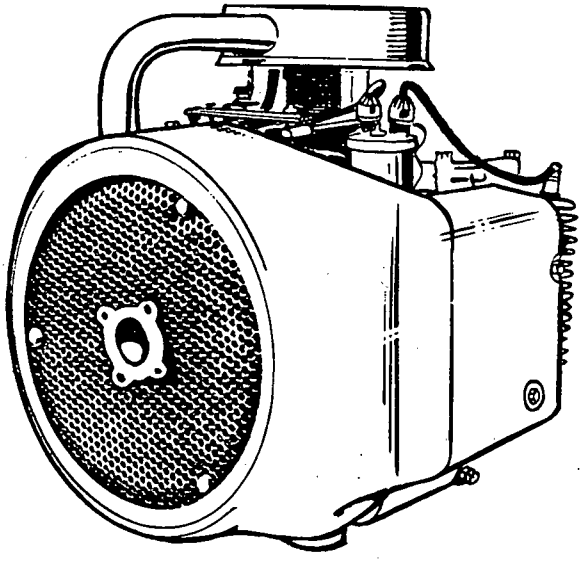
Onan®

OPERATING AND MAINTENANCE INSTRUCTIONS



BF

ENGINE

☆

GARDEN TRACTOR SERVICE

INDUSTRIAL SERVICE

☆

ONAN 1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432
A DIVISION OF ONAN CORPORATION

FORM NUMBER
965-0150

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ISSUE DATE
3-76 (SPEC E)

DPC 710

Engineering Release

Models Affected: N Series, T Series and B Series

ER No. 11,383

Page 1 of 2

Date 7-25-85

Effect on Cost	ER Implementation Required	Project No.	Technical Report No(s).	Result of ECR(s)
☐ Decrease ☒ None ☐ Increase (See Page ____)	☐ Serial No., or ☐ Implementation Date	641070-00	84-8030	

Type of ER		Customer Order No.
☐ New Release	☒ Request by Engrg.	
☐ Model Spec Advance	☐ Record Change Only	AFE No.
☐ _____	☐ Change in Status	

Documents Affected (Attach Supplemental Sheets for Additional Listings)

C 4	T 5	Part Number 22–31	S 32	Rev	Part Number Title 57–78	Remarks	Controlled Item	Interchangeable	Tooling Affected	Pattern Affected	Qty Per Year	Date Needed	Vendor Stock	Work In Process	Completed Part	Part In Assy	Onan Stock	Distributor Stock	Manuals	Onan Mfg	Purchased	Date Processed	Engrs Initials
1	C	175-0233	C	B	Data-Assy, Insp & Svce	Note 1	N	Y	N	N	7	7	7	4	4	4	4	4	8				
1	C	175-0232	C	C	Specification-Eng	Note 1	N	Y	N	N	7	7	7	4	4	4	4	4	8				

Use Yes, No or Code 10 | Tooling Data | Parts Disposition (Manufacturing / Service) | Mfg Use Only

Description/Reason:

The purpose of this ER is to change the valve lash on all of the N Series, T Series and B Series engines in order to provide consistency. This was implemented at Huntsville on 11/13/84 by Deviation No. G841114A

Updates to service manuals should be done immediately.

NOTE 1

All T, N, B Series engines will be changed to: Intake Valve clearance .005" .127 mm
Exhaust Valve clearance .013" .330 mm.

There is no temperature reference nor any difference in gasoline, LPG or natural gas.

Part Disposition Code:

1. Scrap Immediately.
2. Scrap Upon Availability of Replacement Part.
3. Incorporate Upon Availability.
4. Use Up Existing Stock.
5. Rework.
6. Implement Immediately.
7. Not Applicable.
8. Update.
9. Issue Bulletin.
10. See Explanation in ER Description/Reason Area.

Effect at	Mandatory			ER No.
Fridley				11,383
Huntsville	x			

Written by Scott Jacobson

Date 6/14/85 Dept 6452

Engrg Mgr Approval

Date 6/14/85

Other Approvals (When Required)

Title

Name

Date 6/19/85

Form 8B158-A

SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

WARNING **Onan uses this symbol 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.

