit (Refer to “7-3 Inspecting oil line”).

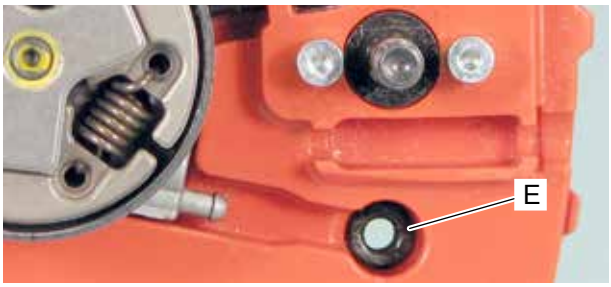
2. Disconnect oil line (A) from auto-oiler assembly (B) together with clip (C).

3. Remove clip (C) from oil line (A).

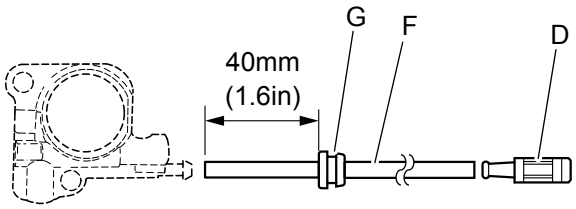


4. Pull out oil strainer (D) from oil tank (Refer to “7-1 Inspecting oil cap and strainer”).

5. Pull out oil line (A) from the unit together with oil strainer (D).

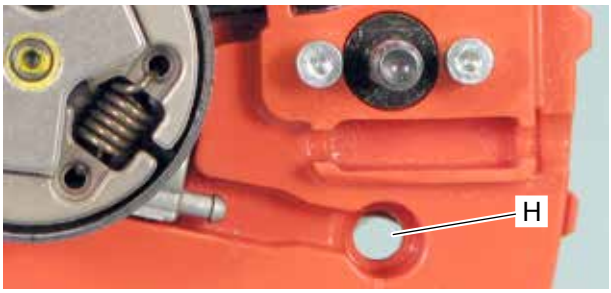


6. Remove grommet (E) with longnose pliers etc.



7. Insert new oil line (F) to new grommet (G).

8. Connect oil strainer (D) to oil line.



9. Pass oil strainer (D) through grommet hole (H) and assemble grommet (G) to grommet hole.

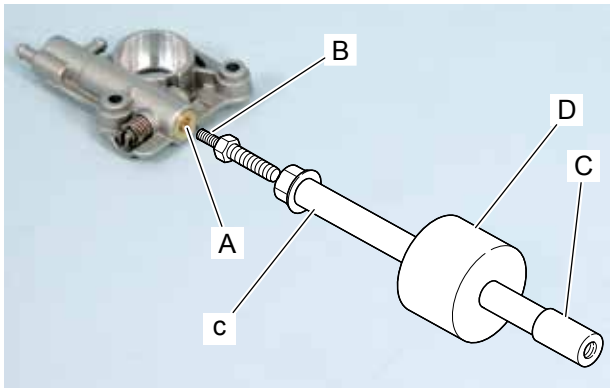
10. Make sure oil strainer can move freely in oil tank.

NOTE: If oil strainer cannot move freely in oil tank, chain oil may not be supplied properly.

7-5 Disassembling auto-oiler assembly

1. Remove auto-oiler assembly from the unit.

2. Tap 5-mm (M5 - Pitch 0.8mm) thread in the hole of plug (A).

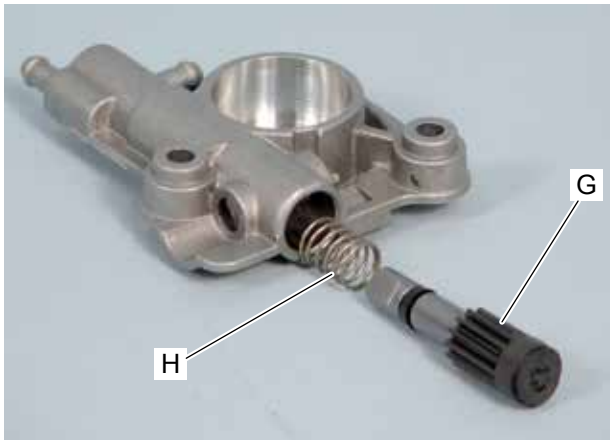


3. Screw the bolt (B) of puller 89750103938 into the hole of plug (A), and connect PTO shaft puller 89760323030 (C) as shown.

4. Hold auto-oiler body by one hand. Hold puller shaft end (c) by another hand. Hold auto-oiler body upper side and shake the weight (D) up and down several times to remove the plug (A).

5. Pull out spring pin (E) from adjuster needle (F) with pliers.

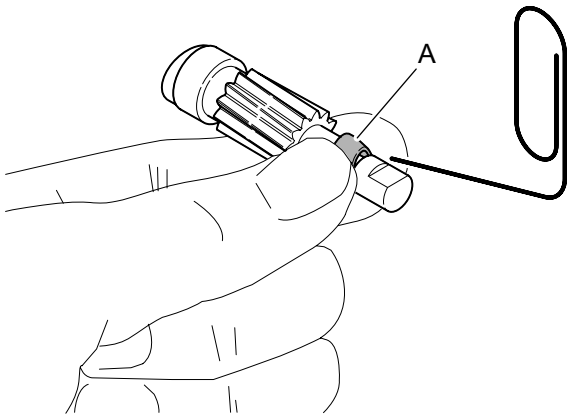
6. Pull out adjuster needle (F) from auto-oiler body.



7. Remove plunger (G) and spring (H).

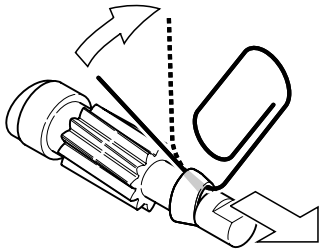
8. Check plunger if worn out or broken, and spring if fatigued or broken. Replace parts if defective.

7-6 Replacing V-ring



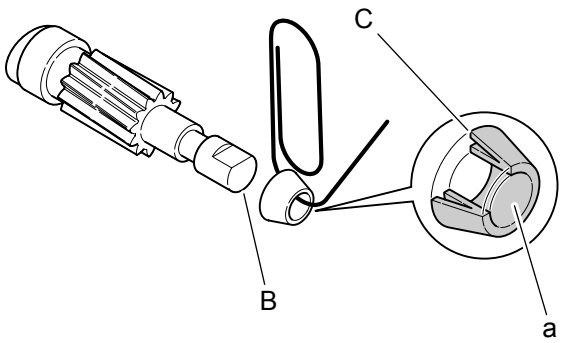
1. Inspect V-ring on plunger for hardness or damage. Replace as follows if required.

2. Secure V-ring (A) and insert thin steel wire such as paper clip through the opening as shown.



3. Bend steel wire and lift up V-ring from the groove.

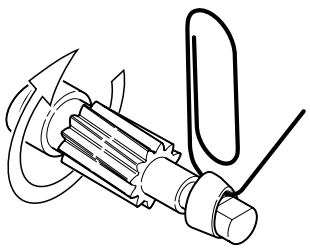
4. Slowly rotate plunger while pulling V-ring all the way out.



5. Oil inner wall (a) of new V-ring. Hook V-ring with steel wire as shown.

6. Put V-ring on the end (B) of plunger.

NOTE: Lips (C) of V-ring should face gear.



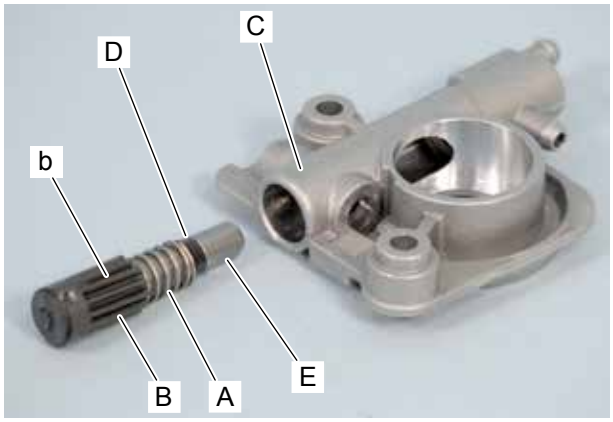
7. Move V-ring into the groove while carefully rotating plunger.

