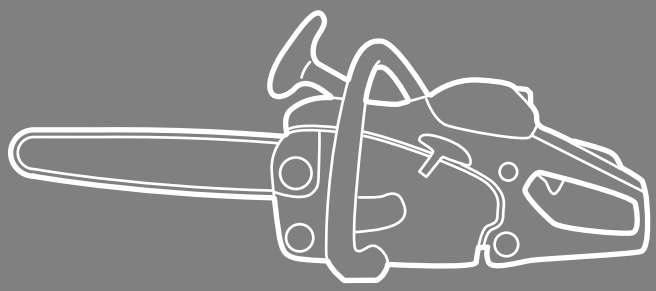
ECHO®



SERVICE MANUAL

CS-350WES

Ord. No. 401-24

INTRODUCTION

This service manual contains information for service and maintenance of **ECHO CHAIN SAW**; model **CS-350WES**.

For systematic diagnosis, to avoid extra work and time loss, please refer to "Troubleshooting guide" that describes problems, tests, remedies and references. We recommend you make use of Operator's Manual and Parts Catalog 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 subjects to change without notice. All specifications, illustrations and directions in this manual are based on the latest products information available at the time of publication.

1 SERVICE INFORMATION

1-1 Specifications

Model			CS-350WES
Dimensions	Length*	mm(in)	392 (15.4)
	Width	mm(in)	241 (9.5)
	Height	mm(in)	236 (9.3)
Dry weight*		kg(lb)	3.6 (7.9)
Engine	Type		KIORITZ, air-cooled, two-stroke, single cylinder
	Rotation		Clockwise as viewed from the output end
	Displacement	$cm^3(in^3)$	35.8 (2.185)
	Bore	mm(in)	39 (1.535)
	Stroke	mm(in)	30 (1.181)
	Compression ratio		7.0
Carburetor	Type		Diaphragm horizontal-draught with auto-return choke
	Model (Walbro)		WT-722, WT-722A, WT-721**
	Venturi size-Throttle bore	mm(in)	13.5 - 15.85 (0.532 - 0.624)
Ignition	Type		CDI (Capacitor discharge ignition) system with electronic timing advancer
	Spark plug		BPMR7A
Starter	Type		ES (Effortless-start)
	Rope diameter x length	mm(in)	3.5 x 950(0.14 x 37.4)
Fuel	Type		Premixed two-stroke fuel
	Mixture ratio		50 : 1 (2 %)
	Petrol		Minimum 89 octane petrol (RON)
	Two-stroke air cooled engine oil		ISO-L-EGD (ISO/CD13738), JASO FC
	Tank capacity	L (U.S.fi.oz)	0.37 (12.5)
Clutch	Type		Centrifugal, 3-shoe slide with 3-tension spring
Guide bar / Saw chain lubrication type			Automatic with volume adjuster
Oil	Tank capacity	L (U.S.fl.oz.)	0.23 (7.8)
Sprocket	Type		Spur
	Number of teeth		6
	Pitch	in	3/8

* Without guide bar and saw chain.

††Serial number 36007691 and after

Cutting devices					
Guide bar	Type		30RC50-3/8	35RC50-3/8	40RC50-3/8
	Called length	cm	30	35	40
	Gauge	in	0.050		
Saw chain	Number of drive links		47	53	58
	Pitch	in	3/8		
	Gauge	in	0.050		

1-2 Technical data

Model			CS-350WES	
Engine				
Idling speed		r/min	2900 - 3500	
Operating speed*		r/min	9300 - 10200	
High speed (No load full throttle)*		r/min	12500 - 13500	
Clutch engagement speed*		r/min	4000 - 4450	
Compression pressure		MPa (kgf/cm²) (psi)	0.97 (9.8) (140)	
Ignition system				
Spark plug gap		mm(in)	0.6 - 0.7 (0.024 - 0.028)	
Minimum secondary voltage at 1500 r/min		kV	17.0	
Primary coil resistance		Ω	100 - 200	
Secondary coil resistance		kΩ	1.2 - 1.8	
Pole shoe air gaps		mm (in)	0.30 - 0.40 (0.012 - 0.016)	
Ignition timing	at 1500 r/min	°BTDC	15 †	20 ††
	at 3000 r/min	°BTDC	16.5 †	21.5 ††
	at 7000 r/min	°BTDC	30 †	35 ††
Carburetor				
Idle adjust screw initial setting		turns in**	2 1/8	
L mixture needle initial setting		turns back	1 7/8 (WT-722, WT-722A), 2 1/8 (WT-721)†††	
H mixture needle initial setting		turns back	2 7/8 (WT-722), 2 3/8 (WT-722A) 3 1/8 (WT-721)†††	
Test Pressure, minimum		MPa (kgf/cm²) (psi)	0.05 (0.5) (7.0)	
Metering lever height		mm(in)	1.65 (0.06) lower than diaphragm seat	
Chain oil discharge volume at 7000 r/ min		mL/min(U.S.fl.oz./min)	Adjustable : 1.5 - 13 (0.05 - 0.44) (Factory set 7 mL/min)	

BTDC: Before top dead center.

*With 35cm guide bar and saw chain.

**Set idle adjust screw to contact throttle plate before initial setting.

†Serial number 36000001 to 36004400

††Serial number 36004401 and after

†††Serial number 36007691 and after

1-3 Torque limits

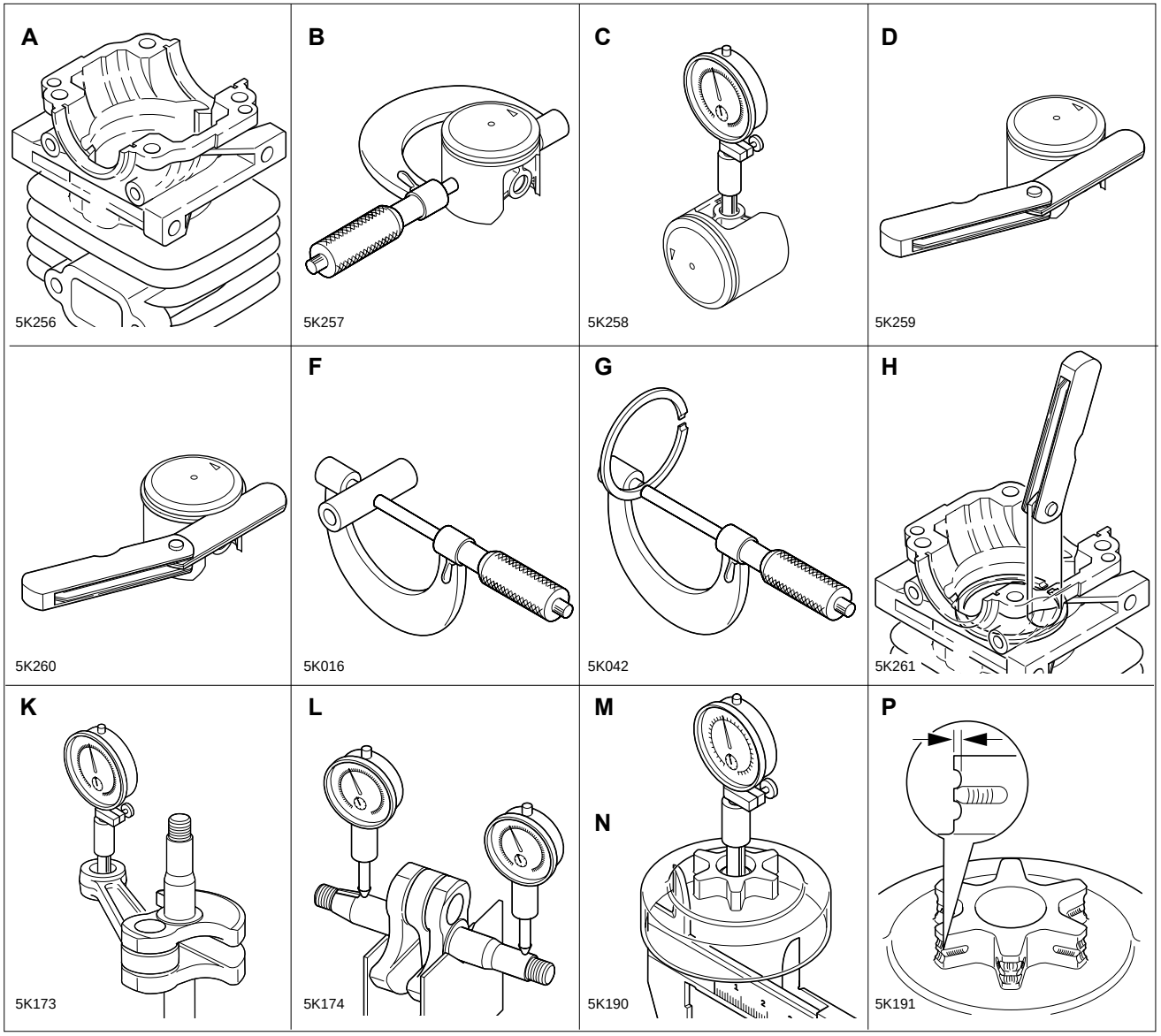
Descriptions		Size	kgf•cm	N•m	in•lbf
Starter system	Starter pawl	M5*	40 - 60	4 - 6	35 - 50
	Starter case	M4**	10 - 20	1 - 2	9 - 18
Ignition system	Magneto rotor (Flywheel)	M8	200 - 240	20 - 24	175 - 210
	Ignition coil	M5*	30 - 45	3.0 - 4.5	26 - 40
	Spark plug	M14	150 - 170	15 - 17	130 - 150
Fuel system	Carburettor	M5	30 - 45	3.5 - 4.5	26 - 40
	Intake bellows	M5	30 - 50	3.5 - 4.5	30 - 40
Clutch	Clutch hub	LM10	230 - 260	23 - 26	200 - 230
Engine	Crankcase	M5	60 - 80	6 - 8	50 - 70
	Engine mount	M5	100	10	85
	Engine mount with lead terminal	M5	80	8	70
	Dust cover	M4**	10 - 20	1 - 2	9 - 18
	Muffler	M5	70 - 100	7 - 10	60 - 90
	Muffler cover	M4**	10 - 20	1 - 2	9 - 18
Others	Auto-oiler	M4	15 - 25	1.5 - 2.5	13 - 22
	Front handle	M4**	20 - 30	2 - 3	17 - 26
	Rear handle	M4**	20 - 30	2 - 3	17 - 26
	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 (two studs type)	M6*	90 - 110	9 - 11	80 - 95
	Guide bar nuts	M6	45 - 75	4.5 - 7.5	40 - 65
Regular bolt, nut and screw		M3	6 - 10	0.6 - 1.0	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 thread locking sealant (See below page) ** Tapping screw

1-4 Special repairing materials

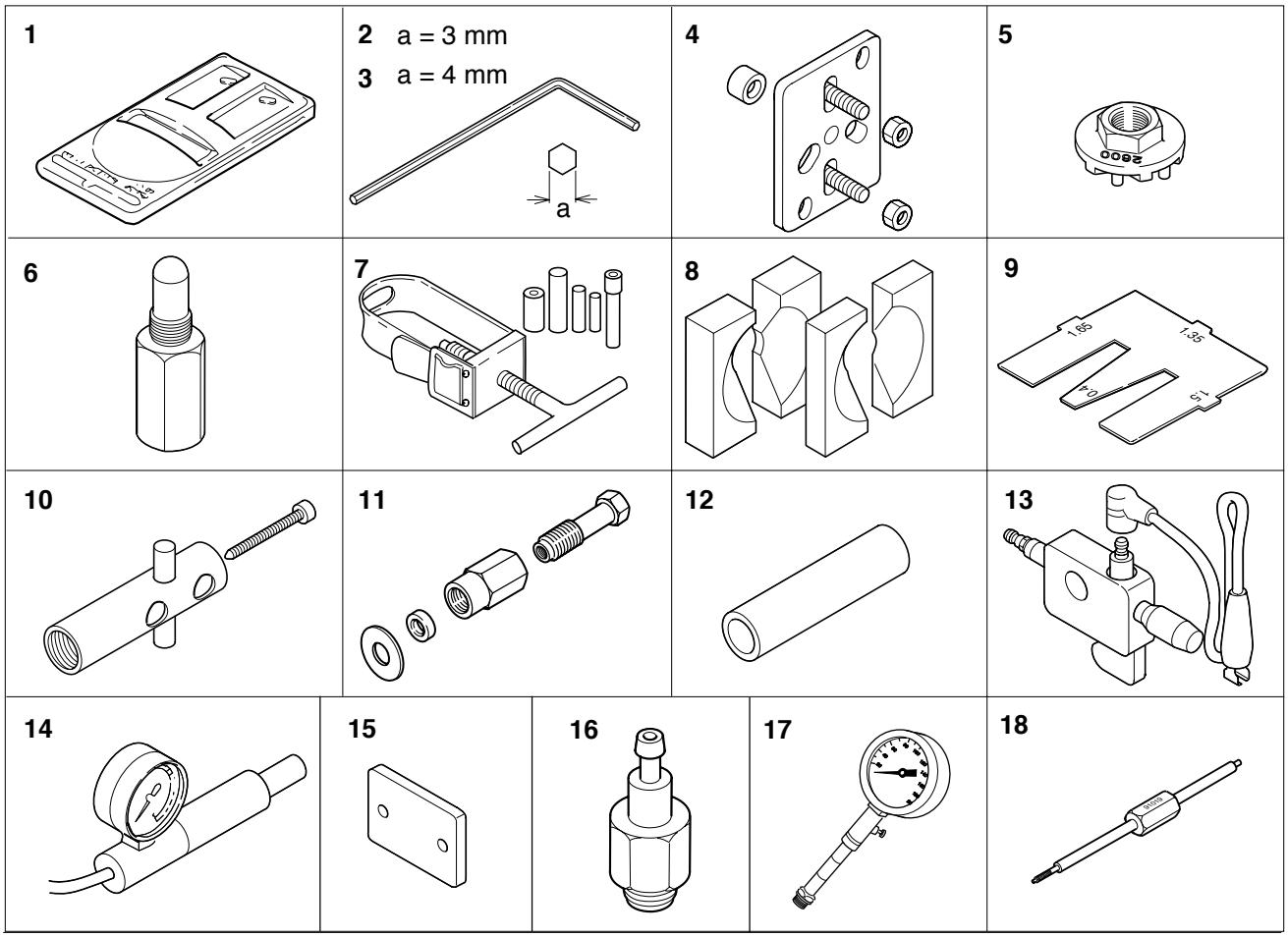
Material	Location	Remarks
Adhesive	Ball bearing outer / crankcase	Loctite #675 or equivalent
	Guide bar stud	
Liquid gasket	Crankcase seams	Loctite #515 or equivalent
Thread locking sealant	Starter pawl bolts	Loctite #242, ThreeBond 1324 or equivalent
	Ignition coil	Loctite #222, ThreeBond 1342 or equivalent
Grease	Auto-oiler worm	Lithium based grease
	Clutch needle bearing	
	Rear handle cushion	
	Rewind spring	
	Starter center shaft	
	Chain brake (metal contact part)	Molybdenum grease (approx. 1 gram)

1-5 Service Limits



			mm (in)
A	Cylinder bore		When plating is worn and aluminium can be seen
B	Piston outer diameter	Min.	38.91 (1.532)
C	Piston pin bore	Max.	8.03 (0.316)
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 (0.314)
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.	11.03 (0.434)
L	Crankshaft runout	Max.	0.05 (0.002)
M	Sprocket bore	Max.	13.07 (0.515)
N	Clutch drum bore	Max.	61.5 (2.42)
P	Sprocket wear limit	Max.	0.5 (0.02)

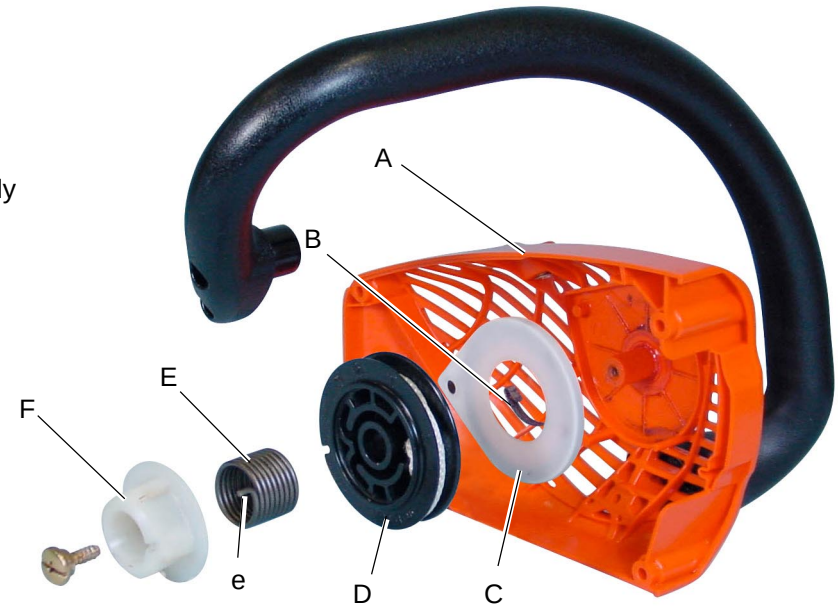
1-6 Special tools



Key	Part Number	Description	Used for:
1	897801-33330	Tachometer PET-1000	Measuring engine speed to adjust carburetor
2	895612-79920	L-hex wrench (3 mm)	Removing and installing hex. socket bolt (M4)
3	895610-79920	L-hex wrench (4 mm)	Removing and installing hex. socket bolt (M5)
4	897501-03938	Puller	Removing magneto rotor
5	X640-000011	Clutch tool	Removing and assembling clutch assembly
6	897537-30130	Piston stopper	Locking crankshaft rotation
7	897702-30131	Piston pin tool	Removing and installing piston pin
8	897701-06030	Bearing wedge	Removing and crankshaft ball bearings
9	897563-19830	Metering lever gauge	Measuring metering lever hight on carburetor
10	897708-19835	Worm puller	Removing auto-oiler worm
11	Y089-000010	Worm inserter	Installing auto-oiler worm
12	897726-09130	Oil seal tool	Installing oil seals
13	897800-79931	Spark tester	Checking ignition system
14	897803-30133	Pressure tester	Testing carburettor and crankcase leakage
15	897826-16131	Pressure rubber plug	Plugging intake port to test crankcase / cylinder leakages
16	897835-16131	Pressure connector	Checking crankcase and cylinder leakages
17	91007	Compression gauge	Measuring cylinder compression
18	91019	Limiter cap tool	Remover and installer of limiter cap

2 STARTER SYSTEM (Effortless starter)

(A) Starter case
(B) Rewind spring
(C) Rewind spring case assembly
(D) Rope reel
(E) Power Spring
(e) Hook end of power spring
(F) Cam plate



Construction

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

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

3. Hook located on the backside of rope reel engages with end 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 cam plate (F).

Working principal

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

2. The rotation force of rope reel (D) is transmitted to cam plate (F) by power spring (E) that is connected with rope reel (D) and cam plate (F).

3. The cam plate (F) engages with starter pawls on flywheel to turn the crankshaft.

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

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

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

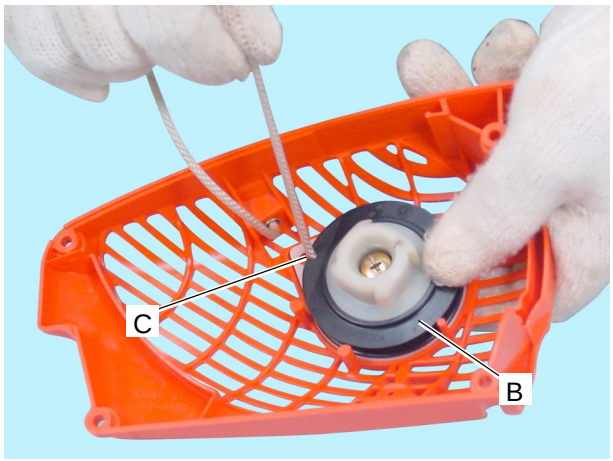
7. The power spring absorbs compression resistance of cylinder and snatch back of engine during starting action.

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

9. After the engine starts, the starter pawls pivots outward by centrifugal force and disengages from the cam plate (F).

2-1 Disassembling starter assembly

1. Remove recoil starter assembly with front handle from unit.



2. Pull out starter rope about 30 centimeters (12 in) and hold rope reel (B). And pull starter rope inside starter case as shown.

3. Rotate rope reel (B) counterclockwise to release tension of rewind spring with the rope hooked at notch (C).

4. Remove screw (D).

5. Remove cam plate (E) and power spring (F).

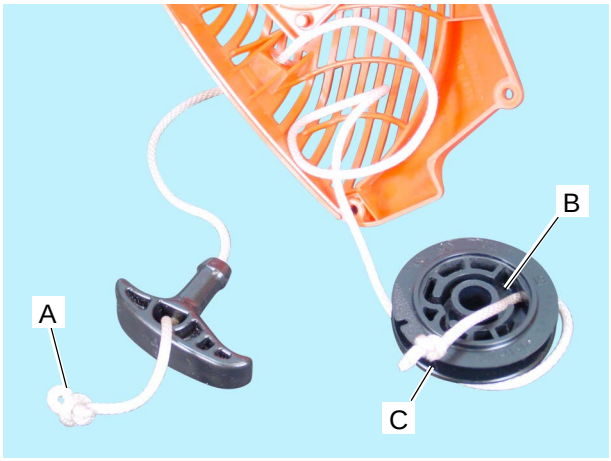
6. Remove rope reel (B) from starter case slowly.

7. Remove rewind spring case (G) from starter case.

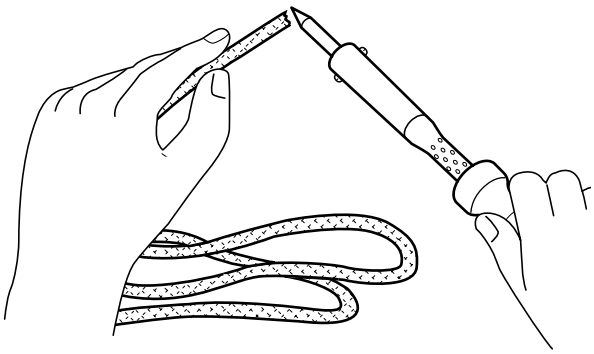
WARNING ⚠ DANGER

Wear eye protection and take care when removing starter drum, because rewind spring may unwind suddenly and cause injury to eyes and body.

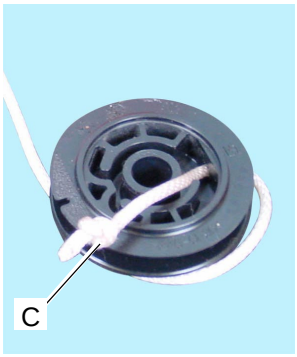
2-2 Replacing starter rope

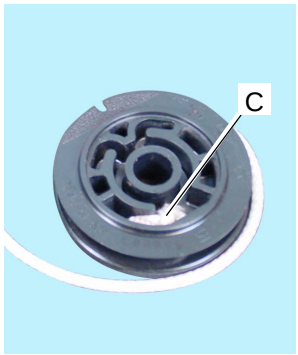


1. Pull out knot (A) and untie knot (A).
2. Pull out knot (C) from dent of rope reel (B).

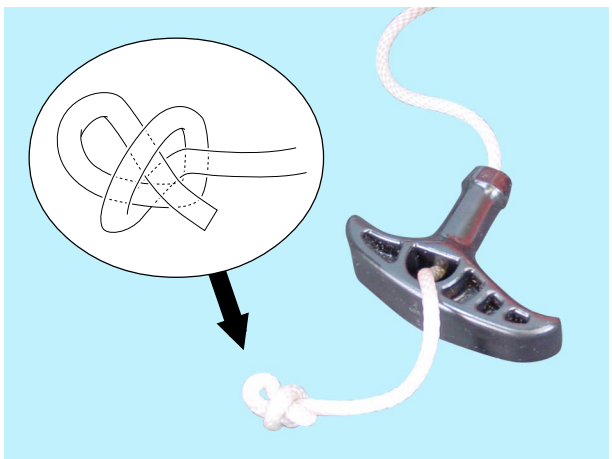


3. When installing a new starter rope, singe both ends of the rope to prevent fraying.



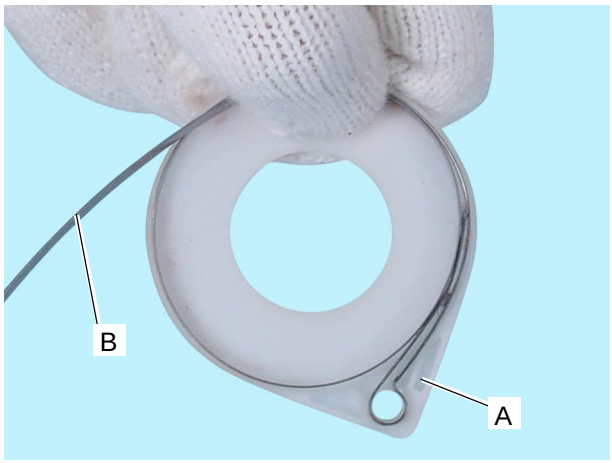


4. Make a knot (C) at end of starter rope and pass the rope through hole of rope reel and press the knot (C) into dent as shown.



