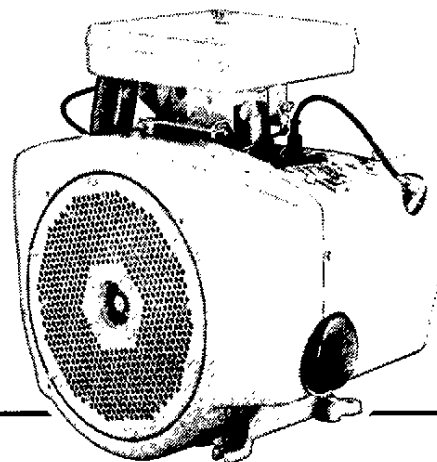


# Onan

## Operators and Service Manual

P216  
P218  
P220  
Engine



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965-0163  
10-95  
Printed in U.S.A.



Emissions Supplement: 900-1021

Date: 07-2000

Insert with-

Manual Number & Date: See Table 1

Models: See Table 1

**Purpose:** This supplement for the Operator's Manuals specified in Table 1 clarifies how compliance with engine emissions regulations, including U. S. EPA Phase 2 and California Air Resources Board regulations for Model Year 2000 onwards, is presented on genset and engine nameplates (Figures 1 and 2). This sheet is to be bound in the genset or engine manual behind the front cover and in front of earlier Supplements, if any.

For engines of less than 225 cc displacement, Category C = 125 hrs, B = 250 hrs, A = 500 hrs. For engines of 225 cc and greater displacement, Category C = 250 hrs, B = 500 hrs, A = 1000 hrs.

TABLE 1. MANUALS AFFECTED BY SUPPLEMENT

Manual No.	Date	Genset Models
965-0138	5/97	BGM / NHM
965-0175	7/97	BGD / NHD
965-0176	7/97	BGE / NHE
981-0153	7/97	KV
981-0158	6/99	KVC
981-0159	5/00	KY
981-0160	7/99	MKY
983-0101	5/00	HGJAA / HGJAB / HGJAC
Manual No.	Date	Engine Models
965-0163	10/95	Miller P216 / P218 / P220 / P224
965-0174	10/97	E124V Floorcare
965-0178	7/97	E125V / E140V
965-0179	7/97	E125H / E140H
965-0180	7/97	P218V / P220V
965-0182B	-	P216 / P218 / P220 / P224
965-0183	-	P248V Floorcare

**Nameplate Information:** See the Operator's Manual for the location of the actual nameplate on the genset or engine. Figures 1 and 2 illustrate where the information regarding compliance with U. S. EPA and California Air Resources Board regulations on the nameplate. The appropriate figure in this supplement supercedes the nameplate illustration in Figure 1 in the genset or engine manual in which the supplement is bound.

**Federal Emissions Compliance Period:** The Federal Emissions Compliance Period referred to on the nameplate indicates the number of operating hours for which the engine has been shown to meet Federal emissions requirements.