- **Use Extreme Caution Near Gasoline, Gaseous Fuel And Diesel Fuel. A constant potential explosive or fire hazard exists.**

  Do not fill fuel tank near unit with engine running. Do not smoke or use open flame near the unit or the fuel tank.

  Be sure all fuel supplies have a positive shutoff valve.

  Fuel lines must be of steel piping, adequately secured and free from leaks. Do not use copper piping on flexible lines as copper becomes hardened and brittle. Use black pipe on natural gas or gaseous fuels, not on gasoline or diesel fuels. Piping at the engine should be approved flexible line.

  Have a fire extinguisher nearby. Be sure extinguisher is properly maintained and be familiar with its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.

- **Guard Against Electric Shock**

  Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

  Jewelry is a good conductor of electricity and should be removed when working on electrical equipment.

  Always use an appropriately sized, approved double-throw transfer switch with any standby generator set. DO NOT PLUG PORTABLE OR STANDBY SETS DIRECTLY INTO A HOUSE RECEPTACLE TO PROVIDE EMERGENCY POWER. It is possible for current to flow from generator into the utility line. This creates extreme hazards to anyone working on lines to restore power.

  Use extreme caution when working on electrical components. High voltages cause injury or death.

  Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

- **Do Not Smoke While Servicing Batteries**

  Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

- **Exhaust Gases Are Toxic**

  Provide an adequate exhaust system to properly expel discharged gases. Check exhaust system regularly for leaks. Ensure that exhaust manifolds are secure and not warped.

  Be sure the unit is well ventilated.

- **Keep The Unit And Surrounding Area Clean.**

  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.

  Dispose of oily rags. Keep the floor clean and dry.

- **Protect Against Moving Parts.**

  Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted because of the danger of becoming caught in moving parts.

  Make sure all nuts and bolts are secure. Keep power shields and guards in position.

  If adjustments *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

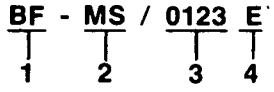
  Do not work on this equipment when mentally or physically fatigued.

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.

How to interpret MODEL and SPEC NO.



1. Factory code for general identification purposes.
2. Specific Type:
   S—MANUAL STARTING
   MS—ELECTRIC STARTING
3. Factory code for optional equipment supplied.
4. Specification (Spec Letter) advances with factory production modification.

RUNNING REPLACEMENT PARTS

Oil Filter (if equipped)	122-0338
Air Filter Element (3 inch height)	140-1216
Wrapper for Above	140-1218
Air Filter Element (1-15/16 inch height)	140-1055
Wrapper for Above	140-1217
Spark Plugs	167-0241
Breaker Points	160-1154
Condenser (Breaker Box)	312-0069
Coil	166-0535
Spark Plug Cables 16-3/4 inch	167-1462
19 inch	167-1463
Carburetor Repair Kit	142-0561
Carburetor Base Gasket	145-0438

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.

SPECIFICATIONS

Engine Design	Opposed two cylinder, four cycle, L head and air cooled
Bore	3-1/8 inch (79.38 mm)
Stroke	2-5/8 inch (66.68 mm)
Displacement	40.3 in³ (660.52 cm³)
HP—Garden Tractor Service @ 3600 rpm	16 hp
Oil Capacity with Filter Change	4-1/2 pt. (2.13 lit.)
Oil Capacity without Filter Change	4 pt. (1.89 lit.)

TUNE-UP SPECIFICATIONS

Spark Plug Gap	.025 inch (0.635 mm)
Breaker Point Gap	.023 inch (0.584 mm)
Valve Lash,	
Intake	.007 to .009 (0.18 to 0.23 mm)
Exhaust	.012 to .014 (0.30 to 0.36 mm)
Ignition Timing (Static Setting)	23° - 25° BTC

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.