NOTE: Parts number

V-ring: 43702032430

Plunger: 43702437330

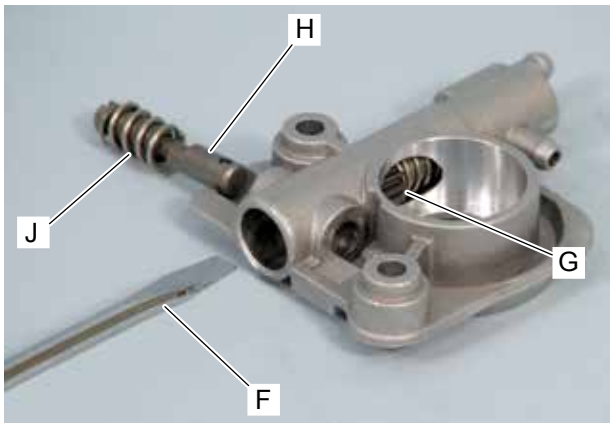
7-7 Assembling auto-oiler parts



1. Assemble spring (A) to plunger (B) as shown.

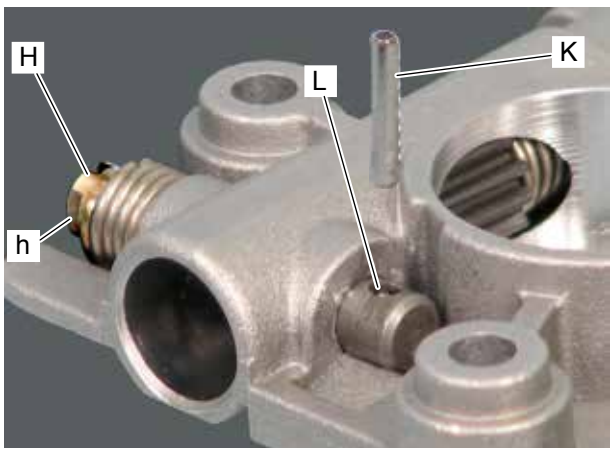
2. Coat plunger gear (b) and spring (A) with grease and insert into cylinder (C) of auto-oiler body.

NOTE: Do not apply grease on V-ring (D) and plunger shaft end (E), because these are a part of chain oil passage.

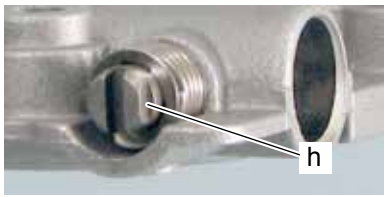


3. Push in plunger with small screwdriver (F), and hold plunger in place with finger through the center hole (G) of auto-oiler body. Remove screwdriver (F).

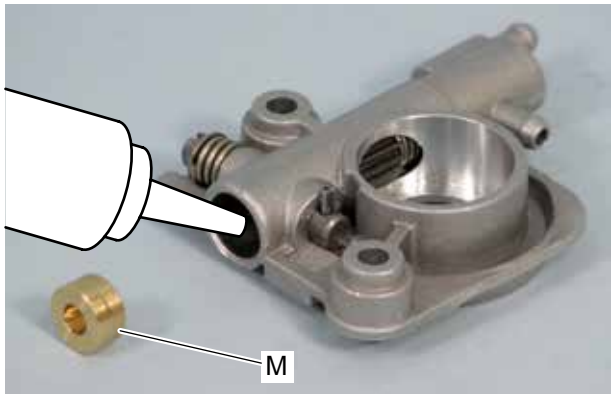
4. Install adjuster needle (H) with spring (J) into oiler body.



5. Press adjuster needle (H) to the bottom, orienting the flat surface (h) as shown.



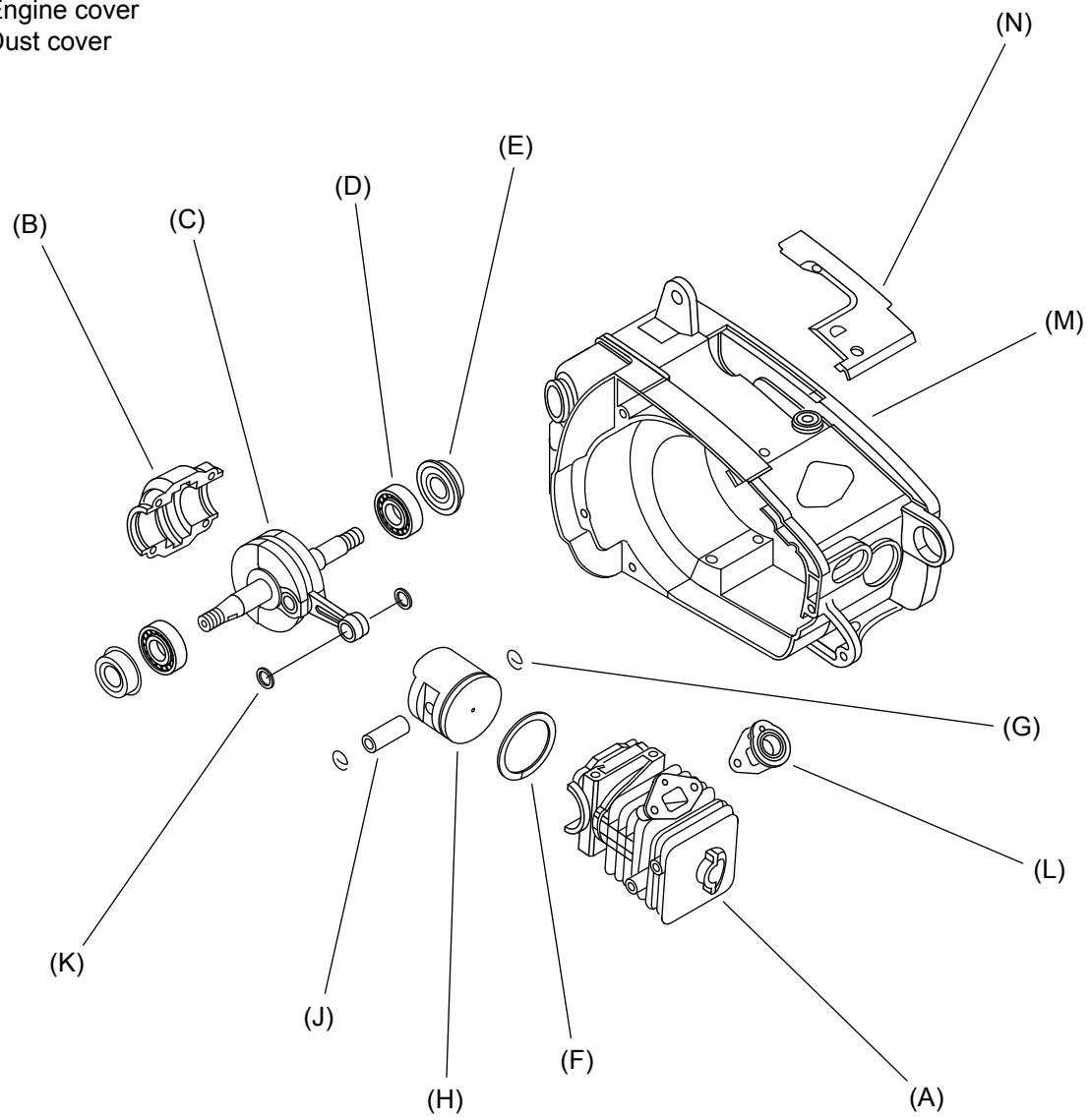
6. Tap in new spring pin (K) into hole (L) of adjuster needle, until spring pin bottoms.



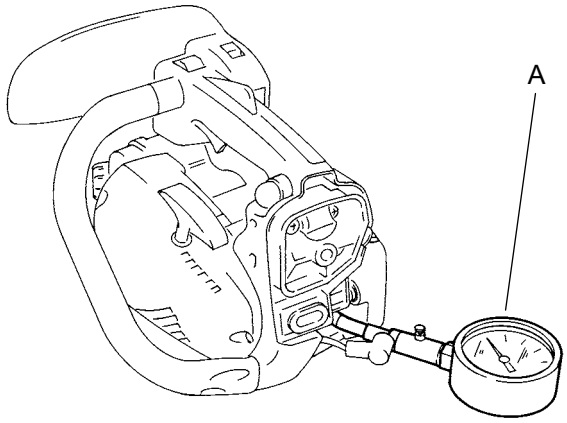
7. Apply grease in plunger hole. Tap plug (M) into hole with plastic mallet until plug is flush with the outer hole wall circumference.

