16, 18, 20 and 24HP Onan Engines

John Deere Horicon Works
CTM2 (19APR90)

LITHO IN U.S.A.
ENGLISH

Introduction

This component technical manual (CTM) contains necessary instructions to repair the engine.

Use this component technical manual in conjunction with the machine technical manual. An engine application listing in the introduction identifies product-model/engine type-model relationship. See the machine technical manual for:

- Engine removal and installation.

- Theory of operation, diagnostic, and testing procedures.

CAUTION: THIS SAFETY-ALERT SYMBOL MEANS ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.

When you see this symbol on your machine or in your manual, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

CTM2,IFC -19-03FEB87

INTRODUCTION

This manual is part of a total service support program.

FOS MANUALS—REFERENCE

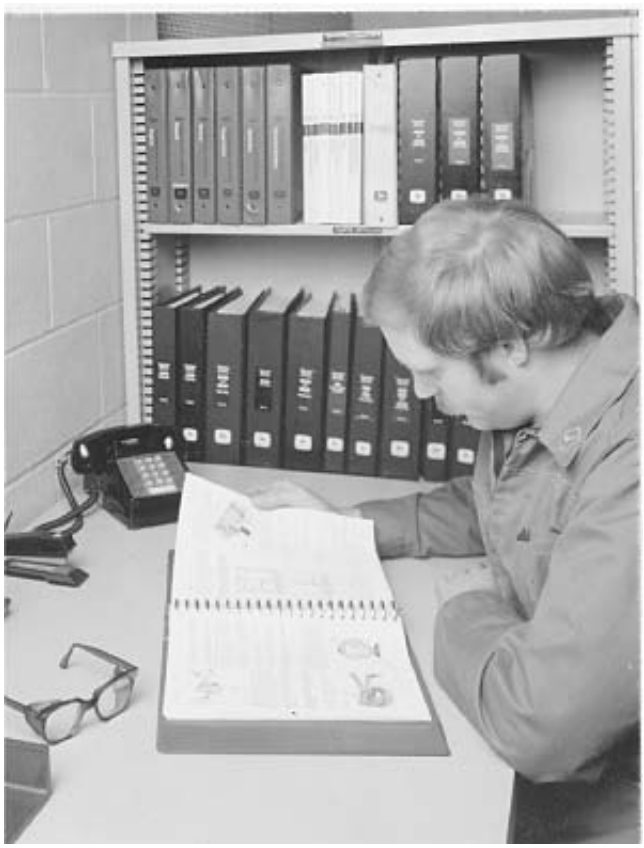
TECHNICAL MANUALS—MACHINE SERVICE

COMPONENT MANUALS—COMPONENT SERVICE

Fundamentals of Service (FOS) Manuals cover basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic types of failures and their causes. FOS Manuals are for training new personnel and for reference by experienced technicians.

Technical Manuals are concise service guides for specific machines. Technical manuals are on-the-job guides containing only the vital information needed by an experienced service technician.

Component Technical Manuals are concise service guides for specific components. Component Technical Manuals are written as stand alone manuals covering multiple machine applications.



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FEATURES OF THIS TECHNICAL MANUAL

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John Deere ILLUSTRUCTION format emphasizing illustrations and concise instructions in easy-to-use modules.

Emphasis on diagnosis, analysis, and testing so you can understand the problem and correct it.

Diagnostic information presented with the most logical and easiest to isolate problems first to help you identify the majority of routine failures quickly.

Step-by-step instructions for teardown and assembly.

Summary listing at the beginning of each group of all applicable specifications, wear tolerances, torque values, essential tools, and materials needed to do the job.

An emphasis throughout on safety—so you do the job right without getting hurt.

This technical manual was planned and written for you—an experienced service technician. Keep it in a permanent binder in the shop where it is handy. Refer to it when you need to know correct service procedures or specifications.

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O53,INTRO3 -19-07OCT85

ABOUT THIS MANUAL

This Component Technical Manual (CTM-2) covers the recommended repair procedures for all 16, 18, 20, and 24 HP Onan Engines removed from the machine. These engines can be repaired on a clean work bench or put on an engine stand.

Some components may be serviced without removing the engine from the machine. You may want to determine the repair procedure before you remove the engine. Refer to the machine technical manual for engine removal and installation procedures.

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ENGINE SERIAL NUMBER PLATE

The engine serial number plate is located under the air cleaner.

Refer to the engine model designation on your engine's serial number plate to identify repair information covered in the Component Technical Manual.

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BASIC ENGINE SPECIFICATIONS

ENGINE	B43E	B43G	P218G	B48G and P220G	T260
CYLINDER	2	2	2	2	2
CYCLE	4	4	4	4	4
BORE	82.55 mm (3.25 in.)	82.55 mm (3.25 in.)	82.55 mm (3.25 in.)	82.55 mm (3.25 in.)	90.42 mm (3.56 in.)
STROKE	66.55 mm (2.62 in.)	66.55 mm (2.62 in.)	73 mm 2.875 in.)	73 mm (2.87 in.)	76.20 mm (3.00 in.)
DISPLACEMENT	710 cm^3 (43.3 cu in.)	710 cm^3 (43 cu in.)	782 cm^3 47.7 cu in.)	782 cm^3 (48 cu in.)	983 cm^3 (60 cu in.)
*HORSEPOWER	12kW (16 hp)	13.5 kW (18 HP)	13.4 kW (18 hp)	15 kW (20 hp)	18 kW (24 hp)

**Horsepower rating is established by engine manufacturer in accordance with Standard International Combustion Institute procedure. It is corrected to (60 ˚F) and 29.92 hg barometer. Laboratory test engines are equipped with air cleaner and muffler.*

M98,INTR,3 -19-10FEB87

ENGINE APPLICATION CHART

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Refer to the engine application chart to identify product-model/engine type-model relationship.

CONSUMER PRODUCTS

Lawn and Garden Tractors

Machine No.	Engine Model
316	B43E or P218G
318	B43G or P218G
420	B48G or P220G

Front Mowers

Machine No.	Engine Model
F910	B48G or P220G
F930	T260

M98,INTR,4 -19-29JAN87

ENGLISH TORQUE SPECIFICATIONS

NOTE: Wrench torque tolerance is ± 20%.

Bolt Diameter	Plain Head*		Three Radial Dashes*		Six Radial Dashes*	
	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m
1/4 in.	6	8	9	12	12	16
5/16 in.	10	14	18	24	25	34
3/8 in.	20	27	30	41	45	61
7/16 in.	30	41	50	68	70	95
1/2 in.	45	61	75	101	110	149
9/16 in.	70	95	110	150	155	210
5/8 in.	95	128	155	210	215	290
3/4 in.	165	225	270	365	385	520
7/8 in.	170	230	435	590	620	840
1 in.	255	345	660	895	930	1260

Torque figures indicated above and in the Specification Sections of this manual are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or cap screws unless otherwise specified in this manual.

** Torque value for bolts and cap screws are identified by their head markings.*

S11,2000,DD -19-11JUL85

METRIC TORQUE SPECIFICATIONS

NOTE: Wrench torque tolerance is ± 20%.

Bolt Diameter	Property Class 8.8* lb-ft	N·m	Property Class 10.9* lb-ft	N·m
M5	5	6	7	9
M6	8	10	11	15
M8	18	25	26	35
M10	37	50	52	70
M12	66	90	92	125
M16	166	225	229	310
M20	321	435	450	610
M24	554	750	775	1050

Torque figure indicated above and in the Specification Sections of this manual are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or cap screws unless otherwise specified in this manual.

** Torque value for bolts and cap screws are identified by their head markings.*

S11,2000,DE -19-11JUL85

SPECIFICATIONS

Item	Measurement	Specification
Breather Valve Cover Bolt	Torque	2 ± 1 N·m (18 ± 9 lb-in.)

M98,2005K,1 -19-07OCT85

REMOVE AIR CLEANER

1. Remove wing nut and cover.

M98,2005K,2 -19-07OCT85

2. Remove lock nut and air cleaner element.

M98,2005K,3 -19-07OCT85

3. Remove precleaner. Wash precleaner as necessary.

M98,2005K,4 -19-07OCT85

4. Wash precleaner in warm, soapy water. Rinse in clean water. Squeeze precleaner to remove most of water. Let precleaner air dry.

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M98,2005K,5 -19-07OCT85

5. Hold a lighted bulb inside air cleaner element. If you can see the light through element and the paper appears clean, the element is still usable. If the element is oily, dirty, bent, torn, crushed or obstructed in any way, install a new element.

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M98,2005K,6 -19-07OCT85

IMPORTANT: Close choke and all openings to keep objects from falling into carburetor, flywheel housing, and air intake system.

6. Remove three cap screws and splash plate (A).

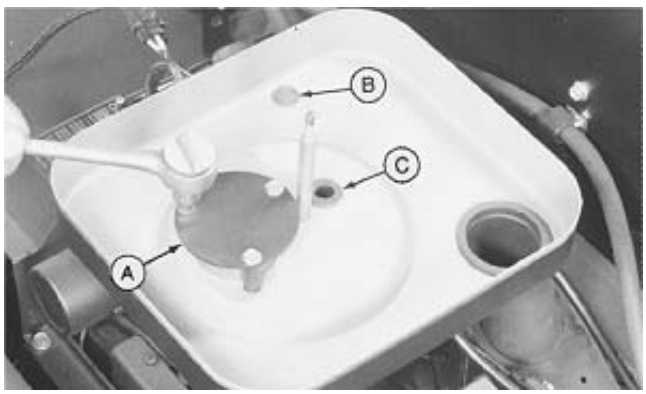
7. Remove two base cap screws (B).

8. Push breather hose (C) from air cleaner base.

9. Lift air cleaner base from carburetor.

10. Clean inside of base and cover.

11. Inspect air intake hose for cracks or deterioration; replace if necessary.



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INSTALL AIR CLEANER

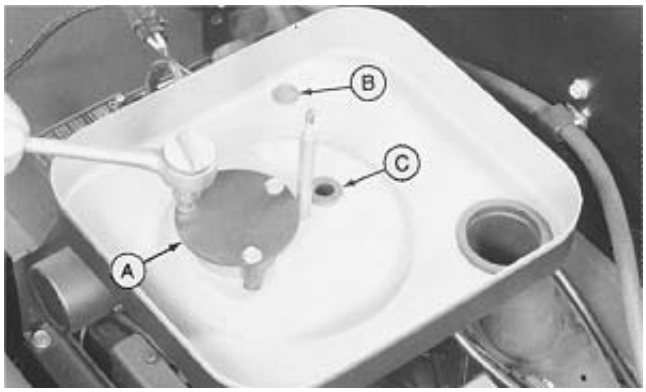
1. Check carburetor intake to make sure the O-ring is in place.

2. Put air cleaner base on carburetor.

3. Install breather hose (C). Be sure breather hose and intake hose are tightly installed to prevent dirt from entering the system.

4. Install and tighten two cap screws (B).

5. Install and fasten splash plate (A) with three screws.



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6. Apply 1 oz (30 ml) of clean engine oil to precleaner.

7. Squeeze precleaner to distribute oil evenly and to remove excess oil.

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M98,2005K,9 -19-08OCT85

8. Put precleaner on air cleaner element. Install element and holddown.

9. Install lock nut. Tighten until snug only.

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M98,2005K,10 -19-11NOV85

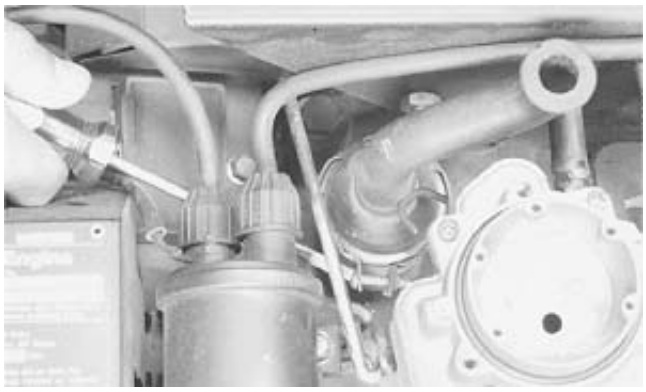
10. Install cover. Fasten with wing nut.

M98,2005K,11 -19-08OCT85

REPAIR BREATHER—T260 ENGINE

1. Remove air cleaner. (See Remove Air Cleaner in this section.)

2. Loosen clamp to remove breather tube.



M98,2005K,12 -19-08OCT85

3. Remove filter packing.

4. Wash filter packing in a safe solvent and blow dry with air pressure. If packing comes apart or is deteriorated, replace it.

M98,2005K,13 -19-08OCT85

5. Wash breather valve with solvent.

Inspect ball valves to be sure they move freely.

Inspect O-ring for cuts or cracks. Replace if defective.

6. When installing breather tube, be sure filter packing is in breather and that the O-ring is installed on the valve assembly.

M98,2005K,14 -19-08OCT85

REPAIR BREATHER—B43E, B43G, B48G, P218G, AND P220G ENGINES

1. Remove air cleaner. (See Remove Air Cleaner in this group.)

2. Pull breather tube from breather assembly.

M98,2005K,15 -19-29JAN87

3. Remove filter packing.

4. Wash filter packing in a safe solvent and blow dry with air pressure. If packing comes apart or is deteriorated, replace it.

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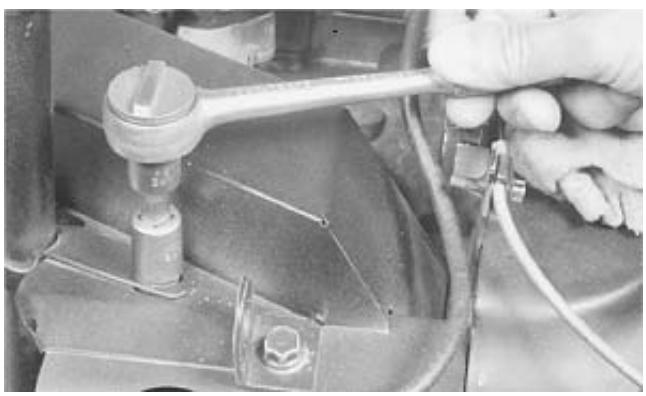
5. Remove three cap screws to remove manifold cover.



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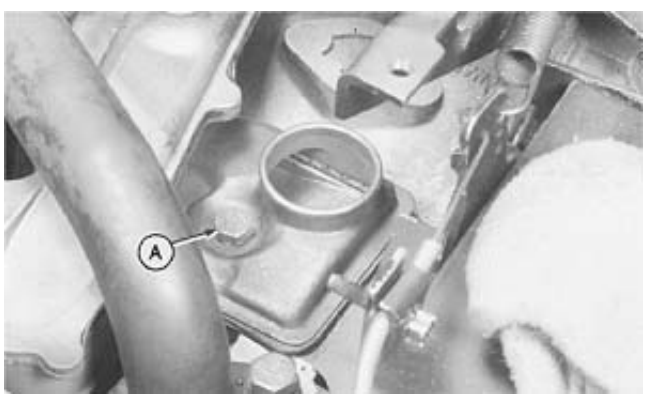
6. Remove cap screw (A).

IMPORTANT: Do not drop small parts into engine opening when removing breather assembly.

7. Remove breather assembly.



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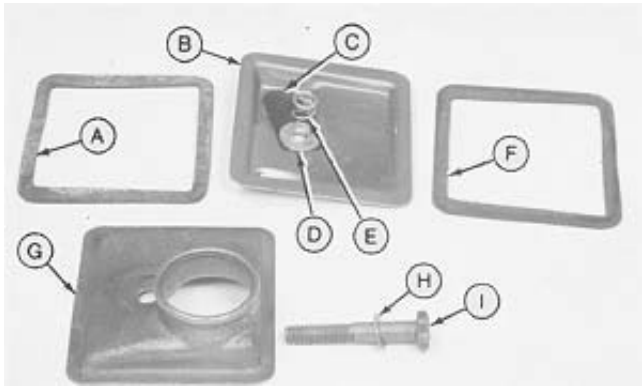
8. Clean parts with solvent. Inspect reed valve (C). Replace it if cracked or bent. Replace gaskets if broken or deteriorated.

NOTE: When installing the first gasket, be sure it aligns with the flange on the deflector (B). Apply a small amount of clean grease to the gaskets to hold them in place during installation.

9. Install in order:

A—Gasket
B—Deflector
C—Reed Valve
D—Washer
E—Spring
F—Gasket
G—Valve Cover
H—Washer
I—Cap Screw



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M98,2005K,19 -19-08OCT85

IMPORTANT: Be sure gaskets are in place before tightening cap screw. Breather will not function properly if air leaks are present.

10. Tighten cap screw to 2 ± 1 N·m (18 ± 9 lb-in.).

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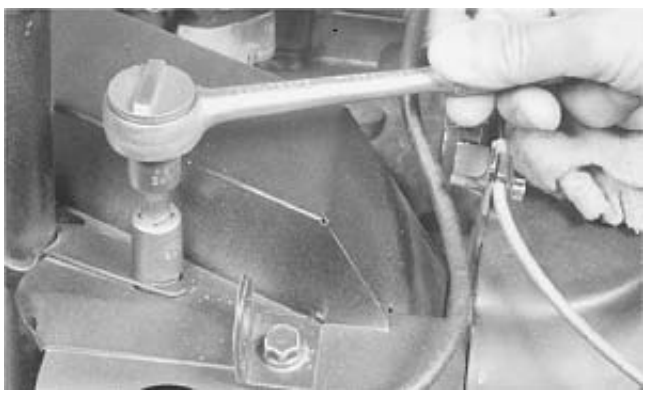
M98,2005K,20 -19-11NOV85

11. Install manifold cover. Fasten with three cap screws.



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12. Install filter packing in breather tube.

M37001 -UN-25JAN90

M98,2005K,22 -19-11NOV85

13. Push breather tube securely onto valve cover.

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M98,2005K,23 -19-11NOV85

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Feeler Gauge	Measure cylinder head flatness

M98,2010K,1 -19-11NOV85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Overhaul Gasket Kit

M98,2010K,2 -19-08OCT85

SPECIFICATIONS

Item	Measurement	Specification
MUFFLER AND EXHAUST PIPES		
Exhaust Pipe Cap Screw		
P218G, P220G, B43E, B43G, B48G Engines	Torque	11 ± 3 N·m 97 ± 27 lb-in.)
T260 Engine	Torque	29 ± 2 N·m (257 ± 18 lb-in.)
Lift Bracket Cap Screw	Torque	11 ± 3 N·m (97 ± 27 lb-in.)
INTAKE MANIFOLD		
Attaching Cap Screw		
B43E, B43G, B48G Engines	Torque	11 ± 3 N·m (97 ± 27 lb-in.)
T260 Engine	Torque	29 ± 2 N·m (257 ± 18 lb-in.)
P218G, P220G Engines	Torque	6 N·m (53 lb-in.)
CYLINDER HEAD		
Cylinder Head	Flatness	0.005—0.10 mm (0.002—0.004 in.)
Attaching Cap Screws or Nuts		
P218G, P220G, B43E, B43G, B48G Engines	Torque-In Sequence	20 ± 1 N·m (180 ± 12 lb-in.)
T260 Engine:		
(Top six nuts with washers)	Torque-In Sequence	16 ± 1 N·m (142 ± 12 lb-in)
(Bottom four nuts)	Torque-In Sequence	20 ± 1 N·m (180 ± 12 lb-in.)
Lift Bracket Cap Screw	Torque	11 ± 3 N·m (97 ± 27 lb-in.)

M98,2010K,3 -19-10FEB87

REMOVE INTAKE MANIFOLD

1. Remove muffler. (See machine technical manual.)

2. Remove four cap screws to remove exhaust pipes and gasket (A). Inspect exhaust pipes for cracks or damage. Replace as necessary.

3. Remove air cleaner base. (See Group 05 in this manual.)

M98,2010K,4 -19-11NOV85

4. For T260 engines, remove two cap screws to remove coil bracket.

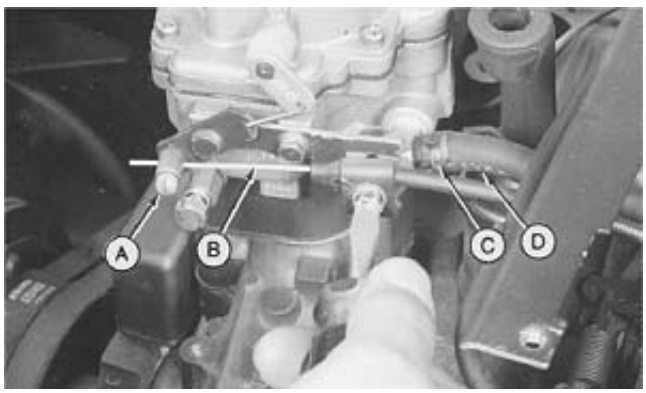
5. Remove clip (A) to disconnect throttle rod.

M98,2010K,5 -19-11NOV85

6. If engine is in machine, loosen clamp and screw (A) to disconnect choke cable (B).

7. If engine is in machine, slide hose clamp (C) back to disconnect fuel inlet line (D).

A—Screw
B—Choke Cable
C—Hose Clamp
D—Fuel Inlet Line



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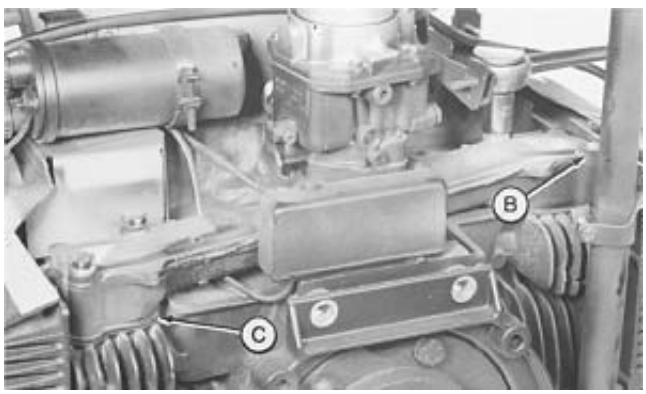
8. For T260 engine, remove four cap screws to remove intake manifold, carburetor, and gaskets (A).

For B43E, B43G, or B48G engine, remove three cap screws to remove spacer (B), intake manifold, carburetor, and gaskets (C).

For P218G and P220G engine, remove four cap screws to remove intake manifold, carburetor, and gaskets.

T260 Engine



B43E, B43G, B48G Engines

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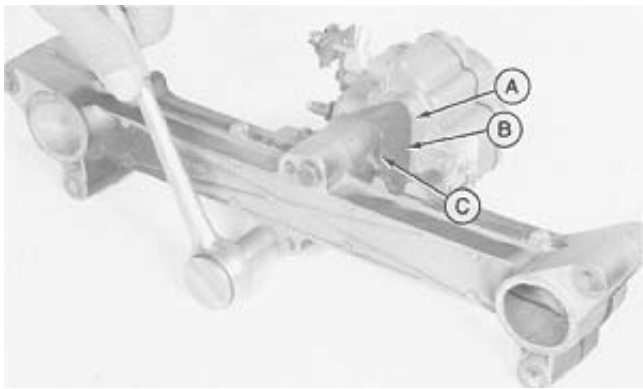
9. For T260, P218G or P220G engine, remove two cap screws to remove carburetor, gasket (A), spacer (B), and gasket (C).

For B43E, B43G, or B48G engine, remove two cap screws to remove carburetor and gasket (A).

10. Inspect intake manifold for cracks or holes. Replace as necessary.



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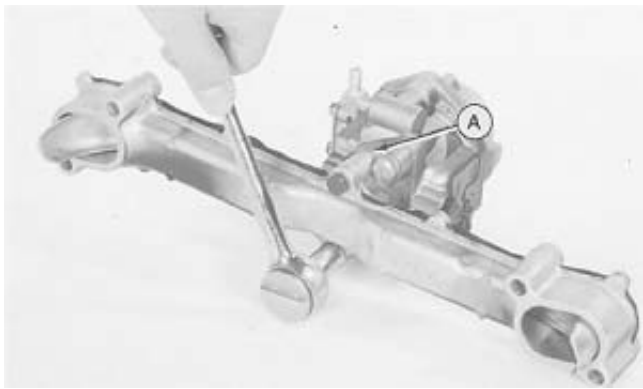
T260, P218G, P220G Engine



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B43E, B43G, B48G Engines

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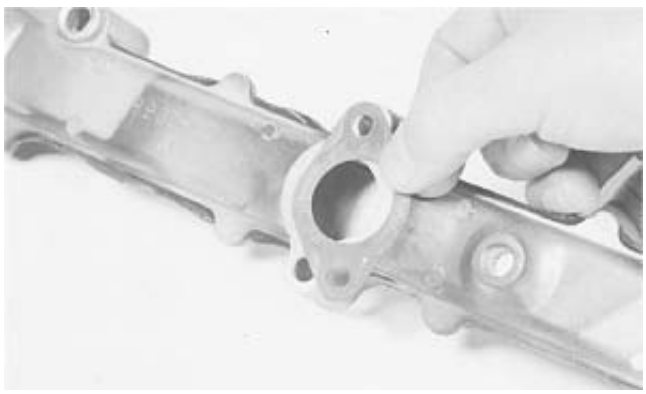
INSTALL INTAKE MANIFOLD

1. Install a new gasket on intake manifold.



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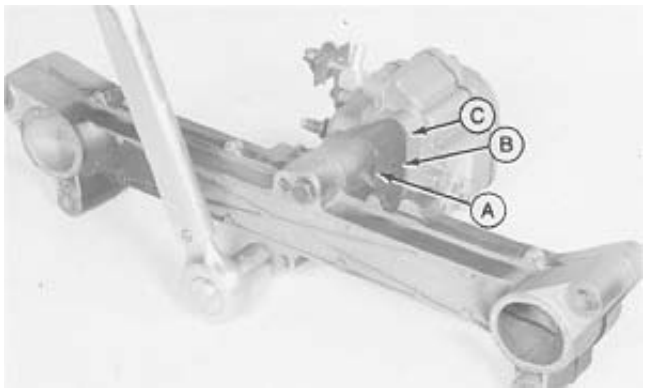
2. For T260, P218G, or P220G engine, install gasket (A) spacer (B), gasket (C), and carburetor on intake manifold. Install and tighten two cap screws.

For B43E, B43G, or B48G engine, install carburetor on intake manifold and fasten with cap screws.



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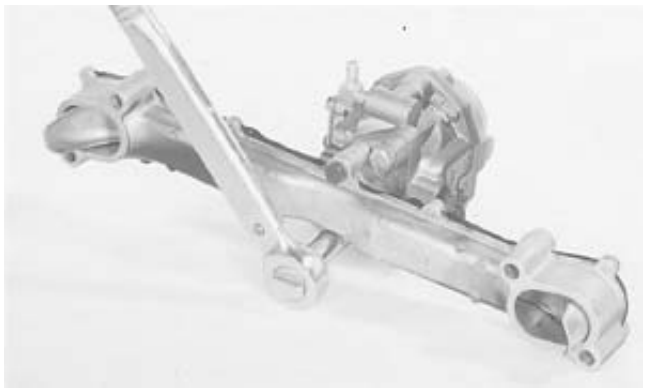
T260, P218G, P220G Engine



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B43E, B43G, B48G Engines

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NOTE: For T260 engine, go to step 5.

3. Install new gaskets with notch in gasket aligned with notch on intake port.

4. For B43E, B43G, or B48G engine, install intake manifold and tighten cap screws to 11 ± 3 N·m (97 ± 27 lb-in.). Install spacer (A).

For P218G or P220G engine, install intake manifold and oil fill tube. Tighten cap screws to 6 N·m (53 lb-in.).

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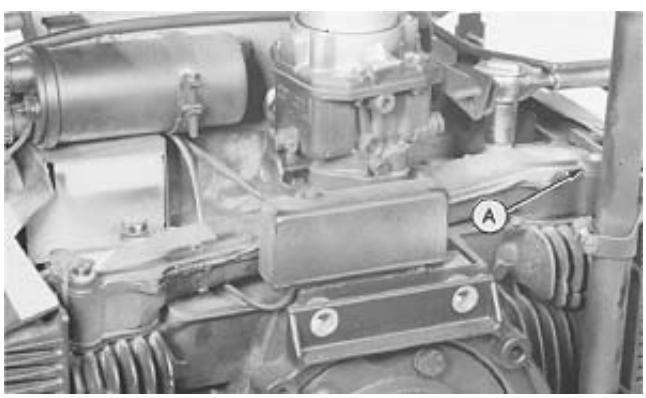

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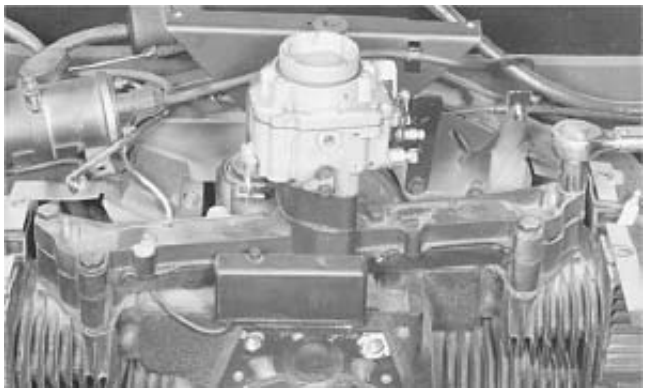
5. Install new gaskets on intake ports.

6. Install intake manifold and tighten cap screws to 29 ± 2 N·m (257 ± 18 lb-in.).



T260 engine

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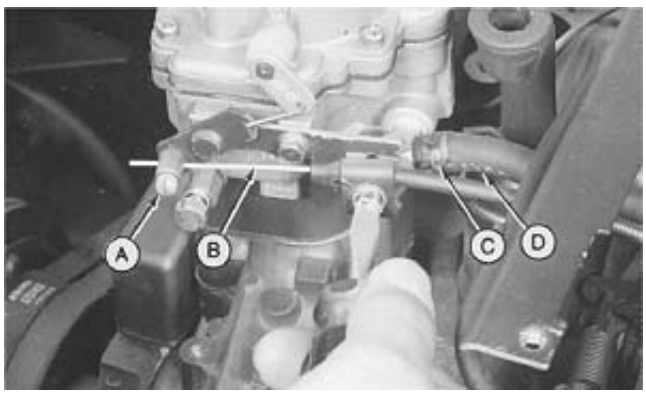
7. If engine is in machine, connect fuel inlet line (D) and fasten with hose clamp (C).

8. If engine is in machine, connect choke cable (B) to choke linkage. Push choke knob down. Hold choke linkage upward (choke plate open). Tighten screw (A) and clamp.

A—Screw
B—Choke Cable
C—Hose Clamp
D—Fuel Inlet Line



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9. Connect throttle rod and fasten with clip (A).

10. For T260 engine, install coil bracket on intake manifold. Install and tighten two cap screws.

M98,2010K,14 -19-30JAN87

11. Install new exhaust pipe gaskets.

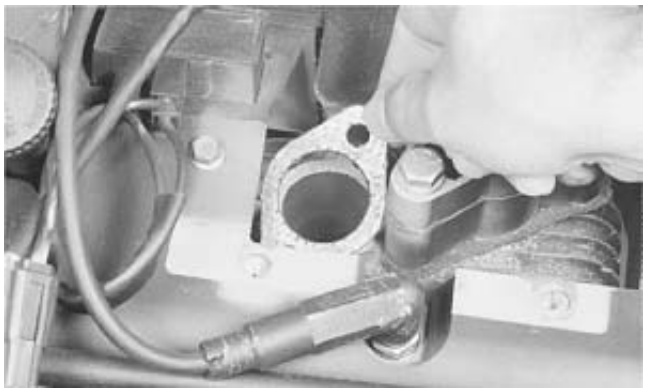
12. Install exhaust pipes and fasten with four cap screws.

EXHAUST PIPE TORQUE SPECIFICATIONS

Engine	Measurement	Specifications
T260	Cap Screw Torque	29 ± 2 N·m (257 ± 18 lb-in.)
B43E, B43G, B48G, P218G or P220G	Cap Screw Torque	11 ± 3 N·m (97 ± 27 lb-in.)

13. Install manifold covers and fasten with cap screws.

14. Install air cleaner assembly. (See Group 05 in this manual.)



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REMOVE CYLINDER HEAD

1. Park tractor safely.

2. Remove engine. (See machine technical manual.)

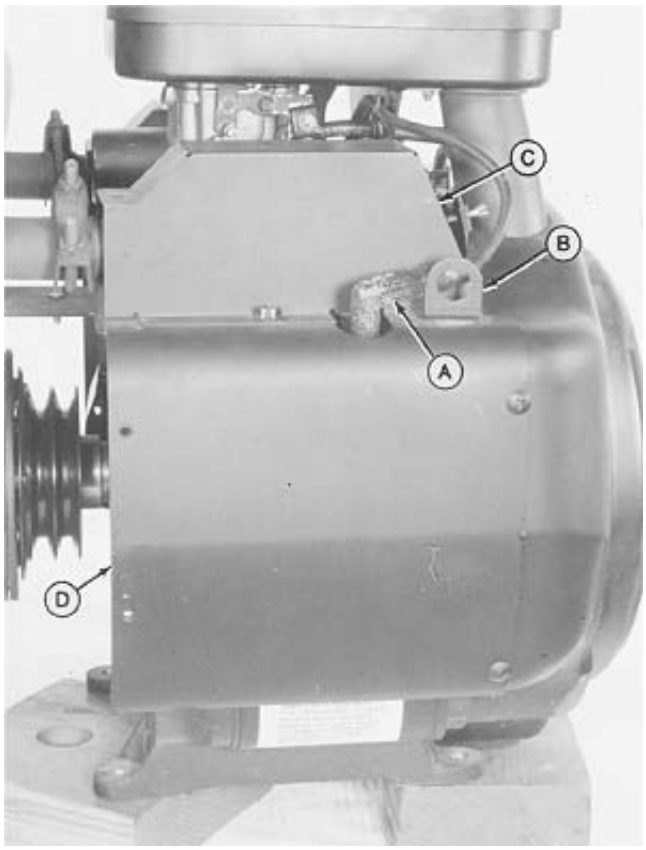
3. Disconnect spark plug wire (A).

4. For T260 engine, remove six cap screws to remove lift bracket (B), exhaust pipe shroud (C), and right side shroud (D).

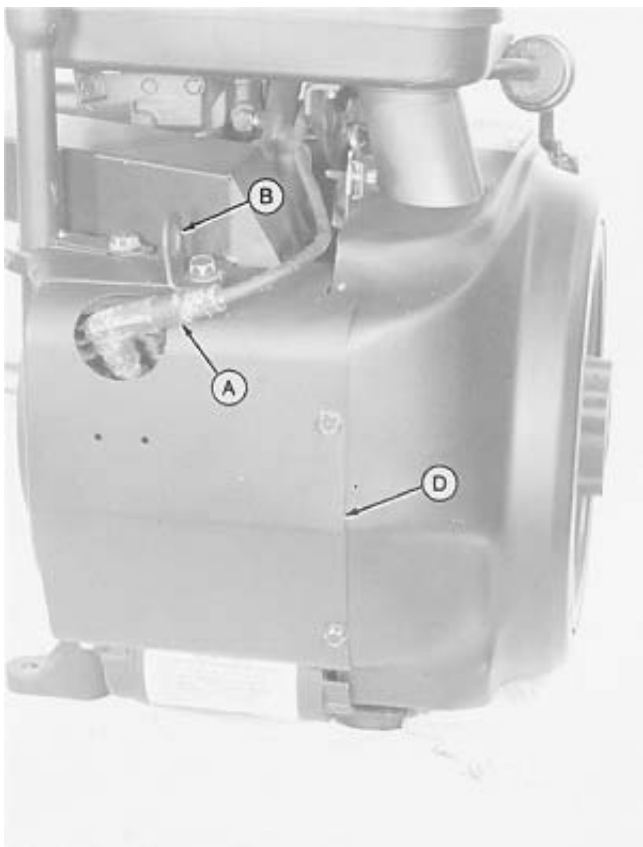
For B43E, B43G, or B48G engine, remove four cap screws to remove lift bracket (B) and right side shroud (D).

For P218G or P220G engines, remove air cleaner assembly (See Group 05 in this manual.) Remove four cap screws to remove lift bracket and right side shroud.

A—Spark Plug Wire
B—Lift Bracket
C—Exhaust Pipe Shroud
D—Right Side Shroud



T260 Engine



B43E, B43G, B48G Engines

M98,2010K,17 -19-30JAN87

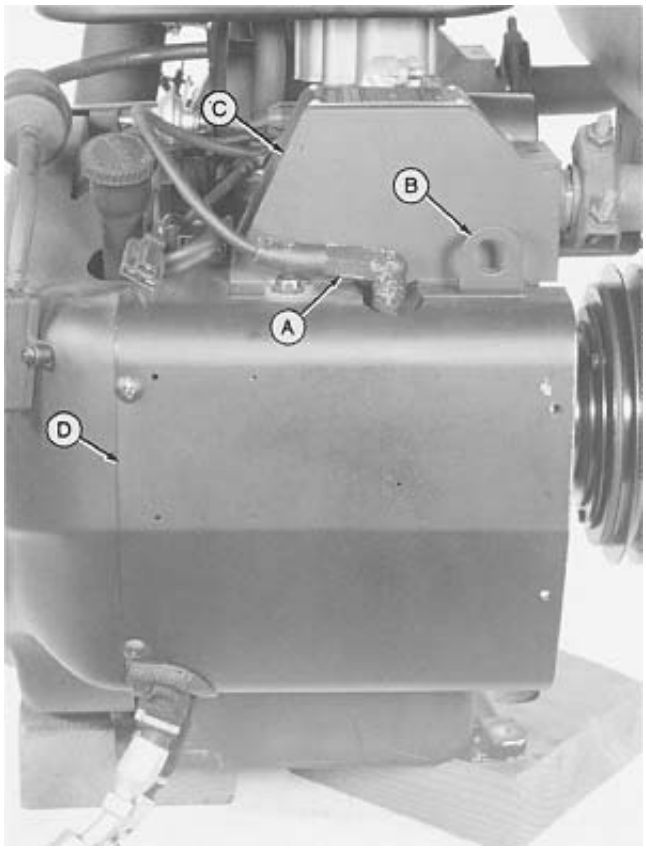
5. Disconnect spark plug wire (A).

6. For T260 engine, remove seven cap screws to remove lift bracket (B), exhaust pipe shroud (C), and left side shroud (D).

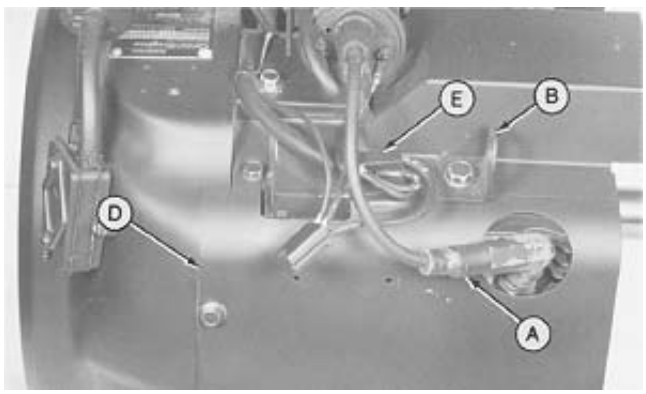
For B43E, B43G, OR B48G engine, disconnect voltage regulator leads (E). Remove five cap screws to remove lift bracket (B) and left side shroud (D).

For P218G or P220G engines, disconnect voltage regulator leads. Remove four cap screws to remove lift bracket and left side shroud.

A—Spark Plug Wire
B—Lift Bracket
C—Exhaust Pipe Shroud
D—Left Side Shroud
E—Voltage Regulator Leads



T260 Engine



B43E, B43G, B48G Engines

M98,2010K,18 -19-10FEB87

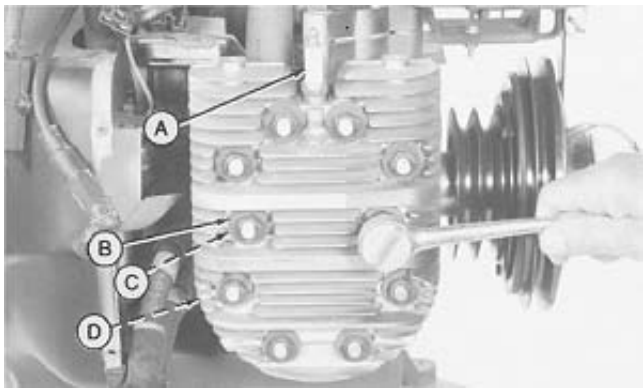
IMPORTANT: Do not remove cylinder heads while they are hot. Cylinder head may warp. A hot gasket will be soft and difficult to remove.

7. Remove spark plug (A).

8. For T260 engine, remove 10 nuts, 20 compression washers (B), and 10 washers (C) to remove cylinder head and gasket (D).

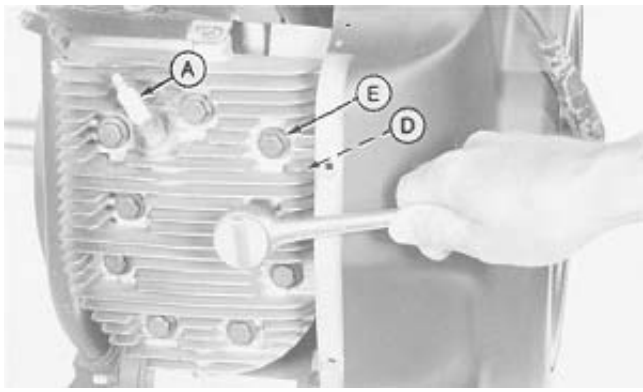
For P21G, P220G, B43E, B43G, OR B48G engine, remove nine cap screws and washers (E) to remove cylinder head and gasket (D).

A—Spark Plug
B—Compression Washer (20 Used)
C—Washer (10 Used)
D—Gasket
E—Washer (9 Used)



M36931 -UN-25JAN90

T260 Engine



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P218G, P220G, B43E, B43G,B48G

M98,2010K,19 -19-10FEB87

IMPORTANT: Do not damage gasket sealing surface while cleaning carbon deposits.

9. Carefully clean carbon deposits from combustion chamber and gasket surface on heads and cylinder block with a scraper and wire brush.

10. Inspect head for cracks or broken cooling fins. Check gasket sealing surface for burrs or nicks. Replace head if damaged.

11. Measure cylinder head flatness in several locations.

CYLINDER HEAD SPECIFICATIONS

Item	New Part	Wear Tolerance
Flat Within	0.05 mm (0.002 in.)	0.10 mm (0.004 in.)

Replace head if cylinder head is warped more than 0.10 mm (0.004 in.).

M30948 -UN-14JUL89

M98,2010K,20 -19-08OCT85

INSTALL CYLINDER HEAD

NOTE: To install cylinder head on P218G, P220G, B43E, B43G, OR B48G engine, go to step 4.

1. For T260 engine, install a new gasket (A) on cylinder head.

2. Install cylinder head on cylinder block. Install flat washer (B), two compression washers (C) with outside edges contacting each other, and nut (D) on each of the top six longer studs. Install flat washer and nut on each of the bottom four shorter studs. Tighten nuts in several steps in the sequence shown.

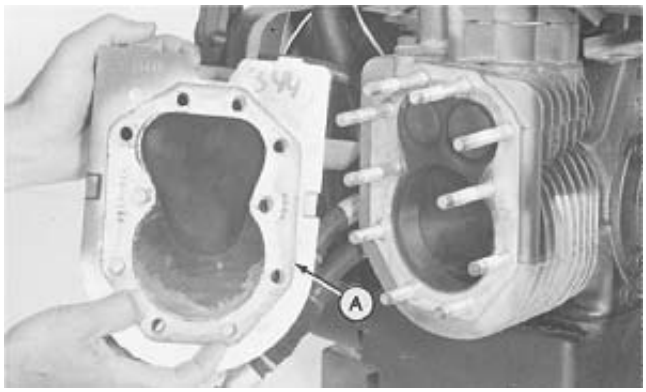
NUT TORQUE SPECIFICATIONS

Top six nuts . . . . . 16 ± 1 N·m (142 ± 12 lb-in.)
(with compression washers)

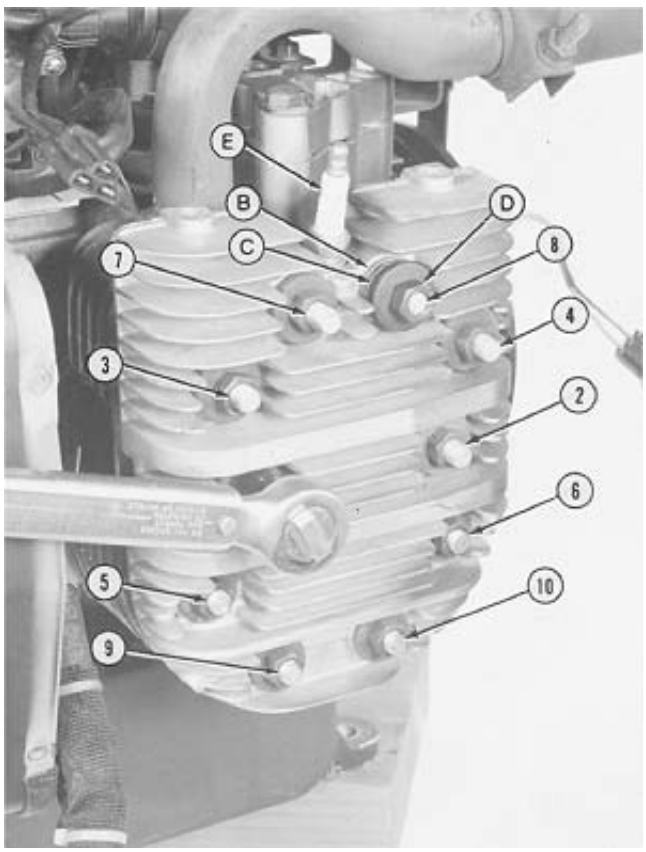
Bottom four nuts . . . . . 20 ± 1 N·m (180 ± 12 lb-in.)

3. Install spark plug (E).

A—Gasket
B—Washer (10 Used)
C—Compression Washer (20 Used)
D—Nut (10 Used)
E—Spark Plug



M36933 -UN-25JAN90



M36934 -UN-25JAN90

M98,2010K,21 -19-30JAN87

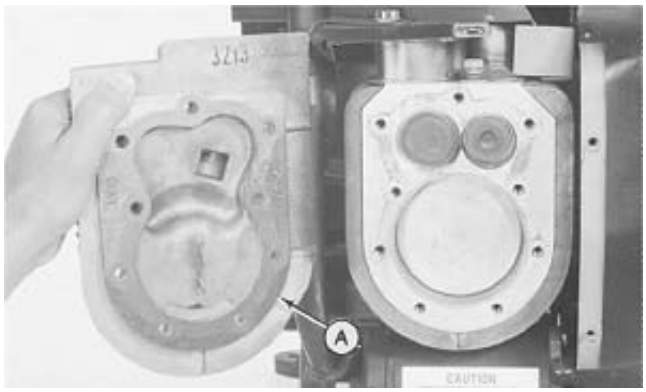
4. For P218G, P220G, B43E, B43G, or B48G engine, install a new gasket (A) on cylinder head.

5. Install cylinder head on cylinder block with the five longest cap screws in the top holes of cylinder head. Tighten cap screws in several steps in the sequence shown.

CAP SCREW TORQUE SPECIFICATION

Attaching Cap Screws . . . . . 20 ± 1 N·m (180 ± 12 lb-in.)

6. Install spark plug (B).



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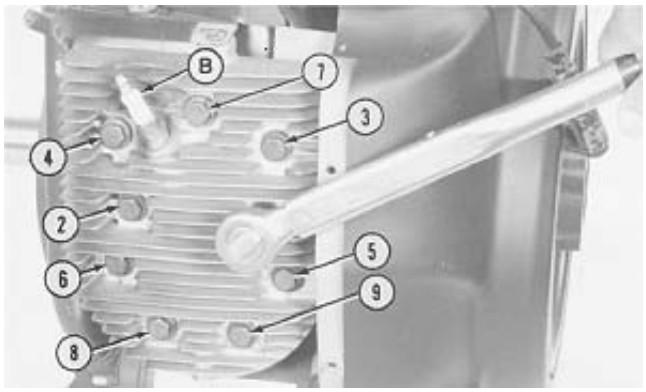

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M98,2010K,22 -19-30JAN87

7. For T260 engine, install left side shroud (D), exhaust pipe shroud (C), lift bracket (B) and fasten with seven cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

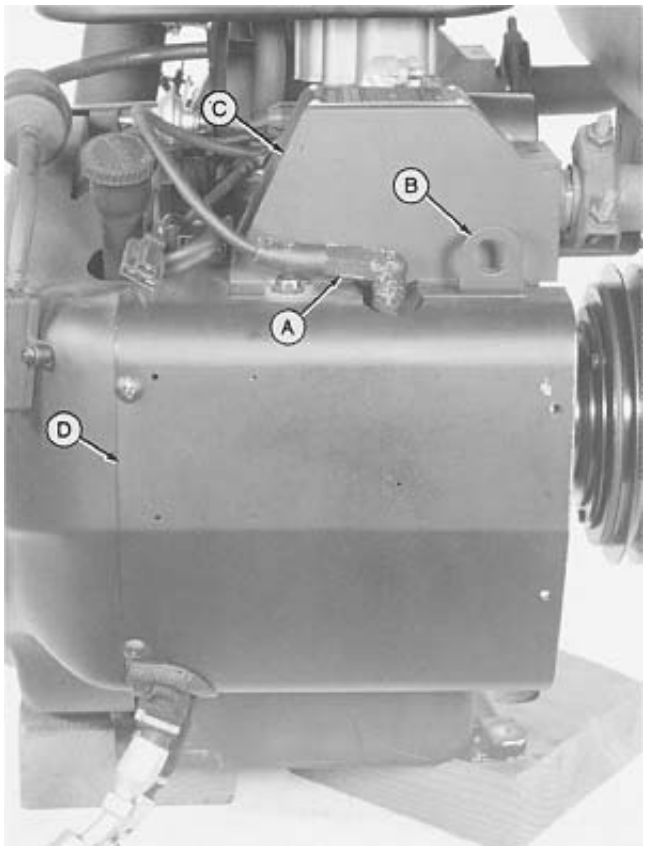
For P218G or P220G engines, install left side shroud, lift side shroud, lift bracket, and fasten with four cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.). Connect voltage regulator leads.

For B43E, B43G, OR B48G engine, install left side shroud (D), lift bracket (B), and fasten with five cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

Connect voltage regulator leads (E). Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of the voltage regulator.

8. Connect spark plug wire (A).

A—Spark Plug Wire
B—Lift Bracket
C—Exhaust Pipe Shroud
D—Left Side Shroud
E—Voltage Regulator Leads



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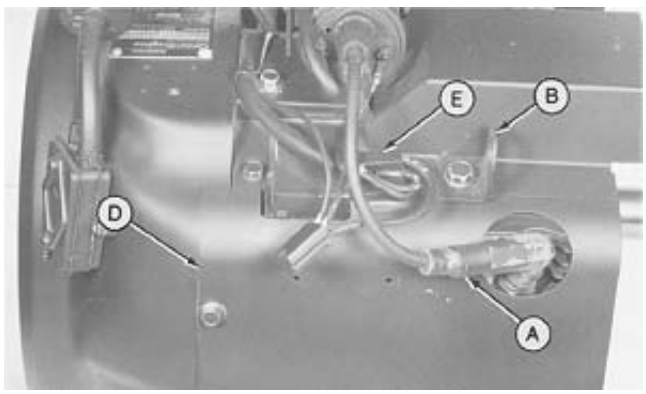
T260 Engine



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B43E, B43G, B48G Engines

M98,2010K,23 -19-10FEB87

9. For T260 engine, install right side shroud (D), exhaust pipe shroud (C), lift bracket (B), and fasten with six cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

For B43E, B43G, OR B48G engine, install right side shroud (D), lift bracket (B), and fasten with four cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

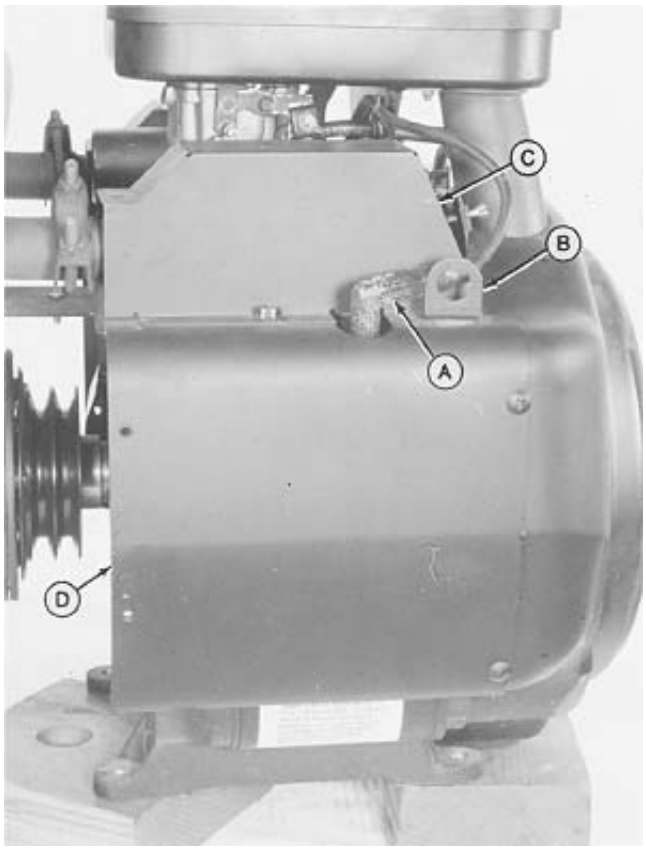
10 14

For P218G or P220G engines, install right side shroud, lift bracket, and fasten with four cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

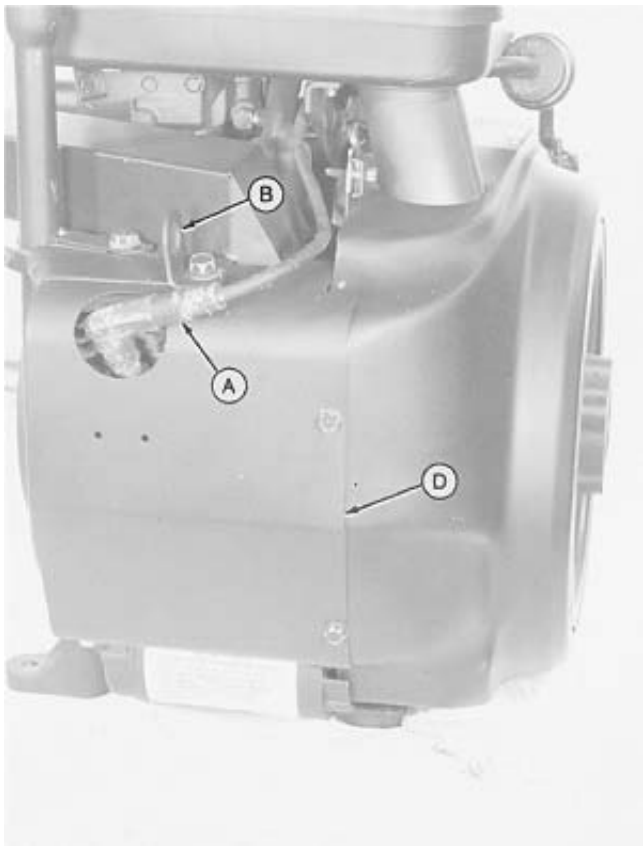
10. Connect spark plug wire (A).

11. Install engine. (See machine technical manual.)

A—Spark Plug Wire
B—Lift Bracket
C—Exhaust Pipe Shroud
D—Right Side Shroud



T260 Engine



B43E, B43G, B48G Engines

M98,2010K,24 -19-10FEB87

ESSENTIAL TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Number	Name	Use
JDG 323	Valve Guide Driver	Remove valve guides
JDE 118	Valve Guide Driver	Remove valve guides
JDG 569	Valve Guide Installer	Install valve guides
JDG 507	Valve Seat Cutter	Cut seats to 45°

M98,2015K,1 -19-10FEB87

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Feeler Gauge	Measure valve clearance
Valve Spring Compressor	Remove and install valves
Valve Inspection Center	Measure valve out-of-round
Outside Micrometer	Measure valves and tappets
Spring Compression Tester	Check valve springs
Valve Guide Brush	Clean valve guides
Telescoping Gauge	Measure tappet and valve guide bores
Valve Seat Cutter	Recondition valve seats
Vernier Calipers	Measure valve seat width
Blind Hole Puller Set	Remove valve seats
Bushing, Bearing, and Seal Driver Set	Install valve seats

M98,2015K,2 -19-11NOV85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Valve Gasket Kit

Tappet Kit

Overhaul Gasket Kit

M98,2015K,3 -19-08OCT85

SPECIFICATIONS

Intake and Exhaust Valves (B43E, B43G, B48G, AND T260 Engines)

Item	New Specification	Wear Tolerance
1. Exhaust Valve Stem O.D.	8.66—8.67 mm (0.341—0.3414 in.)	8.64 mm (0.340 in.)
2. Intake Valve Stem O.D.	8.70—8.71 mm (0.3425—0.3429 in.)	8.66 mm (0.341 in.)
3. Valve Face Angle	44°	
4. Valve Face Margin		0.787 mm (0.031 in.)
5. Valve Spring		
Free length (approx.)	42.21 mm (1.662 in.)	
Test length	34.92 mm (1.375 in.) at 169—187 N (38—42 lb force)	
6. Valve Cover Cap Screw Torque	2.1 ± 0.7 N·m (18 ± 6 lb-in.)	

Intake and Exhaust Valves (P218G and P220G Engines)

Item	New Specification	Wear Tolerance
1. Exhaust Valve Stem O.D.	7.061—7.074 mm (0.2780—0.2785 in.)	7.05 mm (0.2775 in.)
2. Intake Valve Stem O.D.	7.099—7.112 mm (0.2795—0.2800 in.)	7.07 mm (0.2783 in.).
3. Valve Face Angle	44°	
4. Valve Face Margin		0.787 mm (0.031 in.)
5. Valve Spring		
Free length (approx.)	40.64 mm (1.60 in.)	
Test length	26.67 mm (1.05 in.) at 245N (55 lb force)	
6. Valve Cover Cap Screw Torque	2.1 ± 0.7 N·m (18 ± 6 lb-in.)	

M98,2015K,4 -19-10FEB87

TAPPETS

Item	New Specification	Wear Tolerance
Tapped O.D.	18.99—19 mm (0.747—0.748 in.)	18.90 mm (0.744 in.) 2. Tappet Bore
2. Tappet Bore I.D.	19.06—19.09 mm (0.750—0.751 in.)	19.15 mm (0.754 in.)
3. Tappet-To-Bore Clearance	0.04—0.08 mm (0.0015—0.003 in.)	0.15 mm (0.006 in.)

Valve Seats

Item	New Specification	Wear Tolerance
1. Valve Seat Angle	45°	
2. Valve Seat Width	0.8—1.2 mm (0.031—0.047 in.)	

Valve Guides

Item	New Specification	Wear Tolerance
Valve Guide I.D. (B43E, B43G, B48G, T260 Engines)	8.74—8.79 mm (0.344—0.346 in.)	8.84 mm (0.348 in.)
Valve Guide I.D. (P218G, and P220G Engines)	7.14—7.16 mm (0.281—0.282 in.)	7.19 mm (0.283 in.)
2. Intake Valve Stem Clearance	0.03—0.06 mm (0.001—0.002 in.)	0.13 mm (0.005 in.)
3. Exhaust Valve Stem Clearance	0.06—0.10 mm (0.002—0.004 in.)	0.15 mm (0.006 in.)

Valve Clearance

Item	New Specification	Wear Tolerance
1. Intake Valve	0.13 mm (0.005 in.)	
2. Exhaust Valve	0.33 mm (0.013 in.)	

M98,2015K,5 -19-10FEB87

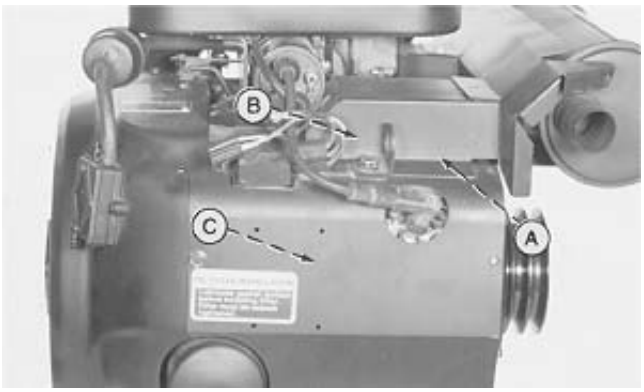
REMOVE INTAKE AND EXHAUST VALVES

1. Remove engine if these components cannot be removed with engine in unit. (See machine technical manual.)

2. Remove exhaust pipes with muffler (A).

3. Remove intake manifold (B). (See Remove Intake Manifold, Group 10 in this manual.)

4. Remove cylinder head (C). (See Remove Cylinder Head, Group 10 in this manual.)



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M98,2015K,6 -19-08OCT85

NOTE: Be careful not to lose breather assembly when removing cover.

5. For P218G, P220G, B43E, B43G, OR B48G engines, carefully remove cap screw to remove breather manifold cover.

For T260 engine, remove cap screw to remove valve cover and gasket (A).

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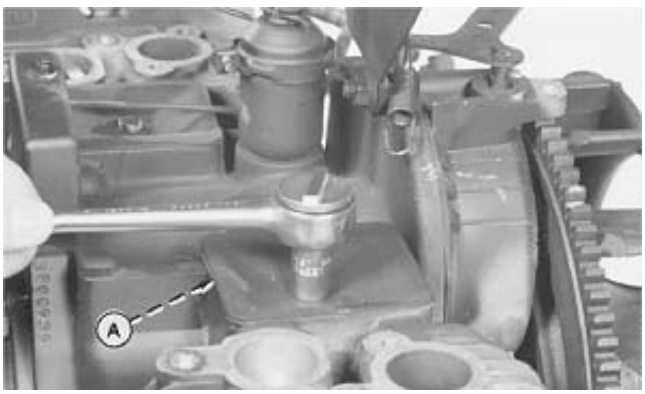
B43E, B43G, B48G Engines



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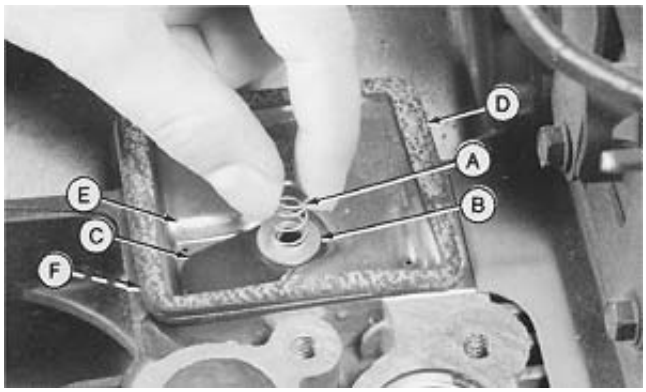
M36263

T260 Engine

M98,2015K,7 -19-17FEB87

6. Remove parts (A—F) if equipped and inspect for wear or damage.

A—Spring
B—Washer
C—Valve
D—Gasket
E—Breather Base
F—Gasket



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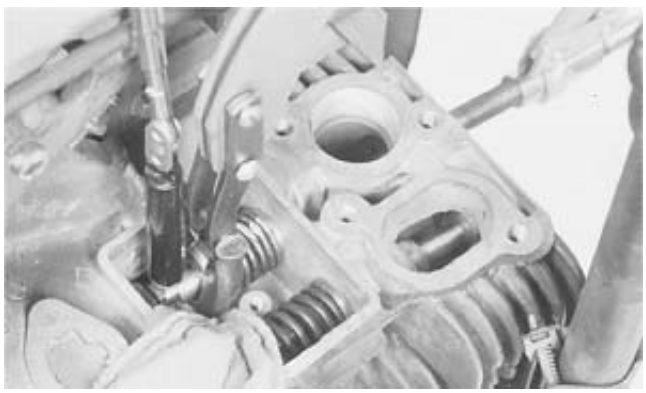
M36264

M98,2015K,8 -19-08OCT85

7. Close oil drain hole with a shop towel to prevent retainers from falling into gear case.

IMPORTANT: Identify valve assembly during removal so they can be installed in original ports.

