Repair Manual

Engine

WM 130
WM 170
WM 270

EN

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Foreword

Machine documentation

- From this point forward in this documentation, Wacker Neuson Production Americas LLC will be referred to as Wacker Neuson.
- Keep a copy of the Operator's Manual with the machine at all times.
- Use the separate Parts Book supplied with the machine to order replacement parts.
- If you are missing any of these documents, please contact Wacker Neuson to order a replacement or visit www.wackerneuson.com.
- When ordering parts or requesting service information, be prepared to provide the machine model number, item number, revision number, and serial number.

Expectations for information in this manual

- This manual provides information and procedures to repair the above Wacker Neuson model(s). For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.
- Wacker Neuson expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.
- The information contained in this manual is based on machines manufactured up until the time of publication. Wacker Neuson reserves the right to change any portion of this information without notice.

CALIFORNIA Proposition 65 Warning

Engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Laws pertaining to spark arresters

NOTICE: State Health Safety Codes and Public Resources Codes specify that in certain locations spark arresters be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

Manufacturer's approval

This manual contains references to *approved* parts, attachments, and modifications. The following definitions apply:

- **Approved parts or attachments** are those either manufactured or provided by Wacker Neuson.
- **Approved modifications** are those performed by an authorized Wacker Neuson service center according to written instructions published by Wacker Neuson.
- **Unapproved parts, attachments, and modifications** are those that do not meet the approved criteria.

Unapproved parts, attachments, or modifications may have the following consequences:

- Serious injury hazards to the operator and persons in the work area
- Permanent damage to the machine which will not be covered under warranty

Contact your Wacker Neuson dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.

1 Safety Information

This manual contains DANGER, WARNING, CAUTION, *NOTICE,* and NOTE signal words which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

*NOTICE***:** Used without the safety alert symbol, *NOTICE* indicates a situation which, if not avoided, could result in property damage.

Note: *Contains additional information important to a procedure.*

1.1 Operating Safety

WARNING

Familiarity and proper training are required for the safe operation of equipment! Equipment operated improperly or by untrained personnel can be dangerous! Read the operating instructions contained in this manual and familiarize yourself with the location and proper use of all controls. Inexperienced operators should receive instruction from someone familiar with the equipment before being allowed to operate the machine.

1.1.1 Do not allow anyone to operate this equipment without proper training. People operating this equipment must be familiar with the risks and hazards associated with it.

1.1.2 Do not touch the engine or muffler while the engine is on or immediately after it has been turned off. These areas get hot and may cause burns.

1.1.3 Do not use accessories or attachments that are not recommended by Wacker Neuson. Damage to equipment and injury to the user may result.

1.1.4 Do not leave the machine running unattended.

1.1.5 Be sure operator is familiar with proper safety precautions and operation techniques before using machine.

1.1.6 Always wear protective clothing appropriate to the job site when operating the machine.

1.1.7 Wear hearing protection when operating equipment.

1.1.8 Close fuel valve on engines equipped with one when machine is not being operated.

1.1.9 Store the machine properly when it is not being used. The machine should be stored in a clean, dry location out of the reach of children.

1.1.10 Always operate machine with all safety devices and guards in place and in working order. Do not modify or defeat safety devices. Do not operate machine if any safety devices or guards are missing or inoperative.

1.1.11 Read, understand, and follow procedures in the Operator's Manual before attempting to operate the machine.

1.2 Operator Safety while Using Internal Combustion Engines

DANGER
Exhaust gas from the engine contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

- ▶ NEVER operate the machine inside an enclosed area, such as a tunnel, unless adequate ventilation is provided through such items as exhaust fans or hoses.

Operating safety

When running the engine:

- Keep the area around exhaust pipe free of flammable materials.
- Check the fuel lines and the fuel tank for leaks and cracks before starting the engine. Do not run the machine if fuel leaks are present or the fuel lines are loose.

When running the engine:

- Do not smoke while operating the machine.
- Do not run the engine near sparks or open flames.
- Do not touch the engine or muffler while the engine is running or immediately after it has been turned off.
- Do not operate a machine when its fuel cap is loose or missing.
- Do not start the engine if fuel has spilled or a fuel odor is present. Move the machine away from the spill and wipe the machine dry before starting.

Refueling safety

When refueling the engine:

- Clean up any spilled fuel immediately.
- Refill the fuel tank in a well-ventilated area.
- Replace the fuel tank cap after refueling.
- Do not smoke.
- Do not refuel a hot or running engine.
- Do not refuel the engine near sparks or open flames.

1.3 Service Safety

WARNING

A poorly maintained machine can become a safety hazard! In order for the machine to operate safely and properly over a long period of time, periodic maintenance and occasional repairs are necessary.

1.3.1 Do not attempt to clean or service the machine while it is running. Rotating parts can cause severe injury.

1.3.2 Do not crank a flooded engine with the spark plug removed on gasoline-powered engines. Fuel trapped in the cylinder will squirt out the spark plug opening.

1.3.3 Do not test for spark on gasoline-powered engines if the engine is flooded or the smell of gasoline is present. A stray spark could ignite the fumes.

1.3.4 Do not use gasoline or other types of fuels or flammable solvents to clean parts, especially in enclosed areas. Fumes from fuels and solvents can become explosive.

1.3.5 Keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.

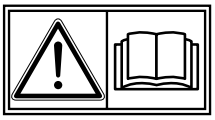
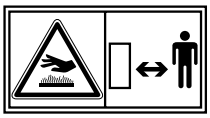
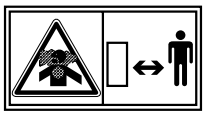
1.3.6 Replace worn or damaged components with spare parts designed and approved by Wacker Neuson.

1.3.7 Disconnect the spark plug on machines equipped with gasoline engines, before servicing, to avoid accidental start-up.

1.3.8 Keep the machine clean and labels legible. Replace all missing and hard-to-read labels. Labels provide important operating instructions and warn of dangers and hazards.

1.4 Safety Labels

Wacker Neuson machines use international pictorial labels where needed. These labels are described below.

Label	Meaning
	Read the Operator's Manual for machine information.
	WARNING! Hot surface
	DANGER! Engines emit carbon monoxide; operate only in well-ventilated area.
	Shut off the engine before refueling.
	DANGER! No sparks, flames or burning objects near machine.

2 Operation

2.1 Recommended Fuel

This engine is certified to operate on automotive unleaded gasoline. Use only fresh, clean gasoline. Gasoline containing water or dirt will damage fuel system.

Use of oxygenated fuels

Some conventional gasolines are blended with alcohol. These gasolines are collectively referred to as oxygenated fuels. If you use an oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirement.

Before using an oxygenated fuel, confirm the fuel's contents. Some states and provinces require this information to be posted on the fuel pump.

The following is the Wacker Neuson approved percentage of oxygenates:

ETHANOL - (ethyl or grain alcohol) 10% by volume. You may use gasoline containing up to 10% ethanol by volume (commonly referred to as E10). Gasoline containing more than 10% ethanol (such as E15, E20, or E85) may not be used because it could damage the engine.

If you notice any undesirable operating symptoms, try another service station, or switch to another brand of gasoline.

Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under warranty.

2.2 Before Starting

2.2.1 Read and understand safety and operating instructions at beginning of this manual.

2.2.2 Check:

- Oil level in engine.
- Fuel level.
- Condition of air cleaner.
- Tightness of external fasteners.

2.3 To Start

See Graphic: wc_gr000655

2.3.1 Open fuel valve by moving lever down **(a1)**.

Note: *If engine is cold, move choke lever to close position* **(d2)**. *If engine is hot, set choke to open position* **(d1)**.

2.3.2 Turn engine switch to “ON” **(b2)**.

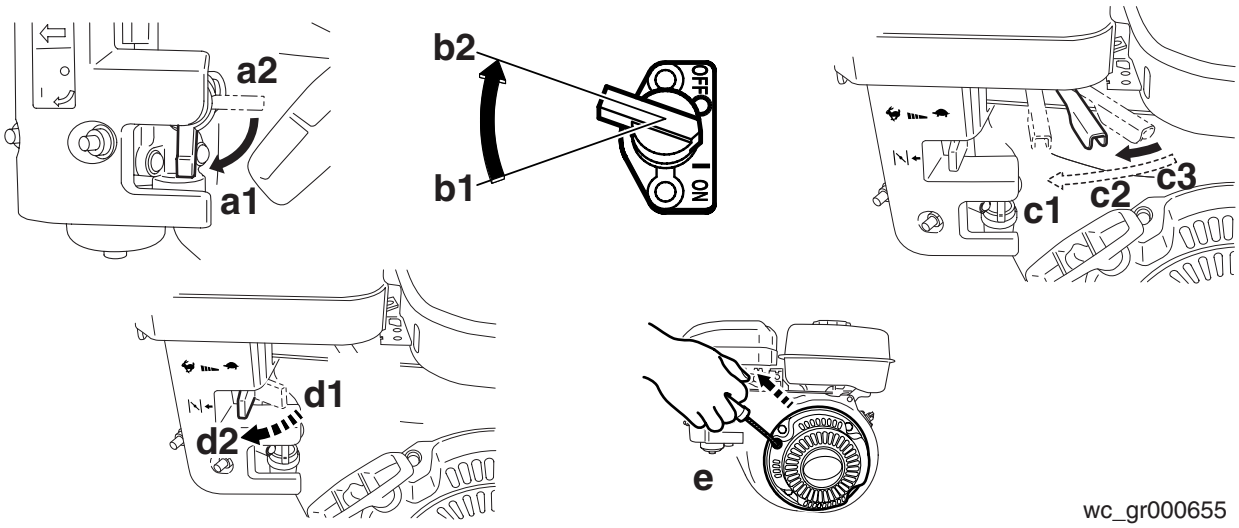
2.3.3 Open throttle by moving it slightly to left **(c2)**.

2.3.4 Pull starter rope **(e)**.

Note: *If the oil level in the engine is low, the engine will not start. If this happens, add oil to engine.*

2.3.5 Open choke as engine warms **(d1)**.

2.3.6 Open throttle fully to operate **(c1)**.



wc_gr000655

2.4 To Stop

See Graphic: wc_gr000655

2.4.1 Reduce engine RPM to idle by moving throttle completely to right **(c3)**.

2.4.2 Turn engine switch to “OFF” **(b1)**.

2.4.3 Close fuel valve **(a2)**.

3 Maintenance

3.1 Maintaining the Emission Control System

Normal maintenance, replacement, or repair of emission control devices and systems may be performed by any repair establishment or individual; however, warranty repairs must be performed by a dealer/service center authorized by Wacker Neuson. The use of service parts that are not equivalent in performance and durability to authorized parts may impair the effectiveness of the emission control system and may have a bearing on the outcome of a warranty claim.

3.2 Periodic Maintenance Schedule

	Daily before starting	After first 20 hours	Every 2 weeks or 50 hrs.	Every month or 100 hrs.	Every year or 300 hrs.	Every 500 hrs.
Check fuel level.	■					
Check engine oil level.	■					
Inspect fuel lines.	■					
Inspect air filter. Replace as needed.	■					
Check external hardware.	■					
Clean air cleaner elements.			■			
Change engine oil.		■*		■		
Clean sediment cup / fuel filter.				■		
Check and clean spark plug.				■		
Check and adjust valve clearance.					■	
Replace spark plug.						■

* Perform initially after first 20 hours of operation.

Maintenance, replacement or repair of emission control devices and systems may be performed by any repair establishment or individual.

3.3 Spark Plug

See Graphic: wc_gr000028

Clean or replace spark plug as needed to ensure proper operation.

WARNING

The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Do not touch the muffler while it is hot.

Note: *Refer to the Technical Data for the recommended spark plug type and the electrode gap setting.*

3.3.1 Remove spark plug and inspect it.

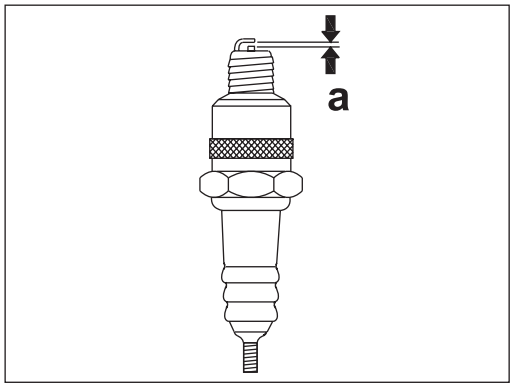
3.3.2 Replace plug if the insulator is cracked or chipped.

3.3.3 Clean spark plug electrodes with a wire brush.

3.3.4 Set the electrode gap **(a)**.

3.3.5 Tighten spark plug securely.

***NOTICE*:** A loose spark plug can become very hot and may cause engine damage.



wc_gr000028

3.4 Engine Oil

See Graphic: wc_gr000087

3.4.1 Drain oil while engine is still warm.

Note: *In the interests of environmental protection, place a plastic sheet and a container under the machine to collect any liquid which drains off. Dispose of this liquid in accordance with environmental protection legislation*.

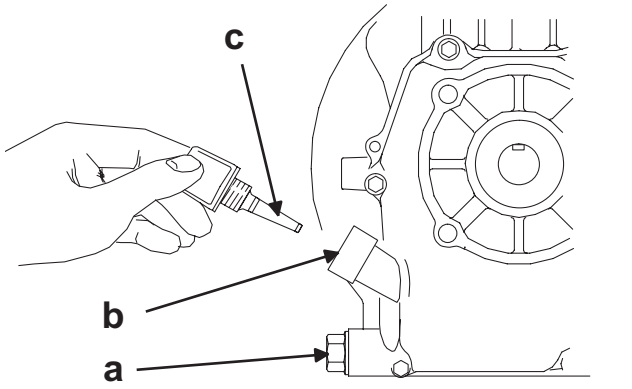
3.4.2 Remove the oil drain plug **(a)**.

3.4.3 Allow the oil to drain.

3.4.4 Install the drain plug.

3.4.5 Fill the engine crankcase through the oil filler opening **(b)**, to the upper mark on the dipstick **(c)**. Do not thread in the dipstick to check the level. *See Technical Data* for oil quantity and type.

3.4.6 When the crankcase is full, reinstall the dipstick.



wc_gr000087

WARNING

Most used oil contains small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

- ▶ Take steps to avoid inhaling or ingesting used engine oil.
- ▶ Wash skin thoroughly after exposure to used engine oil.

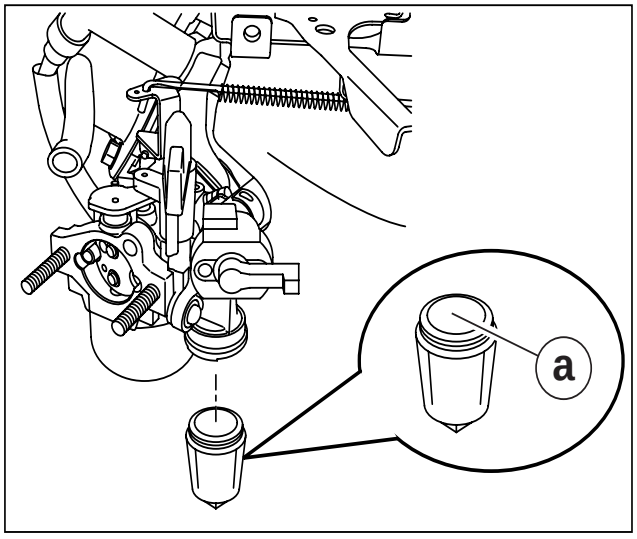
3.5 Cleaning the Fuel Strainer

3.5.1 To remove water and dirt, close the fuel lever and remove the fuel strainer.

3.5.2 Inspect the fuel strainer **(a)** for water and dirt.

3.5.3 After removing any dirt and water, wash the fuel cup with a nonflammable solvent.

3.5.4 Reinstall securely to prevent leakage.



wc_gr001093

3.6 Servicing the Air Cleaner

WARNING

Do not use gasoline or other types of low-flash point solvents for cleaning the air cleaner. A fire or explosion could result.

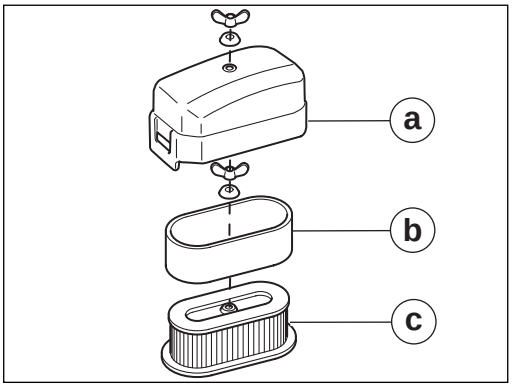
NOTICE: Do not run the engine without the air cleaner. Severe engine damage will occur.

The engine is equipped with a dual-element air cleaner. Under normal operating conditions, the elements should be cleaned once every week. Under severe, dry and dusty conditions, the elements should be maintained daily. Replace an element when it is saturated with dirt that cannot be removed.

3.6.1 Open the air cleaner cover **(a)**. Remove the filter assembly by pulling it straight up. Inspect both elements for holes or tears. Replace damaged elements.

3.6.2 Wash the foam element **(b)** in a solution of mild detergent and warm water. Rinse it thoroughly in clean water. Allow the element to dry thoroughly.

3.6.3 Tap the paper element **(c)** lightly to remove excess dirt or blow compressed air through the filter from the inside out. Replace the paper element if it appears heavily soiled.



wc_gr000656

3.7 Storage

If machine is being stored for more than 30 days:

3.7.1 Drain fuel from tank. Start engine and run until remaining fuel is used.

3.7.2 Remove spark plug. Pour approximately 5 cc of clean SAE 10W30 engine oil into cylinder through spark plug opening. Pull starter rope slowly to distribute oil in engine. Reinstall spark plug.

3.7.3 Change oil.

3.7.4 Cover engine and store in a clean, dry area.

4 Technical Data

		WM 130	WM 170	WM 270
Engine				
Type		4-stroke, overhead valve, single cylinder		
Engine Make		Wacker		
Rated Power	kW (Hp)	3.2 (4.3)	4.2 (5.7)	6.6 (9.0)
Displacement	cm³ (in³)	126 (7.69)	169 (10.31)	265 (16.17)
Engine Speed - max.	rpm	4000		
Engine Speed - idle	rpm	1400 ± 100		
Spark Plug	type	NGK BR6HS (Champion RL86C)		
Electrode Gap	mm (in.)	0.6–0.7 (0.024–0.028)		
Air Cleaner	type	Dual element		
Engine Lubrication	oil grade	SAE 10W30, SE or higher		
Engine Oil Capacity	l (oz.)	0.6 (20)		1.1 (37)
Fuel	type	Automotive unleaded gasoline		
Fuel Tank Capacity	l (qts.)	2.7 (2.8)	3.6 (3.8)	6.0 (6.4)
Valve Clearance (cold)	mm (in.)	0.12–0.15 (0.005–0.006)		
Dimensions (L x W x H)	mm (in.)	297x341x318 (11.7x13.4x12.5)	304x354x335 (12x13.9x13.2)	355x420x410 (14x16.5x16.1)
Dry Weight	kg (lbs.)	14 (31)	15 (33)	21 (46)
Emissions Durability Period (California Only)		500 hours		

5 Emission Control Systems Information and Warranty

The Emission Control Warranty and associated information is valid only for the U.S.A., its territories, and Canada.

5.1 Emission Control System Background Information

Introduction

Wacker Neuson spark-ignited engines/equipment must conform with applicable Environmental Protection Agency (EPA) emissions regulations. There are two types of emissions that fall under these regulations: 1) exhaust, and 2) evaporative. These regulations require that manufacturers warrant the emission control systems for defects in materials and workmanship.

Furthermore, EPA regulations require all manufacturers to furnish written instructions describing how to operate and maintain the engines/equipment including the emission control systems. This information is provided with all Wacker Neuson engines/equipment at the time of purchase.

Exhaust Emissions

The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

Wacker Neuson utilizes lean carburetor settings and other systems to reduce the emissions of carbon monoxide, oxides of nitrogen, and hydrocarbons.

Evaporative Emissions

Evaporative emissions are fuel emissions and generally include emissions that result from permeation of fuel through the fuel-system materials or from ventilation of the fuel system.

Wacker Neuson utilizes low-permeation fuel lines and fuel tanks where applicable to reduce evaporative emissions.

Problems that may affect Emissions

If any of the following symptoms arise, have the engine/equipment inspected and repaired by a Wacker Neuson dealer/service center.

- Hard starting or stalling after starting
- Rough idling
- Misfiring or backfiring under load
- Afterburning (backfiring)
- Presence of black exhaust smoke during operation
- High fuel consumption

Tampering and Altering

Tampering with or altering the emission control system may increase emissions beyond the legal limit. If evidence of tampering is found, Wacker Neuson may deny a warranty claim. Among those acts that constitute tampering are:

- Removing or altering of any part of the air intake, fuel, or exhaust systems.
- Altering or defeating the speed-adjusting mechanism causing the engine to operate outside its design parameters.

5.2 Limited Defect Warranty for Wacker Neuson Emission Control Systems

The Emission Control Warranty is valid only for the U.S.A., its territories, and Canada.

Wacker Neuson Sales Americas, LLC, N92 W15000 Anthony Avenue, Menomonee Falls, WI 53051, (hereinafter “Wacker Neuson”) warrants to the initial retail purchaser, and each subsequent owner, that this engine/equipment, including all parts of its emission control systems, have been designed, built, and equipped to conform at the time of initial sale to all applicable emission regulations of the U.S. Environmental Protection Agency (EPA), and that the engine/equipment is free of defects in materials and workmanship which would cause this engine/equipment to fail to conform to EPA regulations during its warranty period.

Wacker Neuson is also liable for damages to other engine/equipment components caused by a failure of any warranted parts during the warranty period.

Limited Defect Warranty Period for Wacker Neuson Emission Control Systems

The warranty period for this engine/equipment begins on the date of sale to the initial purchaser and continues for a minimum of two (2) years. For the warranty terms for your specific engine/equipment, visit wackerneuson.com.

Any implied warranties are limited to the duration of this written warranty.

What is covered

Wacker Neuson recommends the use of genuine Wacker Neuson parts, or the equivalent, whenever maintenance is performed. The use of replacement parts not equivalent to the original parts may impair the effectiveness of the engine/equipment emission controls systems. If such a replacement part is used in the repair or maintenance of the engine/equipment, assure yourself that such part is warranted by its manufacturer to be equivalent to the parts offered by Wacker Neuson in performance and durability. Furthermore, if such a replacement part is used in the repair or maintenance of the engine/equipment, and an authorized Wacker Neuson dealer/service center determines it is defective or causes a failure of a warranted part, the claim for repair of the engine/equipment may be denied. If the part in question is not related to the reason the engine/equipment requires repair, the claim will not be denied.

For the components listed in the following table, an authorized Wacker Neuson dealer/service center will, at no cost to you, make the necessary diagnosis, repair, or replacement necessary to ensure that the engine/equipment complies with the applicable EPA regulations. All defective parts replaced under this warranty become property of Wacker Neuson.

Exhaust Emissions

Systems Covered	Components
Fuel metering system	Carburetor and internal parts
	Air/fuel ratio feedback system (if applicable)
	Cold start enrichment system (if applicable)
	Regulator assembly (if applicable)
Exhaust system	Catalytic muffler (if applicable)
	Exhaust manifold (if applicable)
Air induction system	Air filter housing
	Air filter element*
	Intake manifold (if applicable)
Ignition system	Flywheel magneto
	Ignition module
	Electronic controls (if applicable)
	Spark advance/retard system (if applicable)
	Spark plug cap
	Spark plug*
Miscellaneous parts associated with the exhaust emission control system	Tubing
	Fittings
	Seals
	Gaskets
	Clamps

** Indicates expendable maintenance items. Warranted only to first scheduled replacement point.*

Evaporative Emissions

Systems Covered	Components
Evaporative control system	Fuel tank (if applicable)
	Fuel tank cap (if applicable)
	Fuel line (if applicable)
	Fuel line fittings (if applicable)
	Clamps (if applicable)
	Carbon canister (if applicable)
	Purge port connector (if applicable)
Miscellaneous parts associated with the evaporative emission control system	Clamps
	Gaskets
	Mounting brackets

What is not covered

- Failures other than those resulting from defects in material or workmanship.
- Any systems or parts which are affected or damaged by owner abuse, tampering, neglect, improper maintenance, misuse, improper fueling, improper storage, accident and/or collision; the incorporation of, or any use of, add-on or modified parts, or unsuitable attachments, or the alteration of any part.
- Replacement of expendable maintenance items made in connection with required maintenance services after the item's first scheduled replacement as listed in the maintenance section of the engine/equipment operator's manual, such as spark plugs and filters.
- Incidental or consequential damages such as loss of time or the use of the engine/equipment, or any commercial loss due to the failure of the engine/equipment.
- Diagnosis and inspection charges that do not result in warranty-eligible service being performed.
- Any non-authorized replacement part, or malfunction of authorized parts due to use of-non authorized parts.

Owner's Warranty Responsibility

The engine/equipment owner is responsible for the performance of the required maintenance listed in the Wacker Neuson engine/equipment operator's manual. Wacker Neuson recommends that all receipts covering maintenance on the engine/equipment be retained, but Wacker Neuson cannot deny warranty coverage solely for the lack of receipts or for the failure to ensure the performance of all scheduled maintenance.

Normal maintenance, replacement, or repair of emission control devices and systems may be performed by any repair establishment or individual; however, warranty repairs must be performed by an authorized Wacker Neuson dealer/service center.

The engine/equipment must be presented to an authorized Wacker Neuson dealer/service center as soon as a problem exists. Contact Wacker Neuson Product Support Department (1-800-770-0957) or visit wackerneuson.com to find a dealer/service center in your area, or to answer questions regarding warranty rights and responsibilities.

How to Make a Claim

In the event that any emission-related part is found to be defective during the warranty period, you shall notify Wacker Neuson Product Support Department (1-800-770-0957, or technical.support@wackerneuson.com, or wackerneuson.com), and you will be advised of the appropriate dealer/service center where warranty repair can be performed. All repairs qualifying under this limited warranty must be performed by an authorized Wacker Neuson dealer/service center.

You must take your Wacker Neuson engine/equipment along with proof of original purchase date, at your expense, to the authorized Wacker Neuson dealer/service center during their normal business hours.

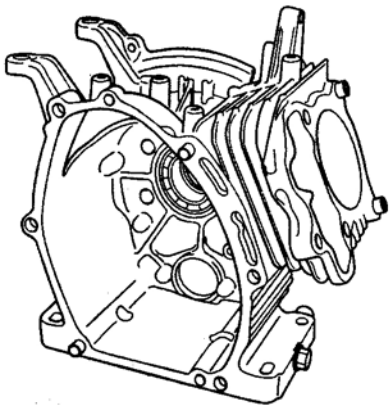
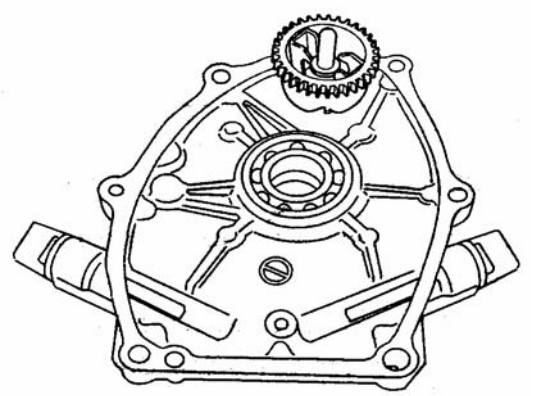
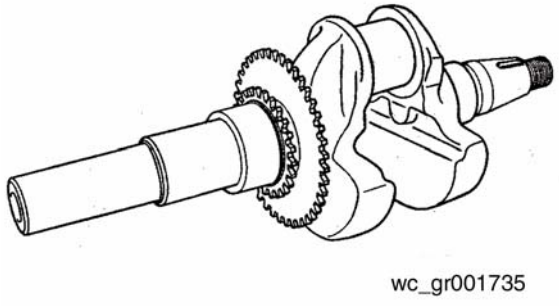
For owners located more than 100 miles from an authorized dealer/service center (excluding the states with high-altitude areas as identified in 40 CFR Part 1068, Appendix III), Wacker Neuson will pay for pre-approved shipping costs to and from an authorized Wacker Neuson dealer/service center.

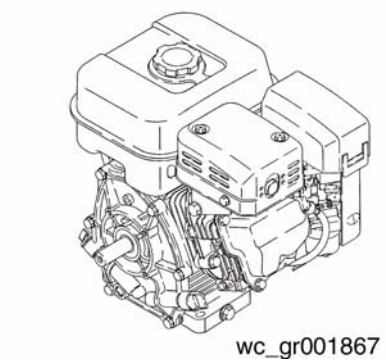
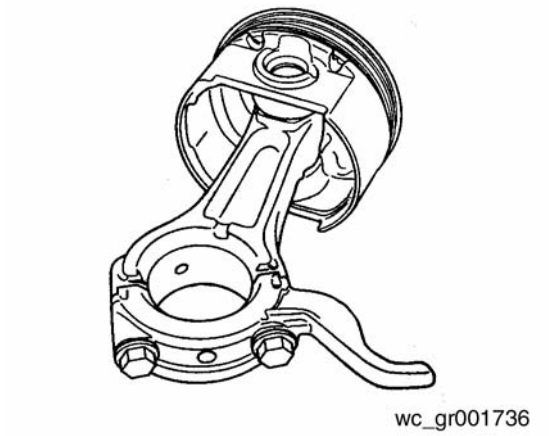
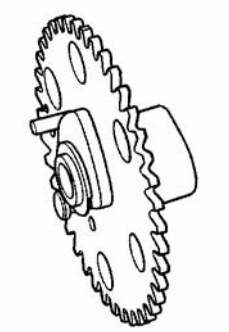
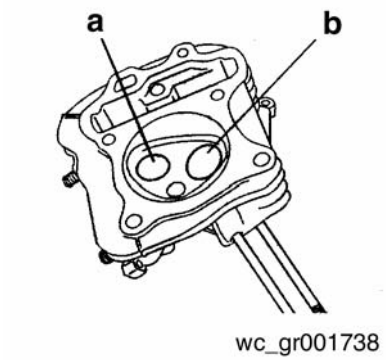
Claims for repair or adjustment found to be caused solely by defects in material or workmanship will not be denied because the engine/equipment was not properly maintained and used.

