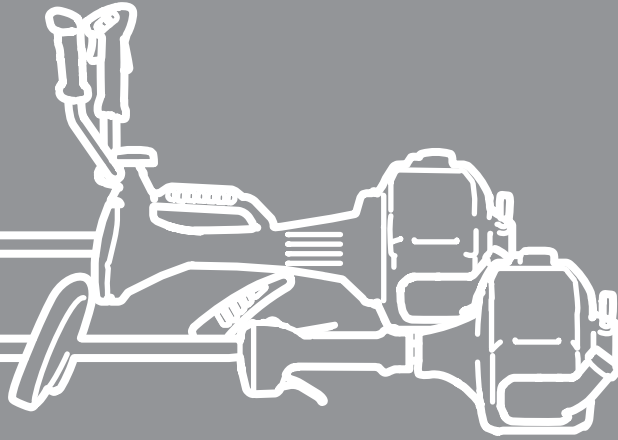


ECHO®

shindaiwa®



SERVICE MANUAL

ECHO: SRM-420ES SRM-420TES

shindaiwa: T410S B410S

T410TS B410TS

(Serial number: 37000001 and after)

REVISED NOV. 2018

Ref. No. 402-44

INTRODUCTION

This service manual contains information for service and maintenance of **ECHO TRIMMER / BRUSHCUTTER**, models **SRM-420ES** and **SRM-420TES**, **shindaiwa TRIMMER / BRUSH-CUTTER**, models **T410S**, **B410S**, **T410TS** and **B410TS**.

For systematic diagnosis, to avoid extra work and time loss, please refer to "Troubleshooting guide" that describes problems, testings, remedies and references. We recommend you make use of Operator's Manual and Parts Catalogue together with this manual when servicing.

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

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SERVICE INFORMATION

1 SERVICE INFORMATION

1-1 Specifications

Model		SRM-420ES (L) T410S	SRM-420ES (U) B410S		
Dimensions* ¹	Length	mm (in) 1840 (72.4)			
	Width	mm (in) 355 (14.0)	700 (27.6)		
	Height	mm (in) 287 (11.3)	585 (23.0)		
Dry weight* ²	kg (lb)	7.8 (17.2)	8.5 (18.7)		
Engine	Type	YAMABIKO, air-cooled, two-stroke, single cylinder			
	Rotation	Counterclockwise as viewed from the output end			
	Displacement	cm ³ (in ³)	41.5 (2.532)		
	Bore	mm (in)	40.0 (1.575)		
	Stroke	mm (in)	33.0 (1.299)		
	Compression ratio		6.7		
Carburetor	Type	Rotary type : Diaphragm, horizontal-draft with purge bulb			
	Model	WT-1046	WT-1046 WT-1170		
	Venturi size-Throttle bore	mm (in)	12.7 - 14.3 (0.50 - 0.56)		
Ignition	Type	CDI (Capacitor discharge ignition) system, Digital magneto			
	Spark plug	BPMR8Y			
Exhaust	Muffler type	Spark arrester muffler with catalyst			
Starter	Type	ES-start (effortless) / Soft Start			
	Rope diameter x length	mm (in)	3.8 x 910 (0.15 x 35.9)		
Fuel* ³	Type* ⁴	Mixed two-stroke fuel			
	Mixture ratio	50 : 1 (2%)			
	Gasoline	Minimum 89 octane			
	Two-stroke engine oil	ISO-L-EGD (ISO/CD13738), JASO FC/FD			
	Tank capacity	L (U.S.fl.oz.)	Full tank capacity: 0.69 (23.3) Usable capacity: 0.60 (20.3)		
Clutch	Type	Centrifugal, 2-shoe pivot			
Handle	Type	Front:	Crescent loop with cushion grip	U-handle with integrated control grip	
		Rear:	Integrated control grip with cushion		
Drive shaft	Type	Solid type with serration (10-tooth)			
	Diameter - Length	mm (in)	8.0 - 1588 (0.31 - 62.52)		
	Housing (Main pipe)	OD - ID	mm (in)	28.0 - 24.0 (1.10 - 0.94)	
		Length	mm (in)	1537 (60.5)	
Gear case	Reduction ratio	1.33			
	Gear tooth	Spiral bevel gear			
	Lubrication	Lithium based grease			
Cutter	Type	Nylon line cutter DS-5	3-tooth blade (255 mm) Nylon line cutter DS-5		
	Arbor diameter for blade	mm (in)	25.4 (1.0)		
	Fastener type, size	mm	Left-hand thread nut, M10 x 1.25 pitch		
	Cutting rotation		Counterclockwise as viewed from top		

1-1 Specifications (continued)

Model		SRM-420TES (L) T410TS	SRM-420TES (U) B410TS
Dimensions* ¹	Length	mm (in) 1852 (72.8)	
	Width	355 (14.0)	700 (27.6)
	Height	312 (12.3)	620 (24.4)
Dry weight** ²		kg (lb) 8.0 (17.6)	8.7 (19.2)
Engine	Type	YAMABIKO, air-cooled, two-stroke, single cylinder	
	Rotation	Counterclockwise as viewed from the output end	
	Displacement	cm ³ (in ³) 41.5 (2.532)	
	Bore	mm (in) 40.0 (1.575)	
	Stroke	mm (in) 33.0 (1.299)	
	Compression ratio	6.7	
Carburetor	Type	Rotary type : Diaphragm, horizontal-draft, with purge bulb	
	Model	WT-1046	WT-1046 WT-1170
	Venturi size-Throttle bore	mm (in) 12.7 - 14.3 (0.50 - 0.56)	
Ignition	Type	CDI (Capacitor discharge ignition) system, Digital magneto	
	Spark plug	BPMR8Y	
Exhaust	Muffler type	Spark arrester muffler with catalyst	
Starter	Type	ES-start (effortless) / Soft Start	
	Rope diameter x length	mm (in) 3.8 x 910 (0.15 x 35.9)	
Fuel* ³	Type* ⁴	Mixed two-stroke fuel	
	Mixture ratio	50 : 1 (2%)	
	Gasoline	Minimum 89 octane	
	Two-stroke engine oil	ISO-L-EGD (ISO/CD13738), JASO FC/FD	
	Tank capacity	Full tank capacity: 0.69 (23.3) Usable capacity: 0.60 (20.3) L (U.S.fl.oz.)	
Clutch	Type	Centrifugal, 2-shoe pivot	
Handle	Type	Front:	Crescent loop with cushion grip
		Rear:	Integrated control grip with cushion
Drive shaft	Type	Solid type with serration (10-tooth)	
	Diameter - Length	mm (in) 8.0 - 1588 (0.31 - 62.52)	
	Housing OD - ID	mm (in) 28.0 - 24.0 (1.10 - 0.94)	
	(Main pipe) Length	mm (in) 1537 (60.5)	
Gear case	Reduction ratio	2.08	
	Gear tooth	Spiral bevel gear	
	Lubrication	Lithium based grease	
Cutter	Type	Nylon line cutter B6	
	Arbor diameter for blade	mm (in) 25.4 (1.0)	
	Fastener type, size	mm Left-hand thread nut, M10 x 1.25 pitch	
	Cutting rotation	Anticlockwise as viewed from top	

OD: Outer diameter. **ID:** Inner diameter.

*¹ Without Nylon line head *² Without Nylon line head and Shield *³ Refer to Operator's manual

*⁴ Premixed alkylate fuel for 2-stroke can be used

1-2 Technical data

Model	SRM-420ES T410S, B410S	SRM-420TES T410TS, B410TS	
Engine			
Compression pressure	MPa (kgf/cm ²) (psi)	0.92 (9.4) (132)	
Clutch engagement speed	r/min	3,700	
Ignition system			
Spark plug gap	mm(in)	0.6 - 0.7 (0.024 - 0.028)	
Spark test	Tester gap w/ spark plug	mm(in)	4.0 (0.16)
	Tester gap w/o spark plug	mm(in)	6.0 (0.24)
Secondary coil resistance	Ω	930 - 970	
Pole shoe air gaps	mm(in)	0.3 - 0.4 (0.012 - 0.016)	
Ignition timing	at 3,000 r/min	°BTDC	12
	at 8,500 r/min	°BTDC	29
Carburetor			
Test Pressure, minimum	MPa (kgf/cm ²) (psi)	0.05 (0.5) (7.0)	
Metering lever height	mm(in)	1.65 (0.06) lower than diaphragm seat	
Tool to adjust mixture needles		D-shaped (L) P/N X645-000031	
Carburetor adjustment			
Cutting head preparation	Nylon line cutter	DS-5	B6
	Line length* ¹	190 mm without shield	240 mm without shield
1) Initial setting	H mixture needle	turn out	3
	L mixture needle	turn out	2 3/8
	Throttle adjust screw	turn in* ²	2 1/8
Engine warm-up	Idle - WOT : Total	sec.	10 - 50 : 180
2) Find idle maximum speed			Adjust L mixture needle to maximum idle speed* ³
3) Set idle maximum speed w/ TAS		r/min	3,550
4) Set idle speed by turning L mixture needle CCW		r/min	2,750
5) Find WOT maximum speed		r/min	Adjust H mixture needle to maximum WOT speed
6) WOT setting		r/min	Turn H mixture needle CCW to decrease WOT speed by : 120
7) Verify final engine speed with standard equipment		r/min	Idle: 2,400 - 3,200
		r/min	WOT: 9,500 - 10,500* WOT: 10,500 - 11,500**
8) Verify clutch engagement speed			Confirm clutch engagement speed. If it is less than 1.25 times the idle speed, adjust the idle speed by turning TAS CCW.

BTDC: Before top dead center. **WOT:** Wide open throttle **CCW:** Counterclockwise **TAS:** Throttle adjust screw

* With Nylon line head and shield ** With 3-tooth blade (255 mm)

*¹ From eyelet on nylon head

*² Set Throttle adjust screw to the point that its tip just contacts throttle plate before initial setting.

*³ If clutch engages during adjustment process 2), decrease engine speed by turning TAS CCW until clutch disengages and then redo 2).

1-3 Torque limits

Descriptions		Size	kgf•cm	N•m	in•lbf
Starter system	Pawl	M5	60 - 90	6 - 9	50 - 80
	Starter case	M5* ³	30 - 45	3 - 4.5	26 - 40
Ignition system	Magneto rotor (Flywheel)	LM8	200 - 240	20 - 24	175 - 210
	Ignition coil	M5	50 - 70	5 - 7	45 - 60
	Spark plug	M14	130 - 170	13 - 17	115 - 150
	Fan cover	M5	50 - 70	5 - 7	45 - 60
Fuel system	Carburetor	M5	40 - 55	4 - 5.5	35 - 50
	Intake bellows	M5* ³	30 - 50	3 - 5	26 - 45
	Intake insulator	M5* ³	50 - 70	5 - 7	45 - 60
	Insulator plate	M5* ³	30 - 45	3 - 4.5	26 - 40
	Fuel tank bracket	M5	50 - 70	5 - 7	45 - 60
	Fuel tank	M5	50 - 70	5 - 7	45 - 60
Clutch	Clutch shoe	M6	70 - 110	7 - 11	60 - 95
Engine	Crankcase	M5* ²	70 - 110	7 - 11	60 - 95
	Cylinder	M5* ²	70 - 110	7 - 11	60 - 95
	Cylinder cover	M5* ³	20 - 30	2 - 3	17 - 26
	Inner cylinder cover	M5* ³	30 - 45	3 - 4.5	26 - 40
	Stand	M5* ³	20 - 30	2 - 3	17 - 26
	Muffler	M6	100 - 140	10 - 14	90 - 125
	Muffler cover	M5* ¹	30 - 45	3 - 4.5	26 - 40
	Muffler stay	M5	60 - 90	6 - 9	50 - 80
Others	Blade fastening nut	LM10	280 - 320	28 - 32	245 - 280
Regular bolt, nut, and screw		M3	6 - 10	0.6 - 1	5 - 9
		M4	15 - 25	1.5 - 2.5	13 - 22
		M5	25 - 45	2.5 - 4.5	22 - 40
		M6	45 - 75	4.5 - 7.5	40 - 65
		M8	110 - 150	11 - 15	95 - 130
		M10	210 - 300	21 - 30	180 - 260

LM: Left hand thread.

*¹ Apply thread locking sealant. (See "1-4 Special repairing materials")

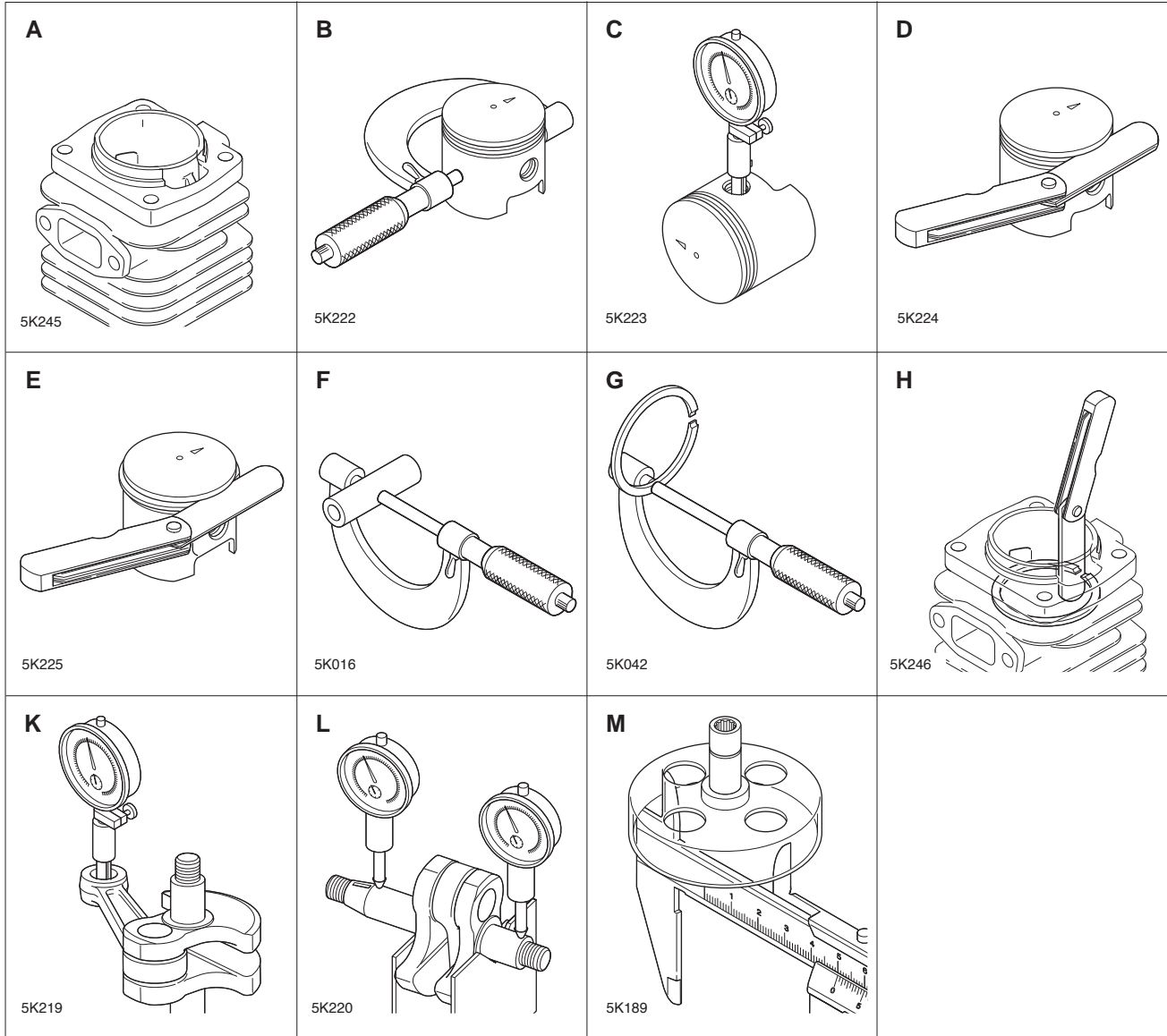
*² The torque differences among four bolts should not exceed 20 kgf•cm (2N•m, 17in•lbf) on one cylinder or crankcase.

*³ Precoat bolt: If old thread locking sealant is left in threads, correct torque may not be secured. In case old thread locking sealant is left, remove it .

1-4 Special repairing materials

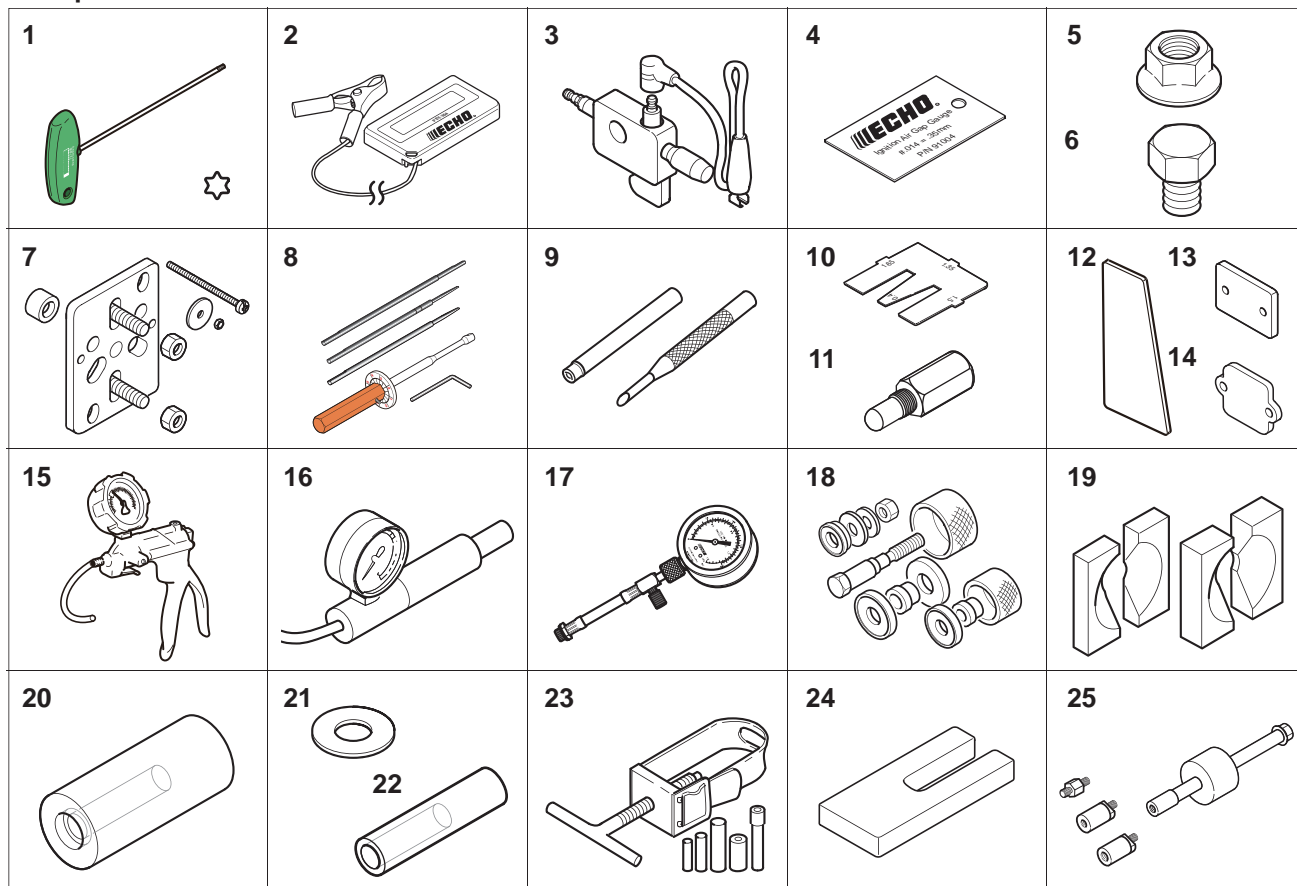
Material	Location	Remarks
Grease	Gear case	Lithium based grease
	Rewind spring	
	Starter center post	
Oil	Oil seal inner lips	Two-stroke engine oil or engine oil (SAE#30)
	Intake bellows lips	
	Drive shaft	
Thread locking sealant	Muffler cover	Loctite #242, ThreeBond #1324 or equivalent
	Ignition switch	

1-5 Service limits



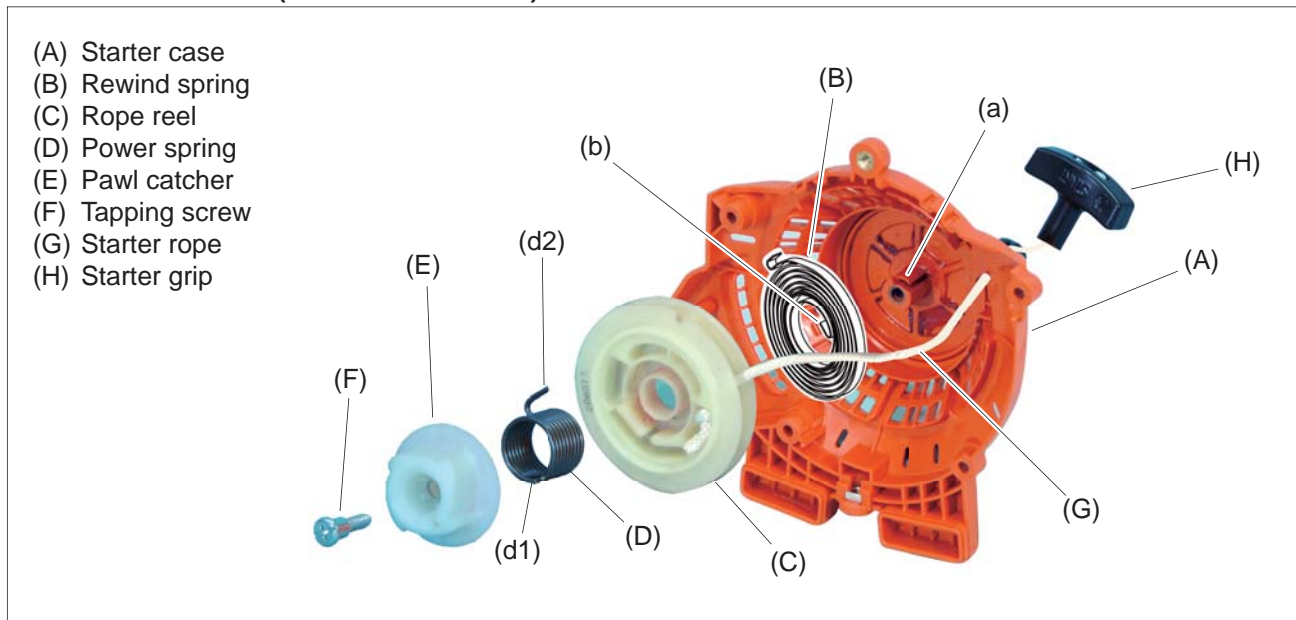
Description		mm (in)
A	Cylinder bore	When plating is worn and aluminum can be seen
B	Piston outer diameter	Min. 39.91 (1.571)
C	Piston pin bore	Max. 10.035 (0.3951)
D	Piston ring groove	Max. 1.6 (0.063)
E	Piston ring side clearance	Max. 0.1 (0.004)
F	Piston pin outer diameter	Min. 9.98 (0.3929)
G	Piston ring width	Min. 1.45 (0.057)
H	Piston ring end gap	Max. 0.5 (0.02)
K	Con-rod small end bore	Max. 13.025 (0.5128)
L	Crankshaft runout	Max. 0.02 (0.001)
M	Clutch drum bore	Max. 71.5 (2.81)

1-6 Special tools



Key	Part Number	Description	Reference
1	X602-000340	Torx wrench (T27)	Removing and installing torx bolt
2	PET304	Tachometer PET-304	Measuring engine speed to adjust carburetor
3	897800-79931	Spark tester	Checking ignition system
4	91004	Module air gap gauge	Adjusting pole shoe air gaps
5	V265-000200	Flange nut	Removing crankshaft from crankcase (clutch side)
6	900100-08008	Bolt	Removing crankshaft from crankcase (clutch side)
7	Y089-000111	Puller	Removing magneto rotor
8	Y089-000094	Carburetor adjustment tool	Adjusting carburetor
9	90101	Welch plug tool (ZAMA)	Removing and installing welch plug
10	897563-19830	Metering lever gauge	Measuring metering lever height on carburetor
11	X644-000020	Piston stopper	Locking crankshaft rotation
12	91041	Pressure rubber plug	Plugging exhaust port to test crankcase / cylinder leakages
13	897826-16131	Pressure rubber plug	Plugging intake port to test crankcase / cylinder leakages
14	897827-16131	Pressure plate	Plugging intake port to test crankcase / cylinder leakages
15	91149	Pressure / vacuum tester	Testing crankcase and cylinder leakages
16	897803-30133	Pressure tester	Testing carburetor and crankcase leakages
17	91037	Compression gauge	Measuring cylinder compression
18	897701-14732	Bearing tool	Removing and installing ball bearings on crankcase
19	897701-02830	Bearing wedge	Removing ball bearings on crankshaft
20	897714-24330	Oil seal tool	Installing ball bearings of gear case
21	363018-00310	Washer	Installing crankcase oil seal
22	897726-21430	Oil seal tool	Installing crankcase oil seal
23	897702-30131	Piston pin tool	Removing and installing piston pin
24	897719-02830	Piston holder	Making piston steady to remove and install piston/ring
25	P021-044870	PTO shaft puller	Removing PTO shaft

2 STARTER SYSTEM (ES-Start / Soft start)



Construction

1. Rewind spring (B) is installed on rope reel (C).
2. Rope reel (C) with rewind spring (B) is installed inside starter case (A).
3. Hook (a) located on the inside of starter case (A) engages with end (b) of rewind spring (B).
4. Power spring (D) is installed on rope reel (C).
5. Hook of power spring (d2) engages with rope reel (C) and top end hook (d1) of power spring engages with pawl catcher (E).

Working principle

1. When starter grip (H) is pulled, rope reel (C) rotates.
2. The rotation force of rope reel (C) is transmitted to pawl catcher (E) by power spring (D) that is connected with rope reel (C) and pawl catcher (E).
3. Pawl catcher (E) engages with starter pawls on flywheel to turn crankshaft.
4. The load from compression pressure in cylinder will keep crankshaft from rotating as power spring (D) is twisted and accumulates energy.
5. As starter grip (H) is pulled further, more energy is stored in power spring (D) until the accumulated energy is enough to overcome the compression pressure in cylinder.
6. When accumulated energy in power spring (D) overcomes the load from compression pressure in cylinder, crankshaft is rotated.
7. Power spring (D) absorbs compression resistance of cylinder and snatch back of engine during starting action.
8. When starter rope (G) is released, rope reel (C) is returned together with power spring (D) and pawl catcher (E) by rewind spring tension.
9. After engine starts, starter pawls pivot outward by centrifugal force and disengage from pawl catcher (E).