8. Compress valve springs using a valve spring compressor to remove retainers. Release spring pressure and remove compressor.



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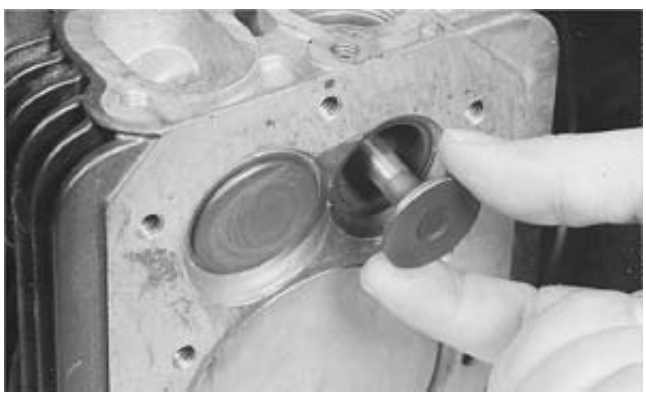
M36265

M98,2015K,9 -19-11NOV85

9. Remove exhaust and intake valves.



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M36266

M98,2015K,10 -19-08OCT85

10. Clean carbon from valve face, head, and stem using a wire brush.

11. Remove scratches from valve stems using steel wool or crocus cloth.

12. Inspect valve for damage, corrosion, pitting, or burned face.

13. Check valve for out-of-round, bent or warped condition using a valve inspection center.

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M35307

M98,2015K,11 -19-08OCT85

14. Measure valve stem outside diameter.

B43E, B43G, B48G, AND T260
VALVE STEM SPECIFICATION

Item	New Parts	Wear Tolerance
Exhaust Valve	8.66—8.67 mm (0.341—0.3414 in.)	8.64 mm (0.340 in.)
Intake Valve	8.70—8.71 mm (0.3425—0.3429 in.)	8.66 mm (0.341 in.)

P21G AND P220G
VALVE STEM SPECIFICATIONS

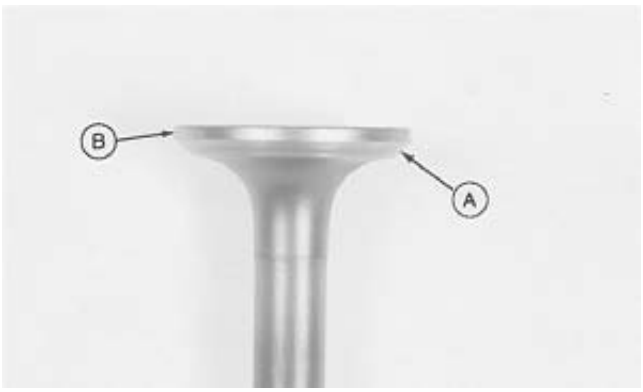
Item	New Parts	Wear Tolerance
Exhaust Valve	7.061—7.074 mm (0.2780—0.2785 in.)	7.05 mm (0.2775 in.)
Intake Valve	7.099—7.112 mm (0.2795—0.2800 in.)	7.07 mm (0.2783 in.)

15. If diameter is less than wear tolerance specification, replace valve.

M98,2015K,12 -19-10FEB87

IMPORTANT: Do not lap valves. The sharp seating surface between the valve and seat will be removed resulting in shorter valve life.

16. If valve faces are worn, burned or pitted, grind valves to a 44 degree face angle (A) following manufacturers instructions. If valve face margin (B) is less than 0.787 mm (0.031 in.) after grinding, replace valve.



M98,2015K,13 -19-08OCT85

17. Remove rotators (A) and springs (B) using a screwdriver. Rotator must turn freely.

18. Check spring using a spring compression tester.

B43E, B43G, B48G AND T260
SPRING SPECIFICATIONS

Free length (approximate) . . . . . 42.21 mm (1.662 in.)

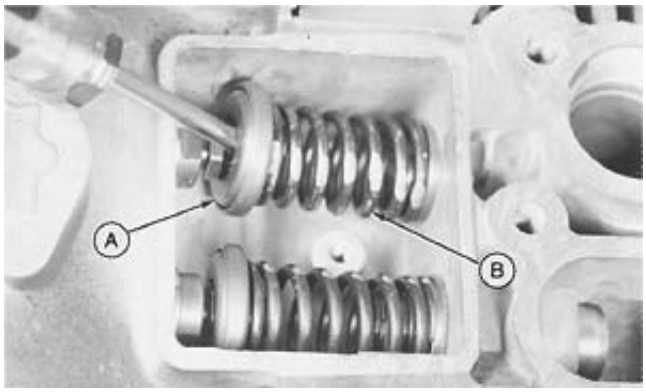
Test length at 169—187 N . . . . . 34.92 mm

(38—42 lb force . . . . . 1.375 in.)

P218G AND P220G
SPRING SPECIFICATIONS

Free Length (approximate) . . . . . 40.64 mm (1.60 in.)

Test length at 245N . . . . . 26.67 mm
(55 lb force . . . . . 1.05 in.)



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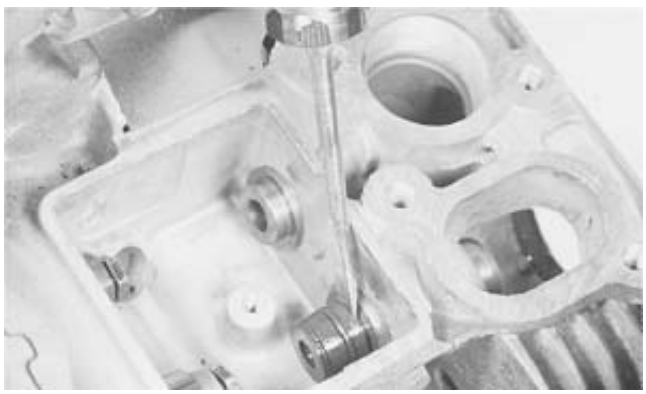
M98,2015K,14 -19-10FEB87

IMPORTANT: Never reuse intake valve seal. The seal must be replaced each time the valve is removed.

19. Remove intake valve seal if equipped.



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M36269

M98,2015K,15 -19-08OCT85

20. Remove tappets. Inspect tappets for wear or damage.

-UN-29JAN90
M36270

M98,2015K,16 -19-08OCT85

21. Measure tappet outside diameter.

TAPPET SPECIFICATIONS

Item	New Parts	Wear Tolerance
Tappet Diameter	18.99—19 mm (0.747—0.748 in.)	18.90 mm (0.744 in.)

If tappet diameter is less than 18.90 mm (0.744 in.), replace tappet.

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M36272

M98,2015K,17 -19-08OCT85

22. Measure tappet bore inside diameter and determine tappet clearance (tappet bore I.D. minus tappet O.D.).

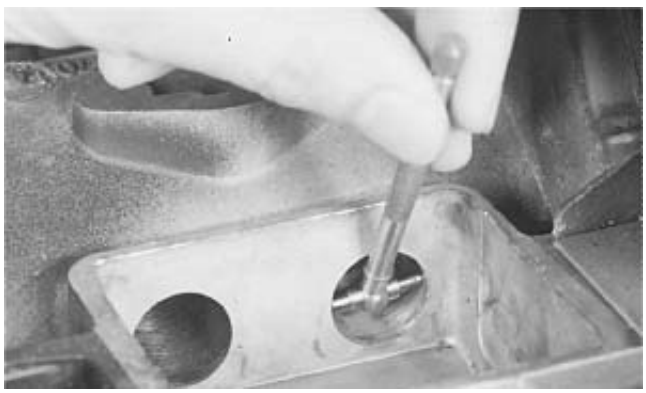
TAPPET BORE SPECIFICATIONS

Item	New Parts	Wear Tolerance
Tappet Bore Diameter	19.06—19.09 mm (0.750—0.751 in.)	19.15 mm (0.754 in.)
Tappet Clearance	0.04—0.08 mm (0.0015—0.003 in.)	0.15 mm (0.006 in.)

If tappet bore diameter exceeds 19.15 mm (0.754 in.), install over-sized tappet or replace cylinder block.

If tappet clearance exceeds 0.15 mm (0.006 in.), install over-sized tappet, replace tappet or replace cylinder block.

NOTE: The over-sized tappets available are 0.05 mm (0.002 in.) and 0.13 mm (0.005 in.).



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M36273

M98,2015K,18 -19-08OCT85

23. Clean valve seats using a wire brush.

24. Inspect valve seats for damage, corrosion, pitting or warped condition.

25. If necessary, cut seats to a 45 degree seat angle using a seat cutter such as JDG507.

-UN-29JAN90
M36274

M98,2015K,19 -19-08OCT85

26. Measure valve seat width after cutting. Valve seat width must be 0.8—1.2 mm (0.031—0.047 in.).

27. If seat is too wide after cutting, use a 30 degree valve seat cutter to narrow seat to specifications.

IMPORTANT: Do not lap valve seat. Doing so will result in shorter valve life.

28. Clean the valve seats, valve guides, and valves with solvent or a vacuum.

M98,2015K,20 -19-08OCT85

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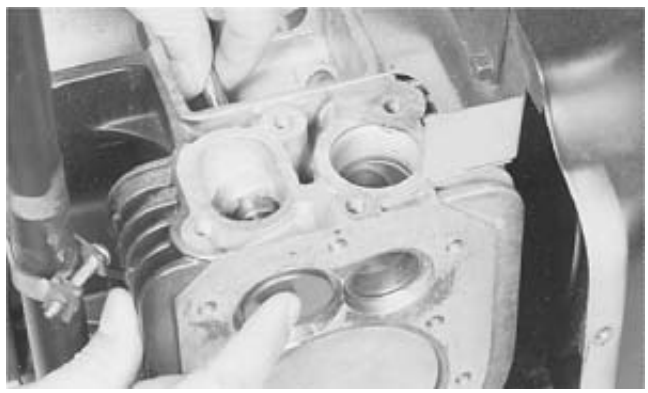
29. After valve grinding or seat cutting, check valves for a tight and uniform seat.

Apply dye to valve face. Install and hold valve against seat and turn slightly.

Remove valve and look for a fine clean line on valve face. The line must be at the center of valve face and have no open spots. If necessary, cut valve seat again or replace valve seat.



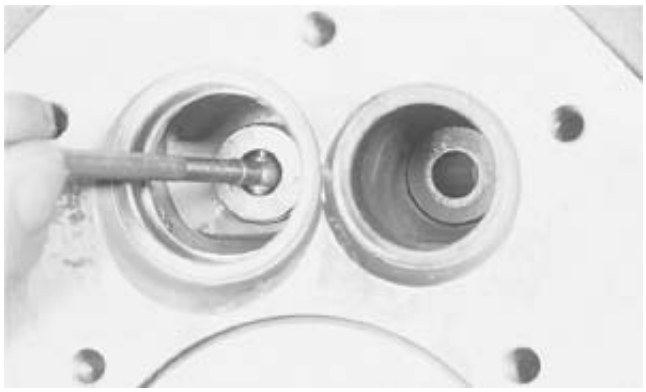
M98,2015K,21 -19-08OCT85

30. Remove valve seats using a blind-hole puller.

M98,2015K,22 -19-08OCT85

31. Clean valve guides using a valve guide brush.

32. Measure valve guide inside diameter and determine valve stem clearance (valve guide I.D. minus valve stem O.D.).



M36277 -UN-29JAN90

VALVE GUIDE SPECIFICATIONS

Item	New Part	Wear Tolerance
Valve Guide Diameter (B43E, B43G,B48G,T260	8.74—8.79 mm (0.344—0.346 in.)	8.84 mm (0.348 in.)
Valve Guide Diameter P218G and P220G)	7.14—7.16 mm (0.281—0.282 in.)	7.19 mm (0.283 in.)
Intake Valve Stem Clearance	0.03—0.06 mm (0.001—0.002 in.)	0.13 mm (0.005 in.)
Exhaust Valve Stem Clearance	0.06—0.10 mm (0.002—0.004 in.)	0.15 mm (0.006 in.)

If valve guide diameter exceeds specifications, replace valve guide.

If valve stem clearance exceeds wear tolerance specification, replace valve guide, valve, or both.

M98,2015K,23 -19-10FEB87

IMPORTANT: Failure to lean top surface of valve guide can damage valve guide bore during removal.

33. Remove carbon from top surface of valve guide using a wire brush.

34. For B43E, B43G, B48G or T260 engine, remove valve guides using JDG 323 Valve Guide Driver.

For P218G or P220G engine, remove valve guides using JDE 118 Valve Guide Driver.

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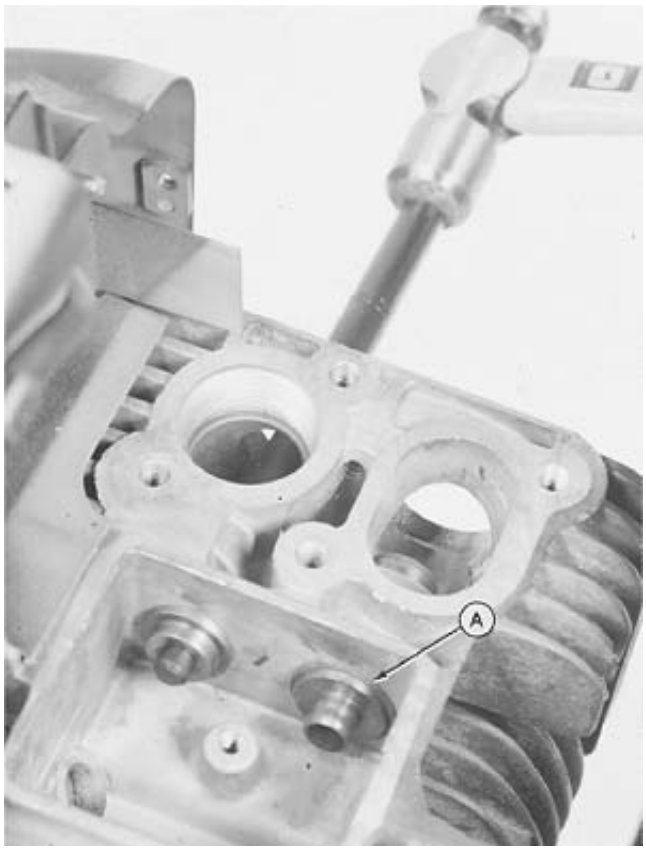
35. Remove gasket (A).



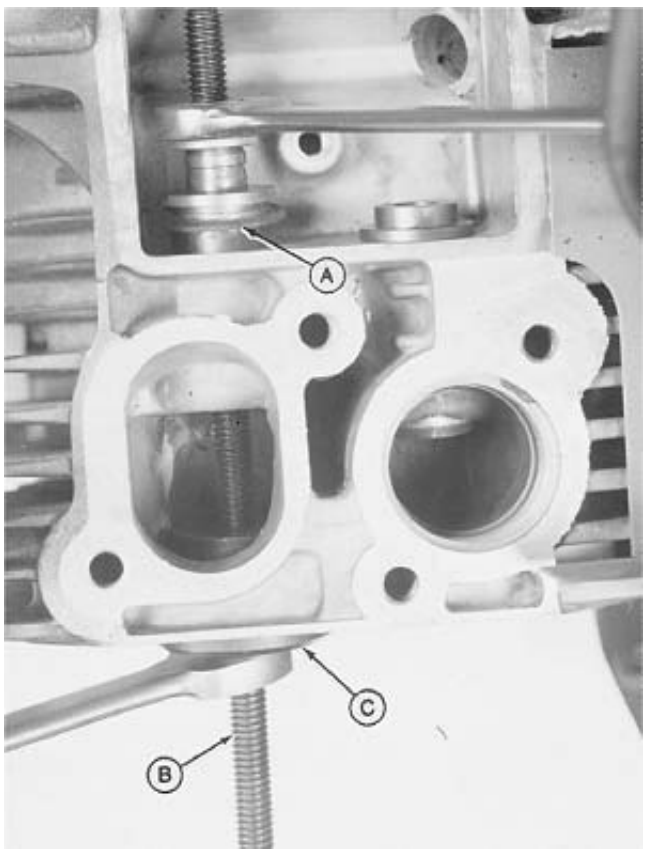
M98,2015K,24 -19-30JAN87

INSTALL INTAKE AND EXHAUST VALVES

1. Clean and dry all parts. Apply clean engine oil to all internal parts. Use a valve gasket kit when assembling the engine.

2. Install a new gasket (A) on intake valve guide.

3. Install valve guides using JDG 569 Valve Guide Installer (B) and a large washer (C). Pull valve guides until shoulder is tight against cylinder block.



M98,2015K,25 -19-30JAN87

4. Install valve seats with chamfer away from driver disk. Push valve seats to bottom of cylinder block bore.

DISKS FOR VALVE SEAT INSTALLATION

Engine	Valve	Size
B43E, B43G, B48G	Intake	1-3/16 and 1-7/16 in.
B43E, B43G, B48G	Exhaust	15/16 and 1-3/16 in.
T260	Intake	1-1/8 and 1-1/2 in.
T260	Exhaust	1 and 1-5/16 in.
P218G, P220G	Intake	1-7/16 in.
P218G, P220G	Exhaust	1-3/16 in.

M36883 -UN-25JAN90

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M98,2015K,26 -19-30JAN87

IMPORTANT: Valve assemblies must be installed in original bores for maximum valve performance.

5. Install tappets in original bores.

M36270 -UN-29JAN90

M98,2015K,27 -19-08OCT85

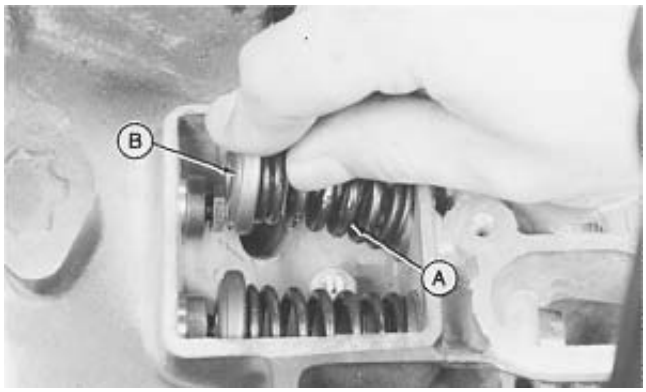
IMPORTANT: Never reuse intake valve seal. The seal must be replaced each time the valve is removed.

6. Install intake valve seal, if equipped, with lip of seal toward tappet.

M36279 -UN-29JAN90

M98,2015K,28 -19-08OCT85

7. Install springs (A) and rotators (B).



M98,2015K,29 -19-08OCT85

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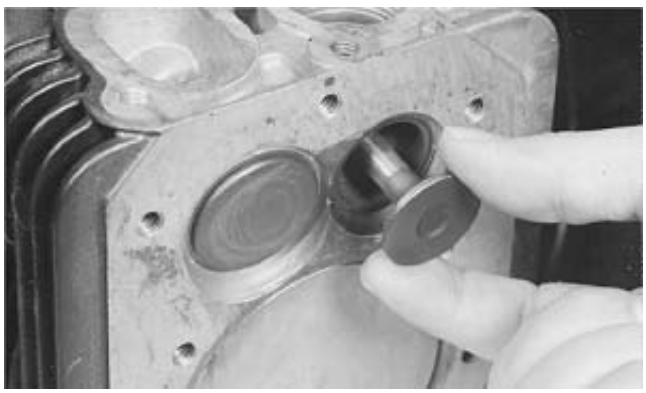
8. Put clean engine oil on valve stems.

9. Install intake and exhaust valves.

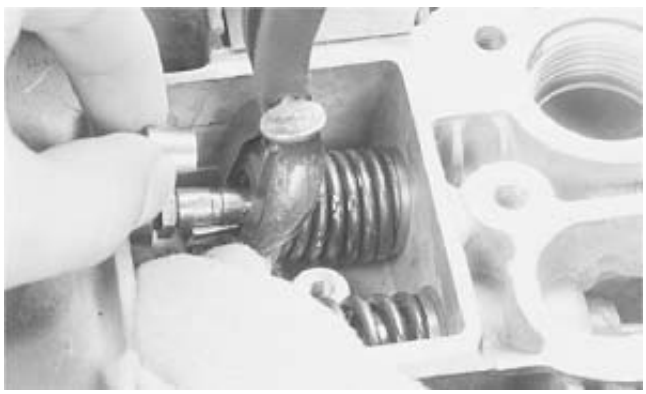


M98,2015K,30 -19-08OCT85

10. Close oil drain hole with a shop towel to prevent retainers from falling into gear case.

11. Compress valve springs using a valve spring compressor.

12. Apply petroleum jelly or retainers to help hold retainers on valve stem. Install retainers on valve stem with taper toward rotator. Be sure retainers are seated in valve stem slot. Slowly release spring pressure to remove compressor.

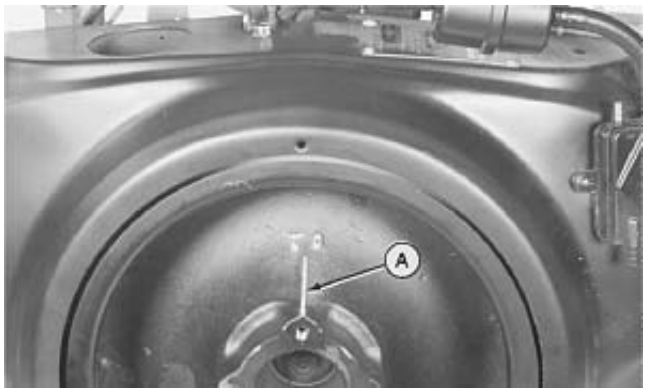


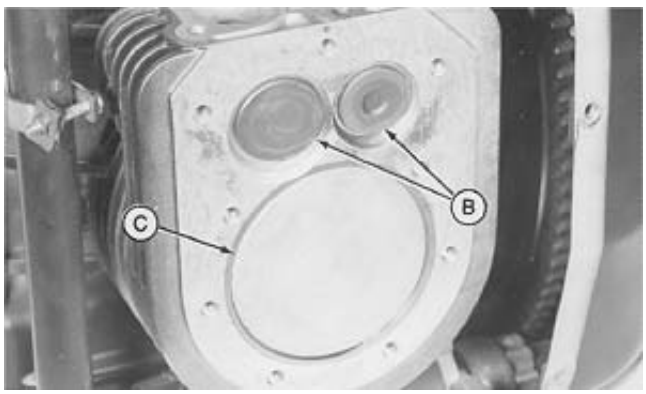
M98,2015K,31 -19-08OCT85

MEASURE AND ADJUST VALVE CLEARANCE

1. Turn the flywheel clockwise until the intake valve opens and then closes. Continue turning flywheel until the TDC (top-dead-center) mark (A) on the flywheel is upward.

Both valves (B) must be closed and the piston (C) must be at the top of its compression stroke. If the valves are open, the piston is on the exhaust stroke and the flywheel must be turned one revolution.



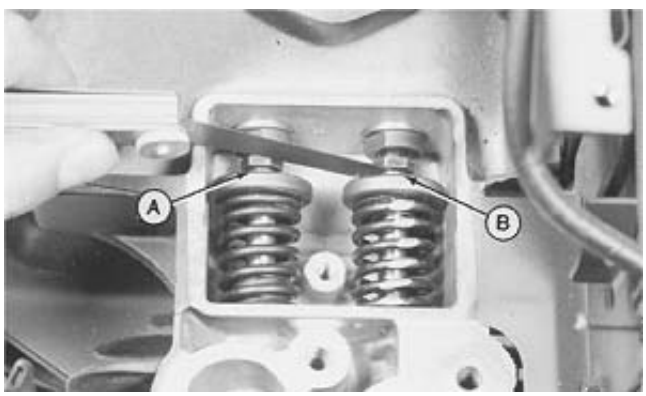


M98,2015K,32 -19-08OCT85

2. Measure valve clearance using a feeler gauge.

VALVE CLEARANCE SPECIFICATION

Item	Specification
Intake Valve (A)	0.13 mm (0.005 in.)
Exhaust Valve (B)	0.33 mm (0.013 in.)



M98,2015K,33 -19-08OCT85

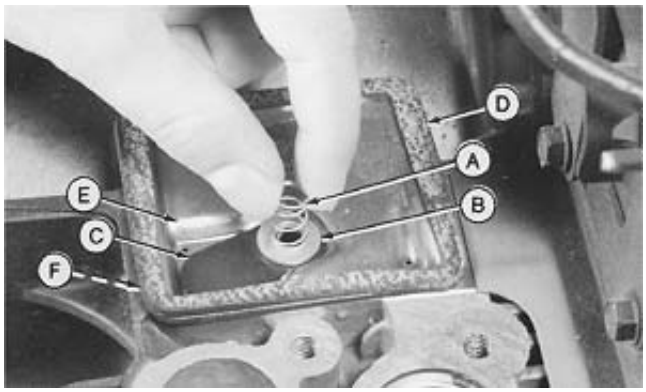
3. If necessary, hold tappet and turn tappet screw to adjust valve clearance.

M98,2015K,34 -19-08OCT85

CONTINUTE TO INSTALL AND EXHAUST VALVES

1. Install parts (A—F) if equipped. Be sure washer (B) is on top of valve (C).

A—Spring
B—Washer
C—Valve
D—Gasket
E—Breather Base
F—Gasket



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M36264

M98,2015K,35 -19-11NOV85

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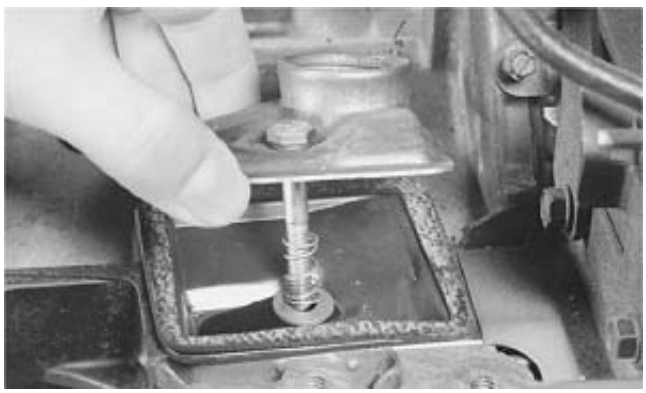
16

NOTE: For T260 engine, go to Step 3.

2. Install breather manifold cover and cap screw. Check that cap screw is installed through spring, washer, and valve. Tighten cap screw to 2.1 ± 0.7 N·m (18 ± 6 lb-in.).



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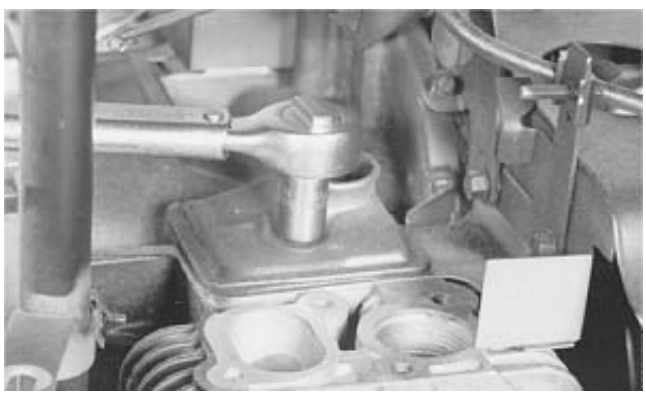
M36286

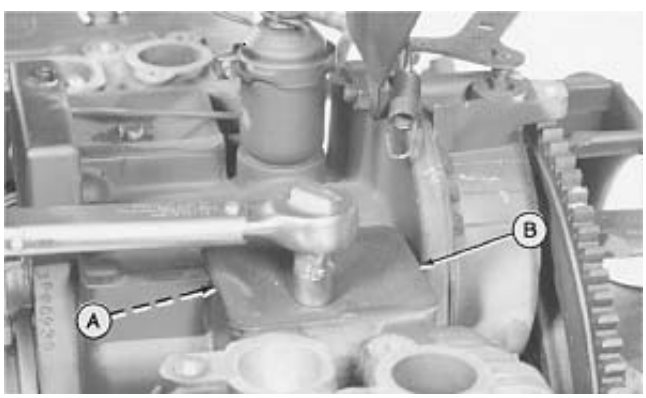


-UN-29JAN90
M36287

P218G, P220G, B43E, B43G, AND B48G

M98,2015K,36 -19-10FEB87

3. Install new gasket (A). Install valve cover (B) and cap screw. Tighten cap screw 2.1 ± 0.7 N·m (18 ± 6 lb-in.)



-UN-29JAN90
M36288

T260 Engine

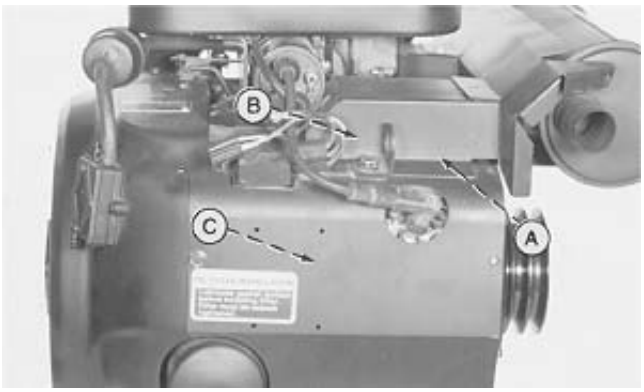
M98,2015K,37 -19-11NOV85

4. Install cylinder head (C). (See Install cylinder Head, Group 10 in this manual.)

5. Install intake manifold (B). (See Install Intake Manifold, Group 10 in this manual.)

6. Install exhaust pipes with muffler (A). (See Intake Manifold, Group 10 in this manual.)

7. Install engine if removed. (See machine technical manual.)



M36473 -UN-29JAN90

M98,2015K,38 -19-11NOV85

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17

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
13-Ton Puller Set	Remove flywheel

M98,2020K,1 -19-08OCT85

OTHER MATERIAL

Number	Name	Use
TY9375	John Deere LOCTITE® Pipe Sealant with TEFLON®	Apply to threads of flywheel cap screw

LOCTITE is a trademark of the Loctite Corp.

TEFLON is a trademark of the DuPont Co.

M98,2020K,1A -19-08OCT85

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1

SPECIFICATIONS

Item	Measurement	Specification
B43E, B43G, B48G, and T260 Engine:		
Flywheel Cap Screw	Torque	51 ± 3 N·m (38 ± 2 lb-ft)
P218G and P220G Engine: Flywheel Cap Screw	Torque	67—75 N·m (50—55 lb-ft)
Lift Bracket Cap Screw	Torque	11 ± 3 N·m (97 ± 27 lb-in.)

M98,2020K,2 -19-10FEB85

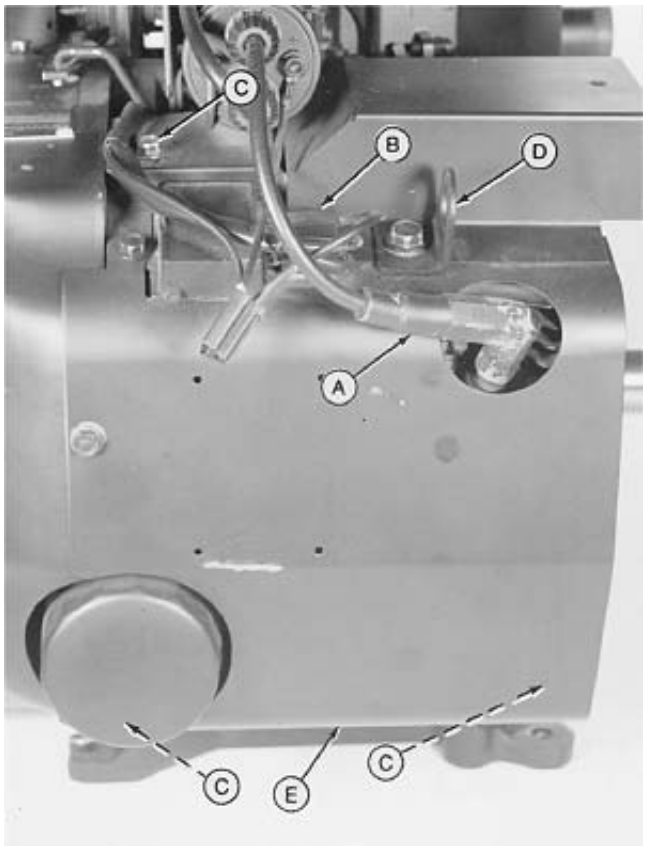
REMOVE FLYWHEEL

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire (A) and voltage regulator leads (B).

3. Remove five cap screws (C) to remove lift bracket (D) and right side shroud (E).

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



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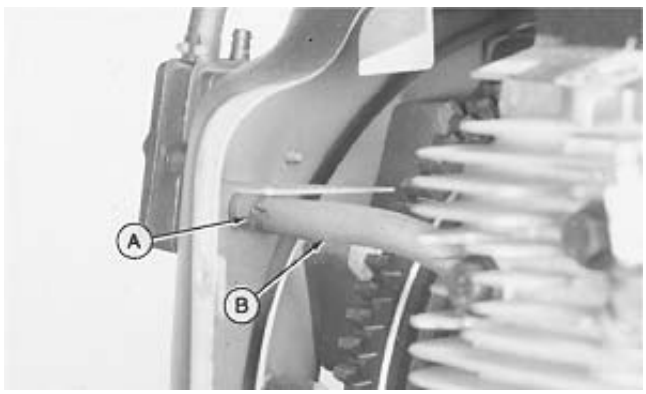
M36289

M98,2020K,3 -19-24OCT85

4. Loosen hose clamp (A) to disconnect fuel pump impulse line (B).



-UN-29JAN90
M36290

M98,2020K,4 -19-08OCT85

5. Disconnect governor spring (A).

6. Remove two screws to remove fuel pump (B).

7. For P218 or P220G engines, remove air clean assembly. Remove two cap screws to disconnect ignition coil from flywheel shroud.

8. Disconnect fuel line.

9. Remove five cap screws to remove flywheel shroud (C).

M36291 -UN-29JAN90

M98,2020K,5 -19-30JAN87

IMPORTANT: Do not use a pry bar in fins to keep flywheel from turning. Doing so can damage fins.

10. Fasten locking pliers to ring gear to prevent flywheel from turning.

CAUTION: Loosen flywheel cap screw only two turns. Do not remove cap screw. If cap screw is removed, flywheel may cause injury when it comes loose.

11. Loosen cap screw two turns only.

M36292 -UN-29JAN90

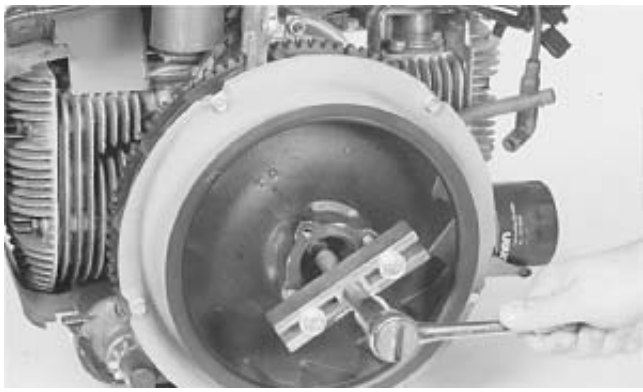
M98,2020K,6 -19-30JAN87

12. For P218G or P220G engines, remove two cap screws from flywheel.

IMPORTANT: Do not pry on flywheel with a screwdriver. Ceramic magnets on gear case cover can be damaged.

13. Loosen flywheel using a puller.

14. Remove puller, cap screw, washer, and flywheel.



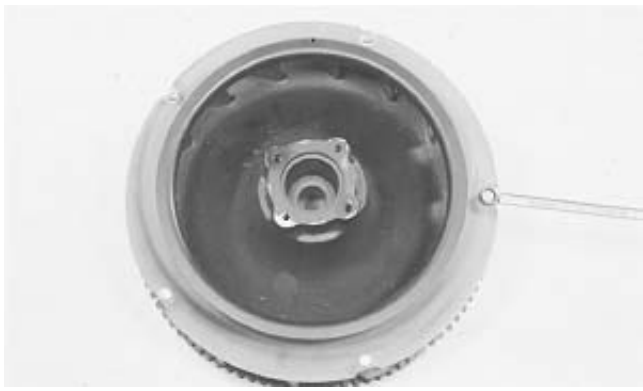
-UN-29JAN90 M36293

M98,2020K,7 -19-30JAN87

NOTE: P218G or P220G engine, flywheel and shield are not shown.

15. If necessary, remove five cap screws to remove flywheel shield.

16. Inspect flywheel for cracks, broken fins, or broken magnets. Inspect flywheel ring gear for chipped or broken teeth. Replace flywheel if damaged.

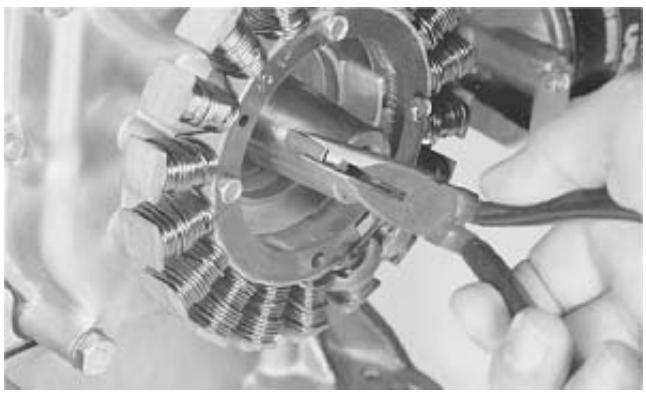


-UN-29JAN90 M36294

M98,2020K,8 -19-30JAN87

NOTE: Different engine models have different shaped keys.

17. Remove key.



-UN-29JAN90 M36295

M98,2020K,9 -19-10FEB87

INSTALL FLYWHEEL

1. Install key in crankshaft.

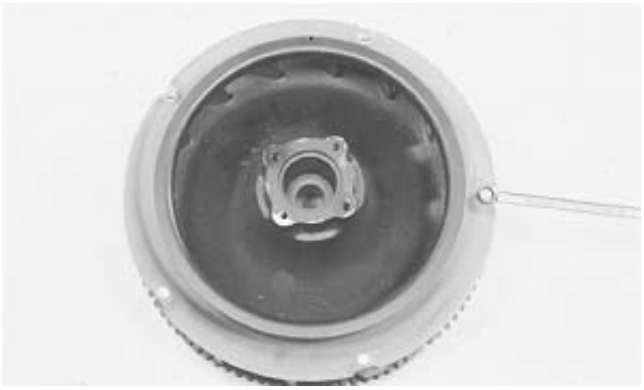
For P218G or P220G engines, align slot in magnetic ring with slot in crankshaft and install key.

-UN-29JAN90 M36296

M98,2020K,10 -19-30JAN87

NOTE: P218G or P220G engine, flywheel and shield are not shown.

2. Install flywheel shield, if removed, and fasten with five cap screws.



M98,2020K,11 -19-30JAN87

IMPORTANT: Do not lubricate crankshaft taper. The crankshaft taper must be dry to hold the flywheel tight.

3. Clean crankshaft taper before installing flywheel.

4. Apply pipe sealant on threads of flywheel cap screw.

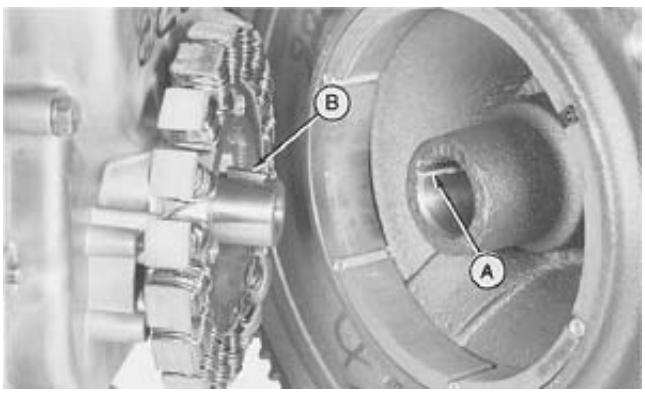
5. Align keyway (A) in flywheel with key (B) in crankshaft. Install flywheel.

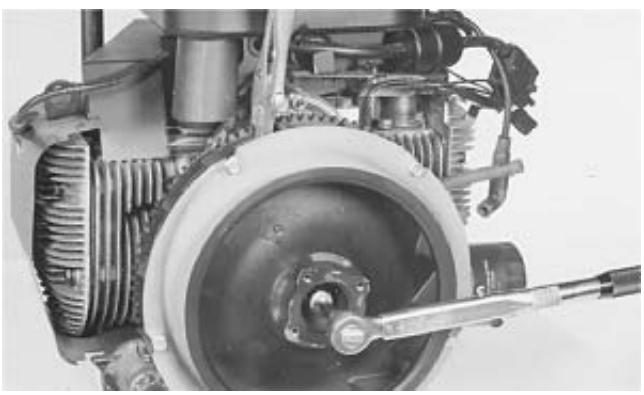
6. Install washer and cap screw.

7. Fasten locking pliers to ring gear to prevent flywheel from turning.

8. On B43E, B43G, B48G, and T260 Engines: Tighten cap screw to 51 ± 3 N·m (38 ± 2 lb-ft).

On P218G and P220G Engines: tighten cap screw to 67—75 N·m (50—55 lb-ft).





M98,2020K,12 -19-10FEB85

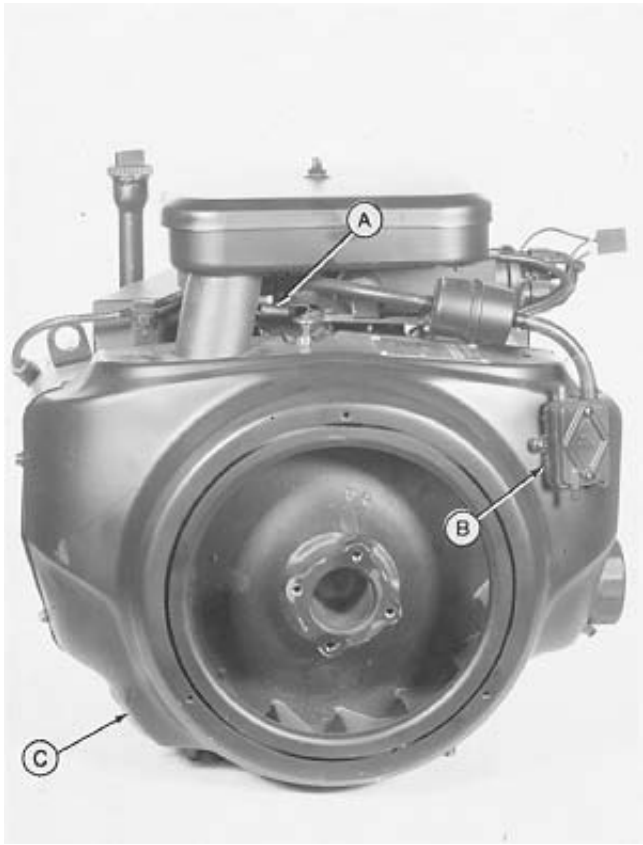
9. Install flywheel shroud (C) and fasten with five cap screws.

10. For P218G or P220G engine, connect ignition coil to flywheel shroud and fasten with two cap screws. Install air cleaner assembly.

11. Connect fuel line to carburetor.

12. Install fuel pump (B) and fasten with two screws.

13. Connect governor spring (A) in top hole of arm.



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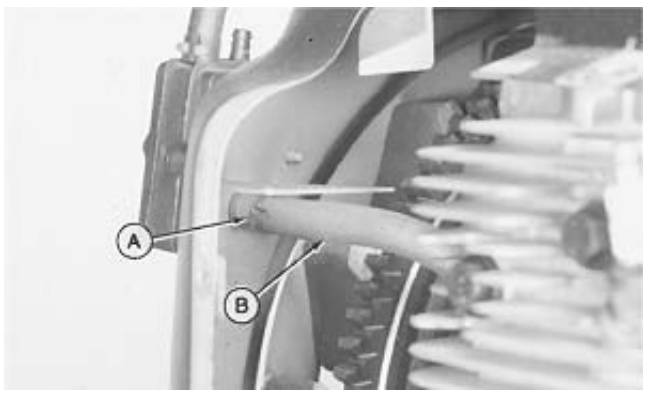
M36291

M98,2020K,13 -19-30JAN87

14. Connect fuel pump impulse line (B) and fasten with hose clamp (A).



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M36290

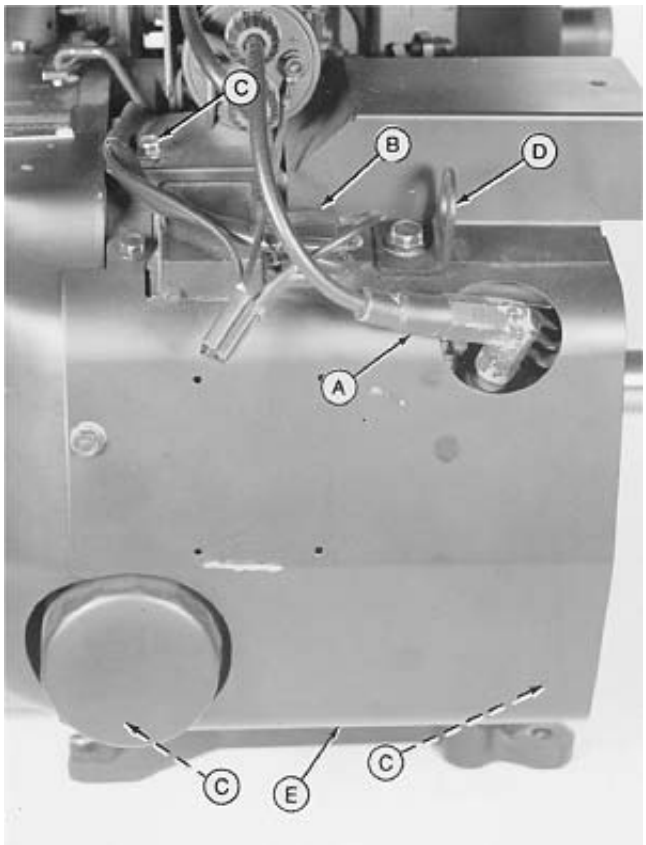
M98,2020K,14 -19-30JAN87

15. Install right side shroud (E), lift bracket (D) and fasten with five cap screws (C). Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

16. Connect spark plug wire (A) and voltage regulator leads (B). Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of the voltage regulator.

17. Install engine. (See machine technical manual.)

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



M36289 -UN-29JAN90

M98,2020K,15 -19-30JAN87

ESSENTIAL TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Number	Name	Use
JDG 325	Crankshaft Seal Installer	Install gear cover oil seal

M98,2025K,1 -19-09OCT85

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Bushing, Bearing, and Seal Driver Set	Remove and install oil seal, bearings, and camshaft gear
Dial Indicator	Measure camshaft gear end play and backlash
Outside Micrometer	Measure camshaft
Telescoping Gauge	Measure camshaft bearings
Press	Remove and install camshaft gear

M98,2025K,2 -19-11NOV85

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OTHER MATERIAL

Number	Name	Use
TY6304	John Deere LOCTITE® Flexible Sealant	Apply to camshaft plug surface of cylinder block.
TY9375	John Deere LOCTITE Pipe Sealant with TEFLON®	Apply to threads of clutch adapter plate screws, gear cover cap screws, and breaker point assembly screw.

LOCTITE is a trademark of the Loctite Corp.

TEFLON is a trademark of the DuPont Co.

M98,2025K,2A -19-11NOV85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Overhaul Gasket Kit

M98,2025K,2B -19-09OCT85

SPECIFICATION

Item	New Specification	Wear Tolerance
1. End Play: B43E, B43G, B48G, and T260 Engine	0.08—0.3 mm (0.003—0.012 in.)	0.4 mm (0.018 in.)
End Play: P218G, P220G Engine	0.280—1.22 mm (0.0110—0.0480 in.)	1.65 mm (0.065 in.)
2. Gear Backlash:		
B43E, B43G, B48G Engine	0.03—0.15 mm (0.001—0.006 in.)	0.23 mm (0.009 in.)
T260 Engine	0.05—0.08 mm (0.002—0.003 in.)	0.15 mm (0.006 in.)
P218G, P220 Engine	0.025—0.127 mm (0.001—0.005 in.)	0.20 mm (0.008 in.)
3. Governor Cup Travel	5.6 mm (0.22 in.)	
4. Journal O.D.	34.90—34.91 mm (1.374—1.375 in.)	34.80 mm (1.370 in.)
5. Lobe Height:		
Intake and Exhaust, B43E	28.37—28.47 mm (1.117—1.121 in.)	27.99 mm (1.102 in.)
Intake, B43G, B48G	29.57—29.72 mm (1.164—1.170 in.)	29.18 mm (1.149 in.)
Exhaust, B43G, B48G	29.44—29.59 mm (1.159—1.165 in.)	29.06 mm (1.144 in.)
Intake and Exhaust, T260	29.57—29.72 mm (1.164—1.170 in.)	29.18 mm (1.149 in.)
Intake, P218G	29 mm (1.142 in.)	28.49 mm (1.122 in.)
Exhaust, P218G	29.5 mm (1.162 in.)	28.98 mm (1.141 in.)
Intake, P220G	29.7 mm (1.171 in.)	29.18 mm (1.149 in.)
Exhaust, P220G	29.5 mm (1.162 in.)	28.98 mm (1.141 in.)
6. Bearing I.D.	34.95—34.98 mm (1.376—1.377 in.)	35.03 mm (1.379 in.)
7. Camshaft Clearance	0.038—0.076 mm (0.0015—0.003 in.)	0.125 mm (0.005 in.)
8. Clutch Adapter Plate Screw Torque	35 ± 1 N·m (310 ± 9 lb-in.)	
9. Gear Cover Cap Screws and Nut Torque	12 ± 1 N·m (106 ± 9 lb-in.)	

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3

M98,2025K,3 -19-10FEB87

REMOVE CAMSHAFT

1. Remove engine. (See machine technical manual.)

2. Remove muffler and exhaust pipes (A).

3. Remove intake manifold (B). (See Remove Intake Manifold, Group 10 in this manual.)

4. Remove cylinder heads (C). (See Remove Cylinder Heads, Group 10 in this manual.)

5. Remove intake and exhaust valves (D). (See Remove Intake and Exhaust Valves, Group 15 in this manual.)

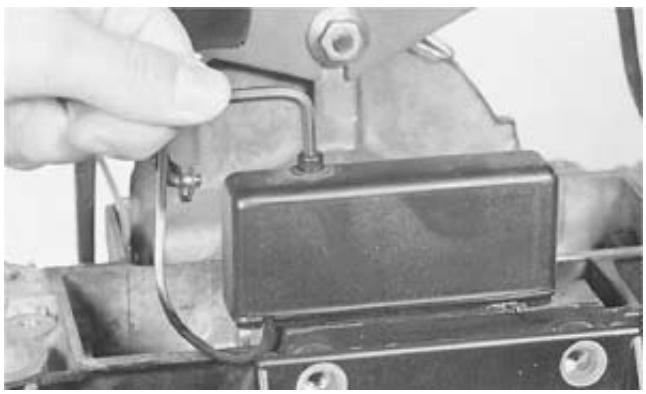
6. Remove flywheel (E). (See Remove Flywheel, Group 20 in this manual.)

A—Muffler and Exhaust Pipes
B—Intake Manifold
C—Cylinder Heads
D—Intake and Exhaust Valves
E—Flywheel

-UN-29JAN90
M36474

M98,2025K,4 -19-11NOV85

7. Remove Allen screw to remove breaker point cover, if equipped.



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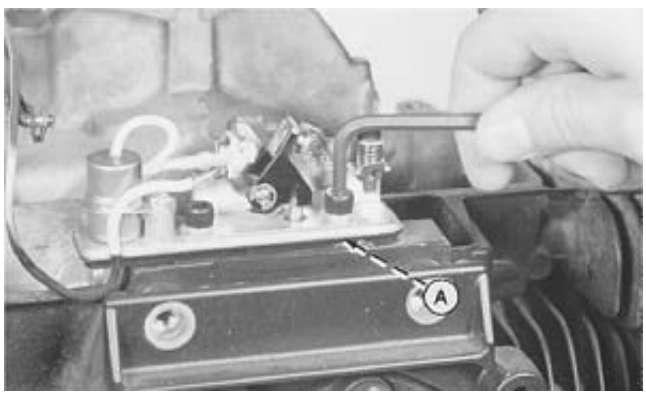
M36299

M98,2025K,5 -19-10FEB87

NOTE: Be careful not to lose the plunger during breaker point assembly removal.

8. Remove two screws to remove breaker point assembly and gasket (A), if equipped.



-UN-29JAN90
M36300

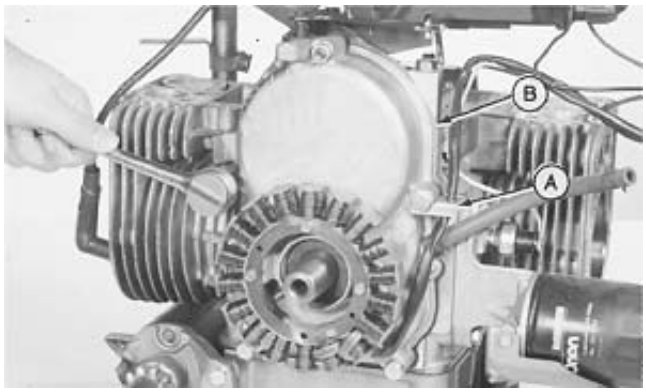
M98,2025K,6 -19-10FEB87

IMPORTANT: Do not hit gear cover with a metal hammer or remove cover with a screwdriver. Doing so may damage gear cover.

9. Remove four cap screws and nut to remove clip (A), gear cover, and gasket (B).

For P218G or P220G engine, disconnect wire leads from ignition coil. Remove crankshaft key and magnetic ring.

10. If gear cover is tight, hit cover lightly with a soft-faced hammer to loosen it.



-UN-29JAN90
M36301

M98,2025K,7 -19-10FEB87

11. Remove oil seal using a 2 in. driver disk.

-UN-29JAN90
M36302

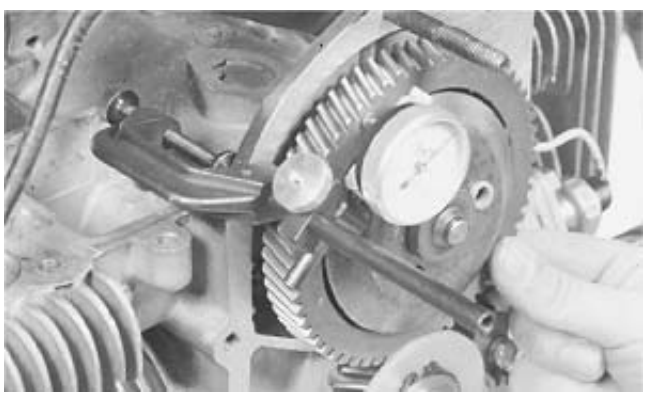
M98,2025K,8 -19-09OCT85

12. Measure camshaft end play.

CAMSHAFT END PLAY SPECIFICATION

Engine	New Parts	Wear Tolerance
B43E, B43G, B48G and T260	0.08—0.3 mm (0.003—0.012 in.)	0.4 mm (0.018 in.)
P218G and P220G	0.280—1.22 mm (0.0110—0.0480 in.)	1.65 mm (0.065 in.)

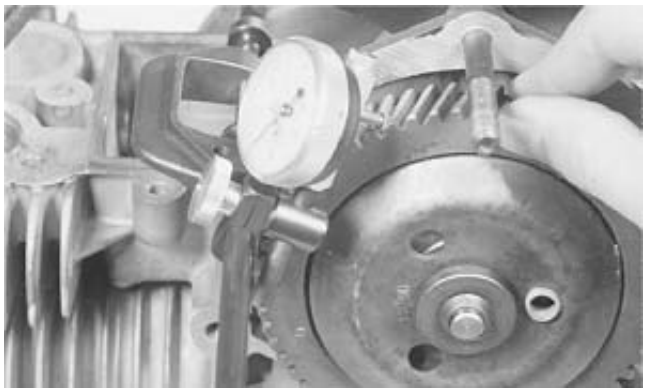
If end play exceeds wear tolerance, replace camshaft thrust washer.



-UN-29JAN90
M36303

M98,2025K,9 -19-02FEB87

13. Measure camshaft gear backlash.



CAMSHAFT GEAR SPECIFICATIONS

Item	New Part	Wear Tolerance
B43E, B43G, B48G Engine		
Camshaft Gear Backlash	0.03—0.15 mm (0.001—0.006 in.)	0.23 mm (0.009 in.)
T260 Engine		
Camshaft Gear Backlash	0.05—0.08 mm (0.002—0.003 in.)	0.15 mm (0.006 in.)
P218G, P220G Engine		
Camshaft Gear Backlash	0.025—0.127 mm (0.001—0.005 in.)	0.20 mm (0.008 in.)

If backlash exceeds wear tolerance, replace camshaft gear and crankshaft gear.

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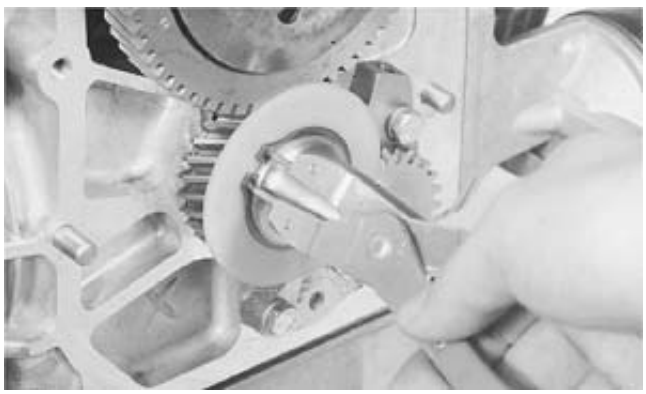
M98,2025K,10 -19-10FEB87

14. Remove snap ring to remove thrust washer.



M98,2025K,11 -19-09OCT85

IMPORTANT: Do not allow camshaft lobes to hit bearing surfaces while removing camshaft. Machined surfaces may be damaged.

15. Carefully remove camshaft until rear lobe is even with camshaft bearing. Turn camshaft until lobe (A) fits into camshaft bearing notch (B). Remove camshaft.

M98,2025K,12 -19-09OCT85

16. Remove thrust washer.

-UN-29JAN90
M36306

M98,2025K,13 -19-09OCT85

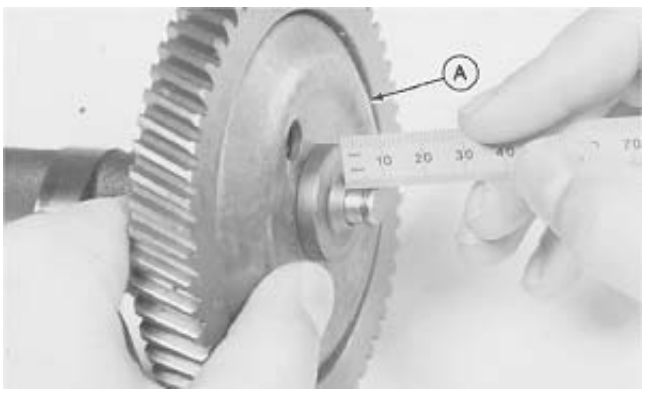
DISASSEMBLE AND INSPECT CAMSHAFT

1. Hold cup against flyballs. Measure distance from snap ring to surface of hub. The distance must be 5.6 mm (0.22 in.).

If the distance is not correct, replace camshaft assembly.

NOTE: The camshaft and pin are only serviced as an assembly.

2. The cup (A) must spin freely on the camshaft pin without excessive play. Replace parts as necessary.



-UN-29JAN90
M36308

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7

M98,2025K,14 -19-09OCT85

3. Remove snap ring to remove hub (A) and cup (B).

4. Inspect cup race for grooved or rough surface. Replace cup if necessary.

-UN-29JAN90
M36309

M98,2025K,15 -19-09OCT85

5. Remove flyballs. Inspect flyballs for grooved or flat spots, replace if necessary.

6. Inspect flyball spacer (A) for wear or damage. Replace camshaft gear if necessary.

NOTE: The flyball spacer, plate, and camshaft gear are serviced as an assembly only.

IMPORTANT: If camshaft gear is replaced, always replace crankshaft gear also.

7. Inspect camshaft gear for chipped or broken teeth. Replace camshaft gear if necessary.

-UN-29JAN90
M36310

M98,2025K,16 -19-09OCT85

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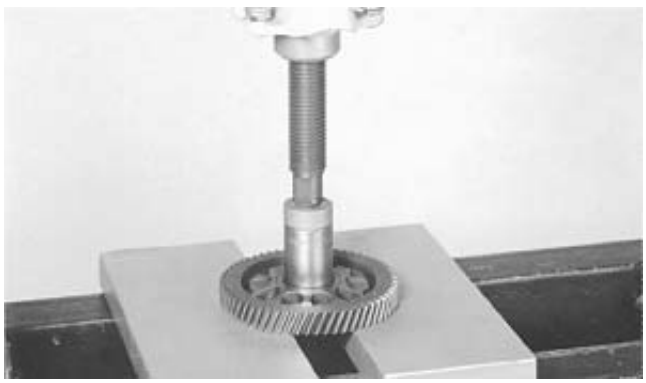
IMPORTANT: Be sure to hold camshaft while removing camshaft gear.

8. Remove gear using a 1 in. deep-well socket, 1 in. driver disk, and a press.

9. Remove key.



-UN-14JUL89
M30688

M98,2025K,17 -19-11NOV85

10. Measure camshaft journal outside diameter.

CAMSHAFT JOURNAL SPECIFICATIONS

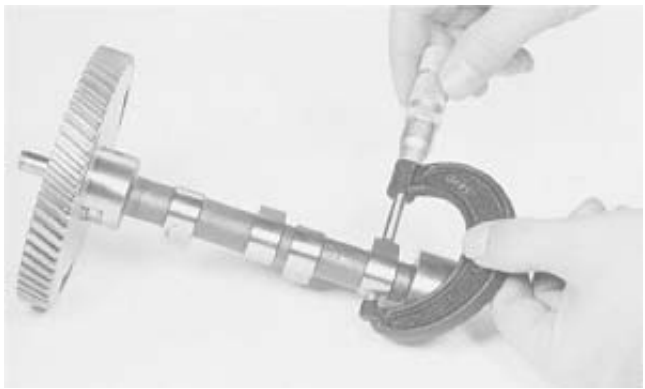
Item	New Part	Wear Tolerance
Journal Diameter	34.90—34.91 mm (1.374—1.3745 in.)	34.80 mm (1.370 in.)

If journal diameter is less than 34.80 mm (1.370 in.), replace camshaft.

-UN-29JAN90
M36311

M98,2025K,18 -19-11NOV85

11. Measure camshaft lobe height.



-UN-29JAN90
M36312

CAMSHAFT LOBE SPECIFICATIONS

Item	New Specification	Wear Tolerance
Lobe Height:		
B43E Intake and Exhaust	28.37—28.47 mm (1.117—1.121 in.)	27.99 mm (1.102 in.)
B43G, B48G Intake	29.57—29.72 mm (1.164—1.170 in.)	29.18 mm (1.149 in.)
B43G, B48G Exhaust	29.44—29.59 mm (1.159—1.165 in.)	29.06 mm (1.144 in.)
T260 Intake and Exhaust	29.57—29.72 mm (1.164—1.170 in.)	29.18 mm (1.149 in.)
P218G Intake	29 mm (1.142 in.)	28.49 mm (1.122 in.)
P218G Exhaust	29.5 mm (1.162 in.)	28.98 mm (1.141 in.)
P220G Intake	29.7 mm (1.171 in.)	29.18 mm (1.149 in.)
P220G Exhaust	29.5 mm (1.162 in.)	28.98 mm (1.141 in.)