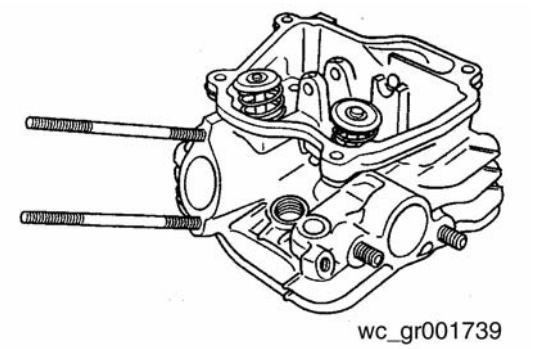
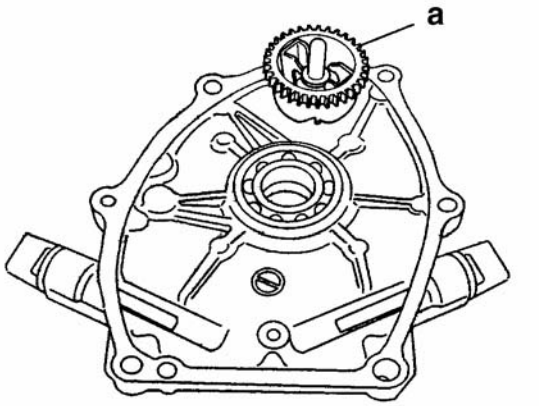
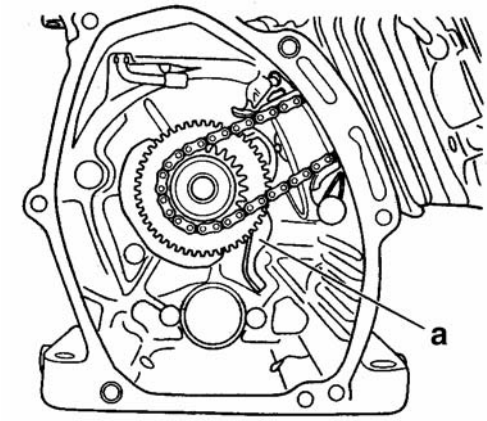
The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

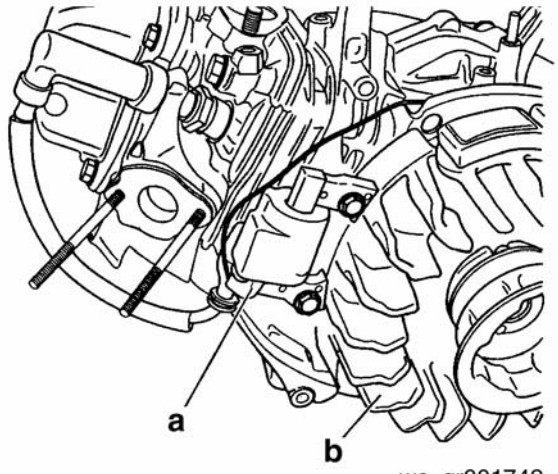
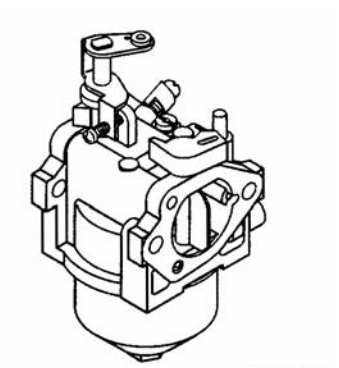
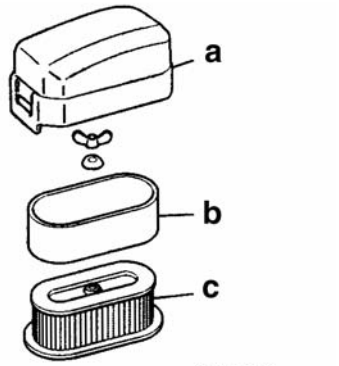
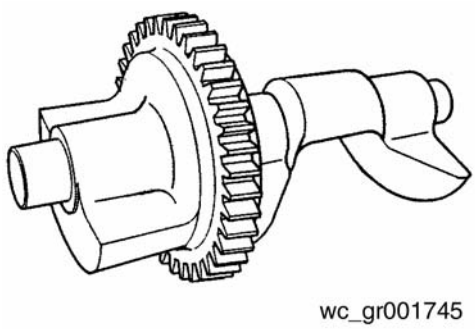
6 Theory of Operation

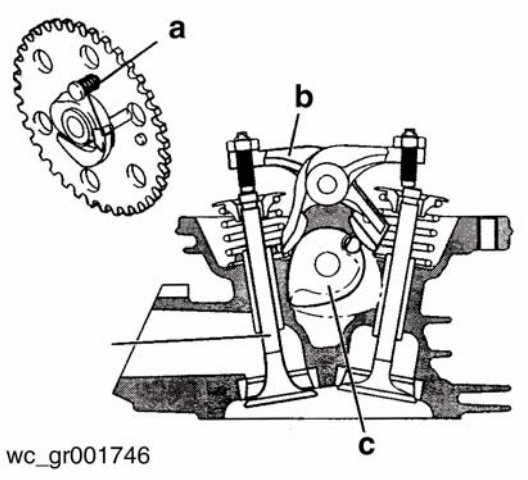
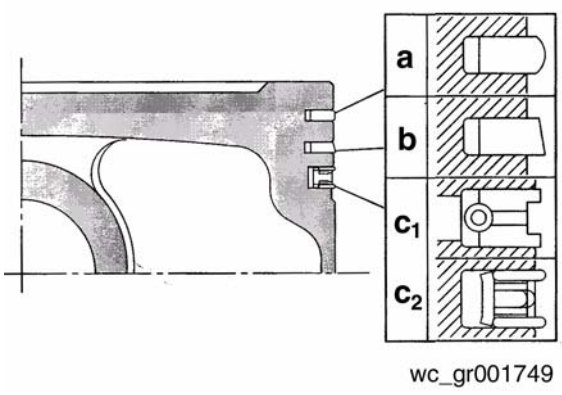
6.1 Component Descriptions

Component Illustration	Component Description
 wc_gr001733	**Cylinder and crankcase** The cylinder and crankcase are die-cast in aluminum as a single piece. A special cast iron cylinder liner is molded into the aluminum die-casting. The crankcase has a mounting surface on the output shaft side to which the main bearing cover is attached. The cylinder is inclined to the right at an angle of 25° from the horizontal as viewed from the output shaft side.
 wc_gr001734	**Main bearing cover** The main bearing cover is an aluminum die-casting, which is mounted on the output shaft side of the crankcase. By removing the main bearing cover, the inside of the engine can be inspected with ease. There is an oil filling port, with oil gauge, on either side of the cover.
 wc_gr001735	**Crankshaft** The crankshaft is made of spheroidal graphite cast iron, and the crank pin is high-frequency induction-hardened. The crank sprocket used to drive the chain and the gear used to drive the governor gear are pressed into the output end of the shaft.

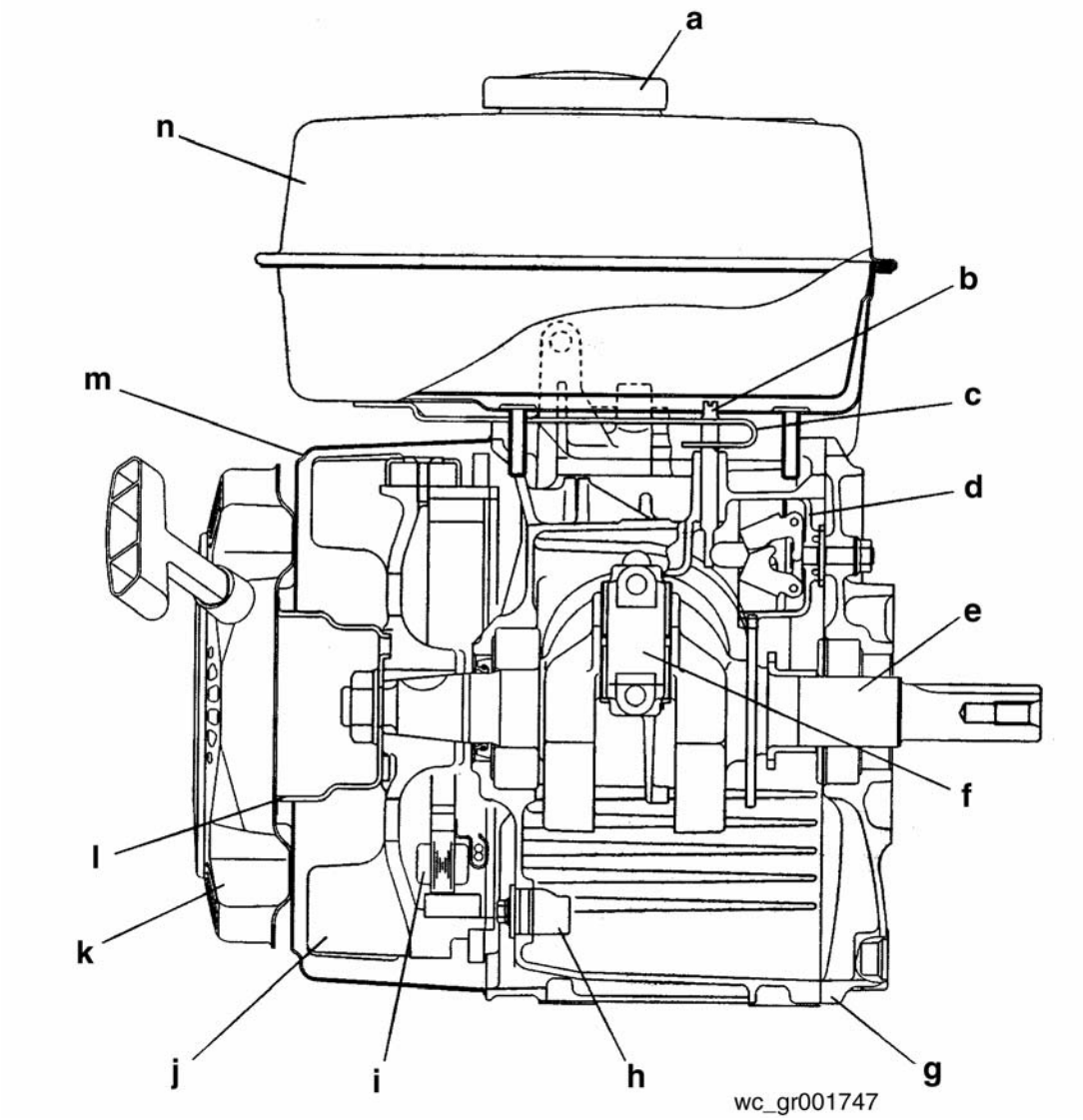
Component Illustration	Component Description
 wc_gr001867	**Cooling system** The engine uses a forced-air cooling system in which a cooling fan (which also works as a fly-wheel) forces cooling air into the cylinder and cylinder head. Baffles are provided to guide the flow of the cooling air.
 wc_gr001736	**Connecting rod and piston** The connecting rod is a specially heat-treated aluminum alloy die-casting. Its large and small ends function as bearings. A splasher built into the connecting rod lubricates by splashing engine oil. The piston is an aluminum alloy casting with grooves for mounting two compression rings and one oil ring.
 wc_gr001737	**Camshaft** The cam shaft and the sprocket are made of special sintered alloy. They are constructed as a single piece. The camshaft is provided with intake and exhaust cam, and the decompression release lever is mounted on the sprocket shaft and side.
 wc_gr001738	**Valve arrangement** The engine has a chain-driven overhead cam and overhead valve construction. A single cam performs both intake and exhaust operations. Exhaust valve **(a)**. Intake valve **(b)**.

Component Illustration	Component Description
 wc_gr001739	**Cylinder head** The cylinder head is an aluminum die-casting. The intake and exhaust ports are arranged in a cross direction to improve combustion efficiency.
 wc_gr001740	**Governor system** The engine is equipped with a centrifugal flyweight-type governor that makes it possible to operate the engine at a constant speed, even with load variations. The governor flyweights are mounted to a governor gear **(a)**.
 wc_gr001741	**Lubrication system** The rotating parts, sliding parts, and valves of the engine are lubricated with oil in the crankcase. The oil is splashed onto the parts by the oil splasher **(a)** on the connecting rod.

Component Illustration	Component Description
 wc_gr001742	**Ignition system** The ignition system is a transistor-controlled magneto system with the ignition timing set at 23° before top dead center. The magneto consists of an ignition coil **(a)** and flywheel **(b)**. The flywheel (which also works as a fan) is directly mounted on the crankshaft and the ignition coil is directly mounted on the crankcase.
 wc_gr001743	**Carburetor** The engine is equipped with a horizontal-draft carburetor. The carburetor setting is calibrated after careful testing for all-around performance.
 wc_gr001744	**Air cleaner** The engine uses a dual-element air cleaner — cover **(a)**, primary dry-type sponge element **(b)**, and secondary dry-type paper element **(c)**.
 wc_gr001745	**Balancer** The balancer cancels unbalanced inertia forces. The balancer rotates at the same speed as the crankshaft to effectively reduce vibration.

Component Illustration	Component Description
 wc_gr001746	**Decompression system** The automatic decompression system is mounted on the camshaft. It opens the exhaust valve before the compression top, thereby alleviating the compression pressure and reducing the force required to pull the recoil starter. During engine operation, the decompression system is overpowered by centrifugal force and compression is fully utilized to produce power. Reference: return spring (**a**), exhaust valve rocker arm (**b**), camshaft (**c**).
 wc_gr001749	**Piston rings** The piston rings are made of special cast iron. The profile of the top ring **(a)** is a barrel face, that of the second ring **(b)** is a tapered face. There are two types of oil rings depending on specification: cutter ring with oil expander **(c_1)** or a three-piece type **(c_2)**.

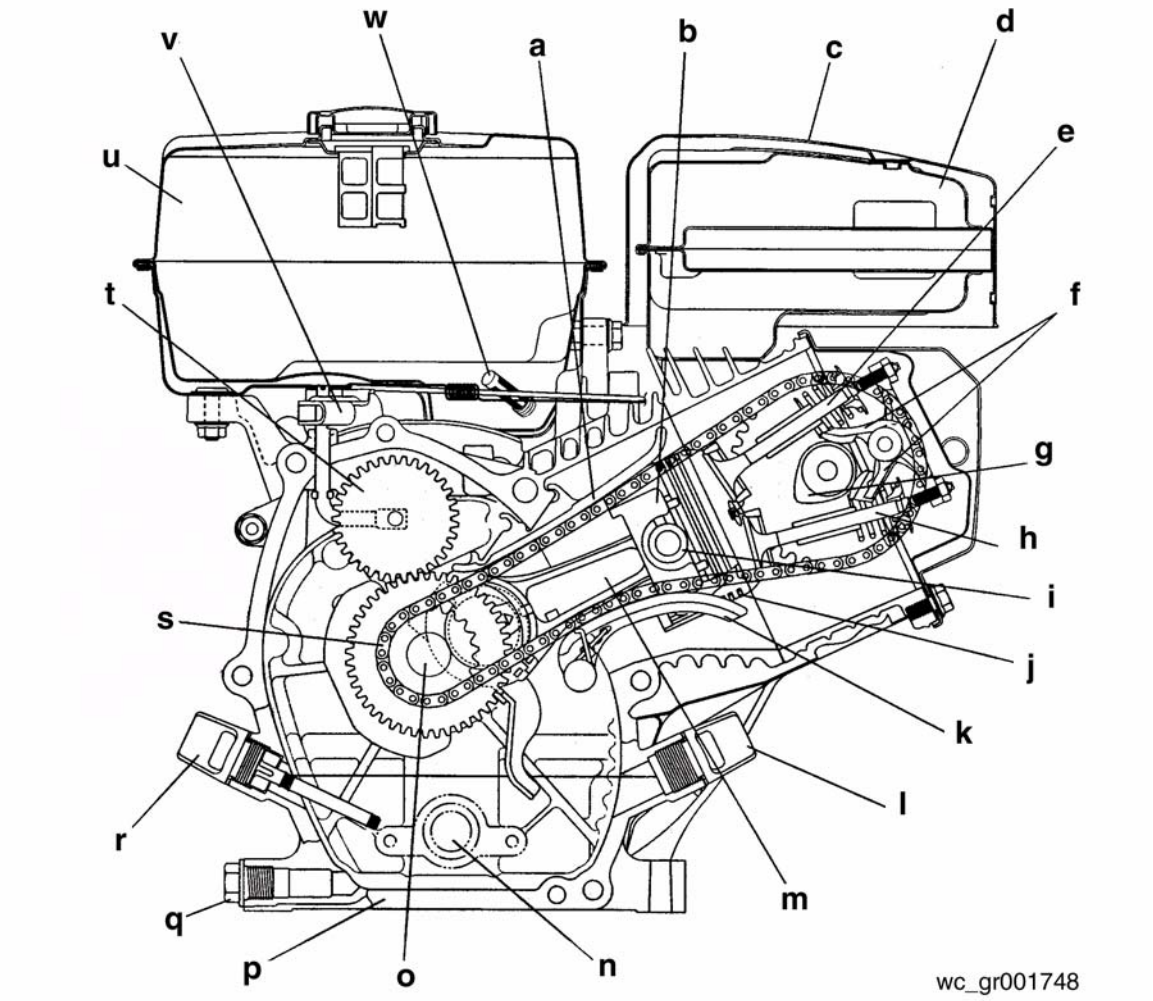
6.2 Cross Section Across Shaft



6.3 Components—Cross Section Across Shaft

Ref.	Description	Ref.	Description
a	Tank cap	h	Oil sensor
b	Governor shaft	i	Charge coil
c	Governor lever	j	Flywheel
d	Governor gear	k	Recoil starter
e	Crankshaft	l	Starter pulley
f	Connecting rod	m	Blower housing
g	Main bearing cover	n	Fuel tank

6.4 Cross Section Along Shaft



6.5 Components—Cross Section Along Shaft

Ref.	Description	Ref.	Description
a	Chain guide	m	Connecting rod
b	Piston	n	Oil sensor
c	Muffler cover	o	Crankshaft
d	Muffler	p	Crankcase
e	Exhaust valve	q	Oil drain plug
f	Rocker arm	r	Oil gauge
g	Camshaft	s	Chain
h	Intake valve	t	Governor gear
i	Piston pin	u	Fuel tank
j	Piston ring	v	Governor lever
k	Tensioner	w	Fuel strainer
l	Filler plug	-	---

7 Teardown/Rebuild Procedures

7.1 Tools

Because all possible problems encountered while repairing the machine cannot be anticipated, it is up to the mechanic to use common sense and good judgement in tool selection.

The use of any special tools is recommended only for those operations where the use of conventional tools proves inadequate.

Before substituting another tool or procedure, you should be satisfied that neither personal injury nor damage to the component will result.

7.2 Ordering Parts

The repair procedures contained in this manual do not include part numbers. For parts replacement information, refer to the Parts Book originally supplied with the machine.

If the original Parts Book has been lost, a replacement may be ordered from Wacker Neuson. When ordering a replacement Parts Book, please list the model number, item number, revision level, and serial number of the machine. Parts Books are also available on the Wacker Neuson Web site. See www.wackerneuson.com.

7.3 Reference Numbers ( )

Repair procedures contain reference numbers enclosed in parentheses ( ). These numbers refer to the item numbers shown on the assembly drawings and other detailed drawings. They are included to aid the mechanic in identifying parts and assembling components.

8 Disassembly Procedures

8.1 Draining Oil

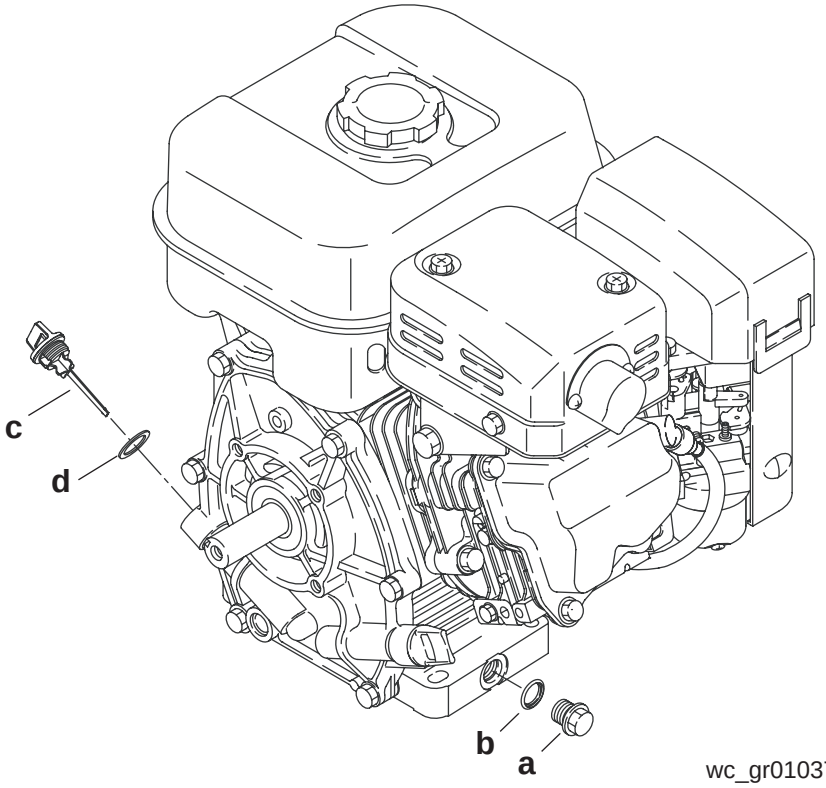
See Graphic: wc_gr001750

Note: *In the interests of environmental protection, place plastic sheeting and a container under the machine to collect the liquid which drains off. Dispose of this liquid properly.*

8.1.1 Remove the drain plug **(a)** and gasket **(b)**.

8.1.2 Remove oil gauge **(c)** and gasket **(d)**.

8.1.3 Drain oil from crankcase. Replace plug, oil gauge, and gaskets when complete.



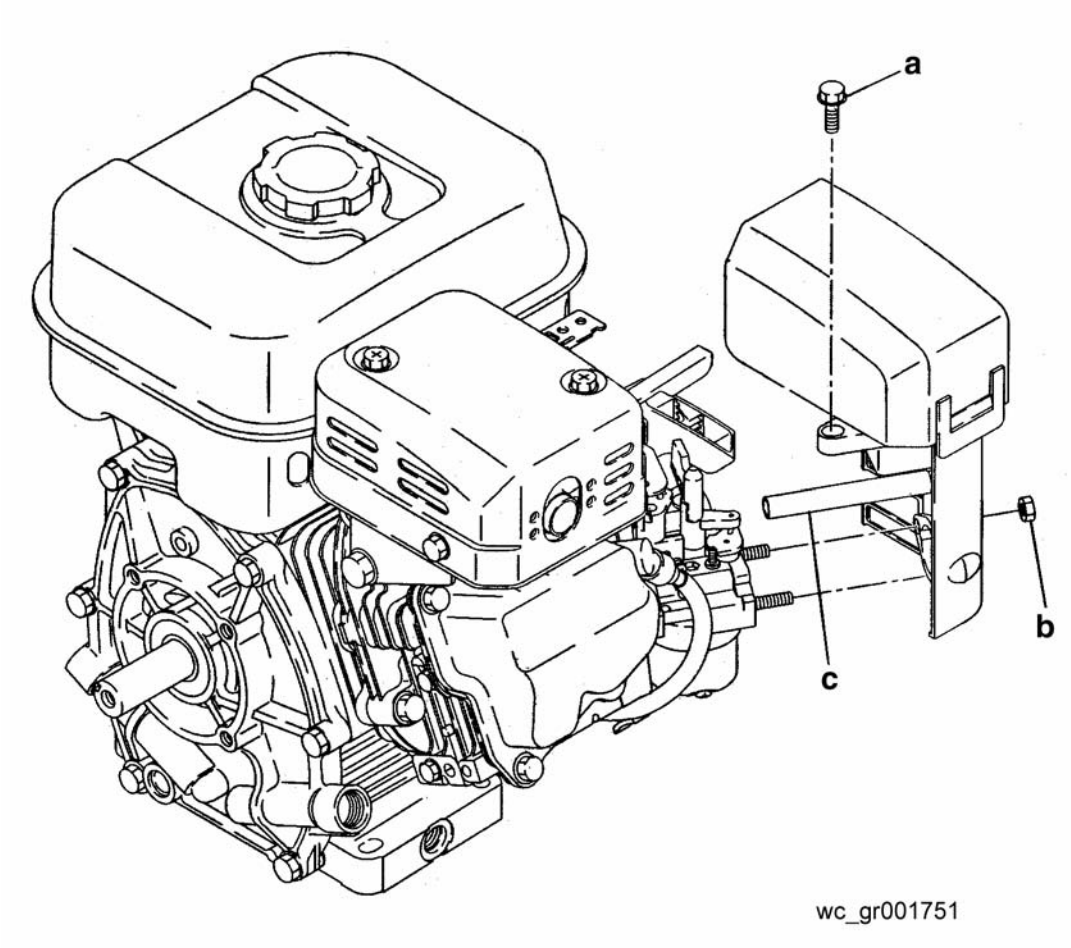
wc_gr010378

8.2 Removing Air Cleaner

See Graphic: wc_gr001751

8.2.1 Remove M6 flange bolt **(a)** and the two M6 flange nuts **(b)**.

8.2.2 Remove the air cleaner while pulling the breather pipe **(c)** away from the rocker cover.



8.3 Removing Stop Switch, Recoil Starter, and Blower Housing

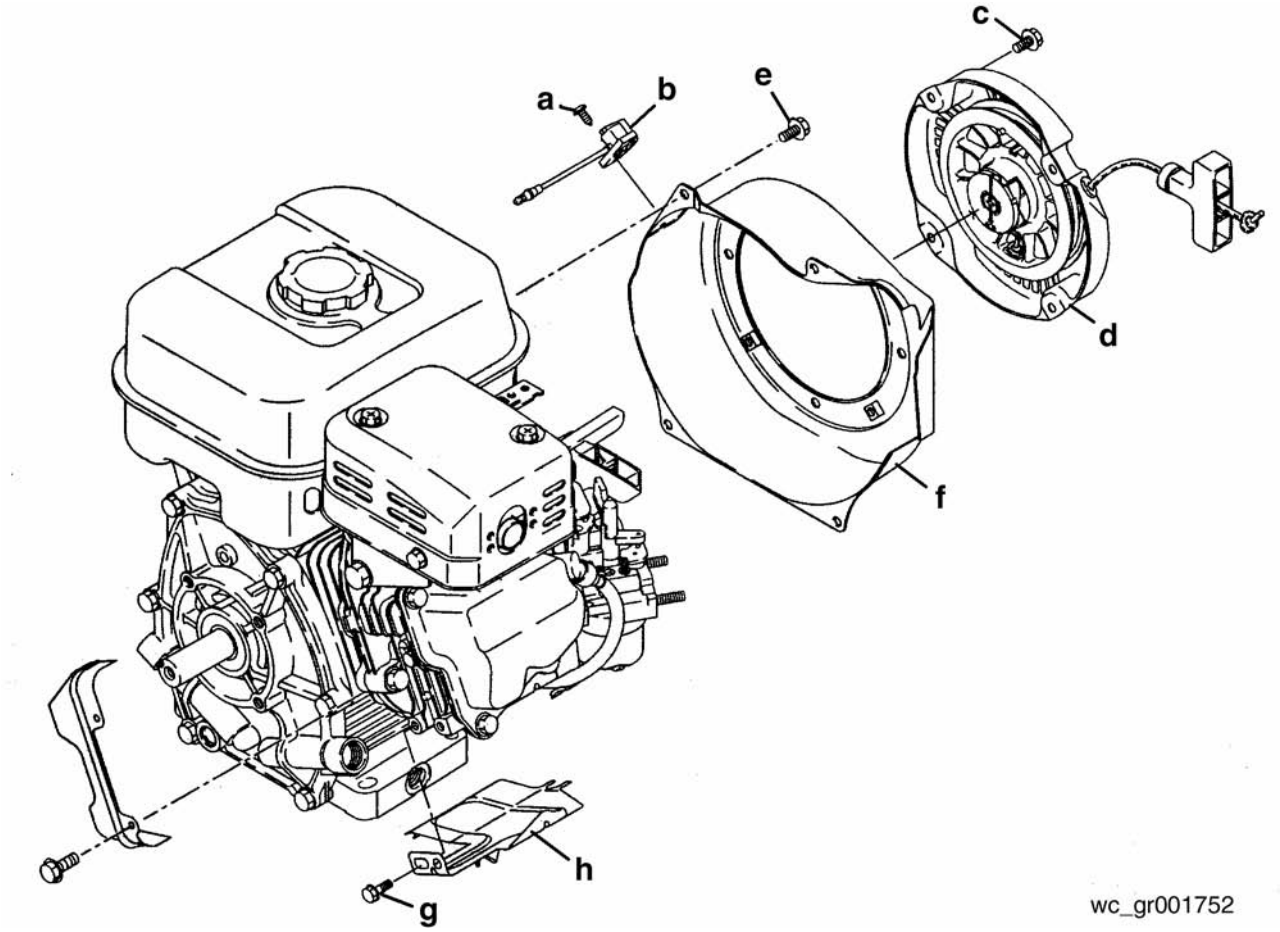
See Graphic: wc_gr001752

8.3.1 Remove the two M4 screws **(a)**, disconnect wire, and remove the stop switch **(b)**.

8.3.2 Remove the four M6 bolts **(c)** and remove the recoil starter **(d)**.

8.3.3 Remove the four M6 bolts **(e)** and remove the blower housing **(f)**.

8.3.4 Also remove the two M6 bolts **(g)** and remove the head baffle **(h)**.



8.4 Removing Fuel Tank, Muffler, and Muffler Cover

See Graphic wc_gr001753

8.4.1 Remove any remaining fuel by using the carburetor drain **(a).** Dispose of fuel in proper manner.

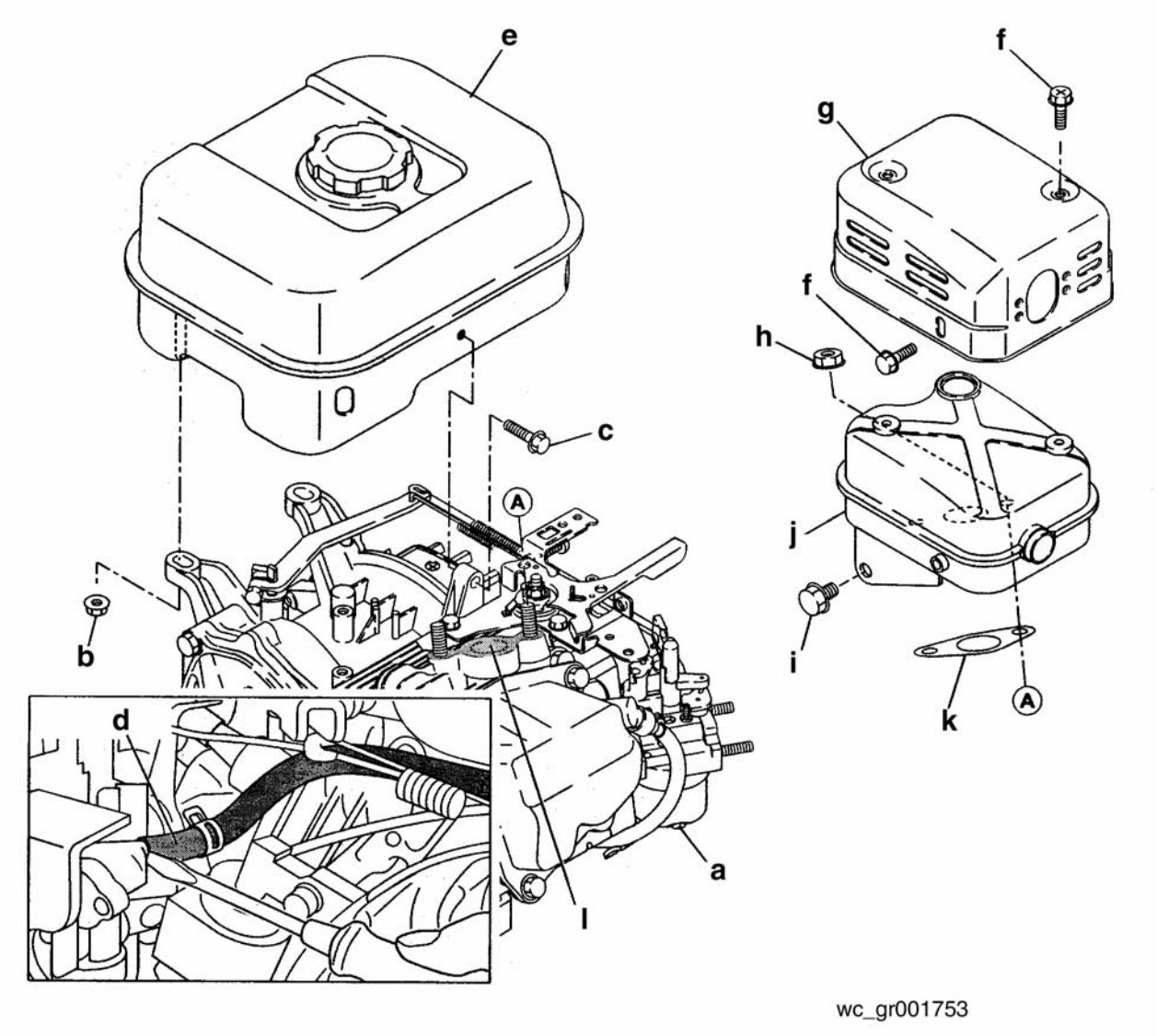
8.4.2 Remove the M6 mounting nuts **(b)** and M6 bolt **(c)**.