8 ENGINE

(A) Cylinder (Upper crankcase)
(B) Crankcase (Lower crankcase)
(C) Crankshaft assembly
(D) Ball bearing
(E) Oil seal
(F) Piston ring
(G) Snap ring
(H) Piston
(J) Piston pin
(K) Piston pin spacer
(L) Intake bellows
(M) Engine cover
(N) Dust cover



8-1 Testing cylinder compression



NOTE: Test cylinder compression when engine is cold.

1. Move ignition switch to STOP position. Then remove air cleaner cover and spark plug.

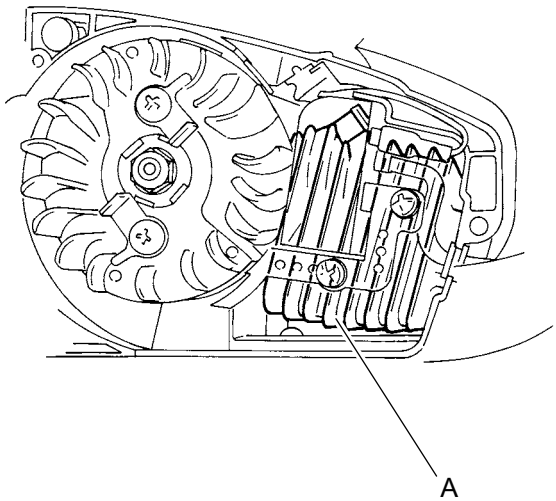
2. Install compression gauge 91037 (A) in spark plug hole and tighten by hand. Pull starter several times to stabilize reading on compression gauge.

3. If pressure is lower than approx. 75% of standard compression pressure (Refer to “1-2 Technical data”), inspect cylinder bore, piston and piston ring for wear or damage.

4. If pressure is more than approx. 125% of standard compression pressure, inspect cylinder combustion chamber and exhaust port, piston crown, and muffler for carbon deposits.

NOTE: Compression pressure varies with volume of compression gauge tip occupying cylinder combustion chamber. If gauge tip volume is considerably different from spark plug volume, it is recommended to measure and note compression pressure of brand-new engines as standard pressure in advance.

8-2 Cleaning cooling air passages



1. Remove starter assembly (Refer to “2-1 Disassembling starter assembly”).

WARNING ⚠ DANGER

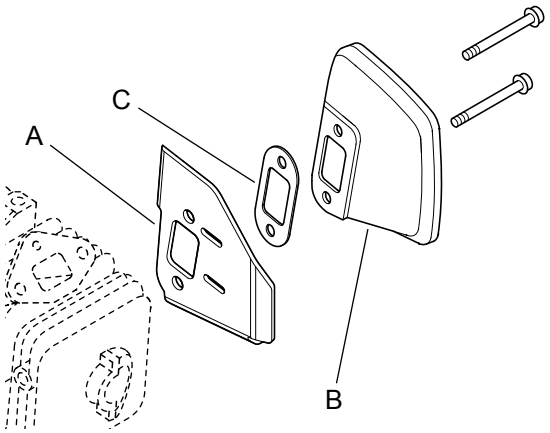
Always wear eye protection when using compressed air for cleaning. Otherwise, eye damage can occur from flying particles.

2. Inspect cylinder cooling fins (A) for blockage with dirt and/or saw dust. Clean them with wooden or plastic stick or compressed air as required.

NOTE: Remove ignition coil if cylinder fins are hard to clean.

3. Install all removed parts.

8-3 Inspecting muffler and exhaust port



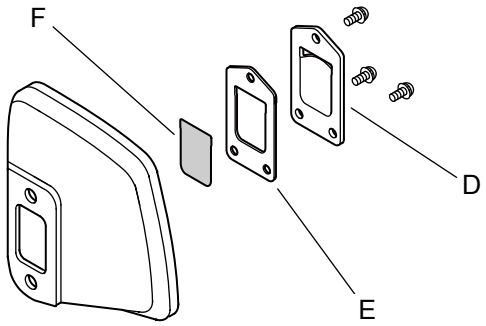
1. Remove muffler cover.

2. Remove exhaust heat shield (A) and muffler (B) with muffler gasket (C).

3. Inspect cylinder exhaust port and clean the port using wooden or plastic stick if carbon is found.

NOTE: When cleaning exhaust port, always position piston at Top Dead Center (TDC) to prevent carbon from entering cylinder. Do not use metal tool, and be careful not to scratch piston or cylinder.

NOTE: Replace muffler gasket with new one when removing muffler.



4. Remove three screws and remove muffler lid (D) from muffler with muffler lid gasket (E). Remove spark arrestor screen (F).

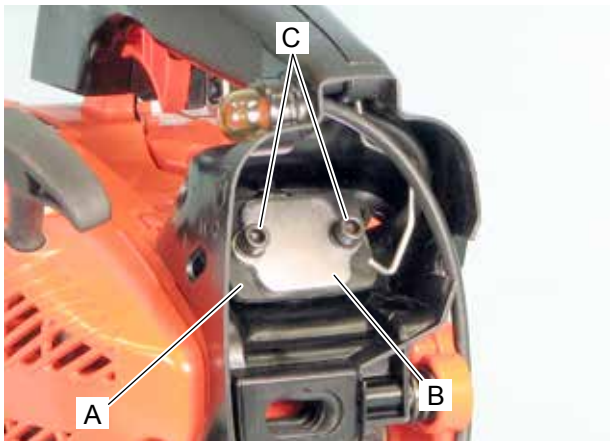
5. Remove carbon deposits from spark arrestor screen (F) and muffler lid (D). If screen has heavy deposits, replace with new one.

6. Reassemble spark arrestor screen and muffler lid with new muffler lid gasket.

NOTE: Replace muffler lid gasket with new one when removing muffler lid.

7. Reinstall muffler with new muffler gasket.

8-4 Testing crankcase and cylinder sealings



1. Remove air cleaner case.

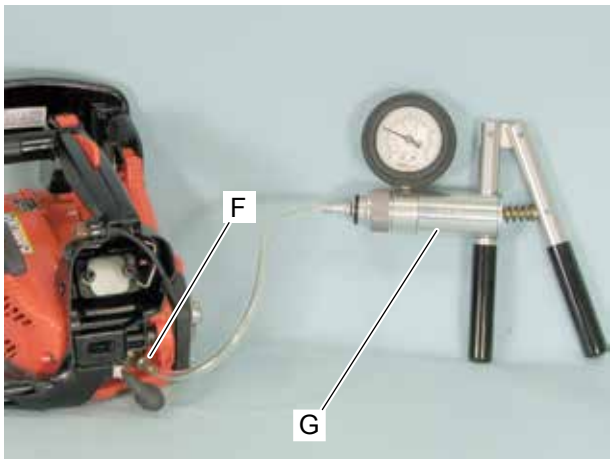
2. Remove carburetor from the unit.

3. To seal intake port and crankcase pulse passage, install pressure rubber plug 89782616131 (A) and pressure plate 89782716131 (B) with M5 bolts (C) of length 15-20 mm (0.6-0.8 in).

4. Remove exhaust heat shield and muffler.

5. To seal exhaust port, assemble pressure rubber plug 89782616131 (D) or rubber trapezoid 91041 between cylinder exhaust port and muffler as shown.

6. Tighten muffler with muffler bolts (E).



7. Remove spark plug and install pressure connector A131000150 (F) to spark plug hole.

8. Connect pressure tester 91024 (G) to pressure connector (F).

9. Apply pressure approx. 19.6 kPa (0.2 kgf/cm^2) (3 psi) by pressure tester and leave for 60 seconds.

NOTE: Do not exceed 30 kPa (0.3 kgf/cm^2) (4.3 psi). Otherwise, damage to oil seal may occur.