If lobe height is less than wear tolerance, replace camshaft.

M98,2025K,19 -19-02FEB87

12. If equipped, remove two screws to remove clutch adapter plate.

-UN-29JAN90
M36313

M98,2025K,20 -19-09OCT85

13. Remove plug (A) using a wooden dowel.

-UN-29JAN90
M36314

M98,2025K,21 -19-09OCT85

14. Measure camshaft bearing inside diameter and determine camshaft clearance (camshaft bearing I.D. minus camshaft journal O.D.).

CAMSHAFT BEARING SPECIFICATIONS

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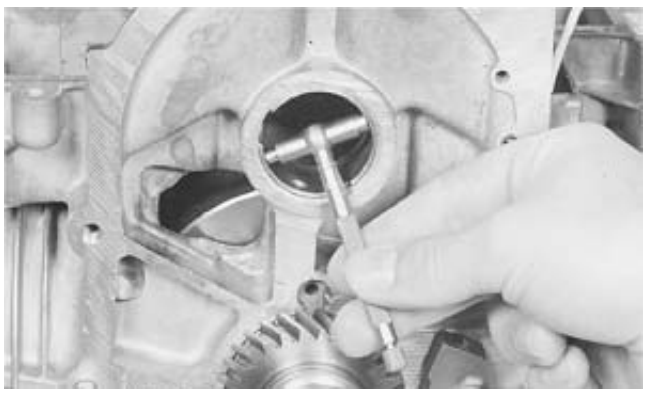
10

Item	New Part	Wear Tolerance
Camshaft Bearing Diameter	34.95—34.98 mm (1.376—1.377 in.)	35.03 mm (1.379 in.)
Camshaft Clearance	0.038—0.076 mm (0.0015—0.003 in.)	0.125 mm (0.005 in.)

If camshaft bearing diameter exceeds 35.03 mm (1.379 in.) replace bearing.

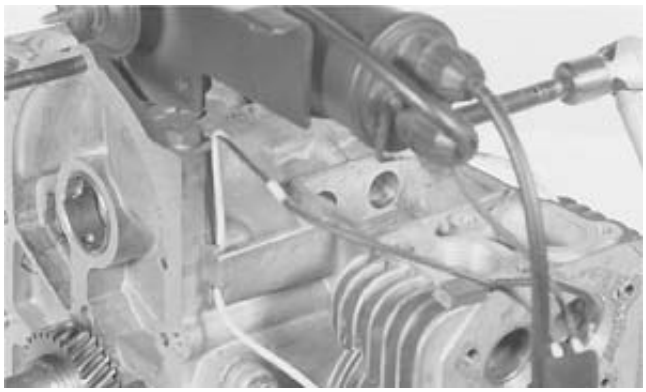
If camshaft clearance exceeds 0.125 mm (0.005 in.), replace camshaft bearing, camshaft, or both.



-UN-29JAN90
M36315

M98,2025K,22 -19-11NOV85

15. Remove camshaft bearing using a soft steel rod or chisel to bend bearing away from side of bore.



-UN-29JAN90
M36316

-UN-29JAN90
M36317

M98,2025K,23 -19-09OCT85

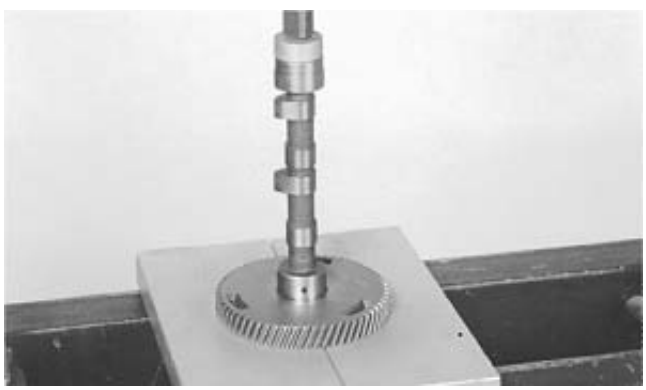
ASSEMBLE CAMSHAFT

1. Install key in camshaft.

2. Install gear with timing mark “0” away from camshaft.

3. Align slot in gear with key in shaft.

4. Push camshaft into gear using a 1-3/8 in. driver disk and a press until camshaft is even with bottom of gear surface.



-UN-14JUL89
M30756

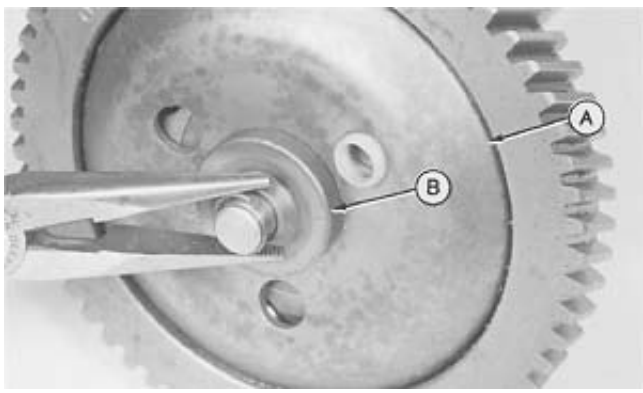
M98,2025K,24 -19-09OCT85

5. Apply clean engine oil on camshaft parts before assembly.

6. Install flyballs in flyball spacer (A) notches.

M98,2025K,25 -19-09OCT85

7. Install cup (A), hub (B), and fasten with snap ring.



M98,2025K,26 -19-09OCT85

8. Install thrust washer.

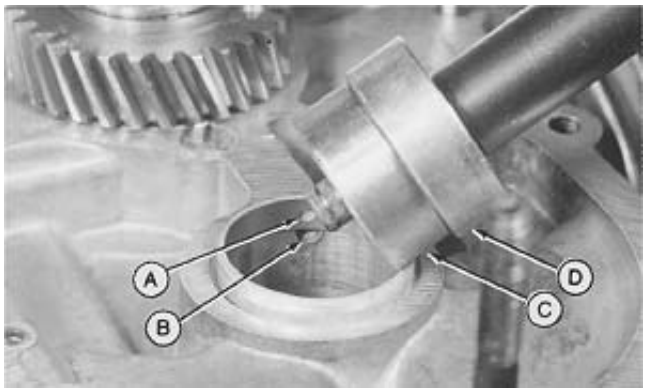
M98,2025K,27 -19-09OCT85

INSTALL CAMSHAFT

1. Clean and dry all parts. Apply clean engine oil on all internal parts before assembly.

NOTE: The service camshaft bearing is half the width of the original bearing, but the camshaft bearing surface is the same.

2. Align oil hole (A) in bearing with oil hole (B) in cylinder block. Install rear bearing using a 1-3/8 in. driver disk (C) and 1-1/2 in. driver disk (D). Push bearing even with surface of cylinder block.



A—Bearing Oil Hole
B—Cylinder Block Oil Hole
C—1-3/8 in. Driver Disk
D—1-1/2 in. Driver Disk

M98,2025K,28 -19-09OCT85

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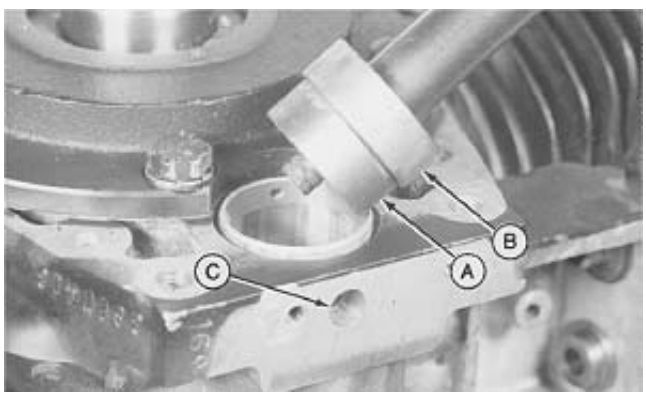
13

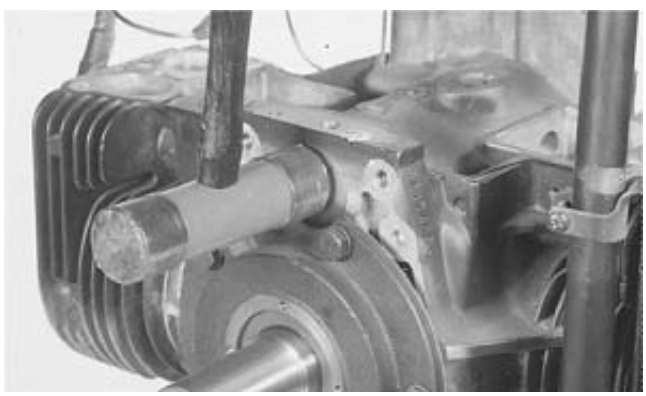
3. Install front bearing using a 1-3/8 in. driver disk (A) and 1-1/2 driver disk (B). Push bearing even with bottom of bore. Be sure bearing is past breaker point plunger hole (C) in cylinder block.



M98,2025K,29 -19-09OCT85

4. Apply flexible sealant on plug surface of cylinder block.

5. Install plug tight against bottom of cylinder block counterbore.



M98,2025K,30 -19-09OCT85

6. If equipped, apply pipe sealant on threads of clutch adapter plate screws.

7. Install clutch adapter plate and two screws. Tighten screws to 35 ± 1 N·m (310 ± 9 lb-in.).

M36322 -UN-29JAN90

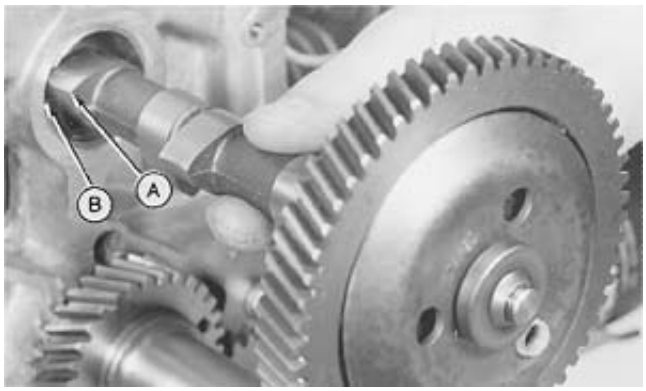
M98,2025K,31 -19-09OCT85

8. Put clean engine oil on camshaft bearing journals.

IMPORTANT: Do not allow camshaft lobe to hit bearing surfaces while installing camshaft. Machined surfaces may be damaged.

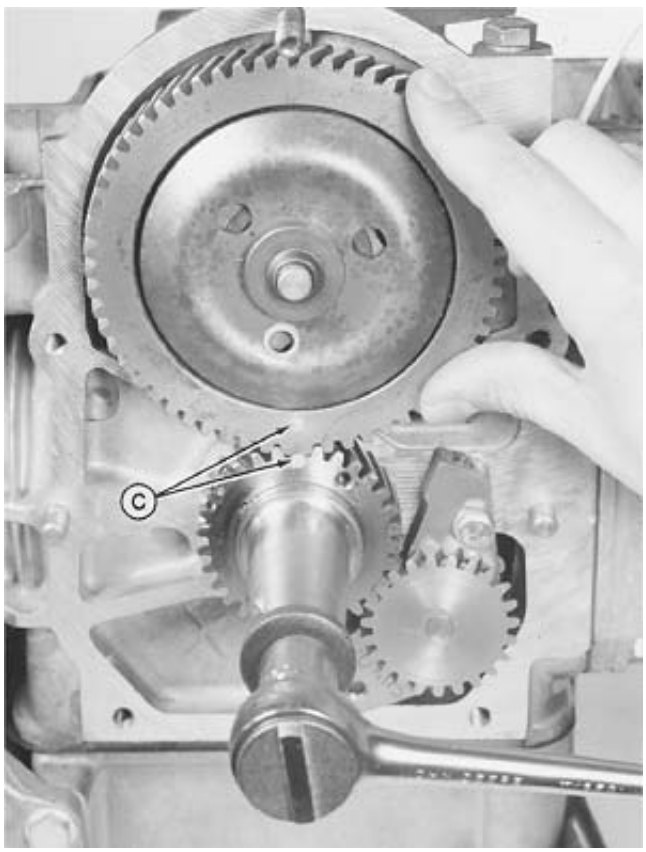
9. Install flywheel cap screw in crankshaft to aid in turning crankshaft for timing mark alignment.

10. Turn camshaft until lobe (A) fits into camshaft bearing notch (B) and carefully install camshaft.



M36307 -UN-29JAN90

11. Align timing marks (C) on camshaft and crankshaft gears and continue to install camshaft.



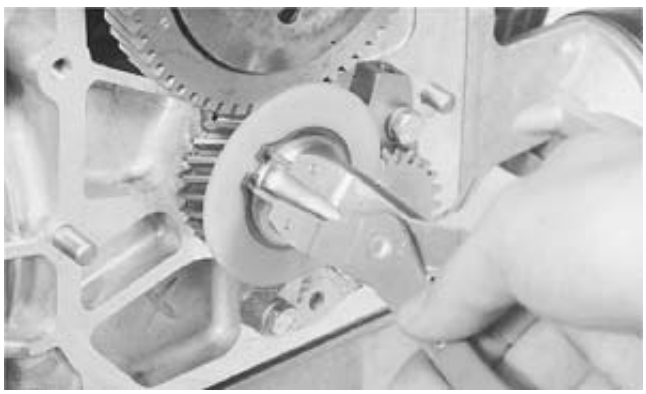
M36323 -UN-29JAN90

M98,2025K,32 -19-09OCT85

12. Align slot (A) in thrust washer with key (B) in crankshaft.

13. Install thrust washer and snap ring.

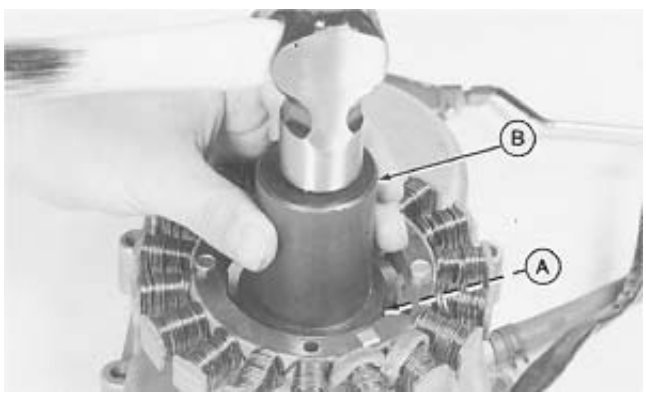
-UN-29JAN90
M36324



-UN-29JAN90
M36305

M98,2025K,33 -19-09OCT85

14. Install oil seal (A) with lip of seal downward, in gear cover using JDG 325 Crankshaft Seal Installer (B).

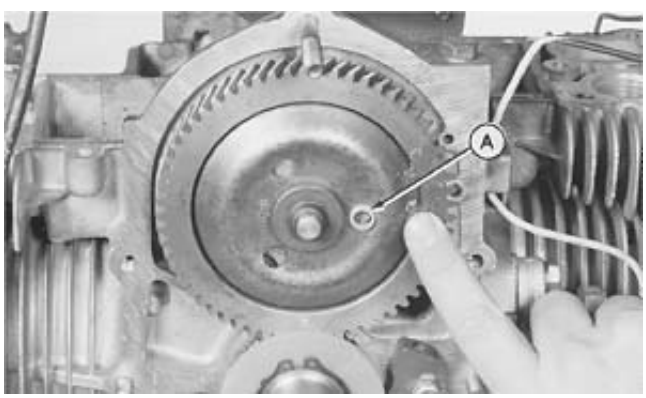


-UN-29JAN90
M36325

M98,2025K,34 -19-09OCT85

15. Turn cup until the plastic bushing (A) is in the 3 o'clock position.

16. Apply multipurpose grease between cup and camshaft gear to hold cup in position.



-UN-29JAN90
M36326

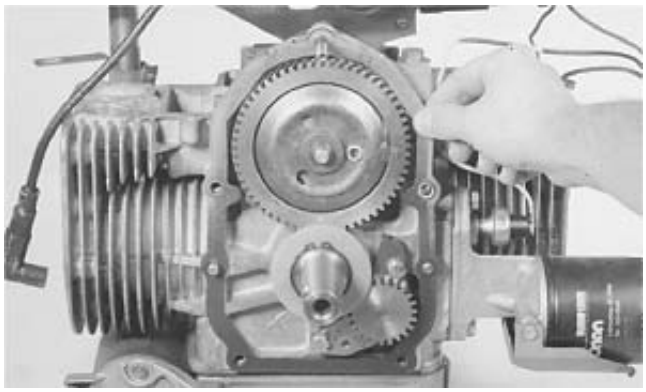
M98,2025K,35 -19-11NOV85

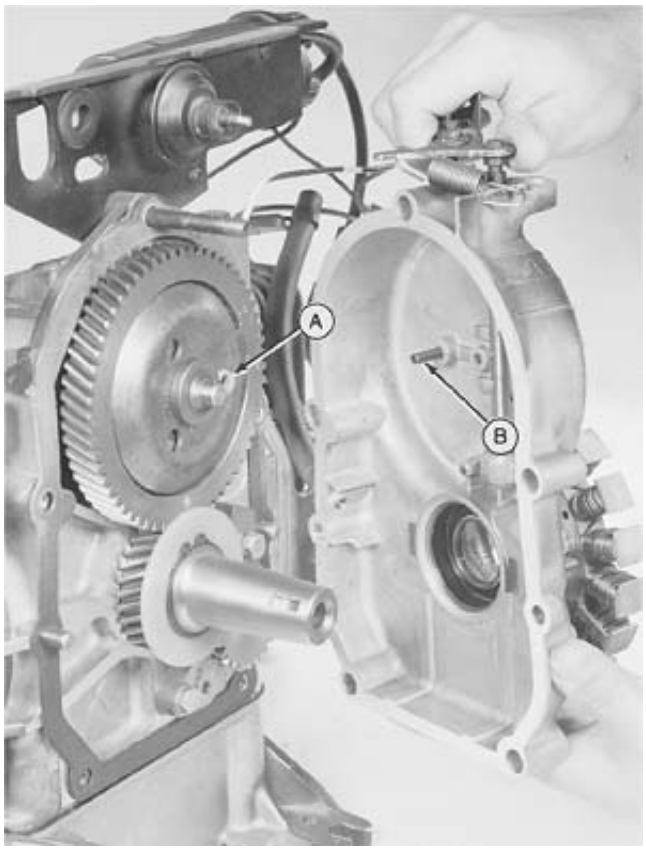
17. Install new gasket on cylinder block.

18. Be sure plastic bushing (A) and pin (B) are aligned.

IMPORTANT: Do not hit gear cover with a metal hammer during installation. Gear cover may be damaged.

19. Hold governor arm away from camshaft and carefully install gear cover.





M98,2025K,36 -19-09OCT85

20. Pull engine forward and move governor arm back and forth. Governor cup should be felt moving in and out. If no movement is felt, the pin is not in plastic bushing. Remove gear cover and repeat steps 18—20.

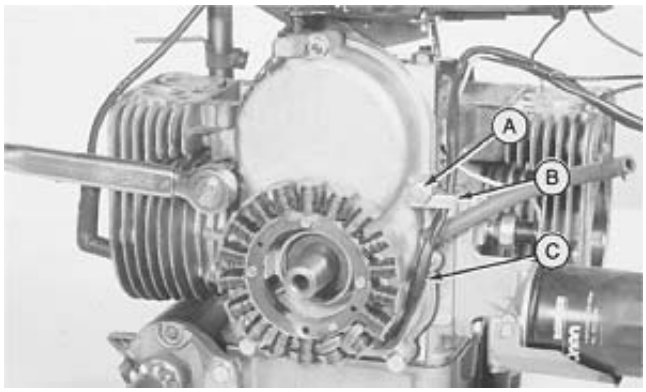
M98,2025K,37 -19-09OCT85

21. Apply pipe sealant on cap screw (A) threads.

22. Install clip (B), four cap screws and nut. Tighten cap screws and nut to 12 ± 1 N·m (106 ± 9 lb-in.).

23. Install stator wiring (C) in clip.

24. For P218G or P220G engine, connect wires leads to ignition coil. Install crankshaft key and magnetic ring.



-UN-29JAN90
M36330

M98,2025K,38 -19-10FEB87

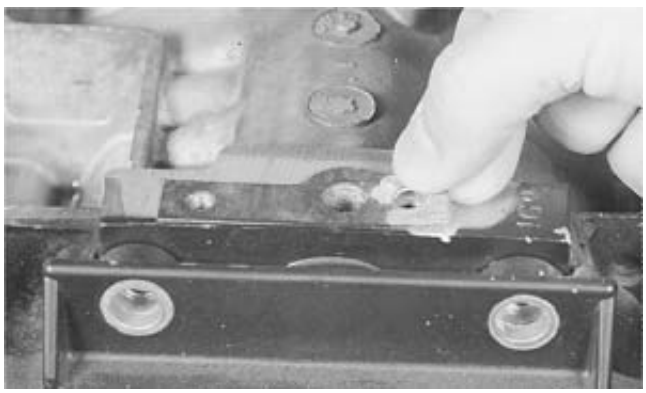
25. Install new gasket (A) on cylinder block.

NOTE: Be careful not to lose the plunger during breaker point assembly installation.

26. Apply clean engine oil on plunger. Remove excess oil after installation.

27. Apply pipe sealant on Allen screw threads.

28. Install breaker point assembly and fasten with two Allen screws, if equipped.



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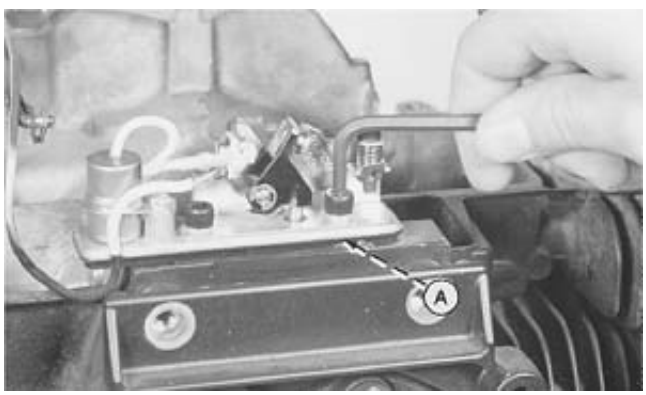
M36331

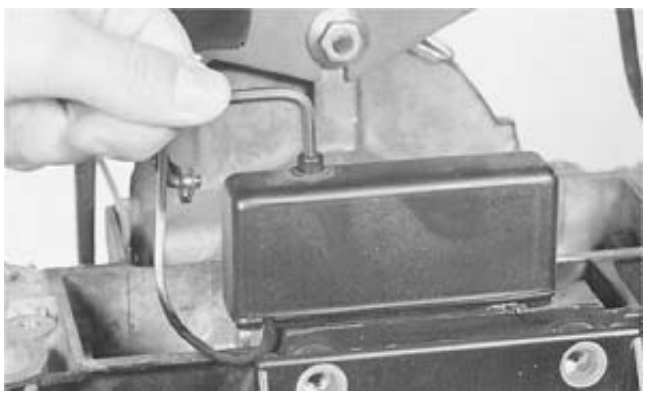


-UN-29JAN90
M36300

M98,2025K,39 -19-10FEB87

29. Install breaker point wire in breaker point assembly groove.

20. Install breaker point cover and tighten Allen screw.



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M36299

M98,2025K,40 -19-10FEB85

31. Install flywheel (E). (See Group 20 in this manual.)

32. Install intake and exhaust valves (D). (See Install intake and Exhaust Valves, Group 15 in this manual.)

33. Install cylinder heads (C). (See Install Cylinder Heads, Group 10 in this manual.)

34. Install intake manifold (B). (See Install Intake Manifold, Group 10 in this manual.)

35. Install engine. (See machine technical manual.)

A—Muffler and Exhaust Pipes
B—Intake Manifold
C—Cylinder Heads
D—Intake and Exhaust Valves
E—Flywheel

M98,2025K,41 -19-10FEB85

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18

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Feeler Gauge	Measure connecting rod end play and piston ring end gap.
Ridge Reamer	Remove ridge from top of cylinder bore.
Outside Micrometer	Measure engine components.
Telescoping Gauge	Measure connecting rod bores and piston pin bore.
Piston Ring Expander	Remove and install piston rings.
Vernier Calipers	Measure piston ring groove width and piston O.D.
Inside Micrometer	Measure piston bore.
Flex Hone	To deglaze cylinder bores
Piston Ring Compressor	Install pistons in cylinder block.

M98,2030K,1 -19-11NOV85

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1

OTHER MATERIAL

Number	Name	Use
	PLASTIGAGE®	Measure connecting rod bearing clearance

PLASTIGAGE is a trademark of the TRW Corp.

M98,2030K,2 -19-09OCT85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Overhaul Gasket Kit

M98,2030K,2A -19-11NOV85

SPECIFICATIONS

Connecting Rods

Item	New Specification	Wear Tolerance
1. Side Clearance	0.05—0.41 mm (0.002—0.016 in.)	0.8 mm (0.03 in.)
2. Connecting Rod Cap Nut Torque:		
B43E, B43G, B48G, P218G, P220G Engine	18 ± 1 N·m (159 ± 9 lb-in.)	
3. Connecting Rod Cap Nut Torque:		
T260	20 ± 1 N·m (177 ± 9 lb-in.)	
4. Piston Pin Clearance:		
B43E, B43G, B48G Engine	0.005—0.010 mm (0.0002—0.004 in.)	
T260 Engine	0.003—0.013 mm (0.001—0.005 in.)	
P218G and P220G Engine	0.001—0.0162 mm (0.00004—0.00064 in.)	
5. Piston O.D.:		
B43E, B43G, B48G, P218G, P220G Engine	82.42—82.44 mm (3.245—3.246 in.)	82.32 mm (3.241 in.)
T260 Engine	90.42—90.45 mm (3.560—3.561 in.)	90.32 mm (3.556 in.)
6. Cylinder Bore I.D.:		
B43E, B43G, B48G, P218G, P220G Engine	82.53—82.55 mm (3.249—3.250 in.)	82.68 mm (3.255 in.)
T260 Engine	90.488—90.512 mm (3.5625—3.5635 in.)	90.632 mm (3.5682 in.)
7. Piston-To-Bore Clearance:		
B43E, B43G, B48G, P218G, P220G Engine	0.076—0.127 mm (0.003—0.005 in.)	0.28 mm (0.011 in.)
T260 Engine	0.178—0.229 mm (0.007—0.009 in.)	0.38 mm (0.015 in.)
8. Cylinder Bore Taper:		
B43E, B43G, B48G, P218G, P220G Engine		0.13 mm (0.005 in.)
T260 Engine		0.08 mm (0.003 in.)
9. Cylinder Bore Out-of-Round		0.08 mm (0.003 in.)

M98,2030K,3 -19-11NOV85

PISTON

Item	New Specification	Wear Tolerance
1. Ring Groove Width:		
Top Ring	2.032—2.057 mm (0.080—0.081 in.)	2.21 mm (0.087 in.)
Second Ring	2.032—2.057 mm (0.080—0.081 in.)	2.21 mm (0.087 in.)
Oil Ring	4.775—4.801 mm (0.188—0.189 in.)	4.95 mm (0.195 in.)
2. Ring End Gap	0.25—0.51 mm (0.010—0.020 in.)	1.52 mm (0.060 in.)
3. Piston Pin Bore I.D.:		
B43E, B43G, B48G, P218G, P220G Engine	17.468—17.478 mm (0.6877—0.6881 in.)	
T260 Engine	19.055—19.065 mm (0.7502—0.7506 in.)	
4. Rod-to-Crankshaft Bearing Clearance	0.051—0.084 mm (0.002—0.0033 in.)	0.13 mm (0.0053 in.)
5. Crankshaft Connecting Rod Journal O.D.	41.28—41.30 mm (1.6252—1.6260 in.)	41.25 mm (1.6242 in.)
6. Connecting Rod Crankshaft Bore I.D.:		
B43E, B43G, B48G, P218G, P220G Engine	41.35—41.36 mm (1.6280—1.6285 in.)	41.39 mm (1.6295 in.)
T260 Engine	44.46—44.48 mm (1.7505—1.7510 in.)	44.50 mm (1.7520 in.)
7. Piston Pin O.D.:		
B43E, B43G, B48G, P218G, P220G Engine	17.463—17.468 mm (0.6875—0.6877 in.)	17.371 mm (0.6839 in.)
T260 Engine	19.050—19.055 mm (0.7500—0.7502 in.)	18.959 mm (0.7464 in.)
8. Connecting Rod Piston Pin Bore I.D.:		
B43E, B43G, B48G, P218G, P220G Engine	17.470—17.480 mm (0.6878—0.6882 in.)	
T260	19.06—19.07 mm (0.7504—0.7508 in.)	
9. Piston Pin Clearance:		
B43E, B43G, B48G, P218G, P220G Engine	0.005—0.018 mm (0.0002—0.00007 in.)	
T260 Engine	0.005—0.020 mm (0.0002—0.0008 in.)	

M98,2030K,4 -19-11FEB87

PISTON—CONTINUED

Item	New Specification	Wear Tolerance
10. Bores Out-of-Round		0.05 mm (0.002 in.)

Cylinder Head

Item	New Specification
1. Attaching Cap Screw Torque:	
B43E Engine	23 ± 1 N·m (204 ± 12 lb-in.)
B43G, B48G, P218G, P220G Engine	20 ± 1 N·m (180 ± 12 lb-in.)
2. Attaching Nut Torque (T260 Engine):	
Top Six Nuts (with compression washers)	16 ± 1 N·m (142 ± 12 lb-in.)
Bottom Four Nuts	20 ± 1 N·m (180 ± 12 lb-in.)
3. Oil Base Cap Screw Torque	27 ± 3 N·m (239 ± 27 lb-in.)
4. Lift Bracket Cap Screw Torque	11 ± 3 N·m (97 ± 27 lb-in.)

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M98,2030K,5 -19-02FEB87

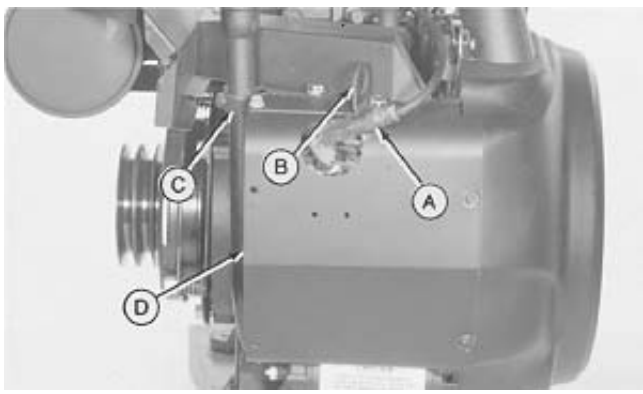
MEASURE CONNECTING ROD END PLAY

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire (A).

3. Remove six cap screws to remove lift bracket (B), oil fill tube bracket (C), and left side shroud (D).

A—Spark Plug Wire
B—Lift Bracket
C—Oil Fill Tube Bracket
D—Left Side Shroud



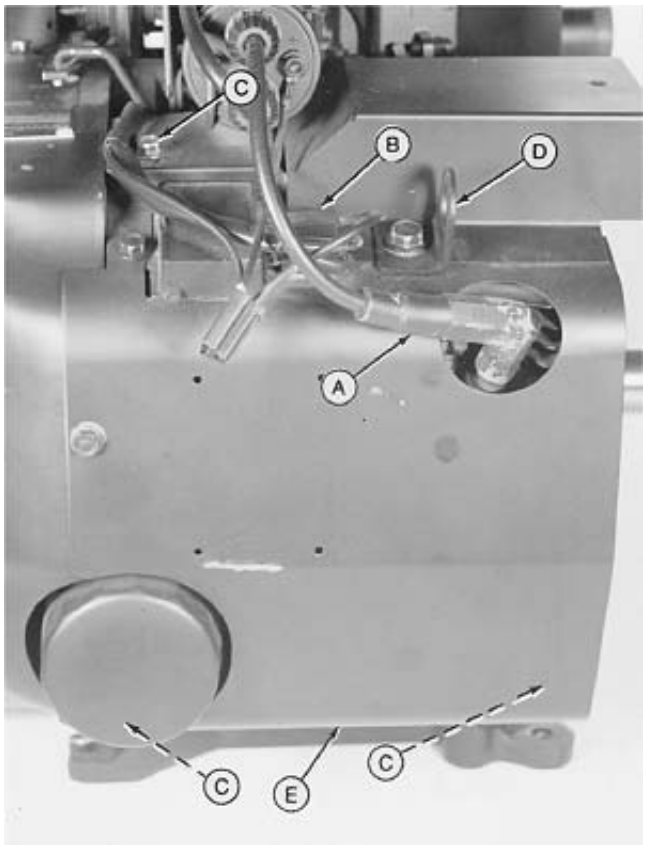
-UN-29JAN90
M36472

M98,2030K,6 -19-09OCT85

4. Disconnect spark plug wire (A) and voltage regulator leads (B).

5. Remove five cap screws (C) to remove lift bracket (D), and right side shroud (E).

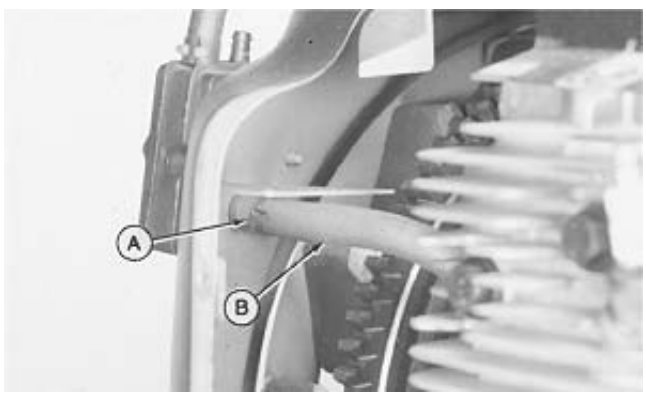
A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



M36289 -UN-29JAN90

M98,2030K,7 -19-09OCT85

6. Loosen hose clamp (A) to disconnect fuel pump impulse line (B).



M36290 -UN-29JAN90

M98,2030K,8 -19-09OCT85

7. Disconnect governor spring (A).

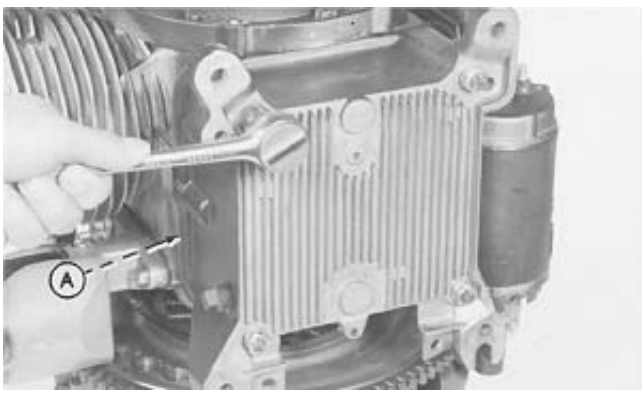
8. Remove two screws to remove fuel pump (B).

9. Remove three cap screws to remove flywheel shroud (C).

M36291 -UN-29JAN90

M98,2030K,9 -19-09OCT85

10. Remove four cap screws to remove oil base and gasket (A).

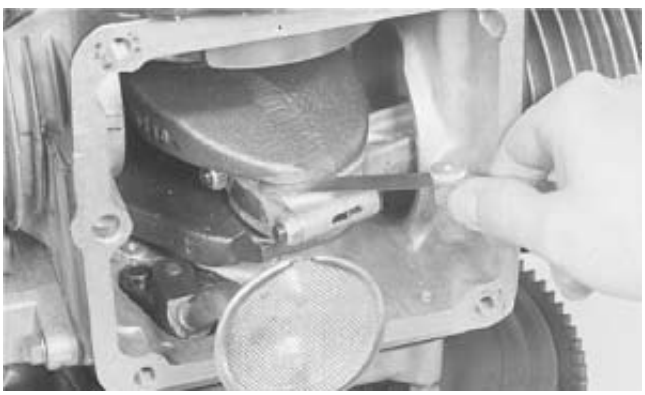


M36374 -UN-29JAN90

M98,2030K,10 -19-09OCT85

11. Measure connecting rod side clearance. New side clearance specification is 0.05—0.41 mm (0.002—0.016 in.).

If clearance exceeds 0.8 mm (0.03 in.), replace connecting rod and connecting rod cap.



M36380 -UN-29JAN90

M98,2030K,11 -19-02FEB87

MEASURE CONNECTING ROD BEARING CLEARANCE

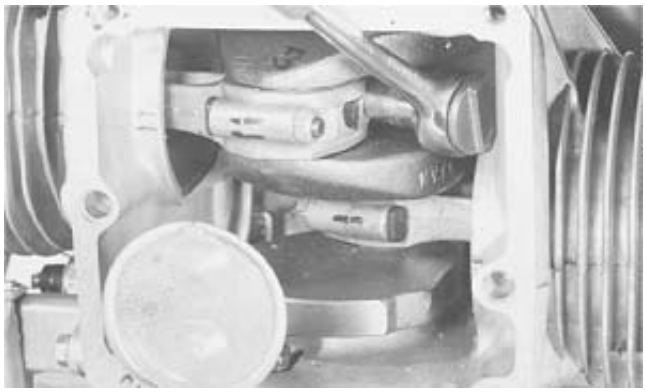
Measure each connecting rod bearing clearance using the following PLASTIGAGE method or by measuring after the pistons have been removed.

IMPORTANT: Connecting rod end caps must be installed on the same connecting rod and in the same direction to prevent crankshaft and connecting rod damage.

1. Put identification marks on connecting rods, rod caps, and cylinder block.

2. Remove nuts to remove connecting rod caps (B43E, B43G, B48G, P218G and P220G Engines—top photo).

Remove cap screws to remove connecting rod caps (T260 Engine—bottom photo).



M98,2030K,12 -19-02FEB87

3. Wipe oil from connecting rod bearing surface and crankshaft journal.

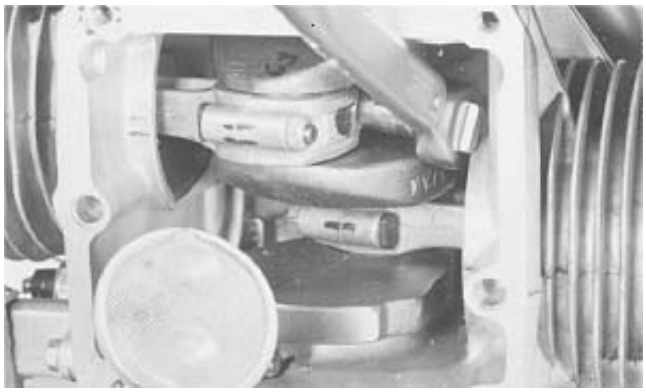
4. Put a piece of PLASTIGAGE or an equivalent on the full length of the bearing surface about 6 mm (1/4 in.) off center.

M98,2030K,13 -19-09OCT85

5. Turn crankshaft about 30° from bottom of oil pan and install connecting rod cap. Install and tighten nuts or cap screws evenly to specifications.

CONNECTING ROD SPECIFICATIONS

Engine	Measurement	Specifications
B43E, B43G, B48G, P218G, P220G	Cap Nut Torque	18 ± 1 N·m (159 ± 9 lb-in.)
T260	Cap Screw Torque	20 ± 1 N·m (177 ± 9 lb-in.)



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M36383

M98,2030K,14 -19-02FEB87

6. Remove nuts or cap screws and connecting rod cap.

7. The flattened PLASTIGAGE will be found on either the bearing surface or crankshaft journal.

8. Use the graduation marks on the envelope to compare the width of the flattened PLASTIGAGE at its WIDEST point. Remove PLASTIGAGE.

The number within the graduation marks indicates the bearing clearance in thousandths of an inch or in millimeters depending on which side of the envelope is used.

9. New bearing clearance is 0.051—0.084 mm (0.002—0.0033 in.).

If clearance exceeds 0.13 mm (0.0053 in.), remove pistons.

If clearance is correct, install connecting rod caps and tighten nuts or cap screws to specifications.

-UN-29JAN90
M36384

M98,2030K,15 -19-09OCT85

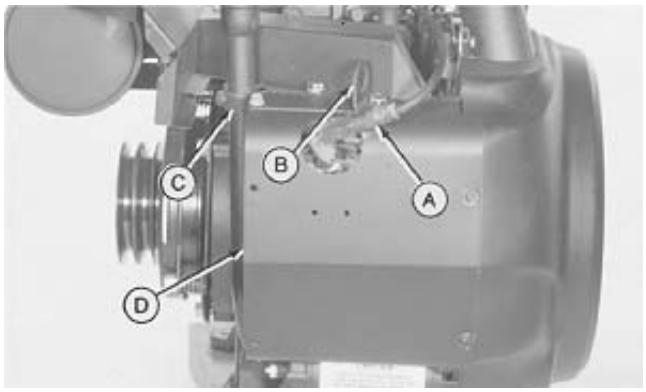
REMOVE PISTONS AND CONNECTING RODS

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire (A).

3. Remove six cap screws to remove lift bracket (B), oil fill tube (C), and left side shroud (D).

A—Spark Plug Wire
B—Lift Bracket
C—Oil Fill Tube Bracket
D—Left Side Shroud



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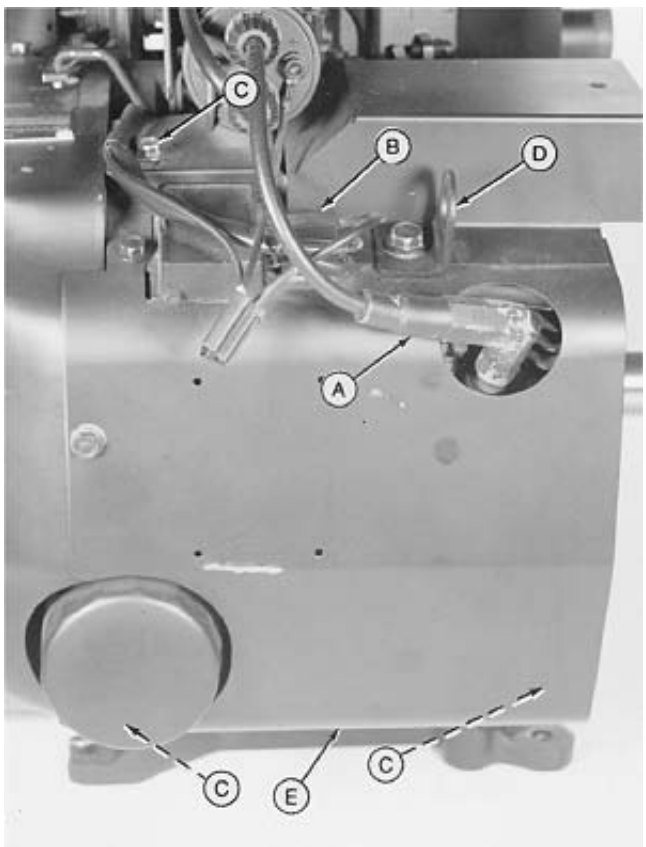
M36472

M98,2030K,16 -19-09OCT85

4. Disconnect spark plug wire (A) and voltage regulator leads (B).

5. Remove five cap screws (C) to remove lift bracket (D), and right side shroud (E).

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



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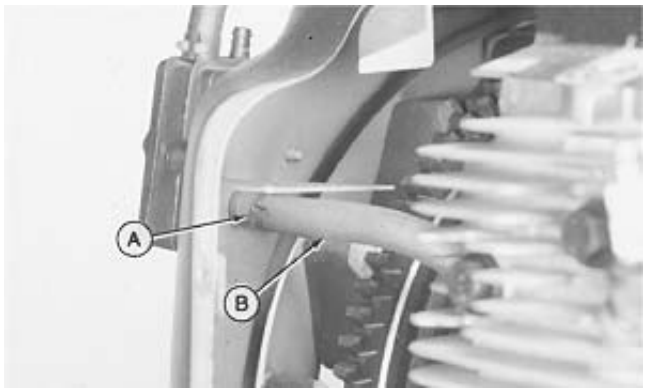
M36289

M98,2030K,7 -19-09OCT85

6. Loosen hose clamp (A) to disconnect fuel pump impulse line (B).

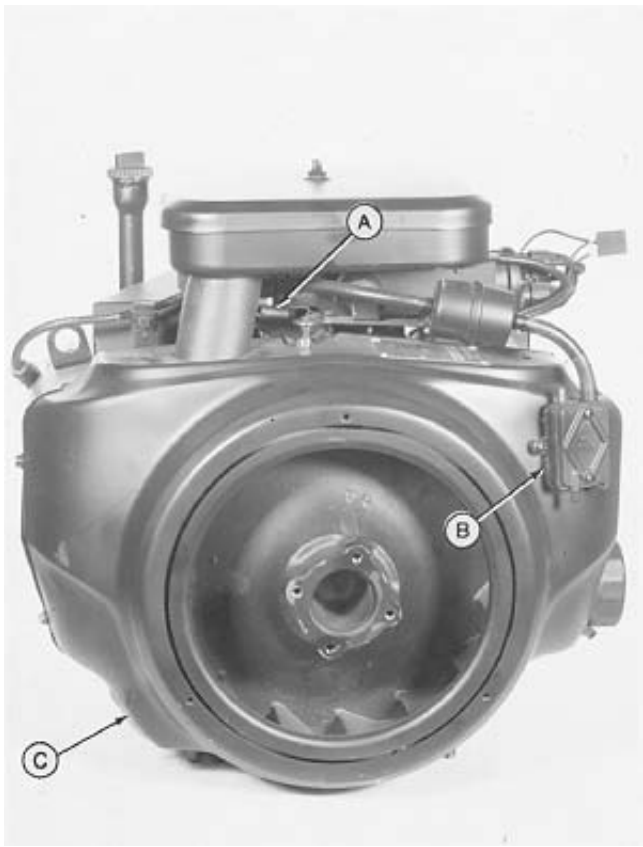


M98,2030K,8 -19-09OCT85

7. Disconnect governor spring (A).

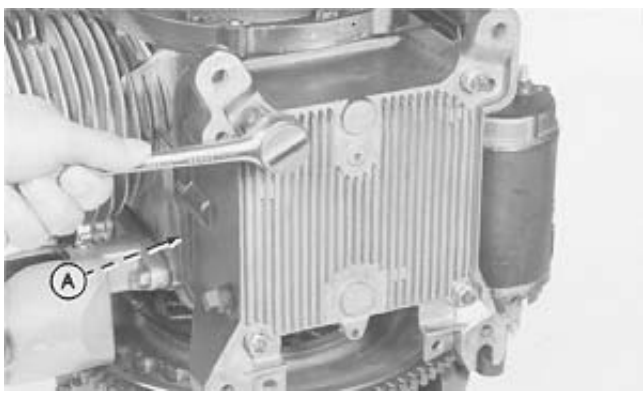
8. Remove two screws to remove fuel pump (B).

9. Remove three cap screws to remove flywheel shroud (C).



M98,2030K,9 -19-09OCT85

10. Remove four cap screws to remove oil base and gasket (A).



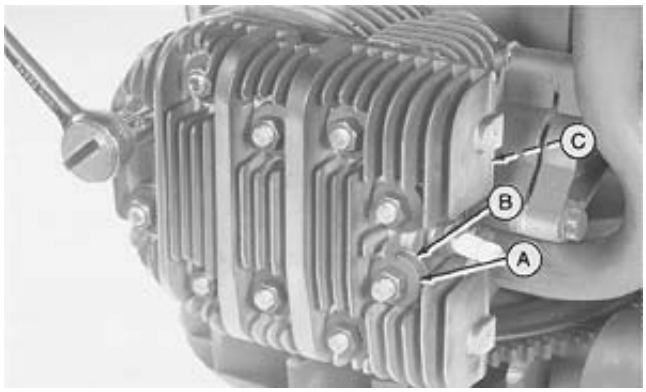
M98,2030K,10 -19-09OCT85

IMPORTANT: Do not remove cylinder heads while they are hot. Cylinder head may warp. A hot gasket will be soft and difficult to remove.

11. Remove nine cap screws to remove cylinder head and gasket (A).

Remove 10 nuts, 20 compression washers (A), and ten washers (B) to remove cylinder head and gasket (C).

B43E,B43G,B48G,P21G and P220G



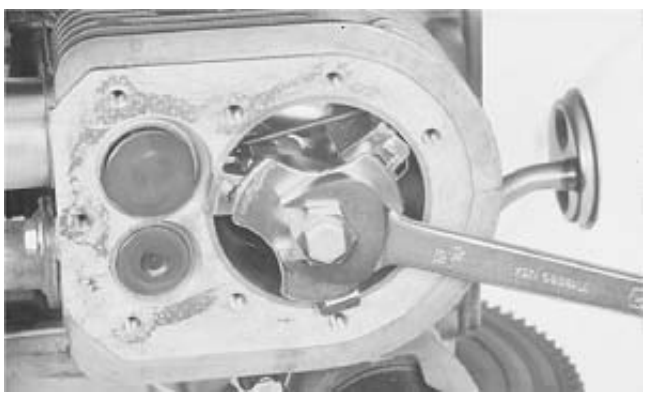
T260 Engine

M98,2030K,17 -19-02FEB87

12. Clean carbon from cylinder bore using a wire brush.

13. Before piston removal, check cylinder bore for ridges. The ridges can cause damage to piston or rings if ridge is not removed.

14. If necessary, remove ridge from top of cylinder bore using a ridge reamer.



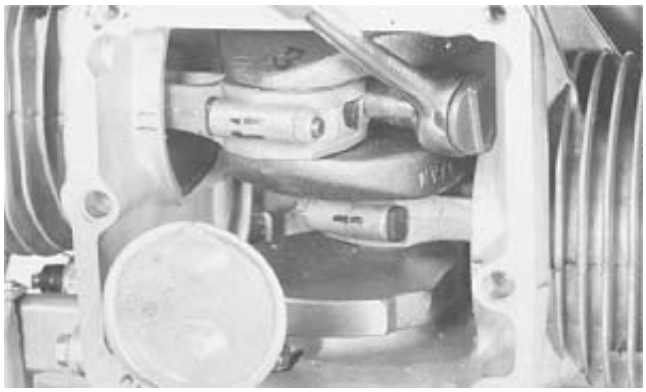
M98,2030K,18 -19-09OCT85

IMPORTANT: Connecting rod caps must be installed on the same connecting rod and in the same direction to prevent crankshaft and connecting rod damage.

15. Put identification marks on connecting rods, rod caps, and cylinder block.

16. Remove nuts to remove connecting rod caps. (B43E, B43G, B48G, P218G and P220G Engines—top photo.)

Remove cap screws to remove connecting rod caps. (T260 Engine-bottom photo)

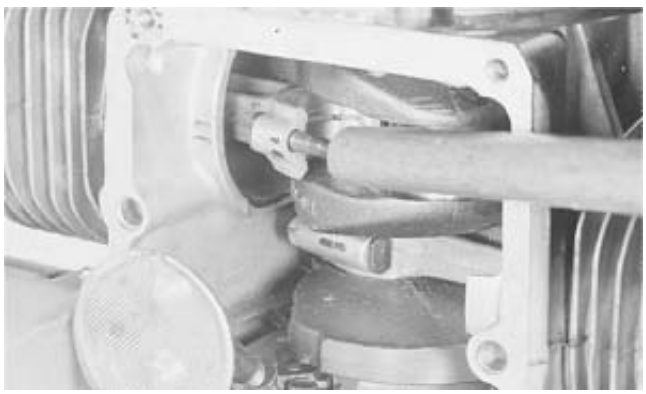


M36381 -UN-29JAN90

M36388 -UN-29JAN90

M98,2030K,19 -19-02FEB87

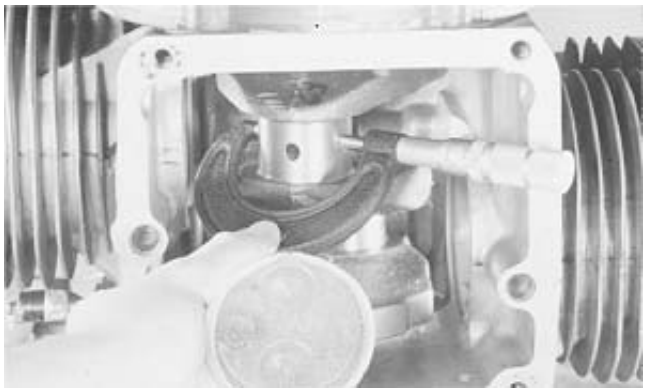
17. Push piston and connecting rod out of cylinder bore using a wooden dowel.



M36389 -UN-29JAN90

M98,2030K,20 -19-09OCT85

INSPECT PISTONS AND CONNECTING RODS


M36390 -UN-29JAN90

1. Measure crankshaft connecting rod journal diameter. Measure several places around each journal and each side of journal.

NOTE: If engine has had previous major overhaul, crankshaft journals may have been ground and undersize connecting rods installed.

CONNECTING ROD JOURNAL SPECIFICATIONS

Item	New Parts	Wear Tolerance
Journal O.D.	41.28—41.30 mm (1.6252—1.6260 in.)	41.25 mm (1.6242 in.)

If journal diameter is less than 41.25 mm (1.6242 in.), replace crankshaft or have journals ground by a qualified machine shop. The following undersize connecting rods are available:

0.25 mm (0.010 in.)
0.50 mm (0.020 in.)
0.76 mm (0.030 in.)

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M98,2030K,21 -19-11NOV85

2. Measure connecting rod bore diameter and connecting rod clearance (bore I.D. minus journal O.D.).

3. Install connecting rod cap on connecting rod. Install and tighten nuts or cap screws evenly to specifications.

CONNECTING ROD SPECIFICATIONS

Cap Nut Torque	
B43E, B43G, B48G, P218G, P220G Engines	18 ± 1 N·m (159 ± 9 lb-in.)
Cap Screw Torque	
T260 Engine	20 ± 1 N·m (177 ± 9 lb-in.)

Item	New Parts	Wear Tolerance
Bore I.D.:		
B43E,B43G,B48G, P218G, P220G Engines	41.35—41.36 mm (1.6280—1.6285 in.)	41.39 mm (1.6295 in.)
T260 Engine	44.46—44.48 mm (1.7505—1.7510 in.)	44.50 mm (1.7520 in.)
Clearance	0.051—0.084 mm (0.0020—0.0033 in.)	0.135 mm (0.0053 in.)

If bore diameter exceeds wear tolerance, replace connecting rod.

If connecting rod clearance exceeds 0.135 mm (0.0053 in.), replace connecting rod or grind crankshaft connecting rod journals and install undersize connecting rods.

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M98,2030K,22 -19-02FEB87

4. Remove piston rings using a piston ring expander.

IMPORTANT: Do not use a caustic cleaning solvent to remove carbon from pistons; piston may be damaged.

5. Clean carbon from piston surfaces using a wire brush. Clean piston ring grooves with a piston ring groove cleaner or the end of a piston ring filed to a sharp point.

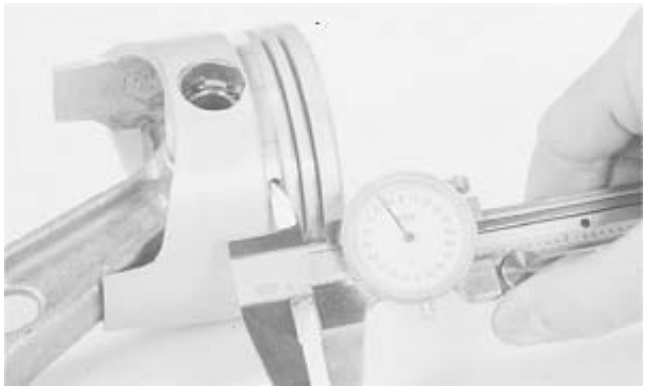
M98,2030K,23 -19-09OCT85

6. Measure piston ring groove width. Measure several places around each piston.

PISTON RING GROOVE SPECIFICATIONS

Item	New Part	Wear Tolerance
Top Ring	2.032—02.057 mm (0.080—0.081 in.)	2.21 mm (0.087 in.)
Second Ring	2.032—2.057 mm (0.080—0.081 in.)	2.21 mm (0.087 in.)
Oil Ring	4.775—4.801 mm (0.188—0.189 in.)	4.95 mm (0.195 in.)

If ring groove width exceeds wear tolerance, replace piston.



M36393 -UN-29JAN90

M98,2030K,24 -19-11NOV85

7. Inspect piston for worn or cracked ring lands. Excessive piston wear near the edge of the top ring land indicated preignition.

8. Clean and inspect oil holes in oil ring groove for a plugged condition. Replace parts as necessary.

M36394 -UN-29JAN90

M98,2030K,25 -19-09OCT85

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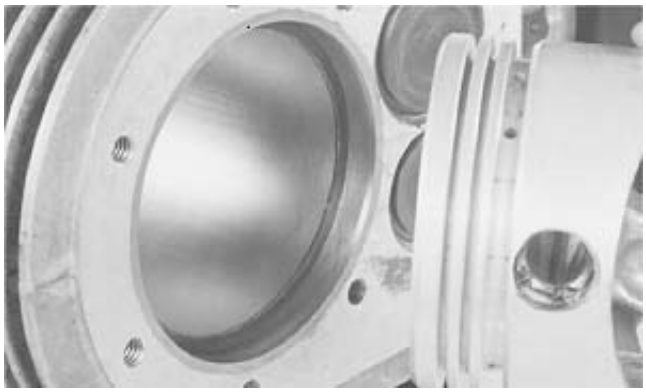
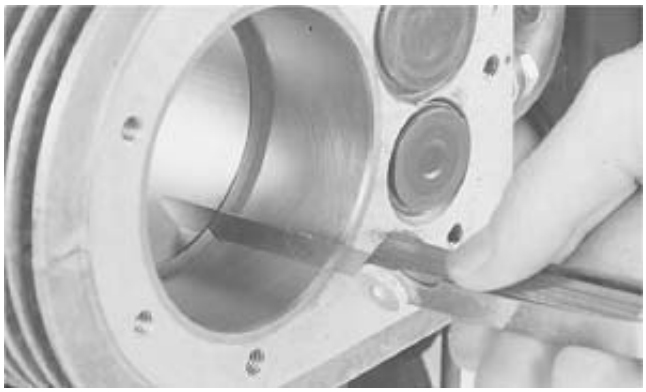
9. Measure piston ring end gap. Push rings into cylinder bore approximately halfway using piston.

PISTON RING END GAP SPECIFICATIONS

Item	New Part	Wear Tolerance
All Rings	0.25—0.51 mm (0.010—0.020 in.)	1.52 mm (0.060 in.)

If end gap exceeds 1.52 mm (0.060 in.), replace rings. Deglaze cylinder bore before installing new rings.





M98,2030K,26 -19-12NOV85

IMPORTANT: Pistons must be installed in the same direction and on the same connecting rod they were removed from.

10. Put a mark on each piston and connecting rod for proper identification to aid in assembly.

11. Remove two snap rings.

12. Remove piston pin using a wooden dowel.

M98,2030K,27 -19-09OCT85

13. Measure diameter of piston pin at six places; two measurements 90˚ apart at each end and two measurements 90˚ at center.

PISTON PIN SPECIFICATIONS

Item	New Part	Wear Tolerance
Pin O.D.		
B43E,B43G,B48G, P218G, P220G Engine	17.463—17.468 mm (0.6875—0.6877 in.)	17.371 mm (0.6839 in.)
T260 Engine	19.050—19.055 mm (0.7500—0.7502 in.)	18.959 mm (0.7464 in.)

If pin diameter is less than wear tolerance, install a new piston pin.

M98,2030K,28 -19-02FEB87

14. Measure piston pin bore in connecting rod and piston pin clearance (bore I.D. minus pin O.D.).

PISTON PIN BORE SPECIFICATIONS

Engine	Item	New Part
B43E, B43G, B48G, P218G, P220G	**Bore I.D.**	**17.470—17.480 mm (0.6878—0.6882 in.)**
B43E, B43G, B48G, P218G, P220G	**Pin Clearance**	**0.005—0.018 mm (0.0002—0.0007 in.)**
T260	**Bore I.D.**	**19.06—19.07 mm (0.7504—0.7508 in.)**
T260	**Pin Clearance**	**0.005—0.020 mm (0.0002—0.0008 in.)**

If piston pin bore diameter exceeds specifications, replace connecting rod.

If pin clearance exceeds specifications, replace connecting rod, piston pin, or both.

15. Inspect connecting rod cap screws and nuts for damaged threads. Inspect connecting rods for nicks, cracks, scored bores, or bores out-of-round more than 0.05 mm (0.002 in.).

M98,2030K,29 -19-11FEB87

16. Measure piston pin bore in piston and piston pin clearance (bore I.D. minus pin O.D.).

PISTON PIN BORE SPECIFICATIONS

Engine	Item	New Part
B43E, B43G, B48G, P218G, P220G	Bore I.D.	17.468—17.478 mm (0.6877—0.6881 in.)
B43E, B43G, B48G	Pin Clearance	0.005—0.010 mm (0.002—0.0004 in.)
P218G, P220G		0.001—0.0162 mm (0.00004—0.00064 in.)
T260	Bore I.D.	19.005—19.065 mm (0.7502—0.7506 in.)
T260	Pin Clearance	0.003—0.013 mm (0.0001—0.0005 in.)

If piston pin bore diameter exceeds specifications, replace piston.

If piston pin clearance exceeds specifications; replace piston, piston pin, or both.

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18

M98,2030K,30 -19-11FEB87

17. Measure piston O.D. perpendicular to piston bore at a point approximately 30 mm (1.2 in.) from top of piston or 2.5 mm (0.1 in.) below oil ring groove.

NOTE: If engine has had a previous major overhaul, oversize pistons and rings may have been installed.

PISTON SPECIFICATIONS

Item	New Part	Wear Tolerance
Piston O.D.		
B43E, B43G, B48G, P218G, P220G Engine	**82.42—82.44 mm (3.245—3.246 in.)**	**82.32 mm (3.241 in.)**
T260 Engine	**90.42—90.45 mm (3.560—3.561 in.)**	**90.32 mm (3.556 in.)**

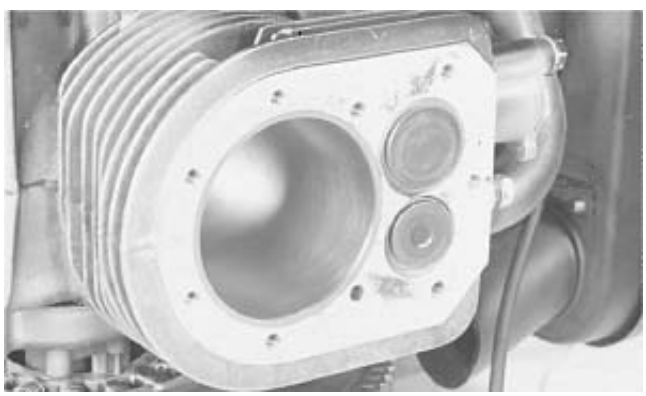
If piston diameter is less than wear tolerance, install a new piston.

18. Inspect piston for cracks at ring lands, skirts, and pin bores. Inspect piston for scuffing or scoring; replace as necessary.

M98,2030K,31 -19-02FEB87

19. Inspect cylinder bores for scuffing, scoring, scratches, cracks, and wear. If cylinder bores are damaged, replace cylinder block or rebore and hone cylinder for next oversize piston.

