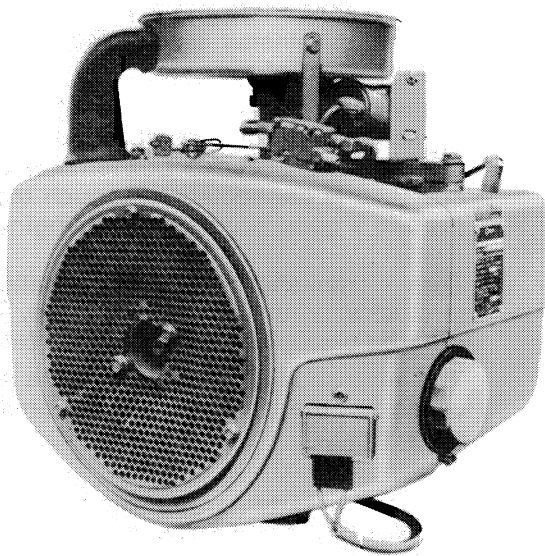




# **OPERATING AND MAINTENANCE INSTRUCTIONS**



**N52M-GA0199**

**INDUSTRIAL ENGINE**

**ONAN**

**1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432**

*A DIVISION OF ONAN CORPORATION*

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# ENGINE SAFETY PRECAUTIONS

It is recommended that you read your engine manual and become thoroughly acquainted with your equipment before you start the engine.

**WARNING** This symbol is used throughout this manual to warn of possible serious personal injury.

**CAUTION** This symbol refers to possible equipment damage.

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that could result in serious, personal injury. Take care in following these recommended procedures.

## Safety Codes

- All local, state and federal codes should be consulted and complied with.

## General

- Provide appropriate fire extinguishers and install them in convenient locations. Use an extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the engine are secure. Tighten supports and clamps, keep guards in position over fans, driving belts, etc.
- If it is necessary to make adjustments while the engine is running, use extreme caution when close to hot exhausts, moving parts, etc.

## Protect Against Moving Parts

- Do not wear loose clothing in the vicinity of moving parts, such as PTO shafts, flywheels, blowers, couplings, fans, belts, etc.
- Keep your hands away from moving parts.

## Batteries

- Before starting work on the engine, disconnect batteries to prevent inadvertent starting of the engine.
- DO NOT SMOKE while servicing batteries. Lead acid batteries give off a highly explosive hydrogen gas which can be ignited by flame, electrical arcing or by smoking.
- Verify battery polarity before connecting battery cables. Connect negative cable last.

## Fuel System

- DO NOT fill fuel tanks while engine is running, unless tanks are outside engine compartment.

- DO NOT smoke or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be of steel piping, adequately secured, and free from leaks. Piping at the engine should be approved flexible line. Do not use copper piping on flexible lines as copper will work harden and become brittle enough to break.
- Be sure all fuel supplies have a positive shutoff valve.

## Exhaust System

- Exhaust products of any internal combustion engine are toxic and can cause injury, or death if inhaled. All engine installations, especially those within a confine, should be equipped with an exhaust system to discharge gases to the atmosphere.
- Do not use exhaust gases to heat a compartment.
- Make sure that your exhaust system is free of leaks. Ensure that exhaust manifolds are secure and are not warped by bolts unevenly torqued.

## Engine Exhaust Gas (Carbon Monoxide) is Deadly!

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are:

- |                           |                        |
|---------------------------|------------------------|
| • Dizziness               | • Vomiting             |
| • Intense Headache        | • Muscular Twitching   |
| • Weakness and Sleepiness | • Throbbing in Temples |

If you experience any of the above symptoms, get out into fresh air immediately.

The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

## Cooling System

- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator pressure cap while the engine is running. Bleed the system pressure first.

## Keep the Unit and Surrounding Area Clean

- Make sure that oily rags are not left on or near the engine.
- Remove all oil deposits. Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and may present a potential fire hazard.

# Important Safety Precautions

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Read and observe these safety precautions when using or working on electric generators, engines and related equipment. Also read and follow the literature provided with the equipment.

