



SERVICE MANUAL

SERVICE TOOLS

REVISED Sep. 2021
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 in this MANUAL, refer to SERVICE MANUAL "SERVICE TOOLS Ref. No. 400-01" issued December 2005.

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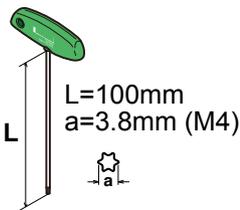
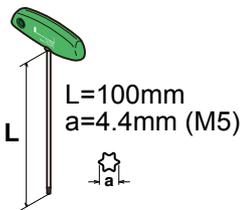
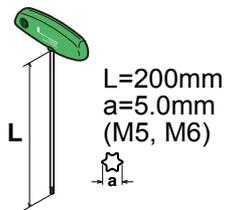
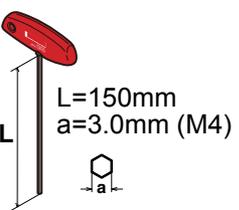
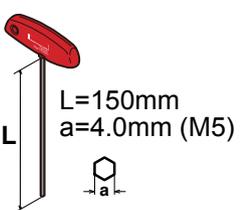
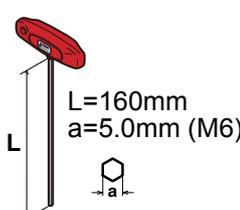
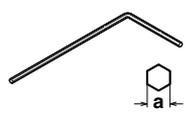
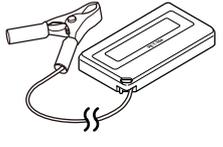
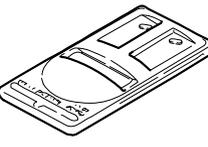
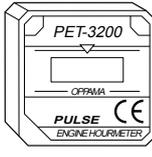
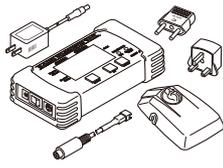
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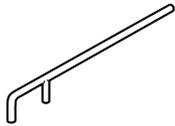
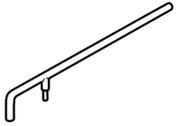
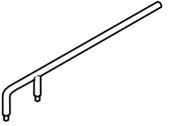
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1. SERVICE TOOL INTRODUCTION

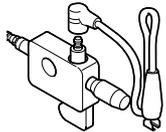
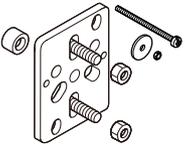
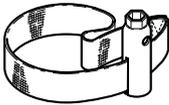
1-1 Standard tools

<p>1. Torx wrench (T20) 895622-30130</p>  <p>L=100mm a=3.8mm (M4)</p> <p>Removing and installing torx bolts</p>	<p>2. Torx wrench (T25) X602-000330</p>  <p>L=100mm a=4.4mm (M5)</p> <p>Removing and installing torx bolts</p>	<p>3. Torx wrench (T27) X602-000340</p>  <p>L=200mm a=5.0mm (M5, M6)</p> <p>Removing and installing torx bolts</p>	<p>4. T-hex. Wrench X602-000350</p>  <p>L=150mm a=3.0mm (M4)</p> <p>Removing and installing hex. head bolts (M4)</p>
<p>5. T-hex. Wrench X602-000360</p>  <p>L=150mm a=4.0mm (M5)</p> <p>Removing and installing hex. head bolts (M5)</p>	<p>6. T-hex.wrench X602-000230</p>  <p>L=160mm a=5.0mm (M6)</p> <p>Removing and installing hex. head bolts (M6)</p>	<p>7. L-hex. Wrench X605-000180</p>  <p>a=3.0mm (M4)</p> <p>Removing and installing hex. socket bolts (M4)</p>	<p>8. Tachometer PET-304 PET304</p>  <p>Measuring engine speed to adjust carburetor</p>
<p>9. Tachometer PET-1000R 897802-33330</p>  <p>Measuring engine speed to adjust carburetor</p>	<p>10. PET-3200 PET3200R</p>  <p>Measuring engine working time</p>	<p>11. E-CARB Diagnostic tool A468-000000</p>  <p>Measuring control value and resetting EMS</p>	

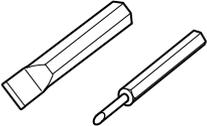
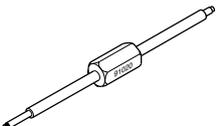
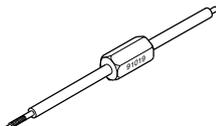
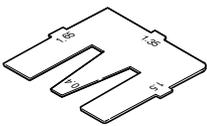
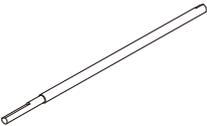
1-2 Starter system

<p>12. 2-pin wrench 897712-04630</p>  <p>Removing and installing starter pulley</p>	<p>13. 2-pin wrench 897712-07930</p>  <p>Removing and installing starter pulley</p>	<p>14. 2-pin wrench X602-000000</p>  <p>Removing and installing starter pulley</p>
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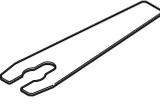
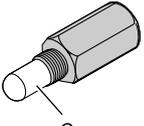
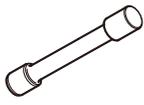
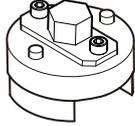
1-3 Ignition system

<p>15. Spark tester 897800-79931</p>  <p>Checking ignition system</p>	<p>16. Module air gap gauge 91004</p>  <p>Adjusting pole shoe air gaps</p>	<p>17. Flange nut V265-000200</p>  <p>M8 - pitch 1.25</p> <p>Removing magneto rotor (flywheel)</p>	<p>18. Bolt 900100-08008</p>  <p>M8 - 8 mm length</p> <p>Removing magneto rotor (flywheel)</p>
<p>19. Puller Y089-000111</p>  <p>Removing magneto rotor (flywheel) and crankcase</p>	<p>20. Flexible wrench 897709-79920</p>  <p>Holding cylindrical part</p>		

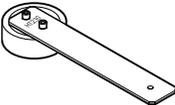
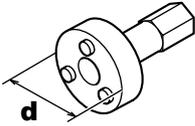
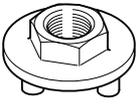
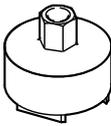
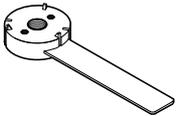
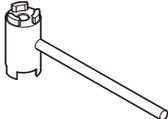
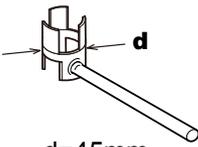
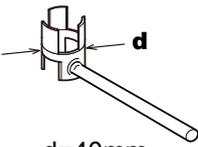
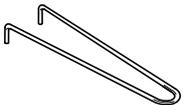
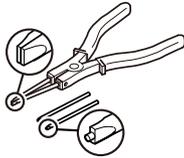
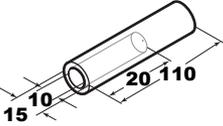
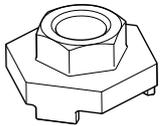
1-4 Fuel system

<p>21. Carburetor adjustment tool Y089-000095</p>  <p>Adjusting carburetor</p>	<p>22. Ethanol tester 91040</p>  <p>Checking ethanol ratio</p>	<p>23. Welch plug tool (ZAMA) 90101</p>  <p>Removing and installing welch plug</p>	<p>24. Welch plug tool (Walbro) 500-500</p>  <p>Removing and installing welch plug</p>
<p>25. Limiter plug tool 91020</p>  <p>Removing and installing limiter plug</p>	<p>26. Limiter cap tool 91019</p>  <p>Removing and installing limiter cap</p>	<p>27. Metering lever gauge 897563-19830</p>  <p>Measuring metering lever height on carburetor</p>	<p>28. D-shaped tool (M) X603-000070</p>  <p>Adjusting carburetor (Use with Y089-000095)</p>
<p>29. Short type D-shaped tool (S) 91159S</p>  <p>Adjusting carburetor</p>	<p>30. Short type Carburetor adjustment tool Y089-000290</p>  <p>Adjusting carburetor</p>		

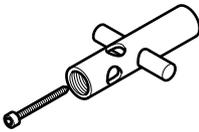
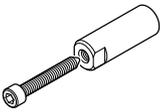
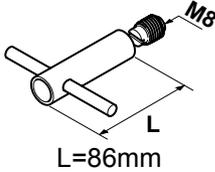
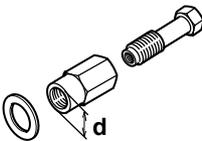
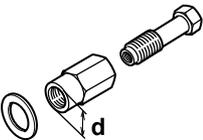
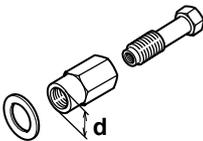
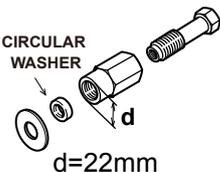
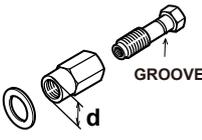
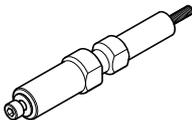
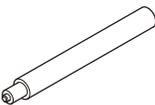
1-5 Clutch system

<p>31. Clutch spanner X600-000111</p>  <p>t=2.3mm</p> <p>Locking crankshaft rotation</p>	<p>32. Piston stopper X644-000020</p>  <p>Cap</p> <p>Locking crankshaft rotation (Cap: C205-000190)</p>	<p>33. Piston stopper X644-000040</p>  <p>Locking crankshaft rotation</p>	<p>34. Clutch spanner X600-000130</p>  <p>Removing and installing clutch assembly and clutch drum</p>
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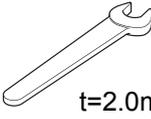
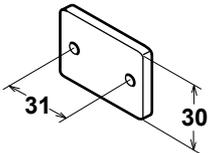
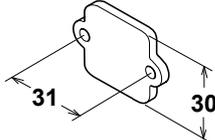
1-5 Clutch system (continued)

<p>35. Clutch tool 897731-04920</p>  <p>Removing and installing clutch assembly</p>	<p>36. Puller Y089-000180</p>  <p>Removing and installing clutch drum</p>	<p>37. Puller X640-000550</p>  <p>d=49.5mm</p> <p>Removing and installing clutch drum</p>	<p>38. Clutch tool 897505-16133</p>  <p>Removing and installing clutch assembly</p>
<p>39. Clutch tool X640-000011</p>  <p>Removing and installing clutch assembly</p>	<p>40. Clutch tool X640-000560</p>  <p>Removing and installing clutch assembly</p>	<p>41. Puller X640-000100</p>  <p>Removing and installing clutch assembly</p>	<p>42. Puller X640-000290</p>  <p>Removing and installing clutch assembly</p>
<p>43. Clutch spanner X640-000130</p>  <p>Removing and installing clutch assembly</p>	<p>44. Clutch spanner X640-000150</p>  <p>d=45mm</p> <p>Removing and installing clutch assembly</p>	<p>45. Clutch spanner X640-000370</p>  <p>d=40mm</p> <p>Removing and installing clutch assembly</p>	<p>46. Wrench tool X602-000290</p>  <p>Removing and installing clutch assembly</p>
<p>47. Snap ring pliers P021-051610</p>  <p>Removing snap ring from clutch drum</p>	<p>48. Rod X646-000180</p>  <p>Installing snap ring</p>	<p>49. Clutch tool X640-000570</p>  <p>Removing and installing clutch assembly</p>	

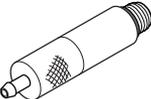
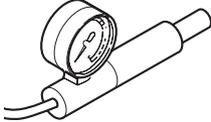
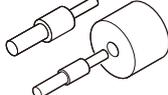
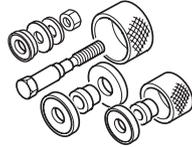
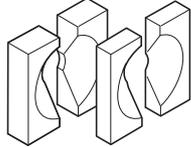
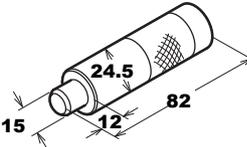
1-6 Lubrication system

<p>50. Puller 897500-00335</p>  <p>Removing auto oiler cover</p>	<p>51. Worm remover 897708-19835</p>  <p>Removing auto-oiler worm</p>	<p>52. Worm puller 897708-50430</p>  <p>Removing auto-oiler worm</p>	<p>53. Worm inserter Y089-000070</p>  <p>Installing auto-oiler worm</p>
<p>54. Worm inserter Y089-000000</p>  <p>d=16mm</p> <p>Installing auto-oiler worm</p>	<p>55. Worm inserter Y089-000020</p>  <p>d=22mm</p> <p>Installing auto-oiler worm</p>	<p>56. Worm inserter Y089-000030</p>  <p>d=24mm</p> <p>Installing auto-oiler worm</p>	<p>57. Worm inserter Y089-000010</p>  <p>CIRCULAR WASHER</p> <p>d=22mm</p> <p>Installing auto-oiler worm</p>
<p>58. Worm inserter Y089-000040</p>  <p>GROOVE</p> <p>d=22mm</p> <p>Installing auto-oiler worm</p>	<p>59. Auto-oiler puller Y089-000131</p>  <p>Removing pencil type auto-oiler</p>	<p>60. Auto-oiler installer 91073A</p>  <p>Installing pencil type auto-oiler</p>	<p>61. Oiler gap adjuster X648-000150</p>  <p>Making appropriate gap between auto-oiler assembly and warm gear</p>

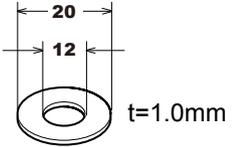
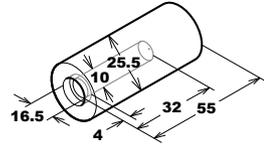
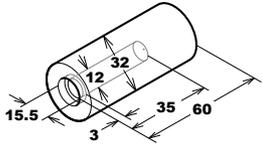
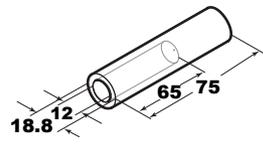
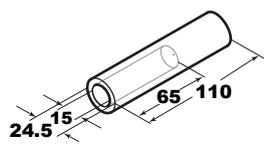
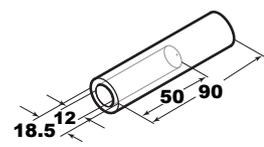
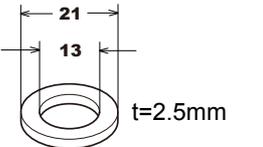
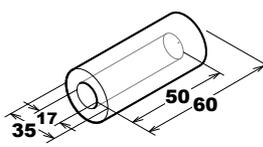
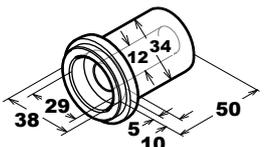
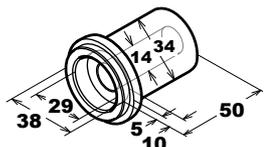
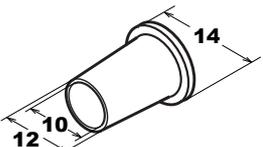
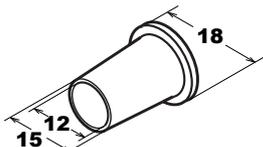
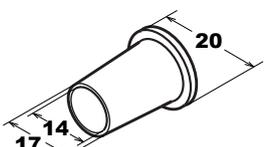
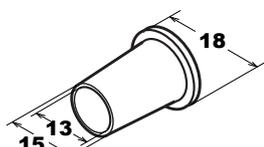
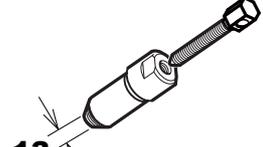
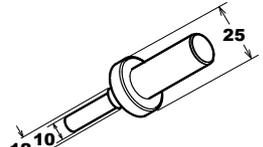
1-7 Engine system

<p>62. Wrench X600-000180</p>  <p>t=2.0mm</p> <p>Adjusting valve clearance</p>	<p>63. Pressure rubber plug 91041</p>  <p>Plugging exhaust port to test crankcase/cylinder leakages</p>	<p>64. Pressure rubber plug 897826-16131</p>  <p>31 30</p> <p>Plugging intake port to test crankcase/cylinder leakages</p>	<p>65. Pressure plate 897827-16131</p>  <p>31 30</p> <p>Plugging intake port to test crankcase/cylinder leakages</p>
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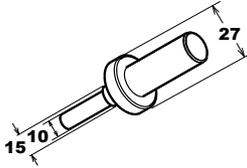
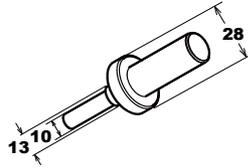
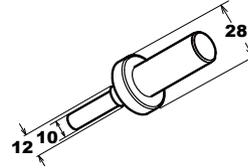
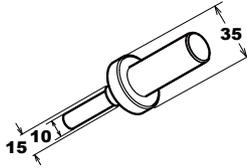
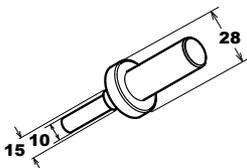
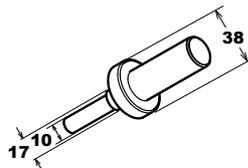
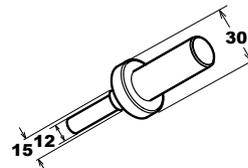
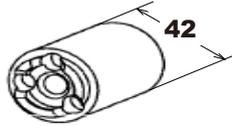
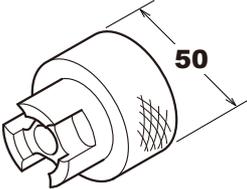
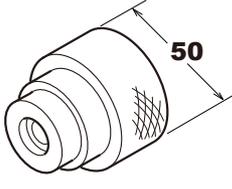
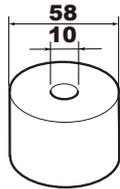
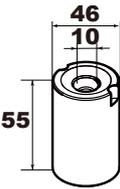
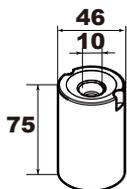
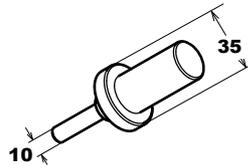
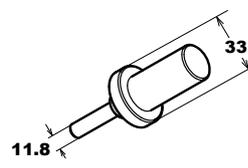
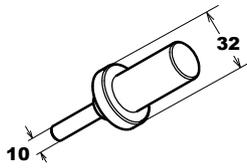
1-7 Engine system (continued)

<p>67. Pressure connector A131-000150</p>  <p>M14 x 1.25</p> <p>Testing crankcase and cylinder leakage</p>	<p>68. Pressure connector A131-000160</p>  <p>M10 x 1.0</p> <p>Testing crankcase and cylinder leakage</p>	<p>69. Pressure / vacuum tester 91149</p>  <p>Testing crankcase and cylinder leakage</p>	<p>70. Pressure tester 897803-30133</p>  <p>Testing carburetor and crankcase leakage</p>
<p>71. Plug 101115-37531</p>  <p>Testing crankcase and cylinder leakage (Use with 900720-00009) (Screw thread: M10 x 1.25)</p>	<p>72. O-ring 900720-00009</p>  <p>Testing crankcase and cylinder leakage (Use with 101115-37531)</p>	<p>73. Compression gauge 91037</p>  <p>Measuring cylinder compression</p>	<p>74. Adapter P021-051690</p>  <p>Measuring cylinder compression (with P/N: 91037)</p>
<p>75. Adjust wrench 68900-98310</p>  <p>Adjusting valve gap (For 4 stroke engine)</p>	<p>76. Spring compressor 68900-98340</p>  <p>Removing and installing valve spring (For 4 stroke engine)</p>	<p>77. Crankcase tool 897502-19830</p>  <p>Separating crankcase</p>	<p>78. Bearing tool 897705-11520</p>  <p>Replacing needle bearing on con-rod small end</p>
<p>79. Bearing tool 897701-14732</p>  <p>Removing and installing ball bearings on crankcase</p>	<p>80. Bearing wedge 897701-02830</p>  <p>Removing ball bearings on crankshaft</p>	<p>81. Oil seal tool 897714-12330</p>  <p>Installing crankcase oil seal</p>	<p>82. Oil seal tool 897727-16130</p>  <p>Installing crankcase oil seal</p>