20. If the cylinder bore is not damaged, check cylinder bore for wear.



M98,2030K,32 -19-09OCT85

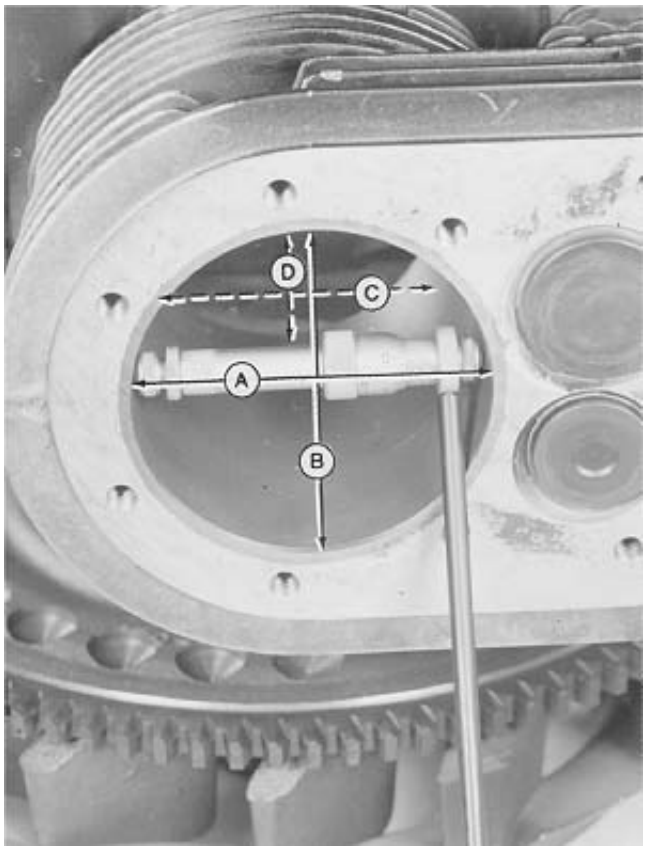
21. Measure piston bore I.D. at four places; two measurements 90˚ apart at top of ring travel and two measurements 90˚ apart at bottom of ring travel.

NOTE: If engine has had a previous major overhaul, oversize pistons and rings may have been installed.

22. Measure piston clearance (piston bore I.D. minus piston O.D.).

23. Measure cylinder bore taper (A—C, B—D).

24. Measure cylinder bore out-of round (A—B, C—D).



M36402 -UN-29JAN90

CYLINDER BORE SPECIFICATIONS

Item	New Part	Wear Tolerance
Bore I.D.		
B43E,B43G, B48G, P218G, P220G Engine	82.53—82.55 mm (3.249—3.250 in.)	82.68 mm (3.255 in.)
T260 Engine	90.488—90.512 mm (3.5625—3.5635 in.)	90.632 mm (3.5682 in.)
Piston Clearance		
B43E, B43G, B48G, P218G, P220G Engine	0.076—0.127 mm (0.003—0.005 in.)	0.28 mm (0.011 in.)
T260 Engine	0.178—0.229 mm (0.007—0.009 in.)	0.38 mm (0.015 in.)
Taper		
B43E, B43G, B48G, P218G, P220G Engine		0.13 mm (0.005 in.)
T260 Engine		0.08 mm (0.003 in.)
Out-of-Round		0.08 mm (0.003 in.)

If cylinder bore exceeds wear tolerance, replace cylinder block or have cylinder rebored by a qualified machine shop. If cylinder is rebored, oversize piston and rings must be installed. The following oversize pistons and rings are available:

0.25 mm (0.010 in.)
0.50 mm (0.020 in.)
0.76 mm (0.030 in.)

If piston clearance exceeds wear tolerance, replace cylinder block, piston or both, or rebore cylinder. Install oversize piston and rings.

If taper or out-of-round exceed wear tolerance, replace cylinder block, or rebore cylinder. Install oversize piston and rings.

M98,2030K,33 -19-11FEB87

DEGLAZE CYLINDER BORES

NOTE: It is recommended that crankshaft be removed. If cylinder bores are to be deglazed with crankshaft installed in engine, put clean shop towels over crankshaft to protect journal and bearing surfaces from any abrasives.

1. Deglaze cylinder bores using a flex-hone.

M36403 -UN-29JAN90

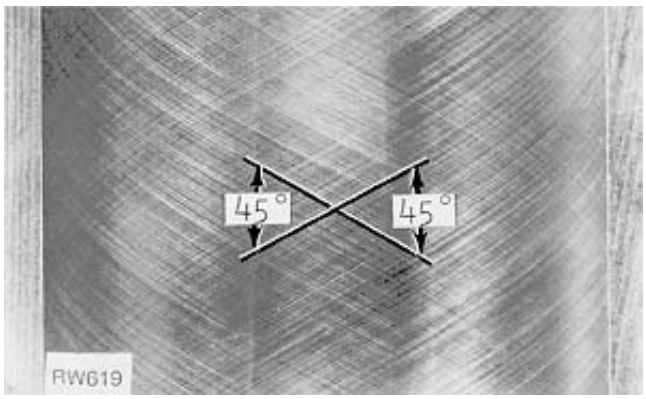
M98,2030K,34 -19-10OCT85

NOTE: A cutaway of a cylinder bore is shown for clarity of photograph.

2. Use flex-hone as instructed by manufacturer to obtain 45° crosshatch pattern as shown.

IMPORTANT: Do not use gasoline, kerosene, or commercial solvents to clean cylinder bores. Solvents will not remove all abrasives from cylinder walls.

3. Remove excess abrasive residue from cylinder walls using a clean dry rag. Clean cylinder walls using clean white rags and water. Continue to clean cylinder until white rags show no discoloration.



RW619 -UN-02DEC88

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M98,2025R,29 -19-31JUL84

ASSEMBLE PISTONS AND CONNECTING RODS

IMPORTANT: Pistons must be installed on connecting rods from which they were removed.

1. Identification marks on piston must be to the same side as marks on connecting rod.

2. Put clean engine oil on piston pin. Install pin through piston and connecting rod.

3. Install snap rings. Be sure snap rings are fastened in groove all around.

M36397 -UN-29JAN90

M98,2030K,35 -19-10OCT85

4. Install oil ring expander in bottom piston ring groove. Turn expander so ends are above either end of the piston pin.

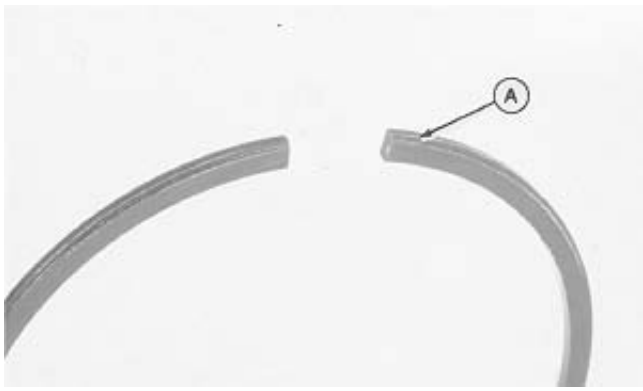
5. Install oil ring over expander with a piston ring expander. Turn oil ring so ends are on opposite side of piston from the expander ends.

-UN-29JAN90
M36392

M98,2030K,36 -19-10OCT85

6. Install second ring in middle groove, with chamfer (A) toward bottom of piston, or with dot (B) toward top of piston (T260 only).

7. Install compression ring in top groove, with dot (B) toward top of piston.



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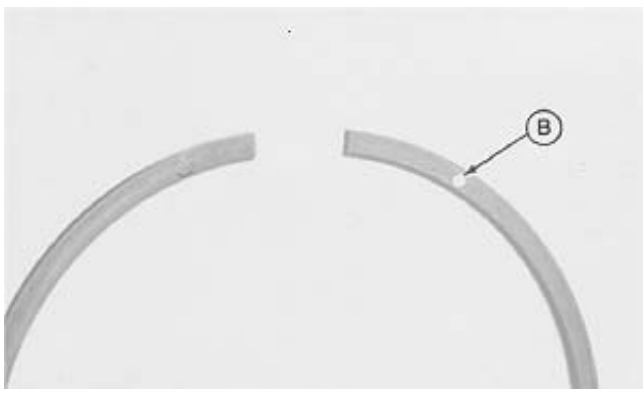
M36406



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M36404

M98,2030K,37 -19-10OCT85

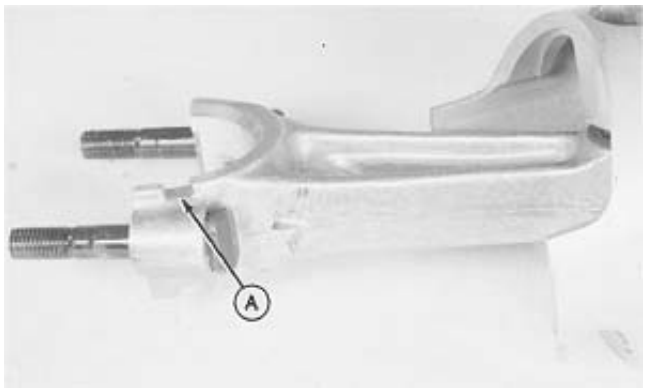
INSTALL PISTONS AND CONNECTING RODS

IMPORTANT: Pistons must be installed in the same cylinder they were removed from and in the same direction. Be careful not to damage crankshaft rod journal while installing piston.

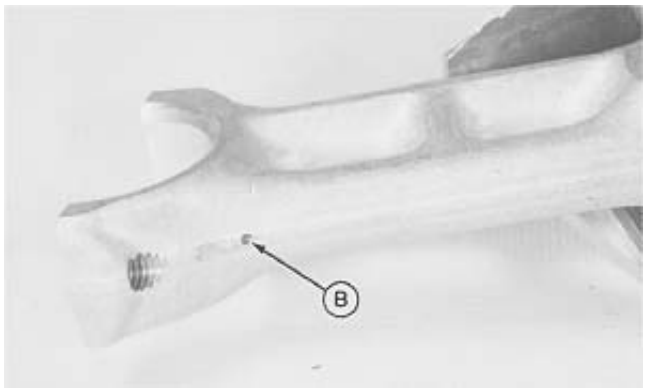
1. Apply clean engine oil on piston,s connecting rod bearing surface, and cylinder bore.

2. Turn crankshaft until rod journal is at bottom of its stroke.

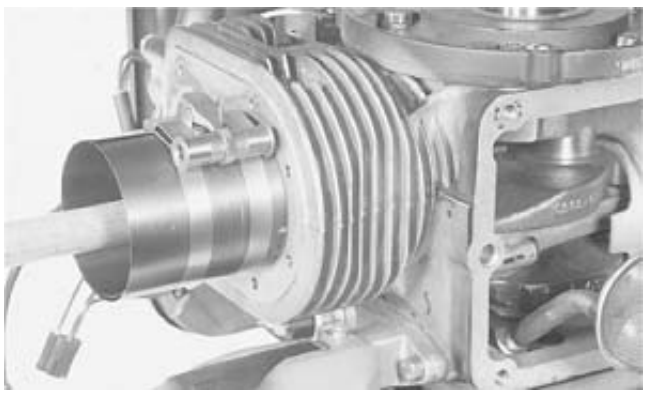
3. Install piston with notch (A) or oil hole (B) toward camshaft using a ring compressor. Push piston down until connecting rod is seated on crankshaft rod journal.



M36363 -UN-29JAN90



M36364 -UN-29JAN90



M36407 -UN-29JAN90

M98,2030K,38 -19-10OCT85

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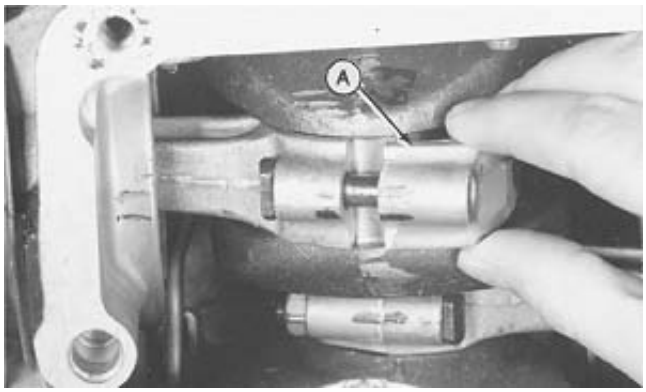
IMPORTANT: Connecting rod caps must be installed on the same connecting rod they were removed from and in the same direction.

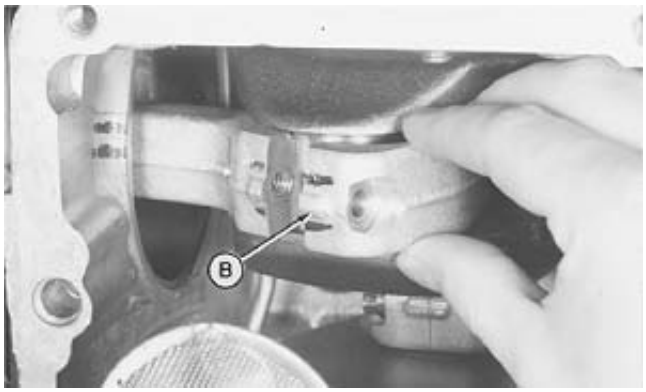
4. Apply clean engine oil on connecting rod cap.

5. Install connecting rod cap with this side (A) outward on connecting rod.

Install connecting rod cap with large tang (B) away from camshaft on connecting rod.



B43E, B43G, B48G, P218G, and P220G



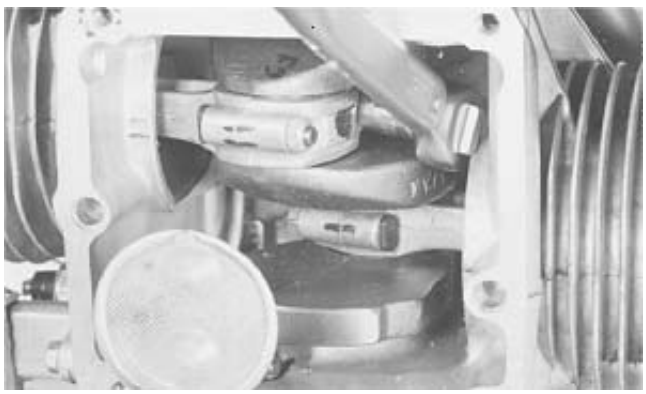
T260 Engine

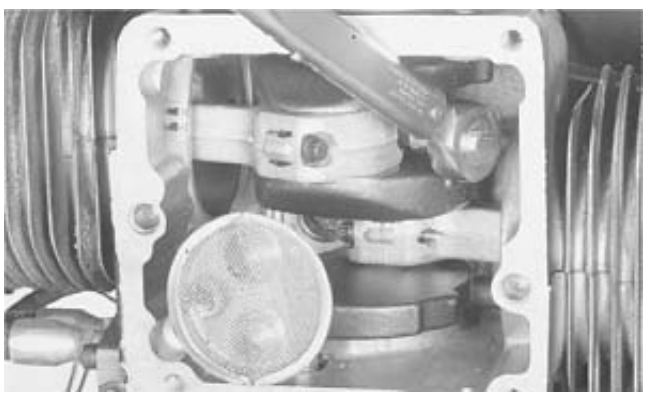
M98,2030K,39 -19-02FEB87

6. Install and tighten nuts or cap screws evenly to specifications. Hit connecting rod cap LIGHTLY with a soft-faced hammer to align it with connecting rod.

CONNECTING ROD SPECIFICATIONS

Engine	Measurement	Specification
B43E, B43G, B48G, P218G, P220G	Cap Nut Torque	18 ± 1 N·m (159 ± 9 lb-in.)
T260	Cap Screw Torque	20 ± 1 N·m (177 ± 9 lb-in.)





M98,2030K,40 -19-02FEB87

NOTE: To install cylinder head on T260 engine, go to Step 9.

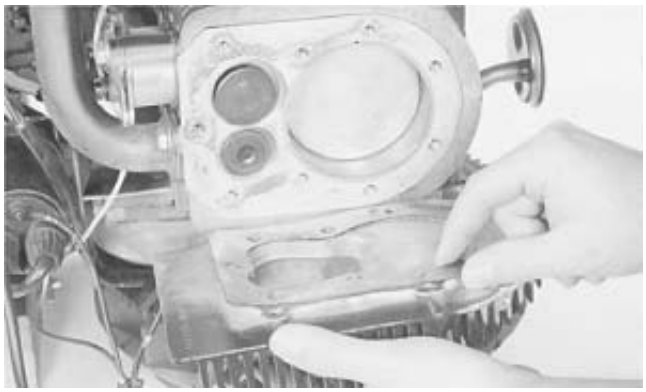
7. Install a new gasket on cylinder head.

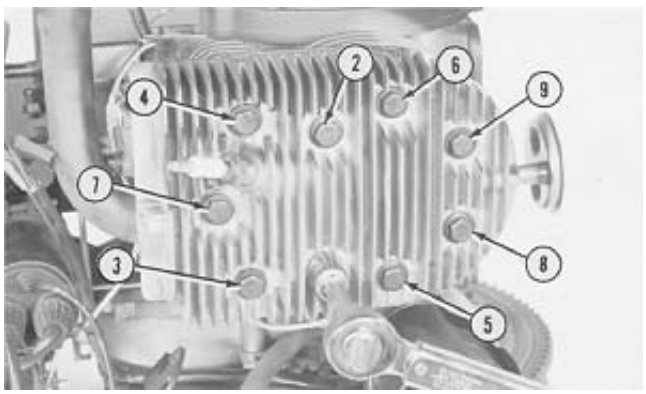
8. Install cylinder head on cylinder block with the five longest cap screws in the top holes of cylinder head. Tighten cap screws in several steps in the sequence shown.

CAP SCREW TORQUE SPECIFICATIONS

B43E, B48G, P218G, P220G Engine . . . . . 20 ± 1 N·m
(180 ± 12 lb-in.)

B43E Engine . . . . . 23 ± 1 N·m
(204 ± 12 lb-in.)





M98,2030K,41 -19-11FEB87

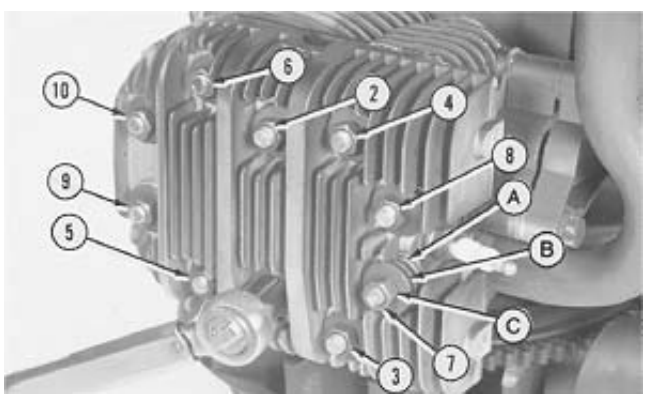
9. Install a new gasket on cylinder head.

10. Install cylinder head on cylnder block. Install flat washer (A), two compression washers (B) with outside edges contacting each other, and nut (C) on each of the top six longer studs. Install flat washer and nut on each of the bottom four shorter studs. Tighten nuts in several steps in sequence shown.

NUT TORQUE SPECIFICATIONS

T260 Engine
Top Six Nuts
(with compression washers) . . . . . 16 ± 1 N·m
(142 ± 12 lb-in.)

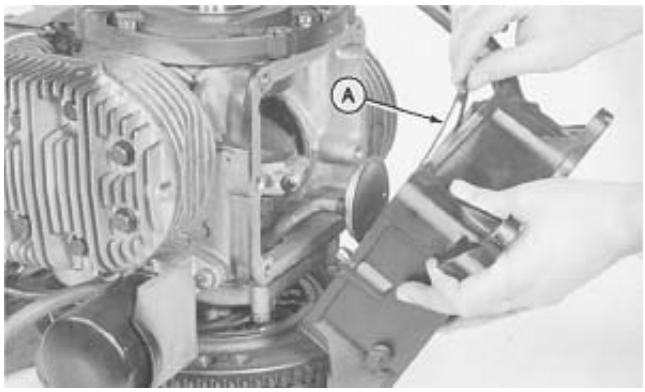
Bottom Four Nuts . . . . . 20 ± 1 N·m
(180 ± 12 lb-in.)



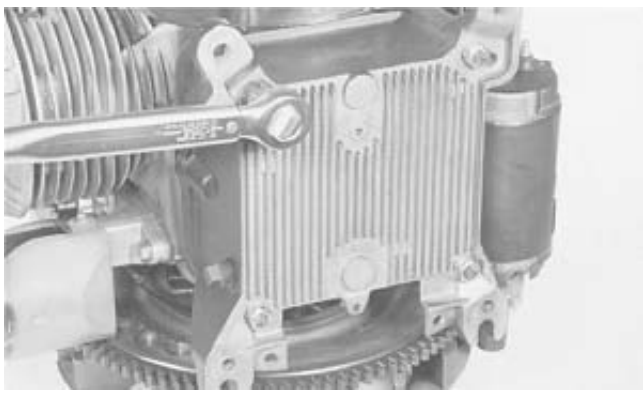
M98,2030K,42 -19-10OCT85

11. Install a new gasket (A) on oil base.

12. Install oil base. Install and tighten four cap screws to 27 ± 3 N·m (239 ± 27 lb-in.).



M36415 -UN-29JAN90



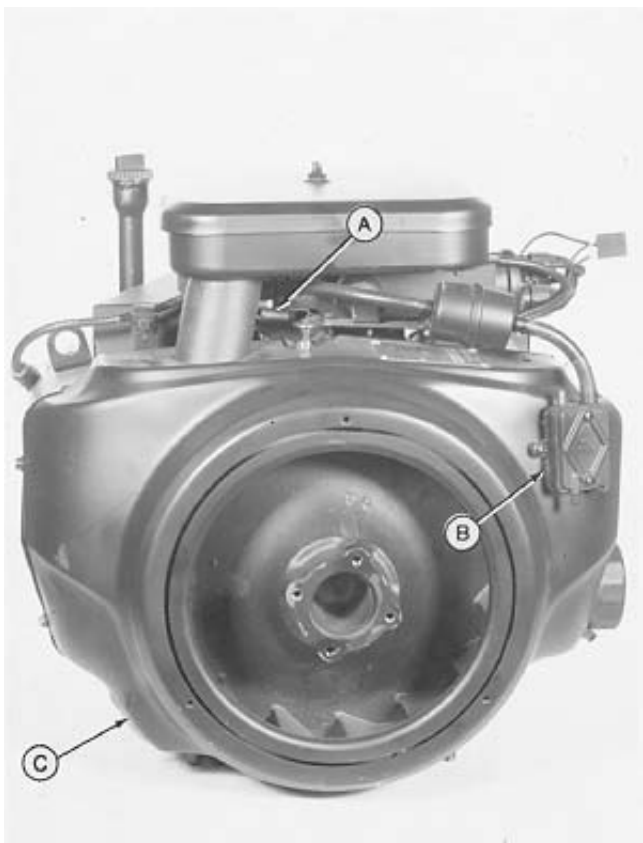
M36416 -UN-29JAN90

M98,2030K,43 -19-10OCT85

13. Install flywheel shroud (C) and fasten with three cap screws.

14. Install fuel pump (B) and fasten with two screws.

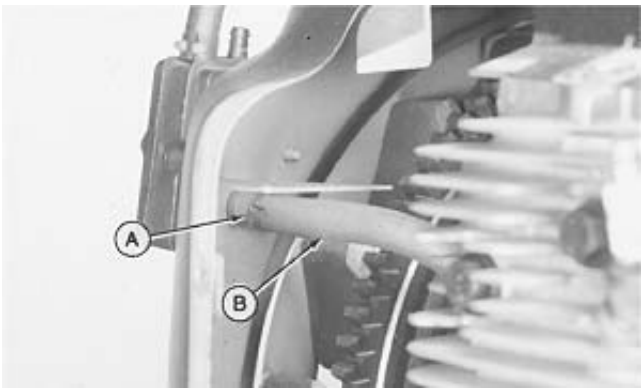
15. Connect governor spring (A) in top hole of arm.



M36291 -UN-29JAN90

M98,2030K,44 -19-10OCT85

16. Connect fuel pump impulse line (B) and fasten with hose clamp (A).

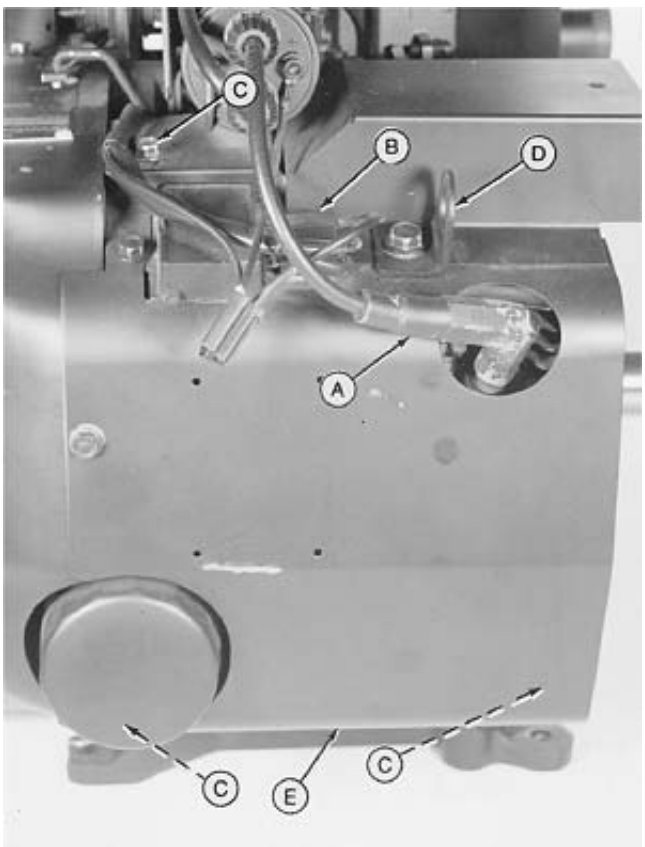


M98,2030K,45 -19-10OCT85

17. Install right side shroud (E), lift bracket (D), and fasten with five cap screws (C). Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

18. Connect spark plug wire (A) and voltage regulator leads (B). Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of the voltage regulator.

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



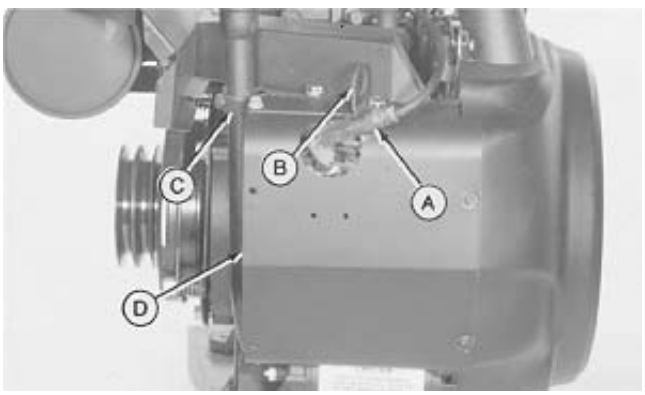
M98,2030K,46 -19-10OCT85

19. Install left side shroud (D), oil fill tube bracket (C), lift bracket (B), and fasten with six cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

20. Connect spark plug wire (A).

21. Install engine. (See machine technical manual.)

A—Spark Plug Wire
B—Lift Bracket
C—Oil Fill Tube Bracket
D—Left Side Shroud



M98,2030K,47 -19-10OCT85

ESSENTIAL TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Number	Name	Use
JDG327	Puller Legs	Remove crankshaft gear and bearing plate.
JDG 329	Seal Expander	Protect and install oil seal on JDG 328.
JDG 328	Crankshaft Seal Installer	Install oil seal in bearing plate.

M98,2035K,1 -19-10OCT85

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
13-Ton Puller Set	Remove crankshaft gear and bearing plate.
Bushing, Bearing, and Seal Driver Set	Remove crankshaft gear, oil seal, main bearings.
Ridge Reamer	Remove ridge from top of cylinder bore.
Outside Micrometer	Measure crankshaft main bearing journals.
Telescoping Gauge	Measure crankshaft main bearing.
Feeler Gauge	Measure crankshaft end play.
Piston Ring Compressor	Install pistons.

M98,2035K,2 -19-10OCT85

OTHER MATERIAL

Number	Name	Use
T43515	John Deere LOCTITE® Retaining Compound	Apply to outside surface of main bearing

LOCTITE is a trademark of the Loctite Corp.

M98,2035K,3 -19-12NOV85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Overhaul Gasket Kit

Crankshaft Bearing Kit

Oil Pump Gasket Kit

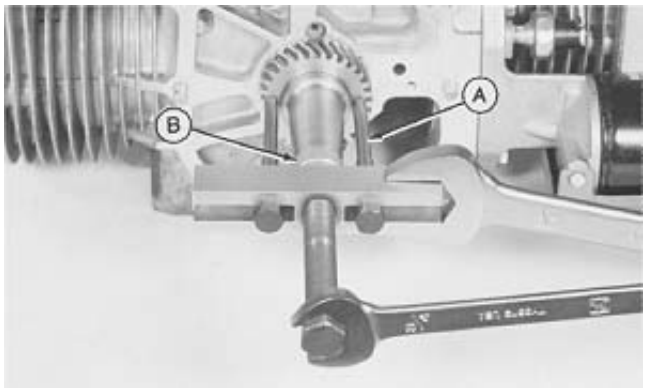
M98,2035K,4 -19-10OCT85

SPECIFICATIONS

Item	Measurement	Specification
1. Main Bearing Journal O.D.	50.78—50.80 mm (1.9992—2.0000 in.)	50.72 mm (1.997 in.)
2. Main Bearing I.D.—B43E, B43G, B48G, T260 Engines	50.838—50.902 mm (2.0015—2.0040 in.)	50.930 mm (2.0051 in.)
3. Main Bearing I.D. P218G, P220G Engine	50.06—50.88 mm (2.0024—2.0034 in.)	50.94 mm (2.0055 in.)
4. Bearing Clearance —B43E, B43G, B48G, T260 Engines	0.064—0.097 mm (0.0025—0.0038 in.)	0.145 mm (0.0057 in.)
5. Bearing Clearance—P218G, P220G Engines	0.061—0.106 mm (0.0024—0.0042 in.)	0.156 mm (0.006 in.)
6. Bearing Plate Cap Screws Torque	35 ± 1 N·m (310 ± 9 lb-in.)	
7. End Play: B43E, B43G, B48G, P218G, P220G Engines	0.15—0.30 mm (0.006—0.012 in.)	
T260 Engine	0.13—0.23 mm (0.005—0.009 in.)	
8. Connecting Rod Cap Nut Torque B43E, B43G, B48G, P218G, P220G Engines	18 ± 1 N·m (159 ± 9 lb-in.)	
9. Connecting Rod Cap Screw Torque T260 Engine	20 ± 1 N·m (177 ± 9 lb-in.)	

M98,2035K,5 -19-02FEB87

REMOVE CRANKSHAFT AND MAIN BEARINGS



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M36332

1. Remove engine. (See machine technical manual.)

2. Remove muffler and exhaust pipes.

3. Remove intake manifold. (See Remove Intake Manifold, Group 10 in this manual.)

4. Remove cylinder heads. (See Remove Cylinder Heads, Group 10 in this manual.)

5. Remove intake and exhaust valves. (See Remove Intake and Exhaust Valves, Group 15 in this manual.)

6. Remove flywheel. (See Remove Flywheel, Group 20 in this manual.)

7. Remove camshaft. (See Remove Camshaft, Group 25 in this manual.)

8. Remove oil pump and oil base. (See Remove Oil Pump and Remove Oil Base, Group 40 in this manual.)

9. Remove crankshaft gear using JDG 327 Puller Legs (A), 1 in. driver disk (B), and a puller.

IMPORTANT: If crankshaft gear is replaced, always replace camshaft gear also.

10. Inspect crankshaft gear for chipped or broken teeth. Replace crankshaft gear if necessary.

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M98,2035K,6 -19-10OCT85

11. Remove key if necessary.


-UN-29JAN90
M36333

M98,2035K,7 -19-10OCT85

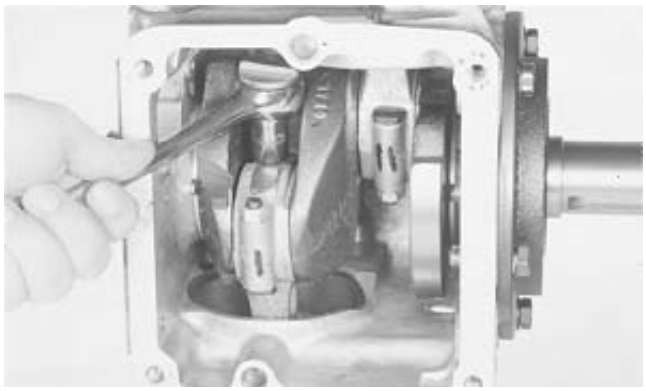
12. If necessary, remove ridge from top of cylinder bore using a ridge reamer.

M98,2035K,8 -19-10OCT85

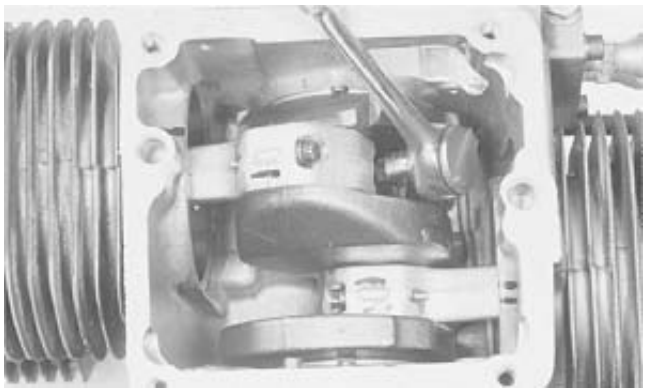
IMPORTANT: Connecting rod caps must be installed in the same connecting rod they were removed from.

13. Put identification marks on connecting rods, rod caps, and cylinder block to aid in assembly. Remove nuts to remove connecting rod caps.

Remove cap screws to remove connecting rod caps.



B43E, B43G, B48G, P218G and P220G



T260 Engine

M98,2035K,9 -19-02FEB87

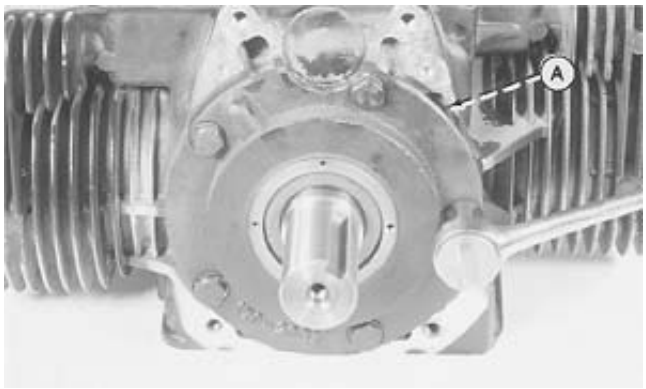
14. Push piston and connecting rod out of cylinder bore using a wooden dowel.

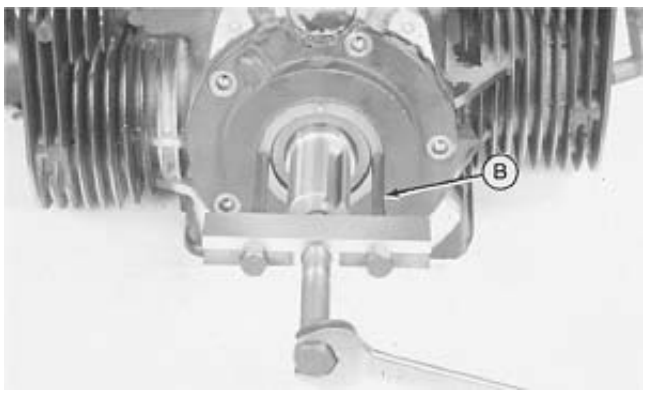
M98,2035K,10 -19-10OCT85

IMPORTANT: Do not remove bearing plate using screwdrivers. Cylinder block or bearing plate sealing surface may be damaged.

15. Remove five cap screws to remove bearing plate and gasket.

16. If bearing plate is tight, remove bearing plate using JDG 327 Puller Legs (B) and a puller.





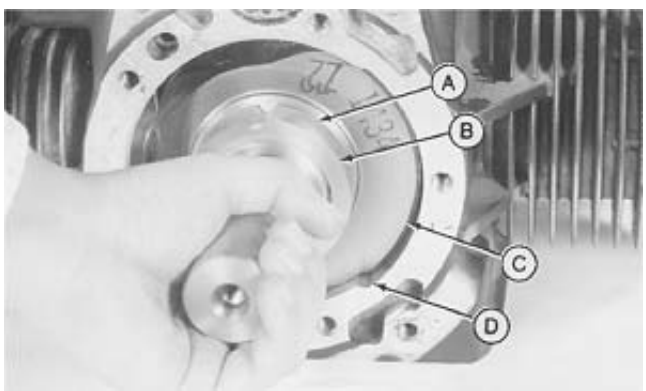
M98,2035K,11 -19-10OCT85

17. If equipped, remove thrust washer (A) and shim (B).

IMPORTANT: Do not allow crankshaft lobes to hit cylinder block while removing crankshaft. Machined surfaces may be damaged.

18. Turn crankshaft until lobe (C) fits into cylinder block notch (D). Carefully remove crankshaft.

A—Thrust Washer
B—Shim
C—Crankshaft Lobe
D—Cylinder Block Notch



M98,2035K,12 -19-10OCT85

NOTE: Original rear bearing uses a separate thrust washer. Replacement rear bearing is a one piece assembly with the thrust washer part of the bearing.

19. If equipped, remove thrust washer and shim.

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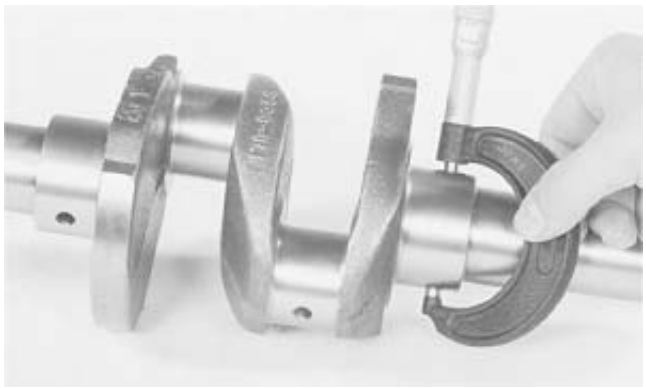
M36341

M98,2035K,13 -19-10OCT85

INSPECT CRANKSHAFT AND MAIN BEARINGS



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M36342

1. Measure crankshaft main bearing journal outside diameter.

NOTE: If engine has had previous major overhaul, crankshaft journals may have been ground and undersize bearings installed.

2. Measure several places around each journal and each side of both journals.

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NOTE: For connecting rod journal specifications, see Piston and Connecting Rods in Group 30 in this section.

MAIN BEARING JOURNAL SPECIFICATIONS

Item	New Parts	Wear Tolerance
Journal O.D.	50.78—50.80 mm (1.9992—2.0000 in.)	50.72 mm (1.997 in.)

If journal diameter is less than 50.72 mm (1.997 in.), replace crankshaft or have journals ground by a qualified machine shop. The following undersize main bearings are available:

0.05 mm (0.002 in.)
0.25 mm (0.010 in.)
0.50 mm (0.020 in.)
0.76 mm (0.030 in.)

M98,2035K,14 -19-12NOV85

3. Measure main bearing diameter and main bearing clearance (bearing I.D. minus journal O.D.).

MAIN BEARING SPECIFICATIONS

Item	New Part	Wear Tolerance
Bearing I.D.		
B43E,B43G,B48G, T260 Engines	50.838—50.902 mm (2.0015—2.0040 in.)	50.930 mm (2.0051 in.)
Bearing Clearance		
B43E,B43G,B48G, T260 Engines	0.064—0.097 mm (0.0025—0.0038 in.)	0.145 mm (0.0057 in.)
Bearing I.D.—		
P218G and P220G Engine	50.06—50.88 mm (2.0024—2.0034 in.)	50.94 mm (2.0055 in.)
Bearing Clearance		
P218G and P220G Engine	0.061—0.106 mm (0.0024—l0.0042 in.)	0.156 mm (0.006 in.)

If bearing diameter exceeds 50.930 mm (2.0051 in.), replace bearing.

If bearing clearance exceeds 0.145 mm (0.0057 in.), replace bearing or grind crankshaft journals. Install undersize bearings.

If bearing diameter and clearance are within specifications and bearings are not damaged, bearings can be reused.

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-UN-29JAN90 M36344

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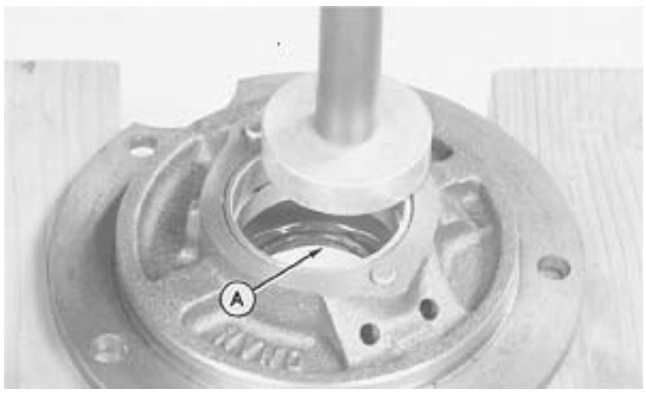
M98,2035K,15 -19-12FEB87

4. Remove oil seal (A) using a 2 in. driver disk.



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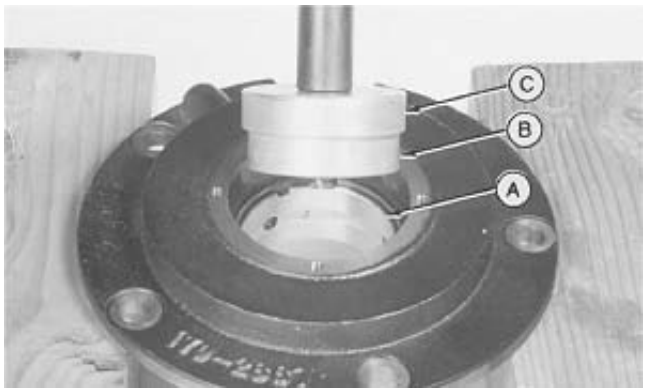
M98,2035K,16 -19-10OCT85

5. Carefully remove crankshaft bearing (A) using a 2 in. driver disk (B) and 2-1/8 in. disk (C).

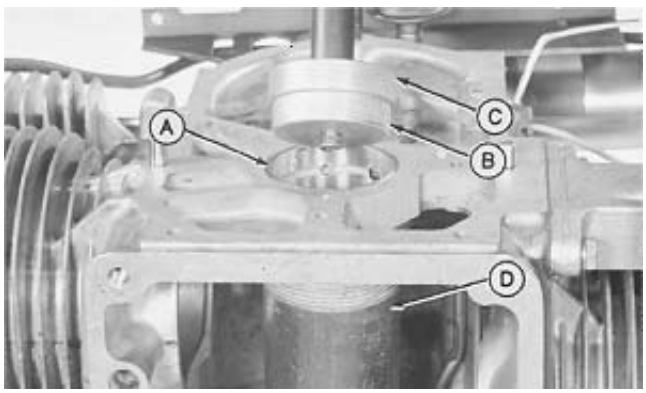


M98,2035K,17 -19-10OCT85

IMPORTANT: Support cylinder block to avoid distortion and damage to bearing bore during removal.

6. Carefully remove crankshaft bearing (A) using 2 in. driver disk (B), 2-1/8 in. driver disk (C), and a pipe (D).

A—Crankshaft Bearing
B—2 in. Driver Disk
C—2-1/8 in. Driver Disk
D—Pipe



M98,2035K,18 -19-10OCT85

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7. Clean and inspect oil passages in main bearing journals, connecting rod journals, main bearing bore in cylinder block, and main bearing bore in bearing plate.

M98,2035K,19 -19-10OCT85

8. Inspect lock pins (A) in bearing plate and cylinder block for wear or damage. If necessary, remove lock pins using an Easy-Out tool.

M98,2035K,20 -19-10OCT85

INSTALL CRANKSHAFT AND MAIN BEARINGS

1. Clean and dry all parts. Apply clean engine oil on all internal parts before assembly.

2. If necessary, install new lock pins (A) in bearing plate and cylinder block.

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M98,2035K,21 -19-10OCT85

3. Clean bearing O.D. and bearing bore in cylinder block with primer.

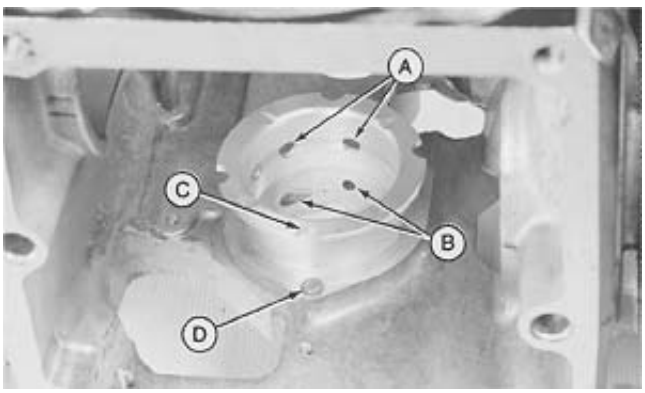
4. Apply retaining compound supplies with bearing on bearing O.D. and bearing bore in cylinder block.

NOTE: Replacement bearing has a flange which is used as the thrust washer.

5. Align oil holes (A) in bearing with oil holes (B) in cylinder block. Align notches (C) in bearing with lock pins (D) in cylinder block.

6. Install bearing using a 2 in. driver disk and 2-3/8 in. disk. Push bearing tight against cylinder block. Be sure bearing notch is around lock pin. Remove excess retaining compound from bearing I.D. and flange.

A—Bearing Oil Holes
B—Cylinder Block Oil Holes
C—Bearing Notches
D—Lock Pins



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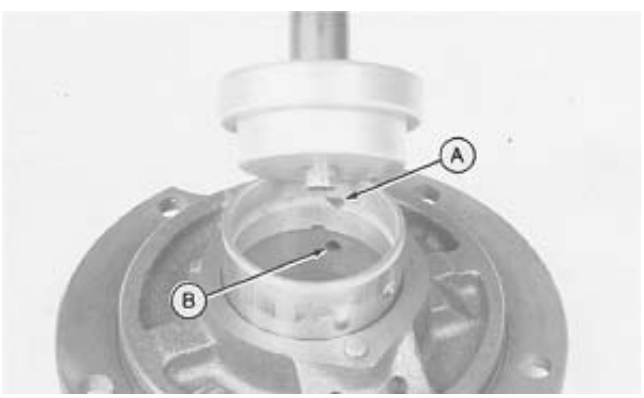
NOTE: Bearing can be put in a freezer to aid installation.

7. Apply clean engine oil on outside surface of bearing.

8. Align oil hole (A) in bearing with oil hole (B) in bearing plate. Install bearing using a 2 in. driver disk and 2-3/8 in. disk. Push bearing flush with surface of bearing plate.



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M98,2035K,23 -19-10OCT85

9. Apply multipurpose grease between lips of oil seal.

M98,2035K,24 -19-10OCT85

10. Install JDG 329 Seal Expander (A) in JDG 328 Crankshaft Seal Installer (B).

11. Install oil seal with lips toward crankshaft seal installer. Push oil seal tight against shoulder of crankshaft seal installer. Remove seal expander ONLY.

M98,2035K,25 -19-10OCT85

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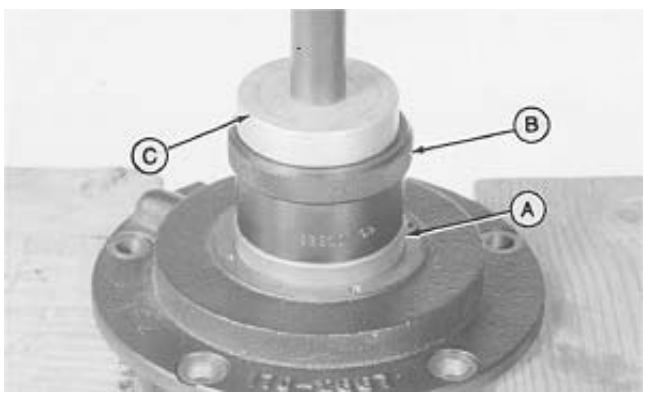
12. Remove old seal material from oil seal bore in bearing plate.

13. Install oil seal (A) using JDG 328 Crankshaft Seal Installer (B) and 2-3/16 in. driver disk (C). Push oil seal to bottom of bearing plate bore. DO NOT remove crankshaft seal installer at this time.

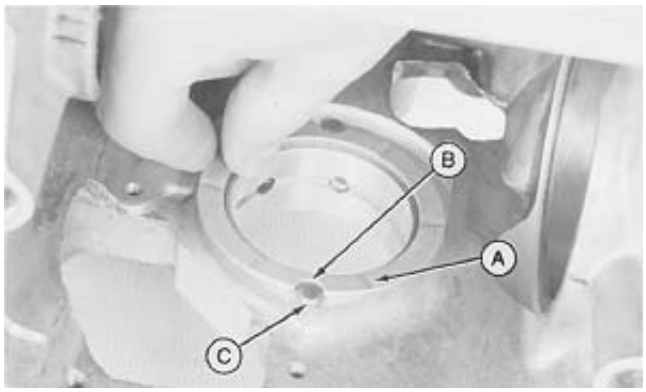


M98,2035K,26 -19-10OCT85

IMPORTANT: Original rear bearing uses a separate thrust washer. Replacement rear bearing is a one piece assembly with the thrust washer part of the bearing. Do not install thrust washer or shim when replacement bearing is used.

14. Apply multipurpose grease on plain side of thrust washer.

15. Install thrust washer with oil grooves (A) toward crankshaft and notches (B) between lock pins (C). DO NOT install shim on this side of crankshaft.



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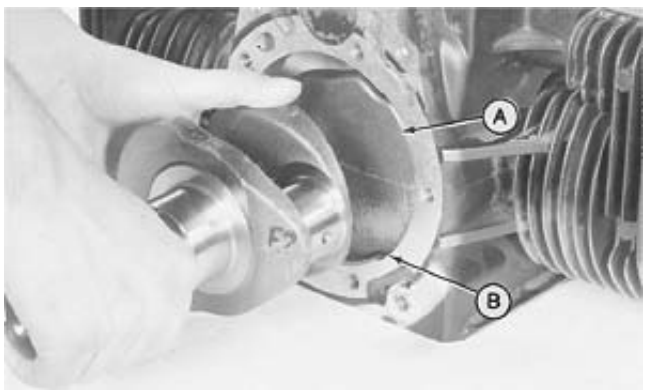
M98,2035K,27 -19-12NOV85

16. Apply clean engine oil on main bearings and crankshaft main bearing journals.

IMPORTANT: Do not allow crankshaft lobes to hit cylinder block while installing crankshaft. Machined surfaces may be damaged.

17. Turn crankshaft until lobe (A) fits into cylinder block notch (B). Carefully install crankshaft.



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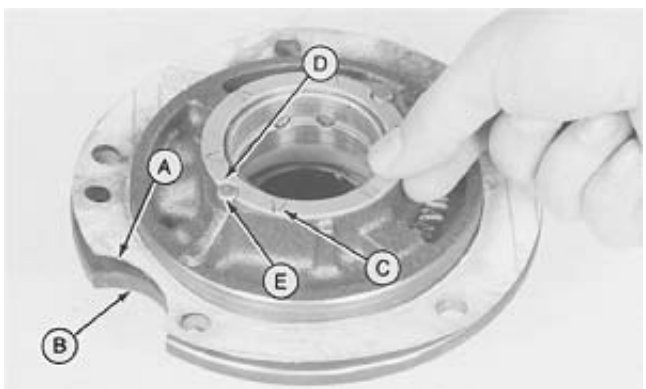
M98,2035K,28 -19-10OCT85

18. Align notch (A) in new gasket with notch (B) in bearing plate and install gasket.

19. Apply multipurpose grease on plain side of washer.

20. Install thrust washer with oil grooves (C) toward crankshaft and notches (D) between lock pins (E). DO NOT install shim at this time.

A—Gasket Notch
B—Bearing Plate Notch
C—Oil Grooves
D—Thrust Washer Notches
E—Lock Pins



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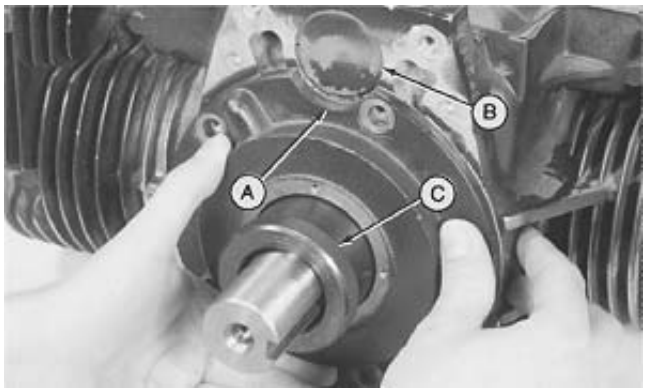
M98,2035K,29 -19-12NOV85

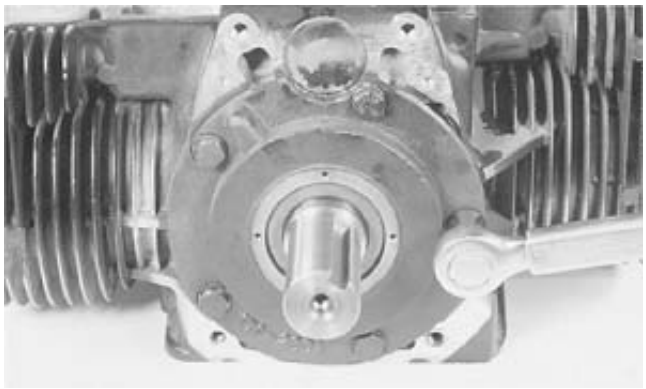
IMPORTANT: Bearing plate will fit tight against cylinder block only if lock pins are in thrust washer notches. Do not pull bearing plate inward using cap screws as lock pins, thrust washer or crankshaft may be damaged.

21. Align notch (A) in bearing plate with plug (B). Carefully install bearing plate. If bearing plate will not fit tight against cylinder block, remove bearing plate and check thrust washer position. Remove JDG 328 Crankshaft Seal Installer (C).



M36359 -UN-29JAN90

22. Install and tighten five cap screws to 35 ± 1 N·m (310 ± 9 lb-in.).


M36360 -UN-29JAN90

M98,2035K,30 -19-10OCT85

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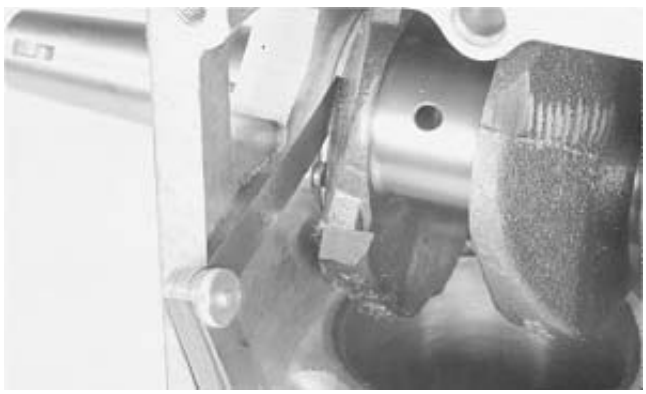
23. Measure crankshaft end play using a feeler gauge.

CRANKSHAFT SPECIFICATIONS

Engine	Measurement	Specification
B43E, B43G, B48G, P218G, P220G	End Play	0.15—0.30 mm (0.006—0.012 in.)
T260	End Play	0.13—0.23 mm (0.005—l0.009 in.)

If end play exceeds specifications, remove bearing plate and add shim(s).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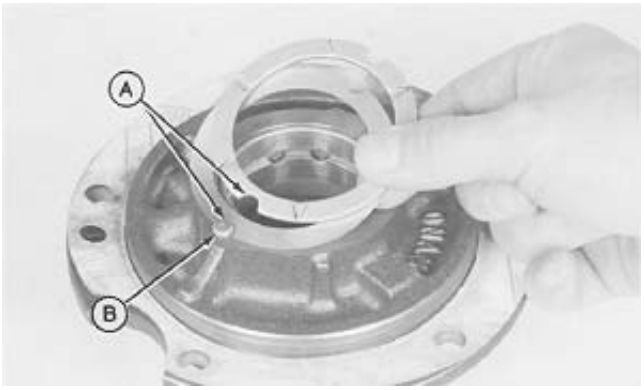
M98,2035K,31 -19-11FEB87

24. Install shim or shims between bearing plate and thrust washer. Be sure shim and thrust washer notches (A) are between lock pins (B). Repeat steps 21—23.

NOTE: Shims are available in 0.13 mm (0.005 in.) thickness only. Use shims as required.



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M98,2035K,32 -19-10OCT85

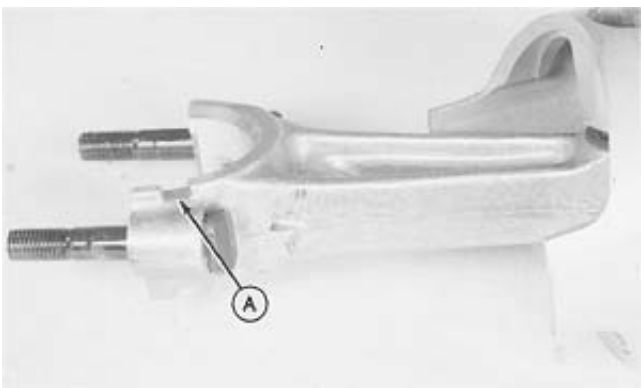
IMPORTANT: Pistons must be installed in the same cylinder they were removed from and in the same direction.

25. Apply clean engine oil on pistons, connecting rod bearing, and cylinder bore.

26. Turn crankshaft until rod bearing journal is at bottom of its stroke.

IMPORTANT: Be careful not to damage crankshaft rod journal while installing piston.

27. Install pistons with notch (A) or oil hole (B) toward camshaft using a ring compressor and wooden dowel. Push piston down until connecting rod is seated on crankshaft rod journal.



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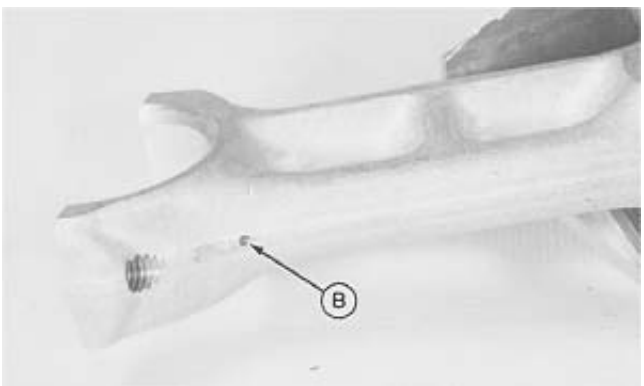

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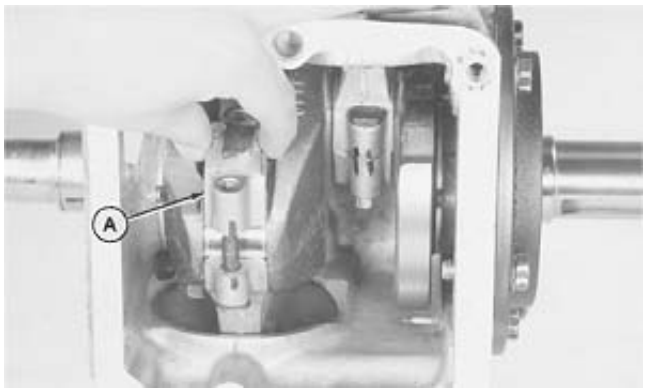
M98,2035K,33 -19-10OCT85

IMPORTANT: Connecting rod caps must be installed on the same connecting rod they were removed from and in the same direction.

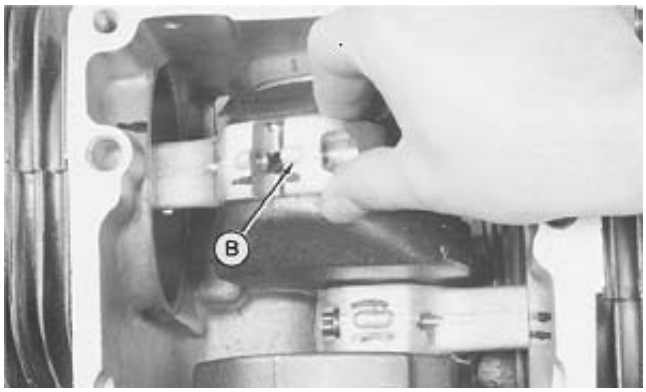
28. Apply clean engine oil on connecting rod cap.

29. Install connecting rod cap with this side (A) outward on connecting rod.

Install connecting rod cap with large tang (B) away from camshaft on connecting rod.



B43E, B43G, B48G, P218G, and P220G



T260 Engine Shown

M98,2035K,34 -19-02FEB87

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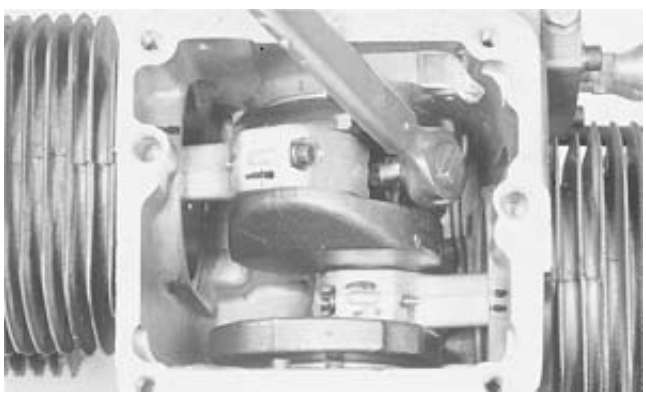
30. Install and tighten nuts or cap screws evenly to specifications. Hit connecting rod cap LIGHTLY with a soft-faced hammer to align it with connecting rod.

CONNECTING ROD SPECIFICATIONS

Engine	Measurement	Specification
B43E, B43G, B48G, P218G, P220G	Cap Nut Torque	18 ± 1 N·m (159 ± 9 lb-in.)
T260	Cap Screw Torque	20 ± 1 N·m (177 ± 9 lb-in.)



M98,2035K,35 -19-02FEB87

31. Install key if removed.

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32. Install crankshaft gear using the following heat method or by driver method. The heat method is recommended.

NOTE: For driver method, go to Step 33.

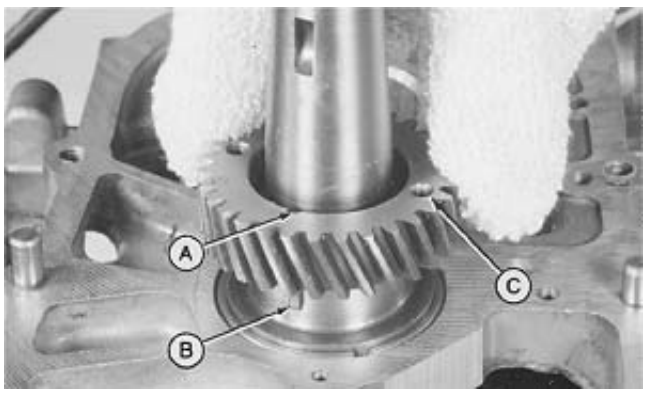
HEAT METHOD

a. Heat crankshaft gear to 232° C (450°F) for 1/2 hour using a bearing oven.

CAUTION: Gear is hot. Be careful not to burn hands while installing gear.

b. Align slot (A) in gear with key (B) in crankshaft.

c. Install gear with holes (C) outward on crankshaft. Push gear tight against crankshaft shoulder.