8.4.3 Disconnect fuel hose **(d)** from the carbuertor and remove the fuel tank **(e)** from the engine.

8.4.4 Remove the M6 flange bolts **(f)** from the muffler cover **(g)** and remove the muffler cover.

8.4.5 Remove the two M8 nuts **(h)** securing the muffler to the cylinder head. Remove the M8 screw **(i)**, the muffler **(j)**, and the gasket **(k)**.

8.4.6 Seal the exhaust port **(l)** with adhesive tape, or plug it with cloth.



wc_gr001753

8.5 Removing Governor, Carburetor, and Speed Control Lever

See Graphic: wc_gr001763

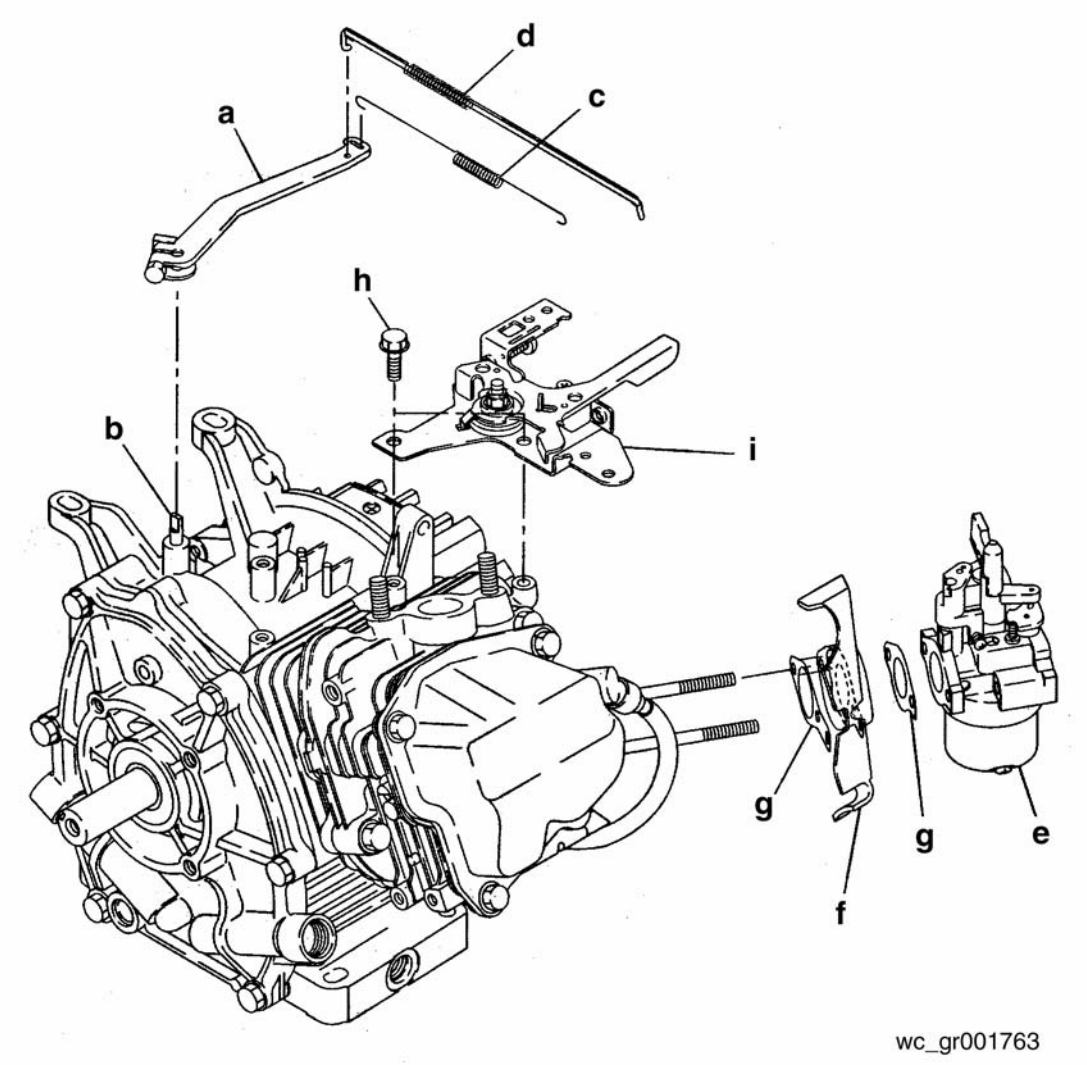
8.5.1 Loosen, but do not remove, the bolt securing the governor lever **(a)** to the governor shaft **(b)**.

8.5.2 Remove the governor spring **(c)**.

8.5.3 Remove the governor rod and the rod spring **(d).**

8.5.4 Remove the carburetor **(e)** from the cylinder head. Also remove the insulator **(f)** and the two gaskets **(g)**.

8.5.5 Remove the M6 bolt **(h)** securing the speed control lever/bracket **(i)** to the cylinder head and remove the speed control lever/bracket.



8.6 Removing Ignition Coil, Starter Pulley, and Flywheel

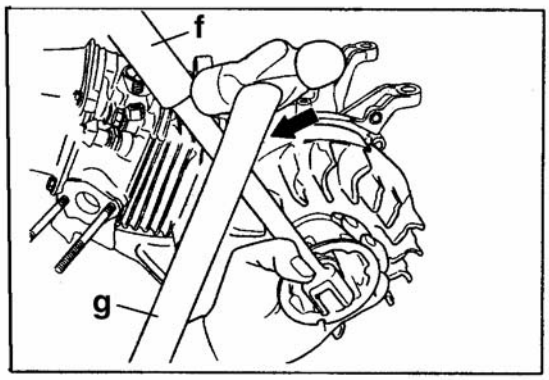
See Graphic: wc_gr001764

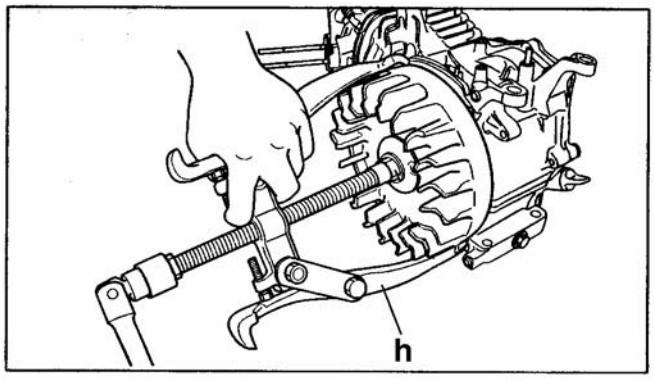
8.6.1 Remove the spark plug cap **(a)** from the spark plug. Remove the screws **(b)** securing the ignition coil **(i)** and remove the ignition coil.

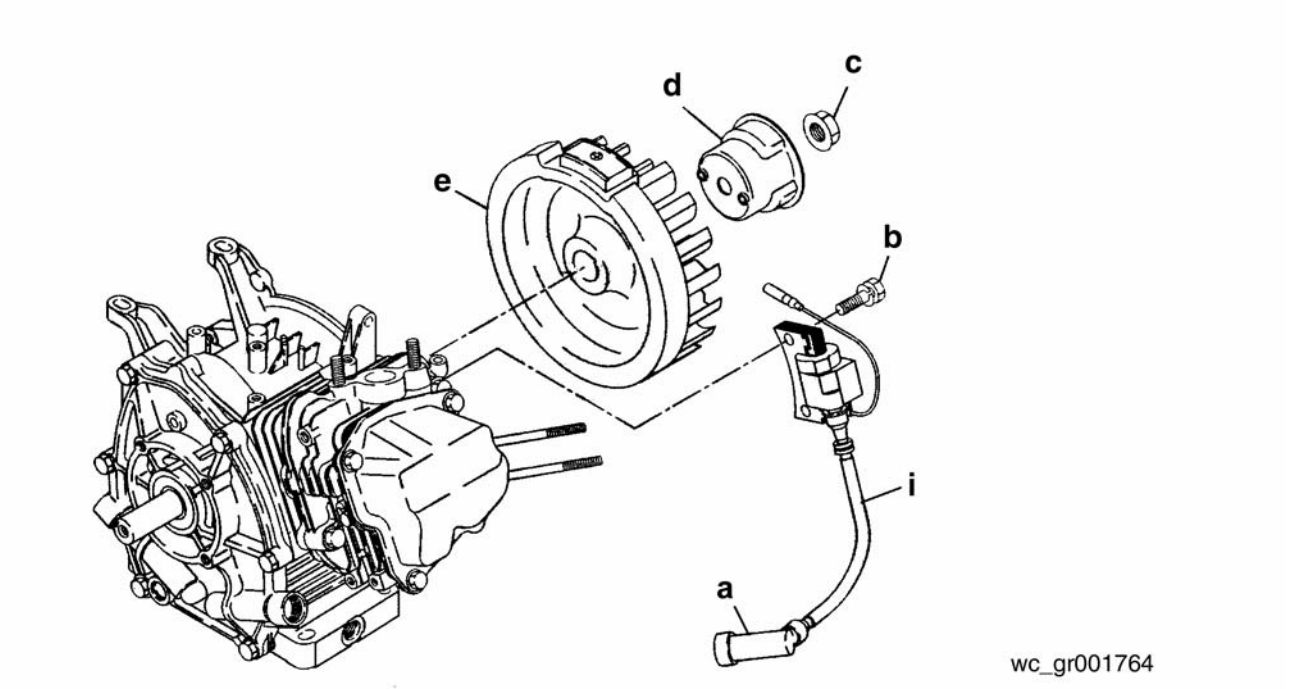
8.6.2 Remove the starter pulley **(d)** from the flywheel **(e).** If necessary, place a socket wrench **(f)** over the pulley nut **(c)** and strike the wrench with a hammer **(g)** to loosen the nut.

***NOTICE*:** Do not insert a screw driver or other prying tool between the flywheel blades. Damage to the blades may occur.

8.6.3 Using a puller **(h)**, remove the flywheel from the crankshaft.







8.7 Removing Case Baffle, Charge Coil, and Spark Plug

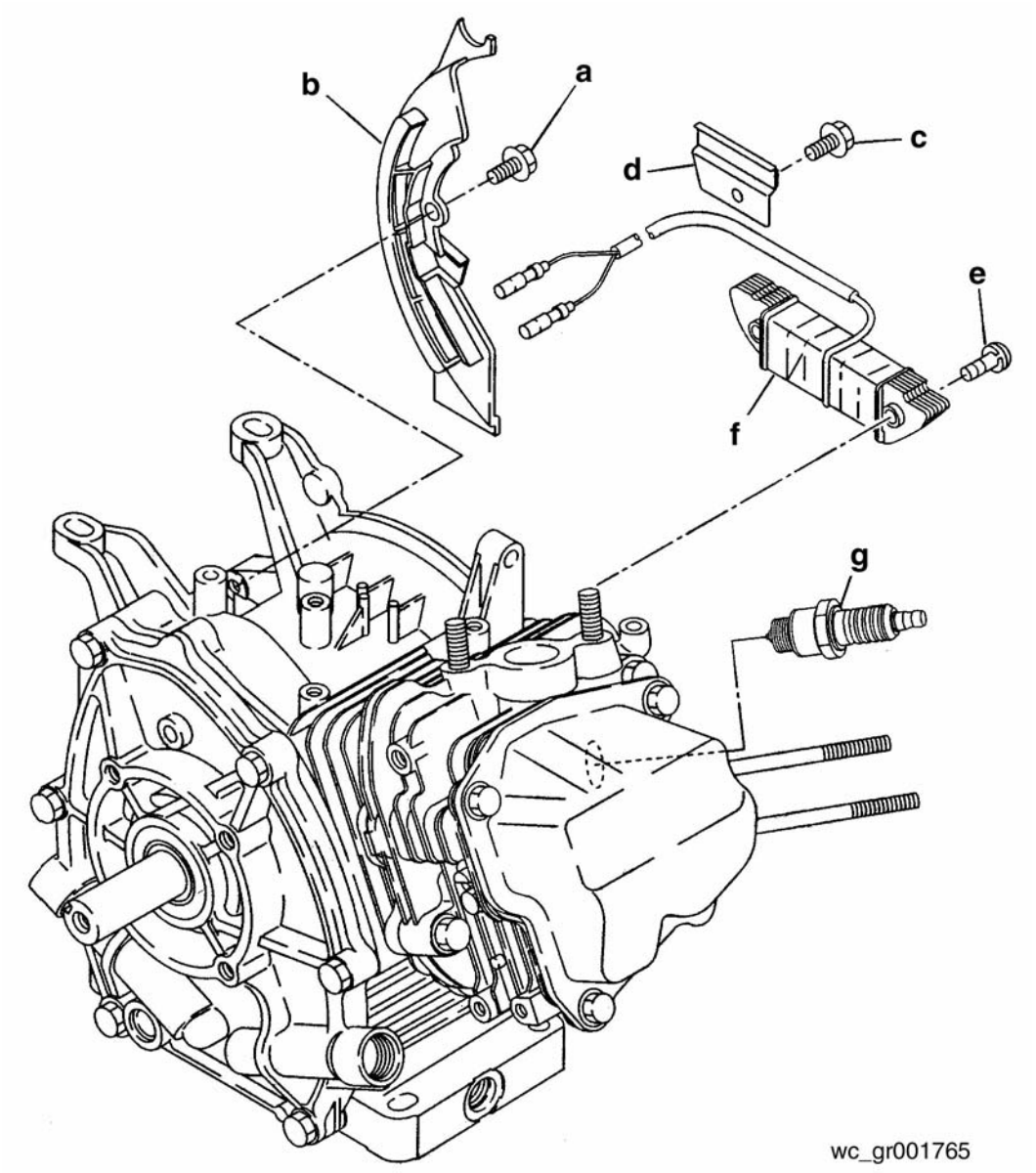
See Graphic: wc_gr001765

8.7.1 Remove the screw **(a)** securing the case baffle **(b)** and remove the case baffle.

8.7.2 If equipped, remove the M6 screw **(c)** securing the clamp **(d)** and remove the clamp.

8.7.3 Remove the M6 screws **(e)** securing the charge coil **(f)** and remove the charge coil.

8.7.4 Remove the spark plug **(g)**.

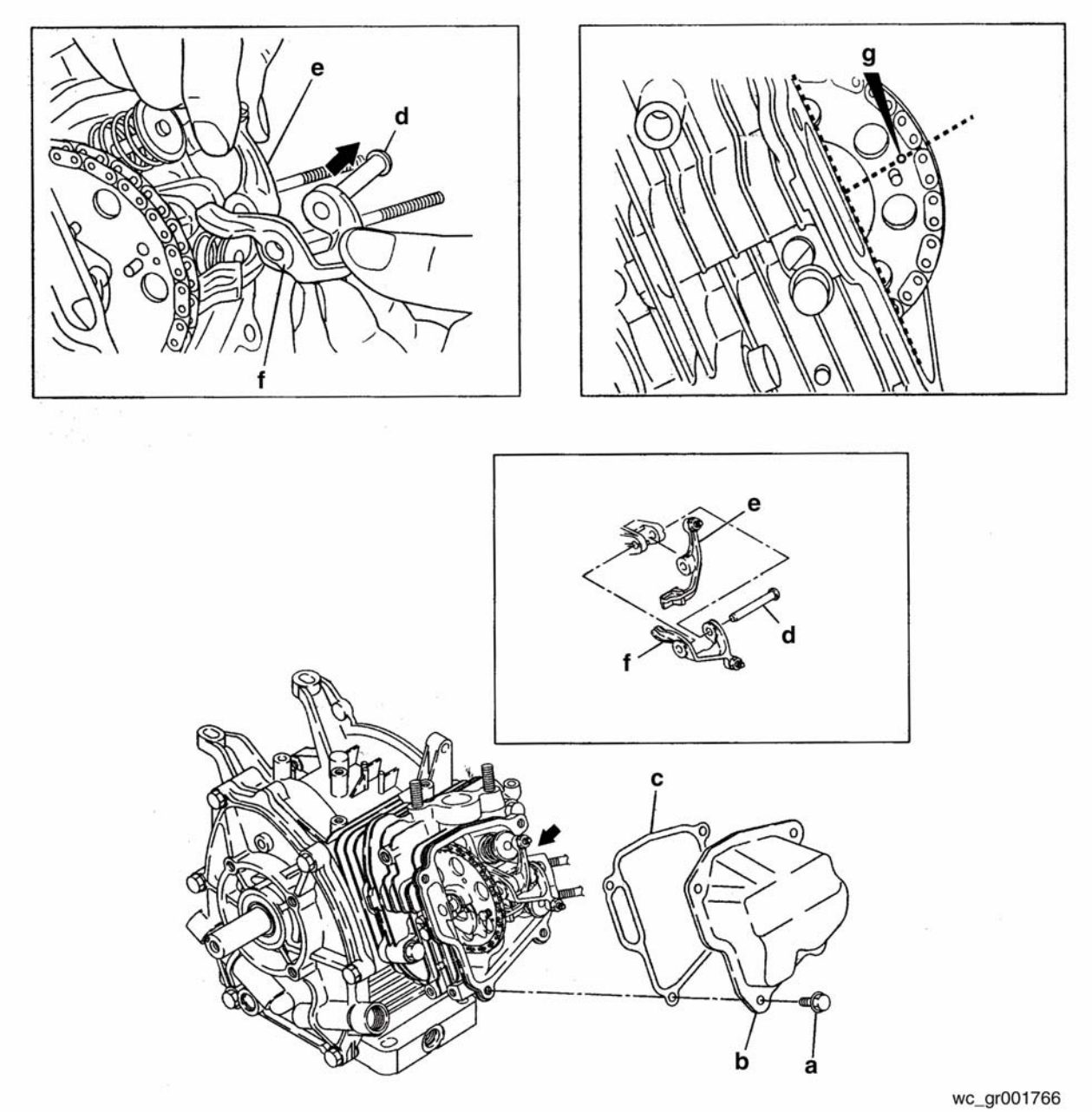


8.8 Removing Rocker Cover and Rocker Arm (older)

See Graphic: wc_gr001766

8.8.1 Remove the M6 bolts **(a)** securing the rocker cover **(b)** and remove the rocker cover. Remove the rocker cover gasket **(c)**.

8.8.2 Remove the rocker arm pin **(d)** and both exhaust-valve-side **(e)** and intake-valve-side **(f)** rocker arms at compression top dead center **(g).**

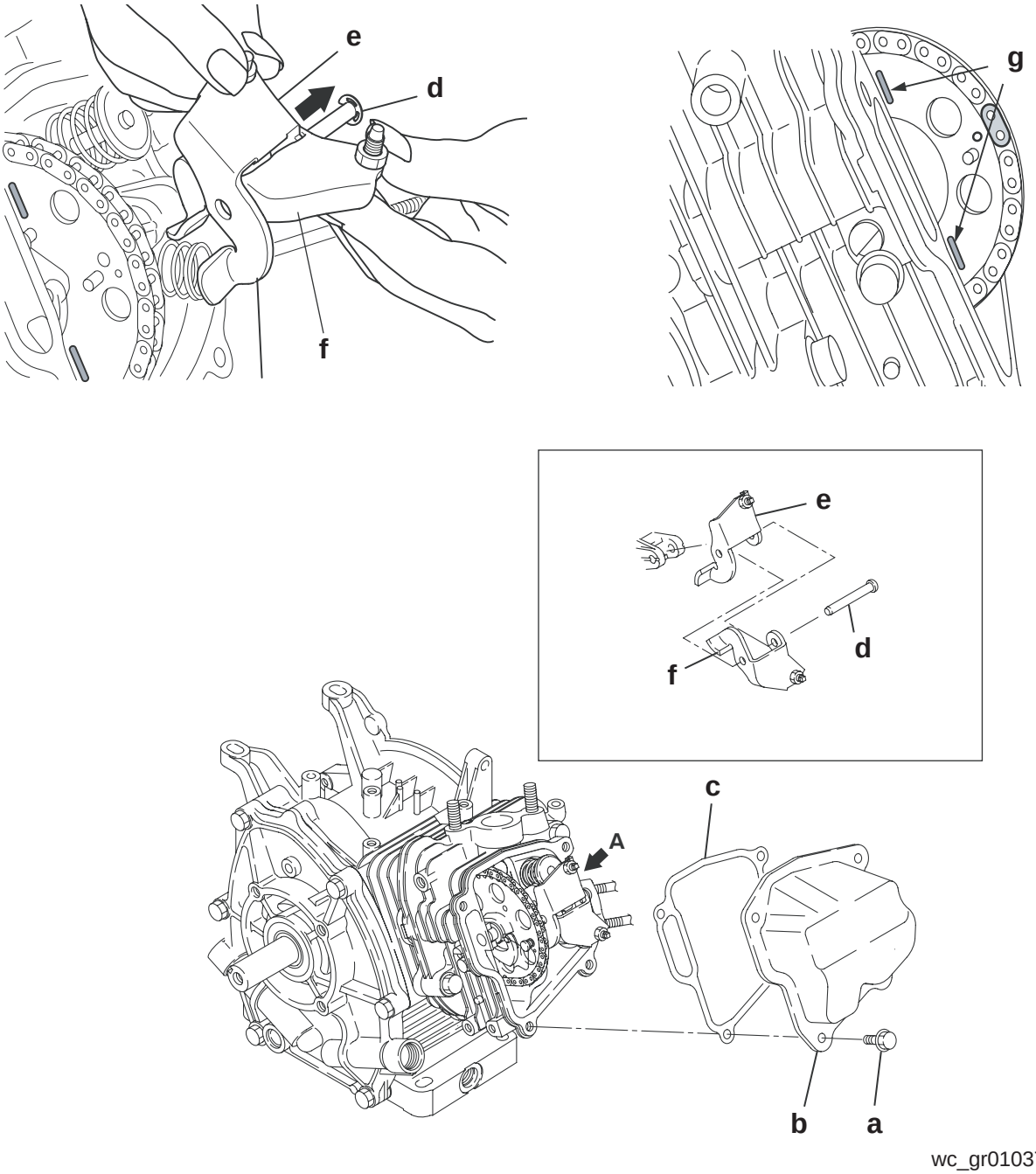


8.9 Removing Rocker Cover and Rocker Arm (newer)

See Graphic: wc_gr001766

8.9.1 Remove the M6 bolts **(a)** securing the rocker cover **(b)** and remove the rocker cover. Remove the rocker cover gasket **(c)**.

8.9.2 Remove the rocker arm pin **(d)** and both exhaust-valve-side **(e)** and intake-valve-side **(f)** rocker arms at compression top dead center. For top dead center, align both punch marks **(g)** as shown**.**



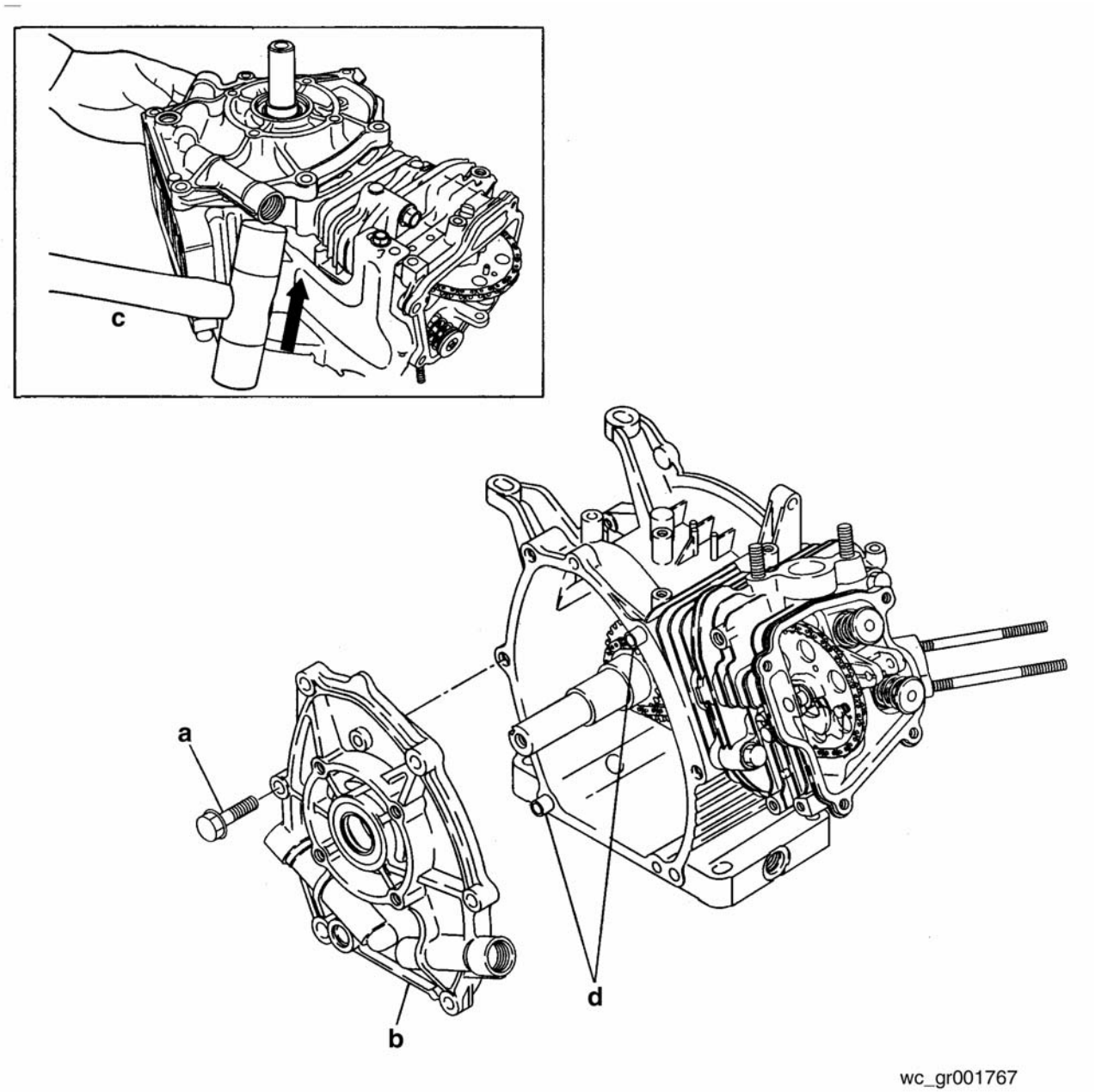
wc_gr010379

8.10 Removing Main Bearing Cover

See Graphic: wc_gr001767

8.10.1 Remove the six M8 bolts **(a)** securing the main bearing cover **(b)**. If necessary, tap the main bearing cover with a rubber mallet **(c)** to loosen it.

8.10.2 Be careful not to damage the oil gauge, oil seal, or guide pins **(d)**.



8.11 Removing Tensioner and Camshaft

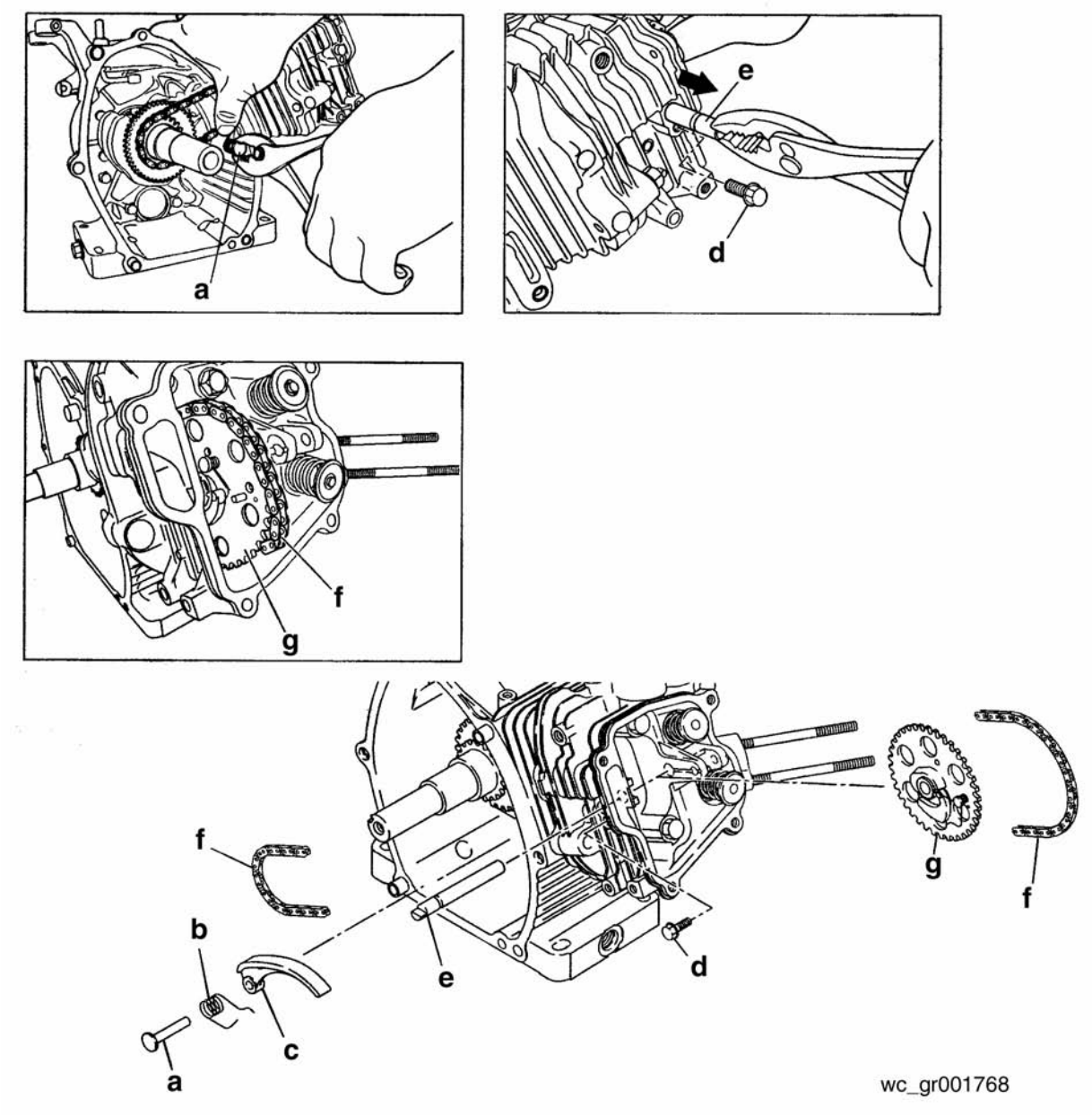
See Graphic: wc_gr001768

8.11.1 Remove the tensioner pin **(a)**, tensioner spring **(b),** and the tensioner **(c)**.

8.11.2 Remove M6 camshaft pin retaining bolt **(d)**. Remove the camshaft pin **(e)**. Be careful not to damage the pin's O-ring.