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 30°F	SAE 5W30
Above 30°F	SAE 30

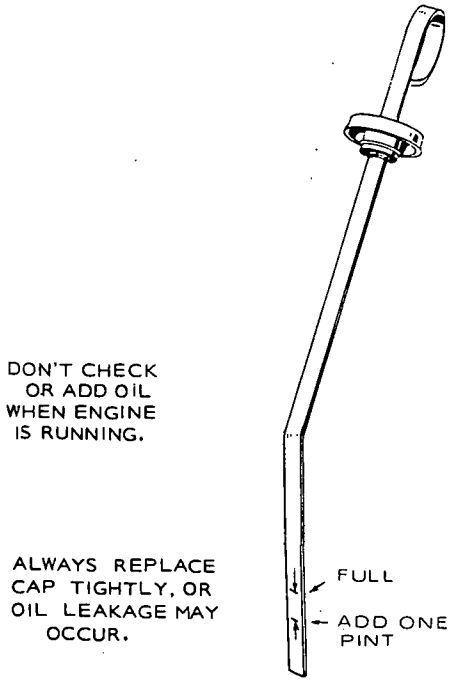
Fill to "Full" mark on dipstick.

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.**

Refer to *PERIODIC SERVICE* section for recommended oil change intervals.

Recommended Fuel: Use clean, fresh, regular grade, automotive gasoline. Do not use highly leaded premium types.

For new engines, the most satisfactory results are obtained by using nonleaded gasoline. For older engines that have previously used leaded gasoline, heads must be taken off and all lead deposits removed from engine before switching to nonleaded gasoline.



CRANKCASE OIL FILL

CAUTION **If lead deposits are not removed from engine before switching from leaded to nonleaded gasoline, preignition could occur, causing severe damage to the engine.**

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.

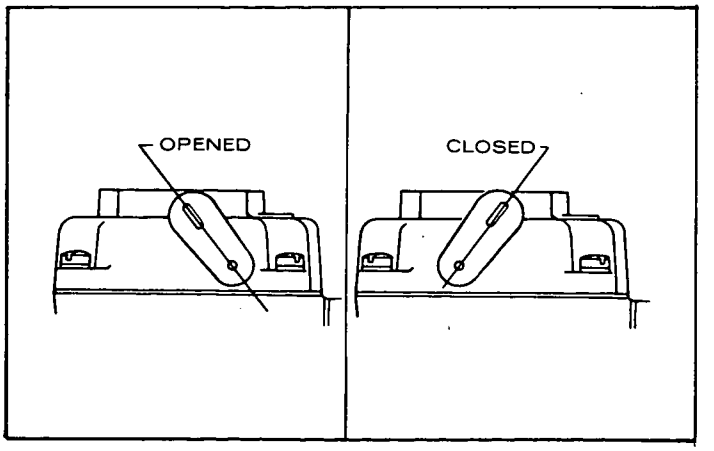
WARNING **Don't check or add oil when engine is running. Hot oil under pressure can cause injury.**

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.



CHOKE OPEN CHOKE CLOSED

OPERATION

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 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 30° F, 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

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 50 hours after that. If operating in extremely dusty conditions, change oil more frequently.

Oil Filter (If Used): Replace oil filter every 100 hours; replace more often in dusty conditions. Tighten the filter finger-tight plus one quarter to one half 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 50 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.

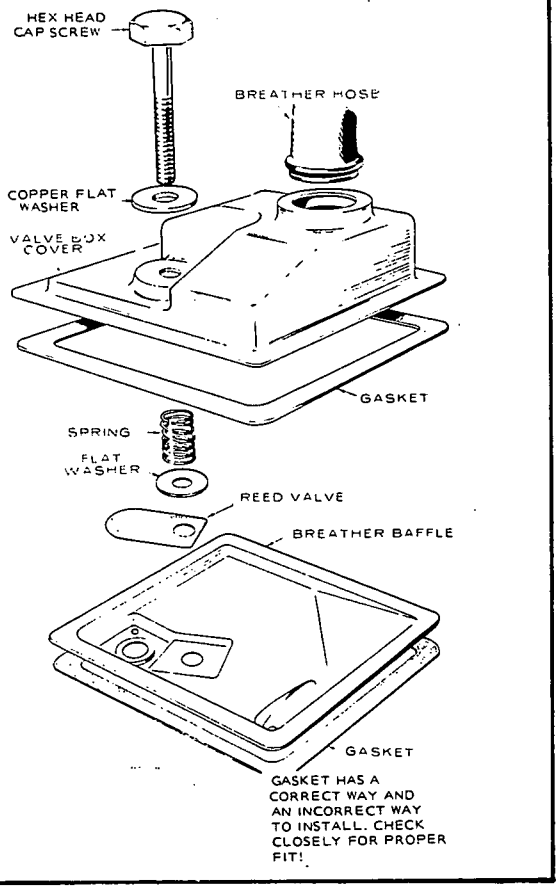
Cooling System: Check and clean cooling fins at least every 50 hours. Remove any dust, dirt or oil which may have accumulated.