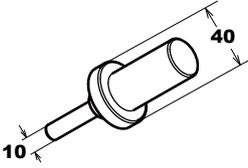
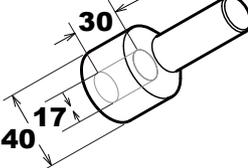
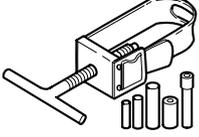
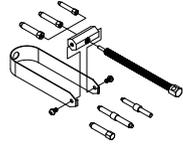
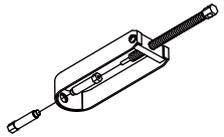
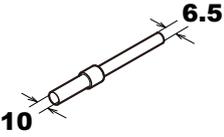
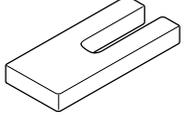
1-7 Engine system (continued)

<p>83. Washer V309-000170</p>  <p>Installing crankcase oil seal</p>	<p>84. Oil seal tool 897714-22830</p>  <p>Installing crankcase oil seal</p>	<p>85. Oil seal tool 897714-24330</p>  <p>Installing crankcase oil seal</p>	<p>86. Oil seal tool X646-000360</p>  <p>Installing oil seal</p>
<p>87. Oil seal tool 897726-21430</p>  <p>Installing oil seal and clutch plate</p>	<p>88. Oil seal tool 897726-09130</p>  <p>Installing oil seal and clutch plate</p>	<p>89. Washer 900600-00012</p>  <p>Installing drive gear</p>	<p>90. Oil seal tool 897726-16431</p>  <p>Installing crankcase oil seal</p>
<p>91. Oil seal tool 897727-19830</p>  <p>Installing crankcase oil seal</p>	<p>92. Oil seal tool 897727-30830</p>  <p>Installing crankcase oil seal</p>	<p>93. Collar oil seal tool X646-000170</p>  <p>Set oil seal collect position</p>	<p>94. Collar oil seal tool X646-000150</p>  <p>Set oil seal collect position</p>
<p>95. Collar oil seal tool X646-000070</p>  <p>Set oil seal collect position</p>	<p>96. Collar oil seal tool X646-000470</p>  <p>Set oil seal collect position</p>	<p>97. Puller X640-000380</p>  <p>Removing oil seal for crankcase</p>	<p>98. Rod oil seal X646-000110</p>  <p>Installing oil seal for crankcase</p>

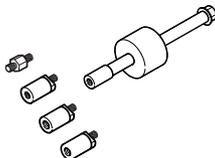
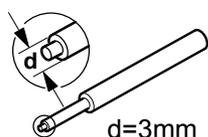
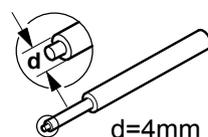
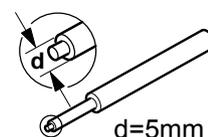
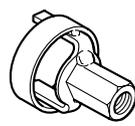
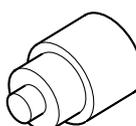
1-7 Engine system (continued)

<p>99. Rod oil seal 22182-96460</p>  <p>Installing oil seal for crankcase</p>	<p>100. Rod oil seal 22155-96420</p>  <p>Installing oil seal for crankcase</p>	<p>101. Rod oil seal 22150-96420</p>  <p>Installing oil seal for crankcase</p>	<p>102. Rod oil seal X646-000040</p>  <p>Installing oil seal for crankcase</p>
<p>103. Rod oil seal 22150-96450</p>  <p>Installing oil seal for crankcase</p>	<p>104. Rod oil seal X646-000060</p>  <p>Installing oil seal for crankcase</p>	<p>105. Rod oil seal X646-000510</p>  <p>Installing oil seal for crankcase</p>	<p>106. Holder 22160-96411</p>  <p>Seat for oil seal / bearing</p>
<p>107. Holder X646-000370</p>  <p>Seat for oil seal / bearing</p>	<p>108. Holder X646-000170</p>  <p>Seat for oil seal / bearing</p>	<p>109. Holder 22169-96410</p>  <p>Seat for oilseal / bearing / gearshaft</p>	<p>110. Holder 22169-96440</p>  <p>Seat for oilseal / bearing</p>
<p>111. Holder X643-000020</p>  <p>Seat for oilseal / bearing</p>	<p>112. Rod bearing X646-000050</p>  <p>Installing bearing for crankcase</p>	<p>113. Rod bearing 22160-96440</p>  <p>Installing bearing for crankcase</p>	<p>114. Rod bearing X646-000120</p>  <p>Installing bearing for crankcase</p>

1-7 Engine system (continued)

<p>115. Rod bearing X646-000081</p>  <p>Installing bearing for crankcase</p>	<p>116. Rod bearing X646-000100</p>  <p>Installing bearing for crankcase (Engine cutter)</p>	<p>117. Piston pin tool 897702-30131</p>  <p>Removing and installing piston pin</p>	<p>118. Piston pin tool Y089-000250</p>  <p>Removing and installing piston pin</p>
<p>119. Piston pin tool X640-000090</p>  <p>Removing and installing piston pin</p>	<p>120. Guide X640-000390</p>  <p>Set piston pin collect position</p>	<p>121. Piston holder 897719-02830</p>  <p>Making piston steady to remove and install piston/ring</p>	<p>122. Plug 91177</p>  <p>Testing crankcase and cylinder leakage (Screw thread: M10 x 1.0)</p>

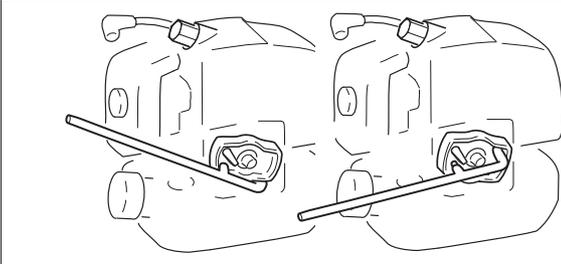
1-8 Others

<p>123. PTO shaft puller P021-044871</p>  <p>Removing PTO shaft</p>	<p>124. Spring pin tool 897724-01261</p>  <p>d=3mm</p> <p>Removing and installing spring pin</p>	<p>125. Spring pin tool 897724-01361</p>  <p>d=4mm</p> <p>Removing and installing spring pin</p>	<p>126. Spring pin tool 897724-02831</p>  <p>d=5mm</p> <p>Removing and installing spring pin</p>
<p>127. Cushion tool 897740-19830</p>  <p>Removing and installing cushion (Right - Rear - Upper)</p>	<p>128. Mechanical seal tool 897741-10510</p>  <p>Removing and installing mechanical seal</p>	<p>129. Load adapter 91156</p>  <p>Properly engine loading for adjusting carburetor</p>	<p>130. Fan remover 91087</p>  <p>Removing blower fan</p>
<p>131. Collar nut installer X646-000620</p>  <p>Installing collar nuts in sprocket guard</p>			

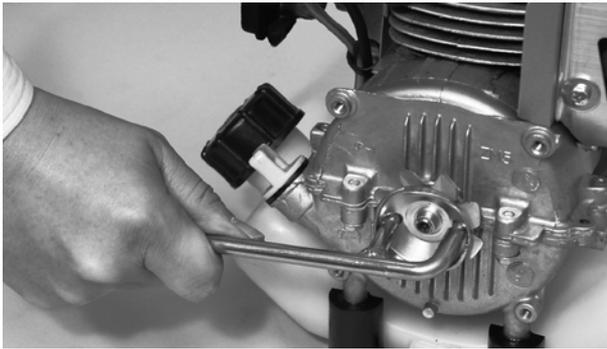
2. SERVICE TOOL INSTRUCTION

2-pin wrench 897712-04630

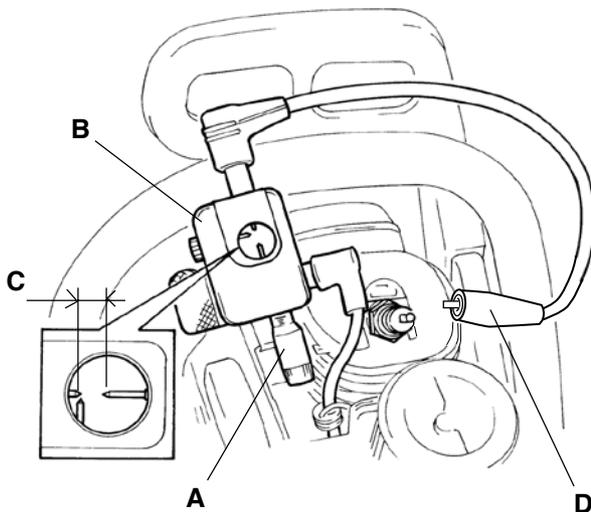
2-pin wrench 897712-07930



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.

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.

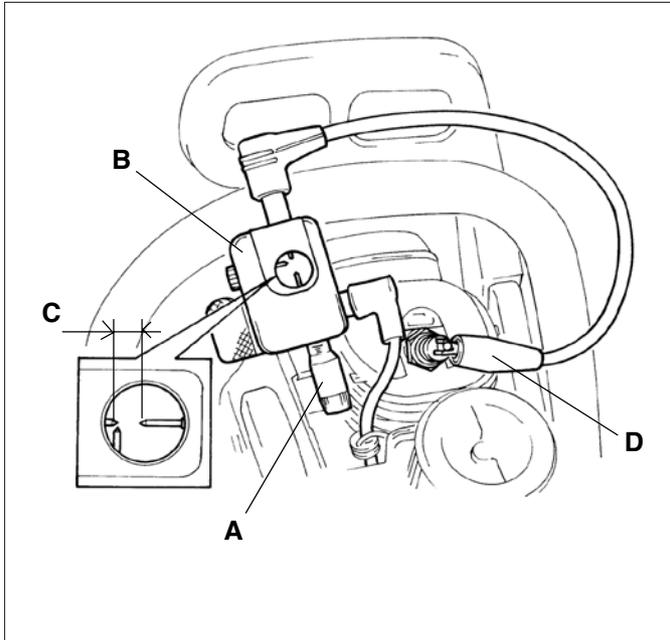
Spark tester 897800-79931

(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.

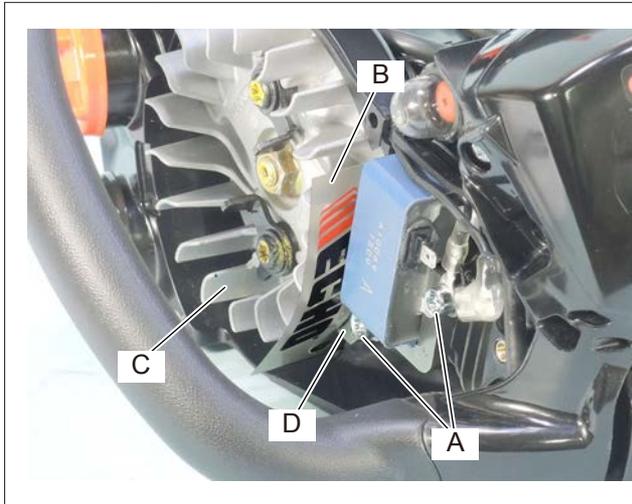
(Continued)

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.

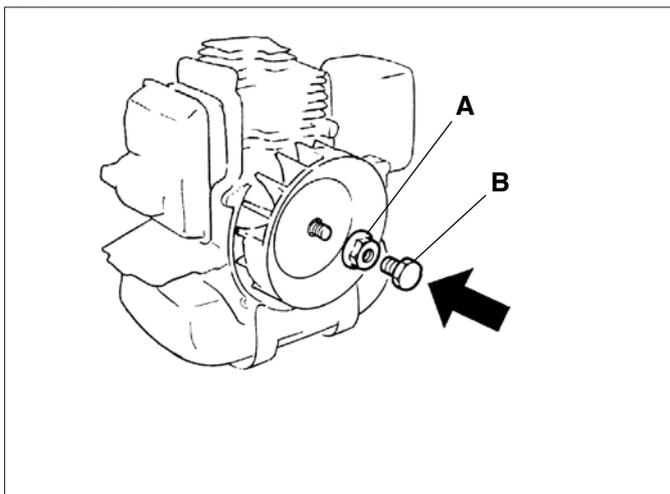
Module air gap gauge 91004



1. Loosen two bolts (A) and insert module air gap gauge (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.

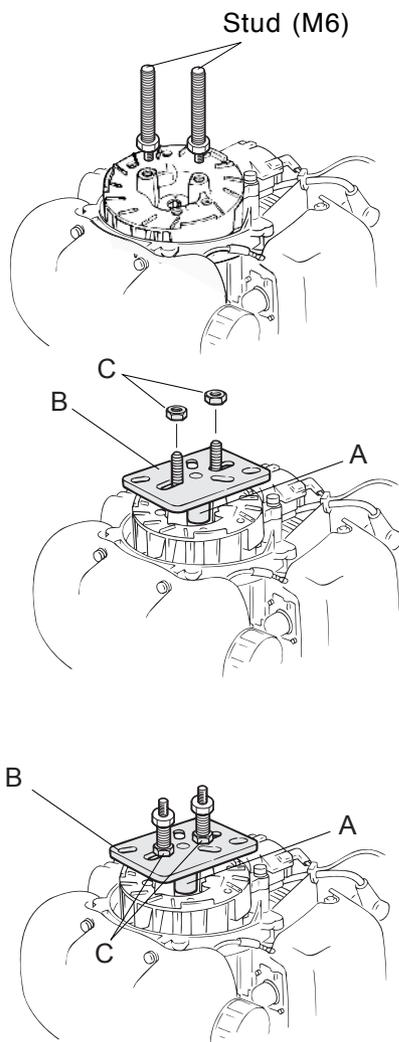
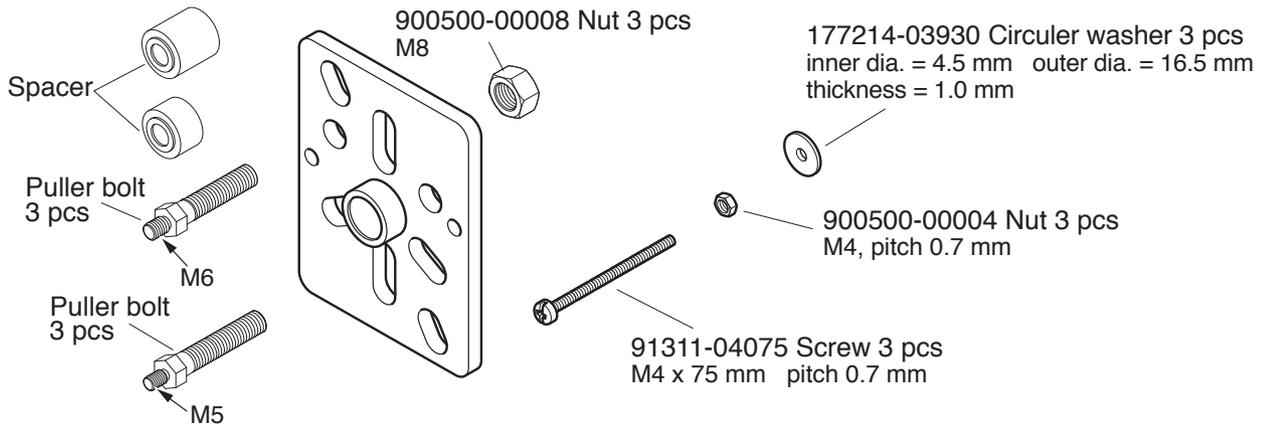
Flange nut V265-000200
Bolt 900100-08008



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.

Puller Y089-0001111



[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.

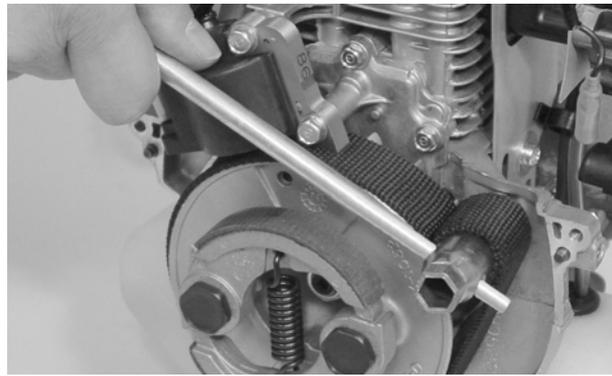
NOTE: Screw studs into magneto rotor firmly, or screw thread may be damaged.

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.

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

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

Ethanol tester 91040

1. Pour water in ethanol tester up to line (A).

2. Pour fuel in ethanol tester up to bottle neck (B).

3. Shake ethanol tester more than 10 times.

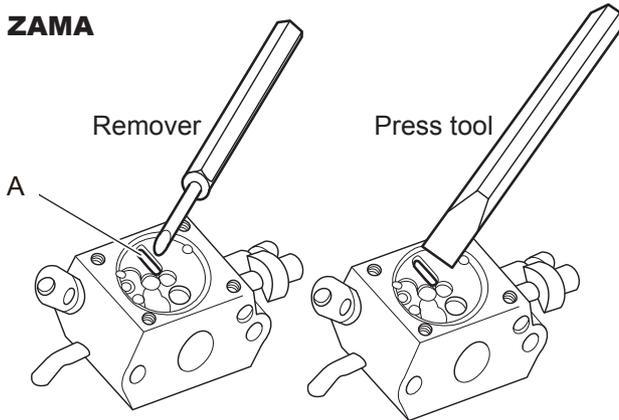
4. Place ethanol tester on the horizontal surface after shaking. After 5 minutes, confirm status of ethanol ratio (C) of fuel.

Ex) Ethanol ratio (C) is 10 %.

The diagram shows a vertical cylindrical ethanol tester with a black cap and a scale on its side. The scale has three horizontal lines labeled '10%', '20%', and '85%'. To the right of the scale, the text 'Water Gasoline' is written vertically, with an upward-pointing arrow labeled 'Fill to neck'. In step 1, the bottle is partially filled with light blue liquid (water) up to the 10% line, indicated by arrow A. In step 2, the bottle is filled with a darker blue liquid (fuel) up to the neck, indicated by arrow B. In step 3, the bottle is tilted and shaken, indicated by curved motion lines. In step 4, the bottle is upright on a horizontal surface. The liquid has separated into two layers. The bottom layer is light blue and has risen to the 10% line, indicated by arrow C. A circular inset provides a magnified view of the 10% line, showing the interface between the two liquid layers.

Welch plug tool (ZAMA) 90101 Welch plug tool (Walbro) 500-500

ZAMA



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.

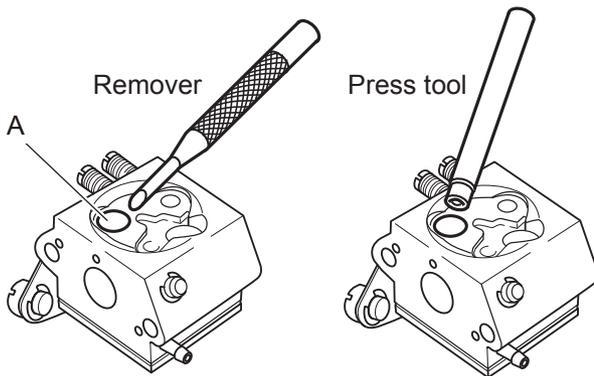
2. Remove welch plug (A) with the remover as shown. Punch the remover through the welch plug at a low angle and pry it out.

3. Clean the idle ports with compressed air.

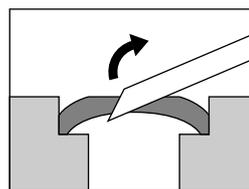
4. Place a new welch plug over the opening and gently tap it in until flush, using press tool.

