ECHO®

ECHO TWIN-CYLINDER CHAIN SAW

SERVICE MANUAL

CST-610EVL

Ord. No. 401-14

INTRODUCTION

This Service Manual contains service and maintenance information on the ECHO Twin-Cylinder Chain Saw, model CST-610EVL. We hope this Manual will assist you how to locate defects, eliminate them and prevent their repetition.
For systematic diagnosis, to avoid extra work and time loss, please refer to "Troubleshooting guide" and "Engine troubleshooting flow chart" on last pages, that describe troubles, checkings, and references. We recommend you make use of Parts Catalogue and Operator's Manual together with this Manual when servicing. We are constantly working to improve the technical quality of our products. For this reason, technical data, equipment, and design are subject to change without notice.
All specifications and illustrations in this Manual are based on the latest product information available at the time of publication.

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1. KNOWLEDGE OF TWIN-CYLINDER CHAIN SAW MODEL CST-610EVL

1-1 Background and development

Recently, the size of the two-stroke engine has been reduced further more and its application has expanded into chain saws, grass trimmers, and many other hand-held equipment. But various anti-vibration systems are needed to isolate the engine vibration which is generated as a nature of reciprocal motion in the power source.

The effective anti-vibration system can be provided, however, the system becomes very soft and thus such a spongy feeling may often sacrifice the maneuverability. On the other hand, if the anti-vibration system is stiff, it does not absorb engine vibrator and also chain cutter induced low frequency vibration well.

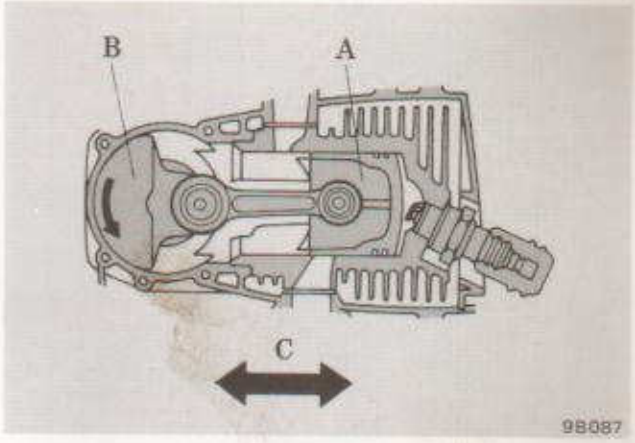
To overcome this dilemma, it is necessary to minimize the engine vibration itself. The power source for chain saw applications require these features simultaneously, such as lightweight, high output, low level of vibration and noise, durability, etc.

The two-stroke horizontally opposed twin-cylinder engine produces only 1/10 the vibration level compared to the average single cylinder two-stroke engine of a similar size. The engine vibration caused by the reciprocating piston motion is completely eliminated by the benefit of horizontally opposed twin-cylinder arrangement.

1-2 Special features

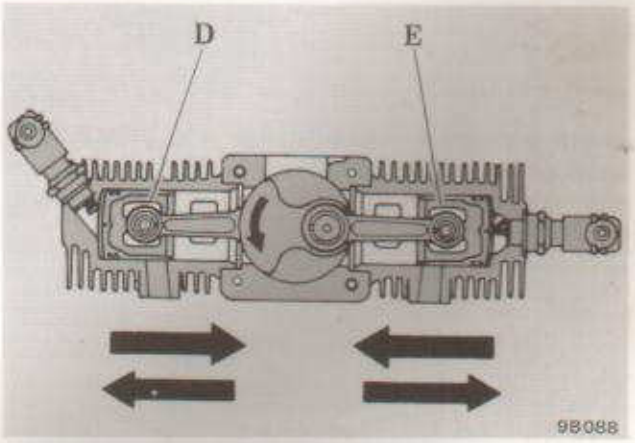
1-2-1 Reduced vibration

Single cylinder engine: While engine is running, piston A reciprocates in the cylinder. To absorb energy of vibration produced by this piston



motion C , counter-balanced weights B can reduce the vibration, but the vibration can not be eliminated completely.

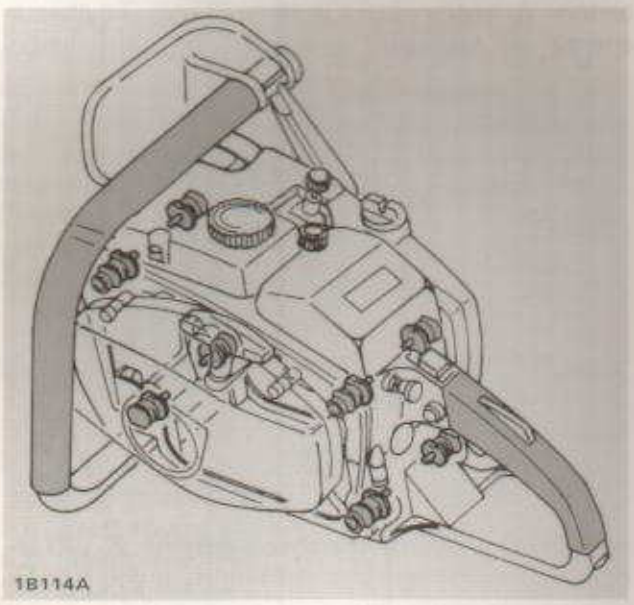
Opposed twin-cylinder engine: Two pistons D & E are arranged oppositely as shown, and simultaneous firing allows complete balance of the



reciprocal motions of two pistons. This twin-cylinder engine, produces only 1/10 vibration of that of single cylinder engine, therefore, guide bar and saw chain do not vibrate too much in the wood while cutting. This ensures a smooth and efficient running of saw chain. Fatigue of the parts due to loosened fasteners or excessive vibration can be minimized.

1-2-2 Anti-vibration system

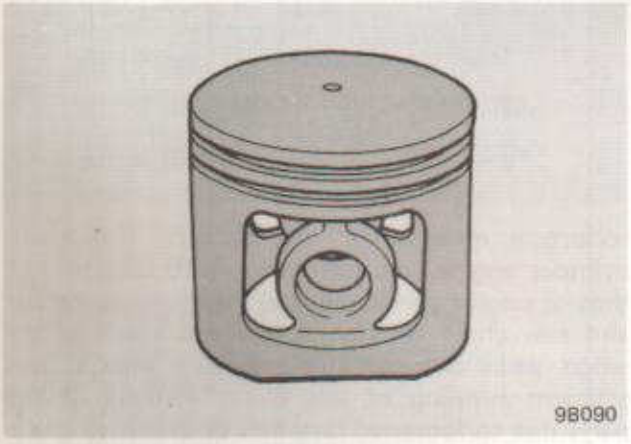
Eight pieces of rubber isolators and rubber grips on both handles isolate the vibration caused by the saw chain cutting. Overall handle vibration



is now reduced greatly to a minimum level which is much lower than the level on single cylinder saws of comparable piston displacement volume.

1-2-3 Ventilated piston

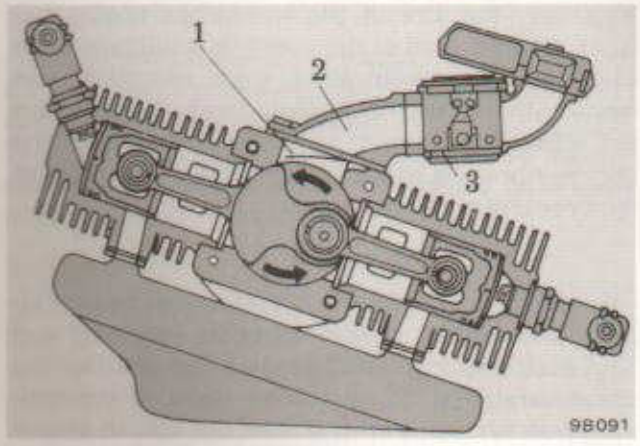
The fresh cool mixture of fuel and intake air is induced to both combustion chambers from common crankcase through the inside of piston and



ports specially provided in the vicinity of piston pin bosses. This transfer system improves cooling of internal motion parts and utilizes the full power and speed of the engine.

1-2-4 Single carburetor and reed valve

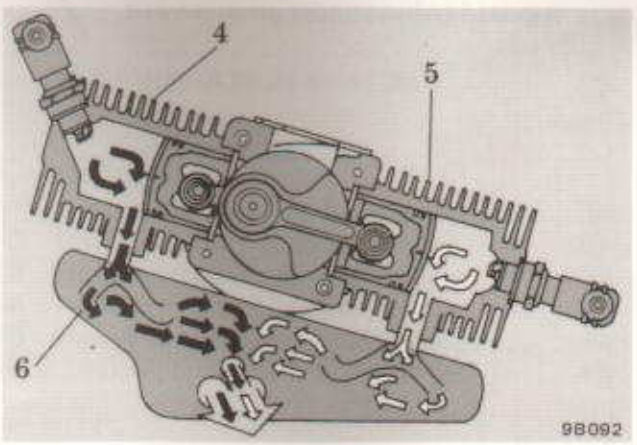
The utilization of reed valve 1 intake system allows to have a well-balanced distribution of air/fuel mixture for both front and rear cylinders via



single carburetor 3 , suction pipe 2 , reed valves, common crankcase, and transfer passages provided in the piston and cylinder castings. The reed valve intake system ensures flexible torque output throughout the range from low to high speed and powerful cutting performance. The reed valves, installed between suction pipe and crankcase, prevents fuel spit back also.

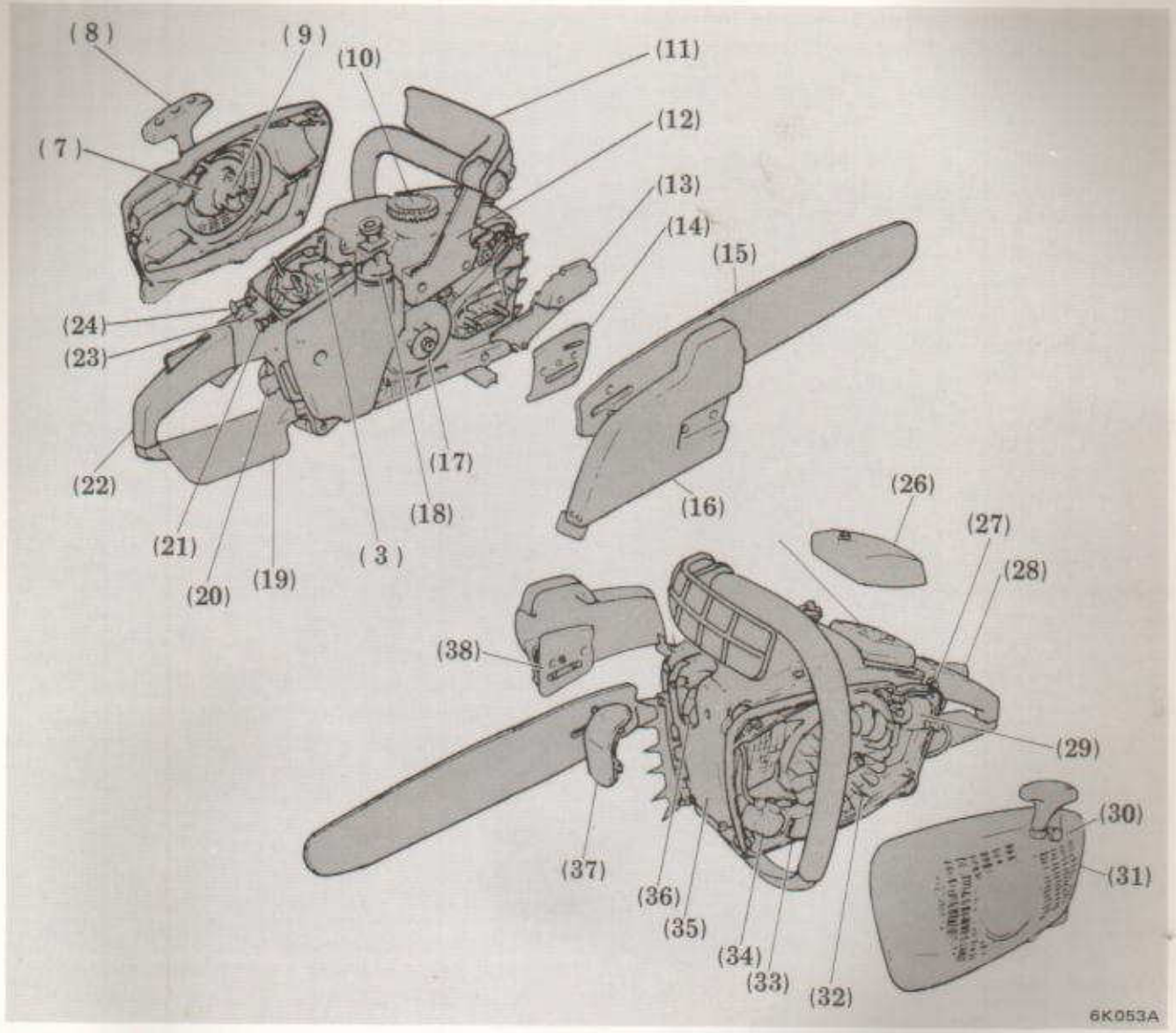
1-2-5 Quiet exhaust muffler

Exhaust emissions from front 4 and rear 5 cylinders are blown into a common canister 6 . Impulses from both cylinders are interfered with



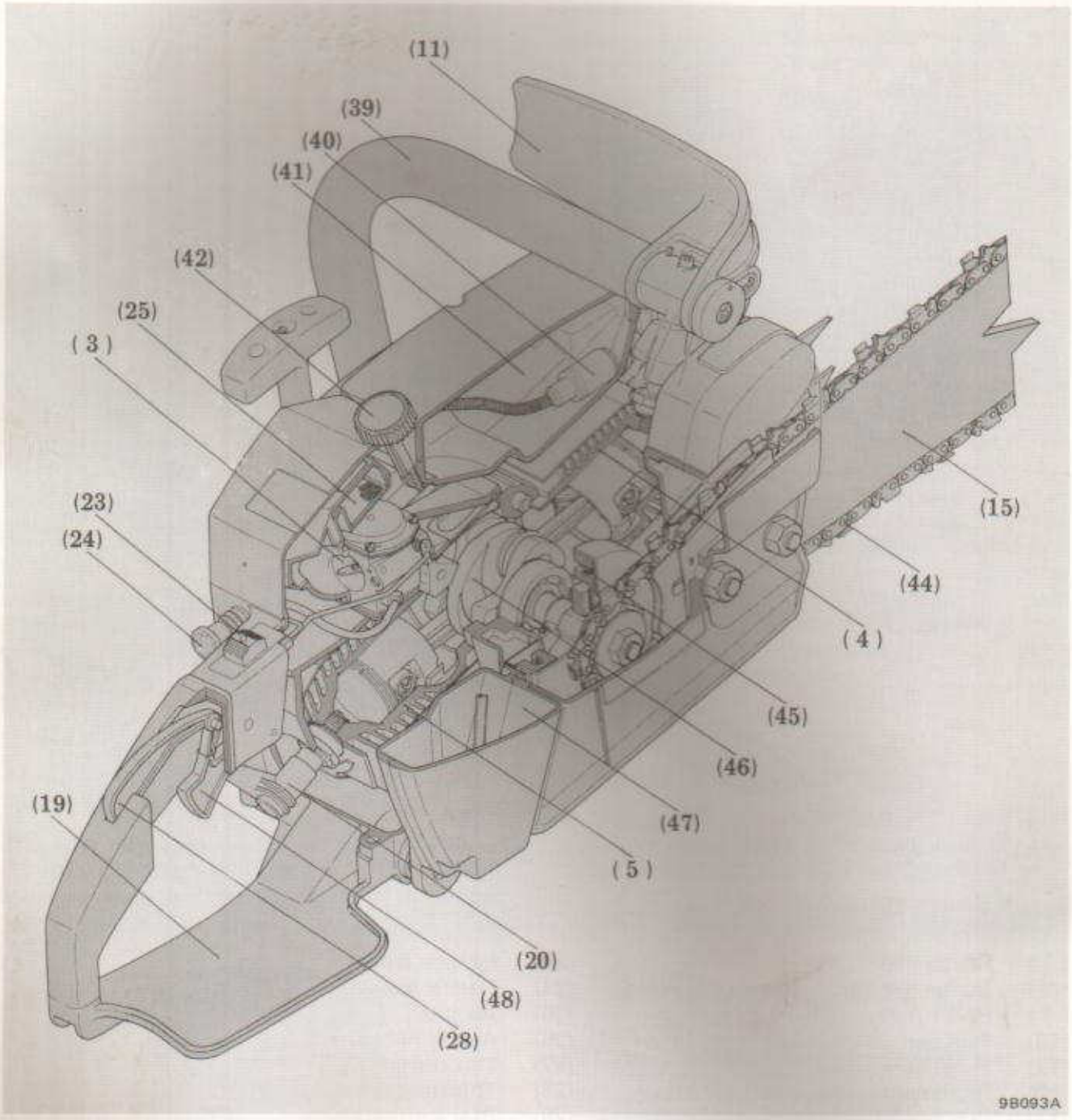
each other after hitting diffusers. As a result, exhaust noise level becomes very low without sacrificing the output performance, so that usual conversation will never be disturbed even while in a full cutting operation.

1-3 Nomenclature (1/2)



(7) Starter reel
(8) Starter handle
(9) Pawl catcher
(10) Fuel cap
(11) Front hand guard
(12) Front handle supporter
(13) Brake cover
(14) Inner pad
(15) Guide bar
(16) Sprocket guard
(17) Clutch drum
(18) Oil cap
(3) Carburetor
(19) Bottom supporter
(20) Rear spark plug
(21) Choke control knob
(22) Rear handle ass'y
(23) Ignition switch
(24) Manual oiler
(25) Air filter
(26) Air cleaner cover
(27) Throttle latch
(28) Throttle control lockout
(29) Rear ignition coil
(30) Idle adjust screw driver
(31) Starter case
(32) Flywheel
(33) CDI module
(34) Front ignition coil
(35) Front cover
(36) Front spark plug
(37) Rubber cover
(38) Outer pad

1-3 Nomenclature (2/2)



(11)	Front hand guard	(15)	Guide bar
(39)	Front handle	(44)	Saw chain
(40)	Fuel strainer	(4)	Front cylinder
(41)	Fuel tank	(45)	Clutch shoe ass'y
(42)	Thumb bolt	(46)	Crankshaft
(25)	Air filter	(47)	Oil tank
(3)	Carburetor	(5)	Rear cylinder
(23)	Ignition switch	(20)	Rear spark plug
(24)	Manual oiler	(48)	Throttle trigger
(19)	Bottom supporter	(28)	Throttle control lockout

1-4 Service information

1-4-1 Specifications

Model	CST-610EVL
Length	420 mm (16.5 in) without spike
Width	260 mm (10.2 in)
Height	305 mm (12.0 in)
Dry weight	6.9 kg (15.1 lb) without bar, chain, and spike
Engine	KIORITZ, Air-cooled, two-stroke, horizontally opposed twin-cylinder
Rotation	Clockwise as viewed from the output end
Displacement	61 cc (3.72 cu.in)
Bore x Stroke	36.0 mm x 30.0 mm (1.4173 in x 1.1811 in)
Compression ratio	7.6 : 1
Carburetor	Diaphragm type with accelerating bleeder
Clutch	Automatic 3-shoe centrifugal type
Muffler	Spark arrester type
Ignition	CDI with step advancing ignition system
Spark plug	NGK BPM7A or Champion CJ-6Y
Starter	Pull/automatic rewind type
Starter rope dia. x length	4 mm x 900 mm (0.16 in x 35.4 in)
Fuel	Premixed two-stroke fuel
Mixing ratio	32 : 1 ratio or 50 : 1 ratio with special oil approved by KIORITZ/ECHO
Fuel tank capacity	0.61 lit. (20.6 U.S. fl. oz.)
Sprocket type/tooth	Spur/7
Sprocket pitch	3/8 in
Saw chain pitch/gauge	3/8 in/0.050 in
Guide bar length	40 cm 45 cm 50 cm 55 cm 60 cm
Number of drive links	60 64 72 78 84
Guide bar/saw chain lubricator	Automatic and manual
Guide bar/saw chain lubricant	Motor oil SAE #30 (in summer) or #10 (in winter)
Oil tank capacity	0.30 lit. (10.1U.S. fl.oz.)

These specifications are subject to change without notice.

1-4-2 Technical data

Model	CST-610EVL
Spark plug gap	0.55 ~ 0.65 mm (0.022 ~ 0.026 in)
Pole shoe air gaps	0.3 ~ 0.4 mm (0.012 ~ 0.016 in)
Ignition timing	28° BTDC/7,000 rpm
Primary coil resistance	0 ~ 0.2 Ω
Secondary coil resistance	1.0 ~ 1.5 kΩ
Exciter coil resistance	130 ~ 200 Ω
Minimum secondary voltage	15 KV/1,000 rpm
H-needle	1 turn open (initial set)
L-needle	1 turn open (initial set)
Idle speed screwdriver	2 turn open (initial set)
Idle speed	2,500 ~ 2,800 rpm
Operating speed	6,000 ~ 9,000 rpm
Standard compression pressure	8.0 kg/cm² (110 psi) in cold state

1-4-3 Service limits
1-4-3-1 Measuring guide

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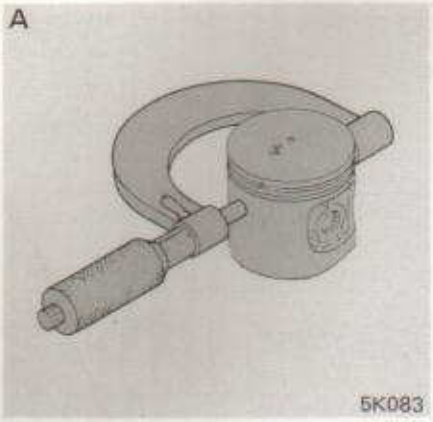
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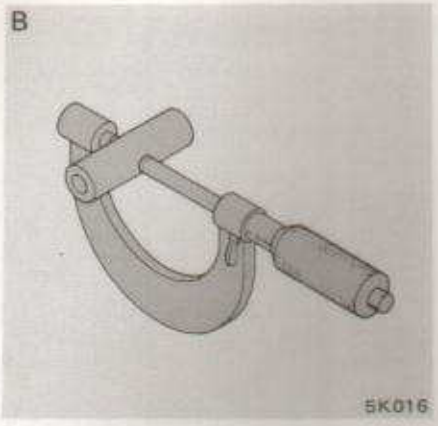
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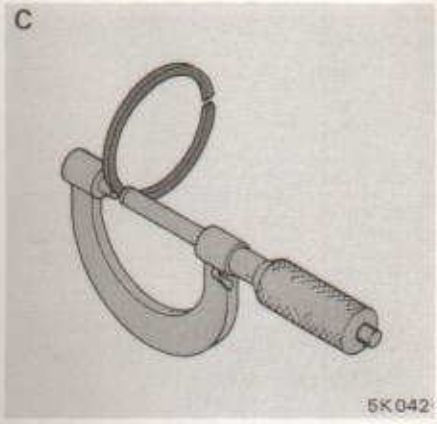
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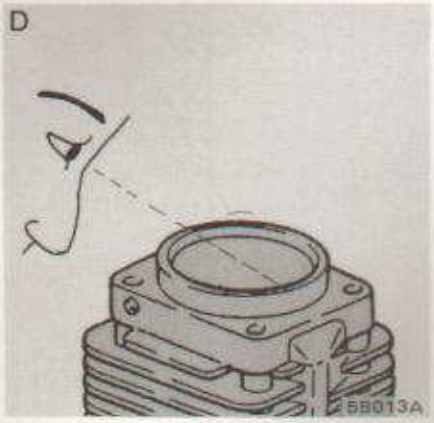
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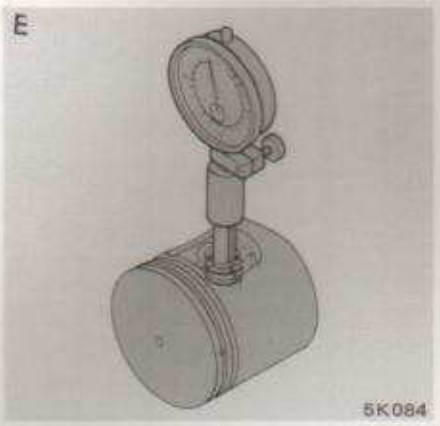
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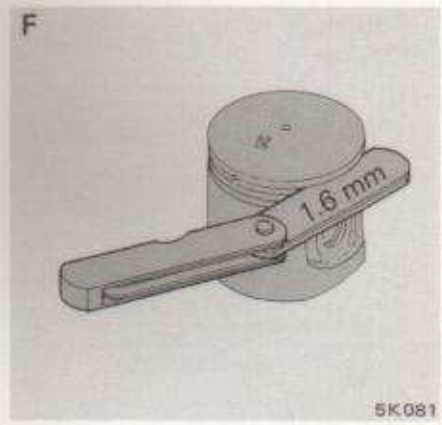