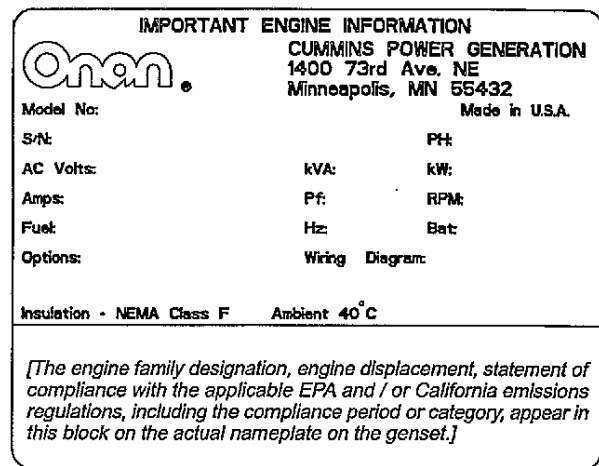


FIGURE 1. TYPICAL GENSET NAMEPLATE

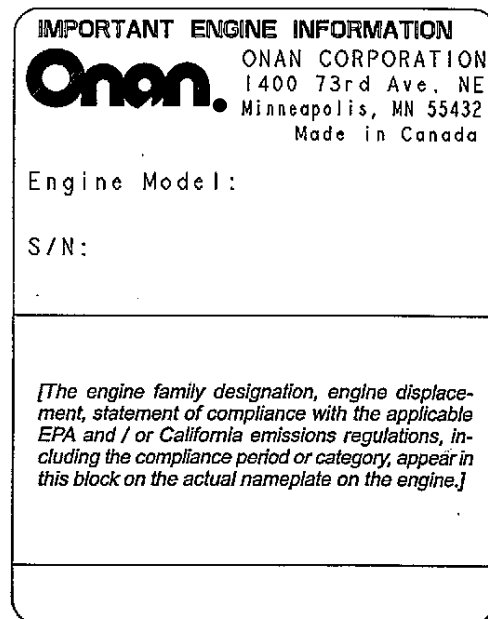


FIGURE 2. TYPICAL ENGINE NAMEPLATE

# Safety Precautions

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

**▲ DANGER** *This symbol if used warns of immediate hazards which will result in severe personal injury or death.*

**▲ WARNING** *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

**▲ CAUTION** *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that can result in serious, personal injury. Take care in following these recommended procedures. All local, state and federal codes should be consulted and complied with.

**▲ WARNING** *This engine is not designed or intended for use in any type of aircraft. Use of this engine in aircraft can result in engine failure and causes serious personal injury or death.*

## 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 and accurately torqued. 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.
- 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 for 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 applications, especially those within a confined area, should be equipped with an exhaust system to discharge gases to the outside 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.

## Exhaust Gas is Deadly!

Exhaust gases contain carbon monoxide, a poisonous gas that can cause unconsciousness and death. It is an odorless and colorless gas formed during combustion of hydrocarbon fuels. Symptoms of carbon monoxide poisoning are:

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

If you experience any of these symptoms, get out into fresh air immediately, shut down the unit and do not use until it has been inspected.

The best protection against carbon monoxide inhalation is proper installation and regular, frequent inspections 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 when coolant temperature is above 212°F (100°C) or while engine is running.

## Keep the Unit and Surrounding Area Clean

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

**Supplement 965-1062**

**Date: 11-95**

**Insert with-**

**Title: Miller Engine Operator and Service Manual**

**Number (Date): 965-0163 (10-95)**

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## **PURPOSE**

This Supplement transmits the revisions to the Operator and Service Manual necessary for covering **Spec G** engines. Note that the nameplate (Figure S-1) on Spec G and later engines will have the statement: "This engine meets 1995-1998 California emissions regulations for ULGE engines."

To satisfy California emissions regulations, Spec G and later engines have modified, precision-manufactured carburetors with tamper-resistant fuel mixture jets. It should therefore be noted that fuel mixture adjustments should not be attempted. Nor should the carburetor be overhauled. Instead, a malfunctioning carburetor should be replaced.

**⚠ WARNING** *Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California.*

*Modification, removal or replacement of the engine label is also prohibited.*

## **REVISIONS TO OPERATOR AND SERVICE MANUAL 965-0163**

1. **Insert this Supplement in its entirety under the front cover of the manual.**
2. On **Page 6-1** write: "See Supplement 965-1062 for fuel and engine oil recommendations."
3. On **Page 7-1** following the PERIODIC MAINTENANCE SCHEDULE write: "For Spec G and later engines, replace spark plugs after every 500 hours of operation."
4. On **Page 8-1** write: "See Supplement 965-1062 for engine oil recommendations."
5. On **Page 9-2** following the third and fourth paragraphs in the first column write: "Does not apply to Spec G and later engines. See Supplement 965-1062."
6. On **Page 9-2** following Paragraph 4. B. under the Sub-heading **P218 Adjustments** write: "Do not attempt to adjust fuel mixture on Spec G and later engines."
7. On **Page 9-2** following Paragraph 3. B. under the Sub-heading **P216, P220 Adjustments** write: "Do not attempt to adjust fuel mixture on Spec G and later engines."
8. On **Page 9-3** under the Heading **CARBURETOR OVERHAUL** write: "Does not apply to Spec G and later engines. See Supplement 965-1062."

## MODEL IDENTIFICATION (BEGINNING SPEC G)

Whenever contacting a Miller® or Onan® dealer or distributor for information, parts or service, always provide the model number and the serial number marked on the nameplate of the engine. (The serial number is in the row marked "S/N", just below the model number.) Figure S-1 illustrates a typical engine nameplate.


