



SERVICE MANUAL

SERVICE TOOLS

REVISED Dec. 2019
Ref. No. 400-01A

INTRODUCTION

All illustrations and part numbers in this MANUAL are based on the latest information available at the time of publication. All illustrations and part numbers are subject to change without notice.

For the service tool not described this MANUAL, refer to SERVICE MANUAL "SERVICE TOOLS Ref. No. 400-01" issued December 2005.

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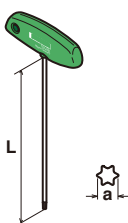
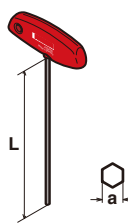
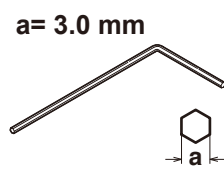
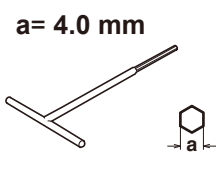
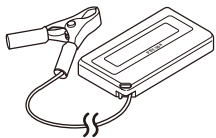
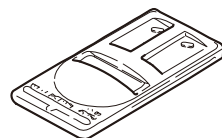
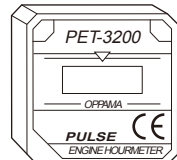
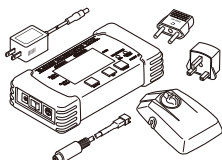
CONTENTS

	Page
1. SERVICE TOOL INTRODUCTION	2
1-1 Service tool illustration	2
1-1-1 Standard tools	2
1-1-2 Starter system	2
1-1-3 Ignition system	2
1-1-4 Fuel system	3
1-1-5 Clutch system	4
1-1-6 Lubrication system	5
1-1-7 Engine system	6
1-1-8 Others	9
2. SERVICE TOOL INSTRUCTION	10
Starter system (Key No. 13-)	10
Ignition system (Key No. 16-)	10
Fuel system (Key No. 22-)	13
Clutch system (Key No. 30-)	16
Lubrication system (Key No. 48-)	21
Engine system (Key No. 59-)	25
Others (Key No. 118-)	41
3. MODEL AND SERVICE TOOL	
REFERENCE TABLE INSTRUCTION	44

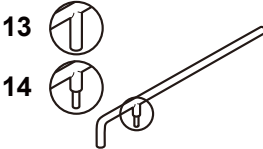
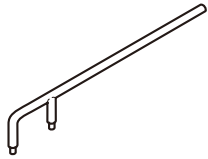
1. SERVICE TOOL INTRODUCTION

1-1 Service tool illustration

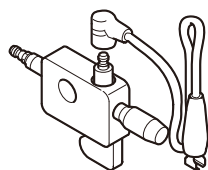
1-1-1 Standard tools

1. Torx wrench (T20) P/N: 895622-30130 2. Torx wrench (T25) P/N: X602-000330 3. Torx wrench (T27) P/N: X602-000340  1: L= 100 mm a= 3.8 mm (M4) 2: L= 100 mm a= 4.4 mm (M5) 3: L= 200 mm a= 5.0 mm (M5, M6) USE: Removing and installing torx bolts	4. T-hex. wrench P/N: X602-000350 5. T-hex. wrench P/N: X602-000350  4: L= 150 mm a= 3.0 mm (M4) 5: L= 150 mm a= 4.0 mm (M5) USE: Removing and installing hex. head bolts		
6. T-hex.wrench P/N: X602-000230  L= 160 mm a= 5.0 mm USE: Removing and installing hex. head bolts (M6)	7. L-hex. wrench P/N: X605-000180  a= 3.0 mm USE: Removing and installing hex. socket bolt (M4)	8. T-hex. wrench P/N: 897559-02831  a= 4.0 mm USE: Removing and installing hex. socket bolt (M5)	9. Tachometer PET-304 P/N: PET304  USE: Measuring engine speed to adjust carburetor
10. Tachometer PET-1000R P/N: 897802-33330  USE: Measuring engine speed to adjust carburetor	11. PET-3200 P/N: PET3200R  USE: Measuring engine working time	12. E-CARB Diagnostic tool P/N: A468-000000  USE: Measuring control value and resetting EMS	

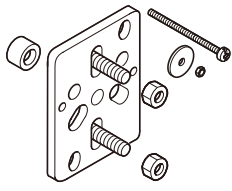
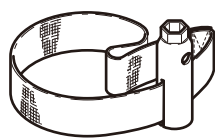
1-1-2 Starter system

2-pin wrench 13. P/N: 897712-04630 14. P/N: 897712-07930  13 14 USE: Removing and installing pawl carrier	15. 2-pin wrench P/N: X602-000000  USE: Removing starter pulley
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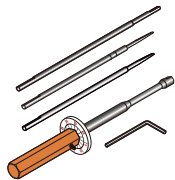
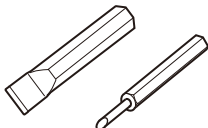
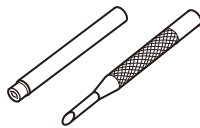
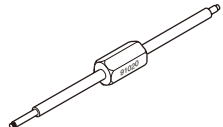
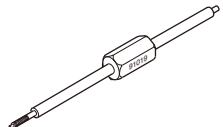
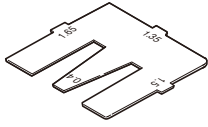
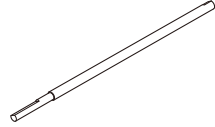
1-1-3 Ignition system

16. Spark tester P/N: 897800-79931  USE: Checking ignition system	17. Module air gap gauge P/N: 91004  USE: Adjusting pole shoe air gaps
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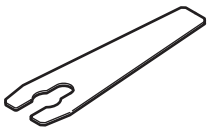
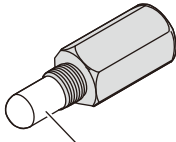
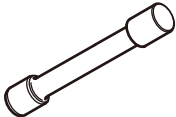
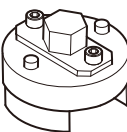
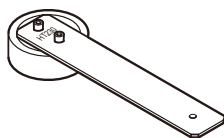
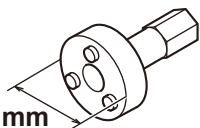
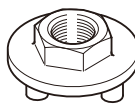
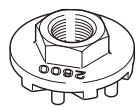
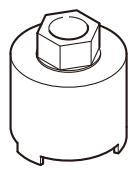
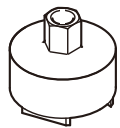
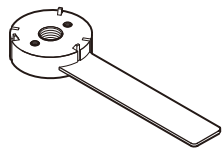
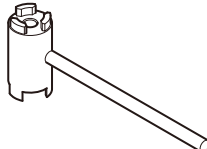
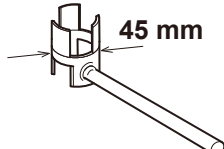
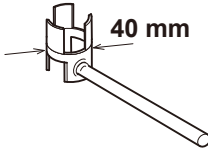
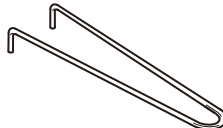
1-1-3 Ignition system (continued)

18. Flange nut P/N: V265-000200  M8 - pitch 1.25 USE: Removing magneto rotor (magneto rotor)	19. Bolt P/N: 900100-08008  M8 - 8 mm length USE: Removing magneto rotor (magneto rotor)	20. Puller P/N: Y089-000111  USE: Removing magneto rotor (magneto rotor) and crankcase	21. Flexible wrench P/N: 897709-79920  USE: Holding cylindrical part
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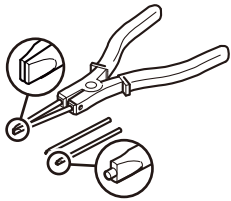
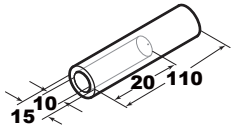
1-1-4 Fuel system

22. Carburetor adjustment tool P/N: Y089-000095  USE: Adjusting carburetor	23. Ethanol tester P/N: 91040  USE: Checking ethanol ratio	24. Welch plug tool (ZAMA) P/N: 90101  USE: Removing and installing welch plug	25. Welch plug tool (Walbro) P/N: 500-500  USE: Removing and installing welch plug
26. Limiter plug tool P/N: 91020  USE: Removing and installing limiter plug	27. Limiter cap tool P/N: 91019  USE: Removing and installing limiter cap	28. Metering lever gauge P/N: 897563-19830  USE: Measuring metering lever height on carburetor	29. D-shaped tool (M) P/N: X603-000070  USE: Adjusting carburetor (Use with Y089-000095)
30. Short type D-shaped tool(S) P/N: 91159S  USE: Adjusting carburetor (For models which has narrow space around carburetor)			

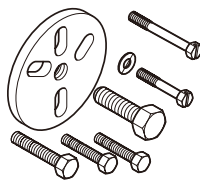
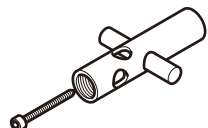
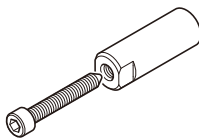
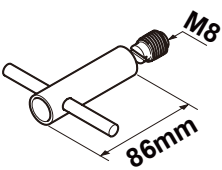
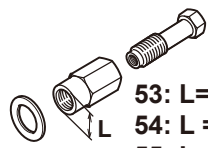
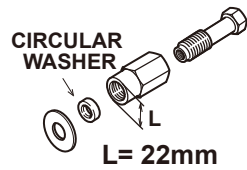
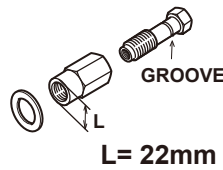
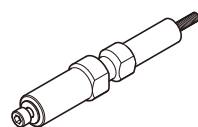
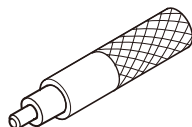
1-1-5 Clutch system

31. Clutch spanner P/N: X600-000111  t= 2.3 mm USE: Locking crankshaft rotation	32. Piston stopper P/N: X644-000020  Cap USE: Locking crankshaft rotation (Cap: C205-000190)	33. Piston stopper P/N: X644-000040  USE: Locking crankshaft rotation	34. Clutch spanner P/N: X600-000130  USE: Removing and installing for clutch assembly and clutch drum
35. Clutch tool P/N: 897731-04920  USE: Removing and installing clutch assembly	36. Puller P/N: Y089-000180  USE: Removing and installing clutch drum	37. Puller P/N: X640-000550  49.5 mm USE: Removing and installing clutch drum	38. Clutch tool P/N: 897505-16133  USE: Removing and installing clutch assembly
39. Clutch tool P/N: X640-000011  USE: Removing and installing clutch assembly	40. Clutch tool P/N: X640-000560  USE: Removing and installing clutch assembly	41. Puller P/N: X640-000100  USE: Removing and installing clutch assembly	42. Puller P/N: X640-000290  USE: Removing and installing clutch assembly
43. Clutch spanner P/N: X640-000130  USE: Removing and installing clutch assembly	44. Clutch spanner P/N: X640-000150  45 mm USE: Removing and installing clutch assembly	45. Clutch spanner P/N: X640-000370  40 mm USE: Removing and installing clutch assembly	46. Wrench tool P/N: X602-000290  USE: Removing and installing clutch assembly

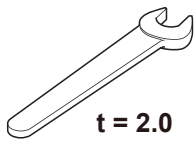
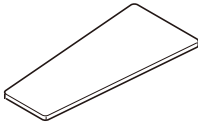
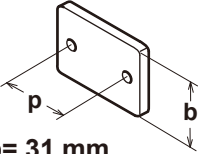
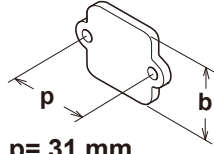
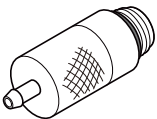
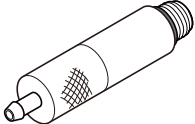
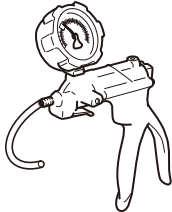
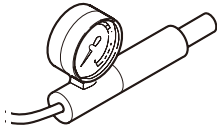
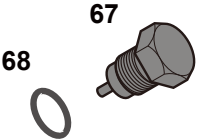
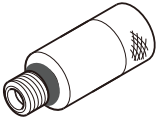
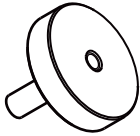
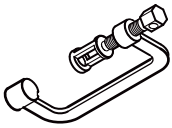
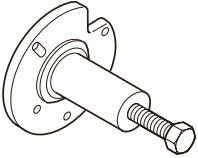
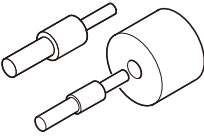
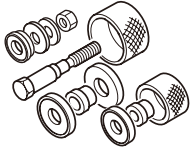
1-1-5 Clutch system (continued)

47. Snap ring pliers P/N: P021-051610  USE: Removing snap ring from clutch drum	48. Rod P/N: X646-000180  USE: Installing snap ring
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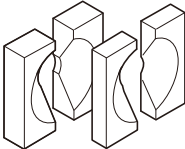
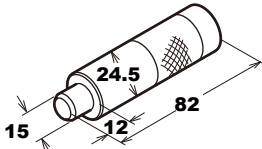
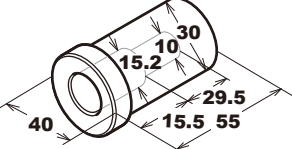
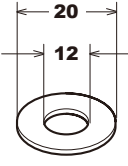
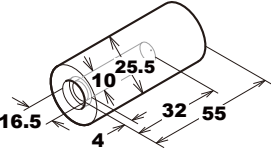
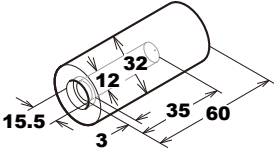
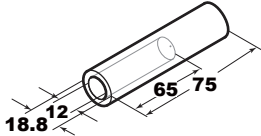
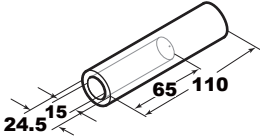
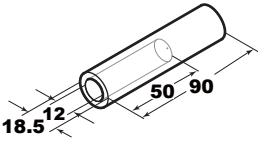
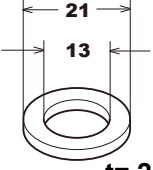
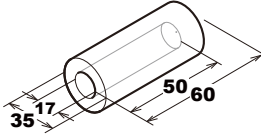
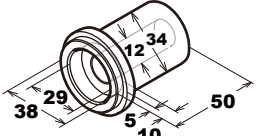
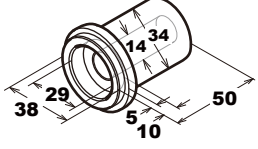
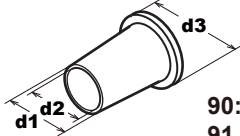
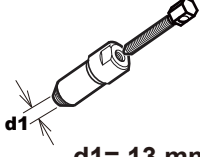
1-1-6 Lubrication system

49. Puller P/N: 897500-00335  USE: Removing auto oiler cover	50. Worm remover P/N: 897708-19835  USE: Removing auto-oiler worm	51. Worm puller P/N: 897708-50430  USE: Removing auto-oiler worm	52. Worm inserter P/N: Y089-000070  USE: Installing auto-oiler worm
Worm inserter 53. P/N: Y089-000000 54. P/N: Y089-000020 55. P/N: Y089-000030  53: L = 16 mm 54: L = 22 mm 55: L = 24 mm USE: Installing auto-oiler worm	56. Worm inserter P/N: Y089-000010  CIRCULAR WASHER GROOVE L = 22mm USE: Installing auto-oiler worm	57. Worm inserter P/N: Y089-000040  GROOVE L = 22mm USE: Installing auto-oiler worm	58. Auto-oiler puller P/N: Y089-000131  USE: Removing pencil type auto-oiler
59. Auto-oiler installer P/N: 91073A  USE: Installing pencil type auto-oiler			

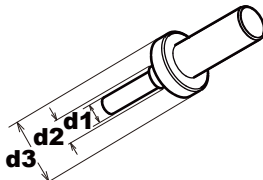
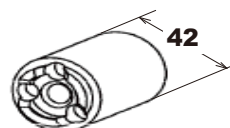
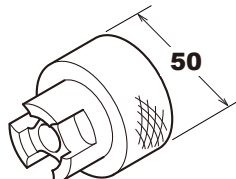
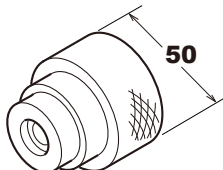
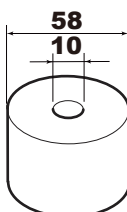
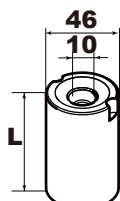
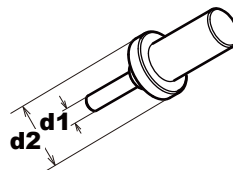
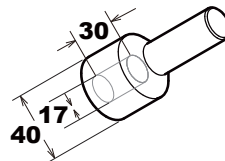
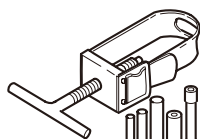
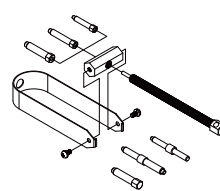
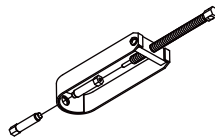
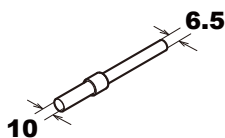
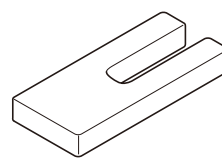
1-1-7 Engine system

60. Wrench P/N: X600-000180  t = 2.0 USE: Adjusting valve clearance	61. Pressure rubber plug P/N: 91041  USE: Plugging exhaust port to test crankcase/cylinder leakages	62. Pressure rubber plug P/N: 897826-16131  p = 31 mm b = 30 mm USE: Plugging intake port to test crankcase/cylinder leakages	63. Pressure plate P/N: 897827-16131  p = 31 mm b = 30 mm USE: Plugging intake port to test crankcase/cylinder leakages
64. Pressure connector P/N: A131-000150  M14 x 1.25 USE: Testing crankcase and cylinder leakage	65. Pressure connector P/N: A131-000160  M10 x 1.0 USE: Testing crankcase and cylinder leakage	66. Pressure / vacuum tester P/N: 91149  USE: Testing crankcase / cylinder leakages	67. Pressure tester P/N: 897803-30133  USE: Testing carburetor and crankcase leakage
68. Plug P/N: 101115-37531 69. O-ring P/N: 900720-00009  68 67 USE: Removing and installing clutch assembly	70. Compression gauge P/N: 91037  USE: Measuring cylinder compression	71. Adapter P/N: P021-051690  USE: Measuring cylinder compression (with P/N: 91037)	72. Adjust wrench P/N: 68900-98310  USE: Adjusting valve gap (For 4 stroke engine)
73. Spring compressor P/N: 68900-98340  USE: Removing and installing valve spring (For 4 stroke engine)	74. Crankcase tool P/N: 897502-19830  USE: Separating crankcase	75. Bearing tool P/N: 897705-11520  USE: Replacing needle bearing on con-rod small end	76. Bearing tool P/N: 897701-14732  USE: Removing and installing ball bearings on crankcase