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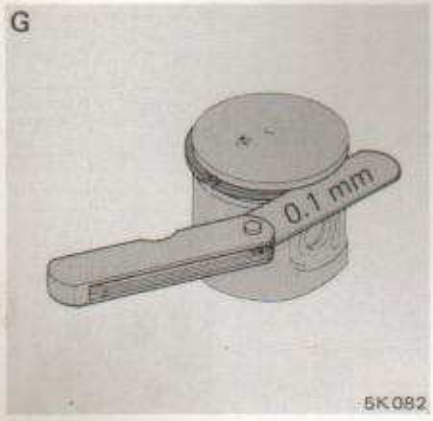

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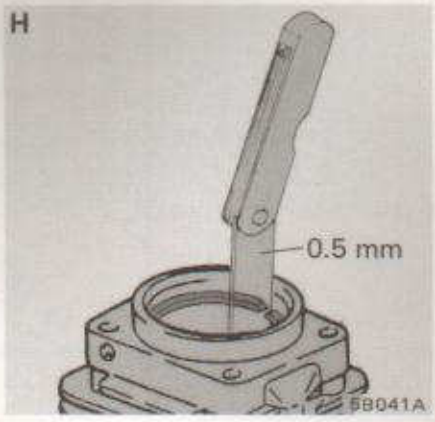

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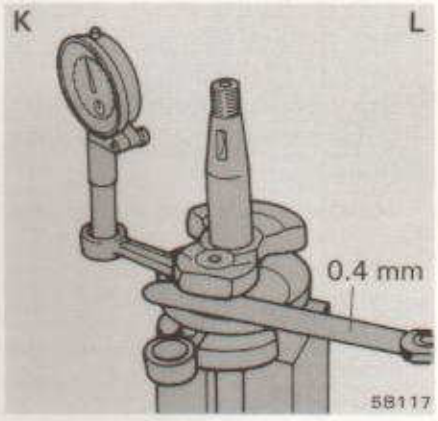

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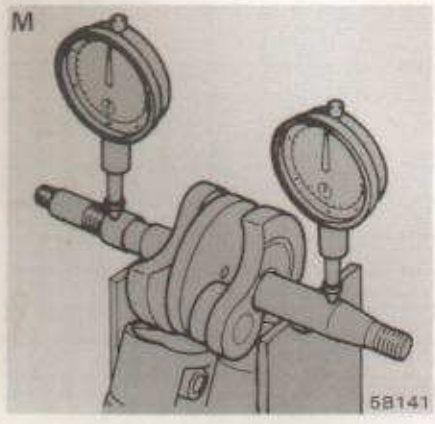
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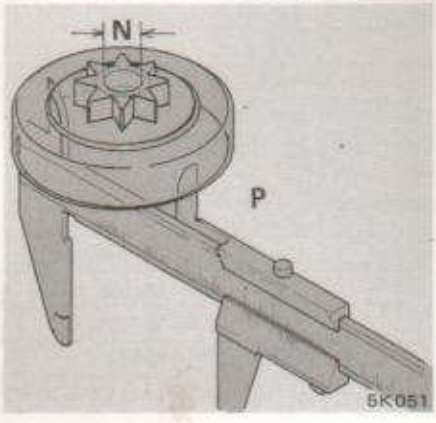

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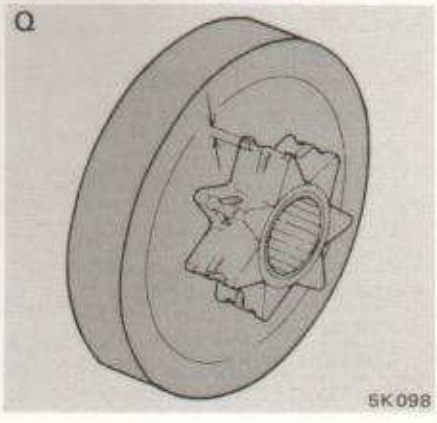
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1-4-3-2 Service limit table

References			mm	in
A	Piston outer diameter	Min.	35.88	1.4125
B	Piston pin outer diameter	Min.	8.98	0.3535
C	Piston ring width	Min.	1.45	0.057
D	Cylinder bore		When plating is worn and aluminum can be seen.	
E	Piston pin bore	Max.	9.03	0.3555
F	Piston ring groove	Max.	1.6	0.063
G	Piston ring side clearance	Max.	0.1	0.004
H	Piston ring end gap	Max.	0.5	0.02
K	Con-rod small end bore	Max.	12.025	0.4734
L	Con-rod big end side play	Max.	0.4	0.016
M	Crankshaft runout	Max.	0.05	0.002
N	Sprocket bore	Max.	14.08	0.554
P	Clutch drum bore	Max.	79.0	3.110
Q	Sprocket tooth wear	Max.	1.0	0.04

1-4-4 Torque tables

1-4-4-1 Special fasteners

References	Size	kg-cm	in-lb
CDI module Ignition coil	M 4	35 ~ 45	30 ~ 40
Starter pawl* Rubber isolator	M 5	35 ~ 45	30 ~ 40
Reed valve	M 3	8 ~ 12	7 ~ 10
Reed valve ass'y*	M 5	40 ~ 45	35 ~ 40
Carburetor	M 5	45 ~ 55	40 ~ 50
Starter case	M 5	50 ~ 70	45 ~ 60
Crankcase Cylinder Front/rear handle Starter reel	M 5	80 ~ 90	70 ~ 80
Muffler	M 5	80 ~ 100	70 ~ 90
Clutch drum	**LM8	200 ~ 240	175 ~ 210
Clutch shoe ass'y	M12	200 ~ 240	175 ~ 210
Sprocket guard	M 8	200 ~ 240	175 ~ 210
Flywheel	M10	330 ~ 370	285 ~ 320
Spark plug	M14	150 ~ 170	130 ~ 150

* Apply thread locking sealant when fastening. ** LM: Left-hand thread

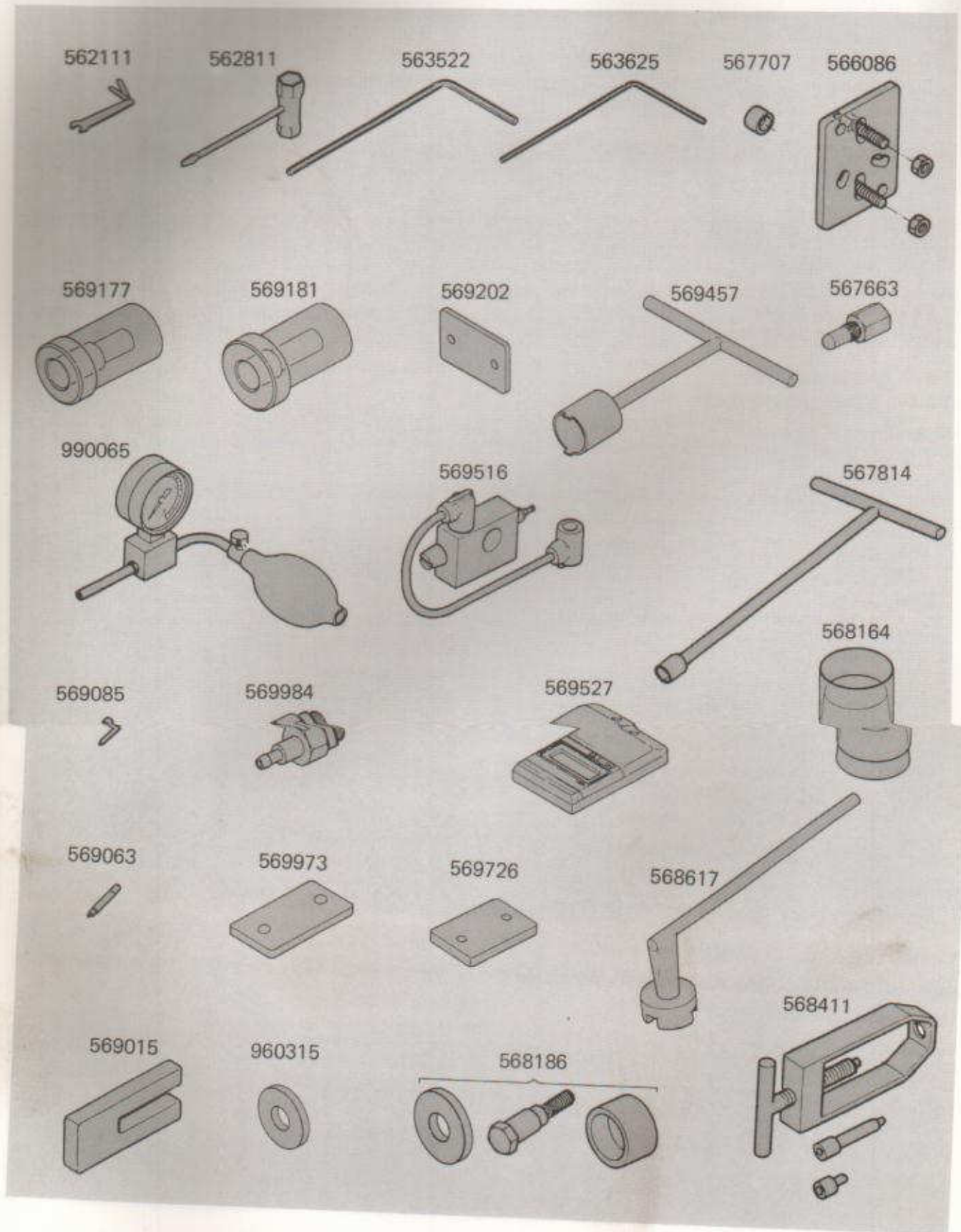
1-4-4-2 Standard fasteners

Standard fasteners other than those listed above should be tightened with the proper tools to the specified torques tabulated below.

References	Size	kg-cm	in-lb
Regular screws, bolts, and nuts	M 3	6 ~ 9	5 ~ 8
	M 4	13 ~ 18	11 ~ 16
	M 5	27 ~ 32	23 ~ 28
	M 6	45 ~ 65	40 ~ 55
	M 8	110 ~ 150	95 ~ 130
	M10	260 ~ 310	225 ~ 270
	M12	400 ~ 450	350 ~ 390

1-5 SPECIAL SERVICE TOOLS

1-5-1 Tool illustrations



1-5-2 Tool descriptions

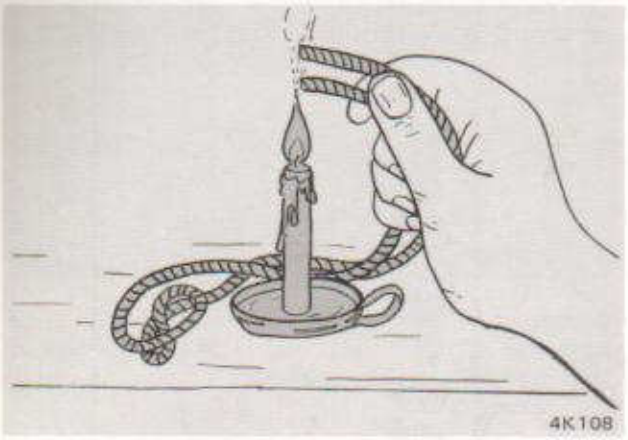
Ref/No.	Part Number	Tool Name	Pages
562111	895115-00330	Magneto wrench	15, 17
562811	895410-02830	Plug wrench	10, 12, 15, 16, 17, 18, 23, 24, 28, 34, 35, 37, 39, 40, 43
563522	895610-79920	L-wrench (4 mm)	23, 28, 35, 39, 40, 43
563625	895612-79920	L-wrench (3 mm)	16, 17, 18, 40
566086	897501-03935	Puller	18, 43
567663	897537-03930	Piston tool	12, 18, 34, 39, 43
567707	897540-03930	Spacer	18, 43
567814	897558-02830	T-box wrench (8 mm)	43
568164	897602-02830	Clutch spring tool	34
568186	897701-12331	Bearing tool	43
568411	897702-04320	Piston pin tool	43
568617	897710-02830	Clutch tool	34, 43
569015	897719-02830	Piston holder	40
569063	897724-02830	Spring pin tool (5 mm)	28
569085	897724-01360	Spring pin tool (4 mm)	28
569177	897726-16130	Oilseal tool (Magneto-side)	39
569181	897727-16130	Oilseal tool (Clutch-side)	39
569202	897827-16130	Pressure plate	39
569457	897740-16130	Isolator tool	35
569516	897800-79930	Spark tester	14
569527	DET-102	Tachometer	24
569726	897826-16131	Rubber plug (IN)	39
569973	897831-16131	Rubber plug (EX)	39
569995	897835-16131	Pressure connector	39
960315	900600-00010	Washer	18
990065	990510-00020	Pressure tester	23, 28, 39

7. Rotate starter reel counterclockwise a half turn to disengage the reel from recoil spring, and pull the reel out carefully.

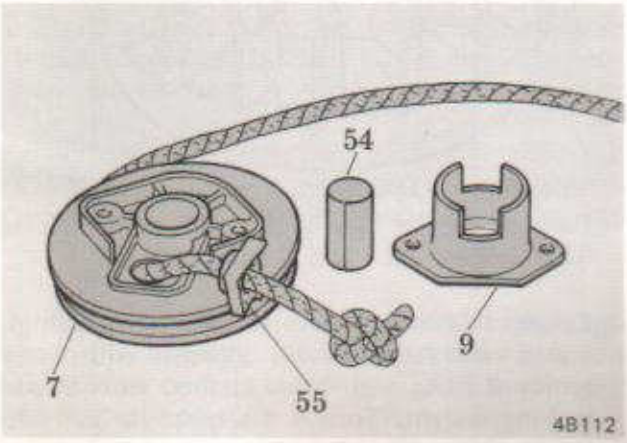
8. Inspect starter rope for damage or fraying, and proceed to replace it as follows.

– Remove starter rope from the reel.

– Remove pawl catcher 9 , bushing 54 , and clip 55 and replace if damaged or cracked.



– Heat both ends of a new starter rope to prevent fraying as shown, and lubricate the rope to reduce friction.



– Make a knot on one end of the rope and pass other end of the rope through clip and starter reel as shown.

– Install clip and pawl catcher with screws, and wind the rope clockwise as viewed from pawl catcher side.

9. Inspect rope guide and replace if damaged or cracked. Apply an adhesive when installing.

10. Inspect starter handle, washer, and inside of starter case and replace if damaged.

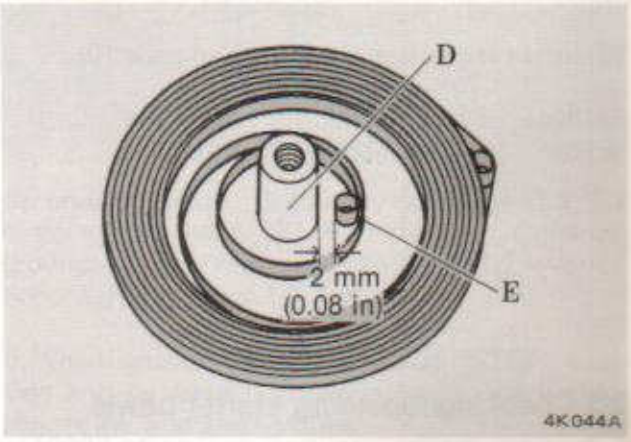
11. To replace recoil spring, proceed as follows.

– Draw outer plate 53 out, recoil spring 52 , and inner plate 51 .

– Inspect both side plates and replace if damaged or cracked.

– Install inner plate.

– Grease both sides of a new recoil spring and install the spring (clockwise from outer to inner) into starter case.



– Position inner loop end E as shown for easy installation of starter reel.

– Assemble outer plate on recoil spring.

12. Place starter reel ensuring that the reel engages well with recoil spring.

13. Apply grease on bushing and install to center post D of starter case.

14. Install the reel with washer 56 and screw 57 , and torque the screw to secure the reel to 80 ~ 90 kg-cm (70 ~ 80 in-lb).

15. Pass starter rope through rope guide, starter handle, and spacer and make a knot C (see illustration of 2-2-2 on page 10).

16. Draw starter rope out from the notch using needle nose pliers.

17. Ensuring that starter rope remains in the notch, rotate starter reel clockwise four turns and hold the reel in this position.

18. Pull starter handle to take up rope slack and retract it to rope guide.

19. With the rope fully extended, ensure that the reel can still be rotated manually half a turn clockwise.

20. Pull starter handle and check rope tension. If starter handle is not fully retracted, refer to 2-1 on page 10 to increase rope tension.

21. For inspecting starter pawls, go to 2-3 on this page.

22. Install starter case (see 2-1-9 on page 10).

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench

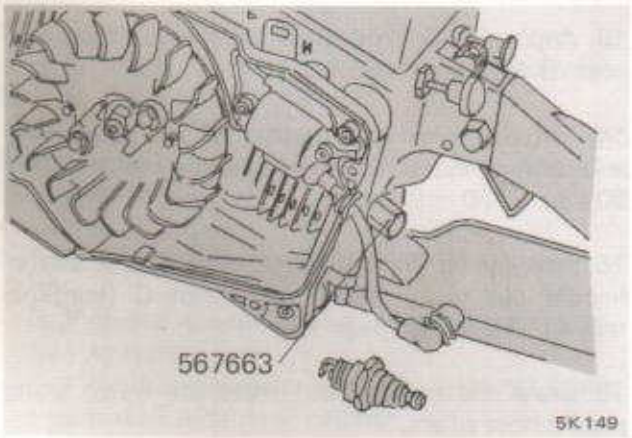
2-3 Checking/replacing starter pawls

1. Remove starter case using wrench 562811.

2. Inspect starter pawls and pawl springs on flywheel, and if damaged or fatigued, proceed to replace as follows.

– Pull rear plug cap out from spark plug.

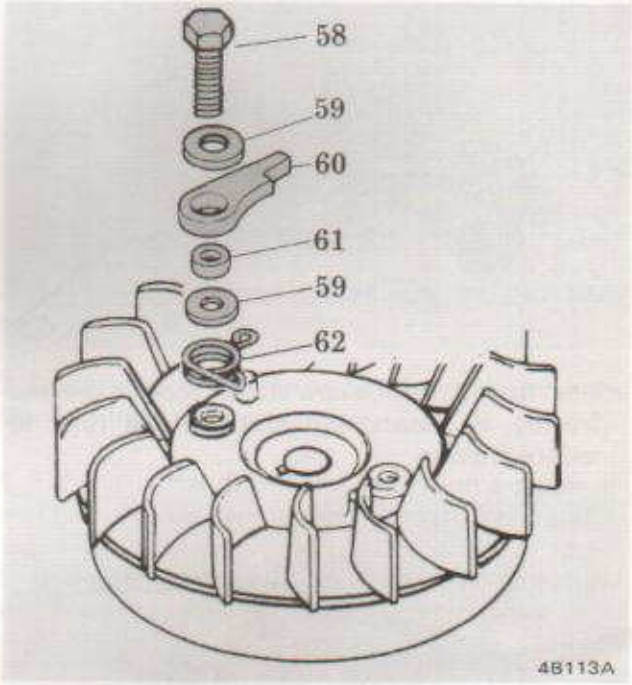
– Remove rear spark plug using plug wrench 562811 and install piston tool 567663 into plug hole.



NOTE: When piston tool 567663 is installed, rotate flywheel (or crankshaft) slowly until piston touches the tool. Then, tighten/loosen fastener gradually without using an air tool or other power tool. Otherwise, piston crown will be hit by the tool, and piston or con-rod can be damaged.

– Remove two bolts **58** securing starter pawls **60**.

NOTE: Bolts are tightened with a thread locking sealant. Do not apply sudden force when removing to avoid damage to bolts.



– Remove starter pawls together with spacers **61**, washers **59**, and pawl springs **62**.

– Taking care not to clamp new pawl springs, install new starter pawls together with other removed parts with bolts applied with thread locking sealant. Torque the bolts to 35 ~ 45 kg-cm (30 ~ 40 in-lb) and check the pawls for free movement.

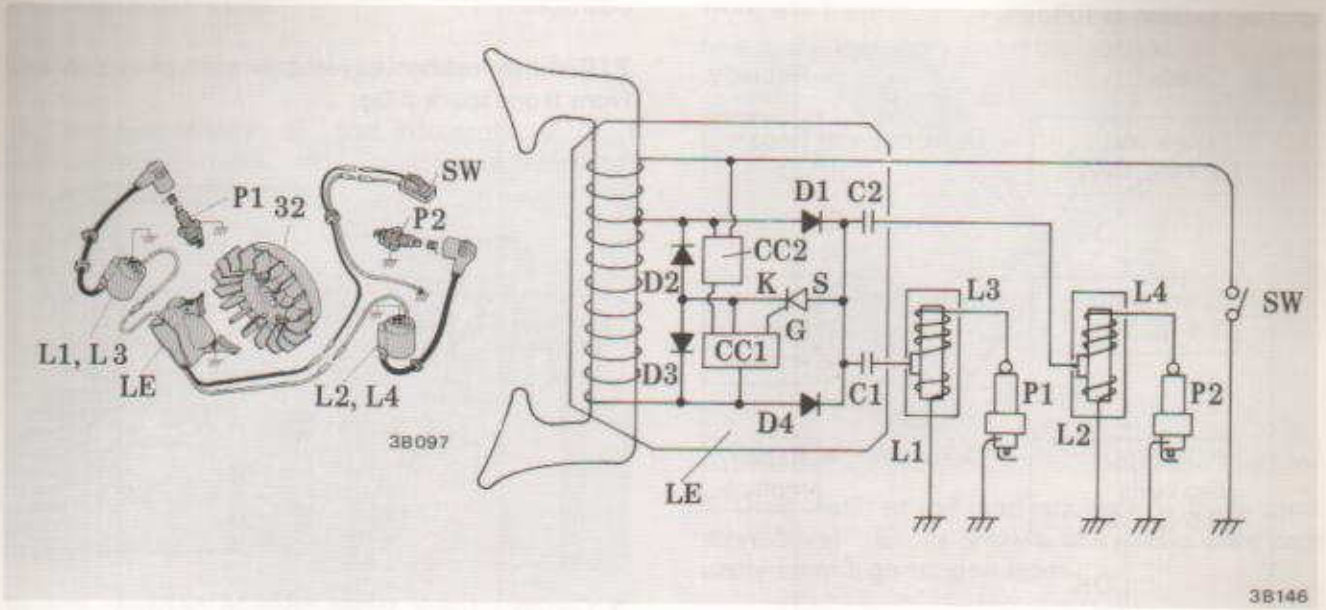
3. Remove piston tool 567663, and install spark plug using plug wrench 562811 and plug cap.

4. Install starter case (see 2-1-9 on page 10).

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
567663	897537-03930	Piston tool

3. IGNITION SYSTEM WITH S.A.I.S.

3-1 Construction and working principles



1. As flywheel rotates, and magnet passes by exciter coil **LE**, capacitor **C1, C2** are being charged.

Charging circuit: Exciter coil **LE** ⟹ Diode **D1** ⟹ Capacitors **C1, C2** ⟹ Primary windings **L1, L2** ⟹ Common grounds ⟹ Exciter coil **LE**

2. Flywheel rotates further and trigger current/voltage is applied to Gate **G** of thyristor **S**. Then, the thyristor **S** turns to conducting state.

Trigger circuit: Exciter coil **LE** ⟹ Control circuit **CC1** ⟹ Gate **G** of thyristor **S** Cathode **K** of thyristor **S** ⟹ Diode **D2** ⟹ Exciter coil **LE**

3. When thyristor **S** turns to conducting stage, energy is instantly discharged from capacitors **C1, C2** to primary windings **L1, L2** of front and rear ignition coils.

Discharging circuit: Capacitors **C1, C2** ⟹ Thyristor **S** ⟹ Diode **D3** ⟹ Common grounds ⟹ Primary windings **L1, L2** ⟹ Capacitors **C1, C2**

4. When energy is discharged to primary windings **L1, L2**, the primary voltages are transformed to high voltage at secondary windings **L3, L4**, and fire spark plugs **P1, P2** simultaneously through high-tension leads.