8.11.3 Remove the chain **(f)** from the camshaft. Remove the camshaft **(g)**.

8.11.4 Remove chain from crankshaft.



8.12 Removing Cylinder Head and Valves

See Graphic: wc_gr001769

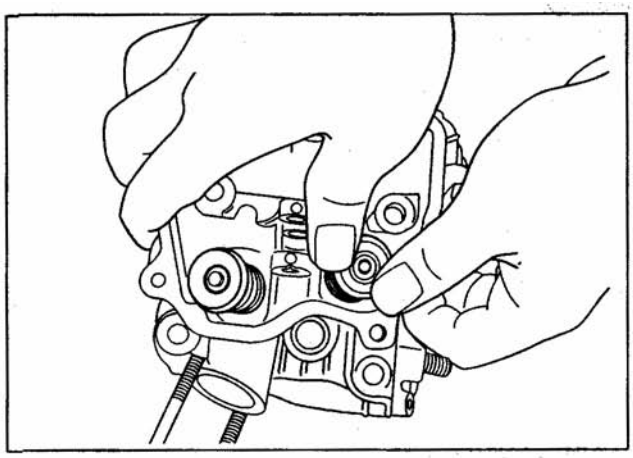
8.12.1 Remove the M8 bolts **(a)** securing the cylinder head **(b)** to the crankcase and remove the cylinder head. Also remove the cylinder head gasket **(c)**. Be careful not to lose the guide pins **(d)**.

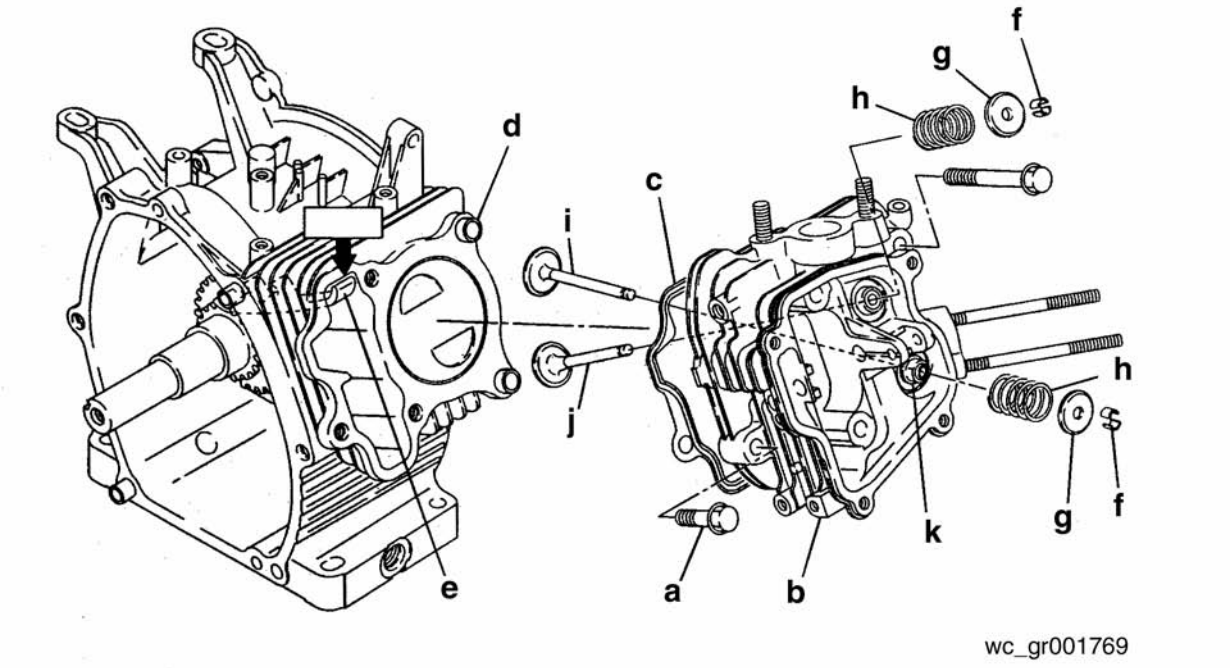
8.12.2 Press down on the chain guide **(e)** and remove it by pulling it through the top side of the crankcase.

8.12.3 Remove the collet **(f)**, spring retainer **(g)**, and valve spring **(h).** Complete for both intake and exhaust.

8.12.4 Remove the intake valve **(i)** and the exhaust valve **(j)**.

Reference: Stem seal **(k)**.





8.13 Removing Connecting Rod and Piston

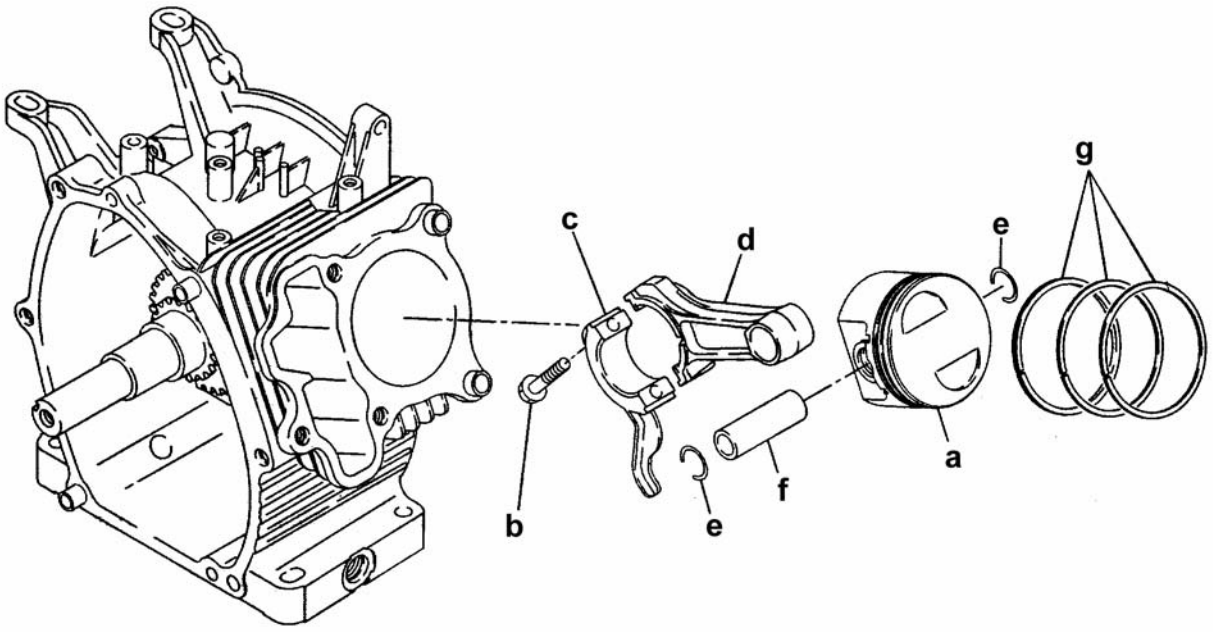
See Graphic: wc_gr001770

8.13.1 Scrape off any carbon from the cylinder and the piston head **(a)**. Remove the two M6 connecting rod bolts **(b)** and remove the connecting rod cap **(c)**.

8.13.2 Rotate the crankshaft until the piston comes to its top position. From inside the crankcase, push the connecting rod **(d)** and piston out the top of the crankcase.

8.13.3 Remove the two piston pin clips **(e)** and remove the piston pin **(f)**. Being careful not to damage the connecting rod, remove it from the piston.

8.13.4 Being careful not to damage the rings or the piston, remove the rings **(g)** from the piston by spreading them at the gap and pulling them from the piston.



wc_gr001770

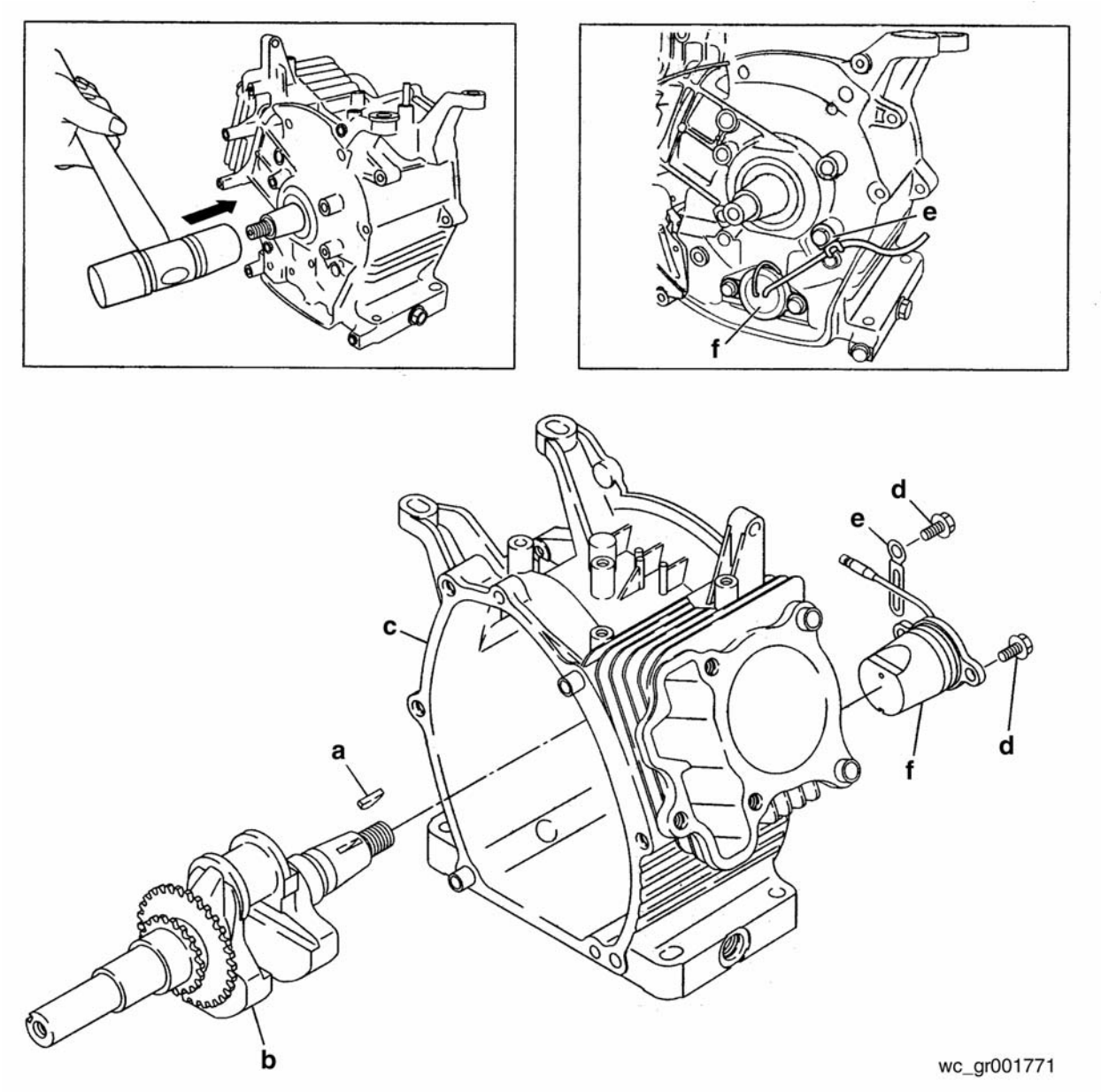
8.14 Removing Crankshaft and Oil Sensor

See Graphic: wc_gr001771

8.14.1 Remove Woodruff key **(a)**.

8.14.2 Taking care not to damage the oil seal, remove the crankshaft **(b)** from the crankcase **(c)** by tapping its magneto-side end with a rubber mallet.

8.14.3 Remove the screws **(d)** securing the sensor clamp **(e)** and then the oil sensor **(f)**.



9 Reassembly Procedures

9.1 Notes on Reassembly

Observe the following prior to/during reassembly of the engine:

- Clean each part carefully, taking special care with the piston, cylinder, crankshaft, connecting rod, and bearings.
- Scrape off any carbon deposits on the cylinder head and the piston head. Be particularly careful when removing carbon from the piston ring grooves.
- Inspect oil seals for any damage to the lip. Replace them if damaged. Apply oil to lip before re-assembling.
- Replace all gaskets with new ones.
- Replace keys, pins, bolts and nuts with new ones if necessary.
- Tighten nuts and bolts to the specified torque settings.
- During re-assembly, apply oil to all moving parts.
- Check clearances and end plays. Adjust the clearances as necessary.
- When mounting any major moving part, rotate it with your hand to check for any jamming or abnormal noise.

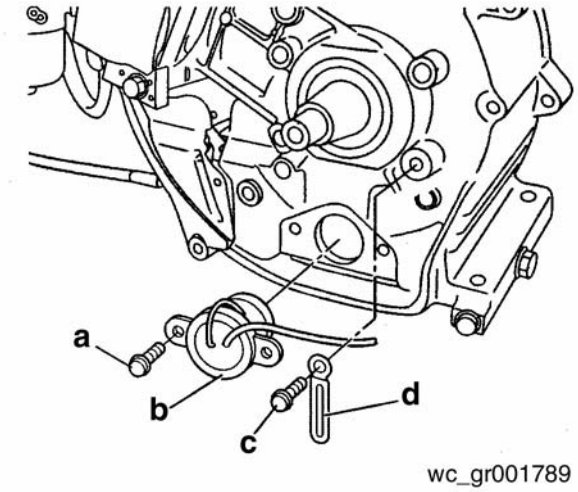
9.2 Oil Sensor

See Graphic: wc_gr001789 and wc_gr001790

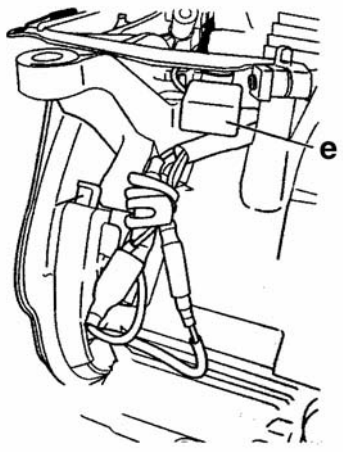
9.2.1 Using M6x16 screws **(a)**, mount the oil sensor **(b)**.

9.2.2 Using M6x12 screw **(c)**, secure the wire with the clamp **(d).**

9.2.3 Mount the control unit **(e)** and the ground wire.



wc_gr001789



wc_gr001790

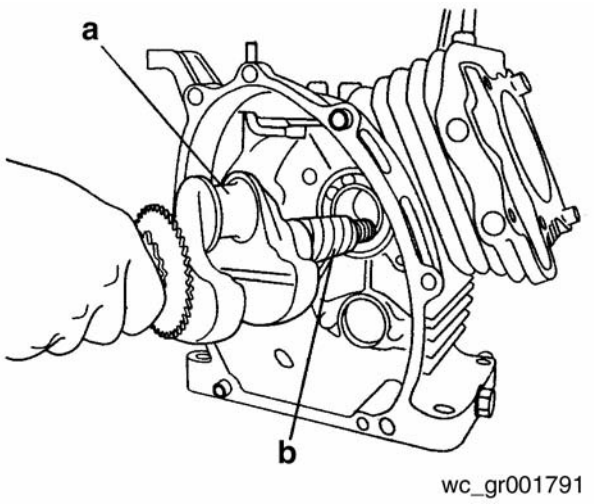
9.3 Crankshaft

See Graphic: wc_001791

9.3.1 Wrap the keyway portion of the crankshaft **(a)** with polyvinyl tape **(b)** and insert the crankshaft into the crankcase, taking care not to damage the oil seal lip.

9.3.2 Remove the polyvinyl tape and insert the Woodruff key, for the flywheel magneto, into the crankcase.

Note: *Do not insert the Woodruff key before inserting the crankshaft into the crankcase.*



wc_gr001791

9.4 Piston and Piston Rings

See Graphic: wc_gr001749, wc_gr001792, and wc_gr001793

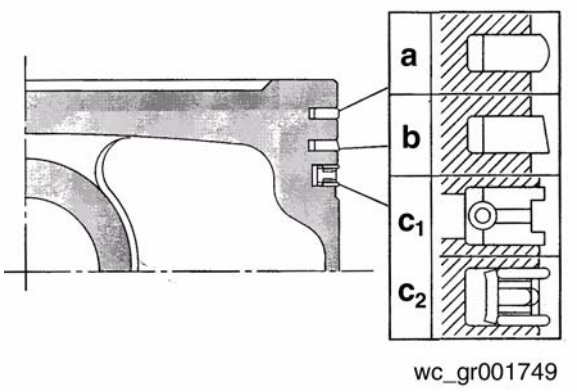
Note: *When installing the piston rings, make sure not to twist the rings too much as they may be damaged.*

9.4.1 Install each piston ring in the correct groove of the piston by widening it enough to slide it over the piston.

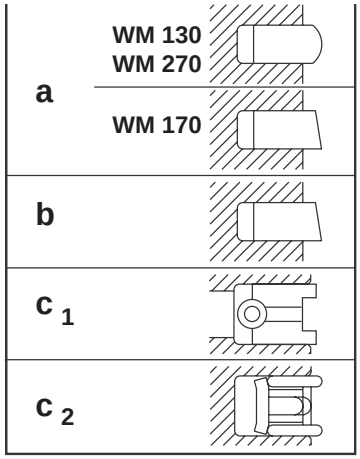
9.4.2 Install the oil ring **(c_1** or **c_2)** first.

9.4.3 Install the second ring **(b)** with the “N” mark facing up.

9.4.4 Install the top ring **(a)**.

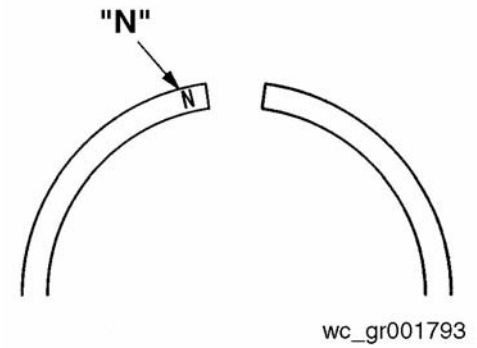


wc_gr001749



wc_gr010380


wc_gr001792



wc_gr001793

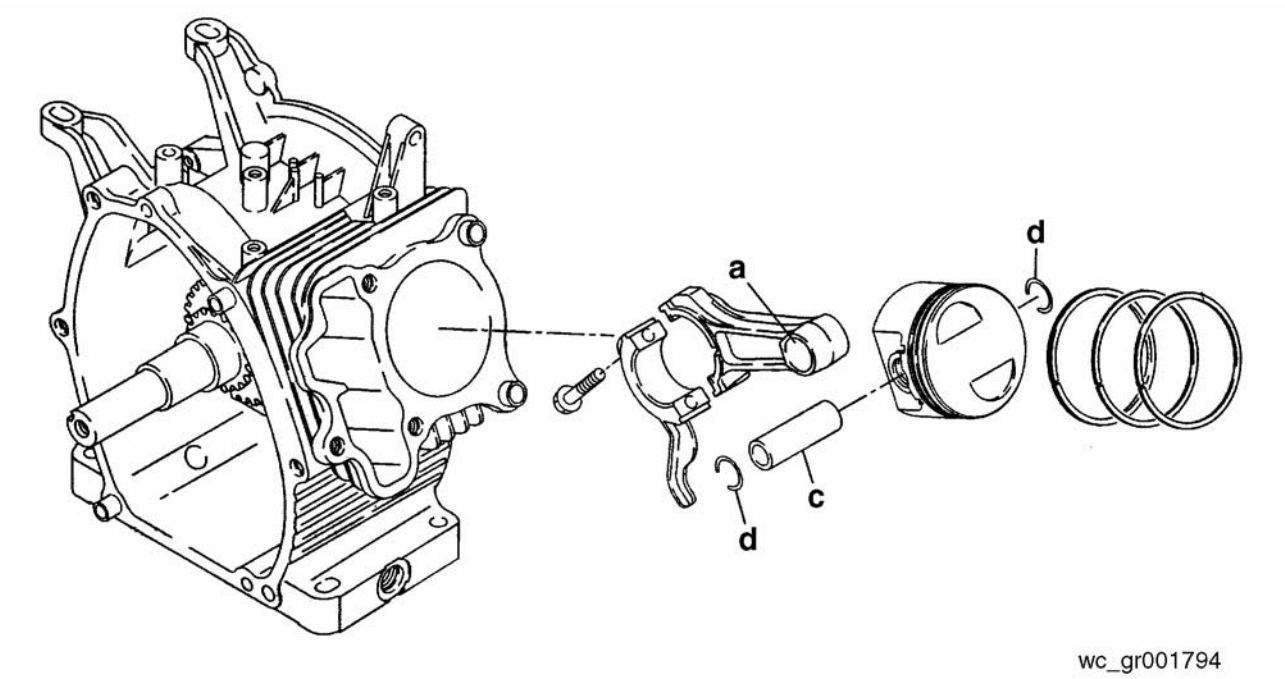
9.5 Piston and Connecting Rod

See Graphic: wc_gr001794 and wc_gr001795

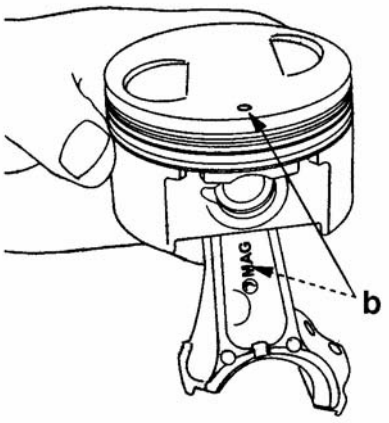
9.5.1 Apply a coat of oil to the inside of the connecting rod's small end **(a)**.

9.5.2 Align the mark on the piston head **(b)** with the "MAG" mark on the connecting rod. Insert the connecting rod into the piston head.

9.5.3 Slide the piston pin **(c)** through the piston and through the connecting rod. Secure the pin with clips **(d)**. Check pins for play. Refer to the *Clearance Data and Limits Table*.



wc_gr001794



wc_gr001795

9.6 Connecting Rod

See Graphic: wc_gr001796 and wc_gr001797

9.6.1 Position the piston rings so that the gaps in the rings are at 90° intervals from each other (**a** = top ring, **b** = second ring, **c** = oil ring).

9.6.2 Apply oil to the piston rings, the cylinder bore, and the large end of the connecting rod.

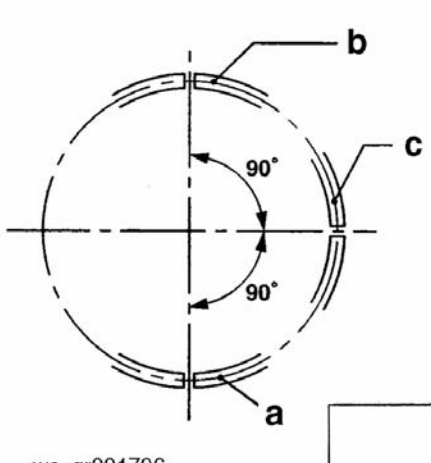
9.6.3 Position the “MAG” mark on the connecting rod **(d)** towards the flywheel side **(f)** of the engine. Then, using a ring guide **(e)**, hold the piston rings in and lower the piston into the cylinder.

Note: *If you do not have a ring guide, hold the piston rings in with your fingers while tapping lightly on the piston head with a block of wood or rubber mallet.*

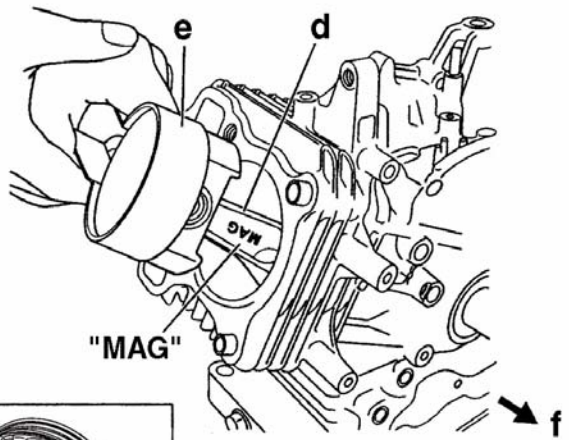
9.6.4 Rotate the crankshaft down to the bottom dead center and lightly tap the piston head until the large end of the connecting rod touches the crank pin.

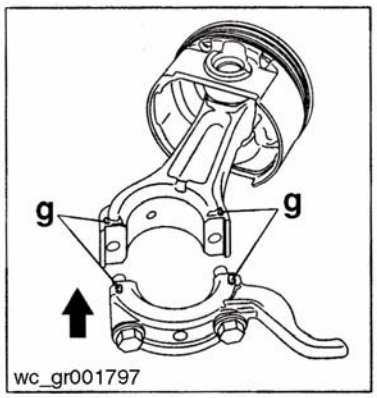
9.6.5 To mount the connecting rod, line up the matching marks **(g)** and fit the clinch portions firmly together. Using two M8 bolts, secure the two halves together. Torque bolts to: WM 130/170 13–15 Nm (9.4–10.8 ft.lbs); WM 270 17–20 Nm (12.3–14.5 ft.lbs).

9.6.6 Check for free movement of the connecting rod by turning the crankshaft slowly.



wc_gr001796





wc_gr001797

9.7 Intake and Exhaust Valves

See Graphic: wc_gr001798

Note: *Replace the valves if they show signs of wear. See Clearance Data and Limits Table.*

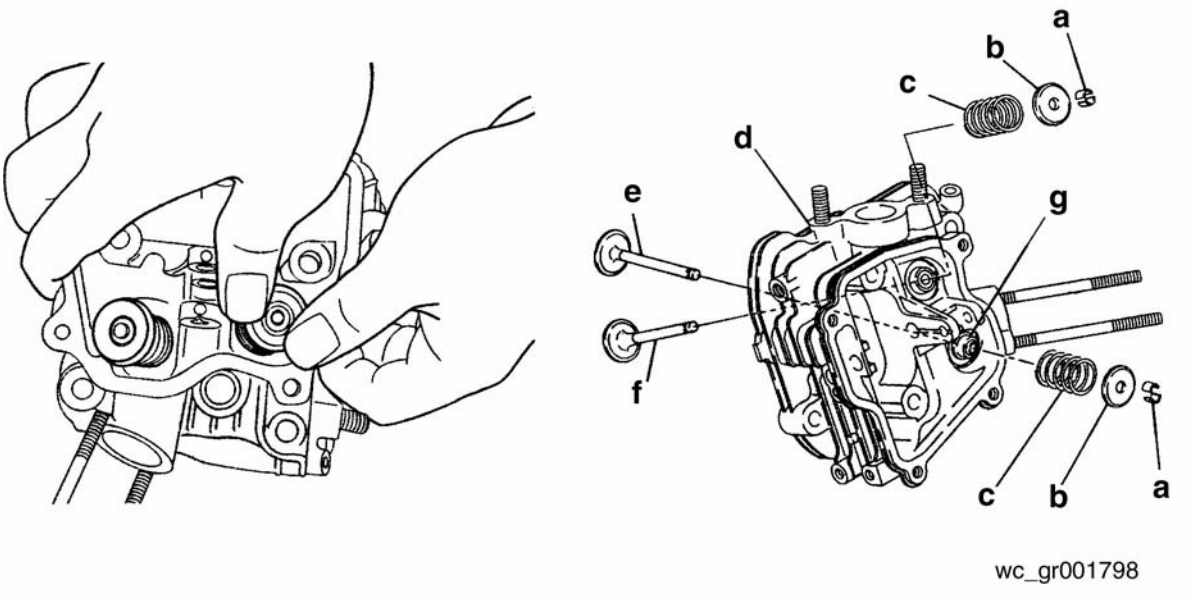
9.7.1 Carefully scrape off any carbon deposits on the combustion chamber.

9.7.2 Before installing, apply oil to the intake valve **(e)** and the exhaust valve **(f)**.

9.7.3 If they have been removed or are being replaced, mount the stem seals **(g)**.

9.7.4 Insert the valve stems into the cylinder head **(d)**. Then, place the cylinder head on a flat workbench.

9.7.5 Mount the valve springs **(c)**, the spring retainers **(b)**, and the collets **(a)**.



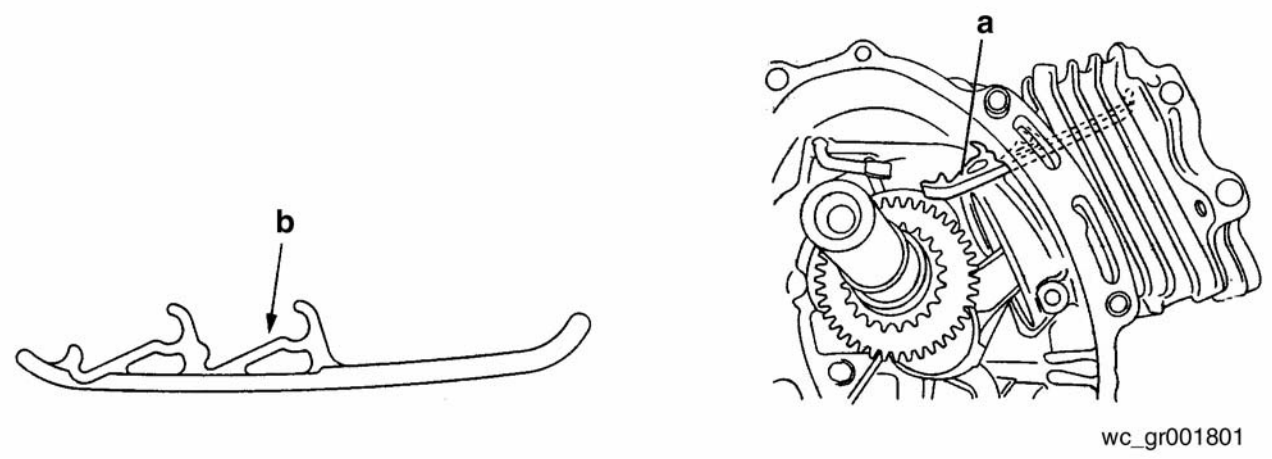
wc_gr001798

9.8 Chain Guide

See Graphic: wc_gr001801

9.8.1 Mount the chain guide **(a)** to the crankcase.

Note: *Use mounting position **(b)**.*



9.9 Cylinder Head

See Graphic: wc_gr001802 and wc_gr001803

Note: *Replace the head gasket **(b)** whenever the cylinder head is removed.*

9.9.1 Inspect for and repair any scratches on the cylinder head **(a)** mounting surface.

9.9.2 Using four M8 x 68 bolts **(c)** and one M8 x 35 bolt **(d)**, secure the cylinder head to the cylinder. Tighten the bolts in the pattern shown. First torque all the bolts to that listed for the M8 x 35 bolts. Then, torque only the M8 x 68 bolts to the larger value.