2-1 Disassembling starter assembly



1. Remove stand (A).
2. Remove muffer cover (B) and cylinder cover (C).

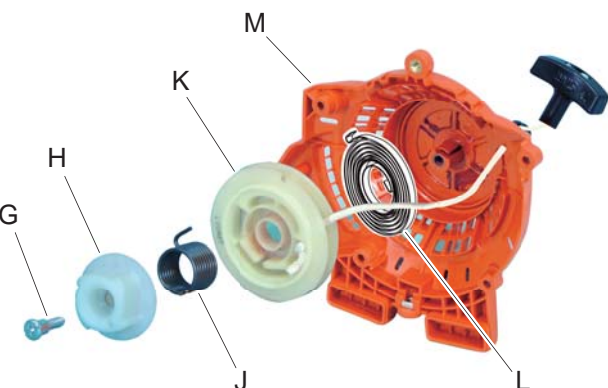


3. Remove four bolts (D) and starter assembly (E) from the unit.



4. Pull out starter rope about 30 cm (12 in) and hold rope reel (F) by hand. Loop excess rope in rope reel notch (f) as shown.

5. Rotate rope reel (F) clockwise to release tension of rewind spring.

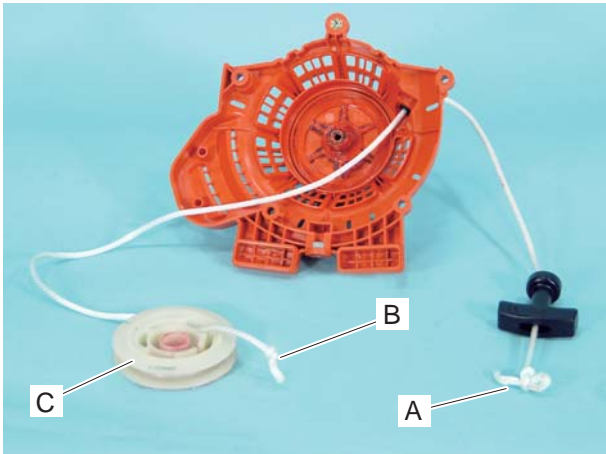


6. Remove tapping screw (G).
7. Remove pawl catcher (H) and power spring (J).
8. Remove rope reel (K) with rewind spring (L) from starter case (M) slowly to prevent rewind spring (L) from unwinding.

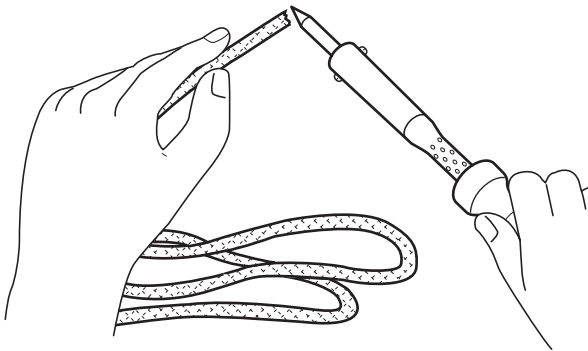
WARNING  **DANGER**

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

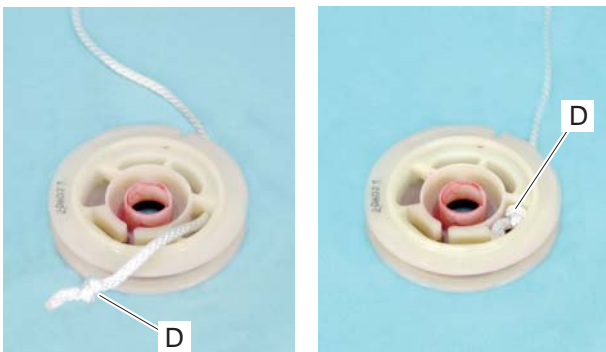
2-2 Replacing starter rope



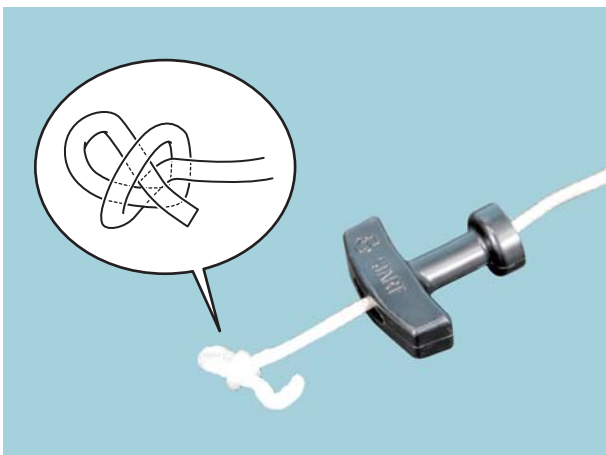
1. Pull out and untie knot (A).
2. Pull knot (B) to remove rope from rope reel (C).



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

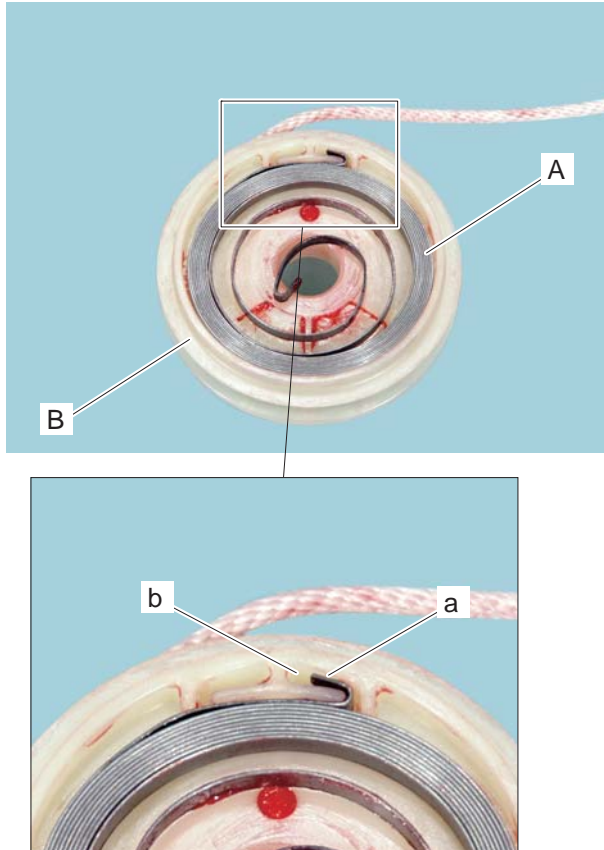


4. Make knot (D) at end of starter rope and pass starter rope through hole of rope reel, then press the knot (D) into recess as shown.



5. Pass other end of starter rope through starter case, from inside to outside.
6. Pass starter rope through starter grip. Make a knot as shown.
7. Tighten knot. Push the knot into recess of starter grip.

2-3 Installing rewind spring



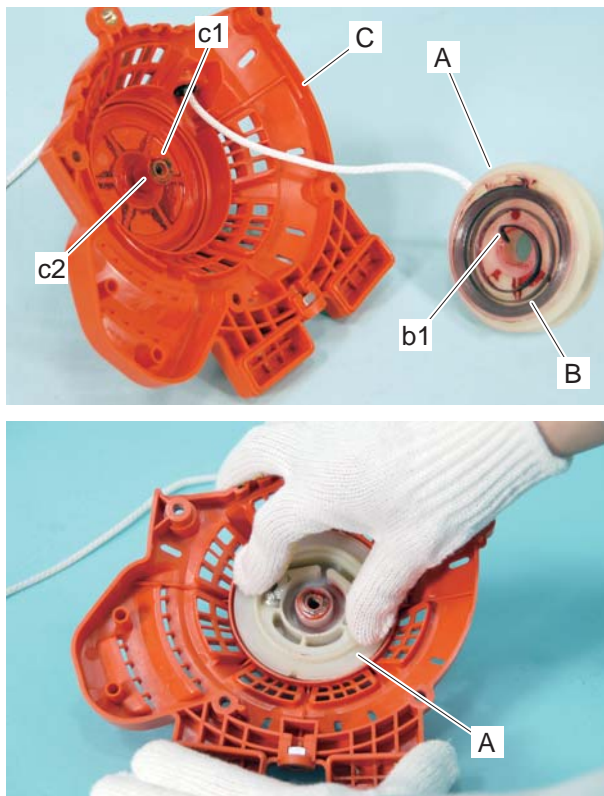
WARNING  **DANGER**
Use of eye protection and safety gloves are strongly recommended while working on rewind spring.

If rewind spring (A) is unwound from rope reel (B), follow steps below.

1) Wind spring inside rope reel, hooking outer hook (a) to holder (b) of rope reel (B) as shown.

2) Apply small amount of lithium based grease to outside of rewind spring.

2-4 Assembling starter

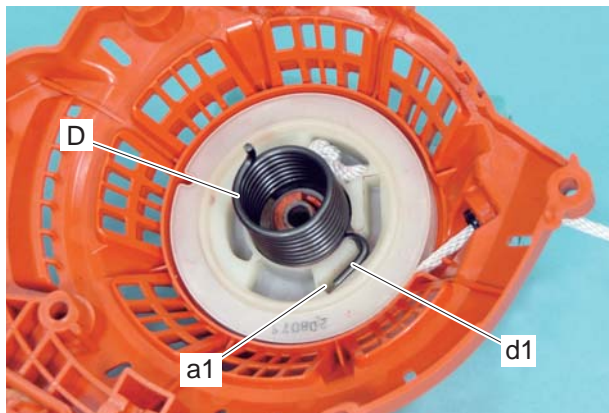


1. Lubricate center post (c2) of starter case with lithium based grease.

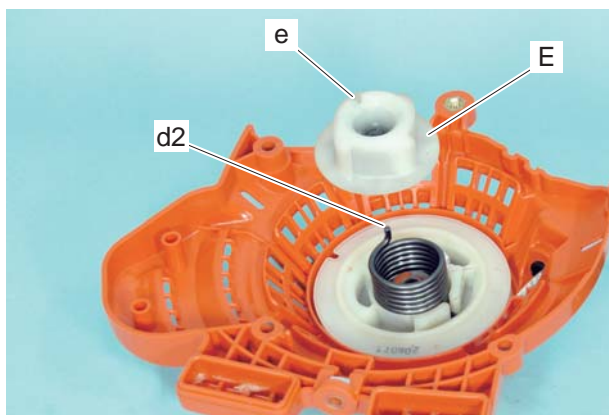
2. Assemble rope reel (A) with rewind spring (B) engaging hook (b1) with hook (c1) of starter case (C).

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

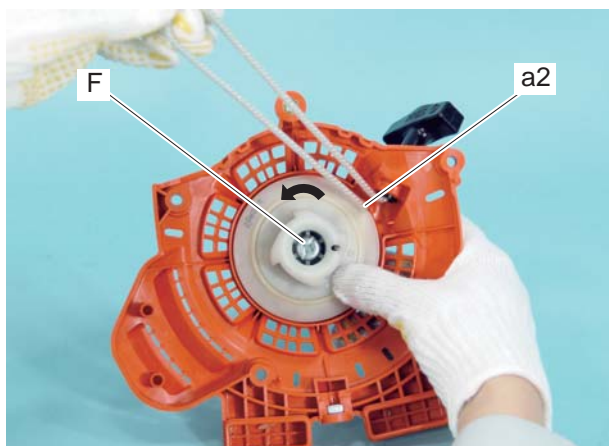
2-4 Assembling starter (continued)



4. Install power spring (D), engaging hook (d1) with rope reel groove (a1).

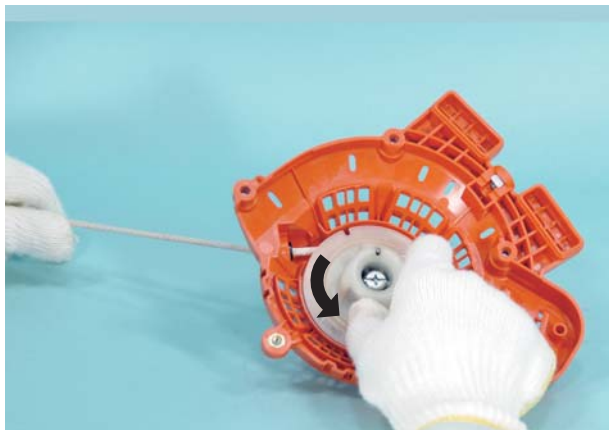


5. Install pawl catcher (E), engaging hole (e) with power spring top end hook (d2).



6. Reinstall tapping screw (F) on starter post.

7. Pull out starter rope inside starter case. Rotate rope reel counterclockwise several turns with starter rope hooked at notch (a2) as shown. Hold rope reel to prevent it from rewinding and pull out starter grip to take the rope slack.

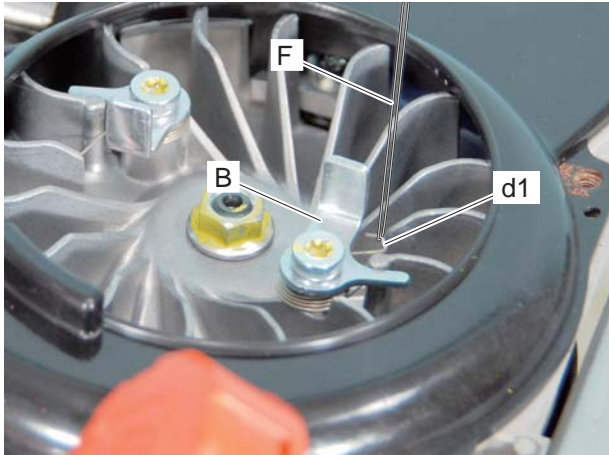
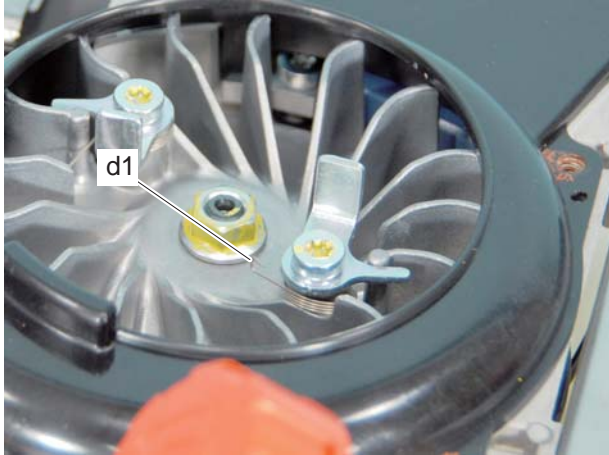
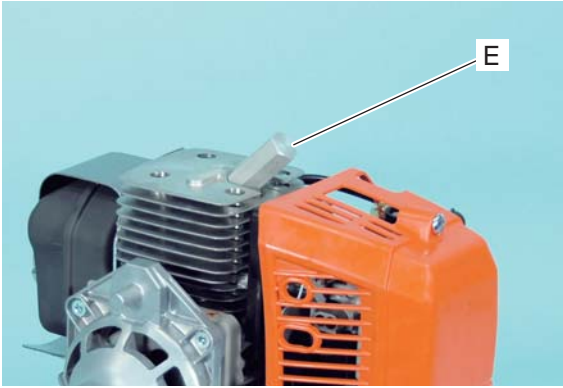
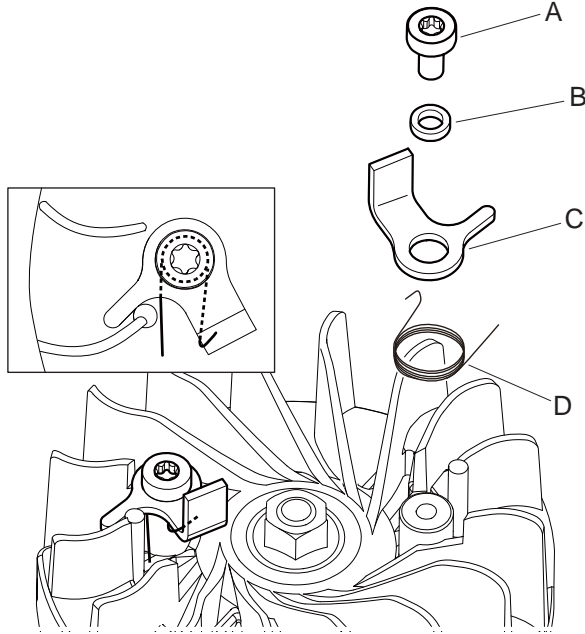


8. Pull starter several times to check rewind spring tension. If starter is not rewinding fully, increase spring tension by rotating rope reel one more turn counterclockwise following above step (7).

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

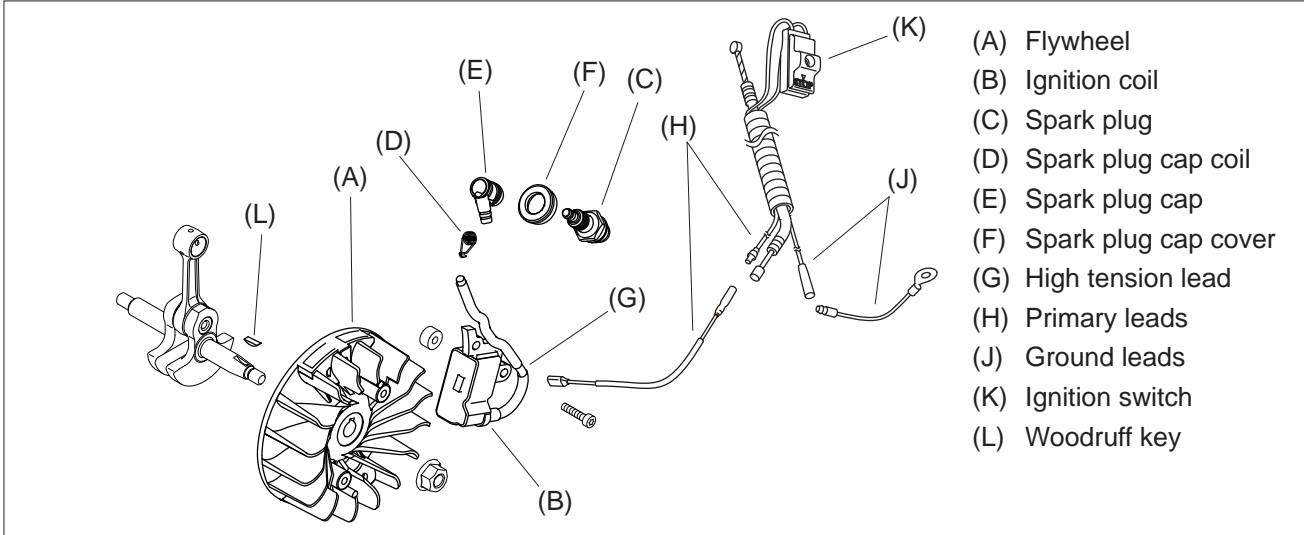
10. If rope reel can not be turned counterclockwise, reduce tension by rotating rope reel clockwise one turn with starter rope hooked at notch (a2).

2-5 Replacing starter pawl

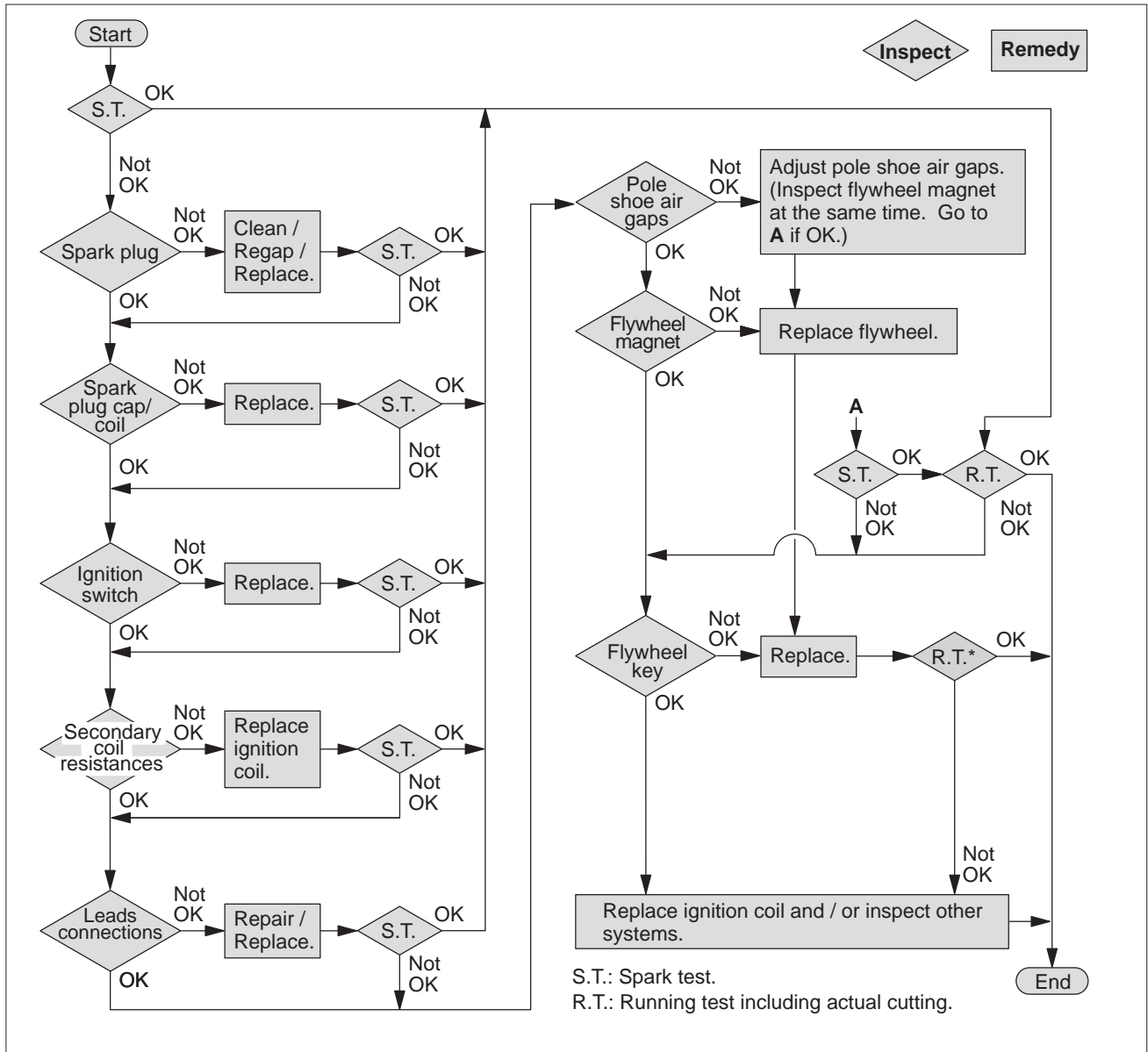


1. Remove starter assembly from unit.
2. Loosen bolt (A) and remove washer (B), pawl (C), and torsion spring (D). Replace damaged or worn parts.
NOTE: When it is hard to loosen bolt, install piston stopper X644-000020 (E) in spark plug hole to stop crankshaft rotation and remove bolt easily.
3. Install torsion spring (D), pawl (C), washer (B) and bolt (A). To avoid pinching of torsion spring, install these parts without setting the end of torsion spring (d1) on starter pawl.
4. Using fine wire (F) or appropriate tool, place the end of torsion spring (d1) on pawl (B), by hooking and passing under pawl as shown. Remove fine wire or tool.
5. Make sure pawl can move smoothly. If it does not move smoothly, check parts for correct installation.

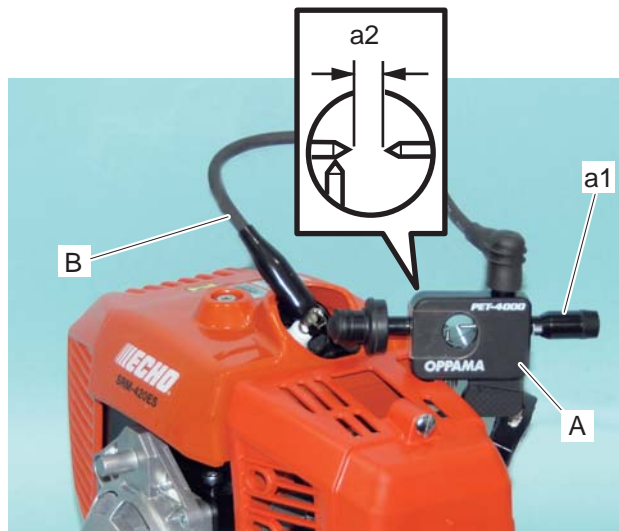
3 IGNITION SYSTEM



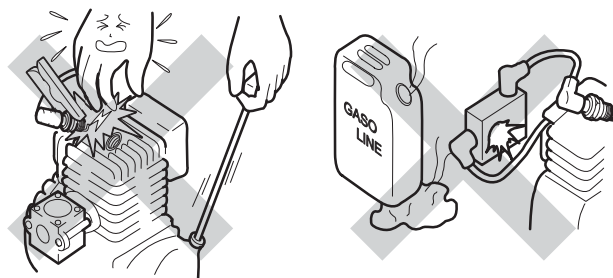
3-1 Troubleshooting guide



3-2 Testing spark



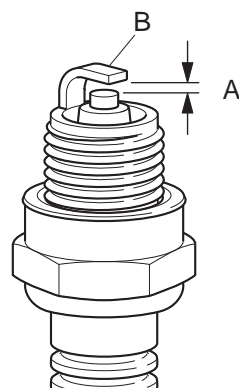
1. Remove spark plug cap from spark plug.
2. Connect spark plug cap to spark tester 897800-79931 (A), and connect spark tester lead (B) on spark plug as shown.
3. Screw in adjuster (a1) until the needle tips contact. Turn out adjuster (a1) 4 turns to set spark tester gap (a2) to 4 mm (0.16 in).
4. Turn ignition switch to "RUN" position. Pull starter grip several times.
5. If spark is steady in blue or white at the tester gap, ignition system is considered good.
6. If no spark exists or spark is intermittent in yellow, orange, or red, continue with further inspection.



WARNING DANGER

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

3-3 Inspecting spark plug



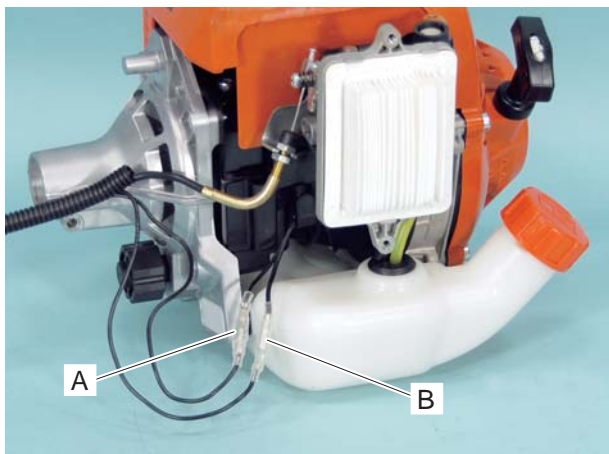
1. Remove spark plug to inspect for fouling, cracked or broken insulator, cracked outer electrode, or rounded center electrode. Clean or replace spark plug as required.
2. Set spark plug gap (A) by bending outer electrode (B).