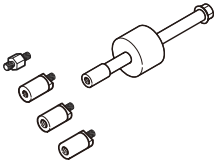
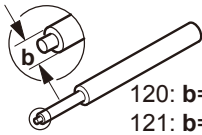
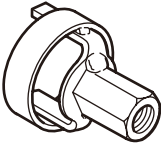
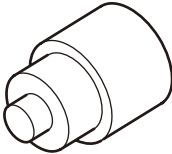
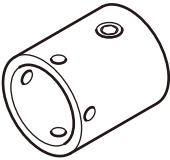
1-1-7 Engine system (continued)

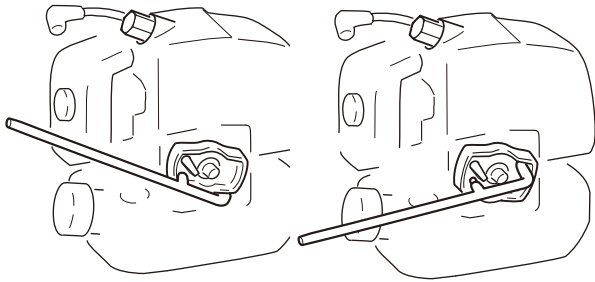
77. Bearing wedge P/N: X600-000180  USE: Removing ball bearings on crankshaft	78. Oil seal tool P/N: 897714-12330  USE: Installing crankcase oil seal	79. Oil seal tool P/N: 897727-16130  USE: Installing crankcase oil seal	80. Washer P/N: 363018-00310  USE: Installing crankcase oil seal
81. Oil seal tool P/N: 897714-22830  USE: Installing crankcase oil seal	82. Pressure connector P/N: 897714-24330  USE: Installing crankcase oil seal	83. Oil seal tool P/N: 22154-96440  USE: Installing oil seal	84. Oil seal tool P/N: 897726-21430  USE: Installing oil seal and clutch plate
85. Oil seal tool P/N: 897726-09130  USE: Installing oil seal and clutch plate	86. Washer P/N: 900600-00012  USE: Installing drive gear	87. Oil seal tool P/N: 897726-16431  USE: Installing crankcase oil seal	88. Oil seal tool P/N: 897727-19830  USE: Installing crankcase oil seal
89. Oil seal tool P/N: 897727-30830  USE: Installing crankcase oil seal	Collar oil seal tool 90. P/N: X646-000170 91. P/N: X646-000150 92. P/N: X646-000070 93. P/N: X646-000470  90: d1= 12 d2= 10 d3= 14 91: d1= 15 d2= 12 d3= 18 92: d1= 17 d2= 14 d3= 20 93: d1= 15 d2= 13 d3= 18 USE: Set oil seal collect position		94. Puller P/N: X640-000380  d1= 13 mm USE: Removing oil seal for crankcase

1-1-7 Engine system (continued)

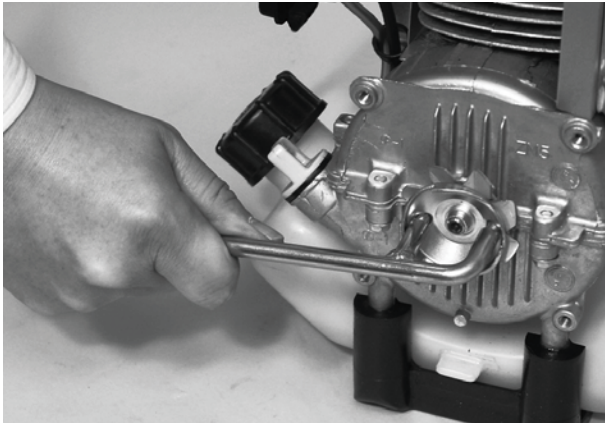
Rod oil seal 95. P/N: X646-000110 96. P/N: 22182-96460 97. P/N: 22155-96420 98. P/N: 22150-96420 99. P/N: X646-000040 100. P/N: 22150-96450 		101. P/N: X646-000060 102. P/N: X646-000510 95: d1= 10 d2= 12 d3= 25 96: d1= 10 d2= 15 d3= 27 97: d1= 10 d2= 13 d3= 28 98: d1= 10 d2= 12 d3= 28 99: d1= 10 d2= 15 d3= 35 100: d1= 10 d2= 15 d3= 28 101: d1= 10 d2= 17 d3= 38 102: d1= 12 d2= 15 d3= 30		103. Holder P/N: 22160-96411 
USE: Installing oil seal for crankcase		USE: Seat for oil seal / bearing		
104. Holder P/N: X646-000370 	105. Holder P/N: X646-000170 	106. Holder P/N: 22169-96410 	Holder 107. P/N: 22169-96440 108. P/N: X643-000020  107: L= 55 108: L= 75	
USE: Seat for oil seal / bearing		USE: Seat for oilseal / bearing / gearshaft		
Rod bearing 109. P/N: X646-000050 110. P/N: 22160-96440  109: d1= 10 d2= 35 110: d1= 11.8 d2= 33 111: d1= 10 d2= 32 112: d1= 10 d2= 40		113. Rod bearing P/N: X646-000100 	114. Piston pin tool P/N: 897702-30131 	
USE: Installing bearing for crankcase		USE: Installing bearing for crankcase (Engine cutter)	USE: Removing and installing piston pin	
115. Piston pin tool P/N: Y089-000250 	116. Piston pin tool P/N: X640-000090 	117. Guide P/N: X640-000390 	118. Piston holder P/N: 897719-02830 	
USE: Removing and installing piston pin		USE: Set piston pin collect position	USE: Making piston steady to remove and install piston/ring	

1-1-8 Others

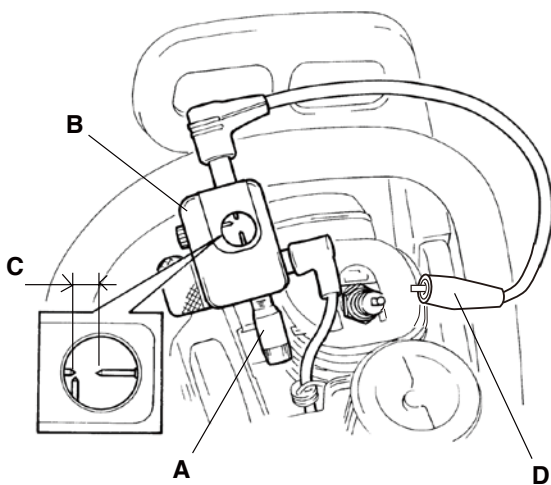
119. PTO shaft puller P/N: P021-044871  USE: Removing PTO shaft	Spring pin tool 120. P/N: 897724-01261 121. P/N: 897724-01361 122. P/N: 897724-02831  120: b= 3 mm 121: b= 4 mm 122: b= 5 mm USE: Removing and installing spring pin	123. Cushion tool P/N: 897740-19830  USE: Removing and installing cushion (Right - Rear - Upper)	124. Mechanical seal tool P/N: 897741-10510  USE: Removing and installing mechanical seal
125. Load adapter P/N: 91156  USE: Properly engine loading for adjusting carburetor			

2. SERVICE TOOL INSTRUCTION**Key No. 13: 2-pin wrench 897712-04630****Key No. 14: 2-pin wrench 897712-07930**

1. Remove spark plug and install piston stopper or clean rope in spark plug hole.
2. Loosen starter pawl assembly with 2-pin wrench as shown.

Key No. 15: 2-pin wrench X602-000000

1. Remove starter assembly, cylinder cover and fan cover.
2. Hold magneto rotor with flexible wrench (Key No. 21) to stop the crankshaft rotation as shown.
3. Loosen starter pulley with 2-pin wrench as shown.

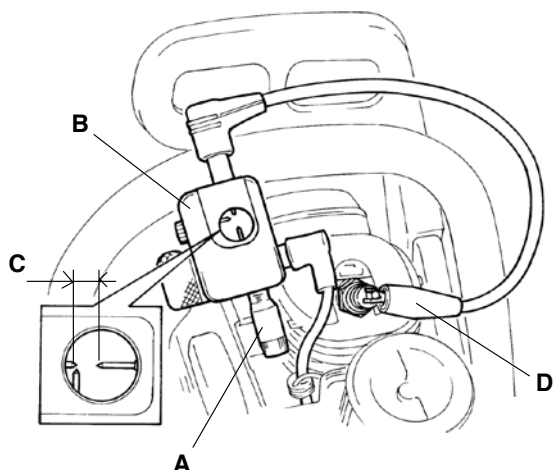
Key No. 16: Spark tester 897800-79931

(1) Checking spark status.

1. Remove spark plug cap.
2. Connect spark tester (B) to plug cap.
3. Screw in adjuster (A) until the tips contact. Turn back six times to set the spark tester gap (C) to 6 mm (0.24 in).
4. Connect clip (D) on cylinder fin.
5. Turn ignition switch to "RUN" position.
6. Pull the starter several times, and checking spark.
7. If the spark is steady blue or white at the tester gap, the ignition system is considered good.
8. If no spark exists or spark is intermittent in yellow, orange, or red, continue with further inspection.

(Continued)

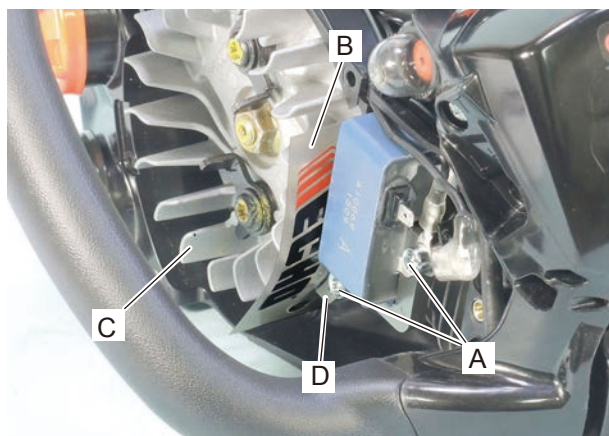
Key No. 16: Spark tester 897800-79931 (Continued)



(2) Checking ignition of engine.

1. Remove spark plug cap.
2. Connect spark tester (B) to plug cap.
3. Screw in adjuster (A) until the tips contact. Turn back four times to set the spark tester gap (C) to 4 mm (0.16 in).
4. Connect clip (D) on the spark plug to start engine.
5. Turn ignition switch to "RUN" position.
6. Pull the starter several times to start engine.
7. Checking spark while running engine.
8. If the spark is steady blue or white at the tester gap, the ignition system is considered good.
9. If no spark exists or spark is intermittent in yellow, orange, or red, continue with further inspection.

Key No. 17: Module air gap gauge 91004

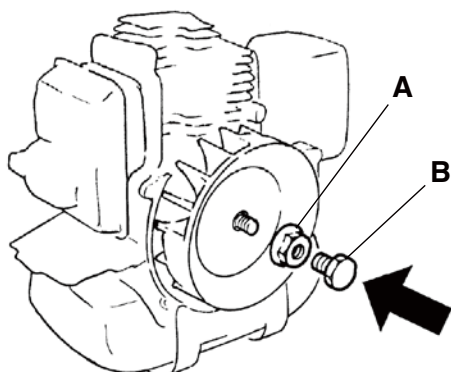


1. Loosen two bolts (A) and insert module air gap gauge 91004 (B) between magneto rotor (C) and ignition coil shoes (D).
2. Rotate magneto rotor (C) until magnetic poles of magneto rotor face ignition coil shoes (D).
3. Hold ignition coil against magneto rotor (C) and tighten the bolts (A). After tightening the bolts, remove module air gap gauge (B).

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

Key No. 18: Flange nut V265-000200

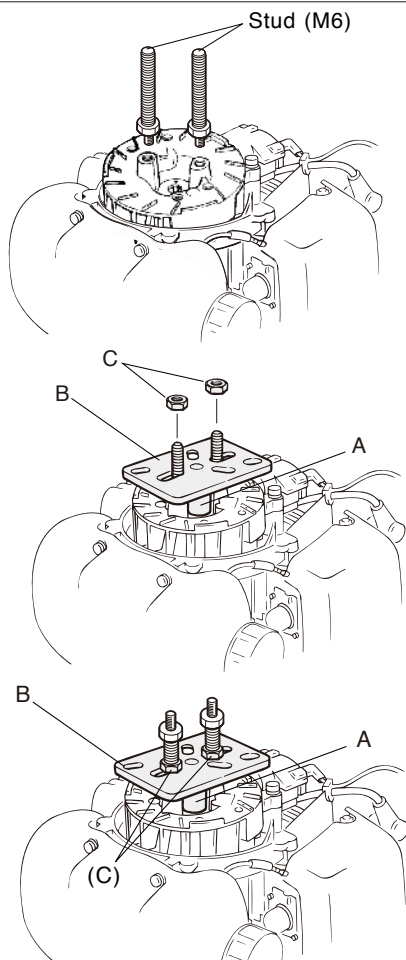
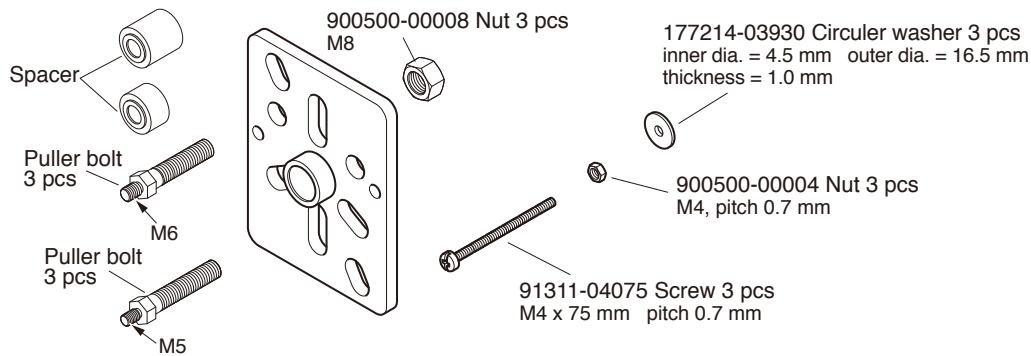
Key No. 19: Bolt 900100-08008



1. Pack the combustion chamber with a starter rope to stop rotation of crankshaft.
2. If the magneto rotor cannot be lifted off, follow steps 3 to 5 to remove the magneto rotor.
3. Turn thread flange nut (A) three times (guide bar flange nut on some ECHO chain saws) on crankshaft.
4. Screw bolt (B) in the nut until its bottom.
5. Hold the magneto rotor and tap the bolt head (axially) to remove the magneto rotor.

NOTE: Do not pry the magneto rotor from the crankshaft, or damage to engine will result.

Key No. 20: Puller Y089-000111



[Example: Removing magneto rotor on SRM-2655]

1. Remove both clutch shoes from magneto rotor.
2. Remove nut securing magneto rotor.

NOTE: Do not pry magneto rotor from crankshaft. Crankshaft, magneto rotor or other main parts of engine may be damaged.

3. Install two studs (M6) on the magneto rotor as shown.

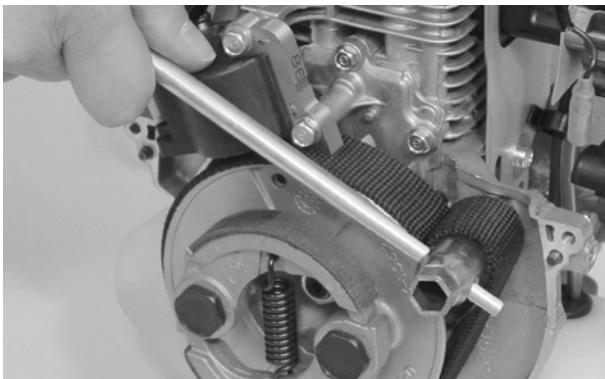
NOTE: Screw studs into magneto rotor firmly, or screw thread may be damaged.

4. Put the bigger spacer (A) on the end of the crankshaft, and puller plate (B) on the magneto rotor.

5. Tighten two nuts (C) on the studs alternately to remove the magneto rotor.

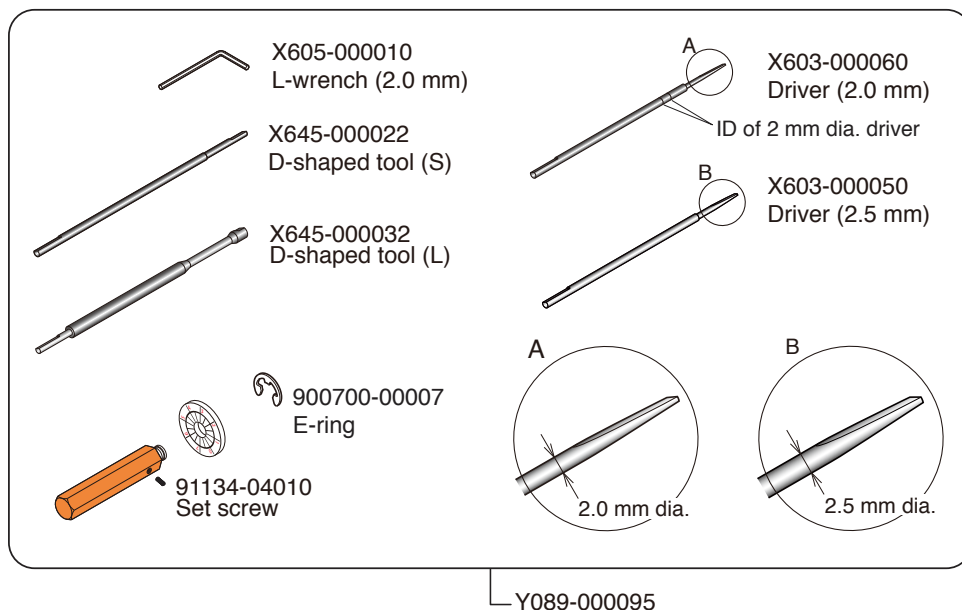
6. When the screw holes on the magneto rotor are 8 mm, use studs as shown.

Key No. 21: Flexible wrench 897709-79920



When piston stopper can not be used, this tool is useful to stop crankshaft rotation for loosening or tightening the parts assembled on the crankshaft

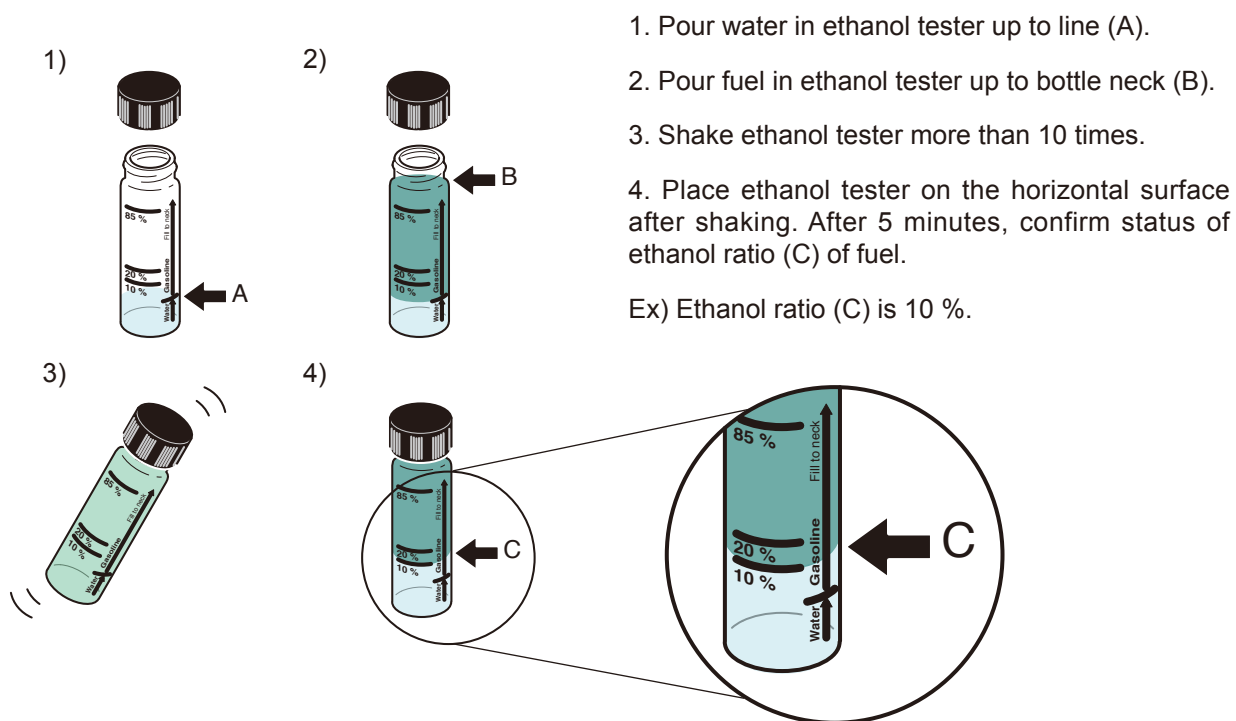
Key No. 22: Carburetor adjustment tool Y089-000095



Above tools can be supplied separately.