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33. Install crankshaft gear using the following driver method.

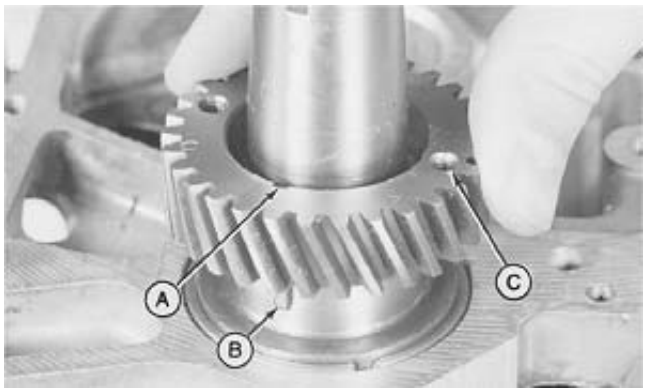
DRIVER METHOD

a. Align slot (A) in gear with key (B) in crankshaft.

IMPORTANT: Support engine on crankshaft only. Do not support engine on cylinder block. Block may be damaged.

b. Install gear with holes (C) outward on crankshaft using a 1-5/8 in. I.D. pipe (D), 1-9/16 in. driver disk (E), and 1-15/16 in. driver disk (F). Push gear tight against crankshaft shoulder.

A—Slot
B—Key
C—Holes
D—1-5/8 in. I.D. Pipe
E—1-9/16 in. Driver Disk
F—1-15/16 in. Driver Disk



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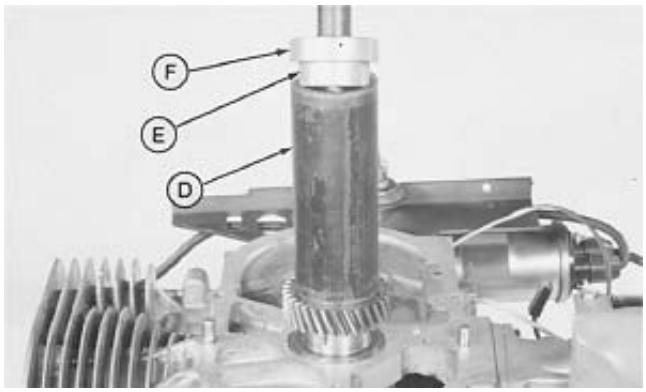

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M98,2035K,37A -19-12NOV85

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34. Install oil pump and oil base. (See Install Oil Pump and Install Oil Base, Group 40 in this manual.)

35. Install camshaft. (See Install Camshaft, Group 25 in this manual.)

36. Install flywheel. (See Install Flywheel, Group 20 in this manual.)

37. Install intake and exhaust valves. (See Install Intake and Exhaust Valves, Group 15 in this manual.)

38. Install cylinder heads. (See Install Cylinder Heads, Group 10 in this manual.)

39. Install intake manifold. (See Install Intake manifold, Group 10 in this manual.)

40. Install muffler and exhaust pipes. (See Install Intake Manifold, Group 10 in this manual.)

41. Install engine. (See machine technical manual.)

M98,2035K,38 -19-12NOV85

ESSENTIAL TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Number	Name	Use
JDG 325	Crankshaft Seal Installer	Install gear cover oil seal.
JDG 333	Crowsfoot Wrench	Tighten oil filter adapter cap screws.

M98,2040K,1 -19-11NOV85

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Bushing, Bearing, and Seal Driver Set	Remove gear cover oil seal.
Dial Indicator	Measure oil pump gear backlash and starter pinion gear backlash.
13-Ton Puller Set	Remove flywheel

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1

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OTHER MATERIAL

Number	Name	Use
TY 9375	John Deere LOCTITE® Pipe Sealant with TEFLON®	Apply to threads of gear cover, flywheel, and oil filter adapter cap screws.

LOCTITE is a trademark of the Loctite Corp.

TEFLON is a trademark of the DuPont Co.

M98,2040K,3 -19-11OCT85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Oil Pump Gasket Kit

Overhaul Gasket Kit

M98,2040K,4 -19-11OCT85

SPECIFICATIONS

Oil Pump

Item	New Specification	Wear Tolerance
1. Gear Backlash: B43E, B43G, B48G, T260 Engines	0.05—0.13 mm (0.002—0.005 in.)	0.23 mm (0.009 in.)
Gear Backlash: P218G, P220G Engines	0.025—0.203 mm (0.001—0.008 in.)	0.36 mm (0.014 in.)
2. Gear Housing Cap Screw Torque: B43E, B43G, B48G, T260 Engines	19 ± 2 N·m (168 ± 18 lb-in.)	
Gear Housing Cap Screw Torque: P218G, P220G Engines	10 N·m (88 lb-in.)	
3. Oil Pump-to-Cylinder Block Cap Screw Torque	11 ± 1 N·m (97 ± 9 lb-in.)	
4. Gear Cover Cap Screw Torque	12 ± 1 N·m (106 ± 9 lb-in.)	

Oil Pressure Regulating Valve

1. Spring Free Length (approx)	25 mm (1.0 in.)	
Spring Test Length	13 mm (0.5 in.) at 12 N (2.6 lb force)	
2. Oil Pressure Regulating Valve Cap Screw Torque	28 ± 3 N·m (248 ± 27 lb-in.)	

Oil Base

1. Starter-to-Oil Base Cap Screw Torque	34 ± 1 N·m (301 ± 9 lb-in.)	
2. Oil Base-to-Oil Base Block Cap Screw Torque	27 ± 3 N·m (239 ± 27 lb-in.)	
3. Starter Pinion Gear Backlash (Adjustable Starter Bracket Only)	318 S.N. (—231,857) 420 S.N. (—224, 882)	0.51 ± 0.38 mm (0.020 ± 0.015 in.)
4. B43E, B43G, B48G, T260 Engine: Flywheel Cap Screw Torque	51 ± 3 N·m (38 ± 2 lb-ft)	
5. Lift Bracket Cap Screw Torque	11 ± 3 N·m (97 ± 27 lb-in.)	

Oil Filter Adapter

Item	Measurement	Specification
1. Attaching Cap Screw	Torque	12 ± 1 N·m (106 ± 9 lb-in.)
2. Lift Bracket Cap Screw	Torque	11 ± 3 N·m (97 ± 27 lb-in.)
3. Oil Filter Bypass Valve Cap Screw (910 and 930 Front Mowers)	Torque	28 ± 3 N·m (248 ± 27 lb-in.)

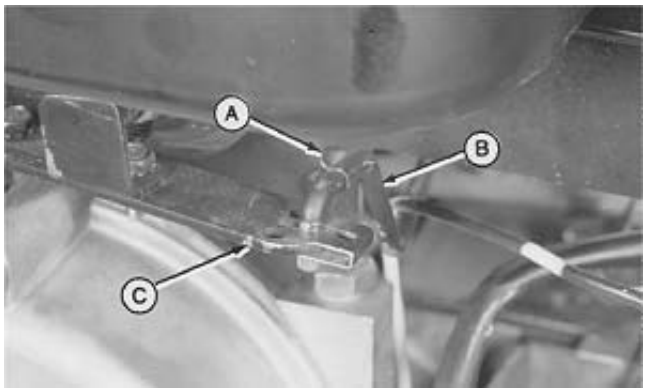
M98,2040K,5 -19-11FEB87

REMOVE OIL PUMP

1. Remove engine. (See machine technical manual.)

2. Remove flywheel. (See Group 20 in this manual.)

3. Remove clip (A) to disconnect governor rod (B) from governor arm (C).

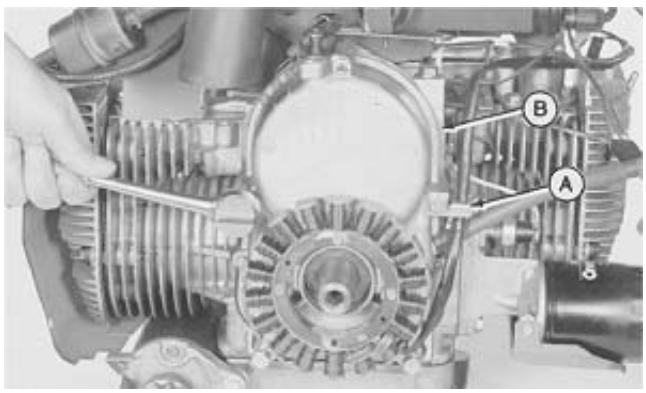


M98,2040K,7 -19-11OCT85

IMPORTANT: Do not hit gear cover with a metal hammer or remove cover with a screwdriver. Doing so can damage gear cover.

4. Remove four cap screws and nut to remove clip (A), gear cover, and gasket (B).

If gear cover is tight, LIGHTLY hit gear cover with a soft-hammer to loosen it.



M98,2040K,8 -19-11OCT85

5. Remove oil seal using a 2 in. driver disk.

M98,2040K,9 -19-11OCT85

6. Measure oil pump gear backlash.

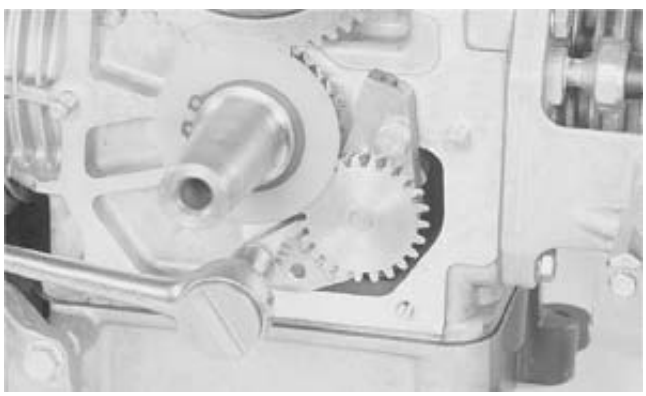
OIL PUMP GEAR SPECIFICATIONS

Item	New Part	Wear Tolerance
Backlash—B43E, B43G, B48G, T260 Engine	0.05—0.13 mm (0.002—0.005 in.)	0.23 mm (0.009 in.)
Backlash—P218G, P220G Engine	0.025—0.203 mm (0.001—0.008 in.)	0.36 mm (0.014 in.)

If backlash exceeds specification replace oil pump.

M98,2040K,10 -19-02FEB87

7. Remove two cap screws to remove oil pump assembly. If suction tube hits crankshaft lobe, install flywheel cap screw in crankshaft. Turn crankshaft until suction tube can be removed.



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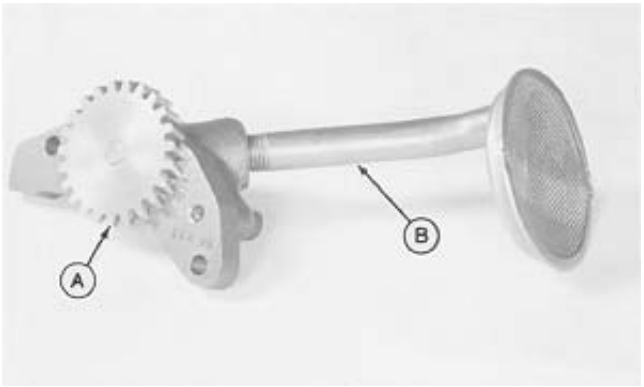
DISASSEMBLE AND INSPECT OIL PUMP

1. Inspect oil pump gear (A) for chipped or broken teeth. If gear is damaged, replace oil pump assembly.

2. Inspect suction tube (B) for cracks, plugged suction screen, or damage. If necessary, remove suction tube using locking pliers.



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M98,2040K,12 -19-11OCT85

3. Remove two cap screws to remove oil pump housing and gasket (A).

4. Measure original gasket thickness. New gasket must be the same thickness as original gasket.

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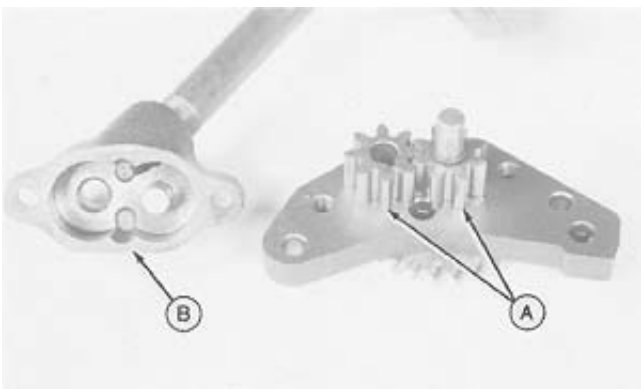
M98,2040K,13 -19-11OCT85

5. Inspect gears (A) for chipped or broken teeth, scoring, and wear.

6. Inspect housing (B) for cracks, wear or damage. If gears or housing are damaged, replace oil pump assembly.



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M98,2040K,14 -19-11OCT85

ASSEMBLE OIL PUMP

1. Thoroughly clean and dry parts. Put clean engine oil on all internal parts.

2. Install suction tube (A), if removed, using locking pliers.

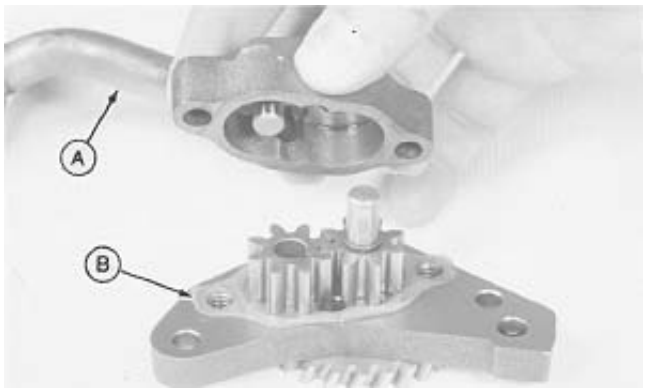
3. Install a new gasket (B), the same thickness as original gasket, on housing.

4. Install housing and two cap screws.

For B43E, B43G, B48G, and T260 Engines: tighten cap screws to 19 ± 2 N·m (168 ± 18 lb-in.).

For P218G and P220G Engines: tighten cap screws to 10 N·m (88 lb-in.).

5. Fill oil pump housing with clean engine oil through pump outlet port (C).



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M36426

M98,2040K,15 -19-11FEB87

INSTALL OIL PUMP

1. Turn crankshaft until suction tube does not hit crankshaft lobe.

2. Install oil pump assembly. Install and tighten two cap screws to 11 ± 1 N·m (97 ± 9 lb-in.).


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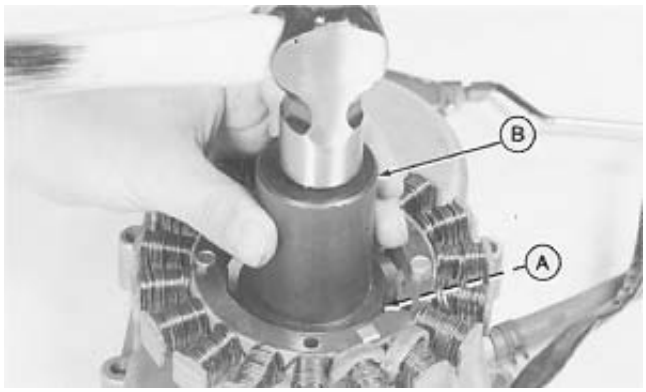
M98,2040K,16 -19-11OCT85

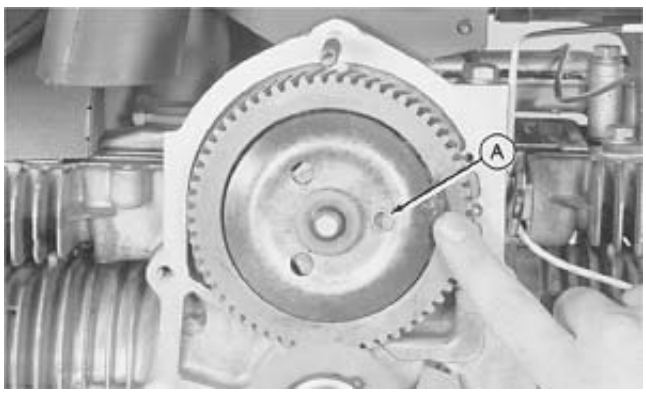
3. Install oil seal (A), with lip of seal downward, in gear cover suing JDG 325 Crankshaft Seal Installer (B).



M98,2040K,17 -19-11OCT85

4. Turn cup until the plastic bushing (A) is in the 3 o'clock position.

5. Apply multipurpose grease between cup and camshaft gear to hold cup in position.



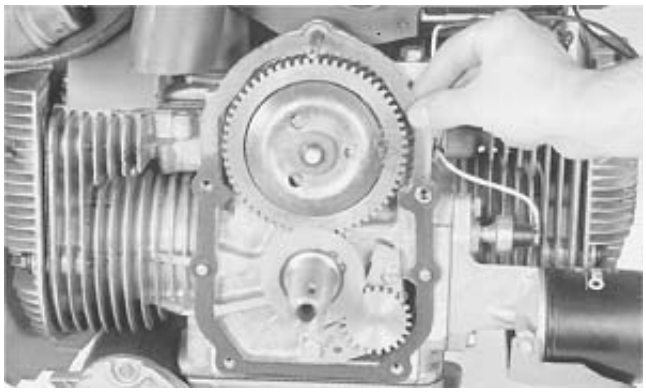
M98,2040K,18 -19-11OCT85

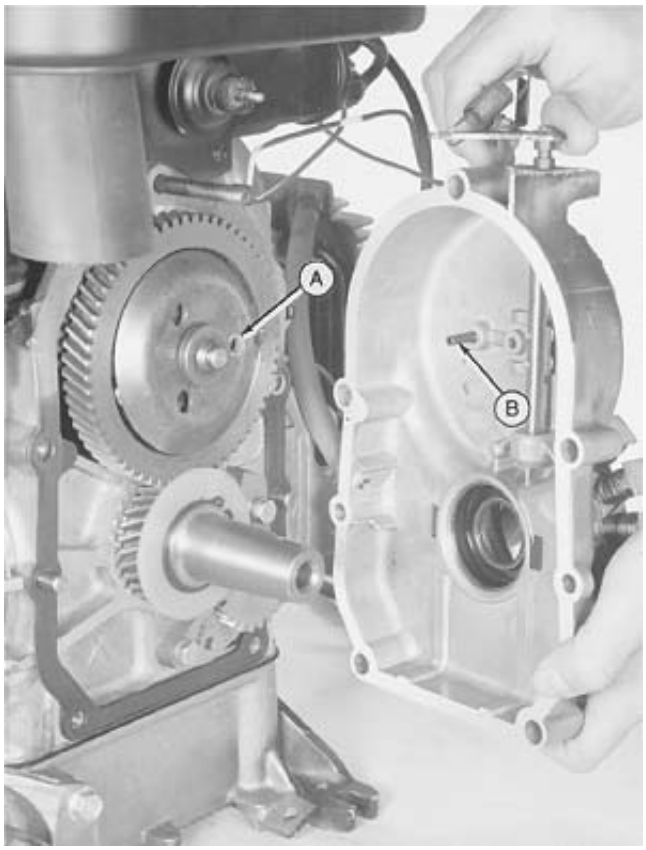
6. Install new gasket on cylinder block.

7. Be sure plastic bushing (A) and pin (B) are aligned.

IMPORTANT: Do not hit gear cover with a metal hammer during installation. Gear cover can be damaged.

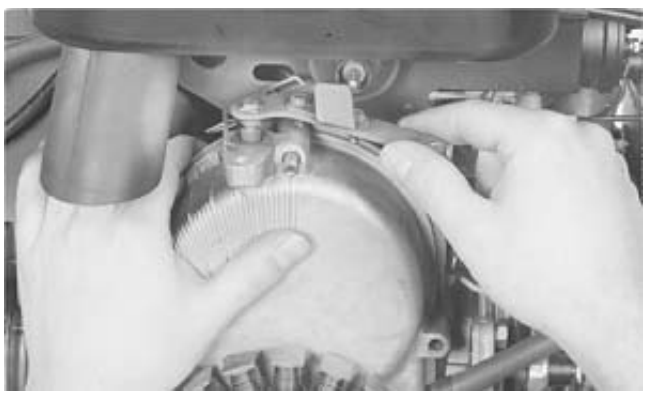
8. Hold governor arm away from camshaft and carefully install gear cover.





M98,2040K,19 -19-11OCT85

9. Tip engine forward and move governor arm back and forth. Governor cup should be felt moving in and out. If no movement is felt, the pin is not in plastic bushing. Remove gear cover and repeat Steps 7—9.

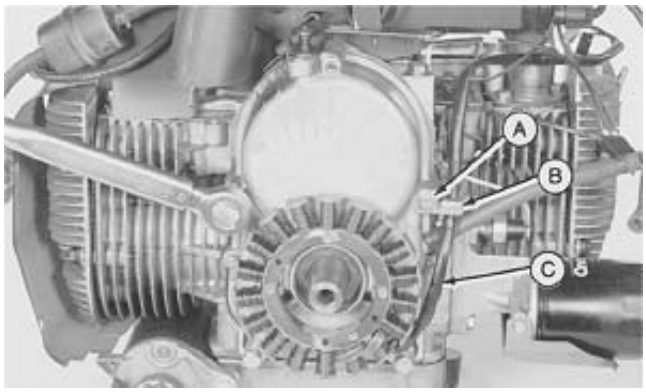


M98,2040K,20 -19-11OCT85

10. Apply pipe sealant on cap screw (A) threads.

11. Install clip (B), four cap screws, and nut. Tighten cap screws and nut to 12 ± 1 N·m (106 ± 9 lb-in.).

12. Install stator wiring (C) in clip.



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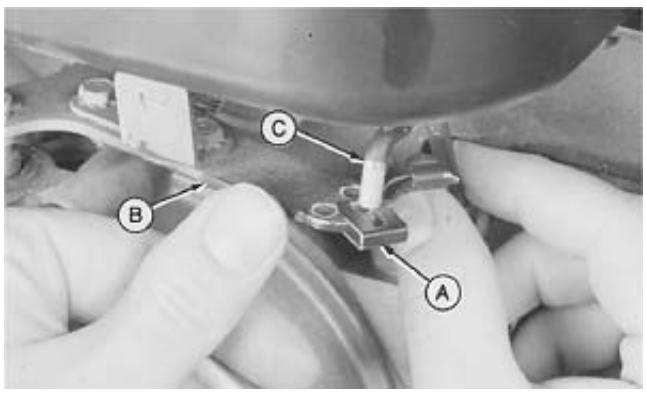
M98,2040K,21 -19-11OCT85

13. Install clip (A) on governor arm (B). Push governor rod (C) and governor arm toward carburetor until they bottom out.

14. Install governor rod in closest governor arm hole. If governor rod is between two holes, install governor rod in next hole toward flywheel. Push clip on governor rod.

15. Install flywheel. (See Group 20 in this manual.)

16. Install engine. (See machine technical manual.)



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M98,2040K,22 -19-11OCT85

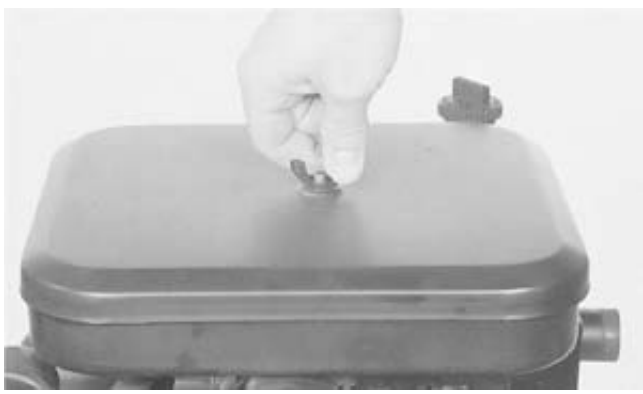
REMOVE OIL PRESSURE REGULATING VALVE

1. Park tractor safely.

2. Disconnect negative (-) battery cable.

NOTE: For T260 engine, go to Step 8.

3. Remove wing nut to remove air cleaner cover.



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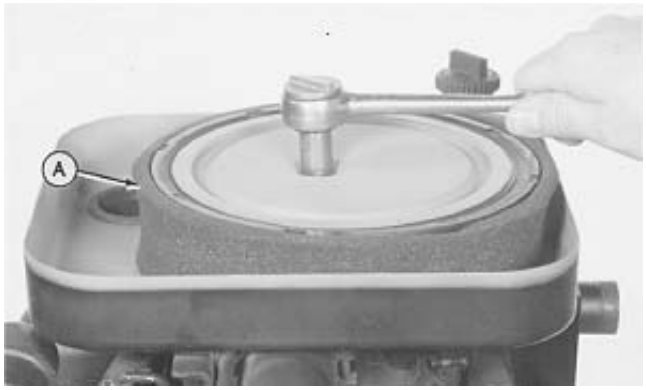
M98,2040K,23 -19-11OCT85

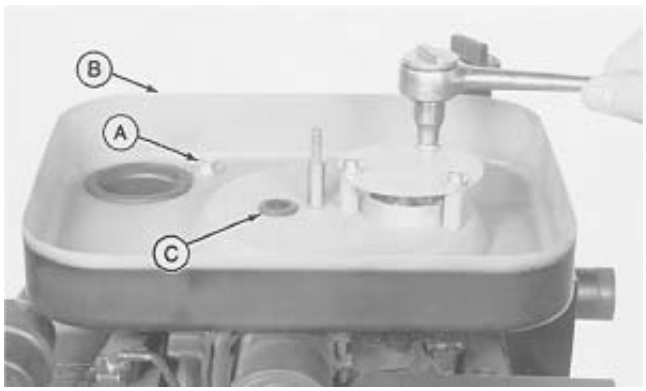
4. Remove lock nut to remove plate and element (A).



M98,2040K,24 -19-14OCT85

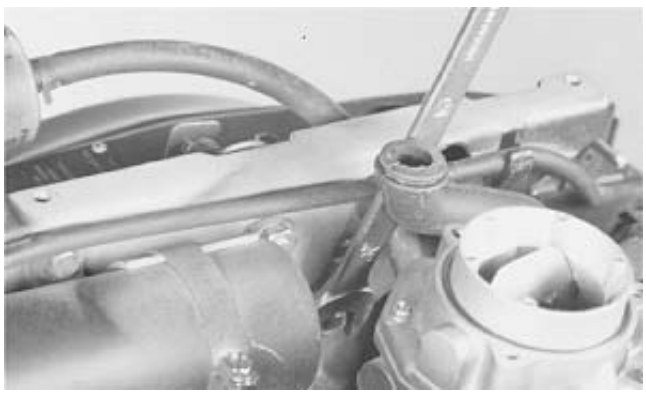
5. Remove three cap screws to remove splash plate.

6. Remove two cap screws (A) to remove air cleaner base (B). Pull breather hose (C) out of air cleaner base.



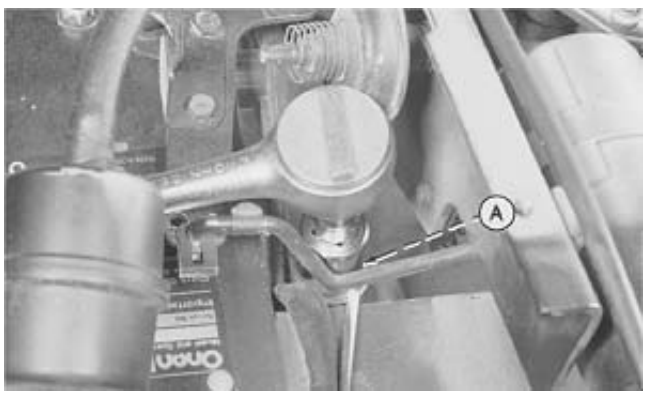
M98,2040K,25 -19-14OCT85

7. Loosen nut to remove air cleaner bracket.



M98,2040K,26 -19-14OCT85

8. Remove cap screw and washer (A).



M98,2040K,27 -19-14OCT85

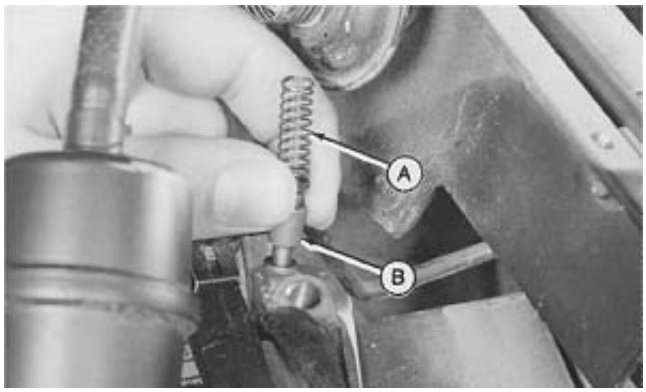
9. Remove spring (A) and valve (B).

10. Inspect spring, valve, and valve bore for wear or damage.

11. Check spring using a spring compression tester.

SPRING SPECIFICATIONS

Free length (approx.) . . . . . 25 mm (1.0 in.)
Test length at 12 N . . . . . 13 mm
(2.6 lb force . . . . . 0.5 in.)



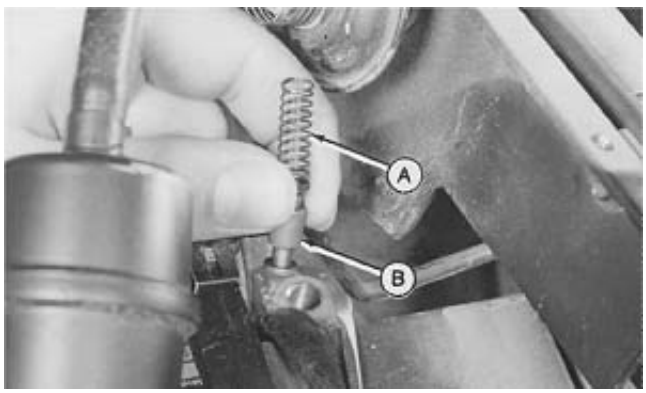
M98,2040K,28 -19-26NOV85

INSTALL OIL PRESSURE REGULATING VALVE

1. Thoroughly clean and dry parts.

2. Put clean engine oil on all internal parts.

3. Install valve (B) and spring (A).



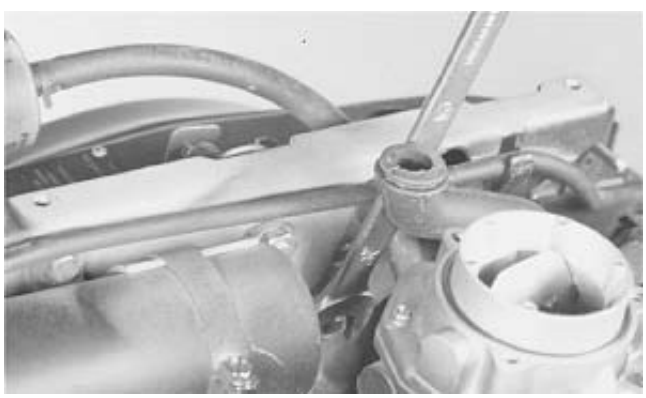
M98,2040K,29 -19-14OCT85

4. Install washer (A) and cap screw. Tighten cap screw to 28 ± 3 N·m (248 ± 27 lb-in.).

NOTE: For T260 engine, stop here.

M98,2040K,30 -19-14OCT85

5. Install air cleaner bracket. Be sure air cleaner bracket is level and tighten nut.



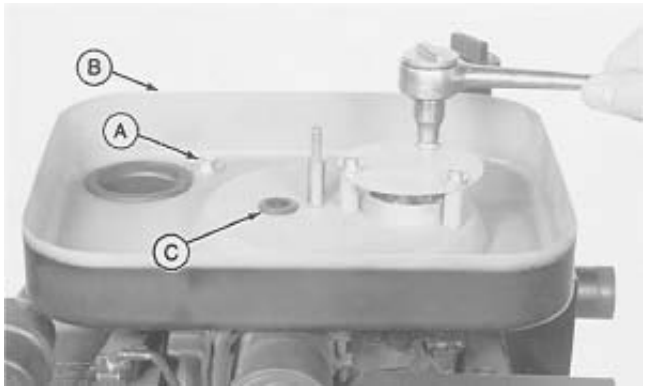
M98,2040K,31 -19-14OCT85

6. Install breather hose (C) in air cleaner base (B).

7. Install air cleaner base on carburetor. Install air intake hose in flywheel shroud hole.

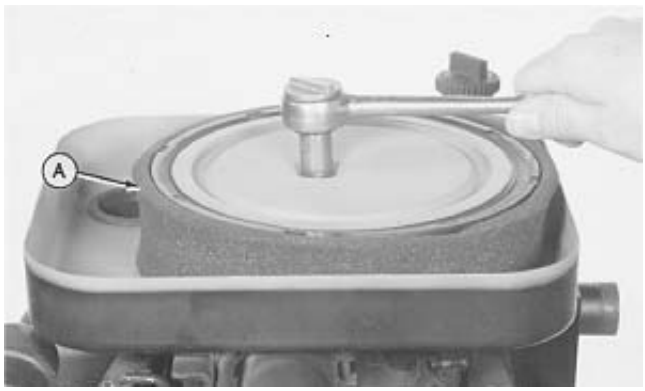
8. Install and tighten two air cleaner base cap screws (A).

9. Install splash plate and fasten with three cap screws.



M98,2040K,32 -19-14OCT85

10. Install element (A) and plate. Install and tighten lock nut.



M98,2040K,33 -19-14OCT85

11. Install air cleaner cover and tighten wing nut.

12. Connect negative (-) battery cable.

M98,2040K,34 -19-14OCT85

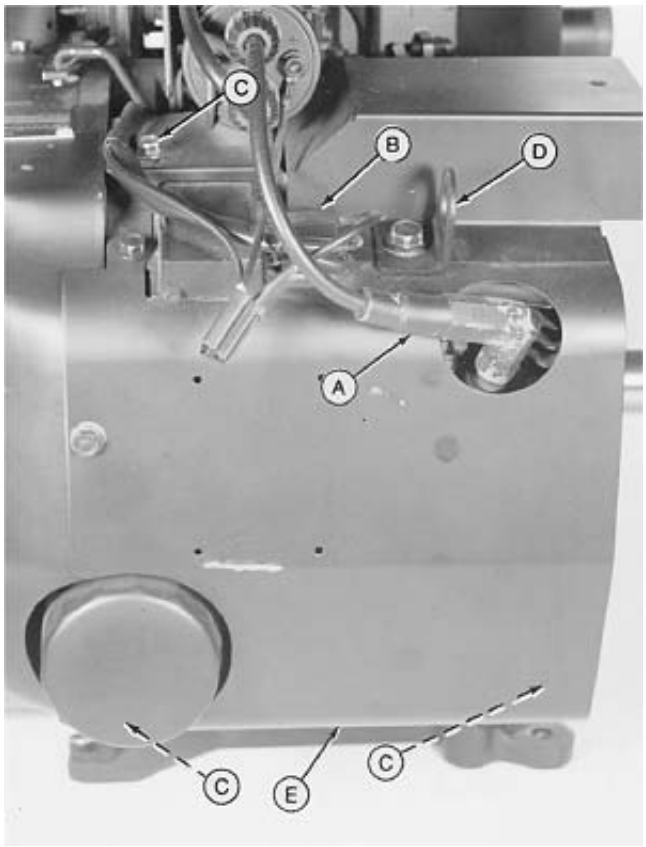
REMOVE AND INSPECT OIL BASE

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire (A) and voltage regulator leads (B).

3. Remove five cap screws (C) to remove lift bracket (D) and right side shroud (E).

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



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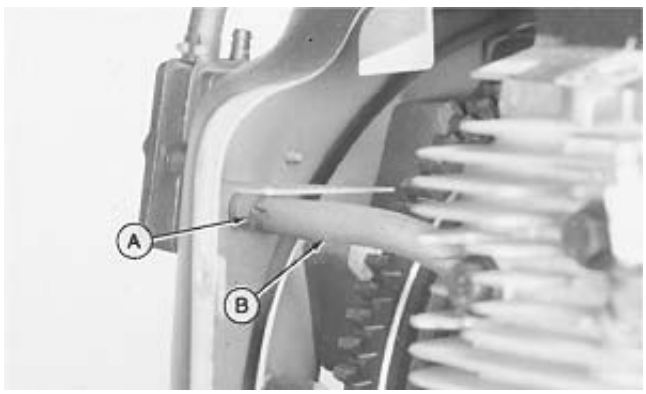
M98,2040K,35 -19-14OCT85

4. Loosen hose clamp (A) to disconnect fuel pump impulse line (B).



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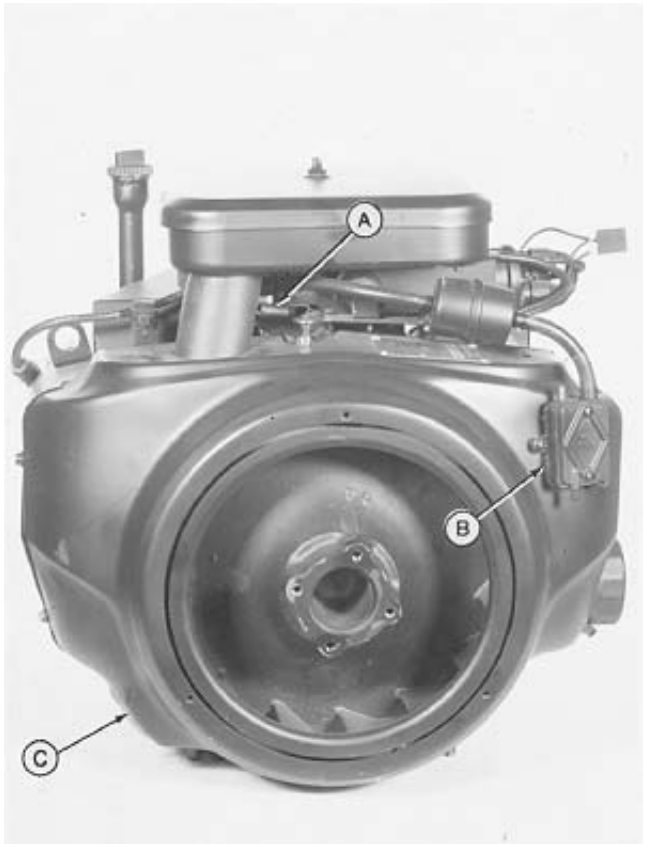
M98,2040K,36 -19-14OCT85

5. Disconnect governor spring (A).

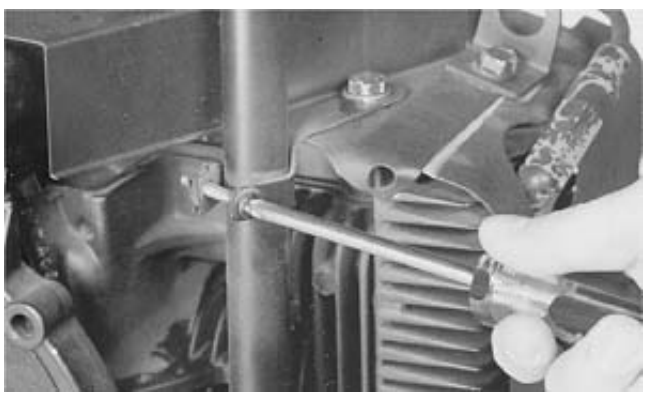
6. Remove two screws to remove fuel pump (B).

7. Remove five cap screws to remove flywheel shroud (C).



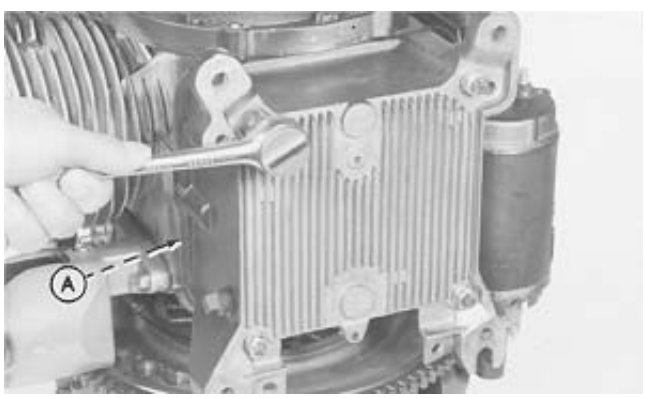
M98,2040K,37 -19-14OCT85

8. Remove screw to disconnect oil fill tube bracket.



M98,2040K,38 -19-14OCT85

9. Remove four cap screws to remove oil base and gasket (A).

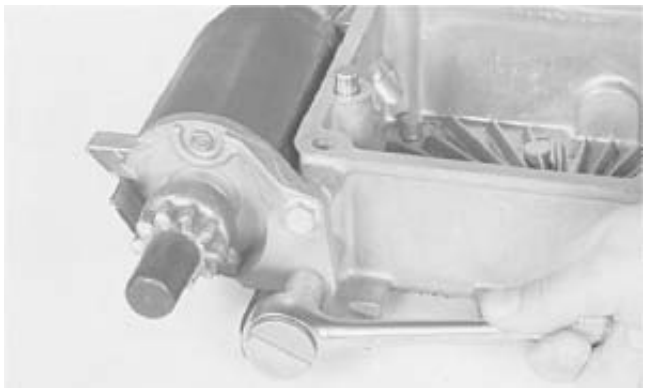


M98,2040K,39 -19-14OCT85

NOTE: On P218G and P220G Engines the starter is not attached to the oil base.

10. Remove two cap screws to remove starter.

11. Inspect oil base for cracks, broken fins, or damage; replace if necessary.



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M98,2040K,40 -19-02FEB87

INSTALL OIL BASE

NOTE: On P218G and P22G Engines the starter is not attached to the oil base.

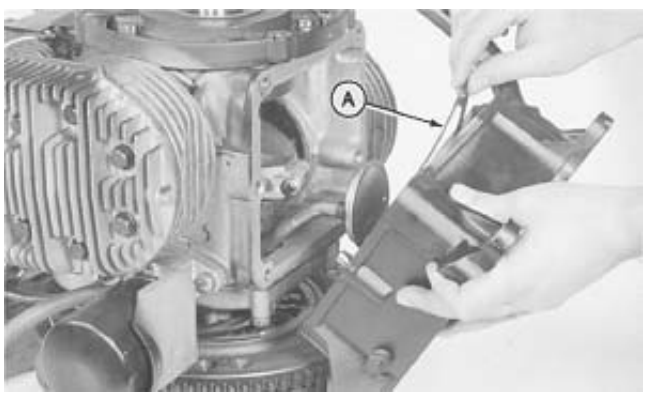
1. Install starter and two cap screws. Tighten cap screws to 34 ± 1 N·m (301 ± 9 lb-in.)

-UN-29JAN90 M36436

M98,2040K,41 -19-02FEB87

2. Install a new gasket (A) on oil base.

3. Install oil base. Install and tighten four cap screws to 27 ± 3 N·m (320 ± 27 lb-in.).



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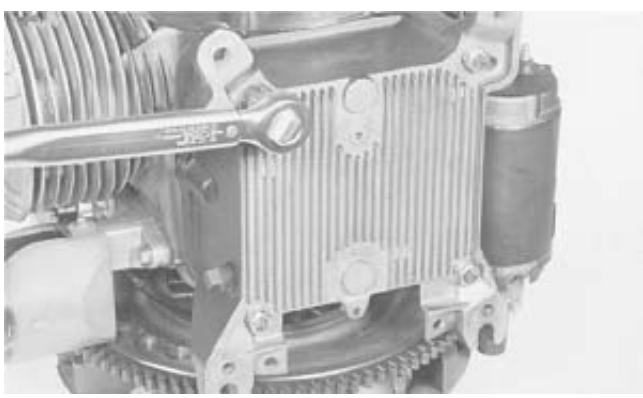
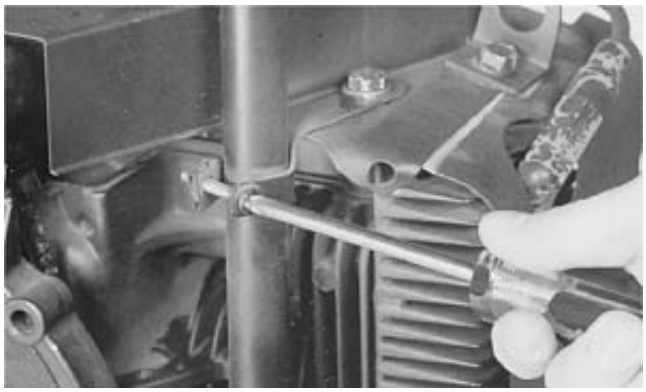


-UN-29JAN90 M36416

M98,2040K,42 -19-26NOV85

4. Install oil fill tube bracket and fasten with screw.



-UN-29JAN90
M36434

M98,2040K,43 -19-14OCT85

NOTE: For engines with adjustable starter bracket, measure starter pinion gear backlash using the following procedure. For all other units with non-adjustable starter bracket, go to Step 18.

5. Pull starter pinion gear outward until teeth contact flywheel ring gear. Measure starter pinion gear backlash. Backlash specification is 0.51 ± 0.38 mm (0.020 ± 0.015 in.).

6. If backlash is not correct, loosen starter cap screws (A) and move starter bracket (B) to obtain correct backlash.

Tighten starter cap screws to hold bracket in position. Check backlash again.

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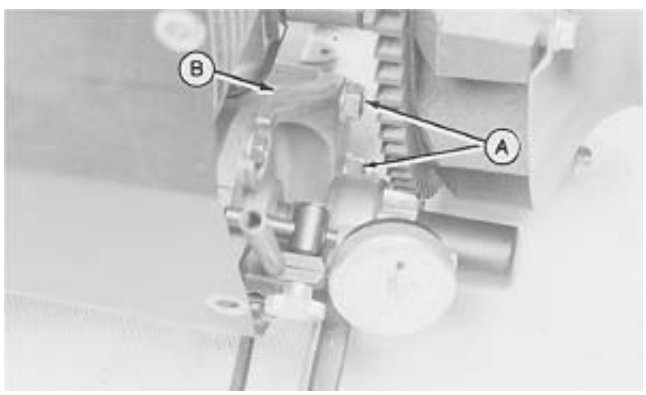


-UN-29JAN90
M36438

M98,2040K,44 -19-14OCT85

IMPORTANT: Do not hold flywheel from turning with a pry bar. Doing so can damage fins.

7. Fasten locking pliers to ring gear to prevent flywheel from turning.

CAUTION: Loosen flywheel cap screw only two turns. Do not remove cap screw. If cap screw is removed, flywheel may cause injury when it comes loose.

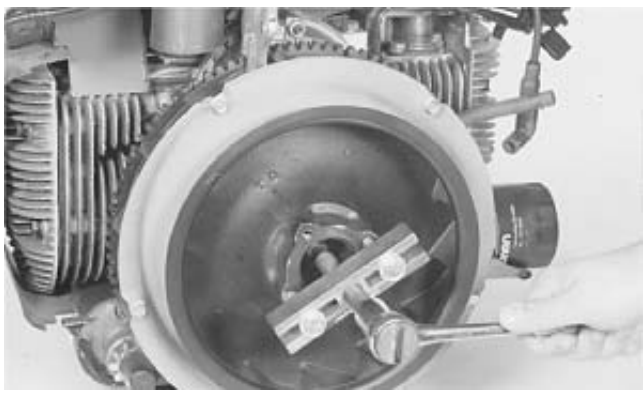
8. Loosen cap screw two turns only.

M98,2040K,45 -19-21OCT85

IMPORTANT: Do not pry on flywheel with a screwdriver. Ceramic magnets or gear case cover can be damaged.

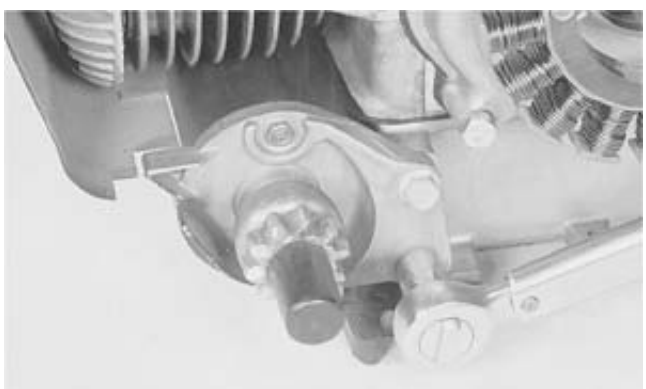
9. Loosen flywheel using a puller.

10. Remove puller, cap screw, washer, and flywheel.



M98,2040K,46 -19-21OCT85

11. Tighten starter cap screws to 34 ± 1 N·m (301 ± 9 lb-in.).



M98,2040K,47 -19-21OCT85

IMPORTANT: Do not lubricate crankshaft taper. The crankshaft taper must able dry to hold the flywheel tight.

12. Clean crankshaft taper before installing flywheel.

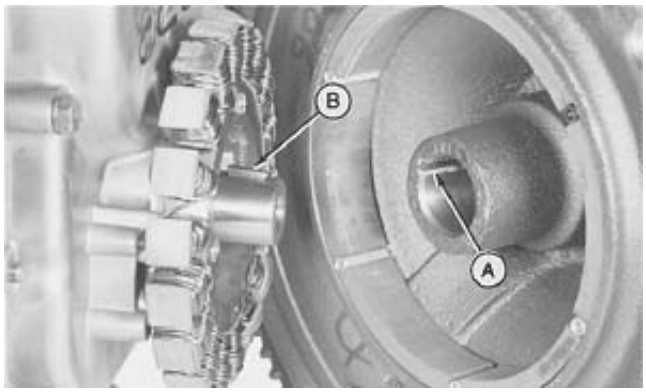
13. Apply pipe sealant on threads of flywheel cap screw.

14. Align keyway (A) in flywheel with key (B) in crankshaft. Install flywheel.

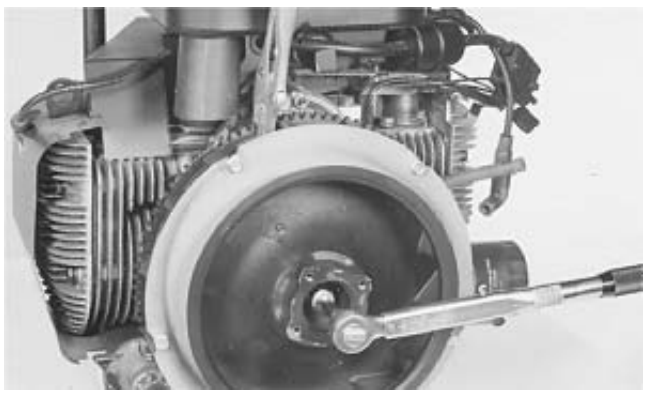
15. Install washer and cap screw.

16. Fasten locking pliers to ring gear to prevent flywheel from turning.

17. On B43E, B43G, B48G, T260 Engines: tighten cap screw to 51 ± 3 N·m (38 ± 2 lb-ft).



M36297 -UN-29JAN90



M36298 -UN-29JAN90

M98,2040K,48 -19-11FEB87

18. Install flywheel shroud (C) and fasten with five cap screws.

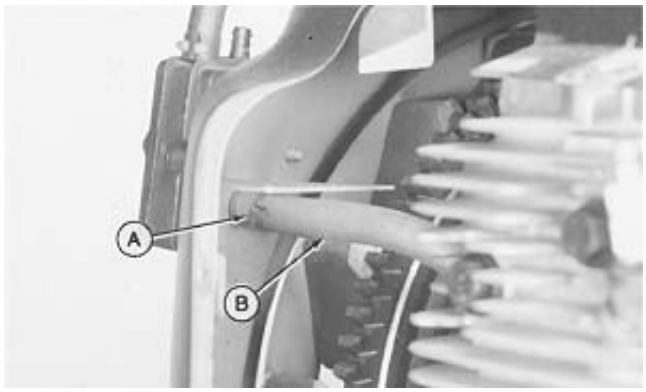
19. Install fuel pump (B) and fasten with two screws.

20. Connect governor spring (A) in top hole of arm.

M36291 -UN-29JAN90

M98,2040K,49 -19-21OCT85

21. Connect fuel pump impulse line (B) and fasten with hose clamp (A).



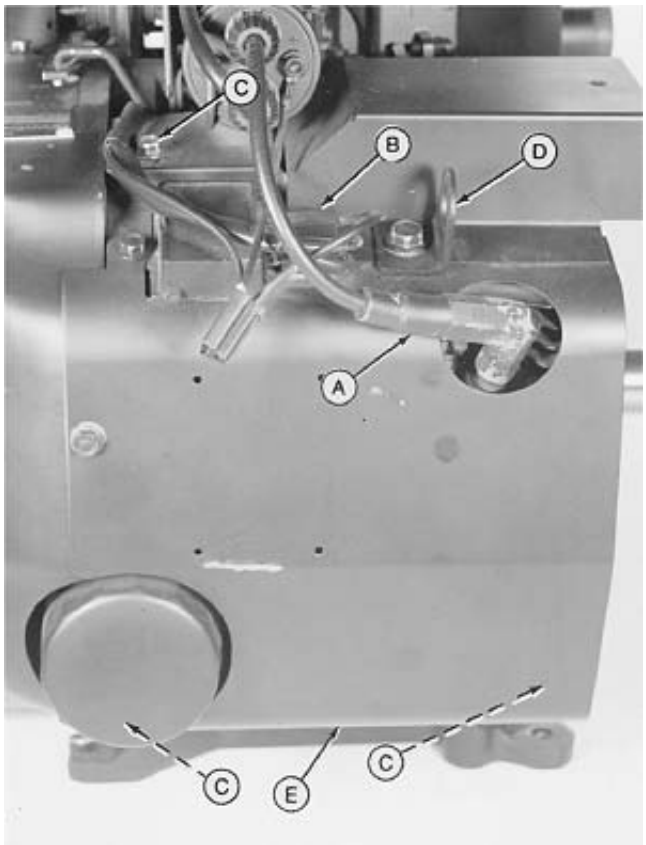
M98,2040K,50 -19-21OCT85

22. Install right side shroud (E), lift bracket (D), and fasten with five cap screws (C). Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

23. Connect spark plug wire (A) and voltage regulator leads (B). Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of the voltage regulator.

24. Install engine. (See machine technical manual.)

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



M98,2040K,51 -19-21OCT85

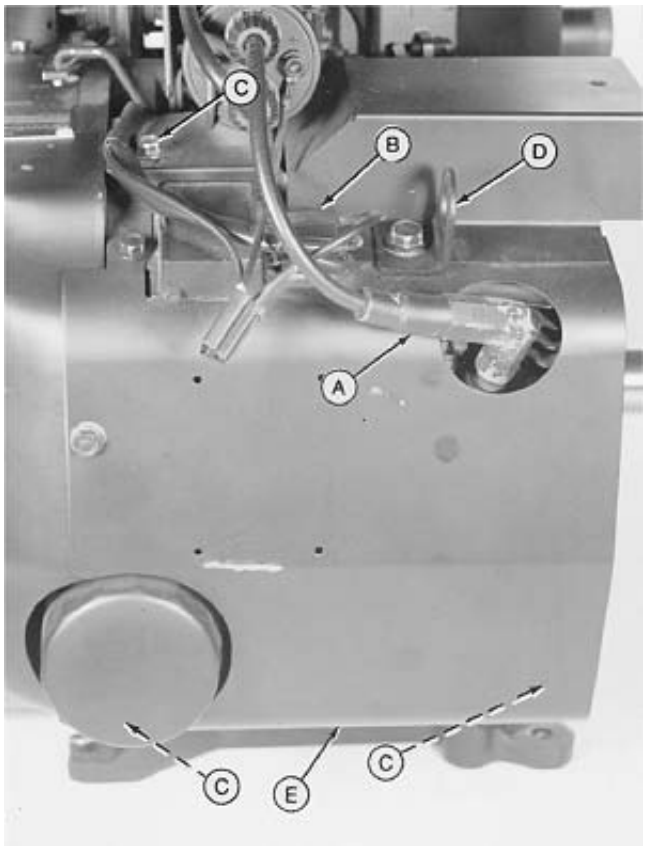
REMOVE OIL FILTER ADAPTER

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire (A) and voltage regulator leads (B).

3. Remove five cap screws (C) to remove lift bracket (D), and right side shroud (E).

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



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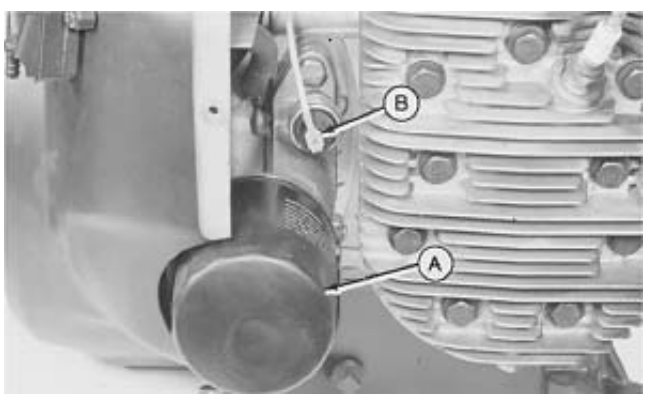
M98,2040K,52 -19-21OCT85

4. Remove oil filter (A).

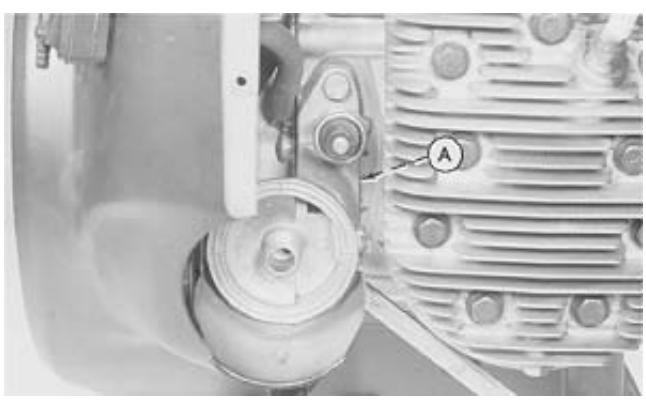
5. Disconnect engine oil pressure sender wiring lead (B).



M36440 -UN-29JAN90

M98,2040K,53 -19-21OCT85

6. Remove two cap screws to remove oil filter adapter and gasket (A).



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M98,2040K,54 -19-21OCT85

7. Remove two cap screws to remove drain pan.

8. Remove engine oil pressure sender (A).

9. Inspect oil filter adapter for thread damage, cracks or damage; replace as necessary.

M98,2040K,55 -19-21OCT85

INSTALL OIL FILTER ADAPTER

1. Install engine oil pressure sender (A).

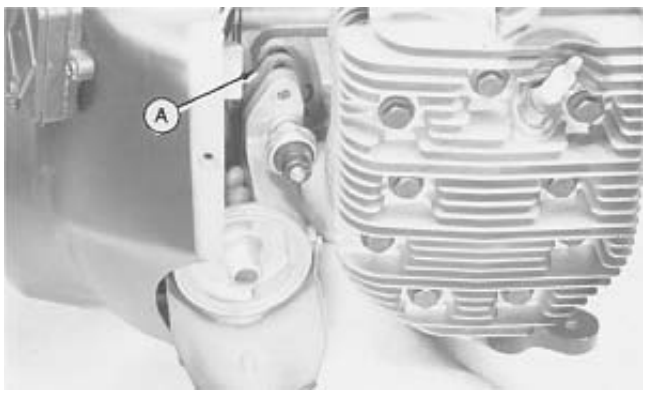
2. Install drain pan and fasten with two cap screws.

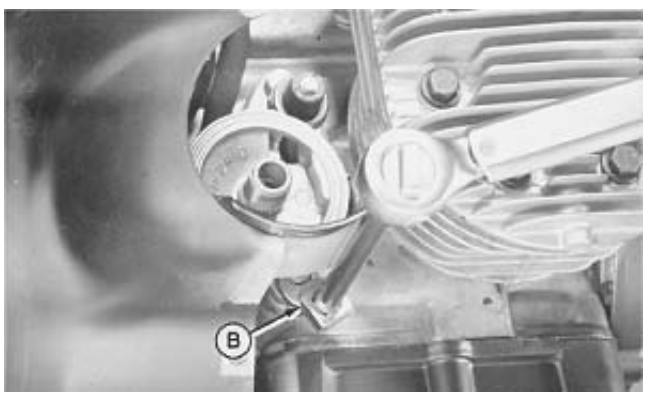
M98,2040K,56 -19-21OCT85

3. Install new gasket (A) on oil filter adapter.

4. Apply pipe sealant on top cap screw threads.

5. Install oil filter adapter and two cap screws. Tighten cap screws to 12 ± 1 N·m (106 ± 9 lb-in.) using JDG 333 Crowsfoot Wrench (B) or a 1/2 in crowsfoot wrench.

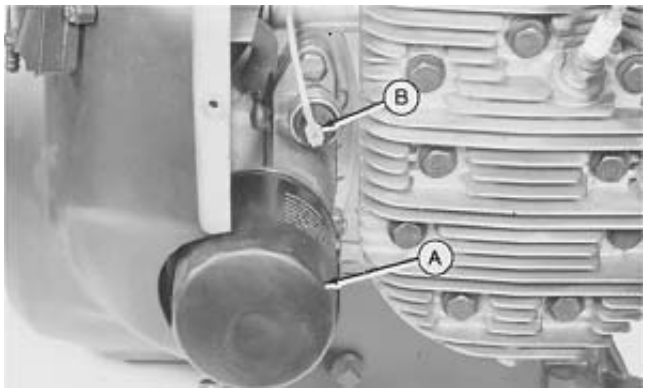




M98,2040K,57 -19-21OCT85

6. Connect engine oil pressure sender wiring lead (B).

7. Install oil filter (A).



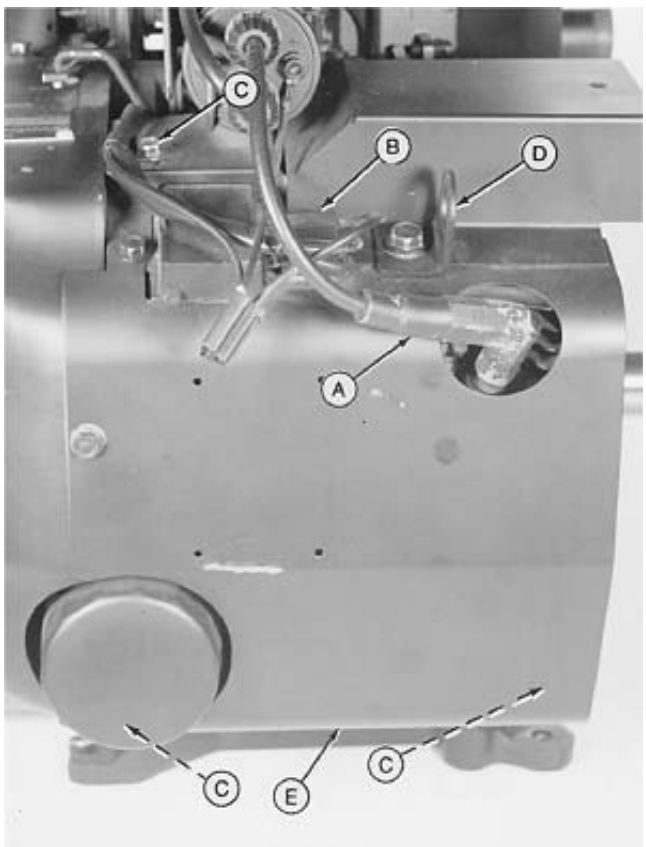
M98,2040K,58 -19-21OCT85

8. Install right side shroud (E), lift bracket (D), and fasten with five cap screws (C). Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 26 lb-in.).

9. Connect spark plug wire (A) and voltage regulator leads (B). Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of the voltage regulator.