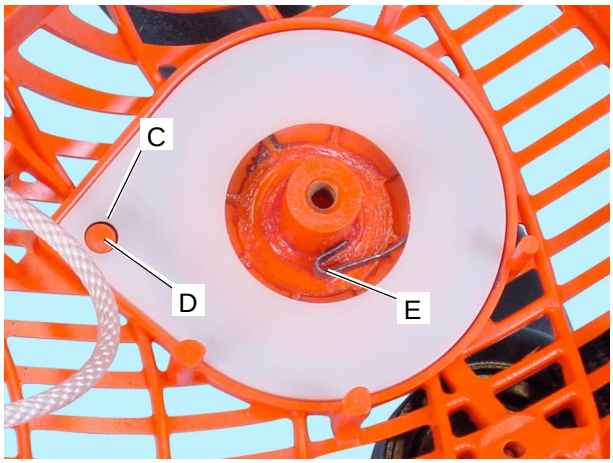
5. Pass the other end of starter rope through rope guide on starter case, then pass the starter rope through starter grip and make a knot as shown.

2-3 Assembling starter

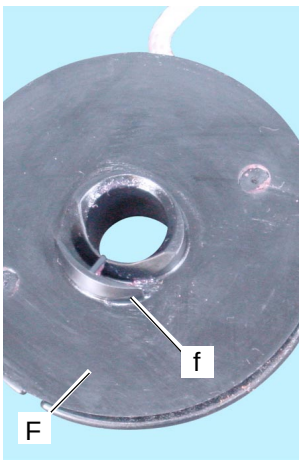


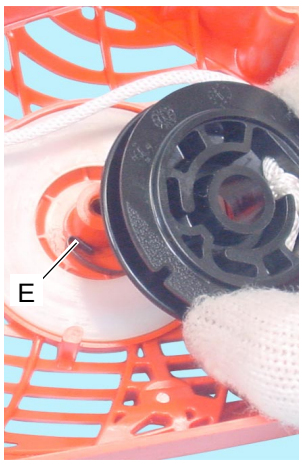
1. When rewind spring (B) is released from rewind spring case (A), wind the released rewind spring from outside end on rewind spring case.

2. When replacing new rewind spring, remove spring holder after assembling rewind spring into rewind spring case (A). Apply small amount of lithium grease to starter case side of new rewind spring.



3. Install rewind spring case on starter case meeting hole (C) of rewind spring case with post (D). End of hook (E) should contact with post of starter case.

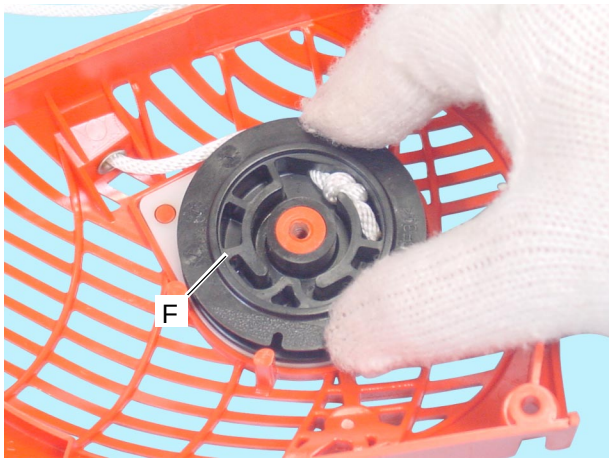




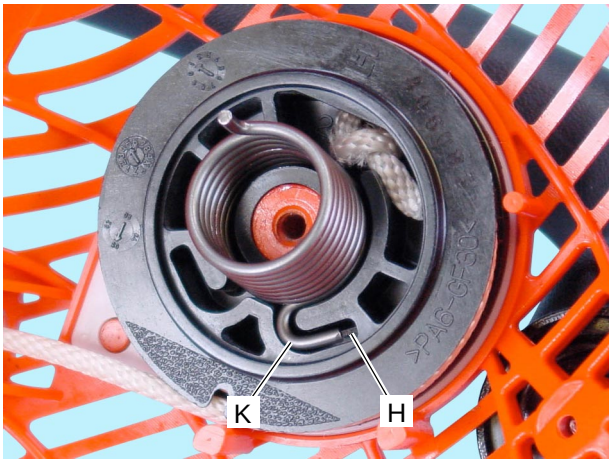
4. Assemble rope reel (F) engaging hook (f) of rope reel with hook (E) of rewind spring.

(continued)

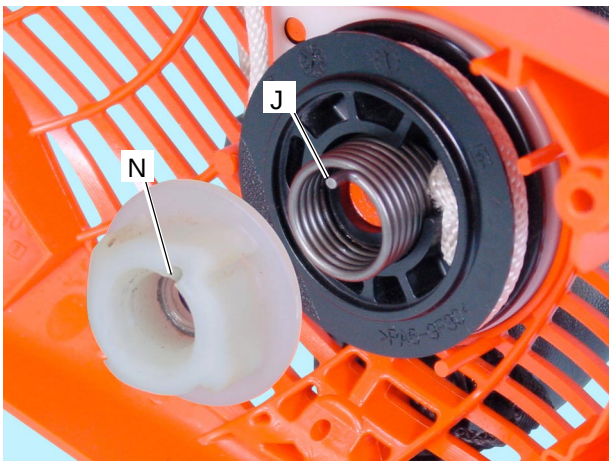
2-3 Assembling starter (continued)



5. Make it sure engagement of rewind spring and rope reel by turning rope reel (F) clockwise and counterclockwise.



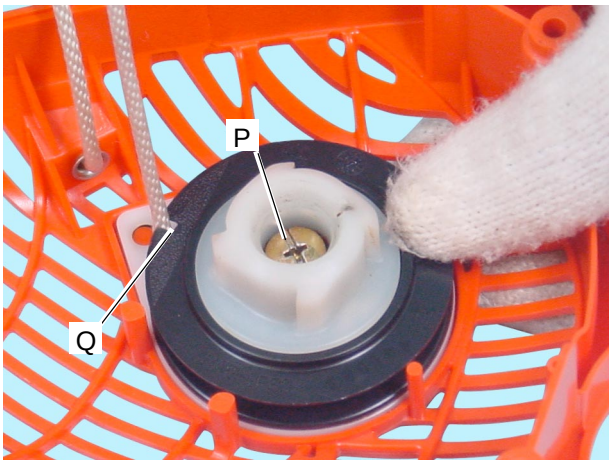
6. Install power spring meeting end (K) of power spring with hollow (H) of rope reel.



7. Install cam plate meeting hole (N) of cam plate with hook (J) of power spring.

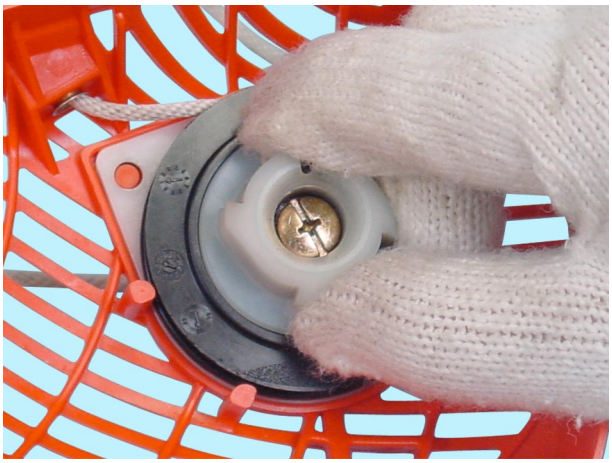
(continued)

2-3 Assembling starter (continued)



8. Fasten screw (P) on starter post.

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

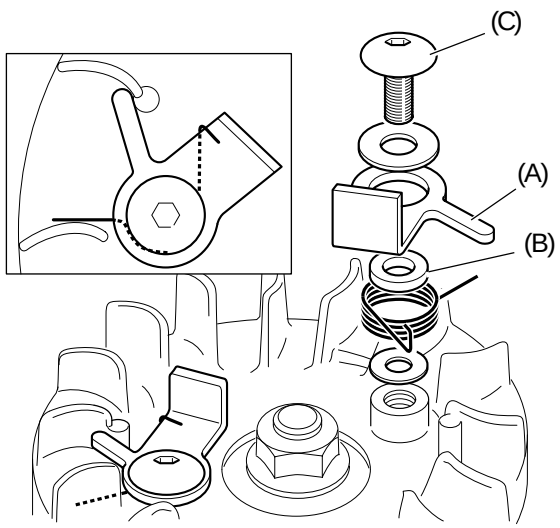


10. Pull starter several times to check the rewind spring tension. If the starter is not rewinding fully, rotate the drum one more turn clockwise following above step (9).

11. Pull the starter rope all the way out and check that the rope reel can be rotated an additional half or more turn clockwise.

12. If it is less than half turn, there is a chance to break rewind spring. In this case, pull out starter rope about 30 centimeter (12 in), and hold rope reel. Then pull starter rope inside starter case and rotate rope reel one turn counterclockwise with rope hooked at notch.

2-4 Replacing starter pawl

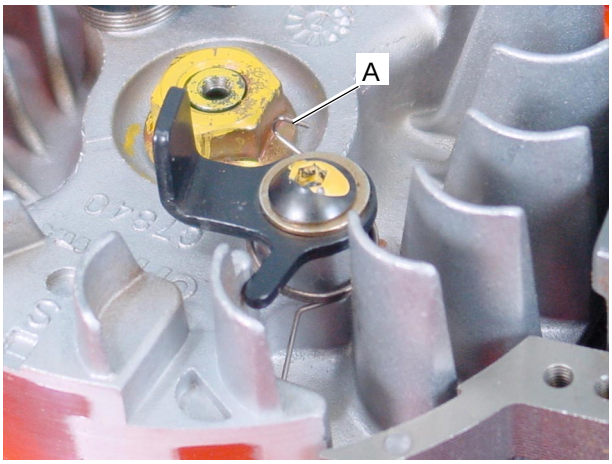


1. Remove starter assembly from unit.

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

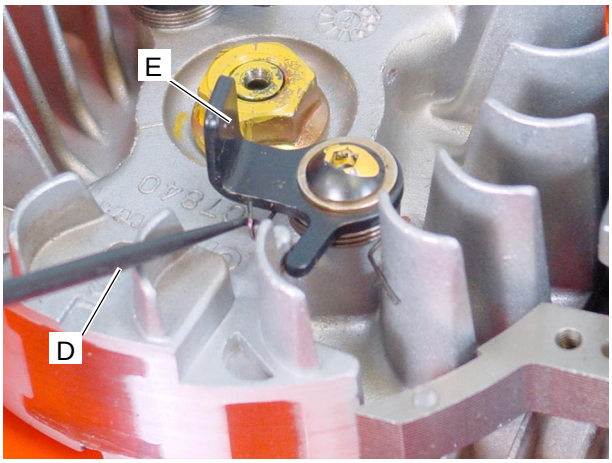
NOTE: When it is hard to loosen the bolt, use flexible wrench 897709-79920 to hold flywheel to remove them easily.

2-4 Replacing starter pawl (continued)



3. Install washer, torsion spring, spacer, pawl, washer and bolt. To avoid pinching of torsion spring, install these parts without setting the hook (A) of torsion spring on starter pawl. The bolt is precoated with sealant on the thread. If the coat is peeled off, apply thread locating sealant (Loctite #242 or ThreeBond #1324).

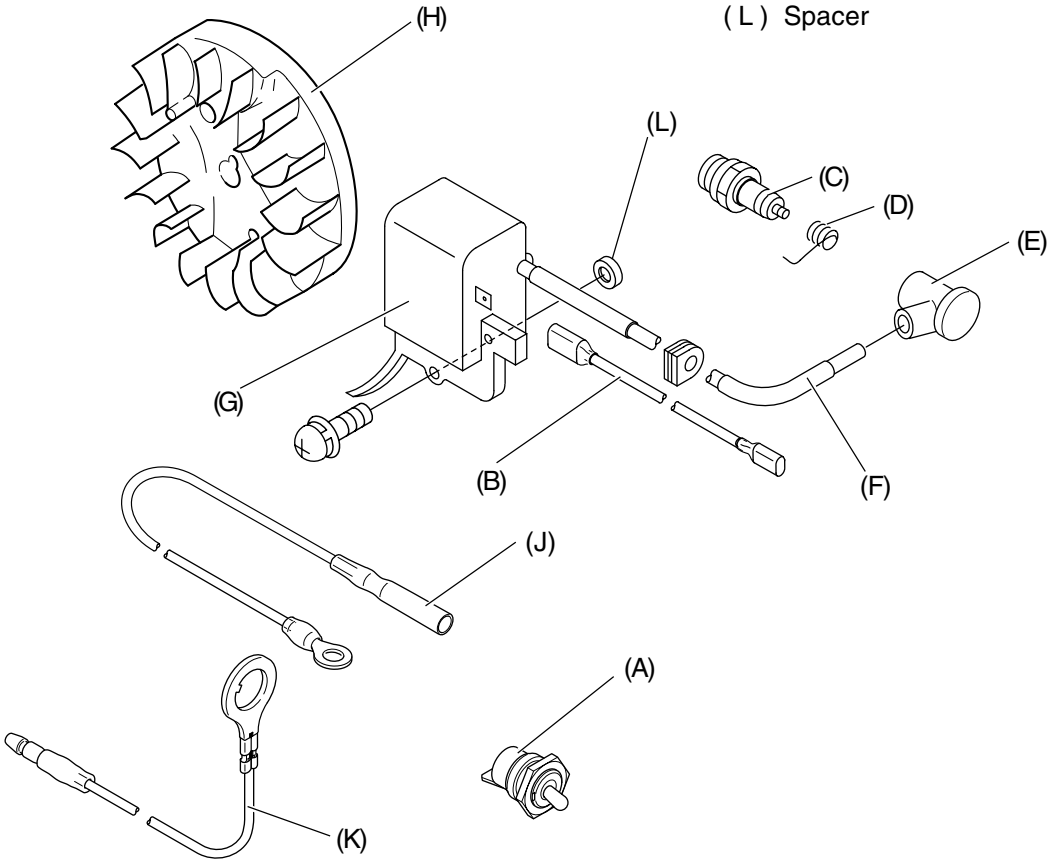
4. Using fine wire or hook tool (D), set hook of torsion spring on pawl (E) as shown.



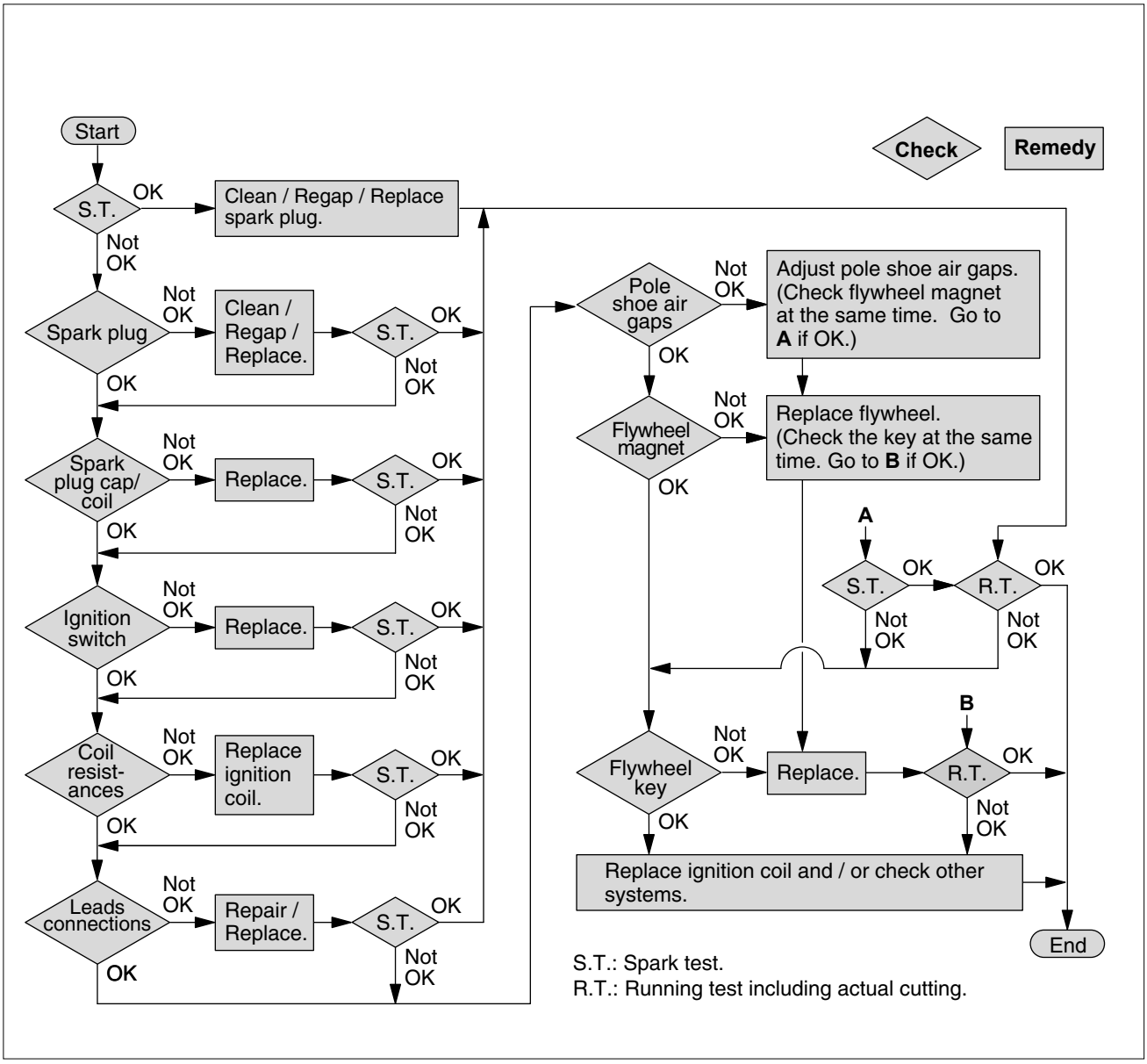
5. Make it sure pawl can move smoothly. If it does not move smoothly, check whether the correct parts are installed correctly.

3 IGNITION SYSTEM

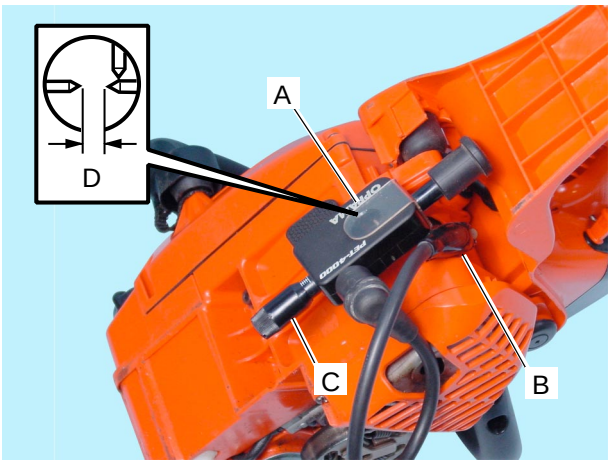
(A) Ignition switch
(B) Stop lead
(C) Spark plug
(D) Spark plug cap coil
(E) Spark plug cap
(F) High tension lead
(G) Ignition coil
(H) Flywheel
(J) Ground lead
(K) Ground lead
(L) Spacer



3-1 Troubleshooting guide



3-2 Testing spark



1. Remove spark plug cap from spark plug. Remove sprocket guard, guide bar and chain.

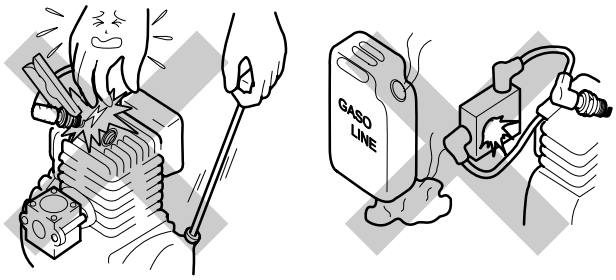
2. Connect spark tester 897800-79931 (A) to high tension lead and set crip (B) on spark plug.

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

4. Turn ignition switch to “RUN” position. Pull starter grip several times.

5. If spark is steady in blue or white at the tester gap, the ignition system is considered good. Go to checking spark plug.

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



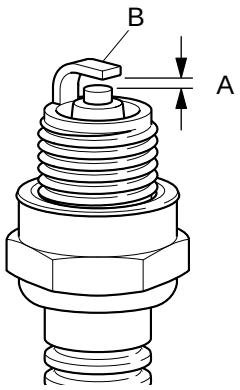
WARNING DANGER

***Do not test near the spark plug hole without spark plug. Otherwise there is a chance to fire mixture fuel inside cylinder and be injured due to fire.**
***Do not touch metal parts of spark tester while performing the test to avoid receiving electrical shock.**

WARNING DANGER

Do not check spark in area where gasoline is spilled or flammable gases may exist.

3-3 Checking spark plug

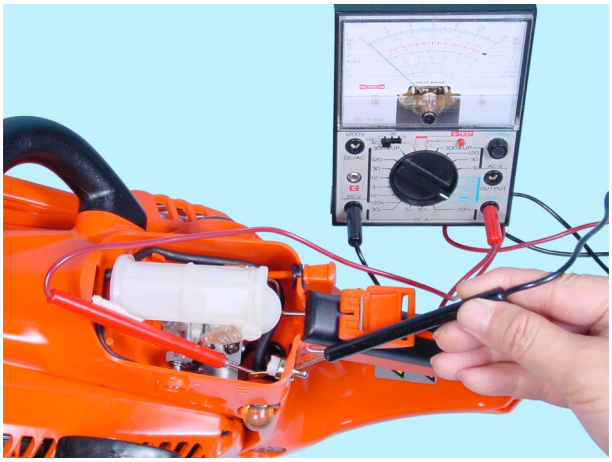


1. When engine can not start with correct spark by ignition checker testing, remove spark plug to check for fouling, cracked or broken insulator, or rounded center electrode. Replace with new one or clean the plug electrodes and insulator as required.

2. Set spark plug gap (A) to 0.6 to 0.7 mm (0.024 to 0.028 in) by bending outer electrode (B).

3. If engine does not start after cranking several times, check if spark plug is wet or dry. If it is excessively wet or dry, check fuel system.

3-4 Checking ignition switch and leads



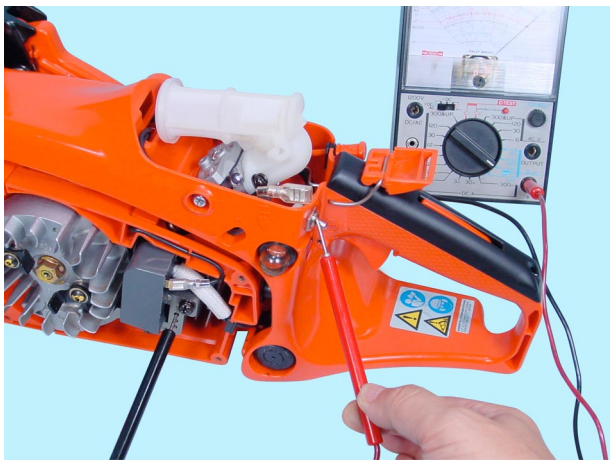
1. Remove air cleaner cover.

2. Remove switch lead connector from ignition switch. Connect one probe of Ohm-meter or multi-meter to switch body, and other probe to switch terminal.

3. When ignition switch is in “RUN” position, the Ohm-meter should indicate infinite resistance.

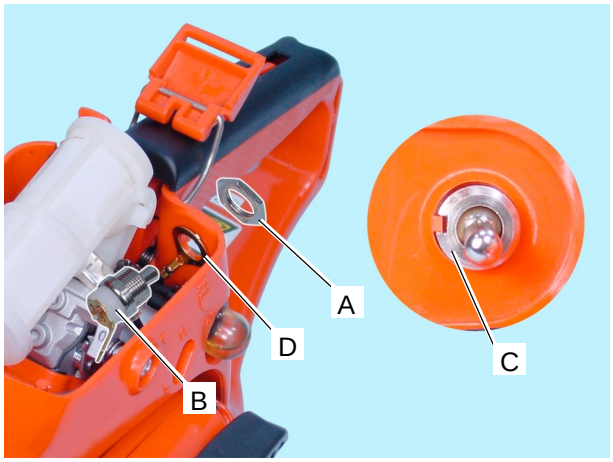
4. When ignition switch is in “STOP” position, the Ohm-meter should show that the circuit is complete (closed circuit). Replace ignition switch as required.