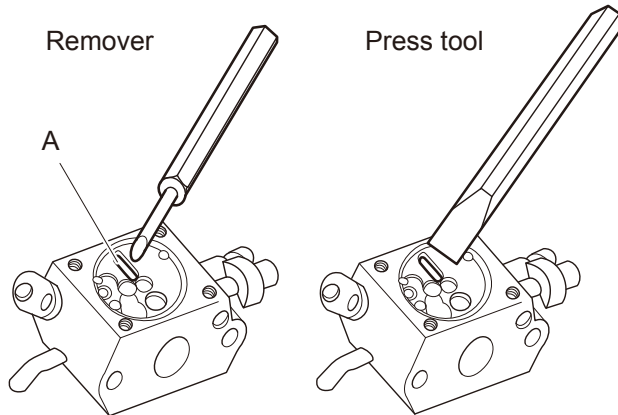
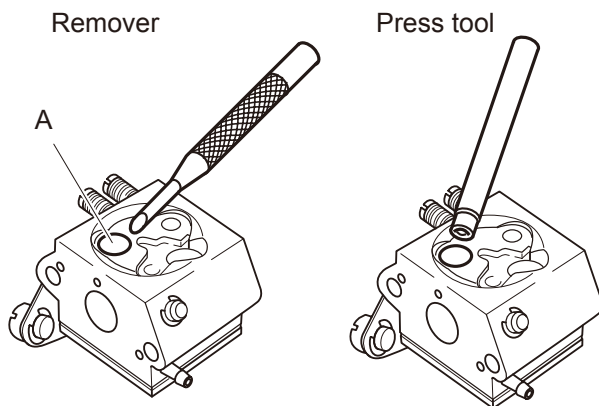
For adjustment procedure, refer to SERVICE MANUAL "CARBURETTOR ADJUSTMENT Ref. No. 400-09".

Key No. 23: Ethanol tester 91040



Key No. 24: Welch plug tool (ZAMA) 90101

Key No. 25: Welch plug tool (Walbro) 500-500

ZAMA (90101)**Walbro (500-500)**

NOTE: If engine does not run smoothly even after readjusting carburetor and checking the carburetor parts other than idle ports, check the idle ports as follows.

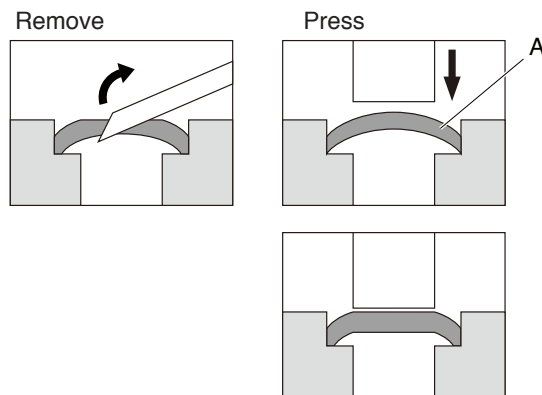
1. Remove relative parts to prevent them from damage.

2. Remove welch plug (A) with the remover as shown. Punch the remover through the welch plug at a low angle and pry it out.

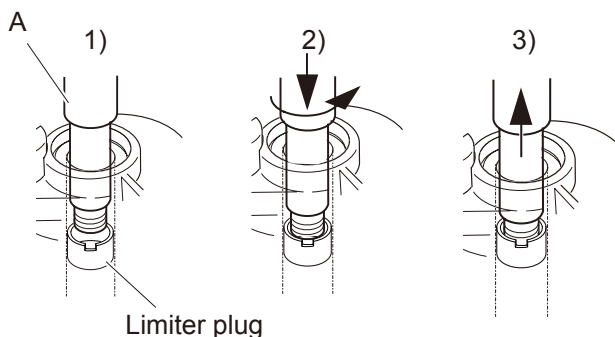
3. Clean the idle ports with compressed air.

4. Place a new welch plug over the opening and gently tap it in until flush, using press tool.

5. Install all removed parts to the carburetor body.



Key No. 26: Limiter plug tool 91020



1. Put limiter plug tool (A) on limiter plug in the mixture needle hole.

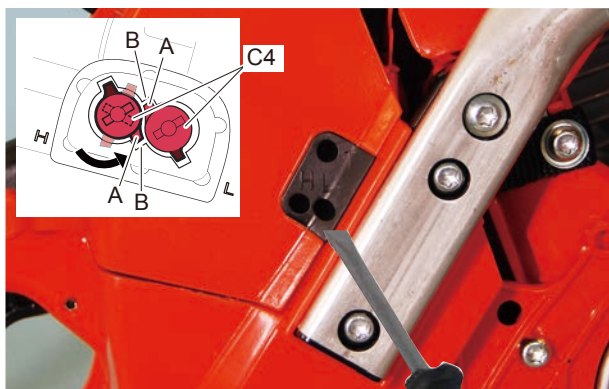
2. With pushing down, slowly turn the limiter plug tool counterclockwise two turns into the limiter plug.

3. Pull out limiter plug tool (A) with the limiter plug from the mixture needle hole.

4. Repeat the above step 1) to 3) to remove the other plug.

After adjusting carburetor, insert new plug(s) in the needle hole(s) using limiter plug tool (A).

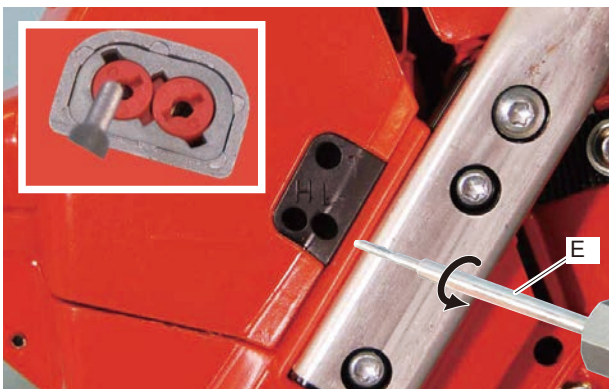
Key No. 27: Limiter cap tool 91019



[Removing]

1. Turn L and H mixture needles with limiter caps (C4) counterclockwise to rich side stop to align limiter cap's tabs (A) with locating slots (B), using 2.5 to 4.0 mm blade screwdriver.

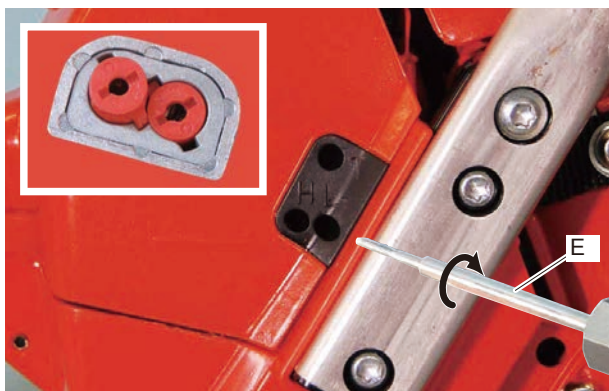
NOTE: If cap's tabs (A) are misaligned with locating slots (B), the cap cannot be removed and the center hole threads will be stripped.



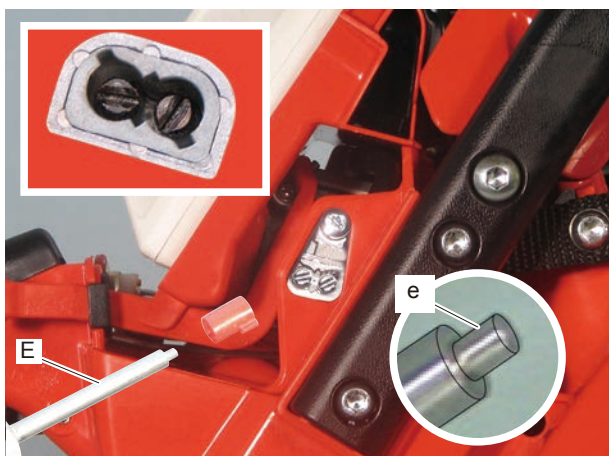
2. Screw limiter cap tool (E) counterclockwise into center hole of limiter cap until tab of limiter cap comes out of locating slot as shown in left below picture.

NOTE: DO NOT REMOVE LIMITER CAPS COMPLETELY FROM CARBURETOR.

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



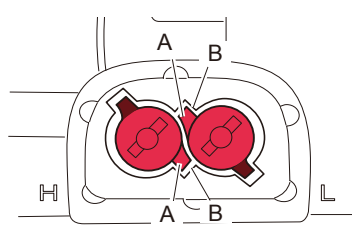
3. Remove the tool from limiter cap by turning clockwise, leaving the limiter cap in place.

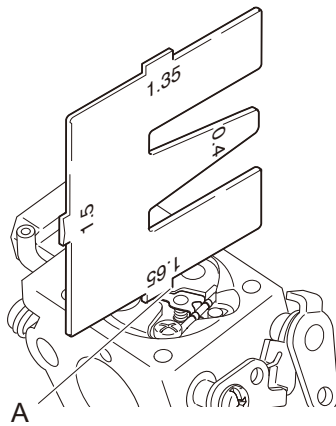


[Installing]

1 After adjusting the carburetor, remove old limiter caps and put new limiter caps (C4) on the mixture needles using the other end (e) of limiter cap tool (E) aligning the limiter cap's tab (A) with locating slot (B) in extended housing of carburetor.

Gently press the caps onto L and H mixture needles. Fully seat caps until housing of carburetor.



Key No. 28: Metering lever gauge 897563-19830

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

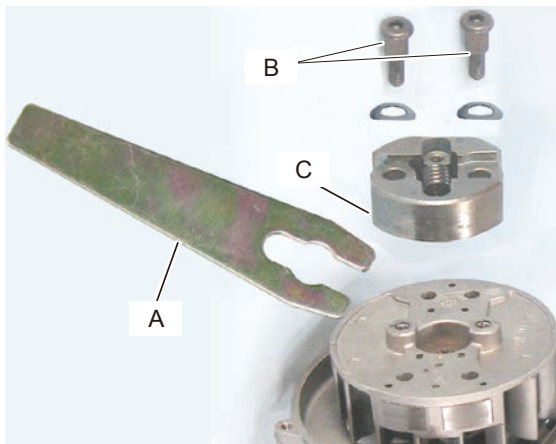
2. Check metering lever (A) height as shown using metering lever gauge 897563-19830.

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

NOTE: When metering lever is:

Too high → Fuel overflow occurs

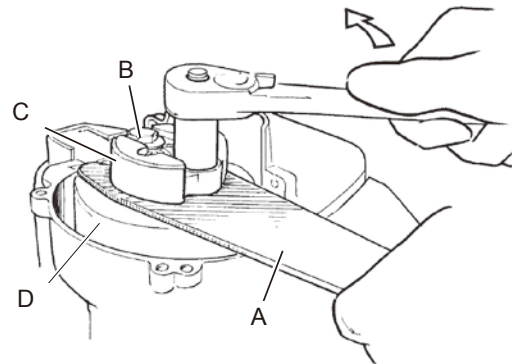
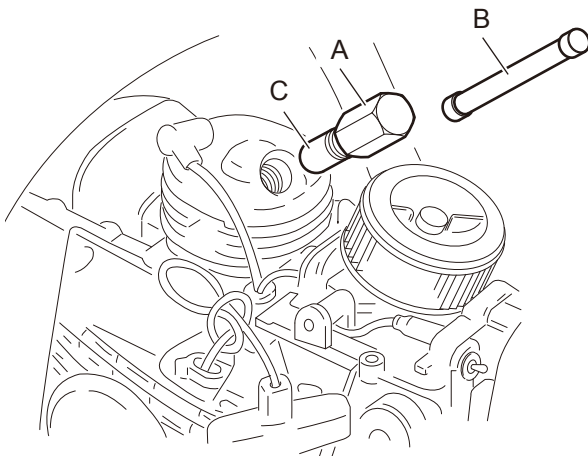
Too low → Fuel starvation / overheating occurs

Key No. 31: Clutch spanner X600-000111

Use clutch spanner (A) to remove bolt (B) which tightening clutch (C) of trimmer (except clutch 3 shoe), hedge trimmer and power blower to rotor.

1. Set clutch spanner (A) as shown, and fix mag-neto rotor (D).

2. Loosen bolt (B) using a socket wrench.

**Key No. 32: Piston stopper X644-000020****Key No. 33: Piston stopper X644-000040**

Install piston stopper (A) or (B) into the spark plug hole to stop crankshaft rotation.

NOTE: Use piston stopper (A) normally to stop crankshaft rotation. If piston stopper (A) touches cylinder wall and can not be installed completely, use piston stopper (B).

NOTE: Use clean rope in place of piston stopper for engine less than 30ml to avoid piston damage.

NOTE: Replace with new cap C205-000190 (C) if damaged.

Key No. 34: Clutch spanner X600-000130

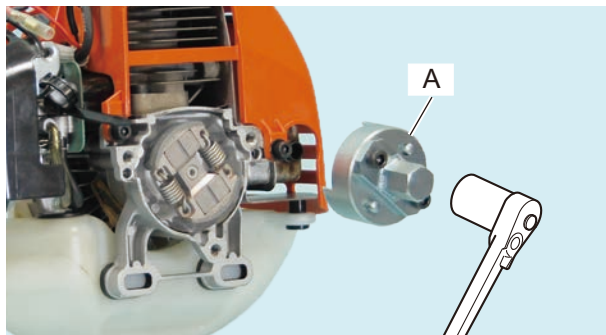
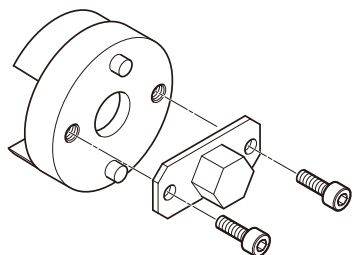
[Loosening / Tightening clutch assembly]

1. Install piston stopper or clean rope into the spark plug hole to stop crankshaft rotation (Refer to "Key No. 30, 31 Piston stopper").

2. Assemble clutch spanner X600-000130 as shown.

3. Loosen or tighten clutch assembly (left-hand thread) rotating clockwise/counterclockwise with clutch spanner (A) using 17 mm socket wrench.

NOTE: Never use an air tool or other power tool when piston stopper is installed in the spark plug hole.

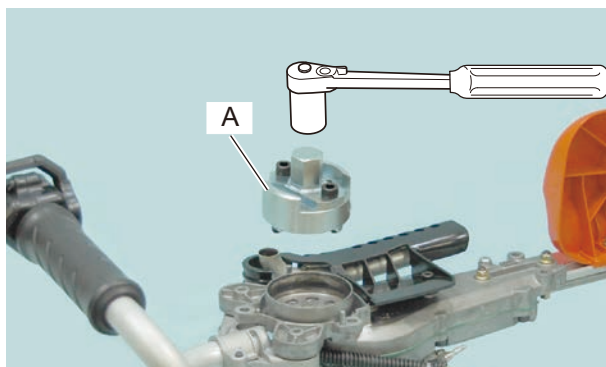
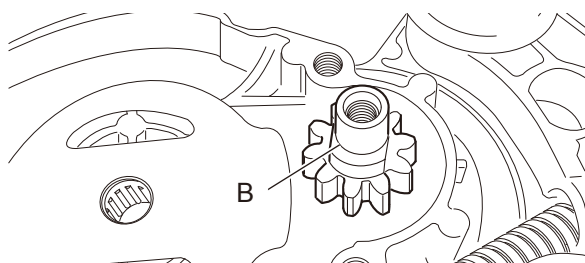
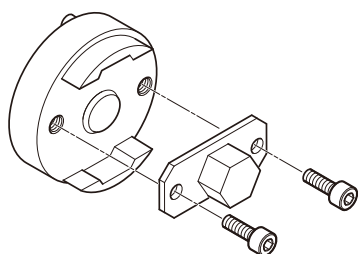


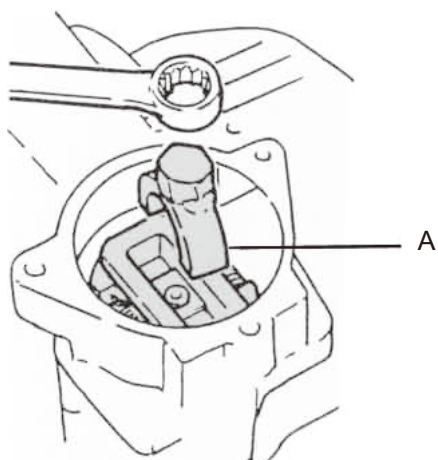
[Loosening / Tightening clutch drum]

1. Assemble clutch spanner X600-000130 as shown.

2. Fix pinion shaft (B).

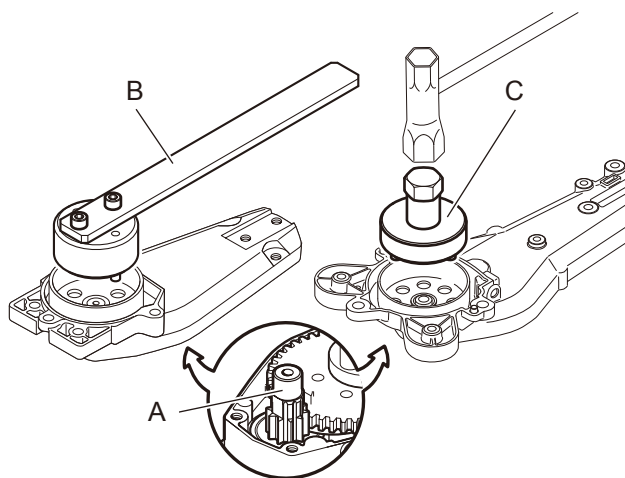
3. Loosen or tighten the clutch drum (left-hand thread) rotating clockwise/counterclockwise with clutch spanner (A) using 17 mm socket wrench.