5. Install all removed parts to the carburetor body.

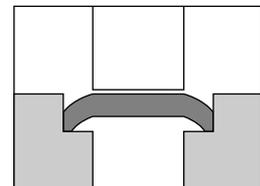
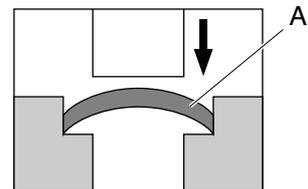
Walbro



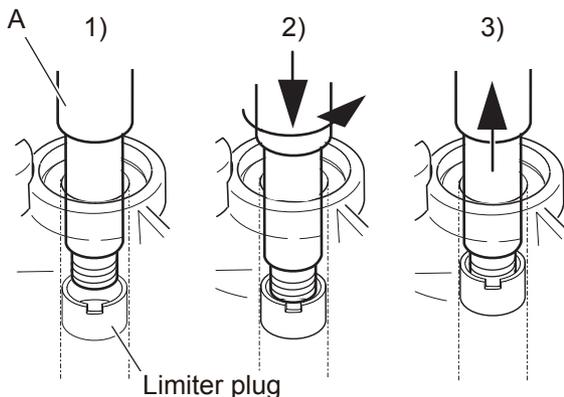
Remove



Press



Limiter plug tool 91020



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

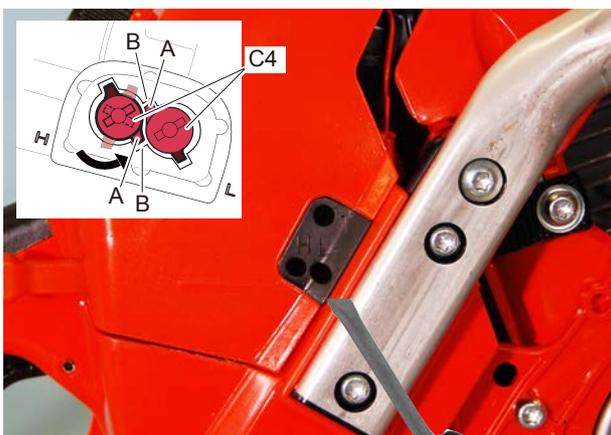
2. With pushing down, slowly turn the limiter plug tool counterclockwise two turns into the limiter plug.

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).

Limiting 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.



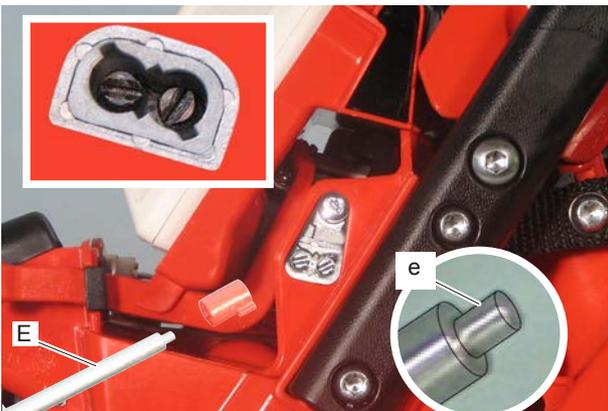
2. Screw limiter cap tool (E) counterclockwise into center hole of limiter cap until tab of limiter cap comes out of locating slot as shown in left below picture.

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).



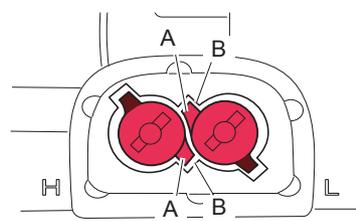
3. Remove the tool from limiter cap by turning clockwise, leaving the limiter cap in place.



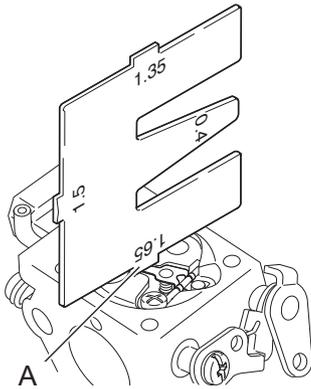
[Installing]

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.



Metering lever gauge 897563-19830



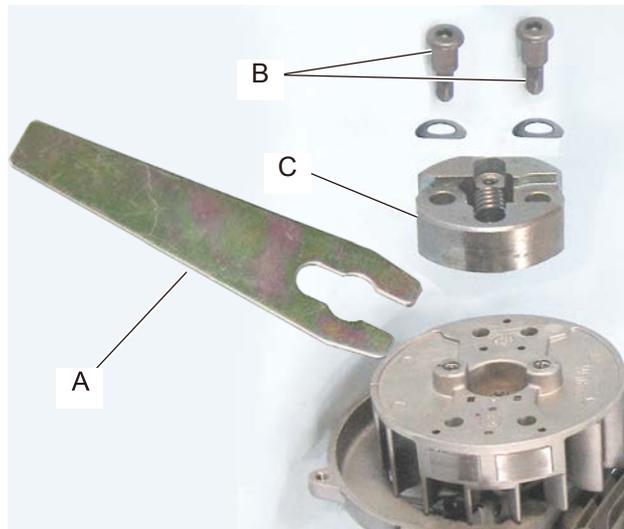
1. Remove metering diaphragm cover, metering diaphragm and gasket.
2. Check metering lever (A) height as shown using metering lever gauge 897563-19830.
3. If necessary, gently bend metering lever up or down to set the metering lever to proper position.

NOTE: When metering lever is:

Too high → Fuel overflow occurs

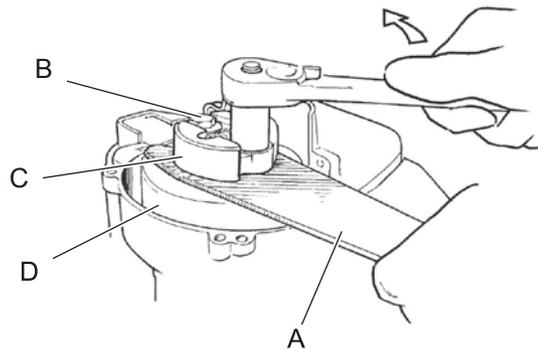
Too low → Fuel starvation / overheating occurs

Clutch spanner X600-000111



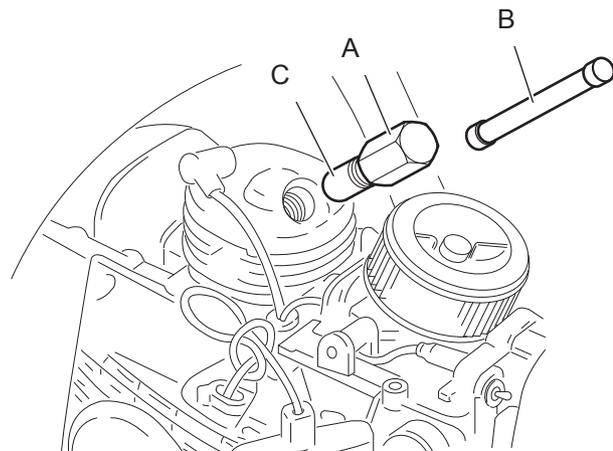
Use clutch spanner (A) to remove bolt (B) which tightening clutch (C) of trimmer (except clutch 3 shoe), hedge trimmer and power blower to rotor.

1. Set clutch spanner (A) as shown, and fix magneto rotor (D).
2. Loosen bolt (B) using a socket wrench.



Piston stopper X644-000020

Piston stopper X644-000040



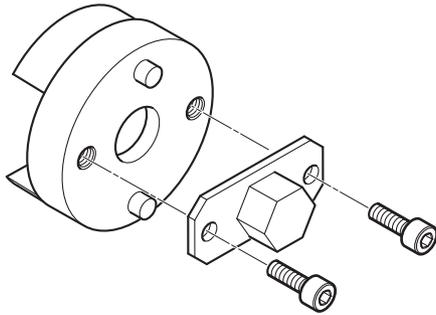
Install piston stopper (A) or (B) into the spark plug hole to stop crankshaft rotation.

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.

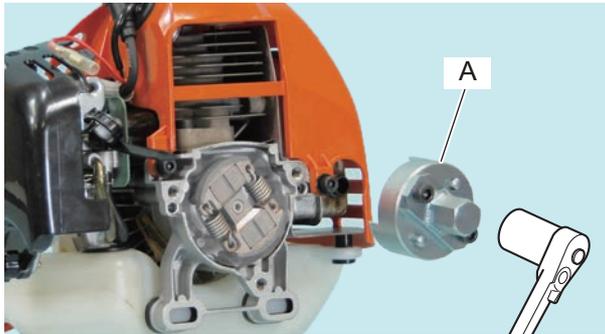
NOTE: Replace with new cap C205-000190 (C) if damaged.

Clutch spanner X600-000130



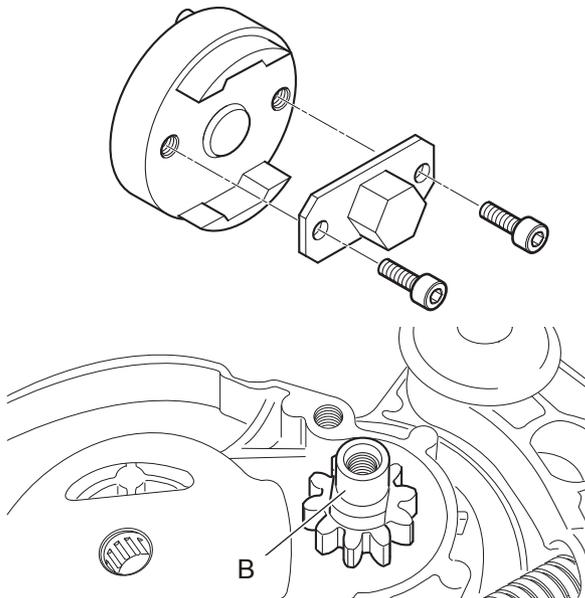
[Loosening / Tightening clutch assembly]

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.

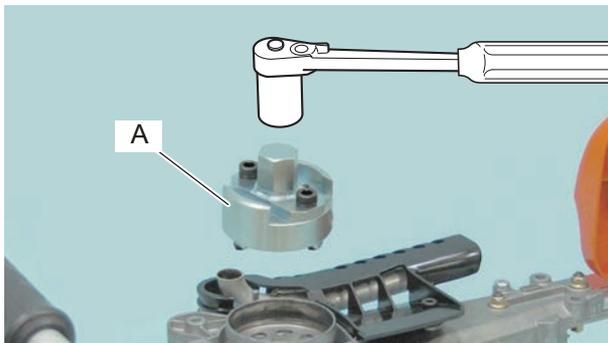


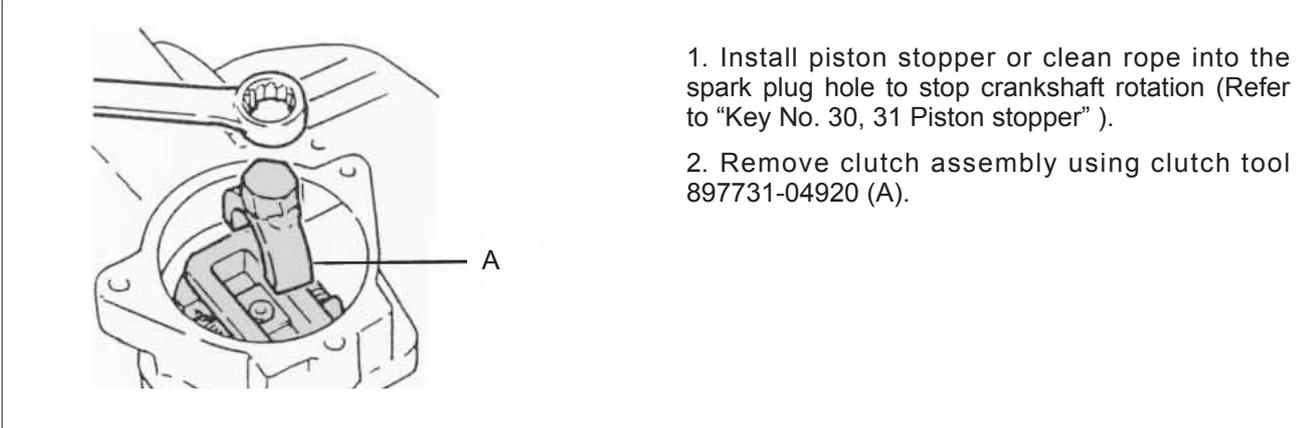
[Loosening / Tightening clutch drum]

1. Assemble clutch spanner X600-000130 as shown.

2. Fix pinion shaft (B).

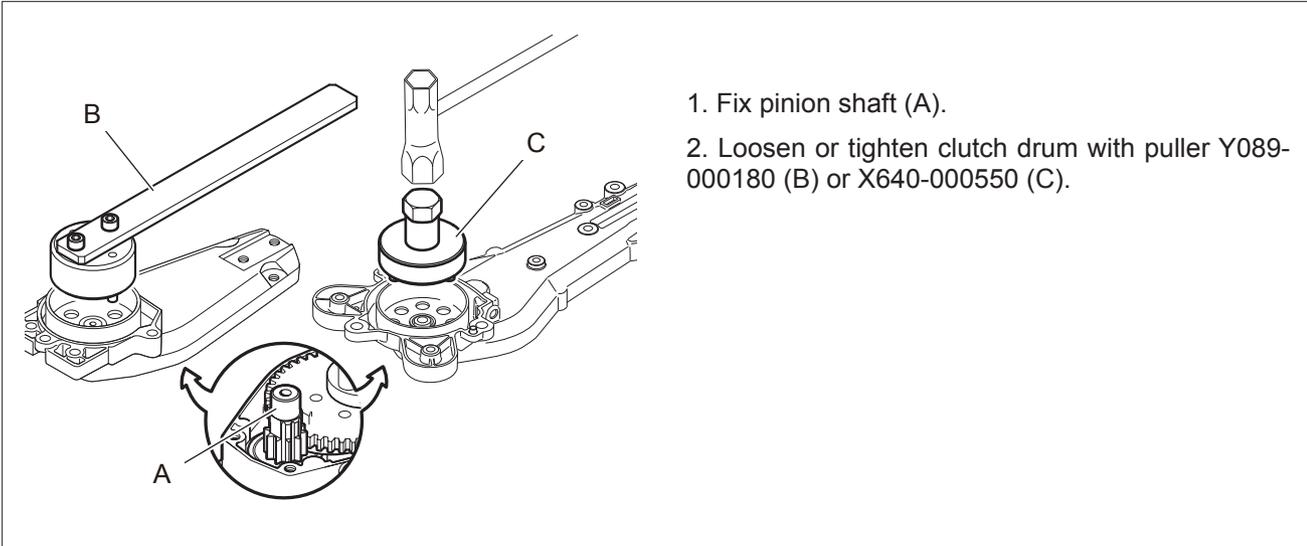
3. Loosen or tighten the clutch drum (left-hand thread) rotating clockwise/counterclockwise with clutch spanner (A) using 17 mm socket wrench.



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”).

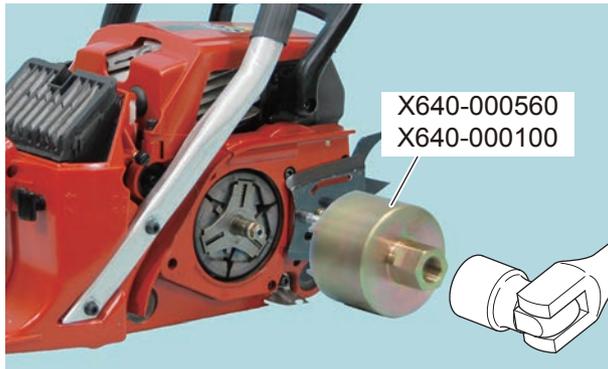
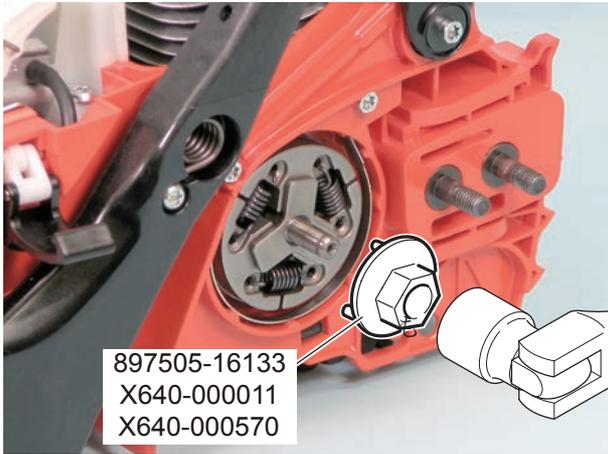
2. Remove clutch assembly using clutch tool 897731-04920 (A).

Puller Y089-000180**Puller X640-000550**

1. Fix pinion shaft (A).

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

Clutch tool 897505-16133, X640-000011, X640-000560, X640-000570
Puller X640-000100, X640-000290
Clutch spanner X640-000130, X640-000150, X640-000370
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.



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.

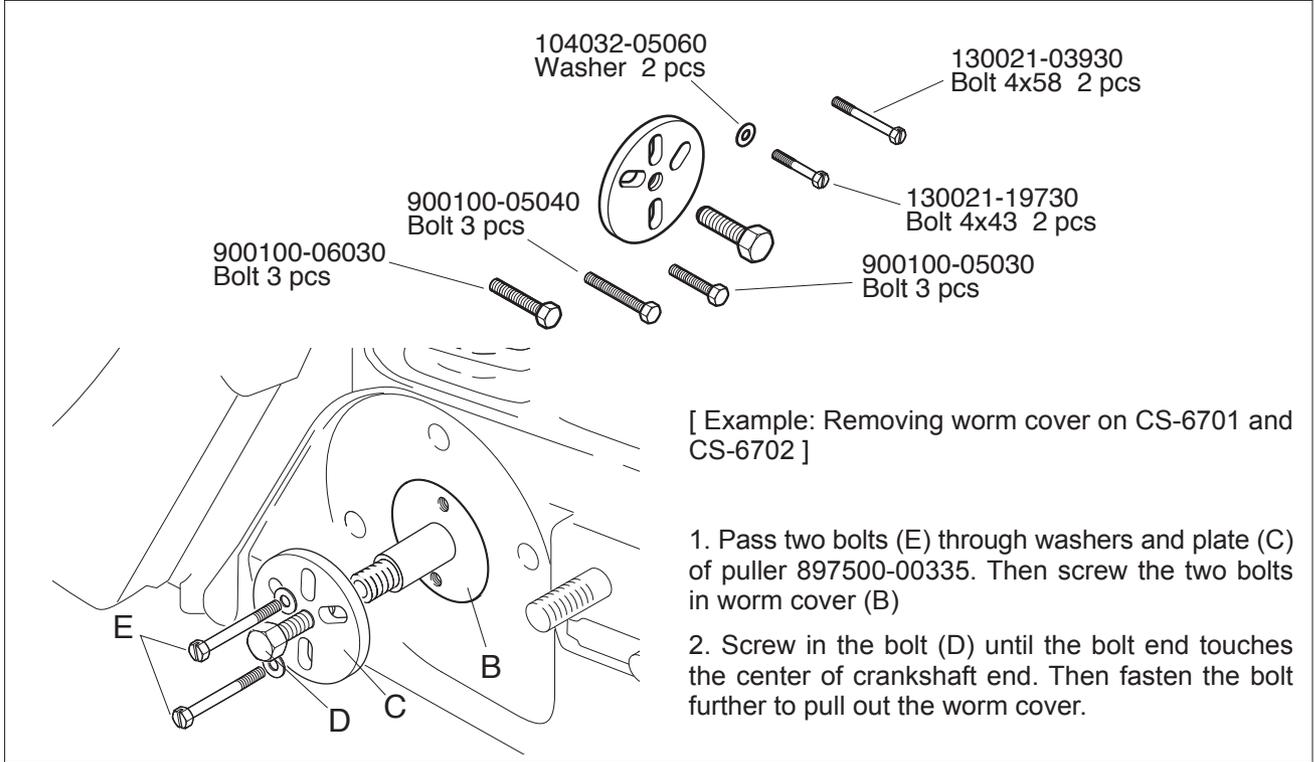
[Removing retaining ring]
Remove retaining ring (E) or (F) from the clutch drum shaft to remove the clutch drum with the snap ring pliers.