If you are reusing the bolts:

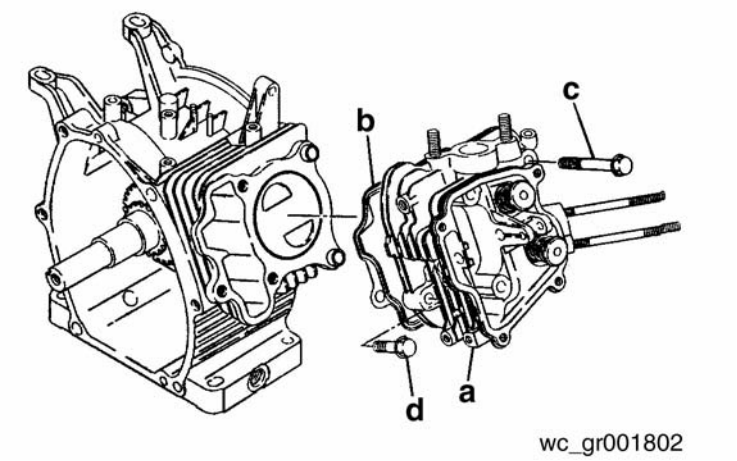
M8 x 35 torque to 17–19 Nm (12.3–13.7 ft.lbs.)

M8 x 68 torque to 25–27 Nm (18.1–19.5 ft.lbs.)

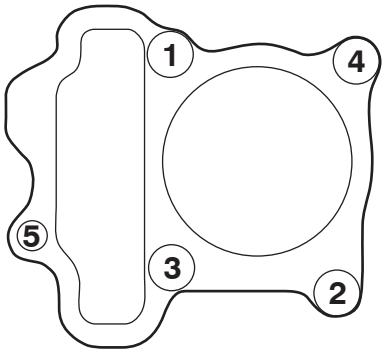
If you are using new bolts:

M8 x 35 torque to 17–19 Nm (12.3–13.7 ft.lbs.)

M8 x 68 torque to 28–30 Nm (20.3–21.7 ft.lbs.)



wc_gr001802



wc_gr001803

9.10 Setting the Timing Chain

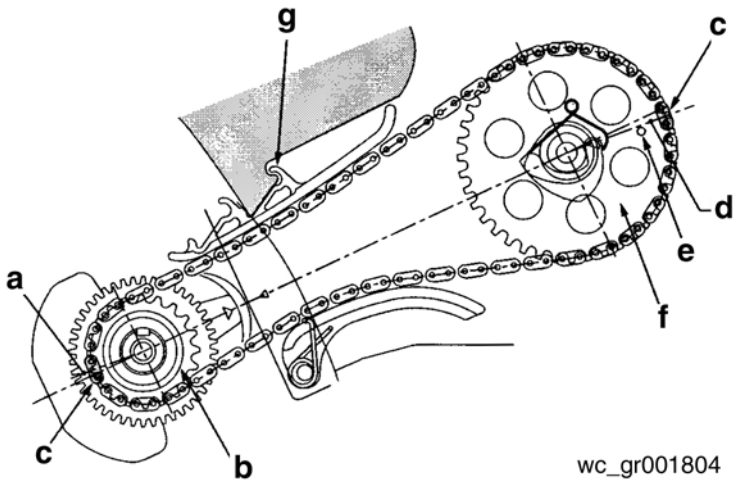
See Graphic: wc_gr001804

9.10.1 Align the timing mark **(a)** on the crankshaft **(b)** with the mark plate **(c)** of the timing chain.

9.10.2 Align the timing mark **(a)** on the crankshaft **(b)** with the mark plate **(c)** on the opposite end of the timing chain.

Note: *The mark plate **(c)** does not have a camshaft side or crankshaft sprocket side.*

Reference: Camshaft sprocket **(f)**; camshaft timing mark **(d)**; roll pin **(e)**; and chain guide position **(g)**.



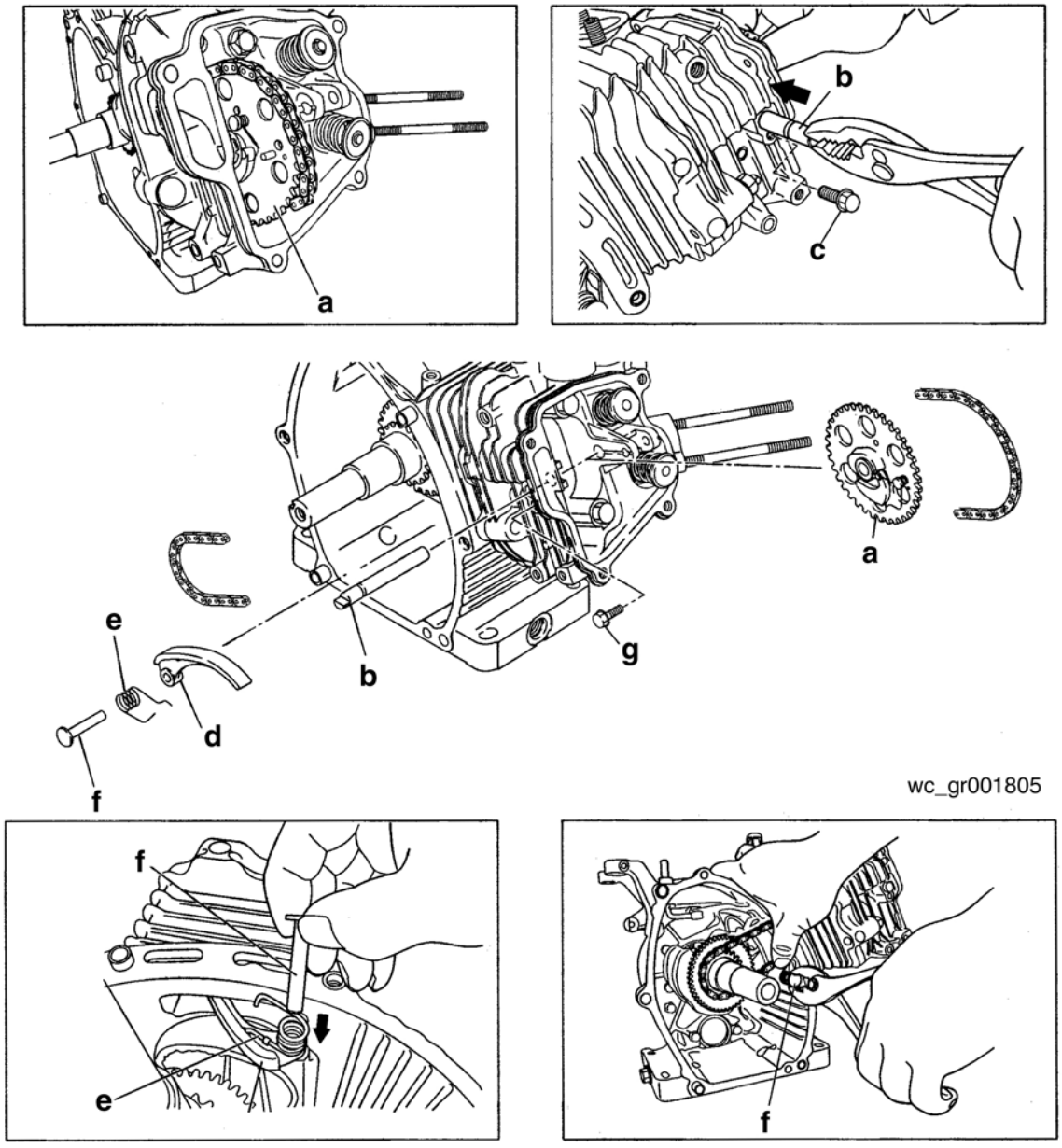
	WM 130	WM 170	WM 270
Number of chain links	86	88	100

9.11 Mounting the Camshaft on the Cylinder Head

See Graphic: wc_gr001805

9.11.1 Mount the camshaft (**a)** on the cylinder head by inserting the camshaft pin **(b)** through the head. Secure the pin with the M6 x 12 bolt **(c)**.

9.11.2 Also mount the tensioner **(d)**, the tensioner spring **(e)**, and the tensioner pin **(f)**.

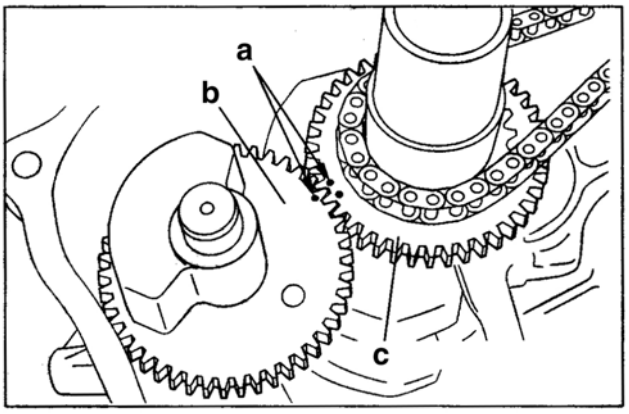


9.12 Balancer Shaft Option (WM 270 only)

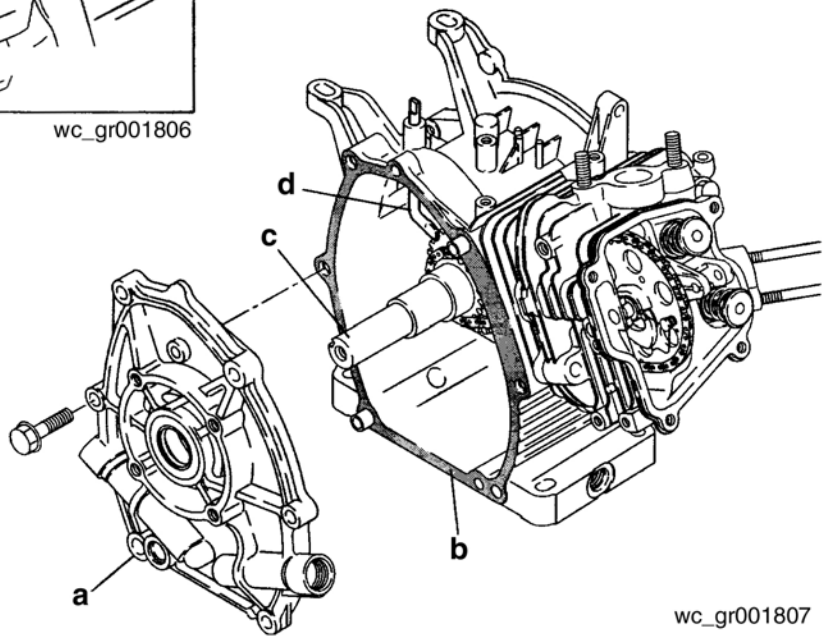
See Graphic: wc_gr001806

9.12.1 Mount the balancer shaft on the crankcase, align the timing marks **(a)** on the balancer gear **(b)** and the crankshaft gear **(c)**.

Note: *Incorrect alignment of the timing marks can result in malfunction of the engine, leading to damage due to interference of the parts.*



wc_gr001806



wc_gr001807

9.13 Main Bearing Cover

See Graphic: wc_gr001807

9.13.1 Apply oil to the bearing and the oil seal lip when mounting the main bearing cover **(a)**. Also apply Loctite® 515 gasket eliminator or equivalent to the surface face **(b)** of the crankcase. To avoid damaging the oil seal lip, wrap the crankshaft key way with polyvinyl tape before mounting the main bearing cover. Remove tape after installing crankshaft.

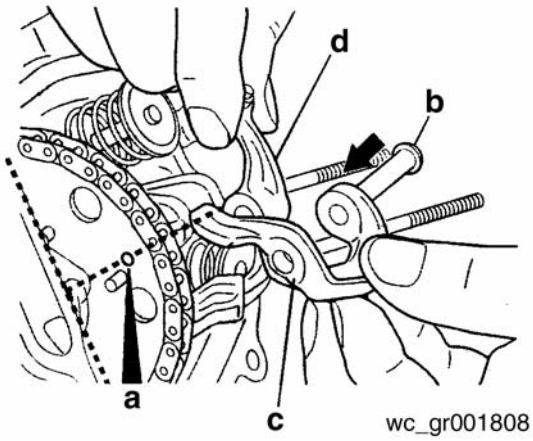
Note: *Be careful that the lever portion of the governor shaft does not face the bearing cover.*

9.14 Mounting Rocker Arms

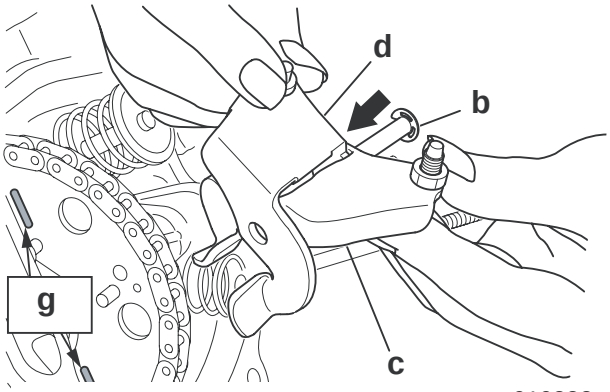
See Graphic: wc_gr001808, wc_gr010382

Note: *Complete this procedure when the piston is at the top dead center position **(a)**. (Timing mark is 90° to the cylinder head surface.)*

9.14.1 Insert the rocker arm pin **(b)** through the intake valve rocker arm **(c)**, through the exhaust rocker arm **(d)**, and mount them to the cylinder head.



wc_gr001808



wc_gr010382

9.15 Valve Clearance Adjustment

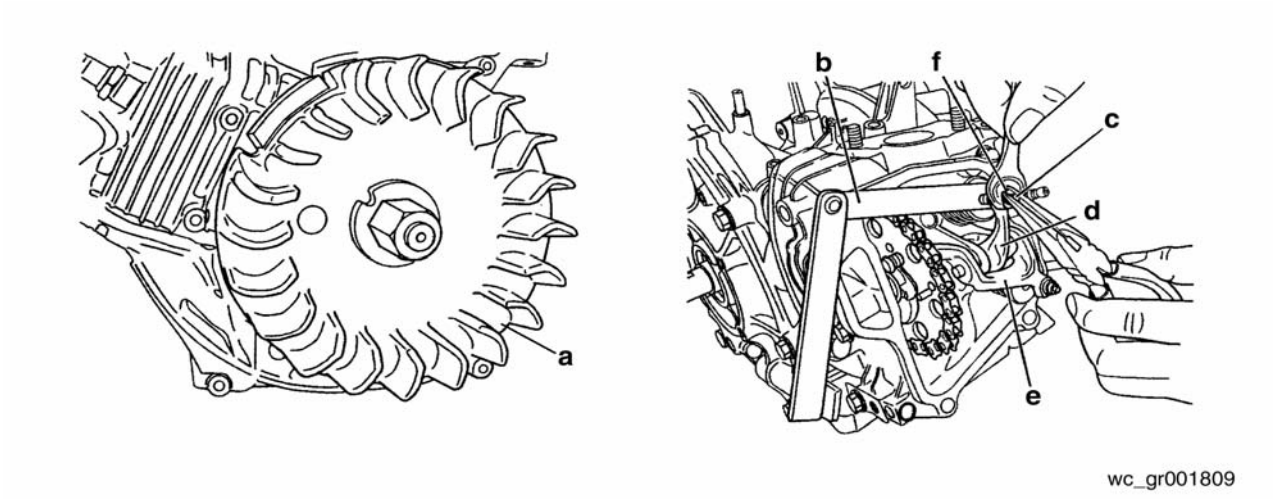
See Graphic: wc_gr001809

9.15.1 Temporarily fit the flywheel **(a)**.

9.15.2 Rotate the crankshaft up to the top dead center position. Measure the clearance by inserting the thickness gauge **(b)** between the valve and the adjusting screw **(c)**. Check clearance of exhaust valve rocker arm **(d)**; also check clearance of intake valve rocker arm **(e)**.

9.15.3 To adjust clearance, loosen the nut **(f)** on the adjusting screw and turn the screw until the clearance is correct. When the clearance is correct, tighten the screw. Adjust both intake and exhaust valve clearance to be 0.135 ± 0.015 mm (0.0053 ± 0.0006 in.). Torque the nut to 5.0–7.0 Nm (3.6–5.1 ft.lbs.).

Note: *After adjusting the valve clearances, rotate the crankshaft at least one full revolution and check the clearances again. Make any necessary adjustments.*



9.16 Rocker Cover and Spark Plug

See Graphic: wc_gr001810

Note: *Replace the gasket with a new one each time the rocker cover is removed.*

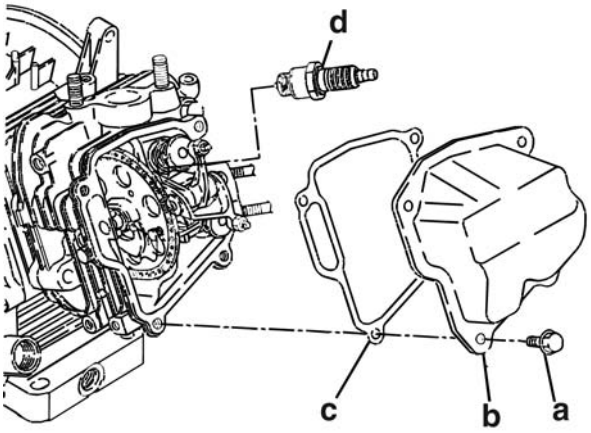
9.16.1 Using four M6 x 12 bolts **(a)**, secure the rocker cover **(b)** and gasket **(c)** to the cylinder head. Torque the bolts to 5.0–7.0 Nm (3.6–5.1 ft.lbs.).

9.16.2 Remove any carbon deposits from the spark plug **(d)** and inspect the electrode for damage. Replace the spark plug if necessary. Use **NGK BR-6HS or Champion RL86C**.

Electrode gap: 0.6–0.7 mm (0.23–0.27 in.).

Spark Plug Torque:

New plug: 12.0–15.0 Nm (8.7–10.8 ft.lbs.)
Reused plug: 23.0–27.0 Nm (16.6–19.5 ft.lbs.)

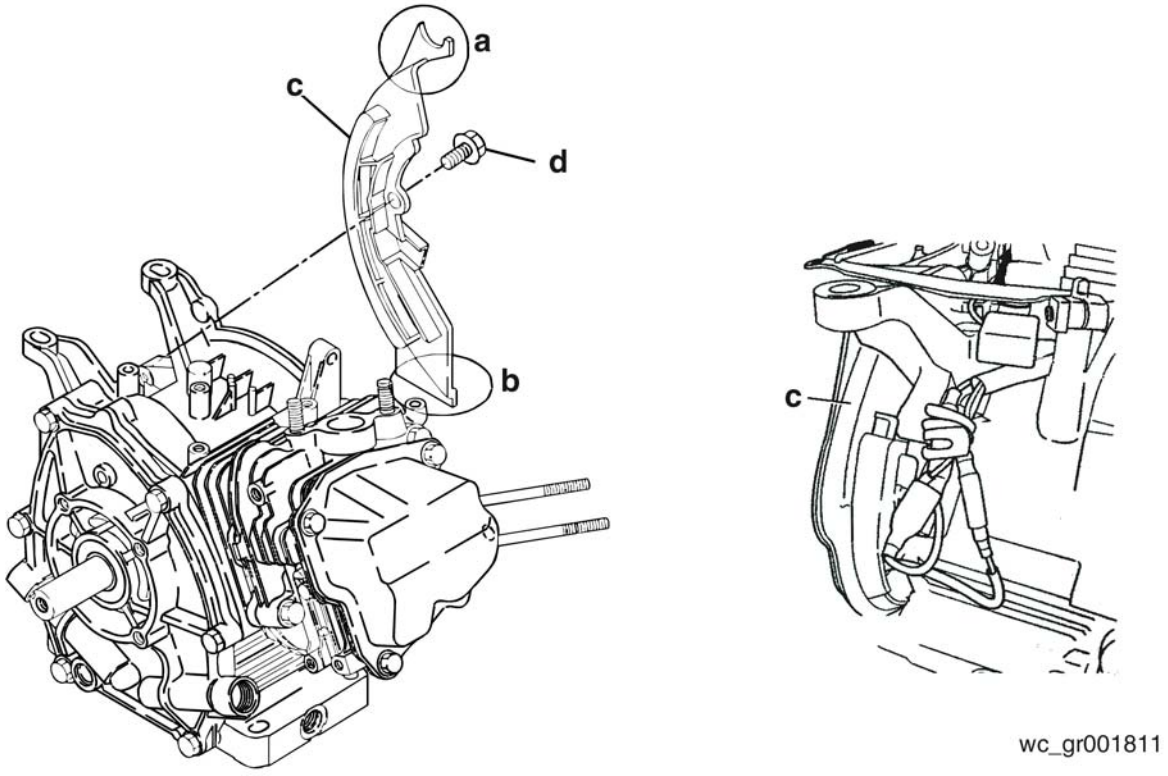


wc_gr001810

9.17 Case Baffle

See Graphic: wc_gr001811

9.17.1 Align the top **(a)** and bottom **(b)** of the baffle **(c)** with the crankcase and using the M6 (WM 130/170) or the M8 (WM 270) bolt **(d)** secure the case baffle to the crankcase.



wc_gr001811

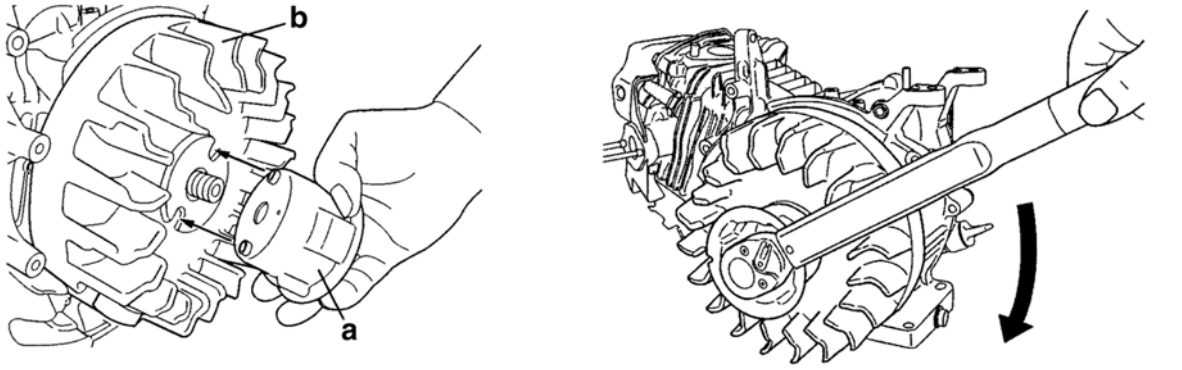
9.18 Flywheel and Starter Pulley

See Graphic: wc_gr001812

Note: *When mounting the flywheel, be sure to wipe off any oil on the tapered portion of the crankshaft and flywheel.*

9.18.1 Place the flywheel on the crankshaft. Align the two bosses of the starter pulley **(a)** with the two depressions on the flywheel **(b)**.

9.18.2 Tighten the flywheel together with the starter pulley. Torque the nut to 59.0–64.0 Nm (42.7–46.3 ft.lbs).



wc_gr001812

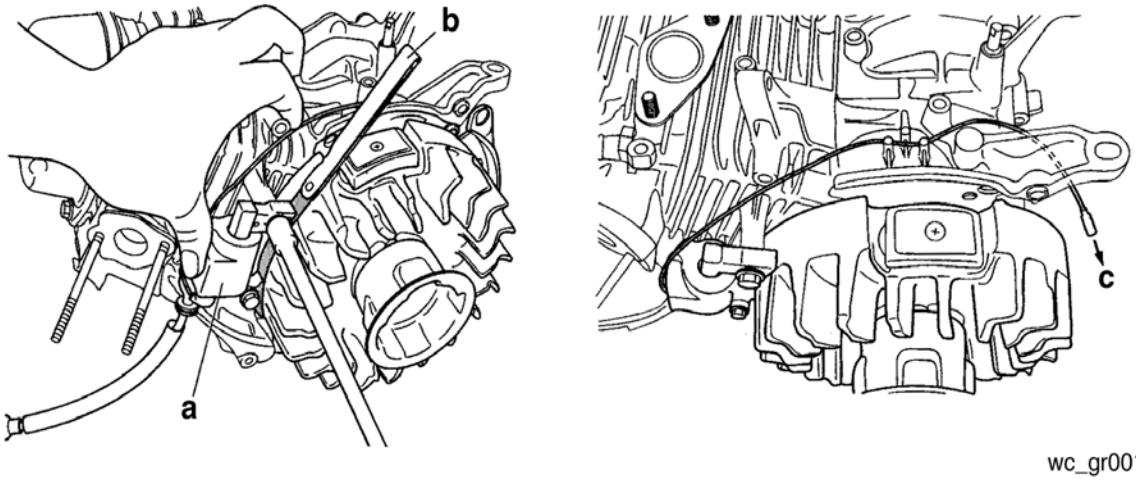
9.19 Ignition Coil

See Graphic: wc_gr001813

9.19.1 Using two M6 x 25 bolts and washers, secure the ignition coil **(a)** to the engine. Use a thickness gauge **(b)** to set the air gap of 0.3–0.5 mm (0.011–0.019 in.).

Torque the nuts to 7.0–9.0 Nm (5.1–6.5 ft.lbs.).

Reference: Wire to stop switch **(c)**.



wc_gr001813

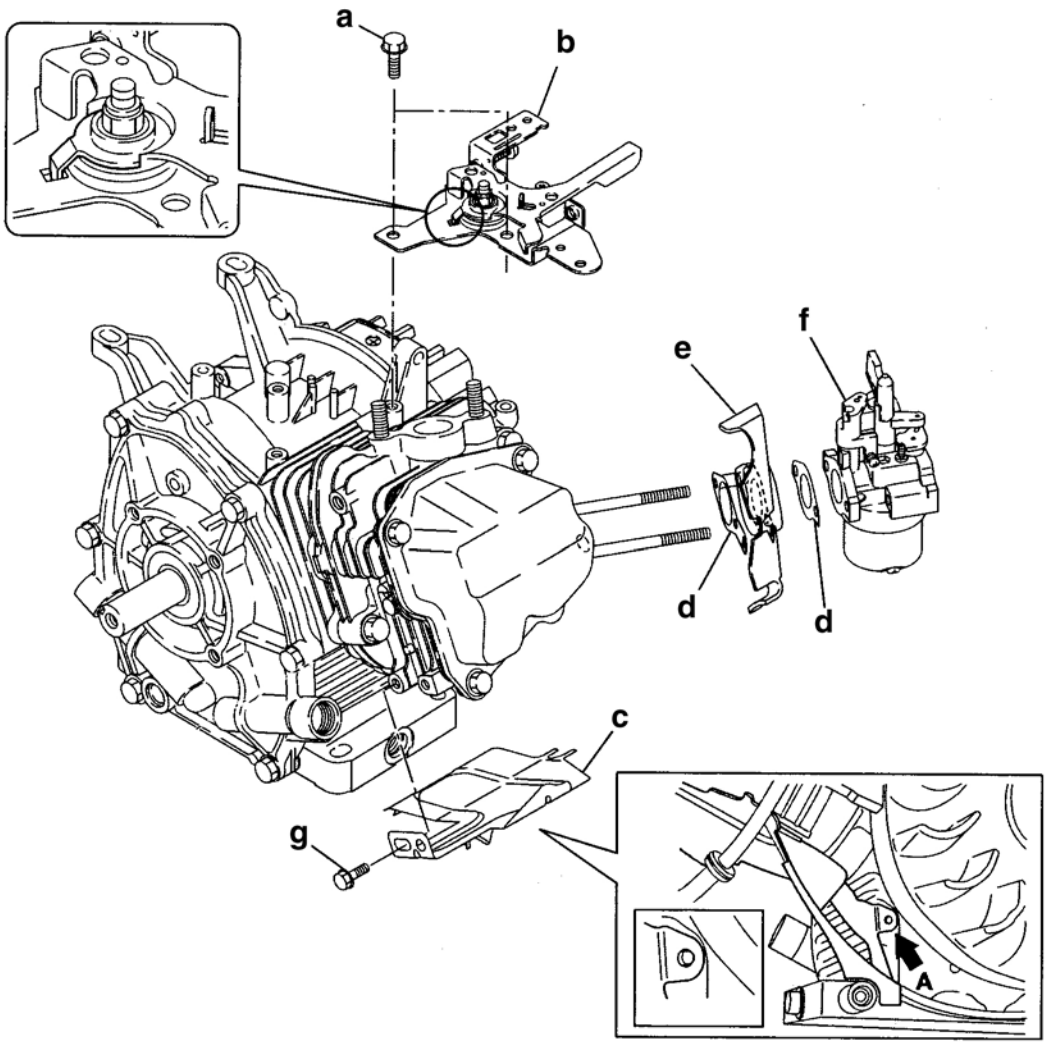
9.20 Speed Control Assembly and Carburetor

See Graphic: wc_gr001814

9.20.1 Using two M6 x 12 bolts **(a)**, secure the speed control assembly **(b)** to the engine.

9.20.2 Using one M6 x 12 bolt **(g)**, secure the head baffle **(c)** to the engine.

9.20.3 Replace the insulator gaskets **(d)** and mount the insulator gaskets, insulator **(e)**, and carburetor **(f)** to the engine.



wc_gr001814

9.21 Governor Lever

See Graphic: wc_gr001815

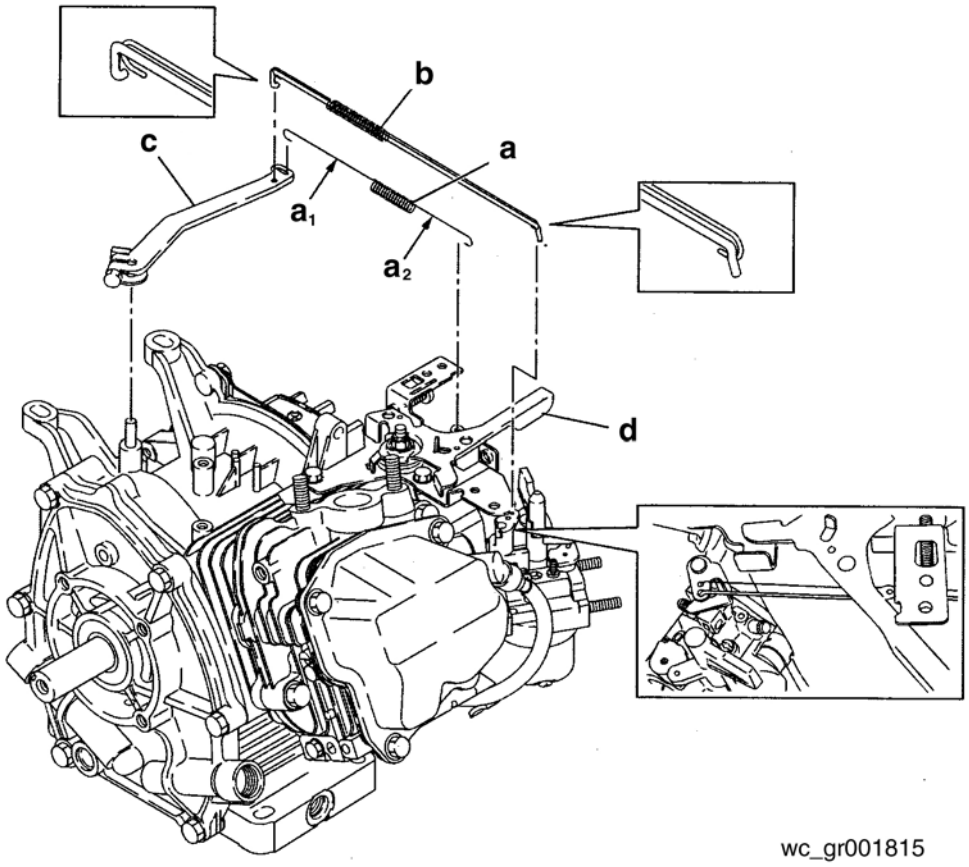
9.21.1 Slide the governor rod through the rod spring **(a)**. Connect the governor rod/spring assembly **(b)** to the throttle lever of the carburetor.