Key No. 35 Clutch tool 897731-04920

1. Install piston stopper or clean rope into the spark plug hole to stop crankshaft rotation (Refer to "Key No. 30, 31 Piston stopper").

2. Remove clutch assembly using clutch tool 897731-04920 (A).

Key No. 36: Puller Y089-000180**Key No. 37: Puller X640-000550**

1. Fix pinion shaft (A).

2. Loosen or tighten clutch drum with puller Y089-000180 (B) or X640-000550 (C).

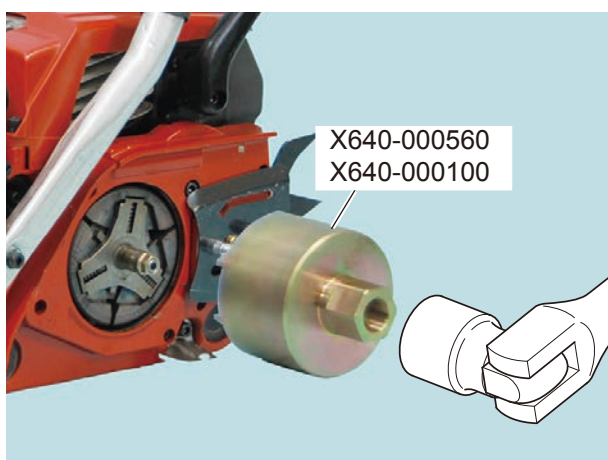
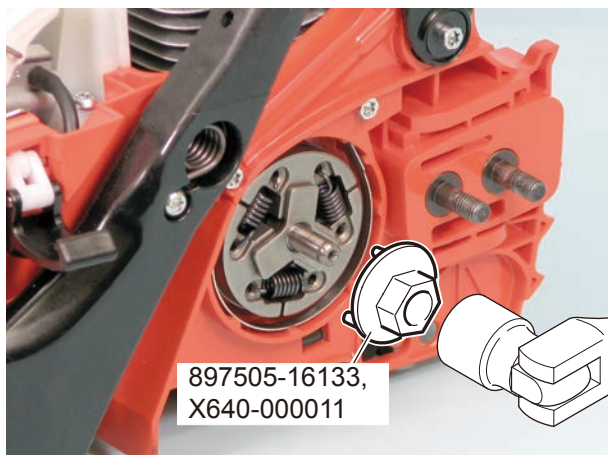
Key No. 38, 39: Clutch tool 897505-16133, X640-000011

Key No. 40, 41: Puller X640-000560, X640-000100

Key No. 42: Puller X640-000290

Key No. 43, 44, 45: Clutch spanner X640-000130, X640-000150, X640-000370

Key No. 46: Wrench tool X602-000290



1. Install piston stopper or clean rope into the spark plug hole to stop crankshaft rotation. (Refer to "Key No. 30, 31 Piston stopper")

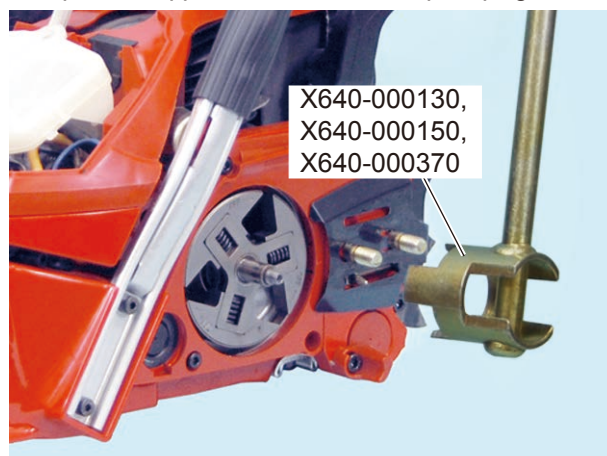
NOTE: If starter assembly is installed, pull starter rope out about 20 cm (8 in), and make a temporary knot to prevent starter damage when installing clutch assembly.

2. Rotate clutch assembly clockwise (when loosening) or counterclockwise (when tightening) by hand until it cannot be rotated further.

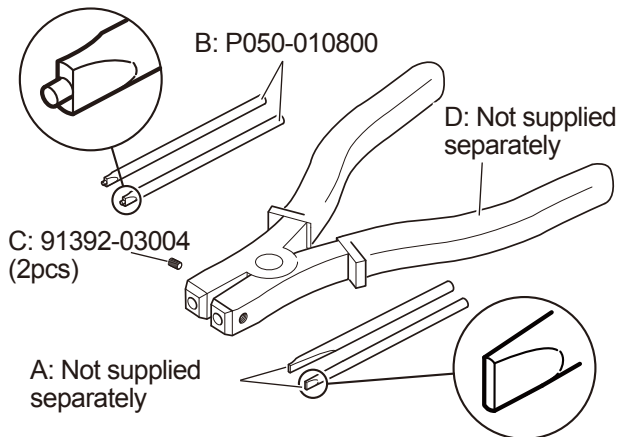
NOTE: When installing the clutch assembly, untie temporary knot holding the starter grip. While holding the starter grip, turn the clutch assembly counterclockwise until it cannot rotate further (piston touches piston stopper). Release the starter grip.

3. Loosen or tighten clutch assembly (left-hand thread) rotating clockwise/counterclockwise with clutch tool.

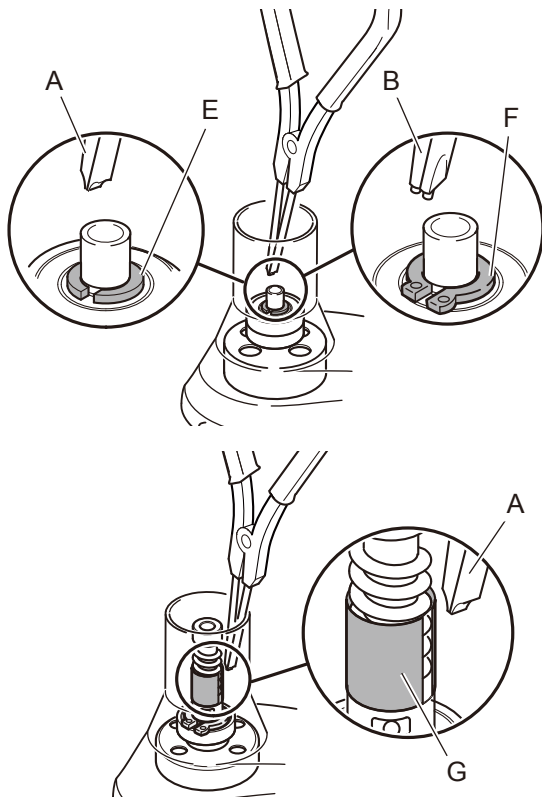
NOTE: Never use an air tool or other power tool when the piston stopper is installed in the spark plug hole.



Key No. 47: Snap ring pliers P021-051610



Snap ring pliers P021-051610 consists of two types of tips (A), (B), two sets of screws (C) and handle (D) as shown. Change the tips according to shape of the retaining ring.



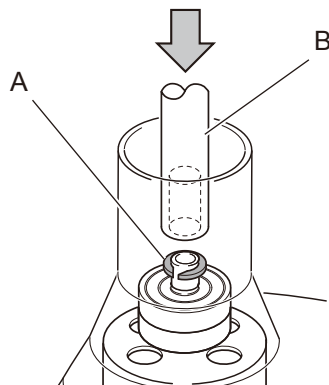
[Removing retaining ring]

Remove retaining ring (E) or (F) from the clutch drum shaft to remove the clutch drum with the snap ring pliers.

[Removing / Installing cover for damper spring]

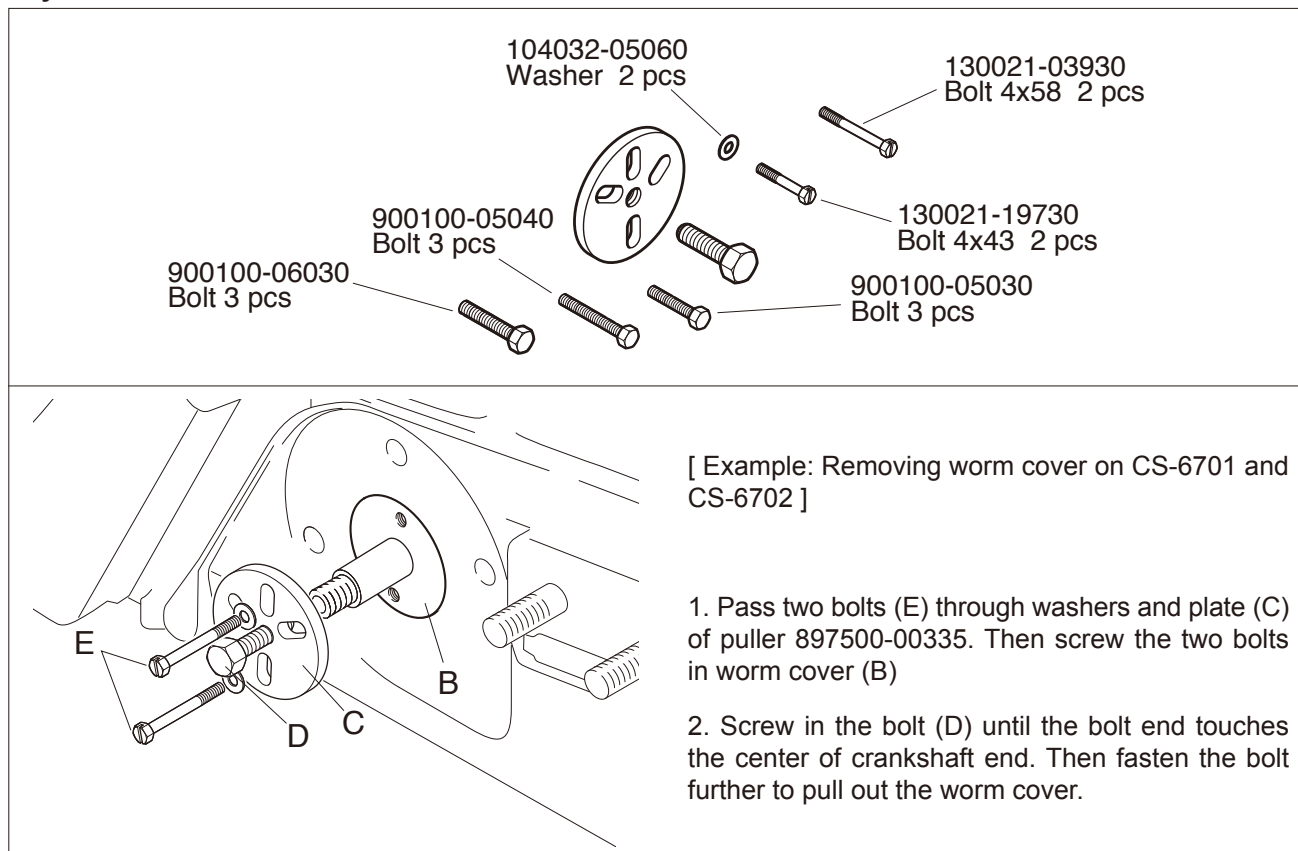
Remove / install cover (G) for the damper spring with the snap ring pliers.

Key No. 48: Rod X646-000180

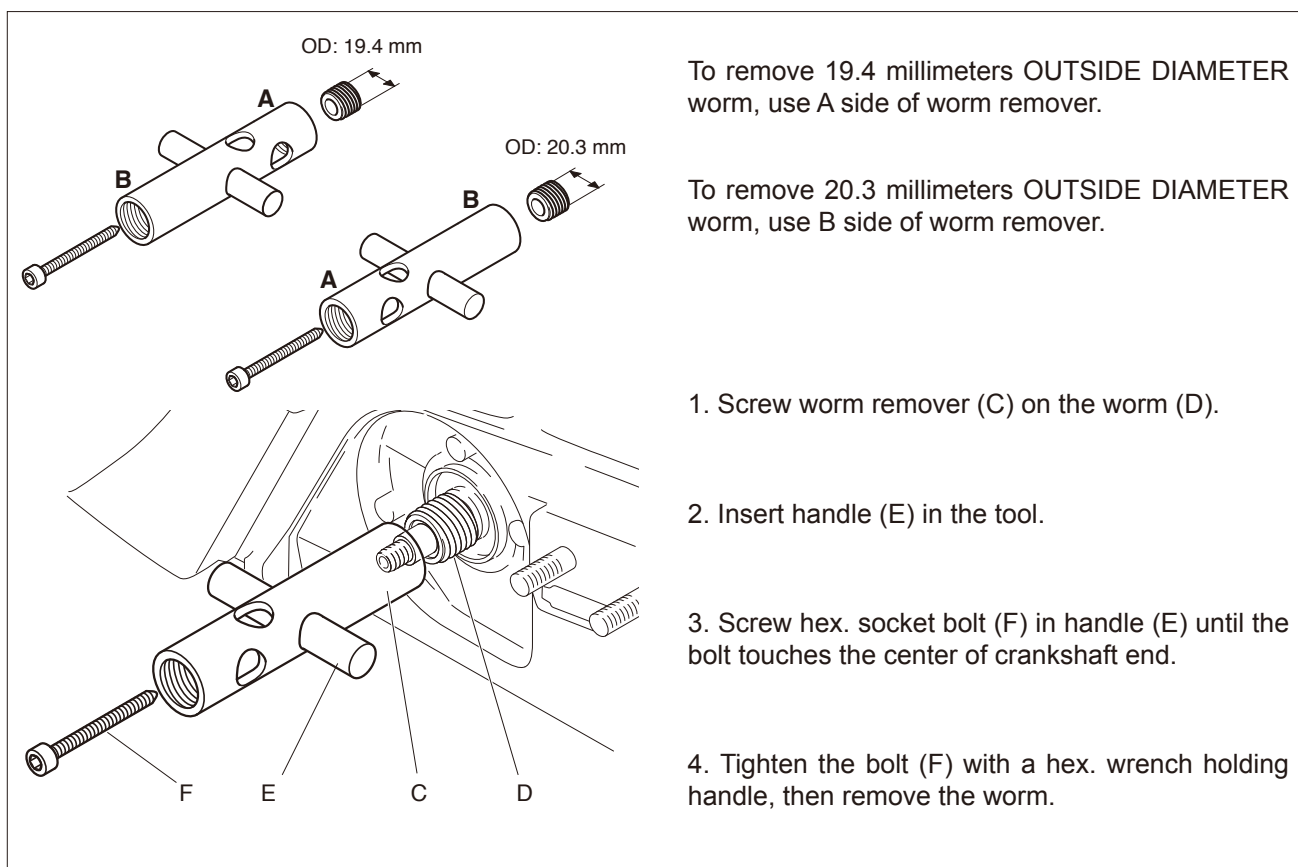


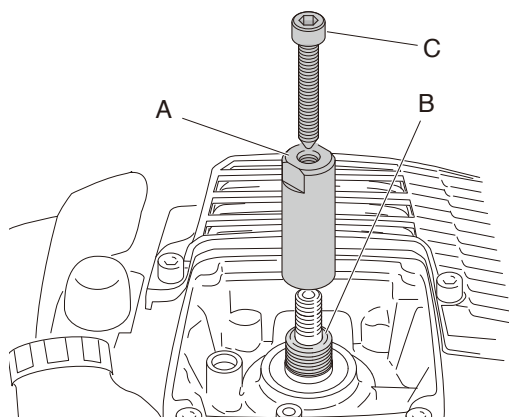
Put retaining ring (A) on the clutch drum shaft and push it with the rod (B).

Key No. 49: Puller 897500-00335



Key No. 50: Worm remover 897708-19835

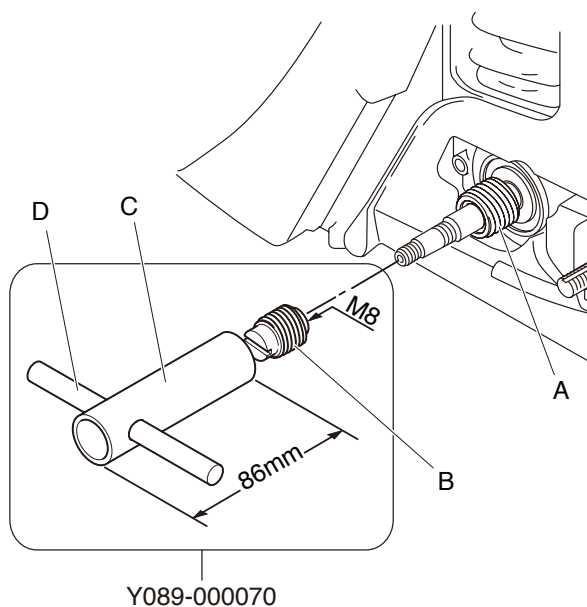


Key No. 51: Worm puller 897708-50430

1. Remove collar from crankshaft and screw worm puller 897708-50430 (A) on the worm (B) until its bottom.

2. Screw hex. socket bolt (C) in the puller.

3. Tighten the bolt (C) with wrench holding puller with 13 mm open-end spanner to remove worm.

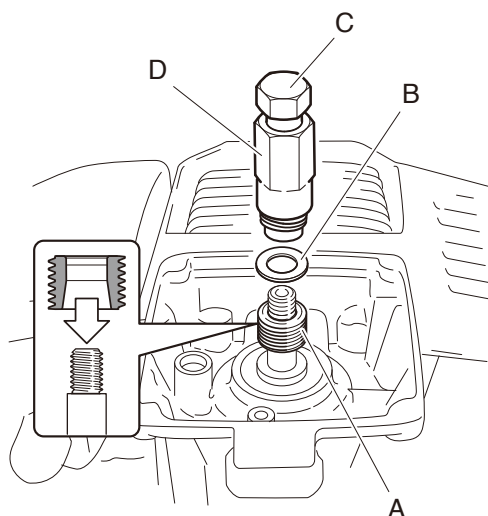
Key No. 52: Worm inserter Y089-000070

NOTE: Do not reuse the removed worm gear. Bore of the used worm gear may be enlarged and the worm may slip on the crankshaft.

1. Put new worm gear (A) on the crankshaft end.

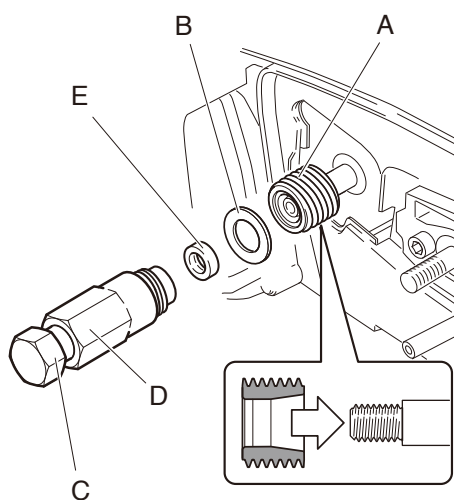
2. Screw adapter (B) counterclockwise on the crankshaft until its bottom.

3. Insert handle (D) in worm inserter (C) and push worm gear (A) turning worm inserter (C) counterclockwise until worm gear (A) touches crankshaft bottom.

Key No. 53: Worm inserter Y089-000000

NOTE: Do not reuse removed worm gear. Bore of the used worm gear may be enlarged and the worm may slip on crankshaft.