5. When checking switch lead, the Ohm-meter should show that the circuit is complete. Replace the lead as required.



6. Connect one probe of Ohm-meter to ignition switch body and the other probe to ignition coil core to check ground lead. The Ohm-meter should show that the circuit is complete. Replace the ground lead as required.

3-5 Replacing ignition switch

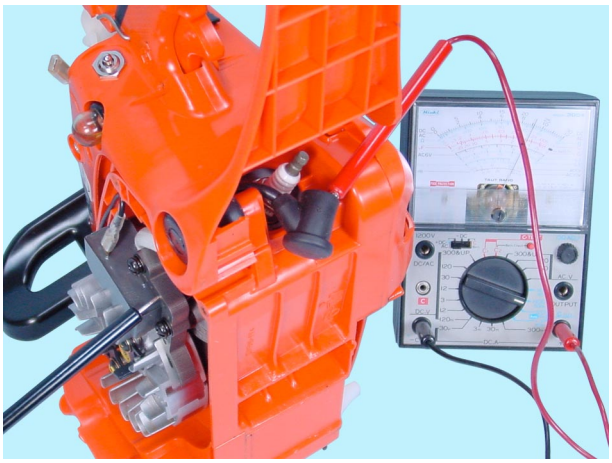


1. Loosen nut (A), and remove ignition switch from carburetor case.

2. Put terminal (D) of ground lead on carburetor case as shown. Align notch (C) of new ignition switch (B) with tab of carburetor case, fasten nut (A) on the new ignition switch.

3. Connect switch lead connector to terminal of ignition switch. Place all leads on original positions.

3-6 Checking ignition coil resistance



1. Remove starter assembly and air cleaner cover. Connect one probe of Ohm-meter or multimeter to spark plug cap coil and the other probe to core of ignition coil. Measure the secondary coil resistance.

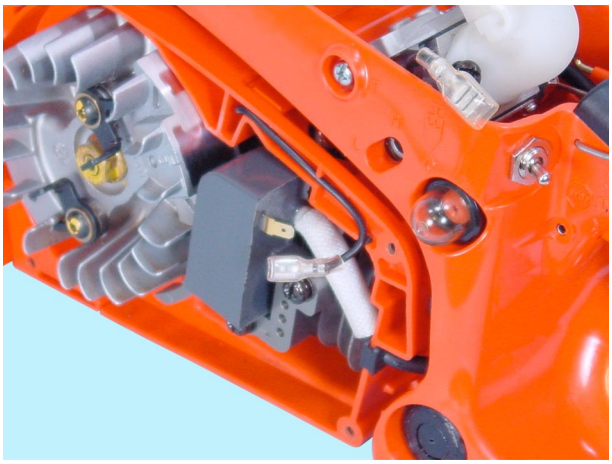
2. If the reading is infinite resistance, remove spark plug cap and spark plug cap coil and measure resistance between the conduction wire of high tension lead and ignition coil core.

3. If the reading at step 1 or 2 is not in the range of “1-2 Technical data”, replace with a new ignition coil.

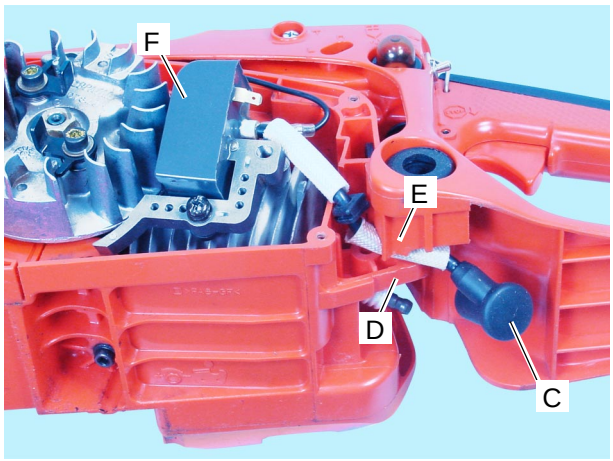
4. Remove connector of switch lead from ignition switch.

5. Connect one probe of an Ohm-meter or multimeter to the connector of switch lead, and the other probe to ignition coil core to check exciter coil resistance (It might be in the range of 100-200 Ω) If the reading is big difference from the range, replace ignition coil with new one.

3-7 Removing ignition coil



1. Disconnect switch lead from lead terminal of ignition coil. Loosen ignition coil bolts.

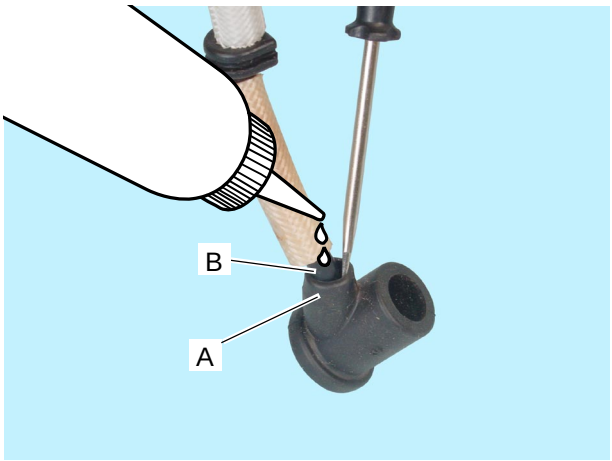


2. Remove cushion cap and loosen cushion rubber bolt.

3. Disconnect spark plug cap (C) from spark plug. Pass high tension lead through the space between engine cover (D) and rear handle (E).

4. Remove ignition coil (F).

3-8 Replacing spark plug cap and coil

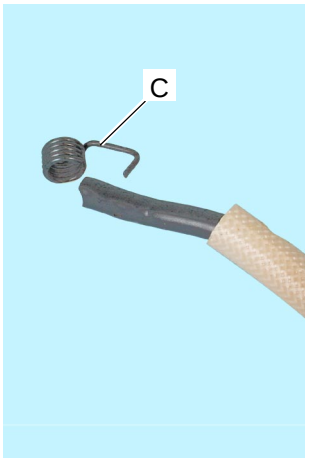


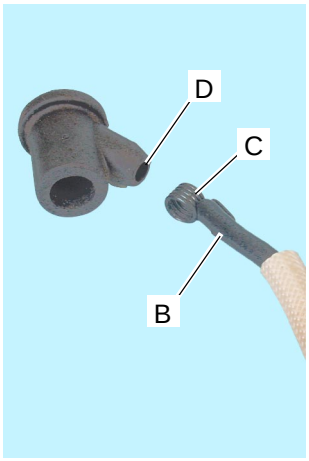
1. Disconnect spark plug cap (A) from spark plug.

2. Apply some oil in the cap (A) to aid in removing the cap from lead (B).

(continued)

3-8 Replacing spark plug cap and coil (continued)





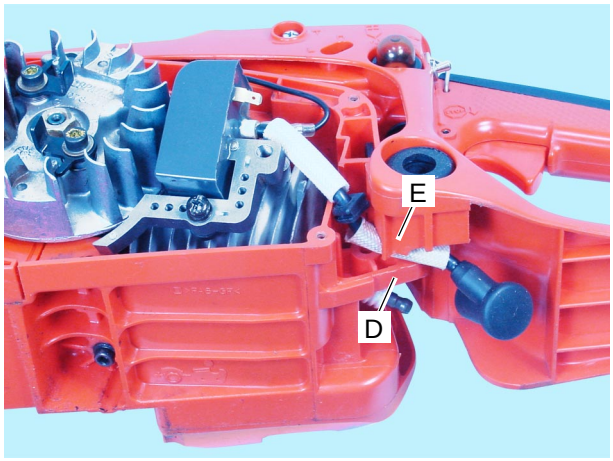
3. Pull the cap away from high tension lead (B).

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

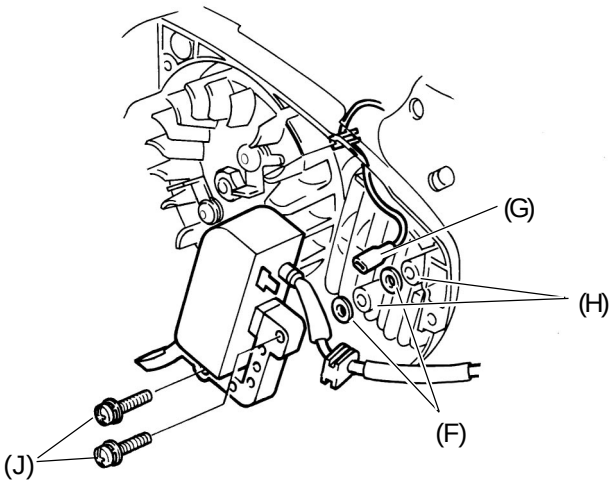
NOTE: Make sure the spark plug cap coil (C) contacts conductor core of high tension lead when re-installing it.

5. Apply oil to spark plug cap (D) and insert high tension lead (B) as shown until the spark plug cap coil is properly seated in the cap.

3-9 Installing ignition coil



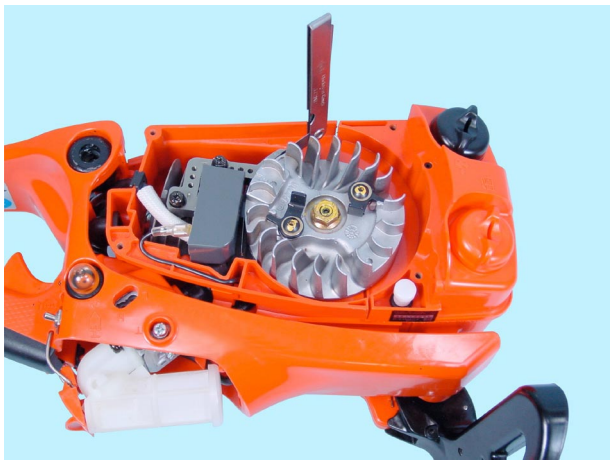
1. Pass high tension lead through the space between engine cover (D) and rear handle (E) as shown.



2. Apply small amount of thread locking sealant to thread holes (H) on cylinder. Set spacers (F) between cylinder and ignition coil core, and fasten screws (J) tentatively. After adjusting air gap using feeler gauge, fasten screws (J) with final torque.

3. Connect switch lead connector (G) to ignition coil terminal (H), and place switch lead along with groove of engine cover.

3-10 Setting pole shoe air gaps



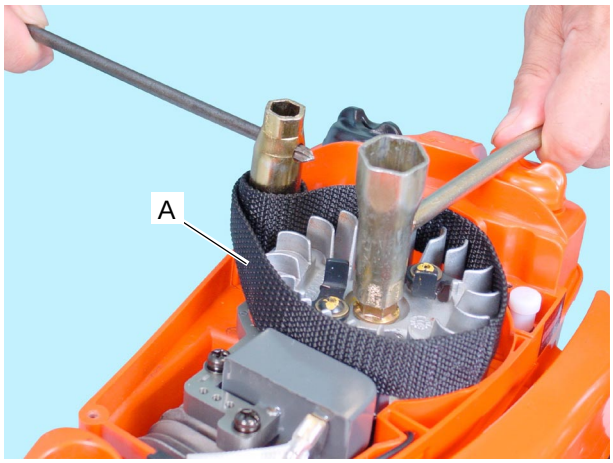
1. Insert 0.3 - 0.4 mm thick feeler gauge between flywheel and ignition coil.

2. Rotate flywheel until poles of flywheel face to ignition coil core.

3. Hold ignition coil against flywheel and tighten the screws. After tightening the screws, remove feeler gauge.

NOTE: When air gap is too narrow, there is a chance to interfere with flywheel. When too wide, spark is weak or ignition timing is improper.

3-11 Replacing flywheel

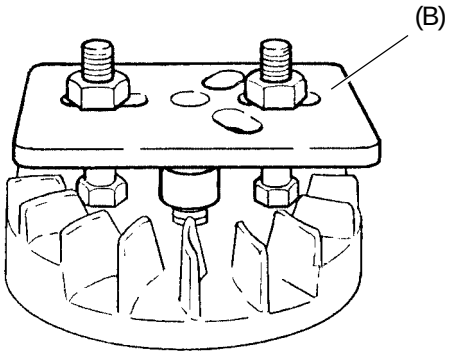


1. Check magnetic force of flywheel using flux meter or bridging with a screw driver and comparing with a good one.

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

3. Holding flywheel using flexible wrench 897709-79920 (A), loosen flywheel nut.

NOTE: Do not use piston stopper to prevent piston from damage.



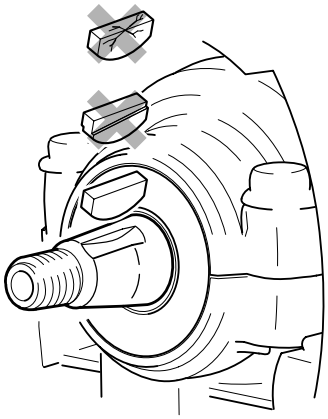
4. Remove starter pawls.

5. Set puller 897501-03938 (B) on flywheel.

6. Fasten 2 pcs of nuts of puller alternately to remove flywheel.

(continued)

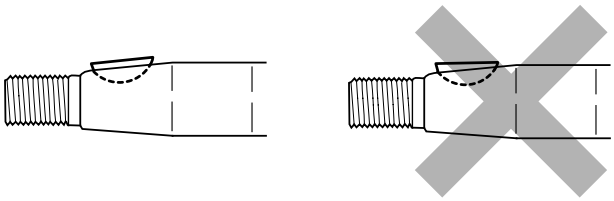
3-11 Replacing flywheel (continued)



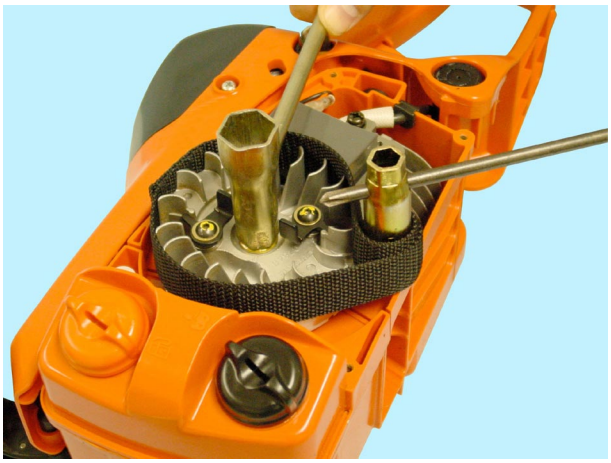
7. Check woodruff key whether defective or sheared. Replace as required.

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

9. Install woodruff key into key groove as shown.



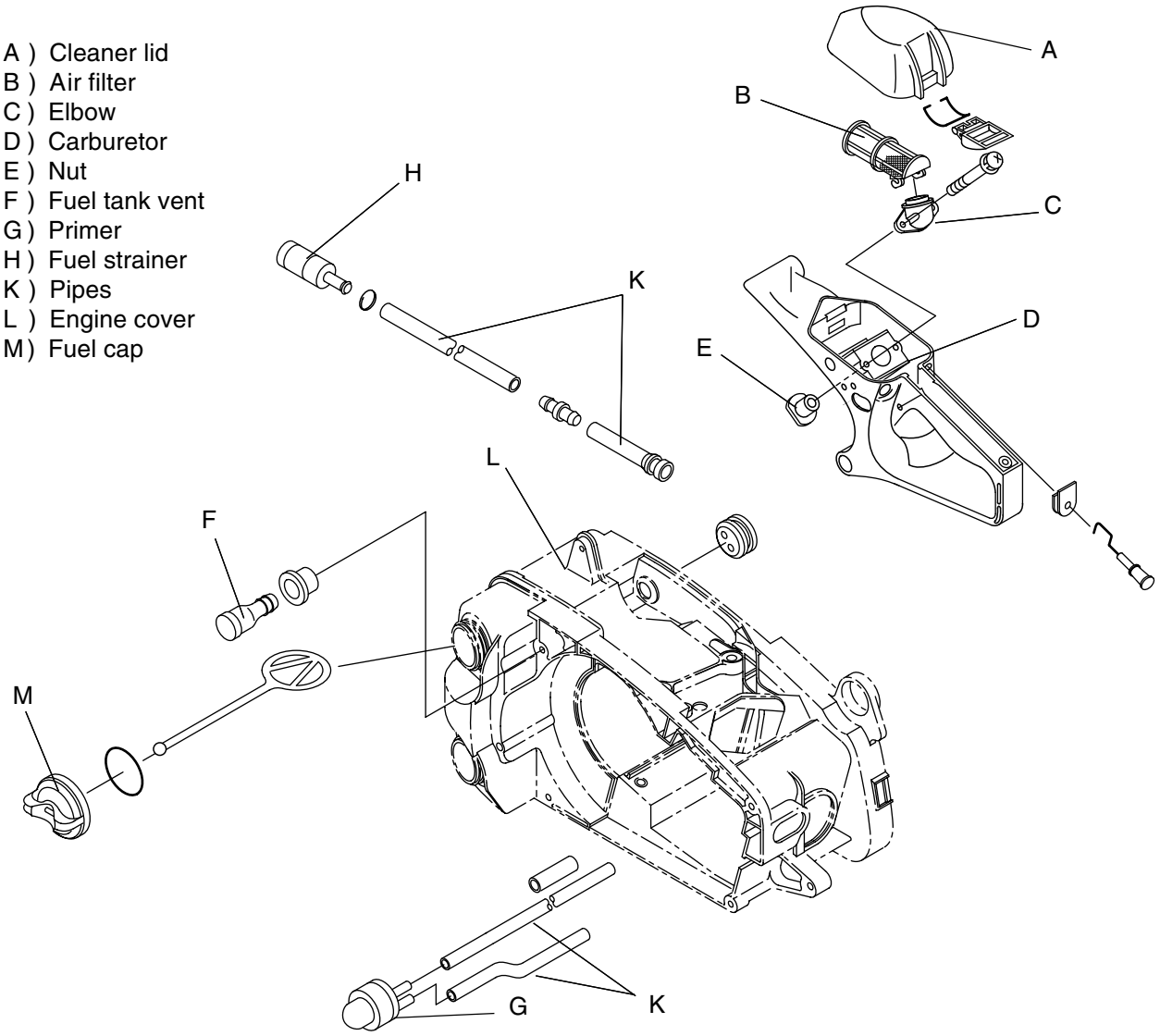
10. Re-install starter pawls and all other removed parts on flywheel.



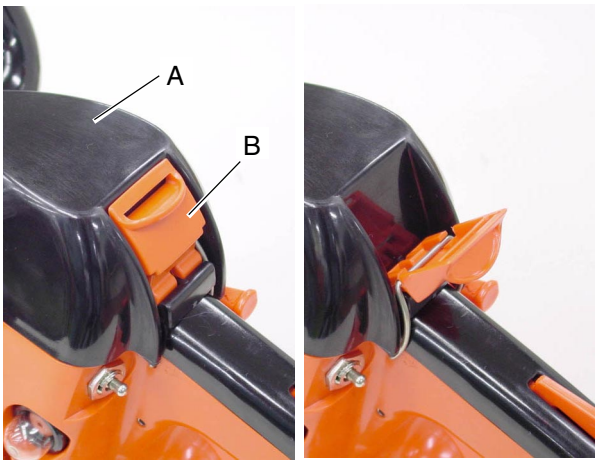
11. Aligning flywheel key groove with woodruff key on crankshaft, install flywheel and fasten flywheel nut.

4 FUEL SYSTEM

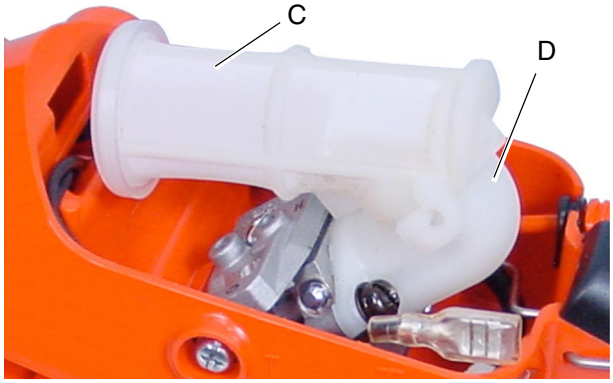
(A) Cleaner lid
(B) Air filter
(C) Elbow
(D) Carburetor
(E) Nut
(F) Fuel tank vent
(G) Primer
(H) Fuel strainer
(K) Pipes
(L) Engine cover
(M) Fuel cap



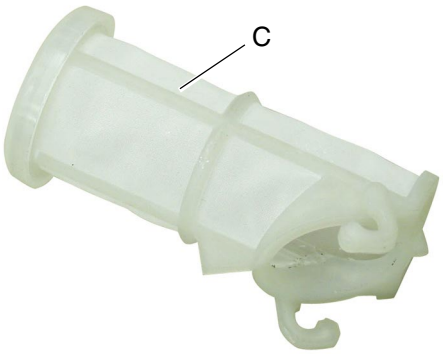
4-1 Checking air filter



1. Release hook (B) of cleaner lid (A) and remove air cleaner lid (A).

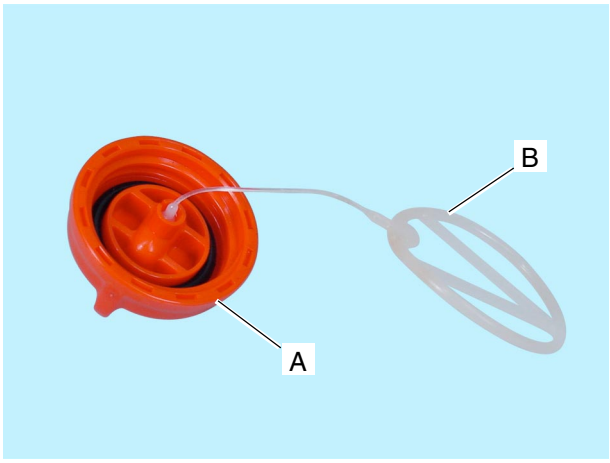


2. Turn air filter (C) counterclockwise and remove from elbow (D).



3. Check air filter (C) whether teared mesh or breakage. Clean air filter with soft brush or gentle compressed air as required. If the mesh is pluged heavily, wash the air filter by solvent.

4-2 Checking fuel cap and strainer



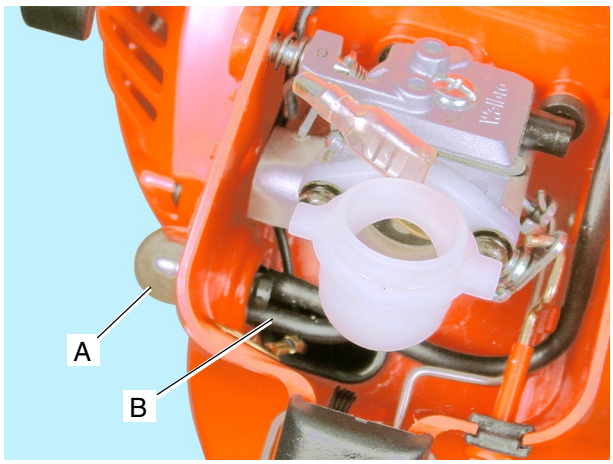
1. Remove fuel cap.

2. Check fuel cap for cracks and O-ring (A) for cuts or damages.

3. Remove connector (B) if defective, install a new connector into center hole.

4. Pull fuel strainer (C) from fuel tank using a wire hook and clean the fuel strainer. Replace with a new one if defective or heavily soiled. Re-install fuel cap.

4-3 Replacing primer

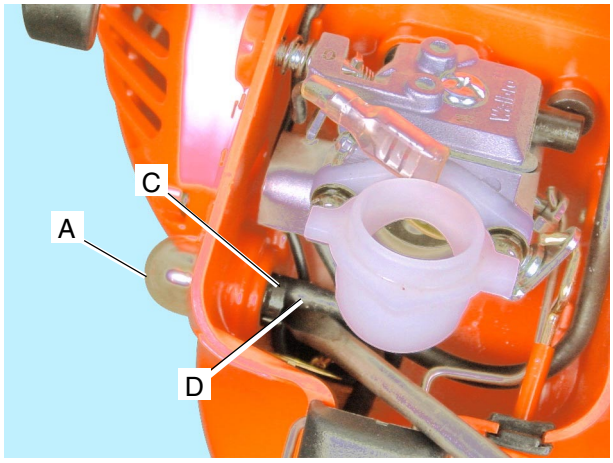


NOTE: It is possible to replace primer, as the carburetor is in the place.