9.21.2 Attach the governor rod/spring assembly to the governor lever **(c)**, then mount the governor lever to the governor shaft. Do not adjust the bolt on the governor yet.

9.21.3 Connect the governor lever and the speed control lever with the governor spring.

Note: *Mount the air cleaner base before adjusting governor*.

Reference: Longer side **(a_1)**; shorter side **(a_2)**.

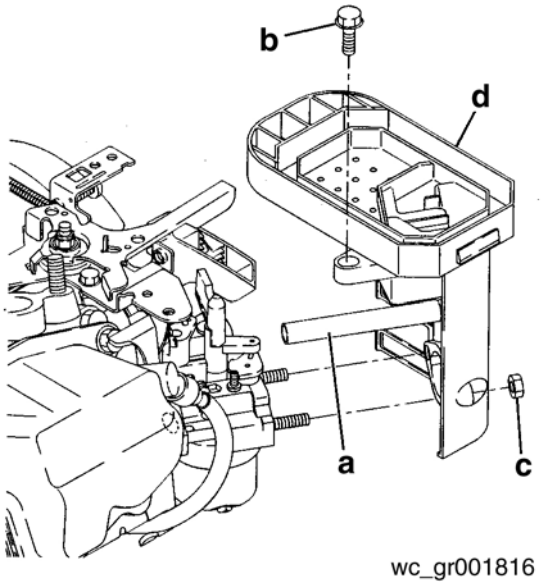


wc_gr001815

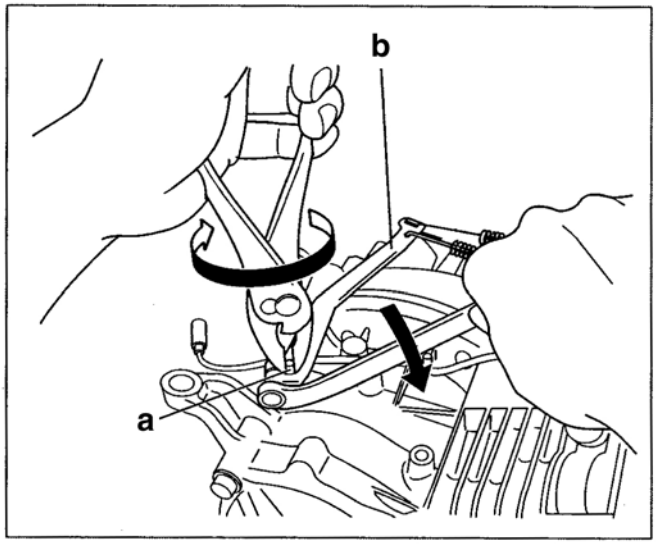
9.22 Air Cleaner Base

See Graphic: wc_gr001816

9.22.1 Insert the breather pipe **(a)** into the rocker cover, then using one M6 x 20 flange bolt **(b)** and two M6 flange nuts **(c)**, mount the air cleaner base **(d)** to the engine.



wc_gr001816



wc_gr001817

9.23 Governor System Adjustment

See Graphic: wc_gr001817

The governor system is a centrifugal flyweight type and is installed on the governor gear. Since it automatically adjusts the throttle valve of the carburetor by means of a link mechanism, it is possible to maintain a constant engine speed, even with load variations.

9.23.1 Turn the speed control lever to the full speed position, making sure that the carburetor throttle valve is fully open.

9.23.2 Hold the top of the governor shaft **(a)**, with a pliers and turn it clockwise as far as it will go. Tighten the bolt on the governor lever **(b)**.

9.24 Muffler

See Graphic: wc_gr001818

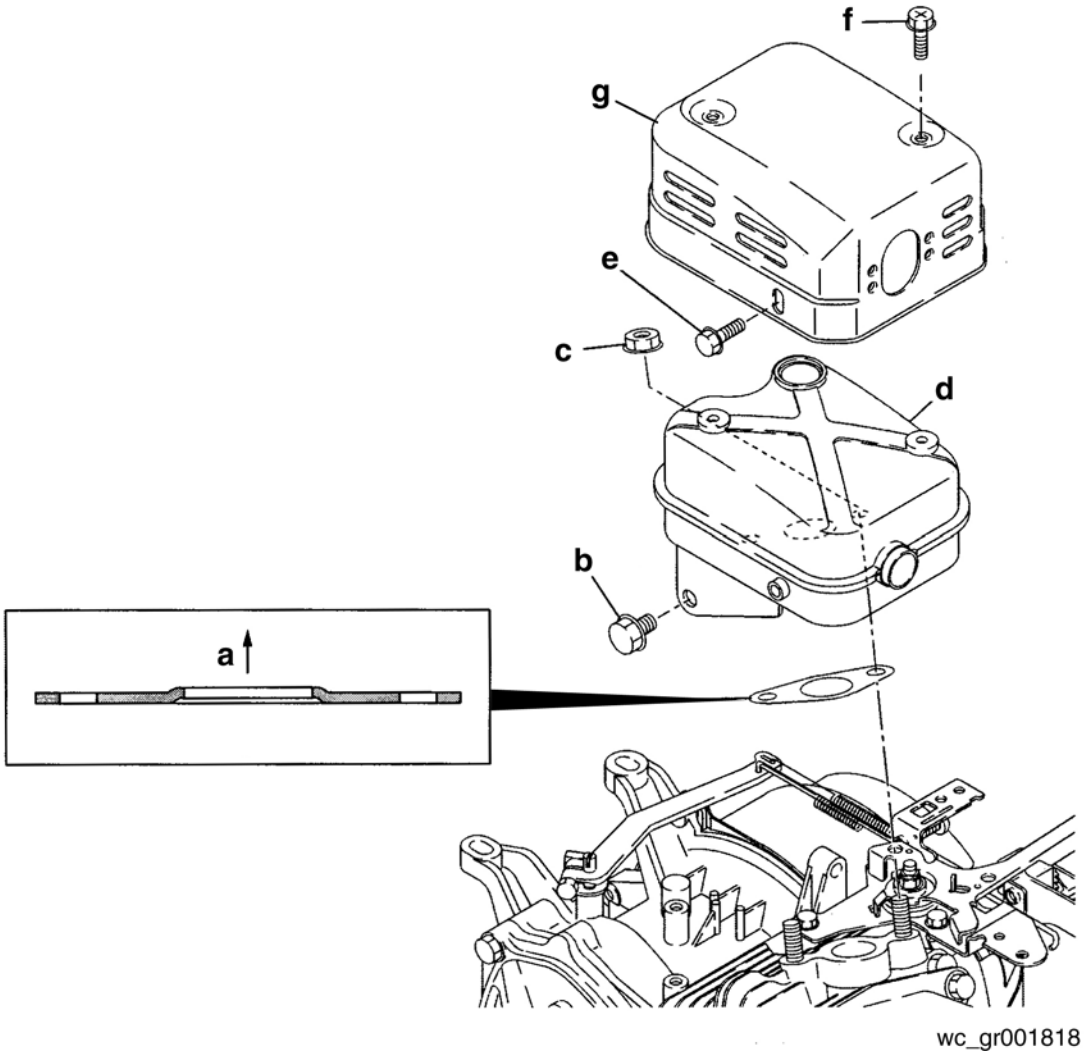
Note: *Remove any tape or cloth used to cover the exhaust port when the engine was disassembled.*

9.24.1 Place the gasket, muffler side up **(a)**, on the engine.

9.24.2 Using one M8 x 12 bolt **(b)** and two M8 nuts **(c)**, attach the muffler **(d)** to the engine.

9.24.3 Using two M6 x 10 bolts **(e)** and one M6 x 8 bolt **(f)**, attach the muffler guard **(g)** to the muffler.

Torque the hardware to 18.0–22.0 Nm (13.0–15.9 ft.lbs.).



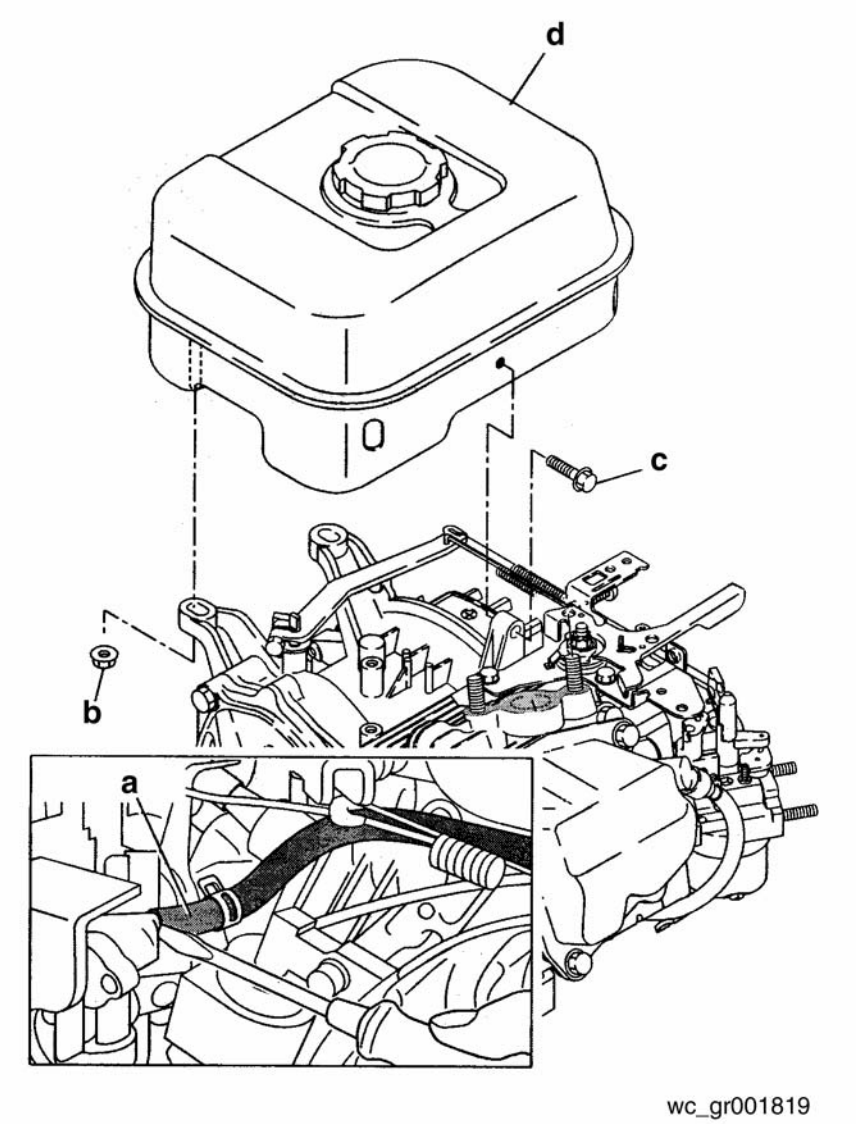
wc_gr001818

9.25 Fuel Tank

See Graphic: wc_gr001819

9.25.1 Connect the fuel line **(a)** with clamp.

9.25.2 Using two M6 nuts **(b)** and one M6 x 25 bolt (WM 130/WM 170) or one M8 x 25 bolt (WM 270) **(c)**, secure the fuel tank **(d)** to the crankcase.



wc_gr001819

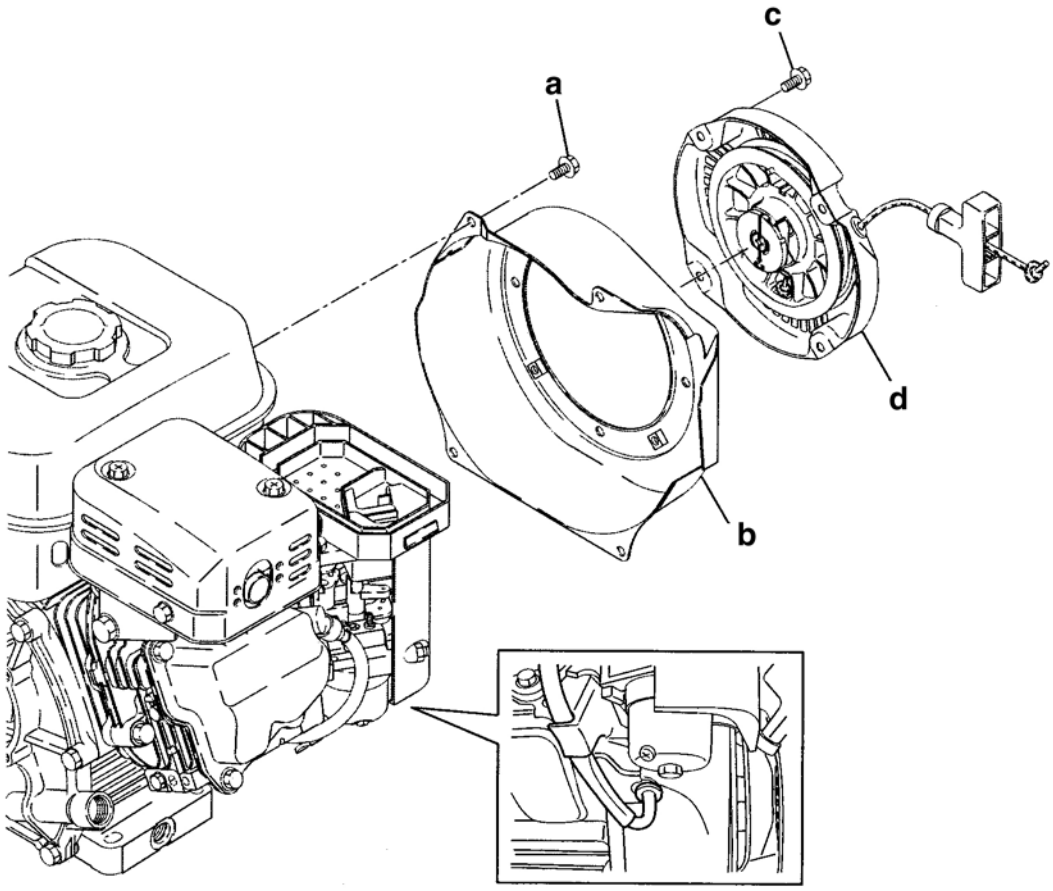
9.26 Blower Housing and Recoil Starter

See Graphic: wc_gr001820

9.26.1 Mount the ignition coil cord on the crankcase by aligning it with the case baffle.

9.26.2 Using four M6 x 12 bolts **(a)**, mount the blower housing **(b)** to the engine.

9.26.3 Using four M6 x 8 bolts **(c)**, mount the recoil starter **(d)** to the engine.



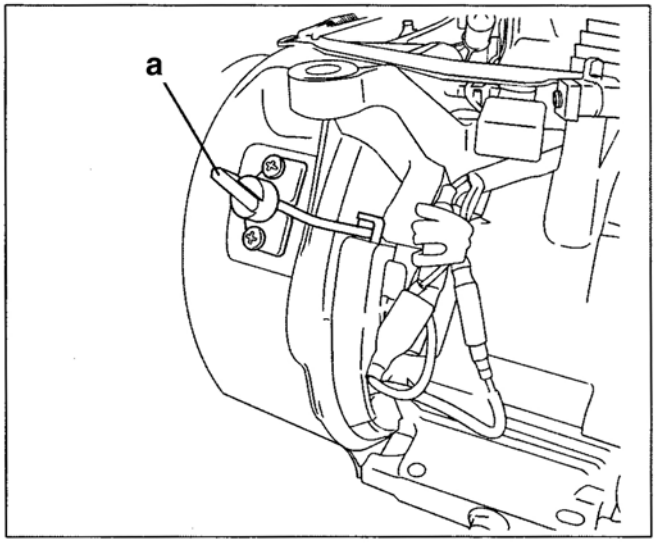
wc_gr001820

9.27 Stop Switch

See Graphic: wc_gr001821

9.27.1 Using two M4 screws, mount the stop switch **(a)** to the blower housing.

9.27.2 Refer to the wiring schematic for wiring details.



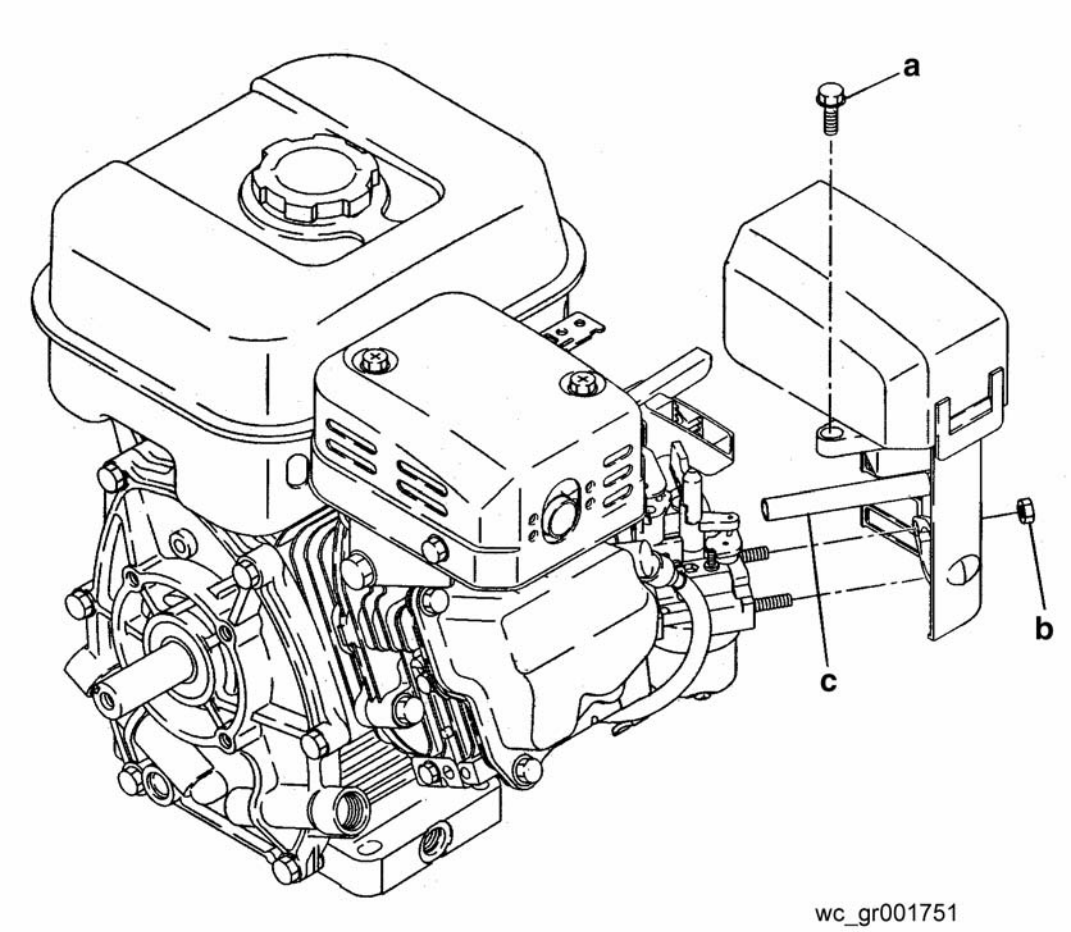
wc_gr001821

9.28 Air Cleaner

See Graphic: wc_gr001751

9.28.1 Insert the breather tube **(c)** into the rocker cover while installing the air cleaner assembly onto the engine.

9.28.2 Using one M6 flange bolt **(a)** and two M6 flange nuts **(b)**, secure the air cleaner assembly to the engine.



9.29 External Inspection

9.29.1 After reassembly is complete, check that the wiring is correct and that there are no loose nuts and bolts or any other faults on the outside of the engine.

9.30 Engine Oil

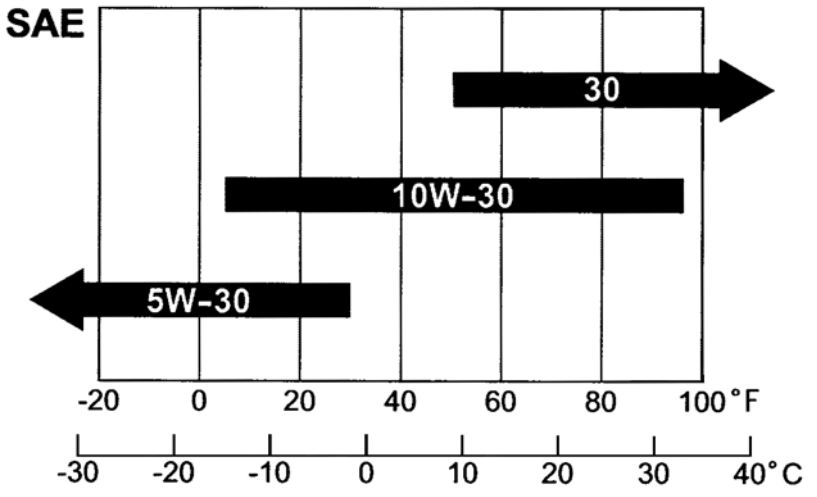
See Graphic: wc_gr001822

Using engine oil of the correct grade and viscosity greatly lengthens engine life and improves performance. Too much or too little oil can result in serious engine problems, including seizure.

9.30.1 Always use the automotive-type engine oil of the viscosity shown in the table. Adjust the viscosity level as temperatures dictate.

9.30.2 Check engine oil level before each use of the engine. Change engine oil according to the maintenance schedule.

Note: *When using multi-grade engine oil, consumption rate tends to increase when the air temperature is high.*



wc_gr001822

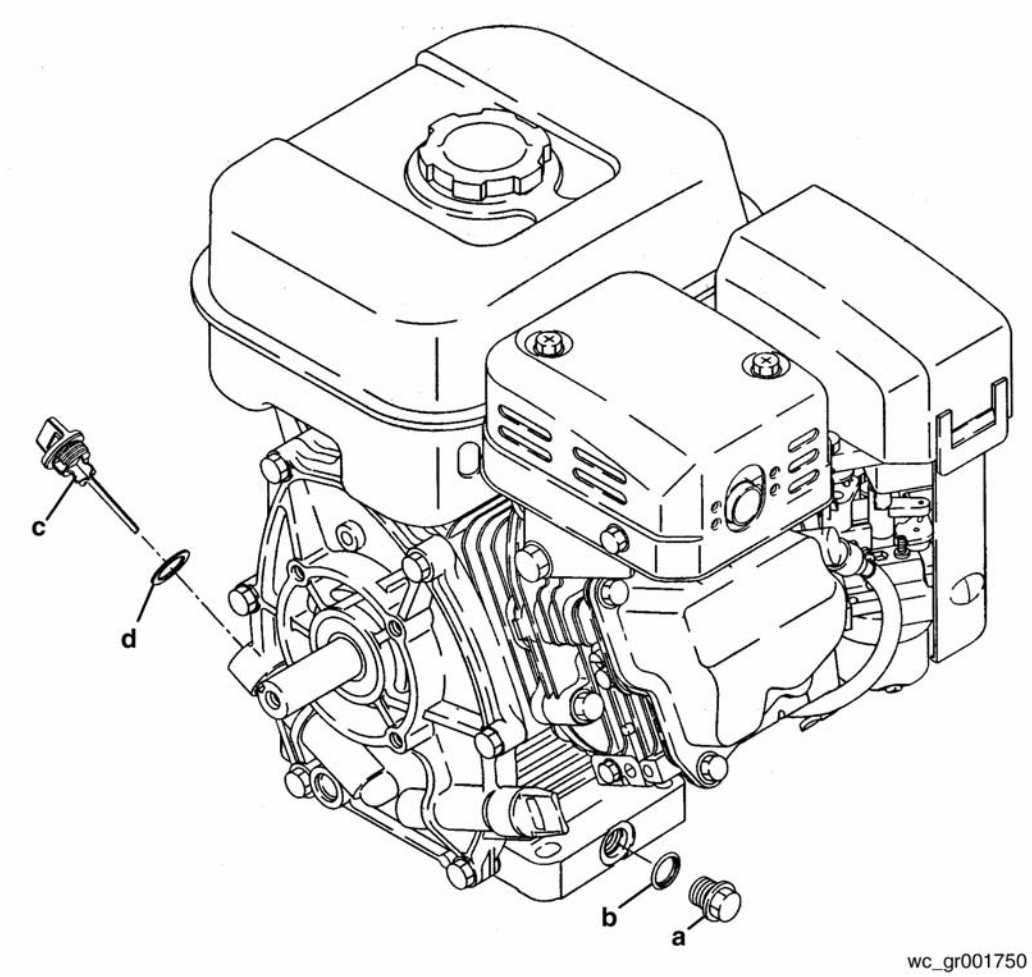
9.31 Filling Engine With Oil

See Graphic: wc_gr001750

9.31.1 Check that gasket **(b)** and drain plug **(a)** are in place and secure.

9.31.2 Remove oil gauge **(c)** and fill engine with automotive-type engine oil, API service class SE or higher.
Quantity:
WM 130/WM 170: 0.6 liter (20 oz.)
WM 270: 1.1 liter (37 oz.)

9.31.3 Reinstall gasket **(d)** and oil gauge.



9.32 Break-in Operation

A new engine or one that has been completely overhauled by being fitted with a new piston, rings, valves, and connecting rod should be thoroughly run-in before being put into service.

Good bearing surfaces and running clearances between the various parts can only be established by operating the engine under reduced speed and loads for a short period of time.

Run-in the engine according to the schedule below. During the run-in period, check for oil leaks, make final carburetor adjustments, and regulate the engine operating speed.

Step	Engine Load			Speed (rpm)	Duration (min.)
	WM 130	WM 170	WM 270		
1	No load			2500	10
2	No load			3000	10
3	No load			3600	10
4	1.5 hp	2 hp	3.5 hp	3600	30
5	3 hp	4 hp	7 hp	3600	30

10 Sub Systems

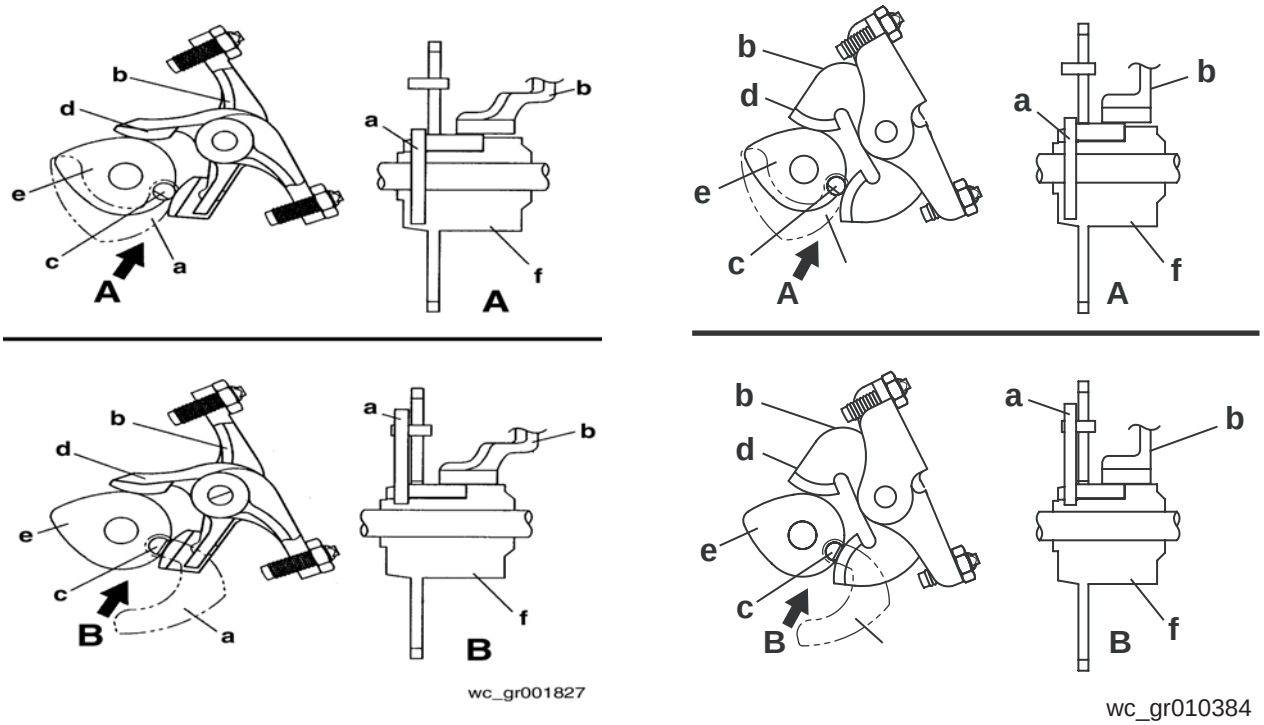
10.1 Automatic Decompression System

See Graphic: wc_gr001827

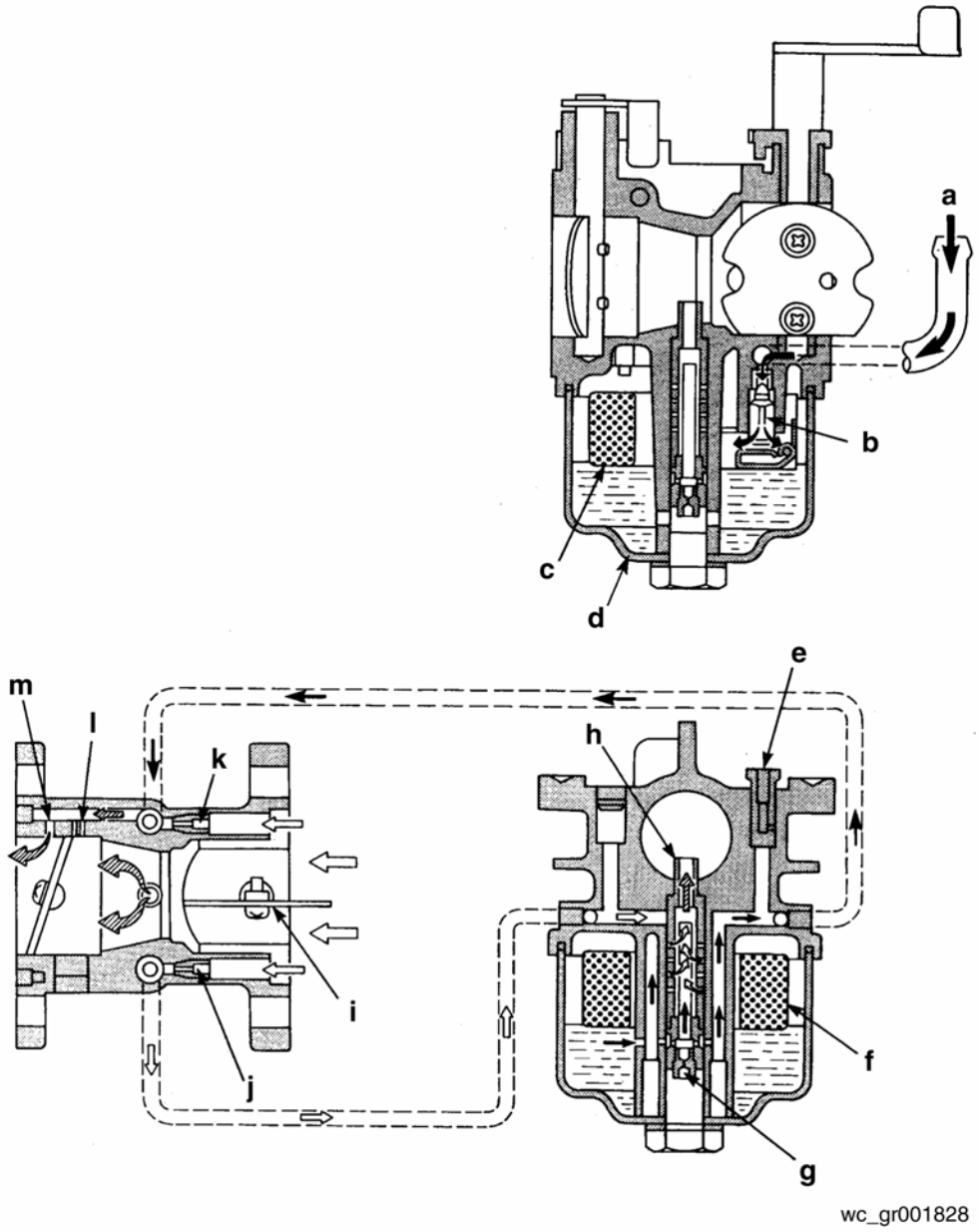
WM-series engines employ an automatic decompression system as a standard feature. This feature enables easy starting of the engine with lighter recoil pull. The automatic decompression system releases the compression of the engine by lifting up the exhaust valve at cranking speed.