1. Put new worm gear (A) and clutch washer (B) on the crankshaft end.
2. Screw bar tool (C) on press tool (D) counter-clockwise until its bottom.
3. Install bar tool (C) with press tool (D) (Right-hand thread) to the crankshaft end.
4. Hold bar tool (C) with a suitable wrench or a vise and push worm gear (A) turning press tool (D) counterclockwise until its bottom.

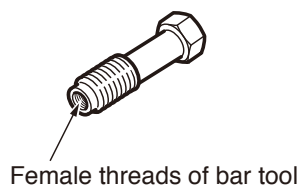
Key No. 54, 55: Worm inserter Y089-000020, Y089-000030**Key No. 56: Worm inserter Y089-000010****Key No. 57: Worm inserter Y089-000040**

NOTE: Do not reuse removed worm gear. Bore of the used worm gear may be enlarged and the worm may slip on crankshaft.

1. Put new worm gear (A) and clutch washer (B) on the crankshaft end.
2. Screw bar tool (C) on press tool (D) until its bottom.
3. Install bar tool (C) with press tool (D) (Left-hand thread) to crankshaft end.

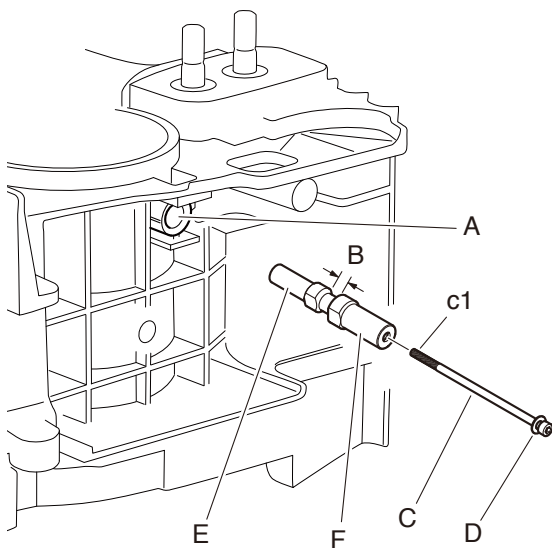
For Y089-000010: Set circular washer (E) between bar tool (C) and clutch washer (B).

4. Hold bar tool (C) with a suitable wrench or a vise and push worm gear (A) turning press tool (D) counterclockwise until its bottom.



Key No.	Tool number	L mm	Female threads of bar tool
54	Y089-000020	22	Left hand thread : M10x1.25mm pitch
55	Y089-000030	24	Left hand thread : M12x1.25mm pitch
56	Y089-000010	22	Left hand thread : M8x1.25mm pitch
57	Y089-000040	22	Left hand thread : M10x1.00mm pitch

Key No. 58: Auto-oiler puller Y089-000130

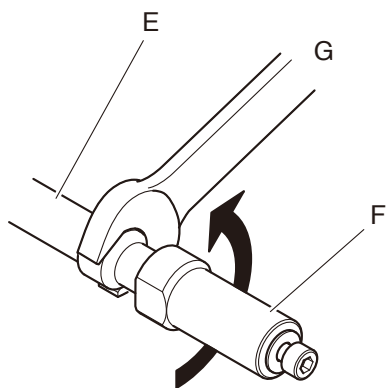


1. Tap 5-mm (M5 - Pitch 0.8 mm) thread in the bore of auto-oiler (A).

2. Set distance (B) to 15-20 mm.

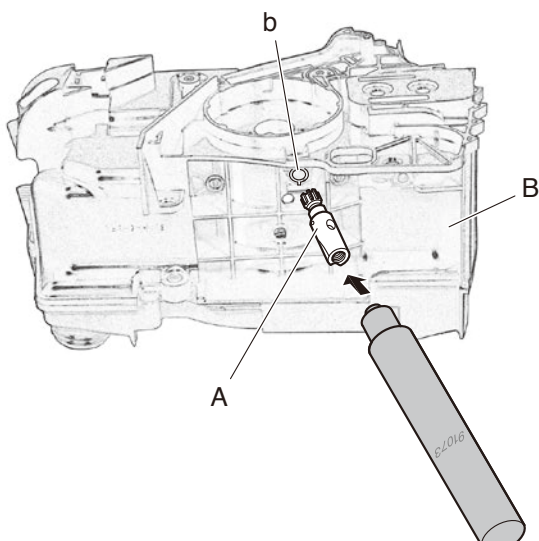
3. Put bolt (C) of auto-oiler puller Y089-000130 through washer (D) as shown. Put bolt (C) through pipes (E) and (F).

4. Screw bolt tip (c1) into the bore of auto-oiler (A).



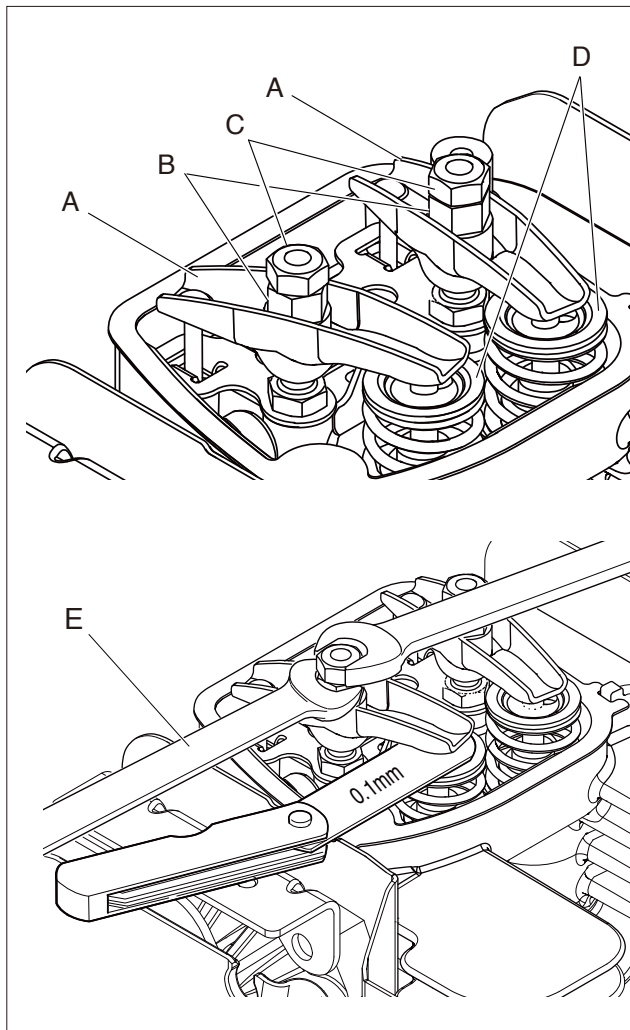
5. Holding inner pipe (E) with a wrench (G), rotate outer pipe (F) counterclockwise by another wrench, to pull out the auto-oiler.

Key No. 59: Auto-oiler installer 91073



Push auto-oiler assembly (A) in hole (b) of engine cover (B) until its bottom using the oiler installer as shown.

Key No. 60: Wrench X600-000180

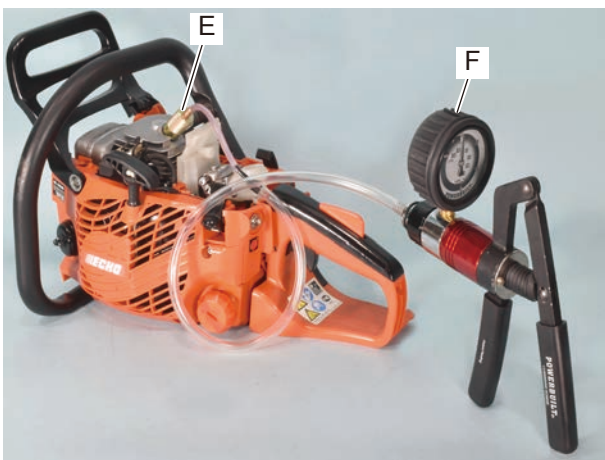
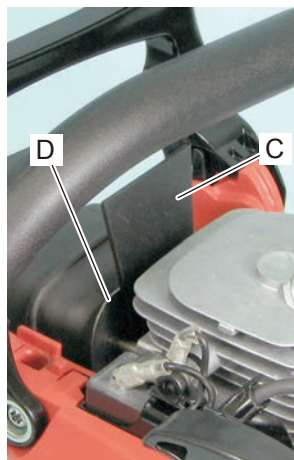
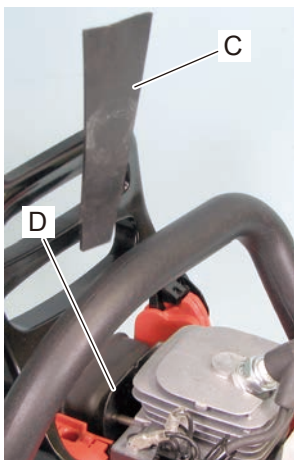
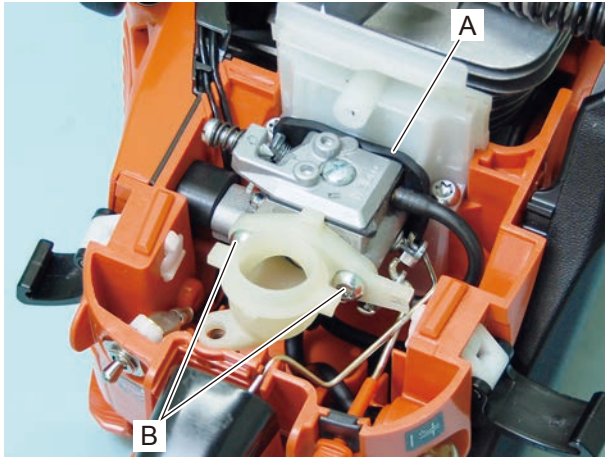


1. Install rocker arms (A), collars (B), and nuts (C).

2. Insert thickness gauge (0.1 mm) between rocker arm (A) and retainer (D), adjust valve clearance with rotating collar (B).

3. Hold collar (B) using wrench X600-000180 (E) and tighten nut (C).

Key No. 61: Pressure rubber plug 91041
Key No. 62: Pressure rubber plug 897826-16131
Key No. 63: Pressure plate 897827-16131
Key No. 64, 65: Pressure connector A131-000150, A131-000160
Key No. 66: Pressure / vacuum tester 91149



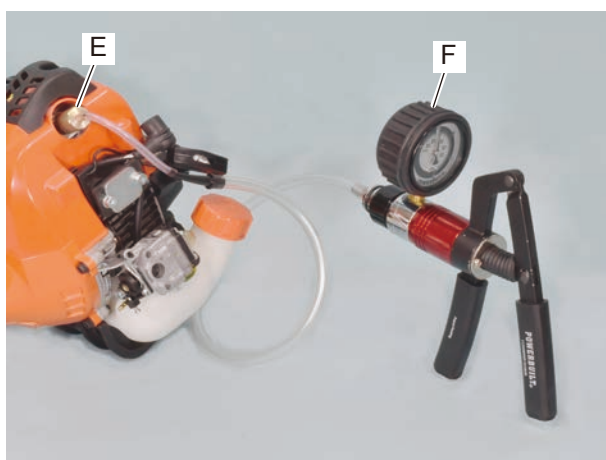
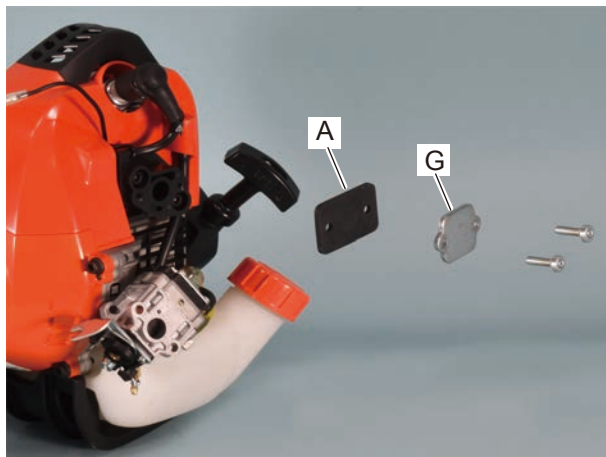
[Example: Checking cylinder and crankcase sealing on model CS-353ES]

1. Remove cylinder cover and air filter.
 2. Remove carburetor and elbow from the unit.
 3. To seal intake port, install pressure rubber plug 897826-16131 (A) between intake bellows and carburetor, using carburetor screws (B). Tighten screws (B).
 4. Loosen two nuts of muffer bolts. To seal exhaust port, insert pressure rubber plug 91041 (C) between cylinder exhaust port and muffer gasket (D), until its bottom.
 5. Tighten the nuts of muffer bolts.
 6. Remove spark plug and install pressure connector A131-000150 (E) to the spark plug hole. (For spark plug M10 : A131-000160)
 7. Connect pressure tester 91139 (F) to pressure connector (E).
 8. Apply pressure approx. 9.8 kPa (0.1 kgf/cm²) (1.4 psi) by the pressure tester.
- NOTE:** Do not exceed 30 kPa (0.3 kgf/cm²) (4.3 psi). Otherwise, damage to the oil seal may occur.
9. If the reading drops, leakage may occur.
 10. Leakage may occur from crankcase seam or oil seal. Use soapy water to locate the leakage.
 11. Then, apply negative pressure approx. 9.8 kPa (0.1 kgf/cm²) (1.4 psi) by the pressure tester.
 12. If the reading drops, leakage may occur from oil seal. Inspect oil seal for damage or wear.
 13. Remove pressure tester (F) from pressure connector (E). Remove pressure rubber plugs (A) and (C) from the intake bellows and exhaust port.

(Continued)

Key No. 61: Pressure rubber plug 91041
Key No. 62: Pressure rubber plug 897826-16131
Key No. 63: Pressure plate 897827-16131
Key No. 64, 65: Pressure connector A131-000150, A131-000160
Key No. 66: Pressure / vacuum tester 91149

(Continued)



[Example: Checking cylinder and crankcase sealing on model SRM-300ES]

1. Remove cylinder cover, muffler and carburetor.
2. Close intake port and crankcase pulse passage using pressure rubber plug 897826-16131 (A), pressure plate 897827-16131 (G), and two screws or bolts (size: M5 x 15 to M5 x 20)
3. To close exhaust port, put pressure rubber plug 91041 between cylinder and muffler. Tighten the muffler.
4. Remove spark plug and install pressure connector A131-000150 (E).
5. Connect pressure tester (F) to connector (E) and apply pressure approx. 0.2 kgf/cm² (3 psi) by hand pumping.

NOTE: Do not exceed 0.5 kgf/cm² (7 psi), or damage to seals will result.

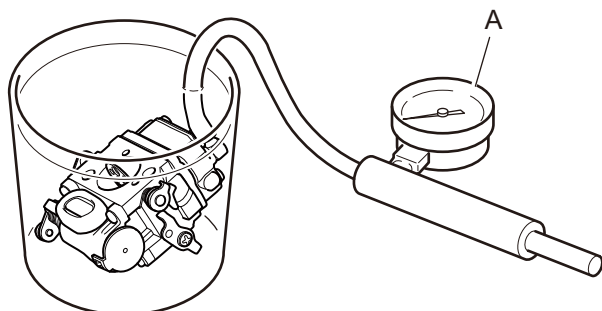
6. Gauge should indicate constant pressure at minimum 0.2 kgf/cm² (3 psi).

NOTE: Leak down not to exceed 0.05 kgf/cm² (1 psi) per minute is allowed.

7. If the reading drops, use soapy water to locate leakage. Leakage may occur from the cylinder base, crankcase seam, and oil seal.

NOTE: Remove the plugs from the exhaust port and the intake port after this test.

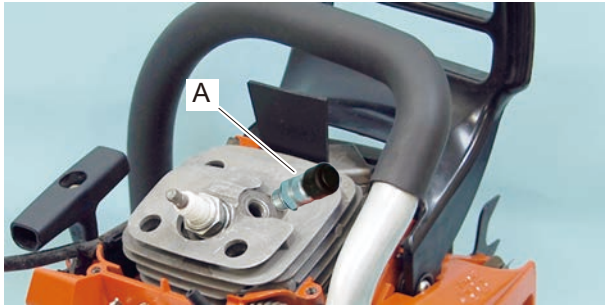
Key No. 67: Pressure tester 897803-30133



Remove carburetor from the unit, connect pressure tester 897803-30133 (A) to the carburetor fuel inlet.

Key No. 68: Plug 101115-37531

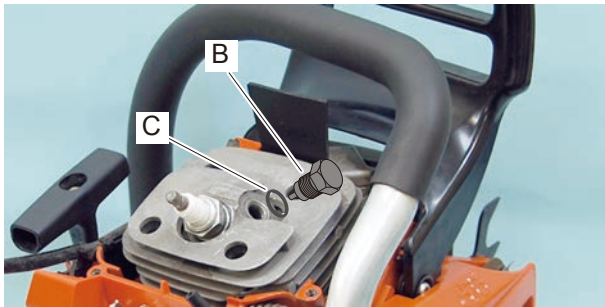
Key No. 69: O-ring 900720-00009



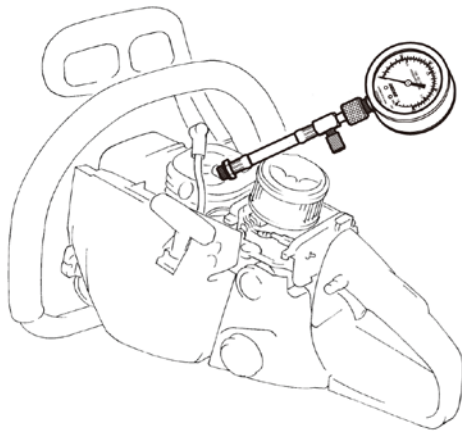
1. Before testing crankcase and cylinder leakages, remove decompressor (A) as shown.

2. Install plug 101115-37531 (B) and O-ring 900720-00009 (C) as shown.

NOTE: For the test procedure, refer to the respective service manual.



Key No. 70: Compression gauge 91037

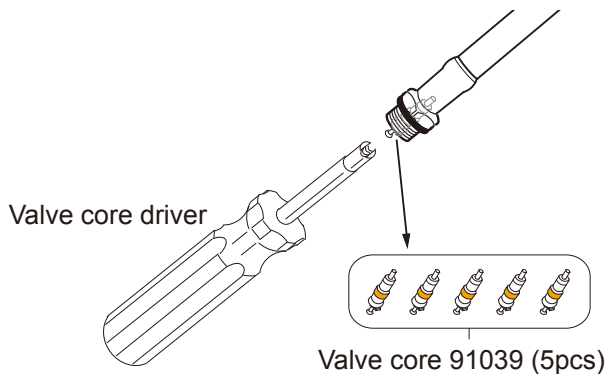


1. Test cylinder pressure when engine is cold.

2. Operate switch to stop position.

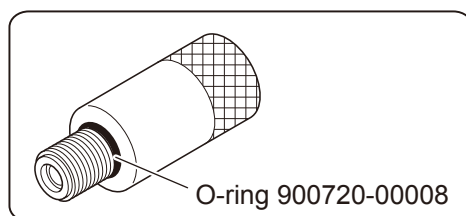
3. Remove spark plug.

4. Install compression gauge 91037 to the spark plug hole (Screw size: M14) and pull starter several times to stabilize reading value, and read the value.