10. If the reading drops, leakage may occur.

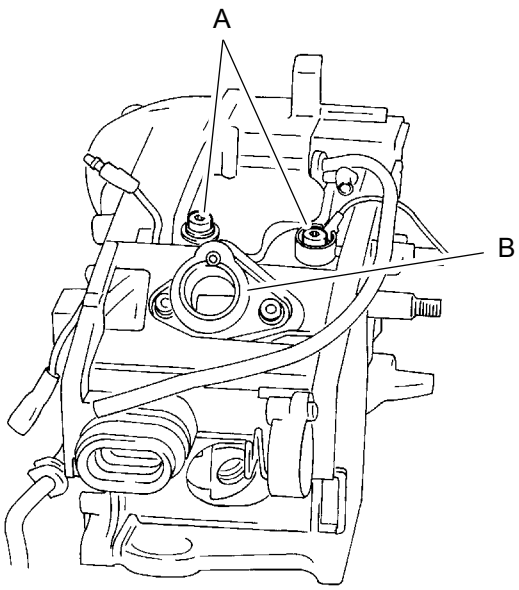
11. Leakage may occur from crankcase seam or oil seal. Use soapy water to locate leakage.

12. Then, apply negative pressure approx. 9.8 kPa (0.1 kgf/cm^2) (1.4 psi) by pressure tester and leave for 60 seconds.

13. If the reading drops, leakage may occur from oil seal. Inspect oil seal for damage or wear.

14. Remove pressure tester (G) and pressure connector (F). Remove pressure rubber plugs (A) and (D).

8-5 Removing engine block



1. Remove sprocket guard, clutch assembly and auto-oiler assembly (Refer to “5-1 Inspecting clutch parts”).

2. Remove air cleaner cover, air filter case and carburetor.

3. Remove flywheel (Refer to “3-10 Inspecting flywheel and key”).

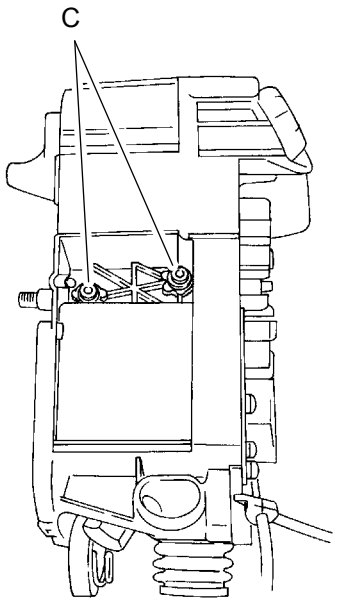
4. Remove ignition coil (Refer to “3-8 Replacing ignition coil”).

5. Remove muffler and heat shield with muffler gasket (Refer to “8-3 Inspecting muffler and exhaust port”).

6. Remove front handle and top handle.

7. Remove dust cover and remove two bolts (A).

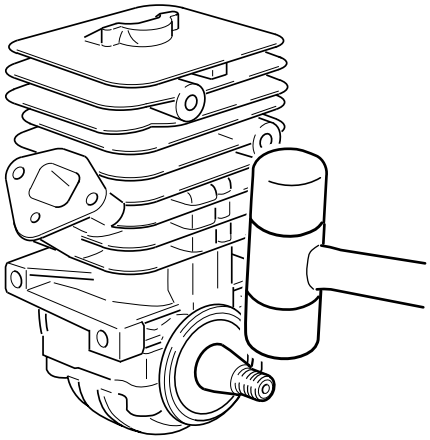
8. Remove intake bellows (B).



9. Remove two bolts (C) from bottom of the unit.

10. Pull out engine block from engine cover.

8-6 Inspecting cylinder



1. Remove 4 bolts securing crankcase.

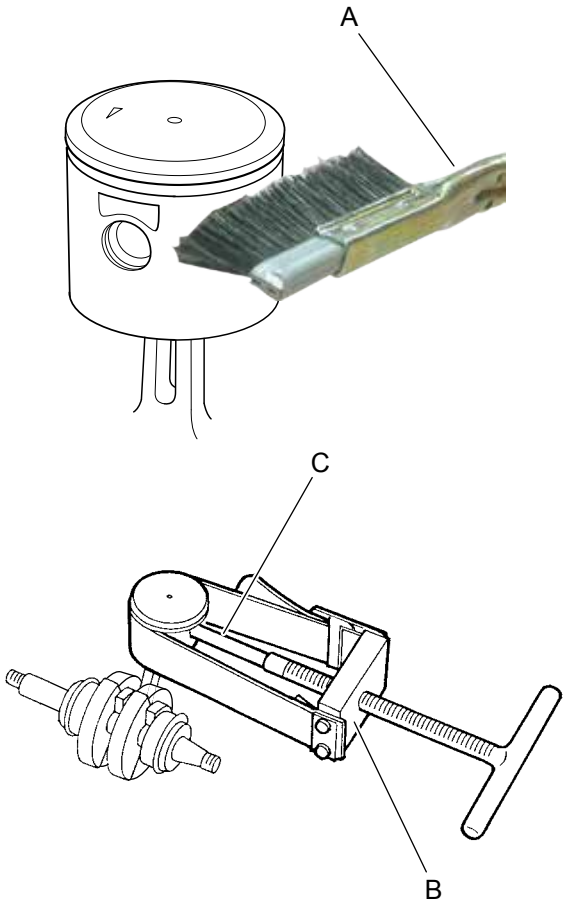
2. Gently tap both crankshaft ends using plastic mallet to remove lower crankcase with crankshaft and piston assembly.

3. Inspect cylinder combustion chamber and clean with a plastic or wooden scraper if carbon is found.

NOTE: Do not use metal tools, or damage to cylinder wall may result.

4. Inspect cylinder wall and replace with new one if plating is worn, peeled away, scored or exposing cylinder base metal.

8-7 Inspecting piston and piston ring



1. Inspect piston ring and replace it if broken or scored, or if it exceeds service limits (Refer to “1-5”).

2. Inspect piston crown. Clean with fine sand paper, oil stone, or soft cleaning brush (A) if carbon is found.

3. Inspect top land, ring groove and skirt. Clean them with soft cleaning brush (A) if carbon is found.

NOTE: Do not use square end of broken piston ring when cleaning piston ring groove, otherwise piston ring groove might be damaged.

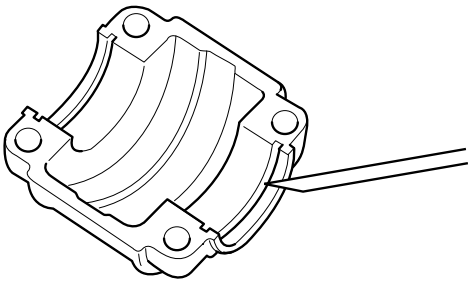
4. Remove snap rings from both sides of piston pin.

5. Push piston pin out from piston.

NOTE: If piston pin is tight, use piston pin tool 89770230131 (B) with adapter (C) stamped “8” on an end.

6. Inspect needle bearing and washers, and replace if wear or discoloration is noted.

8-8 Inspecting crankcase and crankshaft

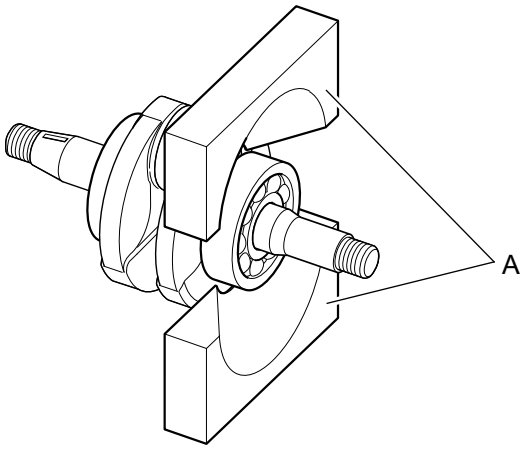


1. Clean crankcase. Replace as a set of cylinder and crankcase if damaged.

2. Completely remove sealant residue on mating surfaces and bearing bore of crankcase using wooden or plastic scraper, or chemical gasket remover.