<b>IMPORTANT ENGINE INFORMATION</b>	
	ONAN CORPORATION 1400 73rd Ave. NE Minneapolis, MN 55432 MADE IN U.S.A.
Engine Model: P220 G-I/11395G	
S/N: L951234567	99-2453
REFER TO OPERATOR'S MANUAL FOR MAINTENANCE SPECIFICATIONS AND ADJUSTMENTS.	
THIS ENGINE MEETS 1995 - 1998 CALIFORNIA EMISSION REGULATIONS FOR ULGE ENGINES.	
SN5782U1G2RA	782 CC
<b>UNLEADED GASOLINE ONLY</b>	

FIGURE S-1. TYPICAL ENGINE NAMEPLATE

## FUEL RECOMMENDATIONS

**⚠ WARNING** *Gasoline is highly flammable and can cause severe personal injury or death. Do not smoke if you smell gasoline or are near fuel tanks or gasoline-burning equipment or are in an area sharing ventilation with such equipment. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other sources of ignition well away. Keep an ABC fire extinguisher handy.*

Use clean, fresh unleaded gasoline having a minimum octane rating (Anti-Knock Index) of 87.

During some times of the year only mandated "oxygenated" gasolines may be available. These are acceptable for use, but not preferable. Leaded gasoline may be used but will result in the extra maintenance required for removing combustion chamber and spark plug deposits. Do not use gasoline or gasoline additives (de-icers) containing methanol because methanol can be corrosive to fuel system components.

**⚠ CAUTION** *Do not use gasoline or gasoline additives containing methanol because methanol can be corrosive to fuel system components.*

*Avoid using highly leaded gasolines and lead additives because of the extra engine maintenance that will be required.*

## ENGINE OIL RECOMMENDATIONS

Use premium quality motor oil. Look for the API (American Petroleum Institute) classification and use Class SG or SH oil (also SG/CD, SG/CE, SH/CD or SH/CE). Also look for the SAE (Society of Automotive Engineers) viscosity grade. Referring to Table S-1, choose the viscosity grade appropriate for the ambient temperatures expected during the period of time until the next scheduled oil change.

Single-grade SAE 30 oil is preferable when temperatures are consistently above freezing. Multigrade oils are better when wide temperature variations are expected.

**TABLE S-1. OIL VISCOSITY VS. TEMPERATURE**

EXPECTED AMBIENT TEMPERATURES	SAE VISCOSITY GRADE
32° F (0° C) and higher	30
10° F to 100° F (-12° C to 38° C)	15W-40 (OnaMax)
0° F to 80° F (-18° C to 27° C)	10W-30 10W-40
-20° F to 50° F (-28° C to 10° C)	5W-30

## INFORMATION FOR CALIFORNIA ENGINE USERS

These engines meet the requirements of California's Exhaust Emissions Standards for 1995 and later for Utility and Lawn and Garden Equipment Engines.

As a California user of these engines, please be aware that unauthorized modifications or replacement of fuel, exhaust, air intake, or speed control system components that affect engine emissions are prohibited. Unauthorized modification, removal or replacement of the engine label is prohibited.

You should carefully review Operator (Owner), Installation and other manuals and information you receive with your engine or equipment. If you are unsure that the installation, use, maintenance or service of your engine or equipment is authorized, you should seek assistance from an approved Onan engine dealer or an approved dealer for your equipment.

California engine users may use Table S-2 as an aid in locating information related to the California Air Resources Board requirements for emissions control.

**TABLE S-2. EMISSIONS CONTROL INFORMATION**

Engine Warranty Information	The California emissions control warranty statement is located in the same packet of information as this manual when the engine is shipped from the factory.
Engine Valve Lash	See <i>Specifications</i> (Page 2-1).
Engine Ignition Timing	See <i>Specifications</i> (Page 2-1). Ignition timing is not adjustable.
Engine Fuel Requirements	The engine is certified to operate on <b>unleaded gasoline</b> . See Fuel Recommendations on Page S-2 of this Supplement.
Engine Fuel Mixture Settings	The engine has a precision-manufactured carburetor which is not adjustable.
Engine Lubricating Oil Requirements	See Engine Oil Recommendations on Page S-3 of this Supplement.
Engine Adjustments	See <b>GOVERNOR OPERATION</b> on Page 9-1 and <b>P218 Adjustments</b> and <b>P216, P220 Adjustments</b> on Page 9-2, as amended by Instructions 5 and 6 on Page S-1 of this Supplement.
Engine Emission Control System	The engine emission control system consists of internal engine modifications (EM).

## CARBURETOR (BEGINNING SPEC G)

### Carburetor Replacement

Other than replacing the carburetor main fuel jet (fixed-type) with the optional high-altitude jet (Figure S-2), fuel mixture adjustments should not be attempted. Nor should the carburetor be overhauled. Instead, a malfunctioning carburetor should be replaced. Before replacing a carburetor, however, make certain 1) that all other necessary engine and generator adjustments and repairs have been performed and 2) that the carburetor is actually malfunctioning (see *Engine Troubleshooting*).