Secondary circuit: Secondary windings **L3, L4** ⟹ Spark plugs **P1, P2** ⟹ Common grounds ⟹ Primary windings **L1, L2** ⟹ Secondary windings **L3, L4**

5. When ignition switch **SW** is at "STOP" position and bypasses charging currents, spark plugs stop firing, and engine stops.

6. Other Diode **D4** is installed for protection of CDI module circuit.

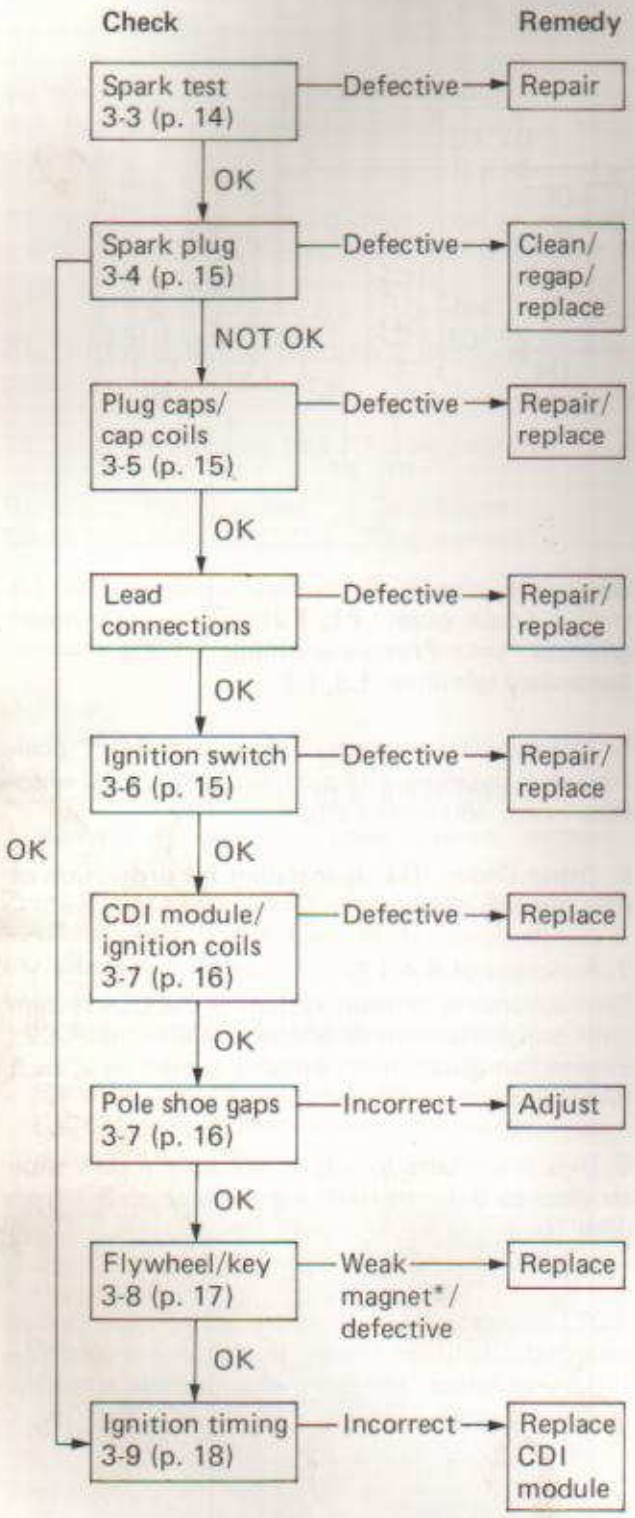
7. Function of S.A.I.S.
Step advancing ignition system is the CDI system with built-in automatic advancer **CC1** and **CC2**. Engine can obtain most suitable condition at each revolution.

8. It is important to adjust accurately pole shoe air gaps to 0.3 mm (0.012 in). Refer to 3-7-3 on page 16.

NOTE: Incorrect pole shoe air gap will advance or retard the ignition timing and change the engine R.P.M. at which the built in automatic advancer operates.

3-2 Troubleshooting chart

If the engine does not start, proceed to check ignition system as follows.

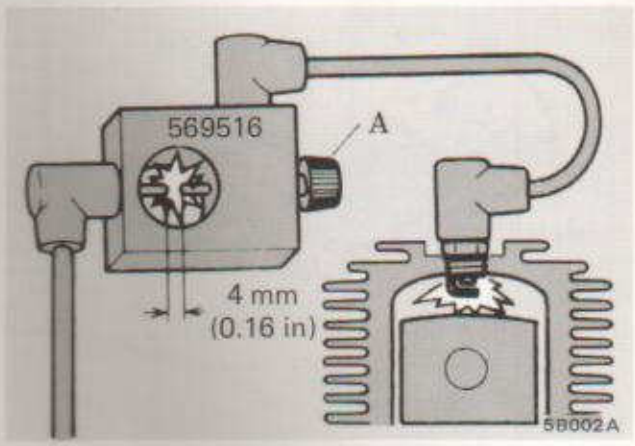


* To check for magnetic force, use a fluxmeter or bridge with a screwdriver comparing with a reliable flywheel.

3-3 Testing spark

1. Push ignition switch knob forward to "RUN" position.

2. Remove rubber cover and pull plug cap out from front spark plug.



3. Connect spark tester 569516 between one of the spark plugs and plug cap as shown.

4. Turn adjuster A of the tester clockwise until poles contact lightly and back counterclockwise four turns to set tester spark gap to 4 mm.

5. Pulling starter handle rapidly, test if crisp blue sparks jump at tester spark gap.

CAUTION: DO NOT TEST SPARK IN AN AREA WHERE GASOLINE IS SPILLED OR INFLAMMABLE GASES MAY EXIST TO AVOID AN HAZARDOUS ACCIDENT. BE CAREFUL, THE ENGINE MAY UNEXPECTEDLY START TO RUN WHEN TESTING WITH THIS SPARK TESTER.

6. Connect the tester 569516 between other spark plug and plug cap, and repeat to test spark as above step 5.

7. If spark is noticed, ignition system is considered good, and go to 3-4-2 ~ 9/3-9 on pages 15/18 to check spark plugs/ignition timing.

8. If no spark is observed, proceed to check ignition system (see 3-2 on this page).

9. Disconnect the tester 569516 and install plug caps and rubber cover.

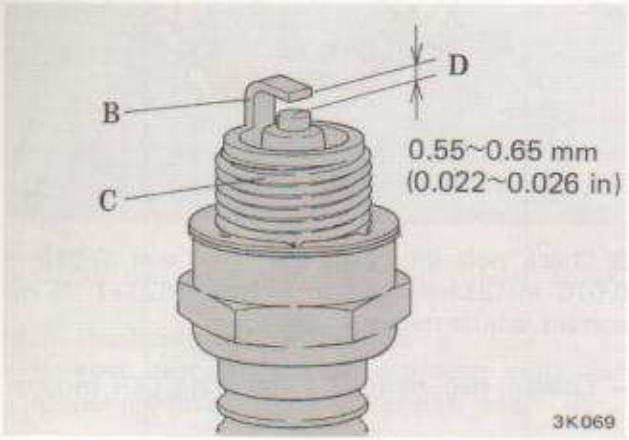
Ref/No.	Part Number	Tool Name
569516	897800-79930	Spark tester

3-4 Checking spark plugs

1. Remove rubber cover and pull both plug caps out from spark plugs.

2. Remove spark plugs using plug wrench 562811.

3. Clean electrodes **B** and insulators **C** if it appears black, sooty, wet, or carbon is deposited.



4. Check spark plug gaps **D** using magneto wrench 562111 and set the gap as shown bending outer electrode if the gap is incorrect.

5. Connect spark plugs to plug caps and ground spark plug hex. bodies to cylinders.

6. Push ignition switch knob forward to "RUN" position.

7. Pulling starter handle rapidly, check if sparks jump at spark plug gaps **D** (refer to **CAUTION** on page 14).

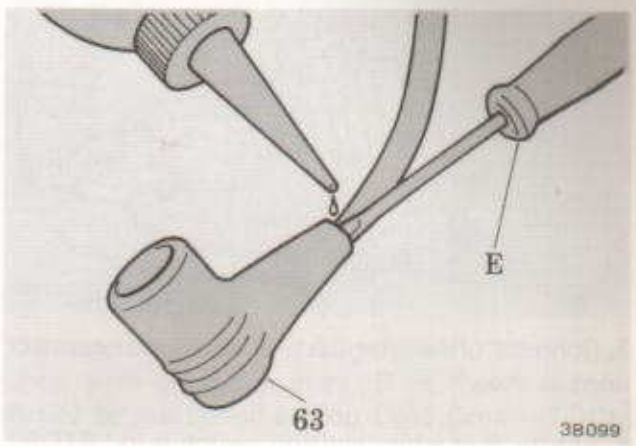
8. If no sparks are observed, replace with new spark plugs.

9. If sparks are noticed, install spark plugs, plug caps, and rubber cover.

Ref/No.	Part Number	Tool Name
562111	895115-00330	Magneto wrench
562811	895410-02830	Plug wrench

3-5 Checking plug caps/cap coils

1. Remove rubber cover and pull plug caps out from spark plugs.



2. Drop fuel or oil and squeeze with a small screwdriver **E** as shown to remove plug caps easily from high-tension leads.

3. Check connection of cap coils and high-tension lead, and repair or replace the coils if defective or damaged.

4. Inspect plug caps **63** and replace if damaged.

5. Apply fuel or oil into plug caps and insert cap coils together with high-tension leads to the caps using needle nose pliers.

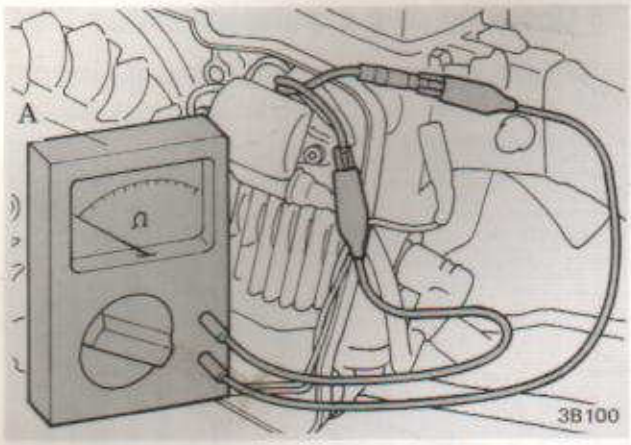
6. Install plug caps to spark plugs and rubber cover.

3-6 Checking ignition switch

1. Remove starter case using wrench 562811.

2. Disconnect the stop lead (black) coupler.

NOTE: When disconnecting/connecting stop lead coupler, use two needle nose pliers. Uncover coupler tube and hole one of pliers clamping firmly on terminal. Then, separate the coupler with another pliers to avoid damage to the lead.



3. Connect ohmmeter A to stop leads connections as shown.

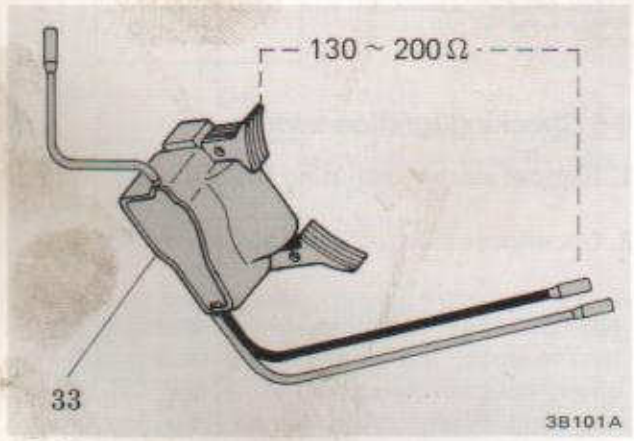
4. Ensure that when ignition switch is in "STOP" position, ohmmeter points to zero, and when the switch is in "RUN" position, the ohmmeter is pointing to infinity. Remove air cleaner cover and air filter, and replace ignition switch with a new one if defective.

5. Disconnect ohmmeter and connect ignition switch lead coupler (see **NOTE** on page 15). Install starter case (see 2-1-9 on page 10).

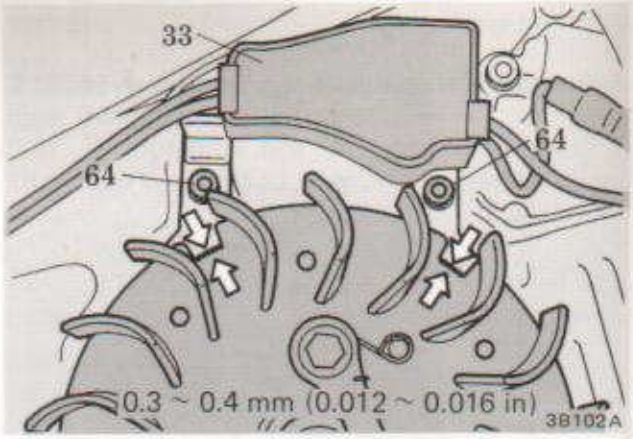
Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563625	895612-79920	L-wrench

3-7 Checking CDI module/pole shoe gaps/ ignition coils

1. Remove starter case using wrench 562811 and disconnect three lead couplers (see **NOTE** on page 15).



2. Measure exciter coil resistance of CDI module as shown. If the value stays out of range, remove flywheel (see 3-8 on page 17) and replace the module 33 using L-wrench 563625.



3. Check pole shoe gaps 0.3 ~ 0.4 mm (0.012 ~ 0.016 in) using magneto wrench 562111. If incorrect, adjust the gaps as follows.

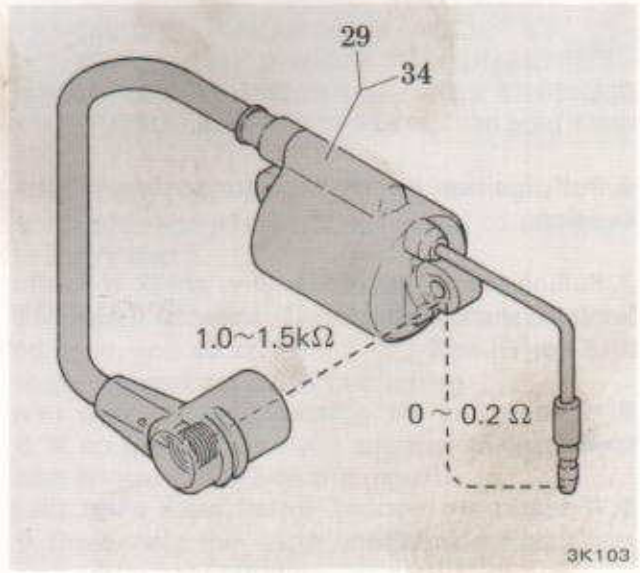
– Loosen two bolts 64 securing CDI module 33.

– Insert magneto wrench 562111 between flywheel and the module shoes.

– Allow the module to be pulled to flywheel with hand.

– Torque the bolts to 35 ~ 45 kg-cm (30 ~ 40 in-lb).

– Remove magneto wrench 562111.



4. Measure primary/secondary resistances of ignition coils 29, 34 as shown. If the values stay out of ranges, replace the coils as follows.

(4-1) Replacing front ignition coil

– Remove rubber cover and pull spark plug cap out from front spark plug.

– Remove spark plug cap from high-tension lead (see 3-5-2 on page 15), and cap coil.

– Remove bolts securing the coil using L-wrench 563625.

– Drop fuel or oil to rubber grommet and remove front ignition coil.

– Install a new ignition coil and torque the bolts to secure the coil to 35 ~ 45 kg-cm (30 ~ 40 in-lb).

– Install cap coil, plug cap, and rubber cover.

(4-2) Replacing rear ignition coil

– Remove rear spark plug cap, cap coil, and rubber grommet from high-tension lead.

– Remove bolts securing the coil using L-wrench 563625.

– Remove rear ignition coil and install a new one. Torque bolts to secure the coil 35 ~ 45 kg-cm (30 ~ 40 in-lb).

– Install rubber grommet, cap coil, and plug cap.

5. Inspect leads, connection, and couplers and repair if defective.

6. Connect three lead couplers (see to **NOTE** on page 15).

7. To check flywheel and Woodruff key, go to next 3-8 on this page.

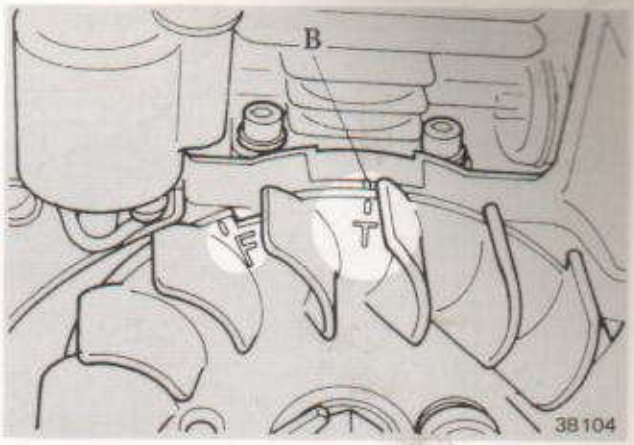
8. Connect spark plug caps to spark plugs and install starter case (see 2-1-9 on page 10).

Ref/No.	Part Number	Tool Name
562111	895115-00330	Magneto wrench
562811	895410-02830	Plug wrench
563625	895612-79920	L-wrench

3-8 Checking flywheel/Woodruff key

1. Pull rear plug cap out and remove rear spark plug using plug wrench 562811.

2. Remove starter case using wrench 562811.



3. Rotate flywheel and align mark "T" on flywheel with crankcase mark B as shown. Piston should be positioned at Top Dead Center (TDC).

– Confirm piston position through the rear spark plug hole of cylinder.

– Install piston tool to spark plug hole in cylinder.

– Then turn flywheel clockwise until locked, and mark the position of T mark on engine body. Turn flywheel counterclockwise and also mark T position on engine body.

– The distances from these two marks on engine body to center mark should be equal. This means that T mark position is correct.

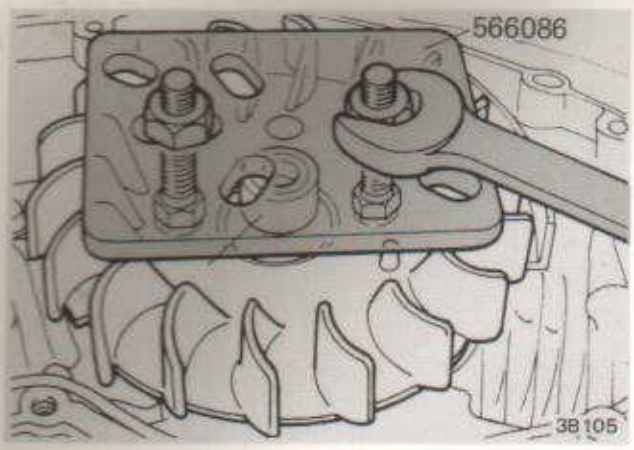
– If the distances are quite different, flywheel position is not correct due to sheared Woodruff key.

NOTE: Some of flywheels on this model have not F and T marks due to its different specification.

4. If not positioned, remove flywheel and Woodruff key to check them as follows.

– Install piston tool 567663 into plug hole.

– Remove starter pawls, pawl springs, spacers, and washers (see **NOTES** on page 12).



– Remove flywheel nut (right hand thread) and pull flywheel out using puller 566086 with spacer 567707 as shown.

– Inspect Woodruff key and replace if damaged. Sheared or missing Woodruff key will cause hard starting or lack of power due to a faulty ignition timing.

– Check for magnetic force (use fluxmeter or bridge with screwdriver comparing with a reliable one) and key way, and replace flywheel if defective or damaged.

5. Install flywheel and torque the nut to 330 ~ 370 kg-cm (285 ~ 320 in-lb).

6. Install pawl springs, washers, spacers, and starter pawls (see 2-3-2 on page 12).

7. To check ignition timing, go to next 3-9 on this page.

8. Remove piston tool 567663. Then, install spark plug and torque to 150 ~ 170 kg-cm (130 ~ 150 in-lb).

9. Install starter case (see 2-1-9 on page 10) and rear plug cap.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
566086	897501-03935	Puller
567663	897537-03930	Piston tool
567707	897540-03930	Spacer

3-9 Checking ignition timing

1. Remove starter case using wrench 562811 and disconnect plug cap from rear spark plug.

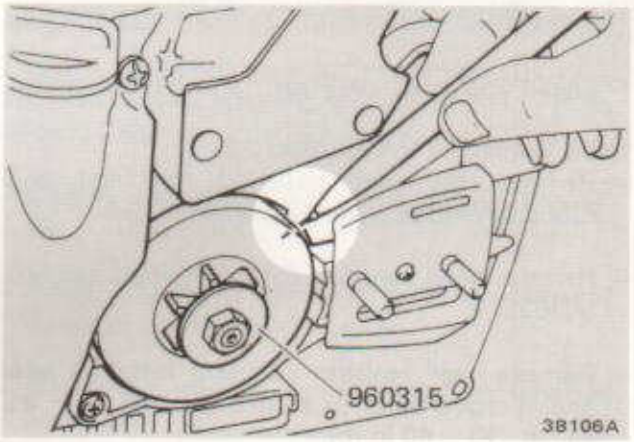
2. Remove rear spark plug using plug wrench 562811 and install piston tool 567663 into plug hole.

3. Remove sprocket guard, guide bar, saw chain, clutch nut (left-hand thread), and clutch washer and prepare washer 960315 (inner/outer diameter 10 mm/22 mm, thickness 1.5 mm).

4. Install washer 960315 for locking clutch drum to crankshaft clutch end, and torque the nut to 200 ~ 240 kg-cm (175 ~ 210 in-lb). Remove piston tool 567663.