10. Install engine. (See machine technical manual.)

A—Spark Plug Wire
B—Voltage Regulator Leads
C—Cap Screw (5 used)
D—Lift Bracket
E—Right Side Shroud



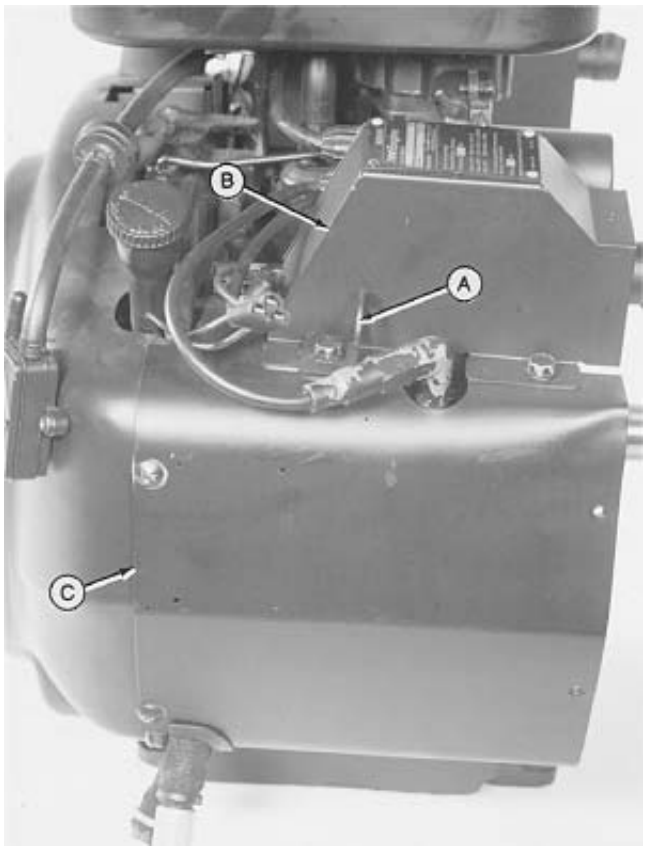
M98,2040K,59 -19-21OCT85

REMOVE OIL LINE ADAPTER

1. Remove engine. (See machine technical manual.)

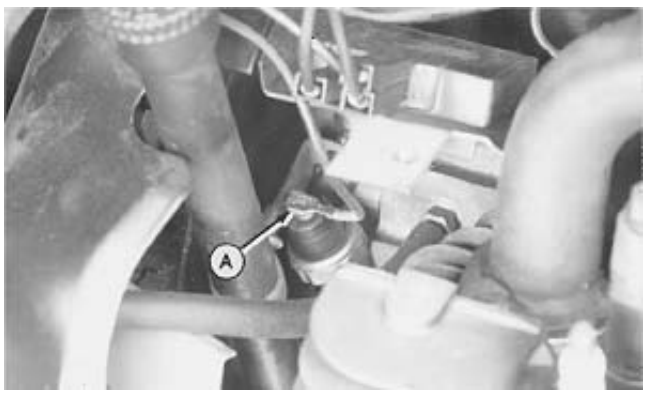
2. Remove three cap screws to remove lift bracket (A) and exhaust shroud (B).

3. Remove four cap screws to remove left side shroud (C).



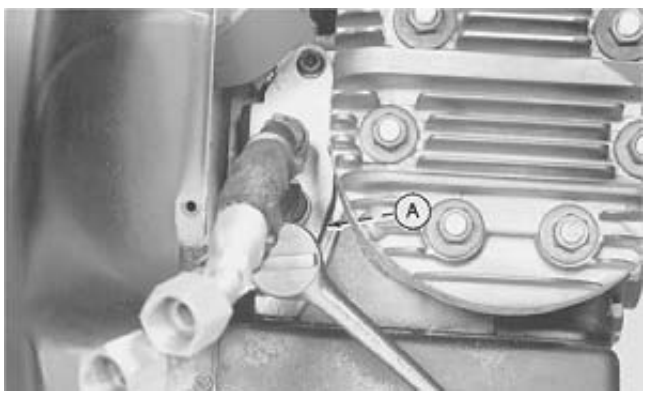
M98,2040K,60 -19-21OCT85

4. Disconnect engine oil pressure sender wiring lead (A).



M98,2040K,61 -19-21OCT85

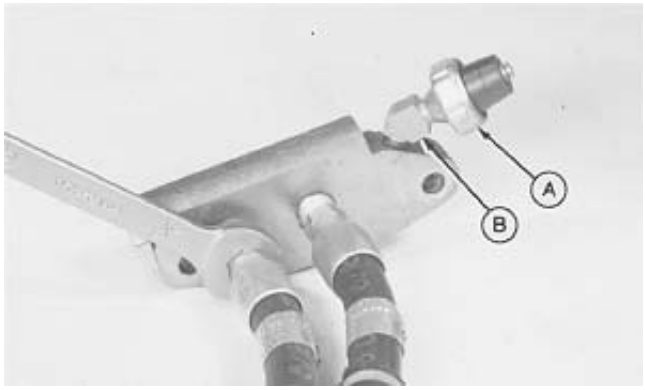
5. Remove two special screw to remove oil adapter and gasket (A).



M98,2040K,62 -19-21OCT85

6. Remove oil adapter hoses.

7. Remove engine oil pressure sender (A) and elbow (B).



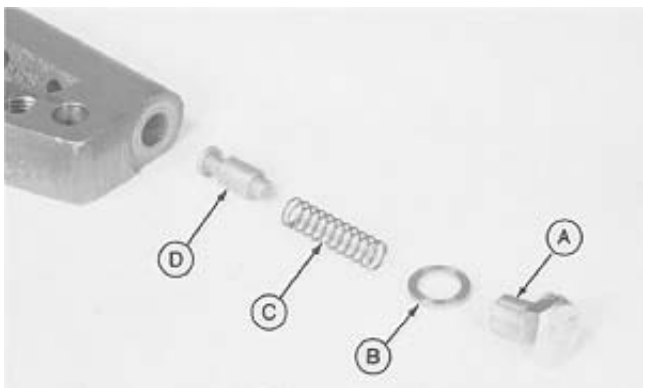
-UN-29JAN90
M36454

M98,2040K,63 -19-21OCT85

8. Remove cap screw (A), washer (B), spring (C), and valve (D).

9. Inspect spring, valve, and valve bore for wear or damage.

A—Cap Screw
B—Washer
C—Spring
D—Valve



-UN-29JAN90
M36455

M98,2040K,64 -19-21OCT85

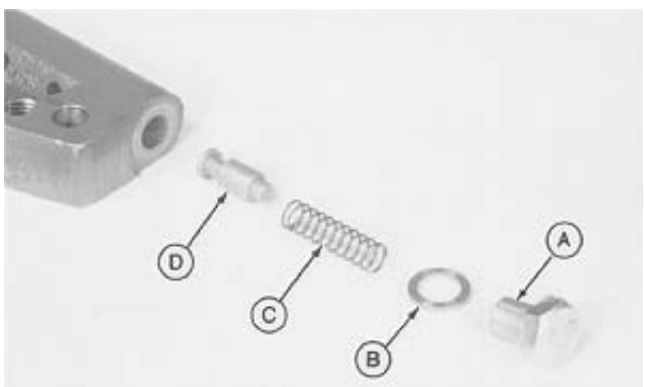
INSTALL OIL LINE ADAPTER

1. Thoroughly clean and dry parts.

2. Put clean engine oil on all internal parts.

3. Install valve(D), spring (C), washer (B), and cap screw (A). Tighten cap screw to 28 ± 3 N·m (248 ± 27 lb-in.).

A—Cap Screw
B—Washer
C—Spring
D—Valve



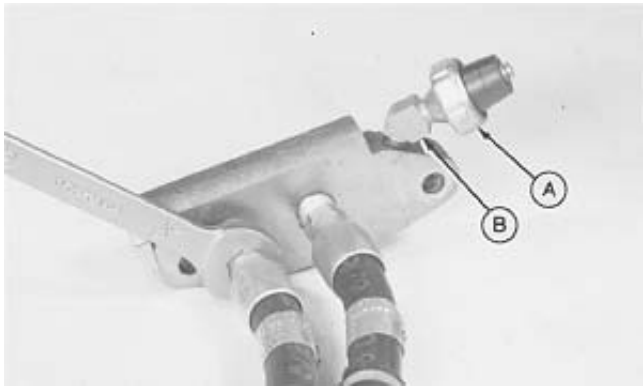
-UN-29JAN90
M36455

M98,2040K,65 -19-21OCT85

4. Apply pipe sealant on threads of elbow, engine oil pressure sender and oil adapter hoses.

5. Install elbow (B) and engine oil pressure sender (A).

6. Install oil adapter hoses.



M98,2040K,66 -19-21OCT85

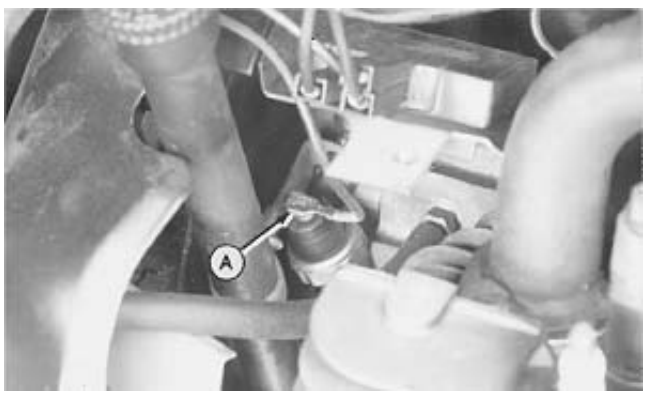
7. Install new gasket on oil adapter.

8. Apply pipe sealant on top special screw threads.

9. Install oil adapter and two special screws. Tighten special screws to 12 ± 1 N·m (106 ± 9 lb-in.).

M98,2040K,67 -19-21OCT85

10. Connect engine oil pressure sender wiring lead (A).

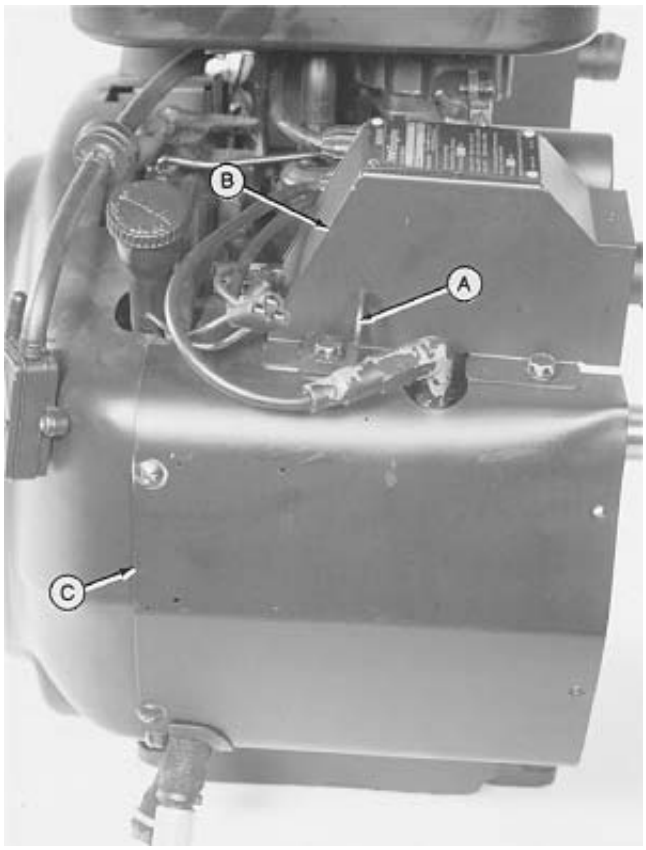


M98,2040K,68 -19-21OCT85

11. Install left side shroud (C) and fasten with four cap screws.

12. Install exhaust shroud (B), lift bracket (A), and three cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

13. Install engine. (See machine technical manual.)



M36445 -UN-29JAN90

M98,2040K,69 -19-21OCT85

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Press	Remove and install camshaft gear.
Bushing, Bearing, and Seal Driver Set	Remove and install gear cover bushing and oil seal

M98,2045K,1 -19-21OCT85

OTHER MATERIAL

Number	Name	Use
T43512	John Deere LOCTITE Thread Lock and Sealer (Medium Strength)	Apply to threads of governor fork screws

LOCTITE is a trademark of the Loctite Corp.

M98,2045K,2 -19-21OCT85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Overhaul Gasket Kit

45
1

M98,2045K,2A -19-11NOV85

SPECIFICATIONS

Item	Measurement	Specification
Governor Cup	Travel	5.6 mm (0.22 in.)
Gear cover surface-to-pin	Distance	19 mm (0.75 in.)

M98,2045K,3 -19-21OCT85

REMOVE GOVERNOR ASSEMBLY AND GOVERNOR LINKAGE

1. Remove engine. (See machine technical manual.)

2. Remove muffler and exhaust pipes (A).

3. Remove intake manifold (B). (See Remove Intake Manifold, Group 10 in this manual.)

4. Remove cylinder heads (C). (See Remove Cylinder Heads, Group 10 in this manual.)

5. Remove intake and exhaust valves (D). (See Remove Intake and Exhaust Valves, Group 15 in this manual.)

6. Remove flywheel (E). (See Remove Flywheel, Group 20 in this manual.)

7. Remove camshaft. (See Remove Camshaft, Group 25 in this manual.)

A—Muffler and Exhaust Pipes
B—Intake Manifold
C—Cylinder Heads
D—Intake and Exhaust Valves
E—Flywheel

-UN-29JAN90
M36474

M98,2045K,4 -19-21OCT85

45
2

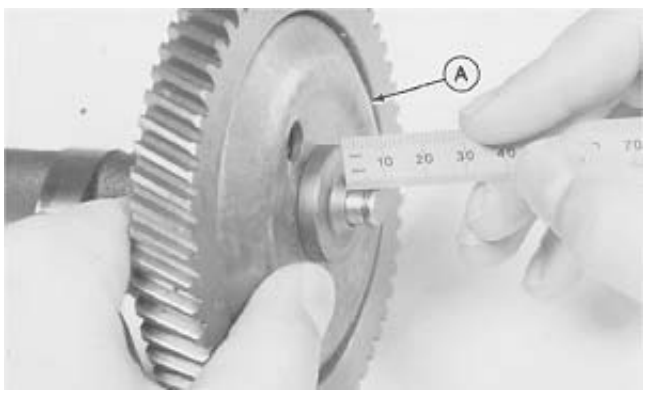
DISASSEMBLE AND INSPECT GOVERNOR ASSEMBLY

1. Hold cup against flyballs. Measure distance from snap ring to surface of hub. The distance must be 5.6 mm (0.22 in.).

If the distance is not correct, replace camshaft assembly.

NOTE: The camshaft and pin are only serviced as an assembly.

2. The cup (A) must spin freely on the camshaft pin without excessive play. Replace parts as necessary.



-UN-29JAN90
M36308

M98,2045K,5 -19-21OCT85

3. Remove snap ring to remove hub (A) and cup (B).

4. Inspect cup race for grooved or rough surface. Replace cup if necessary.

-UN-29JAN90
M36309

M98,2025K,15 -19-09OCT85

5. Remove flyballs. Inspect flyballs for grooved or flat spots, replace if necessary.

6. Inspect flyball spacer (A) for wear or damage. Replace camshaft gear if necessary.

NOTE: The flyball spacer, plate, and camshaft gear are serviced as an assembly only.

IMPORTANT: If camshaft gear is replaced, always replace crankshaft gear also.

7. Inspect camshaft gear for chipped or broken teeth. Replace camshaft gear if necessary.

-UN-29JAN90
M36310

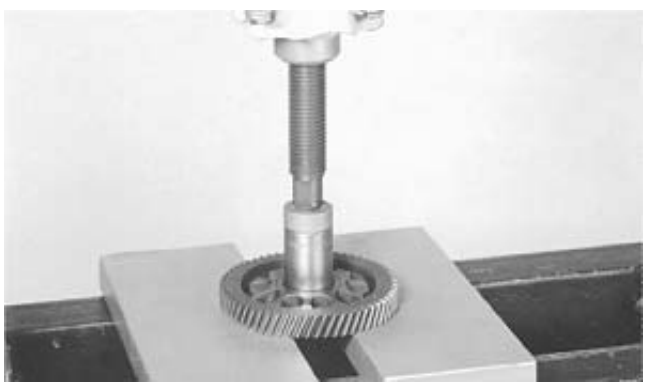
M98,2025K,16 -19-09OCT85

45
3

IMPORTANT: Be sure to hold camshaft while removing camshaft gear.

8. Remove gear using a 1 in. deep-well socket, 1 in. driver disk, and a press.

9. Remove key.



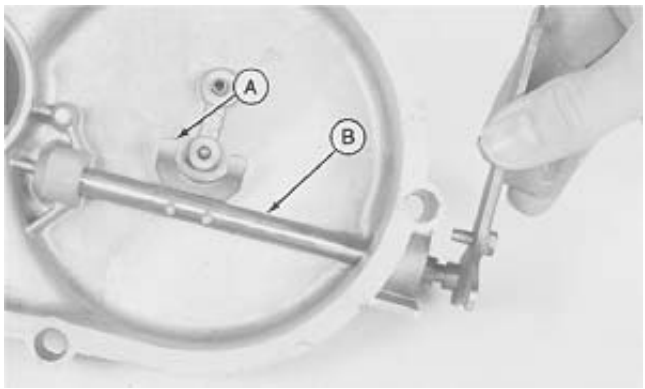
-UN-14JUL89
M30688

M98,2025K,17 -19-11NOV85

DISASSEMBLE AND INSPECT GOVERNOR LINKAGE

1. Move governor arm. The governor arm must move freely without excessive play.

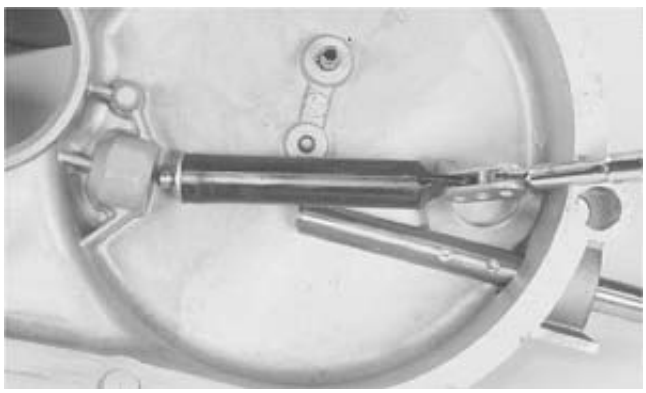
2. Inspect fork (A) and governor arm shaft (B) for wear or bent condition. Replace parts as necessary.



M98,2045K,6 -19-21OCT85

3. Pull governor arm shaft outward.

4. Remove ball bearing from governor arm shaft hole using a magnet.



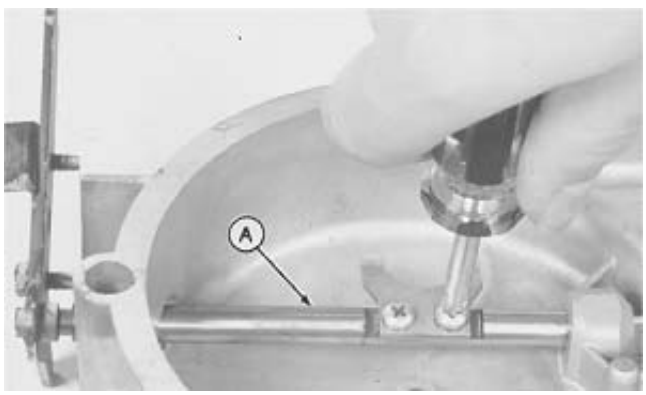
M98,2045K,7 -19-21OCT85

5. If necessary, remove staked ends of fork screws using a small grinder.

M98,2045K,8 -19-02FEB87

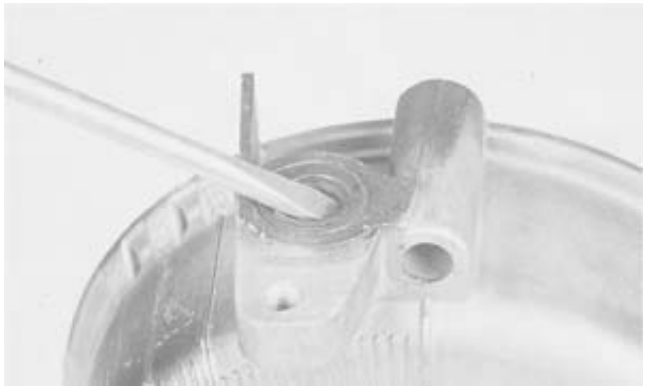
6. Remove two screws to remove fork. If screws are tight, support governor arm shaft (A) and loosen screws using an impact driver.

7. Remove governor arm shaft.



M98,2045K,9 -19-21OCT85

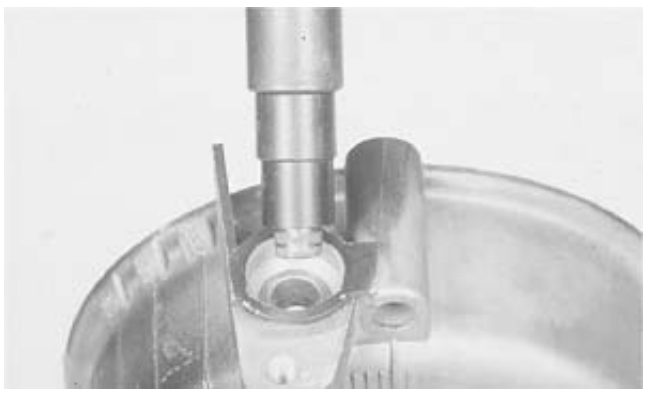
8. Remove seal.



-UN-29JAN90
M36479

M98,2045K,10 -19-21OCT85

9. Remove bushing using a 1/2 in. driver disk and 9/16 in. disk.

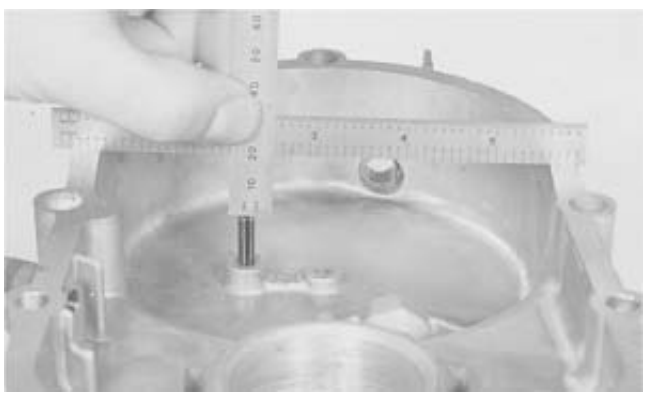


-UN-25JAN90
M36884

M98,2045K,11 -19-21OCT85

10. Measure distance from surface of gear cover to pin. The distance must be 19 mm (0.75 in.). Inspect pin for damage.

11. If the distance is not correct or pin is damaged, remove pin.



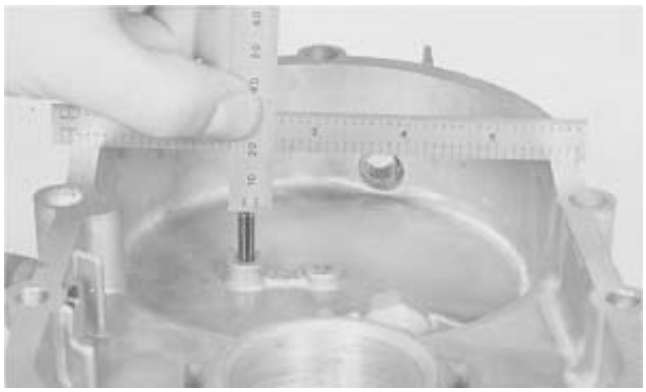
-UN-25JAN90
M36885

-UN-25JAN90
M36886

M98,2045K,12 -19-21OCT85

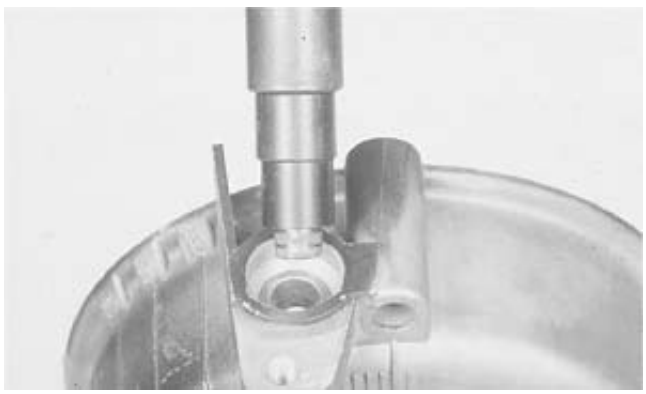
ASSEMBLE GOVERNOR LINKAGE

1. Install new pin in gear cover until pin is 19 mm (0.75 in.) from surface of gear cover.



M98,2045K,13 -19-21OCT85

2. Install new bushing using a 1/2 in. driver disk and 9/16 in. disk. Push bushing even with bottom of oil seal bore.



M98,2045K,14 -19-21OCT85

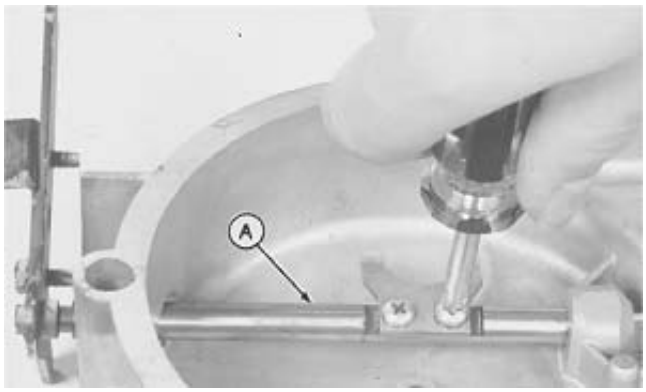
3. Install new seal, with lips of seal toward driver, using a 1 in. driver disk. Push seal even with surface of gear cover.

M98,2045K,15 -19-21OCT85

4. Install governor arm shaft (A).

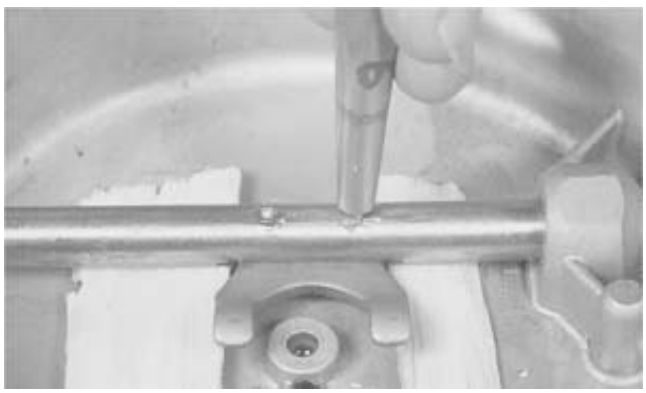
5. Apply thread lock and sealer (medium strength) on threads of fork screws.

6. Install fork with bent ends upward. Install and tighten two screws.



M98,2045K,16 -19-21OCT85

7. Support governor arm shaft. Hit end of fork screws using a punch so screws cannot be removed.

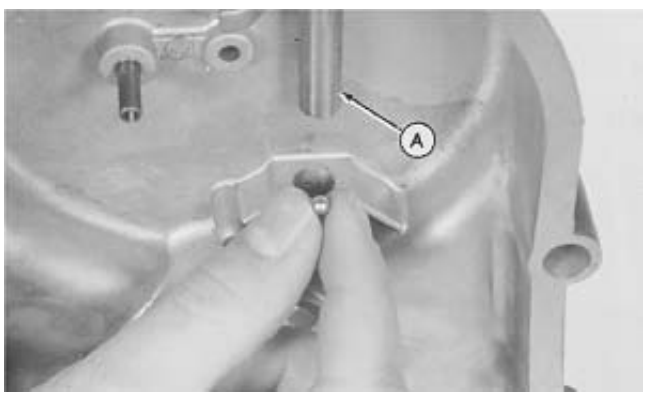


M98,2045K,17 -19-21OCT85

IMPORTANT: Ball bearing must be installed for proper governor shaft operation.

8. Install ball bearing in governor arm shaft hole.

9. Install governor arm shaft (A) in governor arm shaft hole.



M98,2045K,18 -19-21OCT85

45
7

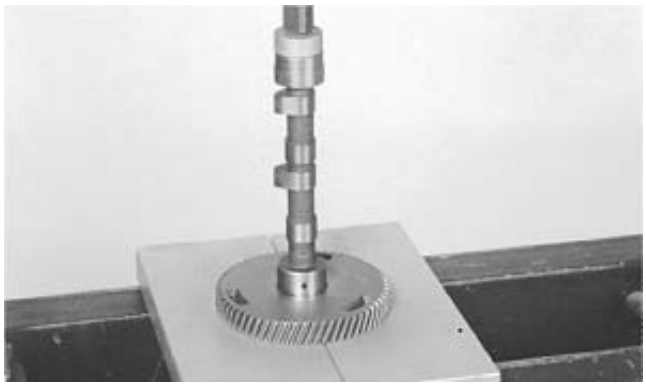
ASSEMBLE GOVERNOR ASSEMBLY

1. Install key in camshaft.

2. Install gear with timing mark “O” away from camshaft.

3. Align slot in gear with key in shaft.

4. Push camshaft into gear using a 1-3/8 in. driver disk and a press until camshaft is even with bottom of gear surface.



M30756 -UN-14JUL89

M98,2045K,19 -19-21OCT85

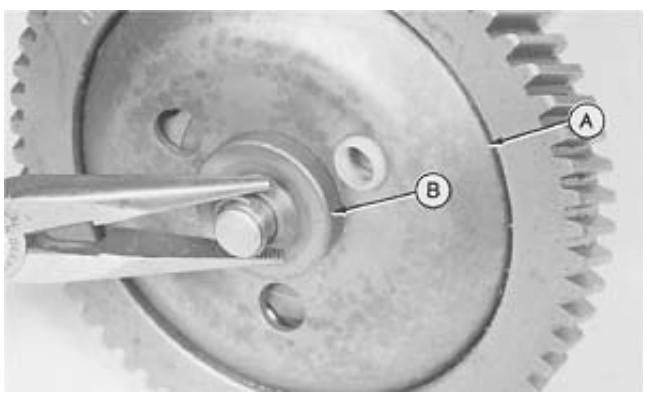
5. Apply clean engine oil on camshaft parts before assembly.

6. Install flyballs in flyball spacer (A) notches.

M36310 -UN-29JAN90

M98,2025K,25 -19-09OCT85

7. Install cup (A), hub (B), and fasten with snap ring.



M36318 -UN-29JAN90

M98,2025K,26 -19-09OCT85

INSTALL GOVERNOR ASSEMBLY AND GOVERNOR LINKAGE

1. Install camshaft. (See Install Camshaft, Group 25 in this manual.)

2. Install flywheel (E). (See Install Flywheel, Group 20 in this manual.)

3. Install intake and exhaust valves (D). (See Install Intake and Exhaust Valves, Group 15 in this manual.)

4. Install cylinder heads (C). (See Install Cylinder Heads, Group 10 in this manual.)

5. Install intake manifold (B). (See Install Intake Manifold, Group 10 in this manual.)

6. Install muffler and exhaust pipes (A). (See Install Intake Manifold, Group 10 in this manual.)

7. Install engine. (See machine technical manual.)

A—Muffler and Exhaust Pipes
B—Intake Manifold
C—Cylinder Heads
D—Intake and Exhaust Valves
E—Flywheel

M36474 -UN-29JAN90

M98,2045K,20 -19-21OCT85

45
9

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
1/2 in. Crowsfoot Wrench	To remove carburetor

M98,2050K,1 -19-21OCT85

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Choke Shaft Kit
Gasket Kit
Carburetor Float Kit
Float Valve And Seat Kit
Idle Needle Kit
Idle Speed Adjusting Screw Kit
Throttle Shaft Kit
Carburetor Repair Kit

M98,2050K,2 -19-21OCT85

SPECIFICATIONS

Item	Measurement	Specification
Carburetor Float Level	Height from edge of bowl	0 to 1 mm (0.0 to 0.04 in.)
Carburetor Float Drop	Depth below edge of bowl	5 mm (0.20 in.) Minimum
Breaker Point Gap	Opening	0.41 mm (0.016 in.)

M98,2050K,3 -19-21OCT85

REMOVE CARBURETOR

NOTE: The carburetor removal includes procedures for all carburetors. The differences are noted. The carburetor can be removed with engine in machine.

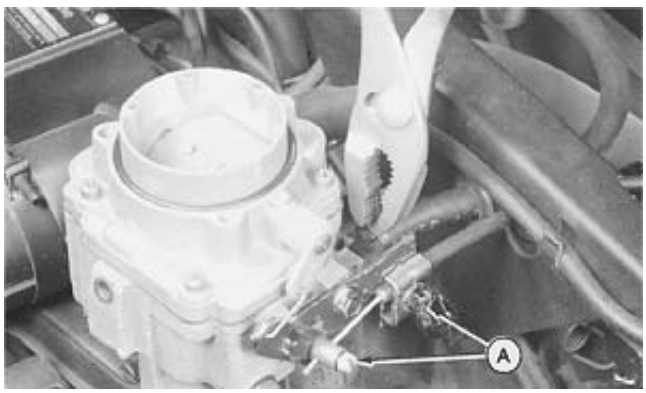
1. If equipped, turn reserve fuel lever to OFF position.

2. Remove air cleaner assembly. (See Remove Air Cleaner in Group 05 of this manual.)

M98,2050K,4 -19-21OCT85

3. If engine is in machine, disconnect fuel line from carburetor.

4. If engine is in machine, loosen choke cable clamp screws (A). Disconnect cable from carburetor.

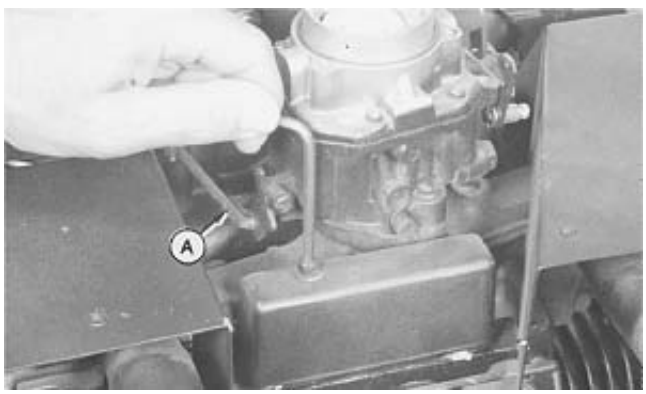


M98,2050K,5 -19-21OCT85

5. If engine is in machine, remove clip (A) to disconnect governor control linkage.

6. Loosen set screw. Remove breaker point cover, if equipped.

T260 Engine



B43E, B43G, or E48G Engine

M98,2050K,6 -19-02FEB87

IMPORTANT: Be careful not to lose the point plunger or to allow dirt to enter the exposed plunger hole.

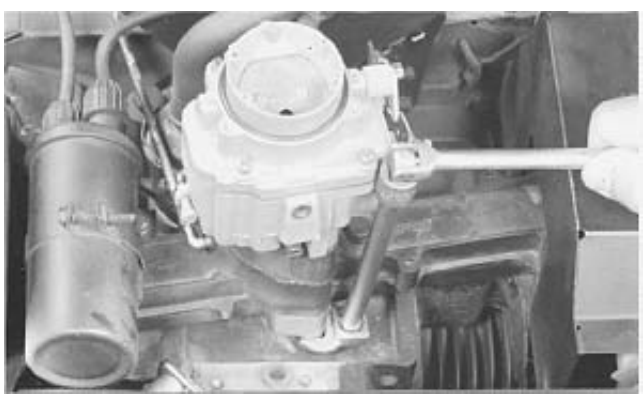
7. Loosen two set screws. Move point assembly, if equipped, out of the way for access to carburetor mounting bolts.

T260 Engine (Early point assembly)

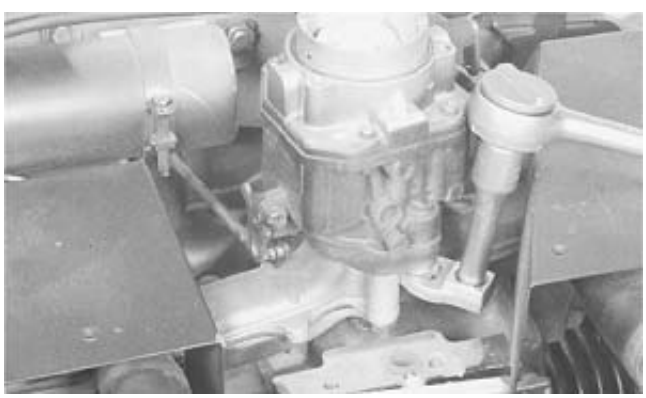
B43E, B43G, OR B48G Engine (Early

M98,2050K,7 -19-11FEB87

8. Loosen two cap screws with JDG-333 Crowsfoot Wrench or short handled 1/2 in. open-end wrench. Remove carburetor.



T260 Engine



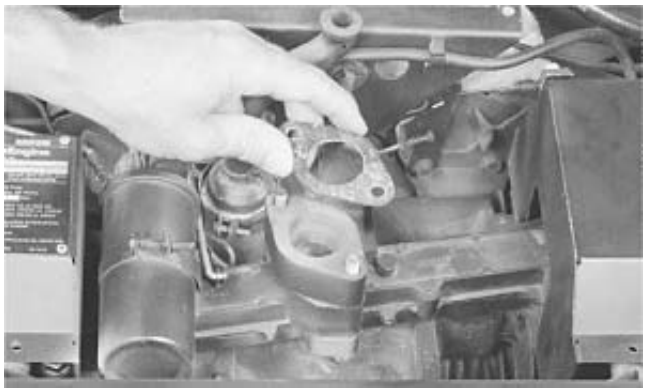
B43E, B43G, or B48G Engine

M98,2050K,8 -19-21OCT85

9. Remove gasket.

NOTE: If it is necessary to replace the mounting cap screws on the T260 engine, the intake manifold must be removed. (See Remove Intake Manifold, Group 10 in this manual.)

T260 Engine



-UN-25JAN90
M36992

M98,2050K,9 -19-21OCT85

DISASSEMBLE CARBURETOR

NOTE: Carburetor disassembly includes procedures for all carburetors. The differences are noted.

1. Remove two cap screws. Remove choke control bracket.

-UN-25JAN90
M36954

M98,2050K,10 -19-21OCT85

2. Remove two screws and choke valve.

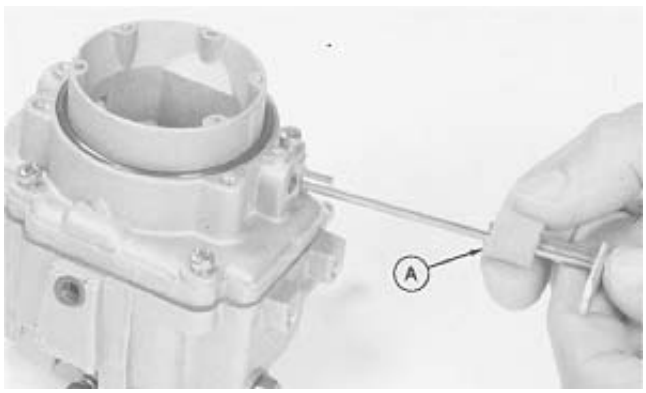
-UN-25JAN90
M36955

M98,2050K,11 -19-21OCT85

3. Remove choke valve shaft.

4. Remove foam seal (A) from shaft.

Inspect choke shaft. Replace shaft if it shows excessive wear or is bent.



-UN-25JAN90
M36956

M98,2050K,12 -19-21OCT85

5. Remove two screws and throttle valve.

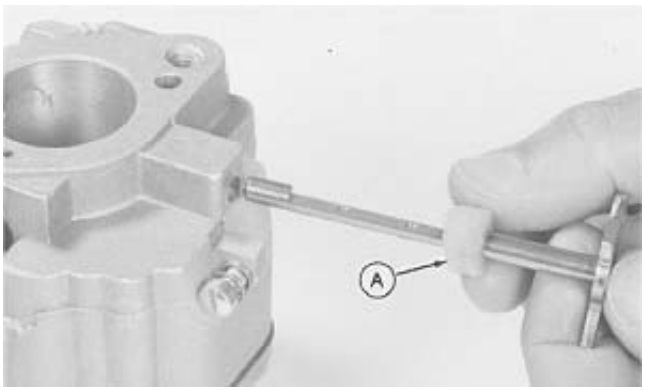
M36957 -UN-25JAN90

M98,2050K,13 -19-21OCT85

6. Remove throttle valve shaft.

7. Remove foam seal (A) from shaft.

Inspect throttle shaft. Replace shaft if it shows excessive wear or is bent.



M36958 -UN-25JAN90

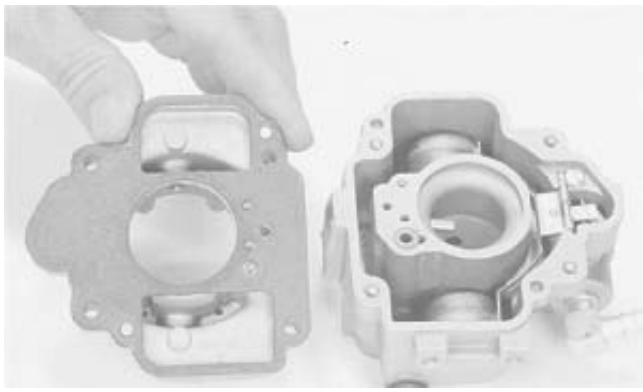
M98,2050K,14 -19-21OCT85

8. Remove four screws to remove air intake.

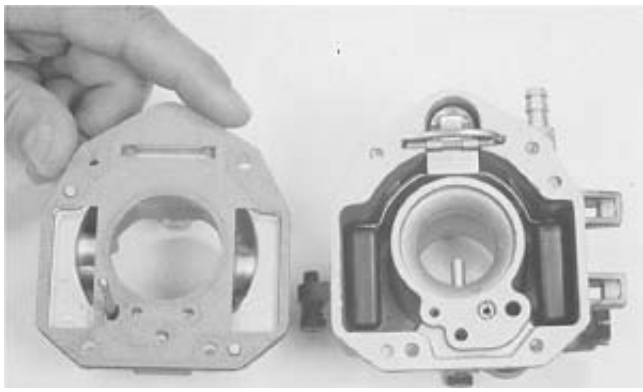
M36959 -UN-25JAN90

M98,2050K,15 -19-21OCT85

9. Remove and discard gasket.



T260 Engine



B43E, B43G, B48G, P218G or P220G

M98,2050K,16 -19-02FEB87

10. Remove O-ring.

M98,2050K,17 -19-21OCT85

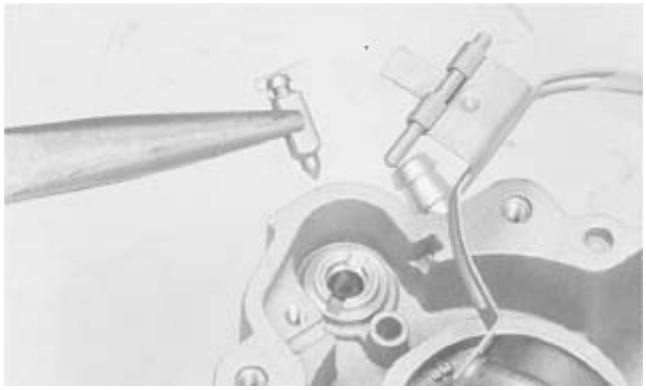
11. For T260 engine, remove float retaining screw.

M98,2050K,18 -19-21OCT85

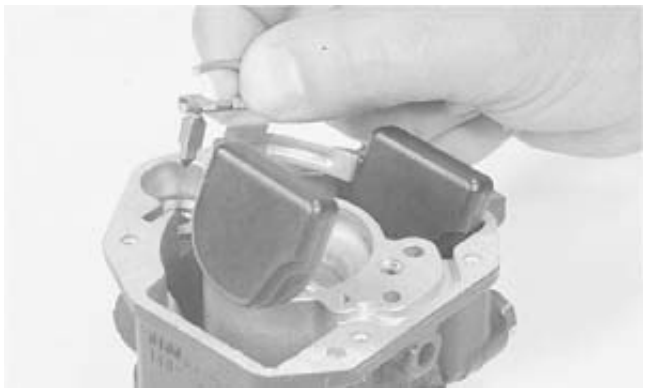
12. Remove float, pivot pin, and needle valve.

Inspect needle valve. Replace valve if it is grooved or pitted.

Check float for dents or leaks. Replace if defective or loaded with fuel.



T260 Engine

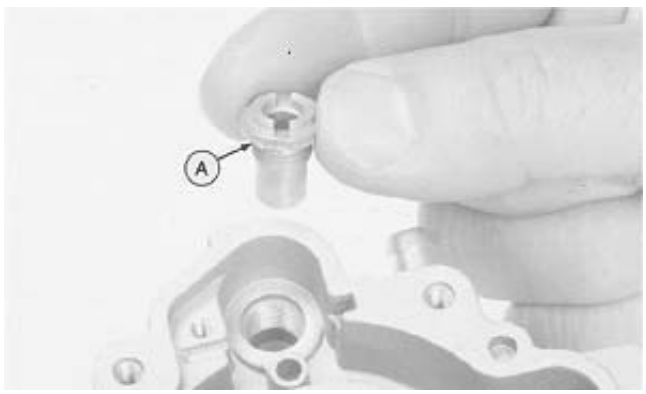


B43E, B43G, B48G, P218G, or P220G

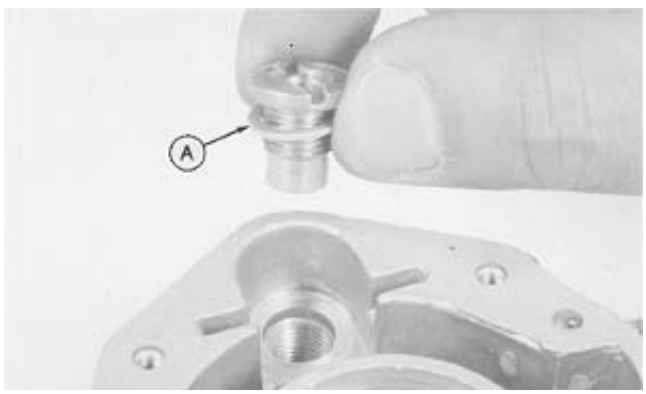
M98,2050K,19 -19-02FEB87

13. Remove seat. Remove washer (A).

Inspect needle seat area for wear or damage. Replace seat if defective.



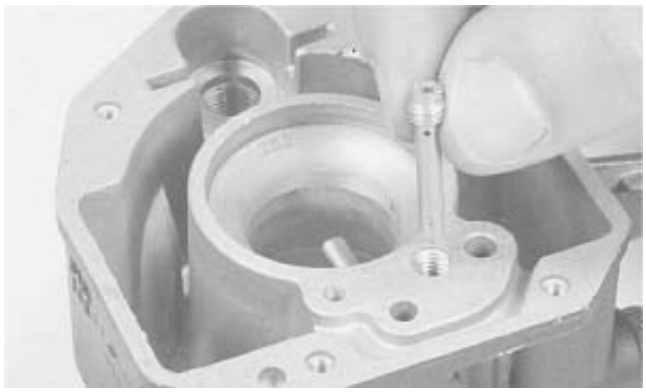
T260 Engine



B43E, B43G, B48G, P218G, or P220G

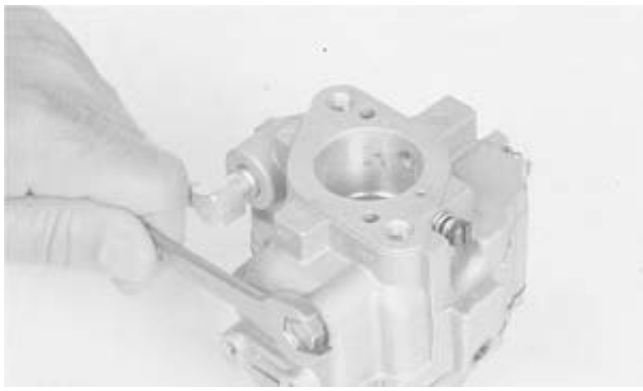
M98,2050K,20 -19-02FEB87

14. For B43E, B43G, B48G, P218G, or P220G engine, remove slow idle jet.



M98,2050K,21 -19-02FEB87

15. Remove reservoir plug and gasket.



T260 Engine

B43E, B43G, B48G, P218G, OR P220G

M98,2050K,22 -19-11FEB87

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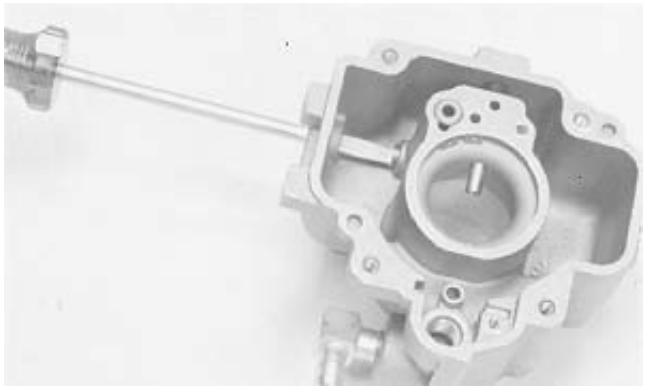
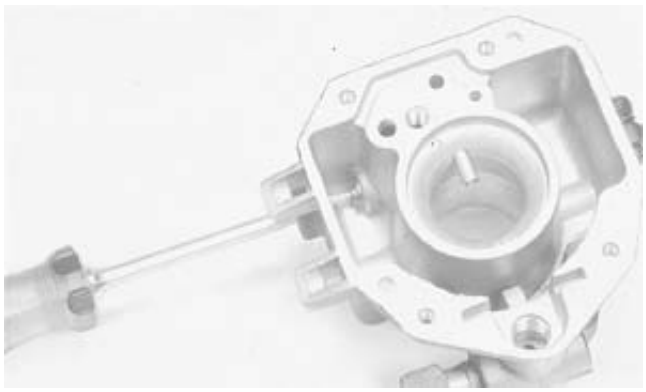
16. Remove main jet.

Inspect main jet. Replace if damaged.



T260 Engine



B43E, B43G, B48G, P218G, or P220G

M98,2050K,23 -19-02FEB87

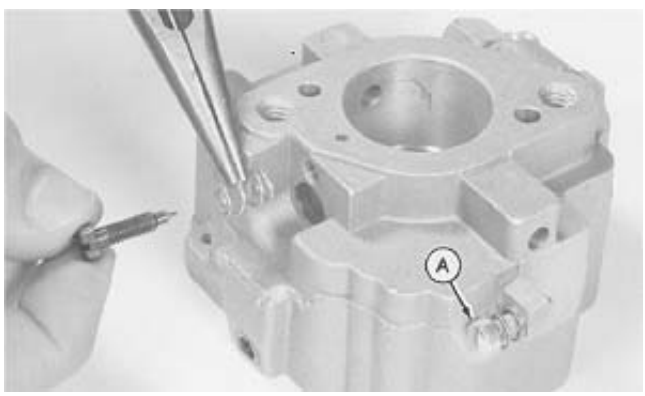
17. For P218G or P220G engines, remove plastic cap from idle mixture screw.

18. Remove idle mixture screw and spring.

Inspect seating surface of mixture screw. Replace if worn or damaged.

19. Remove idle speed screw (A) and spring.

Replace springs if weak or broken.



M98,2050K,24 -19-02FEB87

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CLEAN CARBURETOR

IMPORTANT: Never clean holes or passages with small drill bits or wire because a slight enlargement or burring of these holes will change the performance of the carburetor. No other method of cleaning other than solvent should be used.

1. Soak all metal components not replaced in carburetor cleaner. Do not soak non-metal floats or other non-metal parts.

2. Clean all carbon from carburetor bore. Be careful not to plug the idle or main fuel ports.

3. Dry out all passages with low pressure air 240 kPa (2.4 bar) (35 psi). Make sure all holes and passages are open. Do not use rags or paper to dry parts.

M98,2050K,25 -19-21OCT85

ASSEMBLE CARBURETOR

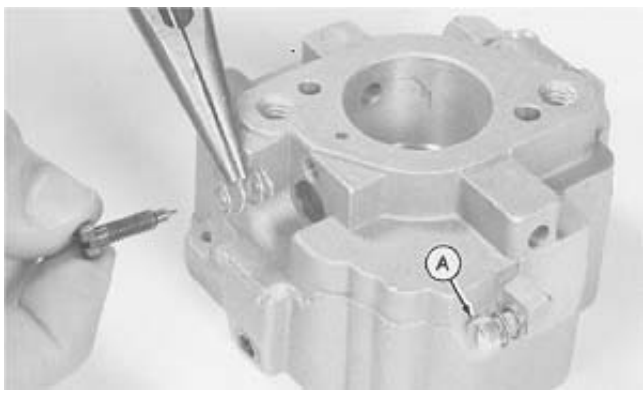
NOTE: Carburetor assembly includes procedures for all carburetors. The differences are noted.

Use new seals, gaskets, and O-ring when assembling carburetor.

1. Install idle speed screw (A) and spring.

2. Install idle mixture screw and spring. Turn idle mixture screw in until lightly seated, then back it out 1-1/4 turns.

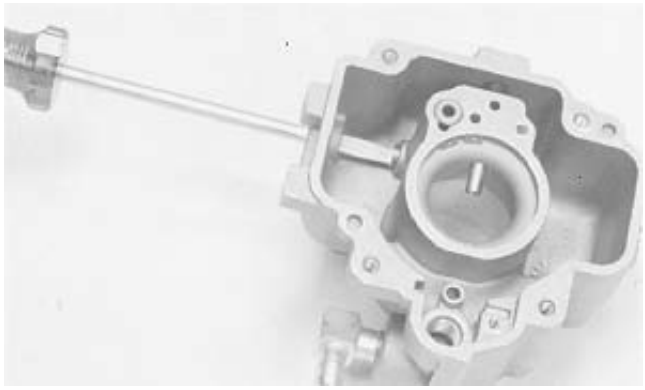
For P218G and P220G engines, install plastic cap on idle mixture screw.



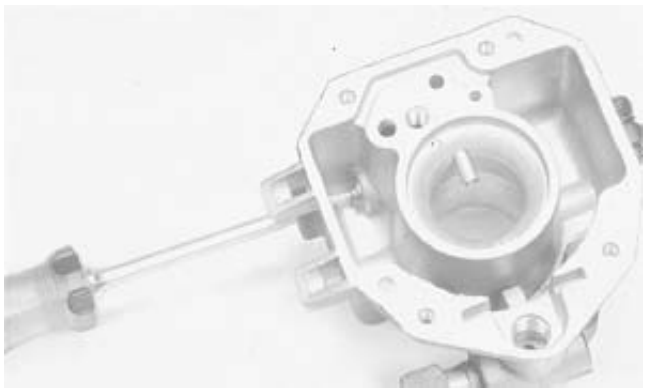
M36967 -UN-25JAN90

M98,2050K,26 -19-11FEB87

3. Install main jet.



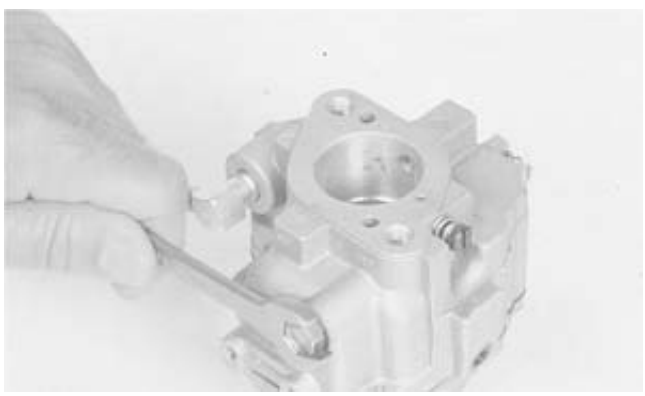
T260 Engine



B43E, B43G, B48G, P218G, or P220G

M98,2050K,27 -19-02FEB87

4. Install reservoir plug and gasket.

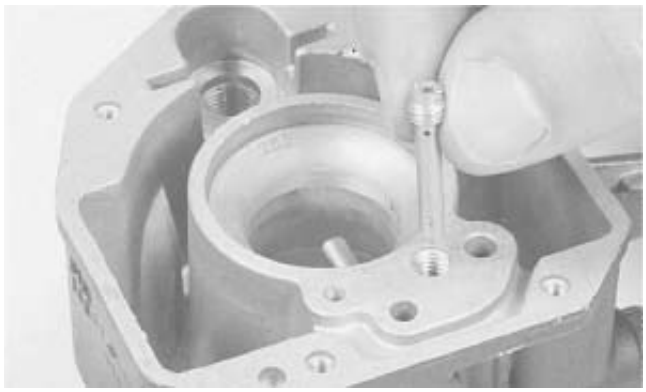


T260 Engine

B43E, B43G, B48G, P218G, or P220G

M98,2050K,28 -19-02FEB87

5. For B43E, G43G, B48G, P218G, or P220G engine, install slow idle jet.



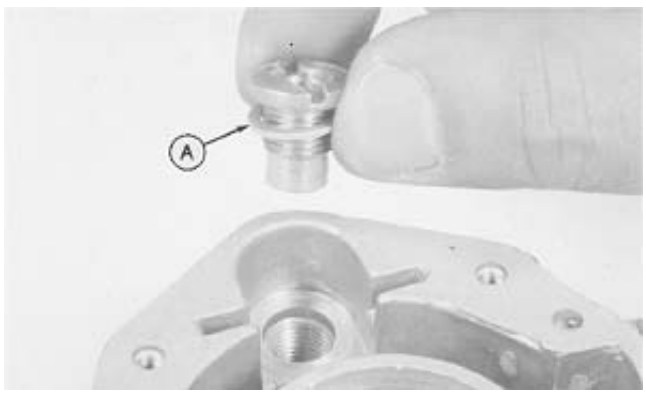
-UN-25JAN90
M36972

M98,2050K,29 -19-02FEB87

6. Install seat and washer (A).

-UN-25JAN90
M36966

T260 Engine



-UN-25JAN90
M36971

B43E, B43G, B48G, P218G, or P220G

M98,2050K,30 -19-01JAN87

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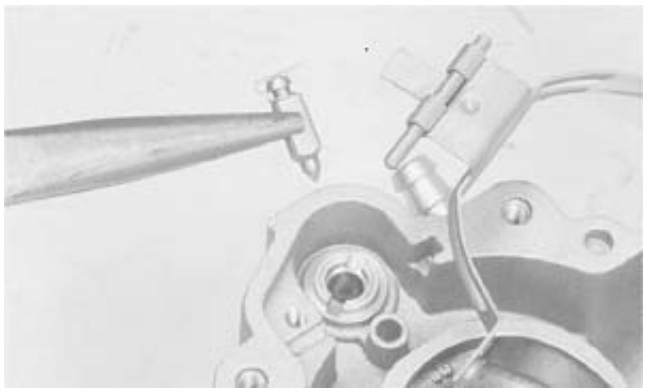
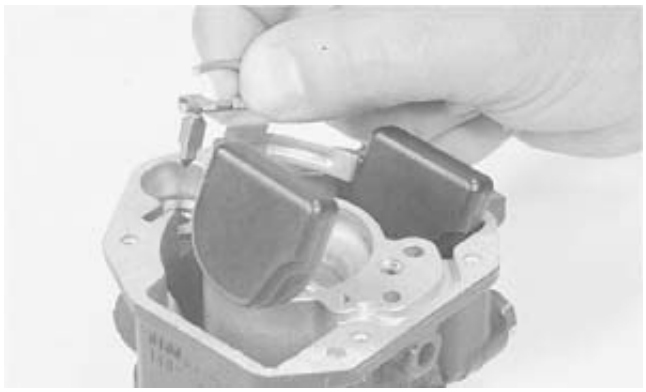
7. Install float, pivot pin, and valve. Be sure wire on valve is hooked over tab on float.

Install float, pivot pin, and valve. Be sure valve is hooked on float tab.



T260 Engine



B43E, B43G, B48G, P218G, or P220G

M98,2050K,31 -19-02FEB87

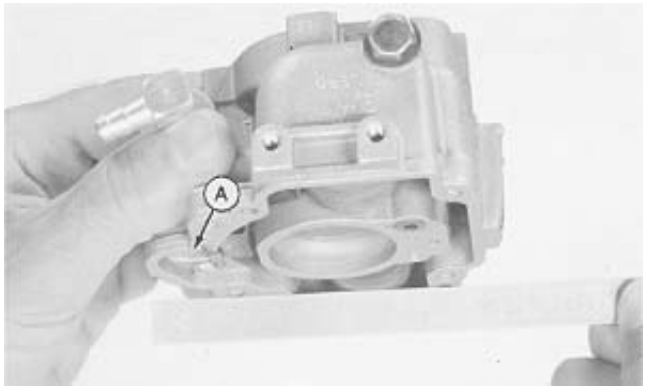
8. For T260 engine, fasten float assembly with retaining screw. Make sure pivot pin is in the groove and that the float moves freely without binding.

M98,2050K,32 -19-21OCT85

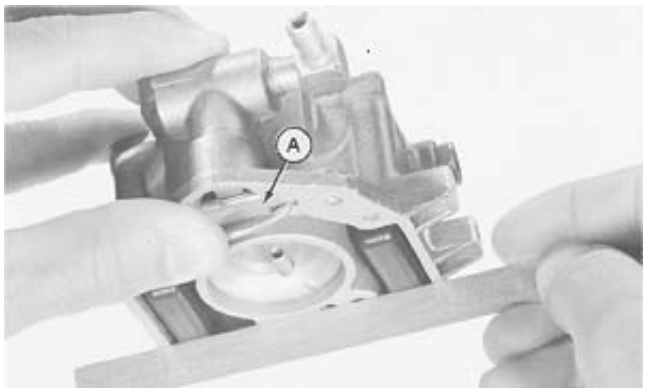
When checking float level and float drop, measure to float body, not seam.

9. Turn carburetor and check float setting using straightedge. Adjust floats so that they are even with edge of bowl or no more than 1 mm (0.04 in.) beyond edge. Bend float tab (A) to adjust.

Turn carburetor and hold pivot pin in place. Check float setting using a straightedge. Adjust floats so that they are even with the edge of bowl or no more than 1 mm (0.04 in.) beyond edge. Bend float tang (A) to adjust.



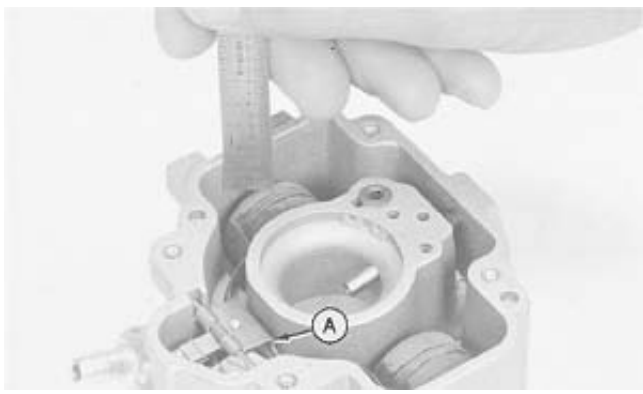
T260 Engine



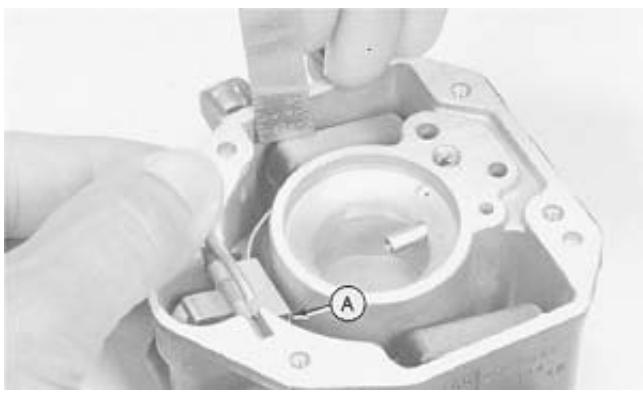
B43E, B43G, B48G, P218G, or P220G

M98,2050K,33 -19-11FEB87

10. Turn carburetor right side up and measure float drop. The distance from top of carburetor body to top of float must be at least 5 mm (0.20 in.). Bend float arm (A) to adjust. If float drop is adjusted, check float level again.