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

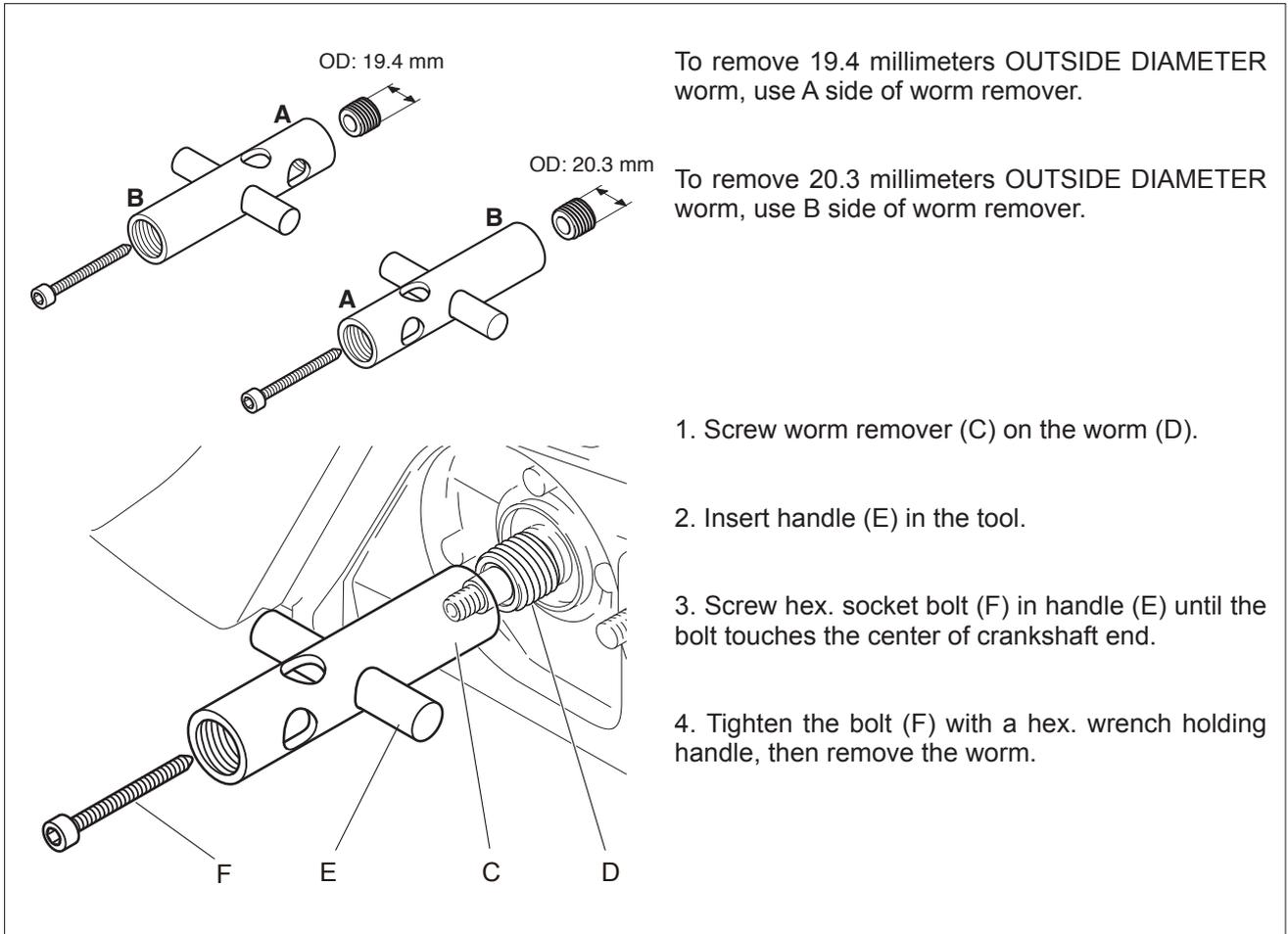
Rod X646-000180

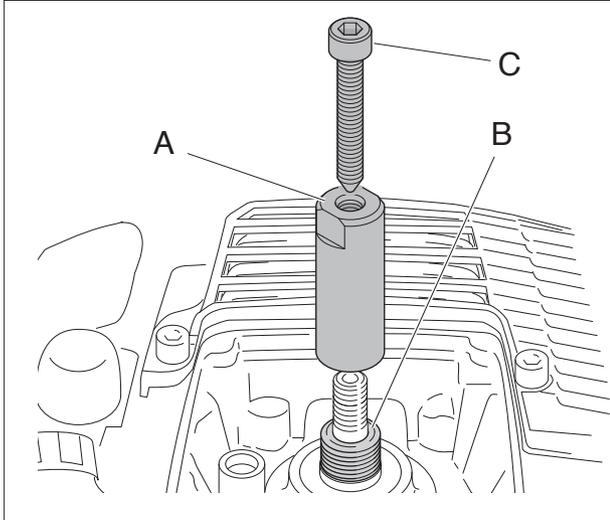
Put retaining ring (A) on the clutch drum shaft and push it with the rod (B).

Puller 897500-00335



Worm remover 897708-19835

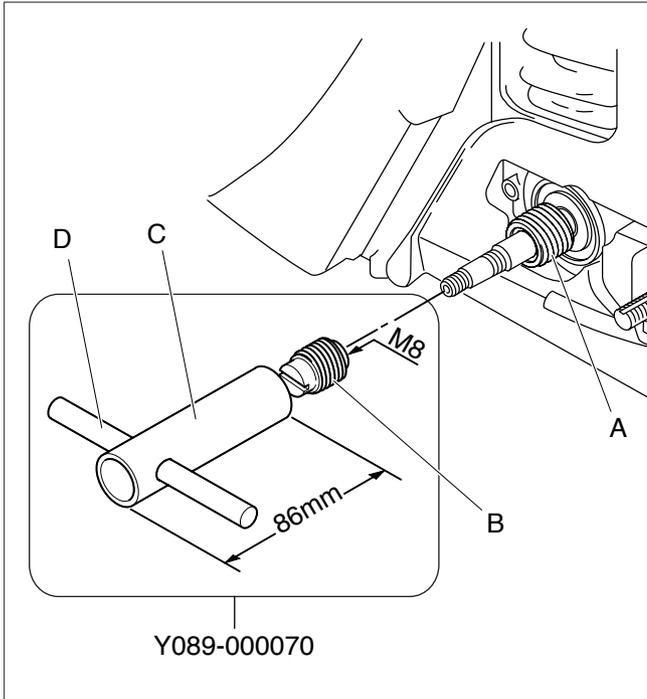


Worm puller 897708-50430

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.

Worm inserter Y089-000070

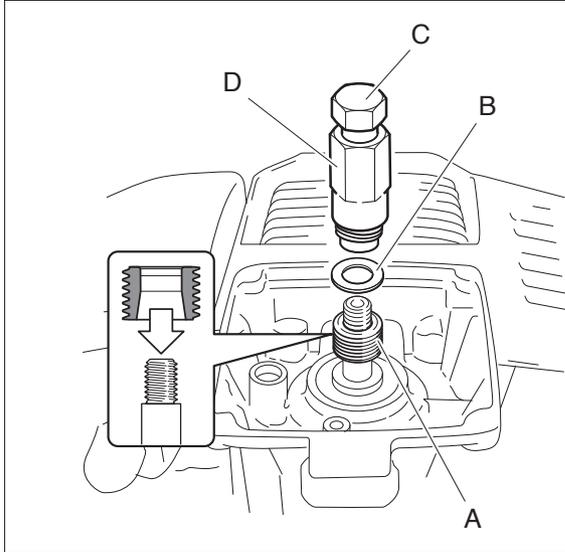
NOTE: Do not reuse the removed worm gear. Bore of the used worm gear may be enlarged and the worm may slip on the crankshaft.

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.

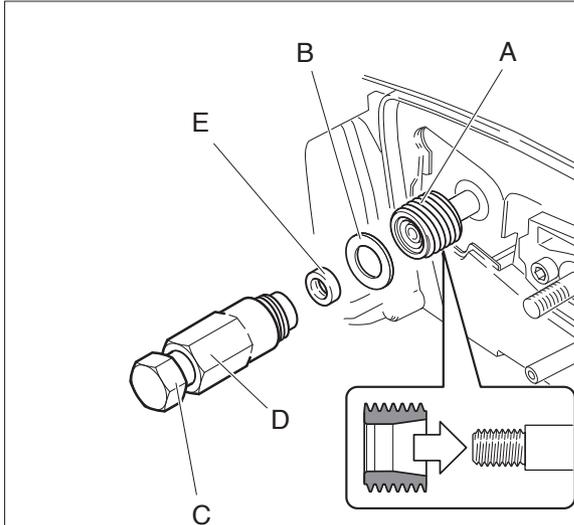
Worm inserter Y089-000000



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) counterclockwise 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.

Worm inserter Y089-000020, Y089-000030, Y089-000010, Y089-000040



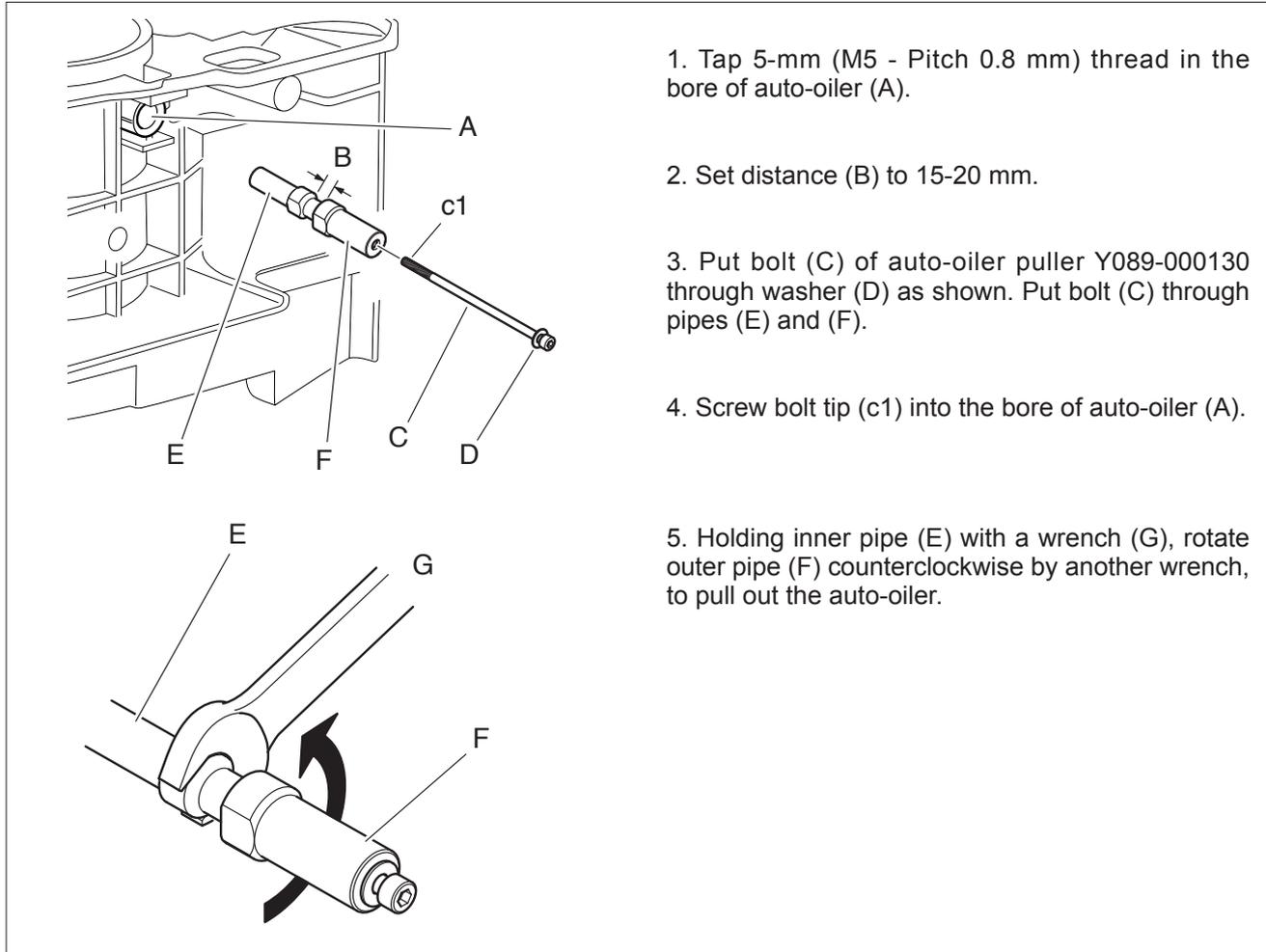
NOTE: Do not reuse removed worm gear. Bore of the used worm gear may be enlarged and the worm may slip on crankshaft.

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.

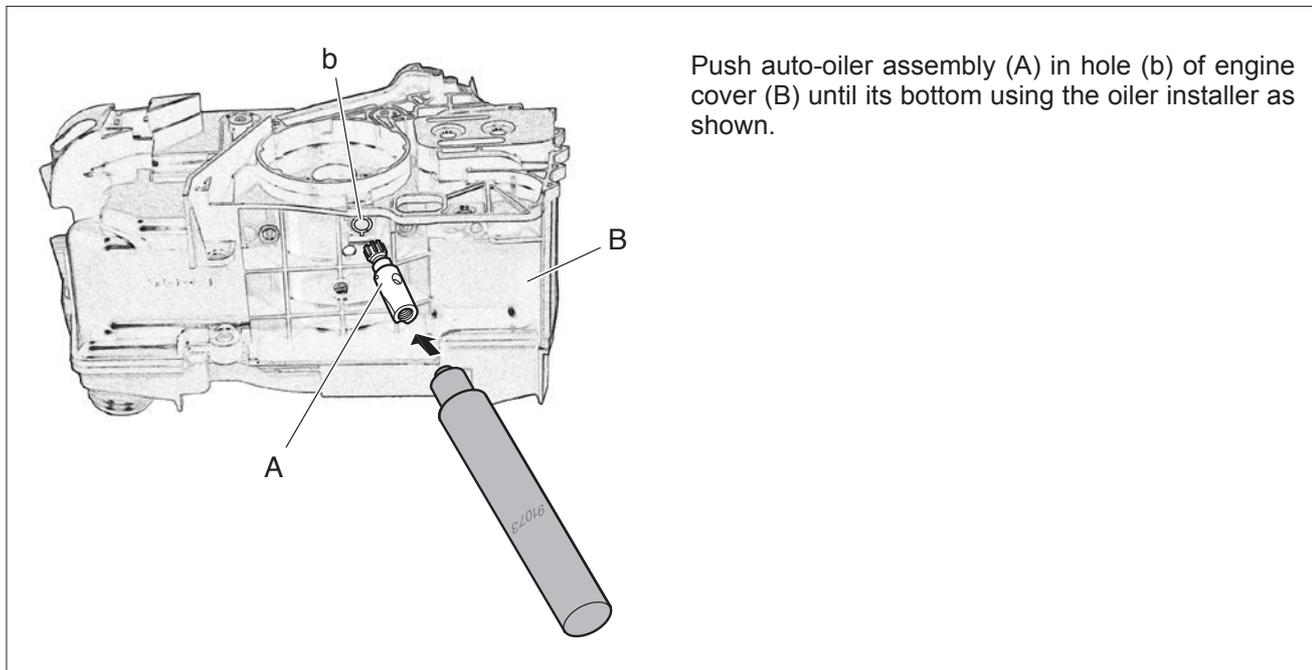


Tool number	L mm	Female threads of bar tool
Y089-000020	22	Left hand thread : M10x1.25mm pitch
Y089-000030	24	Left hand thread : M12x1.25mm pitch
Y089-000010	22	Left hand thread : M8x1.25mm pitch
Y089-000040	22	Left hand thread : M10x1.00mm pitch

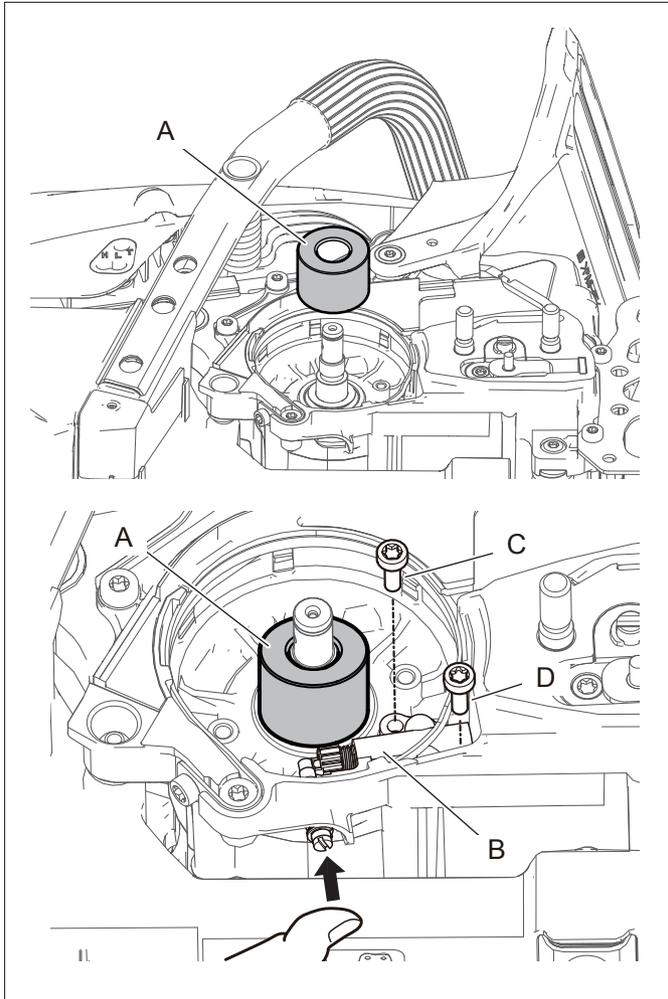
Auto-oiler puller Y089-000131



Auto-oiler installer 91073A



Oiler gap adjuster X648-000150



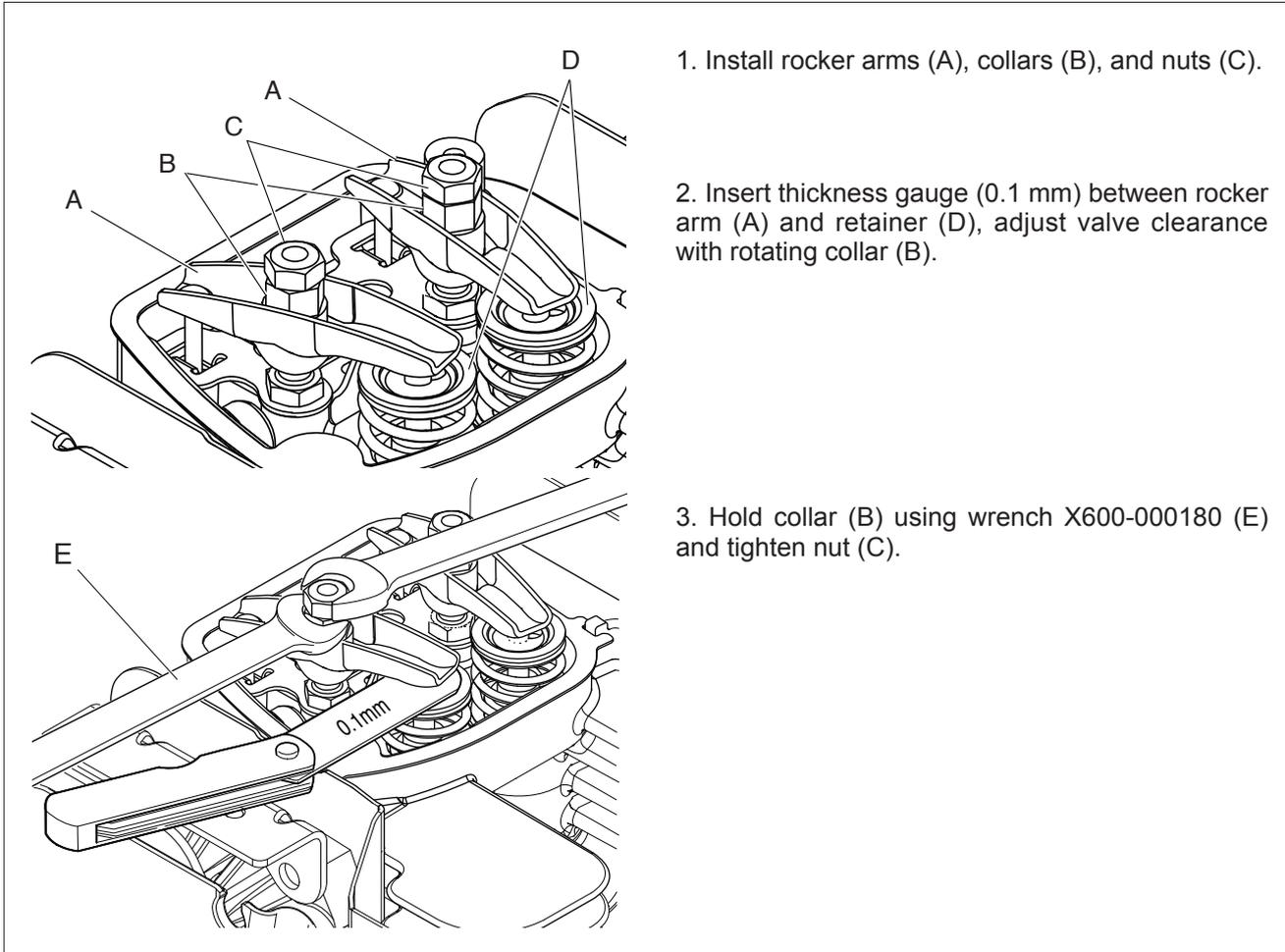
1. Install Oiler gap adjuster (A) on crankshaft.