Proper operation and maintenance are critical to performance and safety. Electricity, fuel, exhaust, moving parts and batteries present hazards that can cause severe personal injury or death.

## FUEL, ENGINE OIL, AND FUMES ARE FLAMMABLE AND TOXIC

Fire, explosion, and personal injury can result from improper practices.

- Used engine oil, and benzene and lead, found in some gasoline, have been identified by government agencies as causing cancer or reproductive toxicity. When checking, draining or adding fuel or oil, do not ingest, breathe the fumes, or contact gasoline or used oil.
- Do not fill tanks with engine running. Do not smoke around the area. Wipe up oil or fuel spills. Do not leave rags in engine compartment or on equipment. Keep this and surrounding area clean.
- Inspect fuel system before each operation and periodically while running.
- Equip fuel supply with a positive fuel shutoff.
- Do not store or transport equipment with fuel in tank.
- Keep an ABC-rated fire extinguisher available near equipment and adjacent areas for use on all types of fires except alcohol.
- Unless provided with equipment or noted otherwise in installation manual, fuel lines must be copper or steel, secured, free of leaks and separated or shielded from electrical wiring.
- Use approved, non-conductive flexible fuel hose for fuel connections. Do not use copper tubing as a flexible connection. It will work-harden and break.

## EXHAUST GAS IS DEADLY

- Engine exhaust contains carbon monoxide (CO), an odorless, invisible, poisonous gas. Learn the symptoms of CO poisoning.
- Never sleep in a vessel, vehicle, or room with a genset or engine running unless the area is equipped with an operating CO detector with an audible alarm.
- Each time the engine or genset is started, or at least every day, thoroughly inspect the exhaust system. Shut down the unit and repair leaks immediately.

- Warning: Engine exhaust is known to the State of California to cause cancer, birth defects and other reproductive harm.

*Make sure exhaust is properly ventilated.*

- Vessel bilge must have an operating power exhaust.
- Vehicle exhaust system must extend beyond vehicle perimeter and not near windows, doors or vents.
- Do not use engine or genset cooling air to heat an area.
- Do not operate engine/genset in enclosed area without ample fresh air ventilation.
- Expel exhaust away from enclosed, sheltered, or occupied areas.
- Make sure exhaust system components are securely fastened and not warped.

## MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not remove any guards or covers with the equipment running.
- Keep hands, clothing, hair, and jewelry away from moving parts.
- Before performing any maintenance, disconnect battery (negative [–] cable first) to prevent accidental starting.
- Make sure fasteners and joints are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- If adjustments must be made while equipment is running, use extreme caution around hot manifolds and moving parts, etc. Wear safety glasses and protective clothing.

## BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- Always disconnect battery negative (–) lead first and reconnect it last. Make sure you connect battery correctly. A direct short across battery terminals can cause an explosion. Do not smoke while servicing batteries. Hydrogen gas given off during charging is explosive.
- Do not disconnect or connect battery cables if fuel vapors are present. Ventilate the area thoroughly.

## **DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS**

Flammable vapor can be ignited by equipment operation or cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. **Do not operate diesel equipment where a flammable vapor environment can be created by fuel spill, leak, etc., unless equipped with an automatic safety device to block the air intake and stop the engine.**

## **HOT COOLANT CAN CAUSE SEVERE PERSONAL INJURY**

- Hot coolant is under pressure. Do not loosen the coolant pressure cap while the engine is hot. Let the engine cool before opening the pressure cap.

## **ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH**

- Do not service control panel or engine with unit running. High voltages are present. Work that must be done while unit is running should be done only by qualified service personnel.
- Do not connect the generator set to the public utility or to any other electrical power system. Electrocutation can occur at a remote site where line or equipment repairs are being made. An approved transfer switch must be used if more than one power source is connected.
- Disconnect starting battery (negative [-] cable first) before removing protective shields or touching electrical equipment. Use insulative mats placed on dry wood platforms. Do not wear jewelry, damp clothing or allow skin surface to be damp when handling electrical equipment.
- Use insulated tools. Do not tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- With transfer switches, keep cabinet closed and locked. Only authorized personnel should have cabinet or operational keys. Due to serious shock hazard from high voltages within cabinet, all service and adjustments must be performed by an electrician or authorized service representative.