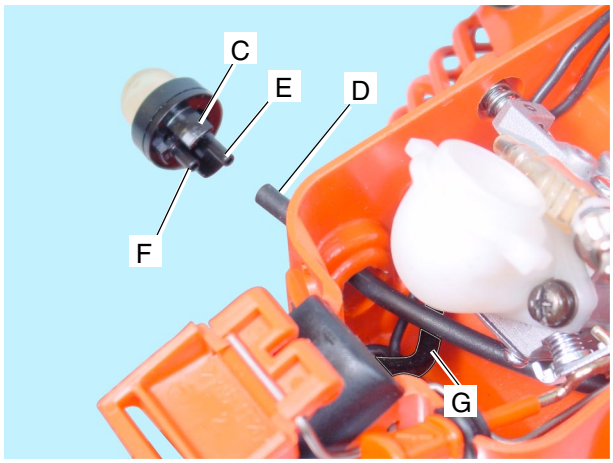
1. Remove fuel inlet pipe (B) from primer (A).

(continued)

4-3 Replacing primer (continued)



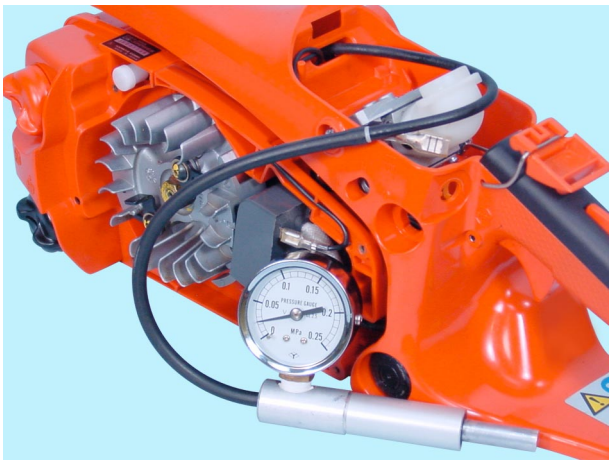
2. Push opposite side hook of hook (C) of primer using screw driver and push hook (C) by finger to remove primer. Remove fuel return pipe (D) from primer.



3. Before installing primer, connect fuel return pipe (D) to longer fitting (E) of new primmer. Hook (C) of primer should be located as shown, and install in the hole of rear handle.

4. Connect fuel inlet pipe (G) to the other fitting (F) of primer.

4-4 Checking fuel tank and pipe



1. Clean fuel tank inside as required.

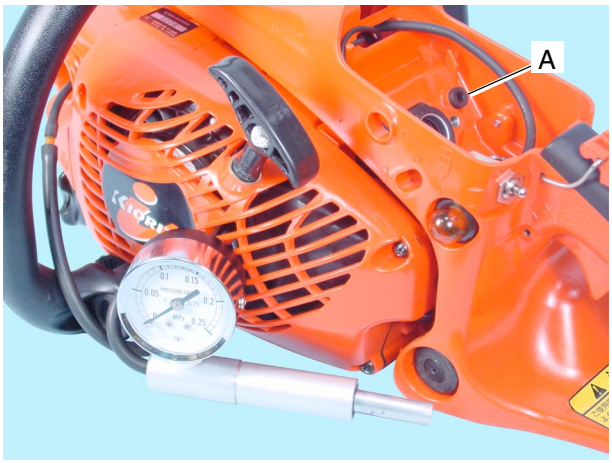
2. Remove air cleaner lid and remove fuel return pipe from primer.

3. Connect pressure tester to the fuel return pipe. And apply pressure approx. 9.8 kPa (0.1 kgf/cm^2) (1.4 psi).

4. If pressure drops, check fuel cap, fuel cap O-ring, fuel tank, grommet or fuel tank vent if leaking. Replace or repair as required.

(continued)

4-4 Checking fuel tank and pipe (continued)

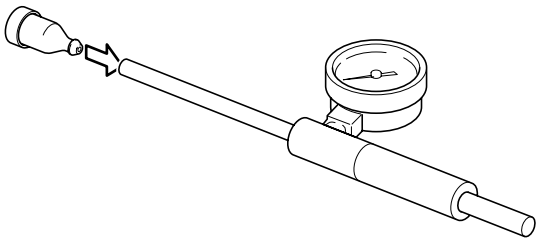


5. Remove fuel cap, and remove fuel strainer from fuel pipe.

6. Connect pressure tester to the fuel pipe and apply pressure approx. 49 kPa (0.5 kgf/cm^2) (7 psi).

7. When the pressure drops, remove carburetor and apply pressure plugging fuel pipe end (A). If pressure drops, remove rear handle and check pipes and connector. Replace them as required.

4-5 Checking and replacing fuel vent



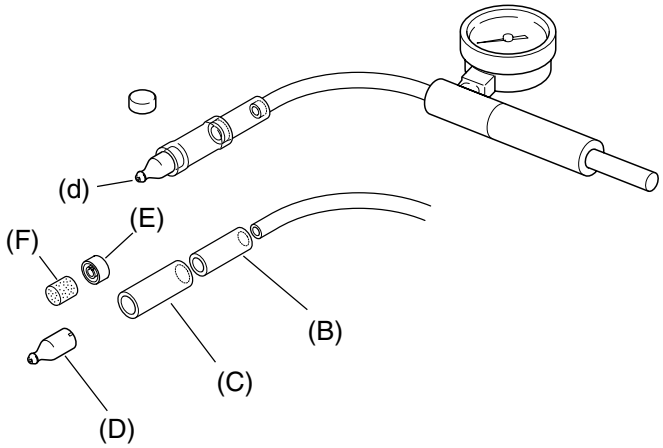
NOTE: Fuel tank vent prevents a vacuum from forming in fuel tank when fuel in the tank is being consumed. When the pressure in the tank becomes too high, fuel tank vent releases the pressure.

1. Remove starter assembly and fuel tank vent. Connect pressure tester to fuel tank vent.

2. Apply pressure approx. 49 kPa (0.5 kgf/cm^2) (7 psi), make it sure the pressure should be stable in range of 9.8 kPa - 39.2 kPa (0.1 - 0.4 kgf/cm^2) (1.4 - 6 psi).

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

NOTE: Do not disassemble check valve in the vent assembly. Damage to the check valve will occur.



4. Remove cap (E) of fuel tank vent, and clean sponge (F).

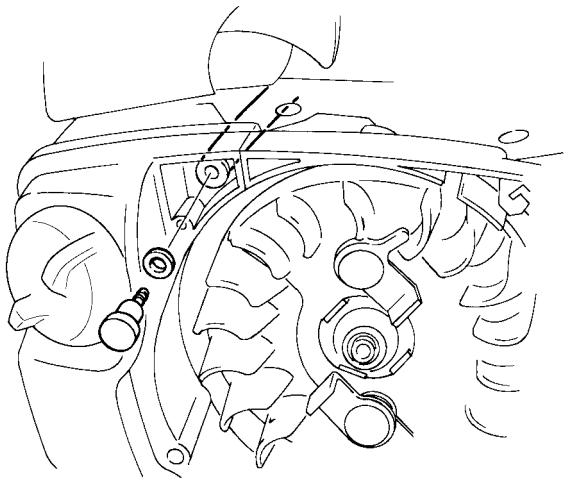
5. Cut pipe 363024-04010 (B) and 382011-01110 (C) in approx. 30mm (1 1/4 in) length, and connect them to pressure tester as shown. Connect tank vent (D) without cap to the pipe as shown.

6. Plug hole (d) by finger and apply pressure 19.6 kPa (0.2 kgf/cm^2) (3 psi). The pressure should be hold steady.

7. When the finger is removed to unplug the hole (d), the tank vent should pass air freely without holding any pressure. If it does not, replace the vent with new one.

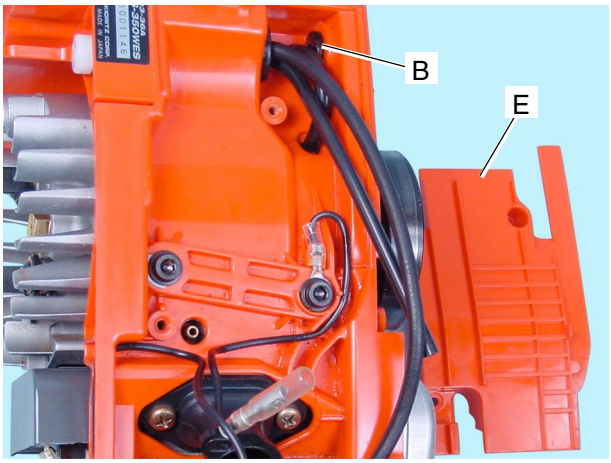
(continued)

4-5 Checking and replacing fuel vent (continued)



8. Reinstall tank vent to original position.

4-6 Replacing fuel pipe

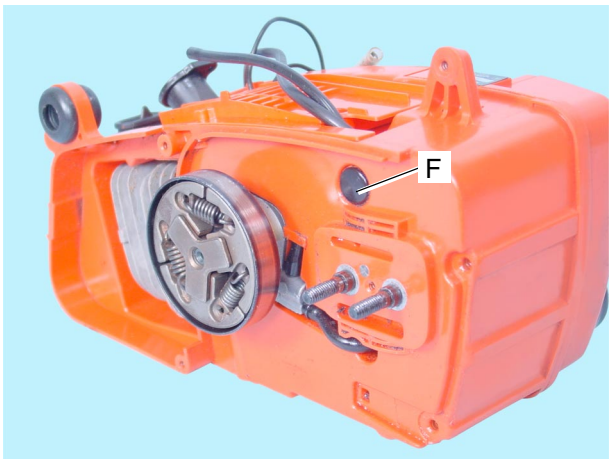


1. Remove fuel cap. Remove fuel strainer and clip from fuel pipe.

2. Remove rear handle (Refer to section 9-3 Page 55).

3. Remove dust cover (E).

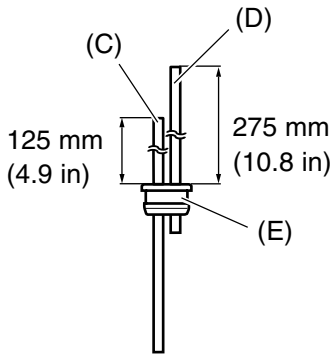
4. Disconnect oil outlet pipe (B) from fitting.



5. Remove plug (F) at upper part of guide bar mount. Remove fuel pipe grommet with fuel pipes from fuel tank using thin blade screw driver.

(continued)

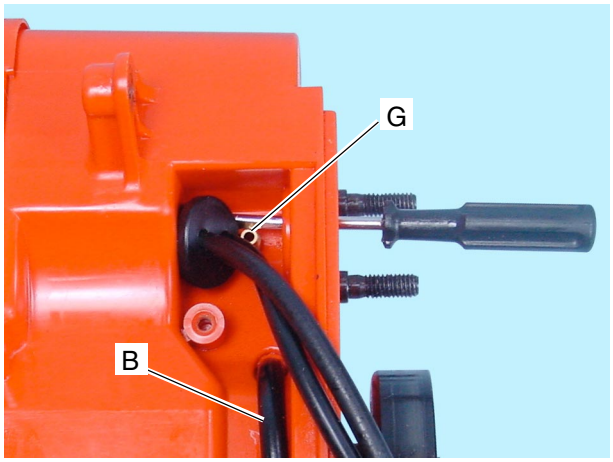
4-6 Replacing fuel pipe (continued)



6. Install fuel pipe (C) and return pipe (D) on the grommet (E) as shown.

7. Install the assembled grommet on fuel tank.

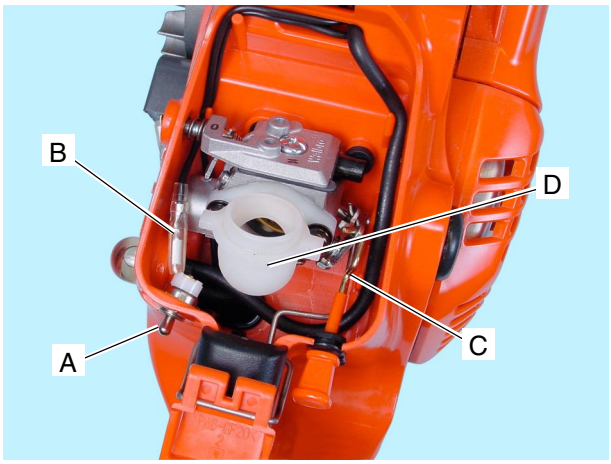
NOTE: Assemble grommet, as the pipe (D) is upper side of fuel pipe (C).



8. Pull out fuel pipe from fuel tank and install fuel strainer and clip to fuel pipe.

9. Install oil outlet pipe (B) to fitting (G) and assemble dust cover.

4-7 Removing carburetor



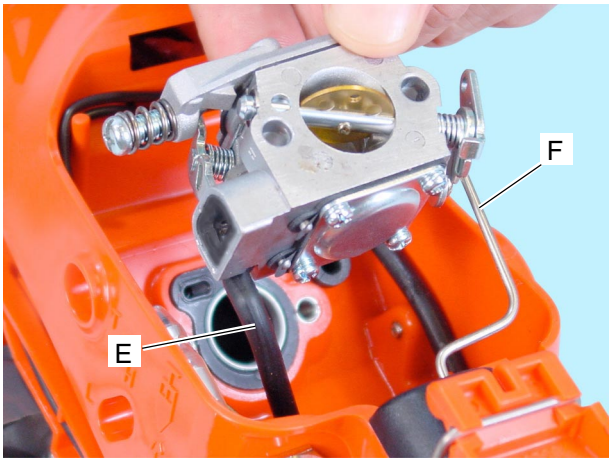
1. Remove lead connector (B) from switch (A).

2. Remove choke rod (C).

3. Loosen 2 pcs of carburetor screws, and remove elbow (D) and carburetor.

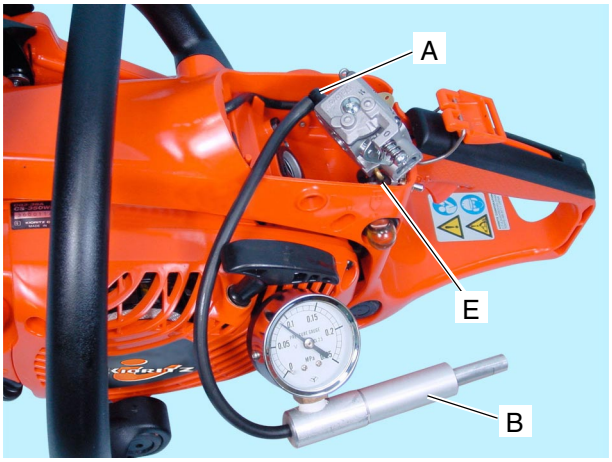
(continued)

4-7 Removing carburetor (continued)



4. Disconnect inlet pipe (E) of primer and throttle rod (F) from carburetor.

4-8 Testing carburetor

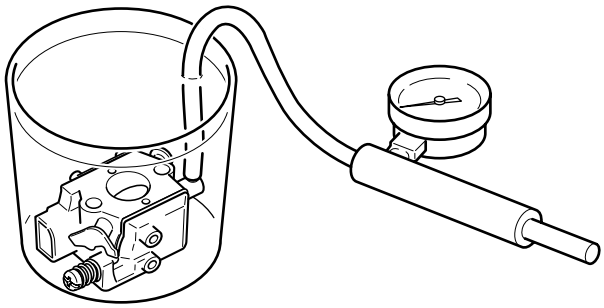


NOTE: To perform this test, inside carburetor should be wet. If it is not, there is a chance to be a little leakage.

1. Connect pressure tester 897803-30133 (B) to carburetor fitting (A), and connect inlet fuel pipe (E) of primer to carburetor fitting.

2. Apply pressure to 98 kPa (1 kgf/cm^2) (14 psi).

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



4. Lightly push primer once. Pressure tester reading should drop and remain above 49 kPa (0.5 kgf/cm^2) (7 psi).

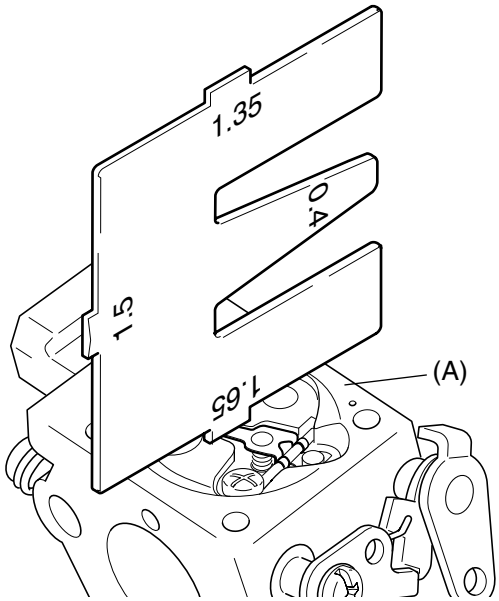
5. If the reading does not drop, check if primer is defective or inlet needle valve is sticking.

6. Submerge carburetor in suitable clean solvent to locate the leak by applying pressure.

7. If air bubbles come out between pump cover and carburetor body, check pump diaphragm, pump gasket, and diaphragm seat of carburetor body.

8. If air bubbles come out from throttle bore, check inlet valve, metering lever spring, and metering lever height.

4-9 Checking metering lever height



1. Remove carburetor.

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

3. Check the metering lever height.
   Metering lever height : 1.65 mm (0.068 in) lower than (A)

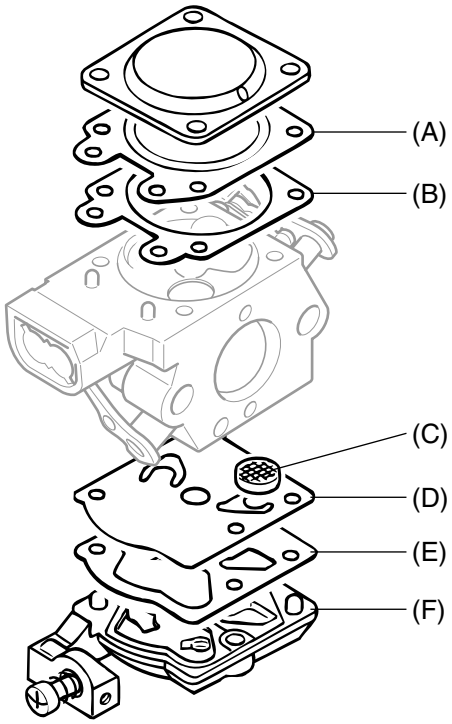
4. If necessary, gently bend the lever up or down to set metering lever at correct position.

NOTE: When the metering lever is :

Too high → Fuel flooding

Too low → Fuel starvation / overheating

4-10 Checking diaphragm



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

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

3. Check pump diaphragm (D) and replace if hardened or curled at the valve tabs.

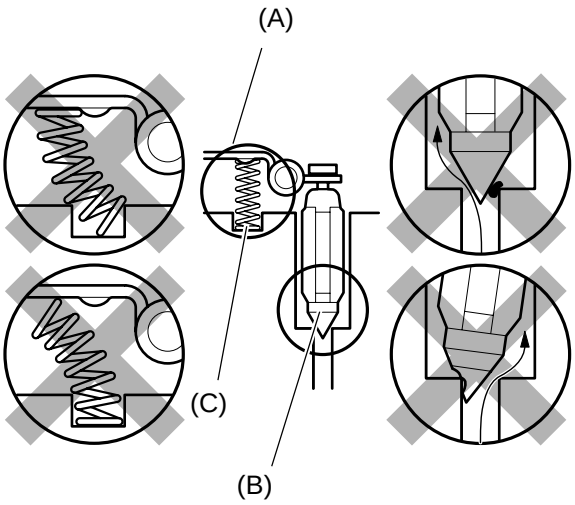
4. Check metering gasket (B) and pump gasket (E) and replace if defective.

5. Check inlet screen (C) if blocked, remove and clean it, or replace.

6. 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 or inlet needle valve spring may be damaged by the compressed air.

4-11 Checking inlet needle valve



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

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 the seat.
- Worn inlet needle valve tip.

3. Clean the valve seat using thin wooden stick and suitable clean solvent. (Do not use metal tools.)

4. Assemble inlet needle valve, pin with metering lever and spring.

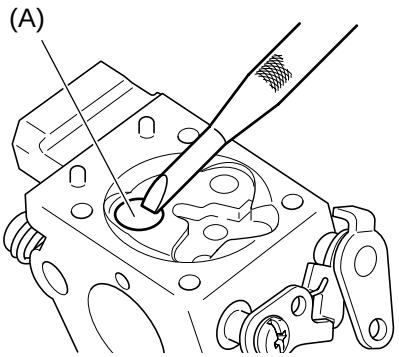
NOTE: Make sure of metering lever installation as follows:

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

(2) The spring is under dimple of metering lever.

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

4-12 Replacing Welch plug



If engine do not run smoothly even after readjusting carburetor and checking carburetor parts, check the low speed ports as follows:

1. Remove metering lever and relative parts to prevent them from damage.

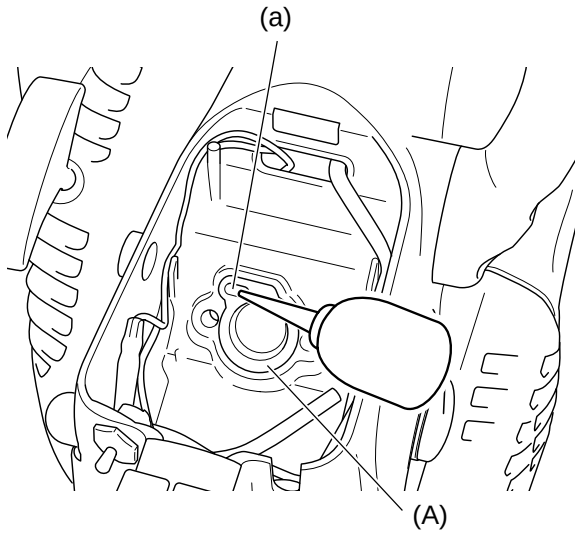
2. To remove Welch plug (A), punch the remover through the Welch plug at a low angle and pry it out.

3. Clean low speed ports with compressed air.

4. Place a new Welch plug over the opening and gently tap it until flush.

5. Install all removed parts to carburetor body.

4-13 Checking crankcase pulse passage

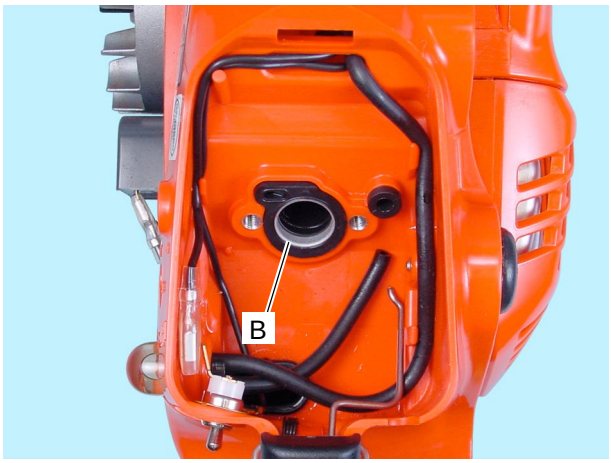


1. Drop a little oil in the pulse hole (a) on intake bellows (A).

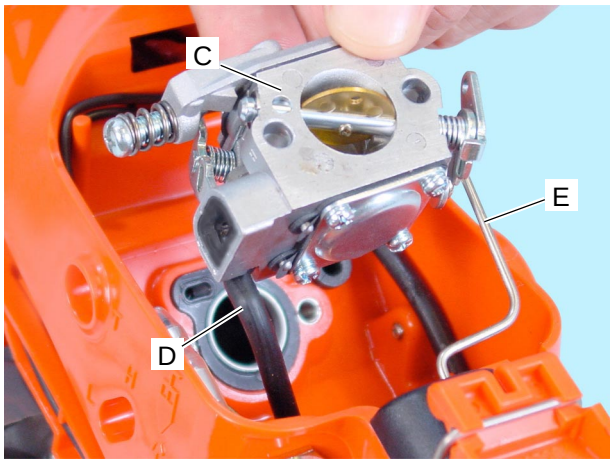
2. Remove spark plug and pull starter grip several times. The oil should spit back from the hole.

3. If not, remove rear handle and check whether connection of pulse pipe is correct and the pulse passage of intake bellows is not blocked. Repair as required.

4-14 Installing carburetor



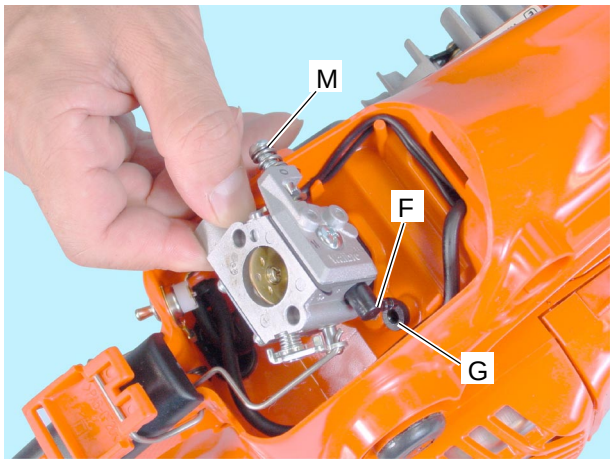
1. Install collar (B) on intake bellows.