2. Loosely install auto-oiler assembly (B) with two bolts (C) and (D).

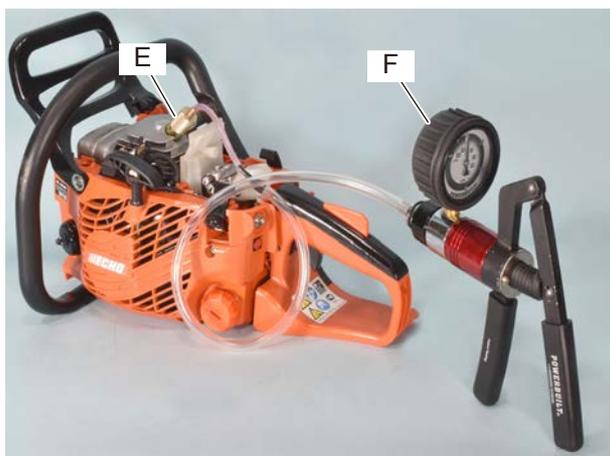
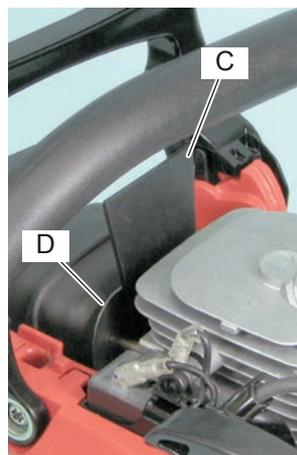
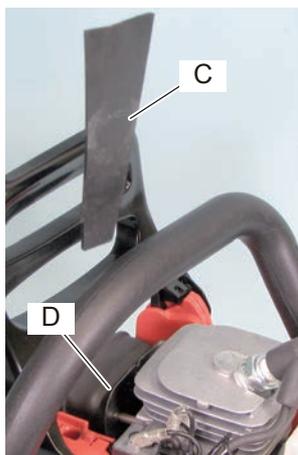
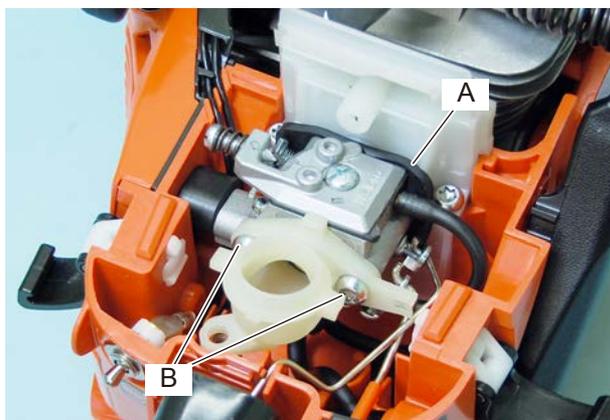
3. Hold auto-oiler assembly (B) against Oiler gap adjuster (A) and tighten bolt (C). Then, tighten bolt (D).

NOTE: Improper gap may result in oil discharge failure or premature wear of warm gear.

Wrench X600-000180



Pressure rubber plug 91041, 897826-16131
Pressure plate 897827-16131
Pressure connector A131-000150, A131-000160
Pressure / vacuum tester 91149



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

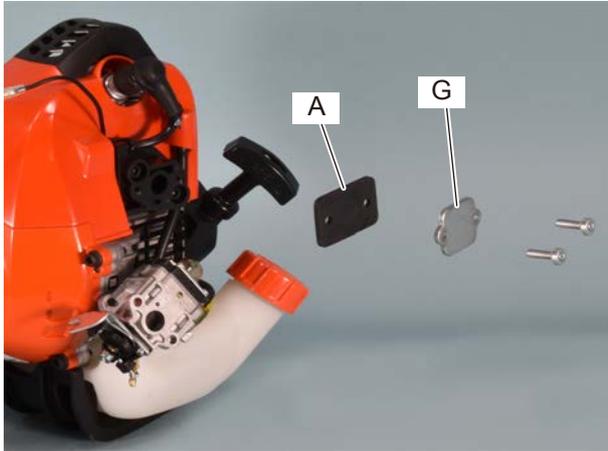
1. Remove cylinder cover and air filter.
2. Remove carburetor and elbow from the unit.
3. To seal intake port, install pressure rubber plug 897826-16131 (A) between intake bellows and carburetor, using carburetor screws (B). Tighten screws (B).
4. Loosen two nuts of muffler bolts. To seal exhaust port, insert pressure rubber plug 91041 (C) between cylinder exhaust port and muffler gasket (D), until its bottom.
5. Tighten the nuts of muffler 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.

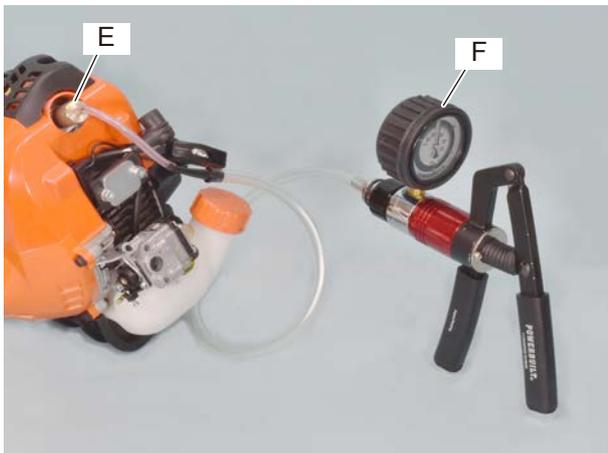
(Continued)

Pressure rubber plug 91041, 897826-16131
 Pressure plate 897827-16131
 Pressure connector A131-000150, A131-000160
 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.

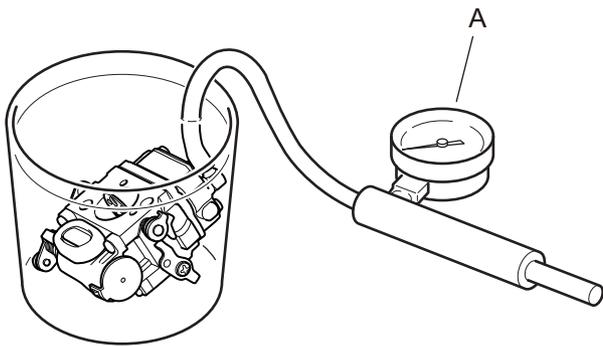
6. Gauge should indicate constant pressure at minimum 0.2 kgf/cm² (3 psi).

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.

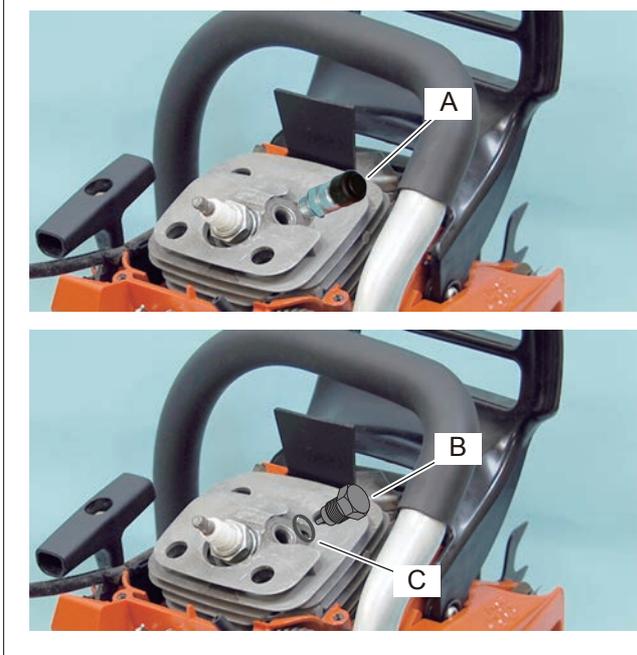
NOTE: Remove the plugs from the exhaust port and the intake port after this test.

Pressure tester 897803-30133



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

Plug 101115-37531
O-ring 900720-00009

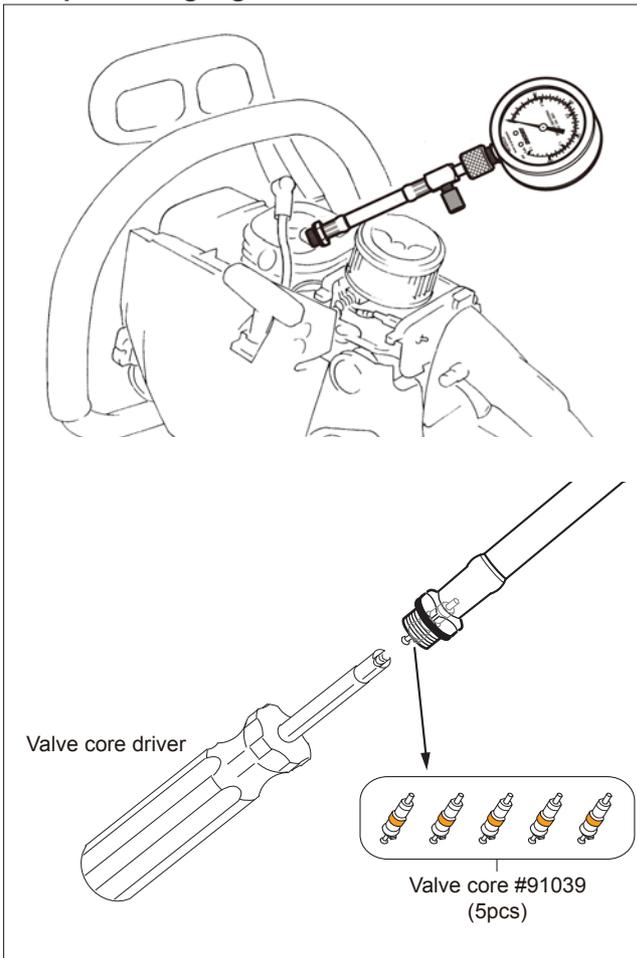


1. Before testing crankcase and cylinder leakages, remove decompressor (A) as shown.

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.

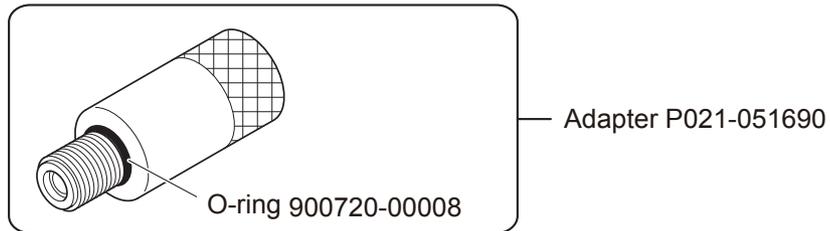
Compression gauge 91037



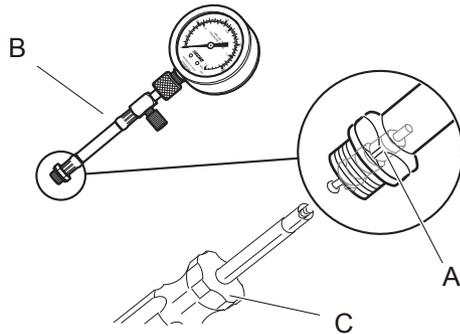
1. Test cylinder pressure when engine is cold.
2. Operate switch to stop position.
3. Remove spark plug.
4. Install compression gauge 91037 to the spark plug hole (Screw size: M14) and pull starter several times to stabilize reading value, and read the value.

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

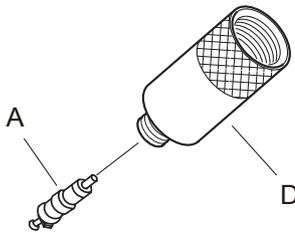
Adapter P021-051690



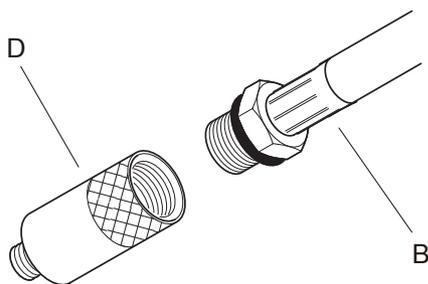
Use adapter P021-051690 with compression gauge 91037, when measuring cylinder compression pressure of engine that has spark plug of screw size M10.



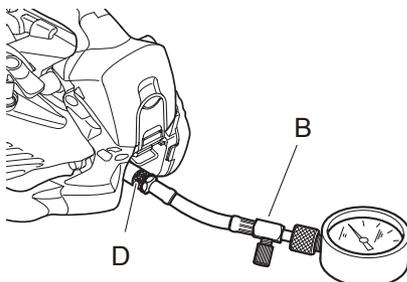
1. Remove valve core (A) from compression gauge 91037 (B) with valve core driver (C).



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



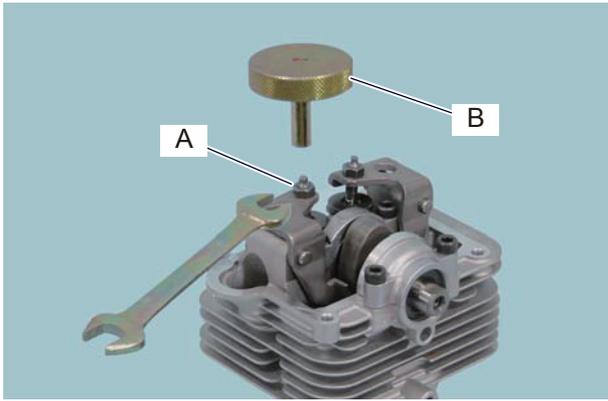
3. Connect adapter (D) and compression gauge (B).



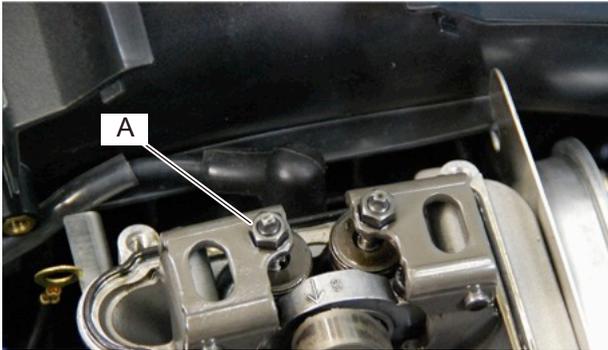
4. Install compression gauge (B) with adapter (D) in the spark plug hole (thread size: M10) and tighten by hand. Pull starter grip several times to stabilize reading on compression gauge.

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

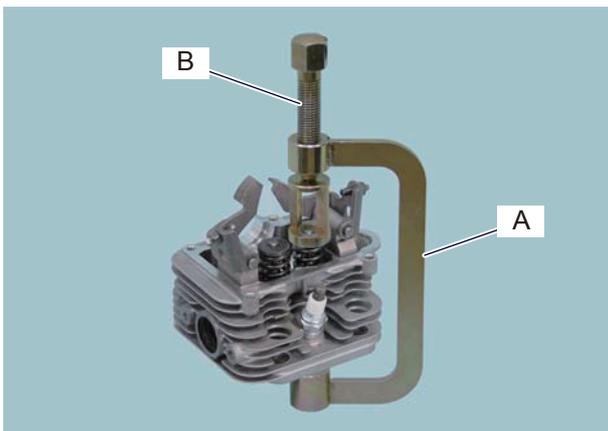
Adjust wrench 68900-98310



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).