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

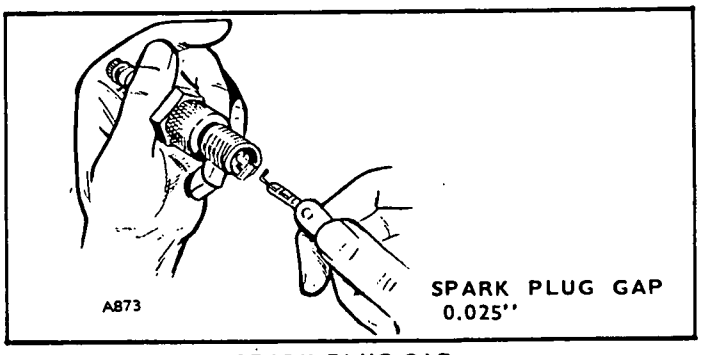
Spark Plugs: Check, clean and reset spark plugs every 100 operating hours. Replace spark plugs that show signs of fouling or electrode erosion.

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.

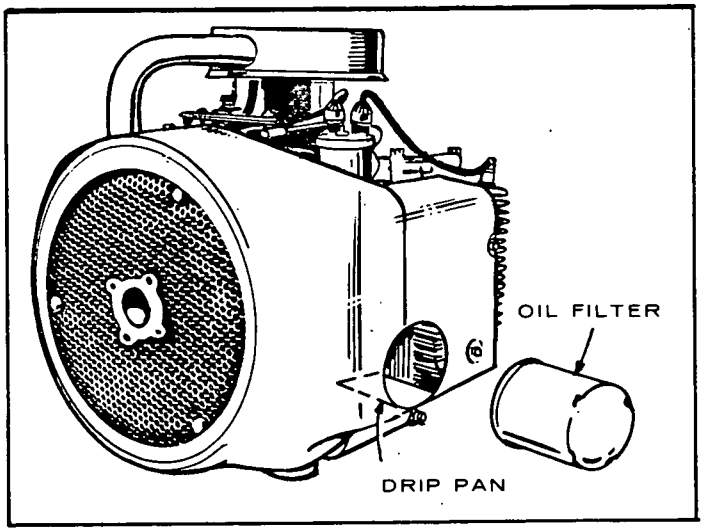
MAINTENANCE



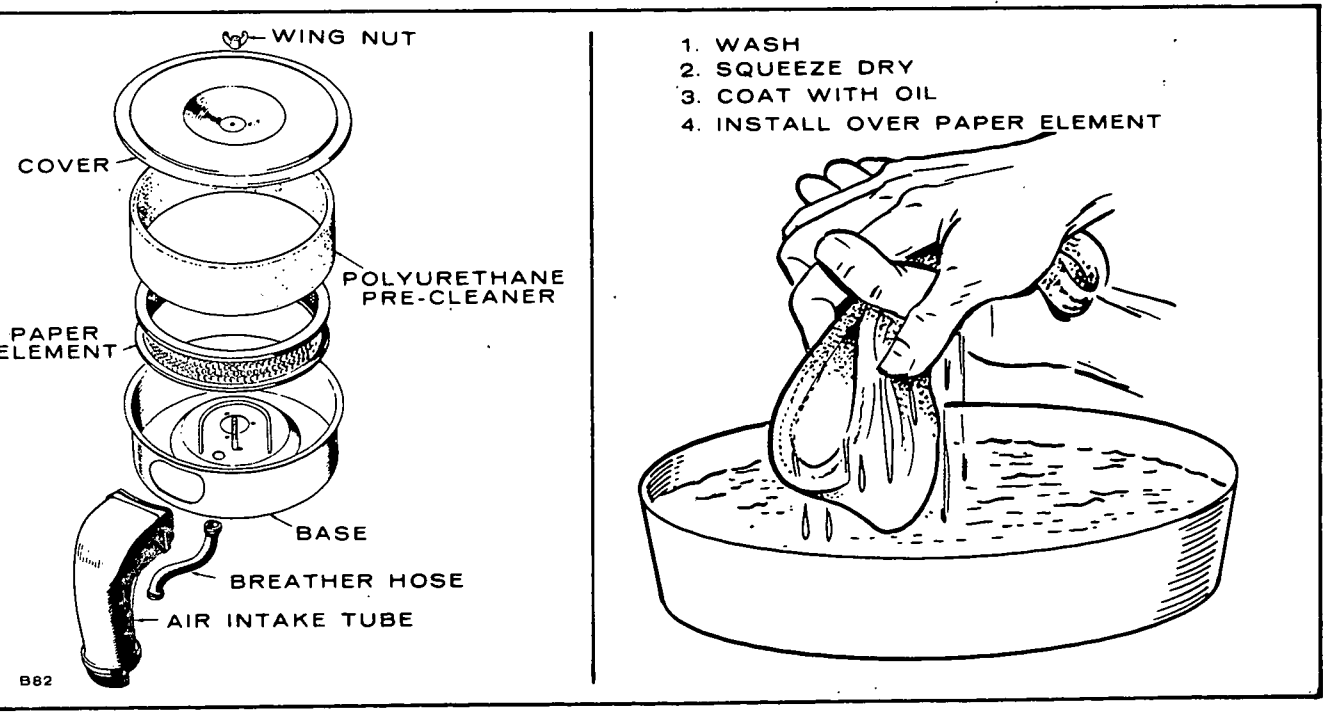
CRANKCASE BREATHER



SPARK PLUG GAP



OIL FILTER



AIR CLEANER

ADJUSTMENTS

CARBURETOR

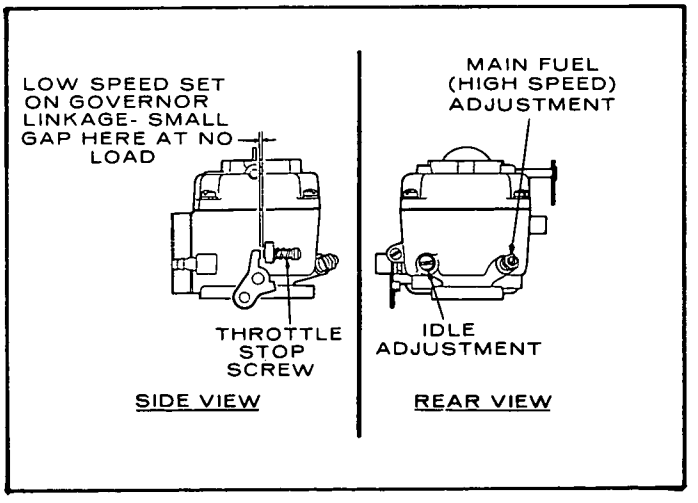
The carburetor has a main (high speed) adjustment and an idle fuel adjustment. The main adjustment affects operation under heavy load conditions. Idle adjustment affects light or no load operating conditions. Under normal circumstances, factory carburetor adjustments should not be disturbed. If an adjustment has been disturbed, turn both adjustment screws in until they just seat; then turn idle screw one turn open and main screw 1-3/8 turns open to permit starting.

CAUTION **Forcing the needle against its seat will damage it.**

Before final adjustments, warm up the engine. Adjust the idle screw with no load connected to the engine. Set the main fuel adjustment with engine running above 2600 rpm to provide smooth acceleration at no load. Final settings for main adjustment should be 1-1/4 to 1-1/2 turn open.

Set throttle stop screw (located on carburetor throttle lever) with no load connected and while running at a low speed. Turn screw to give a 1/32-inch clearance as shown in figure. Readjust idle adjustment screw with screw pushing governor linkage toward carburetor.

If the engine develops a no load "hunting" condition between 1200 and 2600 rpm, try correcting by opening the idle screw a little more. If this fails, adjust the main screw the same. Don't open either adjustment screw more than 1/2 turn beyond the maximum power point.

