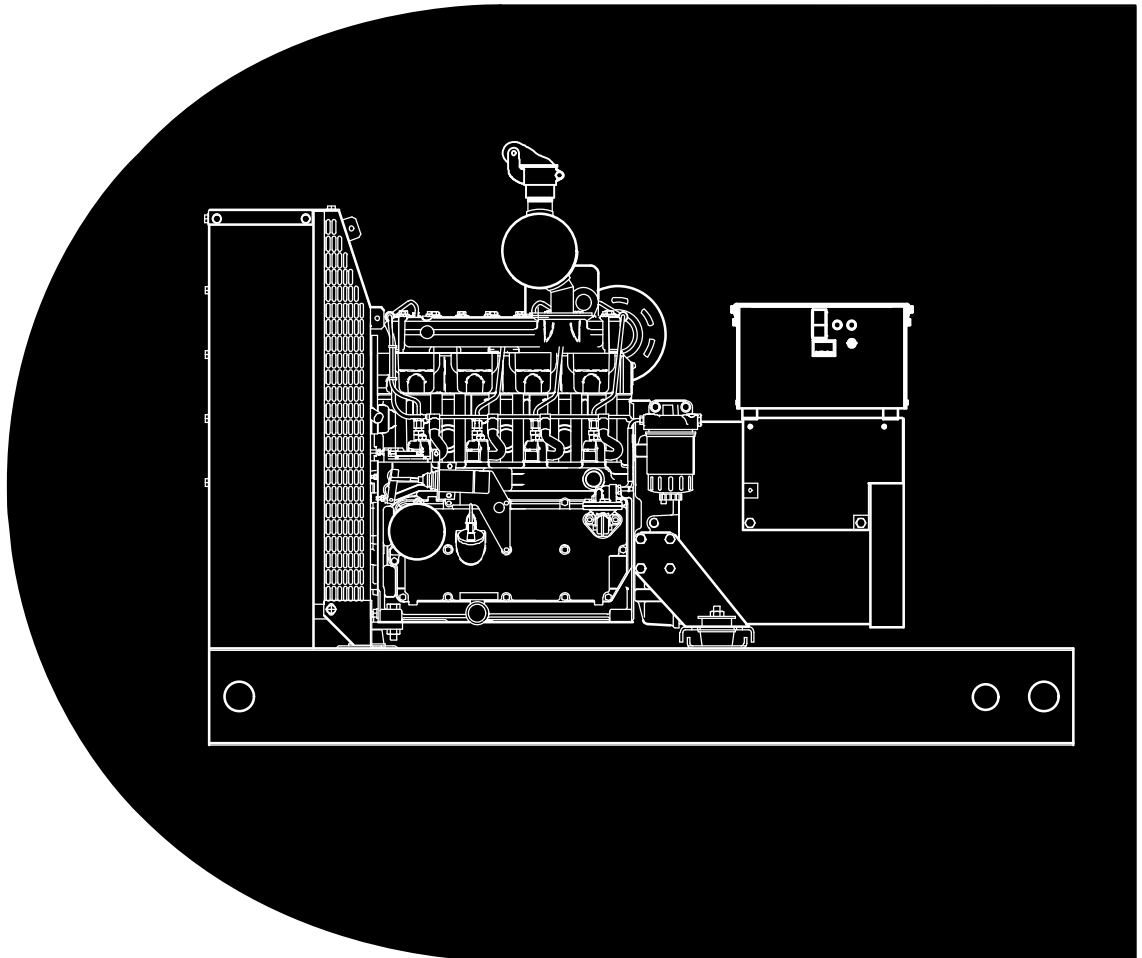


# Service Manual

## DN Series Generator Sets



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# Safety Precautions

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Thoroughly read the **OPERATOR'S MANUAL** before operating the generator set. Safe operation and top performance can be obtained only when equipment is operated and maintained properly.

The following symbols in this Manual alert you to potential hazards to the operator, service person and equipment.

**⚠ DANGER** alerts you to an immediate hazard which will result in severe personal injury or death.

**⚠ WARNING** alerts you to a hazard or unsafe practice which can result in severe personal injury or death.

**⚠ CAUTION** alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

## GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Make sure all fasteners are secure and torqued properly.
- Keep the generator set and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray out and cause severe burns.
- Before working on the generator set, disconnect the negative (–) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the generator set is running—hot, moving or

electrically live parts can cause severe personal injury or death.

- Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Do not work on the generator set when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

## GENERATOR VOLTAGE IS DEADLY!

- Generator output connections must be made by a qualified electrician in accordance with applicable codes.
- The generator set must not be connected to the public utility or any other source of electrical power. Connection could lead to electrocution of utility workers, damage to equipment and fire. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry and stand on a dry wooden platform on the ground or floor.

## FUEL IS FLAMMABLE AND EXPLOSIVE

- Do not fill the fuel tank while the engine is running unless the tank is outside the engine compartment.
- Keep flames, cigarettes, sparks, pilot lights, electrical arc-producing equipment and switches and all other sources of ignition well away from areas where fuel fumes are present and areas sharing ventilation.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.
- Use approved non-conductive flexible fuel hose for fuel connections at the generator set.

### **ENGINE EXHAUST IS DEADLY!**

- The exhaust system must be leak-free and convey all exhaust to the out-of-doors, away from buildings and building air vents, doors and windows. Look and listen for exhaust leaks daily and do not operate the generator set until all leaks have been fixed.
- Do not use engine exhaust or cooling air to heat a room or compartment.
- Make sure there is ample fresh air when operating the generator set.

### **MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH**

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, etc.

### **BATTERY GAS IS EXPLOSIVE**

- Wear safety glasses and do not smoke while servicing batteries.
- When disconnecting or reconnecting battery cables, always disconnect the negative (-) battery cable first and reconnect it last to reduce arcing.

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

Flammable vapor can cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. ***Do not operate a diesel-powered generator set where a flammable vapor environment can be created by fuel spill, leak, etc., unless the generator set is equipped with an automatic safety device to block the air intake and stop the engine.*** The owners and operators of the generator set are solely responsible for operating the generator set safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

## **KEEP THIS MANUAL NEAR THE GENERATOR SET FOR EASY REFERENCE**

# 1. Introduction

## ABOUT THIS MANUAL

This is the service manual for the DN series of generator sets. Three different generator set control schemes are available for this series of generator sets and each is covered in a separate section of this manual. Separate troubleshooting guides for control, engine and generator also appear throughout this manual. See the Table of Contents.

The wiring diagrams in the back of this manual are for reference only. Make wiring connections on the basis of the wiring diagrams shipped with the generator set.

This manual does not have instructions for servicing printed circuit board assemblies. Always replace a faulty printed circuit board assembly. Attempts to repair a printed circuit board can lead to costly damage to the equipment.

Read **Safety Precautions** and carefully observe all instructions and precautions in this manual.

**⚠ WARNING** *Improper service can lead to equipment damage, severe personal injury or death. Service must be performed by qualified persons who know about fuel, electrical and mechanical hazards. Read Safety Precautions and carefully observe all instructions and precautions in this manual.*

**⚠ WARNING** *Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law on generator sets certified by EPA.*

## TEST EQUIPMENT

Most of the tests in this manual can be done with an AC-DC multimeter, frequency meter, load test panel

and Wheatstone bridge (0.001 ohm precision is necessary for measuring generator stator winding resistance).

## FUEL RECOMMENDATIONS

Use clean, fresh No. 2 diesel fuel (ASTM 2-D) in ambients above freezing and No. 1 diesel fuel (ASTM 1-D) in ambients below freezing. The fuel should have a Cetane number of at least 45 for reliable starting.

**⚠ WARNING** *Diesel fuel is combustible and can cause severe personal injury or death. Do not smoke near diesel fuel tanks or equipment. Keep flames, sparks, pilot lights, switches, other and arc-producing equipment and all other sources of ignition well away. Keep a type ABC fire extinguisher handy.*

## ENGINE OIL RECOMMENDATIONS

Use API (American Petroleum Institute) performance Class **CH-4**, **CG-4** or **CF-4** engine oil, which may be in combination with performance Class SJ, SH or SG (for example: CH-4/SJ). Also look for the SAE (Society of Automotive Engineers) viscosity grade. Referring to Figure 1-1, choose the viscosity grade appropriate for the outdoor ambient temperatures expected until the next scheduled oil change.

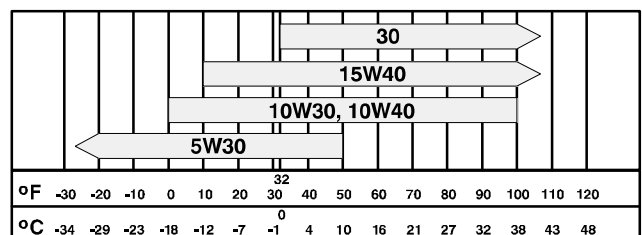


FIGURE 1-1. SAE VISCOSITY GRADE vs. AMBIENT TEMPERATURE

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