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

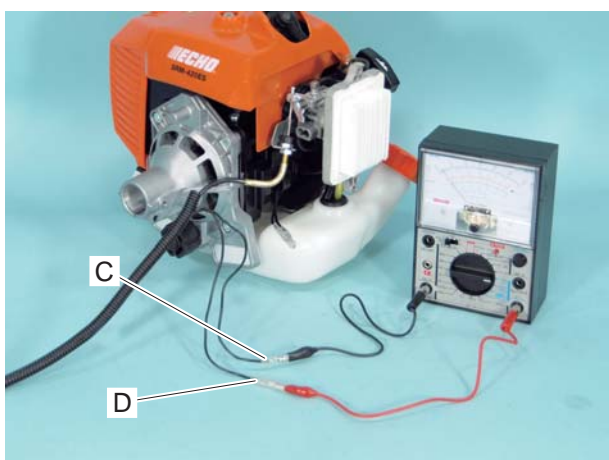
NOTE: Take care not to crank outer electrode when bending.

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

3-4 Inspecting ignition switch

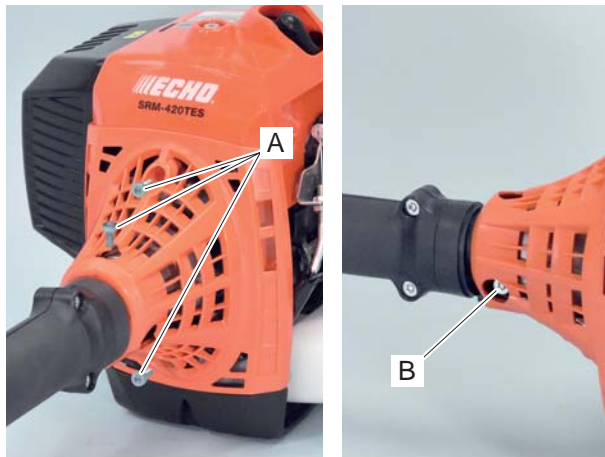


1. Disconnect primary lead coupler (A).
2. Disconnect ground lead coupler (B).



3. Connect one probe of Ohm-meter or multi-meter to primary lead (C) of ignition switch side as shown.
4. Connect other probe to ground lead (D) of ignition switch side as shown.
5. When ignition switch is in "RUN" position, tester should indicate infinite resistance.
6. When ignition switch is in "STOP" position, tester should show that circuit is in conducting state (closed circuit).
7. If ignition switch is defective, replace with a new one.

3-5 Replacing ignition switch



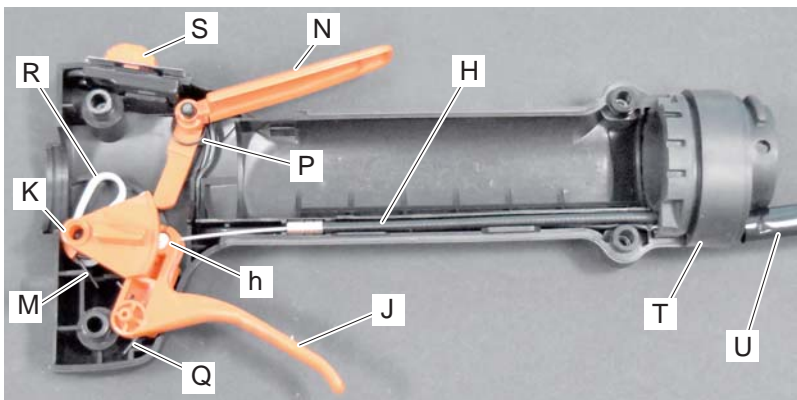
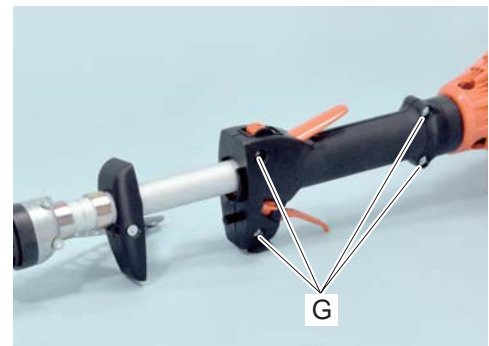
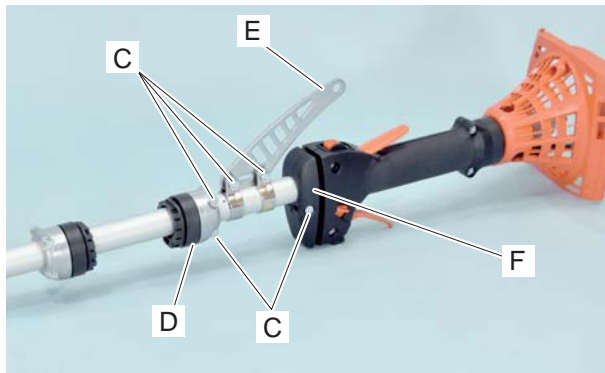
Loop Handle type:

1. Disconnect primary lead coupler and ground lead coupler (Refer to “3-4 Inspecting ignition switch”). Disconnect throttle cable from carburetor. Remove front handle .

2. Remove screws (A) and loosen screw (B). Remove main pipe from engine.

3. Loosen bolts (C) and slide cushion (D), harness hanger (E) and handle fixture (F) to output end.

4. Remove screws (G) and remove rear handle grip from drive shaft housing.



5. Disconnect end (h) of throttle cable (H) from throttle trigger (J).

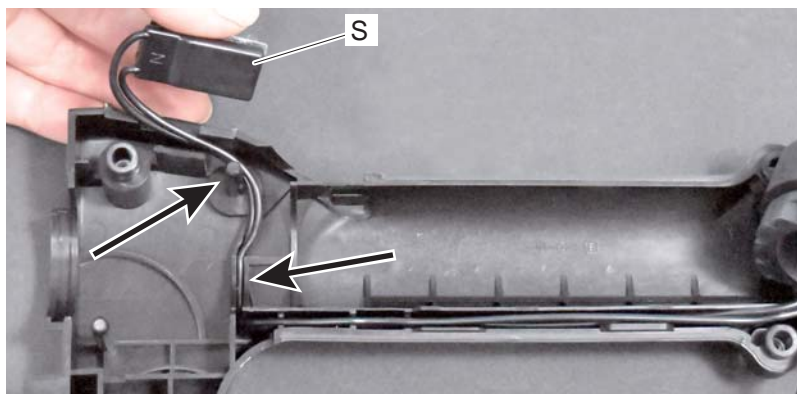
6. Remove throttle latch (K) with torsion spring (M), throttle latch (N) with torsion spring (P), throttle trigger (J) with torsion spring (Q) and throttle latch (R).

7. Remove ignition switch (S) with leads, cushion (T), corrugated tube (U) and throttle cable (H).

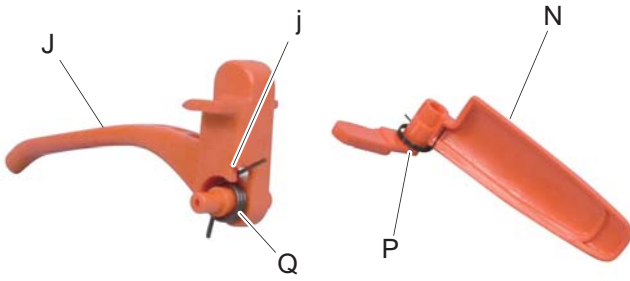
8. Pull out throttle cable from cushion (T) and corrugated tube (U).

9. Pass throttle cable through cushion (T) and corrugated tube (U) of new ignition switch.

10. Route leads behind ignition switch (S), and then install ignition switch to rear handle grip half. Route leads through grooves and ribs of rear handle grip half as shown.



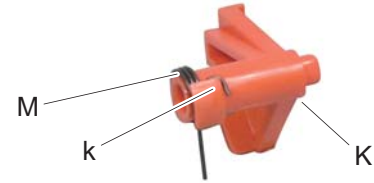
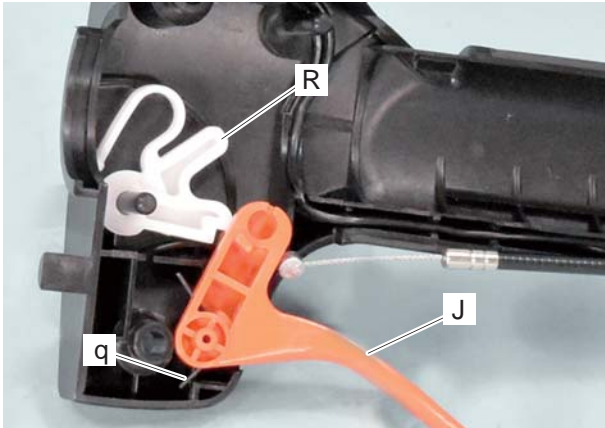
3-5 Replacing ignition switch (continued)



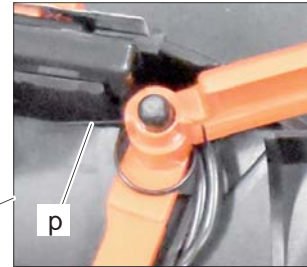
11. Set torsion spring (Q) to throttle trigger (J), hooking one end of torsion spring to rib (j) of throttle trigger as shown.

12. Set torsion spring (P) to throttle latch (N) as shown.

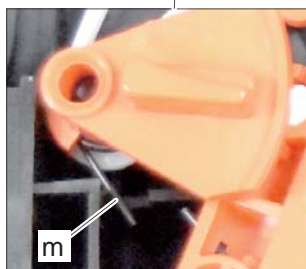
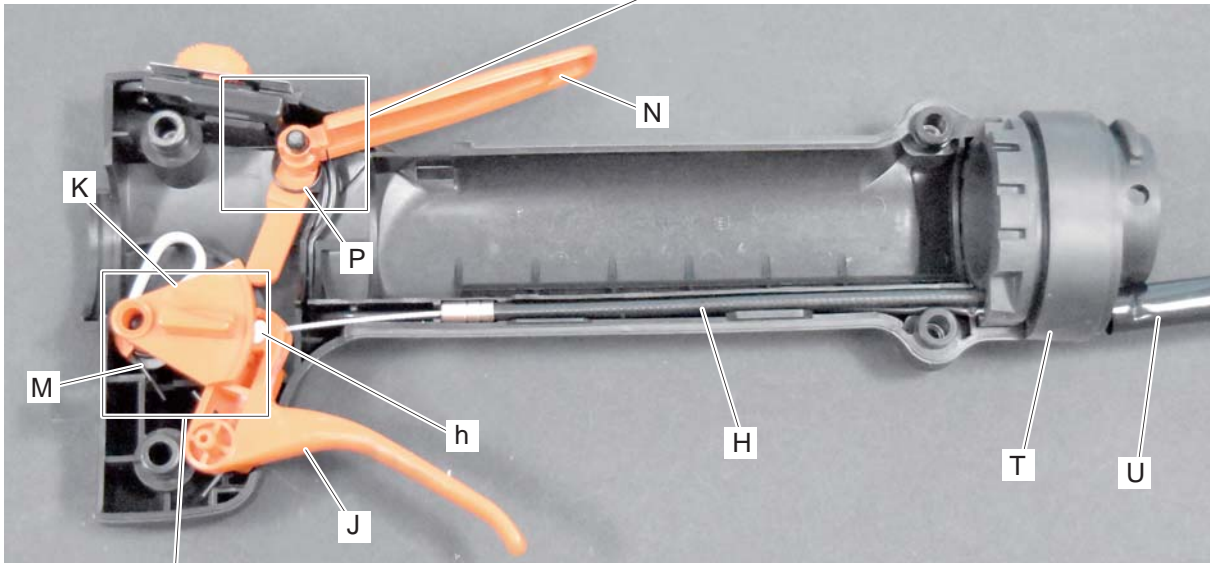
13. Set torsion spring (M) to throttle latch (K), hooking one end of torsion spring to rib (k) of throttle latch as shown.



14. Install throttle latch (R). Install throttle trigger (J) with torsion spring (Q), hooking torsion spring end (q) as shown.



15. Install throttle latch (N) with torsion spring (P), hooking torsion spring end (p) as shown. Install throttle latch (K) with torsion spring (M), hooking torsion spring end (m) as shown.

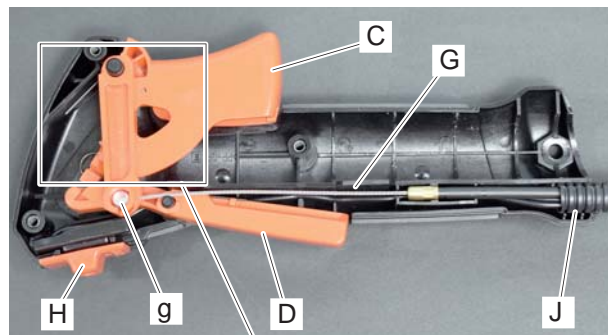
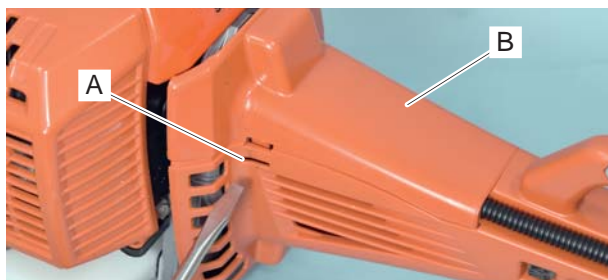


16. Connect end (h) of throttle cable (H) to throttle trigger (J).

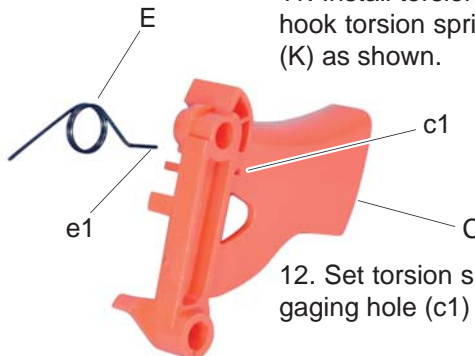
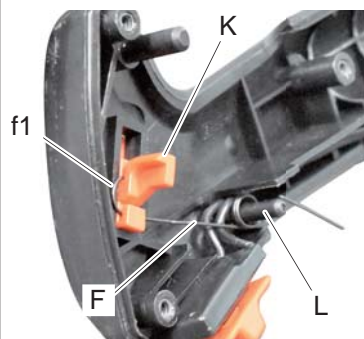
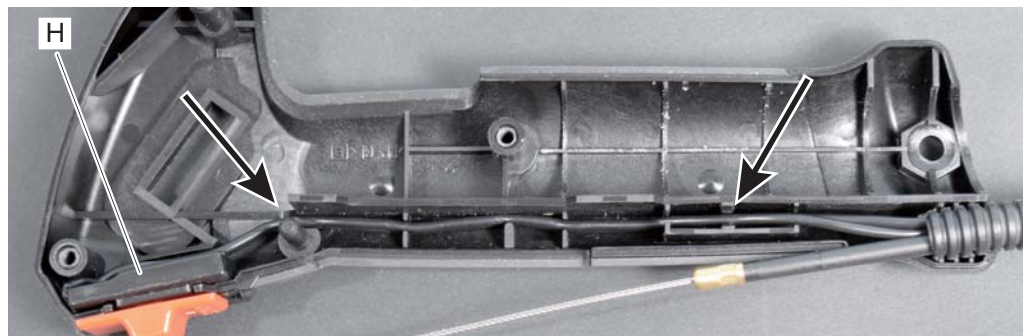
17. Install throttle cable (H), cushion (T) and corrugated tube (U) to rear handle grip half as shown.

18. Install handle grip on drive shaft housing with screws (refer to 4).

3-5 Replacing ignition switch (continued)



10. Route leads behind ignition switch (H), and then install ignition switch to grip half. Route leads through grooves and ribs of grip half as shown.



U-handle type:

NOTE: U-shaped handle and related parts have been changed. For details, refer to Technical Information Y2015-574.

1. Push one side hole (A) and the other side with screwdriver. Then remove cable guide (B).

2. Remove right-hand grip from handle. Disconnect primary lead coupler and ground lead coupler (Refer to "3-4 Inspecting ignition switch"). Disconnect throttle cable from carburetor.

3. Separate right-hand grip.

4. Remove throttle trigger (C) with torsion spring (E) and throttle latch (D) with torsion spring (F).

5. Disconnect end (g) of throttle cable (G) from throttle trigger (C).

6. Remove ignition switch (H) with leads, corrugated tube (J) and throttle cable (G).

7. Remove corrugated tube (J) from handle shaft, together with the cable and leads.

8. Pull out throttle cable (G) from corrugated tube (J).

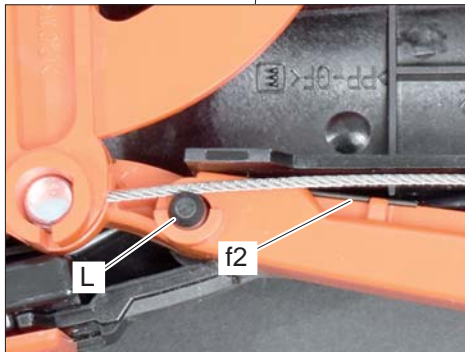
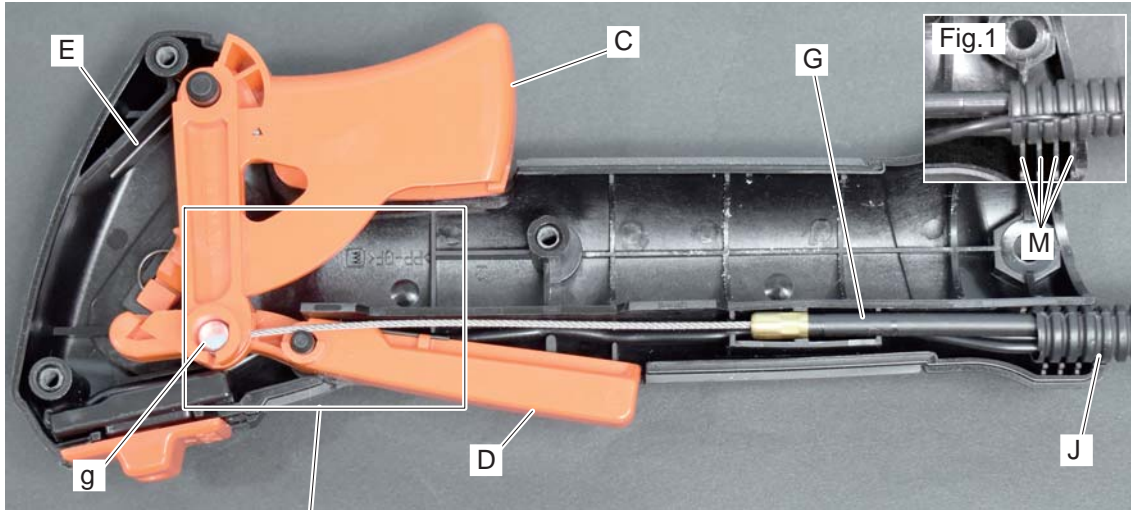
9. Pass throttle cable (G) through corrugated tube (J) of new ignition switch.

11. Install torsion spring (F) to hand grip rib (L) and hook torsion spring end (f1) on notch of latch knob (K) as shown.

12. Set torsion spring (E) to throttle trigger (C), engaging hole (c1) with torsion spring end hook (e1).

3-5 Replacing ignition switch (continued)

13. Install throttle latch (D), hooking torsion spring end (f2) as shown. Install throttle trigger (C) with torsion spring (E) as shown. Connect end (g) of throttle cable (G) to trigger (C) as shown.



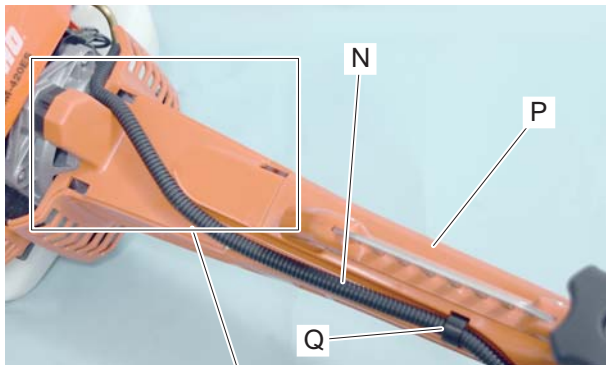
14. Install throttle cable (G) and corrugated tube (J) to the handle grip half as shown.

NOTE: Set grooves of corrugated tube (J) on ribs (M) of the handle grip half (Fig.1).

NOTE: Make sure throttle cable (G) is passing inside of hand grip boss (L) and install the hand grip groove surely as shown.

15. Put together both grip halves.

16. Reinstall right-hand grip on handle.



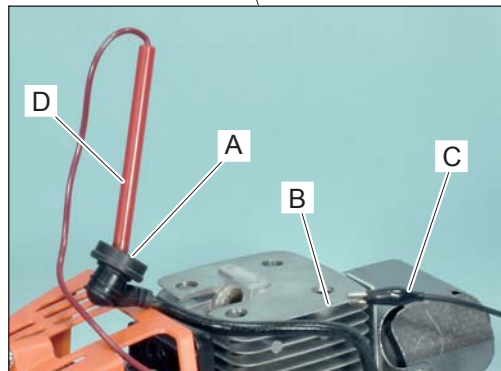
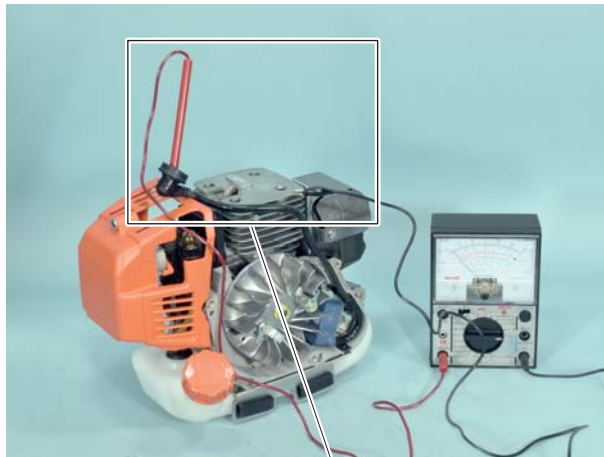
17. Route cable (N) on handle support (P) and secure with clip (Q) .

NOTE: Make sure cable (N) routes through ribs of handle support as shown.

18. Reinstall cable guide. Connect throttle cable to carburetor. Connect primary lead coupler and ground lead coupler.



3-6 Inspecting ignition coil resistance



1. Remove starter assembly (Refer to “2-1 Disassembling starter assembly”). Remove inner cylinder cover and fan cover.

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

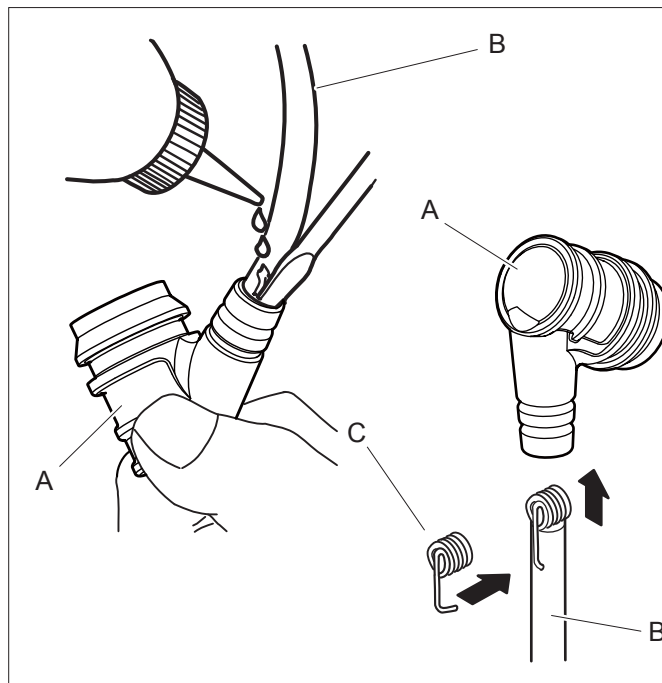
3. Connect the other probe to cylinder fin (B) to measure secondary coil resistance. Secondary coil resistance should be in the range of 930 to 970 Ω .

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

5. Keep probe (C) on cylinder fin (B). Remove probe (D) from spark plug cap coil (A) and connect probe (D) to ignition coil core to confirm that the circuit is in conducting state (closed circuit). If the circuit is not in conducting state, ensure conduction between ignition coil bolt and cylinder.

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

3-7 Replacing spark plug cap and coil



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

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

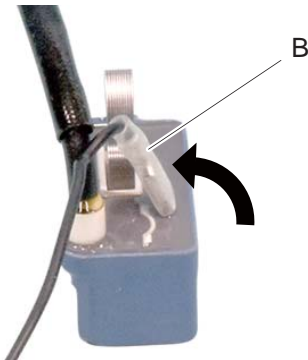
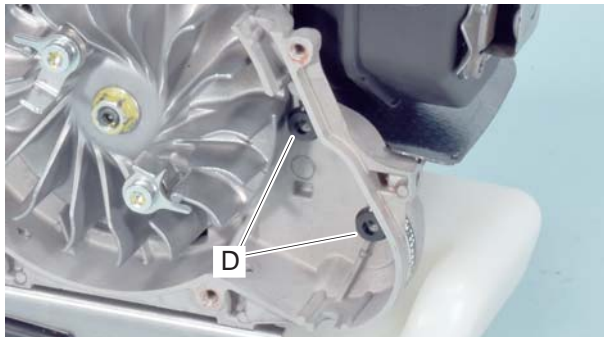
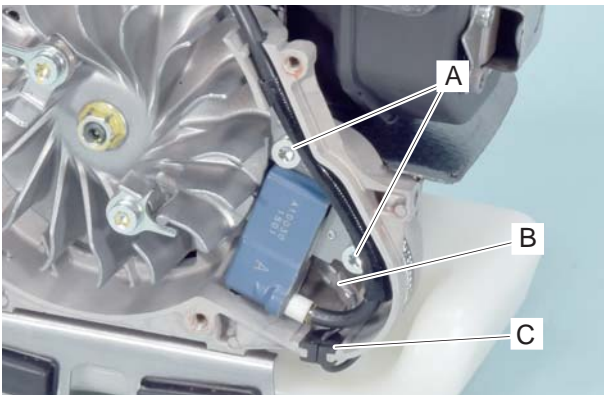
3. Pull spark plug cap (A) away from high tension lead (B).

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

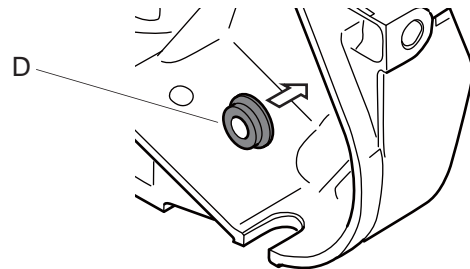
NOTE: Make sure spark plug cap coil (C) contacts center core of high tension lead when reinstalling it.