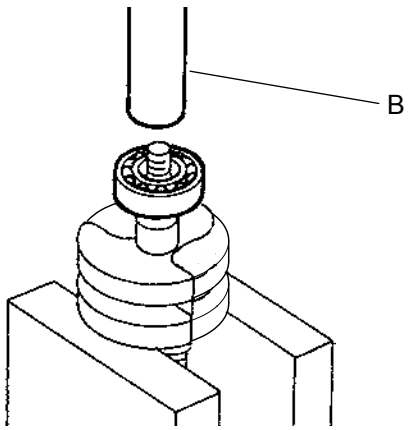
3. Measure crankshaft runout and replace if it exceeds service limits (Refer to “1-5”). Replace crankshaft assembly if the connecting rod bearing is rough, damaged, or discolored. Replace crankshaft assembly if plastic parts (A) are damaged.

8-9 Replacing oil seal and ball bearing



1. Check oil seal(s) and replace if defective.

2. Check ball bearing(s) for smooth rotation. If not, remove ball bearing(s) using bearing wedge (A) 89770102830.

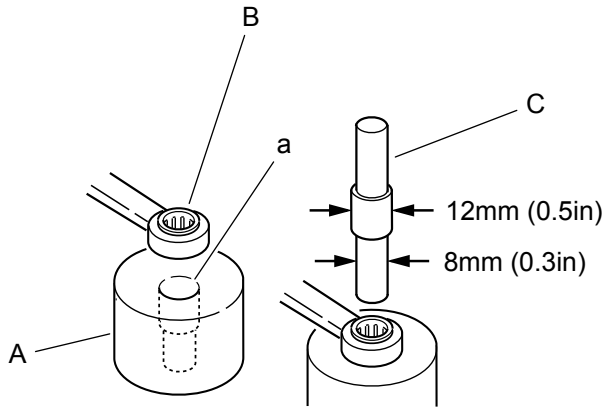


3. Install new ball bearing(s) onto crankshaft using bearing/seal tool 89772621430 (B). Bearing should be completely seated against crankshaft counterweights.

NOTE: Preheat ball bearing using heating gun, heat lamp, or suitable heater for easier installation.

4. Install oil seals onto both ends of crankshaft insuring proper direction of oil seal.

8-10 Replacing needle bearing

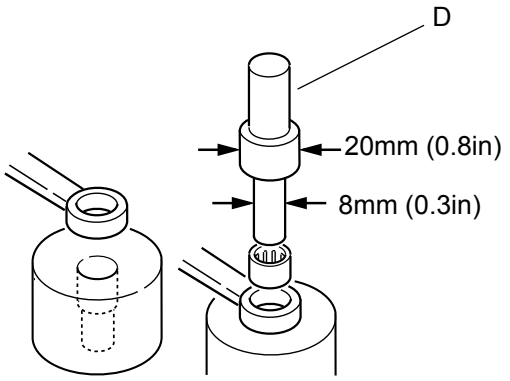


1K235

NOTE: Always use needle bearing tool 89770511520 to replace needle bearing on small end of connecting rod.

1. Put small end on base (A) of needle bearing tool and fit needle bearing (B) in hole (a) of the base.

2. Push needle bearing out from small end using the smaller pusher (C).



1K236

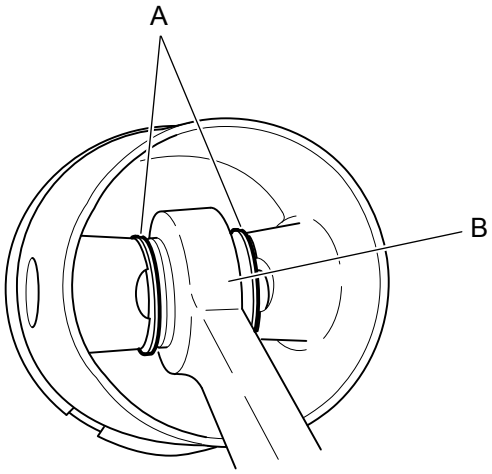
3. Put small end of connecting rod on the base aligning both holes of small end and the base.

4. Put a new needle bearing on small end.

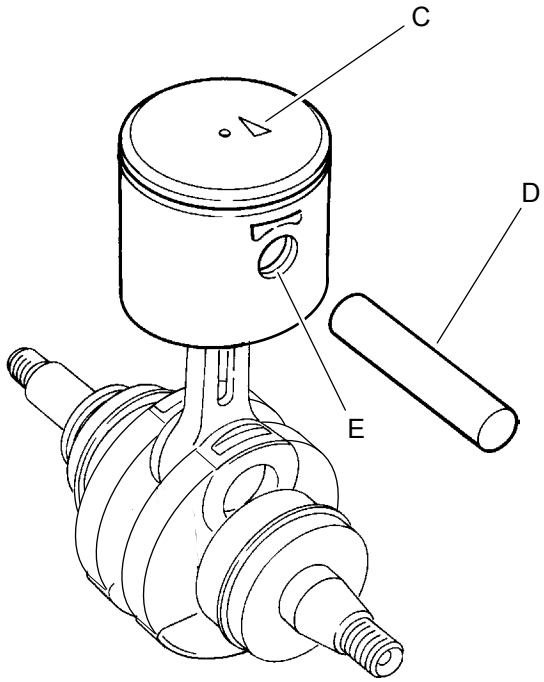
NOTE: The side stamped with identification of needle bearing should face up.

5. Push needle bearing into the bottom using the larger pusher (D).

8-11 Installing piston and piston ring



1. Set piston pin spacers (A) on small end of connecting rod (B) as shown.



NOTE: Place piston over connecting rod with piston arrow mark (C) pointing as shown.

2. Insert pin guide tool (D) stamped “8”, through piston, with piston pin spacers set at step 1.

3. Insert piston pin in piston, pushing out pin guide tool until the pin end comes up to snap ring groove (E).

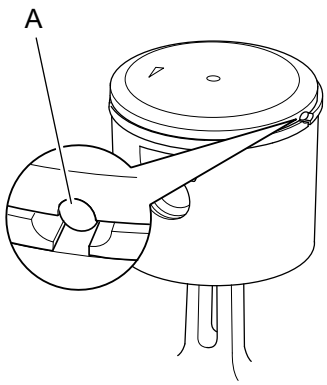
NOTE: If piston pin is tight, use piston pin tool 89770230131 with pusher adapter stamped “8”.

4. Install new snap rings on both end of piston pin. Make sure that they are properly seated in snap ring grooves.

NOTE: Always use new snap rings.

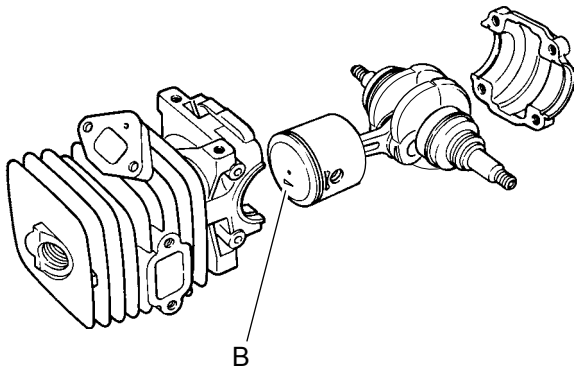
5. Install piston ring on piston.

8-12 Assembling piston into cylinder



1. Apply 2-stroke oil on cylinder walls, oil seal grooves, piston ring, ball bearing, and both sides of con-rod.

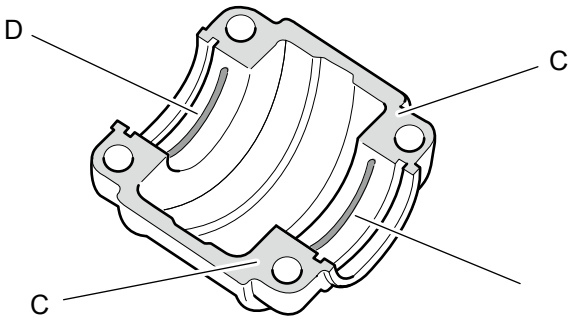
2. Position end gap of piston ring with locating pin (A).