At the end of the compression process, the release lever **(a)** lifts up the exhaust rocker arm **(b)** which in turn opens the exhaust valve slightly to release the compression. The release lever has a flyweight on one end and a crescent cam **(c)** on the other. When the engine is cranked, the crescent cam projects above the cam profile and lifts up the rocker arm because the force of the return spring on the weight is larger than the centrifugal force on the weight.

Reference: Intake rocker arm **(d)**; cam **(e)**; camshaft **(f)**. Cranking **(A)**; running **(B)**.



10.2 Fuel System Diagram



Ref	Description	Ref	Description	Ref	Description
a	Fuel flow	f	Float	k	Pilot air jet
b	Needle valve	g	Main jet	l	Bypass
c	Float	h	Main nozzle	m	Pilot outlet
d	Float chamber	i	Choke valve		
e	Pilot jet	j	Main air jet		

10.3 Carburetor

Specifications

	WM 130		WM 170		WM 270	
A/C Type	**Standard**	**Dual**	**Standard**	**Dual**	**Standard**	**Dual**
Main Jet	70.0	68.8	81.3	80.3	98.0	96.0
Pilot Jet	40.0	40.0	40.0	40.0	40.0	←
Pilot screw turning	1-3/4	←	1-1/4	←	1-1/2	←

Float System

The float chamber is located below the carburetor body. Through the operation of the float and the needle valve, the float chamber maintains a constant fuel level while the engine is working. The fuel flows from the tank into the float chamber through the needle valve. When the fuel rises to a specific level, the float rises. When the buoyancy of the float is balanced with the fuel pressure, the needle valve shuts off the fuel passage, thereby maintaining the fuel at the predetermined level.

Pilot System

The pilot system supplies fuel to the engine during idling and low-speed operation. Fuel is initially metered by the main jet and then metered once again by the pilot jet. At the pilot jet, the fuel is mixed with air metered by the pilot air jet and then the fuel/air mixture is fed to the engine through the pilot outlet and the bypass. During idling, fuel is fed to the engine mainly through the pilot outlet.

Main System

The main system feeds fuel to the engine at medium and high speed operation. Fuel is metered by the main jet and flows into the main nozzle. Air metered by the main jet is mixed with fuel through the bleed holes of the main nozzle. The fuel/air mist is injected into the Venturi and mixed once again with air from the air cleaner. This fuel/air mixture is now of optimum concentration and is fed into the combustion chamber of the engine.

Choke System

The choke system provides easier starting in cold weather conditions. When the engine is started with a closed choke, the negative pressure applied to the main nozzle increases. This causes a larger amount of fuel to be drawn into the carburetor, which in turn makes the engine easier to start.

10.4 Carburetor Overhaul

See Graphic: wc_gr001829

Throttle System

- When the throttle stop screw (26) is removed, the spring (25) can be removed.
- Remove the screw (22) and the throttle valve (23), then take out the throttle shaft (24). When removing the throttle valve, take care not to damage the valve edge.

Choke System

- Remove the choke valve (14). Then pull out the choke shaft (13).
- When reassembling the choke shaft, be sure to position the cutout on the choke valve facing the pilot air jet.

Pilot System

- Remove the pilot jet (18). Use the correct tool so as to avoid damaging the jet.
- When reassembling the pilot jet, be sure to firmly tighten it, otherwise fuel may leak, leading to engine malfunction.

Main System

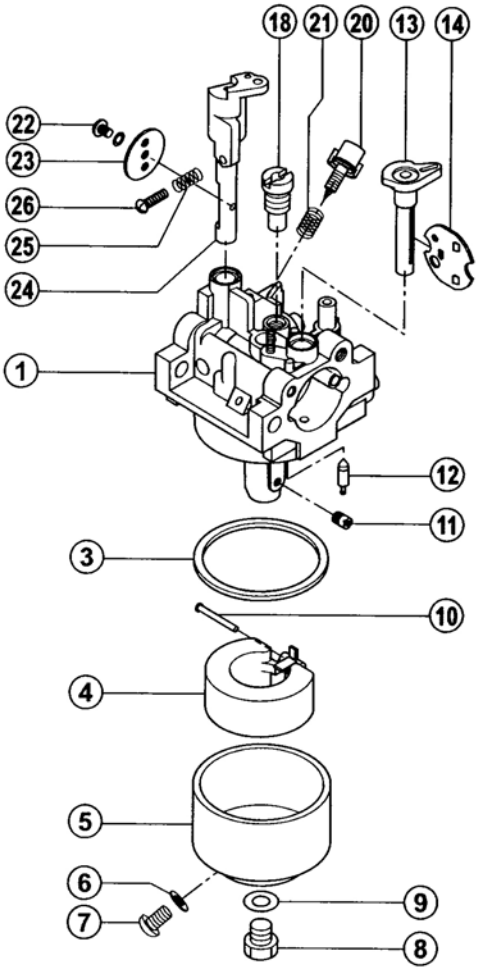
- Remove the bolt (8) and remove the float chamber body (5).
- Remove the main jet (11) from the body (1).
- Remove the main nozzle (2) from the body (1) (WM 270).
- When reassembling the main system, be sure to fasten the main jet and main nozzle to the body, otherwise the fuel concentration in the fuel/air mixture may become too rich, leading to engine malfunction.
- The tightening torque of the bolt (8) is 9 Nm (6.5 ft.lbs.). Do not forget to mount the washer.

Float System

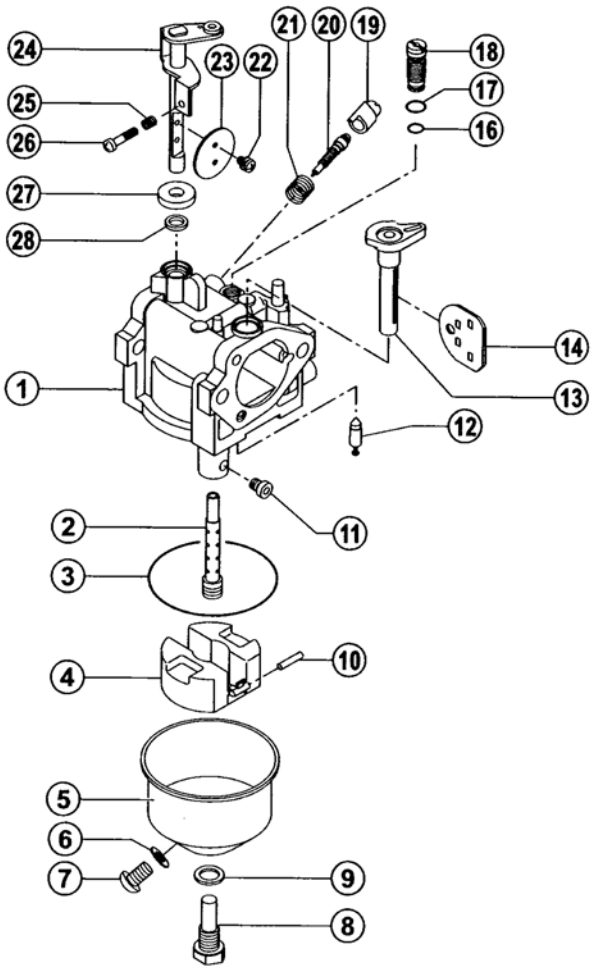
- Remove the float pin (10) and then remove the float (4) and the needle valve (12). Use care when reassembling.
- Do not use a drill or similar objects for cleaning the jets; use compressed air instead.
- The float pin is pressed into the carburetor body. When removing the needle valve, use a tool slimmer than the float pin. Tap the reverse side gently and remove.

10.5 Carburetor Exploded View

WM 130/WM 170



WM 270



wc_gr001829

10.6 Recoil Starter

Disassembly

See Graphic: wc_gr001830

CAUTION

Wear eye protection when working on the recoil starter.

To release the reel spring power:

10.6.1 Hold the starter knob and pull out the starter rope.

10.6.2 Pull out the rope fully and align the rope knot in the reel with the rope guide.

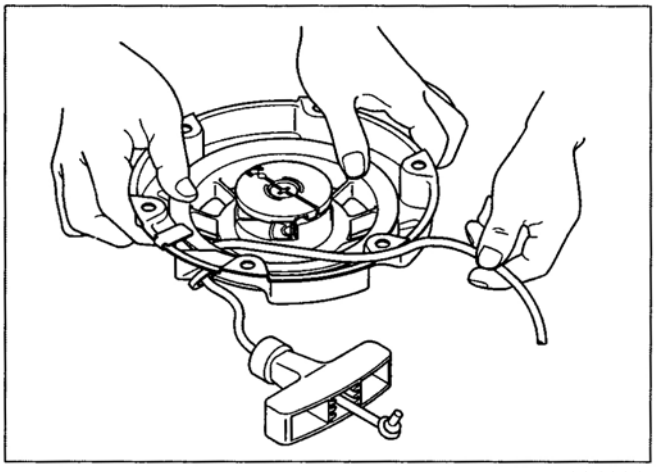
10.6.3 Hold the reel down firmly with both thumbs, taking care to not allow it to spring back.

Note: *The following procedure requires the help of an assistant.*

10.6.4 Remove the knot from the reel, untie the knot and pull the rope out toward the starter knob.

10.6.5 While controlling the reel with your thumbs, slowly wind it back as far as it will go.

Note: *When the rope is pulled out to its full length, the force stored in the spring reaches its maximum. Take care when handling the reel.*



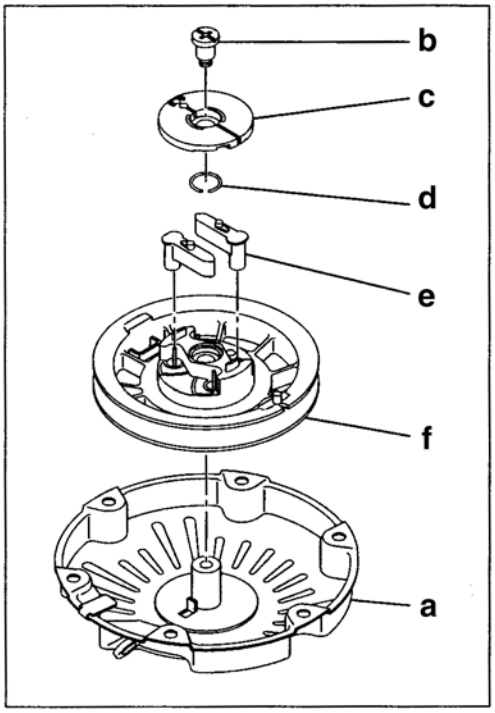
wc_gr001830

See Graphic: wc_gr001831

To remove the components:

10.6.6 Grip the case **(a)** and loosen the set screw **(b)**.

10.6.7 Remove, in this order: the set screw, the ratchet guide **(c)**, the friction spring **(d)**, and the ratchet **(e)**.



wc_gr001831

See Graphic: wc_gr001831

Remove the reel:

10.6.8 Hold down the reel **(f)** gently, to keep it from escaping from its case, and rotate it slowly back and forth by quarter turns until it moves smoothly.

10.6.9 Lift the reel up slightly and remove it from the case.

10.6.10 If the spring is about to pop out of the reel, repeat the previous two steps.

Note: *Since the spring is stored in the reel, make sure not to drop or shake the reel after removing it. Place it on a flat secure surface such as a table.*

Reassembly

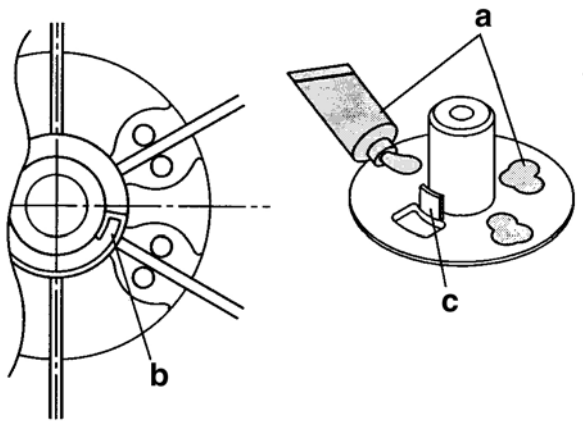
See Graphic: wc_gr001832

Re-installing the reel:

10.6.11 Apply grease (Exxon Unirex or equivalent) **(a)** to the surface of the case.

10.6.12 Adjust the position of the inner end of the spring reel. Reference **(b)**: position where the inner end of the spring touches the rib of the bearing.

10.6.13 Hold the reel in such a way that the inner end of the spring hooks onto the shaft hook **(c)** and then place the reel carefully back into the case.



wc_gr001832

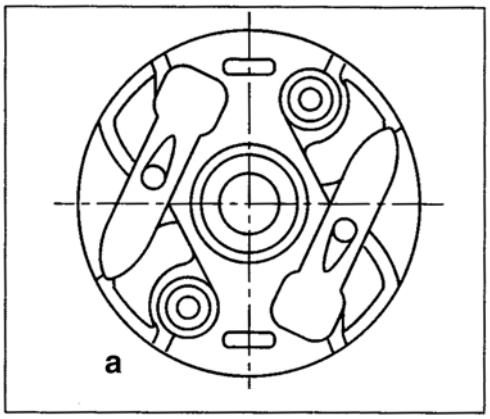
See Graphic wc_gr001833 and wc_gr001834

Reinstalling the components:

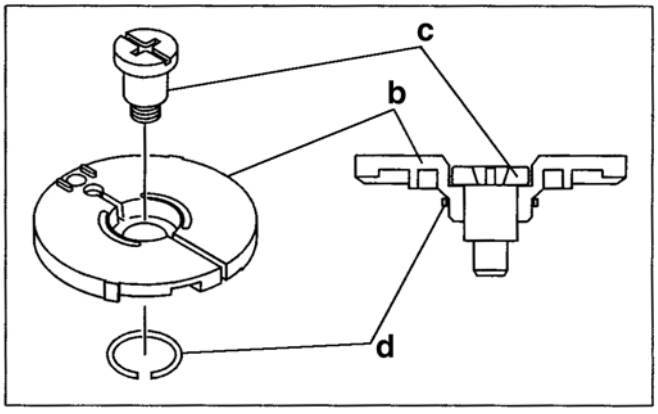
10.6.14 Mount the ratchet into the reel. The ratchet should be in the closed position **(a)**.

10.6.15 Mount the ratchet guide assembly **(b)**, taking care to not move the ratchet or lose the friction spring **(d)**.

10.6.16 Tighten the set screw **(c)**. Torque to 5.5 Nm (4.0 ft.lbs.).



wc_gr001833



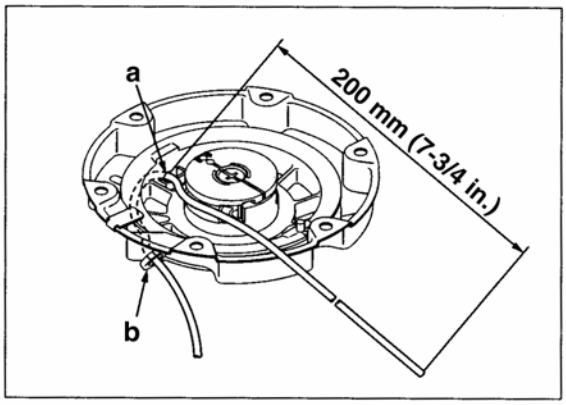
wc_gr001834

See Graphic: wc_gr001835

Tensioning the reel spring:

10.6.17 Grip the case and turn the reel 6 times counterclockwise.

10.6.18 Rotate the reel so that the rope hole **(a)** is aligned with the rope guide **(b)**.



wc_gr001835

See Graphic: wc_gr001836 and wc_gr001837

Installing the rope:

Note: *This procedure requires help from an assistant.*

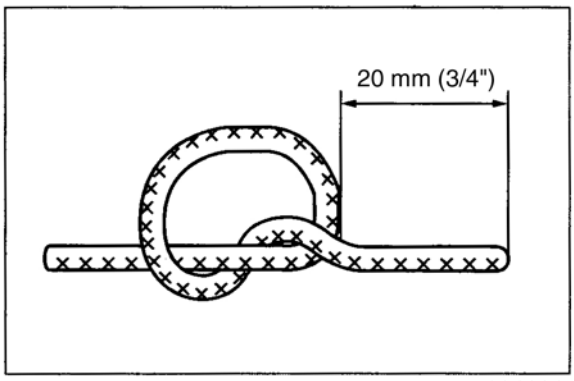
10.6.19 Pass the rope through the rope guide and the rope hole of the reel and pull through approximately 20 cm (7-3/4 in.) out of the reel.

10.6.20 Tie a knot in the end of the rope.

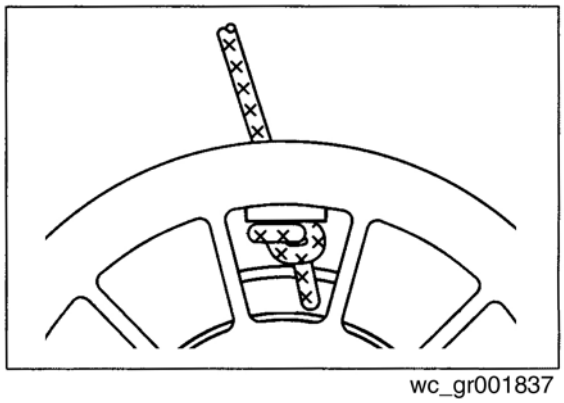
10.6.21 Put the rope into the reel, taking care that the rope end does not stick up.

10.6.22 Grasp the rope firmly with one hand approximately 50 cm (19-5/8 in.) from the rope guide and keep the rope tense, taking care that the rope is not pulled into the reel.

10.6.23 Release the reel carefully and allow the rope to be wound back slowly by the force of the spring until the knob reaches the rope guide.



wc_gr001836


wc_gr001837

10.7 Checking the Recoil Starter After Reassembly

Note: *Carry out the following procedures to ensure proper operation of the starter assembly.*

10.7.1 Pull the starter rope 2–3 times.

- If the starter knob is too heavy to pull, check that each part has been assembled as specified.
- If the ratchet does not work, check for missing parts such as the friction spring.

10.7.2 Pull out the starter knob as far as it will go.

- If the starter rope remains in the rope slot in the reel, the spring may be over-stressed. To fix this, pull out the starter rope approximately 30 cm (11-3/4"), and controlling the rotation of the reel with your thumb, allow the starter rope to rewind about one or two turns.
- If the starter rope rewinds slowly or only partially, apply grease or oil to the rotary parts or the friction surfaces. If this does not help, try winding up the spring one or two turns, taking care to not over-stress the spring.
- If there is a sound indicating that the spring is off the hook and the starter rope cannot be wound back, reassemble the recoil starter from the beginning.

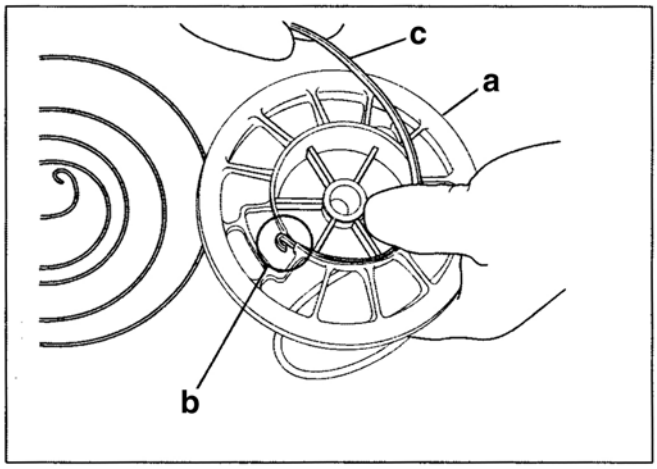
10.8 Other Starter Checks

See Graphic: wc_gr001838 and wc_gr001839

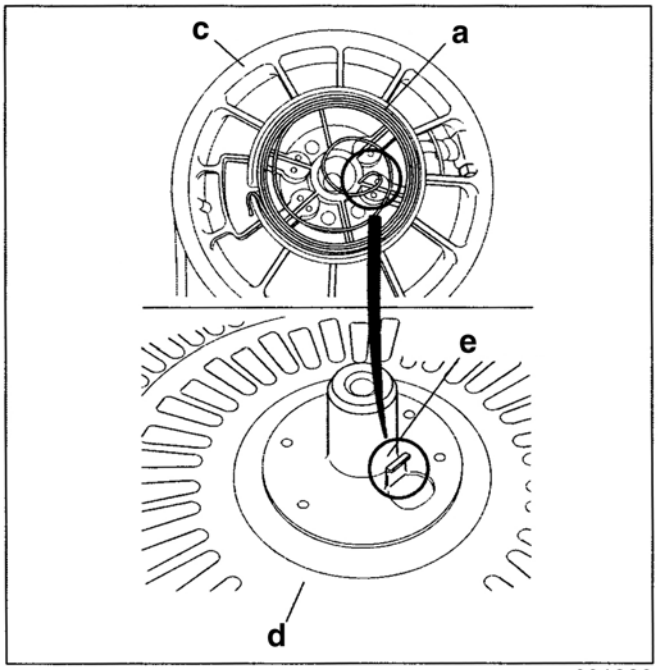
10.8.1 If the spring escapes from the reel **(a)** during assembly:

- Hook the outer end of the spring **(b)** onto the gap in the reel and rewind the spring, holding the spring **(c)** with your fingers to prevent it from spinning out of the housing unit.
- Hook the inner end of the spring onto the projection on the starter case **(d)**.
  Refer to the assembly procedure for more details.

10.8.2 Lubricate the rotating parts and the spring with grease **(e)** when the starter is disassembled and prior to long-term storage.



wc_gr001838



wc_gr001839

11 Electrical

11.1 Magneto

Wacker engines use a TRANSISTOR IGNITER CIRCUIT (TIC) type, breakerless magneto ignition system. The TIC has the ignition coil outside the flywheel and a lighting coil inside. The flywheel is a specialized piece of equipment.

11.2 Inspecting the Magneto

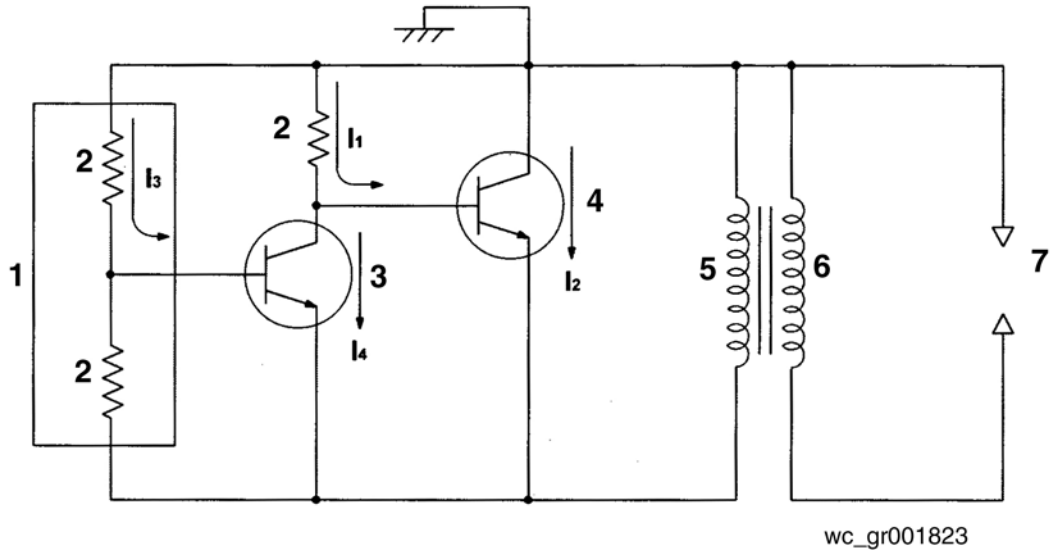
If the engine does not start, has difficulty starting, or does not run smoothly, check the magneto in the following manner:

11.2.1 Check the high-tension cable for any damage or short circuiting.

11.2.2 Check the spark:

- Take the spark plug out of the cylinder, connect the spark plug cap to the spark plug and ground the spark plug on the cylinder head or any other metal position of the engine.
- Pull the recoil starter and check the spark plug gap for sparking. If the spark plug is sparking, check the intensity of the spark.
- Disconnect the spark plug cap from the spark plug and check the spark between the high-tension wire and the cylinder block.

11.3 WM 130/WM170 Ignition Coil Internal Circuit



wc_gr001823

Ref.	Description	Ref.	Description
1	Ignition timing detective circuit	5	Primary coil
2	Resistor	6	Secondary coil
3	Signal transistor	7	Spark plug
4	Power transistor		

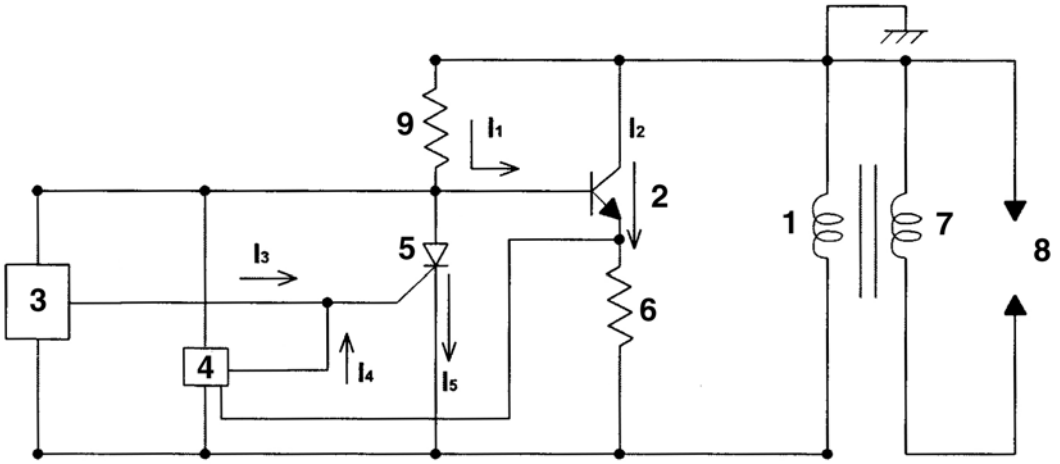
11.4 Basic Theory

See Graphic: wc_gr001823

11.4.1 Revolution of the flywheel generates electricity on the primary side of the ignition coil, and the electric current I_1 flows to the power transistor (4). Current I_1 turns the power transistor “ON” and electric current I_2 flows.

11.4.2 When the revolution of the flywheel reaches the ignition point, the electric current I_3 flows to turn the signal transistor (3) “ON”, thus the current I_1 bypasses the signal transistor as current I_4. At this moment, the power transistor turns “OFF” and the current I_2 is shut off abruptly. As a result, the high voltage electricity is generated on the secondary side of the ignition coil and it sparks at the spark plug (7).