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

3-8 Replacing ignition coil

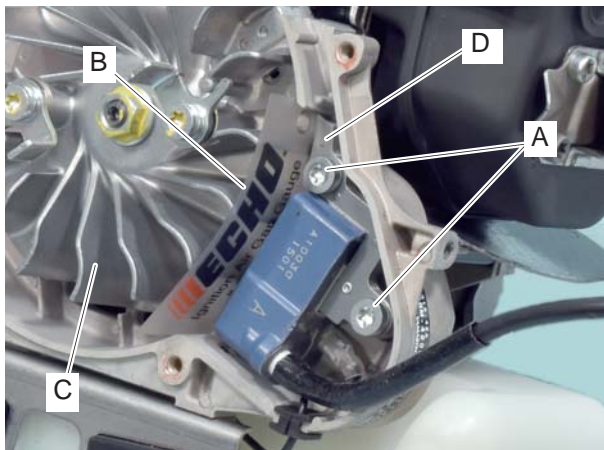


1. Loosen two bolts (A) of ignition coil.
2. Remove ignition coil with primary lead (B) and grommet (C) from crankcase, taking care not to lose collars (D).
3. Disconnect primary lead (B) with grommet (C) from ignition coil.
4. Remove spark plug cap and spark plug cap coil from high tension lead (Refer to "3-7 Replacing spark plug cap and coil").
5. Install spark plug cap and spark plug cap coil, primary lead (B) with grommet (C) to new ignition coil.
6. Set collars (D), facing flange side to the crankcase as shown.



7. Tip primary lead (B) to high tension lead as shown.
8. Loosely install new ignition coil, primary lead (B) and grommet (C) with two bolts (A) as shown. Set pole shoe air gaps (Refer to "3-9 Setting pole shoe air gaps"). Tighten two bolts (A).

3-9 Setting pole shoe air gaps



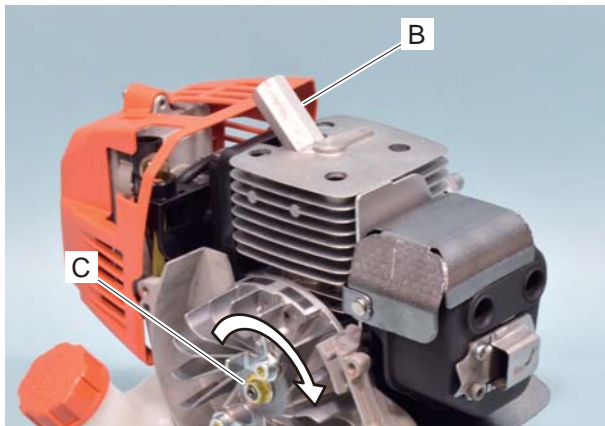
1. Loosen two bolts (A) and insert module air gap gauge 91004 (B) or 0.3 - 0.4 mm (0.012 - 0.016 in) thick feeler gauge between flywheel (C) and ignition coil shoes (D).
2. Rotate flywheel (C) until magnetic poles of flywheel face ignition coil shoes (D).
3. Hold ignition coil against flywheel (C) and tighten bolts (A). After tightening the bolts, remove module air gap gauge 91004 (B) or feeler gauge.

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

3-10 Inspecting flywheel and key



1. Inspect magnetic force of flywheel using flux meter, or screwdriver (A) as shown.



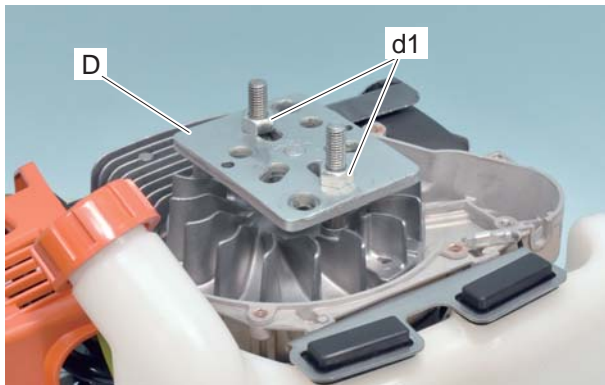
2. If magnetic force is weak, replace flywheel as follows.

3. Disconnect spark plug cap and remove spark plug.

4. Install piston stopper X644-000020 (B) in spark plug hole by hand, to stop crankshaft rotation.

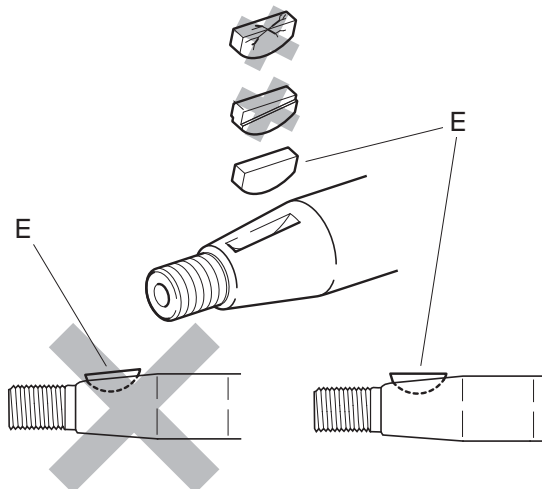
5. Remove nut (C) by rotating clockwise.

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



6. Remove starter pawls. Then set puller Y089-000110 or Y089-000111 (D) on flywheel as shown.

7. Tighten two nuts (d1) on puller alternately to remove flywheel.



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

9. Inspect woodruff key (E) for damage or shearing. Replace it as required.

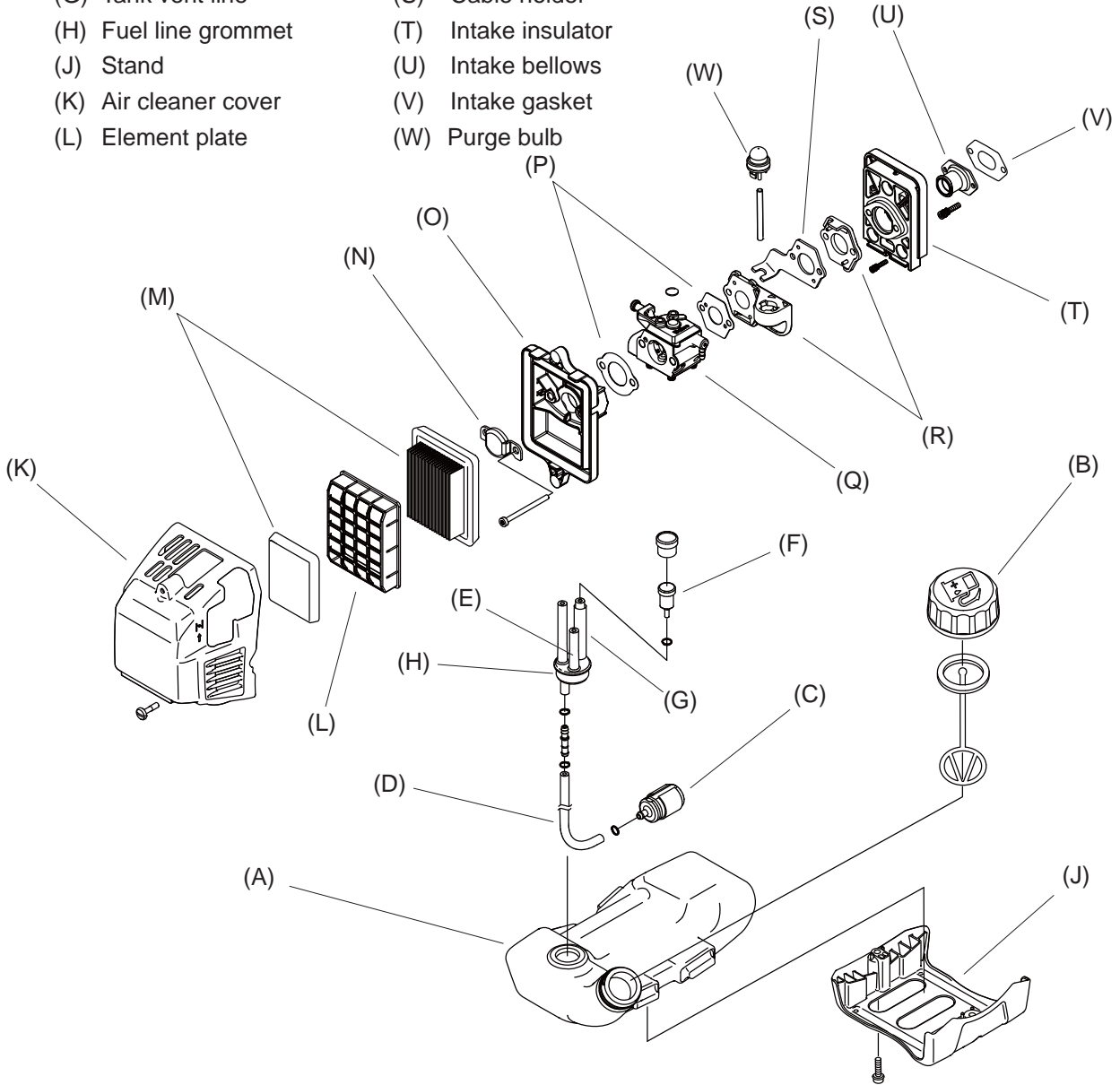
10. Install woodruff key (E) into key groove.

11. Align the woodruff key with center line of crankshaft. Install flywheel and fasten flywheel nut counterclockwise.

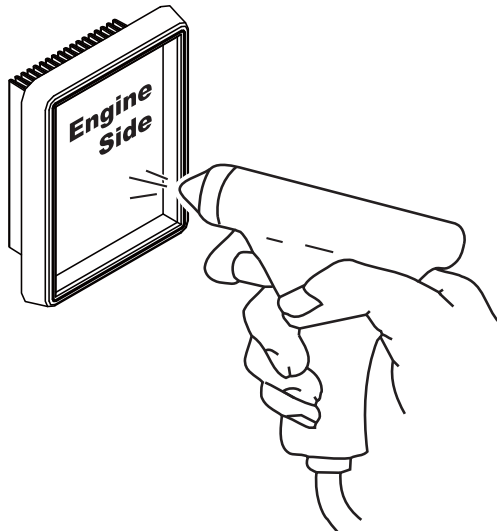
12. Reinstall starter pawls (Refer to "2-5 Replacing starter pawl").

4 FUEL SYSTEM

- | | |
|-----------------------|----------------------|
| (A) Fuel tank | (M) Air filter |
| (B) Fuel cap | (N) Prevent plate |
| (C) Fuel strainer | (O) Air cleaner case |
| (D) Fuel line | (P) Intake gasket |
| (E) Fuel return line | (Q) Carburetor |
| (F) Tank vent | (R) Insulator plate |
| (G) Tank vent line | (S) Cable holder |
| (H) Fuel line grommet | (T) Intake insulator |
| (J) Stand | (U) Intake bellows |
| (K) Air cleaner cover | (V) Intake gasket |
| (L) Element plate | (W) Purge bulb |



4-1 Inspecting air filter



1. Close choke shutter and remove air cleaner cover and air filter.
2. Clean air cleaner cover and air filter with compressed air or wash air filter in a suitable cleaning solvent. Air filter should be dried completely after washing.

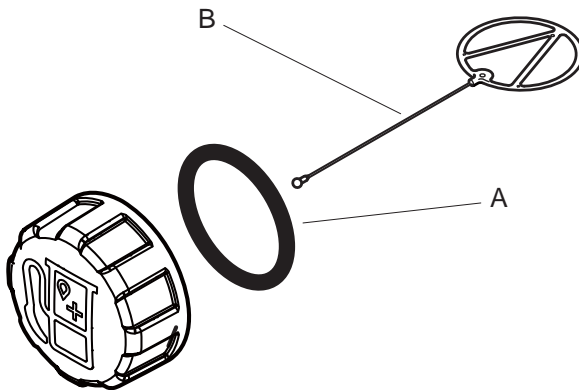
NOTE: To clean air filter with compressed air, blow dirt away carefully and thoroughly by widening the grooves of filter.

WARNING  **DANGER**

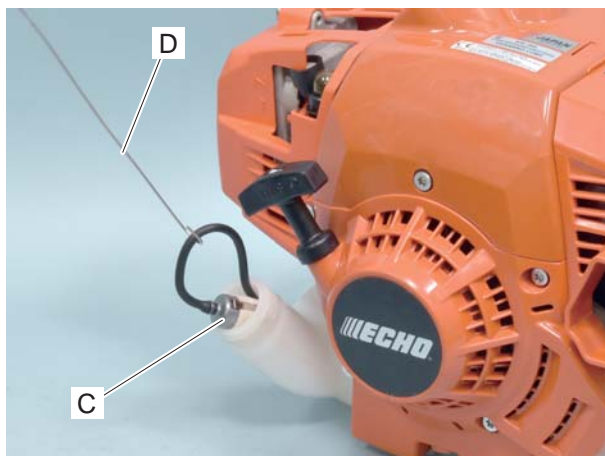
Wear eye protection when working with compressed air. Eye damage can occur from flying particles.

3. Replace air filter if heavily soiled or damaged.

4-2 Inspecting fuel cap and fuel strainer

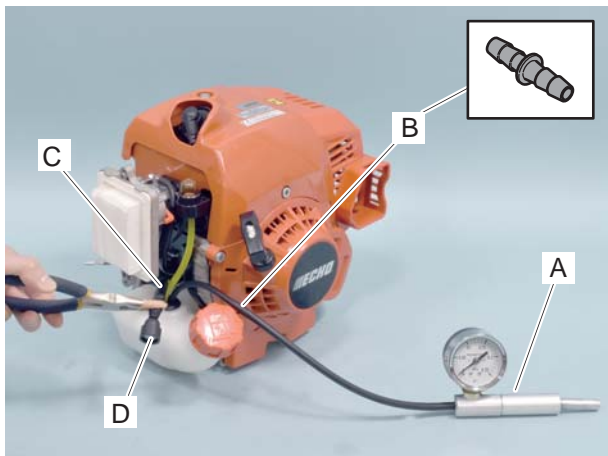


1. Remove fuel cap.
2. Inspect fuel cap for cracks and gasket (A) for cuts or damage, and replace with new one as required.
3. Replace connector (B), if damaged.

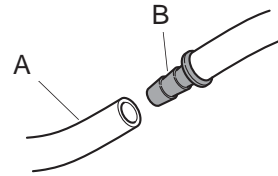


4. Pull fuel strainer (C) out from fuel tank using a wire hook (D). Clean fuel strainer (C). Replace with new one if defective or heavily soiled.
5. Reinstall fuel cap.

4-3 Inspecting fuel tank and tank vent



1. Remove air cleaner cover. Disconnect black fuel line from carburetor and connect pressure tester 897803-30133 (A) to fuel line with joint pipe V186-000510 (B).



2. Pinch tank vent line (C) with longnose pliers to block air passage. And then apply 50 kPa (0.5 kgf/cm²) (7 psi) of pressure.

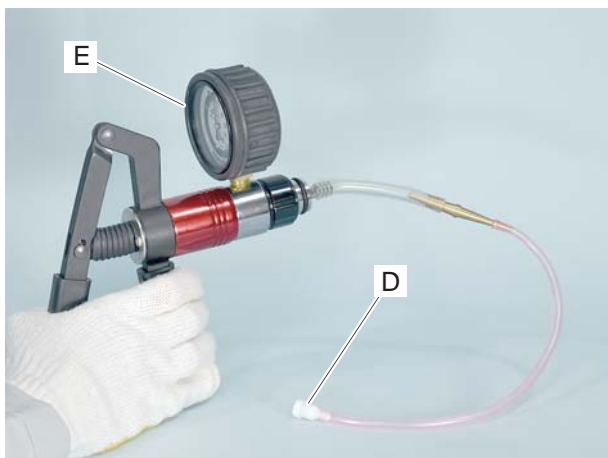
NOTE: Wrap the ends of longnose pliers with tape (or cover with soft pipes) to protect tank vent line from damage.

3. The pressure should not drop. If the pressure drops, leakage may be occurring from fuel cap gasket, fuel tank, fuel lines, tank vent line or fuel line grommet. Inspect and replace them as required.

4. Release tank vent line. The pressure should stay at or above 10 kPa (0.1 kgf/cm²) (1.5 psi). If pressure drops under 10 kPa (0.1 kgf/cm²) (1.5 psi), tank vent or tank vent line is defective.

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

5. Remove tank vent (D) from tank vent line and connect pressure tester 91139 (E) or 91149.



6. Apply pressure approximately 50kPa (0.5 kgf/cm²) (7 psi), make sure the pressure is stable in range of 10 - 40 kPa (0.1 - 0.4 kgf/cm²) (1.4 - 6 psi).

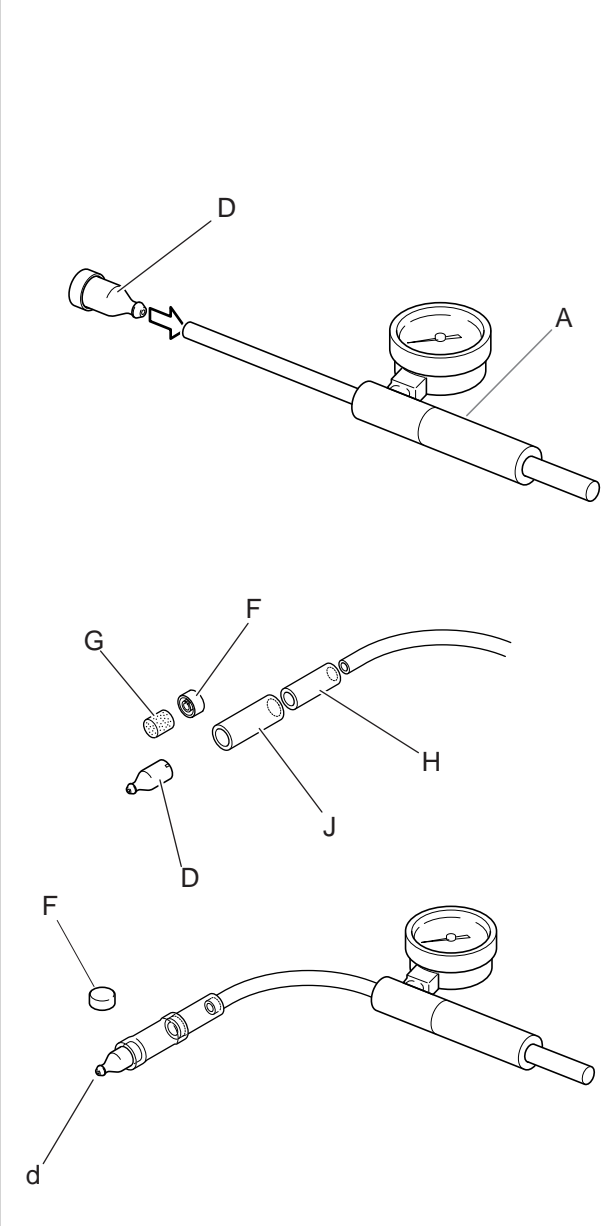
7. If it is not in the range, gently clean tank vent with compressed air or replace with new one.

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

8. Apply negative pressure 20 kPa (0.2 kgf/cm²) (3 psi).

9. Tank vent should pass air freely without holding any pressure. If it dose not, replace tank vent with one.

4-3 Inspecting fuel tank and tank vent (continued)



NOTE: Inspection with pressure tester 897803-30133

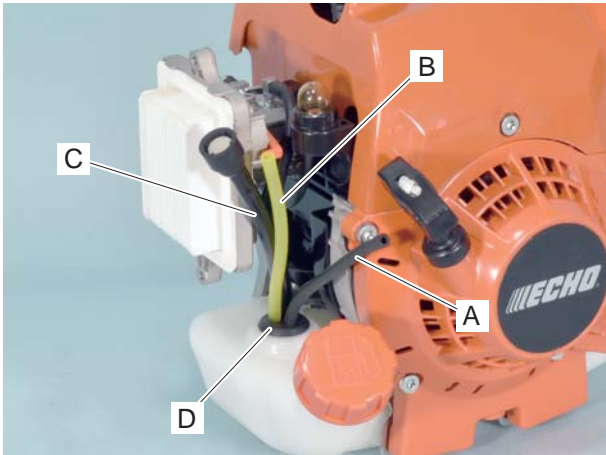
If pressure tester 91139 or 91149 is not available, tank vent can be inspected with pressure tester 897803-30133 as follows.

1. Connect tank vent (D) to pressure tester 897803-30133 (A).
2. Apply pressure approximately 50 kPa (0.5 kgf/cm²) (7 psi). Make sure the pressure is stable in range of 10 - 40 kPa (0.1 - 0.4 kgf/cm²) (1.4 - 6 psi).
3. If it is not in the range, gently clean tank vent with compressed air or replace with new one.

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

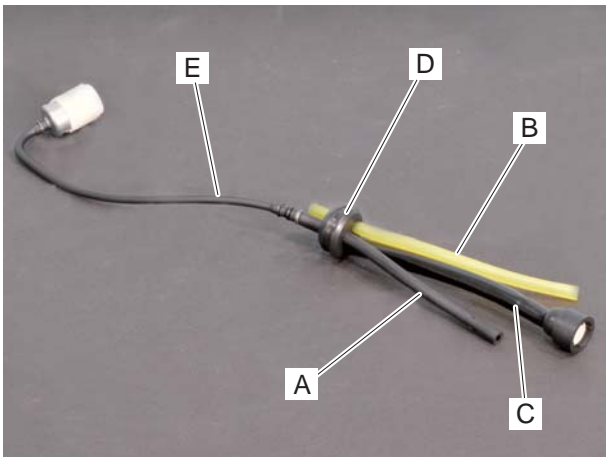
4. Remove cap (F) of tank vent (D), and clean sponge (G).
5. Cut pipe 363011-00210 (H: 7x11x170mm) and 382011-01110 (J: 9x13x350) in approximately 30mm (1 1/4 in) length, and connect them to pressure tester as shown. Connect tank vent (D) without cap to pipe as shown.
6. Plug hole (d) with finger and apply pressure 20 kPa (0.2 kgf/cm²) (3 psi). The pressure should hold steady.
7. Remove finger from hole (d). Tank vent should pass air freely without holding any pressure. If it does not, replace tank vent with new one.

4-4 Replacing fuel line, fuel return line, tank vent line and grommet



1. Disconnect fuel line (A) from carburetor, and fuel return line (B) from purge bulb.

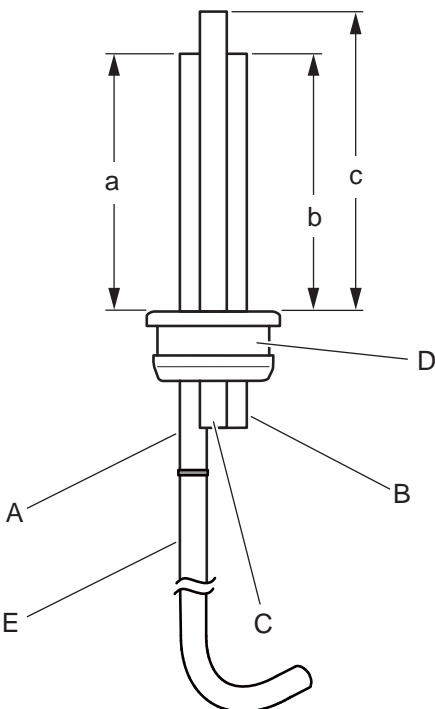
2. Remove fuel line grommet (D) from fuel tank, together with fuel line (A), fuel return line (B) and tank vent line (C). Fuel strainer can be directly pulled out through grommet hole.



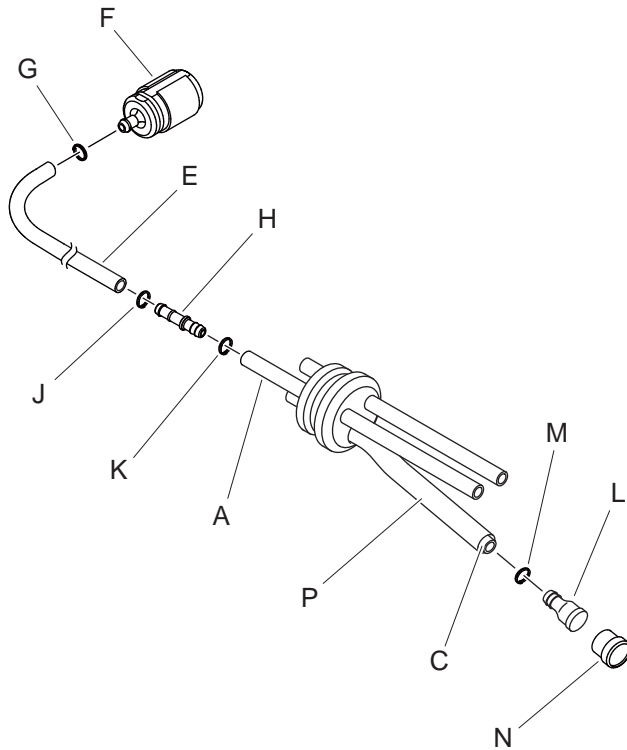
3. Remove fuel line (E) from fuel line (A). Remove fuel line (A), fuel return line (B) and tank vent line (C) from fuel line grommet (D). If line is defective, replace with a new one.

4. Insert new line and adjust length as follows:

Line	(A) Fuel line	(B) Fuel return line	(C) Tank vent line
	Black	Yellow (Transparent)	Black
Length mm (in)	130 (5.12)	140 (5.51)	140 (5.51)
Distance	(a)	(b)	(c)
mm (in)	100 - 104 (3.94 - 4.09)	113 - 117 (4.45 - 4.60)	114 - 119 (4.49 - 4.69)

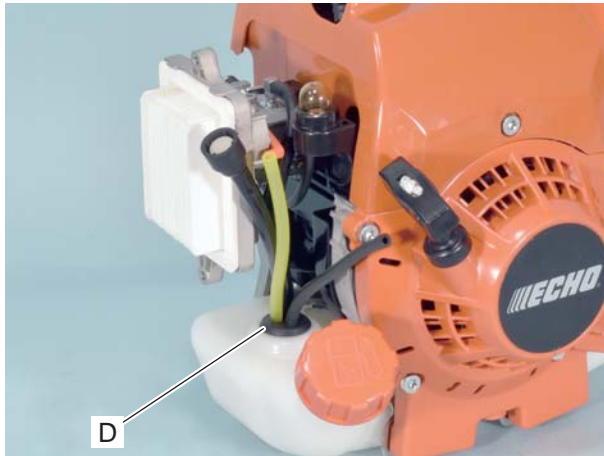
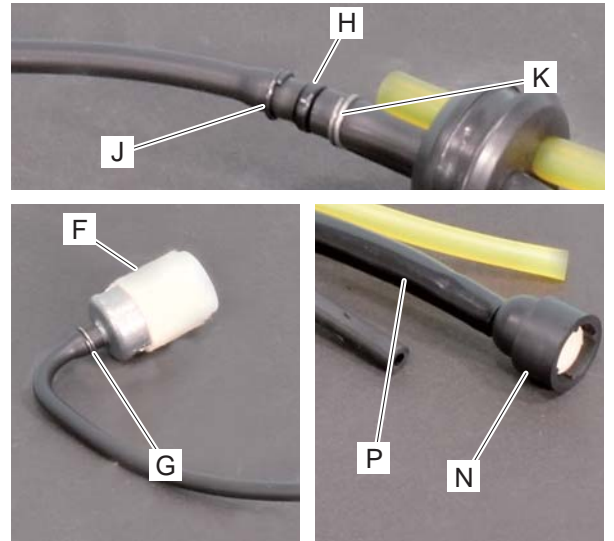


4-4 Replacing fuel line, fuel return line, tank vent line and grommet (continued)

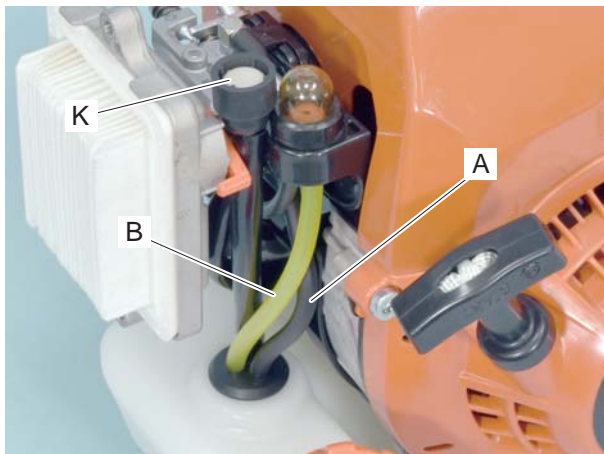


5. Connect fuel strainer (F) with clip (G) to fuel line (E). Connect fuel line (E) to fuel line (A) together with pipe connector (H) and clips (J: dia. 5.5 mm) (K: dia. 6 mm) as shown.