T260 Engine



B43,E, B43G, B48G, P218G, or P220G

M98,2050K,34 -19-02FEB87

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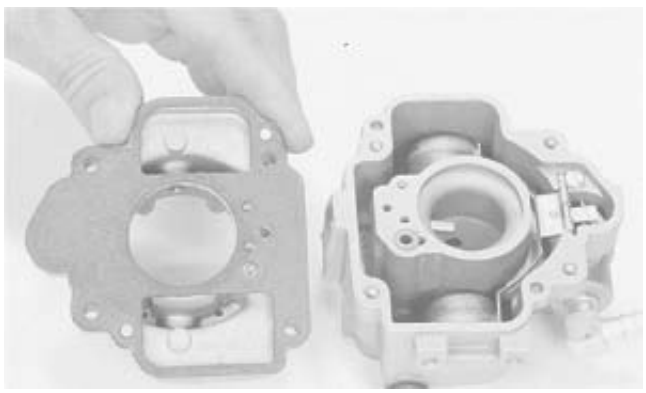
14

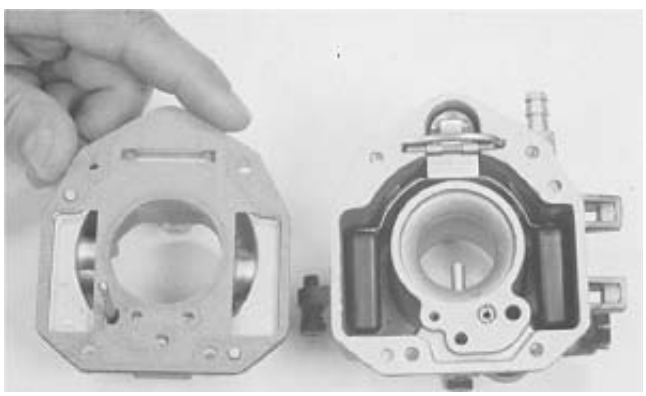
11. Install O-ring on carburetor intake.

M98,2050K,35 -19-21OCT85

12. Install gasket.



T260 Engine



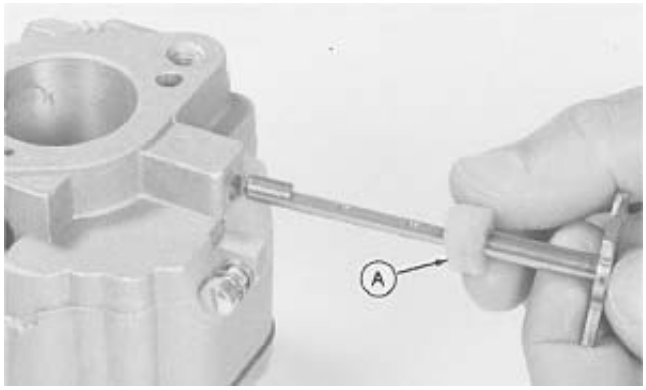
B43E, B43G, B48G, P218G, OR P220G

M98,2050K,36 -19-02FEB87

13. Install air intake. Fasten with four screws.

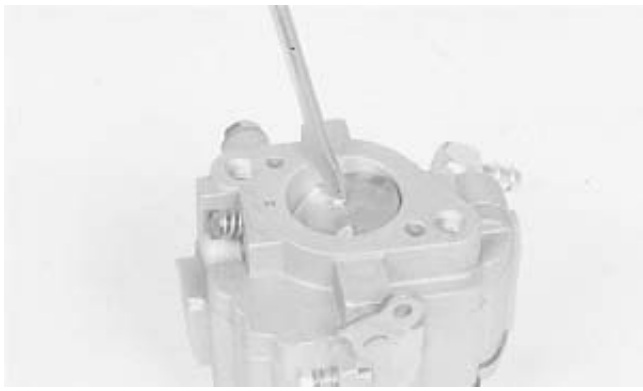
M98,2050K,37 -19-21OCT85

14. Apply a small amount of oil to the foam seal (A). Install foam seal and throttle valve shaft.



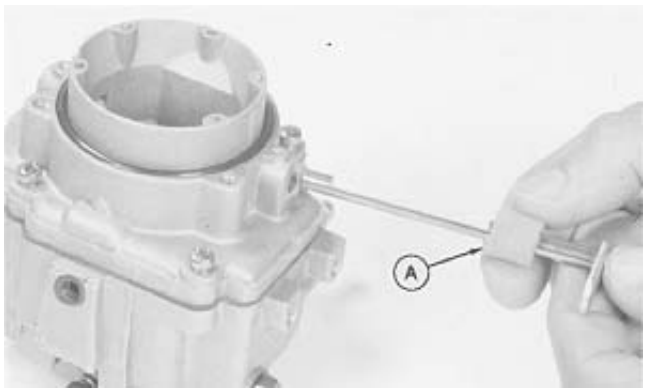
M98,2050K,38 -19-21OCT85

15. Install throttle valve. Adjust valve plate so that it is centered in the bore before tightening the two screws. To center the plate, back off the throttle stop screw and completely close the throttle lever. Seat the valve plate by tapping with a small screwdriver, the tighten screws.



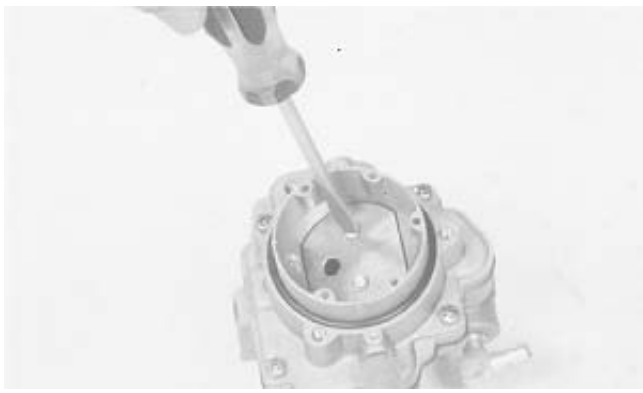
M98,2050K,39 -19-21OCT85

16. Apply a small amount of oil to the foam seal (A). Install foam seal and choke valve shaft.



M98,2050K,40 -19-21OCT85

17. Install choke valve. Adjust valve plate so that it is centered in the bore before tightening two screws.



M98,2050K,41 -19-21OCT85

18. Connect choke shaft wire and install choke control bracket. Fasten with two cap screws.

M36954 -UN-25JAN90

M98,2050K,42 -19-21OCT85

INSTALL CARBURETOR

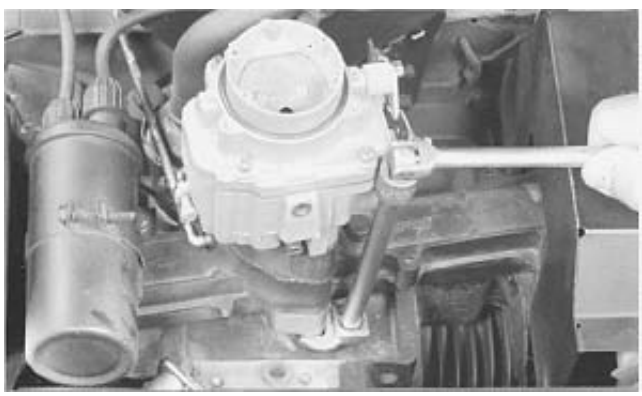
1. Put new gasket on intake manifold. Install carburetor.

M36992 -UN-25JAN90

T260 Engine

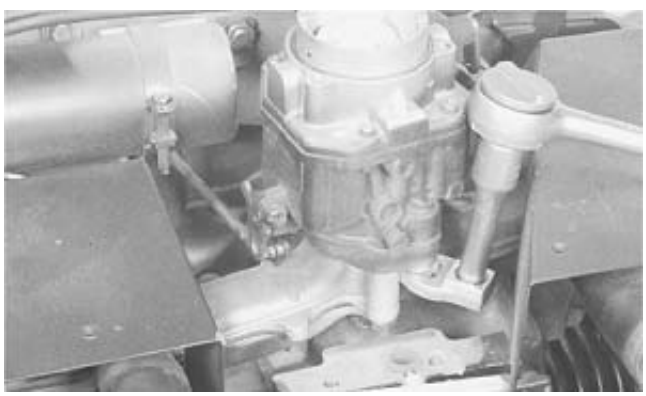
M98,2050K,43 -19-21OCT85

2. Fasten carburetor with two cap screws. Tighten with JDG-333 Crowsfoot Wrench or short handled 1/2 in. open-end wrench.



M36990 -UN-25JAN90

T260 Engine



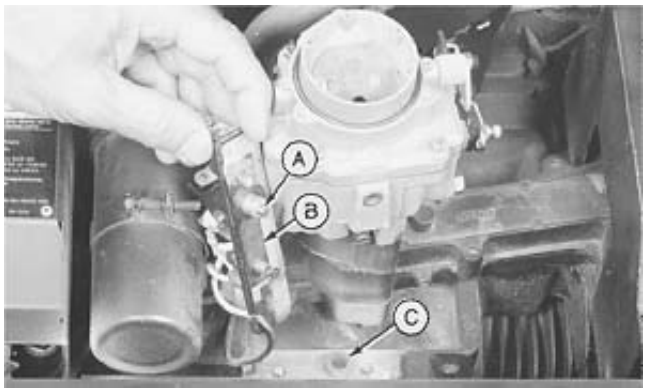
M36991 -UN-25JAN90

B43E, B43G, or B48G Engine

M98,2050K,44 -19-21OCT85

3. Be sure point plunger (A) and gasket (B) are in place. Be sure plunger hole (C) is uncovered.

4. Apply thread sealant on threads of set screws and install breaker point assembly, if equipped.



T260 Engine

M98,2050K,45 -19-11FEB87

5. Fasten point assembly, if equipped, with two set screws.

6. Check point gap. Set gap to 0.41 mm (0.016 in.).

T260 Engine (Early point assembly)

B43E, B43G, or B48G Engine (Early

M98,2050K,46 -19-11FEB87

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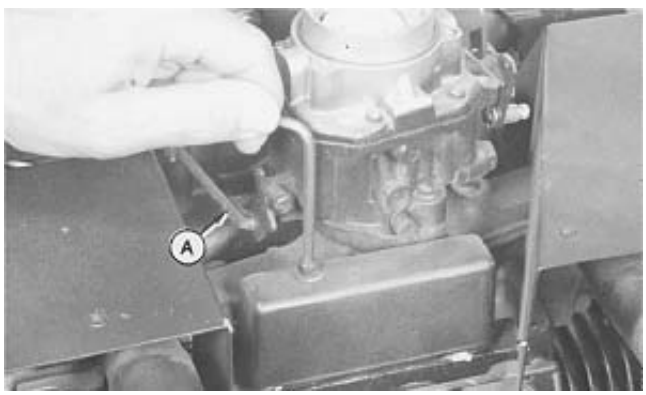
18

IMPORTANT: Be sure to position breaker point lead so cover does not pinch it. Engine will not run if cover and wire make a short circuit.

7. Install breaker point cover and tighten screw, if equipped.

8. If engine is in unit, install clip (A) and connect governor control linkage.

T260 Engine



B43E, B43G, or B48G Engine

M98,2050K,47 -19-11FEB87

9. If engine is in machine, connect and fasten fuel line to carburetor with clamp (A).

NOTE: Adjust choke properly for satisfactory engine starting and operation. The following adjustment can only be made with engine installed in machine.

10. Install choke cable in bracket and fasten with screw (B).

11. Push choke control knob (on instrument panel) in all the way.

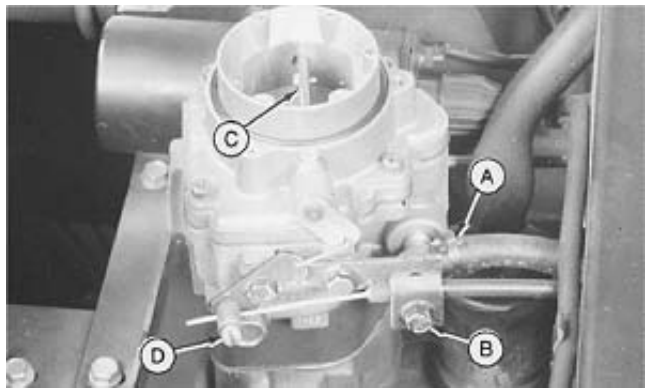
12. Hold choke valve (C) straight up and tighten screw (D).

13. Pull choke control knob out. Choke valve must be closed. Push knob in. Valve must be completely open. Adjust if needed.

14. Check that choke and throttle linkages operate freely.

15. Install air cleaner assembly. (See Install Air Cleaner in Group 05 of this manual.)

16. Adjust engine speed. (See machine technical manual.)



M36994 -UN-25JAN90

M98,2050K,48 -19-26NOV85

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20

SPECIFICATIONS

Item	Measurement	Specification
Lift Bracket Cap Screw	Torque	11 ± 3 N·m (97 ± 27 lb-in.)
B43E, B43G, B48G, T260 Engine: Flywheel Cap Screw	Torque	51 ± 3 N·m (38 ± 2 lb-ft)
P218G and P220G Engine: Flywheel Cap Screw	Torque	67—75 N·m (50—55 lb-ft)

M98,2055K,1 -19-11FEB87

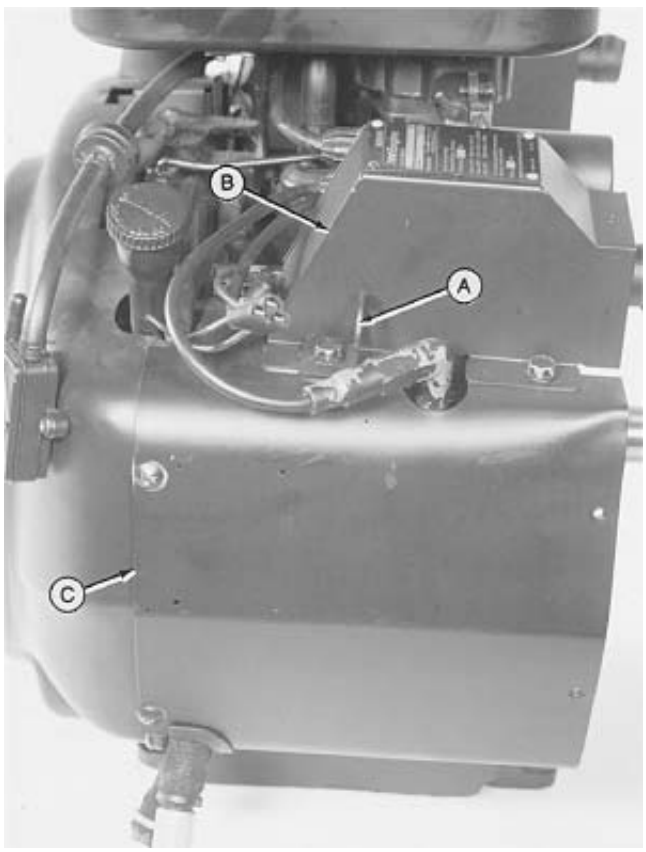
REMOVE STATOR

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire and voltage regulator leads.

3. Remove cap screws to remove lift bracket (A) and manifold cover (B).

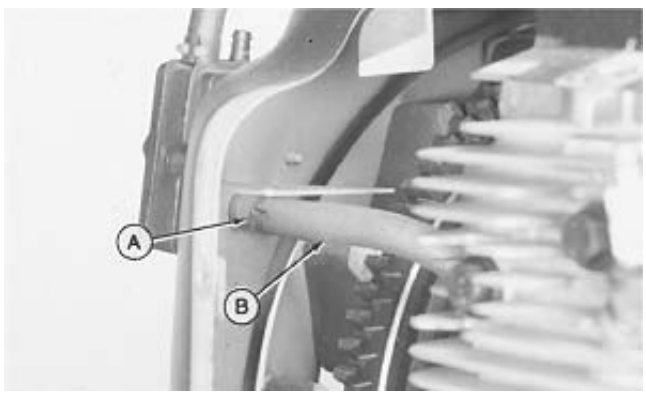
4. Remove four cap screws on T260, P218G, or P220G engine; five cap screws on B43E, B43G, B48G engine to remove side shroud (C).



-UN-29JAN90
M36445

M98,2055K,2 -19-02FEB87

5. Loosen hose clamp (A) to disconnect fuel impulse line (B).



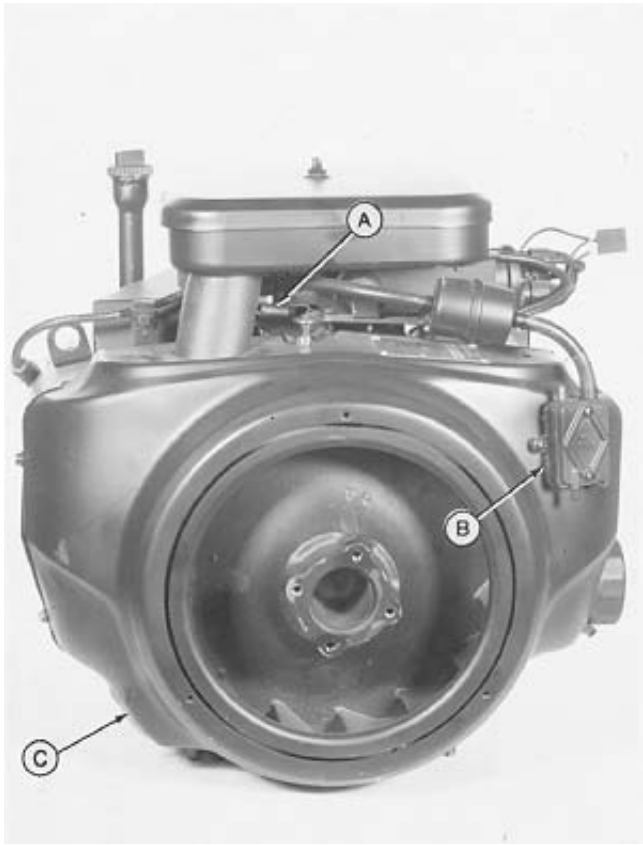
-UN-29JAN90
M36290

M98,2060K,6 -19-05NOV85

6. Disconnect governor spring (A).

7. Remove two screws to remove fuel pump (B).

8. Remove five cap screws to remove flywheel shroud (C).



M36291 -UN-29JAN90

M98,2060K,7 -19-05NOV85

IMPORTANT: Do not hold flywheel from turning with a pry bar. Doing so can damage the fins.

9. Fasten locking pliers to ring gear to prevent flywheel from turning.

CAUTION: Loosen flywheel cap screw only two turns. Do not remove cap screw. If cap screw is removed, flywheel may cause injury when it comes loose.

10. Loosen cap screw two turns only.

M36292 -UN-29JAN90

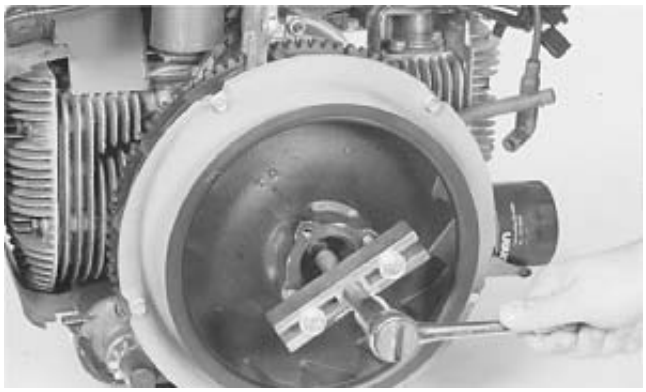
M98,2055K,3 -19-22OCT85

55
2

IMPORTANT: Do not pry on flywheel with a screwdriver. Ceramic magnets and gear case cover can be damaged.

11. Loosen flywheel using a puller.

12. Remove puller, cap screw, washer, and flywheel.

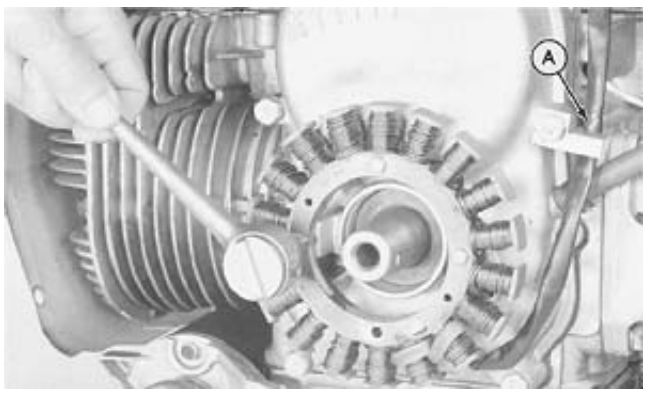


-UN-29JAN90
M36293

M98,2055K,4 -19-22OCT85

13. Disconnect stator lead from retaining clip (A).

14. Remove three cap screws. Gently pull stator off mounting posts.



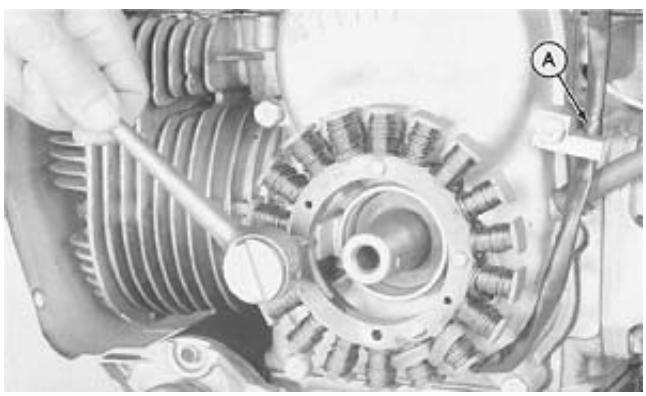
-UN-25JAN90
M37155

M98,2055K,5 -19-22OCT85

INSTALL STATOR

1. Put stator on mounting posts and fasten with three cap screws. Tighten cap screws evenly so that stator is held flat against posts.

Connect stator lead in retaining clip (A).



-UN-25JAN90
M37155

M98,2055K,6 -19-22OCT85

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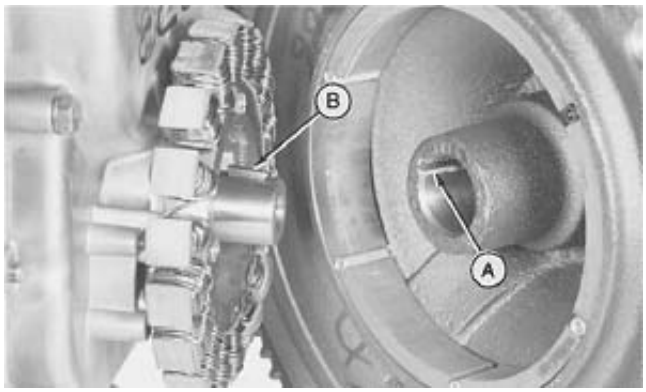
IMPORTANT: Do not lubricate crankshaft taper. The crankshaft taper must be dry to hold the flywheel tight.

2. Clean crankshaft taper before installing flywheel.

3. Apply pipe sealant on threads of flywheel cap screw.

4. Align keyway (A) in flywheel with key (B) in crankshaft and install flywheel.

5. Install washer and cap screw.



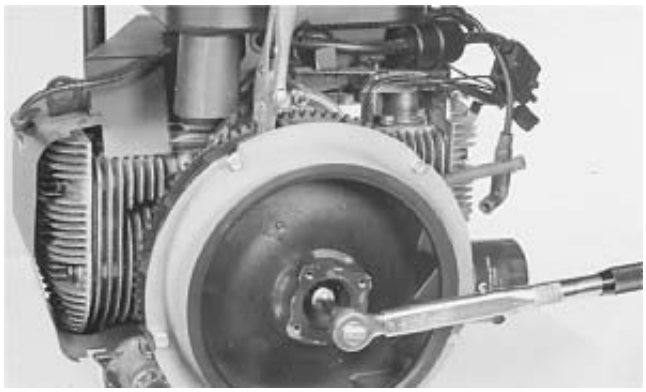
-UN-29JAN90
M36297

IMPORTANT: Do not hold flywheel from turning with a pry bar in the fins. Doing so may damage the fins.

6. Fasten locking pliers to ring gear to prevent flywheel from turning.

7. On B43E, B43G, B48G, T260 engines, tighten cap screw to 51 ± 3 N·m (38 ± 2 lb-ft).

On P218G and P220G engine, tighten cap screw to 67—75 N·m (50—55 lb-ft).



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M36298

M98,2060K,73 -19-11FEB87

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8. Install flywheel shroud (C). Fasten with five cap screws.

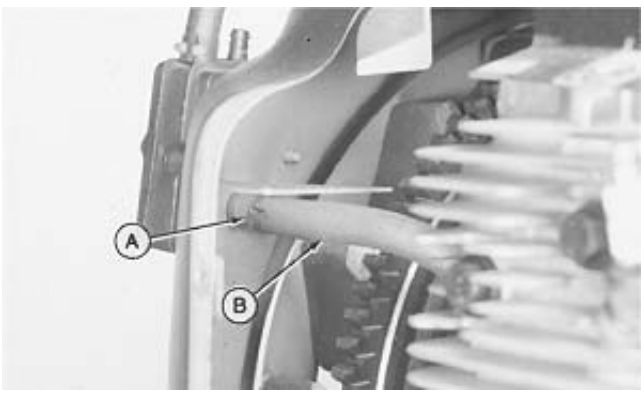
9. Install fuel pump (B). Fasten with two screws.

10. Connect governor spring (A) in top hole of arm.

-UN-29JAN90
M36291

M98,2055K,7 -19-26NOV85

11. Connect fuel pump impulse line (B) and fasten with hose clamp (A).



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M36290

M98,2055K,8 -19-22OCT85

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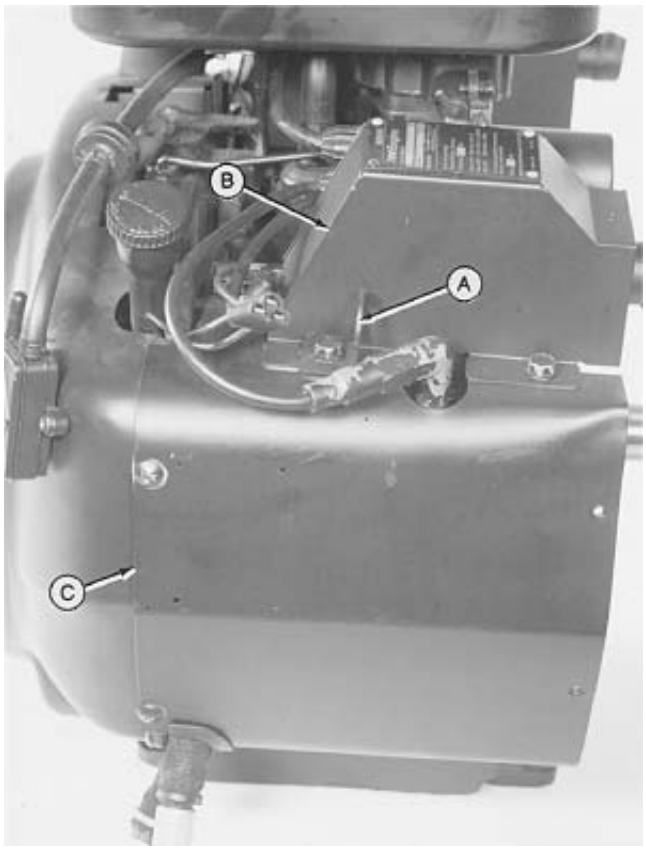
12. Install side shroud (C). Fasten with four cap screws on T260, P218G, and P220G engine; five cap screws on B43E, B43G, or B48G engine.

13. Install manifold cover (B) and lift bracket (A). Fasten with three cap screws on T260 engine; two cap screws on B43E, or B48G engine. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

14. Connect spark plug wire and voltage regulator leads. Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of voltage regulator.

15. Install engine. (See machine technical manual.)



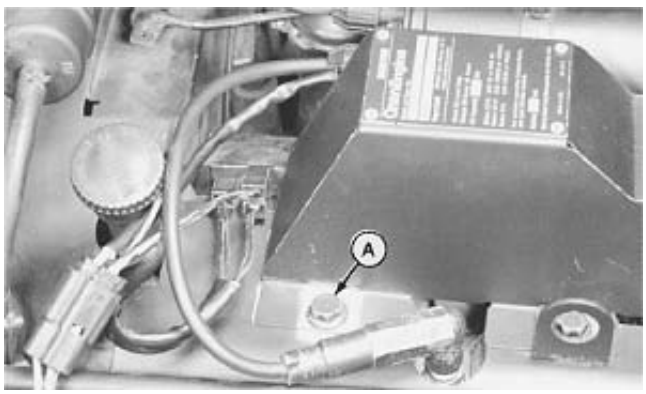
M36445 -UN-29JAN90

T260 Engine Shown

M98,2055K,9 -19-02FEB87

REPLACE RECTIFIER-REGULATOR

1. For T260 engine only, remove three cap screw (A) to remove manifold cover.



M37239 -UN-25JAN90

M98,2055K,10 -19-22OCT85

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2. Disconnect battery lead (A).

3. Disconnect two stator leads (B).

4. Remove cap screw (C).

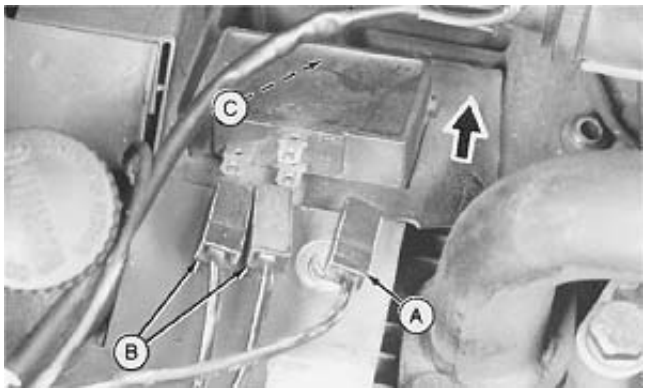
5. Push regulator toward cap screw; then lift from shroud.

6. Install new regulator and fasten with cap screw (C).

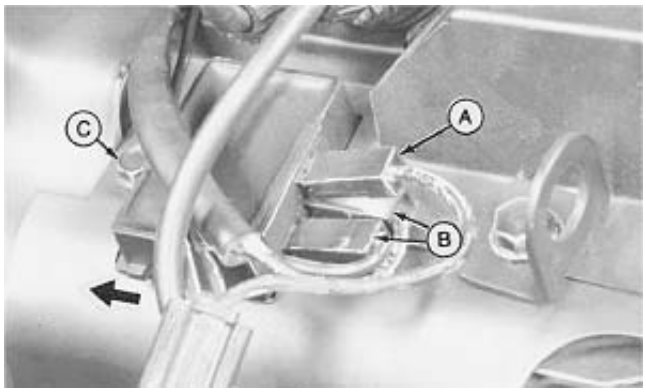
7. Connect two stator leads (B) to “AC” terminals.

8. Connect battery lead (A) to “B+” terminal.

9. For T260 engine only, install manifold cover and fasten with three cap screws. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).



T260 Engine (Top Photo)



B43E, B43G, B48G, P21G, or P220G

M98,2055K,11 -19-02FEB87

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SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
Volt-Ohm-Amp Meter	Check continuity
Armature Growler	Check starter armature
13-Ton Puller Set	Remove flywheel
Blind Hole Puller Set	Pull bushings
Dial Indicator	Check armature shaft thrust gap

M98,2060K,1 -19-05NOV85

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SPECIFICATIONS

Item	Measurement	Specification
BENDIX DRIVE STARTER		
Starter Pinion	Backlash	0.13—0.89 mm (0.005—0.035)
Brushes	Wear Length	6.35 mm (0.25 in.) minimum
Armature Lock Nut	Torque	30 ± 3 N·m (265 ± 27 lb-in.)
Battery Terminal Nut	Torque	6 ± 1 N·m (53 ± 9 lb-in.)
Negative Brush Cap Screw	Torque	4.5 ± 0.5 N·m (40 ± 4.5 lb-in.)
End Cap Thru-Bolts	Torque	7 ± 1 N·m (62 ± 9 lb-in.)
SOLENOID DRIVE STARTER		
Brushes	Wear Length	11.5 mm (0.45 in.) minimum
End Cap Thru-Bolts	Torque	5.7 ± 1.1 N·m (50 ± 10 lb-in.)
Solenoid Screws	Torque	6 ± 1 N·m (53 ± 9 lb-in.)
Armature Shaft Thrust Gap	Clearance	0.1 to 0.5 mm (0.004 to 0.020 in.)
Pinion-to-Stop Ring Gap	Clearance	0.5 to 2.0 mm (0.020 to 0.079 in.)
Starter Mounting Cap Screws	Torque	34 ± 1 N·m (300 ± 9 lb-in.)
B43E, B43G, B48G, T260 Engines: Flywheel Mounting Cap Screw	Torque	51 ± 3 N·m (38 ± 2 lb-ft)
Lift Bracket Cap Screw	Torque	11 ± 3 N·m (97 ± 27 lb-in.)

M98,2060K,2 -19-11FEB87

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SERVICE PARTS KITS

The following kits are available through your parts catalog:

Solenoid Kit

Bushing Kit

Brush Kit

Hardware Kit

Clutch Kit

Shift Lever Kit

M98,2060K,3 -19-26NOV85

REMOVE STARTER—B43E, B43G, B48G, AND T260 ENGINES

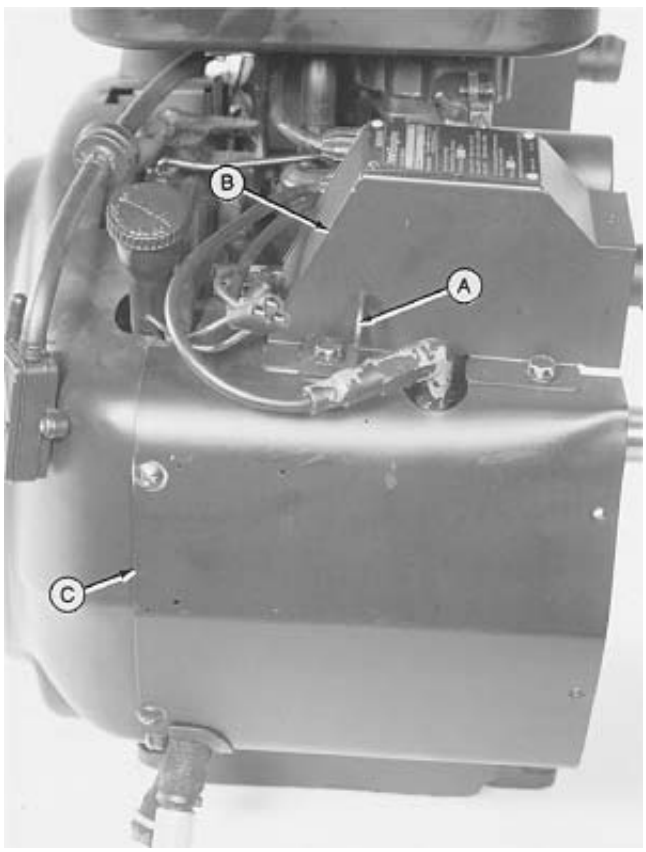
NOTE: See Starting Circuit Diagnosis in machine technical manual before removing starter.

1. Remove engine. (See machine technical manual.)

2. Disconnect spark plug wire and voltage regulator leads.

3. Remove cap screw to remove lift bracket (A) and manifold cover (B).

4. Remove four cap screws on T260 engine; five cap screws on B43E, B43G, or B48G engine, to remove side shroud (C).

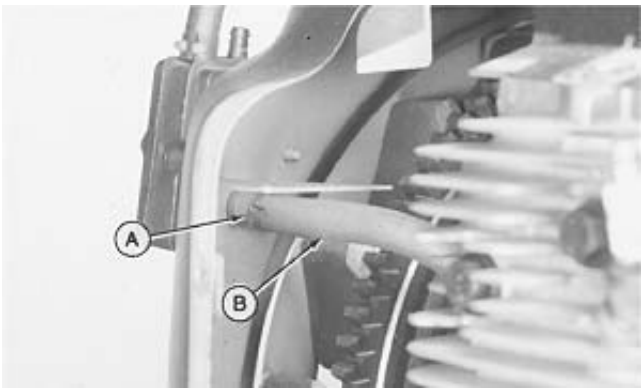


M36445 -UN-29JAN90

T260 Engine Shown

M98,2060K,4 -19-11FEB87

5. Loosen hose clamp (A) to disconnect fuel impulse line (B).



M98,2060K,6 -19-05NOV85

6. Disconnect governor spring (A).

7. Remove two screws to remove fuel pump (B).

8. Remove five cap screws to remove flywheel shroud (C).

M98,2060K,7 -19-05NOV85

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NOTE: Measure starter pinion gear backlash to check for wear.

9. Pull starter pinion gear outward until teeth contact flywheel ring gear. Measure starter pinion gear backlash.

STARTER PINION SPECIFICATIONS

Item	New Part
Backlash	0.13—0.89 (0.005—0.035 in.)

If backlash exceeds 0.89 mm (0.035 in.), replace starter pinion.

M98,2060K,8 -19-05NOV85

IMPORTANT: Do not hold flywheel from turning with a pry bar. Doing so can damage the fins.

10. Fasten locking pliers to ring gear to prevent flywheel from turning.

CAUTION: Loosen flywheel cap screw only two turns. Do not remove cap screw. If cap screw is removed, flywheel may cause injury when it comes loose.

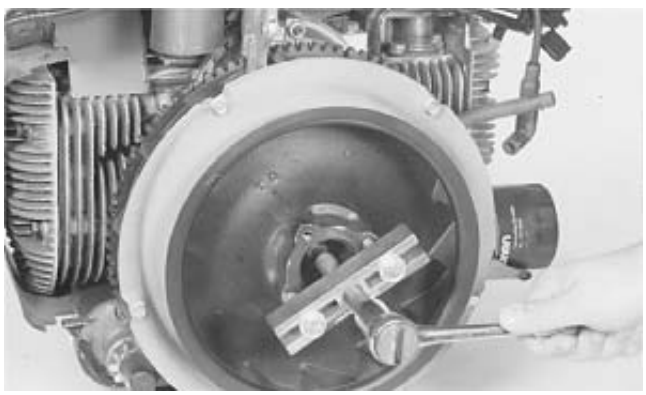
11. Loosen cap screw two turns only.

M98,2060K,9 -19-05NOV85

IMPORTANT: Do not pry on flywheel with a screwdriver. Ceramic magnets and gear case cover can be damaged.

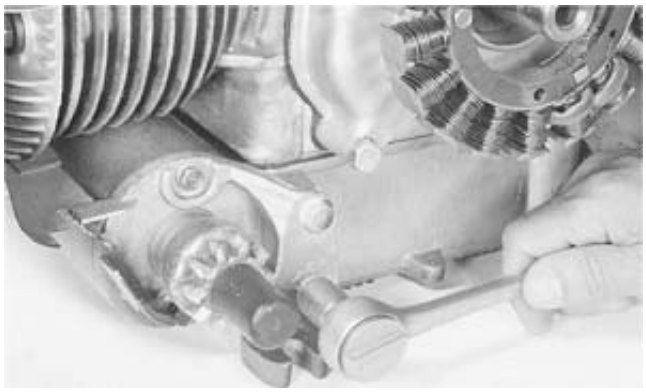
12. Loosen flywheel using a puller.

13. Remove puller, cap screw, washer, and flywheel.



M98,2060K,10 -19-05NOV85

14. Remove two cap screws. Remove starter.



Bendix Drive Starter Shown

M98,2060K,11 -19-05NOV85

REMOVE STARTER—P218G AND P220G ENGINES

NOTE: See Starting Circuit Diagnosis in machine technical manual before removing starter.

1. Remove engine. (See machine technical manual.)

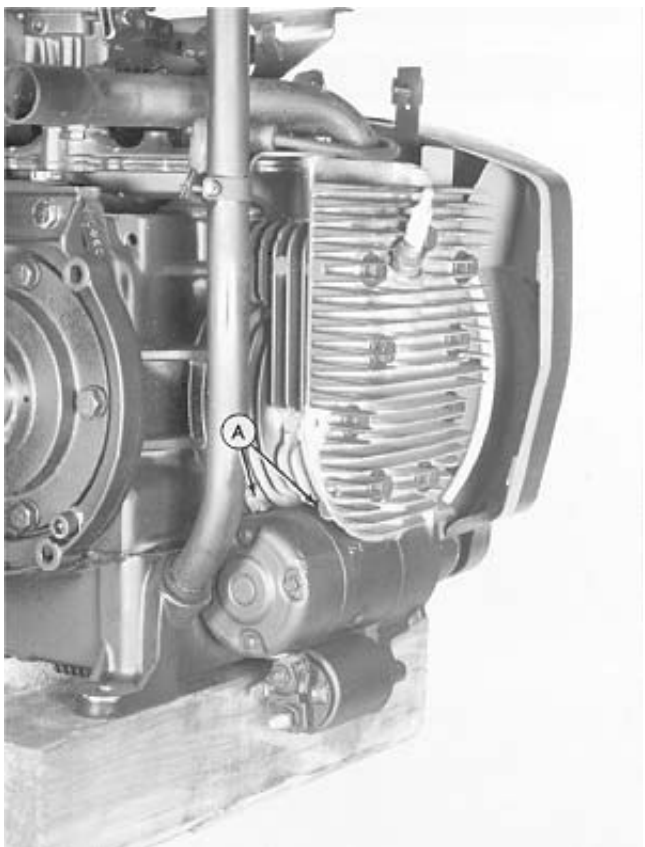
2. Disconnect spark plug wire.

3. Remove cap screw to remove lift bracket and manifold cover.

4. Remove cap screws to remove side shroud.

5. Remove cap screws from flywheel shroud. Move flywheel shroud just far enough to remove starter.

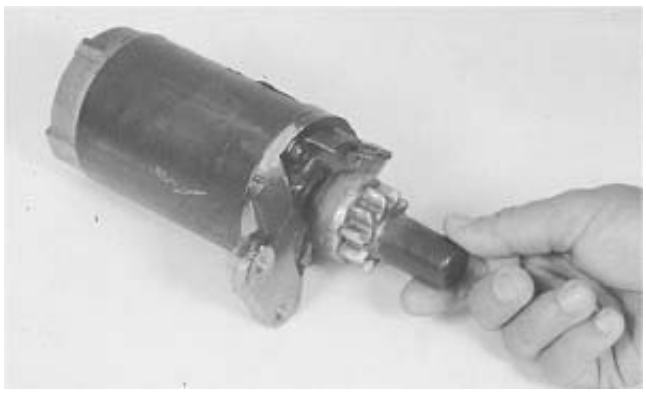
6. Remove two cap screws (A) to remove starter.



M98,2060K,11E -19-11FEB87

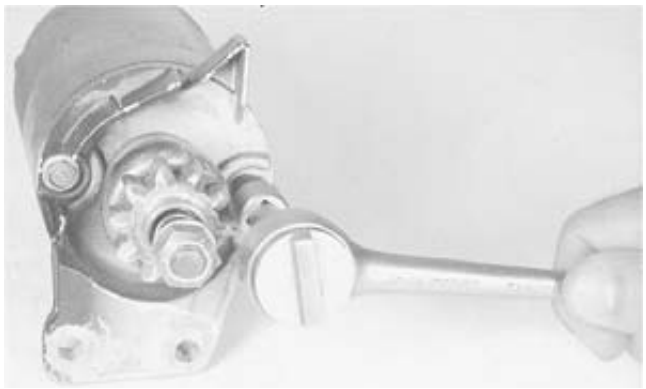
DISASSEMBLE BENDIX DRIVE STARTER

1. Remove rubber dust cover.



M98,2060K,12 -19-05NOV85

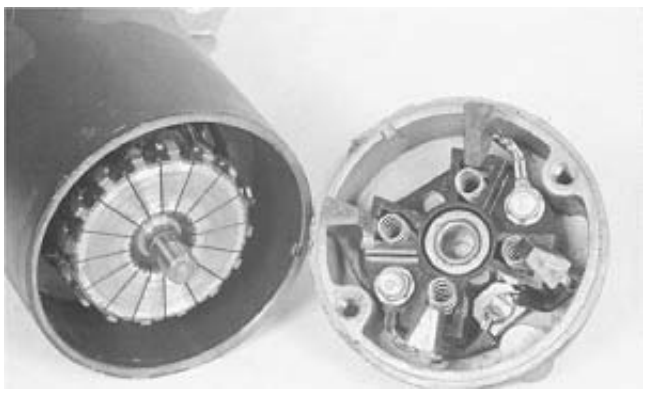
2. Remove two thru-bolts.



M98,2060K,13 -19-05NOV85

NOTE: Brush springs may snap out of the end cap when it is removed. Be careful not to lose springs.

3. Remove end cap.



M98,2060K,14 -19-05NOV85

4. Remove two cap screws to remove negative brushes.

M98,2060K,15 -19-05NOV85

5. Remove nut to remove positive side brushes.

Check all brushes for cracks or excessive wear. Replace brushes if they are worn shorter than 6.35 mm (0.25 in.).

Inspect springs. Replace springs if they are weak or broken.

Always replace springs and brushes as a set if any are defective.

M98,2060K,16 -19-05NOV85

6. Pull armature assembly out of housing.

Clean housing and magnets. Magnets must be securely glued to inside of housing and must be free of cracks.

Replace housing if magnets are loose or cracked.

M37109 -UN-25JAN90

M98,2060K,17 -19-05NOV85

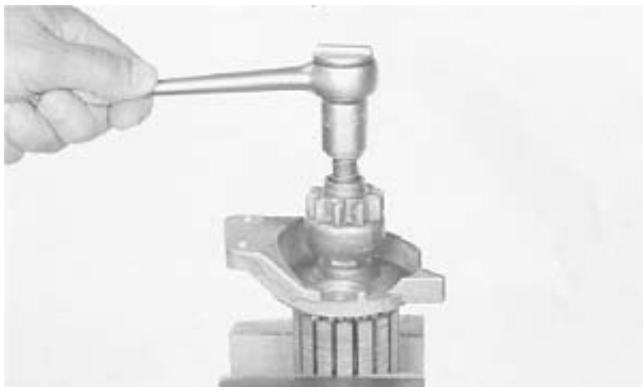
7. Hold armature in soft-jaw vise.

8. Remove lock nut and disassemble parts (I—A).

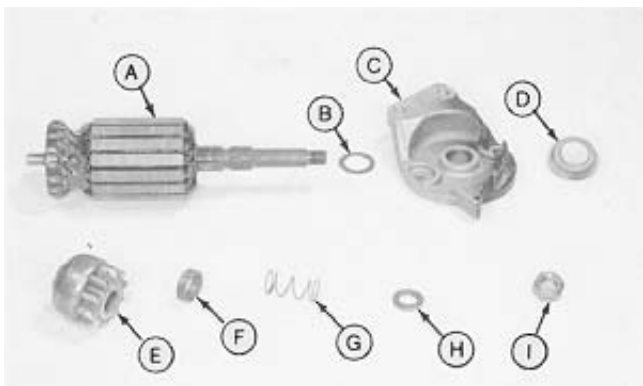
Clean and check starter drive components for wear or damage. Inspect bushing in cap (C) for wear.

Replace damaged or worn parts.

A—Armature
B—Thrust Washer
C—Cap
D—Seal
E—Drive Pinion
F—Spacer
G—Spring
H—Washer
I—Lock Nut



M37110 -UN-25JAN90



M37111 -UN-25JAN90

M98,2060K,18 -19-05NOV85

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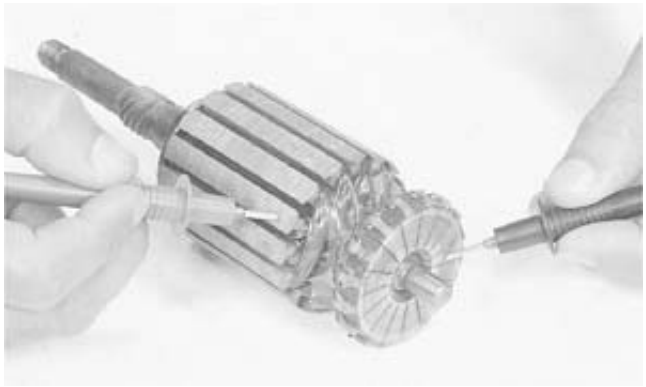
IMPORTANT: Do not clean armature with solvent. Solvent can damage insulation on windings. Use only mineral spirits and a brush.

9. Inspect commutator. Look for roughness, burned bars, or any material which might cause short circuits between bars. If necessary, clean and touch up with 400 grit sandpaper. NEVER use emery cloth. Clean all dust from armature when finished.

10. Test for grounded windings using an ohmmeter or test light.

Touch probes on commutator and armature core. Armature windings are connected in series, so only one commutator bar needs to be checked.

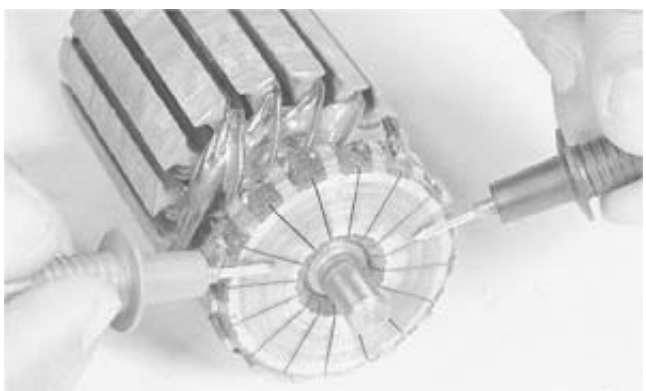
If test shows continuity, a winding is grounded and the armature must be replaced.



M98,2060K,19 -19-05NOV85

11. Test for open circuited windings using an ohmmeter or test light.

Touch probes on two different commutator bars. If test shows no continuity, there is an open circuit and the armature must be replaced.



M98,2060K,20 -19-05NOV85

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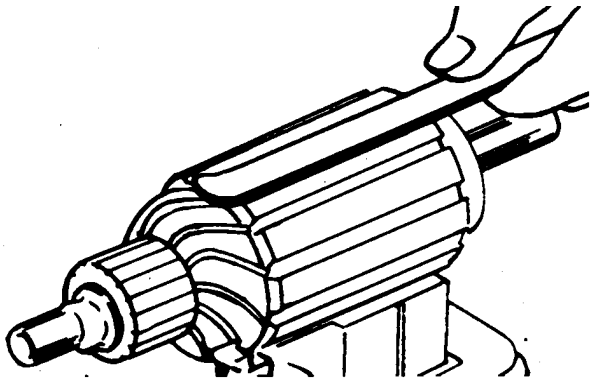
12. Test for short circuited windings using a growler. Put armature in growler and hold a hacksaw blade above each slot while slowly rotating armature.

If coil is shorted, the blade will vibrate on the slot.

NOTE: A short circuit most often occurs because of copper dust or filings between two commutator segments.

13. If test indicates short circuited windings, clean the commutator of dust and filings. Check the armature again. If the test still indicates a short circuit, replace the armature.

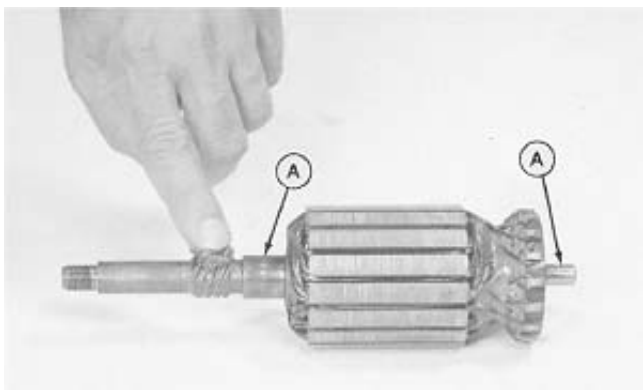


M98,2060K,21 -19-05NOV85

ASSEMBLE BENDIX DRIVE STARTER

1. Apply a generous film of silicone base grease, such as GE Versilube 322-L or equivalent, to the worm gear.

2. Apply a thin film of grease to bearing surfaces (A).



M98,2060K,22 -19-05NOV85

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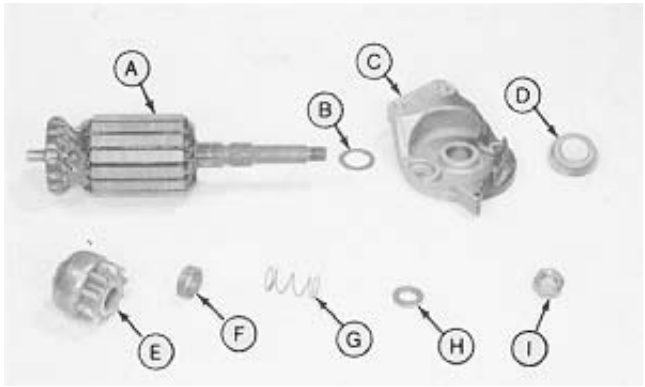
3. Assemble parts (A-I) in sequence order.

4. Hold armature in a soft-jaw vise. Tighten lock nut to 30 ± 3 N·m (265 ± 27 lb-in.).

A—Armature
B—Thrust Washer
C—Cap
D—Seal
E—Drive Pinion
F—Spacer
G—Spring
H—Washer
I—Lock Nut



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M37111

-UN-25JAN90
M37115

M98,2060K,23 -19-05NOV85

5. Put armature assembly in housing. Align notch in cap with mark on housing.

-UN-25JAN90
M37109

M98,2060K,24 -19-05NOV85

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6. Install positive side brushes. Fasten with fiber washer, flat washer, lock washer, and nut.

Tighten nut to 6 ± 1 N·m (53 ± 9 lb-in.).

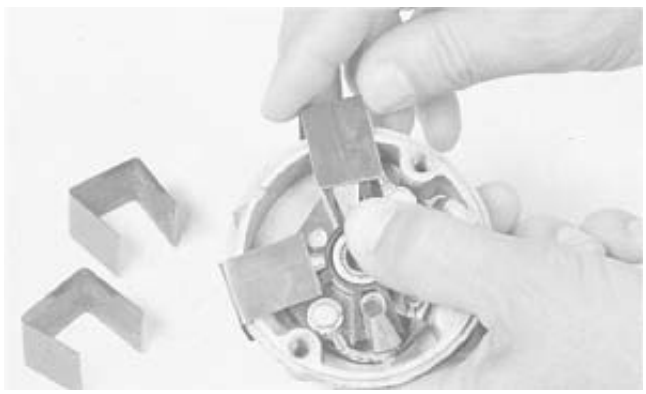
7. Install negative brushes. Fasten with cap screws and tighten to 4.5 ± 0.5 N·m (40 ± 4.5 lb-in.).

8. Install springs.

M98,2060K,25 -19-05NOV85

9. To make temporary brush holders, cut steel banding into four pieces, 76mm (3 in.) long. Bend flanges 25 mm (1 in.) long as shown.

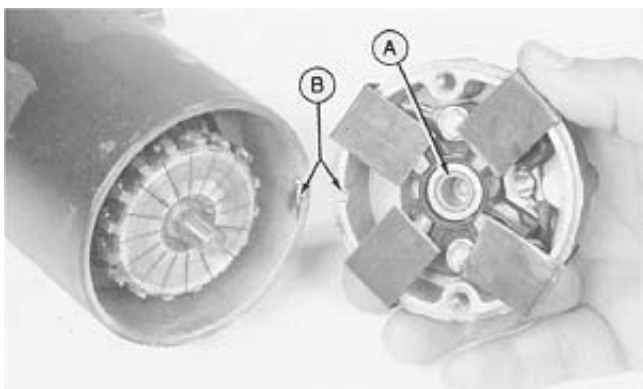
10. Push brushes down on the springs and hold them in place with the four brush holders. Make sure that chamfered side of brush is up and that the wires do not rub against the commutator or end cap.



M98,2060K,26 -19-05NOV85

11. Apply a light film of grease to bushing (A).

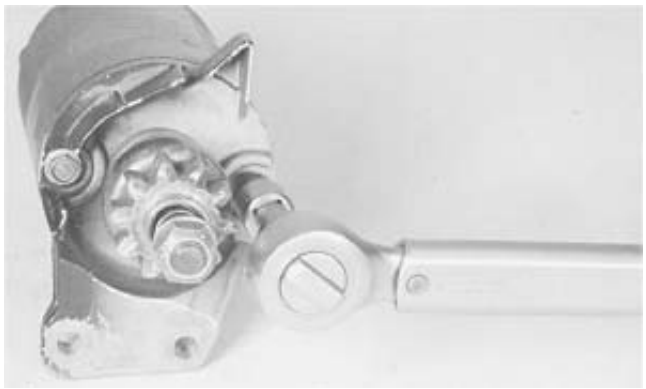
12. Align tab and notch (B); then install end cap on starter.



M98,2060K,27 -19-05NOV85

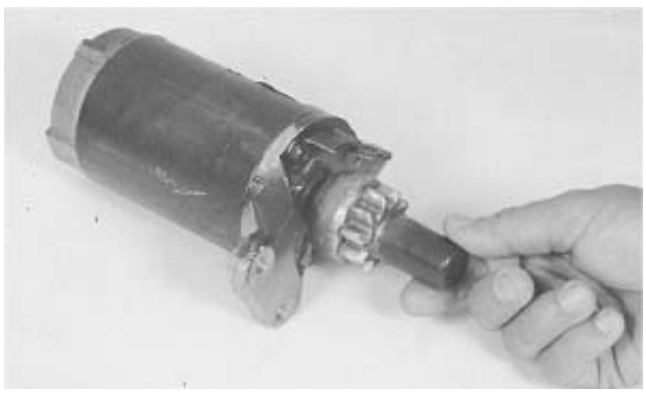
13. Hold end cap in place and remove four temporary brush holding clips.

14. Be sure notches on both end caps are aligned with tabs on housing; then fasten with two thru-bolts. Tighten bolts to 7 ± 1 N·m (62 ± 9 lb-in.).



M98,2060K,28 -19-05NOV85

15. Install rubber dust cover.



M98,2060K,29 -19-05NOV85

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13

BENCH TEST SOLENOID DRIVE STARTER

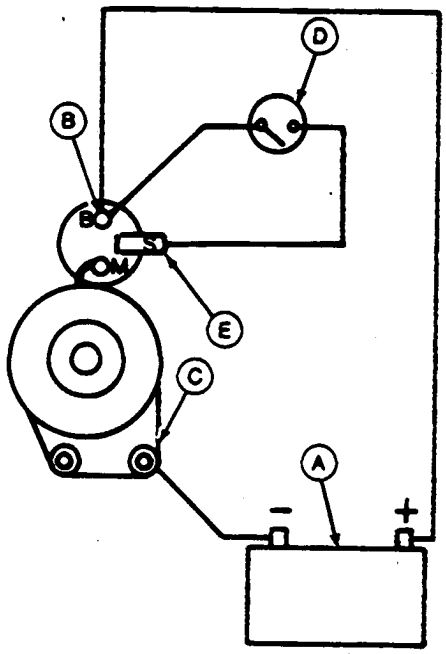
NOTE: Perform bench test before disassembling the starter motor to determine the cause of the problem.

IMPORTANT: Never operate motor longer than 20 seconds. Allow at least two minutes for cooling and battery recovery before operating again. Overheating, caused by excessive operation, will seriously damage starting motor.

1. Connect a 12-volt battery (A) to starter battery terminal (B) and starter frame (C). Use heavy duty cables.

2. Connect a remote start switch (D) between switch terminal (E) and battery terminal (B).

NOTE: A short piece of wire with a small clip on the end will allow a more positive connection at the switch terminal.



M37149 -UN-29AUG88

A—12-Volt Battery
B—Battery Terminal
C—Starter Frame
D—Remote Start Switch
E—Switch Terminal

M98,2060K,30 -19-05NOV85

When switch is activated, starter should engage and run.

IF SOLENOID CHATTERS; hold-in winding is open-circuited.

IF NOTHING HAPPENS; either the solenoid pull-in winding is open-circuited or mechanical parts are sticking.

IF SOLENOID ENGAGES, BUT MOTOR DOES NOT RUN; check solenoid switch continuity, brushes, armature, and field windings.

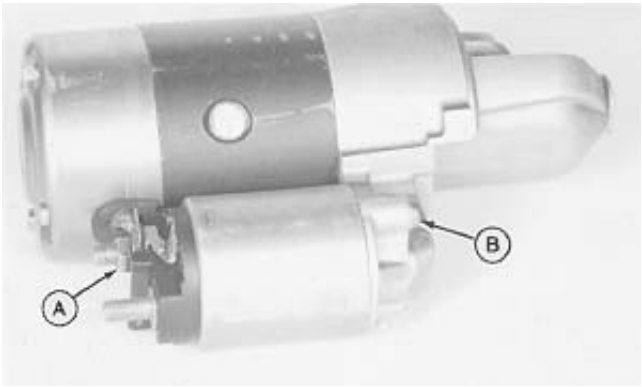
Solenoid cannot be repaired, replace it.

M98,2060K,31 -19-26NOV85

DISASSEMBLE SOLENOID DRIVE STARTER

1. Remove nut (A) to disconnect field coil lead.

2. Remove two screws (B).



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M37150

M98,2060K,32 -19-05NOV85

3. Remove solenoid switch (A), spring (B), and plunger (C).

Clean and inspect parts. Replace solenoid assembly if spring is weak or broken or if other parts are defective.

-UN-25JAN90
M37129

M98,2060K,33 -19-05NOV85

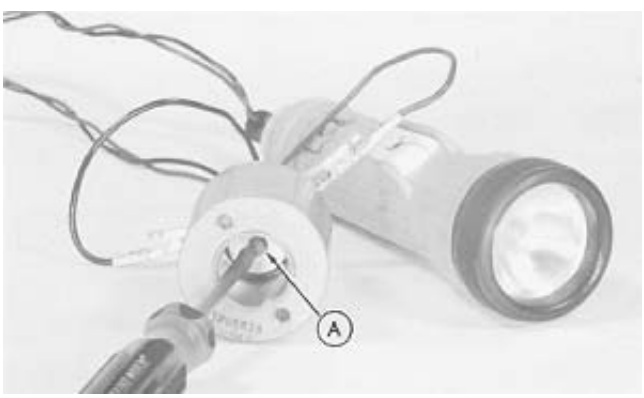
NOTE: If bench test indicated solenoid problems, use an ohmmeter or test light to check switch.

4. Touch one probe of tester to field coil terminal and other probe to battery terminal. There should be no continuity.

-UN-25JAN90
M37151

M98,2060K,34 -19-05NOV85

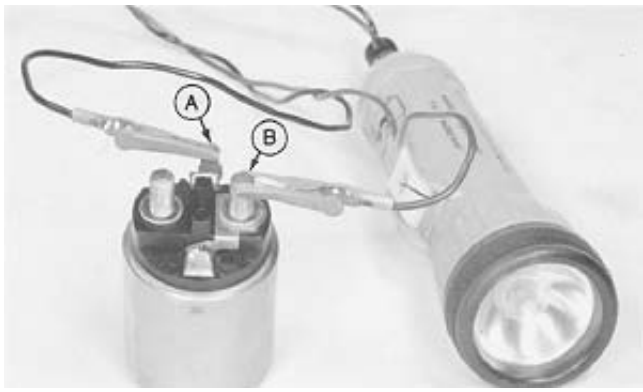
5. With tester probes still on field coil terminal and battery terminal, push spring loaded switch button (A). There should be continuity when button is pushed in all the way.