3. Install piston in cylinder with arrow (B) pointing to muffler side.

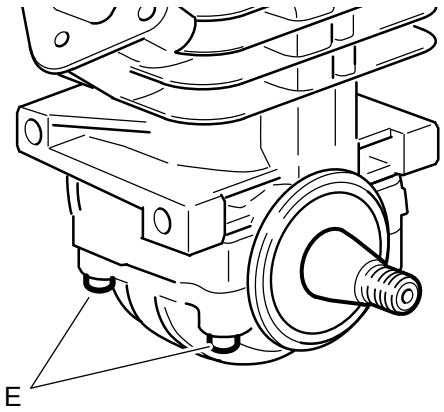
NOTE: When installing piston in cylinder, do not twist cylinder to avoid breakage of piston ring and scoring cylinder bore.

4. Make sure that rims of oil seal are properly seated in the grooves of cylinder (upper crankcase).



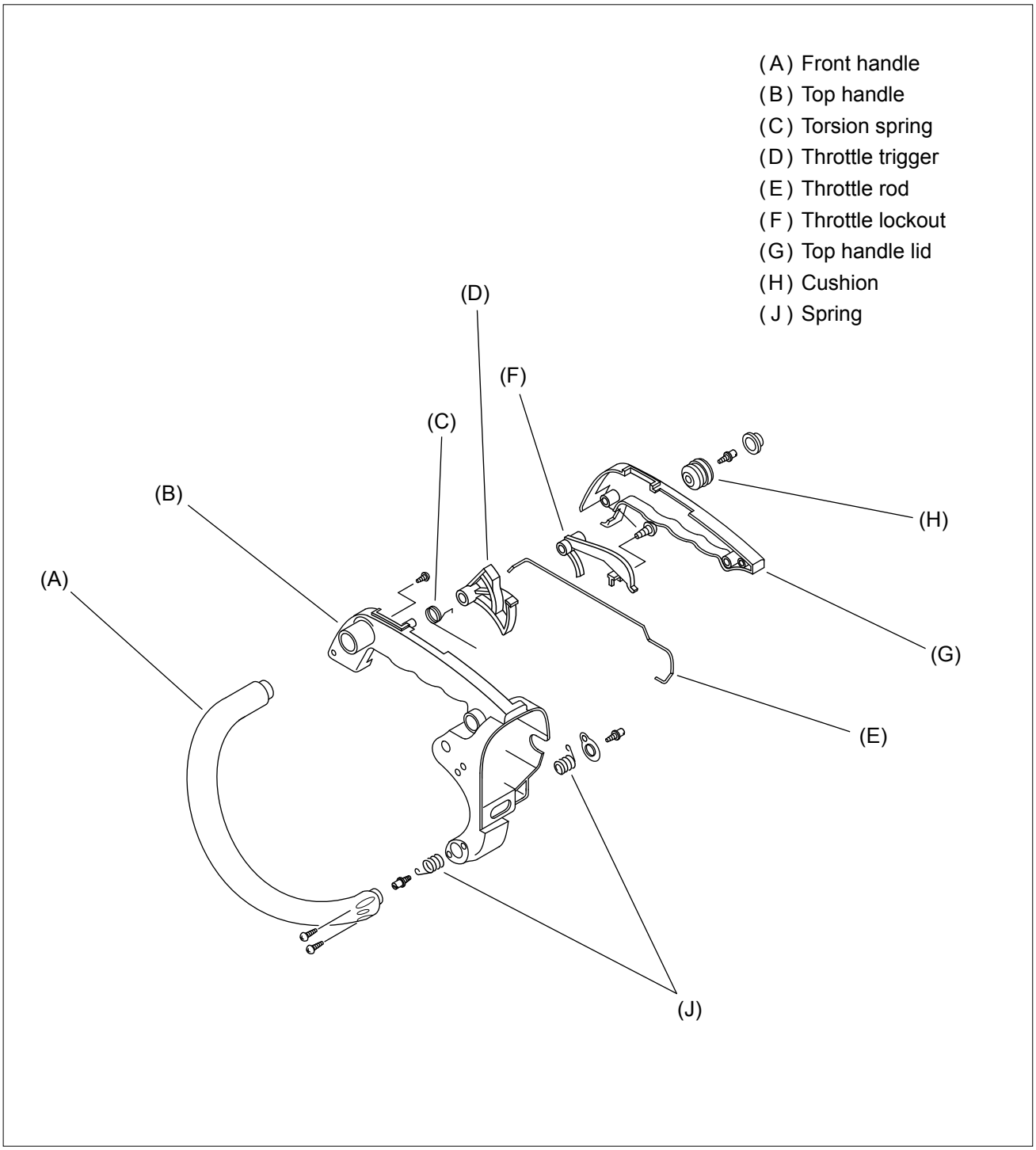
5. Apply liquid gasket (ThreeBond 1207D: Parts No. X686000000, or equivalent) on seams (C) of lower crankcase.

6. Apply adhesive (Loctite #675 or equivalent) on bearing bores (D) of lower crankcase as shown.

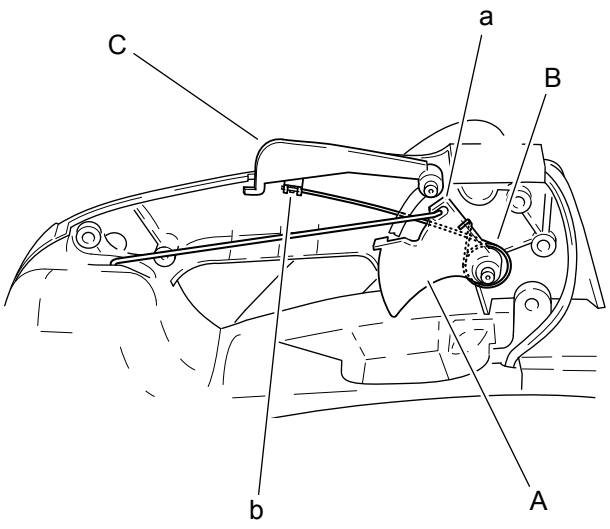


7. Set upper and lower crankcases as shown. Fasten 4 bolts (E).

9 TOP HANDLE AND CONTROL SYSTEM



9-1 Replacing throttle control parts



1. Remove four screws securing top handle lid and a screw securing rubber cushion.

2. Remove top handle lid.

3. Check throttle control parts and replace defective parts with new one as required.

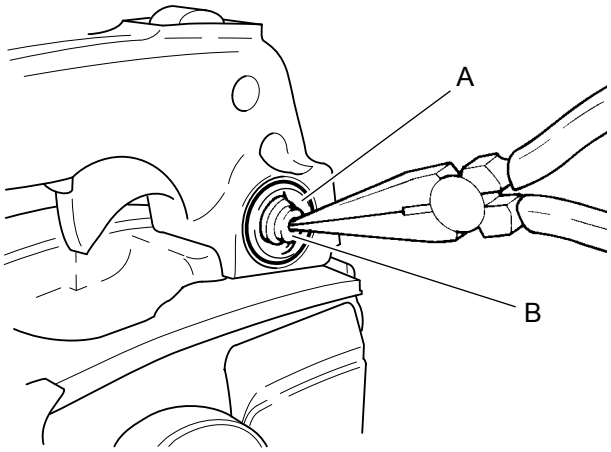
4. Assemble throttle trigger (A) together with torsion spring (B) on top handle.

5. Assemble throttle lockout (C) on top handle, hooking torsion spring end (b) as shown.

6. Assemble throttle rod in the hole (a) of throttle trigger.

7. Assemble top handle cover.

9-2 Replacing cushions

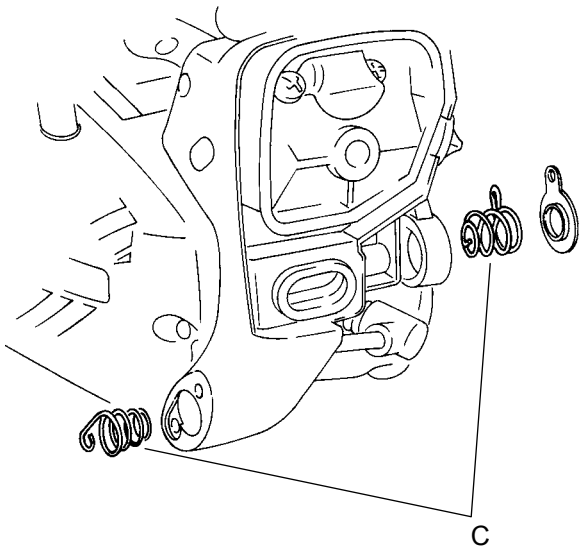


1. Remove sprocket guard.

2. Inspect cushion (A) for cracking, wear or separation from metal part, replace as required.

NOTE: When replacing cushion, remove cushion cap (B) using needlenose pliers as shown.