6. Connect tank vent (L) to tank vent line (C) with clip (M) and tank vent cap (N) as shown. Cover tank vent line (C) by protect tube (P) as shown.



7. Install grommet (D) with lines and fuel strainer to fuel tank as shown.



8. Put tank vent (K) in place as shown. Connect fuel line (A) to carburetor and fuel return line (B) to purge bulb.

4-5 Adjusting carburetor

4-5-1 General adjustment rules

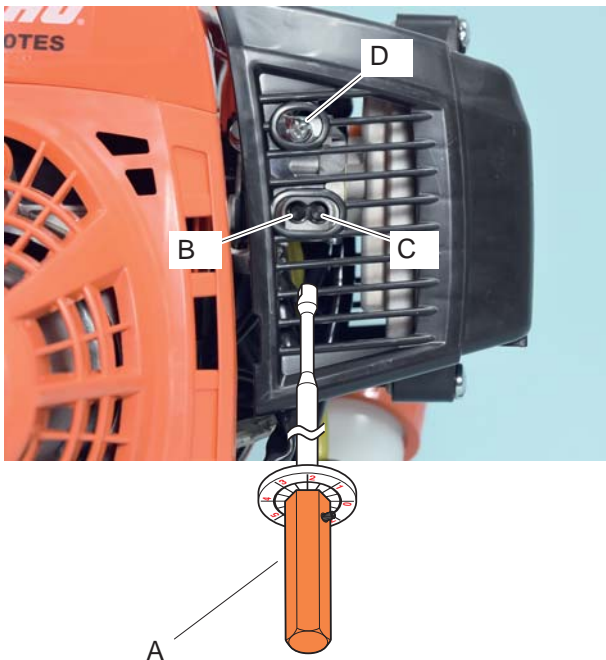
A. Before starting the unit for adjustment, check the following items.

1. The correct spark plug must be clean and properly gapped.
2. The air filter element must be clean and properly installed.
3. The muffler exhaust port must be clear of carbon.
4. The fuel lines, tank vent and fuel filter are in good condition and clear of debris.
5. The fuel is fresh (> 89 octane : RON) and properly mixed at 50 : 1 with "ISO L-EGD" or "JASO FC/FD" 2-stroke oil.
6. Install nylon line head with 2 nylon lines and shield, even if 3-tooth blade is installed, for proper engine loading (SRM-420ES : DS-5, SRM-420TES : B6).

B. Preliminary adjustment by Throttle adjust screw of carburetor.

Start and run engine for 3 minutes alternating engine speed between WOT for 50 seconds and idle for 10 seconds. Adjust idle engine speed to 2,700 - 2,900 r/min by turning Throttle adjust screw. Confirm WOT engine speed 9,000 to 10,000 r/min. If engine does not run correctly after this adjustment, proceed to the next step 2-2.

4-5-2 Throttle adjust screw, L mixture needle and H mixture needle initial settings



Tools Required : Small screwdriver with 2.5 mm blade, P/N PET304 Tachometer PET-304 and P/N X645-000031 Large D-shaped (A).

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

L mixture needle (B) : 2 3/8

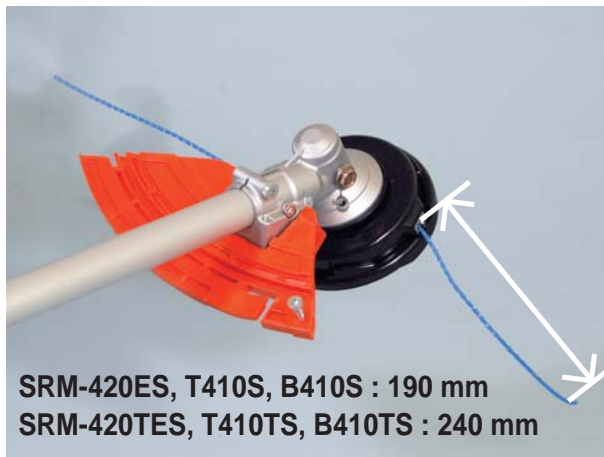
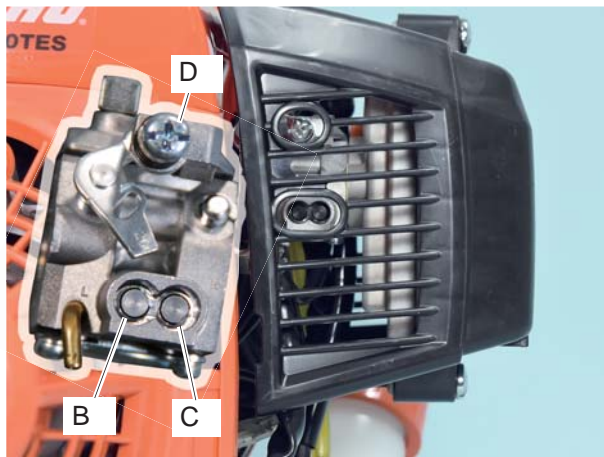
H mixture needle (C) : 3

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

2. Remove air cleaner lid to expose the Throttle adjust screw and throttle plate. Turn Throttle adjust screw (D) counterclockwise until Throttle adjust screw tip just touches throttle plate. Then turn it clockwise 2 1/8 turns. Reinstall air cleaner lid.

NOTE : The initial carburetor settings for Throttle adjust screw, L and H mixture needles are intended to start and run the engine before final carburetor adjustments are made through this procedure. The actual number of turns needed for engine operation may vary.

4-5-3 Adjusting carburetor



SRM-420ES(L), T410S : Remove shield and cut trimmer head line lengths to 190 mm.

SRM-420ES(U), B410S : Remove shield and blade, and install nylon line head, cut the line lengths to 190 mm.

SRM-420TES, T410TS, B410TS : Remove shield and cut trimmer head line lengths to 240 mm.

1. Start and warm engine for 3 minutes alternating engine speed between WOT for 50 seconds and idle for 10 seconds.
2. Adjust L mixture needle (B) to reach maximum idle speed by using 2.5 mm blade screwdriver.
3. Set Idle speed to 3,550 r/min by turning Throttle adjust screw (D). Engine speed should be stable at 3,550 +/- 50 r/min.
4. Turn L mixture needle (B) counterclockwise to reduce engine idle speed 800 r/min to set idle speed at 2,750 r/min. The idle speed range is 2,650 - 2,850 r/min.

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

5. Adjust H mixture needle (C) to reach maximum WOT engine speed. Then turn H mixture needle (C) counterclockwise to reduce WOT engine speed 120 r/min.

6. SRM-420ES(L), T410S : Stop engine. Install shield with knife. Restart engine and verify engine idle speed ranges from 2,400 to 3,200 r/min, and WOT engine speed ranges from 9,500 to 10,500 r/min.

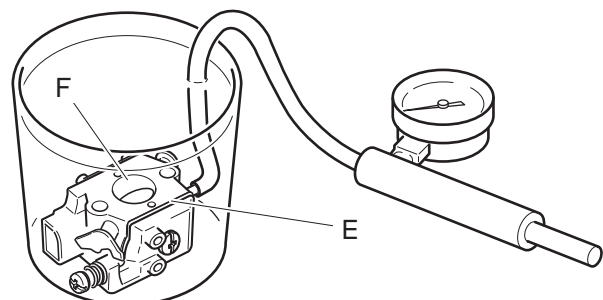
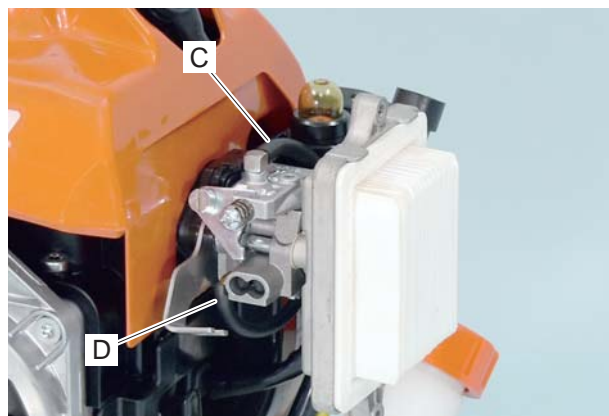
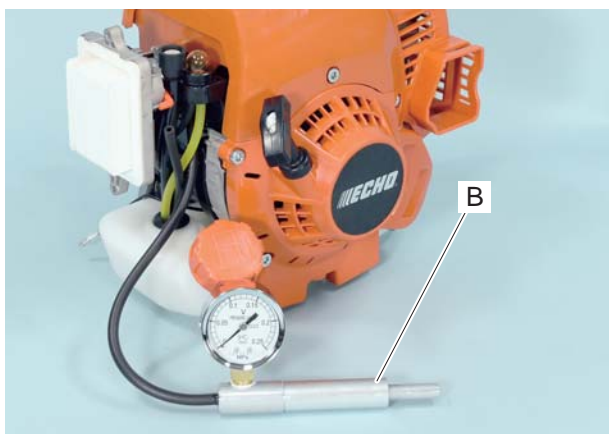
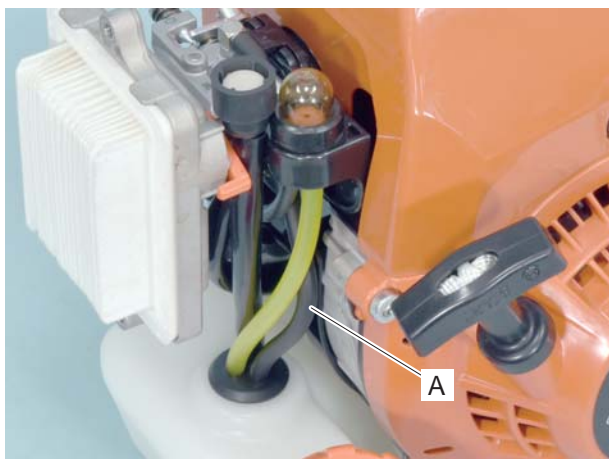
SRM-420ES(U), B410S : Stop engine and re-install shield and the blade. Restart engine and verify engine idle speed ranges from 2,400 to 3,200 r/min, and WOT engine speed ranges from 10,500 to 11,500 r/min.

SRM-420TES, T410TS, B410TS : Stop engine. Install shield with knife. Restart engine and verify engine idle speed ranges from 2,400 to 3,200 r/min, and WOT engine speed ranges from 9,800 to 11,000 r/min.

Make sure the nylon line head or blade does not rotate when engine is at idle. Engine should start and accelerate smoothly.

NOTE : WOT and idle speed in field operation may vary from final adjustment specifications due to changing ambient conditions and fuel. Safe engine speed variances should be within the WOT and Idle speed ranges listed in Section 1-2, otherwise the Carburetor should be readjusted.

4-6 Testing carburetor



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

1. Remove air cleaner cover. Disconnect fuel line (A) from carburetor.

2. Connect pressure tester 897803-30133 (B) to carburetor fuel inlet.

3. Apply pressure approx. 100 kPa (1 kgf/cm²) (14 psi).

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

5. Lightly push purge bulb once. Pressure tester reading should drop and remain above 50 kPa (0.5 kgf/cm²) (7 psi).

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

7. If pressure drops at step 3, or if pressure drops below standard figure at step 5, remove pulse pipe (C) and purge line (D) from carburetor, then remove carburetor from the unit.

8. Submerge carburetor in suitable clean solvent to locate the leak by applying pressure approx. 100 kPa (1 kgf/cm²) (14 psi).

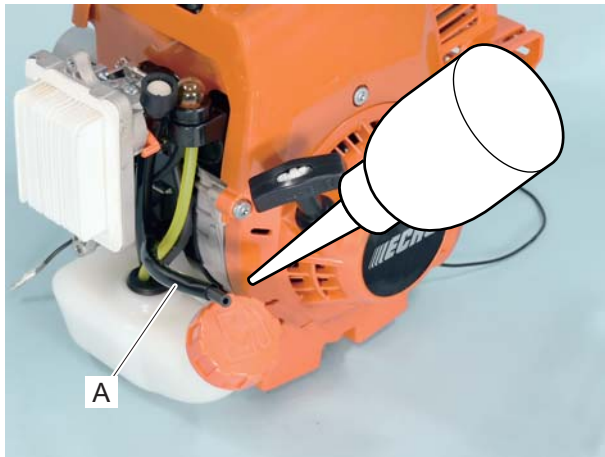
9. If air bubbles come out between pump cover and carburetor body (E), inspect pump diaphragm, pump gasket, and diaphragm seat of carburetor body (Refer to "4-10 Inspecting diaphragm and others").

10. If air bubbles come out from throttle bore (F), inspect inlet valve, metering lever spring, and metering lever height (Refer to "4-9 Inspecting inlet needle valve").

11. Reassemble removed parts.

NOTE: Replace carburetor gasket with new one when remove carburetor.

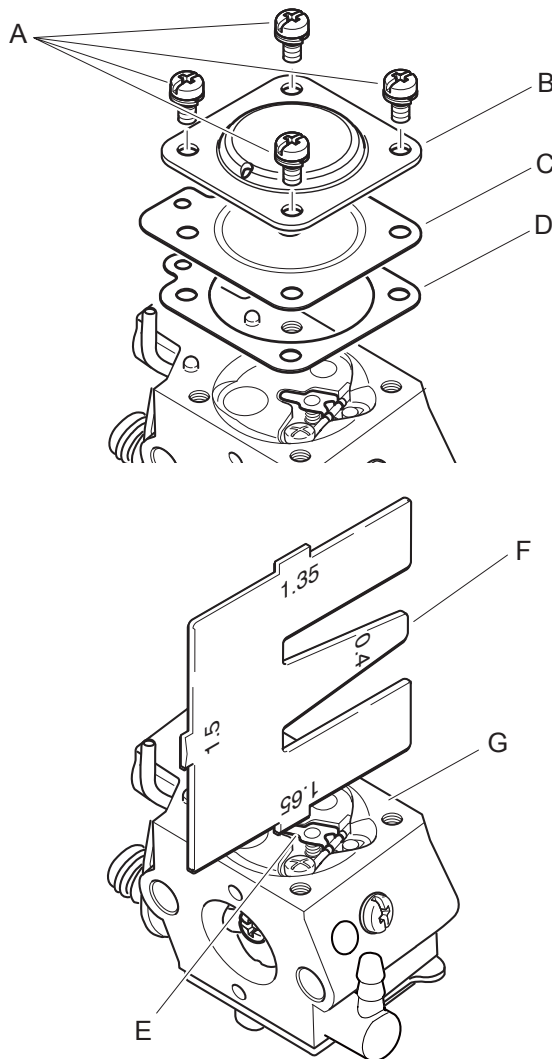
4-7 Inspecting crankcase pulse passage



1. Remove pulse pipe (A) from carburetor and drop a little oil on the end of pulse pipe (A).
2. Remove spark plug and pull starter grip several times. Oil should spit back from the end.
3. If not, remove oil residue clogging pulse passages in cylinder.

NOTE: Place pulse pipe (A) horizontally to keep dropped oil in the pulse pipe.

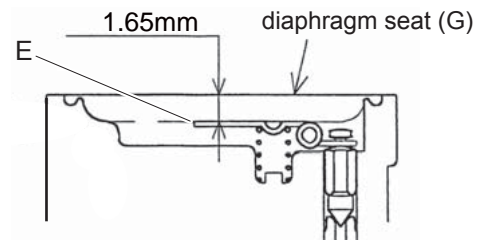
4-8 Inspecting metering lever height



1. Remove carburetor.
2. Remove screws (A), metering diaphragm cover (B), metering diaphragm (C) and gasket (D).

3. Inspect metering lever (E) height by Metering lever gauge 897563-19830 (F).

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



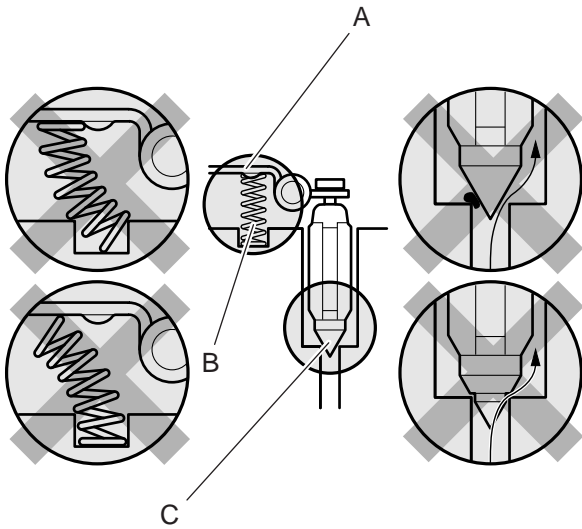
4. If necessary, gently bend metering lever (E) up or down to set metering lever to proper position.

NOTE: When metering lever is:

Too high → Fuel flooding occurs

Too low → Fuel starvation / overheating occurs

4-9 Inspecting inlet needle valve



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

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

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

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

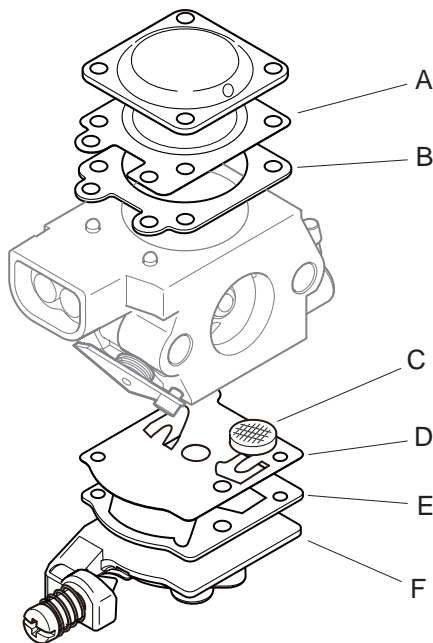
3. Clean inlet needle valve seat using suitable clean solvent (do not use metal tools).

4. Reassemble inlet needle valve (C), spring (B), metering lever (A) and pivot pin.

NOTE: Insure proper metering lever installation as follows.

- (1) Spring is seated in its hole at chamber floor.
- (2) Spring is under dimple of metering lever.
- (3) metering lever fork is holding inlet needle valve.

4-10 Inspecting diaphragm and others



1. Inspect 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. Inspect pump diaphragm (D) and replace if hardened or curled at valve tabs.

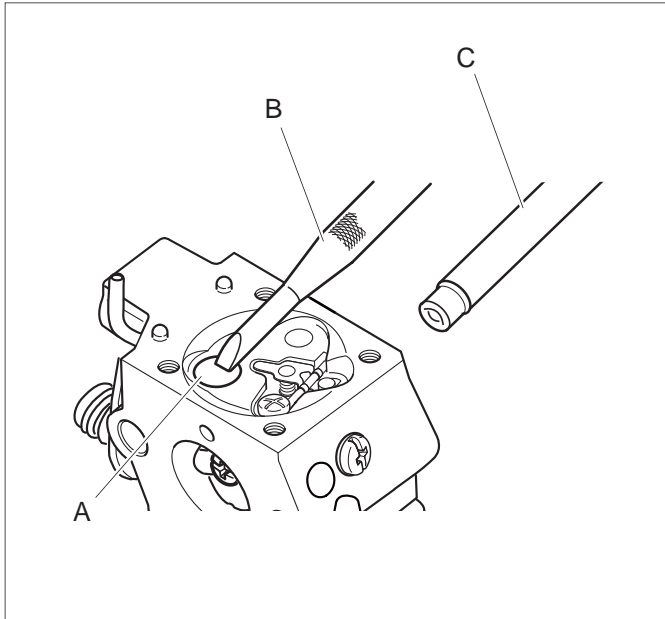
4. Inspect metering gasket (B) and pump gasket (E) and replace if defective.

5. Inspect 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 and inlet needle valve spring may be damaged by the compressed air.

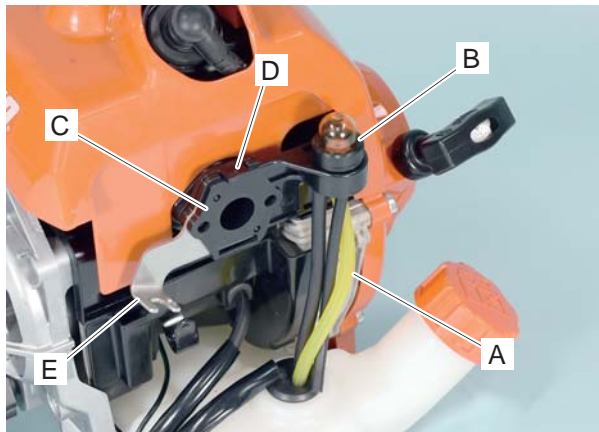
4-11 Replacing welch plug



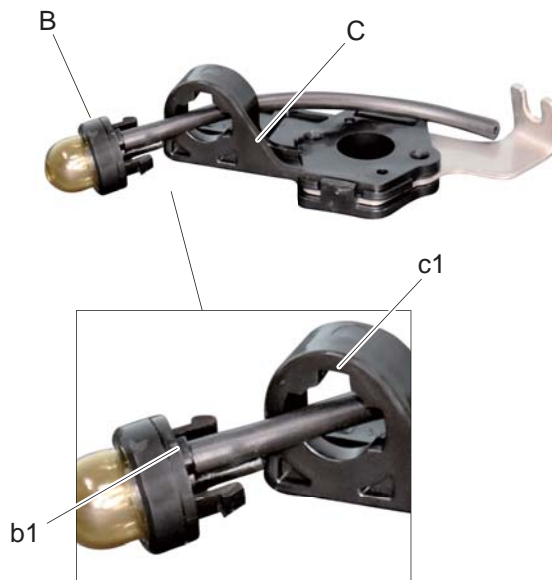
If engine does not run smoothly even after readjusting carburetor and inspecting carburetor parts, inspect low speed ports on carburetor as follows:

1. Remove metering lever and related parts to protect them from damage.
 2. To remove welch plug (A), punch the remover tool (B) through welch plug at low angle and pry it out.
- NOTE:** Remover tool (B) is included in welch plug tool 500-500.
3. Clean low speed ports with compressed air.
 4. Place a new welch plug over the opening and gently tap it until flush using welch plug installer (C).
 5. Install all removed parts to carburetor body.

4-12 Replacing purge bulb

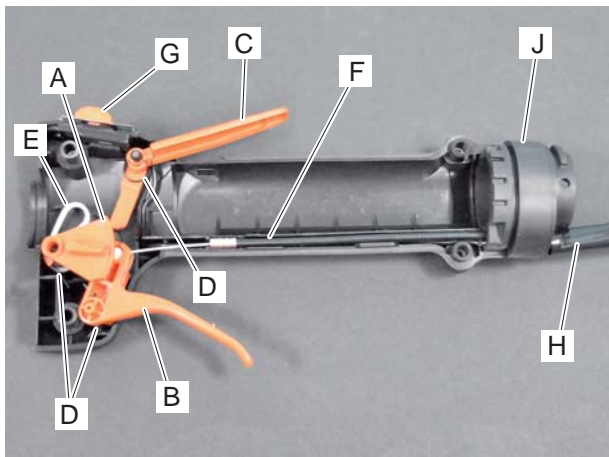


1. Remove carburetor. Disconnect fuel return line (A) from purge bulb.
2. Remove purge bulb (B) with insulator plate (C), (D) and cable holder (E).



3. Remove purge bulb (B) from insulator plate (C).
4. Install new purge bulb to insulator plate (C) engaging notch (b1) with groove (c1) as shown.
 5. Connect fuel return line (A) to purge bulb.
 6. Reinstall removed parts.

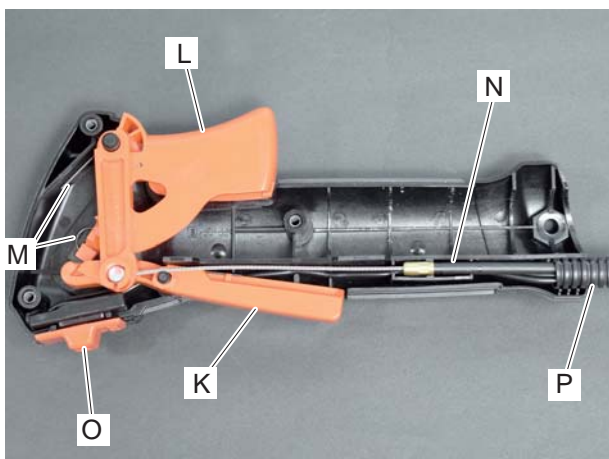
4-13 Replacing throttle cable and control parts



When throttle cable inner wire does not move smoothly, disconnect throttle cable from carburetor and apply lubricating oil inside the cable. If it is still hard to move, replace throttle cable.

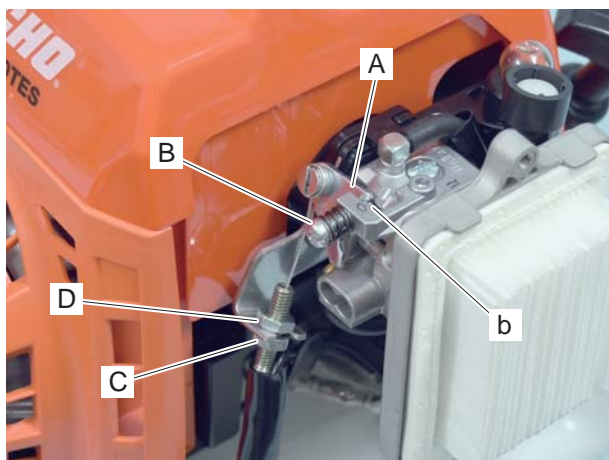
Loop handle type:

1. Referring to "3-5 Replacing ignition switch", remove rear handle grip half.
2. Remove throttle latch (A), throttle trigger (B) and throttle latch (C) with torsion springs (D), throttle latch (E), throttle cable (F) and ignition switch (G) with corrugated tube (H) and cushion (J) from rear handle. Check parts and replace with new one if defective.
3. Pull out throttle cable (F) from corrugated tube (H) and cushion (J). Pass new throttle cable through corrugated tube (H) and cushion (J). Install all parts on rear handle (Refer to "3-5 Replacing ignition switch").