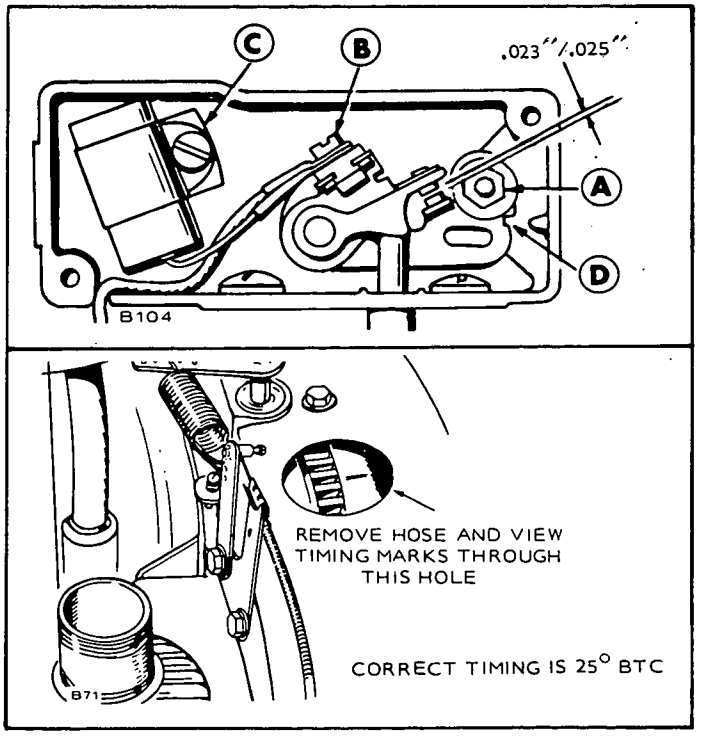


CARBURETOR ADJUSTMENT

BREAKER POINTS

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

1. Remove the two screws and the cover on the breaker box.
2. Remove the two spark plugs so engine can be easily rotated by hand. Check condition of spark plugs at this time.
3. Remove mounting nut (A) and pull the points out of the box just far enough so screw (B) can be removed and leads disconnected.
4. Remove screw (C) and replace condenser with a new one.
5. Replace points with a new set but do not completely tighten mounting nut (A).
6. Remove the air intake hose that connects to blower housing. This provides an access to view timing mark.
7. Rotate the engine clockwise (facing flywheel) by hand until the 25° BTC mark on gear cover aligns with mark on flywheel. Turn another 1/4 turn (90°) to ensure points are fully open.
8. Using a screwdriver inserted in notch (D) on the right side of points, turn points until gap measures .023 to .025 inch with a flat thickness gauge. (Be sure feeler is clean.) Tighten mounting nut and recheck gap.
9. Check ignition timing as soon as possible using continuity test lamp.



IGNITION AND TIMING ADJUSTMENT

IGNITION TIMING

The timing on the engine is preset at the factory. A non-movable breaker point box is used; however, a slight timing change could be made by adjusting points.

The engine is equipped with an automotive type battery ignition system. Both spark plugs fire simultaneously, thus the need for a distributor is eliminated. Spark advance is set at 25° BTC (before top center) and should be maintained for best engine performance. Always check timing after replacing ignition points or if noticing poor engine performance. Proceed as follows:

Timing Procedure (Preferred Method) — Engine Not Running and Cold:

1. Connect 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.
2. Turn crankshaft against rotation (counterclockwise) until the points close. Then slowly turn the crankshaft with rotation (clockwise).
3. The lamp should go out just as the points break which is the time at which ignition occurs (25° BTC).

PERIODIC SERVICE GUIDE

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The following schedule can be used 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 engine or accessories, loss of power, overheating, etc., contact your nearest Onan Parts and Service Center.

PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS					
	8	50	100	200	400	1000
Inspect Engine Generally	x[3]					
Check Oil Level	x					
Service Air Cleaner		x[1]				
Change Crankcase Oil		x[1]				
Check Battery Electrolyte Level		x				
Check Breaker Points			x[1]			
Replace Oil Filter			x			
Replace Spark Plugs			x			
Check Valve Clearance		x[4]		x[2]		
Clean Breather Valve				x		
Remove Carbon and Lead Deposits				x[2]		
Replace Air Cleaner Element				x[1]		
Inspect Valves, Grind if Necessary					x[2]	
Complete Reconditioning (If Required)						x[2]

x[1] Perform more often in extremely dusty conditions.
x[2] For detailed maintenance, contact an Onan Service Center.
x[3] Check for fuel leaks, exhaust leaks, etc.
x[4] Initial break in check only.