5. Install spark plug and torque to 150 ~ 170 kg-cm (130 ~ 150 in-lb). Install plug cap.

6. Rotate flywheel to align mark "F" on flywheel with crankcase mark "B" (see 3-8-2 on page 17).



7. Put line with marking pen on clutch drum and brake cover as shown.

8. Install starter case (see 2-1-9 on page 10) and start engine.

9. Run engine and check if these lines are aligned using an ignition timing light (27°BTDC/7,000 r.p.m.).

10. If not aligned, replace CDI module.

11. Remove washer 960315 and install clutch washer, guide bar, saw chain, and sprocket guard.

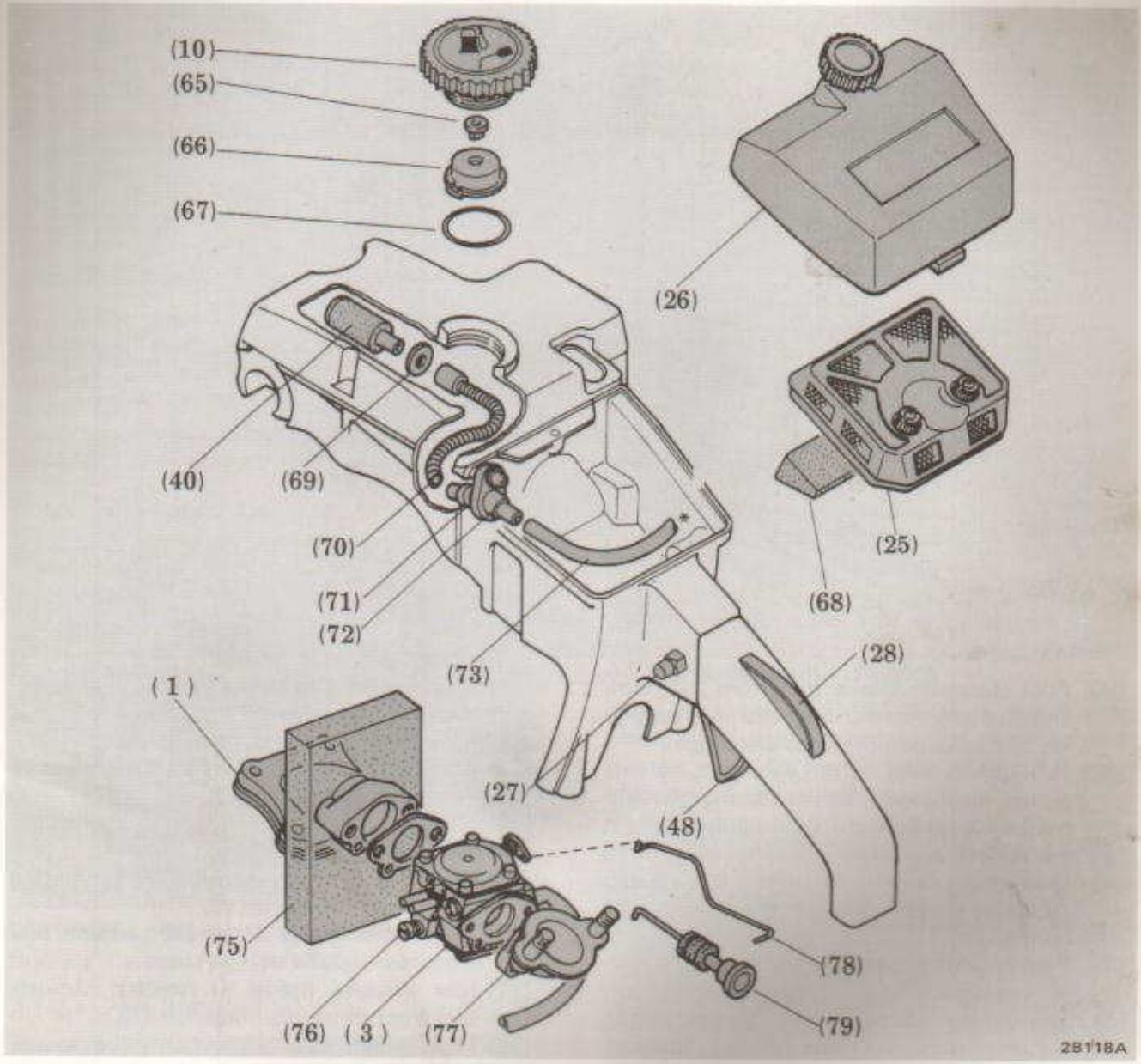
CAUTION: CONFIRM THAT CLUTCH DRUM ROTATES FREELY AFTER THE STEP 11. IF THE WASHER INSTALLED TO LOCK UP CLUTCH DRUM IS NOT REMOVED, THE SAW CHAIN RUNS AT ENGINE IDLE SPEED. REMOVE THE WASHER WITHOUT FAIL.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563625	895612-79920	L-wrench
960315	900600-00010	Washer

4. FUEL SYSTEM

4-1 Construction and working principles

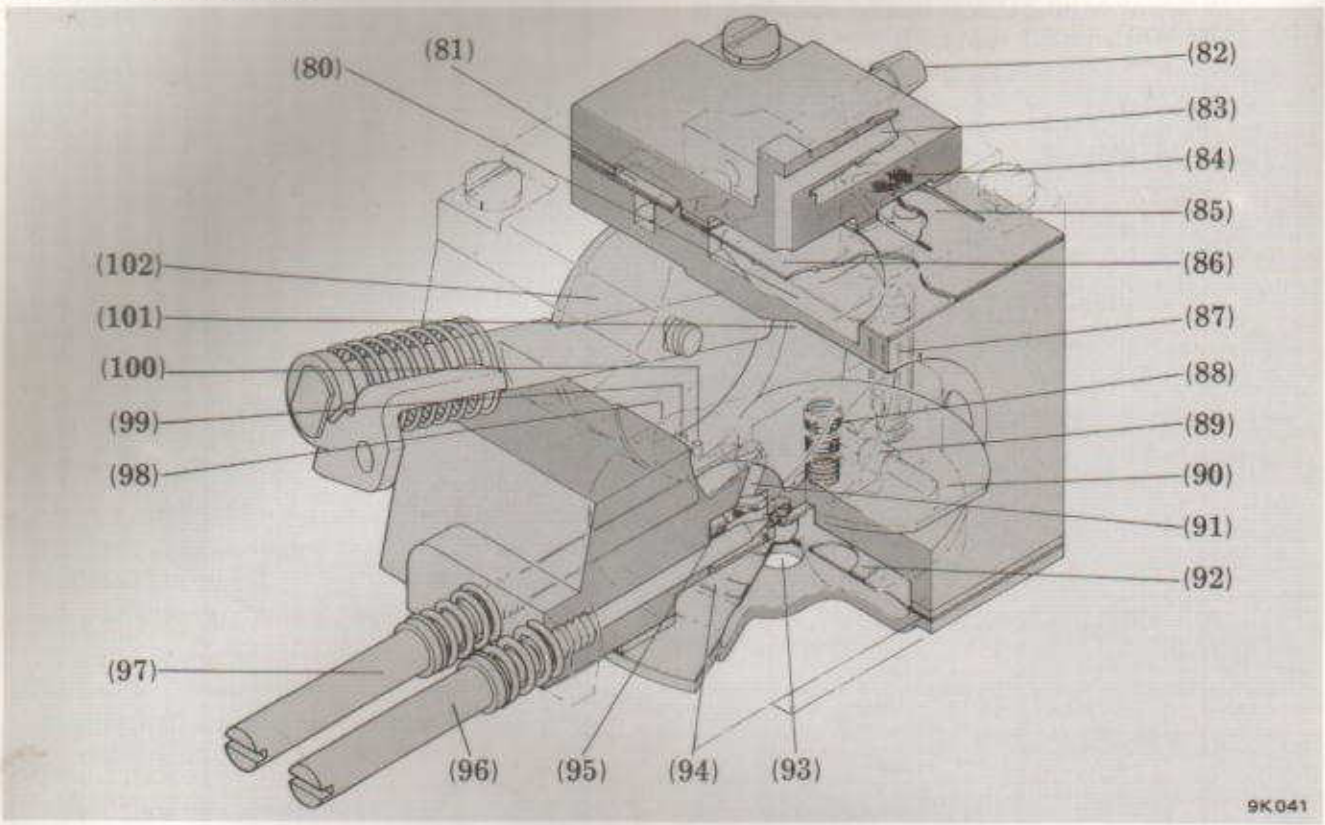
4-1-1 Fuel line



(10) Fuel cap
(65) Check valve
(66) Valve holder
(67) O-ring
(26) Air cleaner cover
(25) Air filter
(68) Sponge pad
(40) Fuel strainer
(69) Washer
(70) Inner fuel pipe
(71) O-ring
(72) Pipe connector
(73) Outer fuel pipe
(27) Throttle latch
(28) Throttle control lockout
(48) Throttle trigger
(1) Reed valve ass'y
(75) Sponge gasket
(76) Idle speed screw
(3) Carburetor
(77) Carburetor elbow
(78) Throttle rod
(79) Choke control rod

4-1-2 Diaphragm carburetor

4-1-2-1 Nomenclature



(80) **Fuel chamber:** Draws fuel from fuel tank and discharges to metering chamber according to fluctuation of pump diaphragm.

(81) **Fuel pump inlet valve:** Responds to fuel pump diaphragm. Opens during vacuum pulses. Closes during pressure pulses.

(82) **Fuel inlet:** Draws fuel from fuel tank.

(83) **Crankcase pulse:** Actuates fuel pump diaphragm with alternating pressure-vacuum pulses.

(84) **Fuel screen:** Filters fuel en route to metering chamber.

(85) **Fuel pump outlet valve:** Closes during vacuum pulses. Opens during pressure pulses.

(86) **Fuel pump diaphragm:** Fluctuates in response to crankcase pulses.

(87) **Inlet needle valve:** Lifts off seat to allow fuel to enter into metering chamber.

(88) **Metering lever spring:** Transmits force to metering lever. Closes inlet needle valve as metering chamber is filled.

(89) **Metering lever:** Lifts inlet needle valve out of seat.

(90) **Choke shutter:** Blocks air entry, and enriches air-fuel mixture for starting purpose.

(91) **Main nozzle:** Discharges fuel for high speed.

(92) **Metering chamber:** Fuel reservoir, feeds fuel to idle holes and main nozzle.

(93) **Atmospheric vent:** Gives ambient pressure to metering diaphragm.

(94) **Metering diaphragm:** Drawn up by vacuum to activate metering lever.

(95) **Nozzle screen:** Prevents air from entering main nozzle at idle speed.

(96) **High speed needle (H-needle):** Adjusts fuel from main nozzle at high speed.

(97) **Idle mixture needle (L-needle):** Adjusts fuel from three idle holes.

(98) **Primary idle hole:** Allows only fuel source to feed fuel to engine at idle.

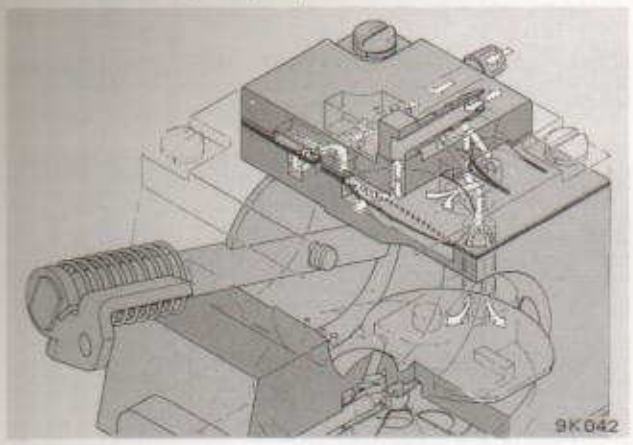
(99) **Secondary idle hole:** Allows additional fuel flow on acceleration.

(100) **Third idle hole:** Increases fuel flow at part throttle.

(101) **Venturi:** Increases air velocity at nozzle, creating a depression at the main nozzle.

(102) **Throttle valve:** Regulates engine speed as it exposes primary, secondary and third idle holes, then main nozzle for fuel delivery.

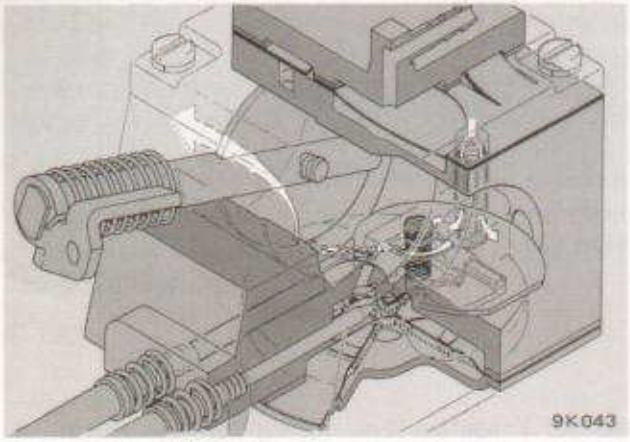
4-1-2-2 Fuel pump operation



Fuel flow (when vacuum pulse draws fuel pump diaphragm up): Fuel tank ⟹ Fuel inlet ⟹ Inlet valve ⟹ Fuel chamber

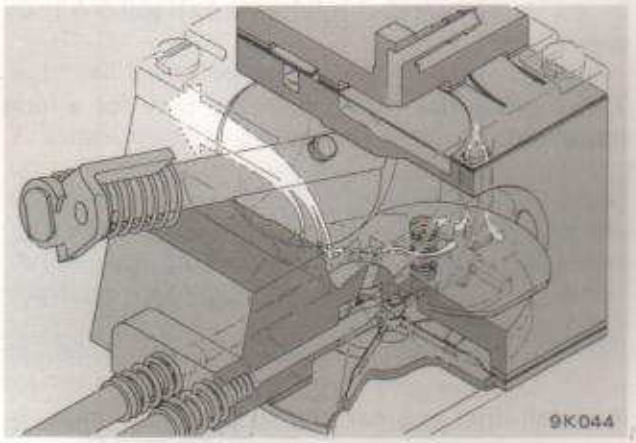
Fuel flow (when pressure pulse pushes fuel pump diaphragm down): Fuel chamber ⟹ Outlet valve ⟹ Fuel screen ⟹ Inlet needle valve

4-1-2-3 Idle speed fuel flow



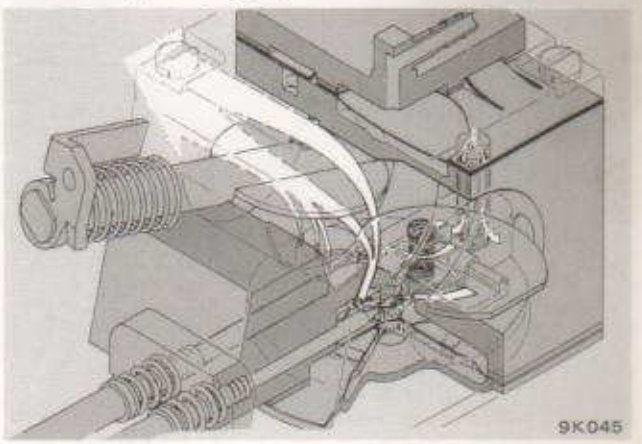
Inlet needle valve ⟹ Metering chamber ⟹ Primary idle hole ⟹ Crankcase

4-1-2-4 Part throttle fuel flow



Inlet needle valve ⟹ Metering chamber ⟹
- ⟹ Primary idle hole
- ⟹ Secondary idle hole ⟹ Crankcase
- ⟹ Third idle hole

4-1-2-5 Operating speed fuel flow

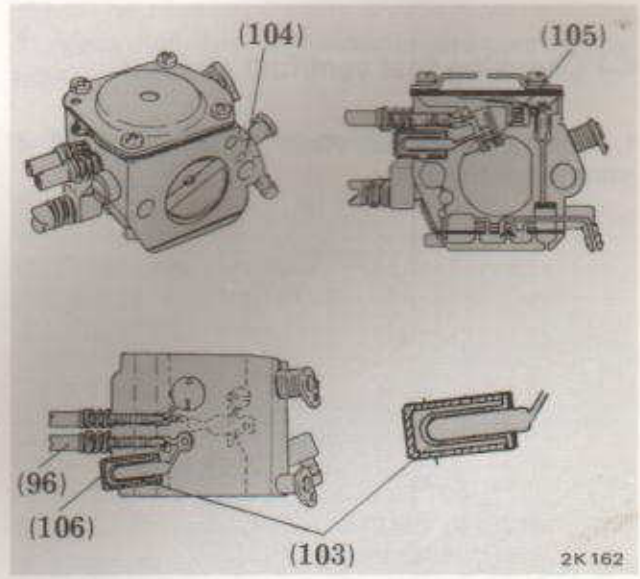


Inlet needle valve ⟹ Metering chamber ⟹
- ⟹ Main nozzle
- ⟹ Primary idle hole
- ⟹ Secondary idle hole ⟹ Crankcase
- ⟹ Third idle hole

Surface of body Section

4-2 Carburetor with bleeder

Carburetor used on CST-610EVL has bleeder which is activated with crankcase pulsation when throttle valve is widely opened to improve acceleration.

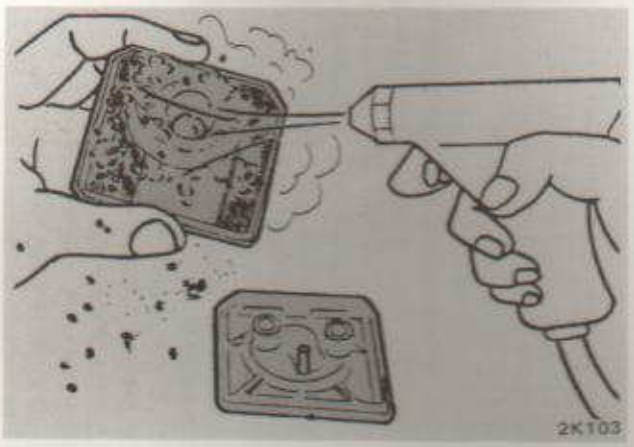


(103)	Bleeder	(106)	Plug
(104)	Pulse hole	(96)	H-needle
(105)	Main nozzle		

4-3 Checking air cleaner

1. Pull choke control knob out to prevent dust entering carburetor.

2. Remove air cleaner cover and air filter **25**.



3. Separate the filter and clean with compressed air or wash in a suitable solvent if blocked with dust and/or dirt. Dry completely before installing.

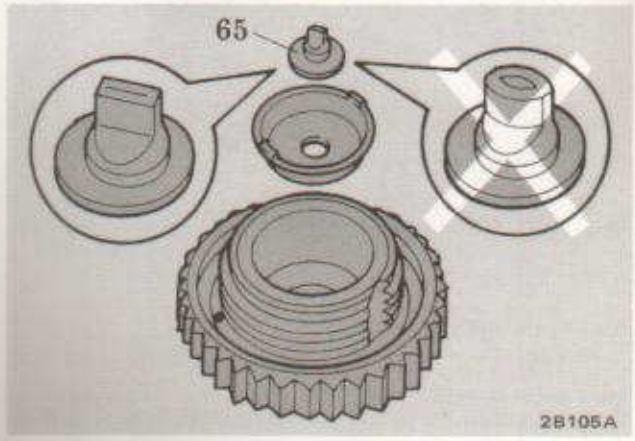
CAUTION: WEAR EYE PROTECTION DURING USE OF COMPRESSED AIR.

4. Replace the filter if damaged or heavily soiled.

5. To check leakage from fuel line/repair carburetor, go to 4-5/4-8 on pages 23/25.

6. Install air filter and air cleaner cover.

NOTE: Check valve allows air to enter into the tank as fuel in the tank is consumed. If check valve is blocked with dust, the engine will stall eventually.



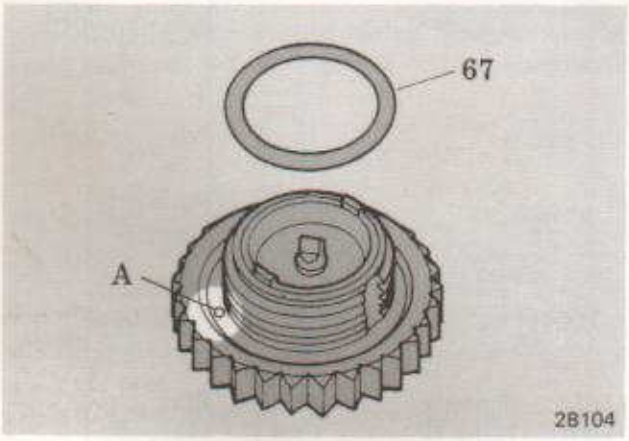
3. Inspect check valve **65** and replace if deformed as shown.

4. Pull fuel strainer out from fuel tank using a wire hook.

NOTE: Do not pull fuel strainer out with force to avoid the pipe disconnecting at the other end and damage.

4-4 Checking fuel vent/fuel strainer

1. Remove fuel cap ass'y and replace O-ring **67** if damaged or hardened.



2. Check vent **A** and clean if blocked with dust.

5. Clean fuel strainer if blocked with dirt and/or water, and replace if damaged.

6. Always use fresh, clean, and good quality fuel in the recommended mixing ratio (see 1-4-1 on page 5).

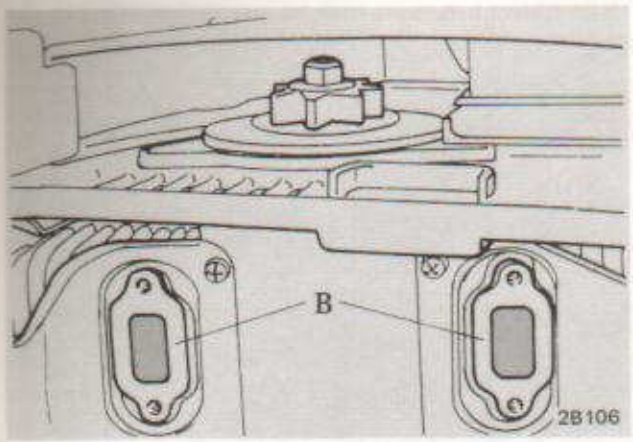
7. If the fuel has been left in the tank for a long time, refill it with fresh fuel.

CAUTION: HANDLE FUEL SAFELY AND MIX FUEL AND OIL OUTDOORS. AVOID OVERFILLING AND WIPE AWAY ANY SPILLED FUEL. DO NOT SMOKE WHEN REFUELING.

8. Install fuel strainer and fuel cap to the tank.

4-5 Checking muffler/exhaust ports

1. Remove front handle, front cover, starter case, bottom supporter, muffler, and muffler gasket using plug wrench 562811/L-wrench 563522.



2. Inspect cylinder exhaust ports B and clean the ports using a wooden stick or the likes if carbon is deposited.

NOTE: When cleaning the ports, position pistons at Top Dead Center (TDC) to prevent loose carbon from entering cylinder. Do not use a metal tool and be careful not to scratch piston.

3. Inspect inlet/outlet ports of muffler and clean if carbon is deposited. Replace with a new muffler if damaged.

4. Inspect muffler gasket and replace if broken or damaged.

5. Remove muffler lid, lid gasket, and spark arrester screen and clean or replace if carbon is deposited or damaged.

6. Install the screen, gasket, and lid.

7. Install muffler gasket and muffler, and torque bolts to secure muffler to 80 ~ 100 kg-cm (70 ~ 90 in-lb).

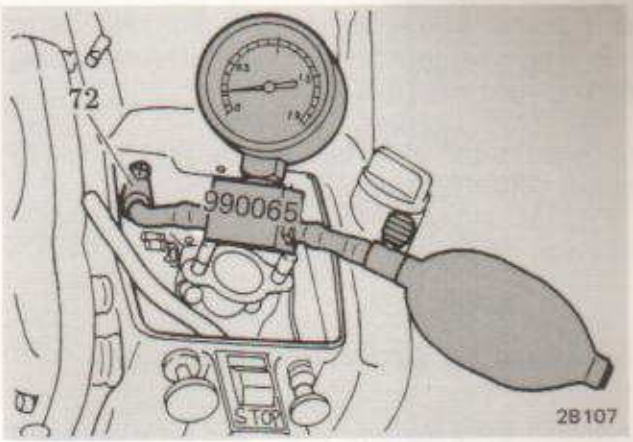
8. Install bottom supporter, starter case (see 2-1-9 on page 10), front cover, and front handle.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563522	895610-79920	L-wrench

4-6 Checking leakage from fuel line

1. Remove air cleaner cover and air filter.

2. Disconnect fuel pipe from pipe connector 72.



3. Connect pressure tester 990065 to pipe connector as shown and install fuel cap.

4. Apply pressure approx. 0.2 kg/cm^2 (3 psi) by hand pumping. Gauge should show constant pressure.

CAUTION: WEAR EYE PROTECTION DURING USE OF PRESSURE TESTER.

5. If gauge does not show constant pressure, replace pipe connector or O-ring.

6. Remove pressure tester 990065.

7. Apply fuel to pipe connector and connect fuel pipe.

8. To repair carburetor, go to 4-8 on page 25.

9. Install air filter and air cleaner cover.

Ref/No.	Part Number	Tool Name
990065	900510-00020	Pressure tester

4-7 Checking if fuel reaches cylinder

1. Remove rubber cover and pull plug caps out.

2. Remove spark plugs using plug wrench 562811 and place your thumb over one of the plug holes.

3. Pull starter handle several times at full throttle (throttle latch can be used), and the thumb should be wet. (Fuel has reached cylinder, and this means that fuel conductivity system is considered good.)

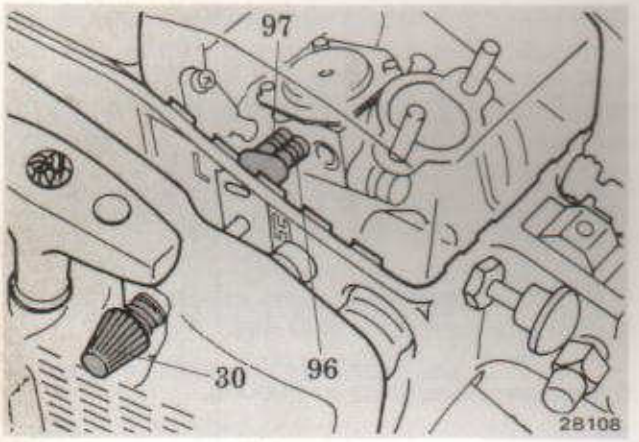
4. If dry (shortage of fuel suction), proceed to adjusting/repairing carburetor and its surrounding parts in next steps 4-7/4-8.