**U-handle type:**

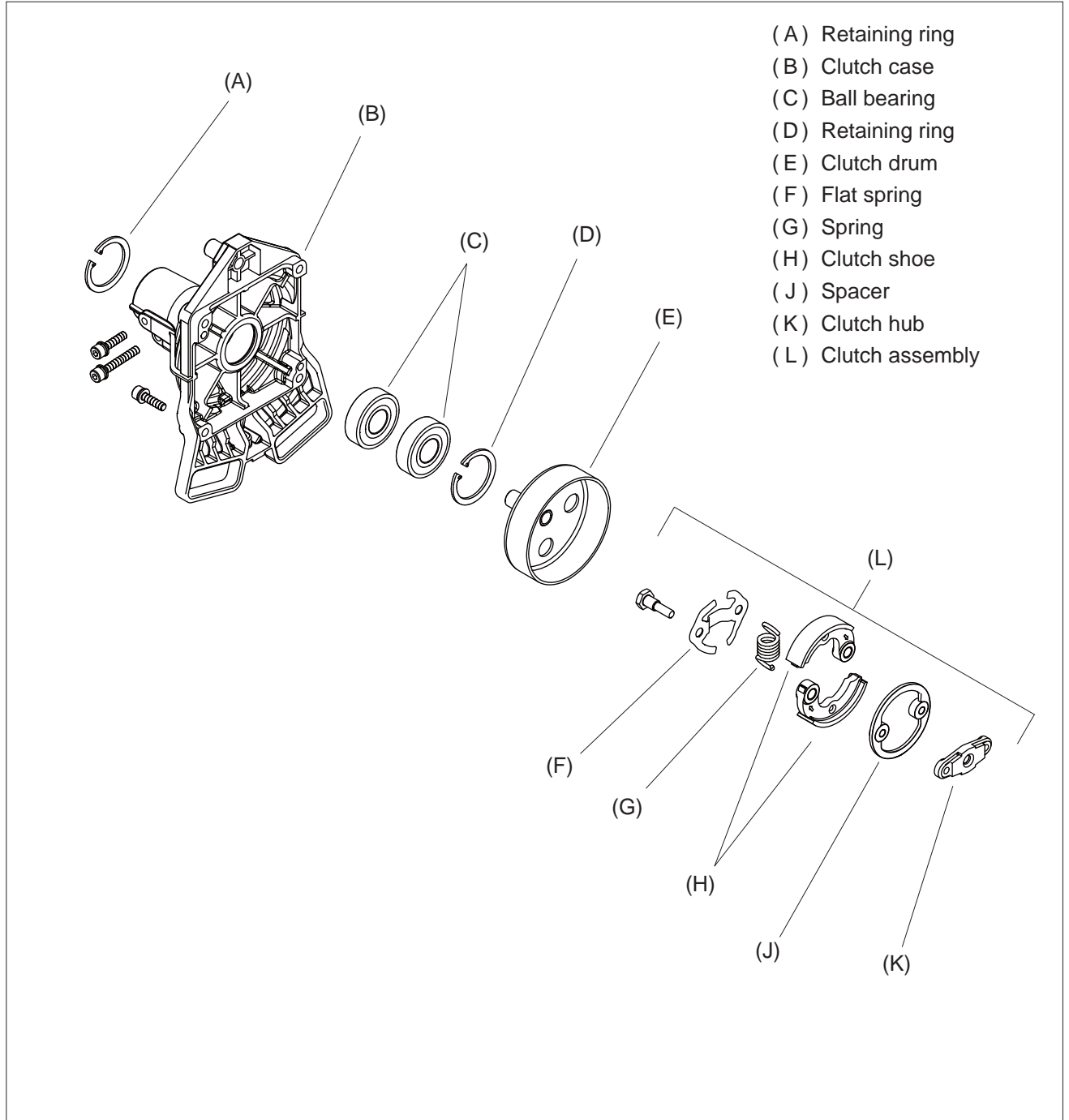
1. Referring to "3-5 Replacing ignition switch", remove right handle grip half.
2. Remove throttle lockout (K) and throttle trigger (L) with torsion springs (M), throttle cable (N), ignition switch (O) and corrugated tube (P) from rear handle. Check parts and replace with new one if defective.
3. Pull out throttle cable (N) from corrugated tube (P). Pass new throttle cable through corrugated tube (P). Install all parts on rear handle (Refer to "3-5 Replacing ignition switch").

4-14 Checking and adjusting throttle cable

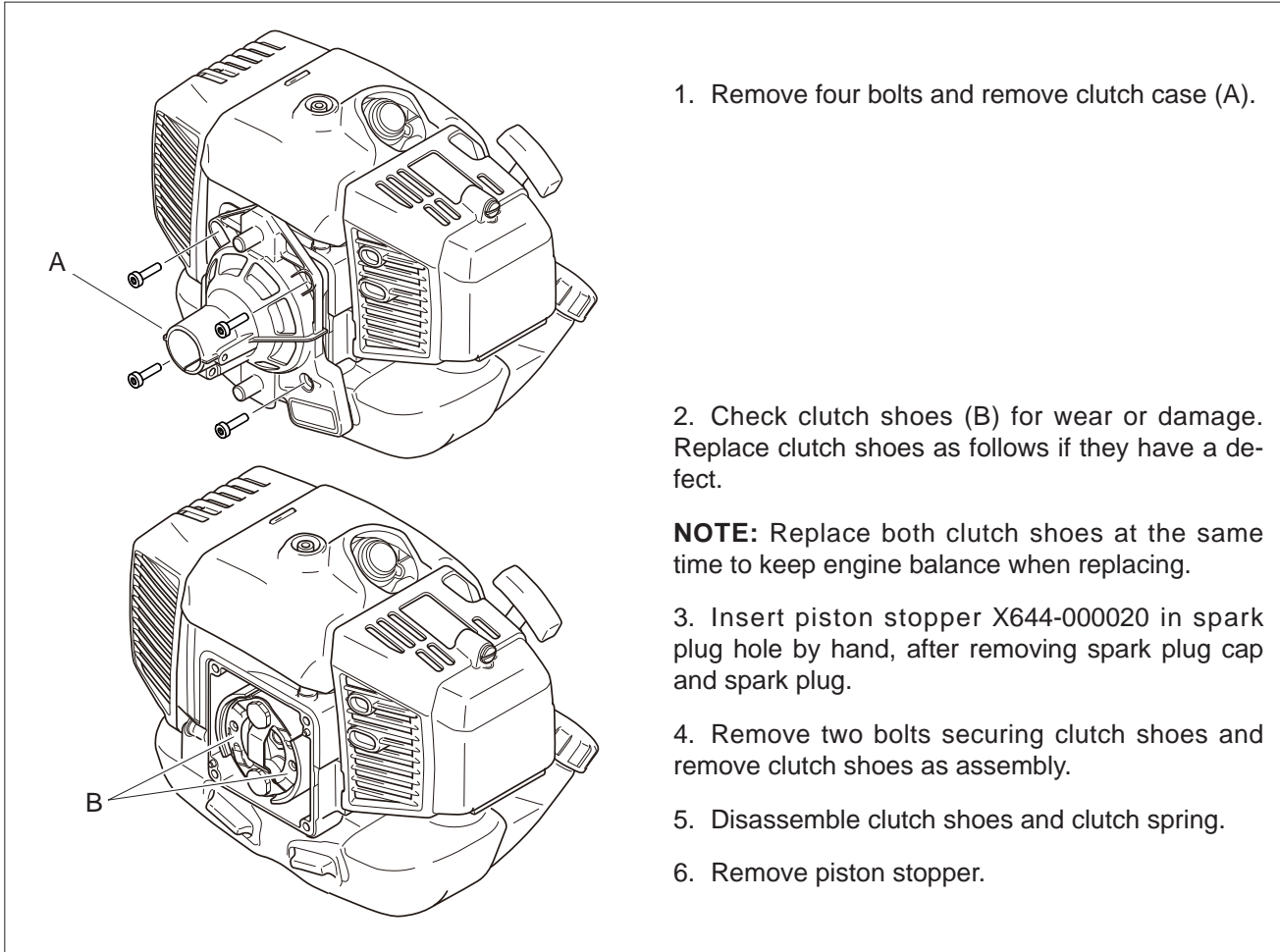


1. Confirm throttle plate (A) contacts tip (b) of Throttle adjust screw (B) when throttle trigger is in idling position.
2. Make sure carburetor become WOT (wide open throttle) when throttle trigger is fully squeezed.
3. If result of 1 and 2 is not sufficient, loosen nut (C) and adjust nut (D) to obtain correct position and movement.
4. After confirming throttle cable inner wire moves smoothly when throttle trigger is squeezed, fasten nut (C) to fix outer throttle cable.

5 CLUTCH SYSTEM



5-1 Removing clutch shoes and spring



1. Remove four bolts and remove clutch case (A).

2. Check clutch shoes (B) for wear or damage. Replace clutch shoes as follows if they have a defect.

NOTE: Replace both clutch shoes at the same time to keep engine balance when replacing.

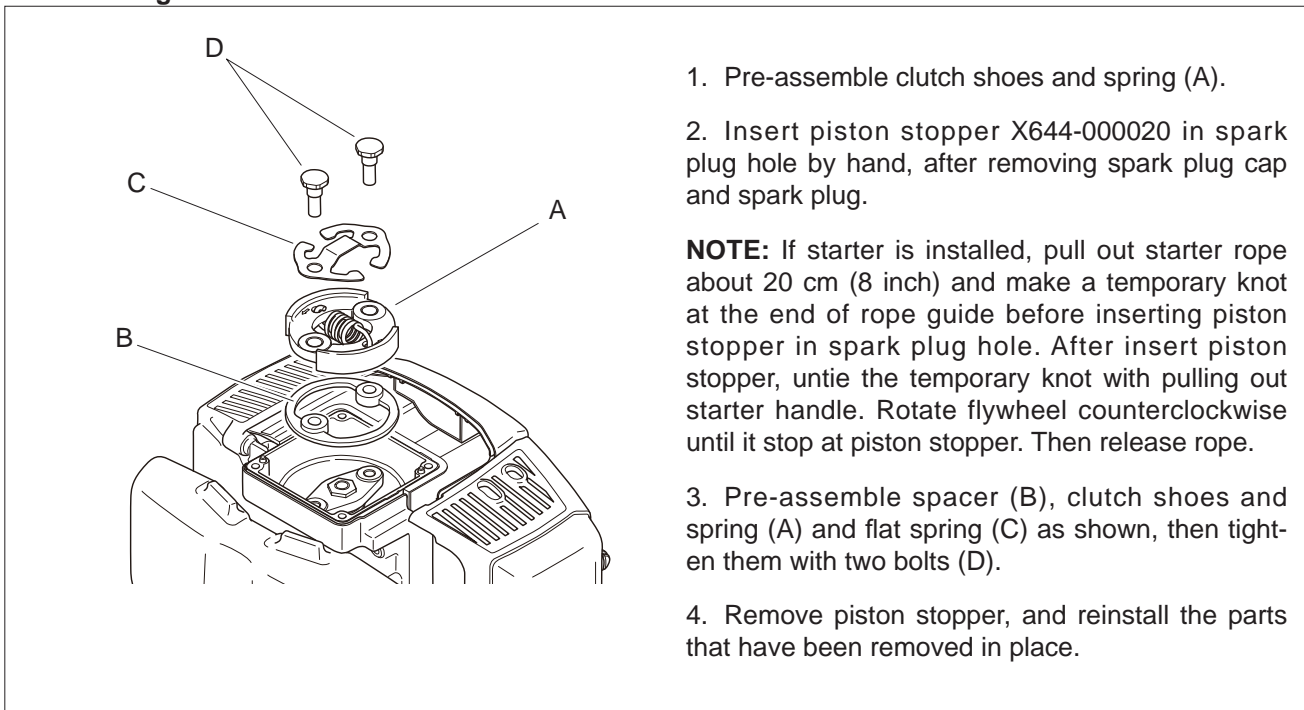
3. Insert piston stopper X644-000020 in spark plug hole by hand, after removing spark plug cap and spark plug.

4. Remove two bolts securing clutch shoes and remove clutch shoes as assembly.

5. Disassemble clutch shoes and clutch spring.

6. Remove piston stopper.

5-2 Installing clutch shoes



1. Pre-assemble clutch shoes and spring (A).

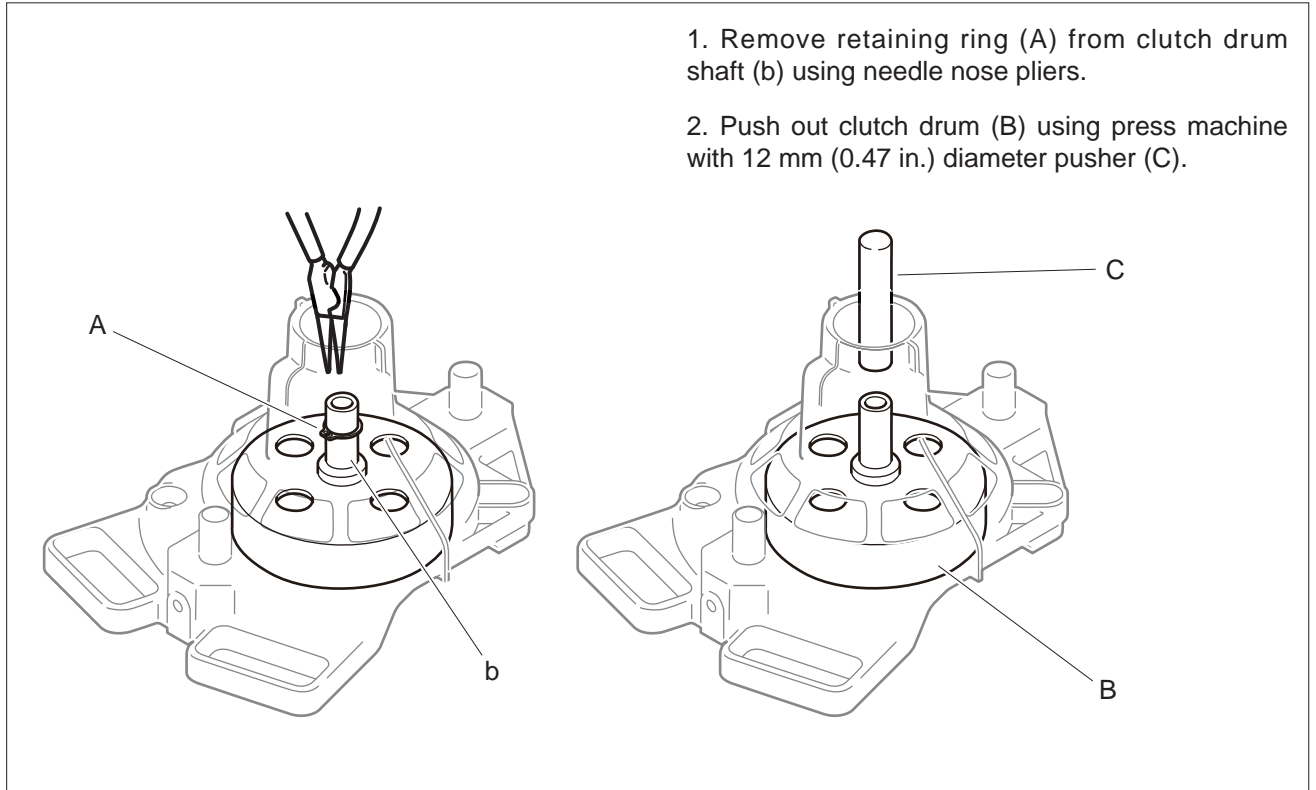
2. Insert piston stopper X644-000020 in spark plug hole by hand, after removing spark plug cap and spark plug.

NOTE: If starter is installed, pull out starter rope about 20 cm (8 inch) and make a temporary knot at the end of rope guide before inserting piston stopper in spark plug hole. After insert piston stopper, untie the temporary knot with pulling out starter handle. Rotate flywheel counterclockwise until it stop at piston stopper. Then release rope.

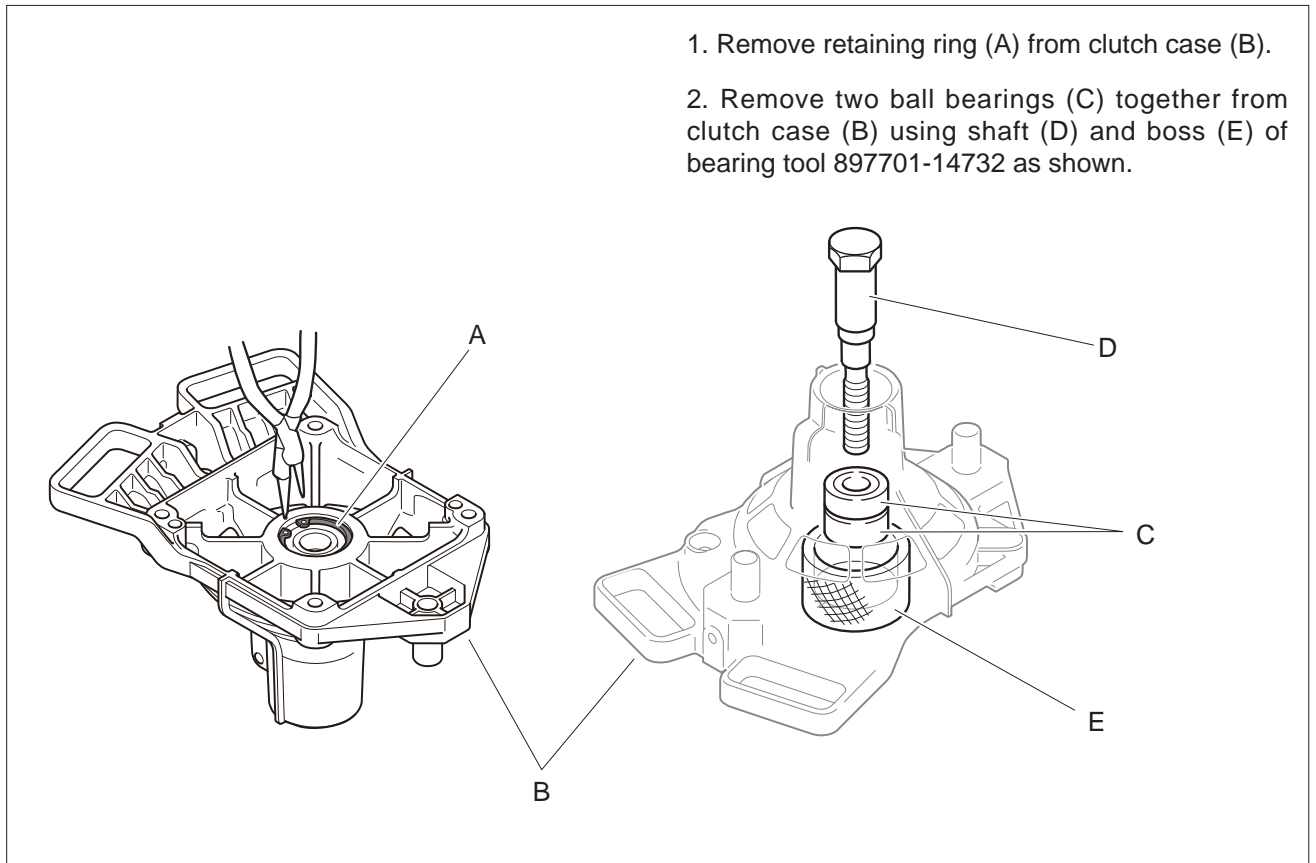
3. Pre-assemble spacer (B), clutch shoes and spring (A) and flat spring (C) as shown, then tighten them with two bolts (D).

4. Remove piston stopper, and reinstall the parts that have been removed in place.

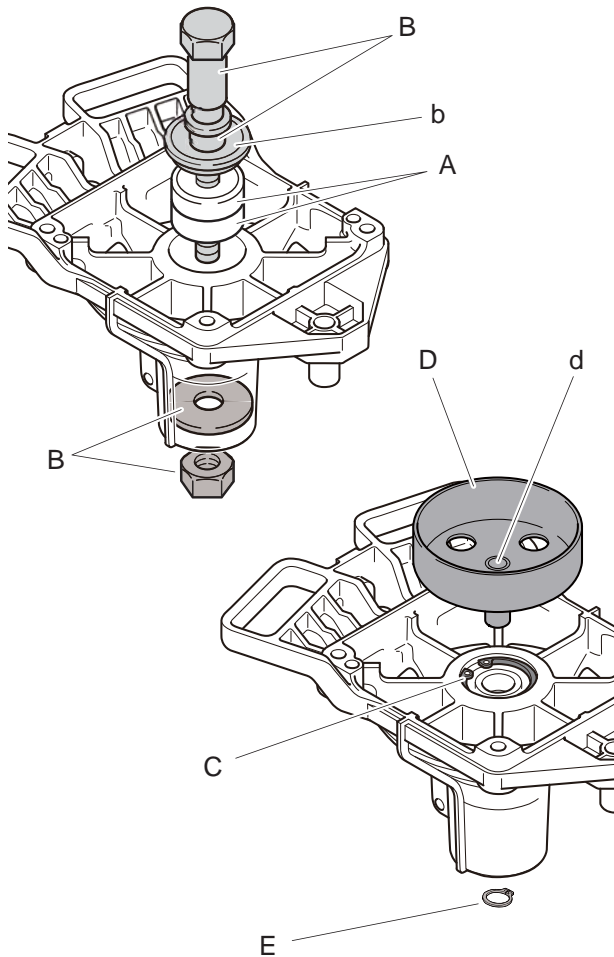
5-3 Removing clutch drum



5-4 Removing clutch drum bearings



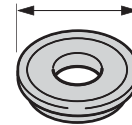
5-5 Installing bearings and clutch drum



1. Lightly lubricate the bearing bore of clutch case with a oil or grease.

2. Meet each open side of new ball bearings (A) and push them together in clutch case until those bottom. To install bearings (A), use bearing tool 897701-14732 (B) as shown.

Outer diameter of adapter (b) : 27.5 mm



3. Check bearings for rotating smoothly.

4. Install retaining ring (C) in the groove of clutch case bore.

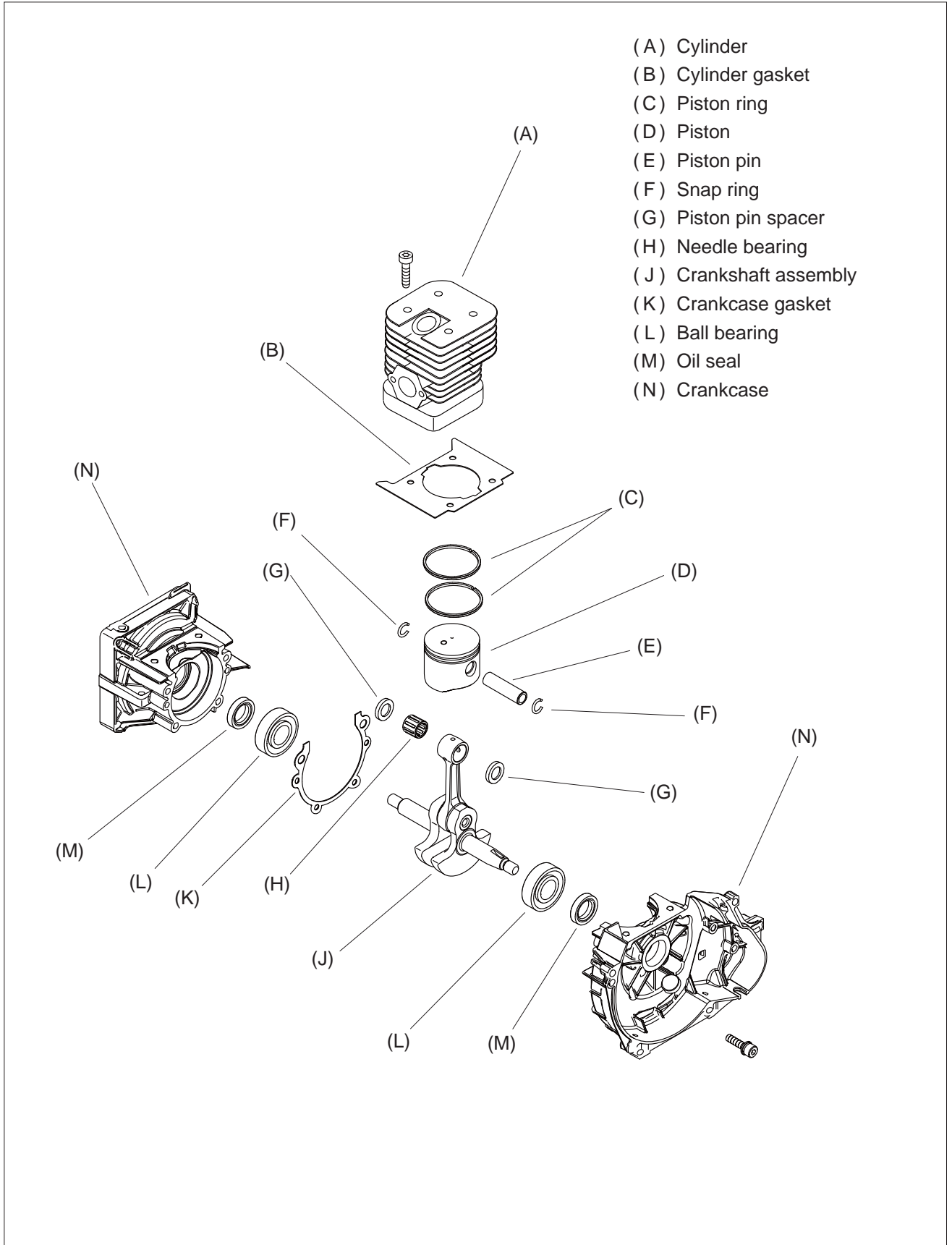
5. Push center (d) of clutch drum (D) in ball bearings with press machine, until it bottoms.