NOTE: When installing cushion, apply lithium-based grease in cushion.



3. Remove two screws securing lower end of front handle.

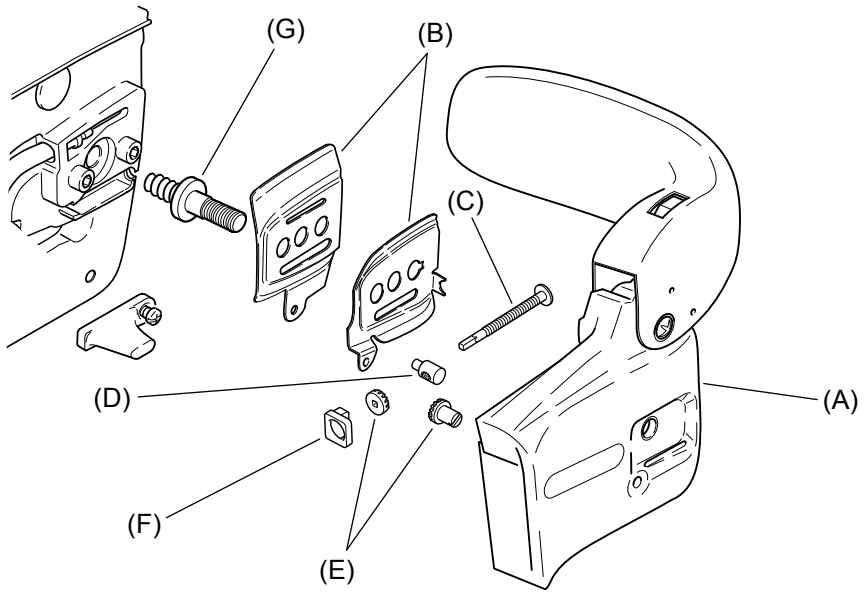
4. Remove top handle lid. Then remove screw securing upper end of front handle and remove front handle.

5. Remove air cleaner cover.

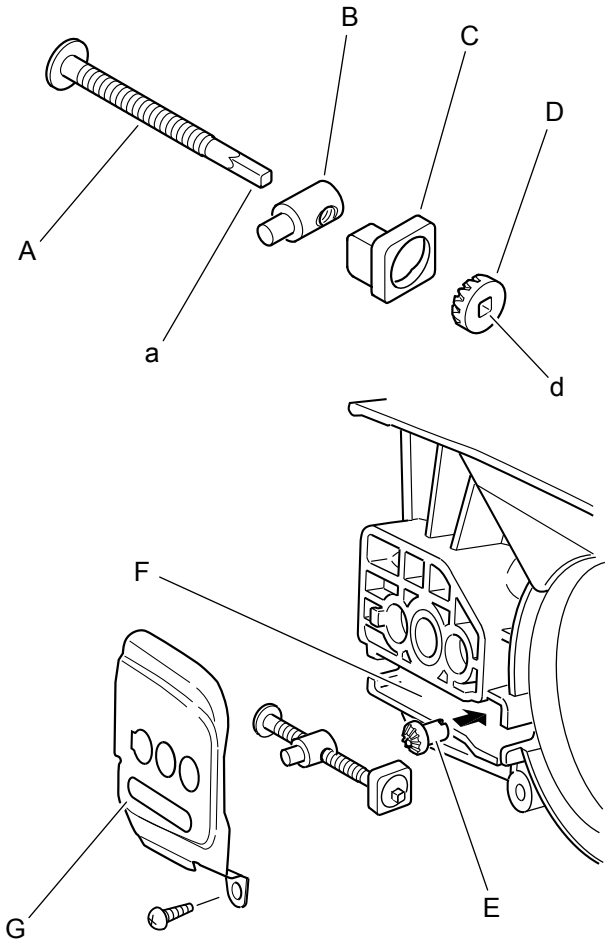
6. Check springs (C). If spring is damaged, replace with new one.

10 GUIDE BAR MOUNTING SYSTEM

(A) Sprocket guard
(B) Sprocket guard plate
(C) Tensioner screw
(D) Chain tensioner
(E) Bevel gear
(F) Collar
(G) Guide bar stud



10-1 Replacing chain tensioner



1. Remove sprocket guard plate (G) from sprocket guard.

2. Remove tensioner screw (A), chain tensioner (B), collar (C) and bevel gear (D). Remove bevel gear (E).

3. Inspect them for damage or wear. Replace as required.

4. Install bevel gear (E) into sprocket guard.

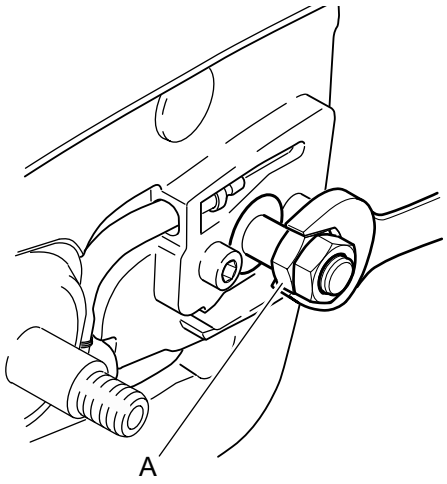
5. Screw chain tensioner (B) on tensioner screw (A).

6. Set bevel gear (D) in collar (C). Insert the end (a) of tensioner screw (A) in the hole (d) of bevel gear (D).

7. Install sub-assembled tensioner screw in slot (F) of sprocket guard, confirming engagement of bevel gear (D) and (E).

8. Reassemble sprocket guard plate (G) on sprocket guard.

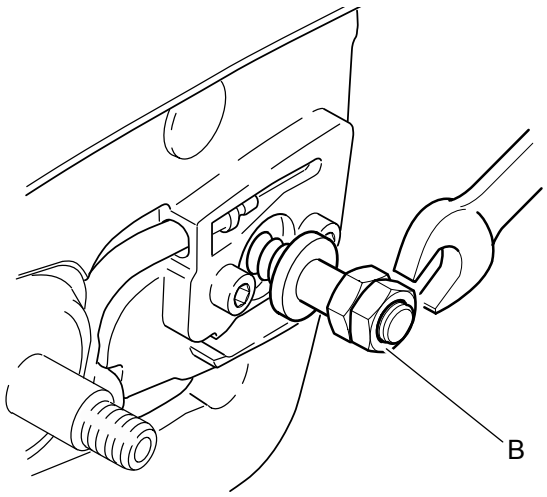
10-2 Replacing guide bar stud



1. Install two nuts on defective stud and tighten them against each other.

2. Turn nut (A) counterclockwise to remove stud.

NOTE: If it is hard to remove or broken stud is too short for tightening two nuts, hold defective stud by vise and turn the chain saw body counterclockwise, or use a suitable stud remover.



3. Install two nuts on new stud and tighten them against each other.

NOTE: Apply a small amount of thread locking sealant in the thread hole (locktite #675 or equivalent).