If the cabinet must be opened for any reason:

1. Move genset operation switch or Stop/Auto/Handcrank switch (whichever applies) to Stop.
2. Disconnect genset batteries (negative [-] lead first).
3. Remove AC power to automatic transfer switch. If instructions require otherwise, use extreme caution due to shock hazard.

## **MEDIUM VOLTAGE GENERATOR SETS (601V TO 15kV)**

- Medium voltage acts differently than low voltage. Special equipment and training are required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Induced voltage remains even after equipment is disconnected from the power source. Plan maintenance with authorized personnel so equipment can be de-energized and safely grounded.

## **GENERAL SAFETY PRECAUTIONS**

- Do not work on equipment when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.
- Never step on equipment (as when entering or leaving the engine compartment). It can stress and break unit components, possibly resulting in dangerous operating conditions from leaking fuel, leaking exhaust fumes, etc.
- Keep equipment and area clean. Oil, grease, dirt, or stowed gear can cause fire or damage equipment by restricting airflow.
- Equipment owners and operators are solely responsible for operating equipment safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

**KEEP THIS DOCUMENT NEAR EQUIPMENT FOR EASY REFERENCE.**

# GENERAL INFORMATION

## ENGINE MODEL REFERENCE

Identify your model by referring to the MODEL and SPEC (specification) NO. as shown on the unit nameplate. Always use this number and the engine serial number when making reference to your engine.

**Onan recommends that all major service be performed by qualified service personnel. An engine service manual and complete parts catalog are available at additional cost. Contact your nearest authorized dealer or Onan Parts and Service Center.**

## RUNNING REPLACEMENT PARTS

Oil Filter .....	122-0469
Oil Filter Air Seal .....	122-0347
Air Filter .....	140-1228
Breather Tube Baffle.....	123-0865
Spark Plugs .....	167-0291
Breaker Points (Top Adjust).....	160-1183
Condenser (Breaker Box) .....	312-0196
Parts Catalog.....	940-0252
Service Manual .....	940-0752

These instructions contain the SI metric equivalents following immediately in parentheses after the U.S. customary units of measure.

## SPECIFICATIONS

Engine Design.....	Opposed two-cylinder, four cycle, air cooled
Displacement.....	52.2 CID (858 cm <sup>3</sup> )
Cylinder Bore .....	3.56 inch (90.4 mm)
Piston Stroke.....	2.62 inch (66.5 mm)
Horsepower @ 3600 rpm.....	19.9 BHP (14.85 kW)
Compression Ratio .....	6.5 to 1
Ventilation Required @ 3600 rpm.....	1100 cfm (31.14 m <sup>3</sup> /min)
Oil Capacity.....	3.5 pt (1.66 litre)
Oil Capacity with Filter Change .....	4 pt (1.89 litre)
Combustion Air @ 3600 rpm .....	80 cfm (2.3 m <sup>3</sup> )
Fuel .....	Nonleaded or Regular Grade Gasoline
Battery.....	12 Volt
Alternator output .....	15 Amp

## TUNE-UP SPECIFICATIONS

Cylinder Head Torque (std) .....	14-16 lb ft (19-21 N•m)
Spark Plug Gap .....	0.025 inch (0.64 mm)
Breaker Point Gap.....	0.020 inch (0.51 mm)
Ignition Timing (Fixed), Electric Start Units .....	25° BTC
Tappets (Cold) Intake.....	0.003 inch (0.08 mm)
Exhaust .....	0.012 inch (0.30 mm)

## OUT-OF-SERVICE PROTECTION

Protect an engine that will be out-of-service for more than 30 days as follows:

1. Run engine until thoroughly warm (5 to 10 minutes).
2. Turn off fuel supply and run until engine stops.
3. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
4. Remove spark plugs. Pour one ounce (two tablespoons) of rust inhibitor (or SAE #50 oil) into the cylinders. Crank engine over a few times. Install spark plugs.
5. Service air cleaner as outlined in *MAINTENANCE* section.
6. Clean governor linkage and protect by wrapping with a clean cloth.
7. Plug exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
8. Wipe entire unit. Coat rustable parts with a light film of grease or oil.
9. Provide a suitable cover for the entire unit.
10. If battery is used, disconnect and follow standard battery storage procedure.