6. Make sure clutch drum rotates freely.

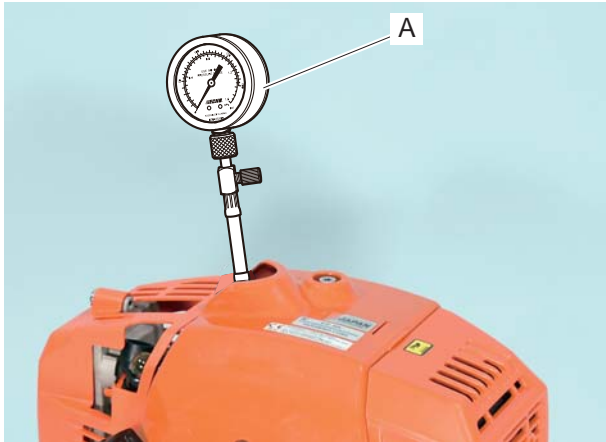
7. Install retaining ring (E) in groove of clutch drum shaft.

8. Reinstall clutch case and other parts.

6 ENGINE



6-1 Testing cylinder compression



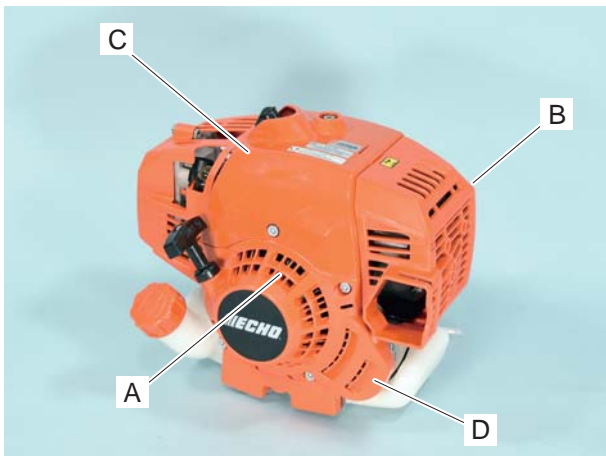
NOTE: Test cylinder compression when engine is cold.

1. Move ignition switch to STOP position. Then remove spark plug.
2. Install compression gauge 91037 (A) in spark plug hole and tighten by hand. Pull starter several times to stabilize reading on compression gauge.
3. If pressure is lower than approx. 75% of standard compression pressure (Refer to "1-2 Technical data"), inspect cylinder bore, piston, and piston rings for wear or damage.

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

NOTE: Compression pressure varies with volume of compression gauge tip occupying cylinder combustion chamber. When you use other than the tool 91037 (A), it is recommended to measure and note compression pressure of brand-new engines as standard pressure in advance.

6-2 Cleaning cooling air passages



1. Inspect air intake grid (A). If blocked with leaves or other debris, clean out debris as required.

2. Remove muffler cover (B), cylinder cover (C) and starter assembly (D). Remove inner cylinder cover and fan cover.



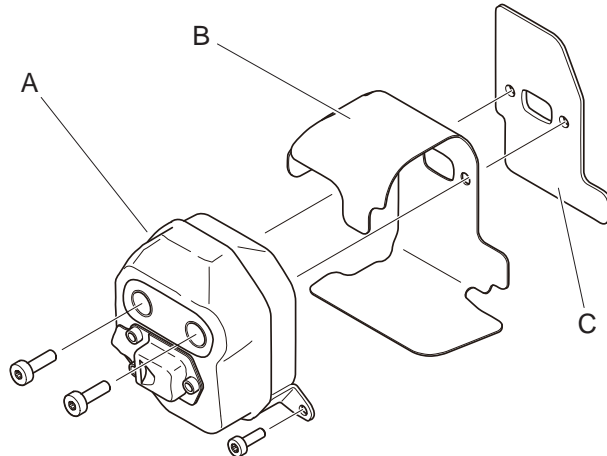
3. Inspect cylinder cooling fins (E) for blockage with dirt or dust.

4. Clean them with wooden stick or plastic stick or compressed air as required.

WARNING  **DANGER**

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

6-3 Inspecting muffler and exhaust port



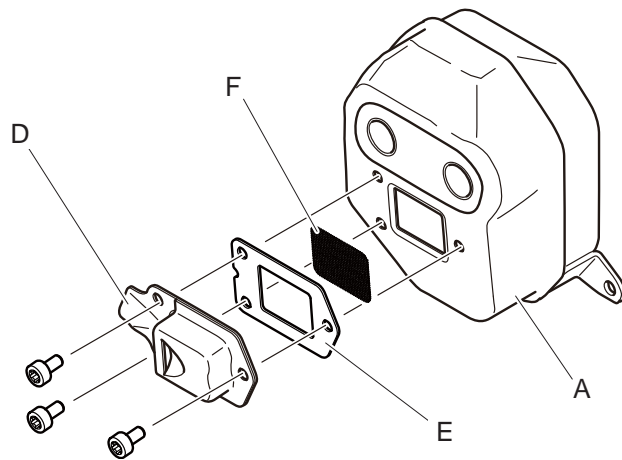
1. Remove three bolts and remove muffler (A), muffler gasket (B) and (C) from cylinder.

NOTE: Replacing muffler gasket (B) and (C) with new one when removing them.



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

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



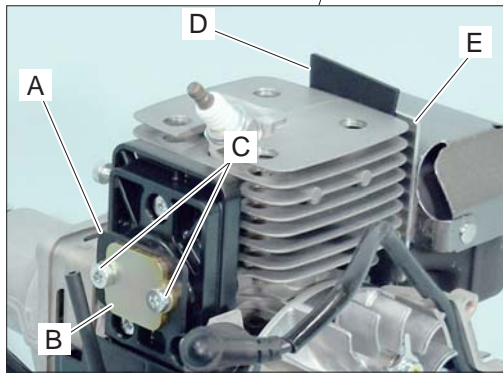
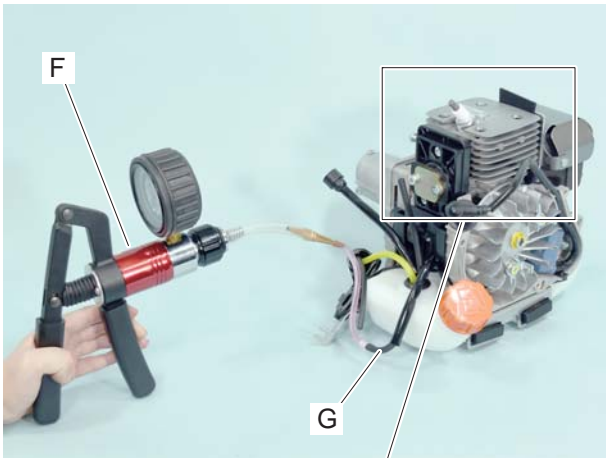
3. Remove three bolts and remove muffler lid (D), muffler lid gasket (E) and spark arrestor screen (F) from muffler (A).

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

5. Reinstall removed parts.

NOTE: Replace muffler lid gasket (E) with new one when removing muffler lid (D).

6-4 Testing crankcase and cylinder sealing



1. Remove muffler cover, air cleaner cover, cylinder cover, starter assembly and inner covers. Remove carburetor, insulator plates and cable holder (Refer to "4-12 Replacing purge bulb").

2. To seal intake port, install pressure rubber plug 897826-16131 (A) and pressure plate 897827-16131 (B) and tighten M5 bolts or screws (C) of 12 - 16 mm (0.5 - 0.6 in) length as shown.

3. Loosen three muffler bolts. To seal exhaust port, insert pressure rubber plug 91041 (D) between cylinder exhaust port and muffler gasket (E), until it bottoms. Tighten the muffler bolts.

4. Connect pressure / vacuum tester 91139 (F) or 91149 to pulse pipe (G).

5. Apply pressure approx. 0.05 MPa (0.5 kgf/cm²) (7 psi) by pressure / vacuum tester and leave for 30 seconds.

6. If the reading drops, leakage may occur.

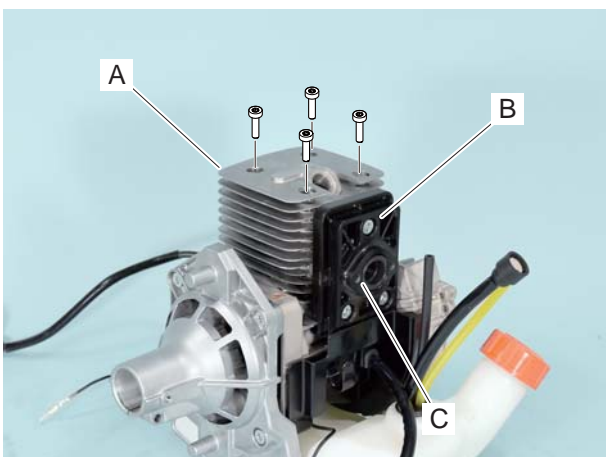
7. Leakage may occur from crankcase seam or oil seal. Use soapy water to locate leakage.

8. Then, apply negative pressure approx. 0.03 MPa (0.3 kgf/cm²) (4 psi) by pressure / vacuum tester and leave for 30 seconds.

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

10. Remove plugs from exhaust port and intake port after this inspection, and reinstall all the removed parts.

6-5 Removing and inspecting cylinder



1. Remove muffler.

2. Remove four bolts and remove cylinder (A) with intake insulator (B) and intake bellows (C) from engine.

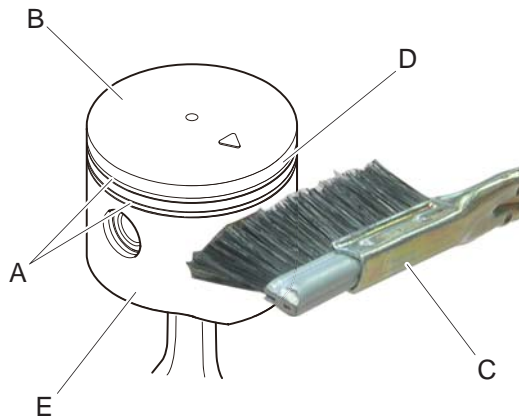
NOTE: If it is hard to remove cylinder, gently tap cylinder head at carburetor side and muffler side with a plastic hammer.

3. Inspect cylinder combustion chamber. Clean it with a wooden scraper if carbon is found.

NOTE: Never use metal scraper in cylinder combustion chamber to avoid damage.

4. Replace cylinder with new one if plating is worn, peeled away or scored, exposing cylinder base metal.

6-6 Inspecting piston and piston ring



1. Inspect piston rings (A) and replace them if broken, scored, or exceeded service limits (Refer to "1-5 Service limits").

2. Inspect piston crown (B). Clean it with fine sand paper, oil stone, and soft cleaning brush (C) if carbon is found.

3. Inspect top land (D), ring grooves and skirt (E). Clean them with soft cleaning brush (C) if carbon is found.

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

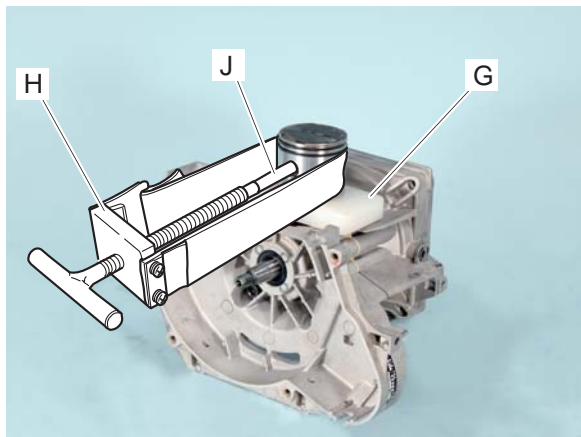
4. Remove snap rings (F) from both sides of piston pin.



5. Push piston pin out from piston with piston holder 897719-02830 (G).

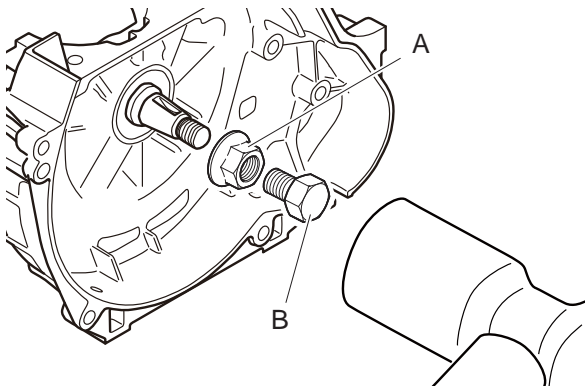
NOTE: If piston pin is tight, use piston pin tool 897702-30131 (H) with adapter (J) stamped "10" on an end.

6. Inspect piston pin, needle bearing and piston spacers, and replace them if wear or discoloration is noted.

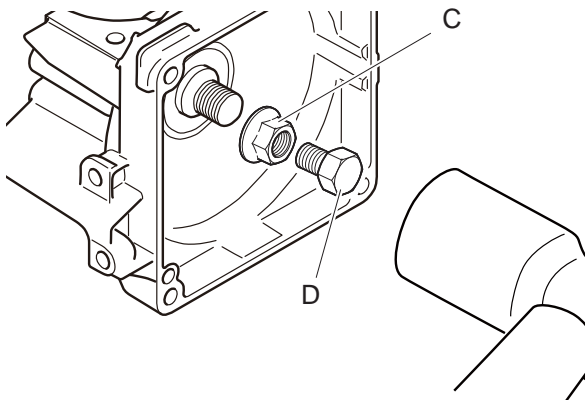


6-7 Inspecting crankcase and crankshaft

Flywheel side of crankcase



Clutch side of crankcase

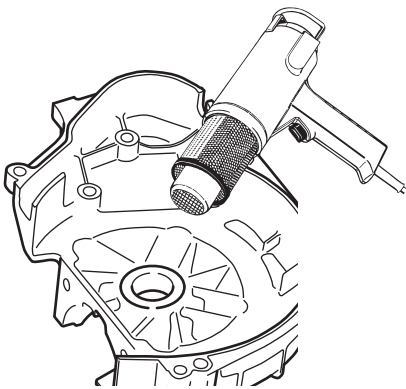


1. Remove four bolts securing crankcase.

NOTE: Before removing flywheel side crankshaft, remove woodruff key. Replace it with new one, when removing it (Refer to “3-10 Inspecting flywheel and key”).

2. Install flange nut (A) (LM8) on flywheel side crankshaft and screw it three turns.
3. Screw bolt (B)(LM8) in flange nut (A) until it bottoms.
4. Hold crankcase half and tap the bolt head (axially) using plastic hammer to separate the halves.
5. Install flange nut V265-000200 (C) on clutch side crankshaft and screw it three turns.
6. Screw bolt 900100-08008 (D) in flange nut (C) until it bottoms.
7. Hold the other crankcase half and tap the bolt head (axially) using plastic hammer to remove crankshaft
8. Clean inside of crankcase halves if they are dirty. Replace them as a set if damaged.
9. Inspect connecting rod big end and needle bearing for discoloration or damage. Replace crankshaft with a new one as required.

6-8 Replacing oil seal



1. Remove crankshaft (Refer to “6-7 Inspecting crankcase and crankshaft”).
2. Heat up oil seal housing with a heat gun.

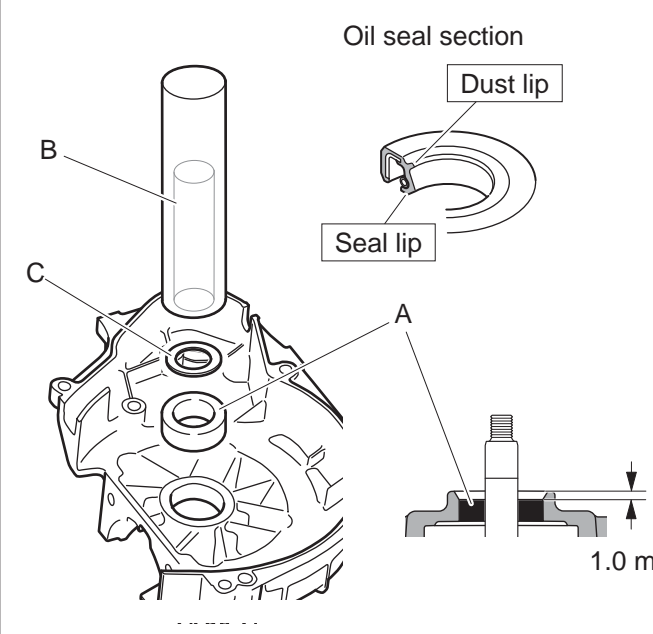
WARNING  **DANGER**

**When using a heat gun, put on gloves.
Otherwise, a burn will result.**

3. Pry defective oil seal from crankcase.

NOTE: Be careful not to damage oil seal housing.

6-8 Replacing oil seal (continued)



Oil seal section

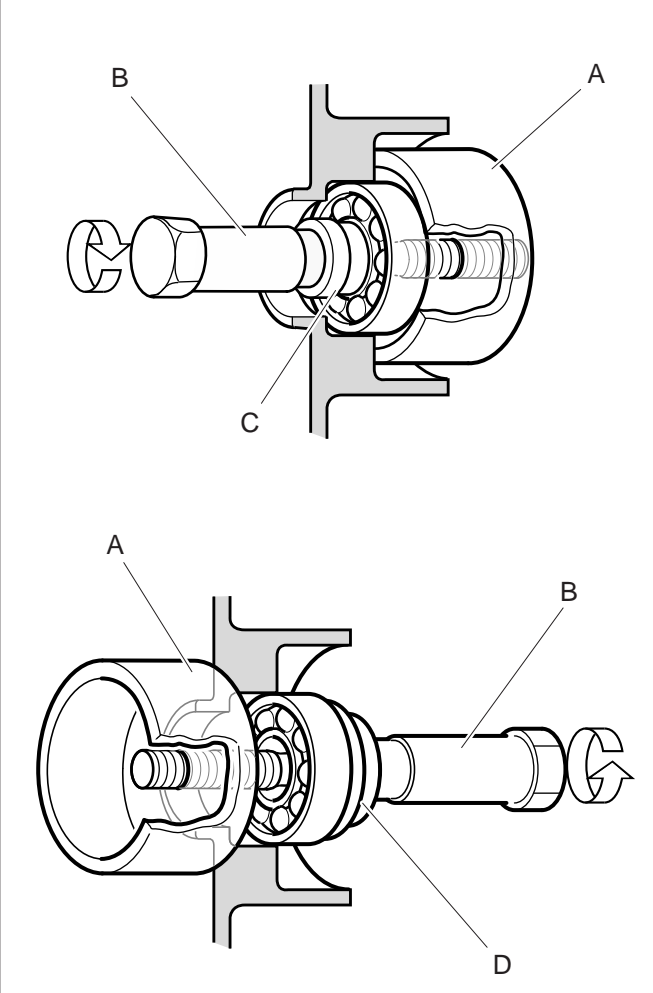
Dust lip

Seal lip

1.0 mm

4. Apply lithium based grease on dust lip and seal lip of oil seal to avoid damage of lips while inserting crankshaft into oil seal.
5. Lubricate circumferences of oil seal with thinner.
6. Push in oil seal (A) by maximum 0.5 mm (0.02 in.) deep using oil seal tool 897726-21430 (B) with washer 363018-00310 (inner dia. 12 mm, outer dia. 20 mm, thickness 1.0 mm) (C).

6-9 Replacing ball bearing

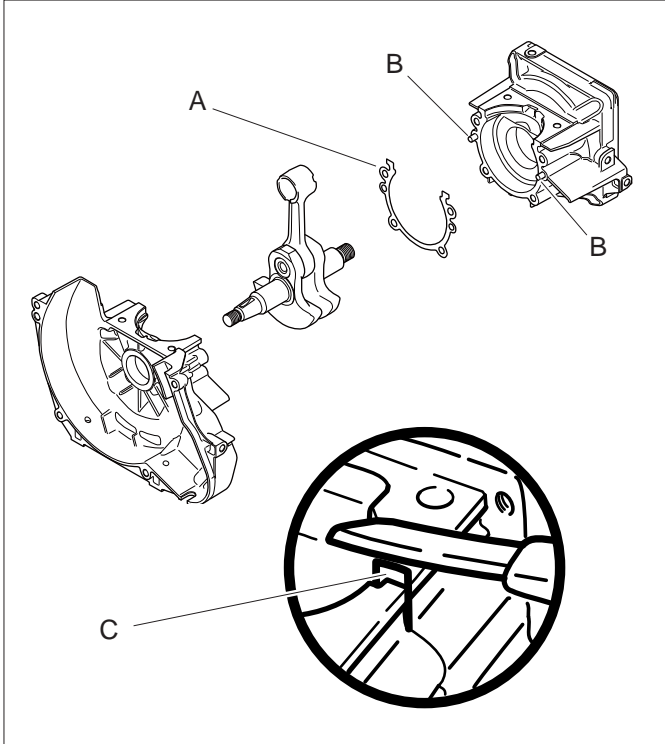


1. Check main ball bearings for smooth rotation, after disassembling crankshaft. If rough, replace it (them) with new one.
2. Pry oil seal from crankcase.
3. Remove main ball bearing from crankcase half using bearing tool 897701-14732 as follows.
4. Set boss (A) and shaft (B) with adapter (C) (inner dia. 12 mm, outer dia. 19 mm) as shown.
5. Tighten shaft (B) with a wrench to remove ball bearing.
6. Coat bearing housing in crankcase with a lithium grease.
7. Set ball bearing with boss (A), shaft (B) and adapter (D) (inner dia. 12 mm, outer dia. 27.5 mm) as shown.
8. Tighten shaft (B) with a wrench to press ball bearing into the crankcase half.

NOTE: Preheat around bearing housing of crankcase using a floodlight or a suitable heater for easier assembly.

9. Check that bearing is seated to the bottom and rotates smoothly. Install new oil seal.

6-10 Assembling crankshaft and crankcase



1. Clean the mating surface of each crankcase half.

2. Insert crankshaft clutch end into clutch side of crankcase half until seated to the bottom.

NOTE: If it is hard to insert crankshaft to crankcase, preheat ball bearing for easier installation.

3. Put a new crankcase gasket (A) on clutch side crankcase half.

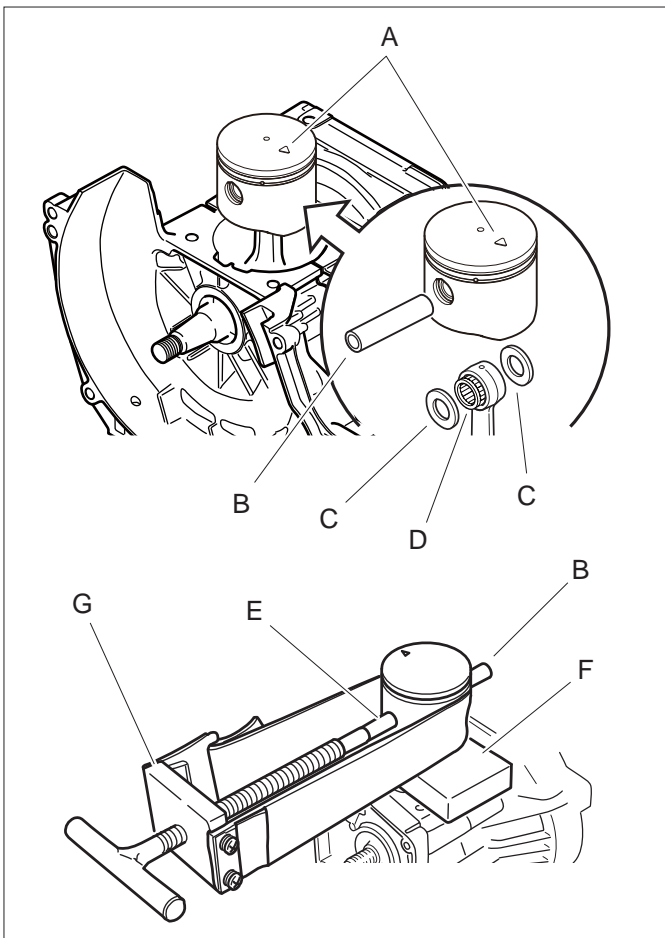
4. Reassemble both crankcase halves together ensuring that dowel pins (B) on crankcase half are properly seated in the holes on the other half.

5. Tighten four bolts to secure the crankcase halves together and check the crankshaft rotation.

NOTE: Tighten four bolts with standard torque (refer to "1-3 Torque limits").

6. Carefully remove protruding portion of crankcase gasket (C) with a sharp knife.

6-11 Installing piston



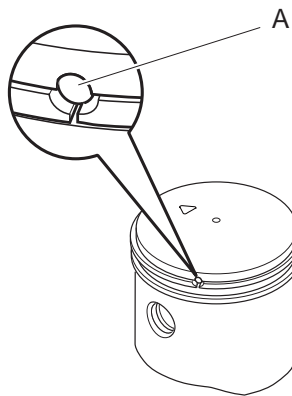
1. Place piston over the small end of connecting rod, so that the arrow mark (A) on piston points toward muffler.

2. Insert piston pin guide (B) stamped "10", through piston, spacers (C) and needle bearing (D) in connecting rod as shown.

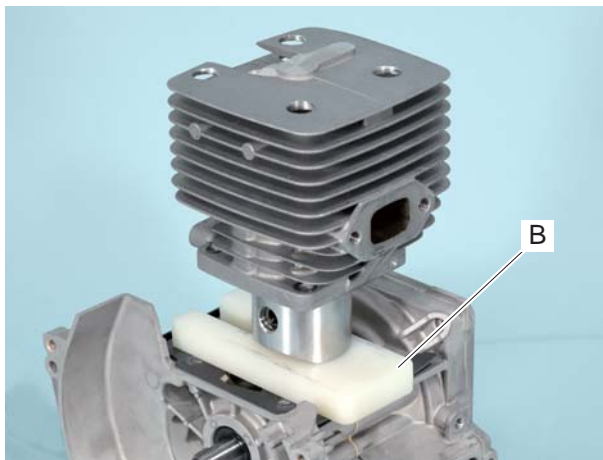
3. Insert piston pin (E) in piston pushing out piston pin guide (B) using piston pin tool 897702-30131 (G) and piston holder 897719-02830 (F).

4. Install new snap rings to the piston pin bore, and be sure that they are correctly seated in the grooves.

6-12 Installing piston ring and cylinder



1. Install piston ring on piston, ensuring the end gaps of piston ring are properly positioned around locating pin (A) as shown.
2. Set new cylinder gasket on cylinder base with a little glue for easier installation of cylinder.
3. Apply oil to piston ring and internal wall of cylinder.
4. Install cylinder over piston ensuring that the exhaust side of cylinder should face the arrow side of piston.