To remove the carburetor, remove the air cleaner, disconnect the fuel line and choke and throttle linkages and unbolt the carburetor from the intake manifold. When mounting the carburetor always use a new gasket. Readjust the choke and throttle cables and engine speed as instructed in the engine or equipment Operator's Manual.

### Carburetor High-Altitude Jet (Optional)

If the engine is operated at an altitude above 5000 feet (1524 metres), it is recommended that the carburetor main fuel jet be replaced with the optional high-altitude jet (which has a slightly smaller orifice).

**CAUTION** To avoid slipping and gouging the main fuel jet, use a screwdriver with a 5/16 inch (8 mm) wide blade.

**Note:** The optional high-altitude jet has not been authorized for use in California.

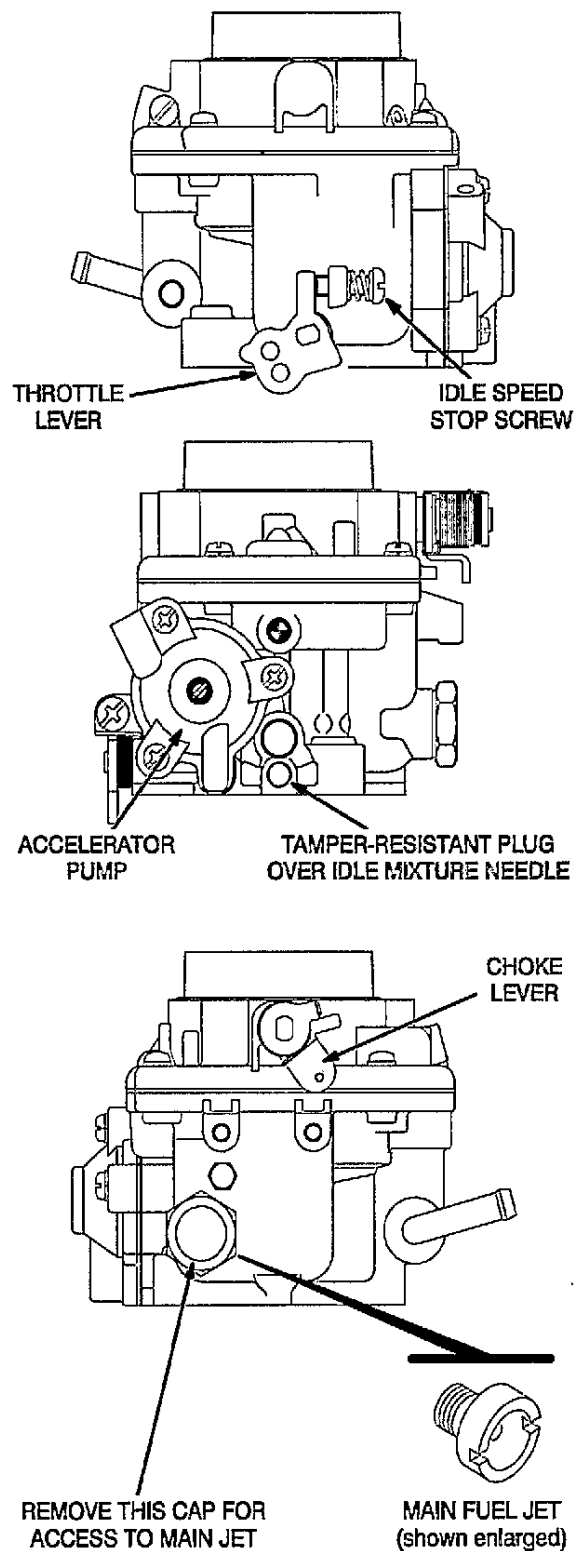


FIGURE S-2. CARBURETOR

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**▲WARNING**

**EXHAUST GAS IS DEADLY!**

*Exhaust gases from all fuels (including diesel, gasoline, liquid propane, natural gas) contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:*

- *Dizziness*
- *Nausea*
- *Headache*
- *Weakness and Sleepiness*
- *Throbbing in Temples*
- *Muscular Twitching*
- *Vomiting*
- *Inability to Think Coherently*

**IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired.**

**Protection against carbon monoxide inhalation includes proper installation, ventilation and regular, frequent visual and audible inspections of the complete exhaust system.**

**▲ WARNING: ▲**

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.



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Thank you very much!**