## Returning a Unit to Service.

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check warning tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check battery. Measure specific gravity (1.260 at 77°F [25°C]) and verify level to be at split ring. If specific gravity is low, charge until correct value is obtained. If level is low, add distilled water and charge until specific gravity is correct. **DO NOT OVERCHARGE.**

### WARNING

**Do not smoke while servicing batteries. Explosive gases are emitted from batteries in operation. Ignition of these gases can cause severe personal injury.**

4. Check that spark plugs and fuel lines are secure, correctly torqued.
5. Be sure cooling fins are clean.
6. Connect batteries.
7. Verify that no loads are connected to engine.
8. Start engine.

**After engine has started, excessive blue smoke will be exhausted until the rust inhibitor or oil has burned away.**

# PRE-START INSTRUCTIONS

## BEFORE STARTING

Check the engine to make sure it has been filled with oil and fuel. The chart below lists oil and fuel recommendations.

**Crankcase Oil:** Fill the crankcase with a good quality oil that meets the API (American Petroleum Institute) service designation SE or SE/CC. Recommended oil numbers for expected ambient temperatures are as follows:

TEMPERATURE	GRADE
Below 32° F (-0° C)	SAE 5W30
Above 32° F (-0° C)	SAE 30

Fill to "Full" mark on dipstick.

**CAUTION** Do not overfill crankcase. Do not use service DS oil. Do not mix brands nor grades of motor oil; some brands of oil are not compatible with others.

**Recommended Fuel:** Use clean, fresh, unleaded or regular grade gasoline. Do not use highly leaded premium fuels. Using unleaded gasoline results in less maintenance.

Use regular gasoline for the first 25 hours to allow the rings to seat well for best performance. Then use unleaded gasoline thereafter.

If regular gasoline is used continually, carbon and lead deposits must be removed from the cylinder heads as required because of engine power loss. Unleaded gasoline may be used safely after lead deposits have been removed.

## STARTING

Most engines are equipped with a cable-controlled manual choke. Refer to illustration for open and closed choke position.

1. Turn on ignition switch, pull the choke lever way out (for a cold engine) and push the start switch. When the engine starts, gradually push the choke lever in until the engine runs smoothly.
2. Black smoke from the exhaust and a rough running engine usually indicate over-choking.
3. To stop engine, turn ignition switch to off position.

If the engine fails to start at first attempt, inhibitor oil used at the factory may have fouled the spark plugs. Remove the plugs, clean in a suitable solvent, dry thoroughly and install. Heavy exhaust smoke when the engine is initially started is normal and usually caused by inhibitor oil.

DON'T CHECK  
OR ADD OIL  
WHEN ENGINE  
IS RUNNING.

ALWAYS REPLACE  
CAP TIGHTLY, OR  
OIL LEAKAGE MAY  
OCCUR.

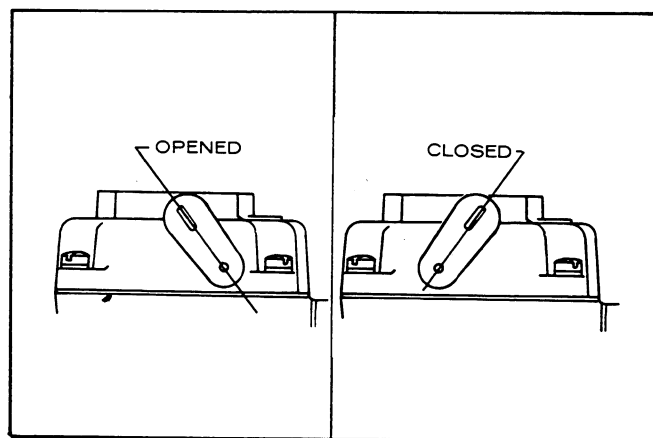
FULL  
ADD ONE  
PINT

CRANKCASE OIL FILL

**WARNING** Do not remove dipstick while the engine is running. Hot oil may blow out the oil fill tube and cause injuries.