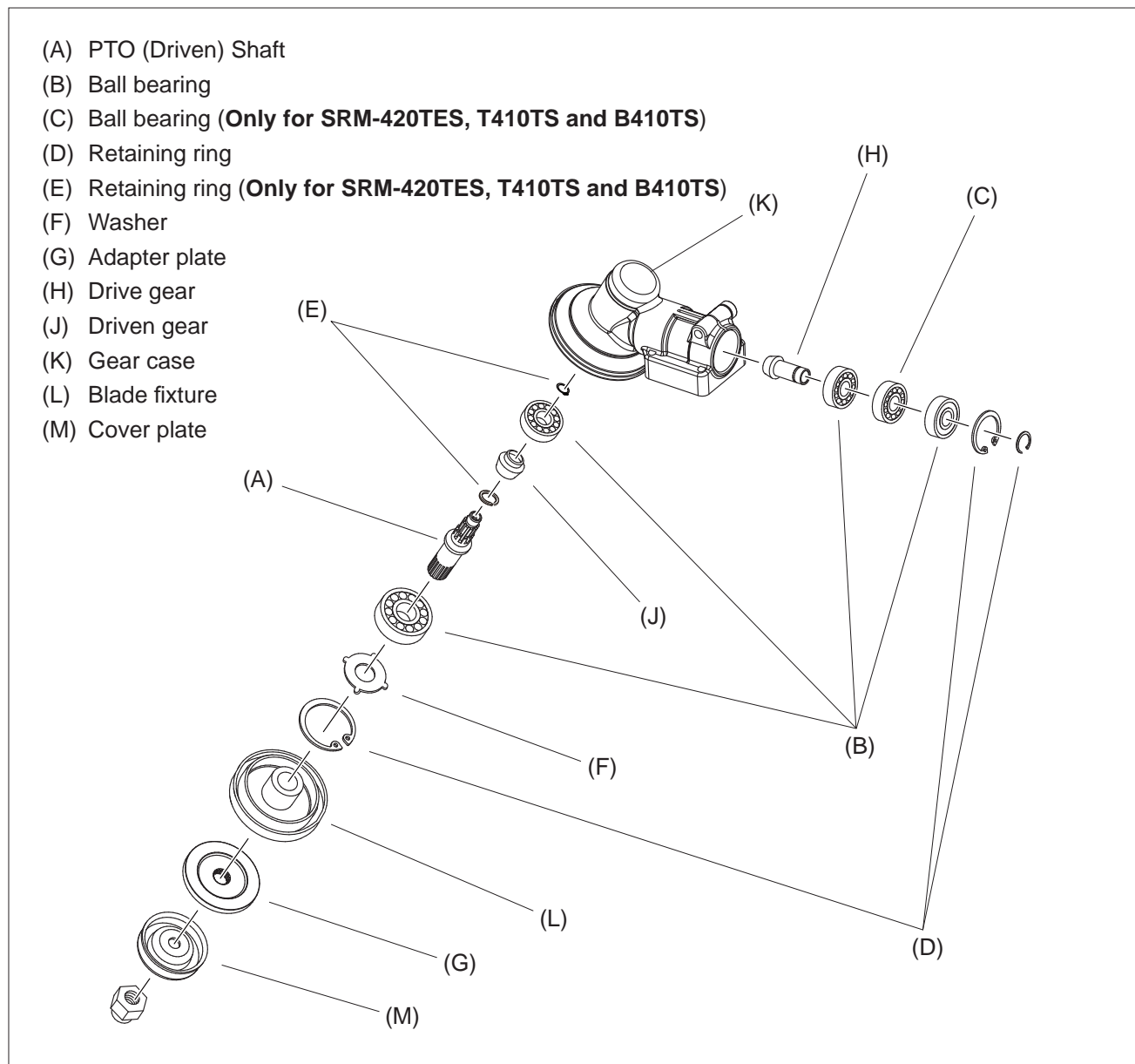


NOTE: When installing cylinder, it is convenient to use piston holder 897719-02830 (B) for stabilizing piston.

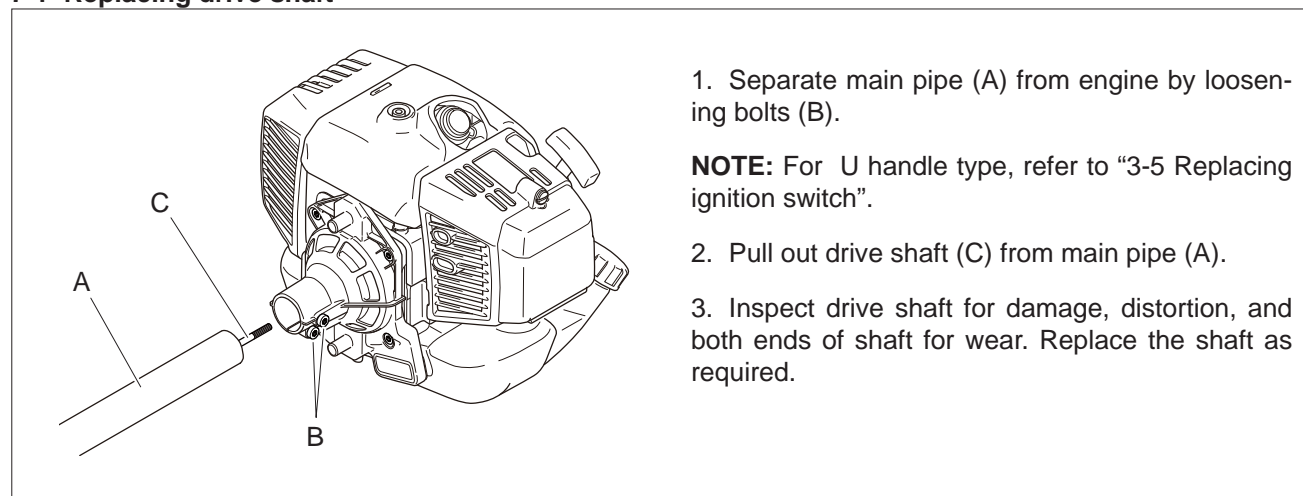
NOTE: When installing piston in cylinder, do not twist cylinder to avoid breakage of piston ring and scoring cylinder bore.

5. Reinstall all removed parts in place.

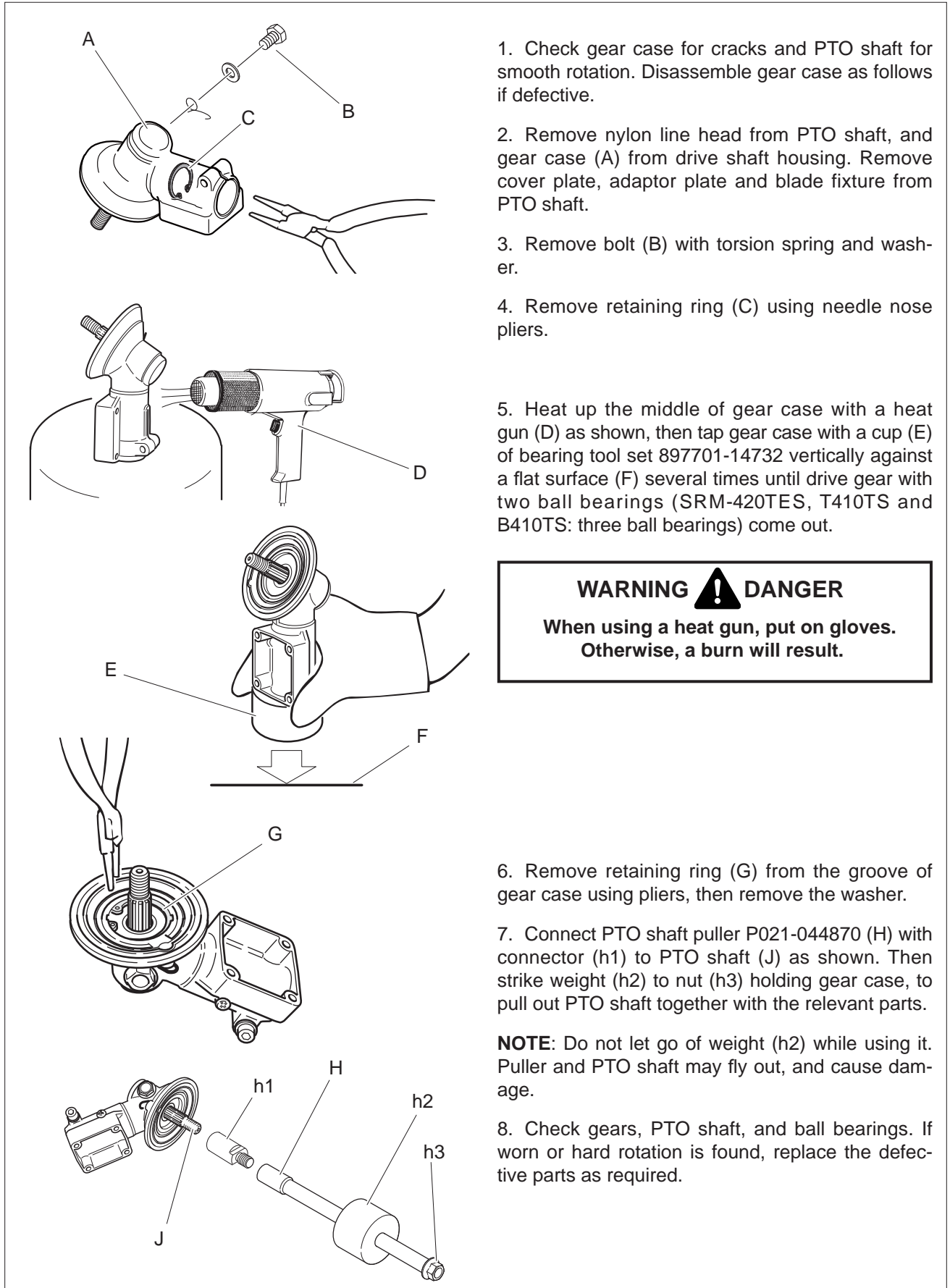
7 CUTTER DRIVE SYSTEM



7-1 Replacing drive shaft



7-2 Disassembling gear case



1. Check gear case for cracks and PTO shaft for smooth rotation. Disassemble gear case as follows if defective.

2. Remove nylon line head from PTO shaft, and gear case (A) from drive shaft housing. Remove cover plate, adaptor plate and blade fixture from PTO shaft.

3. Remove bolt (B) with torsion spring and washer.

4. Remove retaining ring (C) using needle nose pliers.

5. Heat up the middle of gear case with a heat gun (D) as shown, then tap gear case with a cup (E) of bearing tool set 897701-14732 vertically against a flat surface (F) several times until drive gear with two ball bearings (SRM-420TES, T410TS and B410TS: three ball bearings) come out.

WARNING ! DANGER
When using a heat gun, put on gloves.
Otherwise, a burn will result.

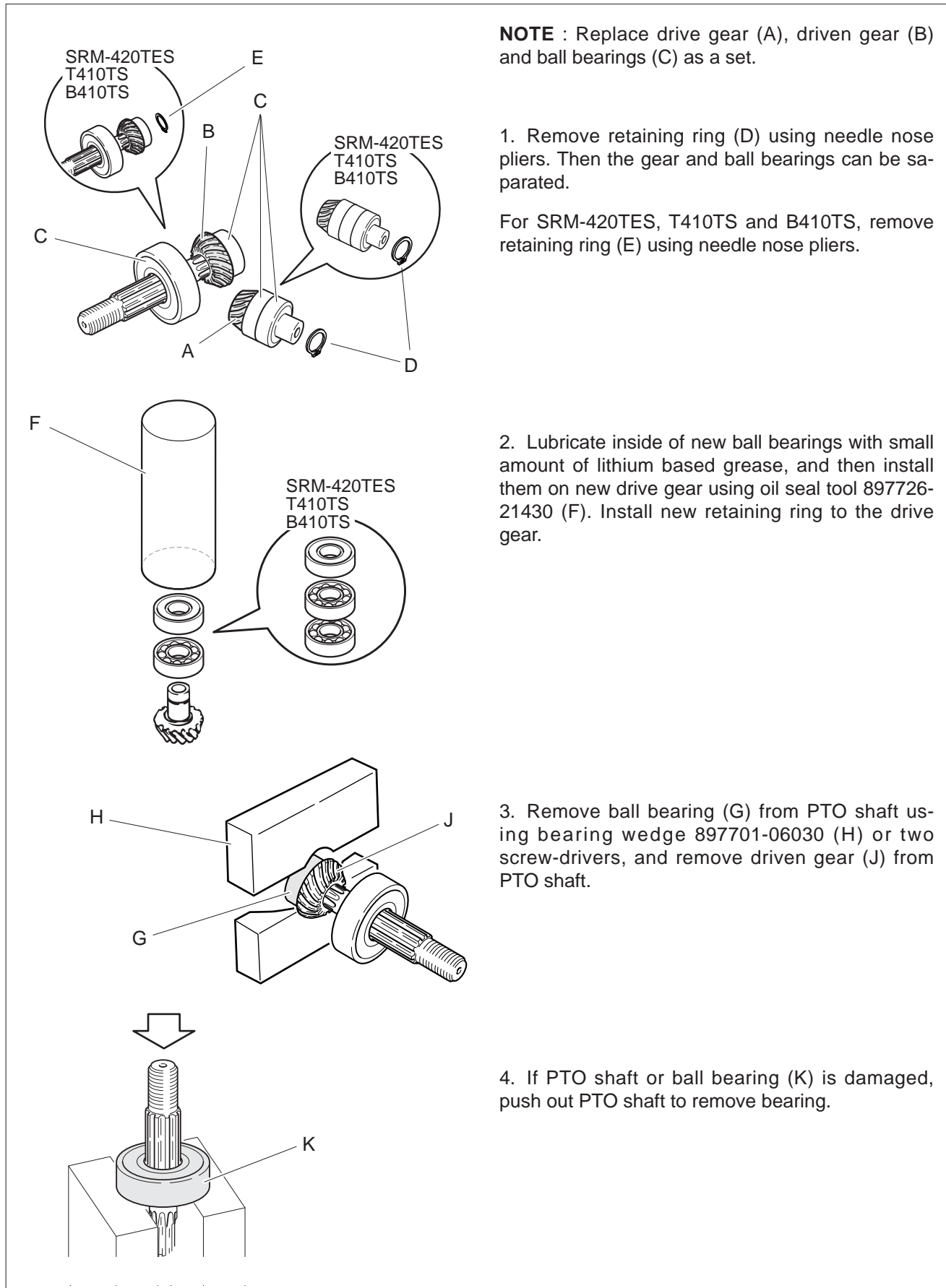
6. Remove retaining ring (G) from the groove of gear case using pliers, then remove the washer.

7. Connect PTO shaft puller P021-044870 (H) with connector (h1) to PTO shaft (J) as shown. Then strike weight (h2) to nut (h3) holding gear case, to pull out PTO shaft together with the relevant parts.

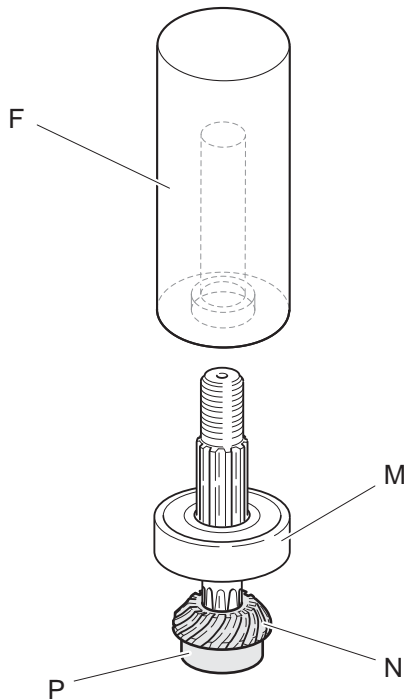
NOTE: Do not let go of weight (h2) while using it. Puller and PTO shaft may fly out, and cause damage.

8. Check gears, PTO shaft, and ball bearings. If worn or hard rotation is found, replace the defective parts as required.

7-3 Replacing gears and PTO shaft

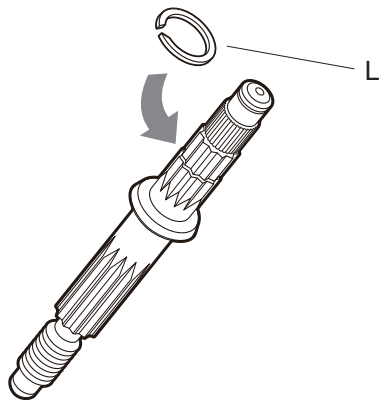


7-3 Replacing gears and PTO shaft (continued)



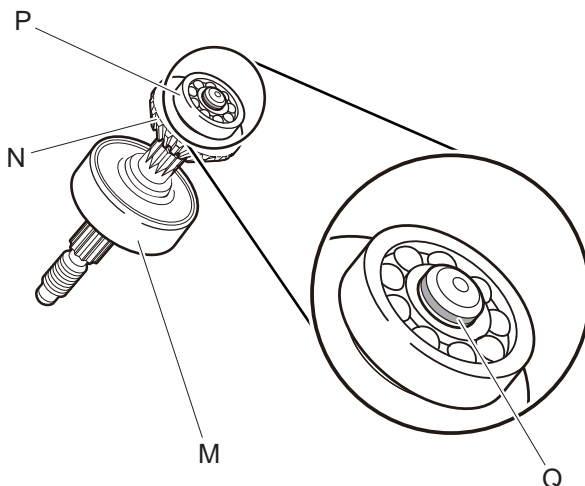
For SRM-420ES, T410S and B410S

5. Install a new ball bearing (M) to PTO shaft using oil seal tool 897714-24330 (F).
6. Install a new driven gear (N) to PTO shaft.
7. Insert PTO shaft in a new ball bearing (P) until the end of shaft is flush with bearing.



For SRM-420TES, T410TS and B410TS

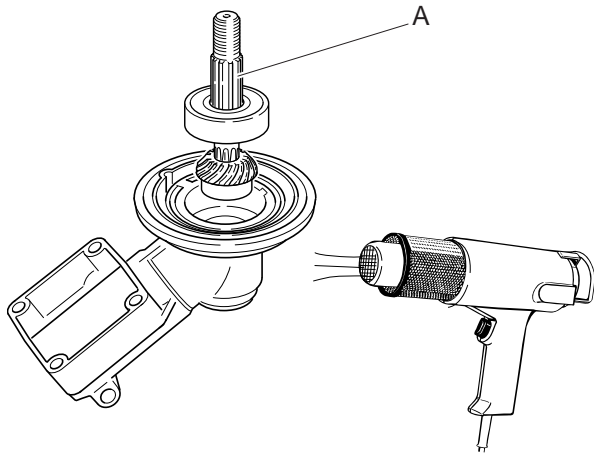
5. If retaining ring (L) is defective, replace with a new one.



6. Install a new ball bearing (M) to PTO shaft using oil seal tool 897714-24330 (F).
7. Install a new driven gear (N) to PTO shaft.
8. Install a new ball bearing (P) to PTO shaft until it becomes slightly lower than groove (Q) as shown.

9. Install new retaining ring to the groove (Q).

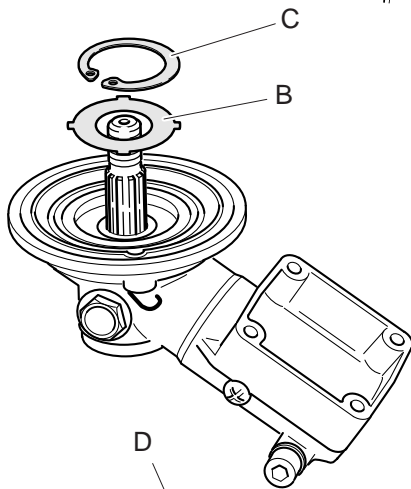
7-4 Assembling gear case



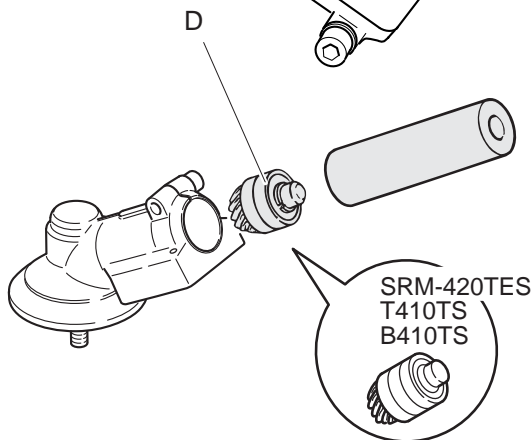
1. Heat up the top of gear case with a heat gun as shown, then insert the assembled PTO shaft (A) into gear case until it bottoms.

WARNING  **DANGER**

When using a heat gun, put on gloves.
Otherwise, a burn will result.



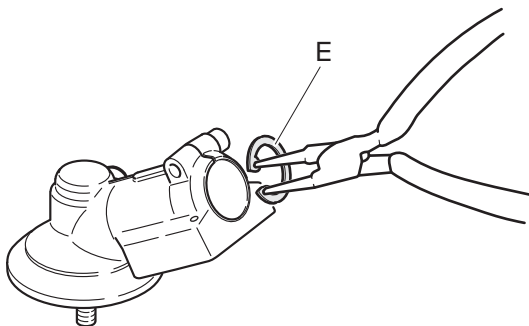
3. Install washer (B) in gear case until it bottoms.
4. Install new retaining ring (C) to the groove of gear case.



5. Insert drive gear assembly (D) into gear case.

NOTE: 28 mm diameter main pipe cut to a suitable length can be used as a pusher.

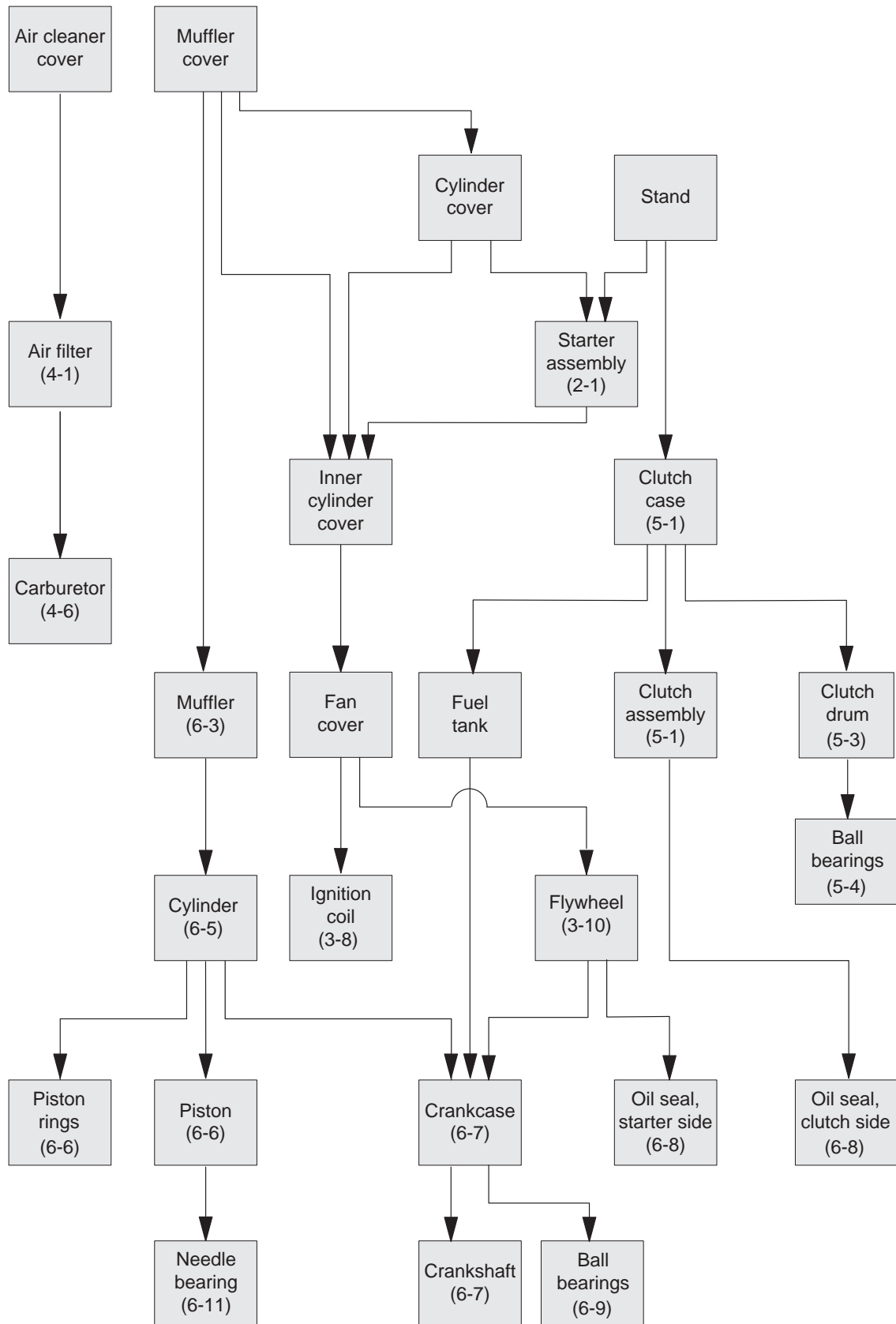
NOTE: Make sure the gears can move smoothly. If it does not, reheat up gear case to bring the gears back into correct position.



6. Install new retaining ring (E) to the groove of the gear case bore.
7. Fill gear case with about 20 grams (0.7 oz.) of lithium based grease.
8. Reinstall cover plate, adaptor plate and blade fixture on gear case assembly.

8 MAINTENANCE GUIDE

8-1 Disassembly chart



8-2 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
Nylon cord head does not rotate.	14
Nylon cord head does not cut well.	15

CHECKING	REFERENCES	Check <input type="radio"/> first.														
		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Starter system																
Rewind spring	2-3															<input type="radio"/>
Starter drum / rope	2-1, 2-2, 2-4															<input type="radio"/>
Starter pawl / spring	2-5															<input checked="" type="radio"/>
Ignition system																
Sparks	3-2							<input checked="" type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input checked="" type="radio"/>
Spark plug	3-3							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
Spark plug cap / coil	3-7							<input type="radio"/>								<input type="radio"/>
Ignition switch	3-4, 3-5			<input checked="" type="radio"/>				<input type="radio"/>								<input type="radio"/>
Ignition coil	3-6, 3-8							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
Pole shoe air gaps	3-9							<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			<input type="radio"/>
Flywheel	3-10							<input type="radio"/>					<input type="radio"/>			<input type="radio"/>
Flywheel key	3-10								<input type="radio"/>				<input type="radio"/>			<input type="radio"/>
(Continued)																

8-3 Service intervals

Inspecting point	Service	Reference	Intervals		
			Daily	3 months or 100 hours	6 months or 300 hours
Screws and bolts *	Retighten / Replace			○	
Air filter	Clean	4-1	○		
	Inspect / Replace			○	
Carburetor	Inspect / Repair	4-5 to 4-11			○
Fuel leaks	Inspect / Repair	4-2	○ **		
Fuel line	Inspect / Repair	4-4		○	
Cylinder exhaust port	Inspect / Clean	6-3		○	
Gear housing	Grease		Every 50 hours of use		
Drive shaft	Grease			○	
Choke system	Inspect / Clean / Replace		○		
Cooling system	Inspect / Clean	6-2	○		
Spark plug	Clean / Regap	3-3		○	
	Inspect / Replace				○
Fuel strainer	Clean / Replace	4-2		○	
Leads and connections	Inspect / Repair	3-5		○	
Fuel tank	Clean inside			○	
Muffler and exhaust port	Clean	6-3		○	
Starter system	Inspect / Repair	2-2, 2-5		○	

Daily: Inspecting in every services.

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

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

Starter assembly bolts (4 pcs.)

Front handle bolts (Loop handle type: 2 pcs.) (U-handle type: 1pc.)

Cylinder cover bolt (2 pcs.)

** Inspect after every refuel.

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