-UN-25JAN90
M37152

M98,2060K,35 -19-05NOV85

6. Test for open circuits by touching probes to switch terminal (A) and to field coil terminal (B). There should be continuity.

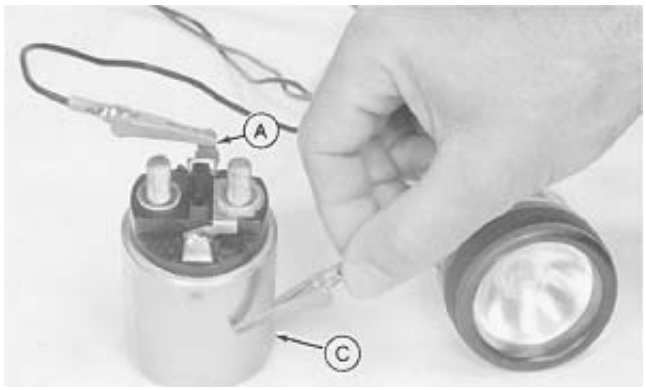


-UN-25JAN90
M37153

M98,2060K,36 -19-05NOV85

7. Touch probes to switch terminal (A) and to solenoid body (C). There should be continuity.

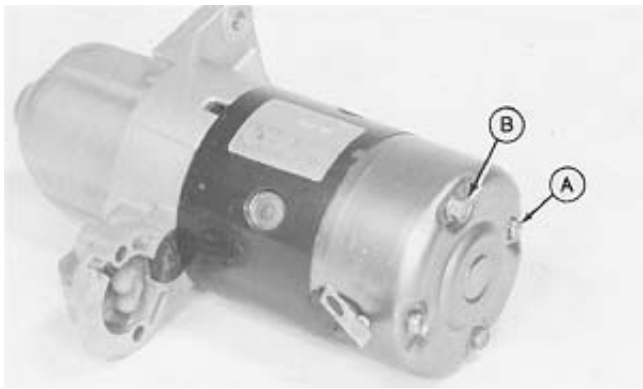
If the solenoid fails any of the tests, it is defective and must be replaced.



-UN-25JAN90
M37154

M98,2060K,37 -19-05NOV85

8. Remove two screws (A) and two thru-bolts (B).



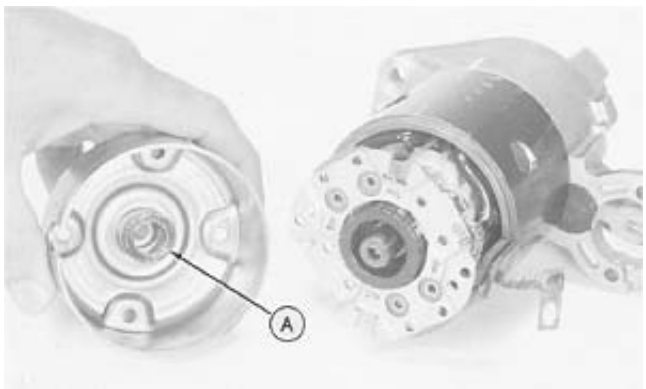
-UN-25JAN90
M37121

M98,2060K,38 -19-05NOV85

NOTE: Make a mark across front bracket, field coil, and end cap to align parts in assembly.

9. Remove end cap. Remove thrust washers (A) which may stick on end cap or around armature shaft.

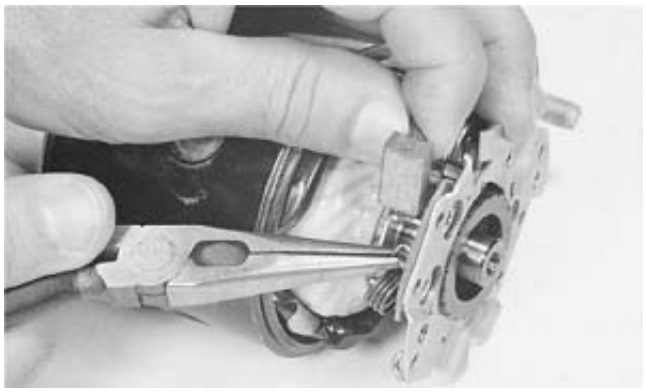
Inspect bushing in end cap for excessive wear. Replace end cap assembly if cap is bent or deformed, or if bushing is worn.



-UN-25JAN90
M37122

M98,2060K,39 -19-05NOV85

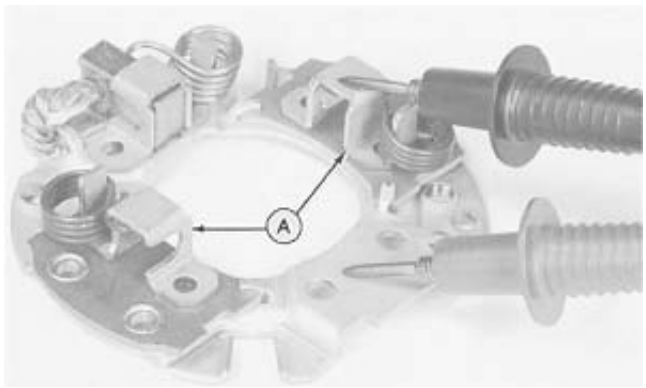
10. Pull springs back to remove two field coil brushes from brush holder. Remove brush holder.



M37123 -UN-25JAN90

M98,2060K,40 -19-05NOV85

11. Use an ohmmeter or test light to check for continuity. Touch one probe of tester to brush mounting plate and other probe to each of the field coil brush holders (A). If there is continuity, replace the brush holder assembly.

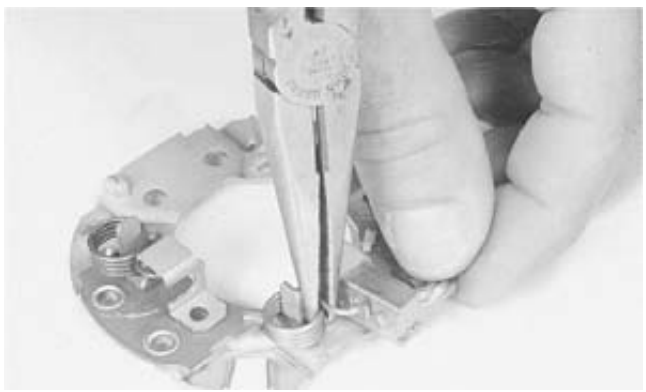


M37139 -UN-29JAN90

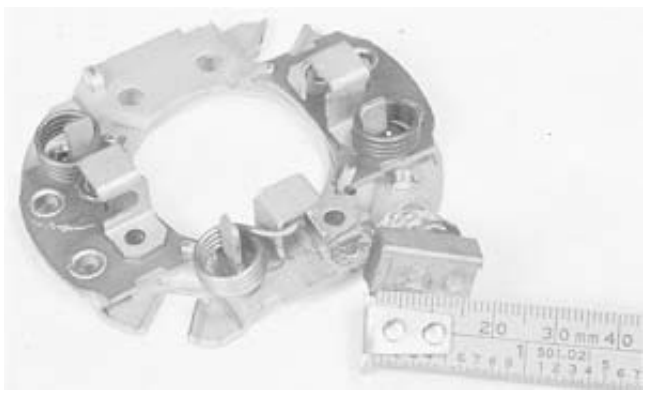
M98,2060K,41 -19-05NOV85

12. Pull spring back to remove negative brush.

Measure brush length. Replace brush if worn below minimum length of 11.5 mm (0.45 in.).



M37124 -UN-25JAN90



M37125 -UN-25JAN90

M98,2060K,42 -19-05NOV85

13. To replace negative brush, cut off worn brush and install new one using a soldering gun and 60-40 rosin core solder. Newly installed wire should be approximately same length as the original.

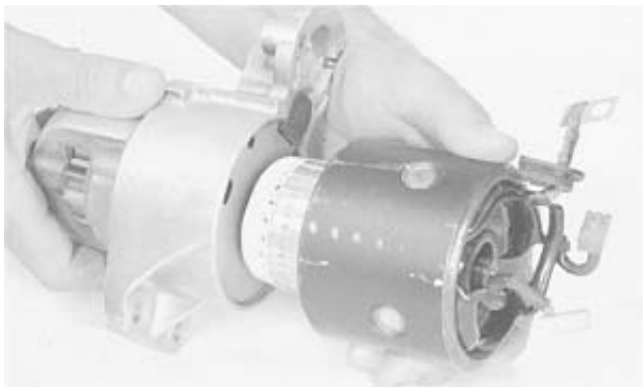
M37140 -UN-29AUG88

M98,2060K,43 -19-05NOV85

14. Remove field coil.

IMPORTANT: Do not clean starter parts with solvent. Solvent can damage insulation on windings. Use only mineral spirits and a brush or wipe clean with a cloth.

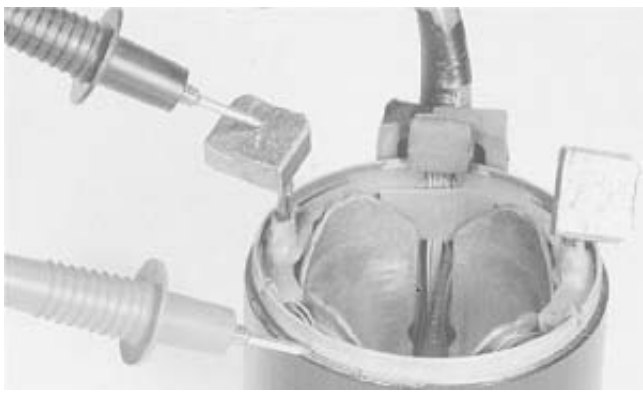
Clean and inspect field coil. Check for bare wires or broken insulation that may cause grounding.



M37126 -UN-25JAN90

M98,2060K,44 -19-05NOV85

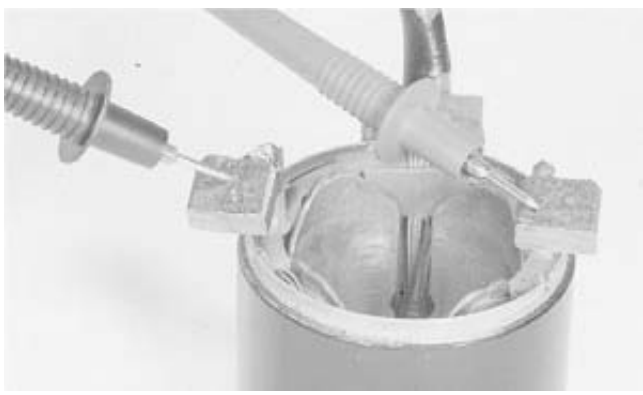
15. Test for grounded field winding using an ohmmeter or test light. Touch one probe of tester to field coil brush and other probe to field frame. Be sure the brush lead is not touching the frame. If there is continuity, the coil is grounded and the field frame assembly must be replaced.



M36757 -UN-29AUG88

M98,2060K,45 -19-05NOV85

16. Test for open field coil by touching a probe to each field coil brush. If there is no continuity, the field coil is open and the field frame assembly must be replaced.

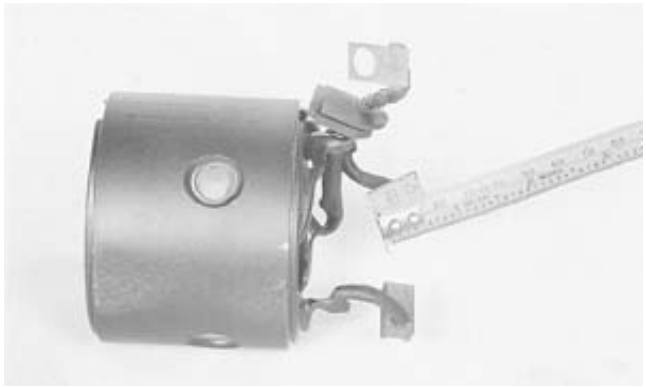


M36758 -UN-29AUG88

M98,2060K,46 -19-05NOV85

17. Check brushes for cracks or excessive wear.

Replace brushes if they are worn shorter than 11.5 mm (0.45 in.).



M37127 -UN-25JAN90

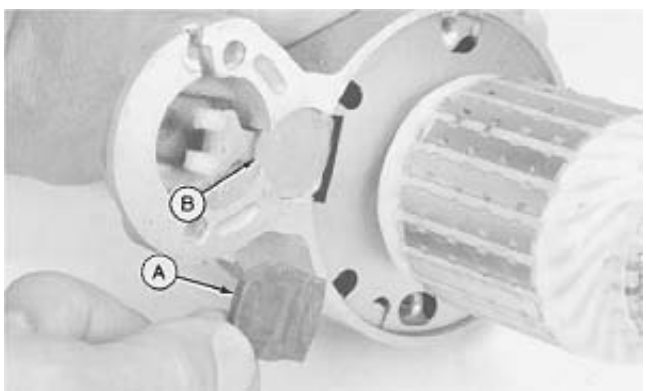
M98,2060K,47 -19-05NOV85

18. To replace brushes, melt solder from brush lead connection and install new brush. If additional solder is needed, use only 60-40 rosin core solder.

M37141 -UN-25JAN90

M98,2060K,48 -19-05NOV85

19. Remove rubber seal (A) and steel plug (B).



M37130 -UN-25JAN90

M98,2060K,49 -19-05NOV85

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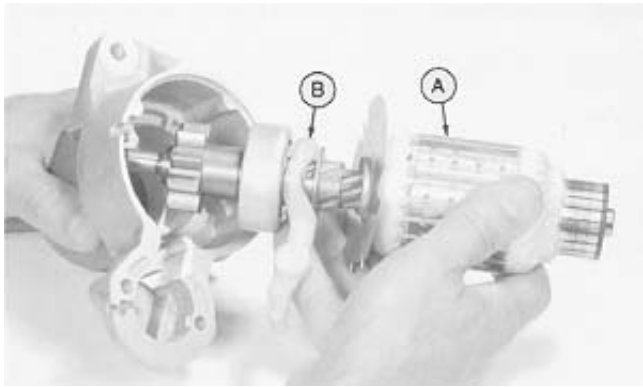
19

20. Remove armature (A) and lever (B).

Inspect armature for signs of dragging against pole shoes.

Inspect lever for cracks or excessive wear. Replace if defective.

Inspect commutator. Look for roughness, burned bars, or any material which might cause short circuits between bars. If necessary, clean and touch up with 400 sandpaper. Never use emery cloth. Clean all dust from armature when finished.



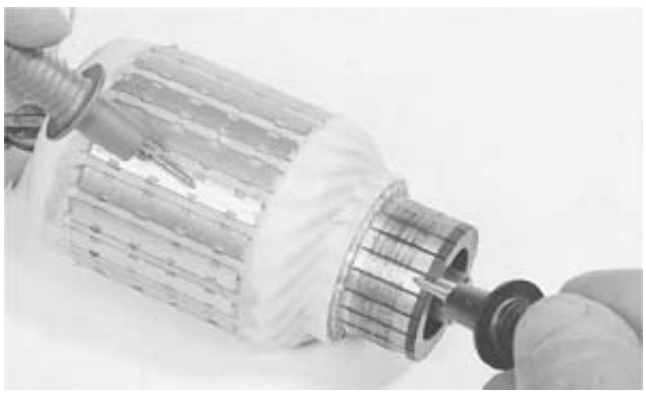
-UN-25JAN90
M37131

M98,2060K,50 -19-05NOV85

21. Test for grounded windings using an ohmmeter or test light.

Touch probes on armature core and commutator bar. Armature windings are connected in series, so only one commutator bar needs to be checked.

If test shows continuity, a winding is grounded and the armature is defective.



-UN-25JAN90
M37132

M98,2060K,51 -19-05NOV85

22. Test for open circuited windings using an ohmmeter or test light.

Touch probes on two different commutator bars. If test shows no continuity, there is an open circuit and the armature is defective.

-UN-25JAN90
M37133

M98,2060K,52 -19-05NOV85

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20

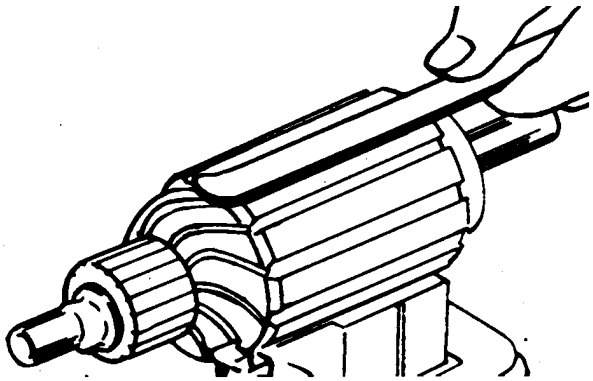
23. Test for short circuited windings using a growler. Put armature in growler and hold a hacksaw blade above each slot while slowly rotating armature.

If coil is shorted, the blade will vibrate on the slot.

NOTE: A short circuit most often occurs because of copper dust or filing between two commutator segments.

24. If test indicates short circuited windings, clean the commutator of dust and filings. Check the armature again. If the test still indicates a short circuit, the armature is defective.

The armature is not serviceable. If any of the tests indicate grounded, shorted, or open circuited windings, replace the entire starter.



M98,2060K,53 -19-05NOV85

IMPORTANT: Do not clean overrunning clutch in solvent. The clutch contains grease which would be removed.

NOTE: Check overrunning clutch before removing it from armature.

25. Turn clutch drive counterclockwise by hand. Pinion should turn freely.

26. Turn pinion clockwise. A definite resistance should be felt.

If clutch is free-wheeling in both directions, or if it shows resistance when turned counterclockwise, it is defective.

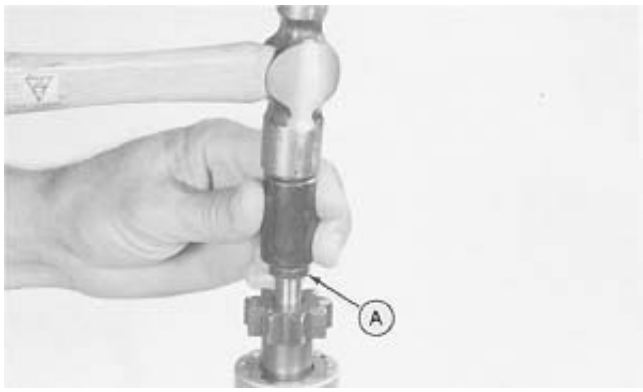
Replace overrunning clutch if it is defective or if pinion gear shows excessive wear or damage.

60
21

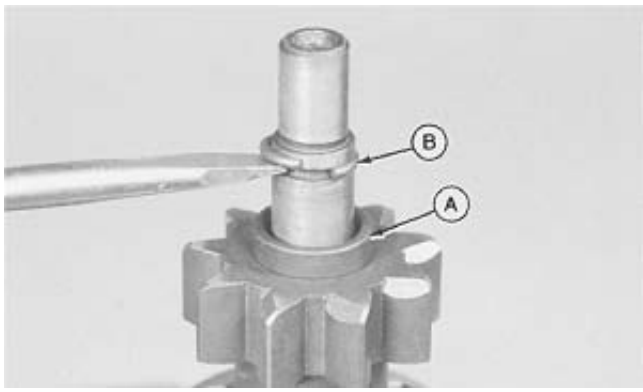
M98,2060K,54 -19-05NOV85

27. Hold armature assembly in a soft-jawed vise. Slide stop ring (A) down using a piece of pipe.

28. Push snap ring (B) from groove.



M37135 -UN-25JAN90

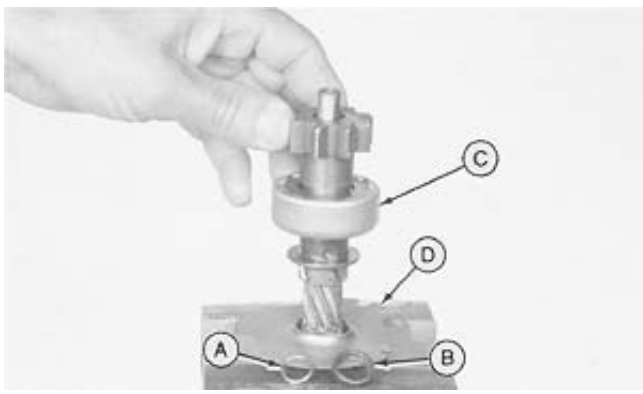


M37136 -UN-25JAN90

M98,2060K,55 -19-05NOV85

29. Remove snap ring (A), stop ring (B), overrunning clutch (C), and baffle plate (D).

A—Snap Ring
B—Stop Ring
C—Overrunning Clutch
D—Baffle Plate



M37137 -UN-25JAN90

M98,2060K,56 -19-05NOV85

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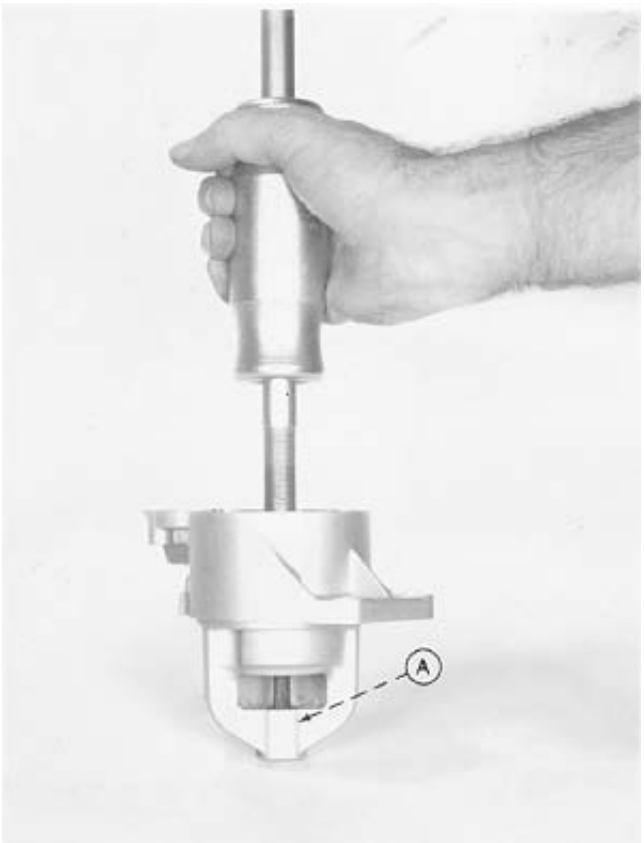
22

30. Check bushing in front frame for excessive wear.

If it is necessary to remove bushing (A), use a 3/8 in. blind-hole puller and slide hammer.

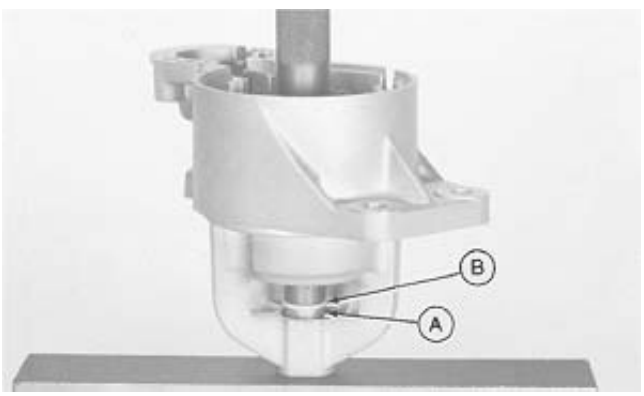
NOTE: Thrust washer will be pulled along with bushing.



M98,2060K,57 -19-05NOV85

ASSEMBLE SOLENOID DRIVE STARTER

1. If front frame bushing is being replaced, press new bushing (A) and thrust washer (B) into front frame. Use a 5/8 in. driver to install washer tight against shoulder of counterbore.



M98,2060K,58 -19-05NOV85

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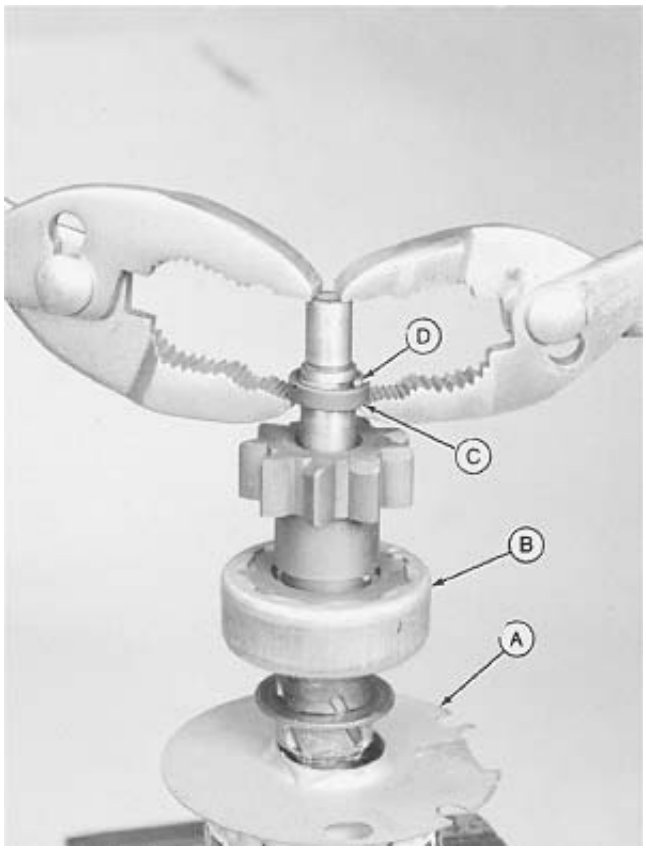
23

2. Install baffle plate (A), overrunning clutch (B), stop ring (C), and snap ring (D). Be sure flange of baffle plate (A) is pointing upward.

3. Put snap ring (D) in groove. Pull stop ring (C) over the snap ring.

A—Baffle Plate
B—Overrunning Clutch
D—Stop Ring
E—Snap Ring

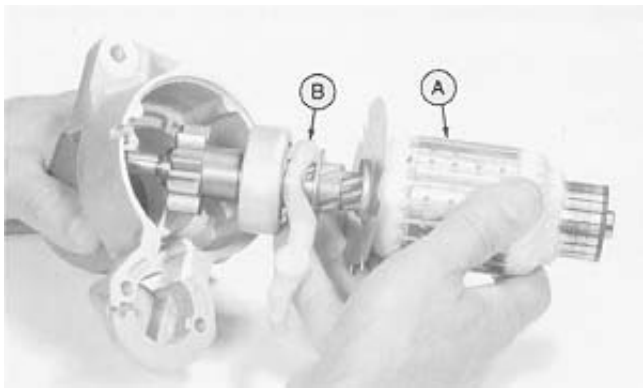


M37143 -UN-25JAN90

M98,2060K,59 -19-05NOV85

4. Apply Multemp PS No. 2 grease or equivalent to both ends of armature shaft and to the lever (B). Apply light oil to the overrunning clutch splines.

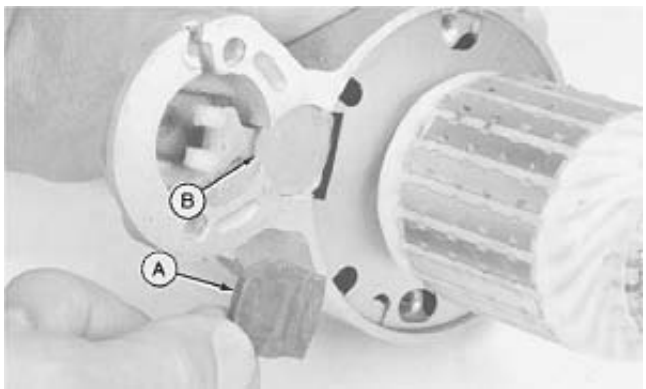
5. Install armature assembly (A) and lever (B) into front frame. Note the position of the lever.



M37131 -UN-25JAN90

M98,2060K,60 -19-05NOV85

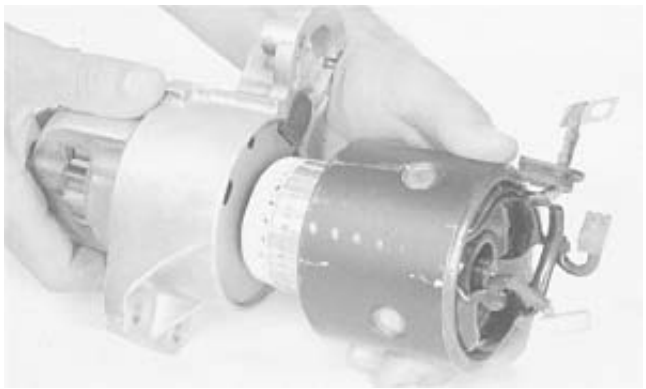
6. Install steel plug (B) and rubber seal (A).



M37130 -UN-25JAN90

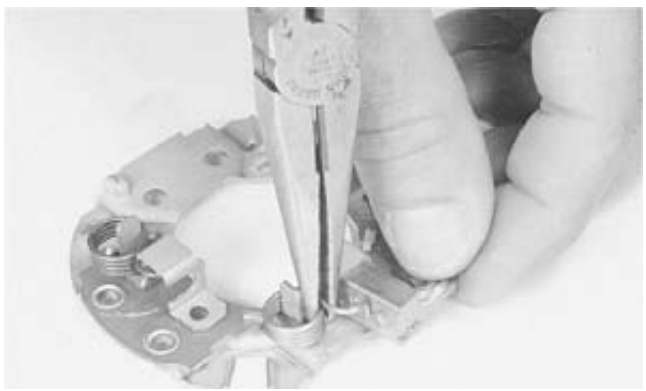
M98,2060K,61 -19-05NOV85

7. Install field coil. Be sure notch in field coil flange aligns with rubber seal.



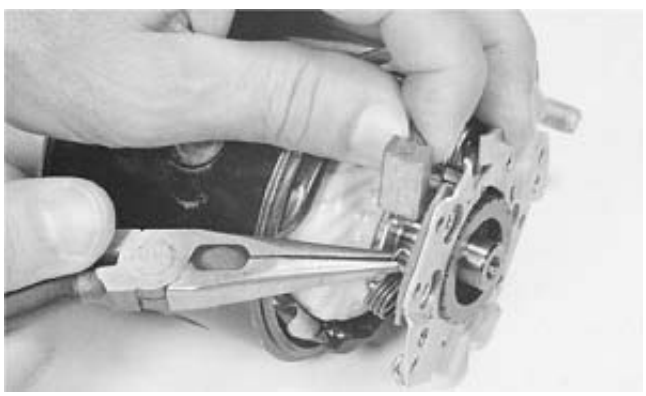
M98,2060K,62 -19-05NOV85

8. Install negative brush and hold it in place with the spring.



M98,2060K,63 -19-05NOV85

9. Put brush holder assembly on commutator and install field coil brushes. Pull springs back and push all three brushes against commutator, then release springs to hold brushes.

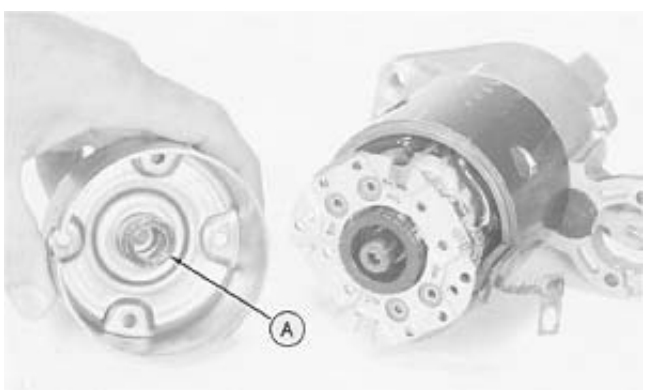


M98,2060K,64 -19-05NOV85

NOTE: Install same number of thrust washers as was removed when disassembling starter.

10. Apply grease to thrust washers (A) to hold them to end cap.

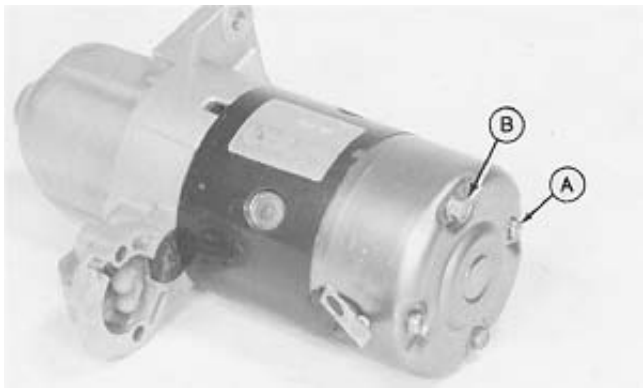
11. Install end cap. Be sure slot in end cap aligns with rubber seal.



M98,2060K,65 -19-05NOV85

12. Install two screws (A).

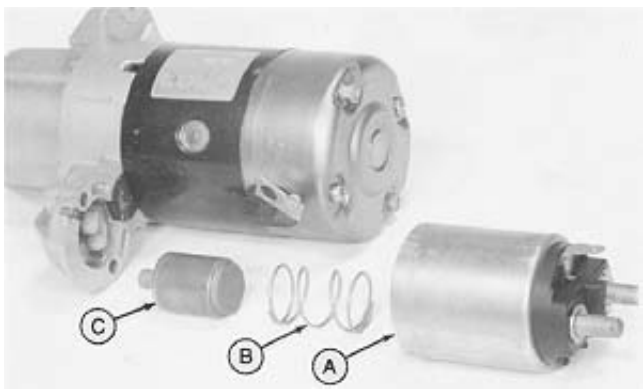
13. Install two thru-bolts (B) and tighten to 5.7 ± 1.1 N·m (50 ± 10 lb-in.).



M98,2060K,66 -19-05NOV85

14. Apply grease to the lever fork and apply light oil to the plunger (C).

15. Connect plunger (C) to lever fork and install spring (B) and solenoid switch (A). Note position of switch terminal on solenoid.



M98,2060K,67 -19-05NOV85

16. Fasten solenoid with two screws. Tighten screws to 6 ± 1 N·m (53 ± 9 lb-in.).

17. Connect field coil lead and fasten with nut (A).

M98,2060K,68 -19-05NOV85

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18. Check armature shaft thrust gap. Set dial indicator on pinion then raise the armature shaft to determine thrust gap.

SPECIFICATION

Item	Nominal Value
Armature Shaft Thrust Gap	0.1 to 0.5 mm (0.004 to 0.020 in.)

If the thrust gap is not within the nominal value limits, add or remove thrust washers shown in Step 10.

M37145 -UN-25JAN90

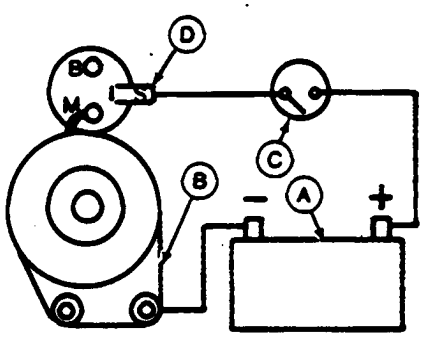
M37146 -UN-25JAN90

M98,2060K,69 -19-05NOV85

NOTE: Normally the pinion clearance will not be affected by servicing the starter unless the solenoid is replaced.

19. To check pinion clearance, connect a 12-volt battery (A) to starter frame (B). Connect a remote switch (C) between solenoid terminal (D) and battery (A). Use heavy duty cables.

A—12-Volt Battery
B—Starter Frame
C—Remote Start Switch
D—Solenoid Switch Terminal



M37147 -UN-26APR89

60
27

M98,2060K,70 -19-05NOV85

IMPORTANT: To avoid solenoid overheating, do not leave solenoid activated longer than necessary to measure clearance.

20. Close the switch to activate solenoid which will shift the pinion into cranking position. Measure clearance between the pinion and stop ring.

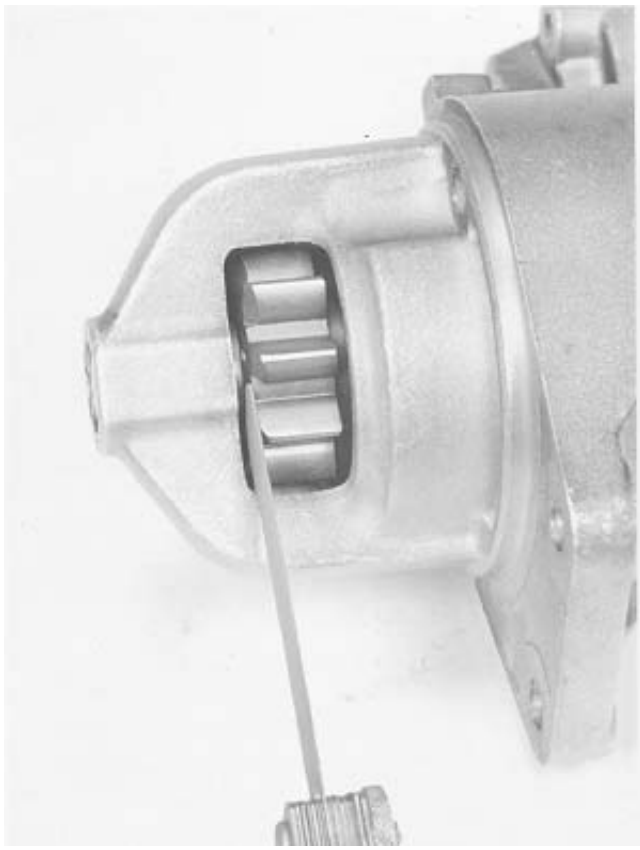
SPECIFICATION

Item	Nominal Value
Pinion-to-Stop Ring Clearance	0.5 to 2.0 mm (0.020 to 0.079 in.)

If clearance is not within the nominal value limits, add or remove shims between solenoid and front frame. See Step 15.

Adding shims provided with Solenoid Repair Kit, decreases the amount of clearance.

21. After assembly, perform bench test. (See “Bench Test Solenoid Drive Starter” in this group.)



M37148 -UN-25JAN90

M98,2060K,71 -19-05NOV85

INSTALL STARTER—P218G AND P220G ENGINES

1. Install starter. Tighten cap screws (A) to 26 N·m (230 lb-in.).

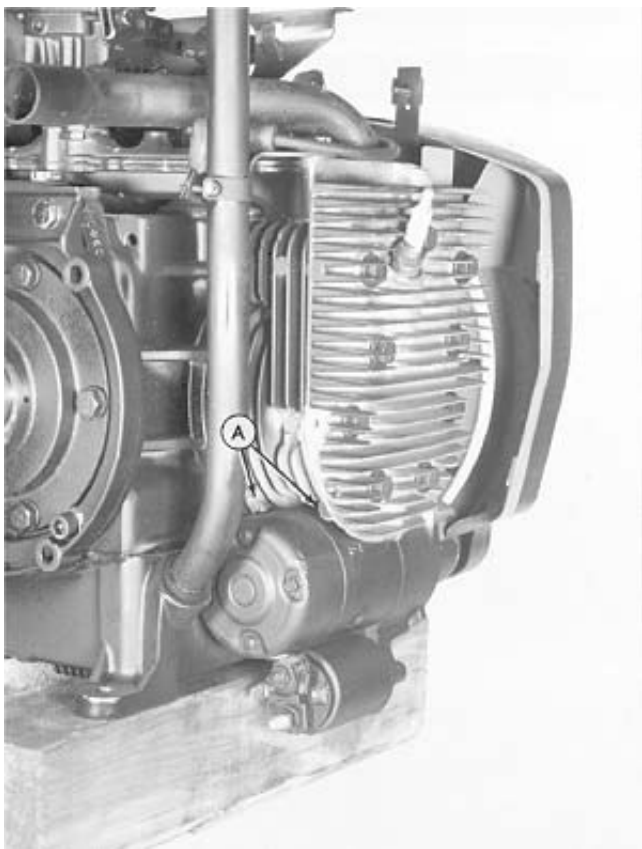
2. Align flywheel shroud and install cap screws.

3. Install side shroud and cap screws.

4. Install manifold and lift bracket. Tighten cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

5. Connect spark plug wire.

6. Install engine. (See machine technical manual.)

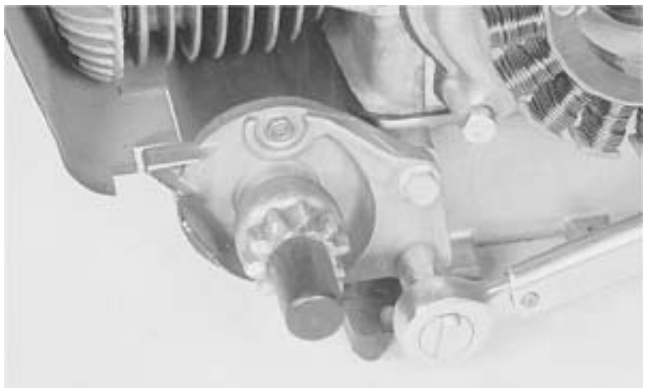


M46014 -UN-08JAN90

M98,2060K,72A -19-02FEB87

INSTALL STARTER—B43E, B43G, B48G, AND T260 ENGINES

1. Install starter. Tighten two cap screws to 34 ± 1 N·m (300 ± 9 lb-in.).



Bendix Drive Starter Shown

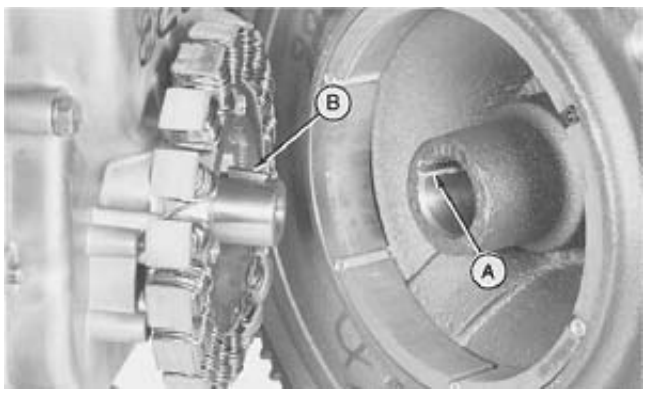
M98,2060K,72 -19-11FEB87

IMPORTANT: Do not lubricate crankshaft taper. The crankshaft taper must be dry to hold the flywheel tight.

2. Clean crankshaft taper before installing flywheel.

3. Apply pipe sealant on threads of flywheel cap screw.

4. Align keyway (A) in flywheel with key (B) in crankshaft and install flywheel.



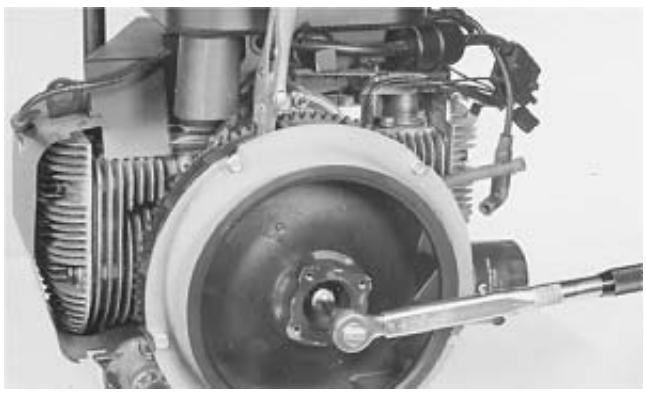
5. Install washer and cap screw.

IMPORTANT: Do not hold flywheel from turning with a pry bar in the fins. Doing so may damage the fins.

6. Fasten locking pliers to ring gear to prevent flywheel from turning.

7. On B43E, B43G, B48G, T260 engines, tighten cap screw to 51 ± 3 N·m (38 ± 2 lb-ft).

On P218G and P220G engine, tighten cap screw to 67—75 N·m (50—55 lb-ft).



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NOTE: For engines with adjustable starter bracket, measure starter pinion gear backlash using the following procedure. For all other units with non-adjustable starter bracket, go to Step 21.

8. Pull starter pinion gear outward until teeth contact flywheel ring gear. Measure starter pinion gear backlash. Backlash specification is 0.51 ± 0.38 mm (0.020 ± 0.15 in.).

If backlash is correct, go to Step 21.

9. If backlash is not correct, loosen starter cap screws (A) and move starter bracket (B) to obtain correct backlash.

Tighten starter cap screws to hold bracket in position. Check backlash again.


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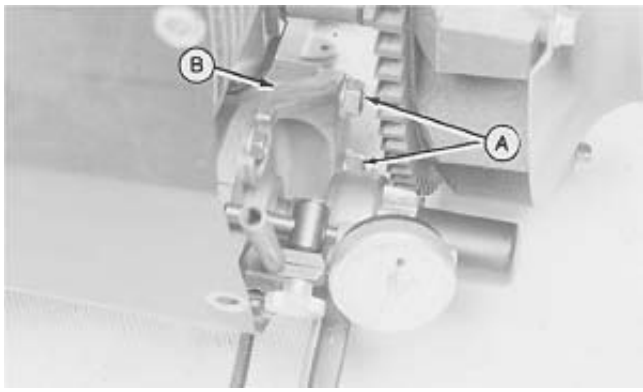

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IMPORTANT: Do not hold flywheel from turning with a pry bar. Doing so can damage the fins.

10. Fasten locking pliers to ring gear to prevent flywheel from turning.

CAUTION: Loosen flywheel cap screw only two turns. Do not remove cap screw. If cap screw is removed, flywheel may cause injury when it comes loose.

11. Loosen cap screw two turns only.


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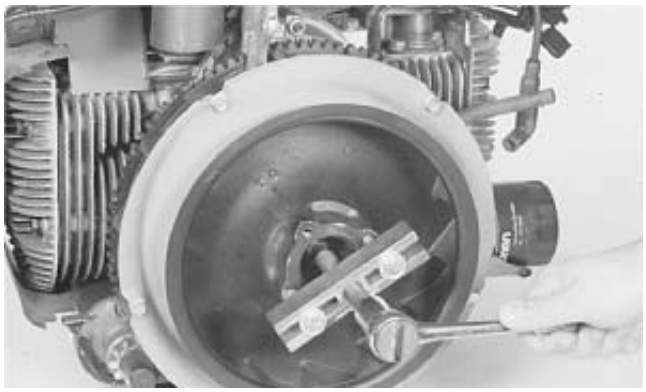
IMPORTANT: Do not pry on flywheel with a screwdriver. Ceramic magnets and gear case cover can be damaged.

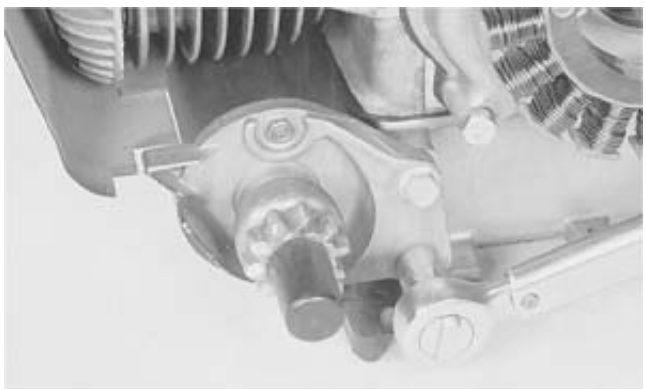
12. Loosen flywheel using a puller.

13. Remove puller, cap screw, washer, and flywheel.



M98,2060K,10 -19-05NOV85

14. Tighten starter cap screws to 34 ± 1 N·m (300 ± 9 lb-in.).



M98,2060K,79 -19-26NOV85

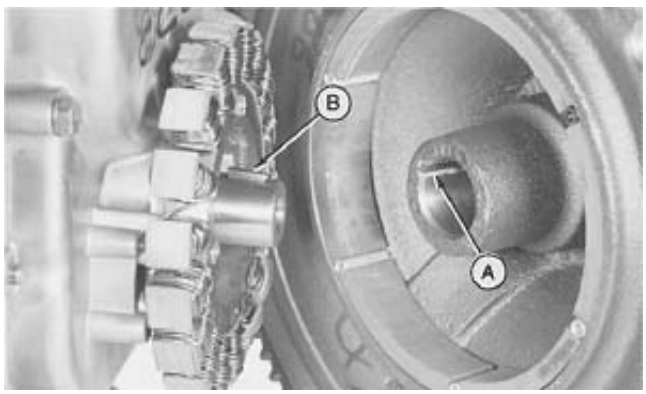
IMPORTANT: Do not lubricate crankshaft taper. The crankshaft taper must be dry to hold the flywheel tight.

15. Clean crankshaft taper before installing flywheel.

16. Apply pipe sealant on threads of flywheel cap screw.

17. Align keyway (A) in flywheel with key (B) in crankshaft and install flywheel.

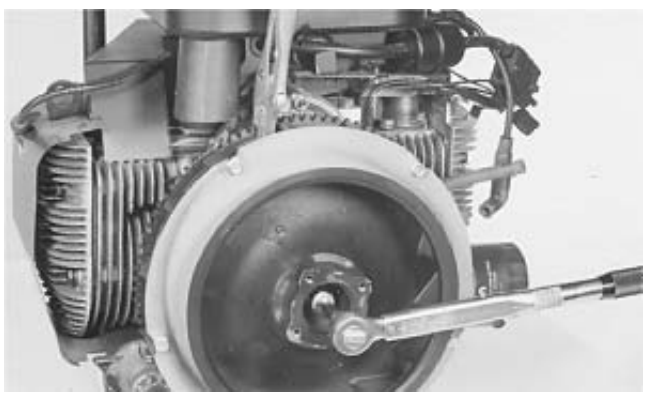
18. Install washer and cap screw.



IMPORTANT: Do not hold flywheel from turning with a prybar in the fins. Doing so may damage the fins.

19. Fasten locking pliers to ring gear to prevent flywheel from turning.

20. Tighten cap screw to 51 ± 3 N·m (38 ± 2 lb-ft).



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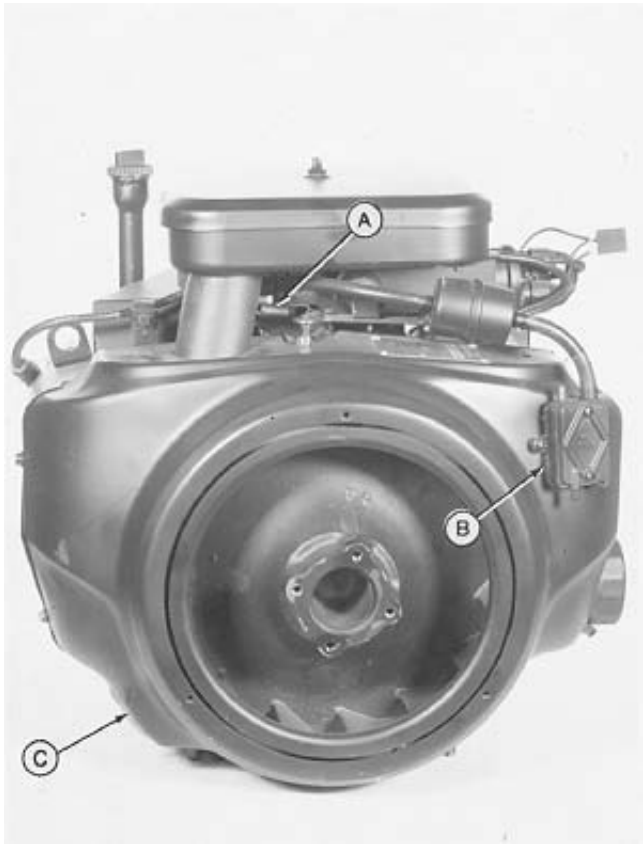
21. Install flywheel shroud (C). Fasten with five cap screws.

22. Install fuel pump (B). Fasten with two screws.

23. Connect governor spring (A) in top hole of arm.



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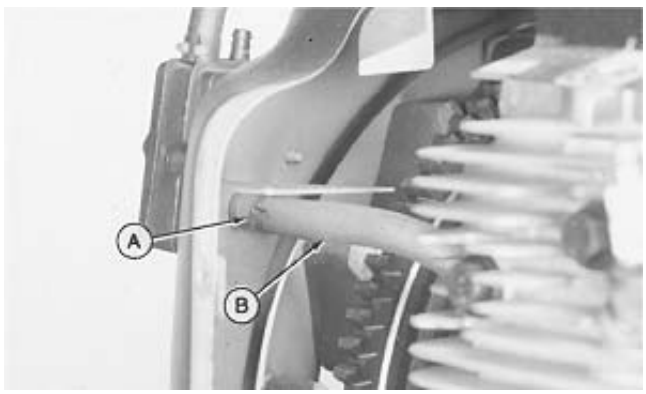
24. Connect fuel pump impulse line (B) and fasten with hose clamp (A).



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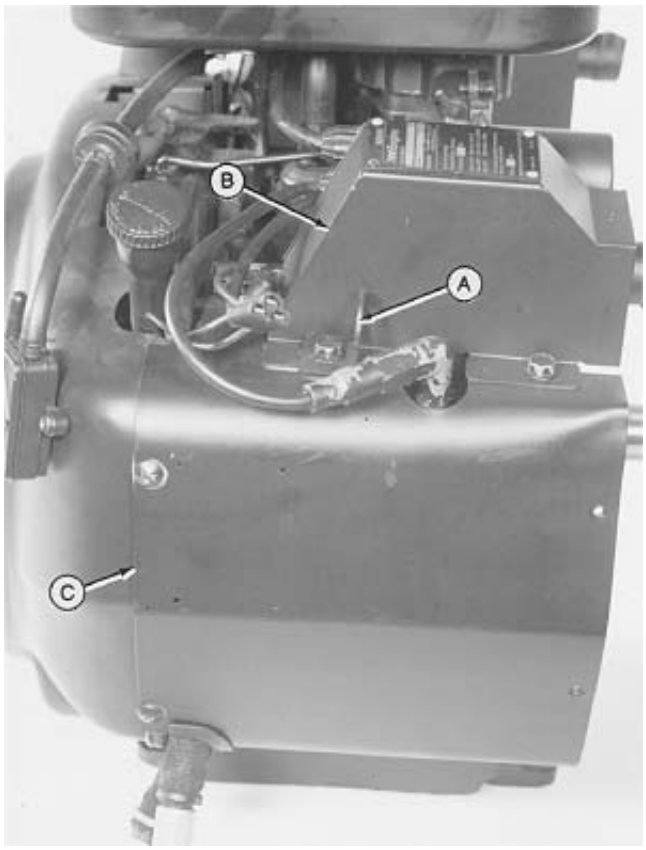
25. Install side shroud (C). Fasten with four cap screws on T260 engine; five cap screws on B43E, B43G, or B48G engine.

26. Install manifold cover (B) and lift bracket (A). Fasten with three cap screws on T260 engine; two cap screws on B43E, B43G, or B48G engine. Tighten lift bracket cap screw to 11 ± 3 N·m (97 ± 27 lb-in.).

27. Connect spark plug wire and voltage regulator leads. Install the two stator leads on “AC” terminals and the battery lead on “B+” terminal of voltage regulator.

28. Install engine. (See machine technical manual.)



T260 Engine Shown

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REPLACE BREAKER POINTS AND CONDENSER—B43E, B43G, B48G, AND T260 ENGINES

NOTE: On later engines, the condenser is located on side of air filter bracket.

1. Remove air cleaner assembly. (See Remove Air Cleaner in Group 05 in this manual.)

2. Remove breaker point cover.

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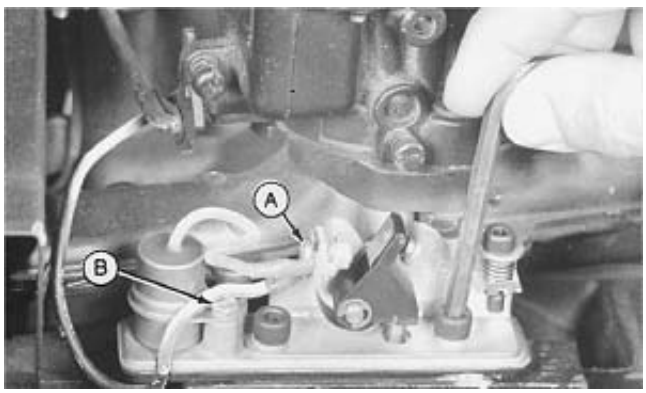
3. Remove two set screws to remove breaker points.

4. Loosen screw (A) to disconnect coil and condenser leads.

5. Remove screw (B) to remove condenser.

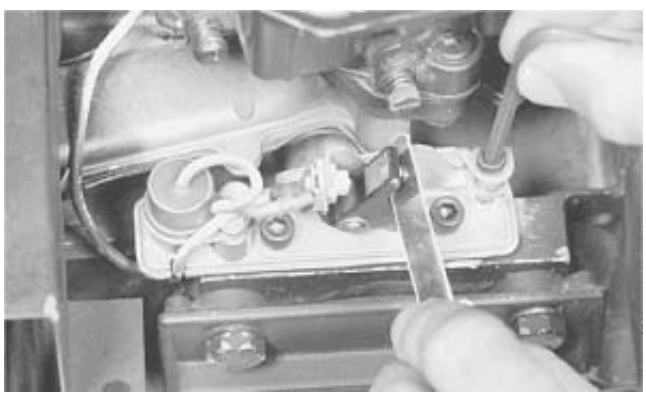
6. Install new condenser and point assembly. Apply thread sealant on threads of set screws and fasten breaker points.



Early Point Assembly Shown

M98,2065K,2 -19-05NOV85

7. Check breaker point gap. Turn engine flywheel until points are at their widest gap. Adjust gap to 0.41 mm (0.016 in.) using a flat feeler gauge.



M98,2065K,3 -19-05NOV85

8. Be sure coil lead wire is in notch in the base; then install breaker point cover. Tighten cover set screw snug only so cover is not crushed or deformed.

9. Install air cleaner assembly. (See Install Air Cleaner in Group 05 in this manual.)

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REPLACE IGNITION COIL—B43E, B43G, B48G, AND T260 ENGINES

1. Remove air cleaner assembly. (See Remove Air Cleaner in Group 05 in this manual.)

2. Disconnect spark plug wires (A).

3. Loosen screw (B) to remove coil.

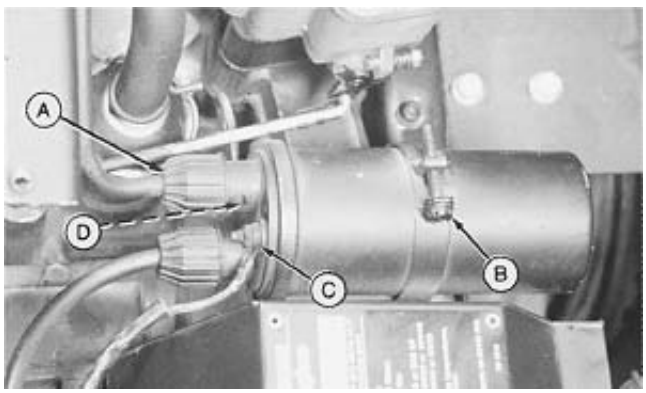
4. Remove wires (C) and (D).

5. To install coil, fasten breaker point lead to negative (-) terminal (D) and ignition switch lead to positive (+) terminal (C).

6. Install coil and fasten with screw clamp (B).

7. Connect spark plug wires (A).

8. Install air cleaner assembly. (See Install Air Cleaner in Group 05 in this manual.)



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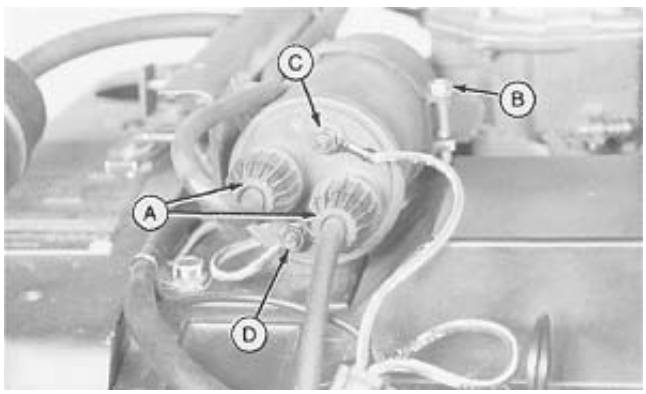
T260 Engine (Top Photo)



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B43E, B43G, B48G Engine (Bottom

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REPLACE IGNITION COIL—P218G AND P220G ENGINES

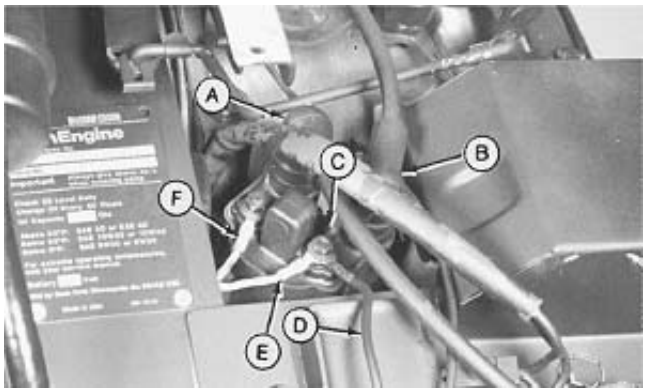
1. Remove air cleaner assembly. (See Remove Air Cleaner in Group 05 in this manual.)

2. Disconnect wire leads (A—F).

3. Remove two cap screws to remove ignition coil.

4. Install ignition coil and two cap screws.

5. Connect wire leads and install air cleaner assembly. (See Install Air Cleaner in Group 05 in this manual.)



A—Spark Plug Wire
B—Spark Plug Wire
C—Condenser Wire
D—Wiring Harness (Key Switch)
E—Orange Wire (Ignition Coil)
F—Black Wire (Ignition Coil)

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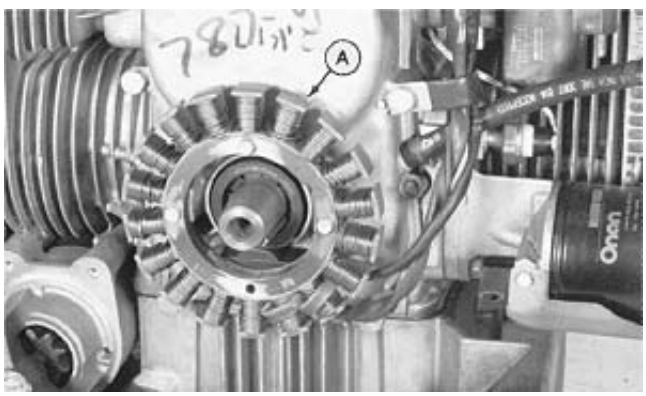
REPLACE IGNITION MODULE AND MAGNETIC RING—P218G AND P220G ENGINES

1. Remove air cleaner assembly. (See Group 05 in this manual.)

2. Remove flywheel. (See Group 20 in this manual.)

3. Remove three cap screws. Gently pull stator (A) off mounting posts.



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4. Remove key (A) and magnetic ring (B).

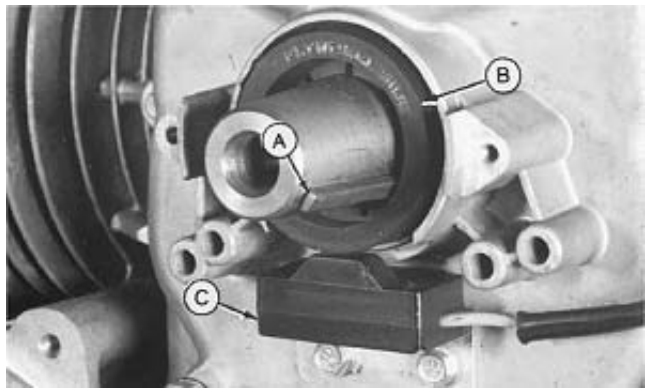
5. Remove two cap screws to remove ignition coil (C).

6. Install coil (C), magnetic ring (B)—marked "FLYWHEEL SIDE", and key (A).

7. Install starter and cap screws.

8. Install flywheel. (See Group 20 in this manual.)

9. Install air cleaner. (See Group 05 in this manual.)



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