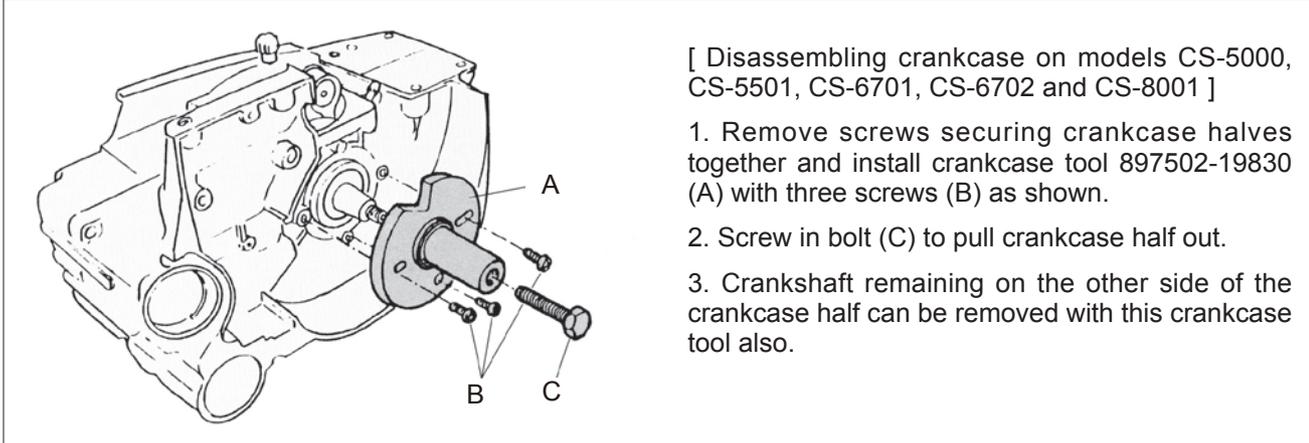


Spring compressor 68900-98340

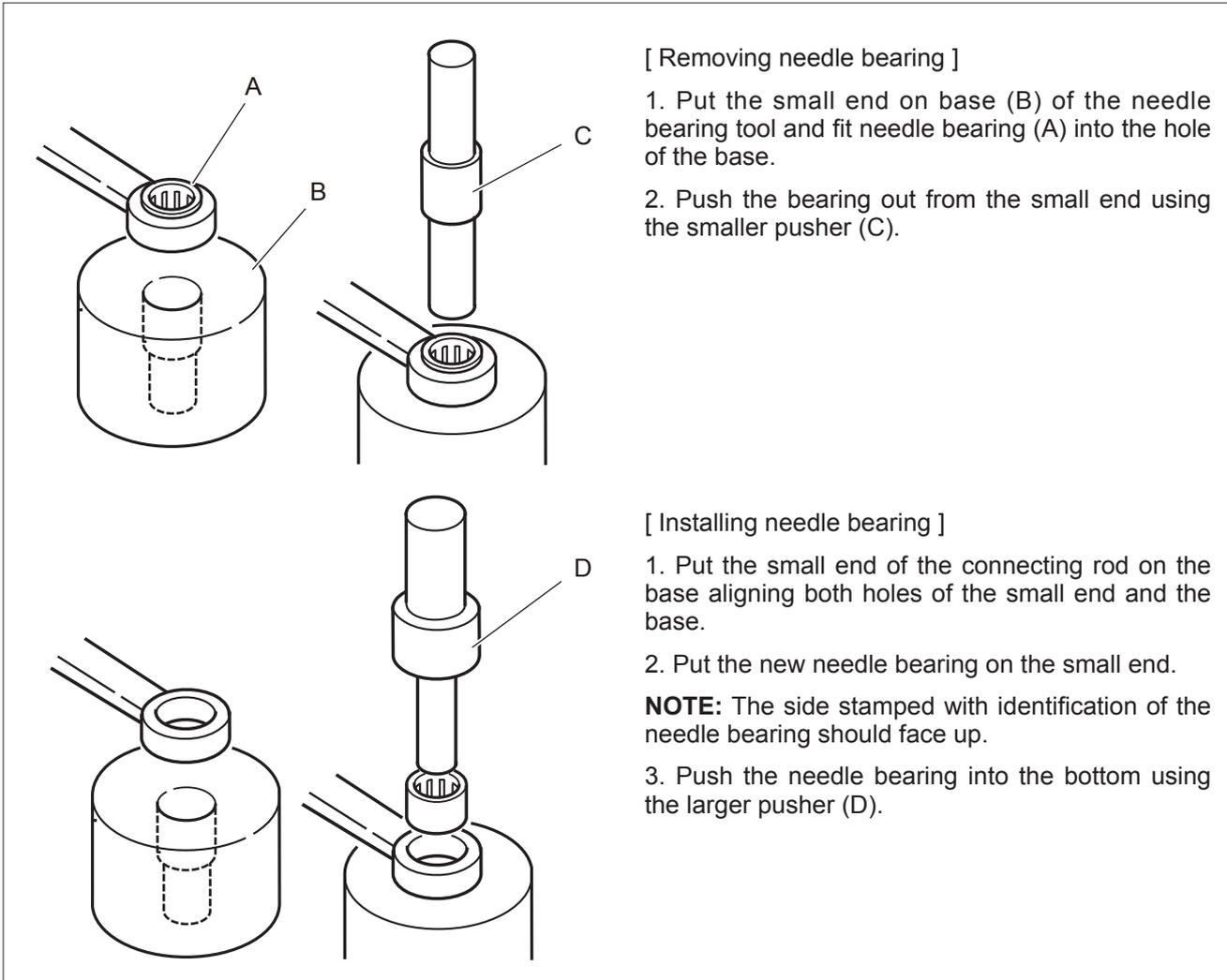


1. Set spring compressor 68900-98340 (A) as shown.
2. Compress valve spring tightening bolt (B).
3. Remove cotter holding the valve spring, and replace the valve spring or the valve.

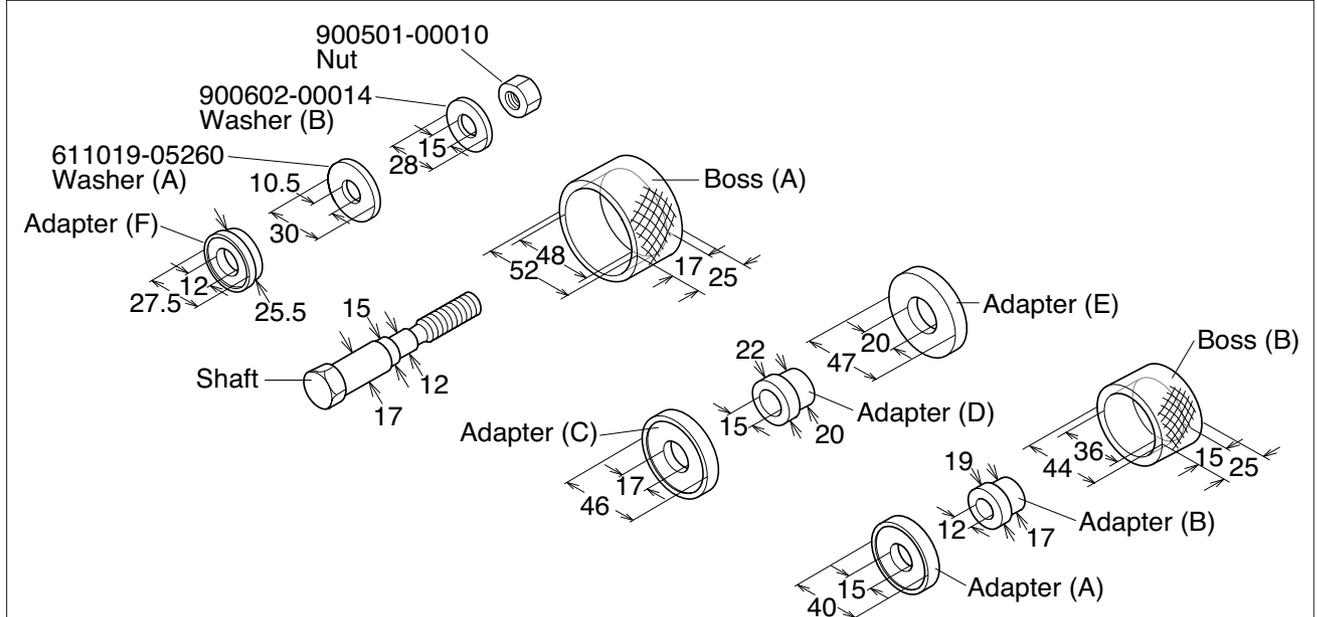
Crankcase tool 897502-19830



Bearing tool 897705-11520

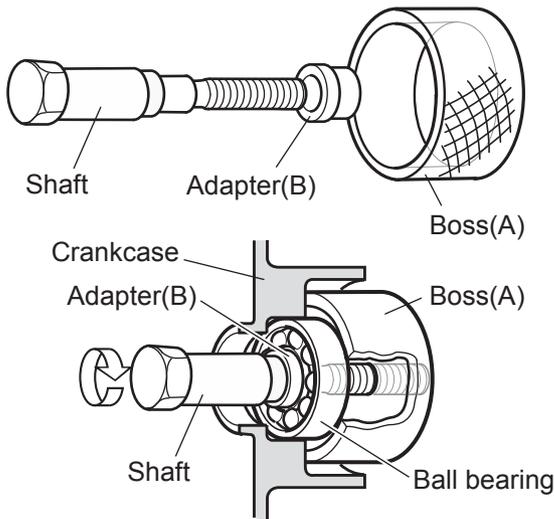


Bearing tool 897701-14732



This bearing tool consists of above parts to remove and install various size of ball bearings.

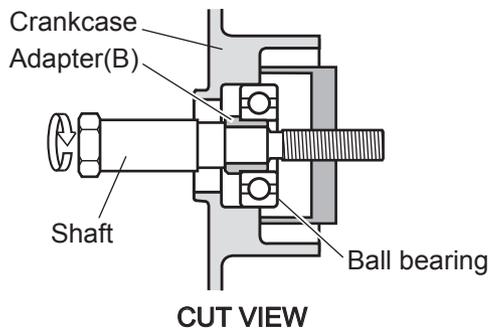
Select the right size of adapter(s) matched with the ball bearing size.



[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).

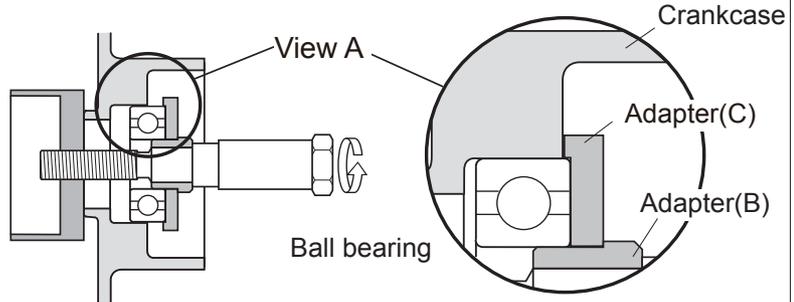
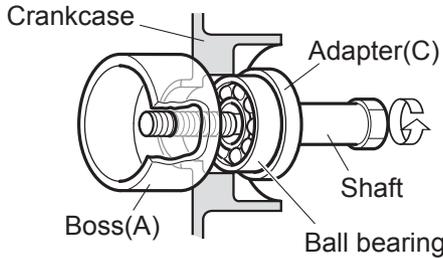
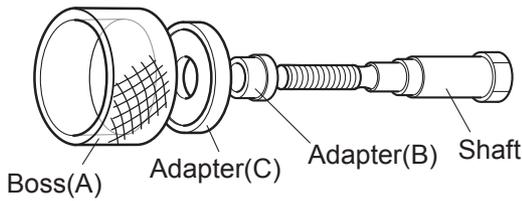
2. Push the ball bearing out from crankcase as shown.



CUT VIEW

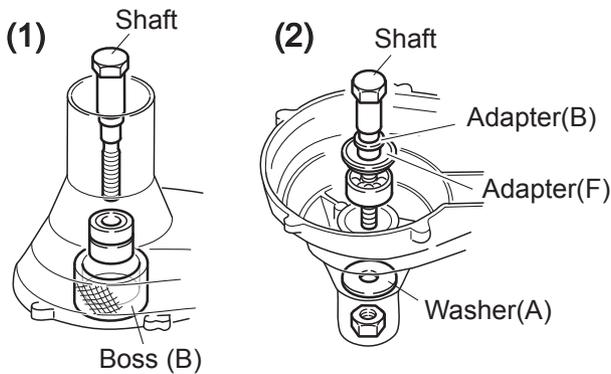
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Bearing tool 897701-14732 (Continued)



[Example: Installing ball bearing to crankcase]

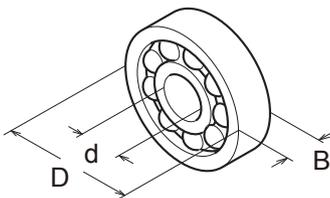
1. When installing ball bearing Called No. 6203 on model CS-8001, use the shaft, adapter (B), adapter (C) and boss (A).
2. Push the ball bearing in the crankcase until the edge of adapter (C) contact with crankcase as View A.
3. When installing ball bearing into crankcase on models CS-5000, CS-5501 and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



[Example: Replacing clutch drum bearings]

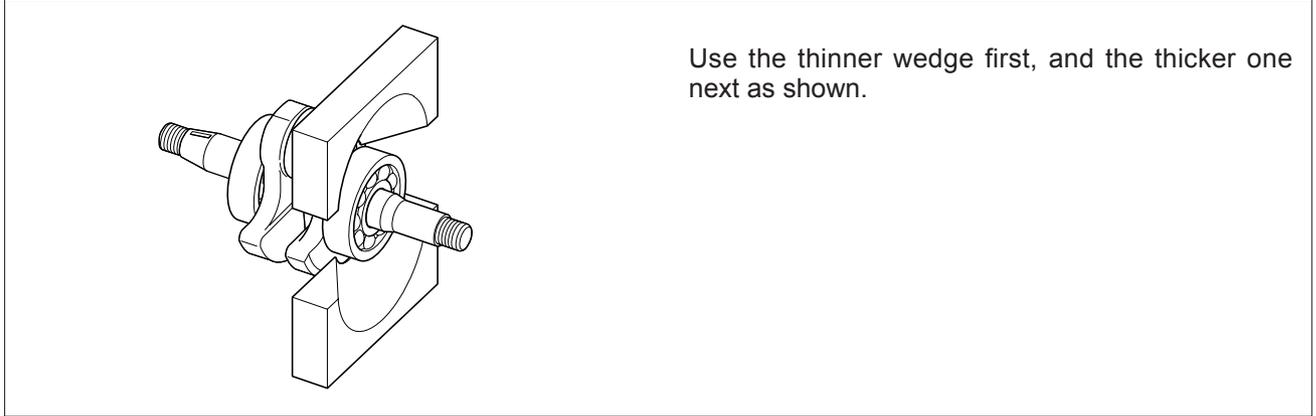
1. To remove the bearings, use the shaft and boss (B), and push the bearings out as shown (1).
2. To install the bearings Called No. 6000 on model SRM-2655, use the shaft, adapter (B), adapter (F), washer (A) and nut. Then push the ball bearings in fan cover one by one and screw the shaft slowly into 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



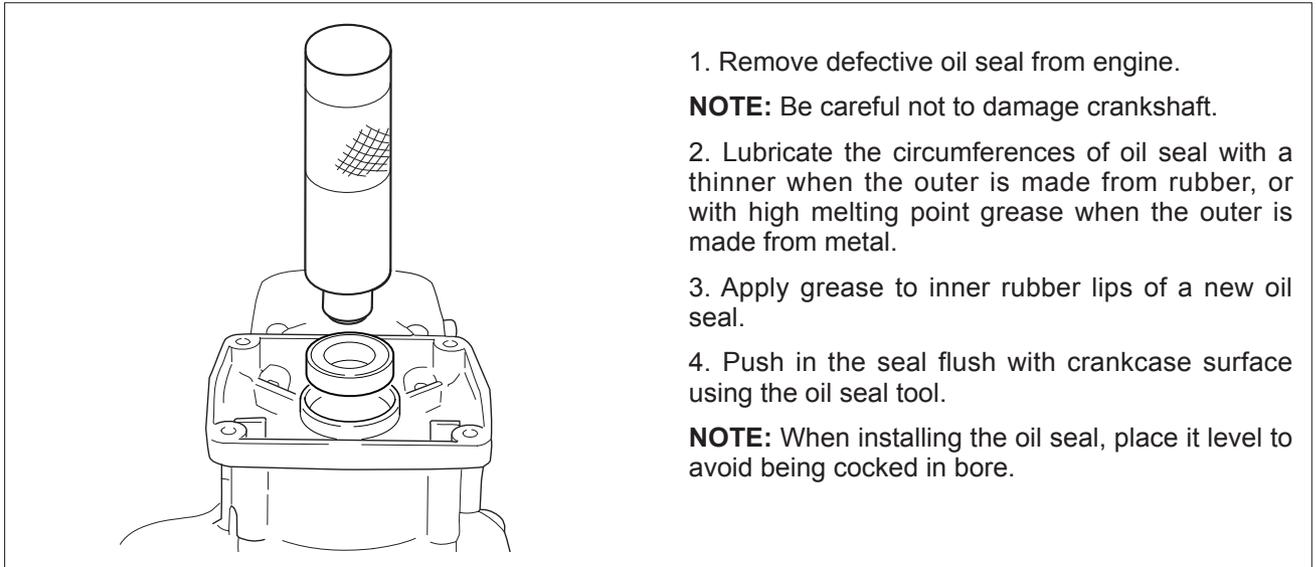
Called No.	d	D	B	Called No.	d	D	B
6000	10	26	8	6200	10	30	9
6001	12	28	8	6201	12	32	10
6002	15	32	9	6202	15	35	11
6003	17	35	10	6203	17	40	12
6004	20	42	12	6204	20	47	14
Called No.	d	D	B	Called No.	d	D	B
6300	10	35	11	6900	10	22	6
6301	12	37	12	6901	12	24	6
6302	15	42	13	6902	15	28	7
6303	17	47	14	6903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

Bearing wedge 897701-02830



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

Oil seal tool 897714-12330



1. Remove defective oil seal from engine.

NOTE: Be careful not to damage crankshaft.

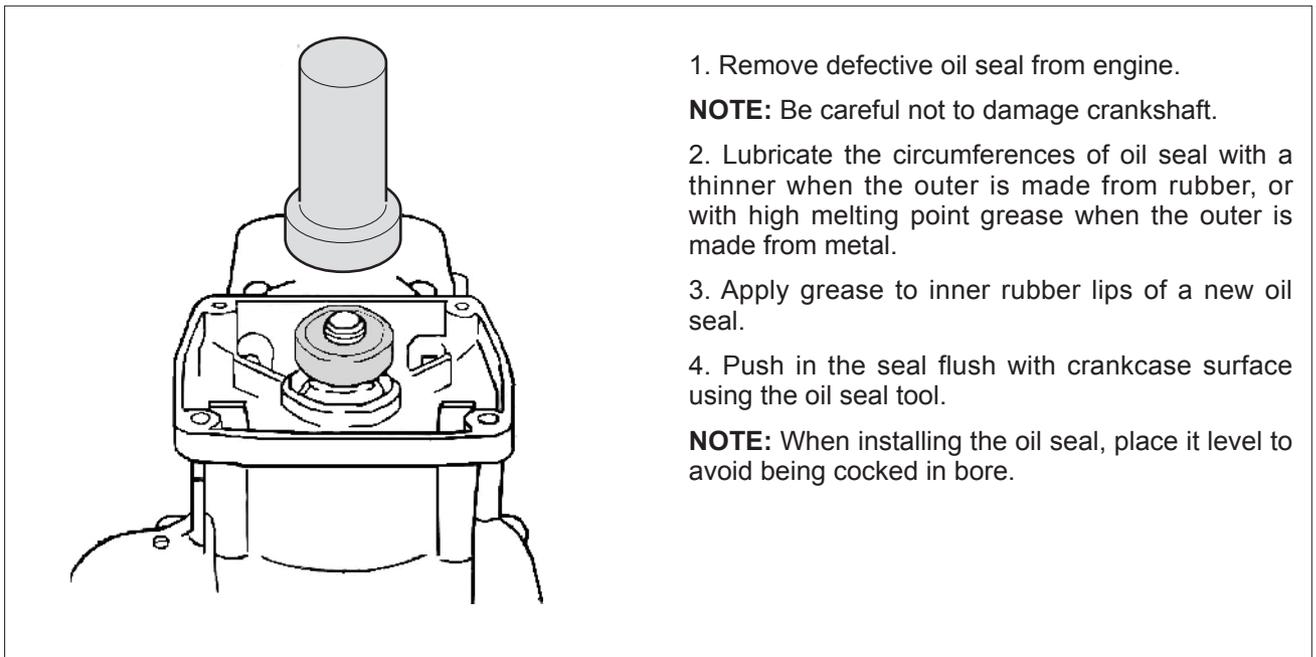
2. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

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.

Oil seal tool 897727-16130



1. Remove defective oil seal from engine.

NOTE: Be careful not to damage crankshaft.

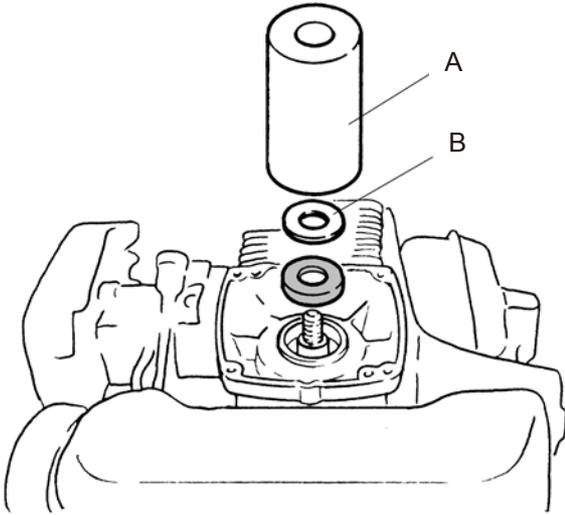
2. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.