11.5 WM 270 Ignition Coil Internal Circuit

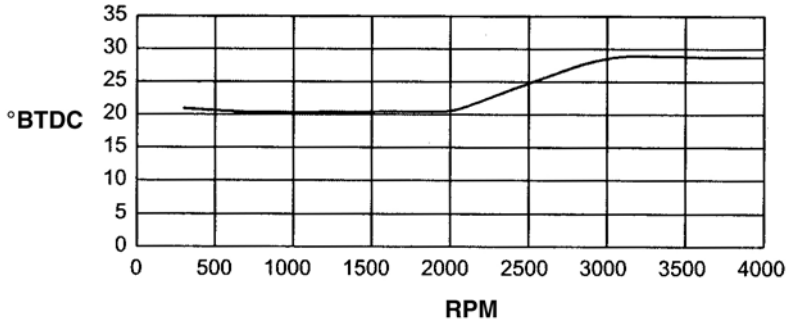


wc_gr001824

Ref.	Description	Ref.	Description
1	Primary coil	6	Revolution sensing resistor
2	Power transistor	7	Secondary coil
3	Low speed ignition timing control circuit	8	Spark plug
4	Advancing control circuit	9	Base resistor
5	Control thyristor		

11.6 Ignition Timing Characteristics

Linear Advancing



wc_gr001825

11.7 WM 270 Basic Theory

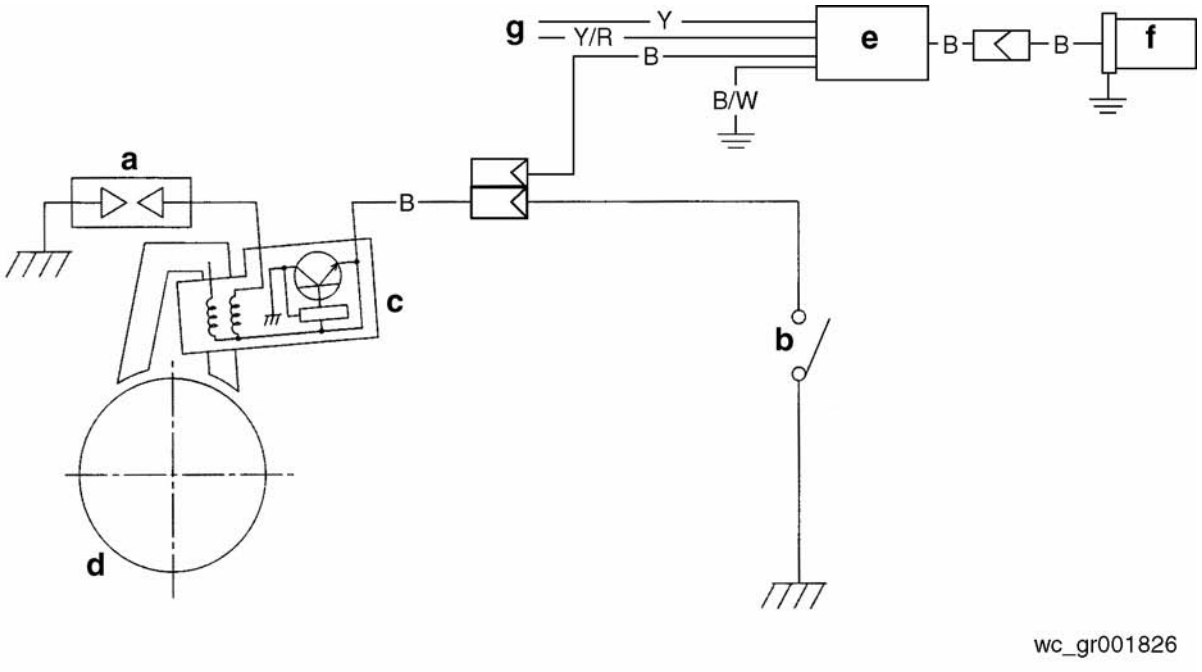
See Graphic: wc_gr001824 and wc_gr001825

Revolution of the flywheel generates electricity on the primary side of the ignition coil (1), and the base current $\mathbf{I_1}$ flows to the power transistor (2). Current $\mathbf{I_1}$ turns the power transistor “ON” and the electric current $\mathbf{I_2}$ flows. This is the same situation when the contact breaker is closed in a case of breaker point type ignition system.

At lower engine revolution, the low speed ignition timing control circuit (3) operates to run the gate current $\mathbf{I_3}$ to turn the control thyristor (5) “ON”, thus the current $\mathbf{I_1}$ bypasses the thyristor as current $\mathbf{I_5}$. At this moment, the power transistor (2) turns “OFF” and the current $\mathbf{I_2}$ is shut off abruptly, resulting in high voltage generated in the secondary coil (7) which produces spark at the spark plug. The ignition timing at lower engine revolution is less advanced as shown in the chart.

At higher engine revolution (over 2,000 rpm), advancing control circuit (4) operates to run the gate current $\mathbf{I_4}$ to turn the control thyristor (5) “ON”, thus the current $\mathbf{I_1}$ bypasses the thyristor as current $\mathbf{I_5}$. At this moment, the power transistor (2) turns “OFF” and the current $\mathbf{I_2}$ is shut off abruptly, resulting in the high voltage generated in the secondary coil (7) which produces spark at the spark plug. At over 2,000 rpm, ignition timing on each engine revolution is controlled by advancing control circuit (4) that receives electrical information from revolution sensing resistor (6). The advancing of ignition timing from lower to higher engine revolution changes linearly as shown in the chart. Reference: °BTDC = degrees before top dead center.

11.8 Wiring Diagram



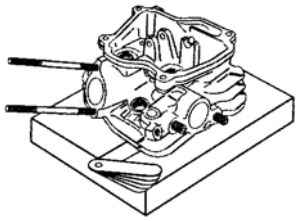
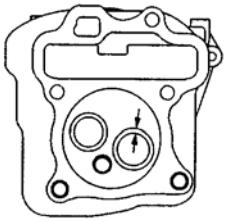
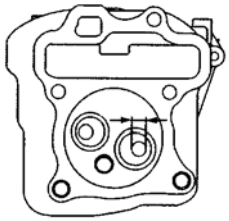
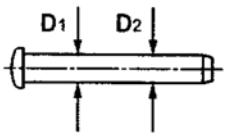
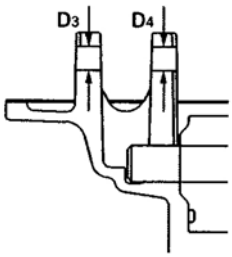
Ref	Description	Ref	Description
a	Spark plug	e	Oil sensor control unit
b	Stop switch	f	Oil sensor
c	Ignition coil (with built-in transistor)	g	To LED if equipped
d	Flywheel		

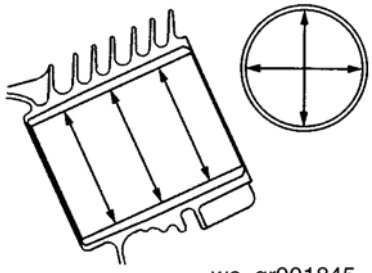
Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light blue

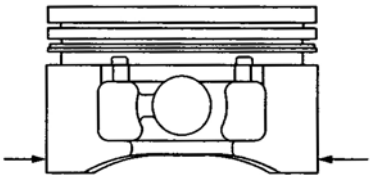
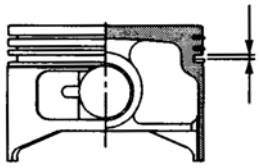
12 Clearance Data and Limits Table

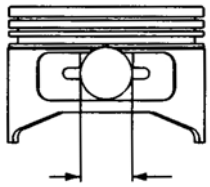
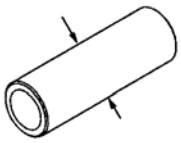
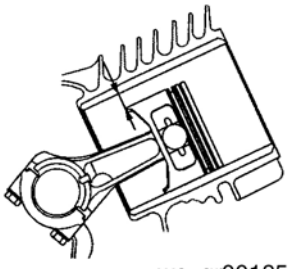
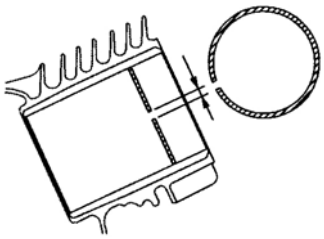
12.1 Term Descriptions

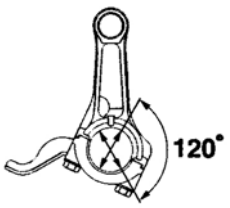
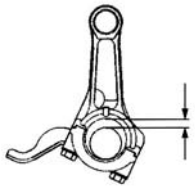
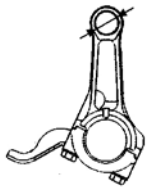
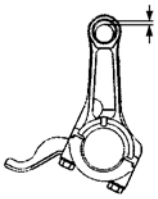
The following table lists critical dimensions of specific parts. The “Standard” column lists the dimension of the part as new from the factory. The “Limit” column lists the maximum allowance. If the measurement exceeds the “Limit” dimension listed, replace or repair the part.

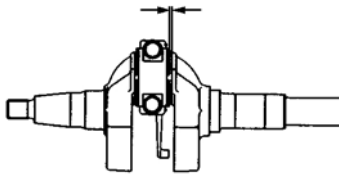
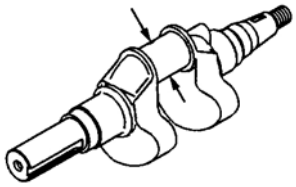
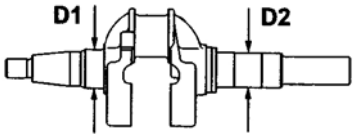
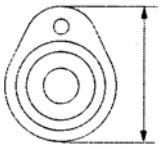
Item		Model	Standard mm (in.)	Limit mm (in.)
Cylinder head  wc_gr001840		WM 130 WM 170 WM 270	0.05 or less (0.002)	0.1 (0.004)
 wc_gr001841	Intake/ exhaust valve contact width	WM 130 WM 170 WM 270	0.7–1.0 (0.0276– 0.0394)	---
 wc_gr001842	Intake exhaust	WM 130 WM 170 WM 270	5.500–5.518 (0.2165– 0.2172)	---
 wc_gr001843	Rocker arm-pin outer diameter D_1, D_2	WM 130 WM 170 WM 270	5.970–5.980 (0.235–0.235)	5.9 (0.232)
 wc_gr001844	Rocker arm pin support inner diameter D_3, D_4	WM 130 WM 170 WM 270	6.00–6.018 (0.236–0.237)	6.05 (0.238)

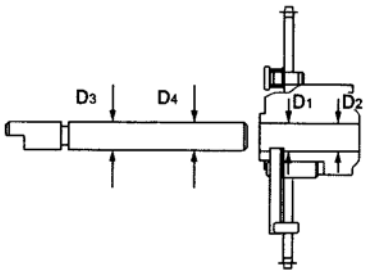
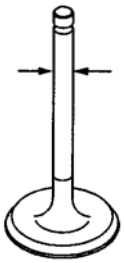
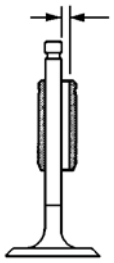
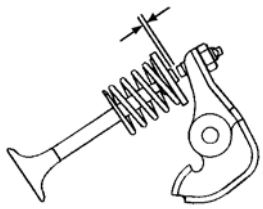
Item		Model	Standard mm (in.)	Limit mm (in.)
Cylinder  wc_gr001845	Inner diameter Standard	WM 130	58.000–58.019 (2.2835–2.2842)	To be rebored when the difference between max. and min. diameter reaches 0.1 (0.004).
		WM 170	67.000–67.019 (2.6378–2.6385)	
		WM 270	75.000–75.019 (2.9528–2.9535)	
	First reboring	WM 130	58.250–58.269 (2.2933–2.2842)	Same as above
		WM 170	67.250–67.269 (2.6476–2.6484)	
		WM 270	75.250–75.269 (2.9626–2.9633)	
	Second reboring	WM 130	58.500–58.519 (2.3031–23039)	Same as above
		WM 170	67.500–67.519 (2.6575–2.6582)	
		WM 270	67.500–67.519 (2.6575–2.6582)	
Roundness after reboring		WM 130 WM 170 WM 270	Less than 0.01 (0.0004)	
Cylindricity after reboring		WM 130 WM 170 WM 270	Less than 0.015 (0.0006)	

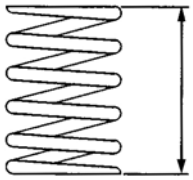
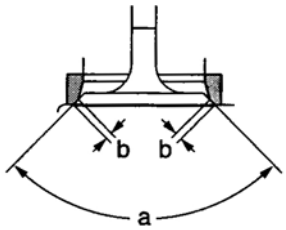
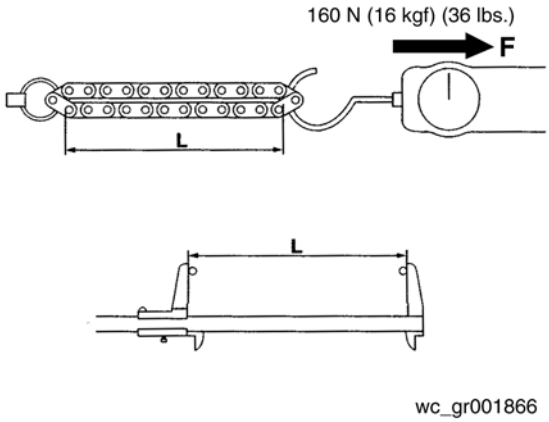
Item		Model	Standard mm (in.)	Limit mm (in.)
Piston Outer diameter at skirt in thrust direction  wc_gr001846	Standard	WM 130	57.980–58.000 (2.2827–2.2835)	57.89 (2.2791)
		WM 170	66.960–67.000 (2.6362–2.6378)	66.88 (2.6331)
		WM 270	74.980–75.000 (2.9520–2.9527)	74.89 (2.9484)
	Oversize (+0.25)	WM 130	58.230–58.250 (2.2925–2.2933)	58.14 (2.2890)
		WM 170	67.210–67.250 (2.6461–2.6476)	67.13 (2.6429)
		WM 270	75.230–75.250 (2.9618–2.9626)	75.14 (2.9583)
	Oversize (+0.50)	WM 130	58.480–58.500 (2.3024–2.3032)	58.39 (2.2988)
		WM 170	67.460–67.500 (2.6559–2.6575)	67.38 (2.6528)
		WM 270	75.480–75.500 (2.9717–2.9724)	75.39 (2.9681)
Piston Ring groove-side clearance  wc_gr001847	Top second	WM 130 WM 170 WM 270	0.035–0.080 (0.0014–0.0031)	0.15 (0.0059)
	Oil ring coil exp	WM 130	0.02–0.075 (0.0008–0.0031)	
		WM 170	0.010–0.065 (0.0004–0.0026)	0.15 (0.0059)
		WM 270	0.010–0.065 (0.0004–0.0026)	
	Oil ring (three-piece)	WM 130	0.060–0.165 (0.0024–0.0065)	---
		WM 170	0.0300–0.185 (0.0012–0.0073)	
		WM 270	0.0100–0.205 (0.0004–0.0081)	

Item		Model	Standard mm (in.)	Limit mm (in.)
Piston pin hole  wc_gr001848		WM 130	12.991–13.009 (0.5115 - 0.5122)	13.035 (0.5132)
		WM 170	15.991–16.009 (0.6296 - 0.6303)	16.035 (0.6313)
		WM 270	17.991–18.009 (0.7083–0.7090)	18.035 (0.7224)
Piston pin outer diameter  wc_gr001849		WM 130	12.992–13.000 (0.5115–0.5118	12.960 (0.5102)
		WM 170	15.992–16.000 (0.6296–0.6299)	15.960 (0.6283)
		WM 270	17.992–18.000 (0.7083–0.7087)	17.960 (0.7071)
Clearance between piston and cylinder skirt  wc_gr001850		WM 130	0.040–0.079 (0.0016–0.0031)	0.25 (0.010)
		WM 170 WM 270	0.050–0.089 (0.0020–0.0035)	
Piston ring end gap  wc_gr001851	Top	WM 130	0.15–0.35	1.5 (0.0591)
		WM 170	0.15–0.3 (0.0059–0.0118)	
	Second	WM 270	0.15–0.3 (0.0059–0.0118)	
	Oil (coil exp)	WM 130	0.2–0.4 (0.0078–0.0157)	1.5 (0.0591)
		WM 170	0.05–0.25 (0.0020–0.0098)	
		WM 270	0.1–0.3 (0.0039–0.0118)	

Item		Model	Standard mm (in.)	Limit mm (in.)
Connecting rod Large-end inner diameter  wc_gr001852		WM 130 WM 170	30.000–30.016 (1.1811–1.1817)	30.1 (1.1850)
		WM 270	34.500–34.516 (1.3386–1.3392)	34.1 (1.3425)
Clearance between large end and crank pin  wc_gr001153		WM 130 WM 170 WM 270	0.020–0.049 (0.0008–0.0019)	0.2 (0.0078)
Small end inner diameter  wc_gr001854		WM 130	13.010–13.021 (0.5122–0.5126)	13.08 (0.5150)
		WM 170	16.010–16.021 (0.6303–0.6307)	16.08 (0.6331)
		WM 270	18.010–18.021 (0.7091–0.7095)	18.08 (0.7118)
Clearance bewteen small end and piston pin  wc_gr001855		WM 130 WM 170 WM 270	0.010–0.029 (0.0004–0.0011)	0.12 (0.0047)

Item		Model	Standard mm (in.)	Limit mm (in.)
Large end side clearance 		WM 130 WM 170 WM 270	0.100–0.780 (0.040–0.307)	1.0 (0.0394)
Crankshaft Crank pin outer diameter  wc_gr001857		WM 130 WM 170	29.967–29.980 (1.1798–1.1803)	29.85 (1.1752)
		WM 270	34.467–34.480 (1.3570–1.3575)	34.35 (1.3524)
Journal outer diameter  wc_gr001858	D_1	WM 130 WM 170	27.988–27.997 (1.1019–1.1022)	
		WM 270	29.988–29.997 (1.1806–1.1810)	
	D_2	WM 130 WM 170	24.988–24.997 (0.9838–0.9841)	
		WM 270	29.988–29.997 (1.1806–1.1810)	
Camshaft Cam peak height (intake and exhaust)  wc_gr001859	Cam peak height	WM 130 WM 170 WM 270	29.028–29.128 (1.1428–1.1468)	28.98 (1.1409)

Item		Model	Standard mm (in.)	Limit mm (in.)
Cam sprocket inner diameter Cam sprocket pin outer diameter  wc_gr001860	Cam inner diameter D_1, D_2	WM 130 WM 170 WM 270	9.0–9.036 (0.3543–0.3557)	9.05 (0.3563)
	Pin outer diameter D_3, D_4	WM 130 WM 170 WM 270	8.953–8.975 (0.3525–0.3533)	8.95 (0.3524)
Intake/exhaust valves Valve stem outer diameter  wc_gr001861	Intake	WM 130 WM 170 WM 270	5.440–5.455 (0.2142–0.2148)	5.35 (0.2106)
	Exhaust	WM 130 WM 170 WM 270	5.426–5.444 (0.2136–0.2143)	5.35 (0.2106)
Clearance between valve stem and valve guide  wc_gr001862	Intake	WM 130 WM 170 WM 270	0.045–0.078 (0.0018–0.0031)	0.3 (0.0118)
	Exhaust	WM 130 WM 170 WM 270	0.056–0.092 (0.0022–0.0036)	0.3 (0.0118)
Valve clearance in cold state  wc_gr001863	Intake	WM 130 WM 170 WM 270	0.12–0.15 (0.0047-0.0059)	0.25 (0.0098)
	Exhaust	WM 130 WM 170 WM 270	0.12–0.15 (0.0047-0.0059)	0.25 (0.0098)

Item		Model	Standard mm (in.)	Limit mm (in.)
Valve spring free length  wc_gr001864		WM 130 WM 170 WM 270	27.4 (1.0787)	---
Valve seat angle (intake and exhaust) Valve cutter angle (a) Valve contact width (b)  wc_gr001865	Intake Exhaust	WM 130 WM 170 WM 270	a: 90° b: 0.7–1.0 (0.0276–0.0394)	2.0 (0.0787)
Chain length  wc_gr001866		WM 130	263.1 (10.3583)	266.0 (10.4726)
		WM 170	269.0 (10.5906)	272.1 (10.7126)
		WM 270	307.1 (12.0906)	310.6 (12.2284)

13 Troubleshooting

If the engine shows any sign of malfunction, the cause should be determined immediately and the appropriate countermeasures should be taken to prevent the problem from worsening. This troubleshooting section describes certain known problems, their possible causes, and appropriate action to take. Note, however, that the list of problems listed here is not all-encompassing. Generally speaking, since there is the possibility of multiple causes for a single problem, please use your experience and common sense when deciding on what action to take.

The following three conditions must be met for the engine to start:

1. The cylinder must be filled with the proper fuel-air mixture.
2. There must be good compression in the cylinder.
3. There must be good spark, properly timed to ignite the mixture.

The engine cannot be started unless the these three conditions are met. There are other factors as well that will make engine starting difficult, such as a heavy load on the engine when attempting to start, or heavy back pressure due to a long exhaust pipe.

13.1 Troubleshooting Table

Problem and possible cause			Remedy
Starting difficulties	1. Ignition system problems	1) Spark plug • Improper gap • Defective insulation • Carbon deposits	 Adjust gap Replace plug Clean plug
		2) Ignition coil • Insulation defect or discontinuity • Poor contact or broken wire	 Replace plug Repair or replace
		3) Improper air gap between ignition coil and flywheel	Adjust gap

Problem and possible cause			Remedy
Starting difficulties	2. Fuel system problems	1) No fuel in tank	Fill tank
		2) Fuel hose clogged or pinched	Clean or replace
		3) Air in fuel lines	Check and retighten joints
		4) Poor quality gasoline, or water in gasoline	Replace with fresh gasoline
		5) Carburetor • Overflow • Clogged or damaged • Throttle valve malfunction (does not fully close)	 Adjust Overhaul Check and adjust
	3. Engine core component malfunction	1) Insufficient tightening of cylinder head bolts	Check and retighten
		2) Wearing of piston, piston rings and/or cylinder	Repair or replace
		3) Improper contact of valve and seat	Repair
		4) Valve sticking	Repair
		5) Improper valve clearance	Adjust
		6) Leakage from intake manifold gasket	Retighten; replace gasket
		7) Leakage from carburetor gasket	Retighten: replace gasket
		8) Insufficient tightening of spark plug	Retighten

Problem and possible cause			Remedy
Poor output	1. Insufficient compression	1) Loose spark plug	Retighten, replace gasket
		2) Leakage from cylinder head gasket	Retighten; replace gasket
		3) Piston ring seizure or wear	Replace
		4) Piston or cylinder wear	Repair or replace
		5) Incorrect valve and seat contact	Repair or replace
		6) Valve stem seizure	Repair or replace
		7) Improper valve clearance	Adjust
	2. Ignition system problems	1) Faulty spark plug	Replace
		2) Faulty ignition coil	Replace
		3) Improper air gap between ignition coil and flywheel	Adjust
		4) Demagnetization (flywheel magneto)	Replace
	3. Fuel system malfunction	1) Carburetor clogged	Overhaul
		2) Fuel strainer and/or hose clogged	Clean or replace
		3) Air in fuel lines	Check and retighten joints
		4) Poor quality gasoline or water in gasoline	Replace with fresh gasoline
	4. Low air intake volume	1) Air cleaner clogged	Clean or replace
		2) Throttle valve malfunction	Repair or replace
Overheating	1. Engine	1) Cooling air flow obstructed at inlet or cylinder baffle portion	Clean
		2) Poor quality engine oil	Change oil
		3) Lean fuel/air mixture	Check and adjust carburetor
		4) Excessive back pressure exhaust system	Check and clean or replace
		5) Overloading	Adjust to rated load

Problem and possible cause			Remedy
Rough Idling	1. Carburetor system	1) Low idling speed	Adjust
		2) Slow system passage clogged	Check and clean
	2. Intake system	1) Air mixing from air intake system joints	Check and tighten; replace gasket
	3. Cylinder head	1) Gasket faulty (blow-by)	Replace
	4. Valve system	1) Improper valve clearance	Adjust
		2) Leakage from valve seat	Repair
		3) Excessive clearance between valve stem and guide	Replace guide and stem
	5. Ignition system	1) Weak spark	Check; adjust or replace plug
Excessive engine oil consumptiom	1. Oil leakage	1) Loose oil drain plug	Tighten
		2) Faulty oil drain gasket	Replace
		3) Loose main bearing cover bolts	Tighten
		4) Faulty main bearing cover gasket	Replace
		5) Crankcase oil seal (front, rear) defective	Replace
	2. Oil up	1) Faulty piston oil ring	Replace
		2) Piston ring seizure, wear, or poor contact	Replace
		3) Excessive wear of piston and/or cylinder	Replace
		4) Faulty stem seal	Replace
		5) Excessive oil level	Adjust
		6) Breather defective	Repair or replace

Problem and possible cause			Remedy
High fuel consumption	1. Fuel system	1) Clogged air cleaner	Clean or replace
		2) Faulty needle valve and/or high fuel level in float chamber	Clean or replace
		3) Choke does not open fully	Repair or replace
	2. Engine core components	1) Low compression	Check and repair
		2) Overcooling	Check and adjust load and/or engine speed
Valve system problems	1. Ignition system problems	1) Loose ignition system wiring	Inspect and tighten
		2) Improper or faulty spark plug	Clean or replace
	2. Fuel system problems	1) Lean or rich fuel/air mixture	Clean, adjust or replace carburetor
		2) Carburetor contamination	Overhaul or clean
		3) Dirty or clogged fuel lines	Clean or replace
		4) Air mixing from air intake system joints	Tighten; replace gasket
	3. Cylinder head	1) Carbon deposits in combustion chamber	Clean
		2) Leakage from cylinder head gasket	Replace
	4. Valve system problems	1) Improper valve clearance	Adjust
		2) Valve heat deterioration	Replace
		3) Worn or broken valve spring	Replace
		4) Improper valve timing	Adjust

Threadlockers and Sealants

Threadlocking adhesives and sealants are specified throughout this manual by a notation of “S” plus a number (S#) and should be used where indicated. Threadlocking compounds normally break down at temperatures above 175°C (350°F). If a screw or bolt is hard to remove, heat it using a small propane torch to break down the sealant. When applying sealants, follow instructions on container. The sealants listed are recommended for use on Wacker Neuson equipment.

TYPE ( ) = Europe	COLOR	USAGE	PART NO. – SIZE
Loctite 222 Hernon 420 Omnifit 1150 (50M)	Purple	Low strength, for locking threads smaller than 6 mm (1/4”). Hand tool removable. Temp. range: -54 to 149°C (-65 to 300°F)	73287 - 10 ml
Loctite 243 Hernon 423 Omnifit 1350 (100M)	Blue	Medium strength, for locking threads larger than 6 mm (1/4”). Hand tool removable. Temp. range: -54 to 149°C (-65 to 300°F)	29311 - .5 ml 17380 - 50 ml
Loctite 271/277 Hernon 427 Omnifit 1550 (220M)	Red	High strength, for all threads up to 25 mm (1”). Heat parts before disassembly. Temp. range: -54 to 149°C (-65 to 300°F)	29312 - .5 ml 26685 - 10 ml 73285 - 50 ml
Loctite 290 Hernon 431 Omnifit 1710 (230LL)	Green	Medium to high strength, for locking preassembled threads and for sealing weld porosity (wicking). Gaps up to 0.13 mm (0.005”) Temp. range: -54 to 149°C (-65 to 300°F)	28824 - .5 ml 25316 - 10 ml
Loctite 609 Hernon 822 Omnifit 1730 (230L)	Green	Medium strength retaining compound for slip or press fit of shafts, bearings, gears, pulleys, etc. Gaps up to 0.13 mm (0.005”) Temp. range: -54 to 149°C (-65 to 300°F)	29314 - .5 ml
Loctite 545 Hernon 947 Omnifit 1150 (50M)	Brown	Hydraulic sealant Temp. range: -54 to 149°C (-65 to 300°F)	79356 - 50 ml
Loctite 592 Hernon 920 Omnifit 790	White	Pipe sealant with Teflon for moderate pressures. Temp. range: -54 to 149°C (-65 to 300°F)	26695 - 6 ml 73289 - 50 ml
Loctite 515 Hernon 910 Omnifit 10	Purple	Form-in-place gasket for flexible joints. Fills gaps up to 1.3 mm (0.05”) Temp. range: -54 to 149°C (-65 to 300°F)	70735 - 50 ml

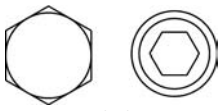
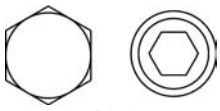
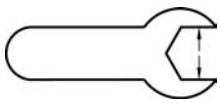
Threadlockers and Sealants (continued)

Threadlocking adhesives and sealants are specified throughout this manual by a notation of “S” plus a number (S#) and should be used where indicated. Threadlocking compounds normally break down at temperatures above 175°C (350°F). If a screw or bolt is hard to remove, heat it using a small propane torch to break down the sealant. When applying sealants, follow instructions on container. The sealants listed are recommended for use on Wacker Neuson equipment.

TYPE ( ) = Europe	COLOR	USAGE	PART NO. – SIZE
Loctite 496 Hernon 110 Omnifit Sicomet 7000	Clear	Instant adhesive for bonding rubber, metal and plastics; general purpose. For gaps up to 0.15 mm (0.006”) Read caution instructions before using. Temp. range: -54 to 82°C (-65 to 180°F)	52676 - 1oz.
Loctite Primer T Hernon Primer 10 Omnifit VC Activator	Aerosol Spray	Fast curing primer for threadlocking, retaining and sealing compounds. Must be used with stainless steel hardware. Recommended for use with gasket sealants.	2006124-6 oz.

Torque Values

Metric Fasteners (DIN)

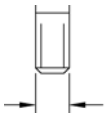
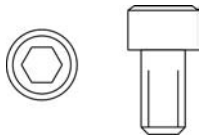
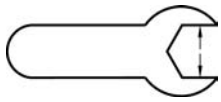
	TORQUE VALUES (Based on Bolt Size and Hardness)						**WRENCH SIZE**			
	 8.8		 10.9		 12.9					
Size	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Metric**	**Inch**	**Metric**	**Inch**
M3	1.2	*11	1.6	*14	2.1	*19	5.5	7/32	2.5	–
M4	2.9	*26	4.1	*36	4.9	*43	7	9/32	3	–
M5	6.0	*53	8.5	6	10	7	8	5/16	4	–
M6	10	7	14	10	17	13	10	–	5	–
M8	25	18	35	26	41	30	13	1/2	6	–
M10	49	36	69	51	83	61	17	11/16	8	–
M12	86	63	120	88	145	107	19	3/4	10	–
M14	135	99	190	140	230	169	22	7/8	12	–
M16	210	155	295	217	355	262	24	15/16	14	–
M18	290	214	405	298	485	357	27	1-1/16	14	–
M20	410	302	580	427	690	508	30	1-1/4	17	–

1 ft.lb. = 1.357 Nm * = in.lb. 1 inch = 25.4 mm

Torque Values

Torque Values (continued)

Inch Fasteners (SAE)

										
Size	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Metric**	**Inch**	**Metric**	**Inch**
No.4	0.7	*6	1.0	*14	1.4	*12	5.5	1/4	–	3/32
No.6	1.4	*12	1.9	*17	2.4	*21	8	5/16	–	7/64
No.8	2.5	*22	3.5	*31	4.7	*42	9	11/32	–	9/64
No.10	3.6	*32	5.1	*45	6.8	*60	–	3/8	–	5/32
1/4	8.1	6	12	9	16	12	–	7/16	–	3/32
5/16	18	13	26	19	33	24	13	1/2	–	1/4
3/8	31	23	45	33	58	43	–	9/16	–	5/16
7/16	50	37	71	52	94	69	16	5/8	–	3/8
1/2	77	57	109	80	142	105	19	3/4	–	3/8
9/16	111	82	156	115	214	158	–	13/16	–	–
5/8	152	112	216	159	265	195	24	15/16	–	1/2
3/4	271	200	383	282	479	353	–	1-1/8	–	5/8

1 ft.lb. = 1.357 Nm * = in.lb. 1 inch = 25.4 mm

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