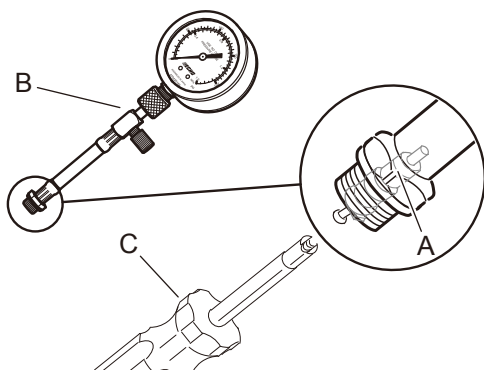
NOTE: If the pressure is too high or too low, check again after replacing with new valve core.

Key No. 71: Adapter P021-051690

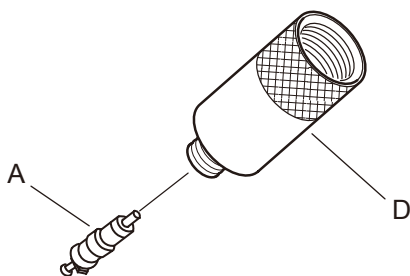


Adapter P021-051690

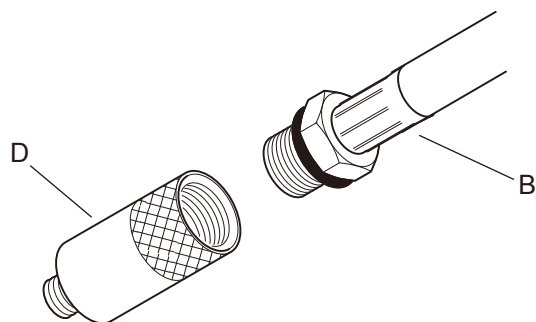
Use adapter P021-051690 with compression gauge 91037, when measuring cylinder compression pressure of engine that has spark plug of screw size M10.



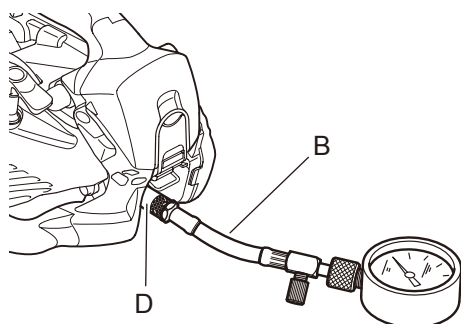
1. Remove valve core (A) from compression gauge 91037 (B) with valve core driver (C).



2. Insert valve core (A) to adapter P021-051690 (D) with valve core driver (C). Replace with new valve core 91039 (5pcs) as required.

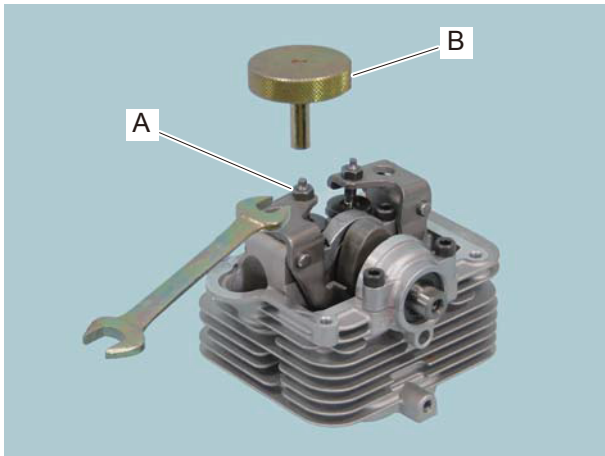


3. Connect adapter (D) and compression gauge (B).

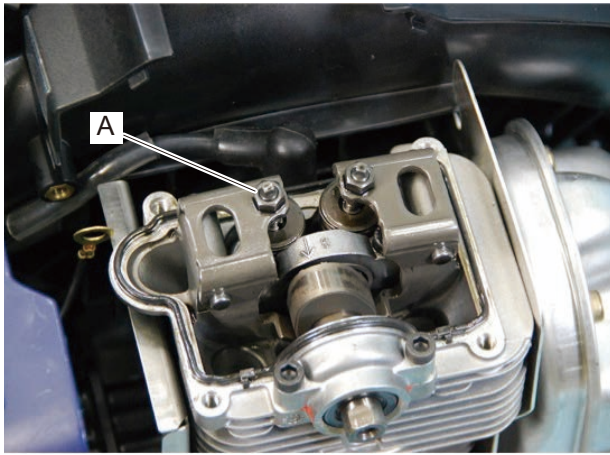
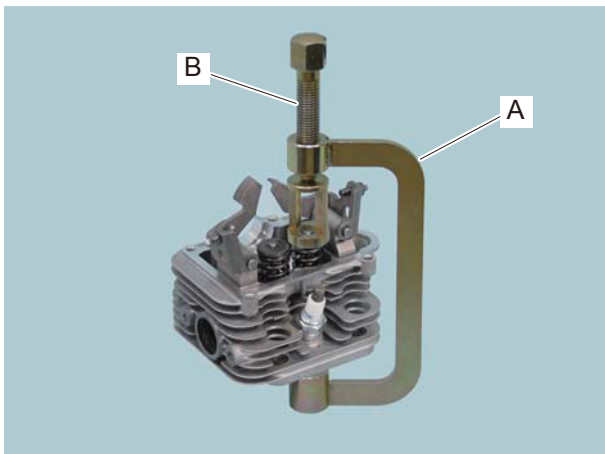


4. Install compression gauge (B) with adapter (D) in the spark plug hole (thread size: M10) and tighten by hand. Pull starter grip several times to stabilize reading on compression gauge.

NOTE: Remaining valve core (A) on compression gauge (B) makes compression valve incorrect.

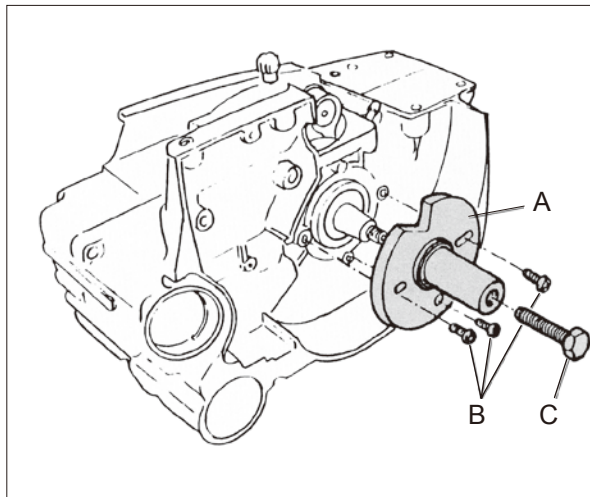
Key No. 72: Adjust wrench 68900-98310

1. Loosen nut (A) using 8 mm wrench.
2. Adjust valve clearance of 0.05 mm using adjust wrench 68900-98310 (B).
3. Tighten nut (A).

**Key No. 73: Spring compressor 68900-98340**

1. Set spring compressor 68900-98340 (A) as shown.
2. Compress valve spring tightening bolt (B).
3. Remove cotter holding the valve spring, and replace the valve spring or the valve.

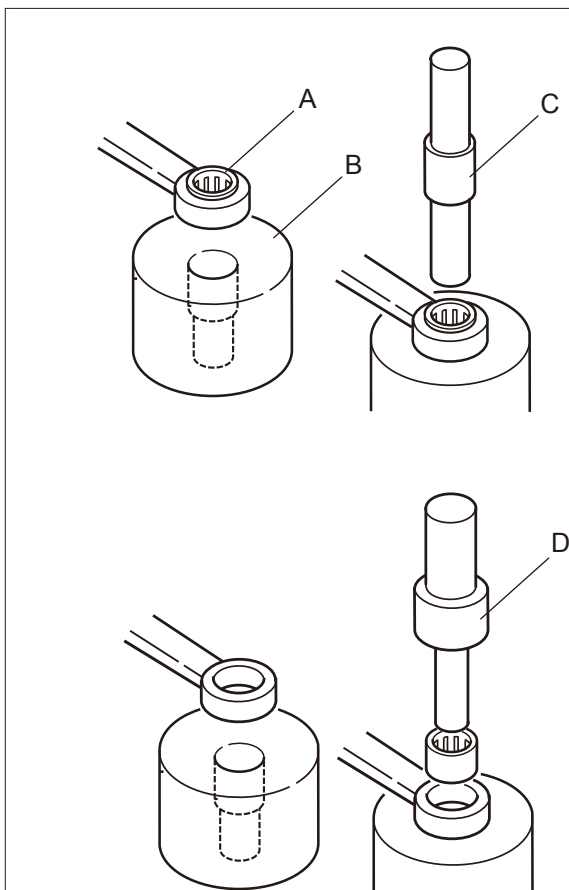
Key No. 74: Crankcase tool 897502-19830



[Disassembling crankcase on models CS-5000, CS-5501, CS-6701, CS-6702 and CS-8001]

1. Remove screws securing crankcase halves together and install crankcase tool 897502-19830 (A) with three screws (B) as shown.
2. Screw in bolt (C) to pull crankcase half out.
3. Crankshaft remaining on the other side of the crankcase half can be removed with this crankcase tool also.

Key No. 75: Bearing tool 897705-11520



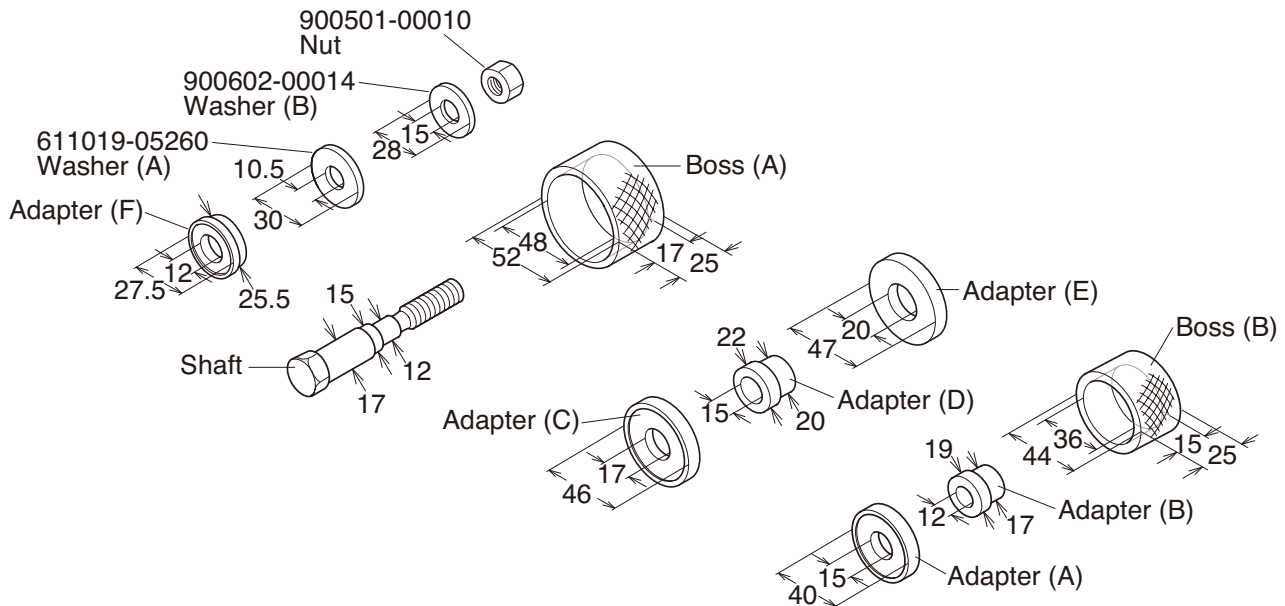
[Removing needle bearing]

1. Put the small end on base (B) of the needle bearing tool and fit needle bearing (A) into the hole of the base.
2. Push the bearing out from the small end using the smaller pusher (C).

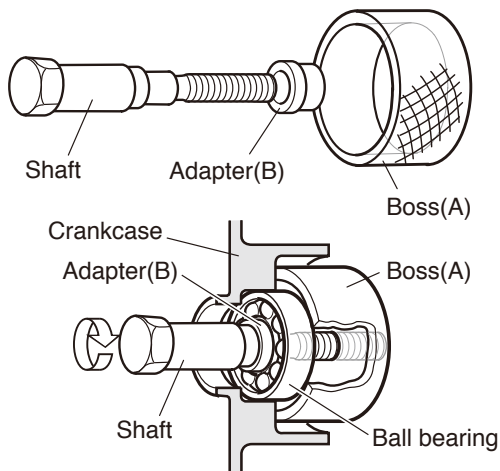
[Installing needle bearing]

1. Put the small end of the connecting rod on the base aligning both holes of the small end and the base.
 2. Put the new needle bearing on the small end.
- NOTE:** The side stamped with identification of the needle bearing should face up.
3. Push the needle bearing into the bottom using the larger pusher (D).

Key No. 76: Bearing tool 897701-14732



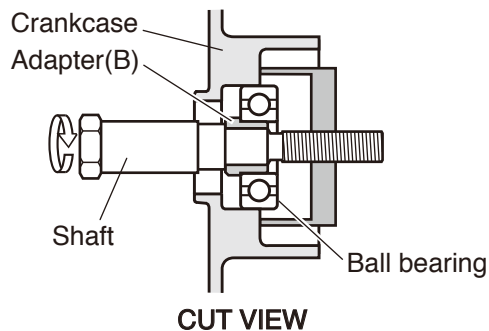
This bearing tool consists of above parts to remove and install various size of ball bearings. Select the right size of adapter(s) matched with the ball bearing size.



[Example: Removing ball bearing from crankcase]

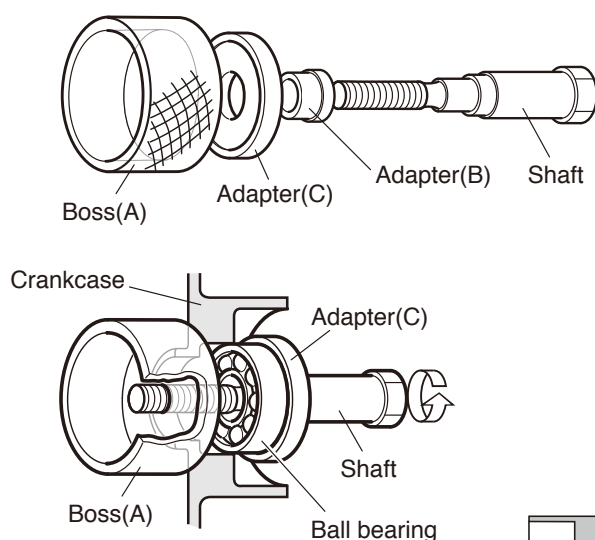
1. When removing ball bearing Called No. 6203 on model CS-8001, use the shaft, adapter (B) and boss (A).

2. Push the ball bearing out from crankcase as shown.



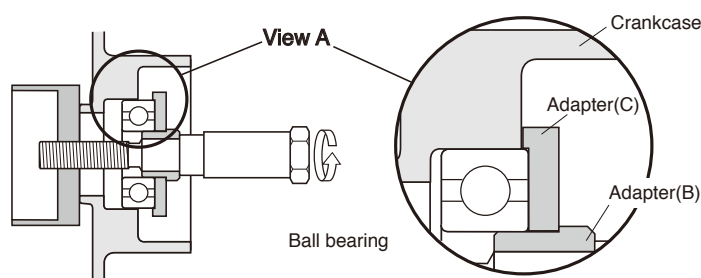
(Continued)

Key No. 76: Bearing tool 897701-14732 (Continued)

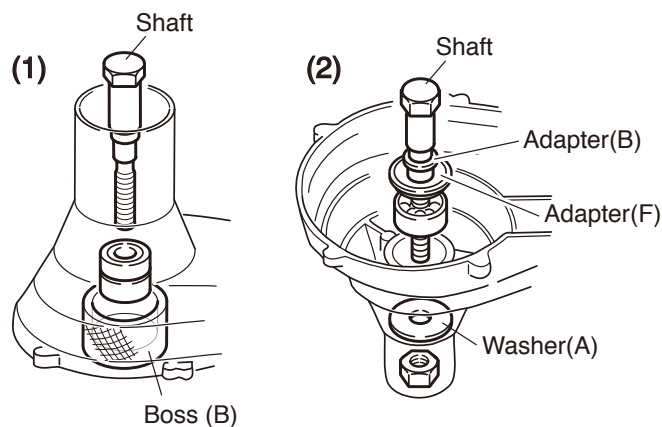


[Example: Installing ball bearing to crankcase]

1. When installing ball bearing Called No. 6203 on model CS-8001, use the shaft, adapter (B), adapter (C) and boss (A).
2. Push the ball bearing in the crankcase until the edge of adapter (C) contact with crankcase as View A.
3. When installing ball bearing into crankcase on models CS-5000, CS-5501 and CS-6702, use the shaft, adapter (A) and boss (B), and follow above step 2.

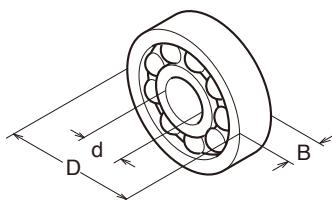


[Example: Replacing clutch drum bearings]

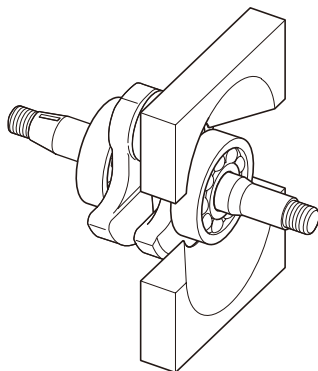


1. To remove the bearings, use the shaft and boss (B), and push the bearings out as shown (1).
2. To install the bearings Called No. 6000 on model SRM-2655, use the shaft, adapter (B), adapter (F), washer (A) and nut. Then push the ball bearings in fan cover one by one and screw the shaft slowly into nut until the bottom of the ball bearing reaches to the end surface as shown (2).
3. To install the bearings Called No. 6001 on the other models, use the shaft, opposite side of adapter (F), washer (B) and nut, and follow the same procedure as above step 2.

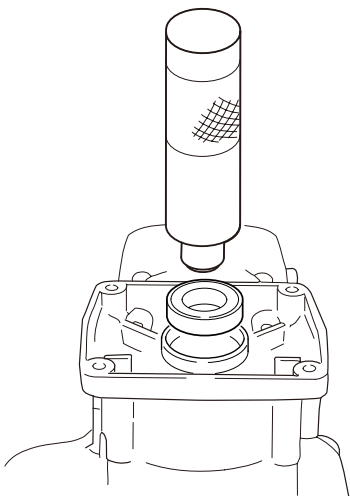
Ball bearing size



Called No.	d	D	B	Called No.	d	D	B
6000	10	26	8	6200	10	30	9
6001	12	28	8	6201	12	32	10
6002	15	32	9	6202	15	35	11
6003	17	35	10	6203	17	40	12
6004	20	42	12	6204	20	47	14
Called No.	d	D	B	Called No.	d	D	B
6300	10	35	11	6900	10	22	6
6301	12	37	12	6901	12	24	6
6302	15	42	13	6902	15	28	7
6303	17	47	14	6903	17	30	7

Key No. 77: Bearing wedge 897701-02830

Use the thinner wedge first, and the thicker one next as shown.