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.

Washer V309-000170
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.

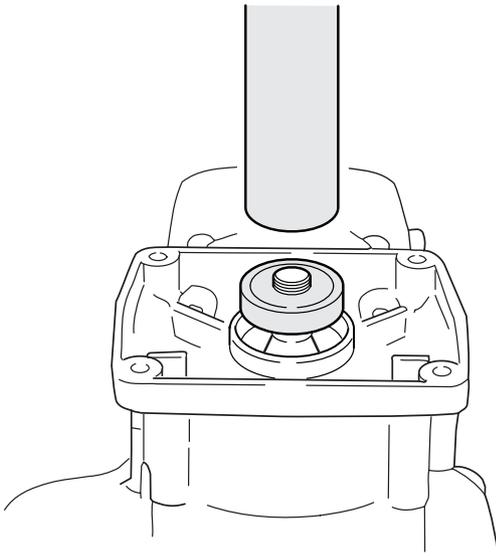
Inner diameter : 12 mm (0.48 in)

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.

Oil seal tool 897714-22830, 897714-24330, X646-000360, 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.

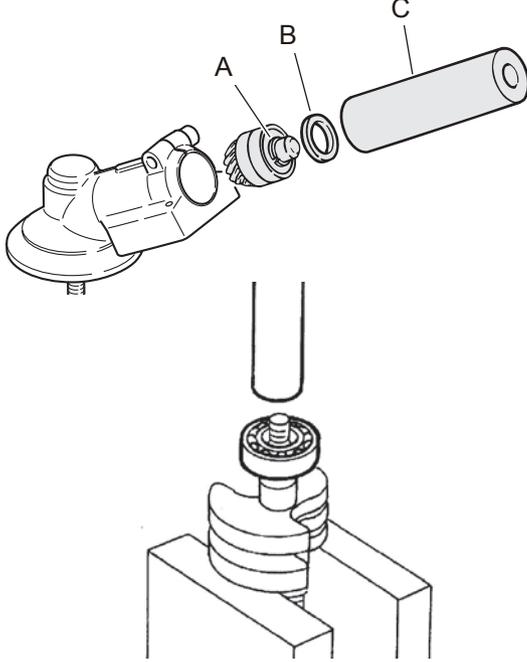
3. Apply grease (Shell EP-2 or equivalent) to inner rubber lips of a new oil seal.

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.

Oil seal tool 897726-09130
Washer 900600-00012



The diagram is divided into two parts. The top part shows a drive gear assembly being installed into a gear case. A clip (A) is shown on the gear assembly, a washer (B) is placed around it, and the oil seal tool (C) is used to press the assembly into the case. The bottom part shows a ball bearing being installed onto a crankshaft. The oil seal tool (897726-09130) is used to press the bearing onto the crankshaft.

[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.

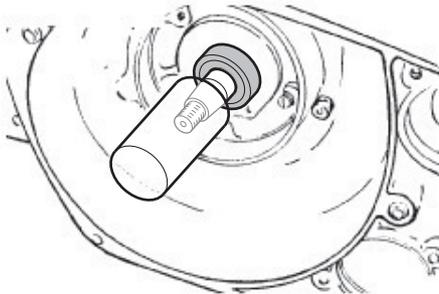
[Installing ball bearing to crankshaft]

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.

Oil seal tool 897726-16431



The diagram shows a cross-section of an engine crankcase with an oil seal being installed. The oil seal tool (897726-16431) is used to push the seal into the bore of the crankcase.

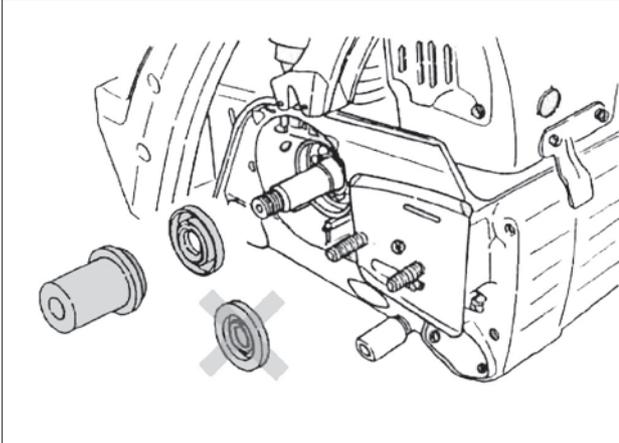
1. Remove defective oil seal from engine.

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.

Oil seal tool 897727-19830, 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.

Collar oil seal tool X646-000170, X646-000150, X646-000070, X646-000470



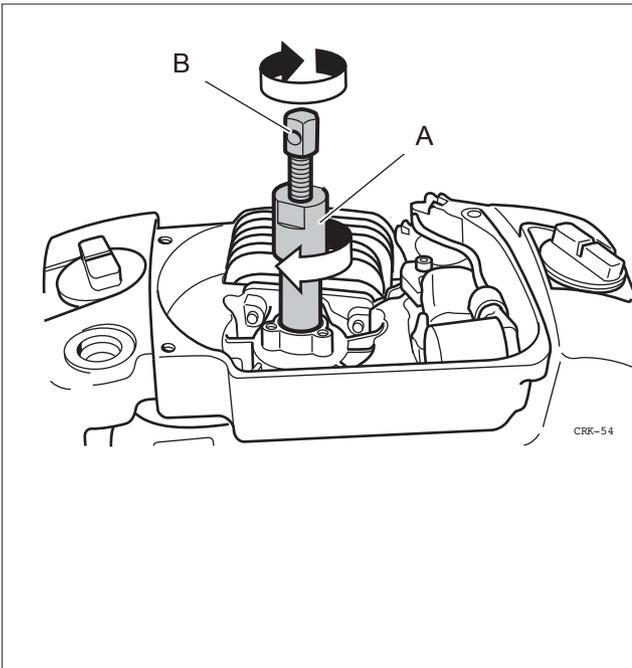
1. Apply grease on the oil seal lip and heat up the main bearing using a heat gun.

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.

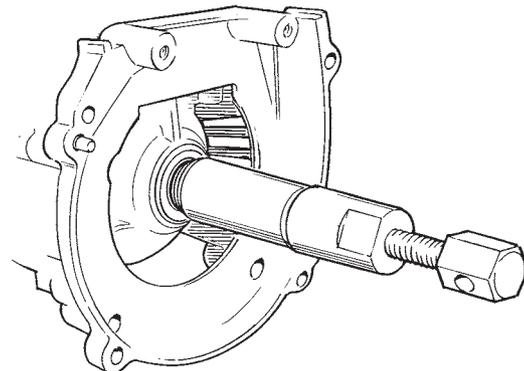
Puller X640-000380



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.



Rod oil seal

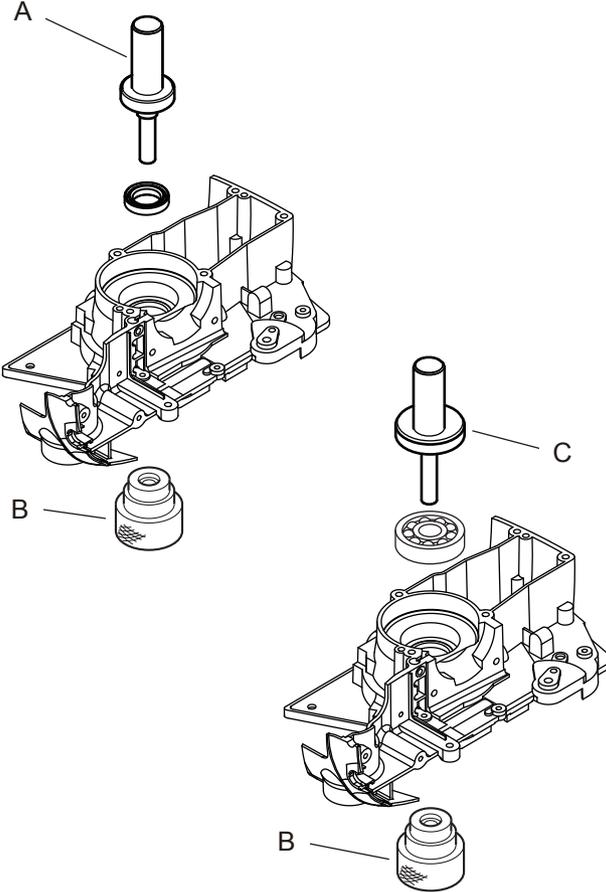
X646-000110, 22182-96460, 22155-96420, 22150-96420, X646-000040, 22150-96450, X646-000060, X646-000510

Holder

22160-96411, X646-000370, X646-000170, 22169-96410, 22169-96440, X643-000020

Rod bearing

X646-000050, 22160-96440, X646-000120, X646-000081



1. Remove defective oil seal and bearing from engine.

NOTE: Be careful not to damage crankshaft.

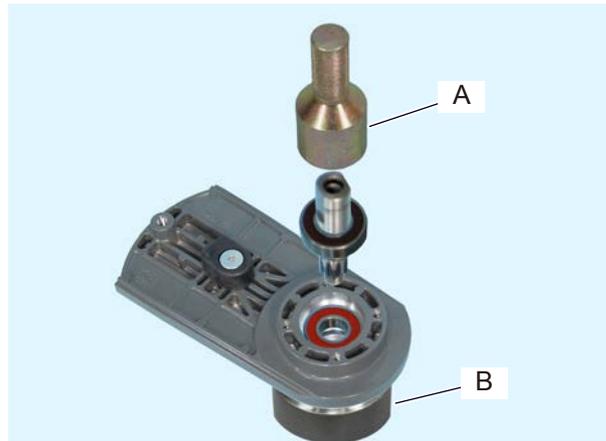
2. Lubricate the circumferences of oil seal with a thinner when the outer is made from rubber, or with high melting point grease when the outer is made from metal.
3. Apply grease to inner rubber lips of a new oil seal.
4. Heat up the crankcase by using a heat gun, and then push in the seal flush with crankcase surface by using a suitable size of rod oil seal tool (A).

5. After installing the oil seal, push in the bearing using a suitable of rod bearing (C).

NOTE: When installing the oil seal and bearing, make sure to use holder (B).

Rod bearing X646-000100

Holder 22169-96410



1. Heat up the bearing case by using a heat gun, and then push in the gear shaft and the bearing by using rod bearing X646-000100 (A).

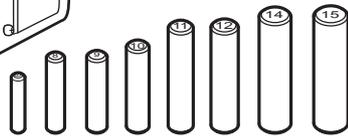
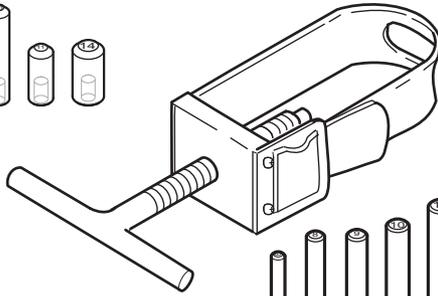
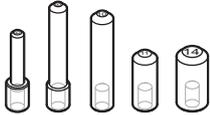
NOTE: When installing the gear shaft and the bearing, make sure to use holder 22169-96410 (B).

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

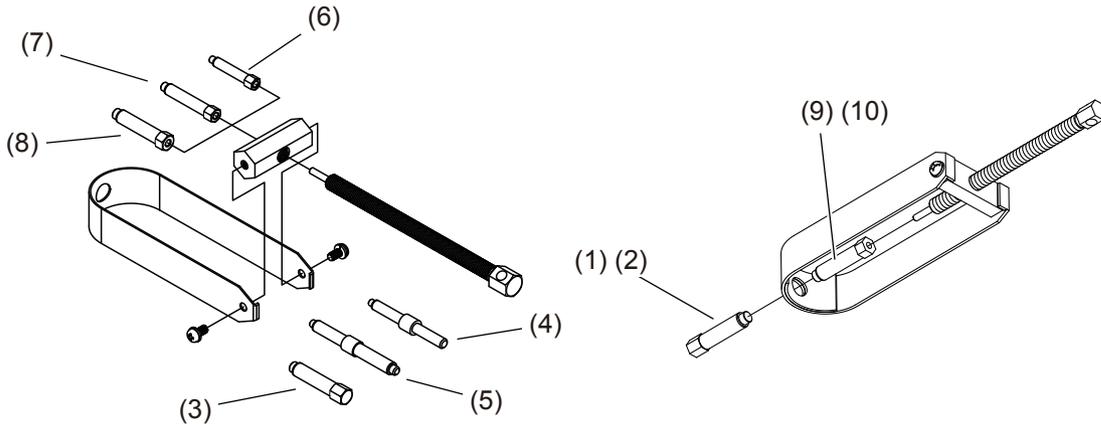
Adapters (6, 8, 10, 11, 14)



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

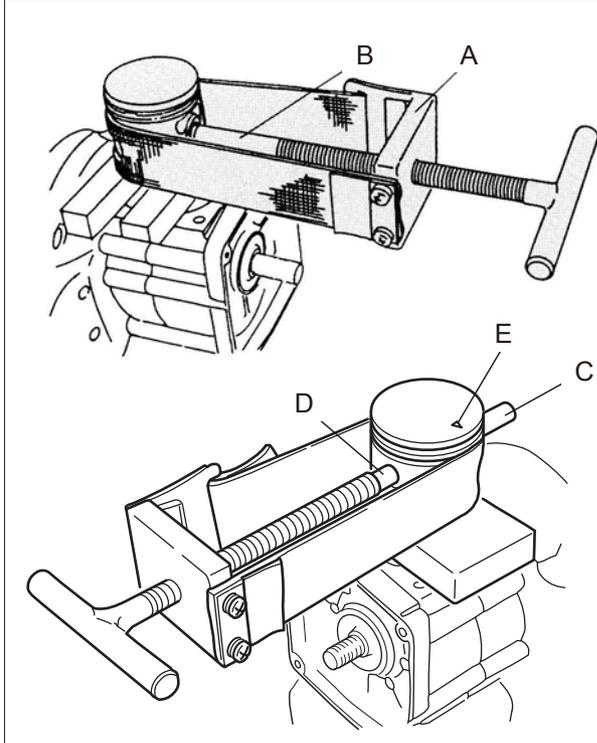
	(1) 22169-96360 A = 757 d1 = 11.8 mm		(4) X648-000090 d1 = 9.9 mm d2 = 8.9 mm
	(2) 22150-96360 A = 680 d1 = 10.8 mm		(5) 20035-96630 d1 = 7.8 mm d2 = 7.8 mm
	(3) 20021-96630 A = 45 d1 = 10.8 mm		

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)

Piston pin tool 897702-30131, Y089-000250, X640-000090 (Continued)



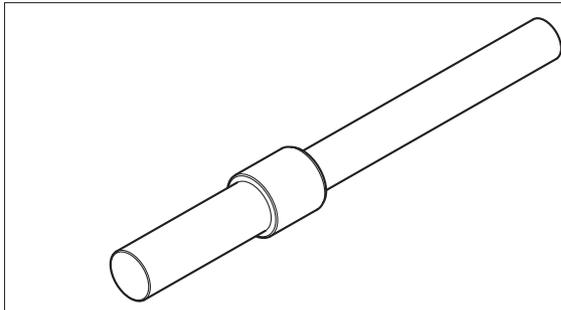
[Removing piston pin]

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.

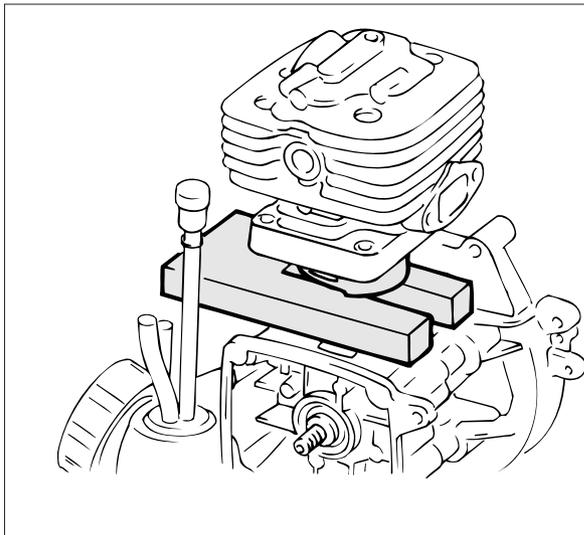
Guide X640-000390



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

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

Piston holder 897719-02830



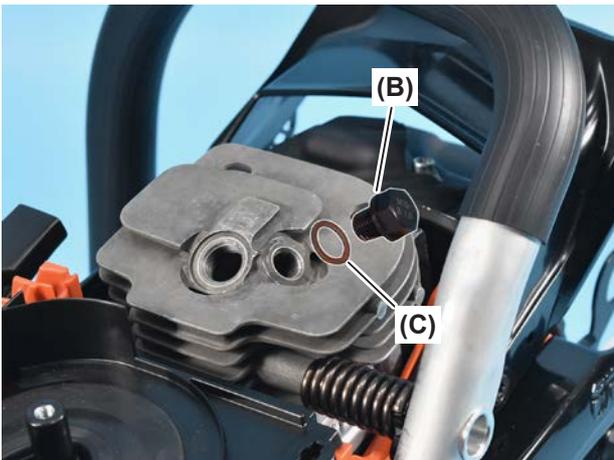
1. When Installing cylinder, set the piston holder under the piston as shown, and install cylinder over piston ensuring that exhaust side of cylinder is at arrow side of piston.

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

Plug 91177



1. Before testing crankcase and cylinder leakage, remove decompression valve (A) from cylinder.



2. Install Plug (B) with washer (C) into the decompression valve hole.

Then, continue the test after sealing the exhaust port and intake port .

PTO shaft puller P021-044871

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 (P/N: 897701-14732) vertically against a flat surface (D) several times until drive gear with two ball bearings come out.

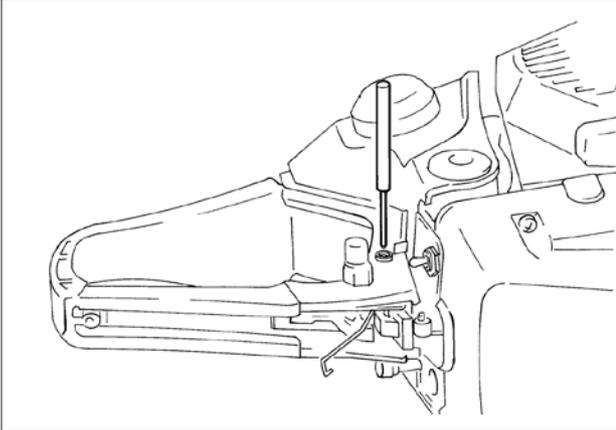
NOTE: When using a heat gun, put on gloves. Otherwise, a burn will result.

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

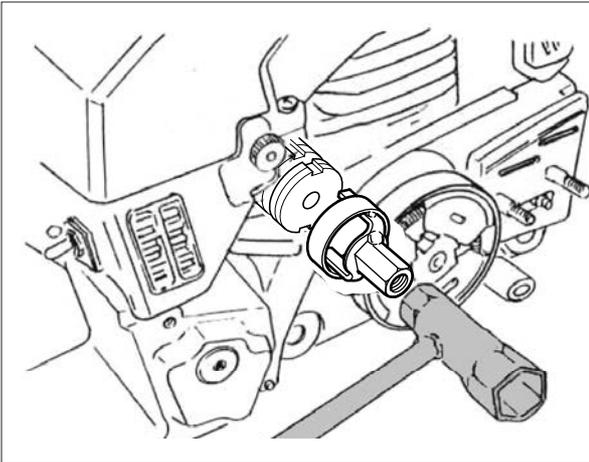
6. Connect PTO shaft puller P021-044870 (F) to PTO shaft (G). Then strike weight (H) to nut (J) holding gear case, to pull out the PTO shaft together with the relevant parts.