**WARNING** Never fill the fuel tank when the engine is running. Gasoline could spill on ignition wires, causing an explosion.

**Inspection:** Inspect the engine visually before starting. Check for loose or missing parts and any damage which may have occurred in shipment.



CHOKE OPEN

CHOKE CLOSED

# OPERATION

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## BREAK-IN PROCEDURE

Controlled break-in with proper oil and a conscientiously applied maintenance program will help assure satisfactory service for many hours from your Onan engine.

Break-in or ideal fitting of all internal moving metal parts can best be achieved by maintaining proper cooling and correct lubrication during the running-in period. Run the engine at about half load for the first three hours with intermittent periods of full load to control engine break-in. Engine damage can be caused by using the wrong grade and weight of oil and high engine operating temperatures during break-in.

Check the oil level at least every five operating hours. Add oil to keep it between low and full, but never overfill as overfilling may cause the oil to foam and enter the breather system.

## HOT WEATHER OPERATION

When operating the engine in temperatures above 75°F pay particular attention to the following items to prevent damage:

1. Keep the engine cooling fins clean and free of



Plugged or clogged cooling fins can cause overheating and engine damage.

obstruction which would decrease air flow to and from the engine.

2. See that nothing obstructs air flow to and from the engine.
3. Ensure that you are using the proper grade and weight of oil for the temperature the engine is being used in. Check the oil level each time you fill the fuel tank.
4. Check the battery water level more frequently than every 50 hours which is recommended under normal conditions. High temperatures cause faster evaporation.

## COLD WEATHER OPERATION

When the engine is being used in temperatures below 32°F (-0°C), check the following items closely:

1. Use the correct grade and weight of oil for the temperature conditions. Change the oil only when the engine is warm. If an unexpected temperature drop occurs when the engine is filled with summer oil, before starting the engine, move to a warm location until the oil will flow freely.
2. Use fresh fuel. Fill the fuel tank after each days use to protect against moisture condensation.
3. Keep battery in a well-charged condition.

# MAINTENANCE

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**Oil Level:** Check oil level at least every eight hours of operation. Check more frequently on a new or overhauled engine as oil consumption is higher until piston rings seat properly.

**Oil Change:** Change crankcase oil after the first 25 hours of operation; change every 25 hours after that. If operating in extremely dusty conditions, change oil more frequently.

**Oil Filter:** Replace oil filter every 50 hours; replace more often in dusty conditions. Tighten the filter finger-tight plus 1/4 to 1/2 turn.

**Crankcase Breather:** This engine uses a crankcase breather valve for maintaining crankcase vacuum. No maintenance is generally required. If the crankcase becomes pressurized as evidenced by oil leaks at the seals, clean baffle and valve in a suitable solvent.

**Cartridge Air Cleaner:** Check and clean air cleaner element every 25 hours. Clean by gently tapping element on a flat surface. Replace element every 200 hours. Clean or replace more frequently in dusty operating conditions.