5. Install spark plugs and torque to 150 ~ 170 kg-cm (130 ~ 150 in-lb).

6. Install rubber cap.

4-8 Adjusting diaphragm carburetor

1. Install guide bar, saw chain, and sprocket guard using plug wrench 562811.



2. Turn L-needle **97** /H-needle **96** clockwise until lightly seated and back both needles out one turn.

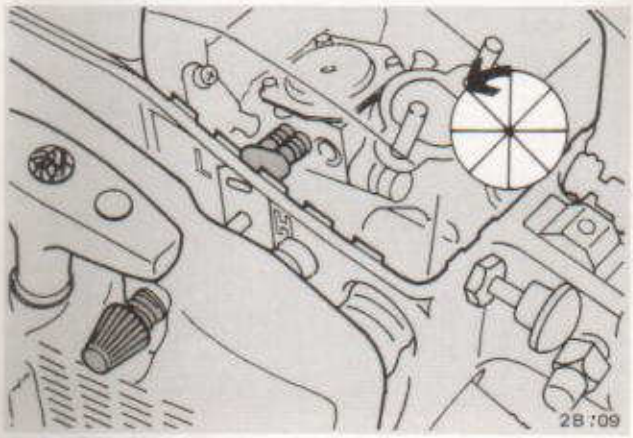
3. Engage idle speed screwdriver **30** to idle speed screw, and turn the driver clockwise until lightly seated. Then, back the driver two turns.

4. Start engine and turn idle speed screwdriver counterclockwise until saw chain stops running when throttle trigger is released.

5. Run engine at low speed for a few minutes to warm it up.

6. Turn idle speed screwdriver to obtain maximum consistent idle speed and rotate L-needle counterclockwise to obrain smooth acceleration.

7. Readjust idle speed screwdriver if saw chain runs.



8. Turn H-needle counterclockwise 1/8 turn from the maximum high speed position.

CAUTION: NEVER OPERATE THE ENGINE IN AN UNVENTILATED ROOM. SINCE EXHAUST EMISSIONS CONTAIN TOXIC SMOKE SUCH AS CARBON MONOXIDE.

NOTE: Do not run the engine at high speed longer than 5 seconds to avoid damage to engine. When carburetor is adjusted too lean, engine may be overheated or stop and too rich adjustment may cause engine stop.

9. Tighten saw chain if loose and sharpen saw cutters if dull (see Operator's Manual).

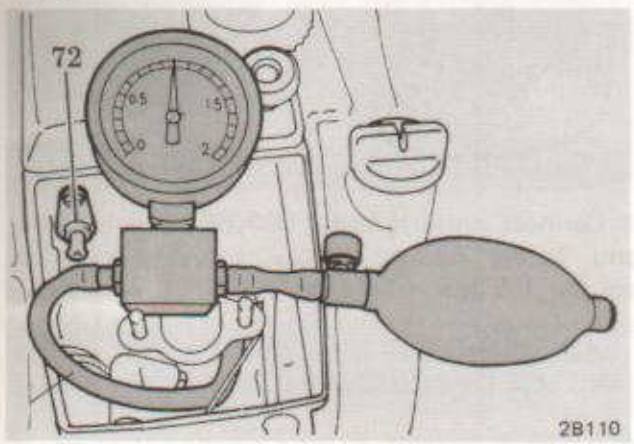
10. Wear safety footwear, groves, snugfitting clothing, and eye, ear, and head protection devices and practice cutting some timber. Check idle/operating speeds using tachometer 569527.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
569527	DET-102	Tachometer

4-9 Repairing diaphragm carburetor/reed valve/throttle control

1. Remove air cleaner cover and air filter.

2. To check leakage of fuel pipe and pump chamber, proceed as follows.



– Pull fuel pipe 73 out from pipe connector 72 and connect pressure tester 990065 to the pipe as shown.

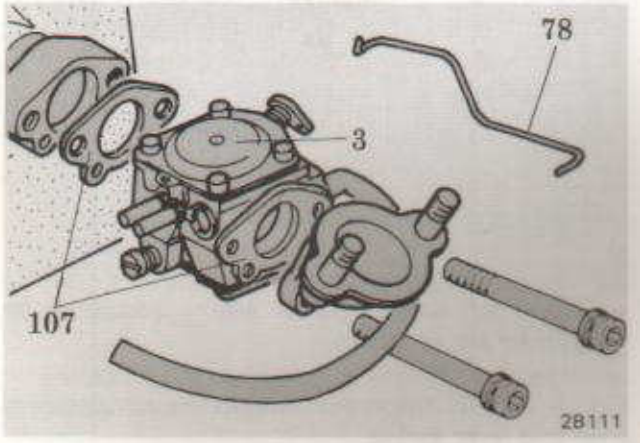
– Apply pressure to approx. 1.0 kg/cm² (14 psi) by hand pumping.

CAUTION: WEAR EYE PROTECTION DURING USE OF PRESSURE TESTER.

– Pressure gauge should show constant pressure (only a slight "leakdown" is permissible).

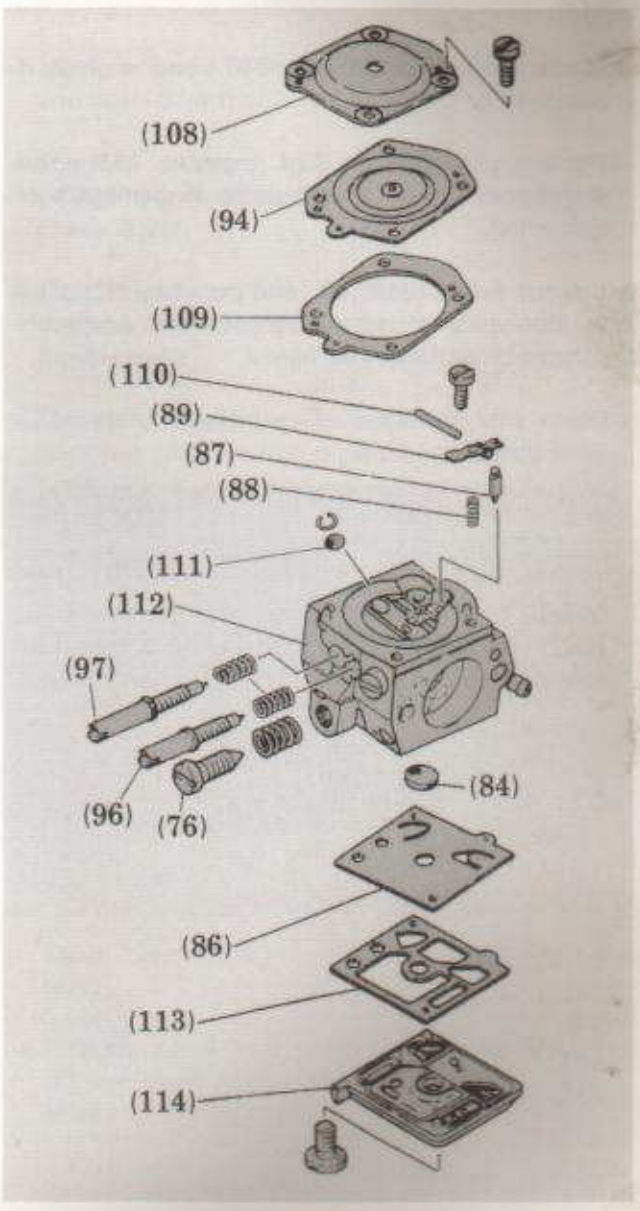
– If the pressure does not hold constantly, check the fuel pipe and replace if damaged, and go to next step to repair carburetor.

3. Repair diaphragm carburetor as follows.



– Remove carburetor 3 together with its mounting parts.

Part identification



(108)	Metering cover
(94)	Metering diaphragm
(109)	Metering gasket
(110)	Lever shaft
(89)	Metering lever
(87)	Inlet needle valve
(88)	Metering lever spring
(111)	Plug
(112)	Carburetor body
(97)	L-needle
(96)	H-needle
(76)	Idle speed screw
(84)	Fuel screen
(86)	Pump diaphragm
(113)	Pump gasket
(114)	Pump cover

– Disconnect choke control rod/throttle rod **78** from carburetor.

– Check carburetor gasket **107** and replace if damaged or broken.

– Remove pump cover **114** , gasket **113** , and diaphragm **86** and replace if damaged or deformed.

– Inspect fuel screen **84** and pry it out if soiled or blocked with dust. Then, wash in a suitable solvent or replace if damaged.

– Clean fuel passages of carburetor body **112** with compressed air.

CAUTION: WEAR EYE PROTECTION DURING USE OF COMPRESSED AIR.

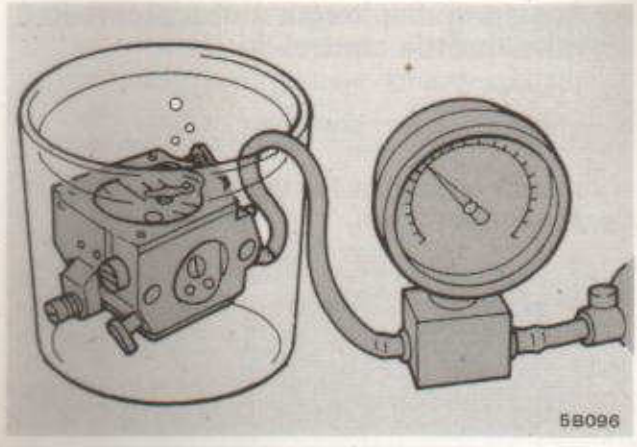
– Install fuel screen (use an end of 7 mm or 9/32" dia. steel rod for installing a new fuel screen), pump diaphragm, gasket, and cover.

4. Retest by following the same procedure as step 4-8-2 on page 25. If gauge still does not hold constant pressure, inlet needle valve **87** may be defective (see 4-8-10 on this page).

5. Remove metering cover **108** , diaphragm **94** , and gasket **109** .

6. Check metering diaphragm and gasket, and replace if damaged, deformed, or improperly assembled.

7. Remove L-needle **97** /H-needle **96** and replace if rusty, worn out, or damaged.



8. Connect pressure tester 990065 to carburetor, and locate leaking places applying pressure approx. 0.5 kg/cm² (7 psi).

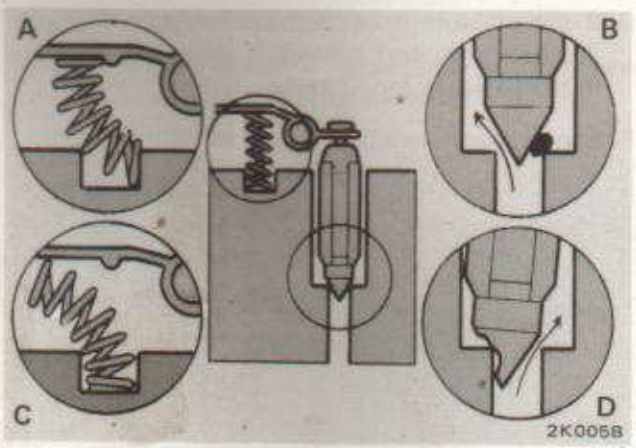
CAUTION: WEAR EYE PROTECTION DURING USE OF PRESSURE TESTER.

9. If any leakage from inlet needle valve **87** is noted, proceed to repair as follows.

– Remove carefully metering lever **89** together with lever shaft **110** , lever spring **88** , and inlet needle valve.

– Clean fuel passages of carburetor body **112** with compressed air.

CAUTION: WEAR EYE PROTECTION DURING USE OF COMPRESSED AIR.



– Causes of fuel overflow from carburetor to cylinder are as shown.

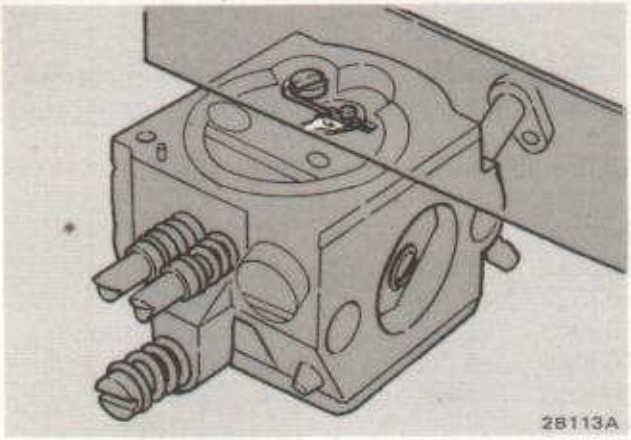
Fig. A and C: Improper assembling of metering lever and lever spring.
Fig. B: Dirt or dust at seat of inlet needle valve
Fig. D: Worn inlet needle valve rubber tip

– When inlet needle valve is sticking at the seat, fuel flow will be restricted.

– Inspect nozzle screen and clean if soiled or blocked with dust.

– Install inlet needle valve, lever spring, metering lever together with lever shaft. Make sure that lever spring is seated under dimple of metering lever and in its hole at chamber floor, and metering lever is hooked with inlet needle valve.

11. Check metering lever height as follows.



– Place a straight edge as shown, and metering lever should just contaot straight edge. If not, gently bend the lever end up or down to correct it.

NOTE: When metering lever level is:
too high ⇨ fuel overflow/flooding
too low ⇨ fuel-starvation/overheating

– Retest leaking from inlet needle valve (see 4-8-9 on page 26).

– Install L/H needles, metering gasket, diaphragm, and cover.

– To install carburetor and its mounting parts, go to 4-8-18 on page 28.

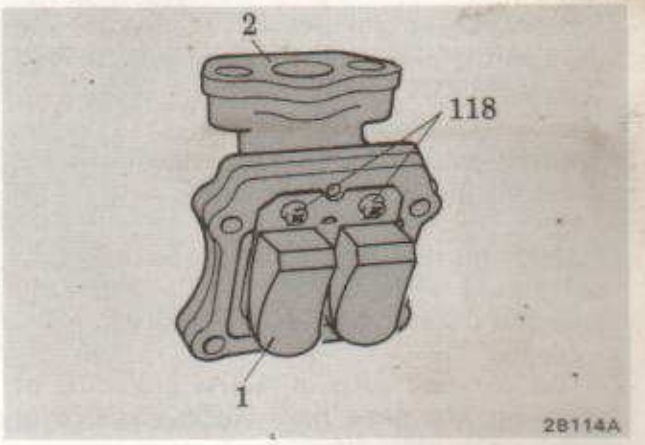
12. To check reed valve ass'y 1 , remove surrounding parts as follows.

– Remove front handle, front cover, starter case, and auto-oiler dial.

– Remove sprocket guard using plug wrench 562811, guide bar, saw chain, inner pad, and brake cover.

– Disconnect stop lead connections and remove manual oiler ass'y, return spring, and rear handle ass'y.

– Loosen oil pipe nut and remove reed valve ass'y together with suction pipe 2 and gaskets.



– Clean dust or dirt if it lifts reeds off from the seat.

– Inspect reeds and reed seating surface, and replace reed valve ass'y if cracked, warped, worn, or damaged.

– Inspect suction pipe and replace if cracked or defective.

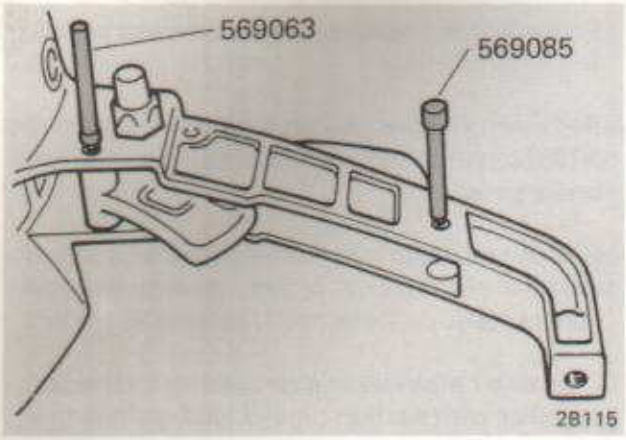
– Torque two screws 115 securing reeds to retainer to 8 ~ 12 kg-cm (7 ~ 10 in-lb) if loosened.

– Inspect gaskets and replace if damaged.

– Install reed valve ass'y and torque four screws applied thread locking sealant to 40 ~ 45 kg-cm (35 ~ 40 in-lb).

13. To repair manual oiler and its pipings, go to 5-5 on page 32.

14. If throttle control parts are defective, replace as follows.



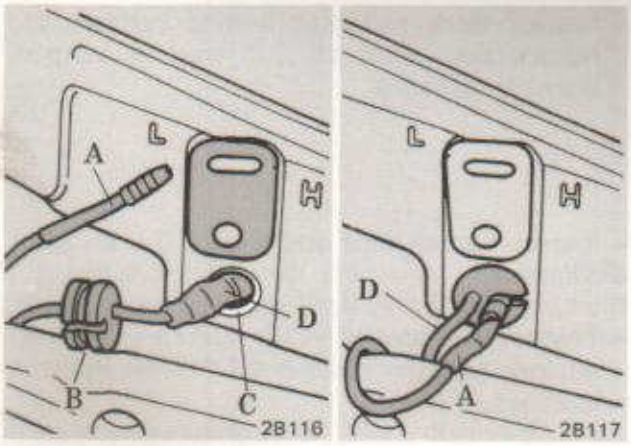
– Remove rubber grip (see 7-1 on page 35) and drive spring pins out using pin tools 569063 (5 mm)/569085 (4 mm).

NOTE: Place supporting base underneath of rear handle to protect it from damage.

– Inspect throttle trigger, throttle control lock-out, return spring, and throttle latch and replace if cracked, fatigued, or damaged.

– Install removed parts in reverse procedure of removing. Use same tools 569063/569085 to install spring pins.

– Install rubber grip applying an adhesive.



15. Pass stop lead through grommet mounted in rear handle as follows.

– Pass stop lead black A through hole C.
– Mount grommet B to the hole.
– Pass stop lead white A through grommet B.
– Connect stop leads A, D to the stop leads connections.

16. Connect oil pipe nut and install rear handle ass'y, manual oiler ass'y, brake cover, inner pad, guide bar, saw chain, and sprocket guard using plug wrench 562811.

17. Install starter case (see 2-1-9 on page 10), front cover, auto-oiler dial (see 5-4-9 on page 32), and front handle.

18. Connect choke/throttle rods to carburetor and install carburetor together with its mounting parts using L-wrench 563522. Torque bolts to secure carburetor to 45 ~ 55 kg-cm (40 ~ 50 in-lb).

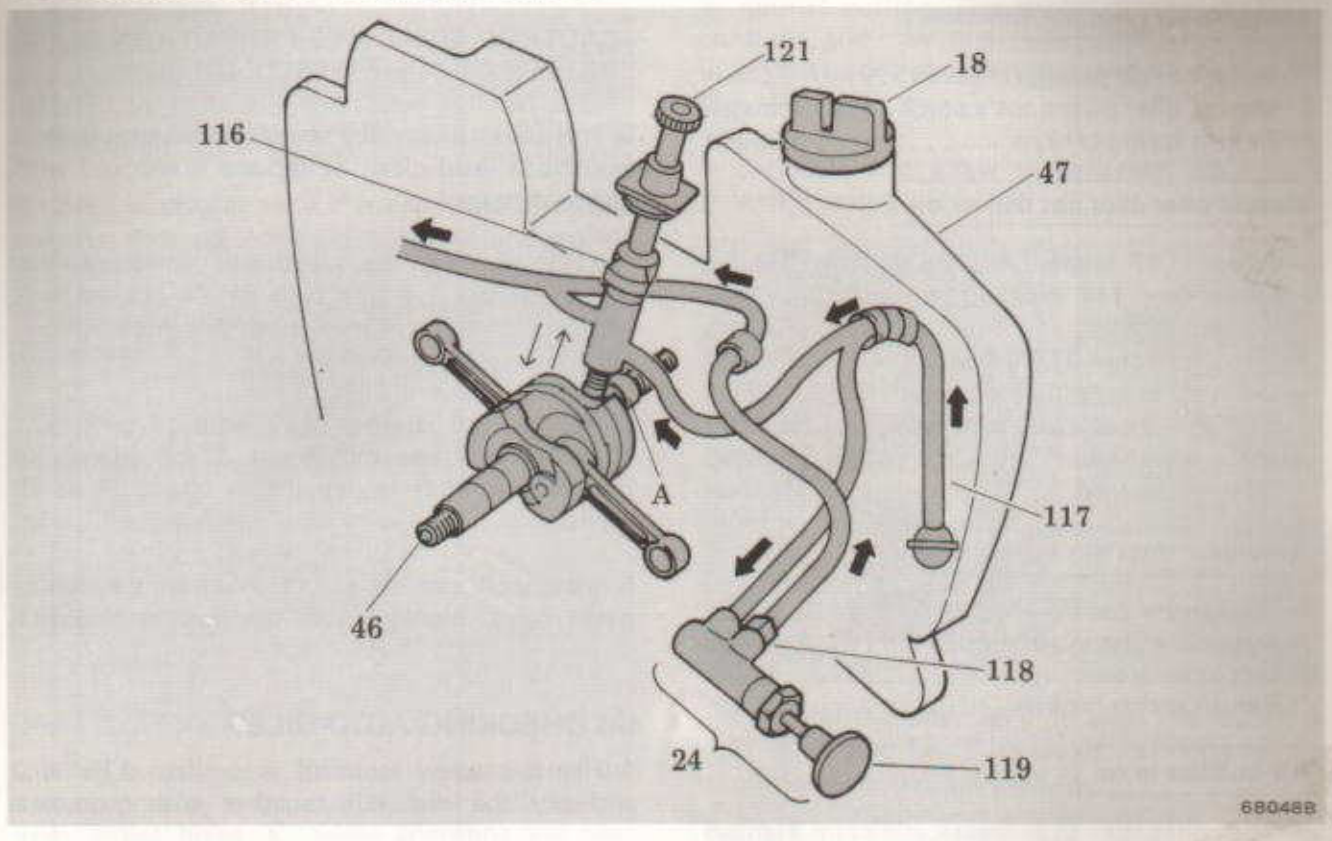
NOTE: Ensure that crankcase pulse passage is not blocked by improper installing.

– Check throttle trigger for smooth movement and connect outer fuel pipe to pipe connector.