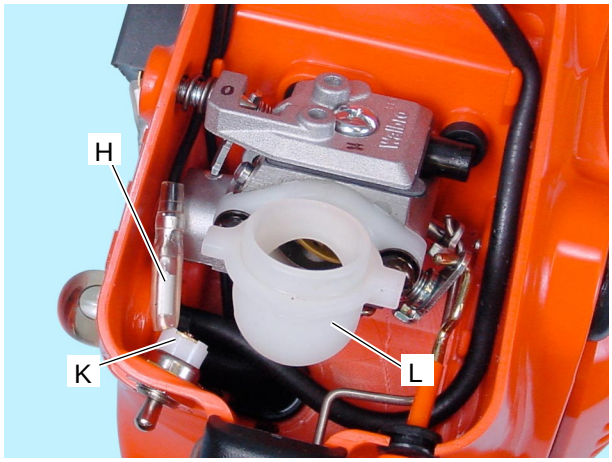
2. Connect inlet pipe (D) of primer and throttle rod (E) to carburetor (C).

(continued)

4-14 Installing carburetor (continued)



3. Align idle adjust screw (M) of carburetor with hole of rear handle and insert fuel fitting (F) in fuel pipe (G).



4. Connect switch lead connector (H) to ignition switch (K).

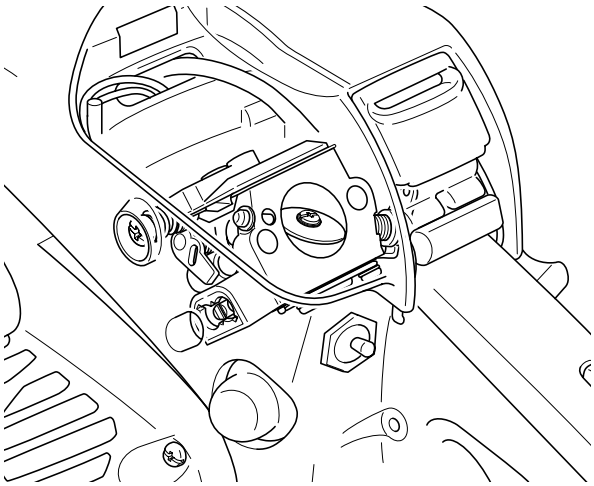
5. Fasten elbow (L) and carburetor together with 2 screws.

NOTE: If the screw is pressed strongly before engaging with the thread of nut, the nut may drop. If the nut dropped, rear handle should be disassembled to reinstall the nut on rear handle.

6. Install choke rod.

7. Install air cleaner and air cleaner lid.

4-15 Adjusting carburetor



GENERAL ADJUSTMENT RULES:

A. Before starting the unit for adjustment, check the following items:

- The correct spark plug must be clean and properly gapped.
- The air filter must be clean and properly installed.
- Exhaust port must be clean of carbon.
- The recommended bar and chain combination must be installed to the powerhead, and properly tensioned.
- The fuel is fresh (>89 octane : RON) and properly mixed at 50 : 1 with “ISO L-EGD“or “JASO FC” 2-stroke oil .

(continued)

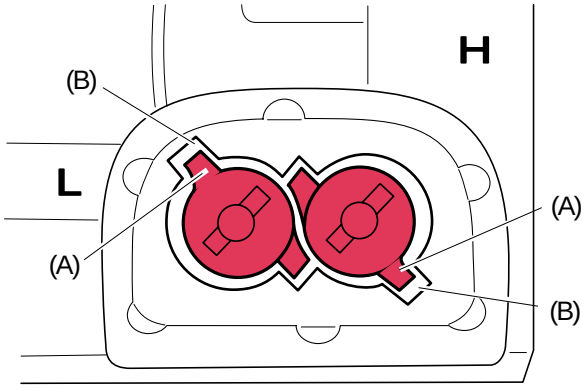
4-15 Adjusting carburetor (continued)

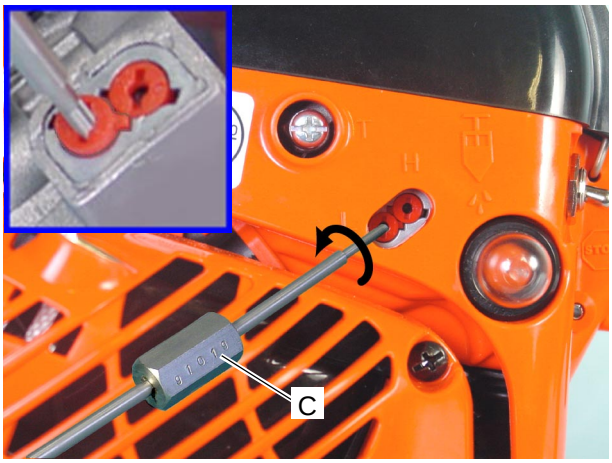
B. Adjust carburetor turning L and H mixture needles with limiter caps within the moving range (approx. : 90°) and idle adjust screw. When engine does not run correctly after this adjustment, proceed to the next step (4-15-1).

C. After adjusting carburetor according to the 4-15-1 and 4-15-2, the limiter cap(s) must be installed on L and/or H mixture needle(s) to comply with Emission Directive.

4-15-1 Presetting idle adjust screw, L mixture needle and H mixture needle

1. Turn the L and H mixture needles out counterclockwise to rich side stop. And meet limiter cap tab (A) with locating slot (B).





2. Screw thread of limiter cap tool 91019 (C) into center hole of limiter cap counterclockwise until tab of the limiter cap just come out from locating slot.

NOTE: If the limiter cap is pulled out completely, there is a chance that the other mixture needle will turn and limiter cap tab will misalign with locating slot when screwing the limiter cap tool into center hole of the other limiter cap.

(continued)

4-15-1 Presetting idle adjust screw, L mixture needle and H mixture needle (continued)

3. Screw thread side of limiter cap tool 91019 into center hole of the other limiter cap counterclockwise until the limiter cap is pulled out from the mixture needle completely.

4. Remove the limiter cap from the limiter cap tool turning clockwise.

5. Screw thread of limiter cap tool 91019 into center hole of previous limiter cap to pull out completely.

6. Turn L mixture needle and H mixture needle clockwise until lightly seated, and then turn out both needles following turns.

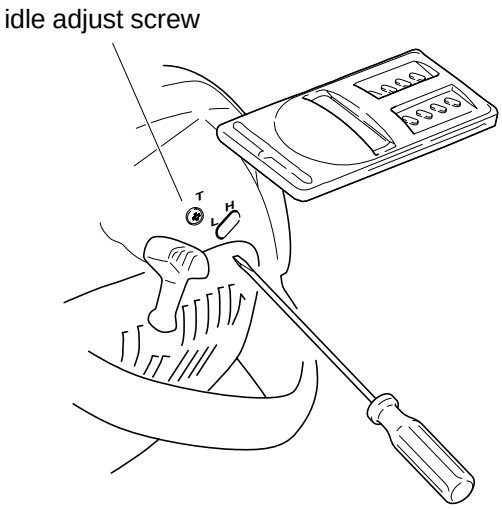
	WT-722	WT-722A	WT-721
L mixture needle	1 7/8	1 7/8	2 1/8
H mixture needle	2 7/8	2 3/8	3 1/8

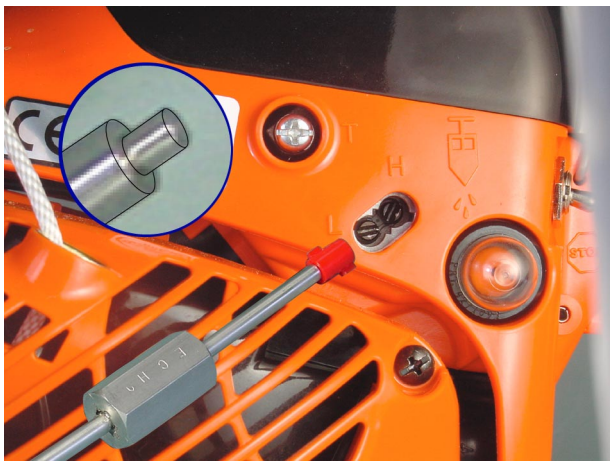
NOTE: If needles are force during seating, damage to carburetor may occur.

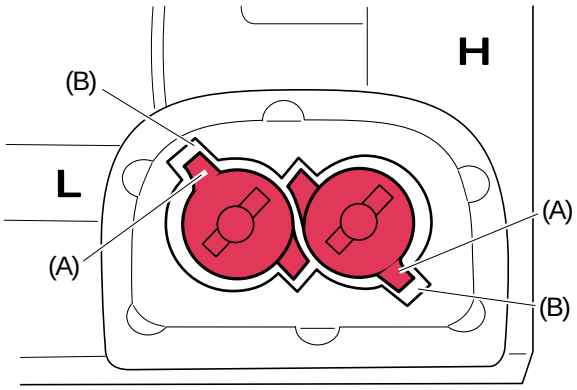
7. Turn idle adjust screw counterclockwise and set the screw until the tip to just contact throttle plate. Then turn idle adjust screw following turns.

	WT-722, WT-722A, WT-721
Idle adjust screw	2 1/8

4-15-2 Adjusting carburetor







1. Start engine and warm it up well for 2-3 minutes with cycle of 5 seconds at WOT (Wide Open Throttle) and 10 seconds at idling.

2. Turn L mixture needle clockwise at idle speed slowly until engine speed drops. Turn L mixture needle counterclockwise to obtain maximum idle speed using 2.5 mm wide blade screw driver.

3. Set idle speed to 4,000 r/min by turning idle adjust screw.

4. Turn L mixture needle counterclockwise to reduce engine idle speed 800 r/min to set idle speed at 3,200 r/min the idle speed is allowed in the range of 3,000 to 3,400 r/min.

5. Turn H mixture needle counterclockwise at WOT until engine speed drops less than 12,000 r/min. Then turn H mixture needle clockwise to obtain 12,800 to 13,200 r/min at WOT.

6. If the engine speed at WOT is above 13,500 r/min, adjust H mixture needle counterclockwise and set maximum engine speed at less the 13,500 r/min.

NOTE: Do not run engine at high speed without load longer than 5 seconds, or engine damage may occur.

7. After adjusting carburetor, put limiter cap on tip of limiter cap tool : 91019 and install the caps on L and H mixture needles as shown.

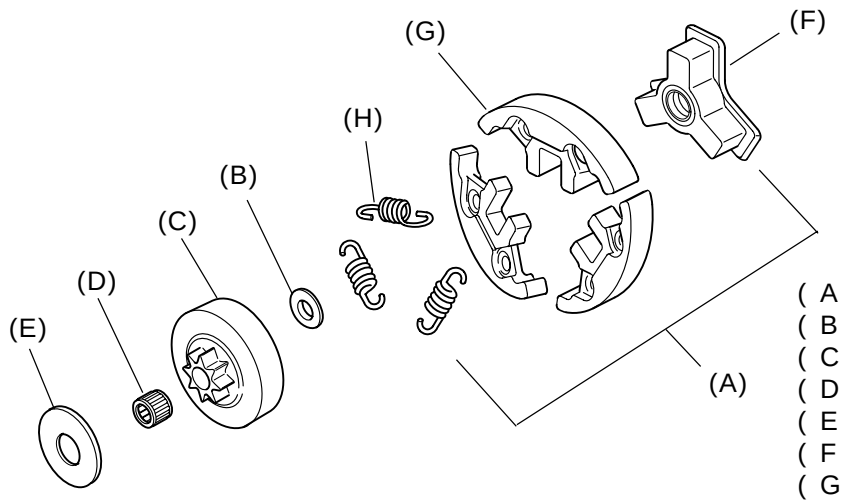
NOTE: Align the limiter cap's tabs (A) with locating slots (B) in extended housing of carburetor.

IMPORTANT: The limiter cap must be installed L and H mixture needles to comply with Emission Directive.

8. Start engine again and make it sure engine runs at idle speed in the range of 2,900 to 3,500 r/min and at WOT speed in the range of 12,500 to 13,500 r/min. If idle speed is not the range, adjust idle screw to meet with the range. Also make it sure chain would not turn at engine idle speed and suitable acceleration.

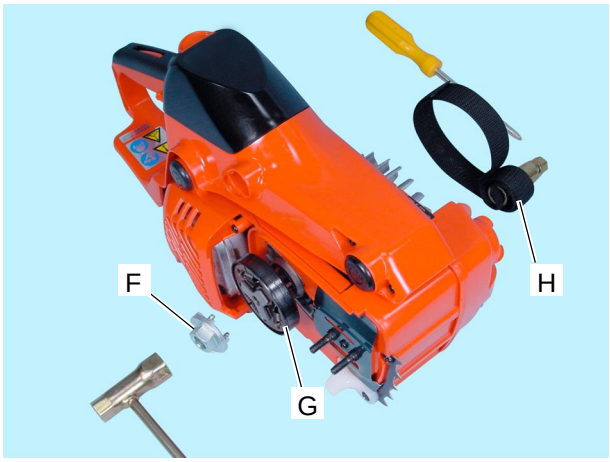
NOTE: Initial carburetor setting (Idle adjust screw, L and H mixture needles) shown here is to start the engine after restoration or carburetor change. Idle adjust screw, L and H needles turn for designated engine revolution through procedures indicated here may vary. As long as idle and WOT engine speed is set in given range, variance would be ignorable.

5 CLUTCH SYSTEM



(A) Clutch assembly
(B) Clutch plate
(C) Clutch drum
(D) Needle bearing
(E) Washer
(F) Clutch hub
(G) Clutch shoe
(H) Spring

5-1 Checking clutch parts



1. Remove sprocket guard and recoil starter.

2. Holding flywheel by flexible wrench (H), turn clutch assembly clockwise to remove using clutch tool (F).

3. Remove clutch drum (G), needle bearing and washer.

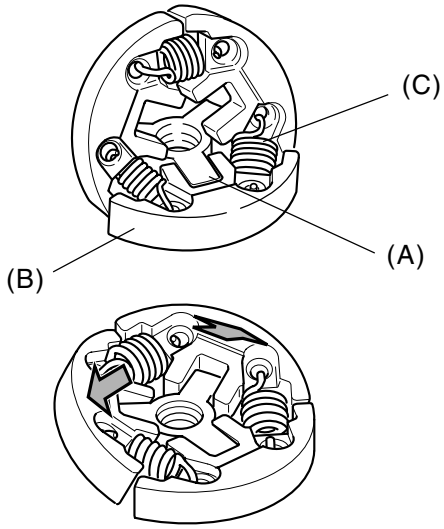
NOTE: Do not use piston stopper. Otherwise, piston damage may occur.

4. Check clutch shoes for wear and spring for weakness of damage. Replace clutch parts as required.

5. Check clutch drum and the sprocket. Replace if deformed or worn out.

6. Check needle bearing for discoloration or damage. Replace as required.

5-2 Replacing clutch parts

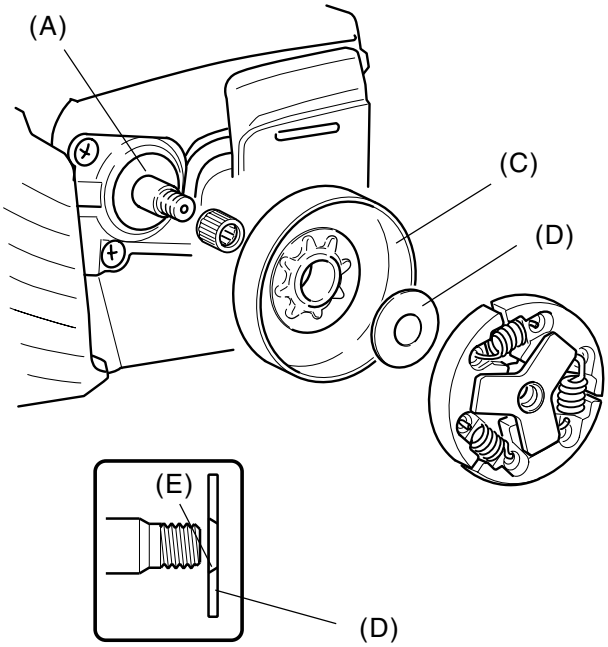


1. Install tension spring (C) to the clutch shoes (B).

2. Set one arm of the clutch hub (A) to one guide of the clutch shoe.

3. Install other two guides of the clutch shoes on two arms as shown.

5-3 Installing clutch assembly



1. Insert washer (A) on crankshaft (Press fitting).

2. Apply lithium-based grease to needle bearing (B) and install the needle bearing and clutch drum (C) on crankshaft.

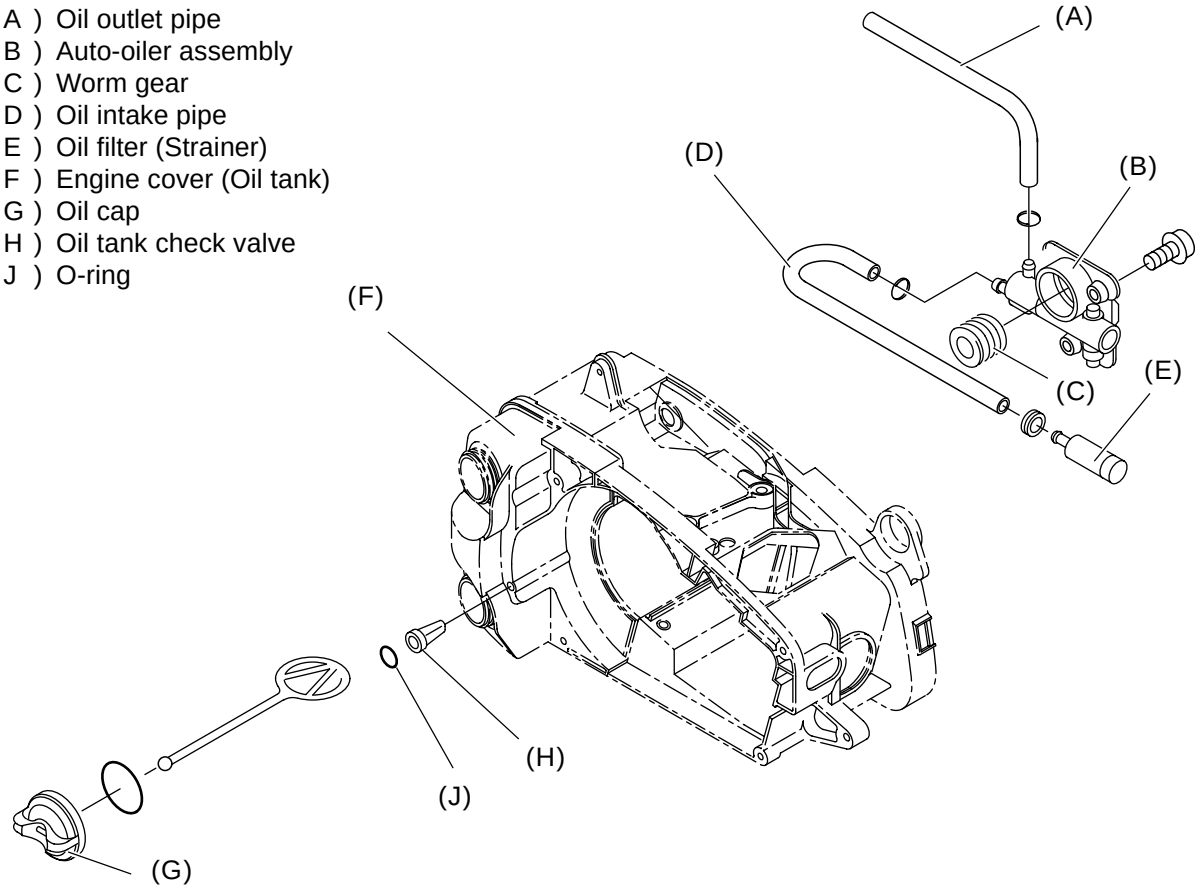
3. Install clutch plate (D) and clutch assembly to the crankshaft turning it counterclockwise manually.

NOTE: Chamfered corner (E) of clutch plate (D) should face inside.

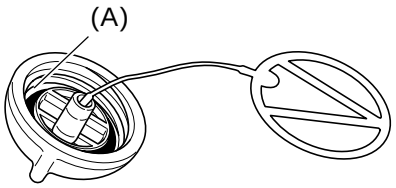
4. Holding flywheel using flexible wrench, turn clutch assembly counterclockwise using clutch tool X640-000011.

6 SAW CHAIN LUBRICATION SYSTEM

(A) Oil outlet pipe
(B) Auto-oiler assembly
(C) Worm gear
(D) Oil intake pipe
(E) Oil filter (Strainer)
(F) Engine cover (Oil tank)
(G) Oil cap
(H) Oil tank check valve
(J) O-ring

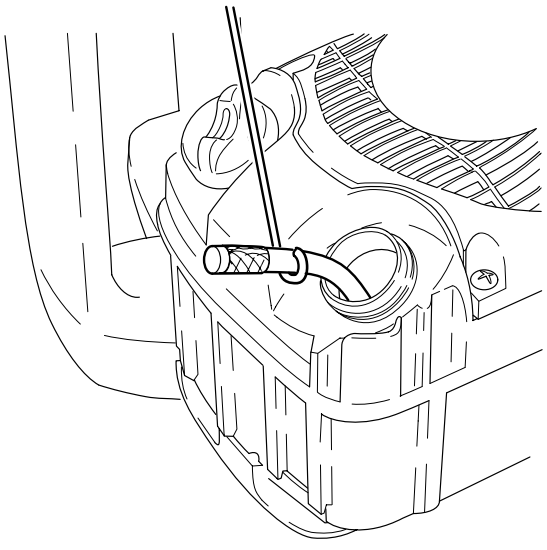


6-1 Checking oil cap and strainer



1. Remove oil cap.

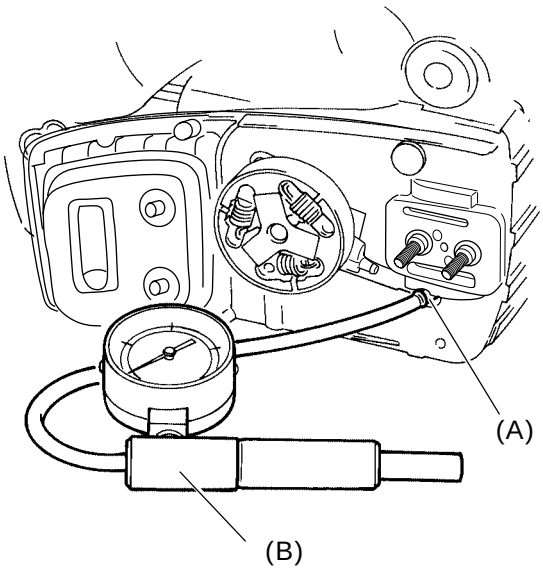
2. Check oil cap for cracks and O-ring (A) for cuts or damage. Replace defective parts as required.



3. Pull oil strainer from oil tank using a wire hook.

4. Clean oil strainer in a suitable solvent, or replace with a new one if damaged.

6-2 Checking oil pipe



1. Remove guide bar, chain and sprocket guard.

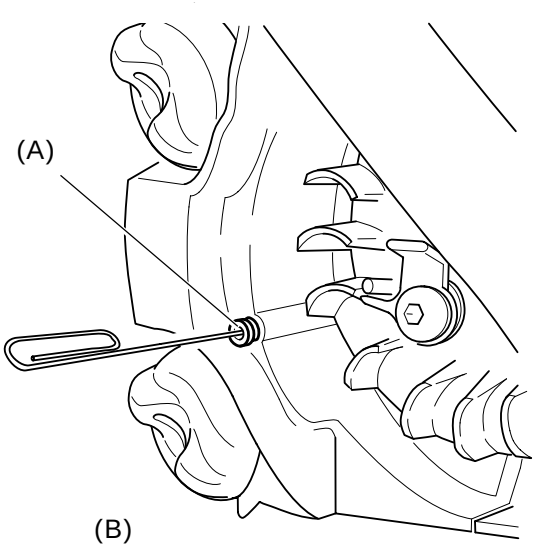
2. Remove chain catcher, spiked bumper and sprocket guard plate.

3. Disconnect lower oil pipe (A) from auto-oiler assembly and connect pressure tester 897803-30133 (B) to oil pipe (A).

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

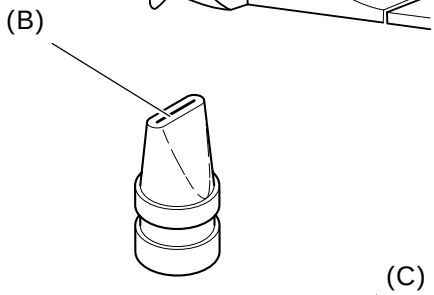
5. Pressure should not drop. If the pressure drops, leakage may occur at oil cap, oil cap O-ring, oil tank, oil pipe, grommet, or oil tank check valve. Check them and replace defective part(s).