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

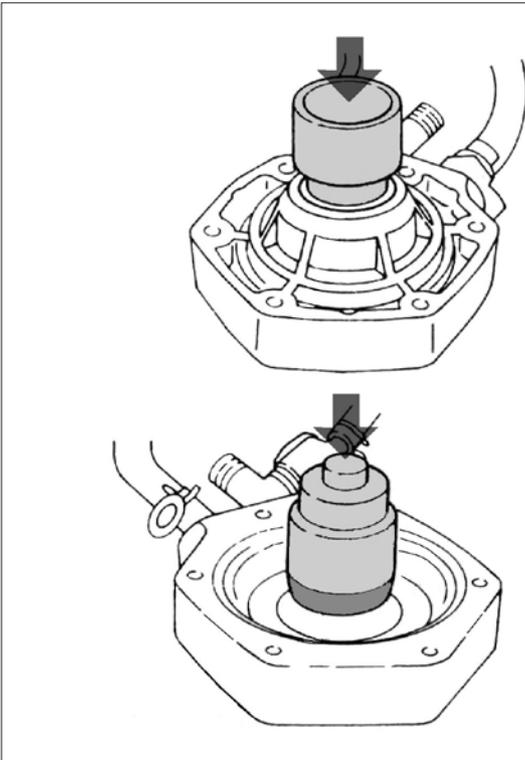
7. Check the gears, PTO shaft, and ball bearings. If worn or hard rotation is found, replace the defective parts as required.

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.

Cushion tool 897740-19830

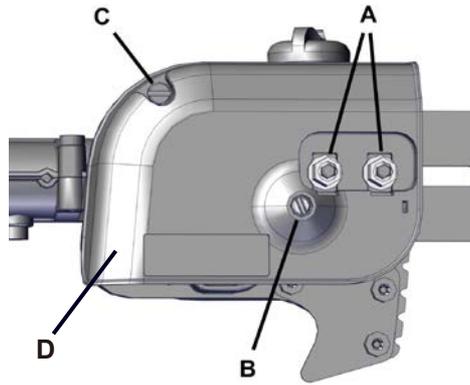
Cushion tool 897740-19830 is used for removing and installing rubber cushion as shown.

Mechanical seal tool 897741-10510

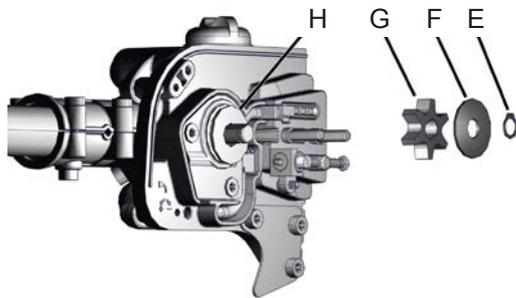
1. Remove the mechanical seal using the mechanical seal tool as shown.

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

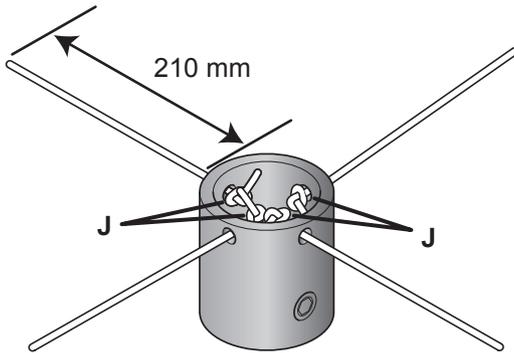
Load adapter 91156



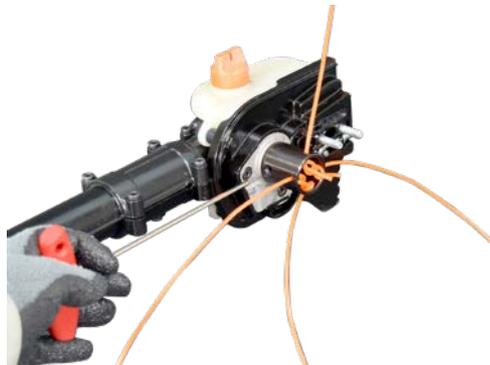
1. Empty oil tank.
2. Remove two nuts (A) and screw (C). Turn chain tensioning screw (B) counterclockwise to release chain tension.
3. Remove sprocket guard (D).
4. Remove guide bar and saw chain.



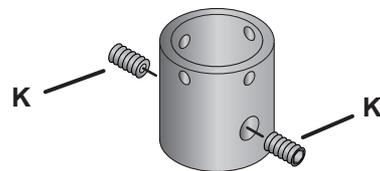
5. Remove snap ring (E), washer (F) and drive sprocket (G).
- NOTE:** Do not remove washer (H).



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.

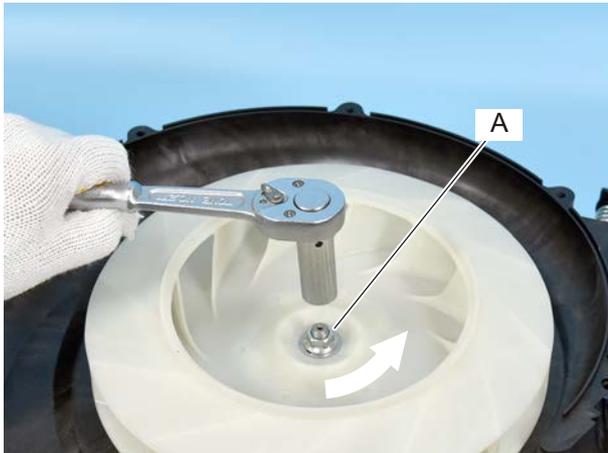


7. Install Load adapter output end of drive shaft, tighten two screws (K) using a 3 mm hex. wrench.



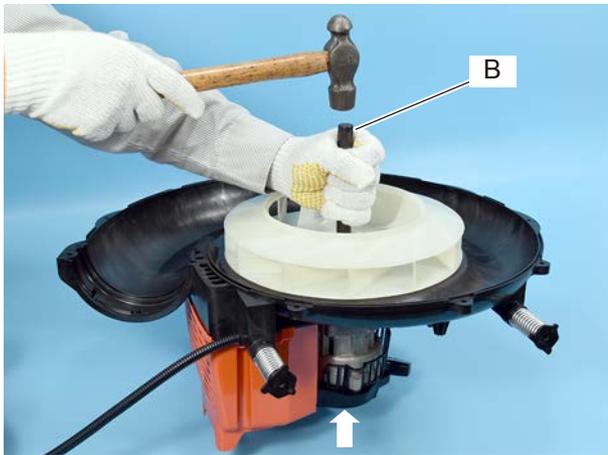
NOTE: Refer to SERVICE DATA for detailed carburetor adjustment procedure.

Fan remover 91087



1. Install clean rope in spark plug hole by hand.

2. Remove fan nut (A) using 14mm socket wrench counterclockwise.

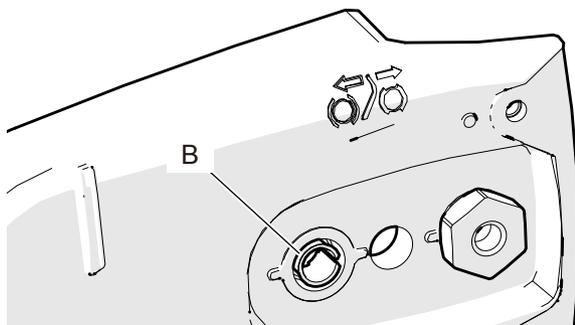


3. Thread Fan remover 91087 (B) on crankshaft end.

4. Lift up the remover (B).

5. Strike the end of the remover with a hammer squarely as shown.

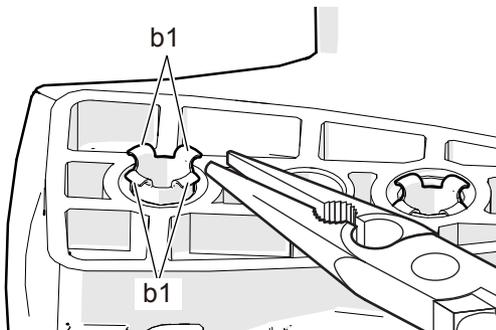
Collar nut installer X646-000620



-- Removing --

[When captive bar nut has come off from sprocket guard]

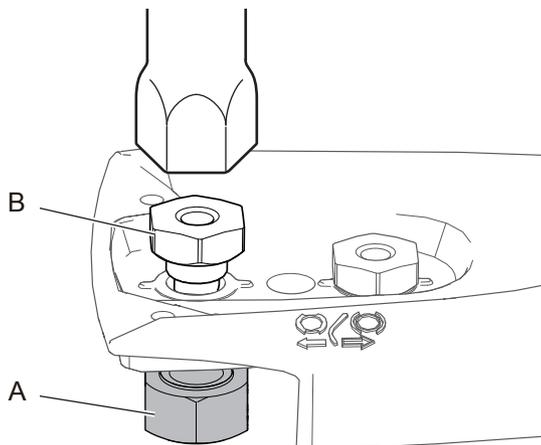
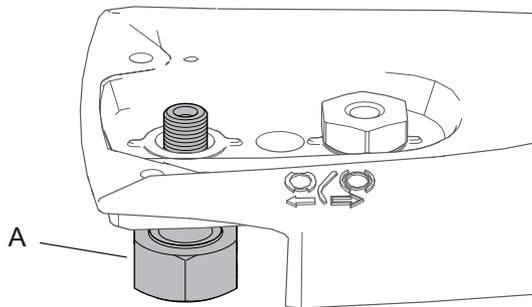
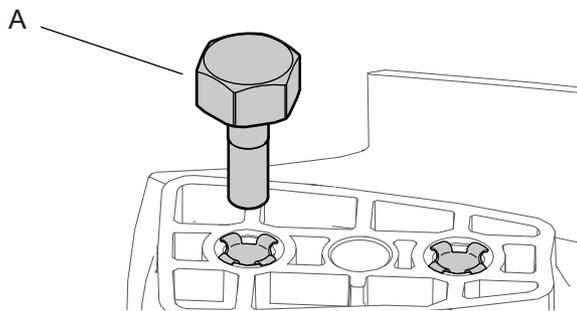
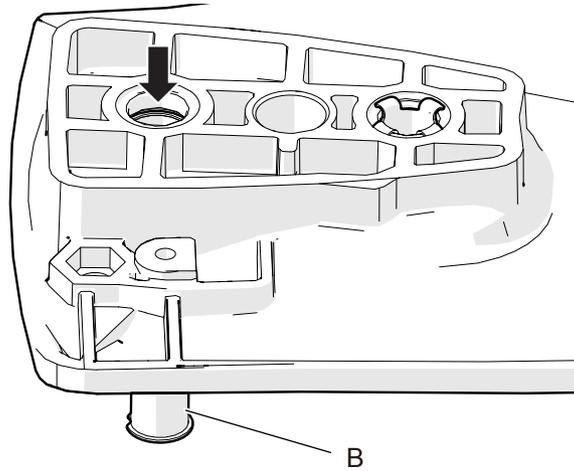
1. Push remaining collar (B) out from outside of sprocket guard.



2. Then, straighten tabs (b1) of remaining collar (B) with a long nose pliers.

(Continued)

Collar nut installer X646-000620 (Continued)



3. Remove remaining collar (B), pushing down from inside of sprocket guard.

[When removing entire captive bar nut installed on sprocket guard]

1. Partially screw collar nut installer (A) into captive bar nut from inside of sprocket guard, leaving some clearance to drive the nut collar out.
2. Hold sprocket guard in one hand and tap top of installer (A) with a hammer to remove captive bar

-- Installing --

1. Insert collar nut installer (A) from inside of sprocket guard.

2. Hold collar nut installer (A) with a vise or wrench.

3. Install new collar nut (B) on installer (A).

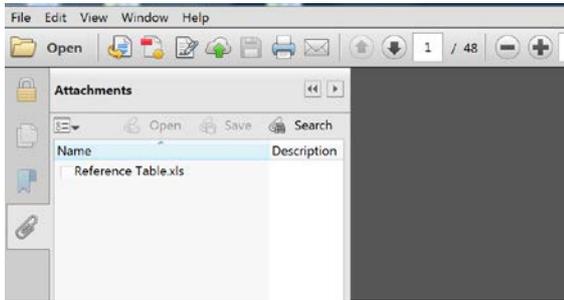
4. Tighten new collar nut (B) with a wrench until it bottoms.

NOTE: Make sure that the collar nut tabs are properly seated and the nut rotates freely on the collar.

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 tab.



How To Search SERVICE TOOL

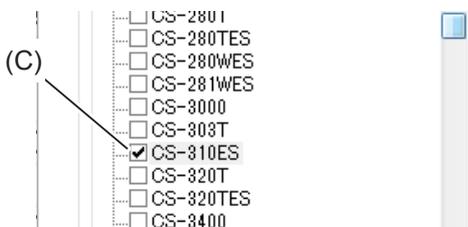
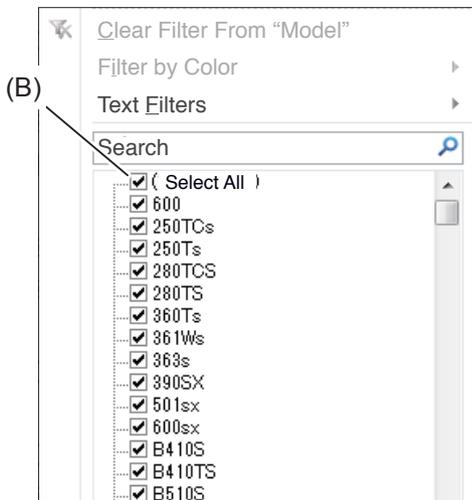
[Example: CS-310ES]

1. Click arrow (A) next to Model.



2. (1) WAY1.

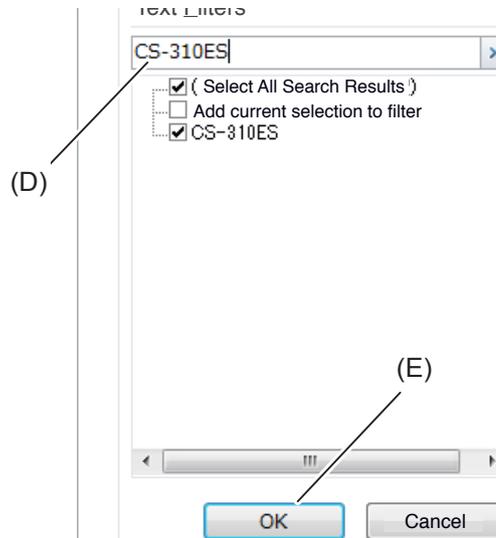
Click check box (B) (Select All) to clear all check boxes, and click check box (C) on CS-310ES.



(2) WAY2.

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

[NOTE] Applies to: Excel 2010 and after



3. Click OK button (E).

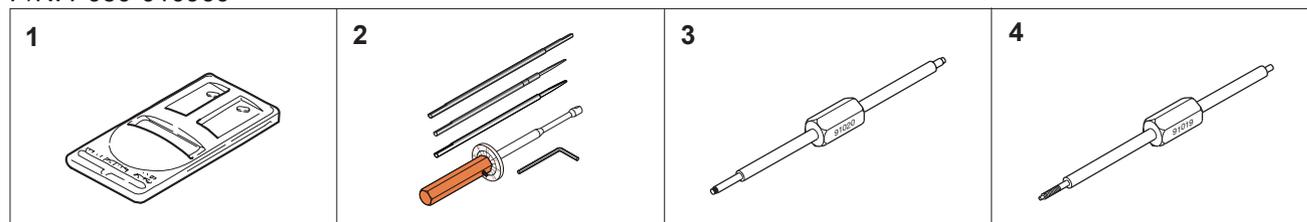
4. Result. Excel only displays part numbers for CS-310ES.

	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		
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4. SERVICE TOOL KIT

SERVICE TOOL KIT 1 (Pre Delivery Inspection)

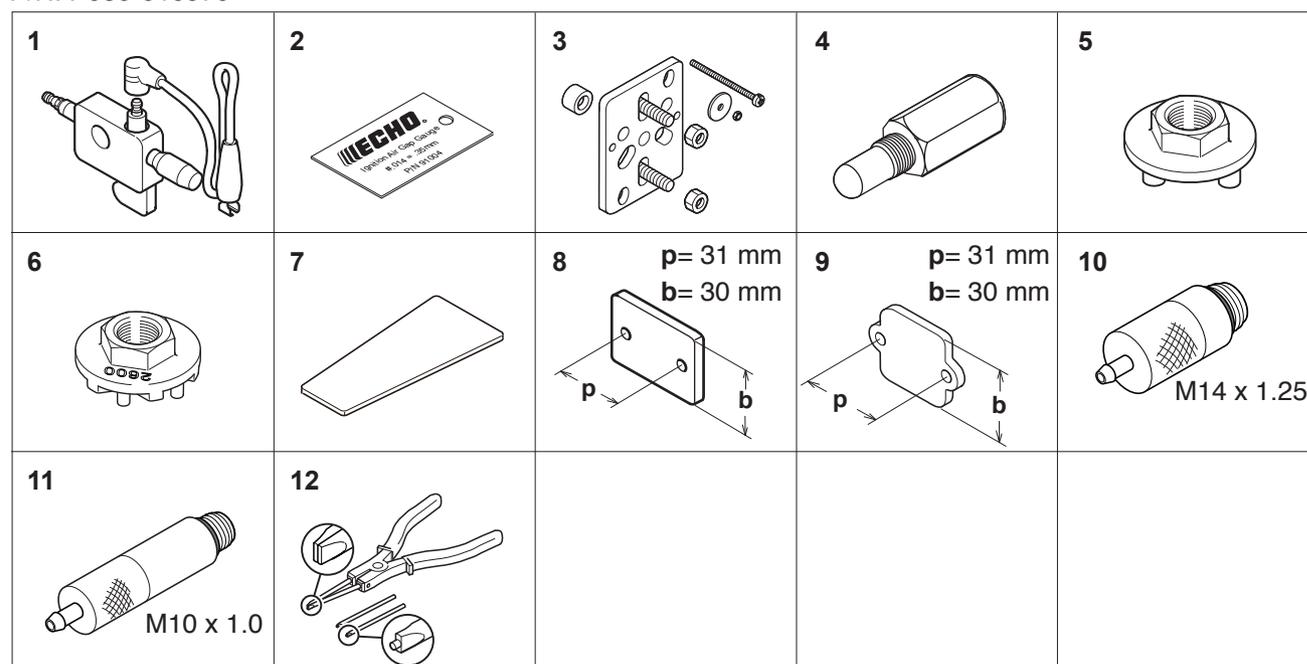
P/N: P050-010960



Key	Part Number	Description	Reference
1	897802-33330	Tachometer PET-1000	Measuring engine speed to adjust carburetor
2	Y089-000095	Carburetor adjustment tool	Adjusting carburetor
3	91020	Limiter plug tool	Removing and installing limiter plug
4	91019	Limiter cap tool	Removing and installing limiter cap

SERVICE TOOL KIT 2 (Service and Repairs)

P/N: P050-010970



Key	Part Number	Description	Reference
1	897800-79931	Spark tester	Checking ignition system
2	91004	Module air gap gauge	Adjusting pole shoe air gaps
3	Y089-000111	Puller	Removing magneto rotor (flywheel) and crankcase
4	X644-000020	Piston stopper	Locking crankshaft rotation
5	897505-16133	Clutch tool	Removing and installing clutch assembly
6	X640-000011	Clutch tool	Removing and installing clutch assembly
7	91041	Pressure rubber plug	Plugging exhaust port to test crankcase/cylinder leakages
8	897826-16131	Pressure rubber plug	Plugging intake port to test crankcase/cylinder leakages
9	897827-16131	Pressure plate	Plugging intake port to test crankcase/cylinder leakages
10	A131-000150	Pressure connector	Testing crankcase and cylinder leakage
11	A131-000160	Pressure connector	Testing crankcase and cylinder leakage
12	P021-051610	Snap ring pliers	Removing snap ring from clutch drum

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