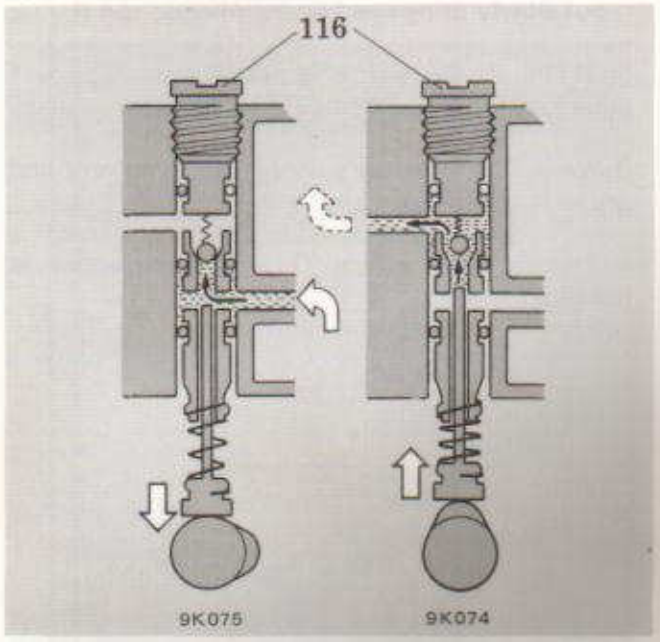
19. Install air filter and air cleaner cover.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563522	895610-79920	L-wrench
569063	897724-02830	Spring pin tool
569085	897724-01360	Spring pin tool
990065	990510-00020	Pressure tester

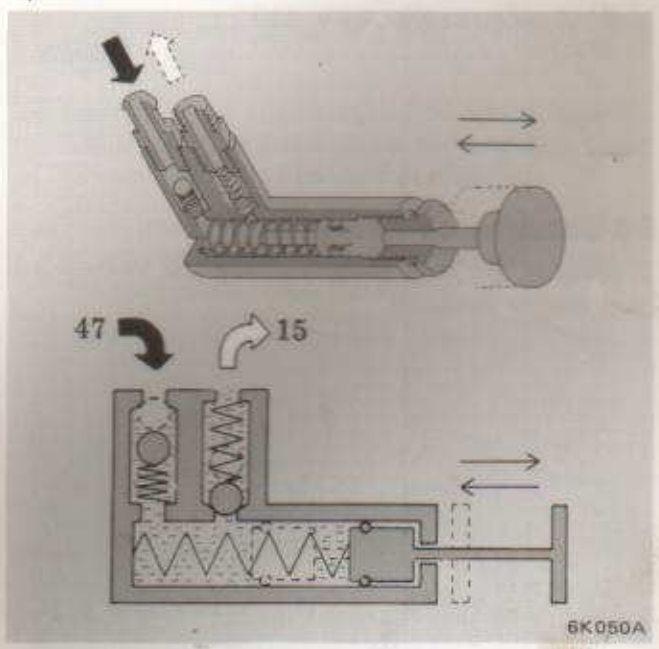
5. LUBRICATION SYSTEM
5-1 Construction and working principles



Operation of auto-oiler



Operation of manual oiler



(116) Auto-oiler ass'y
(18) Oil cap ass'y
(47) Oil tank
(117) Oil strainer
(118) Pipe connector

(119) Manual oiler knob
(24) Manual oiler ass'y
(A) Cam
(46) Crankshaft
(15) Guide bar/saw chain

5-2 Troubleshooting chart

Manual oiler does not function

- Guide bar oil passage blocked . . . . . Clean
- Manual oiler piston ass'y stuck . . . . . Reinstall
- Return spring broken . . . . . Replace

Manual oiler does not deliver oil

- Oil tank 47 empty . . . . . Refill
- Oil strainer 117 blocked . . . . . Clean
- Oil vent blocked . . . . . Clean
- Pipe connector 118 loose . . . . . Tighten
- Oil inlet/outlet pipe blocked . . . . . Clean
- Ball valve installation incorrect . . . . . Reinstall
- Valve ball stuck . . . . . Reinstall
- O-rings damaged . . . . . Replace

Auto-oiler does not deliver oil

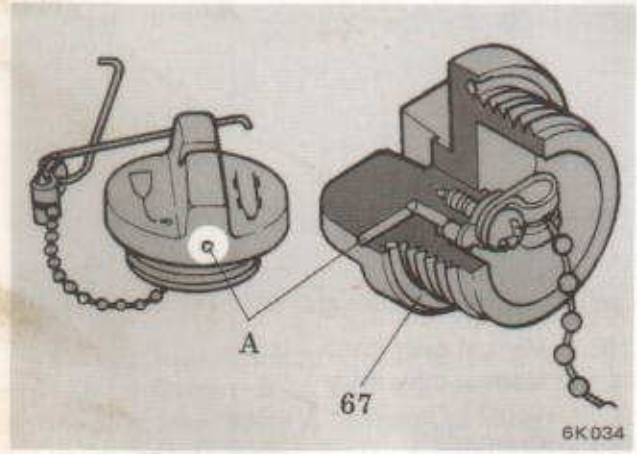
- Oil delivery control incorrect . . . . . Readjust
- Auto-oiler piston ass'y stuck . . . . . Reinstall
- Dirt in auto-oiler . . . . . Clean
- Return spring broken . . . . . Replace

Air bubbles in oil

- Pipe connector 118 loose . . . . . Tighten
- Manual oiler O-rings scored . . . . . Replace
- Manual/Auto-oiler ass'y 116 cracked . . . . . Replace

5-3 Checking oil vent/oil strainer

1. Remove oil cap ass'y and replace O-ring if hardened or damaged.



2. Inspect and clean the vent A using compressed air if dirt is deposited. Replace component parts or cap ass'y if defective.

CAUTION: WEAR EYE PROTECTION DURING USE OF COMPRESSED AIR.

3. Pull oil strainer 117 out from oil tank using a wire hook, and clean or replace if blocked with dirt or damaged.

NOTE: Always use clean and good quality chain oil (see 1-4-1 on page 5). Do not use old drained oil which can damage saw chain, guide bar, or manual/auto-oilers.

4. Reinstall oil strainer 117 into oil tank 47. Make sure of free movement of oil strainer in the tank so that it remains in chain oil at all times.

5. Install oil cap ass'y and clean oil passage of guide bar if blocked with saw dust and/or dirt.

5-4 CHECKING AUTO-OILER

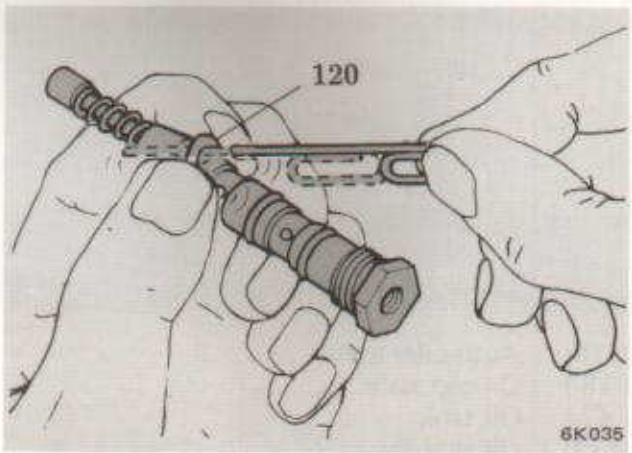
1. Remove screw securing auto-oiler 116 dial and pry the dial out together with grommet.

2. Turn auto-oiler ass'y counterclockwise and pull it out slowly using needle nose pliers.

NOTE: If the auto-oiler ass'y is pulled out quickly, O-rings 120 could be damaged.

3. Wash auto-oiler ass'y in a suitable solvent and dry with compressed air.

4. Inspect and replace O-rings if defective as follows.

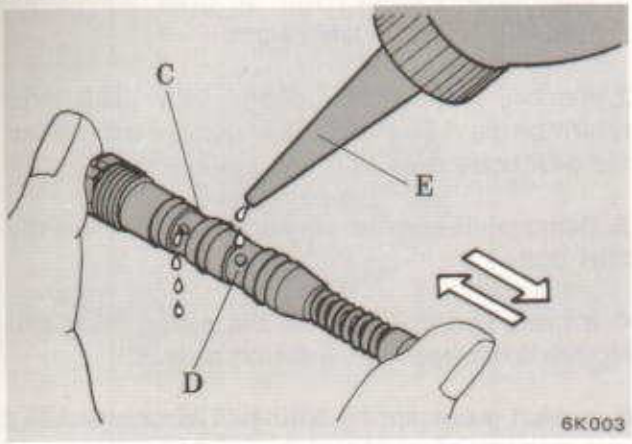


– Squeeze O-ring to make an opening as shown.

– Insert an end of paper-clip or the like into the opening to remove O-rings **120** out from auto-oiler ass'y **116**.
– Install new O-rings to auto-oiler ass'y.

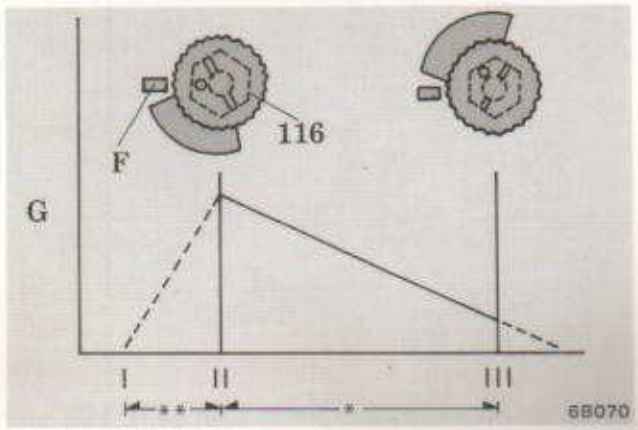
NOTE: Do not use a sharpened end rod or the like to avoid damage to O-rings.

5. Check auto-oiler ass'y if it can move smoothly and oiler spring if tension is still good, and replace if defective.



6. When dropping oil **E** into inlet hole **D** of the auto-oiler ass'y, make sure that oil is discharged from outlet holes **C** while operating the oiler ass'y manually as shown. Replace as an auto-oiler ass'y if not operating well.

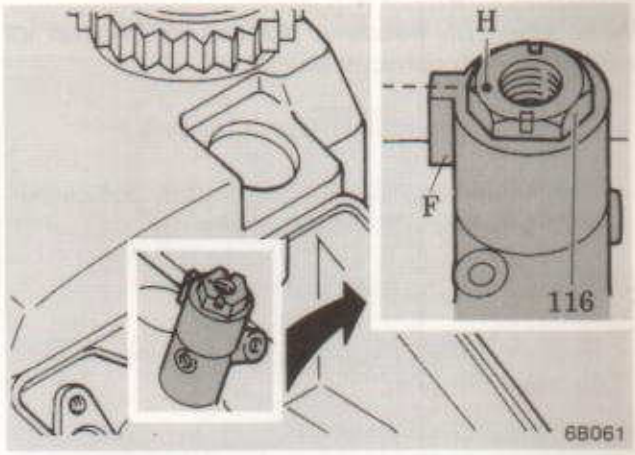
7. Install auto-oiler ass'y as follows.



* Controlled range
** Approx. 3/4 turn
I: Auto-oiler bottoming
II: Maximum oil discharging (Screw out about 3/4 turn from position I)
III: Minimum oil discharging

Maximum discharge of chain oil is 20 cc (0.7 U.S. fl. oz.)/min./8,000 rpm of engine speed and oil temperature 30 ~ 40°C (86 ~ 104°F). Saw chain requires 10 ~ 15 cc (0.3 ~ 0.5 U.S. fl. oz.)/min. in normal cutting. The stroke of oiler piston is constant, and moving the oiler down or up (screw in or out) controls the volume of oil discharged **G**.

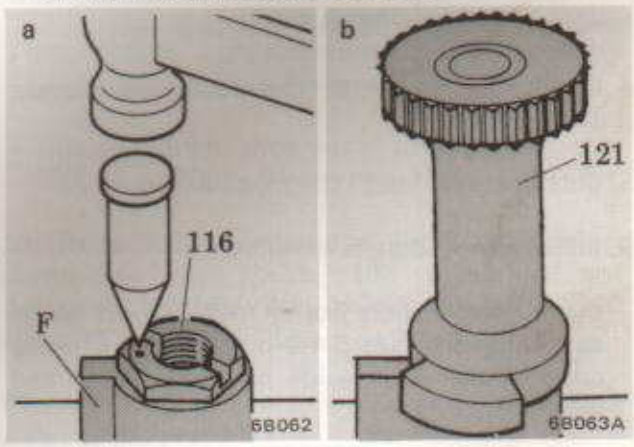
– Lubricate and screw in auto-oiler ass'y until lightly seated.



– Unscrew the oiler ass'y to align the top mark **H** with stop fin **F** as shown turning counterclockwise about 3/4 turn.

8. When installing a new auto-oiler ass'y, proceed as follows.

– Lubricate and screw in a new oiler ass'y until lightly seated.
– Start and run engine at middle speed (approx. 6,000 rpm) without guide bar and saw chain (throttle latch can be used as required).
– Turn the oiler ass'y counterclockwise and stop at maximum oil discharge position (approx. 3/4 turn open). Stop the engine.



– Mark the cylinder top aligned with stop fin **F** as shown in "a".

9. Install auto-oiler dial **121** allowing that it can be turned counterclockwise but not clockwise as shown in "b".

10. Install screw to secure auto-oiler dial.

5-5 Checking oil pipe connector

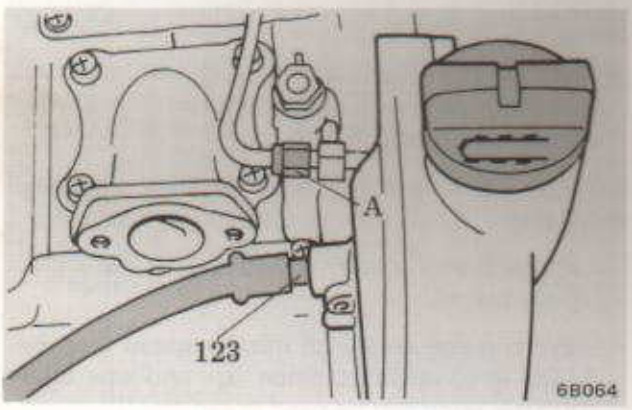
When chain oil floods or noticed air bubbles in oil, check the connector as follows.

1. Remove surrounding parts as follows.

– Remove air cleaner cover, air filter, and carburetor together with related parts.

– Tighten oil pipe nut **A** if loosened.

– Remove other surrounding parts (see 4-8-12 on page 27).



2. Draw oil pipe connector **123** out together with oil pipe and oil strainer.

3. Inspect O-rings for cracks or damage and replace if defective (see 5-4-4 on page 30).

4. Check the connector for cracks and replace if damaged.

5. Lubricate and install the pipe connector.

6. Install removed parts as follows.

– Install rear handle ass'y, manual oiler ass'y, auto-oiler dial (see 5-4-9 on this page), brake cover, inner pad, guide bar, saw chain, and sprocket guard.

– Install front cover, starter case (see 2-1-9 on page 10), and front handle.

– To check manual oiler, go to next 5-6 on this page.

– Install carburetor together with related parts (see 4-8-18 on page 28), and connect fuel pipe to fuel inlet.

– Install air filter and air cleaner cover.

5-6 Checking manual oiler

1. Remove air cleaner cover, air filter, and carburetor together with related parts.

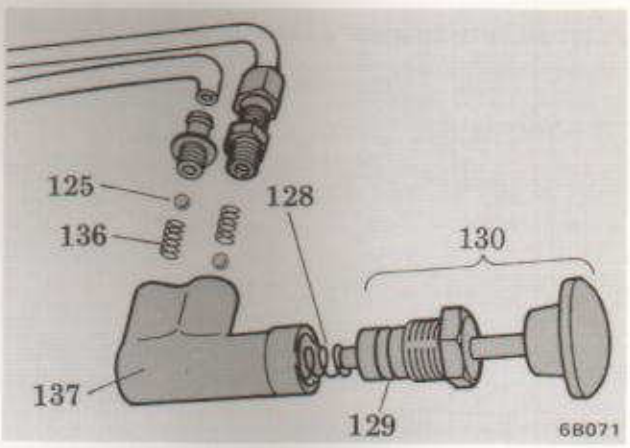
2. Remove manual oiler piston ass'y **130** and return spring **138** , and disconnect oil pipes from the oiler body **127** .

3. Remove inlet/outlet connectors **124** from the oiler body.

4. Inspect O-ring **129** of the piston ass'y and replace if damaged (see 5-4-4 on page 30).

5. Inspect return spring, springs **126** , balls **125** , and passage of connectors. Clean or replace if blocked with dust, fatigued, or damaged.

6. Inspect insides of the body and clean if blocked with dust. Blow compressed air through oil passage if ball is stuck.



7. Install connectors together with balls **125** and springs **136** to oiler body, and install manual oiler ass'y to rear handle.

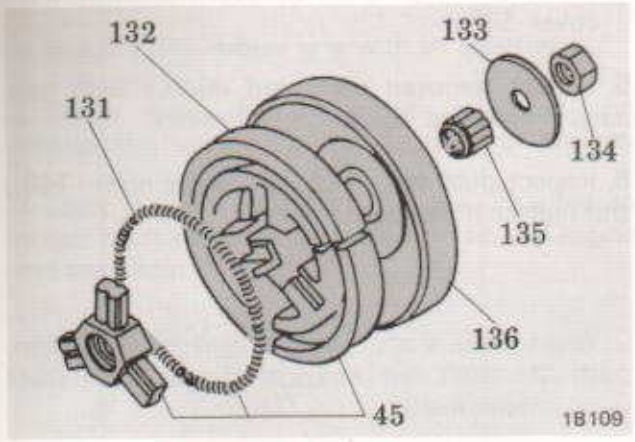
8. Fill oil tank and check manual oiler operation. Make sure that oil is discharged without air bubbles after several strokes.

9. Install carburetor (see 4-8-18 on page 28), air filter, and air cleaner cover.

6. CLUTCH/CHAIN BRAKE SYSTEM
6-1 Checking clutch drum/clutch shoes

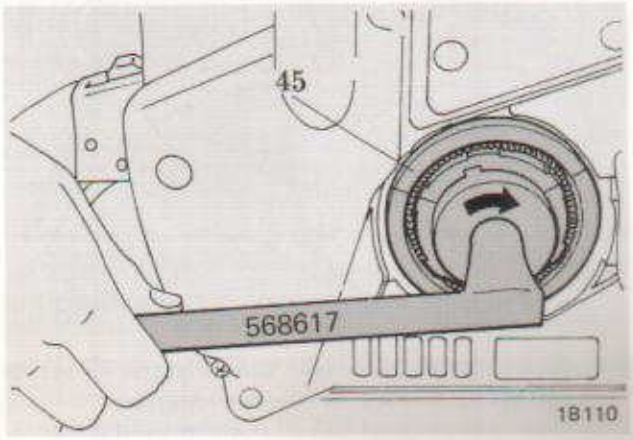
1. Pull plug cap out, and remove rear spark plug, guide bar, saw chain, and sprocket guard using plug wrench 562811.

2. Pull brake actuator backward to release chain brake.



3. Install piston tool 567663 into plug hole and remove nut **134** (left-hand thread) using plug wrench 562811.

4. Remove washer **133** , drum **136** , and roller bearing **135** .



5. Remove clutch shoe ass'y **45** (left-hand thread) using clutch tool 568617 as shown.

6. Check drum bore and sprocket teeth, and replace drum if damaged or out of service wear limits.

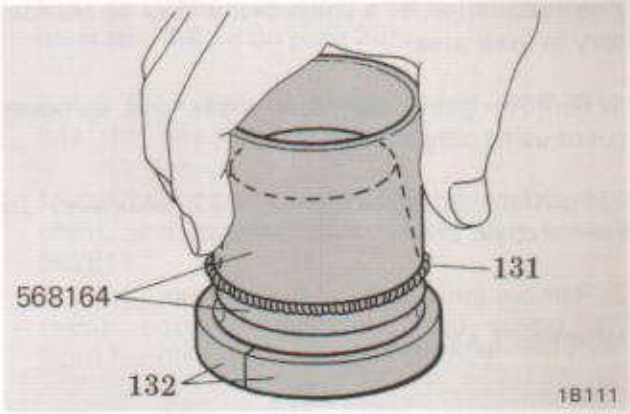
Clutch drum bore	79.0 mm (3.1 in)
Sprocket bore	14.08 mm (0.554 in)
Sprocket tooth wear	1.0 mm (0.04 in)

7. Inspect roller bearing and replace if damaged or discoloration is noted.

8. If saw chain is still running even if engine speed is lower than 2,800 rpm, clutch spring **131** may be jammed with saw dust, fatigued, or broken. So, proceed to repair as follows.

– Push clutch spring out using screwdriver.

– Replace clutch shoes **132** as a set if damaged.



– Install a new clutch spring using clutch spring tool 568164.

9. To install clutch shoe ass'y, proceed as follows.

– Install clutch shoe ass'y (left-hand thread) facing clutch spring outside and tighten it manually.

– Remove piston tool 567663.

– Pull starter handle about 30 cm (1 ft.) and keep the handle in this position.

– Reinstall piston tool 567663 into plug hole and, retracting starter handle gradually, rotate clutch shoe ass'y counterclockwise manually until piston reaches the tool.

– Tighten clutch shoe ass'y using clutch tool 568617 to 200 ~ 240 kg-cm (175 ~ 210 in-lb).

10. Grease roller bearing and install the bearing, clutch drum, and washer **133** with clutch nut (left-hand thread). Torque nut to 200 ~ 240 kg-cm (175 ~ 210 in-lb).

11. Remove piston tool 567663 and install spark plug and plug cap.

12. To check chain brake, go to 6-2 on next page.

13. Install guide bar, saw chain, and sprocket guard using plug wrench 562811.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
567663	897537-03930	Piston tool
568164	897602-02830	Clutch spring tool
568617	897710-02830	Clutch tool

6-2 Checking chain brake

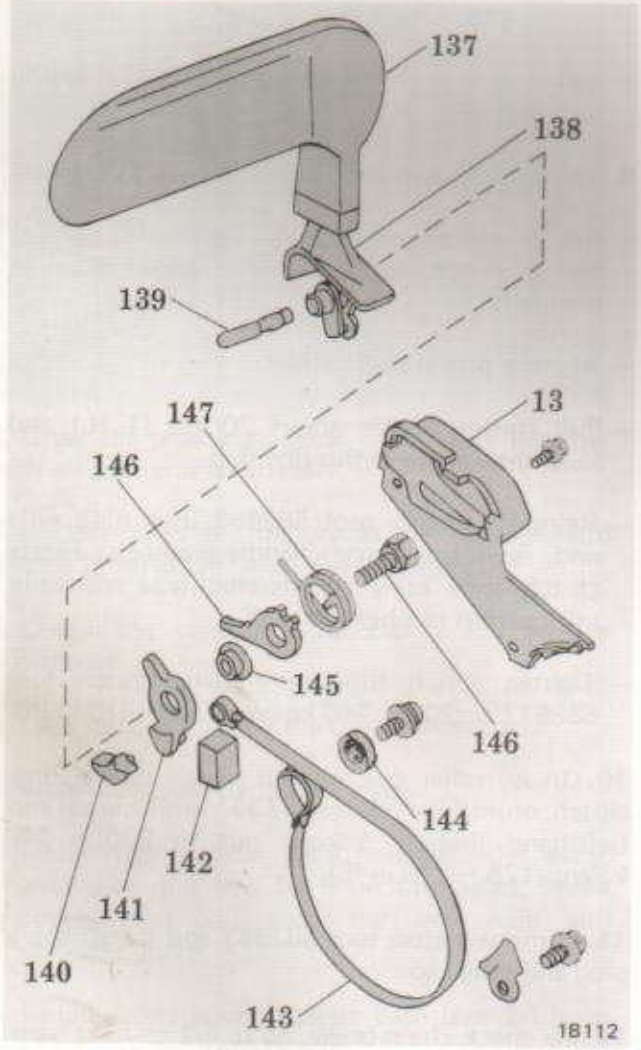
Chain brake is available.
The installation of a chain brake may be mandatory in your area.

1. Remove guide bar, saw chain, and sprocket guard using plug wrench 562811.

2. Position brake actuator **137** backward to release chain brake.

3. Remove inner pad and brake cover.

NOMENCLATURE



4. Remove brake component parts as follows.

– Remove adjuster **144** and brake band **143**.

– Remove brake spring **147** using pliers.

– Remove fulcrum bolt **148** cam lever **146**, spacer **145**, and actuating link **141**.

– Remove brake actuator together with dust cover **138**.

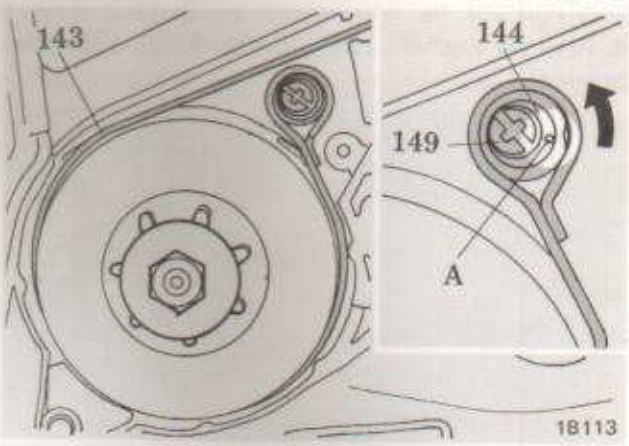
5. Inspect removed parts and replace with new parts if damaged, worn out, or broken.

6. Inspect dust seal **142** and brake reset **140**, and replace if damaged.

7. When brake shaft **139** is damaged or broken, push the shaft out and insert new brake shaft using copper mallet.

8. Assemble removed parts in reverse procedure of removing.

9. Check chain brake function and adjust as follows when brake band is worn or elongated.



– Loosen screw **149** and turn adjuster to set its peak **A** to correct tensioning location.

– Ensure that clutch drum can be rotated freely by hand when brake actuator is in released position.

10. Install brake cover **13**, inner pad, guide bar, saw chain, and sprocket guard.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench

7. ANTI-VIBRATION SYSTEM

1. Check rear handle rubber grip **150** and if damaged or broken replace as follows.

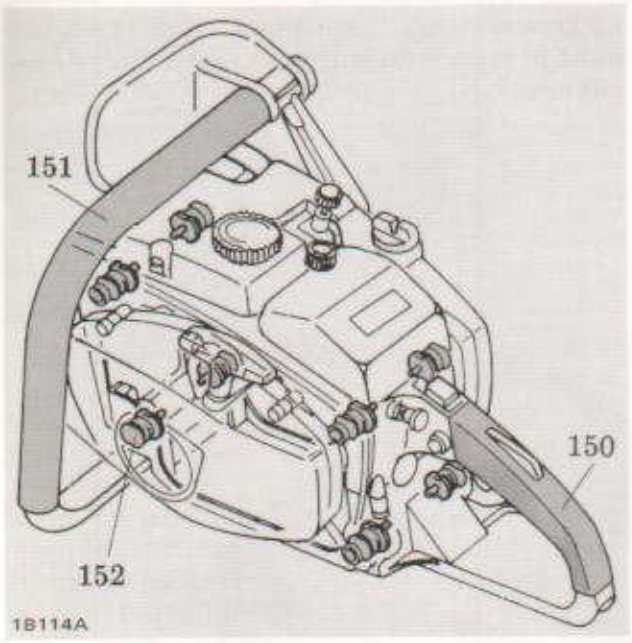
– Cut seam of the grip and remove the grip from rear handle.