6-3 Checking oil tank check valve

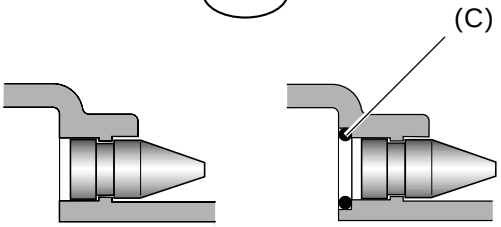


NOTE: The oil tank check valve prevents a vacuum from forming in oil tank when chain oil in the tank is consumed.

1. Remove oil tank check valve (A) and clean it.

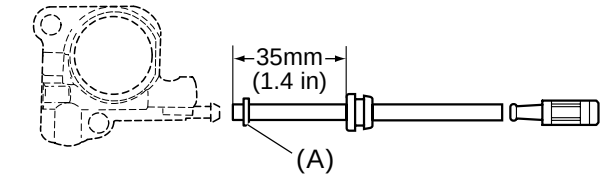


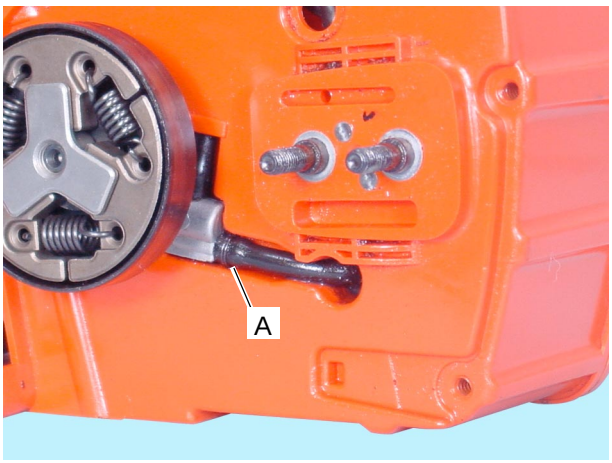
2. Check if the valve lips (B) are hardened or left opened. Replace as required.



3. There is two different shape of engine cover for check valve. One has space for O-ring (C), and the other does not have the space. Install check valve as shown.

6-4 Replacing oil pipe and grommet





1. Remove oil pipe and grommet from engine cover.

2. Insert new oil pipe to the grommet as shown.

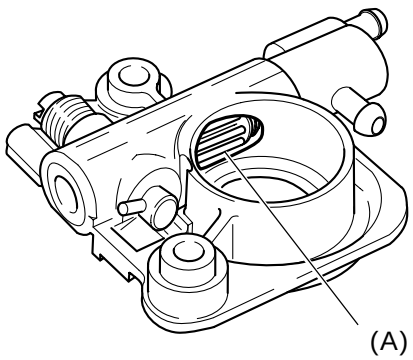
NOTE: Apply sealant (Loctite #424 or equivalent) into hole of grommet to prevent oil pipe from moving.

3. Install oil strainer to oil pipe.

4. Insent oil pipe with oil strainer through the hole of oil tank (engine cover), and install grommet on engine cover.

5. Install clip (A) on end of oil pipe, and connect the oil pipe to fitting of auto-oiler assembly as shown.

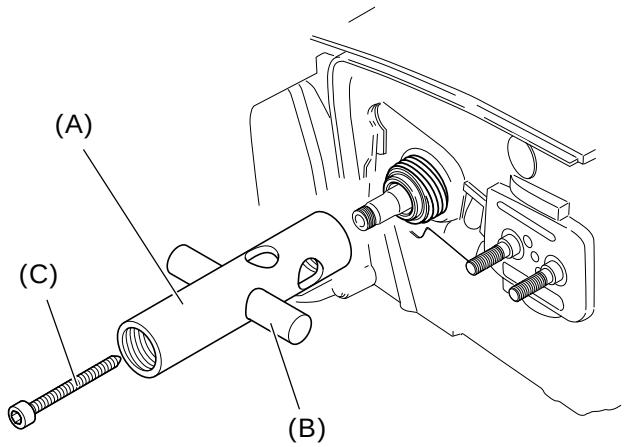
6-5 Checking auto-oiler assembly



1. Loosen screws on auto-oiler assembly. Remove oil pipe from auto-oiler assembly and remove auto-oiler assembly.

2. Check whether the plunger of auto-oiler assembly rotates smootly and gear of the plunger (A) is not damaged. If damaged, replace with a new one.

6-6 Removing worm gear



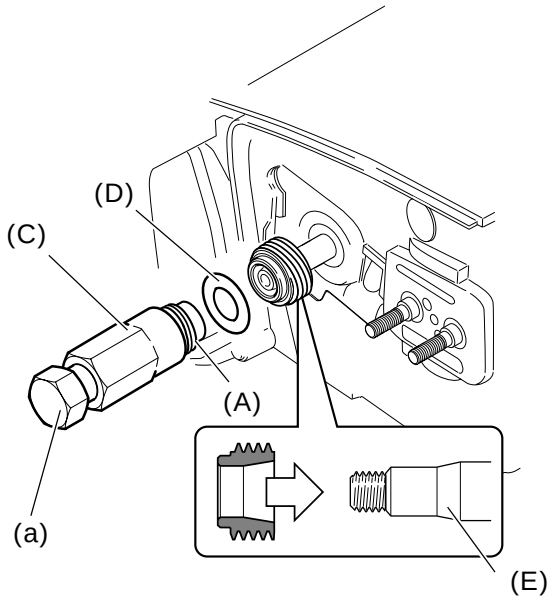
1. Screw worm remover 897702-30131 (A) on the worm gear.

2. Insert handle (B) in the tool.

3. Screw hex. socket bolt (C) in the center of the handle (B) until the bolt touches the center of the crankshaft end.

4. Tighten the bolt with wrench holding handle (B) until the worm gear comes off.

6-7 Installing worm gear

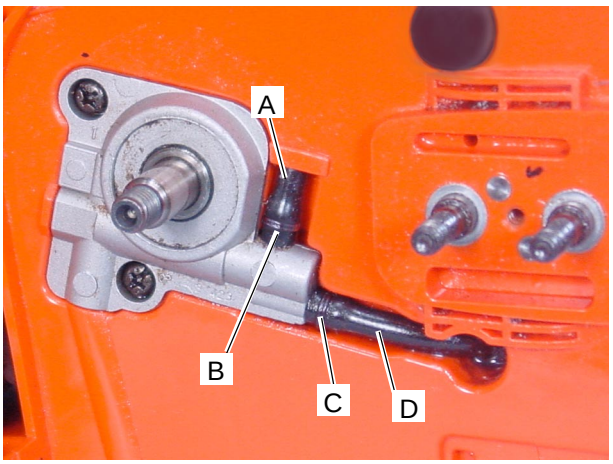


1. Put new worm gear on the crankshaft end.

2. Setting circular washer (D) on end of worm press tool (C) and screw bar tool (A) on thread of crankshaft counterclockwise.

3. Holding hexagonal part (a) of bar tool (A) by wrench, turn press tool (C) clockwise until worm gear is bottomed to taper part (E) of crankshaft.

6-8 Installing auto-oiler assembly



1. Install clip (B) on oil outlet pipe (A), connect the oil outlet pipe (A) to auto-oiler.

2. Apply a small amount of lithium-based grease to worm gear.

3. Install the auto-oiler assembly on engine cover.

4. Install clip (C) on oil pipe (D) and connect the pipe to auto-oiler assembly.

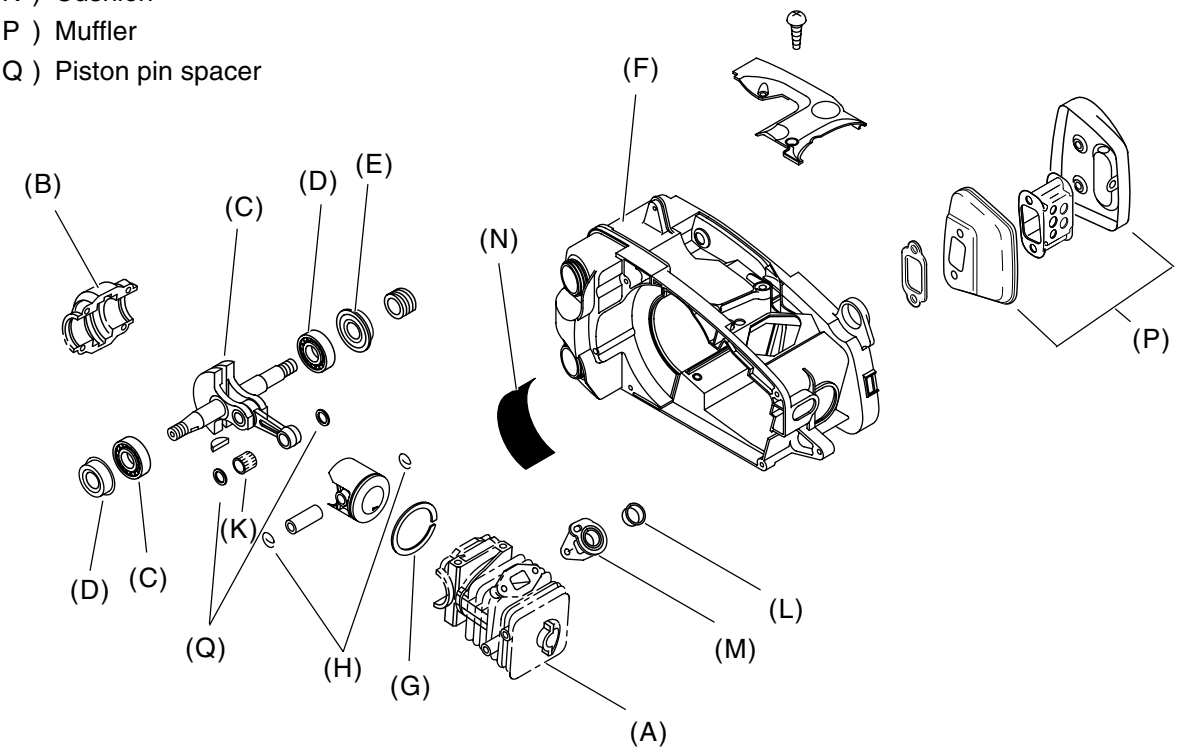
5. Fasten screws securing auto-oiler assembly.

6. Install sprocket guard plate, spiked bumper and chain catcher.

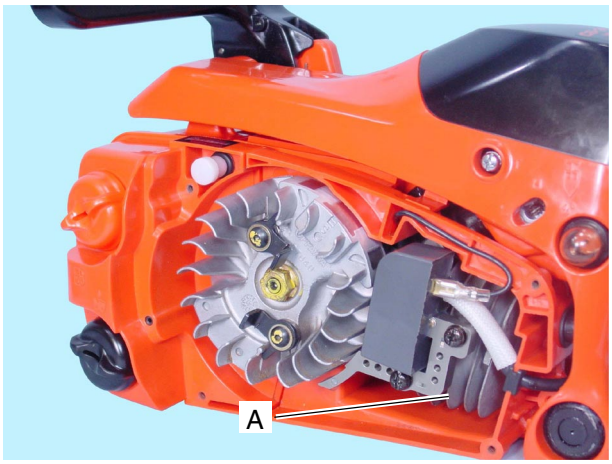
7. Install all other removed parts.

7 ENGINE

(A) Crankcase (Cylinder)
(B) Crankcase
(C) Crankshaft
(D) Ball bearing
(E) Oil seal
(F) Engine cover
(G) Piston ring
(H) Snap ring
(J) Piston
(K) Needle bearing
(L) Collar
(M) Intake bellows
(N) Cushion
(P) Muffler
(Q) Piston pin spacer



7-1 Cleaning cooling air passage



1. Remove starter assembly with front handle from engine body.

WARNING ⚠ DANGER

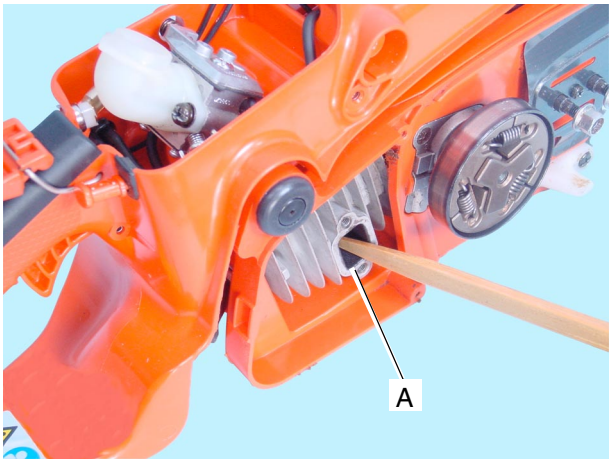
Always wear eye protection when using compressed air for cleaning. Otherwise, eye damage can occur from flying patricles

Remove ignition coil for cleaning cylinder fins easily.

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

3. Install all removed parts.

7-2 Checking muffler and exhaust port



1. Remove muffler cover and muffler.

NOTE: Always position piston at top dead center to prevent loosened carbon from entering cylinder.

2. Remove carbon deposits in exhaust port (A) with bamboo or plastics stick as shown.

NOTE: Using of metal tools results scratch of cylinder or piston.

NOTE: Replace exhaust gasket with new one when removing muffler. Also when re-installing muffler, retighten muffler bolts after running test.

3. Remove carbon deposit from muffler.

4. Install muffler on engine.

7-3 Testing cylinder compression

NOTE: Test the cylinder compression when engine is cold.

1. Move ignition switch to STOP position.

2. Remove spark plug.

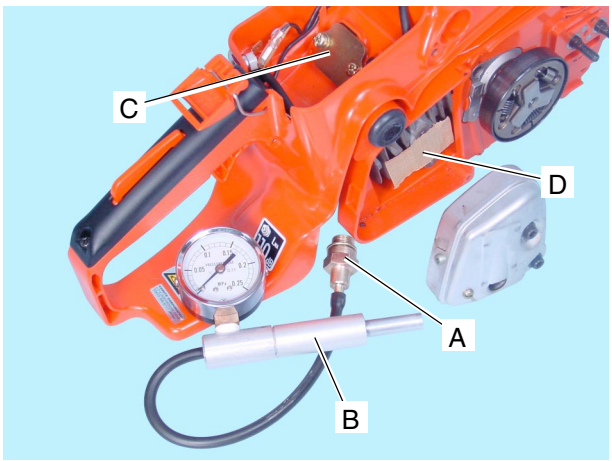
3. Install a compression gauge 91007 (A) into spark plug hole and pull starter several times to stabilize reading.

4. If the pressure is lower than approx. 80% of standard compression pressure (refer to “1-2 Technical data” Emission applicable models 90%), check cylinder bore, piston, and piston ring if worn or damaged.

5. If the pressure is more than approx. 130% (Emission applicable models 120%) of standard compression pressure, check cylinder combustion chamber and exhaust port, piston crown, and muffler for carbon deposits.

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

7-4 Testing crankcase and cylinder sealing



1. Remove air cleaner, carburetor and starter assembly with front handle.

2. Install pressure plate (C) on intake port of rear handle.

3. Remove muffler and close exhaust port with duct tape (D) as shown and install muffler.

4. Screw pressure connector (A) in thread of spark plug hole and connect pressure tester (B).

5. Apply pressure approx. 9.8kPa (0.1kgf/cm^2) by hand pumping of the pressure tester (B).

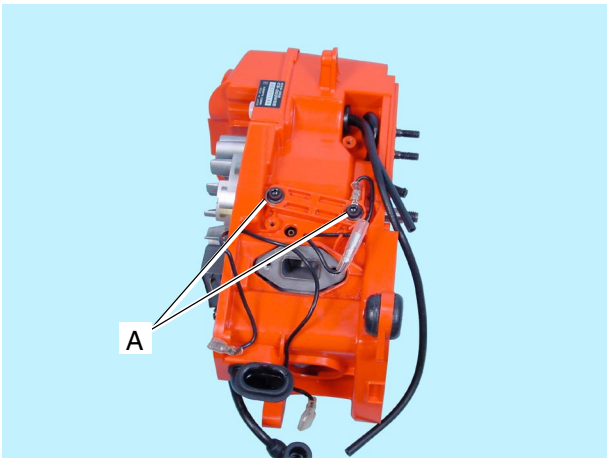
NOTE: Do not exceed 30kPa (0.3kgf/cm^2), or damage to seals will result.

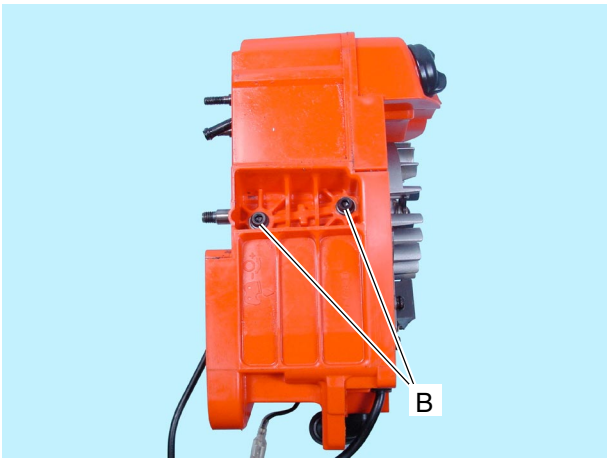
6. If the reading drops, leakage may occur.

7. Leakage may occur from crankcase seam and oil seal. Use soapy water to locate leakage.

8. Remove all plugs and tape from exhaust port and intake port, and pressure connector.

7-5 Removing engine block





1. Remove clutch assembly, auto-oiler, ignition coil, flywheel and rear handle.

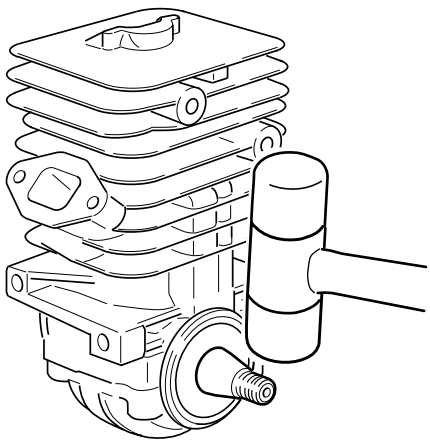
2. Remove dust cover and loosen bolts (A) fastening cylinder and bolts (B) on back side of the unit.

3. Remove intake bellows.

4. Remove engine block (crankcase assembly) from engine cover.

NOTE: When disassembling piston, piston ring and piston pin needle bearing, it is not necessary to remove ignition coil, flywheel and worm gear.

7-6 Checking cylinder



1. Loosen 4pcs of screws securing crankcase.

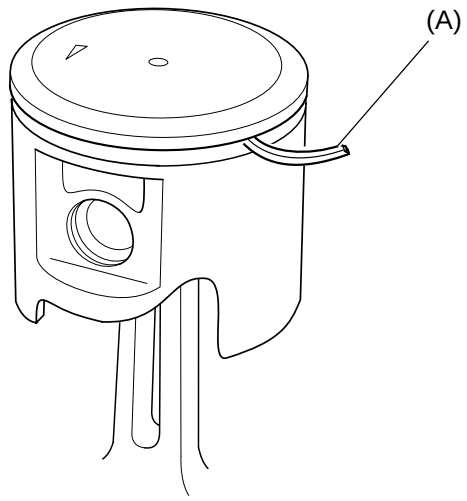
2. Gently tap both crankshaft ends evenly using plastics mallet to remove lower crankcase.

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

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

4. Check cylinder wall and replace crankcase as a set if plating is worn, peeled away or scored exposing cylinder base metal.

7-7 Checking piston and piston ring



1. Check piston ring and replace it if broken, scored, or exceed service limits. Refer to 1-5.

2. Inspect piston crown and ring groove, and clean with fine sand paper, oil stone, or ring groove cleaning tool if carbon is deposited.

NOTE: The squared end of a broken piston ring (A) can be used to clean the groove.

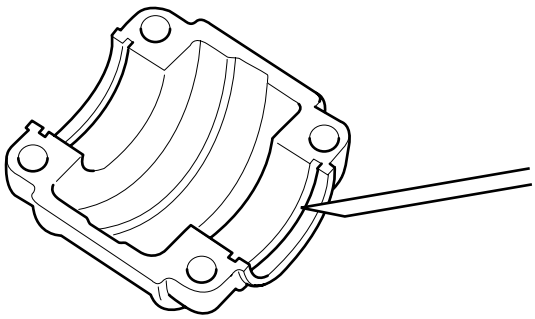
3. Remove snap rings from both sides of piston pin.

4. Push piston pin out from piston.

NOTE: If piston pin is tight, heat piston with a heating gun, a heat lamp, or a suitable heater and/or use piston pin tool 897702-30131 with adapter stamped “8” on an end.

5. Inspect needle bearing and spacers, and replace if wear or discoloration is noted.

7-8 Checking crankcase and crankshaft

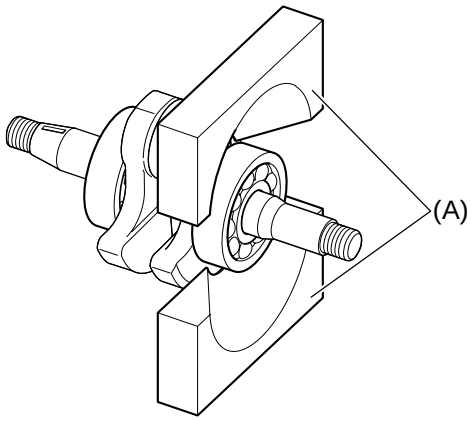


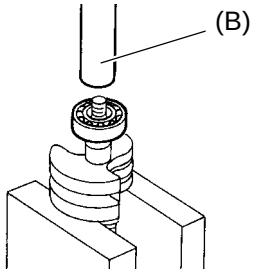
1. Clean lower crankcase. Replace as a set of upper and lower crankcase if damaged.

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. Replace crankshaft if the connecting rod bearing is rough, damaged, or discolored.

7-9 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) 897701-02830.

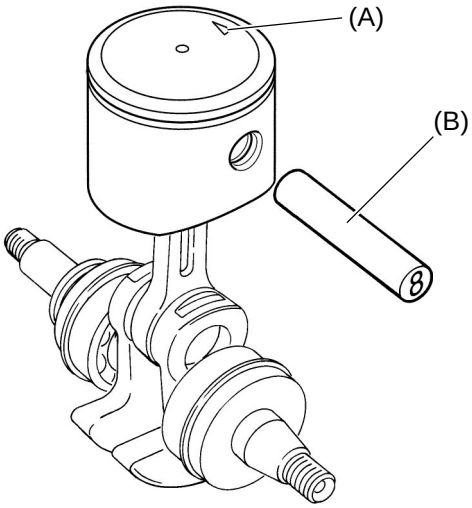
NOTE: When removing the oil seal or ball bearing at clutch side, worm gear should be removed in advance.

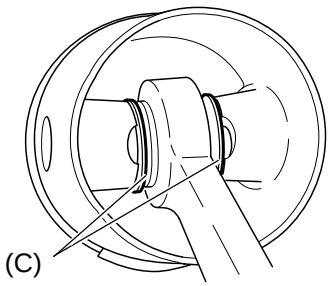
3. Install new ball bearing(s) using bearing/seal tool 897726-09130 (B) to the bottom.

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

4. Install oil seals into both ends of crankshaft with taking care of proper direction of oil seal.

7-10 Installing piston and piston ring





1. Lubricate needle bearings with 2-stroke engine oil.

2. Set needle bearing and piston pin spacers (C) on small end of connecting rod. Place piston over connecting rod with piston arrow mark (A) pointing as shown.

3. Insert pin guide tool (B) stamped “8” through piston, piston pin spacers and needle bearing in small end of connecting rod.

4. Insert piston pin in piston pushing out the pin guide until the pin end comes up to snap ring groove in piston pin bore of piston.