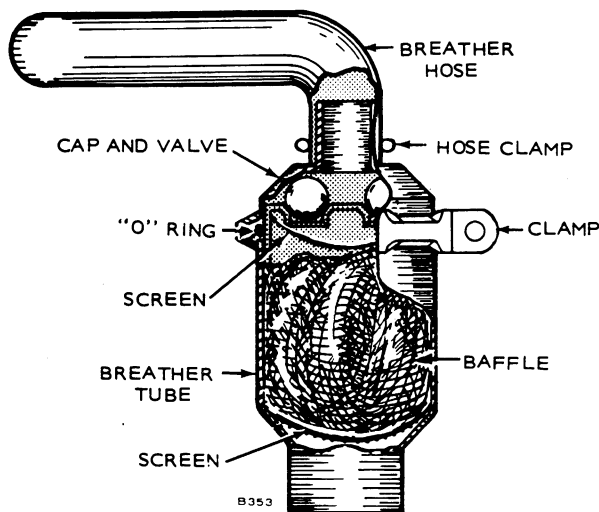
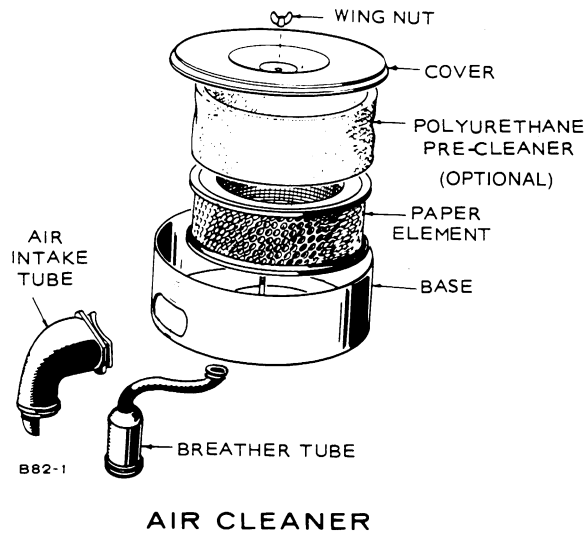
**Air Cleaner Wrapper (Pre-Cleaner):** Wash in water and detergent and squeeze dry like a sponge. Allow to dry, then coat evenly with three tablespoons of SAE30 engine oil. Knead into and wring excess oil from pre-cleaner. Reinstall over cartridge.

**Cooling System:** Check and clean cooling fins at least every 50 hours. Remove any dust, dirt or oil which may have accumulated.

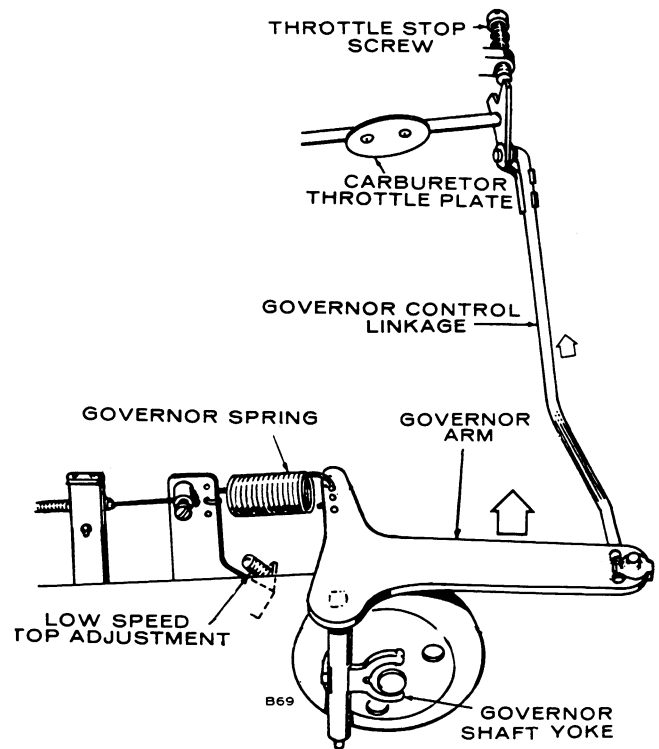
**Spark Plugs:** Check, clean and reset spark plugs every 100 operating hours. Replace spark plugs that show signs of fouling or electrode erosion.

**Breaker Points:** Check breaker points every 100 hours. Clean and reset breaker points every 200 operating hours. Replace points if they are pitted or burned. See *ADJUSTMENTS* section.