– Remove front handle, front cover, and bottom supporter.

– Install a new rubber grip with an adhesive.

2. Check front handle rubber grip **151** and replace the handle ass'y if damaged or broken.

3. Eight rubber isolators **152** are installed to isolate front/rear handles from vibration of engine and saw chain.



If the engine is being run on no-load and vibrates excessively, stop engine and proceed to replace rubber isolators as follows.

– Remove auto-oiler dial, sprocket guard, saw chain, guide bar, inner pad, and brake cover using plug wrench 562811.

– Remove air cleaner cover, air filter, and carburetor with its mounting parts.

– Disconnect stop lead connections.

– Remove front handle, front cover, bottom supporter, and rear handle ass'y using L-wrench 563522.

– Remove eight rubber isolators using spanner 17 mm (or isolator tool 569457 as required).

– Check the isolators and replace if cracked, damaged, or hardened.

– Pass stop leads together with grommet through crankcase hole and connect stop lead connections (see 4-8-15 on page 28).

– Install rear handle ass'y using L-wrench 563522 and carburetor together with its mounting parts (see 4-8-18 on page 28).

– Install air filter, air cleaner cover, and auto-oiler dial (see 5-4-9 on page 32).

– Install brake cover, inner pad, guide bar, saw chain, and sprocket guard using plug wrench 562811.

– Install bottom supporter, front cover, and front handle using L-wrench 563522.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563522	895610-79920	L-wrench
569457	897740-16130	Isolator tool

8. ENGINE
8-1 Construction and working principles

Two-stroke engine
The two-stroke engine is used on many KIORITZ/ECHO products because of its:
1. simple construction
2. excellent horsepower-to-weight ratio
3. ability to operate in any position
4. easy maintenance

The two-stroke engine provides a power stroke with every revolution of the crankshaft.

8-1-1 Induction and compression (A)

The first stroke of pistons from Bottom Dead Center (BDC) to Top Dead Center (TDC) have two functions.
1. To induce an air-fuel mixture through carburetor into crankcase.
2. To compress the mixture in combustion chambers.

8-1-2 Ignition (B)

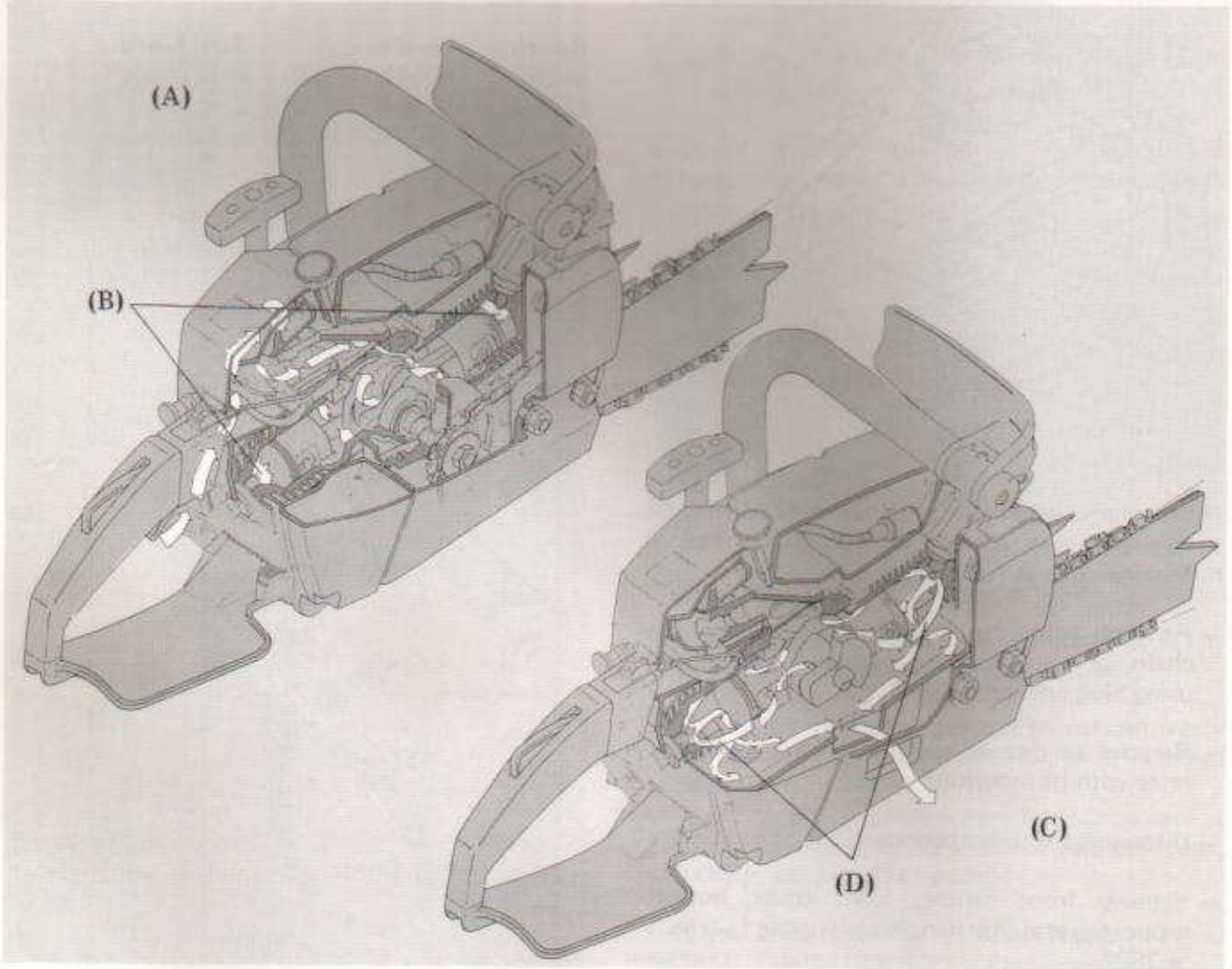
Just before pistons reach TDC, spark plugs ignite the compressed mixture, so that the gas expansion forces pistons to BDC as a power stroke.

8-1-3 Exhaust and transfer (C)

The second stroke of pistons from TDC to BDC also have two functions in addition to providing a power stroke of engine.
1. To open exhaust ports and allow discharge of burned exhaust gases.
2. To compress the mixture in crankcase and force them through transfer passages of cylinders and pistons into combustion chambers.

8-1-4 Loop scavenging (D)

Loop scavenging flow allows efficient replacement of burned exhaust gases with a fresh air-fuel mixture.



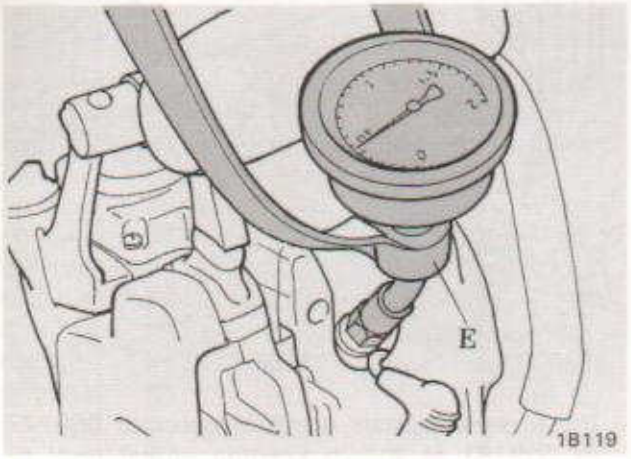
When engine does not crank, is hard to start, vibrates excessively, loses power, or becomes overheated soon after a short time of running, proceed to test, check or repair as follows.

8-2 Testing cylinder compression

1. Remove rubber cover and pull front plug cap out.

2. Remove front spark plug using plug wrench 562811.

3. Pull ignition switch knob backward to "STOP" position.



4. Install a compression gauge E into one of the plug holes as shown.

5. Pull starter handle several times at full throttle (throttle latch can be used) to stabilize reading. Standard compression pressure should be 8.0 kg/cm² (110 psi) in cold state.

CAUTION: WEAR EYE PROTECTION DURING USE OF COMPRESSION GAUGE.

6. Install front spark plug and torque to 150 ~ 170 kg-cm (130 ~ 150 in-lb).

7. Test rear cylinder compression as same procedure of above.

8. If the pressure is too low, go to 8-5 on page 39 to check cylinders/piston rings.

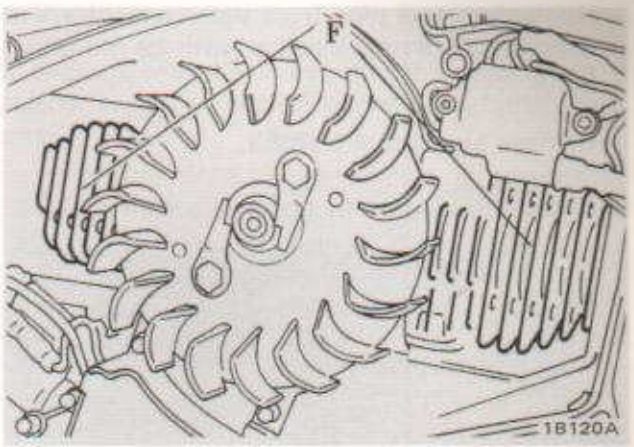
9. Install spark plug caps and rubber cover.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench

8-3 Checking cooling air passage

1. Remove starter case using plug wrench 562811.

2. Inspect air intake grid of starter case and clean if blocked with dust and/or leaves.



3. Inspect cylinder cooling fins F and clean with a small screwdriver or compressed air if blocked with dirt, saw dust and/or leaves.

CAUTION: WEAR EYE PROTECTION DURING USE OF COMPRESSED AIR.

4. Install starter case (see 2-1-9 on page 10).

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench

8-4 Testing crankcase sealing

1. Proceed to remove surrounding parts as follows.

– Pull rear plug cap out.

– Remove rear spark plug and sprocket guard, guide bar, and saw chain using plug wrench 562811.

– Install piston tool 567663 into plug hole.

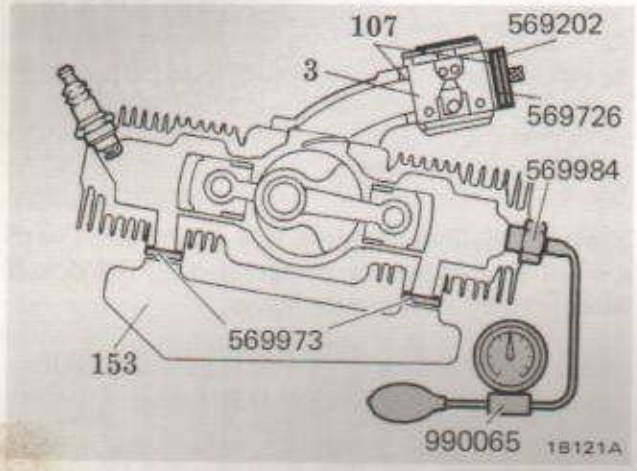
– Remove front handle, front cover, bottom supporter, and muffler ass'y **153** together with gasket using L-wrench 563522.

– Remove air cleaner cover and air filter.

– Disconnect fuel pipe from pipe connector and remove carburetor together with its mounting parts.

– Remove piston tool 567663.

2. Rotate crankshaft to position piston at BDC.



3. Install pressure testing tools carburetor **2** and muffler **153** as shown, and apply pressure approx. 0.2 kg/cm² (3 psi) by hand pumping.

CAUTION: WEAR EYE PROTECTION DURING USE OF PRESSURE TESTING TOOLS.

4. Gauge should indicate constant pressure. If not, proceed as follows.

– Remove clutch drum and clutch shoe ass'y (see 6-1 on page 33).

– Remove starter case, starter pawls, and flywheel (see 2-3-2/3-8-4 on pages 12/17).

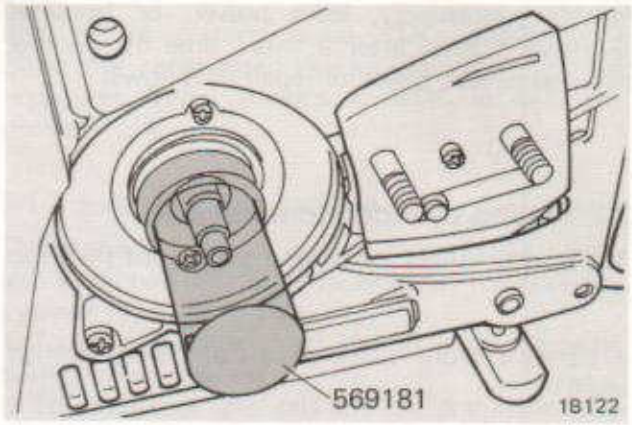
– Apply soapy water on crankshaft oilseals and retest leakage from the seals.

5. When leakage from oilseals is observed, replace as follows.

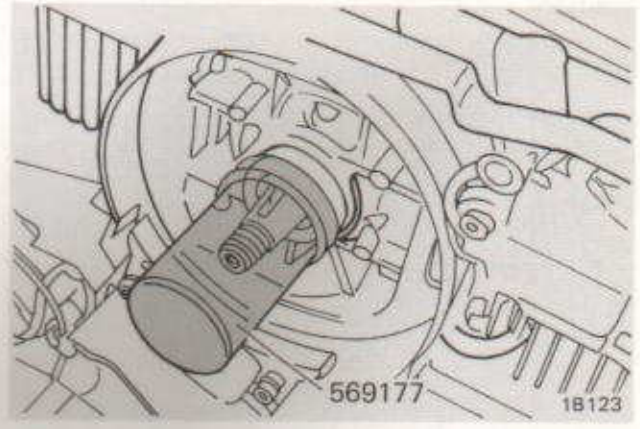
– Pry oilseals out using a screwdriver and remove Woodruff key.

– Apply heat resistant grease on crankcase where oilseals are installed.

Clutch side



Magneto side



– Install new oilseals using oilseal tool 569177 or 569181 as shown keeping oilseal level to prevent it from cocking in bore.

– Install Woodruff key.

6. When leakage from carburetor gaskets **107** is noticed, to replace with a new gaskets for Bleeder can move normal.

7. When leakage from cylinder/crankcase gasket is noticed, go to 8-5 and 8-6 on pages 39/40 to replace with new gaskets.

8. Remove pressure testing tools.

9. Proceed to install removed parts as follows.

– Connect fuel pipe to pipe connector.

– Install air filter, air cleaner cover, and muffler ass'y and torque the bolts to secure muffler to 80 ~ 100 kg-cm (70 ~ 90 in-lb).

– Install bottom supporter, front cover, front handle, and piston tool 567663 into plug hole.

– Install flywheel with nut and torque to 330 ~ 370 kg-cm (285 ~ 320 in-lb).

– Install starter pawls, pawl springs, spacers, and washers (see 2-3-2 on page 12).

– Install clutch shoe ass'y and clutch drum (see 6-1-9/10 on page 33).

– Remove piston tool 567663.

– Install guide bar, saw chain, sprocket guard, and spark plug using plug wrench 562811, and torque the plug to 150 ~ 170 kg-cm (130 ~ 150 in-lb).

– Install plug caps and rubber cover.

– Install starter case (see 2-1-9 on page 10).

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563522	895610-79920	L-wrench
567663	897537-03930	Piston tool
569177	897726-16130	Oilseal tool (M)
569181	897727-16130	Oilseal tool (C)
569202	897827-16130	Pressure plate
569726	897826-16131	Rubber plug (IN)
569973	897831-16131	Rubber plug (EX)
569984	897835-16131	Pressure connector
990065	990510-00020	Pressure tester

8-5 Checking cylinders/piston rings

1. Proceed to remove cylinders as follows.

– Remove rubber cover, spark plugs, and sprocket guard, guide bar, and saw chain using plug wrench 562811.

– Remove inner pad, brake cover, and front handle.

– Remove air cleaner cover, air filter, carburetor together with its mounting parts, and manual oiler.

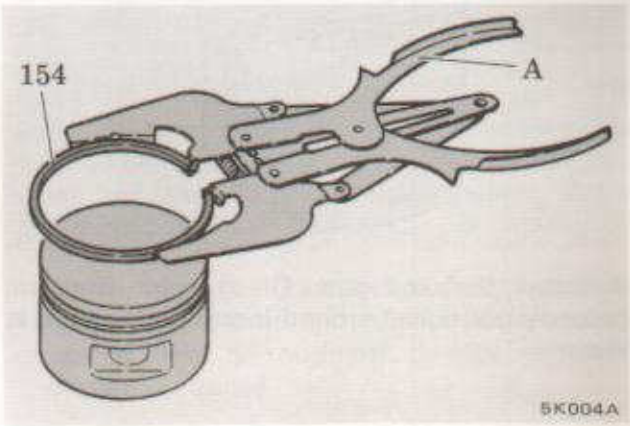
– Remove front cover, starter case, bottom supporter, auto-oiler dial, muffler ass'y using plug wrench 562811/L-wrench 563522.

– Disconnect stop lead connections, and remove rear handle and cylinder covers.

– Remove cylinders. (Lightly tap the side of cylinder with a plastic hammer to loosen if it is tight.)

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

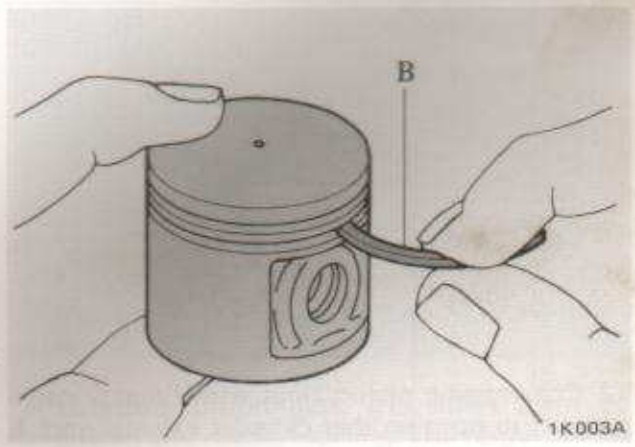
3. Replace with a new cylinder if plating is worn, peeled away, or scored exposing cylinder base metal.



4. Remove piston rings **154** using a suitable ring tool **A** as shown.

5. Inspect piston rings and replace if broken, scored, or exceed service limits.

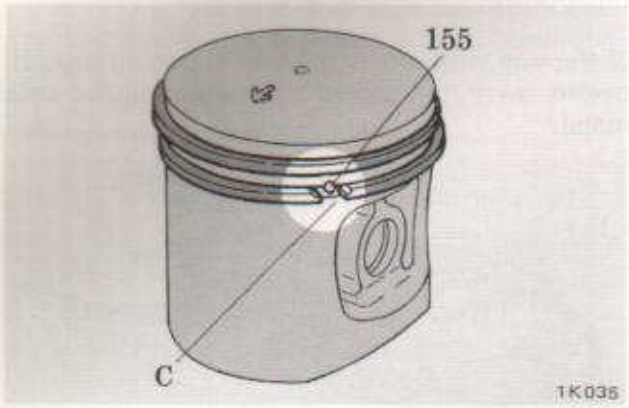
Piston ring width	1.45 mm (0.057 in)
Piston ring end gap	0.5 mm (0.02 in)



7. Inspect piston crown and ring grooves, and clean with fine sandpaper, oil stone, or ring groove cleaning tool if carbon is deposited. The squared end of a broken piston ring **B** can be used to clean the grooves as shown.

7. To check/replace piston, go to 8-6-3 on page 41.

8. Install piston rings which top ring is half-keystone and second ring is rectangular using suitable ring tool (see 8-5-4 on page 39).

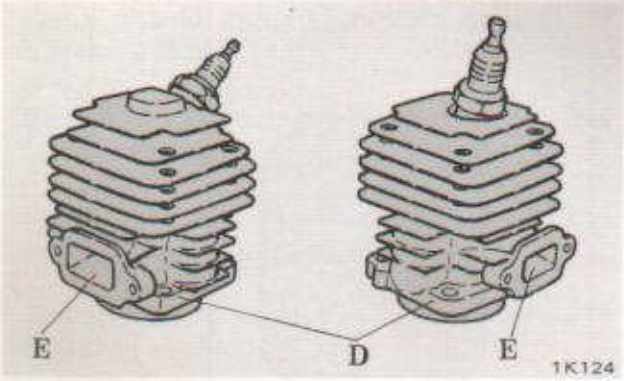


9. Ensure that end gaps C of piston rings are properly positioned around locating pins 155 as shown.

10. Inspect cylinder base flanges D and gaskets.

11. Apply oil to piston rings and cylinder internal walls, and place cylinder gaskets to cylinders.

Front cylinder Rear cylinder



12. Compressing piston rings with fingers, install cylinder in position that cylinder exhaust port E certainly faces muffler side.

NOTE: Do not rotate cylinder when installing to avoid ring end gap misalignment. Use piston holder 569015 to work easily.

13. Install cylinders with bolts and torque to 80 ~ 90 kg-cm (70 ~ 80 in-lb). Install spark plugs.

14. Proceed to install removed parts as follows.

- Install cylinder covers, rear handle ass'y, and grommet and connect stop lead connections.
- Install muffler ass'y together with gasket and torque bolts to 80 ~ 100 kg-cm (70 ~ 90 in-lb).
- Install bottom supporter, front cover, and auto-oiler dial (see 5-4-9 on page 32).
- Install carburetor together with its mounting parts (see 4-8-18 on page 28), air filter, and air cleaner cover.
- Install front handle, brake cover, inner pad, guide bar, saw chain, and sprocket guard using plug wrench 562811, and replace rubber cover.

Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563522	895610-79920	L-wrench
563625	895612-79920	L-wrench
569015	897719-02830	Piston holder

8-6 Checking crankshaft/ball bearings

1. Proceed to remove surrounding parts as same procedure of 8-5-1 on page 39.

2. Remove related parts as follows.

- Remove auto-oiler ass'y (see 5-4-2 on page 30).
- Remove reed valve ass'y together with gasket.
- Remove clutch drum, clutch shoes ass'y, starter pawl parts, and flywheel (see 3-8-4 on page 17).

NOTE: Piston holder 569015 can be used to hold crankshaft for easy working.

– Remove four bolts securing crankcase halves together.

– Support crankcase half and drive crankshaft out tapping with a plastic mallet.

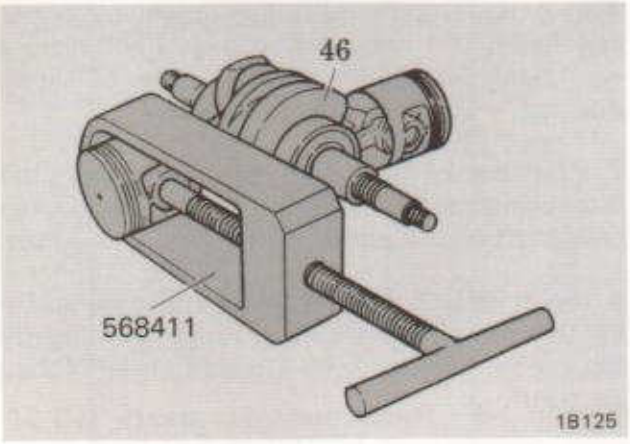
NOTE: To avoid crankshaft misalignment, use 0.5 kg (1 lb) plastic mallet with minimum force when driving it out.

– Separate crankcase ass'y and remove crankshaft.

3. To check pistons and crankshaft **46** proceed as follows.

– Remove circlips from both side of piston pin.

– Remove piston rings (see 8-5-4 on page 39).



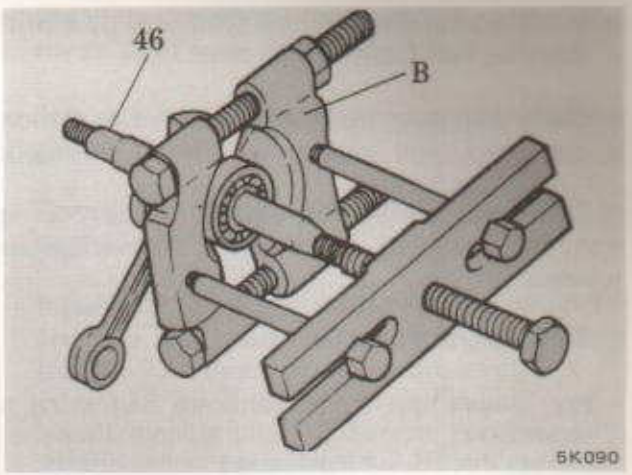
– Push piston pin out from piston. If it can not be pushed out manually, use piston pin tool 568411 as shown.