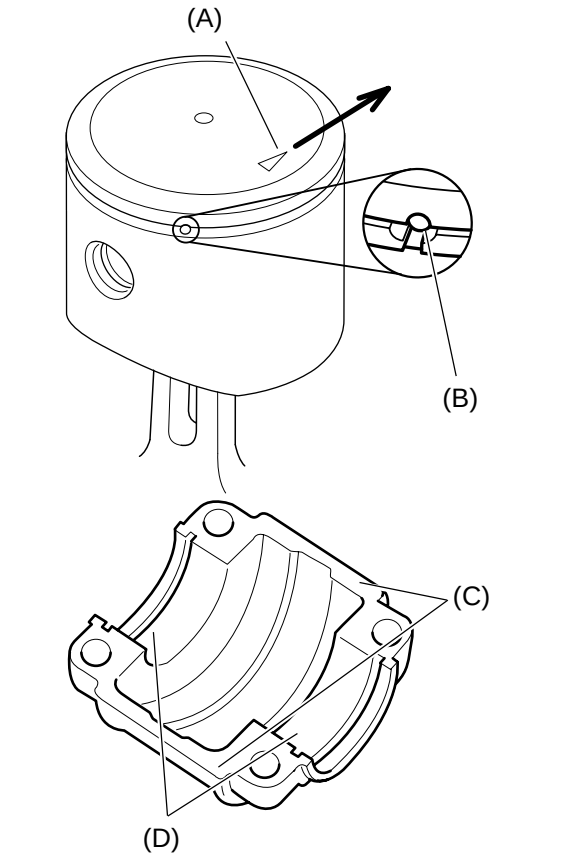
NOTE: If piston pin is tight, use piston pin tool 897702-30131 with pusher stamped “8”.

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

NOTE: Always use new snap rings.

6. Install piston ring to piston.

7-11 Installing piston into cylinder



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

2. Meet end gap of piston ring with locating pin (B).

NOTE: When installing piston in cylinder, do not rotate upper crankcase half (cylinder) to avoid breakage of piston ring and scoring cylinder bore.

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

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

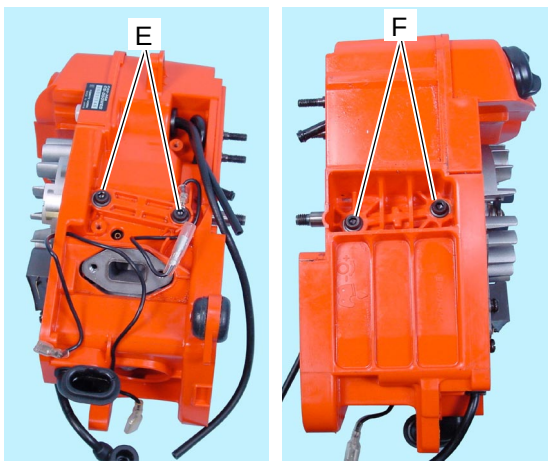
5. Apply a liquid gasket (Loctite #515 or equivalent) on seams (C) of lower crankcase half.

6. Apply adhesive (Loctite #675 or #638 or equivalent) on bearing bores (D) of lower crankcase half.

7. Apply 2-stroke oil in oil seal groove.

8. Set crankcase halves and fasten 4pcs of bolts.

7-12 Installing engine block



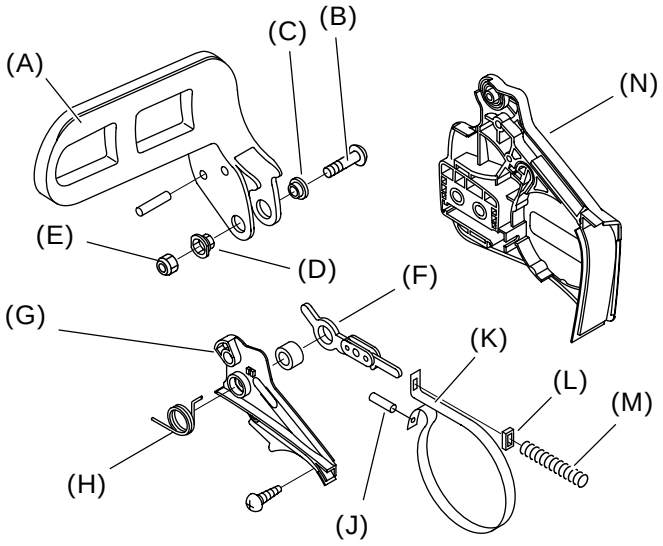
1. Install cushion between engine block and engine cover, and fasten 2pcs of bolts (M5X20) (E) on upper engine cover and 2pcs of bolts (M5X30) (F) on lower engine cover.

2. Install all other removed parts.

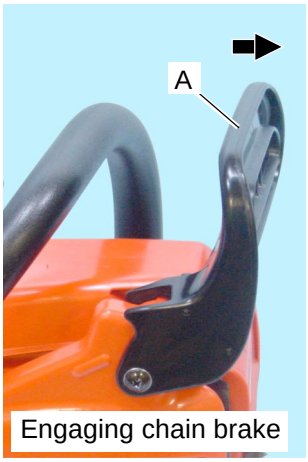
NOTE: It is IMPORTANT to retighten muffler bolts after running test.

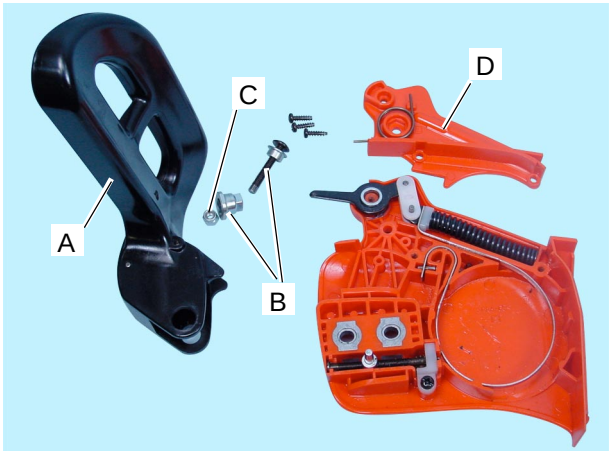
8 CHAIN BRAKE SYSTEM

(A) Brake lever
(B) Screw
(C) Collar
(D) Collar
(E) Lock nut
(F) Brake connector
(G) Brake cover
(H) Torsion spring
(J) Roller
(K) Brake band
(L) Spacer
(M) Compression spring
(N) Sprocket guard



8-1 Disassembling chain brake





WARNING ⚠ DANGER

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

1. Move brake lever to the releasing position of chain brake. And remove sprocket guard from unit.

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

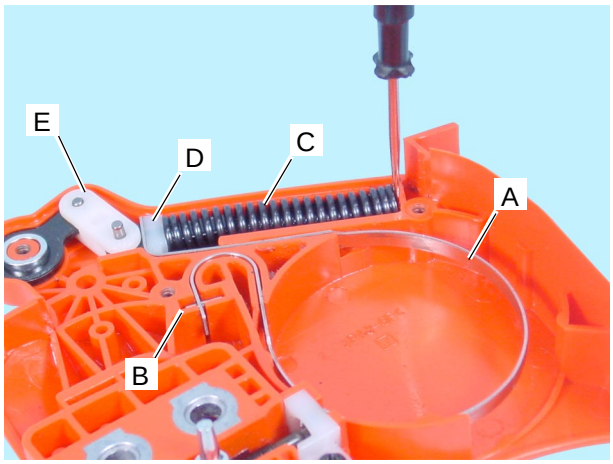
3. Loosen screw securing brake lever (A) and remove collar (B), lock-nut (C), and brake lever.

NOTE: Make it sure that the brake lever is in engaging position before removing brake lever, otherwise the spring may jump out.

4. Loosen screw securing brake cover (D) and remove brake cover.

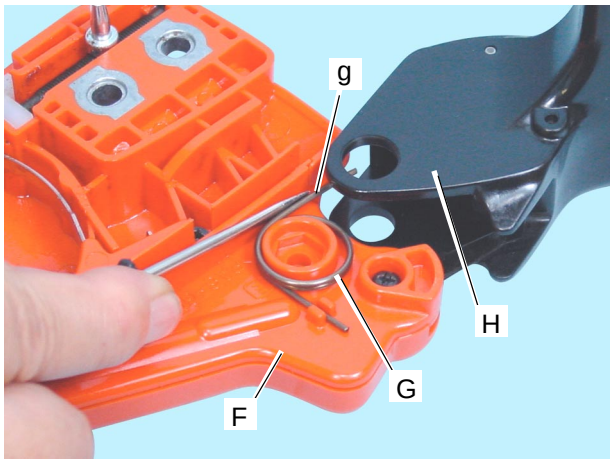
5. Check whether all the brake parts for damage and replace them as required.

8-2 Assembling brake parts



1. Install pin (B) through brake band (A) hole. Assemble the brake band together with pin (B), compression spring (C), spacer (D) and brake connector (E) to sprocket guard as shown.

2. Apply molybdenum grease on whole of compression spring (C) and friction part of other parts.



3. Install brake cover (F).

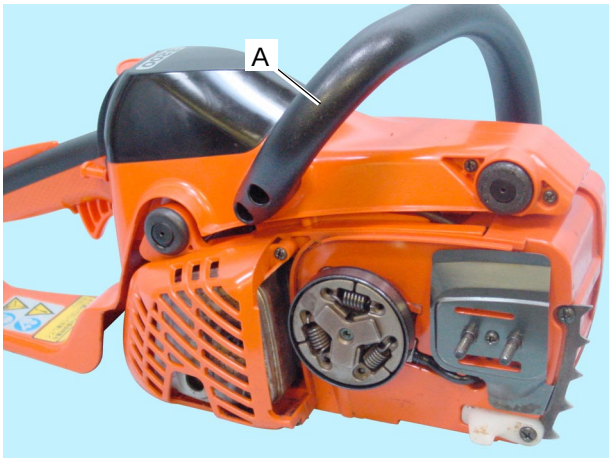
4. Set torsion spring (G) and install end (g) of torsion spring (G) to inside of brake lever (H) using small brade screw driver.

5. Install brake lever (H) and fasten screw with spacer (2 pcs) and lock nut.

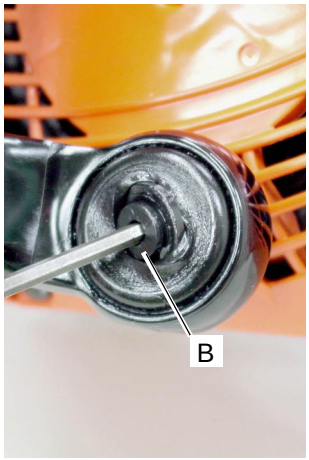
6. Check whether the chain brake operates properly.

9 HANDLE AND CONTROL SYSTEM

9-1 Removing front handle

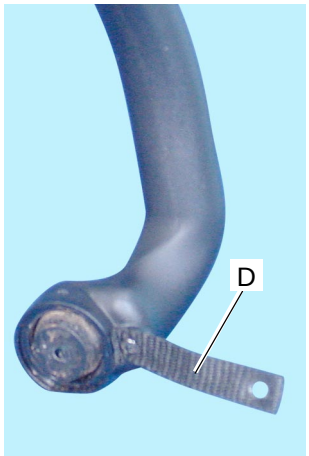


1. Remove screws securing front handle (A) on clutch side.



2. Remove cap (B) in handle cushion of starter side, and loosen cushion bolt and remove front handle (A) from unit.

9-2 Installing front handle



1. Install strap (D) on front handle (starter side) as shown.

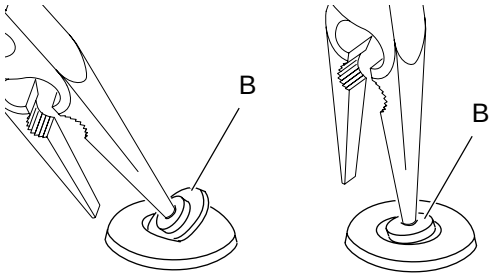
2. Install front handle (clutch side) into dent part of rear handle.

3. Pass cushion bolts (C) through hole of strap (D) and tighten the bolt.

4. Apply grease in the cushion.

(continued)

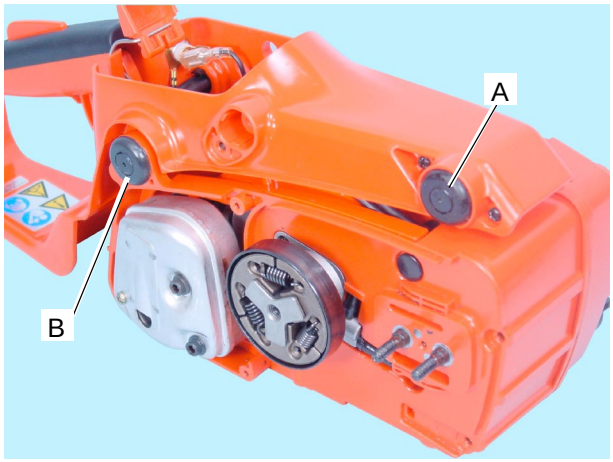
9-2 Installing front handle (continued)



5. Install cap (B) as shown.

6. Tighten screws securing front handle (clutch side).

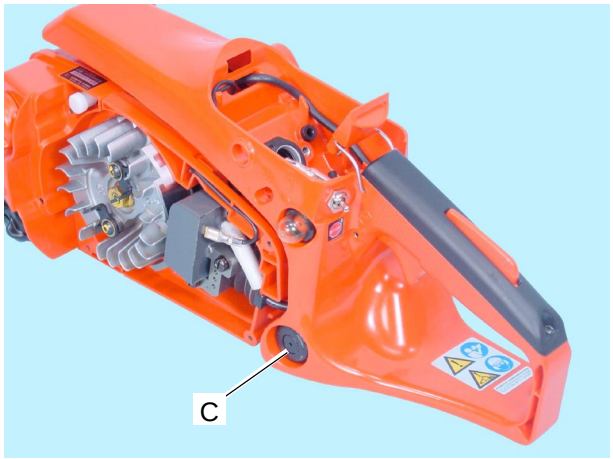
9-3 Removing rear handle



1. Remove front handle with stater assembly.

2. Remove air cleaner cover, air filter elbow and carburettor.

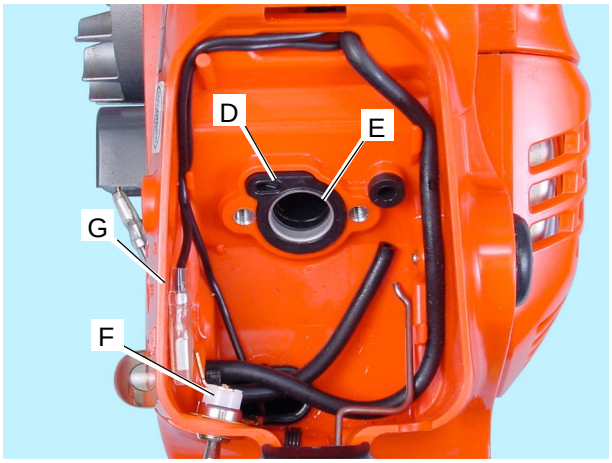
3. Remove switch lead connector.



4. Remove cushion cap (A) of front side rear handle, cushion cap (B) of rear side of rear handle and cushion cap (C) of starter side of rear handle. And then loosen cushion bolts.

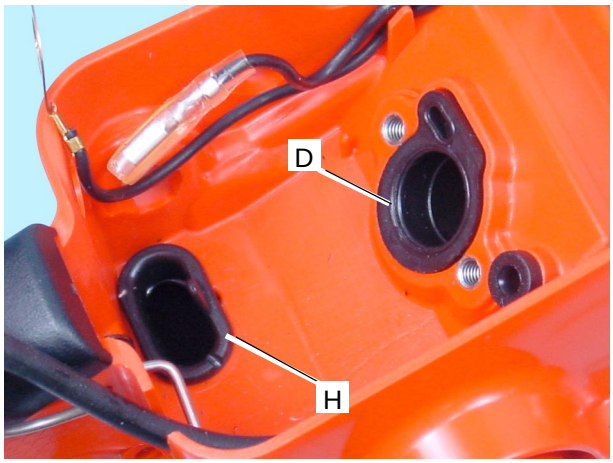
(continued)

9-3 Removing rear handle (continued)



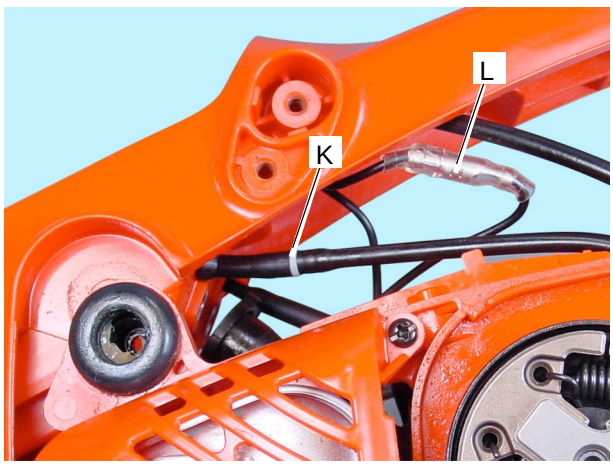
5. Remove collar (E) from intake bellows (D).

6. Loosen nut securing switch (F) and remove ignition switch (F) from rear handle (G). Remove primer from rear handle and remove return pipe from primer.



7. Push out intake bellows (D) and intake pipe (H) to engine cover side to remove from rear handle.

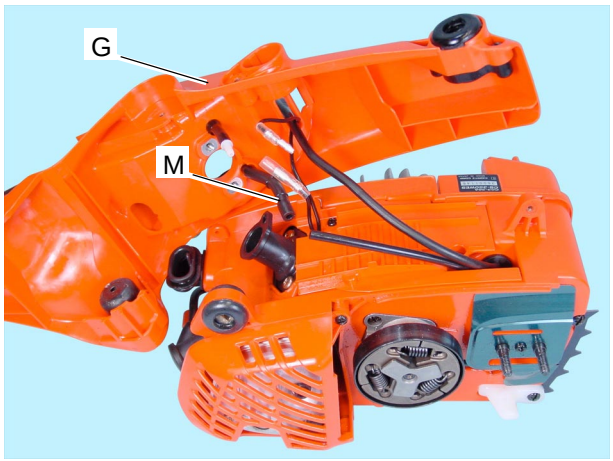
NOTE: Do not use sharp tool to remove intake bellows to prevent it from damage. If damage, replace with new one.



8. Lifting rear handle a little, disconnect fuel pipe (K) and connector of switch ground lead (L).

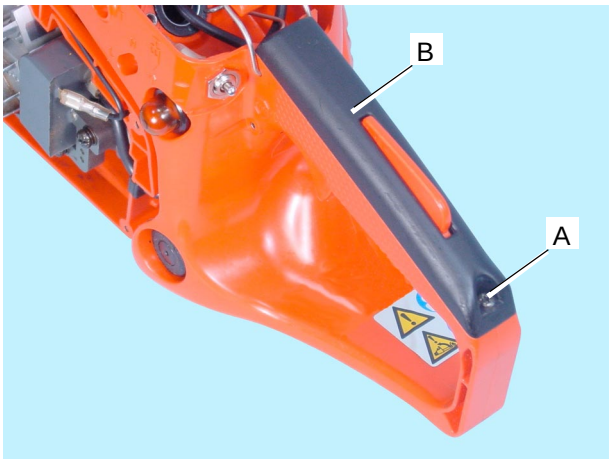
(continued)

9-3 Removing rear handle (continued)

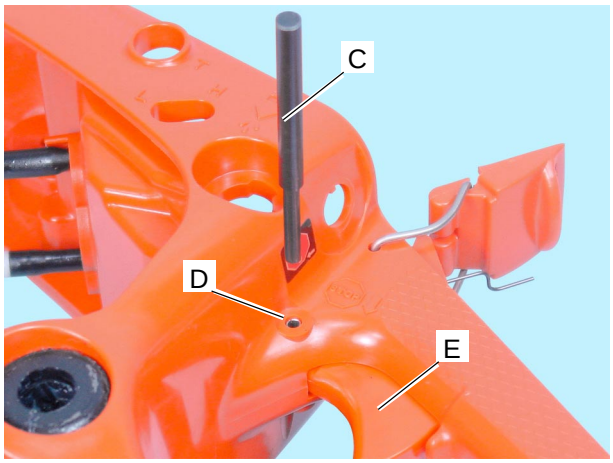


9. Removing pulse pipe (M) from crankcase fitting, remove rear handle (G) from engine cover.

9-4 Replacing throttle trigger



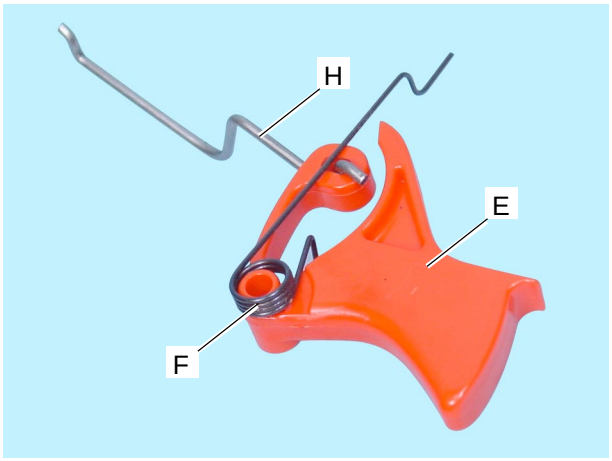
1. Loosen screw (A) securing handle cover, and remove handle cover (B).



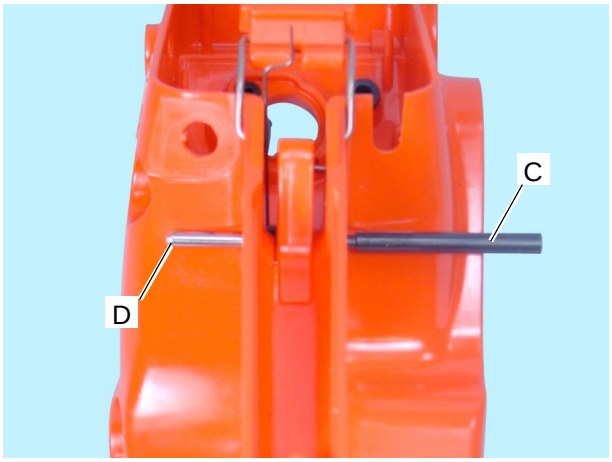
2. Remove spring pin (D) using spring pin tool 897724-01361 (C) and remove throttle trigger (E).

(continued)

9-4 Replacing throttle trigger (continued)



3. Set torsion spring (F) and throttle rod (H) on throttle trigger (E) as shown.

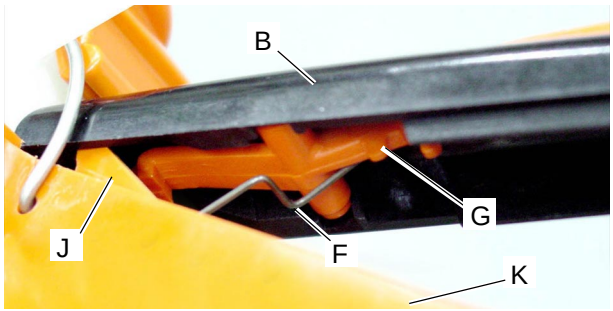


4. Install the throttle trigger (E) with torsion spring and throttle rod on rear handle (K) and insert throttle shaft (D) as follows.

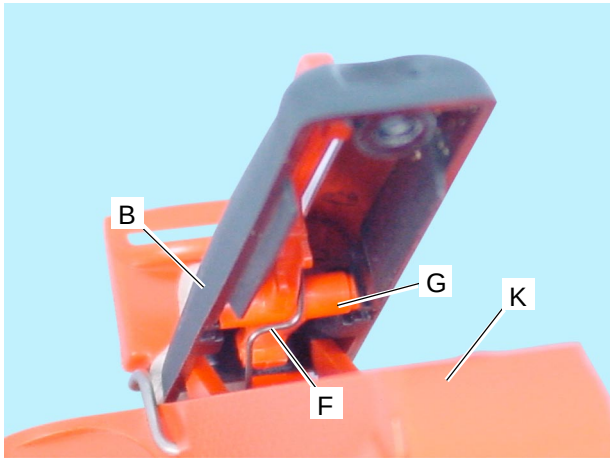
① Insert throttle shaft (D) in the hole of rear handle as the tip of the shaft does not protrude inside.

② Install throttle trigger (E) with torsion spring and throttle rod using spring pin tool (C) from the other side tentatively.

③ Lightly tap and insert throttle shaft (D) pushing out the spring pin tool (C).