## MAINTENANCE



## ADJUSTMENTS



### GOVERNOR ADJUSTMENT

The governor should allow a nominal engine speed of 2400 rpm at no load. The no load speed should be slightly higher (90 rpm) than the speed requirements of the connected load. Using a tachometer, check engine speed and adjust the governor as follows:

1. Disconnect clip and link at end of governor arm.
2. Push linkage and governor arm toward carburetor as far as they will go and hold.
3. Install rod end in nearest hole at end of governor arm. Install clip to secure rod to arm.
4. The governor control spring is factory set in the center hole of the governor control shaft bracket. To increase the sensitivity, move the spring loop into the hole nearest the control shaft. To decrease the sensitivity, move the spring outward.
5. After sensitivity has been set, adjust the low speed stop adjustment screw on the control wire bracket.



# ADJUSTMENTS

## CARBURETOR

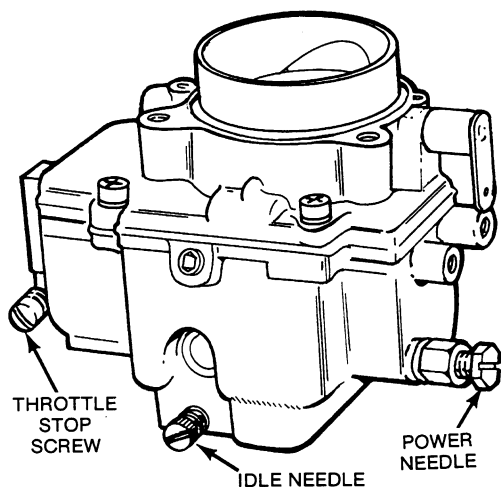
The carburetor has a power (high speed) adjustment and an idle fuel adjustment. The main adjustment affects operation under heavy load conditions. Idle adjustment affects operation under light or no load conditions. Under normal circumstances, factory carburetor adjustments should not be disturbed. If the adjustments have been disturbed, turn idle needle 1-1/8 to 1-3/8 turns open and main jet (power needle) 1-1/8 to 1-3/8 turns open (off of needle seat). Then, readjust them for smooth operation.

**CAUTION** Forcing the needle against its seat will damage it. The needle does not completely shut off fuel when turned fully in.

Before final adjustment, allow the engine to warm up. Make the idle needle adjustment under no load. Open the power needle until the engine runs smooth under acceleration with no load. Slightly more fuel may be needed (open about 1/4 turn further) when a sudden load is applied.

Set the throttle stop screw (located on carburetor throttle lever) with no load connected and while running at a low speed setting. Turn the screw to give approximately 1/32 inch (.029 mm) clearance between the screw and pin.

If the engine develops a "hunting" condition (alternate increase and decrease of engine speed), try correcting it by opening the power needle a little more. Do not open more than 1/2 turn beyond the maximum point of power.



CARBURETOR ADJUSTMENT

## BREAKER POINTS (Cold Setting) IGNITION TIMING

To maintain maximum engine efficiency, change the breaker points every 200 hours of operation. Proceed as follows:

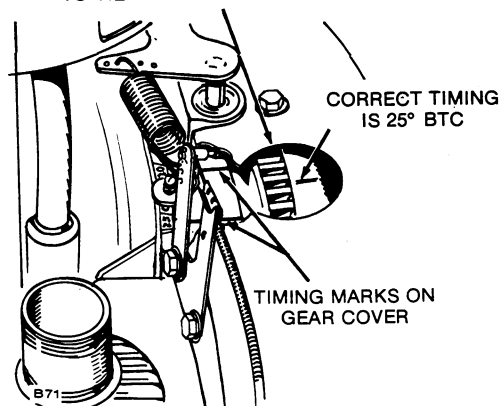
1. Remove the air intake hose that connects to blower housing. This provides an access to view timing mark. See illustration.
2. Remove spark plugs and rotate flywheel TC mark clockwise to 25° BTC (points open).
3. Remove breaker box cover and unplug coil wire at coil (+) terminal.
4. Remove condenser (screw A) and detach condenser lead and coil lead (screw B).
5. Remove two Allen screws (C) and lift breaker assembly from engine.
6. Replace condenser and point assembly with new parts and reinstall using above procedure in reverse order of removal.
7. Connect an ohmmeter or a continuity test lamp set across the ignition breaker points. Touch one test prod to the breaker box terminal to which the coil lead is connected and touch the other test prod to a good ground on the engine.
8. Turn crankshaft against rotation (counterclockwise) until the points close. Then slowly turn the crankshaft with rotation (clockwise).
9. The lamp should go out just as the points break which is the time at which ignition occurs (25° BTC).