4. Turn nut (B) clockwise to install stud.

11 MAINTENANCE GUIDE

11-1 Troubleshooting guide

TROUBLE	
Engine does not crank.	**01**
Engine does not start.	**02**
Fuel leaks.	**03**
Idling is not stable.	**04**
Acceleration is poor.	**05**
Engine stalls at high speed.	**06**
Engine lacks power.	**07**
Engine seizure / overheat	**08**
Engine misfires.	**09**
Engine / others are extremely noisy.	**10**
Fuel consumption is excessive.	**11**
Vibration is excessive.	**12**
Engine does not stop.	**13**
Oiler does not function.	**14**
Saw chain does not cut well.	**15**

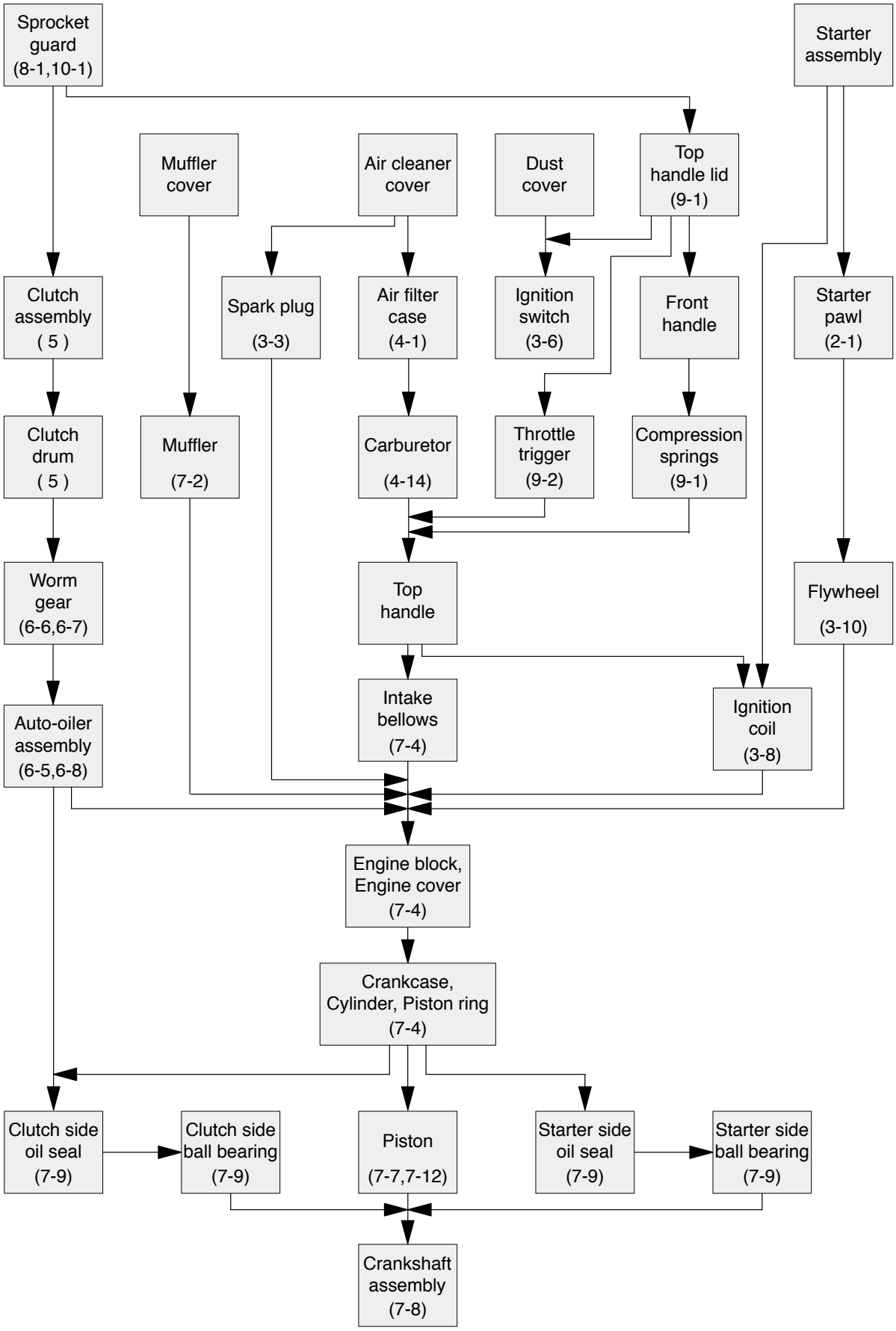
INSPECTING	REFERENCES	Inspecting ◎ first.														
Starter system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Starter pawl / spring	2-4															◎
Starter drum / rope	2-2															○
Rewind spring	2-3															○
Ignition system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Sparks	3-2							◎			○	○	○		◎	
Spark plug	3-3							○	○		○	○	○		○	
Spark plug cap / coil	3-7							○							○	
Ignition switch	3-4			◎				○							○	
Ignition coil	3-6, 3-8							○			○	○	○		○	
Pole shoe air gaps	3-9							○		○			○		○	○
Flywheel	3-10				○			○					○		○	
Flywheel key	3-10							○	○	○		○	○		○	
Clutch system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Clutch shoes / spring / bearing	5-1 to 5-3	○			○		○									
Clutch drum	5-1, 5-3	○			○		○									
Sprocket	1-5, 5-1	○			○											

(Continued)

11-1 Troubleshooting guide (continued)

INSPECTING	REFERENCES	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
		Inspecting ◎ first.														
Fuel system / Carburetor																
Air filter	4-1					○				○	○	○	○			
Fuel cap / strainer	4-2								○	○	○	○	○	◎		
Carburetor adjustment	4-7					◎			○	◎	◎	◎	◎		○	
Fuel tank/line/vent, Purge bulb	4-3 to 4-6								○	○	○	○	○	◎	○	
Carburetor leakage	4-8					○				○	○	○	○	○	○	
Carburetor metering lever height	4-10					○			○	○	○	○	○	○	○	
Carburetor diaphragms	4-12					○				○	○	○	○	○	○	
Carburetor inlet needle valve	4-11					○					○	○	○	○	○	
Welch plug	4-13								○			○	○			
Crankcase pulse passage	4-9								○		○	○	○			
Throttle trigger	9-1									○		○	○			
Fuel (octane / freshness / purity)	4-7-1								○	○		○	○		○	
2-stroke oil (grade / mix ratio)	4-7-1								○							
Saw chain lubrication system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Oil cap	7-1	○	○													
Oil tank / line / strainer	7-1, 7-3, 7-4	○	◎													
Oil tank vent	7-2	○	○													
Auto-oiler	7-5 to 7-7	○	○													
Guide bar / Oil holes	Clean	○														
Engine		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Cooling air passage	8-2								◎	○						
Muffler / Exhaust port	8-3						◎			○	○	○				
Cylinder compression	1-2, 8-1						○		○	○		○	○		○	
Crankcase / cylinder sealing	8-4								○	○	○	○	○		○	
Crankcase / Cylinder	8-4, 8-6						○		○	○			○		○	○
Piston / Piston ring	8-7						○		○	○			○		○	○
Oil seal / Ball bearings	8-9				○			○		○			○		○	○
Others		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Chain brake	6-1 to 6-3											○				
Cushions	9-2				◎											
Chain tensioner	10-1	○														
Saw chain	Replace / Sharpen	◎	○		◎											

11-2 Disassembly chart



11-3 Service intervals

Inspecting point	Service	Reference	Intervals		
			Daily	3 months or 100 hours	6 months or 300 hours
Screws and bolts *	Retighten / Replace			○	
Air filter	Clean	4-1	○		
	Inspect / Replace	4-1		○	
Carburetor	Inspect / Repair	4-8 to 4-14			○
Fuel leaks	Inspect / Repair	4-2, 4-3	○ **		
Fuel line	Inspect / Repair	4-3, 4-6		○	
Cooling system	Inspect / Clean	8-2	○		
Spark plug	Clean / Regap	3-2, 3-3		○	
	Inspect / Replace	3-3			○
Fuel strainer	Clean / Replace	4-2		○	
Leads and connections	Inspect / Repair	3-4, 3-5		○	
Fuel tank	Clean inside.	4-3		○	
Muffler and exhaust port	Clean	8-3		○	
Starter system	Inspect / Repair	2-1 to 2-4		○	
Oil tank	Clean inside.			○	
Oil strainer	Clean / Replace	7-1		○	
Sprocket	Inspect / Replace	1-5, 5-1		○	
Guide bar	Inspect / Clean		○		
Chain brake	Inspect / Repair	6-1 to 6-3	○		

Daily: Inspecting in every services.

IMPORTANT: Service intervals shown above are maximum. Actual use and your experience will determine the frequency of required maintenance.

* Retighten the following screws and bolts after first 1 week use, and every 3 months.

Starter assembly screws (3 pcs.)

Anti-vibration spring screws (2 pcs.)

Front handle screws (3 pcs.)

Muffler bolts (2 pcs.)

** Inspect after every refuel.

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