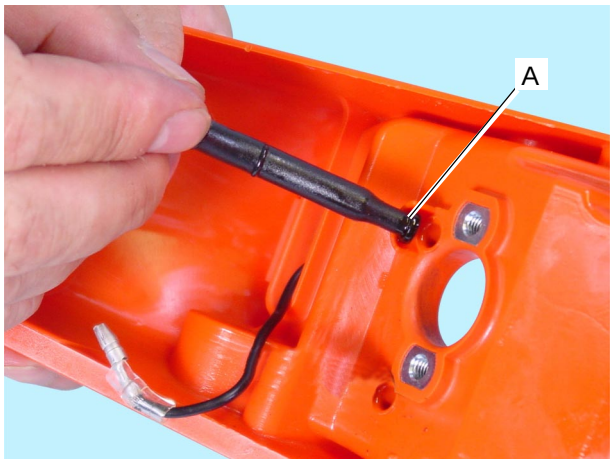


5. Inspect throttle control lock out (G) for cracking or wear. Replace as required.

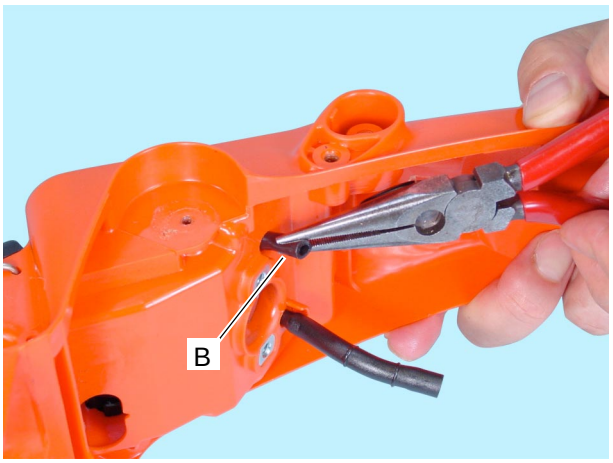


6. Hook end of handle cover (B) on tab (J) of rear handle (K), and assemble handle cover (B) on rear handle (K), setting torsion spring (F) with throttle control lock out (G) as shown. Tighten screw securing handle cover (B). Check throttle trigger and throttle control lock out for moving correctly.

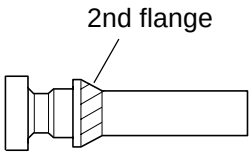
9-5 Installing rear handle

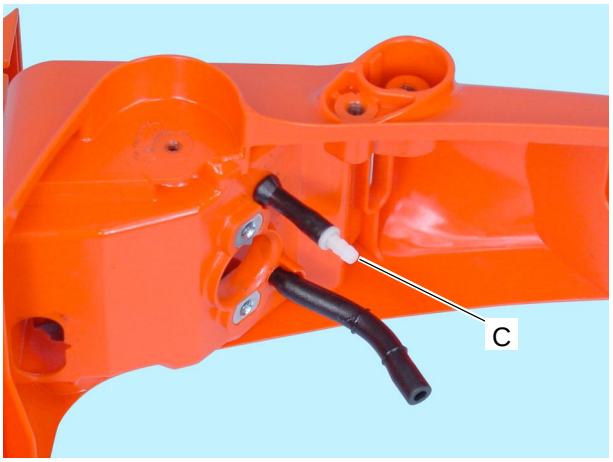


1. Apply oil on flange (A) of pulse pipe and install it in the hole of rear handle.



2. Apply oil on 2nd flange of short fuel pipe (B) and pull it in the hole of rear handle using long nose pliers with taking care of damage.

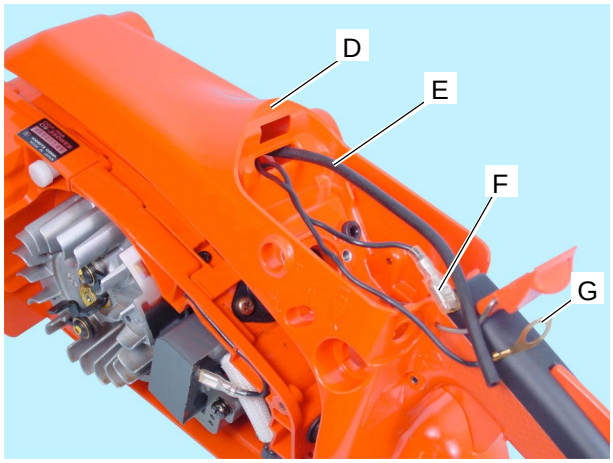




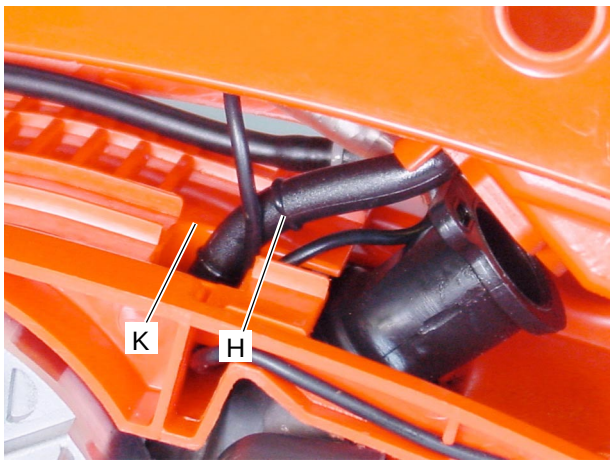
3. Put connector (C) in the pipe.

(continued)

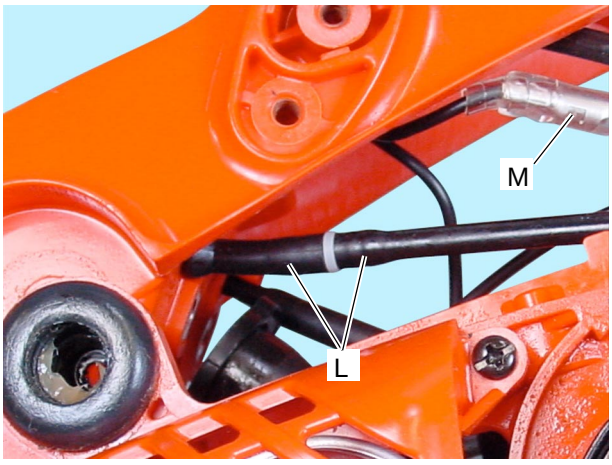
9-5 Installing rear handle (continued)



4. Put rear handle (D) on engine cover, pass return pipe (E), lead (F) and ground lead (G) through hole of rear handle as shown.



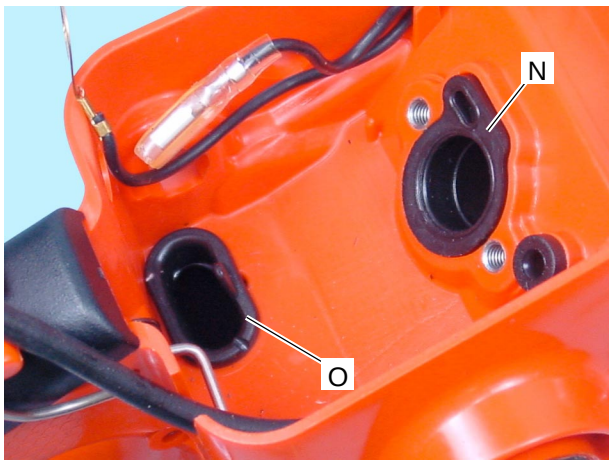
5. Insert pulse pipe until upper eye mark (H) faces with level of dust cover (K).



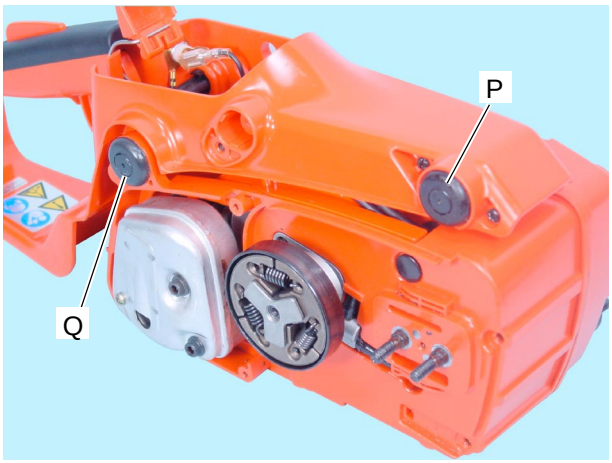
6. Connect fuel pipe (L) and switch ground lead (M).

(continued)

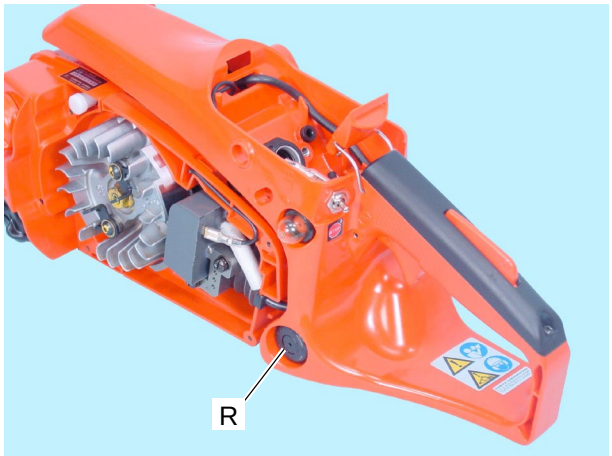
9-5 Installing rear handle (continued)



7. Install intake bellows (N) and intake pipe (O) on rear handle, using blade screw driver with taking care of damage. Install collar on intake bellows (N).

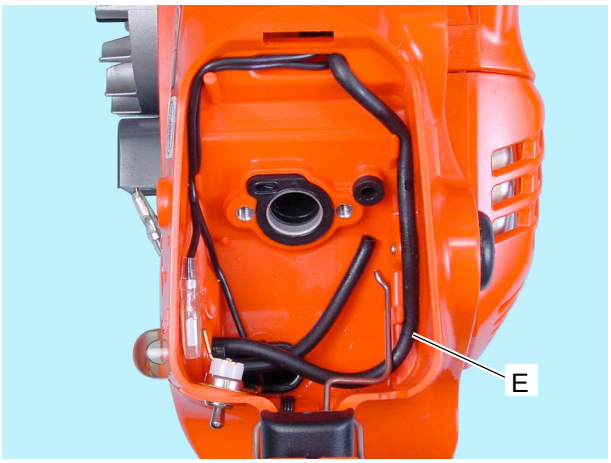


8. Tighten cushion bolts in rear handle front side cushion (P), rear handle rear side cushion (Q) and starter side cushion (R). And install cushion caps.

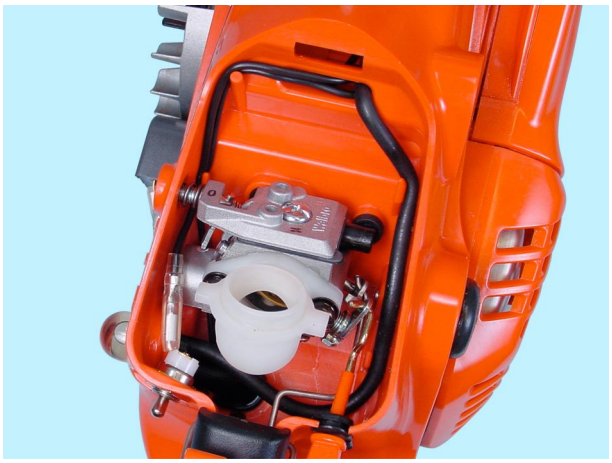


(continued)

9-5 Installing rear handle (continued)



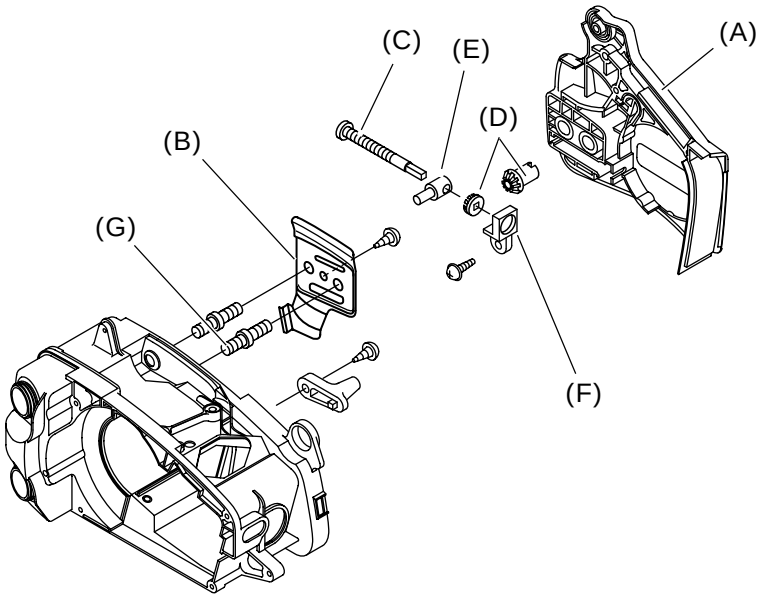
9. Connect return pipe (E) to primer.



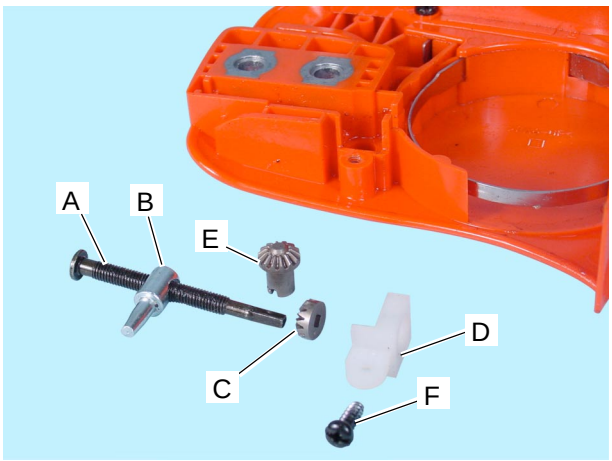
10. Set pipes and leads at correct positions respectively, and install carburetor and all other removed parts.

10 GUIDE BAR MOUNTING SYSTEM

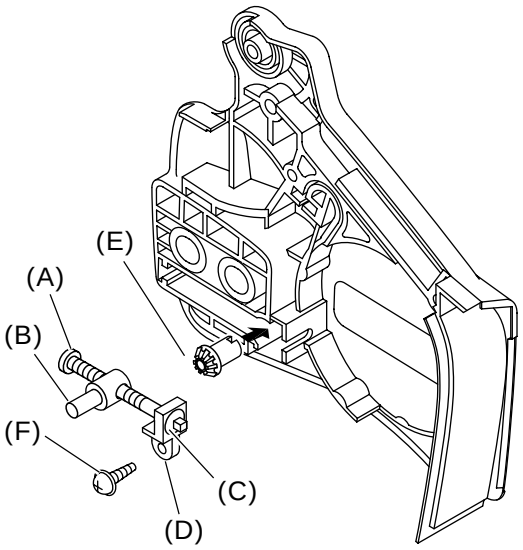
(A) Sprocket guard
(B) Sprocket guard plate
(C) Tensioner screw
(D) Bevel gear
(E) Chain tensioner
(F) Collar
(G) Guide bar stud



10-1 Replacing chain tensioner



1. Remove tensioner screw (A), bevel gears (C)(E) and chain tensioner (B). Check them for bent, damage or wear. Replace it (them) as required.



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

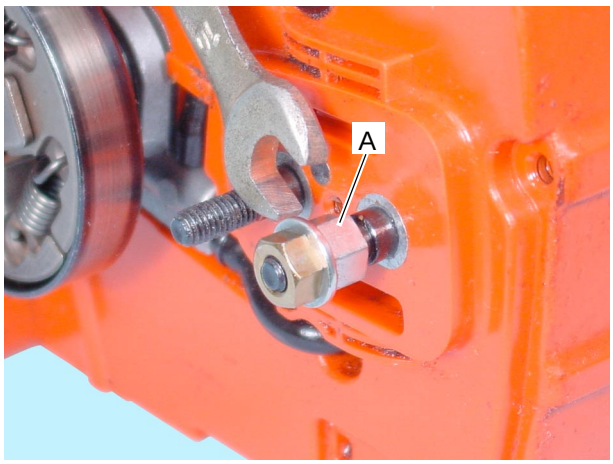
3. Screw chain tensioner on tensioner screw.

4. Insert tensioner screw in bevel gear (C) and set collar (D) on the bevel gear (C).

5. Install bevel gear (E) and subassembled tensioner screw (A), chain tensioner (B), bevel gear (C) and collar (D) on sprocket guard. Check the engagement of bevel gears (E) (C) turning tensioner screw (A).

6. Fasten screw (F) securing collar.

10-2 Replacing guide bar stud

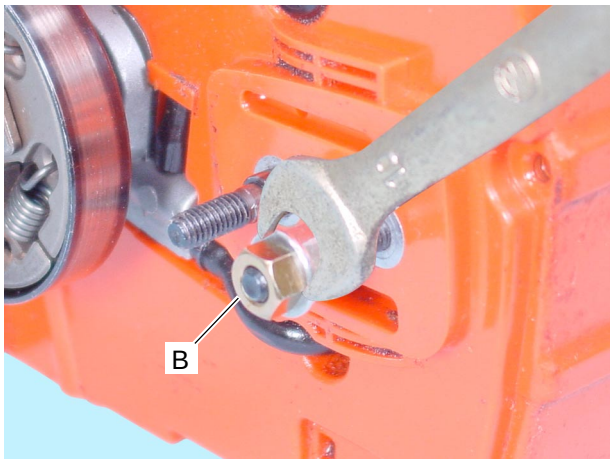


1. Install two nuts on defective stud and tighten them against each other.

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

3. If hard to remove or the stud is broken and too short for tightening 2 nuts, hold defective stud by vise and turn the chain saw body counterclockwise, or use a suitable stud remover.

4. Install two nuts to new stud and tighten them against each other.

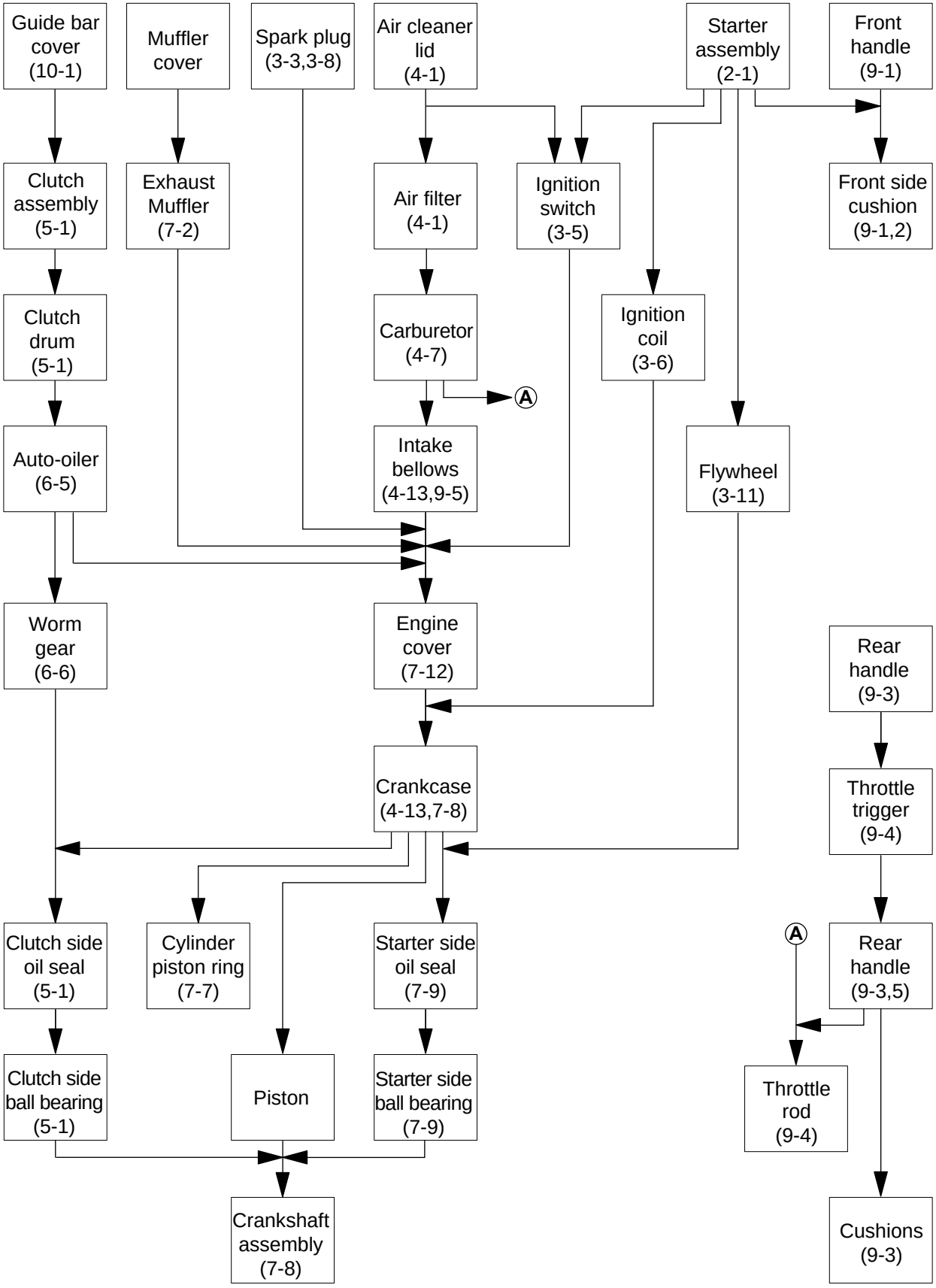


NOTE: Apply a small amount of thread locking sealant in the thread hole (loctite #675 or equivalent).

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

11 MAINTENANCE GUIDE

11-1 Disassembly Chart



11-2 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 overheats.	**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**

CHECKING	REFERENCES	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
																Check ◎ first.
Starter system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Starter pawl / spring	2-1															◎
Starter drum / rope	2-2															○
Rewind spring	2-2															○
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	3-8							○							○	
Ignition switch	3-5, 3-6			◎				○							○	
Ignition coil	3-7, 3-9							○			○	○	○		○	
Pole shoe air gaps	3-10							○		○			○			○
Flywheel	3-11							○					○		○	
Flywheel key	3-11								○	○			○		○	

(Continued)

11-2 Troubleshooting guide (continued)

CHECKING	REFERENCES															Check ◎ first.
Fuel system / Carburetor		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Air filter	4-1					○				○	○	○	○			
Fuel cap / filter	4-2								○	○	○	○	○			
Carburetor adjustment	4-15					◎			○	◎	◎	◎	◎		○	
Fuel tank / line / vent	4-4, 4-5									○	○	○	○	○	○	
Carburetor leakage	4-8					○				○	○	○	○	○	○	
Carburetor metering lever height	4-9					○				○	○	○	○	○	○	
Carburetor diaphragms	4-10					○				○	○	○	○	○	○	
Carburetor inlet needle valve	4-11					○					○	○	○	◎	○	
Welch plug	4-12								○			○	○			
Crankcase pulse passage	4-13										○	○	○			
Primer	4-3														○	
Throttle control parts	9-4									○		○	○			
Clutch system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Clutch shoes / spring / bearing	5-2	○			○		○						○			
Clutch drum	5-1	○			○		○						○			
Sprocket	1-5, 5-1	○			○								○			
Saw chain lubrication system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Oil cap	6-1	○	○													
Oil tank / line / filter	6-2, 6-3	○	◎													
Oil check valve	6-3	○	○													
Auto-oiler	6-8	○	○													
Guide bar / Oil holes	Clean	○														
Compression / Exhaust system		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Cooling air passage	7-1								◎	○						
Muffler / Exhaust port	7-2						◎			○	○	○				
Cylinder compression	1-2, 7-3						○		○	○			○		○	
Crankcase / cylinder seal	7-4								○	○	○		○		○	
Crankcase / Cylinder	7-4						○		○	○			○			
Piston / Piston ring	7-7						○		○	○			○		○	○
Crankshaft / Ball bearings	7-8, 7-9				○			○		○			○		○	○
Others		**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**
Chain brake	8-1, 8-2									○		○	○			
Cushions	9-1, 9-3				○											
Chain tensioner	10-1	○														
Saw chain	Replace / Sharpen	◎	○		◎											

11-3 Service Intervals

Check point	Service	Reference	Intervals			
			Daily	3 months or 100 hours	6 months or 300 hours	Yearly or 600 hours
Screws, bolts, and nuts	Inspect / Retighten / Replace		○			
Air filter	Clean	4-1	○			
	Replace			○		
Carburetor	Inspect / Rebuild	4-8			○	
	Replace	4-7, 4-14				○
Fuel leaks	Inspect / Repair	4-2, 4-4	○			
Fuel line	Inspect / Repair	4-4		○		
Choke system	Inspect / Clean / Replace	4-7	○*1			
Cooling system	Inspect / Clean	7-1	○			
Spark plug	Clean / Regap	3-3		○		
	Replace	3-3			○	
Fuel strainer	Clean / Replace	4-2		○		
Leads and connections	Inspect / Repair	3-4		○		
Fuel tank	Clean inside.	4-4		○		
Muffler and exhaust port	Clean	4-2		○		
Starter rope	Inspect / Clean	2-2	○			
Oil filter	Inspect / Replace	6-1		○		
Sprocket	Inspect / Replace	1-5, 5-1		○		
Guide bar	Inspect / Clean		○			
Chain brake	Inspect / Replace	8-1, 8-2	○			

Daily: Checking in every services.

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

*1: User should check every refuel.

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