Key No. 78: Oil seal tool 897714-12330

1. Remove defective oil seal from engine.

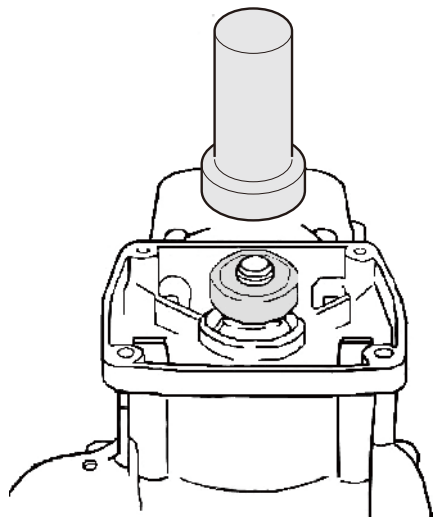
NOTE: Be careful not to damage crankshaft.

2. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

3. Apply grease to inner rubber lips of a new oil seal.

4. Push in the seal flush with crankcase surface using the oil seal tool.

NOTE: When installing the oil seal, place it level to avoid being cocked in bore.

Key No. 79: Oil seal tool 897727-16130

1. Remove defective oil seal from engine.

NOTE: Be careful not to damage crankshaft.

2. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

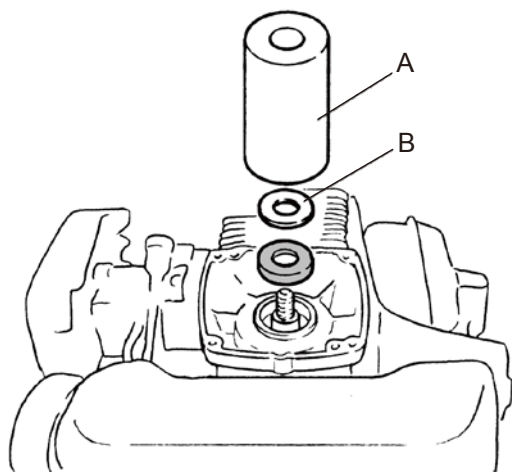
3. Apply grease to inner rubber lips of a new oil seal.

4. Push in the seal flush with crankcase surface using the oil seal tool.

NOTE: When installing the oil seal, place it level to avoid being cocked in bore.

Key No. 80: Washer 363018-00310

Key No. 82: Oil seal tool 897714-24330



1. Remove defective oil seal from engine.

NOTE: Be careful not to damage crankshaft.

2. Apply grease (Shell EP-2 or equivalent) to inner rubber lips of a new oil seal.

3. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

4. Push in the seal using oil seal tool 897714-24330 (A).

NOTE: Since the oil seal on the starter side should be located at 1 to 1.5 mm (0.04 to 0.06 in) deeper than the crankcase surface, always use the washer 363018-00310 (B) or similar size of the washer as below together with the oil seal tool.

Inner diameter : 12 mm (0.48 in)

Outer diameter : 19 to 22 mm (0.75 to 0.85 in)

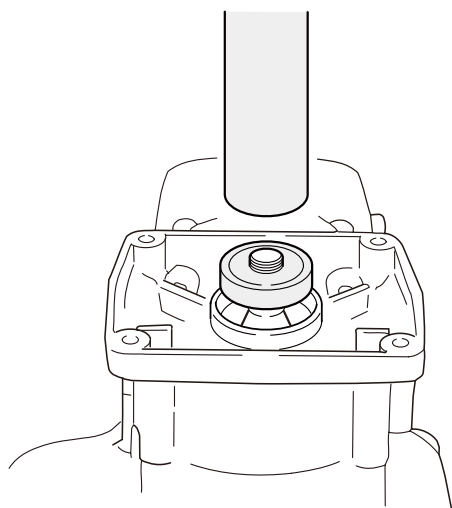
Thickness : 1 to 1.5 mm (0.04 to 0.06 in)

NOTE: When installing the oil seal, place it level to avoid being cocked in bore.

Key No. 81, 82: Oil seal tool 897714-22830, 897714-24330

Key No. 83: Oil seal tool 22154-96440

Key No. 84: Oil seal tool 897726-21430



1. Remove defective oil seal from engine.

NOTE: Be careful not to damage crankshaft.

2. Remove Woodruff key when installing magneto rotor side oil seal.

3. Apply grease (Shell EP-2 or equivalent) to inner rubber lips of a new oil seal.

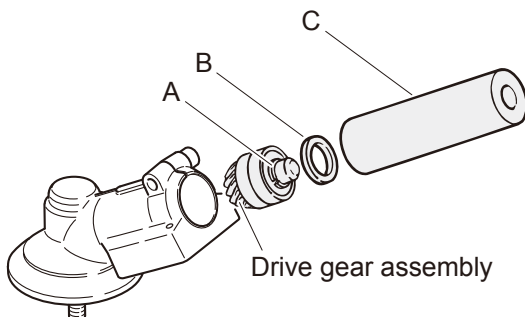
4. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

5. Push in the seal flush with crankcase surface or to maximum 1 mm (0.04 in) deep using a suitable size of the oil seal tool.

NOTE: When installing the oil seal, place it level to avoid being cocked in bore.

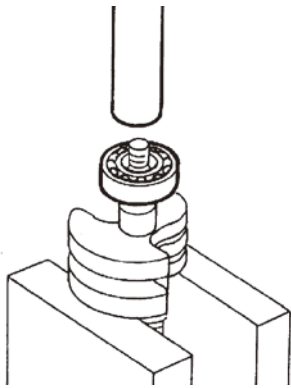
Key No. 85: Oil seal tool 897726-09130

Key No. 86: Washer 900600-00012



[Installing drive gear assembly on gear case]

1. Put washer 900600-00012 (B) around clip (A).
2. Put drive gear assembly in the gear case and press it in using oil seal tool 897726-09130 (C) until its bottom.
3. Do not forget to remove the washer (B) after installing drive gear assembly.



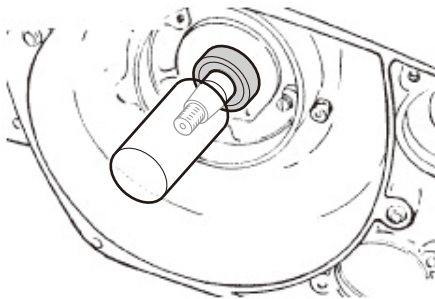
[Installing ball bearing to crankshaft]

The oil seal tool 897726-09130 can be used for installing ball bearing on crankshaft models CS-3000, CS-3050, CS-3500 etc.

1. Install new ball bearing(s) using oil seal tool 897726-09130 to the bottom.

NOTE: Pre-heat ball bearing using a heat lamp or a suitable heater for easier installation.

Key No. 87: Oil seal tool 897726-16431



1. Remove defective oil seal from engine.

NOTE: Be careful not to damage crankshaft.

2. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

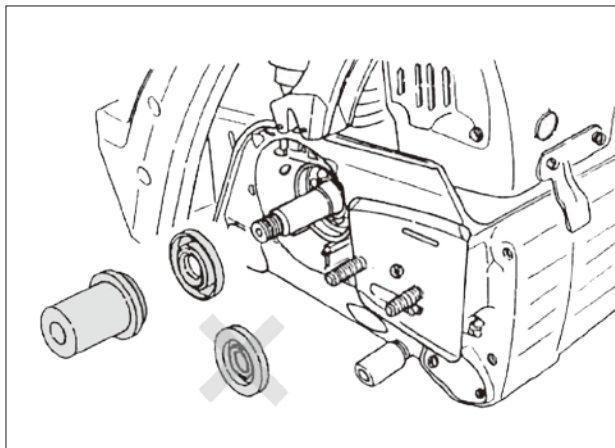
3. Apply grease to inner rubber lips of a new oil seal.

4. Push in the seal flush with crankcase surface using a suitable size of oil seal tool.

NOTE: When installing the oil seal, place it level to avoid being cocked in bore.

Key No. 88: Oil seal tool 897727-19830

Key No. 89: Oil seal tool 897727-30830



1. Remove defective oil seal from engine.

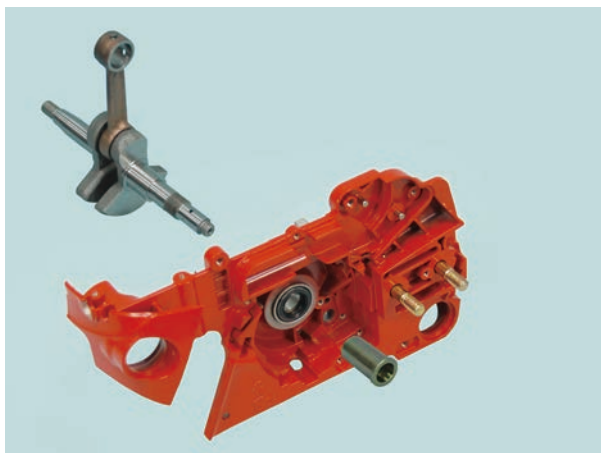
NOTE: Be careful not to damage crankshaft or crankcase.

2. Lubricate the circumferences and inner rubber lips of a new oil seal with high melting point grease.

3. Push in the seal flush with crankcase surface using the oil seal tool.

NOTE: When installing the oil seal, place it level to avoid being cocked in bore.

Key No. 90, 91, 92, 93: Collar oil seal tool X646-000170, X646-000150, X646-000070, X646-000470



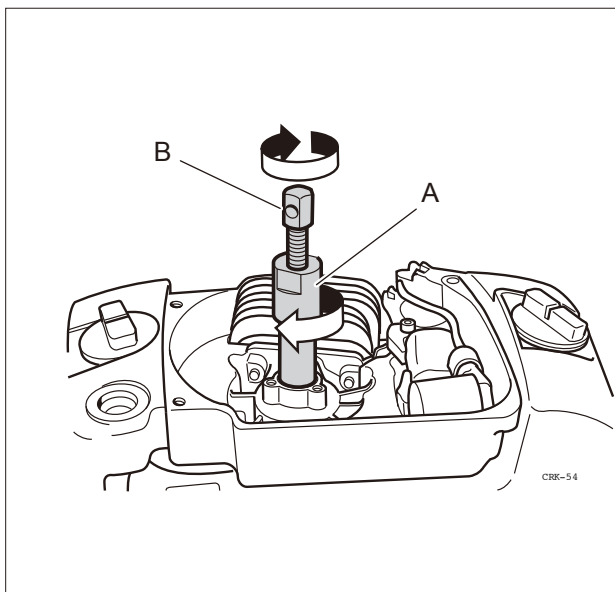
1. Apply grease on the oil seal lip and heat up the main bearing using a heat gun.

2. Insert collar oil seal tool into the oil seal lip of the clutch side.

3. After inserting the crankshaft, assemble the gasket and the other side crankcase, and then tighten crankcase bolts evenly and slowly.

NOTE: If the bolts is not long enough, prepare longer bolts.

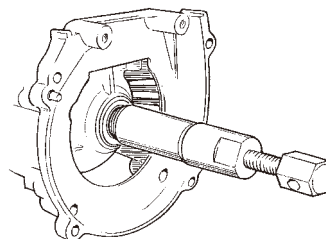
Key No. 94: Puller X640-000380



1. Screw puller (A) into the oil seal.

2. Screw center bolt (B) in the puller (A) until its bottom.

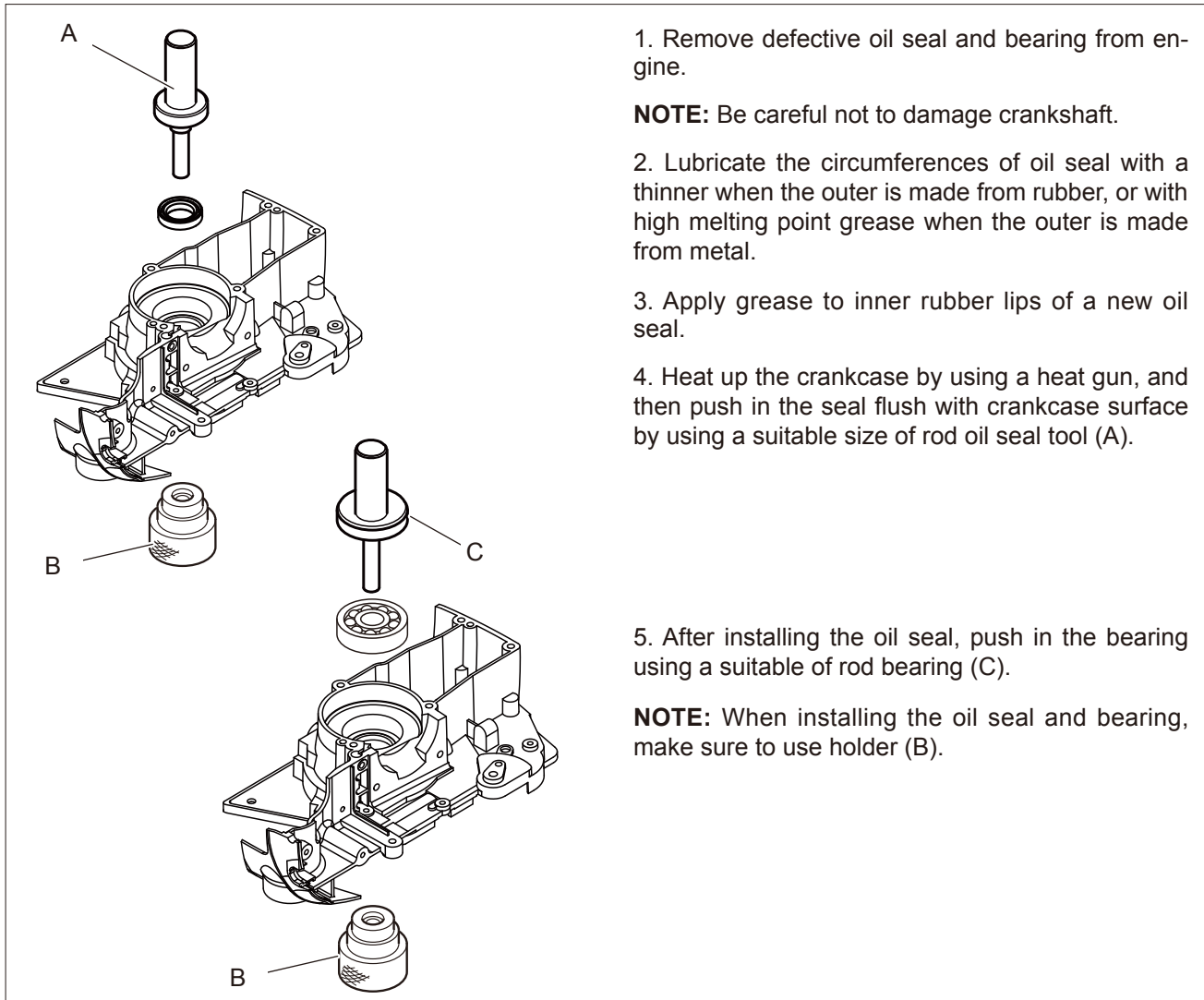
3. Tighten the center bolt (B) with a wrench holding the puller, then remove the oil seal.



Key No. 95, 96, 97, 98, 99, 100, 101, 102: Rod oil seal tool X646-000110, 22182-96460, 22155-96420, 22150-96420, X646-000040, 22150-96450, X646-000060, X646-000510

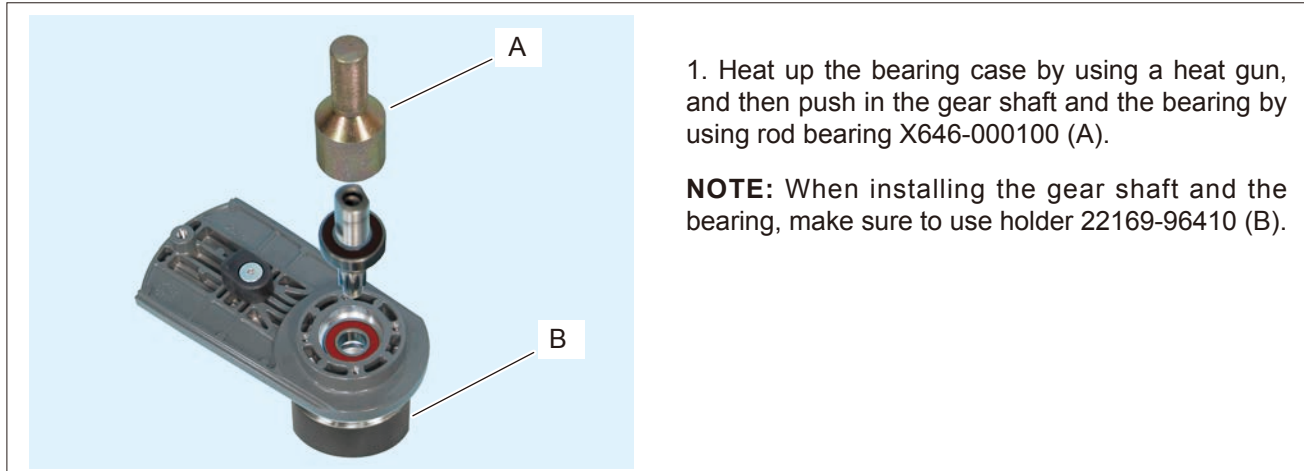
Key No. 103, 104, 105, 106, 107, 108: Holder 22160-96411, X646-000370, X640-000170, 22169-96410, 22169-96440, X643-000020

Key No. 109, 110, 111, 112: Rod bearing X646-000050, 22160-96440, X646-000120, X646-000081



Key No. 113: Rod bearing X646-000100

Key No. 106: Holder 22169-96410

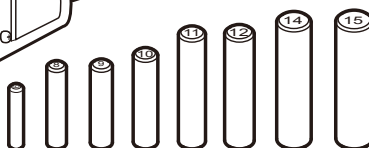
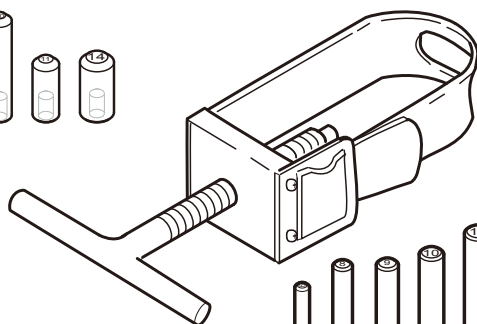
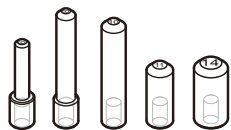


Key No. 114, 115, 116: Piston pin tool 897702-30131, Y089-000250, X640-000090

These piston pin tools contain adapters and guides. Select the right size of adapter and guide matched with the piston pin size.