If timing is early (large point gap) or late (small point gap), adjust point gap using Allen screw (D) so that lamp goes out at 25° BTC with crankshaft rotation clockwise.

If a continuity lamp or an ohmmeter is not available, use a clean flat feeler gauge as follows: Rotate crankshaft clockwise (facing flywheel) by hand until TC mark on flywheel aligns with 25° BTC mark on gear cover. Then rotate flywheel another 1/4 turn clockwise (90°) to ensure points open fully. Using Allen screw (D), set point gap at .020 inch (0.51 mm).

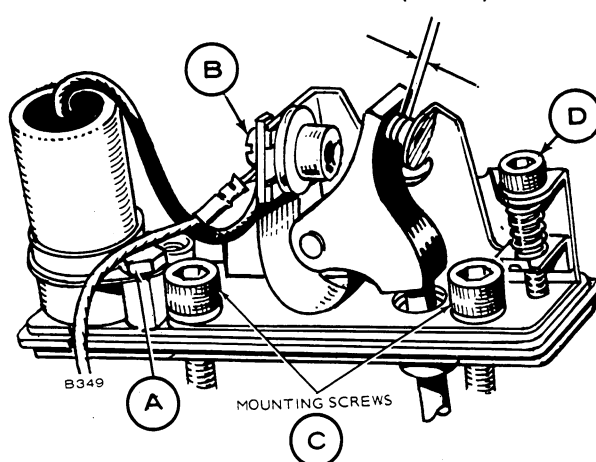
10. Replace breaker box cover, coil wire and spark plug cables and air intake hose.

REMOVE HOSE FROM AIR CLEANER  
TO VIEW TIMING MARKS



**TIMING ADJUSTMENT**

.020" GAP  
(0.51 mm)



**SETTING POINT GAP AND TIMING**

## PERIODIC SERVICE GUIDE

Regularly scheduled maintenance lowers operating costs and lengthens the service life of the unit. Use the following schedule as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check the condition of the

crankcase oil, the filters, etc., frequently until the proper service time periods can be established.

For any abnormalities in operation, unusual noises from the engine or accessories, loss of power, overheating, etc., contact your nearest Onan Service Center.

### PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS				
	8	25	50	100	200
Inspect Engine Generally	x <sup>1</sup>				
Check Oil Level	x				
Service Air Cleaner		x <sup>2</sup>			
Change Crankcase Oil		x <sup>2</sup>			
Check Battery Electrolyte Level			x		
Clean Cooling Fins			x		
Replace Oil Filter (if used)			x		
Replace Spark Plugs				x	
Check Breaker Points				x	
Clean Breather Valve					x <sup>2</sup>
Replace Air Cleaner Element					x <sup>2</sup>
Check Valve Clearance			x <sup>3</sup>		x <sup>4</sup>
Compression Check					x

x<sup>1</sup> - Check for fuel leaks, exhaust leaks, etc.

x<sup>2</sup> - Perform more often in extremely dusty conditions.

x<sup>3</sup> - Initial break-in check only.

x<sup>4</sup> - For detailed maintenance, contact an Onan Service Center.





Onan Corporation  
1400 73rd Avenue N.E.  
Minneapolis, MN 55432  
1-800-888-ONAN  
612-574-5000 International Use  
Telex: 275477  
Fax: 612-574-8087

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