– Measure piston and replace if it exceeds service limits:

Piston outer diameter	35.88 mm	(1.4125 in)
Piston pin bore	9.3 mm	(0.3555 in)
Piston ring groove	1.6 mm	(0.063 in)
Piston ring side clearance	0.1 mm	(0.004 in)

– Inspect needle bearings of con-rods and replace if damaged or discoloration is noted.

– Measure piston pin and replace if outer diameter is smaller than service limit: 8.98 mm (0.3535 in).

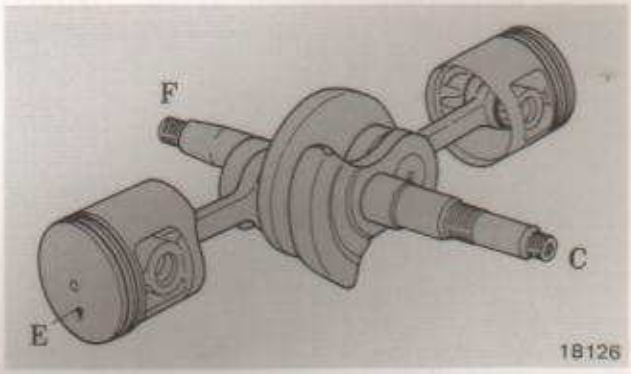


– Ball bearings generally stay in crankcase halves when crankcase ass'y is separated. If they stay on crankshaft, use a bearing puller **B** to remove bearings as shown.

– When engine vibrates excessively, measure crankshaft runout and replace if it exceeds service limits or roughness, damage, or discoloration is noticed.

Con-rod small end bore	12.025 mm	(0.4734 in)
Con-rod big end side play	0.4 mm	(0.016 in)
Crankshaft runout	0.05 mm	(0.002 in)

– Lubricate needle bearings and install them into small end of con-rods.
F : Flywheel end **C** : Clutch end



– Place pistons over connecting rods with piston triangle marks **E** pointing to downside as shown.

– Lubricate piston pins, and insert them into pistons and needle bearings. Use piston pin tool 568411 if piston pins can not be pushed in manually.

– Install new circlips and confirm they are properly seated in the grooves.

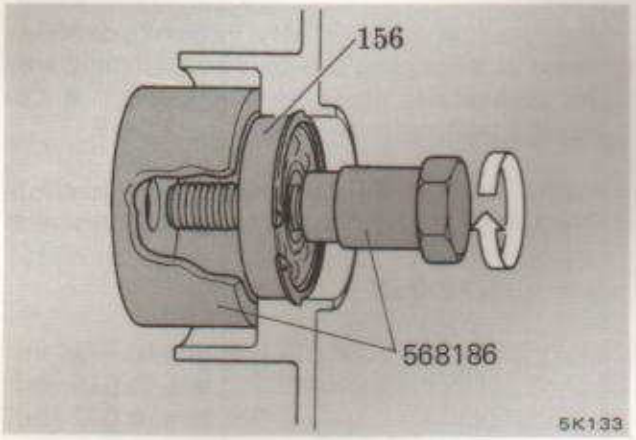
– Install piston rings in the groove using a suitable ring tool (see 8-5-4 on page 39).

4. Clean crankcase half inside if soiled or carbon is deposited, and replace as a set if damaged.

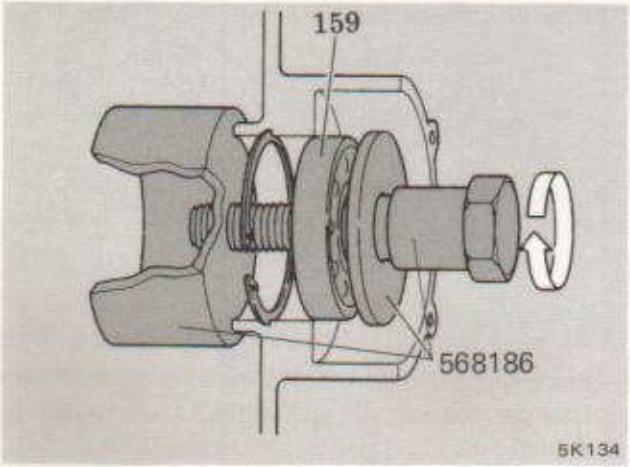
5. Check ball bearings for rotation. If not rotating smoothly, proceed to replace ball bearings as follows.

– Remove brake band and dust plate.

– Pry oilseals out from crankcase half using a screwdriver.



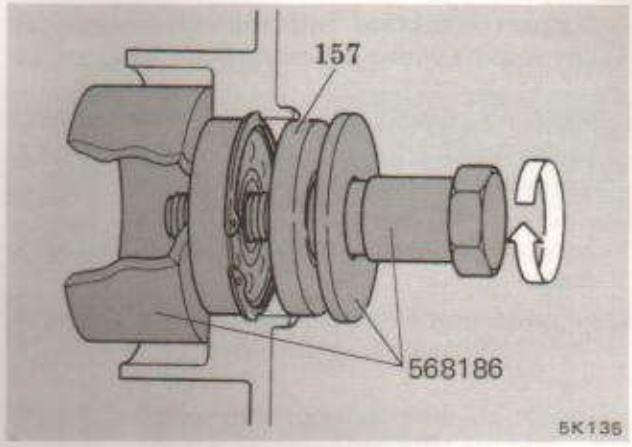
– Remove defective ball bearing **159** from crankcase half using bearing tools 568186 as shown.



– Lubricate new ball bearings and install into crankcase half until seated using bearing tools 568186 as shown.

NOTE: Preheat around ball bearing housing of crankcase half using a hair-dryer or a floodlight for easier installation.

– Apply heat resistant grease on crankcase half where oilseals installed.

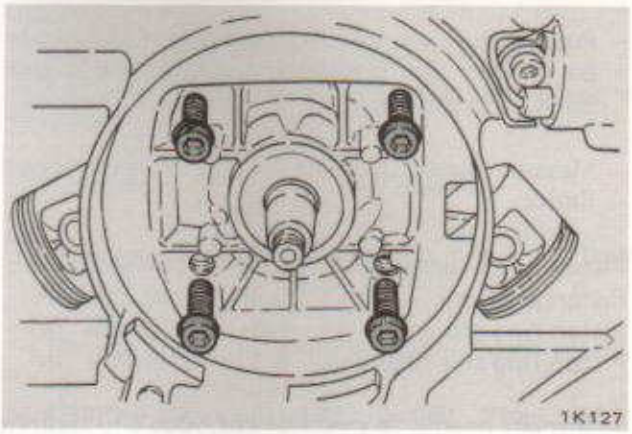


– Install new oilseals **157** using the tools 568186 as shown.

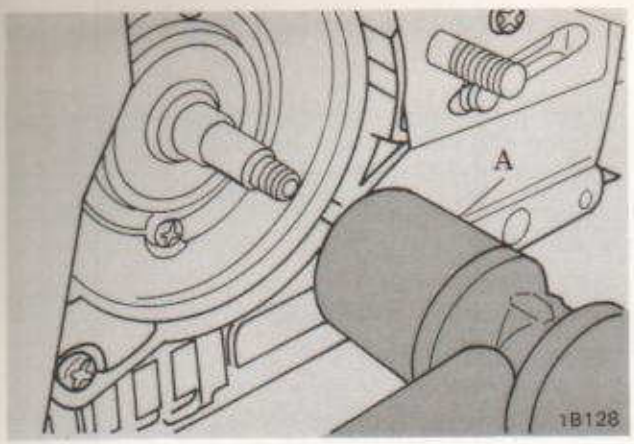
6. Remove old crankcase gasket material (Clean around dowel pins carefully, otherwise, crankcase halves will not mate properly.) and place a new crankcase gasket onto the face of clutch side half.

7. Insert crankshaft clutch end (not keyway side) into crankcase clutch side half and gently tap crankshaft with a plastic mallet until it is seated.

8. Install other half to assemble crankcase ensuring that dowel pins are aligned with holes (lightly tap starter side half with a plastic mallet if they are tight).

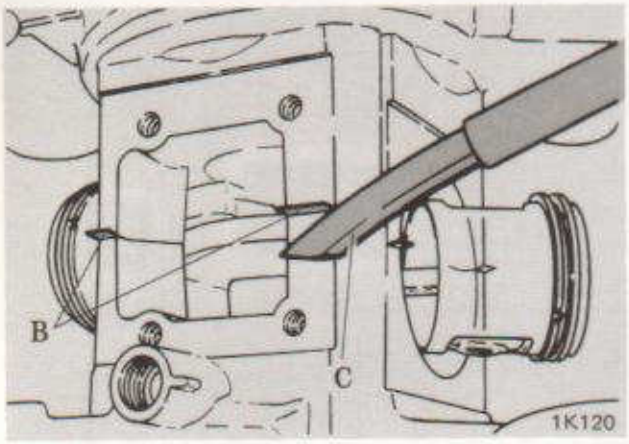


9. Install four bolts to secure crankcase halves together, and tighten diagonally opposite bolts as shown gradually to pull crankcase halves together evenly (do not tighten the bolts to final torque at this time).



10. Check crankshaft rotation. If crankshaft does not rotate smoothly with fingers tap both ends of crankshaft with a plastic mallet **A**.

11. Give a final torque 80 ~ 90 kg-cm (70 ~ 80 in-lb) to the four bolts and make sure that crankshaft can be rotated easily with fingers.



12. Cut excess crankcase gasket **B** material protruding at three sides of cylinders/reed valve base using a sharp knife **C**.

13. Install removed parts as follows.

- Apply an adhesive to reed valve gasket, and install the gasket and reed valve ass'y with screws. Torque the screws to 40 ~ 45 kg-cm (35 ~ 40 in-lb).
- Install auto-oiler ass'y (refer to 5-4-7 on page 31).
- Install gaskets, cylinders (see 8-5-11/13 on page 40), and cylinder covers.
- Install piston tool 567663 into plug hole and install clutch shoes ass'y and clutch drum (see 6-1-9/6-1-10 on page 33).
- Install brake cover, inner pad, flywheel, and starter pawl parts (see 2-3-2 on page 12).
- Pass stop leads through rear handle and install rear handle ass'y.
- Connect stop lead connections (see NOTE on page 15).
- Install muffler ass'y, auto-oiler dial (see 5-4-9 on page 32), bottom supporter, starter case (see 2-1-9 on page 10), and front cover.
- Install manual oiler, carburetor together with its mounting parts (see 4-8-18 on page 28), air filter, air cleaner cover, and front handle.
- Install guide bar, saw chain, sprocket guard, spark plugs, and rubber cover.
- Remove piston tool 567663 and install spark plugs, plug caps, and rubber cover.

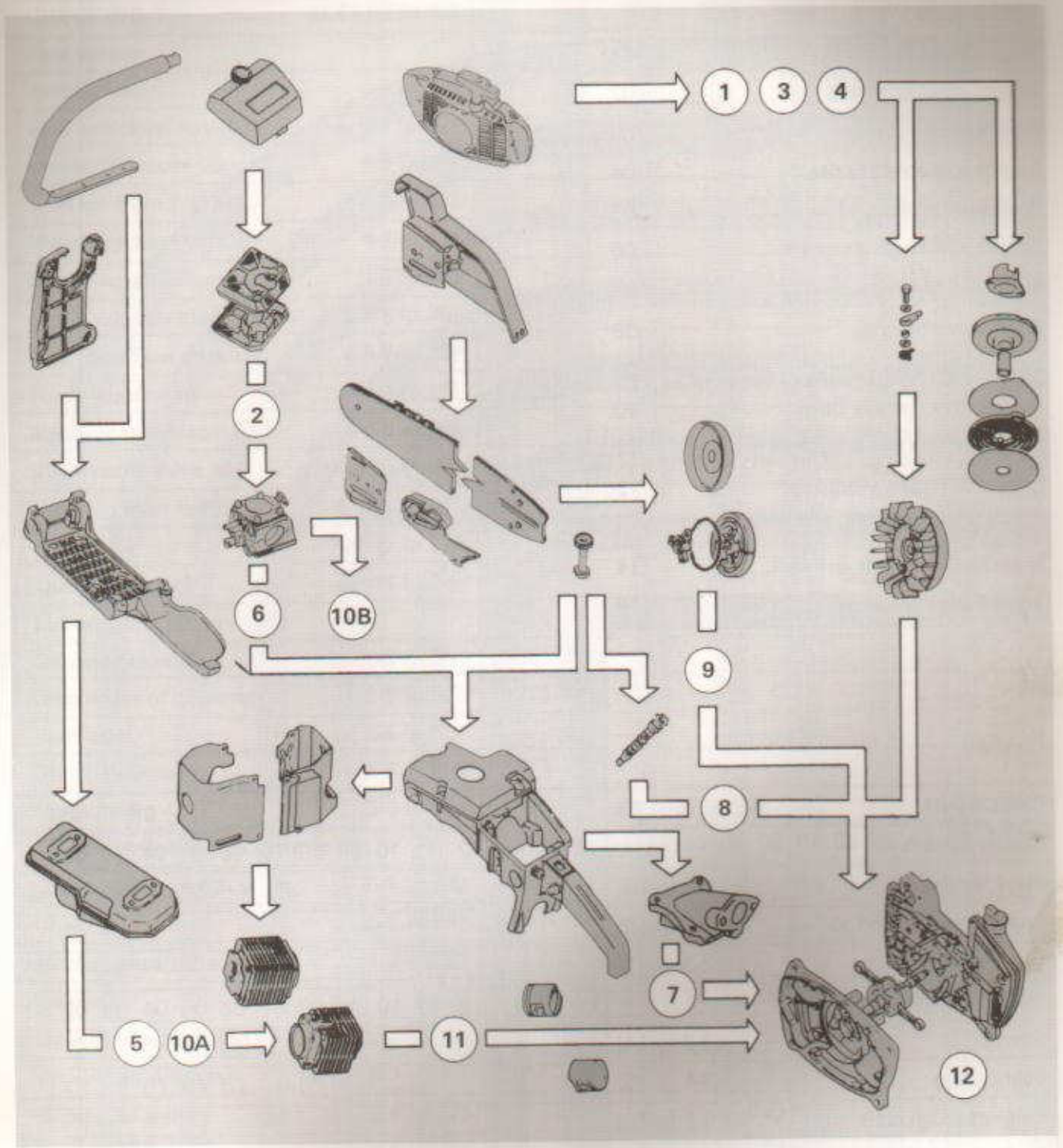
Ref/No.	Part Number	Tool Name
562811	895410-02830	Plug wrench
563522	895610-79920	L-wrench
566086	897501-03935	Puller
567663	897537-03930	Piston tool
567707	897540-03930	Spacer
567814	897558-02830	T-box wrench
568411	897702-04320	Piston pin tool
568617	897710-02830	Clutch tool
568186	897701-12331	Bearing tool

9. SERVICE GUIDE
9-1 Service interval

Check point	Service	Interval		
		Daily	Weekly	Monthly
Air filter	Clean*	○		
Auto-oiler function	Check and adjust*	○		
Chain brake function	Check and adjust*	○		
Cylinder fins	Clean	○		
Fuel vent	Clean*	○		
Guide bar groove	Clean*	○		
Manual oiler function	Check*	○		
Oil vent	Clean*	○		
Saw chain	Sharpen and tension*	○		
Screws, bolts, and nuts	Tighten*	○		
Sprocket	Check*	○		
Sprocket guard	Clean*	○		
Fuel strainer	Clean*		○	
Oil strainer	Clean*		○	
Spark plugs	Clean and gap*		○	
Starter rope	Inspect*		○	
Carburetor	Adjust*			○
Clutch drum	Clean and check*			○
Clutch shoes	Check*			○
Cylinder compression	Test*			○
Fuel/oil tanks	Clean			○
Muffler	Clean*			○
Spark arrester screen	Clean*			○

* Repair or replace related parts if defective.

9-2 Disassembly and repair chart



1. Repairing recoil starter/checking ignition switch (2/3-6, pages 10/15)
2. Checking air cleaner/fuel line (4-2/4-5, pages 22/23)
3. Checking CDI module/pole shoe gaps/ignition coils/cooling air passage (3-7/8-3, pages 16/37)
4. Checking ignition timing (3-9, page 18)
5. Checking muffler/exhaust ports (4-4, page 23)
6. Repairing carburetor (4-8, page 25)
7. Checking reed valve (4-8, page 25)
8. Checking auto-oiler (5-4, page 30)
9. Checking clutch drum/shoes (6-1, page 33)
10. Testing crankcase sealing (8-4, page 37)
11. Checking cylinders/rings (8-5, page 39)
12. Checking crankshaft/bearings (8-6, page 40)

9-3 Troubleshooting guide

TROUBLES

Engine does not crank.	01
Engine does not start.	02
Fuel leaks.	03
Engine idle speed varies.	04
Poor acceleration.	05
Engine stalls at high speed.	06
Engine lacks power.	07
Engine overheating.	08
Engine misfiring.	09
Engine is extremely noisy.	10
Excessive fuel consumption.	11
Excessive engine vibration.	12
Oiler does not function.	13
Saw chain does not cut well.	14
Engine does not stop.	15

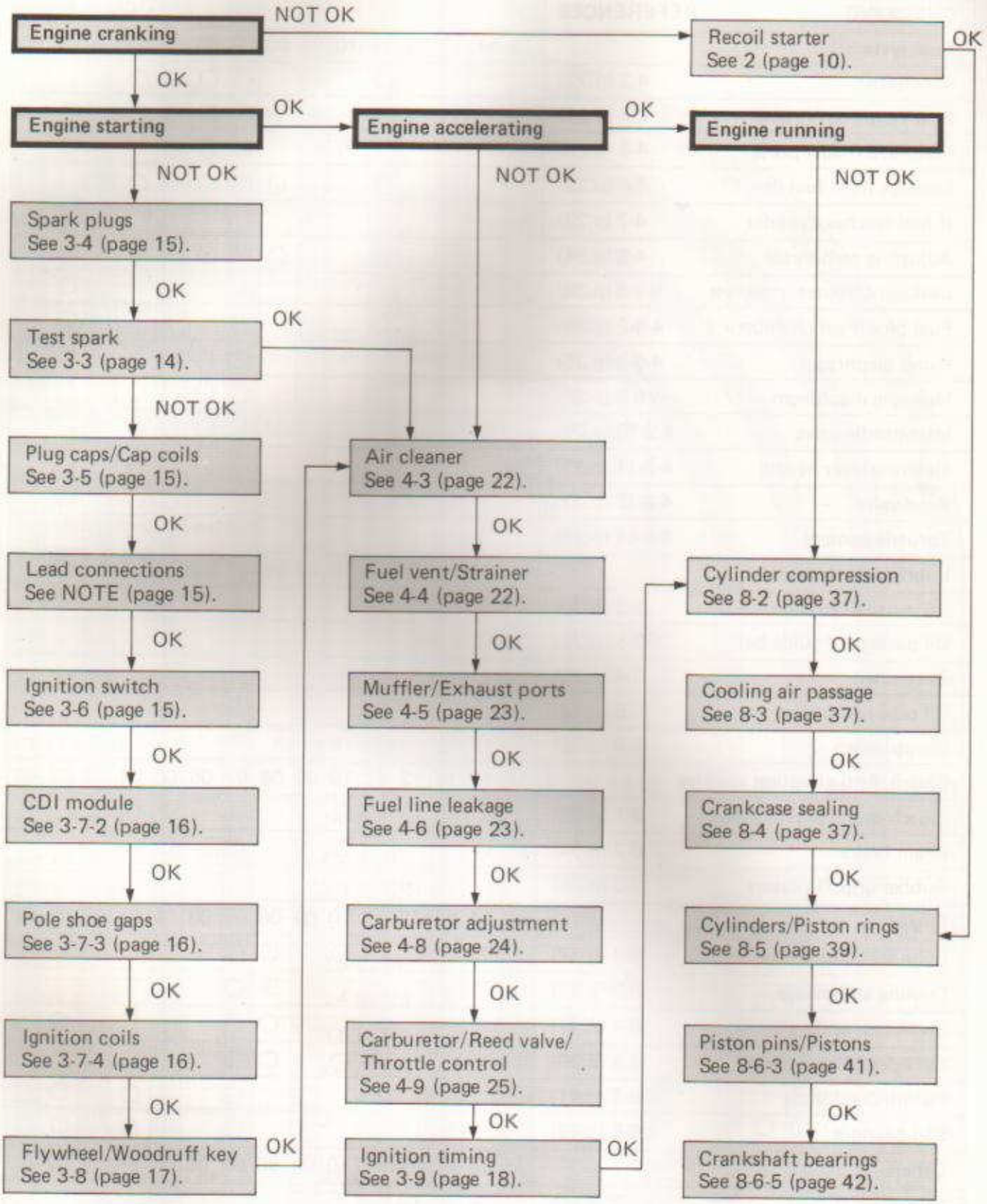
CHECKING	REFERENCES	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
		⊛ Check first														
Starter system																
Rope tension	2-1 (p.10)															⊛
Starter rope/Recoil spring	2-2 (p.10)															○
Starter pawls	2-3 (p.12)															○
Ignition system		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Sparks	3-3 (p.14)							○			○	○	○		○	
Spark plugs	3-4 (p.15)	○						○	○		○	○	○		○	
Plug caps/Cap coils	3-5 (p.15)							○							○	
Ignition switch	3-6 (p.15)	⊛						○							○	
CDI module/Pole shoe gaps/ Ignition coils	3-7 (p.16)							○			○	○	○		○	
Flywheel/Woodruff key	3-8 (p.17)							○			○	○	○		○	
Ignition timing	3-9 (p.18)						○	○	○	○	○	○	○		○	

[Continued on next page.]

[Continued from page 46]

CHECKING	REFERENCES	⊛ Check first														
Fuel system		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Air cleaner	4-3 (p.22)					○				○	○	○	○			
Fuel vent/Fuel strainer	4-4 (p.22)								○	○	○	○	○		○	
Muffler/Exhaust ports	4-5 (p.23)						⊛			○	○	○			○	
Leakage from fuel line	4-6 (p.23)					○			○	○	○	○	○	⊛		
If fuel reaches cylinder	4-7 (p.23)														○	
Adjusting carburetor	4-8 (p.24)					⊛			○	⊛	⊛	⊛	⊛		○	
Leakage carburetor gaskets	8-4-6 (p.38)											○			○	
Fuel pipe/Fuel chamber	4-9-2 (p.25)					○									○	
Pump diaphragm	4-9-3 (p.25)									○	○	○	○		○	
Metering diaphragm	4-9-6 (p.26)									○	○	○	○		○	
Inlet needle valve	4-9-10 (p.26)										○	○	○		○	
Metering lever height	4-9-11 (p.27)										○	○	○		○	
Reed valve	4-9-12 (p.27)											○	○		○	
Throttle control	4-9-14 (p.28)											○	○			
Lubrication system		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Oil vent/Oil strainer	5-3 (p.30)		○	⊛												
Oil passage of guide bar	5-3-5 (p.30)		○	○												
Auto-oiler	5-4 (p.30)		○	○												
Oil pipe connector	5-5 (p.32)		○	○												
Manual oiler	5-5 (p.32)		○	○												
Clutch/Anti-vibration systems		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Clutch drum/Clutch shoes	6-1 (p.33)		○		○		○						○			
Chain brake	6-2 (p.34)		○				○			○		○				
Rubber grips/Isolators	7-3 (p.35)				⊛											
Engine		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Cylinder compression	8-2 (p.37)						○		○	○			○			
Cooling air passage	8-3 (p.37)	○							⊛	○						
Crankcase sealing	8-4 (p.37)								○	○			○		○	
Cylinders/Piston rings	8-5 (p.39)						○		○	○			○		○	○
Piston/Crankshaft	8-6-3 (p.41)									○			○		○	○
Ball bearings	8-6-5 (p.42)									○			○		○	○
Others		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Saw chain cutters	Sharpen		⊛		○											
Saw chain tension	Adjust		○									○				
Depth gauge	Reset		○		○											

9-4 Engine troubleshooting flow chart



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