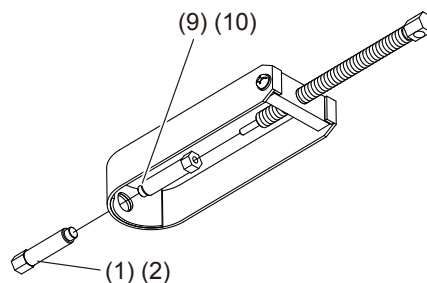
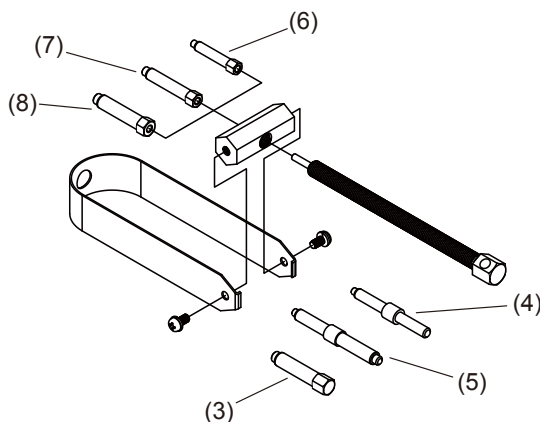
Piston pin tool 897702-30131

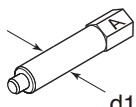
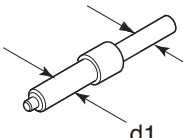
Adapters (6, 8, 10, 11, 14)



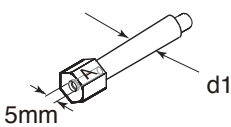
Guides (6, 8, 9, 10, 11, 12, 14, 15)

Piston pin outer diameter	Adapter No.	Guide No.
6mm	6	6
8mm	8	8
9mm	8	9
10mm	10	10
11mm	11	11
12mm	11	12
14mm	14	14
15mm	14	15

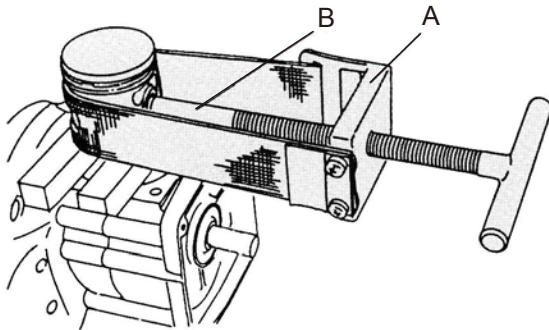
Piston pin tool Y089-000250, X640-000090**Adapters**

	(1) 22169-96360 A = 757 d1 = 11.8 mm		(4) X648-000090 d1 = 9.9 mm d2 = 8.9 mm
	(2) 22150-96360 A = 680 d1 = 10.8 mm		(5) 20035-96630 d1 = 7.8 mm d2 = 7.8 mm
	(3) 20021-96630 A = 45 d1 = 10.8 mm		

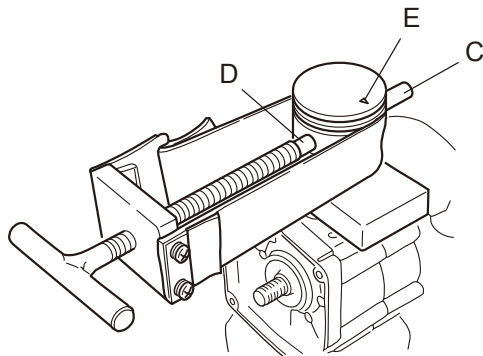
Guides

	(6) X648-000110 A = 20/25 d1 = 7.4 mm	(9) 22169-96350 A = 757 d1 = 11.4 mm
	(7) 20021-96660 A = 35/40 d1 = 8.9 mm	(10) 22150-96350 A = 680 d1 = 10.4 mm
	(8) X648-000130 A = 45 d1 = 10.4 mm	

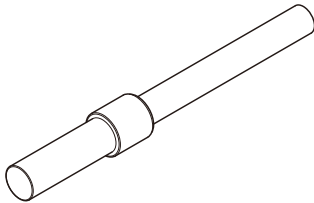
(Continued)

Key No. 114, 115, 116: Piston pin tool 897702-30131, Y089-000250, X640-000090 (Continued)**[Removing piston pin]**

1. Remove snap rings from piston and discard them.
2. Push piston pin out from the piston using piston pin tool (A) and right size of adapter (B) as shown.

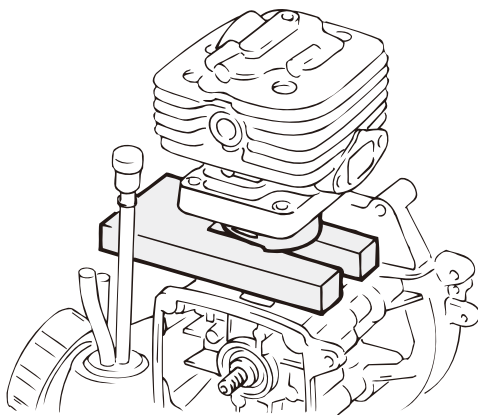
**[Installing piston pin]**

1. Assemble piston on connecting rod together with needle bearing, spacers when utilized, using right size of guide (C) temporarily. Be sure to place piston with arrow mark (E) pointing exhaust side.
2. Push piston pin in the piston using piston pin tool (A) and right size of adapter (D) pushing out the guide (C) as shown.
3. Install new snap rings on both ends of piston pin and make sure that they are properly seated in the grooves.

Key No. 117: Guide X640-000390

This guide is used to models not used piston pin tool.

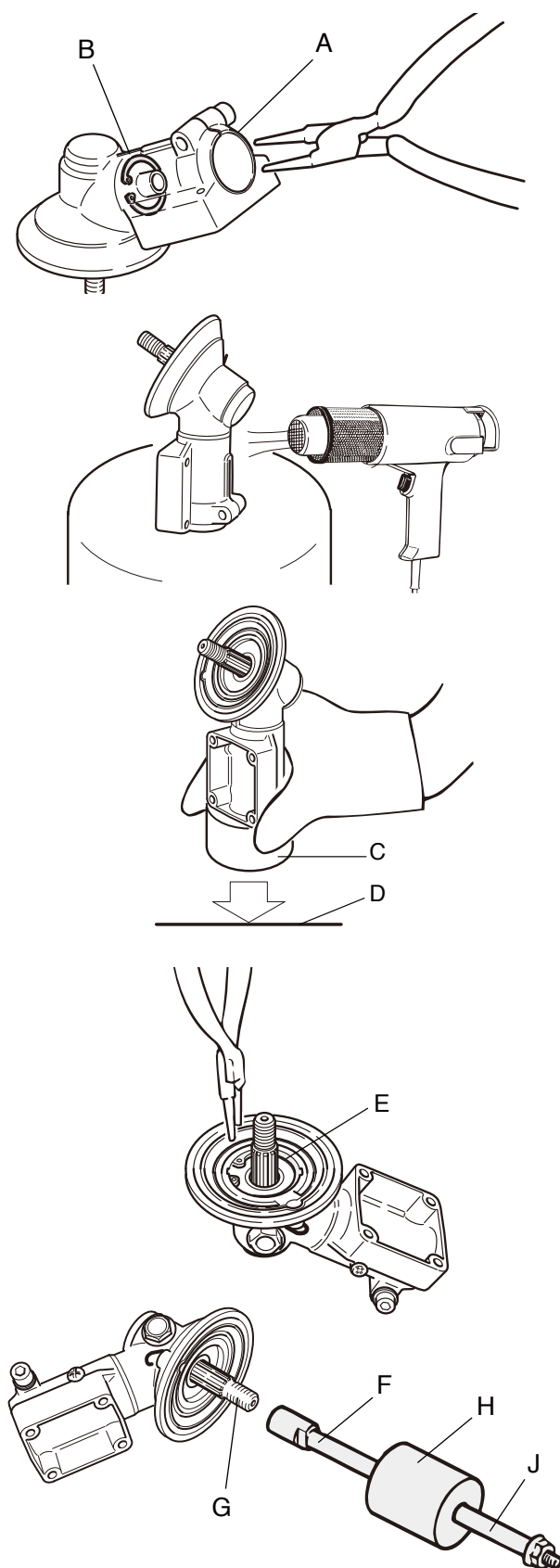
After positioning with guide X640-000390, remove or install the piston pin.

Key No. 118: Piston holder 897719-02830

1. When Installing cylinder, set the piston holder under the piston as shown, and install cylinder over piston ensuring that exhaust side of cylinder is at arrow side of piston.

NOTE: Do not rotate the cylinder while installing. Otherwise, the piston rings and/or cylinder wall might be damaged.

Key No. 119: PTO shaft puller P021-044870



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

2. Remove cutting head from PTO shaft, and gear case (A) from drive shaft housing. Remove O-ring and blade fixture from PTO shaft.

3. Remove retaining ring (B) using long nose pliers.

4. Heat up the middle of gear case using a heat gun, then strike the gear case with a cup (C) of bearing tool (Key No. 73) vertically against a flat surface (D) several times until drive gear with two ball bearings come out.

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

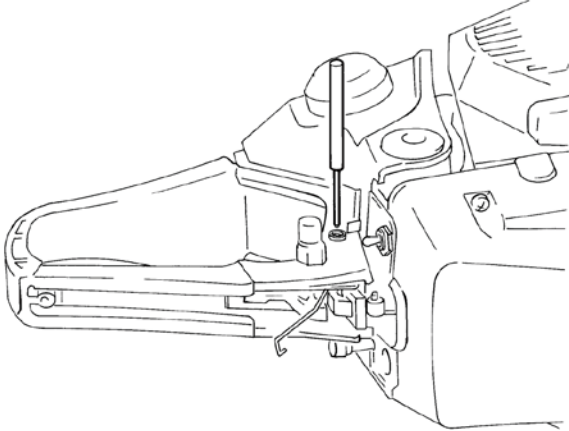
5. Remove retaining ring (E) from the groove of gear case using the pliers, then remove the washer.

6. Connect PTO shaft puller P021-044870 (F) to PTO shaft (G). Then strike weight (H) to nut (J) holding gear case, to pull out the PTO shaft together with the relevant parts.

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

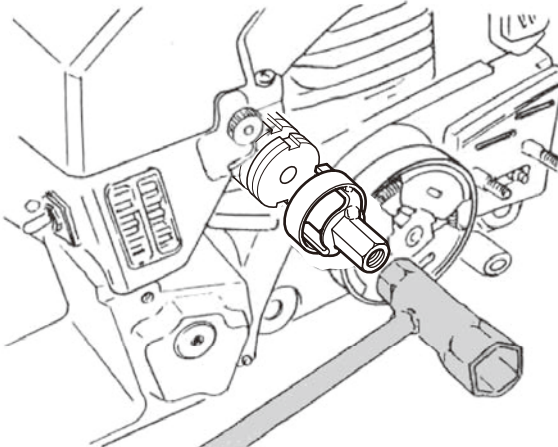
7. Check the gears, PTO shaft, and ball bearings. If worn or hard rotation is found, replace the defective parts as required.

Key No. 120, 121, 122: Spring pin tool 897724-01261, 897724-01361, 897724-02831



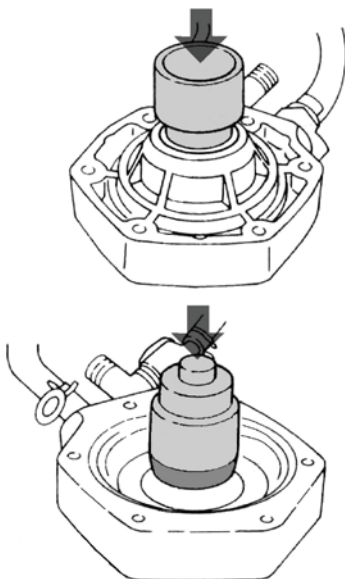
1. Push out spring pin with spring pin tool.
2. Before install the spring pin, preassemble the relative parts with the spring pin tool, and install the spring pin on the opposite side pushing out the spring pin.

Key No. 123: Cushion tool 897740-19830



Cushion tool 897740-19830 is used for removing and installing rubber cushion as shown.

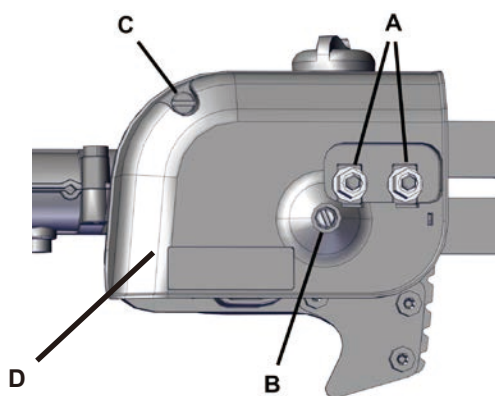
Key No. 124: Mechanical seal tool 897741-10510



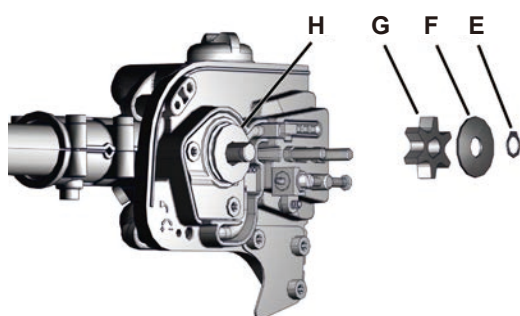
1. Remove the mechanical seal using the mechanical seal tool as shown.

2. Install the mechanical seal using the mechanical seal tool as shown.

Key No. 125: Load adapter 91156

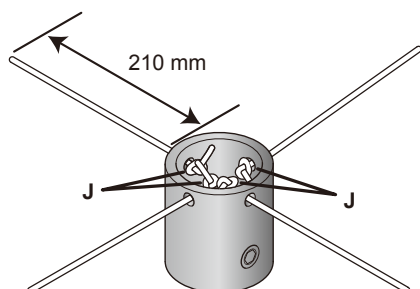


1. Empty oil tank.
2. Remove two nuts (A) and screw (C). Turn chain tensioning screw (B) counterclockwise to release chain tension.
3. Remove sprocket guard (D).
4. Remove guide bar and saw chain.



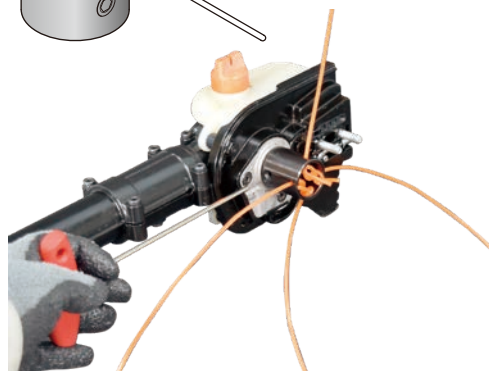
5. Remove snap ring (E), washer (F) and drive sprocket (G).

NOTE: Do not remove washer (H).

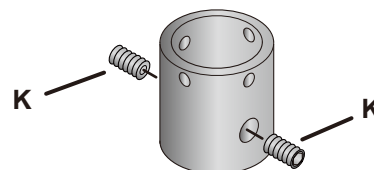


6. Insert nylon lines (2.4 diameter) through four holes in Load adapter 91156 and make four knots (J) as shown.

Cut the lines to 210 mm from eyelet on Load adapter.



7. Install Load adapter output end of drive shaft, tighten two screws (K) using a 3 mm hex. wrench.



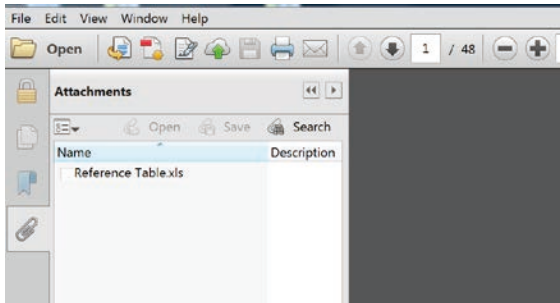
NOTE: Refer to SERVICE DATA of each model for details of Carburetor adjustment procedure. Then before WOT setting, confirm Maximum WOT speed. If the WOT speed does not obtain the following speed, adjust nylon line lengths.

Models	WOT maximum speed with Load adapter 91156
PPT-235ES, PPF-235ES	approx. 8,250 r/min
PPT-236ES, PPF-236ES	approx. 8,000 r/min
PPT-265ES, PT266S	approx. 8,500 r/min
PPT-2620ES/HES, PT262S	approx. 8,500 r/min
PPT-300ES, PPF-300ES	approx. 8,500 r/min

3. MODEL AND SERVICE TOOL REFERENCE TABLE INSTRUCTION

Excel file "Reference Table" is embedded in this manual as attachments. This table lists service tool for each model.

Required tools can be searched easily on this table.
NOTE: When using "Reference Table", download this manual on your computer desktop. Then, open the table on attachments tub.

**How To Search SERVICE TOOL**

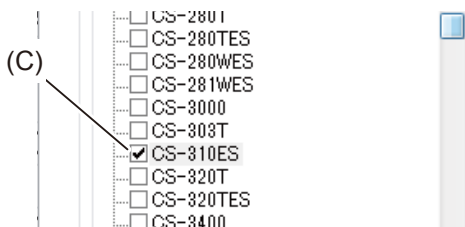
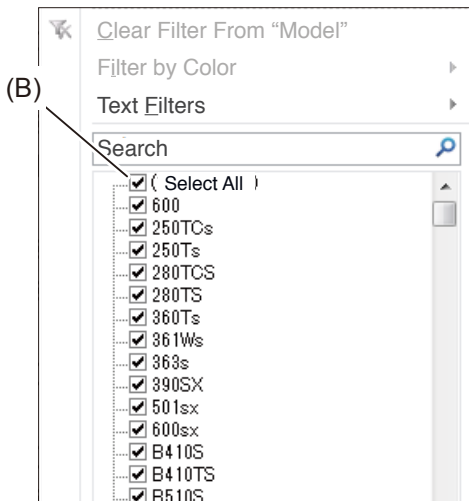
[Example: CS-310ES]

1. Click arrow (A) next to Model.



2. (1) WAY1.

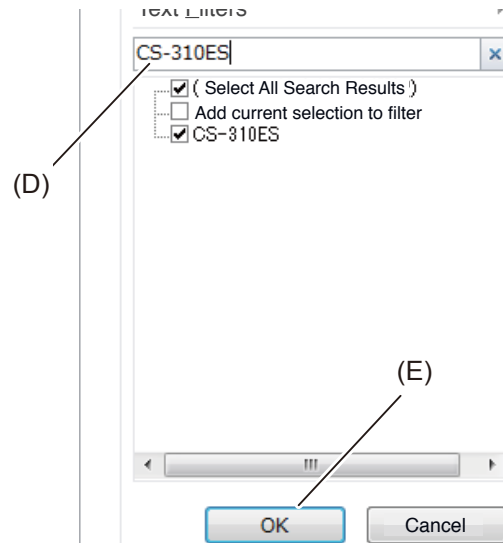
Click check box (B) (Select All) to clear all check boxes, and click check box (C) on CS-310ES.



(2) WAY2.

Enter model name into search box (D) as shown.

[NOTE] Applies to: Excel 2010 and after



3. Click OK button (E).

4. Result. Excel only displays part numbers for CS-310ES.

	A	B	
1	Part number	Model	
647	897801-33330	CS-310ES	
648	X605-000050	CS-310ES	
649	897501-03938	CS-310ES	
650	X640-000011	CS-310ES	
651	91037	CS-310ES	
652	897702-30131	CS-310ES	
653	897701-06030	CS-310ES	
654	897563-19830	CS-310ES	
655	X686-000000	CS-310ES	
656	91019	CS-310ES	
657	897726-21430	CS-310ES	
658	897800-79931	CS-310ES	
659	897803-30133	CS-310ES	
660	500-500	CS-310ES	
661	X646-000030	CS-310ES	
662	91004	CS-310ES	
3843			
3844			
3845			
3846			
3847			
3848			
3849			

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